Alcatel·Lucent

Alcatel-Lucent 7705

SERVICE AGGREGATION ROUTER OS | RELEASE 2.1

INTERFACE CONFIGURATION GUIDE

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List of Acronyms

Acronym	Expansion
2G	second generation wireless telephone technology
3DES	triple DES (data encryption standard)
3G	third generation mobile telephone technology
5620 SAM	5620 Service Aware Manager
7705 SAR	7705 Service Aggregation Router
7710 SR	7710 Service Router
7750 SR	7750 Service Router
9500 MPR	9500 Microwave Packet Radio
ABR	available bit rate area border router
AC	alternating current attachment circuit
ACL	access control list
ACR	adaptive clock recovery
AFI	authority and format identifier
AIS	alarm indication signal
ANSI	American National Standards Institute
Apipe	ATM VLL
ARP	address resolution protocol
AS	autonomous system
ASAP	any service, any port
ASBR	autonomous system boundary router
ATM	asynchronous transfer mode
ATM PVC	ATM permanent virtual circuit

Acronym	Expansion
Batt A	battery A
B-bit	beginning bit (first packet of a fragment)
Bellcore	Bell Communications Research
BFD	bidirectional forwarding detection
BITS	building integrated timing supply
BOF	boot options file
BRAS	Broadband Remote Access Server
BSC	Base Station Controller
BSTA	Broadband Service Termination Architecture
BTS	base transceiver station
CAS	channel associated signaling
CBN	common bonding networks
CBS	committed buffer space
CC	control channel continuity check
CCM	continuity check message
CE	customer edge circuit emulation
CEM	circuit emulation
CES	circuit emulation services
CESoPSN	circuit emulation services over packet switched network
CFM	connectivity fault management
CIDR	classless inter-domain routing
CIR	committed information rate
CLI	command line interface
CLP	cell loss priority

Acronym	Expansion
CoS	class of service
CPE	customer premises equipment
Cpipe	circuit emulation (or TDM) VLL
CPM	Control and Processing Module (CPM is used instead of CSM when referring to CSM filtering – to align with CLI syntax used with other SR products)
CPU	central processing unit
CRC	cyclic redundancy check
CRON	a time-based scheduling service (from chronos = time)
CSM	Control and Switching Module
CSNP	complete sequence number PDU
CSPF	constrained shortest path first
CV	connection verification customer VLAN (tag)
CW	control word
DC	direct current
DC-C	DC return - common
DC-I	DC return - isolated
DCE	data communications equipment
DCO	digitally controlled oscillator
DDoS	distributed DoS
DES	data encryption standard
DHCP	dynamic host configuration protocol
DIS	designated intermediate system
DNS	domain name server
DoS	denial of service

Acronym	Expansion
dot1p	IEEE 802.1p bits, found in Ethernet or VLAN ingress packet headers and used to map traffic to up to eight forwarding classes
dot1q	IEEE 802.1q encapsulation for Ethernet interfaces
DPLL	digital phase locked loop
DSCP	differentiated services code point
DSL	digital subscriber line
DSLAM	digital subscriber line access multiplexer
DTE	data termination equipment
DU	downstream unsolicited
e911	enhanced 911 service
E-bit	ending bit (last packet of a fragment)
ECMP	equal cost multi-path
EFM	Ethernet in the first mile
EGP	exterior gateway protocol
EIA/TIA-232	electronic industries alliance/telecommunications industry association standard 232 (also known as RS-232)
ELER	egress label edge router
Epipe	Ethernet VLL
ERO	explicit route object
ESD	electrostatic discharge
ETE	end-to-end
ETH-CFM	Ethernet connectivity fault management (IEEE 802.1ag)
EVDO	evolution - data optimized
EXP bits	experimental bits
FC	forwarding class
FCS	frame check sequence

Acronym	Expansion
FDB	forwarding database
FDL	facilities data link
FEC	forwarding equivalence class
FF	fixed filter
FIB	forwarding information base
FIFO	first in, first out
FNG	fault notification generator
FRR	fast reroute
FTN	FEC-to-NHLFE
FTP	file transfer protocol
GigE	Gigabit Ethernet
GRE	generic routing encapsulation
GSM	Global System for Mobile Communications (2G)
HCM	high capacity multiplexing
HEC	header error control
HMAC	hash message authentication code
HSDPA	high-speed downlink packet access
HSPA	high-speed packet access
IBN	isolated bonding networks
ICMP	Internet control message protocol
ICP	IMA control protocol cells
IEEE	Institute of Electrical and Electronics Engineers
IEEE 1588v2	Institute of Electrical and Electronics Engineers standard 1588-2008
IES	Internet Enhanced Service
IETF	Internet Engineering Task Force

Acronym	Expansion
IGP	interior gateway protocol
ILER	ingress label edge router
ILM	incoming label map
IMA	inverse multiplexing over ATM
IOM	input/output module
IP	Internet Protocol
IPCP	Internet Protocol Control Protocol
Ipipe	IP interworking VLL
IS-IS	Intermediate System-to-Intermediate System
IS-IS-TE	IS-IS-traffic engineering (extensions)
ISO	International Organization for Standardization
LB	loopback
LBM	loopback message
LBR	loopback reply
LCP	link control protocol
LDP	label distribution protocol
LER	label edge router
LIB	label information base
LLF	link loss forwarding
LLID	loopback location ID
LSA	link-state advertisement
LSDB	link-state database
LSP	label switched path link-state PDU (for IS-IS)
LSR	label switch router link-state request

Acronym	Expansion
LSU	link-state update
LT	linktrace
LTM	linktrace message
LTN	LSP ID to NHLFE
LTR	linktrace reply
MA	maintenance association
MAC	media access control
MBB	make-before-break
MBS	maximum buffer space maximum burst size media buffer space
MBSP	Mobile Backhaul Service Provider
MC-MLPPP	multi-class multilink point-to-point protocol
MD	maintenance domain
MD5	message digest version 5 (algorithm)
MDA	media dependent adapter
ME	maintenance entity
MEF	Metro Ethernet Forum
MEN	Metro Ethernet network
MEP	maintenance association end point
MFC	multi-field classification
MHF	MIP half function
MIB	management information base
MIP	maintenance association intermediate point
MIR	minimum information rate
MLPPP	multilink point-to-point protocol

Acronym	Expansion
MP	merge point multilink protocol
MPLS	multiprotocol label switching
MPR	see 9500 MPR
MRRU	maximum received reconstructed unit
MRU	maximum receive unit
MSDU	MAC Service Data Unit
MS-PW	multi-segment pseudowire
MTSO	mobile trunk switching office
MTU	maximum transmission unit multi-tenant unit
MW	microwave
NBMA	non-broadcast multiple access (network)
NET	network entity title
NHLFE	next hop label forwarding entry
NHOP	next-hop
NNHOP	next next-hop
NNI	network-to-network interface
Node B	similar to BTS but used in 3G networks — term is used in UMTS (3G systems) while BTS is used in GSM (2G systems)
NSAP	network service access point
NSSA	not-so-stubby area
NTP	network time protocol
OAM	operations, administration, and maintenance
OAMPDU	OAM protocol data units
OC3	optical carrier, level 3
OS	operating system

Acronym	Expansion
OSI	Open Systems Interconnection (reference model)
OSINLCP	OSI Network Layer Control Protocol
OSPF	Open Shortest Path First
OSPF-TE	OSPF-traffic engineering (extensions)
OSS	operations support system
PDU	protocol data units
PDV	packet delay variation
PDVT	packet delay variation tolerance
PE	provider edge router
PHB	per-hop behavior
PHY	physical layer
PID	protocol ID
PIR	peak information rate
PLR	point of local repair
POP	point of presence
POS	packet over SONET
PPP	point-to-point protocol
PSN	packet switched network
PSNP	partial sequence number PDU
PTP	precision time protocol
PVC	permanent virtual circuit
PVCC	permanent virtual channel connection
PW	pseudowire
PWE3	pseudowire emulation edge-to-edge
QoS	quality of service
RADIUS	Remote Authentication Dial In User Service

Acronym	Expansion
RAN	Radio Access Network
RDI	remote defect indication
RED	random early discard
RESV	reservation
RIB	routing information base
RNC	Radio Network Controller
RRO	record route object
RS-232	recommended standard 232 (also known as EIA/TIA-232)
RSVP-TE	resource reservation protocol - traffic engineering
R&TTE	Radio and Telecommunications Terminal Equipment
RT	receive/transmit
RTM	routing table manager
RTN	battery return
RTP	real-time protocol
SAA	service assurance agent
SAP	service access point
SAR-8	7705 Service Aggregation Router - 8-slot chassis
SAR-F	7705 Service Aggregation Router - fixed form-factor chassis
SAToP	structure-agnostic TDM over packet
SCP	secure copy
SDH	synchronous digital hierarchy
SDI	serial data interface
SDP	service destination point
SE	shared explicit
SFP	small form-factor pluggable (transceiver)
SGT	self-generated traffic

Acronym	Expansion
SHA-1	secure hash algorithm
SIR	sustained information rate
SLA	Service Level Agreement
SNMP	Simple Network Management Protocol
SNPA	subnetwork point of attachment
SNTP	simple network time protocol
SONET	synchronous optical networking
S-PE	switching provider edge router
SPE	source provider edge router
SPF	shortest path first
SPT	shortest path tree
SR	service router (includes 7710 SR, 7750 SR)
SRLG	shared risk link group
SSH	secure shell
SSU	system synchronization unit
STM1	synchronous transport module, level 1
SVC	switched virtual circuit
TACACS+	Terminal Access Controller Access-Control System Plus
TCP	transmission control protocol
TDM	time division multiplexing
TE	traffic engineering
TFTP	trivial file transfer protocol
TLDP	targeted LDP
TLV	type length value
ToS	type of service
T-PE	terminating provider edge router

Acronym	Expansion
TPE	target provider edge router
TPID	tag protocol identifier
TTL	time to live
TTM	tunnel table manager
UBR	unspecified bit rate
UDP	user datagram protocol
UMTS	Universal Mobile Telecommunications System (3G)
UNI	user-to-network interface
V.35	v-series recommendation 35
VC	virtual circuit
VCC	virtual channel connection
VCCV	virtual circuit connectivity verification
VCI	virtual circuit identifier
VID	VLAN ID
VLAN	virtual LAN
VLL	virtual leased line
VoIP	voice over IP
VP	virtual path
VPC	virtual path connection
VPI	virtual path identifier
VPN	virtual private network
VPRN	virtual private routed network
VRF	virtual routing and forwarding table
WCDMA	wideband code division multiple access (transmission protocol used in UMTS networks)
WRED	weighted random early discard

Preface

About This Guide

This guide describes system concepts and provides configuration examples to provision CSM cards, adapter cards, and ports for the Alcatel-Lucent 7705 Service Aggregation Router.

This guide is organized into functional chapters and provides concepts and descriptions of the implementation flow, as well as Command Line Interface (CLI) syntax and command usage.

For hardware information on the 7705 SAR chassis and the adapter cards, including installation, connections, LEDs, and pinouts, refer to:

- 7705 SAR-8 Chassis Installation Guide
- 7705 SAR-F Chassis Installation Guide
- 7705 SAR 16-port T1/E1 ASAP Adapter Card Installation Guide
- 7705 SAR 8-port Ethernet Adapter Card Installation Guide
- 7705 SAR OC3/STM1 Adapter Card Installation Guide
- 7705 SAR Serial Data Interface Card Installation Guide

Audience

This guide is intended for network administrators who are responsible for configuring the 7705 SAR. It is assumed that the network administrators have an understanding of networking principles and configurations, routing processes, and protocols and standards, including:

- CLI concepts
- adapter card and port configuration
- QoS policies
- services

List of Technical Publications

The 7705 SAR OS documentation set is composed of the following guides:

- 7705 SAR OS Basic System Configuration Guide

  This guide describes basic system configurations and operations.
- 7705 SAR OS System Management Guide

  This guide describes system security and access configurations as well as event logging and accounting logs.
- 7705 SAR OS Interface Configuration Guide

  This guide describes card and port provisioning.
- 7705 SAR OS Router Configuration Guide

  This guide describes logical IP routing interfaces, IP-based filtering, and routing policies.
- 7705 SAR OS MPLS Guide

  This guide describes how to configure Multiprotocol Label Switching (MPLS), Resource Reservation Protocol for Traffic Engineering (RSVP-TE), and Label Distribution Protocol (LDP).
- 7705 SAR OS Services Guide

  This guide describes how to configure service parameters such as service access points (SAPs), service destination points (SDPs), customer information, user services, and Operations, Administration and Maintenance (OAM) tools.
- 7705 SAR OS Quality of Service Guide

  This guide describes how to configure Quality of Service (QoS) policy management.
- 7705 SAR OS Routing Protocols Guide

  This guide provides an overview of dynamic routing concepts and describes how to configure them.

Technical Support

If you purchased a service agreement for your 7705 SAR router and related products from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller for assistance. If you purchased an Alcatel-Lucent service agreement, contact your welcome center at:

Web: http://www.alcatel-lucent.com/support

Getting Started

In This Chapter

This chapter provides process flow information to configure CSM cards, adapter cards, and ports.

Alcatel-Lucent 7705 SAR Interface Configuration Process

Table 1 lists the tasks necessary to provision CSM cards, adapter cards, and ports.

This guide is presented in an overall logical configuration flow. Each section describes a software area and provides CLI syntax and command usage to configure parameters for a functional area.

Table 1: Configuration Process

Area	Task	Chapter
Provisioning	Chassis slots and cards	Configuring the IOM and Card Slot on page 28
	Adapter cards	Configuring Adapter Cards on page 29
	Ports	Configuring Ports on page 31
Reference	List of IEEE, IETF, and other proprietary entities	Standards and Protocol Support on page 301

Notes on 7705 SAR-8 and 7705 SAR-F

The 7705 SAR-8 and the 7705 SAR-F run the same operating system software. The main difference between the products is their hardware configuration. The 7705 SAR-8 has an 8-slot chassis that supports two CSMs, six adapter cards, and a Fan module. The 7705 SAR-F chassis has a fixed hardware configuration, replacing the 7705 SAR-8 physical components (the CSM, Fan module, and adapter cards) with an all-in-one unit that provides comparable functional blocks, as detailed in Table 2.

The fixed configuration of the 7705 SAR-F means that provisioning the router at the "card slot" and "type" levels is preset and is not user-configurable. Operators begin configurations at the port level.

Note: Unless stated otherwise, references to the terms "Adapter card" and "CSM" throughout the 7705 SAR OS documentation set include the equivalent functional blocks on the 7705 SAR-F.

Table 2: 7705 SAR-8 and 7705 SAR-F Comparison

7705 SAR-8	7705 SAR-F	Notes
CSM	Control and switching functions	The control and switching functions include the console and management interfaces, the alarm and fan functions, the synchronization interfaces, system LEDs, and so on.
Fan module	Integrated with the control and switching functions	
16-port T1/E1 ASAP Adapter card	16 individual T1/E1 ports on the faceplate	The T1/E1 ports on the 7705 SAR-F are equivalent to the T1/E1 ports on the 16-port T1/E1 ASAP Adapter card, except that the 16 T1/E1 ports on the 7705 SAR-F support multiple synchronization sources to support two timing references. On the 7705 SAR-8, the CLI indicates the MDA type for the 16-port T1/E1 ASAP Adapter card as `a16-chds1`. On the 7705 SAR-F, the CLI indicates the MDA type for the 7705 SAR-F ports as `a16-chds1v2`.

Table 2: 7705 SAR-8 and 7705 SAR-F Comparison (Continued)

7705 SAR-8	7705 SAR-F	Notes
8-port Ethernet Adapter card	8 individual Ethernet ports on the faceplate	The –48 VDC versions of the 7705 SAR-8 support two versions of the 8-port Ethernet Adapter card, with version 2 having additional support for Synchronous Ethernet. The Ethernet ports on the 7705 SAR-F are equivalent to the Ethernet ports on version 2 of the 8-port Ethernet Adapter card and support multiple synchronization sources to support two timing references. The +24 VDC version of the 7705 SAR-8 only supports version 2 of the 8-port Ethernet Adapter card. On the 7705 SAR-8, the CLI indicates the MDA type for the 8-port Ethernet Adapter card as `a8-eth` or `a8-ethv2`. On the 7705 SAR-F, the CLI indicates the MDA type for the 7705 SAR-F Ethernet ports as `a8-ethv3`, to distinguish it from the actual version 2 of the 8-port Ethernet Adapter card.
Requires user configuration at card (IOM) and MDA (adapter card) levels	Configuration at card (IOM) and MDA (adapter card) levels is preset and users cannot change these types	

7705 SAR Interfaces

In This Chapter

This chapter provides information about configuring chassis slots, cards, and ports.

Topics in this chapter include:

Configuration Overview

This guide uses the term "preprovisioning" in the context of preparing or preconfiguring entities such as chassis slots, the IOM, adapter cards, ports, and interfaces, prior to hardware actually being installed in the chassis. These entities can be installed but not enabled. When the entity is in a `no shutdown` state (administratively enabled), the entity is considered to be provisioned.

Alcatel-Lucent 7705 SAR routers provide the capability to configure chassis slots to accept specific adapter card types and set the relevant configurations before the equipment is actually installed. The preprovisioning ability allows you to plan your configurations as well as monitor and manage your router hardware inventory. Ports and interfaces can also be preprovisioned. When the functionality is needed, the card(s) can be inserted into the appropriate chassis slots as required.

The following sections are discussed:

- Configuring the IOM and Card Slot
- Configuring Adapter Cards
- Configuring Ports

Configuring the IOM and Card Slot

The 7705 SAR card slot ID is always **1** and the card type for the IOM is always **iom-1g**.

On the 7705 SAR-8, the CSM, which can only be installed in slot A or B of the chassis, does not need to be provisioned. However, the IOM, which is virtualized in the 7705 SAR software, must be activated before the adapter cards and ports can be preprovisioned and configured. The IOM is activated by designating it a card slot ID and card type. This enables the chassis slots to accept the adapter cards.

The 7705 SAR-F has a fixed physical configuration and uses only one control and switching functional block, which is referred to on the CLI as CSM A. The CSM and IOM do not need to be provisioned in order to provision the interface on the adapter cards.

The slot ID (1) is used as part of the adapter card and port identifier on the CLI.

Configuring Adapter Cards

A chassis slot and card type must be specified and provisioned before an adapter card can be preprovisioned. A chassis slot is a physical slot designated with an MDA ID from 1 to 6. An adapter card is provisioned when a type designated from the allowed adapter card types is inserted. A preprovisioned adapter card slot can remain empty without conflicting with populated slots.

The 7705 SAR-8 supports the following adapter cards:

- 16-port T1/E1 ASAP Adapter card
- 8-port Ethernet Adapter cards (version 1 and version 2)
- 4-port OC3/STM1 Clear Channel Adapter card
- 2-port OC3/STM1 Channelized Adapter card
- 12-port Serial Data Interface card

Up to six adapter cards can be installed in the chassis in any combination that does not exceed the supported number. Up to two 2-port OC3/STM1 Channelized Adapter cards can be installed in a 7705 SAR-8 chassis. If 12-port Serial Data Interface cards are installed in the chassis, network applications require at least one 16-port T1/E1 ASAP Adapter card or 8-port Ethernet Adapter card to be installed as well.

Once installed and enabled, the system verifies that the installed adapter card type matches the configured parameters. If the parameters do not match, the adapter card remains offline.

On the CLI, the adapter cards are referred to as MDAs. The adapter card is identified using the format *slot/mda*, where *slot* identifies the IOM card slot ID (always 1) and *mda* identifies the physical slot in the chassis for the adapter card; for example, 1/5.

The 7705 SAR-F has a fixed physical configuration that includes T1/E1 and Ethernet ports based on the 16-port T1/E1 ASAP Adapter card and the 8-port Ethernet Adapter card (version 2). These cards do not need to be provisioned in order to provision the T1/E1 and Ethernet ports.

The following output displays the administrative and operational states of all cards in the 7705 SAR-8 chassis. A similar output for the 7705 SAR-F is also shown.

For the 7705 SAR-8:

```
ALU-1>config# show card state

===============================================================================
Card State
===============================================================================
Slot/  Provisioned      Equipped         Admin Operational   Num   Num Comments
Id     Type             Type             State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-1g           iom-1g           up    up                  6
1/1    a8-ethv2         a8-ethv2         up    up            8
1/2    a16-chds1        a16-chds1        up    up            16
1/3    a4-oc3           a4-oc3           up    up            4
1/5    a2-choc3         a2-choc3         up    up            2
A      csm-1g           csm-1g           up    up                      Active
B      csm-1g                            up    down                    Standby
===============================================================================
ALU-1>config#
```

For the 7705 SAR-F:

```
ALU-1# show card

===============================================================================
Card State
===============================================================================
Slot/  Provisioned      Equipped         Admin Operational   Num   Num Comments
Id     Type             Type             State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-1g           iom-1g           up    up            2
1/1    a16-chds1v2      a16-chds1v2      up    provisioned   16
1/2    a8-ethv3         a8-ethv3         up    provisioned   8
A      csm-1g           csm-1g           up    up                      Active
 ===============================================================================
ALU-1#
```

Channelized Adapter Card Support

Each 16-port T1/E1 ASAP Adapter card and 12-port Serial Data Interface card supports channelization down to DS0.

On the 16-port T1/E1 ASAP Adapter card and 2-port OC3/STM1 Channelized Adapter card, up to 24 channel groups are supported on a DS1 circuit and up to 32 channel groups on an E1 circuit. The 12-port Serial Data Interface card supports a single channel group on a channelized RS-232 (also known as EIA/TIA-232) or V.35 circuit.

Configuring Ports

Before a port can be configured, the slot must be provisioned with a card type and the adapter card type must be specified.

The 7705 SAR supports the following port types:

- Ethernet — the 8-port Ethernet Adapter cards have six RJ-45 ports for 10/100BASE-T (Ethernet and Fast Ethernet) connections. The cards also have two SFP ports for fiber or copper SFPs. Fast Ethernet and Gigabit (100 Mb/s and 1000 Mb/s) fiber connections and 10/100/1000BASE-T copper connections are supported. This variety of connections enables the Ethernet Adapter card to be connected to different devices at the customer site, including wireless basestations, DSL modems, microwave boxes, and other auxiliary equipment. As well, with fiber connections, the adapter card can be directly connected to the Metro Ethernet Provider (MEP) central office. Version 2 of the 8-port Ethernet Adapter card also supports synchronous Ethernet timing.
- TDM — the 16-port T1/E1 ASAP Adapter card and 2-port OC3/STM1 Channelized Adapter card support TDM ports. On the 16-port T1/E1 ASAP Adapter card, channelization is supported down to the DS0 level. To change port types, all ports must first be shut down. The ports on these cards can be configured for DS1 or E1 operation. All ports on the 16-port T1/E1 ASAP Adapter card must be either T1 or E1; there cannot be a mix of the two types. When the first port is configured, all other ports on the 16-port T1/E1 ASAP Adapter card must be set to the same type. For the 2-port OC3/STM1 Channelized Adapter card, OC3 port bandwidth can be channelized into multiple DS3 channels. Within the channel, you must have all DS1 or E1 subchannels.
- serial (TDM) — the 12-port Serial Data Interface card has four connectors, which support three serial data ports each. Each port grouping may be configured for either RS-232 or V.35 operation. Once a port has been configured for an RS-232 or V.35 interface type, the other two ports in that same grouping can only be configured for the same type. Channelization is supported down to the DS0 level.

  By setting the encapsulation type to circuit emulation (cem), the 12-port Serial Data Interface card can be configured to support TDM pseudowires.
- multilink bundles — the 16-port T1/E1 ASAP Adapter card and the 2-port OC3/STM1 Channelized Adapter card support multilink bundles. A multilink bundle is a collection of channels on channelized ports that physically reside on the same adapter card. All member links of an MLPPP group must reside on the same T1/E1 ASAP card or the same port on a 2-port OC3/STM1 Channelized Adapter card, and they must be of the same type (either E1 or DS1). Multilink bundles are used by providers who offer either bandwidth-on-demand services or fractional bandwidth (DS3) services. Multilink bundles are supported over PPP channels (MLPPP).

- IMA — the 16-port T1/E1 ASAP Adapter card and the 2-port OC3/STM1 Channelized Adapter card support Inverse Multiplexing over ATM (IMA). IMA is a standard developed to address the increasing need for bandwidth greater than the DS1 or E1 link speeds (1.544 or 2.048 Mb/s, respectively) but less than higher link speeds such as DS3 (44.736 Mb/s). IMA combines the transport bandwidth of multiple DS1 or E1 channels in a logical link (called an IMA group) to provide scalable bandwidth.
- SONET/SDH ports— the 4-port OC3/STM1 Clear Channel Adapter card has four hot-pluggable SFP-based ports that can be independently configured to be SONET (OC3) or SDH (STM1). The 2-port OC3/STM1 Channelized Adapter card has two hot-pluggable SFP-based ports that can be configured to be SONET (OC3) or SDH (STM1).

On the CLI, a port is identified using the format *slot/mda/port*, where *slot* identifies the IOM card slot ID (always 1), *mda* identifies the physical slot in the chassis for the adapter card, and *port* identifies the physical port on the adapter card; for example, 1/5/1.

Channelized ports are identified using the format *slot/mda/port.channel-group-id*, where *slot* identifies the IOM card slot ID (always 1), *mda* identifies the physical slot in the chassis for the adapter card, *port* identifies the physical port on the adapter card, and *channel-group-id* identifies the channel group ID. For the 2-port OC3/STM1 Channelized Adapter card and the T1/E1 ASAP Adapter card, the *channel-group-id* identifies the DS1 or E1 channel group; for example, 1/5/1.20. For the 12-port Serial Data Interface card, the *channel-group-id* identifies the RS-232 or V.35 channel group; for example, 1/1/1.1.

Access and Network Ports

All ports on adapter cards must be set to either access (customer-facing) or network mode:

- access ports — configured for customer-facing traffic on which services are configured. If a Service Access Point (SAP) is to be configured on the port or channel, the port or channel must be configured as an access port or channel. When a port is configured for access mode, the appropriate encapsulation type must be configured to distinguish the services on the port or channel. The encapsulation type on the Ethernet Adapter card can be set as null or dot1q. On the T1/E1 ASAP Adapter card and 2-port OC3/STM1 Channelized Adapter card, the encapsulation type can be ipcp, cem, or atm. On the 4-port OC3/STM1 Clear Channel Adapter card, the encapsulation type must be atm. On the 12-port Serial Data Interface card, the encapsulation type must be cem.

  Once a port has been configured for access mode, one or more services can be configured on the port or channel, depending on the encapsulation value.

- network ports — configured for network-facing traffic. Network ports are used as uplinks for Ethernet, ATM, and TDM pseudowires. On Ethernet cards, the encapsulation type can be set as null or dot1q. On the T1/E1 ASAP Adapter card and 2-port OC3/STM1 Channelized Adapter card, the encapsulation type must be ppp-auto for PPP/MLPPP bundles. On the 4-port OC3/STM1 Clear Channel Adapter card configured for POS, the encapsulation type must be ppp-auto.

All channel groups on a port must either be all access or all network channel groups; there cannot be a mix. When the first channel group is configured, all other channel groups on that port must be set to the same mode. To change modes, all channel groups must first be shut down.

The default mode for the T1/E1 ASAP Adapter card and 2-port OC3/STM1 Channelized Adapter card is access, and the default mode for the Ethernet Adapter card is network. The default mode for the 4-port OC3/STM1 Clear Channel Adapter card is access; it must be set to network mode for Packet over SONET (POS). The 12-port Serial Data Interface card operates in access mode only.

Access Ports

Access ports on the Ethernet Adapter card can transport traffic from sources such as e911 locators, site surveillance equipment, VoIP phones, and video cameras. The Ethernet traffic is transported over the PSN using Ethernet VLLs.

Access ports on the T1/E1 ASAP card can be configured for PPP/MLPPP channel groups. Customer IP traffic can be transported directly over PPP or MLPPP links. The access ports can also be configured for TDM to transport 2G traffic from BTSs or ATM/IMA to transport 3G UMTS traffic from Node Bs. All member links of the IMA group must reside on the same card. The 2G traffic is transported across the PSN encapsulated in a TDM VLL. The 3G traffic is transported using ATM VLLs.

For PPP/MLPPP channel groups, the encapsulation type must be ipcp. For Ethernet VLLs, the encapsulation type can be null or dot1q. For TDM VLLs, the encapsulation type must be cem. For ATM VLLs, the encapsulation type must be atm.

Note: For information on VLLs, refer to the 7705 SAR OS Services Guide.

In access mode, PPP channels on the T1/E1 ASAP Adapter card can be associated with n × DS0 channel groups. Although multiple PPP channel groups are supported per T1/E1 port, all the channel groups must be the same encapsulation type. For example, if one channel group on a given port is set for ipcp encapsulation, another channel group on the same port cannot be set to cem.

If MLPPP channels are used, an MLPPP channel group fills up an entire DS1 or E1 link.

Access ports on the 2-port OC3/STM1 Channelized Adapter card can be configured for ATM/IMA to transport 3G UMTS traffic from Node Bs, for example.

SONET/SDH ports in access mode on a 4-port OC3/STM1 Clear Channel Adapter card can be configured for ATM (such as for 3G UMTS Node Bs). The encapsulation type is atm.

The data ports on the 12-port Serial Data Interface card provide transport between two data devices. Each data stream that is transported across the network can be mapped into a TDM pseudowire (Cpipe) for transport across an MPLS network. The other end can terminate either on another 7705 SAR or a multiplexer capable of terminating the pseudowire. The 12-port Serial Data Interface card can also be part of a system architecture where a circuit originates on an SDI port on the 7705 SAR, transits over an MPLS network, and terminates on a 3600 MainStreet node connected to a 7705 SAR over a T1/E1 connection.

In addition to the MPLS network functionality, the 12-port Serial Data Interface card can also operate in a TDM SAP-to-SAP mode where the other SAP can be another port on the 12-port Serial Data Interface card or on a T1/E1 ASAP card.

Network Ports

For network uplinks on the T1/E1 ASAP card and the 2-port OC3/STM1 Channelized Adapter card, standalone PPP ports can be used or MLPPP can be configured on a number of T1/E1 ports or channels. For MLPPP groups, all member links of an MLPPP group must reside on the same T1/E1 ASAP card or the same port on a 2-port OC3/STM1 Channelized Adapter card, and they must be of the same type (either E1 or DS1). The encapsulation type for MLPPP must be ppp-auto.

Ethernet uplinks can also be used as a cost-effective alternative to T1/E1 links.

For network uplinks on the 4-port OC3/STM1 Clear Channel Adapter card, a clear channel port can be configured for POS to connect to the packet network. PPP can be enabled on a port by setting the encapsulation type to ppp-auto.

The 7705 SAR supports both copper and fiber uplinks.

Rate Limiting on Network Ethernet Ports

The 7705 SAR supports egress rate limiting on uplink Ethernet ports. Rate limiting sets a hard limit on the amount of traffic that can leave the Ethernet port, which is useful when a mobile operator has leased a fixed amount of bandwidth.

Port Features

Multilink Point-to-Point Protocol

Multilink point-to-point protocol (MLPPP) is a method of splitting, recombining, and sequencing packets across multiple logical data links. MLPPP is defined in the IETF RFC 1990, *The PPP Multilink Protocol (MP).*

MLPPP allows multiple PPP links to be bundled together, providing a single logical connection between two routers. Data can be distributed across the multiple links within a bundle to achieve high bandwidth. As well, MLPPP allows for a single frame to be fragmented and transmitted across multiple links. This capability allows for lower latency and also for a higher maximum receive unit (MRU).

Multilink protocol is negotiated during the initial LCP option negotiations of a standard PPP session. A system indicates to its peer that it is willing to perform MLPPP by sending the MP option as part of the initial LCP option negotiation.

The system indicates the following capabilities.

- The system offering the option is capable of combining multiple physical links into one logical link.
- The system is capable of receiving upper layer protocol data units (PDUs) that are fragmented using the MP header and then reassembling the fragments back into the original PDU for processing.
- The system is capable of receiving PDUs of size N octets, where N is specified as part of the option, even if N is larger than the maximum receive unit (MRU) for a single physical link.

Once MLPPP has been successfully negotiated, the sending system is free to send PDUs encapsulated and/or fragmented with the MP header.

MP introduces a new protocol type with a protocol ID (PID) of 0x003d. Figure 1 and Figure 2 show the MLPPP fragment frame structure. Framing to indicate the beginning and end of the encapsulation is the same as that used by PPP and described in RFC 1662, *PPP in HDLC-like framing*.

MP frames use the same HDLC address and control pair value as PPP: Address – 0xFF and Control – 0x03. The 2-octet protocol field is also structured the same way as in PPP encapsulation.

Figure 1: MLPPP 24-bit Fragment Format

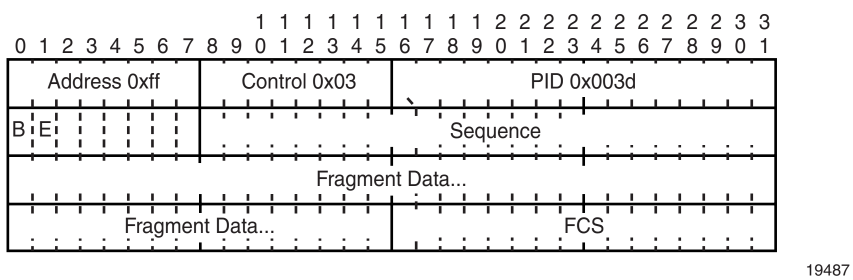
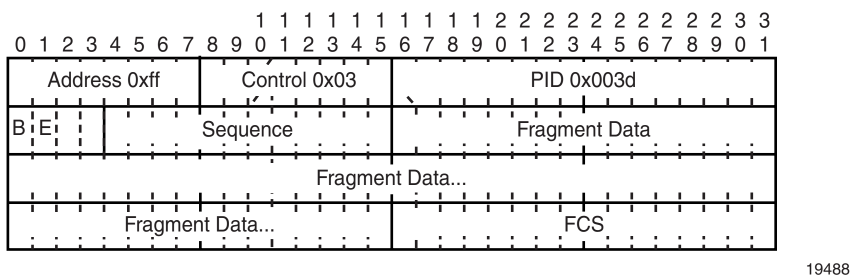


Figure 2: MLPPP 12-bit Fragment Format



The required and default format for MP is the 24-bit format. During the LCP state, the 12-bit format can be negotiated. The 7705 SAR is capable of supporting and negotiating the alternate 12-bit frame format.

The maximum differential delay supported for MLPPP is 25 ms.

Protocol Field (PID)

The protocol field is two octets. Its value identifies the datagram encapsulated in the Information field of the packet. In the case of MP, the PID also identifies the presence of a 4-octet MP header (or 2-octet, if negotiated).

A PID of 0x003d identifies the packet as MP data with an MP header.

The LCP packets and protocol states of the MLPPP session follow those defined by PPP in RFC 1661. The options used during the LCP state for creating an MLPPP NCP session are described below.

B&E Bits

The B&E bits are used to indicate the start and end of a packet. Ingress packets to the MLPPP process will have an MTU, which may or may not be larger than the maximum received reconstructed unit (MRRU) of the MLPPP network. The B&E bits manage the fragmentation of ingress packets when the packet exceeds the MRRU.

The B-bit indicates the first (or beginning) packet of a given fragment. The E-bit indicates the last (or ending) packet of a fragment. If there is no fragmentation of the ingress packet, both B&E bits are set to true (=1).

Sequence Number

Sequence numbers can be either 12 or 24 bits long. The sequence number is 0 for the first fragment on a newly constructed bundle and increments by one for each fragment sent on that bundle. The receiver keeps track of the incoming sequence numbers on each link in a bundle and reconstructs the desired unbundled flow through processing of the received sequence numbers and B&E bits. For a detailed description of the algorithm, refer to RFC 1990.

Information Field

The Information field is zero or more octets. The Information field contains the datagram for the protocol specified in the protocol field.

The MRRU will have the same default value as the MTU for PPP. The MRRU is always negotiated during LCP.

Padding

On transmission, the Information field of the ending fragment may be padded with an arbitrary number of octets up to the MRRU. It is the responsibility of each protocol to distinguish padding octets from real information. Padding must only be added to the last fragment (E-bit set to true).

FCS

The FCS field of each MP packet is inherited from the normal framing mechanism from the member link on which the packet is transmitted. There is no separate FCS applied to the reconstituted packet as a whole if it is transmitted in more than one fragment.

LCP

The Link Control Protocol (LCP) is used to establish the connection through an exchange of configure packets. This exchange is complete, and the LCP opened state entered, once a Configure-Ack packet has been both sent and received.

LCP allows for the negotiation of multiple options in a PPP session. MP is somewhat different from PPP, and therefore the following options are set for MP and are not negotiated:

- no async control character map
- no magic number
- no link quality monitoring

- address and control field compression
- protocol field compression
- no compound frames
- no self-describing padding

Any non-LCP packets received during this phase must be silently discarded.

T1/E1 Link Hold Timers

T1/E1 link hold timers (or MLPPP link flap dampening) guard against the node reporting excessive interface transitions. Timers can be set to determine when link up and link down events are advertised; that is, up-to-down and down-to-up transitions of the interface are not advertised to upper-layer protocols (are dampened) until the configured timer has expired.

Multi-Class MLPPP

The 7705 SAR supports multi-class MLPPP (MC-MLPPP) to address end-to-end delay caused by low-speed links transporting a mix of small and large packets. With MC-MLPPP, large, low-priority packets are fragmented to allow opportunities to send high-priority packets.

MC-MLPPP allows for the prioritization of multiple types of traffic flowing over MLPPP links, such as traffic between the cell site routers and the mobile operator's aggregation routers. MC-MLPPP, as defined in RFC 2686, *The Multi-Class Extension to Multi-Link PPP*, is an extension of the MLPPP standard. It allows multiple classes of service to be transmitted over an MLPPP bundle, with each class representing a different priority level mapped to a forwarding class. The highest-priority traffic is transmitted over the MLPPP bundle with minimal delay regardless of the order in which packets are received.

Figure 3 shows the original MLPPP header format that allowed only two implied classes. The two classes were created by transmitting two interleaving flows of packets; one with MLPPP headers and one without. This resulted in two levels of priority sent over the physical link, even without the implementation of multi-class support. Figure 4 shows the short and long sequence number fragment format MC-MLPPP headers. The short sequence number fragment format header includes two class bits to allow for up to four classes of service. Four class bits are available in the long sequence number fragment format header, but a maximum of four classes are still supported. This extension to the MLPPP header format is detailed in RFC 2686.

Figure 3: Original MLPPP Header Format

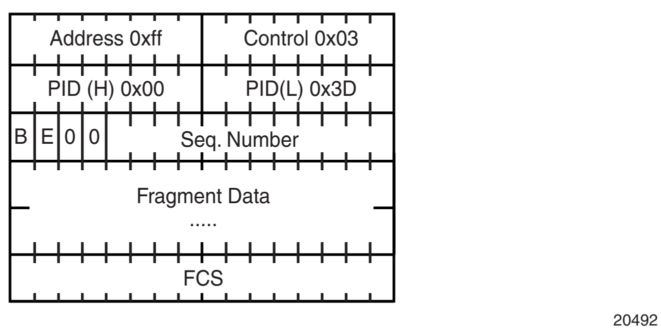
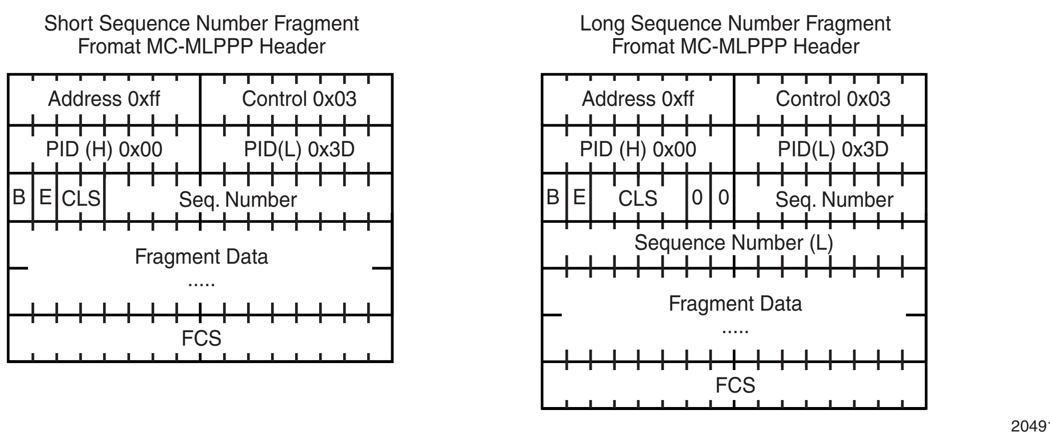


Figure 4: MC-MLPPP Header Format



The new MC-MLPPP header format uses the previously unused bits before the sequence number as the class identifier to allow four distinct classes of service to be identified.

QoS in MC-MLPPP

MC-MLPPP on the 7705 SAR supports scheduling based on multi-class implementation. Instead of the standard profiled queue-type scheduling, an MC-MLPPP encapsulated access port performs class-based traffic servicing. The four MC-MLPPP classes are scheduled in a strict priority fashion, as shown in Table 3.

Table 3: MC-MLPPP Class Priorities

MC-MLPPP Class	Priority
0	Priority over all other classes
1	Priority over classes 2 and 3
2	Priority over class 3
3	No priority

For example, if a packet is sent to an MC-MLPPP class 3 queue and all other queues are empty, the 7705 SAR fragments the packet according to the configured fragment size and begins sending the fragments. If a new packet arrives at an MC-MLPPP class 2 queue while the class 3 fragment is still being serviced, the 7705 SAR finishes sending any fragments of the class 3 packet that are on the wire, then holds back the remaining fragments in order to service the higher-priority packet. The fragments of the first packet remain at the top of the class 3 queue. For packets of the same class, MC-MLPPP class queues operate on a first-in, first-out basis.

The user configures the required number of MLPPP classes to use on a bundle. The forwarding class of the packet, as determined by the ingress QoS classification, is used to determine the MLPPP class for the packet. The mapping of forwarding class to MLPPP class is a function of the user-configurable number of MLPPP classes. The mapping for 4-class, 3-class, and 2-class MLPPP bundles is shown in Table 4.

Table 4: Packet Forwarding Class to MC-MLPPP Class Mapping

FC ID	FC Name	MLPPP Class 4-class Bundle	MLPPP Class 3-class Bundle	MLPPP Class 2-class Bundle
7	NC	0	0	0
6	H1	0	0	0
5	EF	1	1	1
4	H2	1	1	1
3	L1	2	2	1

Table 4: Packet Forwarding Class to MC-MLPPP Class Mapping (Continued)

FC ID	FC Name	MLPPP Class 4-class Bundle	MLPPP Class 3-class Bundle	MLPPP Class 2-class Bundle
2	AF	2	2	1
1	L2	3	2	1
0	BE	3	2	1

If one or more forwarding classes are mapped to a queue, the scheduling priority of the queue is based on the lowest forwarding class mapped to it. For example, if forwarding classes 0 and 7 are mapped to a queue, the queue is serviced by MC-MLPPP class 3 in a 4-class bundle model.

Inverse Multiplexing Over ATM (IMA)

IMA is a cell-based protocol where an ATM cell stream is inverse-multiplexed and demultiplexed in a cyclical fashion among ATM-supporting channels to form a higher bandwidth logical link. This logical link is called an IMA group. By grouping channels into an IMA group, customers gain bandwidth management capability at in-between rates (for example, between DS1 and DS3 or between E1 and E3) through the addition or removal of channels to or from the IMA group.

The 7705 SAR supports the IMA protocol as specified by the *Inverse Multiplexing for ATM (IMA) Specification* version 1.1.

In the ingress direction, traffic coming over multiple ATM channels configured as part of a single IMA group is converted into a single ATM stream and passed for further processing to the ATM layer, where service-related functions (for example, Layer 2 traffic management or feeding into a pseudowire) are applied. In the egress direction, a single ATM stream (after service functions are applied) is distributed over all paths that are part of an IMA group after ATM layer processing takes place.

An IMA group interface compensates for differential delay and allows for only a minimal cell delay variation. The maximum differential delay supported for IMA is 75 ms on T1/E1 ASAP cards and 50 ms on 2-port OC3/STM1 Channelized Adapter cards.

The interface deals with links that are added or deleted, or that fail. The higher layers see only an IMA group and not individual links; therefore, service configuration and management is done using IMA groups, and not individual links that are part of it.

The IMA protocol uses an IMA frame as the unit of control. An IMA frame consists of a series of 128 consecutive cells. In addition to ATM cells received from the ATM layer, the IMA frame contains IMA OAM cells. Two types of cells are defined: IMA Control Protocol (ICP) cells and IMA filler cells. ICP cells carry information used by the IMA protocol at both ends of an IMA group (for example, IMA frame sequence number, link stuff indication, status and control indication, IMA ID, Tx and Rx test patterns, version of the IMA protocol). A single ICP cell is inserted at the ICP cell offset position (the offset may be different on each link of the group) of each frame. Filler cells are used by the transmitting side to fill up each IMA frame in case there are not enough ATM stream cells from the ATM layer, so a continuous stream of cells is presented to the physical layer. Those cells are then discarded by the receiving end. IMA frames are transmitted simultaneously on all paths of an IMA group, and when they are received out of sync at the other end of the IMA group link, the receiver compensates for differential link delays among all paths.

Network Synchronization on Ports

The 7705 SAR provides network synchronization on T1/E1, Ethernet, and SONET/SDH ports as described in the sections that follow.

Network Synchronization on T1/E1 and Ethernet Ports

T1/E1 ports or synchronous Ethernet ports configured for line timing provide the best synchronization performance through a synchronization distribution network. Line timing mode derives an 8 KHz clock from the framing of T1/E1 that can be used as an accurate reference for nodes in a network. This mode is immune to any packet delay variation (PDV) occurring on Layer 2 or Layer 3 links. Line timing is supported on the 7705 SAR-F T1/E1 ports and Ethernet SFP ports with SFPs that support Synchronous Ethernet. On the 7705 SAR-8, line timing is supported by the 16-port ASAP Adapter card and by the 8-port Ethernet v2 card on two Ethernet SFP ports with SFPs that support Synchronous Ethernet.

Synchronous Ethernet is a variant of line timing supported on the 7705 SAR-8 with an Ethernet v2 Adapter card and on the 7705 SAR-F on Ethernet SFP ports with SFPs that support Synchronous Ethernet. When synchronous Ethernet is enabled, the operator can select an Ethernet port as a candidate timing reference. The recovered timing from this port is then used to time the system. This ensures that any of the system outputs are locked to a stable, traceable frequency source.

Network Synchronization on SONET/SDH Ports

Each SONET/SDH port can be independently configured to be looped-timed (that is, recovered from an Rx line) or node-timed (that is, recovered from the SSU in the active CSM).

A SONET/SDH port's receive clock rate can be used as a synchronization source for the node.

Flow Control on Ethernet Ports

IEEE 802.3x Flow Control, which is the process of pausing the transmission based on received pause frames, is supported on Fast Ethernet and Gigabit Ethernet ports. In the transmit direction, the Ethernet ports generate pause frames if the buffer occupancy reaches critical values or if port FIFOs are overloaded. Pause frame generation is automatically handled by the Ethernet Adapter card when the system-wide constant thresholds are exceeded. The generation of pause frames ensures that newly arriving frames still can be processed and queued, mainly to maintain the SLA agreements.

If autonegotiation is on for an Ethernet port, enabling and disabling of IEEE 802.3x Flow Control is autonegotiated for receive and transmit directions separately. If autonegotiation is turned off, the reception and transmission of IEEE 802.3x Flow Control is enabled by default and cannot be disabled.

Ethernet OAM

802.3ah Clause 57 (EFM OAM) defines the Operations, Administration, and Maintenance (OAM) sublayer, which is a link level Ethernet OAM that is supported on 7705 SAR Ethernet ports configured as network ports. It provides mechanisms for monitoring link operations such as remote fault indication and remote loopback control. Ethernet OAM gives network operators the ability to monitor the health status of Ethernet links and quickly determine the location of failing links or fault conditions.

Because some of the sites where the 7705 SAR will be deployed will only have Ethernet uplinks, this OAM functionality is mandatory. For example, mobile operators must be able to request remote loopbacks from the peer router at the Ethernet layer in order to debug any connectivity issues. EFM OAM provides this capability.

EFM OAM is supported on network Ethernet ports only. The access ports can be configured to tunnel the OAM traffic originated by the far-end devices.

EFM OAM has the following characteristics.

- All EFM OAM, including loopbacks, operate on point-to-point links only.
- EFM loopbacks are always line loopbacks (line Rx to line Tx).
- When a port is in loopback, all frames (except EFM frames) are discarded. If dynamic signaling and routing is used (dynamic LSPs, OSPF or IS-IS routing), all services also go down. If all signaling and routing protocols are static (static routes, LSPs, and service labels), the frames are discarded but services stay up.

The following EFM OAM functions are supported:

- OAM capability discovery
- configurable transmit interval with an Information OAMPDU
- active or passive mode
- OAM loopback
- OAMPDU tunneling and termination (for Epipe service)
- dying gasp at network and access ports

For information on Epipe service, refer to the 7705 SAR OS Services Guide.

Remote Loopback

EFM OAM provides a link-layer frame loopback mode, which can be controlled remotely.

To initiate a remote loopback, the local EFM OAM client sends a loopback control OAMPDU by enabling the OAM remote loopback command. After receiving the loopback control OAMPDU, the remote OAM client puts the remote port into local loopback mode.

OAMPDUs are slow protocol frames that contain appropriate control and status information used to monitor, test, and troubleshoot OAM-enabled links.

To exit a remote loopback, the local EFM OAM client sends a loopback control OAMPDU by disabling the OAM remote loopback command. After receiving the loopback control OAMPDU, the remote OAM client puts the port back into normal forwarding mode.

When a port is in local loopback mode (the far end requested an Ethernet OAM loopback), any packets received on the port will be looped back, except for EFM OAMPDUs. No data will be transmitted from the node; only data that is received on the node will be sent back out.

When the node is in remote loopback mode, local data from the CSM is transmitted, but any data received on the node is dropped, except for EFM OAMPDUs.

When a port is in loopback mode, service mirroring is not operational if the port is a mirror-source or mirror-destination SAP.

Remote loopbacks should be used with caution; if dynamic signaling and routing protocols are used, all services go down when a remote loopback is initiated. If only static signaling and routing is used, the services stay up. On the 7705 SAR, the Ethernet port can be configured to accept or reject the `remote-loopback` command.

802.3ah OAMPDU Tunneling and Termination for Epipe Service

Customers who subscribe to Epipe service might have customer equipment running 802.3ah at both ends. The 7705 SAR can be configured to tunnel EFM OAMPDUs received from a customer device to the other end through the existing network using MPLS or GRE, or to terminate received OAMPDUs at a network or an access Ethernet port.

Note: This feature applies only to port-based Epipe SAPs because 802.3ah runs at port level, not at VLAN level.

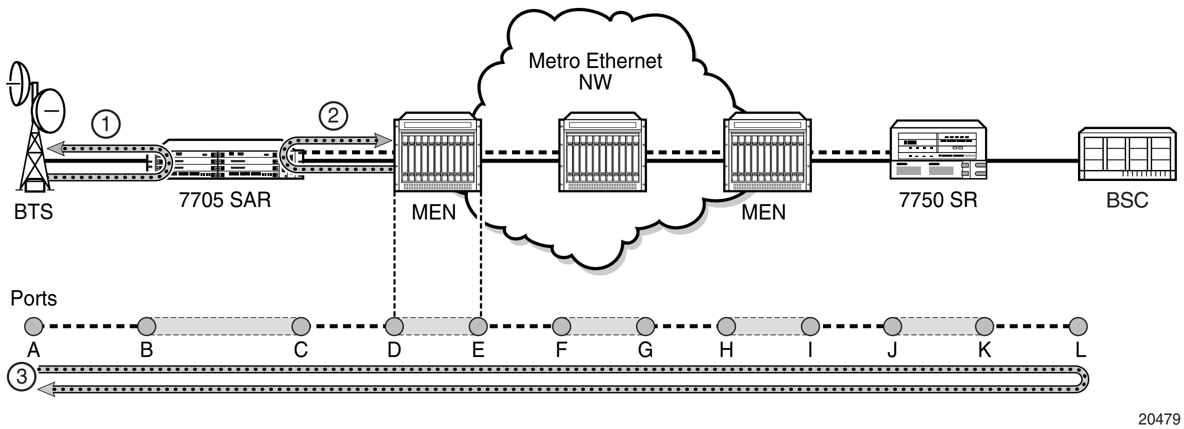
While tunneling offers the ability to terminate and process the OAM messages at the head-end, termination on the first access port at the cell site can be used to detect immediate failures or can be used to detect port failures in a timelier manner.

The user can choose either tunneling or termination, but not both at the same time.

In Figure 5, scenario 1 shows the termination of received EFM OAMPDUs from a customer device on an access port, while scenario 2 shows the same thing except for a network port. Scenario 3 shows tunneling of EFM OAMPDUs through the associated Ethernet PW.

To configure termination (scenario 1), use the `config>port>ethernet>efm-oam>no shutdown` command.

Figure 5: EFM Capability on 7705 SAR



Dying Gasp

Dying gasp is used to notify the far end that EFM-OAM is disabled or shut down on the local port. The dying gasp flag is set on the OAMPDUs that are sent to the peer. The far end can then take immediate action and inform upper layers that EFM-OAM is down on the port.

Ethernet Loopbacks

The 7705 SAR supports timed line loopbacks and both timed and untimed internal loopbacks on Ethernet ports.

A line loopback loops frames received on the corresponding port back towards the transmit direction. Line loopbacks are supported on ports configured in network mode.

An internal loopback loops frames from the local router back to the framer. This is usually referred to as an equipment loopback. The transmit signal is looped back and received by the interface. Internal loopbacks are supported on ports configured in access mode.

If a loopback is enabled on a port, the port mode cannot be changed until the loopback has been disabled.

A port can support only one loopback at a time. If a loopback exists on a port, it must be disabled or the timer must expire before another loopback can be configured on the same port. EFM-OAM cannot be enabled on a port that has an Ethernet loopback enabled on it. Similarly, an Ethernet loopback cannot be enabled on a port that has EFM-OAM enabled on it.

When an internal loopback is enabled on an Ethernet port, autonegotiation is turned off silently. This is to allow an internal loopback when the operational status of a port is down. Any user modification to autonegotiation on a port configured with an internal Ethernet loopback will not take effect until the loopback is disabled.

The loopback timer can be configured from 30 seconds to 86400 seconds. All Ethernet loopbacks are turned off automatically under the following conditions: an adapter card reset, an activity switch, or timer expiry. The timer for an internal loopback can also be configured to 0 seconds, turning it into a latched loopback that is enabled indefinitely, until it is turned off by the user or there is a system restart. These latched loopbacks survive adapter card resets and activity switches.

The `admin-save` and `admin-save-detail` commands do not save Ethernet loopbacks to the database.

MTU Configuration Guidelines

Because of all the services overhead (that is, pseudowire/VLL, MPLS tunnel, dot1q and dot1p overhead), it is crucial that configurable variable frame size be supported for end-to-end service delivery.

Observe the following general rules when planning your service and physical Maximum Transmission Unit (MTU) configurations.

- The 7705 SAR must contend with MTU limitations at many service points. The physical (access and network) port, service, and SDP MTU values must be individually defined.
- The ports that will be designated as network ports intended to carry service traffic must be identified.
- MTU values should not be modified frequently.
- MTU values must conform to both of the following conditions:
  - → the service MTU must be less than or equal to the SDP path MTU
  - → the service MTU must be less than or equal to the access port (SAP) MTU

For information on configuring the MTU for access and network ports, SDP path, and service, refer to the 7705 SAR OS Services Guide.

For the Ethernet Adapter card, all received frames on an ingress network or access port are policed against 2106 bytes (2102 + 4 bytes of FCS), regardless of the port MTU. Any frames longer than 2106 bytes are discarded and the "Too Long Frame" and "Error Stats" counters in the port statistics menu are incremented.

At network egress, Ethernet frames are policed against the configured port MTU. If the frame exceeds the configured port MTU, the "interface out discards" counter in the port statistics menu is incremented.

IP Fragmentation

IP fragmentation is used to fragment a packet that is larger than the MTU of the egress interface, so that the packet can be transported over that interface.

The router fragments or discards the IP packets based on whether the DF (Do not fragment) bit is set in the IP header. If the packet that exceeds the MTU cannot be fragmented, the packet is discarded and an ICMP message "Fragmentation Needed and Don't Fragment was Set" is sent back to the source IP address.

Default MTU Values

Table 5 displays the default and maximum port MTU values that are dependent upon the port type, mode, and encapsulation type.

Table 5: MTU Default Values

Port Type	Mode	Encap Type	Default (bytes)	Max MTU (bytes)
10/100 Ethernet	Access/Network	null	1514	2102 (access) 2102 (network)
10/100 Ethernet	Access/Network	dot1q	1518	2106 (access) 2106 (network)
GigE SFP	Access/Network	null	1514 (access) 1572 (network)	2102
GigE SFP	Access/Network	dot1q	1518 (access) 1572 (network)	2106
TDM (PW)	Access	cem	1514	1514
TDM (ATM PW)	Access	atm	1524	1524
TDM (PPP/MLPPP)	Access	ipcp	1502	2090

Table 5: MTU Default Values (Continued)

Port Type	Mode	Encap Type	Default (bytes)	Max MTU (bytes)
TDM (PPP/MLPPP)	Network	ppp-auto	1572	2090
SONET/SDH	Access	atm	1524	1524
SONET/SDH	Network	ppp-auto	1572	2090

For more information on MTU (in particular, as they apply to services), refer to the 7705 SAR OS Services Guide. For information on encapsulation, refer to the 7705 SAR OS Quality of Service Guide.

Deploying Preprovisioned Components

When a CSM or adapter card is installed in a preprovisioned slot, the system tests for discrepancies between the preprovisioned card and card type configurations and the types actually installed. Error messages display if there are inconsistencies, and the card will not initialize.

When the proper preprovisioned cards are installed into the appropriate chassis slot, alarm, status, and performance details will be displayed on the CLI.

Configuration Notes

The following information describes provisioning caveats.

- The IOM can only be designated slot 1 of the chassis.
- An IOM must be preprovisioned to accept specific adapter card types; the card type is always iom-1g.

  If an adapter card type is installed in a slot provisioned for a different type, the card will not initialize.
- An adapter card installed in an unprovisioned slot remains administratively and operationally down until the IOM software is activated and the MDA slot and type is specified.
- Ports cannot be provisioned until the IOM software is activated and the MDA type is specified.

Reference Sources

For information on supported IETF drafts and standards as well as standard and proprietary MIBs, refer to Standards and Protocol Support on page 301.

Configuring Physical Components with CLI

This section provides information to configure cards, adapter cards, and ports.

Topics in this section include:

Preprovisioning Guidelines

The 7705 SAR has two ports on the chassis to connect terminals for management access: a console port for a terminal connection and a management port for a Telnet connection.

The console port is used to configure parameters locally through a direct connection from a system console. The management port is used to configure parameters remotely through a connection to a remote workstation, using Telnet or SSH to open a secure shell connection.

For more information on management connections, refer to the 7705 SAR Chassis Installation Guide.

Predefining Entities

In order to initialize an adapter card, the IOM type and adapter card type must match the preprovisioned parameters. In this context, preprovisioning means to configure the entity type (IOM type, adapter card type, port, and interface) that is planned for an adapter card. Preprovisioned entities can be installed but not enabled, or the slots can be configured but remain empty until populated. Provisioning means that the preprovisioned entity is installed and enabled.

You can preprovision ports and interfaces after the IOM is activated (card slot and card type are designated) and adapter card types are specified.

Preprovisioning a Port

Before a port can be configured, the slot must be preprovisioned with an allowed card type and the adapter card slot must be preprovisioned with an allowed adapter card type.

Other recommendations include:

- Ethernet
  - → Configure an access port for customer-facing traffic on which services are configured.
  - → Configure a network port for uplink traffic.

    An encapsulation type must be specified in order to distinguish services on the access port. Encapsulation types must also be specified for network ports. By default, the encapsulation type for Ethernet ports in network mode is null.

- Channelized
  - → Channelized ports can be configured on the T1/E1 ASAP Adapter card, 2-port OC3/STM1 Channelized Adapter card, and 12-port Serial Data Interface card (access mode only).
  - → Configure an access port for customer-facing traffic on which services are configured.
  - → Configure a network port for uplink traffic.

    An encapsulation type must be specified in order to distinguish services on the access port or channel. For network mode, the encapsulation type is set to ppp-auto and cannot be changed.

Maximizing Bandwidth Use

For T1/E1 ASAP Adapter cards and 2-port OC3/STM1 Channelized Adapter cards, once ports are preprovisioned, multilink bundles (MLPPP) or IMA groups can be configured to increase the bandwidth available between two nodes. Up to eight links can be bundled in an IMA group or MLPPP bundle. All physical links or channels in a given bundle or group combine to form one logical connection. A bundle or group also provides redundancy in case one or more links that participate in the bundle fail. For command syntax, see Configuring Multilink PPP Bundles. To configure channelized ports for TDM, see Configuring Channelized Ports.

For 12-port Serial Data Interface cards, some or all of a port's bandwidth can be dedicated to a channel by aggregating a number of DS0s into a single bundle. Serial data transmission rates below the rate of a single DS0, that is, less than 64 kb/s, are achieved using the High Capacity Multiplexing (HCM) proprietary protocol. These rates are known as subrates, and are supported only when operating in RS-232 mode.

Note: A DS0 channel operating at a rate less than 64 kb/s still uses a full 64 kb/s timeslot.

Basic Configuration

The basic 7705 SAR OS interface configuration must include the following tasks:

- identify chassis slot (step in activating the IOM)
- specify card type (step in activating the IOM)
- identify adapter card (MDA) slot
- specify adapter card type (must be an allowed adapter card type)
- identify specific port to configure

The following example displays some card and port configurations.

```
ALU-A>config# info
.....
#--------------------------------------------------
echo "Card Configuration"
#--------------------------------------------------
    card 1
        card-type iom-1g
        mda 1
            mda-type a12-sdi
        exit
        mda 2
            mda-type a4-oc3
        exit
        mda 3
            mda-type a16-chds1
        exit
        mda 4
            mda-type a16-chds1
        exit
        mda 5
            mda-type a8-eth
        exit
        mda 6
            mda-type a2-choc3
        exit
    exit
#--------------------------------------------------
echo "Port Configuration"
#--------------------------------------------------
    port 1/1/1
        shutdown
        serial
            rs232
                shutdown
                control-lead
                    input
                    exit
                    output
                    exit
                exit
            exit
        exit
```

```
exit
port 1/1/2
    shutdown
    serial
        rs232
            shutdown
            control-lead
                input
                    rts-dcd end-to-end
                    alb-cts end-to-end
                    rdl-ri low
                exit
                output
                    dcd-rts end-to-end
                    cts-alb end-to-end
                    ri-rdl low
                exit
            exit
            channel-group 1
                shutdown
                description "RS232serial1"
                encap-type cem
            exit
        exit
    exit
exit
port 1/1/3
    shutdown
    serial
    exit
exit
port 1/1/4
    shutdown
    serial
        v35
            shutdown
            control-lead
                input
                exit
                output
                exit
            exit
            speed 256k
            channel-group 1
                shutdown
                description "V35serial1"
                encap-type cem
            exit
        exit
    exit
exit
port 1/1/5
    shutdown
    serial
    exit
exit
port 1/1/6
    shutdown
    serial
```

```
            exit
        exit
....

        port 1/1/11
            shutdown
            serial
            exit
        exit
        port 1/1/12
            shutdown
            serial
            exit
        exit
        port 1/2/2
            shutdown
            sonet-sdh
            exit
        exit
        port 1/2/3
            shutdown
            sonet-sdh
            exit
        exit
        port 1/2/4
            shutdown
            sonet-sdh
            exit
        exit
        port 1/3/1
            shutdown
            tdm
                e1
                    shutdown
                    channel-group 1
                        shutdown
                        encap-type cem
                        timeslots 2-10
                    exit
                exit
            exit
        exit
        port 1/3/2
            shutdown
            tdm
                e1
                    shutdown
                    channel-group 1
                        shutdown
                        encap-type cem
                        timeslots 2-10
                    exit
                exit
            exit
        exit
        port 1/3/3
            shutdown
            tdm
            exit
```

```
    exit
.....

   port 1/3/15
       shutdown
       tdm
       exit
   exit

   port 1/3/16
       shutdown
       tdm
           e1
               shutdown
               channel-group 1
                   shutdown
                   description "network_port"
                   mode network
               exit
           exit
       exit
   exit
   port 1/4/1
       shutdown
       tdm
       exit
   exit
   port 1/4/2
       shutdown
       tdm
       exit
   exit
.....

    port 1/4/15
        shutdown
        tdm
        exit
    exit
    port 1/4/16
        shutdown
        tdm
        exit
    exit
    port 1/5/1
        shutdown
        ethernet
        exit
    exit
    port 1/5/2
        shutdown
        ethernet
        exit
    exit
.....

    port 1/5/7
        shutdown
        ethernet
```

```
            exit
        exit
        port 1/5/8
            shutdown
            ethernet
            exit
        exit
        port 1/6/1
            shutdown
            sonet-sdh
            exit
            tdm
            exit
        exit
        port 1/6/2
            shutdown
            sonet-sdh
            exit
            tdm
            exit
        exit
    #--------------------------------------------------
    .....
```

Common Configuration Tasks

The following basic system tasks must be performed.

- Configuring Cards and Adapter Cards
  - → Configuring Adapter Card Network Queue Policies
  - → Configuring Adapter Card Fabric Statistics
  - → Configuring Adapter Card Fabric Profile
  - → Configuring Adapter Card Clock Mode
  - → Displaying Adapter Card Information
- Configuring Ports
  - → Configuring Ethernet Port Parameters
  - → Configuring Channelized Ports
  - → Configuring SONET/SDH Port Parameters
  - → Configuring ATM Interface Parameters
  - → Configuring Multilink PPP Bundles
  - → Configuring MC-MLPPP
  - → Configuring Multilink ATM Inverse Multiplexing (IMA) Groups

Configuring Cards and Adapter Cards

Card configurations must include a chassis slot designation. A slot must be preconfigured with the type of card and adapter cards that are allowed to be provisioned.

The following CLI syntax shows an example of configuring a chassis slot and card (to activate the IOM) and adapter card.

Example:

```
ALU-1>config# card 1
ALU-1>config>card# card-type iom-1g
ALU-1>config>card# mda 1
ALU-1>config>card>mda# mda-type a12-sdi
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 2
ALU-1>config>card>mda# mda-type a4-oc3
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 3
ALU-1>config>card>mda# mda-type a16-chds1
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 4
ALU-1>config>card>mda# mda-type a16-chds1
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 5
ALU-1>config>card>mda# mda-type a8-eth
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 6
ALU-1>config>card>mda# mda-type a2-choc3
ALU-1>config>card>mda# exit
```

Configuring Adapter Card Network Queue Policies

Network queue policies can optionally be applied to adapter cards. Network queue policies define the ingress network queuing at the adapter card node level. Network queue policy parameters are configured in the `config>qos` context. For more information on network queue policies, refer to the 7705 SAR OS Quality of Service Guide.

Use the following CLI syntax to configure network queue policies on an adapter card.

CLI Syntax:

```
config>card>mda#
     network
        ingress
           queue-policy name
     no shutdown
no shutdown
```

Configuring Adapter Card Fabric Statistics

The collection of fabric statistics can be enabled on an adapter card to report about the fabric traffic flow and potential discards.

Use the following syntax to configure fabric statistics on an adapter card.

CLI Syntax:
```
config>card>mda#
    [no] fabric-stats-enabled
```

Configuring Adapter Card Fabric Profile

Ingress fabric profiles can be configured on an adapter card, in either a network or access context, to allow network ingress to fabric shapers to be user-configurable at rates that provide up to 1 Gb/s switching throughput from the adapter card towards the fabric.

Use the following CLI syntax to assign a fabric profile on an adapter card.

CLI Syntax:
```
config>card>mda#
    mda-type type
    [no] fabric-stats-enabled
    network
       ingress
          fabric-policy <fabric-policy-id>
          queue-policy <name>
    access
       ingress
          fabric-policy <fabric-policy-id>
    no shutdown
```

Configuring Adapter Card Clock Mode

Clocking mode is defined at the adapter card level. Only the T1/E1 ASAP Adapter card and the 2-port OC3/STM1 Channelized Adapter card support configuration of clocking mode, and the only supported clocking mode is adaptive.

Use the following CLI syntax to configure the clocking mode.

CLI Syntax:
```
config>card>mda#
    clock-mode {adaptive}
    no shutdown
```

Displaying Adapter Card Information

After performing the adapter card configuration, you can use the `config info` command to display the information.

```
ALU-A>config# info
.....
#--------------------------------------------------
echo "Card Configuration"
#--------------------------------------------------
    card 1
        card-type iom-1g
        mda 1
            mda-type a12-sdi
        exit
        mda 2
            mda-type a4-oc3
        exit
        mda 3
            mda-type a16-chds1
        exit
        mda 4
            mda-type a16-chds1
        exit
        mda 5
            mda-type a8-eth
        exit
        mda 6
            mda-type a2-choc3
        exit
    exit
#--------------------------------------------------
ALU-A> config#
```

Use the `config info detail` command to display the adapter card detailed configuration information.

```
ALU-A>config# info detail
.....
#--------------------------------------------------
echo "Card Configuration"
#--------------------------------------------------
    card 1
        card-type iom-1g
        mda 1
            mda-type a12-sdi
            network
                ingress
                    fabric-policy 1
                    queue-policy "default"
                exit
            exit
            access
                ingress
                    fabric-policy 1
                exit
            exit
```

```
        no shutdown
    exit
    mda 2
        mda-type a4-oc3
        no fabric-stats-enabled
        network
            ingress
                fabric-policy 1
                queue-policy "default"
            exit
        exit
        access
            ingress
                fabric-policy 1
            exit
        exit
        no shutdown
    exit
    mda 3
        mda-type a16-chds1
        clock-mode adaptive
        no fabric-stats-enabled
        network
            ingress
                fabric-policy 1
                queue-policy "default"
            exit
        exit
        access
            ingress
                fabric-policy 1
            exit
        exit
        no shutdown
    exit
    mda 4
        mda-type a16-chds1
        clock-mode adaptive
        no fabric-stats-enabled
        network
            ingress
                fabric-policy 1
                queue-policy "default"
            exit
        exit
        access
            ingress
                fabric-policy 1
            exit
        exit
        no shutdown
    exit
    mda 5
        mda-type a8-eth
        no fabric-stats-enabled
        network
            ingress
                fabric-policy 1
                queue-policy "default"
```

```
                exit
            exit
            access
                ingress
                    fabric-policy 1
                exit
            exit
            no shutdown
        exit
        mda 6
            mda-type a2-choc3
            no fabric-stats-enabled
            network
                ingress
                    fabric-policy 1
                    queue-policy "default"
                exit
            exit
            access
                ingress
                    fabric-policy 1
                exit
            exit
            no shutdown
        exit
        no shutdown
    exit
#--------------------------------------------------
.....
ALU-A> config#
```

Configuring Ports

This section provides the CLI syntax and examples to configure the following:

- Configuring Ethernet Port Parameters
  → Configuring an Ethernet Network Port
  → Configuring an Ethernet Access Port
- Configuring Channelized Ports
  → Verifying the Adapter Card Type
- Configuring SONET/SDH Port Parameters
  → Configuring a SONET/SDH Access Port
  → Configuring a SONET/SDH Network Port
- Configuring ATM Interface Parameters
  → ATM Interface Commands
- Configuring Multilink PPP Bundles
- Configuring MC-MLPPP
- Configuring Multilink ATM Inverse Multiplexing (IMA) Groups
  → Configuring IMA Groups
  → Configuration Notes
  → IMA Test Procedure

Configuring Ethernet Port Parameters

Use the following CLI syntax to configure Ethernet network and access port parameters.

CLI Syntax:
```
config# port port-id
ethernet
    autonegotiate limited
    dot1q-etype 0x0600 to 0xffff
    duplex {full|half}
    efm-oam
        [no]accept-remote-loopback
        mode {active|passive}
        [no]shutdown
        [no]transmit-interval interval [multiplier
          multiplier]
        [no]tunneling
    egress-rate sub-rate
    encap-type {dot1q|null}
    hold-time hold-time [up hold-time-up | down
```

```
   hold-time-down]
loopback {line | internal} timer {0 | 30..86400}
no loopback
mac ieee-address
mode {access|network}
mtu mtu-bytes
network
   queue-policy name
report-alarm [signal-fail] [remote] [local] [no-
   frame-lock] [high-ber]
speed {10|100|1000}
```

Configuring an Ethernet Network Port

A network port is network facing and participates in the service provider transport or infrastructure network processes.

Use the following basic CLI syntax to configure Ethernet network mode port parameters.

CLI Syntax:

```
port port-id
ethernet
    mode {network}
    network
       queue-policy name
```

The following CLI syntax shows an example of configuring an Ethernet port for network mode.

Example:

```
config# port 1/1/1
config>port# description "Ethernet network port"
config>port# ethernet
config>port>ethernet# mode network
config>port>ethernet# exit
config>port># no shutdown
```

Use the `config port info` command to display port configuration information.

```
ALU-B>config>port# info
---------------------------------------------
        description "Ethernet network port"
        ethernet
        exit
        no shutdown
---------------------------------------------
ALU-B>config>port#
```

Configuring an Ethernet Access Port

Services are configured on access ports used for customer-facing traffic. If a Service Access Point (SAP) is to be configured on a port, it must be configured for access mode.

When a port is configured for access mode, the appropriate encapsulation type can be specified to distinguish the services on the port. Once a port has been configured for access mode, multiple services may be configured on the port.

Use the following basic CLI syntax to configure Ethernet access mode port parameters

CLI Syntax:
```
port port-id
     mode {access}
     encap-type {dot1q | null}
```

The following CLI syntax shows an example of configuring an Ethernet port for access mode.

Example:
```
config# port 1/1/2
config>port# description "Ethernet access port"
config>port# ethernet
config>port>ethernet# mode access
config>port>ethernet# encap-type dot1q
config>port>ethernet# exit
config>port# no shutdown
```

Use the `config port info` command to display port configuration information.

```
ALU-A>config>port# info
----------------------------------------------
        description "Ethernet access port"
        ethernet
            mode access
            encap-type dot1q
        exit
        no shutdown
----------------------------------------------
ALU-A>config>port#
```

Configuring Channelized Ports

Channelized ports are supported on the 16-port T1/E1 ASAP Adapter card, on the 12-port Serial Data Interface card, and on the 2-port OC3/STM1 Channelized Adapter card. Ethernet ports cannot be channelized.

When configuring channelized ports, the port ID is specified in different ways depending on the TDM type and level of channelization, as follows:

N × DS0 in DS1 port.*channel-group*, where *channel-group* is {1 to 24}

N × DS0 in E1 port.*channel-group*, where *channel-group* is {1 to 32}

1 × DS0 in RS-232 and V.35 port.*channel-group*, where *channel-group* is 1

Verifying the Adapter Card Type

To ensure that you have a channel-capable adapter card, verify the adapter card you are configuring by using the `show mda` command.

In the following example, mda 1, mda 3, and mda 5 show channelized adapter cards.

```
*A:ALU-1# show mda
===============================================================================
MDA Summary
===============================================================================
Slot  Mda   Provisioned          Equipped             Admin     Operational
            Mda-type             Mda-type             State     State
-------------------------------------------------------------------------------
1     1     a12-sdi              a12-sdi              up        up
      2     a4-oc3               a4-oc3               up        up
      3     a16-chds1            a16-chds1            up        up
      4     a8-eth               a8-eth               up        up
      5     a2-choc3             a2-choc3             up        up
      6     a4-oc3               a4-oc3               up        up
===============================================================================
*A:ALU-1
```

Use the `show mda detail` command to show detailed information for the channelized adapter cards.

```
*A:ALU-1# show mda 1/1 detail
===============================================================================
MDA 1/1 detail
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     1     a12-sdi                                     up        provisioned

MDA Specific Data
    Maximum port count            : 12
    Number of ports equipped      : 12
    Network ingress queue policy  : default
    Network ingress fabric policy : 1
    Access ingress fabric policy  : 1
    Fabric Stats Enabled          : TRUE
    Capabilities                  : Serial, CEM
    Min channel size              : PDH DS0 Group
    Max channel size              : Serial RS-232
    Max number of channels        : 12
    Channels in use               : 2

CEM MDA Specific Data
    Clock Mode                    : n/a

Hardware Data
    Part number                   :
    CLEI code                     :
    Serial number                 :
    Manufacture date              :
    Manufacturing string          :
    Manufacturing deviations      :
    Administrative state          : up
    Operational state             : provisioned
    Software version              : N/A
    Time of last boot             : N/A
    Current alarm state           : alarm cleared
    Base MAC address              :
===============================================================================
*A:ALU-1#
```

```
*A:ALU-1# show mda 1/3 detail
===============================================================================
MDA 1/3 detail
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     3     a16-chds1             a16-chds1             up        up

MDA Specific Data
    Maximum port count            : 16
    Number of ports equipped      : 16
    Network ingress queue policy  : default
    Network ingress fabric policy : 1
    Access ingress fabric policy  : 1
    Fabric Stats Enabled          : FALSE
    Capabilities                  : TDM, PPP, ATM, CEM
    Min channel size              : PDH DS0 Group
    Max channel size              : PDH DS1
    Max number of channels        : 256
    Channels in use               : 3

CEM MDA Specific Data
    Clock Mode                    : adaptive

Hardware Data
    Part number                   : Sim Part#
    CLEI code                     : Sim CLEI
    Serial number                 : mda-3
    Manufacture date              : 01012003
    Manufacturing string          : Sim MfgString mda-3
    Manufacturing deviations      : Sim MfgDeviation mda-3
    Administrative state          : up
    Operational state             : up
    Software version              : N/A
    Time of last boot             : N/A
    Current alarm state           : alarm active
    Base MAC address              : a4:58:01:03:00:01
===============================================================================
*A:ALU-1#
```

```
*A:ALU-1# show mda 1/5 detail

===============================================================================
MDA 1/5 detail
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     5     a2-choc3              a2-choc3              up        up

MDA Specific Data
    Maximum port count           : 2
    Number of ports equipped     : 2
    Network ingress queue policy  : default
    Network ingress fabric policy : 1
    Access ingress fabric policy  : 1
    Fabric Stats Enabled         : FALSE
    Capabilities                 : Sonet, TDM, PPP, ATM, cHDLC
    Min channel size             : PDH DS0 Group
    Max channel size             : PDH DS3
    Max number of channels       : 512
    Channels in use              : 0

Hardware Data
    Part number                  : 3HE03127AAAB0102
    CLEI code                    : IPU3AFPEAA
    Serial number                : NS092040281
    Manufacture date             : 05192009
    Manufacturing string         : ECO C03759
    Manufacturing deviations     :
    Administrative state         : up
    Operational state            : up
    Temperature                  : 37C
    Temperature threshold        : 75C
    Software version             : N/A
    Time of last boot            : 2009/06/28 18:47:04
    Current alarm state          : alarm cleared
    Base MAC address             : 00:23:3e:99:7a:12
===============================================================================
*A:ALU-1#
```

On the T1/E1 ASAP Adapter card and 2-port OC3/STM1 Channelized Adapter card, DS0 channel groups and their parameters are configured in the DS1 or E1 context. For a DS1 channel group, up to 24 timeslots can be assigned (numbered 1 to 24). For an E1 channel group, up to 31 timeslots can be assigned (numbered 2 to 32). For ATM, all timeslots are auto-configured when a channel group gets created.

On the 12-port Serial Data Interface card, DS0 channel groups and their parameters are configured in the RS-232 or V.35 context. For RS-232, a single timeslot is auto-configured when a channel group is created. For V.35, the number of timeslots auto-configured when a channel group is created depends on the interface speed.

Note: Encapsulation type on the T1/E1 ASAP Adapter card and 2-port OC3/STM1 Channelized Adapter card is configured at the DS1 or E1 level; on the 12-port Serial Data Interface card, the encapsulation type is configured at the RS-232 or V.35 level. A port can support only one encapsulation type. When the first channel group is configured for encap-type, all other channel groups on the port are automatically configured with that encap-type.

The following is an example of an E1 channel group configuration.

```
ALU-A>config>port>tdm# e1
ALU-A>config>port>tdm>e1# channel-group 1
ALU-A>config>port>tdm>e1>channel-group# timeslots 2
ALU-A>config>port>tdm>e1>channel-group# no shutdown
ALU-A>config>port>tdm>e1>channel-group#
ALU-A>config>port>tdm>e1# no shutdown
ALU-A>config>port>tdm>e1# channel-group 2
ALU-A>config>port>tdm>e1>channel-group# timeslots 3,4
ALU-A>config>port>tdm>e1>channel-group# encap-type cem
ALU-A>config>port>tdm>e1>channel-group# no shutdown
ALU-A>config>port>tdm>e1>channel-group# exit
```

The following is an example of an RS-232 channel group configuration.

```
ALU-A>config>port 1/1/2
ALU-A>config>port# serial
ALU-A>config>port>serial# rs232
ALU-A>config>port>serial>rs232# channel-group 1
ALU-A>config>port>serial>rs232>channel-group# description "RS232GRP1"
ALU-A>config>port>serial>rs232>channel-group# encap-type cem
ALU-A>config>port>serial>rs232>channel-group# idle-payload-fill all-ones
ALU-A>config>port>serial>rs232>channel-group# no shutdown
ALU-A>config>port>serial>rs232>channel-group# exit
```

Services can now be applied to the configured channelized ports.

Configuring SONET/SDH Port Parameters

Use the following CLI syntax to configure SONET/SDH port parameters on a 4-port OC3/STM1 Clear Channel Adapter card.

CLI Syntax:

```
[no] port {port-id}
    sonet-sdh
        clock-source {loop-timed | node-timed}
        framing {sonet | sdh}
        hold-time {[up hold-time-up] [down hold-time-
          down]}
        no hold-time
        loopback {line | internal}
        no loopback
        [no] path [sonet-sdh-index]
            atm
                cell-format cell-format
                min-vp-vpi value
            crc {16 | 32}
            description description
            no description
            encap-type {atm | ppp-auto}
            mode {access | network}
            mtu mtu
            no mtu
            network
                queue-policy name
                no queue-policy
            ppp
                keepalive time-interval [dropcount drop-
                    count]
                no keepalive
            [no] report-alarm [pais] [plop] [prdi] [pplm]
            [prei] [puneq]
            [no] scramble
            [no] shutdown
            signal-label value
            no signal-label
            trace-string [trace-string]
            no trace-string
        [no] report-alarm [loc] [lais] [lrdi][lb2er-sd]
          [lb2er-sf] [slof][slos] [lrei]
        section-trace {increment-z0 | byte value | string
          string}
        speed {oc3}
        no speed
        threshold {ber-sd | ber-sf} rate threshold
```

Use the following CLI syntax to configure SONET/SDH port parameters on a 2-port OC3/STM1 Channelized Adapter card.

CLI Syntax:
```
[no] port {port-id}
    sonet-sdh
       clock-source {loop-timed | node-timed}
       framing {sonet | sdh}
       group sonet-sdh-index payload {tu3 | vt2 | vt15}
       hold-time {[up hold-time-up] [down hold-time-
         down]}
       no hold-time
       loopback {line | internal}
       no loopback
       [no] path [sonet-sdh-index]
          description description
          no description
          [no] report-alarm [pais] [plop] [prdi] [pplm]
          [prei] [puneq]
          [no] shutdown
          signal-label value
          no signal-label
          trace-string [trace-string]
          no trace-string
       [no] report-alarm [loc] [lais] [lrdi][lb2er-sd]
         [lb2er-sf][slof][slos][lrei]
       section-trace {increment-z0 | byte value | string
         string}
       speed {oc3}
       no speed
       threshold {ber-sd | ber-sf} rate threshold
```

Configuring a SONET/SDH Access Port

Use the following CLI syntax to configure a SONET/SDH access port on a 4-port OC3/STM1 Clear Channel Adapter card.

CLI Syntax:
```
port {port-id}
     sonet-sdh
         path [sonet-sdh-index]
             encap-type {atm}
             [no] shutdown
```

The following CLI syntax shows an example of configuring a SONET/SDH access port on a 4-port OC3/STM1 Clear Channel Adapter card.

Example:
```
config# port 1/2/1
config>port# sonet-sdh
config>port>sonet-sdh# path
config>port>sonet-sdh>path# encap-type atm
config>port>sonet-sdh>path# no shutdown
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# exit
config>port# exit
config#
```

Use the `config info` command to display port configuration information.

```
ALU-B>config>info
....
#--------------------------------------------------
echo "Port Configuration"
#--------------------------------------------------
....
    port 1/2/1
        shutdown
        sonet-sdh
            path
                encap-type atm
                atm
                exit
                no shutdown
            exit
        exit
    exit
....
```

Use the following CLI syntax to configure a SONET/SDH access port on a 2-port OC3/STM1 Channelized Adapter card.

CLI Syntax:
```
port {port-id}
     tdm
         ds1 ds1-id
             channel-group channel-group
                 encap-type {atm}
             mode {access}
             [no] shutdown
```

The following CLI syntax shows an example of configuring a SONET/SDH access port on a 2-port OC3/STM1 Channelized Adapter card.

Example:
```
config# port 1/2/2
config>port# tdm
config>port>tdm#ds1 22
config>port>tdm>ds1# encap-type atm
config>port>tdm>ds1# mode access
config>port>tdm>ds1# no shutdown
config>port>tdm>ds1# exit
config>port>tdm># exit
config>port# exit
config#
```

Use the `config info` command to display port configuration information.

```
ALU-B>config>info
....
#--------------------------------------------------
echo "Port Configuration"
#--------------------------------------------------
....

sonet-sdh
            path sts1-1
                payload vt15
                no shutdown
            exit
            path sts1-2
                no shutdown
            exit
            path vt15-1.1.1
                no shutdown
            exit
        exit
        tdm
            ds3 2
                channelized ds1
                no shutdown
            exit
            ds1 1.1.1
                channel-group 1
                    encap-type atm
```

```
                    atm
                    exit
                    no shutdown
                exit
                no shutdown
            exit
            ds1 2.1
                channel-group 1
                    encap-type atm
                    atm
                    exit
                    no shutdown
                exit
                no shutdown
            exit
      exit
....
```

Configuring a SONET/SDH Network Port

Use the following CLI syntax to configure a SONET/SDH network port on a 4-port OC3/STM1 Clear Channel Adapter card.

CLI Syntax:

```
port {port-id}
     sonet-sdh
        path [sonet-sdh-index]
           encap-type {ppp-auto}
           mode {network}
           [no] shutdown
```

The following CLI syntax shows an example of configuring a SONET/SDH network port on a 4-port OC3/STM1 Clear Channel Adapter card.

Example:

```
config# port 1/2/2
config>port# sonet-sdh
config>port>sonet-sdh# path
config>port>sonet-sdh>path# mode network
config>port>sonet-sdh>path# encap-type ppp-auto
config>port>sonet-sdh>path# no shutdown
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# exit
config>port# exit
config#
```

Use the `config info` command to display port configuration information.

```
ALU-B>config>info
....
#--------------------------------------------------
echo "Port Configuration"
#--------------------------------------------------
....
    port 1/2/2
        sonet-sdh
            path
                no shutdown
                mode network
                encap-type ppp-auto
                network
                    queue-policy "default"
                exit
            exit
        exit
        no shutdown
    exit
....
```

Use the following CLI syntax to configure a SONET/SDH network port on a 2-port OC3/STM1 Channelized Adapter card.

CLI Syntax:

```
port {port-id}
     tdm
        ds1 ds1-id
            channel-group channel-group
               encap-type {ppp-auto}
            mode {network}
            [no] shutdown
```

The following CLI syntax shows an example of configuring a SONET/SDH network port on a 2-port OC3/STM1 Channelized Adapter card.

Example:

```
config# port 1/2/2
config>port# tdm
config>port>tdm#ds1 22
config>port>tdm>ds1# encap-type ppp-auto
config>port>tdm>ds1# mode network
config>port>tdm>ds1# no shutdown
config>port>tdm>ds1# exit
config>port>tdm># exit
config>port# exit
config#
```

Use the `config info` command to display port configuration information.

```
ALU-B>config>info
....
#--------------------------------------------------
echo "Port Configuration"
#--------------------------------------------------
....
    port 1/2/2
        shutdown
        sonet-sdh
            encap-type
                ppp-auto
              mode
                 network
                exit
                no shutdown
            exit
        exit
    exit
....
```

Configuring ATM Interface Parameters

ATM interface parameters can be configured for SONET/SDH ports in access mode, TDM ports or channels supporting ATM encapsulation, and IMA multilink bundles. The parameters allow users to configure characteristics of an ATM interface. The 7705 SAR supports configuration of the following ATM interface characteristics:

- cell-format — allows the user to select the ATM cell format to be used on a given interface: UNI or NNI (NNI is not supported on SONET/SDH interfaces)
- min-vp-vpi — allows the user to set the minimum allowable virtual path identifier (VPI) value that can be used on the ATM interface for a VPC

ATM Interface Commands

Use the following CLI syntax to configure ATM interface parameters for SONET/SDH ports.

CLI Syntax:
```
port {port-id}
     sonet-sdh
        path [sonet-sdh-index]
           atm
              cell-format cell-format
              min-vp-vpi value
```

Use the following CLI syntax to configure ATM interface parameters for TDM channels.

CLI Syntax:
```
port {port-id}
    tdm
       ds1
          channel-group 1
             atm
                cell-format cell-format
                min-vp-vpi value
       e1
          channel-group 1
             atm
                cell-format cell-format
                min-vp-vpi value
```

Use the following CLI syntax to configure ATM interface parameters for IMA multilink bundles.

CLI Syntax:
```
port>multilink-bundle
    ima
       atm
          cell-format cell-format
          min-vp-vpi value
```

Configuring Multilink PPP Bundles

Multilink PPP bundles can be created with as few as one, or as many as eight members. On a 16-port T1/E1 ASAP Adapter card, you can configure up to eight multilink bundles. On a 2-port OC3/STM1 Channelized Adapter card, you can configure up to 16 multilink bundles per port to a maximum of 32 bundles. Each bundle represents a single connection between two routers. The bundles aggregate channelized ports to define the bandwidth between the routers over the DS1 links.

Multilink bundling is based on a link control protocol (LCP) option negotiation that permits a system to indicate to its peer that it is capable of combining multiple physical links into a bundle.

Multilink bundling operations are modeled after a virtual PPP link-layer entity where packets received over different physical link-layer entities are identified as belonging to a separate PPP network protocol (the Multilink Protocol, or MP) and recombined and sequenced according to information present in a multilink fragmentation header. All packets received over links identified as belonging to the multilink arrangement are presented to the same network-layer protocol processing machine, whether they have multilink headers or not.

When you configure multilink bundles, consider the following guidelines:

- a multilink bundle configuration should include at least two ports
- a maximum of eight ports can be included in a multilink bundle
- multilink bundles can only be aggregated on a single adapter card
- all member links of an MLPPP group must reside on the same T1/E1 ASAP card or the same port on a 2-port OC3/STM1 Channelized Adapter card, and be of the same type (either E1 or DS1)
- links inside an MC-MLPPP bundle must be configured for access mode and IPCP encapsulation type. All links must be from the same adapter card and all timeslots must be allocated to a single channel group.
- when you configure a channel group on the network side with ppp-auto encapsulation, the system automatically allocates all timeslots to the channel group
- when you configure a channel group on the access side with IPCP encapsulation, the system does not automatically allocate all timeslots to the channel group. In order to use the port or channel group as a member in an MLPPP or MC-MLPPP, you must manually allocate all the timeslots to the channel group before adding it to the bundle.

Configuring MC-MLPPP

Use the following CLI syntax to configure MC-MLPPP.

CLI Syntax:

```
config port {bundle-id}
        multilink-bundle
              mlppp
                    multiclass count
```

The following CLI syntax shows an example of configuring MC-MLPPP.

Example:

```
config# port bundle-ppp-1/6.1
config>port# multilink-bundle
config>port>multilink-bundle# mlppp
config>port>multilink-bundle>mlppp# multiclass 4
config>port>multilink-bundle>mlppp# exit
config>port>multilink-bundle# exit
config>port# exit
config#
```

Use the `config info` command to display port configuration information.

```
ALU-B>config>info
....
#--------------------------------------------------
echo "Port Configuration"
#--------------------------------------------------
....
   port bundle-ppp-1/6.1
        shutdown
        multilink-bundle
            mlppp
                multiclass 4
            exit
        exit
    exit
....
```

When you configure MC-MLPPP on a port, consider the following guidelines:

- MC-MLPPP can be enabled on every MLPPP bundle
- MC-MLPPP must be enabled before links are added
- links inside an MC-MLPPP bundle must be configured for access mode and IPCP encapsulation type. All links must be from the same adapter card and all timeslots must be allocated to a single channel group.
- a single fragment size for all classes is supported
- prefix elision is not supported, as per RFC 2686. The prefix elision (compressing common header bytes) option advises the router that, in each of the given classes, the implementation expects to receive only packets with a certain prefix; this prefix is not to be sent as part of the information in the fragment(s) of this class.

Configuring Multilink ATM Inverse Multiplexing (IMA) Groups

IMA groups are supported on channelized T1/E1 ASAP Adapter cards and 2-port OC3/STM1 Channelized Adapter cards. The groups aggregate E1 or DS1 ATM channels into a single logical ATM interface. Up to eight links can be bundled in an IMA group, and up to eight IMA groups can be configured on the T1/E1 ASAP Adapter card. On the 2-port OC3/STM1 Channelized Adapter card, up to 16 IMA groups can be bundled per port, and up to 32 IMA groups can be configured per card.

Configuring IMA Groups

Use the following CLI syntax to configure IMA group parameters.

CLI Syntax:
```
configure# port bundle-ima-slot/port.bundle-num
          description description-string
          multilink-bundle
               ima
                  atm
                     cell-format {uni|nni}
                     min-vp-vpi vp-vpi-value
                  exit
                  link-delay {activate | deactivate} milliseconds
                  version IMA-version
          member port-id
          minimum-links minimum-links
          red-differential-delay red-diff-delay [down]
```

Configuration Notes

An IMA group has common interface characteristics (for example, configuration that applies to a logical ATM interface either configured via the IMA group context or taken from the primary link). The following list details the common IMA group interface characteristics:

- ATM interface characteristics (under the ATM menu context)
- interface mode type (only access is supported)

Member links inherit these common characteristics from the IMA group that they are part of and as long as they are part of the IMA group.

The primary link is the member that has the lowest ifindex. When a member is added or deleted, the primary member may be changed based on ifindicies of all member links.

Once a path becomes part of an IMA group logical link, the path ceases to exist as a physical ATM path interface. This means that:

- ATM interface characteristics enforced over the link are those of a group. When a link is removed from an IMA group, the link's ATM characteristics are reset to ATM interface defaults.
- no services can be configured on the member link itself

After the primary member has been added, each additional member added to the group will only be accepted if it matches the configuration of the IMA group.

ATM interface characteristics are not part of this verification as they are overwritten or reset to defaults when a link is added to or removed from an IMA group.

When a member is assigned to an IMA group, it is automatically assigned an IMA link ID. IMA link IDs are in range from 0 to 7 and stay constant as long as the router does not reboot.

When configuring IMA groups, consider the following guidelines.

- IMA groups should contain at least two members.
- A maximum of eight members can be included in an IMA group.
- A maximum of eight IMA groups can be configured on a single T1/E1 adapter card. All IMA links in an IMA group must belong to the same T1/E1 card.
- A maximum of 32 IMA groups (16 per port) can be configured on a 2-port OC3/STM1 Channelized Adapter card. All IMA links in an IMA group must belong to the same physical OC3 port.
- IMA bundles can only be aggregated on a single adapter card.
- IMA group maximum bandwidth and minimum link settings allow, by default, for oversubscription of shaped services. When that occurs, however, scheduling of traffic over an IMA group ATM interface degrades to round-robin between shaped services. To preserve full ATM traffic management even during a member link failure, it is recommended that maximum bandwidth be set to minimum links.
- On the 2-port OC3/STM1 Channelized Adapter card, the red differential delay is configurable from 2 to 50 ms and is accurate within 1 ms. On the 16-port T1/E1 ASAP Adapter card, the red differential delay is configurable from 2 to 75 ms and is accurate within 1 ms.
- If no member links are configured on an IMA group, the speed of an E1 channel will be used to compute the maximum IMA group bandwidth that may be allocated to shaped services.
- When adding member links to an IMA group, the clock-source of the E1 or DS1 link must be set to node-timed.

The following example illustrates creation of an IMA group with three group members residing on a channelized 16-port T1/E1 ASAP Adapter card in slot 1/3/1:

```
ALU-A>config# port bundle-ima-1/3.1
ALU-A>config>port# multilink-bundle
ALU-A>config>port>ml-bundle# member 1/3/1.1
ALU-A>config>port>ml-bundle# member 1/3/2.1
ALU-A>config>port>ml-bundle# member 1/3/3.1
```

IMA Test Procedure

Use the following CLI syntax to perform an IMA test pattern procedure on a member link of an IMA group.

CLI Syntax:
```
configure# port bundle-ima-slot/port.bundle-num
multilink-bundle
     ima
     test-pattern-procedure
        test-link port-id
        test-pattern [pattern]
        no shutdown
```

An operator can deploy IMA test procedures to verify operations of an IMA group and its member links. The following is a list of key points about the test pattern procedure.

1. The test procedure is performed as defined by the IMA specification version 1.1. That is, a test pattern is sent over the specified link and is expected to be looped back over all the links in the group. ICP cells are used to perform the test.
2. The test procedure is not traffic-affecting; that is, data traffic will not be affected by the ongoing test.
3. There can only be a single test executed per IMA group at any given time.
4. The IMA member link must exist in the specified group for the command to be accepted.
5. The test pattern procedure must be shut down before a new test-link value or test pattern is accepted.
6. The current IMA group test pattern configuration and result of a given IMA test can be seen by executing a show command for the IMA group. A test-link result can have three values:
   - Disabled: the test-link is currently not running
   - Operating: the test pattern procedure is `no shutdown` and there are currently no failed links for this running test-pattern procedure
   - Link-Failed: one or more links have failed the test-pattern procedure. Execute a `show port <slot/mda/port> ima-link` command to see the failed link and received pattern value.
7. Deleting a member link that is the same as the specified test-link, to stay in compliance with key point 4, will result in the test-link value being reset to default.
8. IMA test procedure configurations are not saved when the admin `save` command is executed.

Service Management Tasks

This section discusses basic procedures of the following service management tasks:

- Modifying or Deleting an Adapter Card
- Deleting a Card
- Deleting Port Parameters

Modifying or Deleting an Adapter Card

To change an adapter card type already provisioned for a specific slot/card, you must first shut down the slot/MDA/port configuration and then delete the adapter card from the configuration.

Use the following CLI syntax to modify an adapter card.

CLI Syntax:
```
config> port port-id
shutdown
```

CLI Syntax:
```
config> card slot-number
     shutdown
[no] mda mda-number
     [no] mda-type mda-type
     shutdown
```

The following CLI syntax shows an example of modifying an adapter card.

Example:
```
config# port 1/1/1
config>port# shutdown
config>port# exit
config# port 1/1/2
config>port# shutdown
config>port# exit
config# card 1
config>card# mda 1
config>card>mda# shutdown
config>card>mda# exit
config>card# no mda 1
config>card# mda 1
config>card# mda-type a8-eth
config>card>mda# no shutdown
```

Deleting a Card

To delete a CSM or adapter card provisioned for a specific slot, you must shut down existing port configurations and shut down and remove all adapter card configurations.

Use the following CLI syntax to delete a card provisioned for a specific slot.

CLI Syntax:
```
config> port port-id
shutdown
```

CLI Syntax:
```
config> card slot-number
card-type card-type
mda mda-number
     no mda-type mda-type
     no shutdown
```

The following CLI syntax shows an example of deleting a card.

Example:
```
config# port 1/1/1
config>port# shutdown
config>port# exit
config# port 1/1/2
config>port# shutdown
config>port# exit
config> card 1
config>card# mda 1
config>card>mda# shutdown
config>card>mda# no mda 1
config>card>mda# exit
config>card# no card 1
config>card# exit
```

Deleting Port Parameters

Use the following CLI syntax to delete a port provisioned for a specific adapter card.

CLI Syntax:
```
config> port port-id
shutdown
```

The following CLI syntax shows an example of deleting a port.

Example:
```
config# port 1/1/1
config>port# shutdown
config>port# no port 1/1/1
```

Card, Adapter Card, and Port Command Reference

Command Hierarchies

Configuration Commands

Card Commands

config
- — [**no**] **card** *slot-number*
  - — **card-type** *card-type*
  - — **no card-type**
  - — [**no**] **shutdown**

Adapter Card Commands

config
- — [**no**] **card** *slot-number*
  - — [**no**] **mda** *mda-slot*
    - — **mda-type** *mda-type*
    - — **no mda-type**
    - — [**no**] **fabric-stats-enabled**
    - — **clock mode adaptive**
    - — **network**
      - — **ingress**
        - — **fabric-policy** *fabric-policy-id*
        - — **no fabric-policy**
        - — **queue-policy** *name*
        - — **no queue-policy**
    - — **access**
      - — **ingress**
        - — **fabric-policy** *fabric-policy-id*
        - — **no fabric-policy**
    - — [**no**] **sync-e**
    - — [**no**] **shutdown**

Port Configuration Commands

config
- — **port** {*port-id* | *bundle-id*}
- — **no port** {*port-id* | *bundle-id*}
  - — [**no**] **ddm-events**
  - — **description** *description-string*
  - — **no description**
  - — **ethernet**
  - — **serial**
  - — **sonet-sdh**
  - — **multilink-bundle**
  - — **tdm**
  - — [**no**] **shutdown**

Ethernet Commands

config
- — [**no**] **port** {*port-id*}
  - — **ethernet**
    - — **autonegotiate** [**limited**]
    - — [**no**] **autonegotiate**
    - — **dot1q-etype** *0x0600* to *0xffff*
    - — **no dot1q-etype**
    - — **duplex** {**full** | **half**}
    - — **efm-oam**
      - — [**no**] **accept-remote-loopback**
      - — **mode** {**active** | **passive**}
      - — [**no**] **shutdown**
      - — [**no**] **transmit-interval** *interval* [**multiplier** *multiplier*]
      - — [**no**] **tunneling**
    - — **egress-rate** *sub-rate*
    - — **no egress-rate**
    - — **encap-type** {**dot1q** | **null**}
    - — **no encap-type**
    - — **hold-time** [**up** *hold-time-up* | **down** *hold-time-down*]
    - — **no hold-time**
    - — **loopback** {**line** | **internal**} **timer** {**0** | **30 .. 86400**}
    - — **no loopback**
    - — **mac** *ieee-address*
    - — **no mac**
    - — **mode** {**access** | **network**}
    - — **no mode**
    - — **mtu** *mtu-bytes*
    - — **no mtu**
    - — **network**
      - — **queue-policy** *name*
      - — **no queue-policy**
    - — [**no**] **report-alarm** [**signal-fail**] [**remote**] [**local**] [**no-frame-lock**] [**high-ber**]
    - — **speed** {**10** | **100** | **1000**}

Serial Commands

```
config
    — [no] port {port-id}
        — serial
            — [no] rs232
                — [no] channel-group channel-group-id
                    — description description-string
                    — no description
                    — encap-type {cem}
                    — no encap-type
                    — idle-payload-fill {all-ones | pattern pattern}
                    — no idle-payload-fill
                    — [no] shutdown
                — character-length {6 | 7 | 8}
                — clock-source {slave}
                — control-lead {input | output}
                    — input
                        — dtr-dsr {high | low}
                        — rts-dcd {high | low | end-to-end}
                        — alb-cts {high | low | end-to-end}
                        — rdl-ri {high | low}
                    — output
                        — dsr-dtr {high | low}
                        — dcd-rts {high | low | end-to-end}
                        — cts-alb {high | low | end-to-end}
                        — ri-rdl {high | low}
                — device-gender {dte | dce}
                — device-mode {synchronous | asynchronous}
                — duplex {full}
                — loopback {bidir-b | bidir-e}
                — no loopback
                — parity {odd | even | mark | space}
                — no parity
                — [no] report-alarm [hcmOof | hcmRai]
                — [no] shutdown
                — speed {1200 | 2400 | 9600 | 19200 | 38400 | 56000}
                — stop-bits {1 | 2}
            — [no] v35
                — [no] channel-group channel-group-id
                    — description description-string
                    — no description
                    — encap-type {cem}
                    — no encap-type
                    — idle-payload-fill {all-ones | pattern pattern}
                    — no idle-payload-fill
                    — [no] shutdown
                — character-length {6 | 7 | 8}
                — clock-source {slave}
                — control-lead {input | output}
                    — input
                        — dtr-dsr {high | low}
                        — rts-dcd {high | low | end-to-end}
                        — alb-cts {high | low | end-to-end}
```

— **output**
— **dsr-dtr** {**high** | **low**}
— **dcd-rts** {**high** | **low** | **end-to-end**}
— **cts-alb** {**high** | **low** | **end-to-end**}
— **device-gender** {**dte** | **dce**}
— **device-mode** {**synchronous**}
— **duplex** {**full**}
— **loopback** {**bidir-b** | **bidir-e**}
— **no loopback**
— **parity** {**odd** | **even** | **mark** | **space**}
— **no parity**
— [**no**] **shutdown**
— **speed** {**64k** | **128k** | **256k** | **384k** | **512k** | **640k** | **768k** | **896k** | **1024k** | **1152k** | **1280k** | **1408k** | **1536k** | **1664k** | **1792k** | **1920k**}
— **stop-bits** {**1** | **2**}

SONET/SDH Commands

config
- — [**no**] **port** {*port-id*}
  - — **sonet-sdh**
    - — **clock-source** {**loop-timed** | **node-timed**}
    - — **framing** {**sonet** | **sdh**}
    - — **group** *sonet-sdh-index* **payload** {**tu3** | **vt2** | **vt15**}
    - — **hold-time** {[**up** *hold-time-up*] [**down** *hold-time-down*]}
    - — **no hold-time**
    - — **loopback** {**line** | **internal**}
    - — **no loopback**
    - — [**no**] **path** [*sonet-sdh-index*]
      - — **atm**
        - — **cell-format** *cell-format*
        - — **min-vp-vpi** *value*
      - — **crc** {**16** | **32**}
      - — **description** *description-string*
      - — **no description**
      - — **encap-type** {**atm** | **ppp-auto**}
      - — **mode** {**access** | **network**}
      - — **mtu** *mtu*
      - — **no mtu**
      - — **network**
        - — **queue-policy** *name*
        - — **no queue-policy**
      - — **payload** {**sts3** | **tug3** | **ds3** | **vt2** | **vt15** | **ds1** | **e1**}
      - — **ppp**
        - — **keepalive** *time-interval* [**dropcount** *drop-count*]
        - — **no keepalive**
      - — [**no**] **report-alarm** [**pais**] [**plop**] [**prdi**] [**pplm**] [**prei**] [**puneq**]
      - — [**no**] **scramble**
      - — [**no**] **shutdown**
      - — **signal-label** *value*
      - — **no signal-label**
      - — **trace-string** [*trace-string*]
      - — **no trace-string**
    - — [**no**] **report-alarm** [**loc**] [**lais**] [**lrdi**] [**lb2er-sd**] [**lb2er-sf**] [**slof**] [**slos**] [**lrei**]
    - — **section-trace** {**increment-z0** | **byte** *value* | **string** *string*}
    - — **speed** {**oc3**}
    - — **no speed**
    - — **threshold** {**ber-sd** | **ber-sf**} **rate** *threshold-rate*
    - — **no threshold** {**ber-sd** | **ber-sf**}

Multilink Bundle and IMA Group Commands

config
- — [**no**] **port** {*bundle-id*}
  - — **multilink-bundle**
    - — **fragment-threshold** *fragment-threshold*
    - — **fragment-threshold**
    - — **no fragment-threshold**
    - — **ima**
      - — **atm**
        - — **cell-format** *cell-format*
        - — **min-vp-vpi** *value*
      - — **link-delay** {**activate** | **deactivate**} *milliseconds*
      - — **no link-delay** {**activate** | **deactivate**}
      - — **max-bandwidth** *number-links*
      - — **test-pattern-procedure**
        - — [**no**] **shutdown**
        - — **test-link** *port-id*
        - — **no test-link**
        - — **test-pattern** *pattern*
        - — **no test-pattern**
      - — **version** *IMA-version*
      - — **no version**
    - — [**no**] **member** *port-id*
    - — **minimum-links** *minimum-links*
    - — **no minimum-links**
    - — **mlppp**
      - — **endpoint-discriminator class** {**ip-address** | **global-mac-address** | **null**} [**discriminator-id** *discriminator-id*]
      - — **no endpoint-discriminator**
      - — **multiclass** *count*
      - — **no multiclass**
    - — **mrru** *mrru*
    - — **no mrru**
    - — **red-differential-delay** *red-diff-delay* [**down**]
    - — **no red-differential-delay**
    - — [**no**] **short-sequence**
    - — **yellow-differential-delay** *yellow-diff-delay*
    - — **no yellow-differential-delay**

TDM Commands

config
— [**no**] **port** {*port-id*}
— **tdm**
— **buildout short**
— [**no**] **ds1**
— [**no**] **ds3** *[sonet-sdh-index]*
— [**no**] **e1**
— **length** {**133** | **266** | **399** | **533** | **655**}
— **line-impedance** {**75 | 100 | 120**}

DS1 Commands

config
- — [**no**] **port** {*port-id*}
  - — **tdm**
    - — [**no**] **ds1**
      - — [**no**] **channel-group** *channel-group-id*
        - — **atm**
          - — **cell-format** *cell-format*
          - — **min-vp-vpi** *value*
        - — **crc** {**16** | **32**}
        - — **description** *description-string*
        - — **no description**
        - — **encap-type** {**atm** | **cem** | **ipcp** | **ppp-auto**}
        - — **no encap-type**
        - — **idle-cycle-flag** {**flags** | **ones**}
        - — **no idle-cycle-flag**
        - — **idle-payload-fill** {**all-ones** | **pattern** *pattern*}
        - — **no idle-payload-fill**
        - — **idle-signal-fill** {**all-ones** | **pattern** *pattern*}
        - — **no idle-signal-fill**
        - — **mode** {**access** | **network**}
        - — **no mode**
        - — **mtu** *mtu-bytes*
        - — **no mtu**
        - — **network**
          - — **queue-policy** *name*
          - — **no queue-policy**
        - — [**no**] **ppp**
          - — **keepalive** *time-interval* [**dropcount** *drop-count*]
          - — **no keepalive**
        - — [**no**] **scramble**
        - — [**no**] **shutdown**
        - — **speed** {**56** | **64**}
        - — **timeslots** *timeslots*
        - — **no timeslots**
      - — **clock-source** {**adaptive-timed** | **loop-timed** | **node-timed**}
      - — **framing (DS1)** {**esf** | **sf** | **ds1-unframed**}
      - — **hold-time** [**up** *hold-time-up*] [**down** *hold-time-down*]
      - — **no hold-time**
      - — **loopback (DS1)** {**line** | **internal** | **fdl-ansi** | **fdl-bellcore** | **payload-ansi**}
      - — **no loopback (DS1)**
      - — [**no**] **remote-loop-respond (DS1)**
      - — [**no**] **report-alarm** {**ais** | **los** | **oof** | **rai** | **looped**}
      - — [**no**] **signal-mode** {**cas**}
      - — [**no**] **shutdown**

DS3 Commands

config
— [**no**] **port** {*port-id*}
— **tdm**
— [**no**] **ds3** [*sonet-sdh-index*]
— **channelized** {**ds1** | **e1**}
— **no channelized**
— **clock-source (ds3)** {**loop-timed** | **free-run**}
— **description** *description-string*
— **no description**
— [**no**] **feac-loop-respond**
— **framing (DS3)** {**c-bit** | **m23**}
— **loopback (DS3)** {**line** | **internal** | **remote**}
— **no loopback (DS3)**
— **mdl** {**eic** | **lic** | **fic** | **unit** | **pfi** | **port** | **gen**} *mdl-string*
— [**no**] **mdl**
— [**no**] **mdl-transmit** {**path** | **idle-signal** | **test-signal**}
— [**no**] **report-alarm** {**ais** | **los** | **oof** | **rai** | **looped**}
— [**no**] **shutdown**

E1 Commands

```
config
    — [no] port {port-id}
        — tdm
            — [no] e1
                — [no] channel-group channel-group-id
                    — atm
                        — cell-format cell-format
                        — min-vp-vpi value
                    — crc {16 | 32}
                    — description description-string
                    — no description
                    — encap-type {atm | cem | ipcp | ppp-auto}
                    — no encap-type
                    — idle-cycle-flag {flags | ones}
                    — no idle-cycle-flag
                    — idle-payload-fill {all-ones | pattern pattern}
                    — no idle-payload-fill
                    — idle-signal-fill {all-ones | pattern pattern}
                    — no idle-signal-fill
                    — mode {access | network}
                    — no mode
                    — mtu mtu-bytes
                    — no mtu
                    — network
                        — queue-policy name
                        — no queue-policy
                    — [no] ppp
                        — keepalive time-interval [dropcount drop-count]
                        — no keepalive
                    — [no] scramble
                    — [no] shutdown
                    — speed {56 | 64}
                    — timeslots timeslots
                    — no timeslots
                — clock-source {adaptive-timed | loop-timed | node-timed}
                — framing (E1) {no-crc-g704 | g704 | e1-unframed}
                — loopback (E1) {line | internal}
                — hold-time [up hold-time-up] [down hold-time-down]
                — no hold-time
                — no loopback (E1)
                — [no] report-alarm {ais | los | oof | rai | looped}
                — [no] signal-mode {cas}
                — [no] shutdown
```

Show Commands

show
- — **card** [*slot-number*] [**detail**]
- — **card** **state**
- — **mda** *slot* [/*mda*] [**detail**]
- — **mda** [*slot* [/*mda*]] **statistics** [**source-mda** | **dest-mda**]
- — **mda** **with-fabric-stats**
- — **multilink-bundle** [*bundle-id* | *slot/mda* | **type** {**mlppp** | **ima-grp**}] [**detail**]
- — **multilink-bundle** [*bundle-id* | *slot/mda* | [**ppp** [**multiclass**] | **ima**]]
- — **multilink-bundle** *bundle-id*
  - — **ima**
    - — **atm** [**detail**]
      - — **connections**
      - — **pvc** [*vpi/vci*] [**detail**]
      - — **pvp** [*vpi*] [**detail**]
- — **port** *port-id* [**count**] [**detail**]
- — **port** *port-id* **acr** [**detail**]
- — **port** *port-id* **description**
- — **port** *port-id* **associations**
- — **port** *port-id* **ppp** [**detail**]
- — **port** *port-id* **ethernet** [**efm-oam** | **detail**]
- — **port** *port-id* **atm**
- — **port** *port-id* **atm connections**
- — **port** *port-id* **atm pvc** [*vpi/vci*] [**detail**]
- — **port** *port-id* **atm pvp** [*vpi*] [**detail**]
- — **port-tree** *port-id*

Monitor Commands

monitor
- — **port** *port-id* [*port-id*...(up to 5 max)] [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**] [**multiclass**]
- — **port** *port-id* **atm** [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
- — **fabric-profile** **mda** {*mda-id* | **with-stats-enabled**} {**dest-mda** | **source-mda**} [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]

Clear Commands

clear
- — **mda** *mda-id*
- — **mda** *mda-id* **statistics** [**source-mda** | **destination-mda** | **fabric-port** | **fabric-global** | **all**]
- — **port** *port-id* **statistics**
- — **port** *port-id* **atm pvc** [*vpi*[/*vci*]] **statistics**
- — **port** *port-id* **atm pvp** [*vpi*] **statistics**

Command Descriptions

Configuration Commands

Generic Commands

description

Syntax **description** *description-string*
no description

Context config>port
config>port>tdm>ds1>channel-group
config>port>tdm>ds3
config>port>tdm>e1>channel-group
config>port>sonet-sdh>path
config>port>serial>rs232>channel-group
config>port>serial>v35>channel-group

Description This command creates a text description for a configuration context to help identify the content in the configuration file.

The **no** form of this command removes any description string from the context. For the serial context, the **no** form of this command restores the default value.

Default **none**

"DS0GRP" (for the serial context)

Parameters *description-string* — description character string. Allowed values are any string up to 80 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, $, spaces, etc.), the entire string must be enclosed within double quotes.

shutdown

Syntax [**no**] **shutdown**

Context config>card
config>card>mda
config>port
config>port>tdm>ds1
config>port>tdm>ds1>channel-group
config>port>tdm>ds3
config>port>tdm>e1
config>port>tdm>e1>channel-group
config>port>ethernet>efm-oam
config>port>sonet-sdh>path
config>port>serial>rs232
config>port>serial>v35
config>port>serial>rs232>channel-group
config>port>serial>v35>channel-group

Description This command administratively disables an entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics.

The operational state of the entity is disabled as well as the operational state of any entities contained within. Many objects must be shut down before they can be deleted.

When used with the **ethernet>efm-oam** command, **shutdown** enables tunneling on the port (see tunneling), and **no shutdown** enables Ethernet EFM OAM 802.3ah.

The **no** form of this command administratively enables an entity.

Default **card — no shutdown**

mda — no shutdown

port — shutdown

Card Commands

card

Syntax [**no**] **card** *slot-number*

Context config

Description This mandatory command is the first step in activating the IOM software: designating it a slot position in the chassis. On the 7705 SAR, the slot number is always **1**.

The IOM software must be activated before the adapter cards and ports can be configured.

The **no** form of this command removes the card from the configuration. All associated ports, services, and adapter cards must be shut down.

Default **none**

Parameters *slot-number* — the slot number of the card in the chassis

Values 1

card-type

Syntax **card-type** *card-type*
no card-type

Context config>card

Description This mandatory command is the second step in activating the IOM software: designating the card type. The card type can be preprovisioned, meaning that the card does not need to be installed in the chassis. On the 7705 SAR, the card type is always **iom-1g**.

A card must be provisioned (configured) before an adapter card or port can be configured.

A card can only be provisioned in a slot that is vacant, which means that no other card can be provisioned for that particular slot. To reconfigure a slot position, use the **no** form of this command to remove the current information. Port and adapter card information must be shut down.

A card can only be provisioned in a slot if the card type is allowed in the slot. An error message is generated if an attempt is made to provision a card type that is not allowed.

The **no** form of this command removes the card from the configuration. This operation requires that the card be administratively shut down. All dependencies to ports on this card must be shut down and removed from the configuration before issuing the **no card-type** command.

Default **none**

Parameters *card-type* — the type of card to be configured and installed in the slot

Values iom-1g

Adapter Card Commands

mda

Syntax [**no**] **mda** *mda-slot*

Context config>card

Description This mandatory command enables access to a card's MDA CLI context to configure adapter cards.

Default **none**

Parameters *mda-slot* — the adapter card slot number to be configured

Values 1 to 6

mda-type

Syntax **mda-type** *mda-type*
no mda-type

Context config>card>mda

Description This mandatory command provisions a specific adapter card type to the device configuration for the slot. The adapter card can be preprovisioned, but it must be provisioned before ports can be configured. Ports can be configured once the adapter card is properly provisioned.

A maximum of six adapter cards can be installed in a 7705 SAR-8 chassis. Only one adapter card can be provisioned per MDA slot. To modify an MDA slot, shut down all port associations.

A medium severity alarm is generated if an adapter card is inserted that does not match the adapter card type configured for the slot. This alarm is cleared when the correct adapter card is inserted or the configuration is modified. A high severity alarm is raised if an administratively enabled adapter card is removed from the chassis. This alarm is cleared if either the correct adapter card type is inserted or the configuration is modified. A low severity trap is issued if an administratively disabled adapter card is removed.

An alarm is raised if partial or complete adapter card failure is detected. The alarm is cleared when the error condition ceases.

The **no** form of this command deletes the adapter card from the configuration. The adapter card must be administratively shut down before it can be deleted from the configuration. Before an adapter card can be shut down, all port associations with this adapter card, for example SAPs and IP interfaces, must be shut down first.

fabric-stats-enabled

Syntax [**no**] **fabric-stats-enabled**

Context config>card>mda

Description This command enables the fabric port statistics counter to count egress traffic toward a specified adapter card. The CSM allows the collection of fabric statistics from only one fabric port at any given time.

To change the port statistics counter to a different adapter card, turn off statistics collection on the assigned adapter card by using **no fabric-stats-enabled** and then enabling statistics collection on another adapter card.

clock mode

Syntax **clock mode adaptive**

Context config>card>mda

Description This command defines the clocking mode on the T1/E1 ASAP Adapter card or 2-port OC3/STM1 Channelized Adapter card. The only mode supported is adaptive.

Default **adaptive**

sync-e

Syntax [**no**] **sync-e**

Context config>card>mda

Description This command enables Synchronous Ethernet on the 8-port Ethernet v2 Adapter card and on optical SFP ports on the 7705 SAR-F. When Synchronous Ethernet is enabled, the transmit timing of all optical SFPs that support synchronous Ethernet is derived from the node’s SSU. Additionally, these SFP ports can be used to provide timing for the SSU. When Synchronous Ethernet is disabled, the optical SFP ports are timed from a local oscillator. Refer to the 7705 SAR OS Basic System Configuration Guide for more information about Synchronous Ethernet.

Default **no sync-e**

Interface QoS Commands

network

Syntax **network**

Context config>card>mda

Description This command enables the network context to configure QoS policy parameters for the specified adapter card.

ingress

Syntax **ingress**

Context config>card>mda>network
config>card>mda>access

Description This command enables the context to configure the QoS policy parameters for ingress traffic, in either a network or access context, for the specified adapter card.

access

Syntax **access**

Context config>card>mda

Description This command enables the access context to configure QoS policy parameters for the specified adapter card.

fabric-policy

Syntax **fabric-policy** *fabric-policy-id*
no fabric-policy

Context config>card>mda>network>ingress
config>card>mda>access>ingress

Description This command configures the ingress fabric policy, in either a network or access context, for the specified adapter card. The **no** form of this command reverts the *fabric-policy-id* to the default value.

Default **1**

Parameters *fabric-policy-id* — an existing fabric policy ID

queue-policy

Syntax **queue-policy** *name*
no queue-policy

Context config>card>mda>network>ingress

Description This command specifies the network ingress queue policy that defines queue parameters such as CBS, high-priority-only burst size, MBS, CIR, and PIR rates, as well as forwarding class-to-queue mappings. The network queue policy is defined in the **config>qos>network-queue** context. Refer to the 7705 SAR OS Quality of Service Guide for more information.

The **no** form of this command reverts to the default.

Default **"default"**

Parameters *name* — specifies an existing network queue policy name

General Port Commands

port

Syntax **port** {*port-id* | *bundle-id*}
no port {*port-id* | *bundle-id*}

Context config

Description This command enables access to the context to configure ports, multilink bundles, and IMA groups. Before a port can be configured, the chassis slot must be provisioned with a valid card type and the adapter card slot must be provisioned with a valid adapter card type. (See the card and mda commands.)

Default **none**

Parameters *port-id* — specifies the physical port ID in the *slot/mda/port* format

bundle-id — specifies the multilink bundle to be associated with this IP interface. Up to eight MLPPP bundles or IMA groups can be configured on a 16-port T1/E1 ASAP Adapter card. Up to 16 MLPPP bundles or IMA groups per port to a maximum of 32 bundles can be configured on a 2-port OC3/STM1 Channelized Adapter card. The command syntax must be configured as follows:

Syntax: bundle-*type-slot/mda.bundle-num*
bundle[-**ppp**]-*slot/mda.bundle-num* (Creates a multilink PPP bundle)
bundle-ima-*slot/mda.bundle-num* (Creates an IMA group)
bundle: keyword
slot: card/adapter card slot numbers
bundle-num: 1 to 16 (up to 8 for MLPPP and IMA)

For example:
router1>config# port bundle-1/1.1 (multilink PPP bundle)
router1>config# port bundle-ima-1/1.2 (IMA group bundle)

ddm-events

Syntax [**no**] **ddm-events**

Context config>port

Description This command enables or disables digital diagnostic monitoring (DDM) events for the port. DDM is supported on Ethernet SFP ports and OC3 SONET SFP ports.

Default **no ddm-events**

Ethernet Port Commands

ethernet

Syntax **ethernet**

Context config>port

Description This command enables access to the context to configure Ethernet port attributes on an 8-port Ethernet Adapter card.

autonegotiate

Syntax **autonegotiate** [**limited**]
[**no**] **autonegotiate**

Context config>port>ethernet

Description This command enables speed autonegotiation and duplex autonegotiation on Ethernet 10/100BASE-T RJ-45 ports.

The command enables speed autonegotiation on the two SFP ports (10, 100, or 1000 Mb/s). Duplex autonegotiation is only supported on SFP ports using 100 Mb/s fiber SFPs or 10/100/1000BASE-T copper SFPs. Duplex autonegotiation is not supported for Gigabit Ethernet SFPs; the mode is always full duplex.

Speed autonegotiation takes place automatically — all ports are configured for speed autonegotiation by default. Speed autonegotiation might need to be disabled (for example, if a port must be forced to a certain speed or to avoid speed negotiation loops between the Ethernet Adapter card and other devices). To turn off speed autonegotiation for a port, the user configures the port speed manually.

When autonegotiation is disabled on a port, the port does not attempt to autonegotiate and will only operate at the speed and duplex settings configured for the port.

Note: Disabling autonegotiation on Gigabit Ethernet ports is not allowed, as the IEEE 802.3 specification for Gigabit Ethernet requires that autonegotiation be enabled for far-end fault indication.

If the **autonegotiate limited** keyword option is specified, the port will autonegotiate but will only advertise a specific speed and duplex mode. The speed and duplex mode advertised are the settings configured for the port. One use for limited mode is for multispeed gigabit ports to force gigabit operation while keeping autonegotiation enabled for compliance with IEEE 801.3.

The **no** form of this command disables autonegotiation on this port.

Default **autonegotiate**

dot1q-etype

Syntax **dot1q-etype** *0x0600* to *0xffff*
no dot1q-etype

Context config>port>ethernet

Description This command specifies the EtherType expected when the port's encapsulation type is dot1q. Dot1q encapsulation is supported only on Ethernet interfaces.

IEEE 802.1q (also known as VLAN tagging) defines a process to channelize a single Ethernet port into VLANs. Each VLAN can represent a customer or an application. Up to 4096 VLANs can be configured per port.

The EtherType specifies the protocol being carried in an Ethernet frame. In 802.1q, the EtherType is set to the Tag Protocol Identifier (TPID) value of 0x8100, which identifies the frame as an IEE 802.1Q-tagged frame. As well, 2 bytes of Tag Control Information (TCI), followed by 2 bytes containing the frame's original EtherType are added to the frame. Together, the TPID and TCI make up the VLAN tag.

The **no** form of this command reverts the dot1q-etype value to the default.

For more information on VLANs and VLAN tagging, refer to the 7705 SAR OS Services Guide.

Default **0x8100**

Parameters *0x0600* to *0xffff* — specifies the EtherType to expect

duplex

Syntax **duplex** {**full** | **half**}

Context config>port>ethernet

Description This command configures the duplex mode of an Ethernet or Fast Ethernet port when autonegotiation is disabled.

SFP slots hosting Ethernet or Fast Ethernet SFPs can be configured to full or half duplex mode when autonegotiation is disabled.

Duplex autonegotiation is automatically turned off when the user sets the mode with this command.

SFP slots hosting GigE SFPs only support full duplex mode. Duplex autonegotiation is not supported, and the mode is always full duplex.

Default **full**

efm-oam

Syntax **efm-oam**

Context config>port>ethernet

Description This command configures EFM-OAM attributes.

accept-remote-loopback

Syntax [**no**] **accept-remote-loopback**

Context config>port>ethernet>efm-oam

Description This command enables reactions to loopback control OAMPDUs from peers.

The **no** form of this command disables reactions to loopback control OAMPDUs.

mode

Syntax **mode** {**active** | **passive**}

Context config>port>ethernet>efm-oam

Description This command configures the mode of OAM operation for this Ethernet port.

Active mode causes the port to initiate the negotiation process and continually send out efm-oam information PDUs. **Passive** mode waits for the peer to initiate the negotiation process. A passive mode port cannot initiate monitoring activities (such as loopback) with the peer.

Default **active**

transmit-interval

Syntax [**no**] **transmit-interval** *interval* [**multiplier** *multiplier*]

Context config>port>ethernet>efm-oam

Description This command configures the transmit interval of OAMPDUs.

Parameters *interval* — specifies the transmit interval

Values 1 to 600 (in 100 ms)

multiplier — specifies the multiplier for the transmit-interval to set the local link down timer

Values 2 to 5

tunneling

Syntax [**no**] **tunneling**

Context config>port>ethernet>efm-oam

Description This command enables EFM OAMPDU tunneling. OAMPDU tunneling is required when a loopback is initiated from a router end and must be transported over the existing network infrastructure to the other end. Enabling tunneling will allow the PDUs to be mapped to Epipes so that the OAM frames can be tunneled over MPLS to the far end.

To enable Ethernet EFM OAM 802.3ah on the port, use the **efm-oam>no shutdown** command.

The **no** form of the command disables tunneling.

egress-rate

Syntax **egress-rate** *sub-rate*
no egress-rate

Context config>port>ethernet

Description This command configures the rate of traffic leaving the network.

The **no** form of this command returns the value to the default.

Default **no egress-rate**

Parameters *sub-rate* — the egress rate in kb/s

Values 1 to 10000000

encap-type

Syntax **encap-type** {**dot1q** | **null**}
no encap-type

Context config>port>ethernet

Description This command configures the encapsulation method used to distinguish customer traffic on an Ethernet access port or different VLANs on a network port.

The **no** form of this command restores the default.

See also dot1q-etype for information on IEEE 802.1q tagging and encapsulation.

Default **null**

Parameters **dot1q —** ingress frames carry 802.1Q tags where each tag signifies a different service

null — ingress frames will not use any tags to delineate a service. As a result, only one service can be configured on a port with a null encapsulation type.

hold-time

Syntax **hold-time** [**up** *hold-time-up* | **down** *hold-time-down*]
no hold-time

Context config>port>ethernet

Description This command configures port link dampening timers, which reduce the number of link transitions reported to upper layer protocols.

The **hold-time** value is used to dampen interface transitions.

When an interface transitions from an up state to a down state, it is immediately advertised to the rest of the system, but subsequent interface down transitions are not advertised to upper layers until the **hold-time-down** interval has expired. Likewise, when an interface transitions from a down state to an up state, it is immediately advertised as up to the rest of the system, but subsequent up transitions are not advertised until the **hold-time-up** interval has expired.

The **no** form of this command reverts to the default values.

Default **down 0 or up 0—** no port link dampening is enabled; link transitions are immediately reported to upper layer protocols

Parameters *hold-time-down* **—** the interval, in tenths of seconds, used when an interface transitions from a down state to an up state

Values 0 to 50

hold-time-up **—** the interval, in tenths of seconds, used when an interface transitions from an up state to a down state

Values 0 to 50

loopback

Syntax **loopback** {**line** | **internal**} **timer** {**0** | **30 .. 86400**}
no loopback

Context config>port>ethernet

Description This command configures timed line loopbacks and both timed and untimed internal loopbacks on Ethernet ports.

A line loopback loops frames received on the corresponding port back towards the transmit direction. Line loopbacks are supported on ports configured in network mode.

An internal loopback loops the frames from the local router back at the framer. This is usually referred to as an equipment loopback. The transmit signal is looped back and received by the interface. Internal loopbacks are supported on ports configured in access mode.

Loopback timers can be configured for 30 s to 86400 s. Internal loopback timers can also be configured to 0 s, which turns the loopback into a latched loopback. A latched loopback is enabled indefinitely until it is turned off by the user or there is a system restart.

All timed Ethernet loopbacks are turned off under the following conditions: an adapter card reset, an activity switch, or timer expiry.

If a loopback exists on a port, it must be disabled or the timer must expire before another loopback can be configured on the same port. An Ethernet loopback cannot be configured on a port that has EFM-OAM enabled on it; EFM-OAM cannot be enabled on a port that has an Ethernet loopback enabled on it.

The loopback command is not saved to the system configuration.

The **no** form of this command disables the specified type of loopback.

Parameters **line —** places the associated port into line loopback mode

internal — places the associated port into internal loopback mode

timer — the timer set for loopbacks, in seconds

Values 0 | 30 to 86400

mac

Syntax **mac** *ieee-address*
no mac

Context config>port>ethernet

Description This command assigns a specific MAC address to an Ethernet port. When the command is issued while the port is operational, IP will issue an ARP, if appropriate, and BPDUs are sent with the new MAC address.

The **no** form of this command returns the MAC address to the default value.

Default a default MAC address is assigned by the system

Parameters *ieee-address* — specifies the 48-bit MAC address in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC, and non-IEEE reserved MAC addresses.

mode

Syntax **mode** {**access** | **network**}
no mode

Context config>port>ethernet

Description This command configures an Ethernet port for access or network mode operation.

An **access** port is used for customer-facing traffic on which services are configured. A Service Access Point (SAP) can only be configured on an access port or channel.

Once an Ethernet port has been configured for access mode, multiple services can be configured on the Ethernet port.

A **network** port participates in the service provider transport or infrastructure network when a network mode is selected.

The **no** form of this command restores the default.

Default **network**

Parameters **access —** configures the port as service access

network — configures the port for transport network use

mtu

Syntax **mtu** *mtu-bytes*
no mtu

Context config>port>ethernet

Description This command configures the maximum payload MTU size for an Ethernet port.

The Ethernet port level MTU parameter indirectly defines the largest physical packet the port can transmit or the far-end Ethernet port can receive. Packets to be transmitted over a given port that are larger than the MTU of the port will be fragmented or discarded, depending on whether the DF bit is set in the packet header.

If the port mode or encapsulation type is changed, the MTU assumes the default values of the new mode or encapsulation type.

The **no** form of this command restores the default values.

Default The default MTU value depends on the port type, mode, and encapsulation as listed in the following table.

Parameters *mtu-bytes* — sets the maximum allowable size of the MTU, expressed as an integer

Values 512 to 2106 bytes (see the following table)

Type	Mode	Encap Type	Default (Bytes)	Max MTU (bytes)
10/100 Ethernet	Access/Network	null	1514	2102
10/100 Ethernet	Access/Network	dot1q	1518	2106
GigE SFP	Access/Network	null	1514 (access) 1572 (network)	2102
GigE SFP	Access/Network	dot1q	1518 (access) 1572 (network)	2106

report-alarm

Syntax [**no**] **report-alarm** [**signal-fail**] [**remote**] [**local**] [**no-frame-lock**] [**high-ber**]

Context config>port>ethernet

Description This command specifies when and if to generate alarms and alarm clear notifications for this port.

Parameters **signal-fail —** reports an Ethernet signal lost alarm

remote — reports remote faults

local — reports local faults

no-frame-lock — reports a “not locked on the ethernet framing sequence” alarm

high-ber — reports a high bit error rate alarm

speed

Syntax **speed** {**10** | **100** | **1000**}

Context config>port>ethernet

Description This command configures the port speed of an Ethernet port when autonegotiation is disabled.

Setting the speed turns off autonegotiation.

Default **100**

Parameters **10 —** sets the link to 10 Mb/s speed

100 — sets the link to 100 Mb/s speed

1000 — sets the link to 1000 Mb/s speed (only supported on GigE SFPs)

Serial Commands

serial

Syntax **serial**

Context config>port

Description This command enables the context to configure RS-232 or V.35 parameters for a port on a channelized 12-port Serial Data Interface card. This context cannot be accessed by any other card.

A serial port configuration allows some or all of the bandwidth to be dedicated to a port by aggregating a number of DS0s into a single bundle.

Serial data transmission rates below the rate of a single DS0, that is, less than 64 kb/s, are achieved using a proprietary protocol called High Capacity Multiplexing (HCM). These speeds, known as subrate speeds, are supported only on RS-232 ports.

Default **none**

rs232

Syntax [**no**] **rs232**

Context config>port>serial

Description This command enables the context to configure RS-232 parameters for a channel. Once one of the three ports on a connector has been configured for an RS-232 channel, the other two ports on the connector can only be configured for RS-232.

The **no** form of this command deletes the RS-232 channel.

Default **none**

v35

Syntax [**no**] **v35**

Context config>port>serial

Description This command enables the context to configure V.35 parameters for a channel. Once one of the three ports on a connector has been configured for a V.35 channel, the other two ports on the connector can only be configured for V.35.

The **no** form of this command deletes the V.35 channel.

Default **none**

character-length

Syntax **character-length** {**6** | **7** | **8**}

Context config>port>serial>rs232
config>port>serial>v35

Description This command configures the number of data bits used to transmit a character.

This command is valid only if device-mode is asynchronous. The value for this command cannot be 8 if the value for parity is anything other than **no parity** (that is, anything other than none) and the value for stop-bits is 2.

Default **8**

Parameters **6** — specifies six bits in a character

7 — specifies seven bits in a character

8 — specifies eight bits in a character

clock-source

Syntax **clock-source** {**slave**}

Context config>port>serial>rs232
config>port>serial>v35

Description This command configures the source of the transmit clock.

This command is valid only if device-mode is synchronous, and only the slave mode is supported.

Default **slave**

Parameters see Table 6

Table 6: Synchronous Clocking Options

Attached Device Gender		Circuit Gender		Transmit Clock Option	Description
DTE*	DCE**	DTE*	DCE**		
√			√	Slave	DCE slave — the transmit and receive clocks are derived from the BRG locked to the system timing
	√	√		Slave	DTE slave — the transmit clock and the receive clock are supplied by the attached DCE device (this is the default mode)
*Data Terminal Equipment **Data Communications Equipment					

control-lead

Syntax **control-lead** {**input** | **output**}

Context config>port>serial>rs232
config>port>serial>v35

Description This command enables access to the context to configure the input and output leads that carry control signals. Control signals provide the handshaking for call setup, tear-down, and synchronization.

Default **none**

input

Syntax **input**

Context config>port>serial>rs232>control-lead
config>port>serial>v35>control-lead

Description This command enables access to the context to configure the input control leads.

Default **none**

output

Syntax **output**

Context config>port>serial>rs232>control-lead
config>port>serial>v35>control-lead

Description This command enables access to the context to configure the output control leads.

Default **none**

dtr-dsr

Syntax **dtr-dsr** {**high** | **low**}

Context config>port>serial>rs232>control-lead>input
config>port>serial>v35>control-lead>input

Description This command configures the Data Terminal Ready (DTR) or Data Set Ready (DSR) input control lead. The input signal that is sent depends on the device-gender setting. For a DCE device, the input signal is DTR. For a DTE device, the input signal is DSR.

Default **high**

Parameters **high** — the input control lead is assumed to be on

low — the input control lead is assumed to be off

rts-dcd

Syntax **rts-dcd** {**high** | **low** | **end-to-end**}

Context config>port>serial>rs232>control-lead>input
config>port>serial>v35>control-lead>input

Description This command configures the Request To Send (RTS) or Data Carrier Detect (DCD) input control lead. The input signal that is sent depends on the device-gender setting. For a DCE device, the input signal is RTS. For a DTE device, the input signal is DCD.

Default **high**

Parameters **high** — the input control lead is assumed to be on

low — the input control lead is assumed to be off

end-to-end — the input control lead follows that of the remote end. This parameter is not supported for interface speeds ≥ 64 kb/s.

alb-cts

Syntax **alb-cts** {**high** | **low** | **end-to-end**}

Context config>port>serial>rs232>control-lead>input
config>port>serial>v35>control-lead>input

Description This command configures the Analog Loopback (ALB) or Clear To Send (CTS) input control lead. The input signal that is sent depends on the device-gender setting. For a DCE device, the input signal is ALB. For a DTE device, the input signal is CTS.

Default **high**

Parameters **high** — the input control lead is assumed to be on

low — the input control lead is assumed to be off

end-to-end — the input control lead follows that of the remote end. This parameter is not supported for interface speeds ≥ 64 kb/s.

rdl-ri

Syntax **rdl-ri** {**high** | **low**}

Context config>port>serial>rs232>control-lead>input

Description This command configures the Remote Digital Loopback (RDL) or Ring Indicator (RI) input control lead. The input signal that is sent depends on the device-gender setting. For a DCE device, the input signal is RDL. For a DTE device, the input signal is RI.

This command is valid only for an RS-232 interface.

Default **high**

Parameters **high** — the input control lead is assumed to be on

low — the input control lead is assumed to be off

dsr-dtr

Syntax **dsr-dtr** {**high** | **low**}

Context config>port>serial>rs232>control-lead>output
config>port>serial>v35>control-lead>output

Description This command configures the Data Set Ready (DSR) or Data Terminal Ready (DTR) output control lead. The output signal that is sent depends on the device-gender setting. For a DCE device, the outputs signal is DSR. For a DTE device, the output signal is DTR.

Default **high**

Parameters

high — the output control lead is forced on

low — the output control lead is forced off

dcd-rts

Syntax **dcd-rts** {**high** | **low** | **end-to-end**}

Context config>port>serial>rs232>control-lead>output
config>port>serial>v35>control-lead>output

Description This command configures the Data Carrier Detect (DCD) or Request To Send (RTS) output control lead. The output signal that is sent depends on the device-gender setting. For a DCE device, the output signal is DCD. For a DTE device, the output signal is RTS.

Default **high**

Parameters

high — the output control lead is forced on

low — the output control lead is forced off

end-to-end — the output control lead follows that of the remote end

cts-alb

Syntax **cts-alb** {**high** | **low** | **end-to-end**}

Context config>port>serial>rs232>control-lead>output
config>port>serial>v35>control-lead>output

Description This command configures the Clear To Send (CTS) or Analog Loopback (ALB) output control lead. The output signal that is sent depends on the device-gender setting. For a DCE device, the output signal is CTS. For a DTE device, the output signal is ALB.

Default **high**

Parameters

high — the output control lead is forced on

low — the output control lead is forced off

end-to-end — the output control lead follows that of the remote end

ri-rdl

Syntax **ri-rdl** {**high** | **low**}

Context config>port>serial>rs232>control-lead>output

Description This command configures the Ring Indicator (RI) or Remote Digital Loopback (RDL) output control lead. The output signal that is sent depends on the device-gender setting. For a DCE device, the output signal is RI. For a DTE device, the output signal is RDL.

This command is valid only for an RS-232 interface.

Default **high**

Parameters **high** — the output control lead is forced on

low — the output control lead is forced off

device-gender

Syntax **device-gender** {**dte** | **dce**}

Context config>port>serial>rs232
config>port>serial>v35

Description This command configures the gender of the device.

Data and control signals are transmitted and received over wire pairs. The gender of a device indicates which wire in the pair is used to send and receive the signal.

Default **dce**

Parameters **dte** — the device is performing the role of the data terminal equipment

dce — the device is performing the role of the data communications equipment

device-mode

Syntax **device-mode** {**synchronous** | **asynchronous**}

Context config>port>serial>rs232
config>port>serial>v35

Description This command configures the mode of operation for the device. An RS-232 channel can be configured for either synchronous or asynchronous mode. Asynchronous mode is not supported on a V.35 channel; it can only be configured for synchronous mode.

Default **synchronous**

Parameters **synchronous —** transmits data continuously based on timing

asynchronous — transmits data one character at a time

duplex

Syntax **duplex** {**full**}

Context config>port>serial>rs232
config>port>serial>v35

Description This command configures the duplex method. In Release 2.1, only the full duplex mode is supported; half duplex mode is not supported.

Default **full**

Parameters **full —** uses two independent transmission paths, one in each direction

loopback

Syntax **loopback** {**bidir-b** | **bidir-e**}
no loopback

Context config>port>serial>rs232
config>port>serial>v35

Description This command puts the specified interface into a loopback mode. The corresponding interface must be in a shutdown state in order for the loopback mode to be enabled.

In the serial context, a bidirectional loopback B or E may be configured. A bidirectional loopback is a circuit loopback that loops traffic from the line back to the line and simultaneously loops traffic from the system back to the system. Bidirectional loopback B takes place on the control card (CSM) side of the adapter card, and is closer to the system. Loopback E takes place on the data device side of the adapter card, and is closer to the line.

This command is not saved in the router configuration between boots.

The **no** form of this command disables loopback on the interface.

Default **no loopback**

Parameters **bidir-b —** bidirectional loopback B is closer to the system side of the adapter card

bidir-e — bidirectional loopback E is closer to the line side of the adapter card

parity

Syntax **parity** {**odd** | **even** | **mark** | **space**}
no parity

Context config>port>serial>rs232
config>port>serial>v35

Description This command configures the parity bit in a character. Parity is an error detection method that adds an extra bit to each character, based on the number of 0s or 1s in the character.

This command is valid only if device-mode is asynchronous.

The value for this command must be **no parity** (that is, none) if the character-length value is 8 and the stop-bits value is 2.

The **no** form of this command disables the parity bit in a character.

Default **no parity**

Parameters **odd** — the parity bit set to 0 or 1 to make the total number of 1s in the set of bits odd

even — the parity bit set to 0 or 1 to make the total number of 1s in the set of bits even

mark — the parity bit is present but not used and always set to 1

space — the parity bit is present but not used and always set to 0

report-alarm

Syntax [**no**] **report-alarm** [**hcmOof** | **hcmRai**]

Context config>port>serial>rs232

Description This command enables logging of HCM alarms for RS-232 interfaces. HCM alarms are not generated for V.35 interfaces, since V.35 interfaces do not operate at subrate speeds.

The **no** form of this command disables the logging of the specified alarms.

Parameters **hcmOof** — reports local HCM out-of-frame errors. When configured, hcmOof events are raised and cleared.

Default HCM out-of-frame alarms are issued

hcmRai — reports remote HCM alarm indications. When configured, hcmRai events are raised and cleared.

Default HCM alarm indications are issued

speed

Syntax **speed** {**1200** | **2400** | **9600** | **19200** | **38400** | **56000**}

Context config>port>serial>rs232

Description This command configures the speed of the RS-232 interface.

The maximum speed for an RS-232 interface is 56000 b/s.

The rate of 56000 b/s is valid only if the device-mode is set to synchronous.

Default **9600**

Parameters **1200** — sets the link to 1200 b/s speed

2400 — sets the link to 2400 b/s speed

9600 — sets the link to 9600 b/s speed

19200 — sets the link to 19200 b/s speed

38400 — sets the link to 38400 b/s speed

56000 — sets the link to 56000 b/s speed

speed

Syntax **speed** {**64k** | **128k** | **256k** | **384k** | **512k** | **640k** | **768k** | **896k** | **1024k** | **1152k** | **1280k** | **1408k** | **1536k** | **1664k** | **1792k** | **1920k**}

Context config>port>serial>v35

Description This command configures the speed of the V.35 interface. The speed also determines the DS0 timeslots assigned to the channel group.

The super-rate speeds (that is, higher than 64 kb/s) operate in transparent mode and are valid only if the device-mode is set to synchronous.

Default **64k**

Parameters **64k** — sets the link to 64 kb/s speed

128k — sets the link to 128 kb/s speed

256k — sets the link to 256 kb/s speed

384k — sets the link to 384 kb/s speed

512k — sets the link to 512 kb/s speed

640k — sets the link to 640 kb/s speed

768k — sets the link to 768 kb/s speed

896k — sets the link to 896 kb/s speed

1024k — sets the link to 1024 kb/s speed

1152k — sets the link to 1152 kb/s speed

1280k — sets the link to 1280 kb/s speed

1408k — sets the link to 1408 kb/s speed

1536k — sets the link to 1536 kb/s speed

1664k — sets the link to 1664 kb/s speed

1792k — sets the link to 1792 kb/s speed

1920k — sets the link to 1920 kb/s speed

stop-bits

Syntax **stop-bits** {**1** | **2**}

Context config>port>serial>rs232
config>port>serial>v35

Description This command configures the number of stop bits used to signify the end of a character.

This command is valid only if the device-mode is asynchronous.

This command cannot have a value of 2 if the character-length value is 8 and the parity value is anything other than **no parity** (that is, anything other than none).

Default **1**

Parameters **1** — specifies one stop bit in a character

2 — specifies two stop bits in a character

RS-232 and V.35 Channel Group Commands

channel-group

Syntax [**no**] **channel-group** *channel-group-id*

Context config>port>serial>rs232>channel-group
config>port>serial>v35>channel-group

Description This command creates a DS0 channel group on a channelized RS-232 or V.35 circuit.

Channel groups cannot be further subdivided.

The **no** form of this command deletes the specified RS-232 or V.35 channel group.

Default **none**

Parameters *channel-group-id* — specifies the channel group ID number

Values RS-232: 1
V.35: 1

encap-type

Syntax **encap-type** {**cem**}
no encap-type

Context config>port>serial>rs232>channel-group
config>port>serial>v35>channel-group

Description This command configures the encapsulation method used for the channel group.

Once **encap-type** is specified, the channel group must be deleted before **encap-type** can be changed.

The **no** form of this command restores the default value.

Default **no encap-type**

Parameters **cem** — specifies the encapsulation type as circuit emulation mode

idle-payload-fill

Syntax **idle-payload-fill** {**all ones** | **pattern** *pattern*}
no idle-payload-fill

Context config>port>serial>rs232>channel-group
config>port>serial>v35>channel-group

Description This command defines the data pattern to be transmitted when the circuit emulation service is not operational or temporarily experiences underrun conditions.

This command is valid only if encap-type is cem.

The **no** form of this command restores the default value.

Default **all ones**

Parameters **all ones —** defines the 8-bit value to be transmitted as 11111111

pattern — defines the 8-bit value to be transmitted as a user-defined pattern (0 to 255)

SONET/SDH Port Commands

sonet-sdh

Syntax **sonet-sdh**

Context config>port

Description This command enables access to the context to configure SONET/SDH ports. This context can only be used when configuring an OC3 or STM1 port on an appropriate adapter card.

clock-source

Syntax **clock-source** {**loop-timed** | **node-timed**}

Context config>port>sonet-sdh

Description This command configures the clock for transmitted data from either the internal clock or from a clock recovered from the line's receive data stream.

Default **node-timed**

Parameters **loop-timed —** the link recovers the clock from the received data stream

node-timed — the link uses the internal clock when transmitting data

framing

Syntax **framing** {**sonet** | **sdh**}

Context config>port>sonet-sdh

Description This command specifies the SONET/SDH framing to be either SONET or SDH.

Default **sonet**

Parameters **sonet —** configures the port for SONET framing

sdh — configures the port for SDH framing

group

Syntax **group** *sonet-sdh-index* **payload** {**tu3** | **vt2** | **vt15**}

Context config>port>sonet-sdh

Description This command configures the SONET/SDH group payload on a 2-port OC3/STM1 Channelized Adapter card.

Default **none**

Parameters *sonet-sdh-index* — specifies the components making a SONET/SDH path as configured by the path command. Depending on the type of SONET/SDH port, the *sonet-sdh-index* must specify more path indexes to indicate the payload location of the path.

tu3 — specifies the tributary unit group (TUG3) on a path and configures the port or channel for transport network use

vt2 — configures the path as a vt2 type virtual tributary group

vt15 — configures the path as a vt15 type virtual tributary group

hold-time

Syntax **hold-time** {[**up** *hold-time-up*] [**down** *hold-time-down*]}
no hold-time

Context config>port>sonet-sdh

Description This command configures SONET link dampening timers in 100s of milliseconds, to guard against reporting excessive interface transitions. This is implemented by not advertising subsequent transitions of the interface to upper layer protocols until the configured timer has expired.

Default **no hold-time**

Parameters *hold-time-up* — configures the hold-timer for link up event dampening. A value of zero (0) indicates that an up transition is reported immediately.

Values 0 to 100 (in 100 ms)

hold-time-down — configures the hold-timer for link down event dampening. A value of zero (0) indicates that a down transition is reported immediately.

Values 0 to 100 (in 100 ms)

loopback

Syntax **loopback** {**line** | **internal**}
no loopback

Context config>port>sonet-sdh

Description This command activates a loopback on the SONET/SDH port. The SONET port must be in a shutdown state to activate any type of loopback. The loopback setting is never saved to the generated/saved configuration file.

Note: Loopback mode changes on a SONET/SDH port can affect traffic on the remaining ports.

Default **no loopback**

Parameters **line** — sets the port into line loopback state

internal — sets the port into internal loopback state

report-alarm

Syntax [**no**] **report-alarm** [**loc**] [**lais**] [**lrdi**] [**lb2er-sd**] [**lb2er-sf**] [**slof**] [**slos**] [**lrei**]

Context config>port>sonet-sdh

Description This command enables logging of SONET/SDH line and section alarms for a SONET/SDH port.

The **no** form of this command disables logging of the specified alarms.

Parameters **loc** — reports a loss of clock that causes the operational state of the port to be shut down

Default loss of clock alarms are issued

lais — reports line alarm indication signal errors. When configured, line alarm indication signal alarms are raised and cleared.

Default line alarm indication signal alarms are not issued

lrdi — reports line remote defect indication errors. Line remote defect indication errors are caused by remote loss of frame (LOF), loss of clock (LOC), and loss of signal (LOS) conditions. When configured, line remote defect indication alarms are raised and cleared.

Default line remote defect indication alarms are issued

lb2er-sd — reports line signal degradation BER (bit interleaved parity) errors. When configured, line signal degradation BER alarms are raised and cleared.

Default line signal degradation BER alarms are not issued

lb2er-sf — reports line signal failure BER errors. When configured, line signal failure BER alarms are raised and cleared.

Default line signal failure BER alarms are issued

slof — reports section loss of frame errors. When configured, section loss of frame alarms are raised and cleared.

Default section loss of frame alarms are issued

slos — reports a section loss of signal error on the transmit side. When configured, section loss of signal alarms are raised and cleared.

Default section loss of signal alarms are issued

lrei — reports a line error condition raised by the remote end as a result of b1 errors received from this node. When configured, line error traps are raised but not cleared.

Default line error traps are not issued

section-trace

Syntax **section-trace** {**increment-z0** | **byte** *value* | **string** *string*}

Context config>port>sonet-sdh

Description This command configures the section trace bytes in the SONET section header to interoperate with some older versions of ADMs or regenerators that require an incremental STM ID. You can explicitly configure an incremental STM value rather than a static one in the SDH overhead by specifying an **increment-z0** value.

Default **byte** 0x1

Parameters **increment-z0 —** configures an incremental STM ID instead of a static value

value **—** sets values in SONET header bytes

Values 0 to 255 or 0x00 to 0xFF

Default 0x1

string — specifies a text string that identifies the section

Values a string up to 16 bytes

speed

Syntax **speed** {**oc3**}
no speed

Context config>port>sonet-sdh

Description This command configures the speed of a SONET/SDH port. To change the port speed, the port must be administratively shut down and all channels must be removed. When the port speed is changed, the default channel configuration is recreated.

For Release 2.1, this option is available, but may not be configured, since only one speed type is supported.

The **no** form of this command reverts back to the default value.

Default **oc3**

Parameters **oc3** — sets the speed of the port to OC3

threshold

Syntax **threshold** {**ber-sd** | **ber-sf**} **rate** *threshold-rate*
no threshold {**ber-sd** | **ber-sf**}

Context config>port>sonet-sdh

Description This command configures the line signal (b2) degradation bit error rate (BER) and line signal failure thresholds.

Alarms are raised if the line signal bit interleaved parity error rates exceed either the degradation or failure thresholds. If the failure threshold is crossed, the link will be set to operationally down.

The **no** form of this command reverts to the default value.

Default **threshold ber-sf 6** — signal degrade BER threshold of 10^{-6}

threshold ber-sf 3 — signal failure BER threshold of 10^{-3}

Parameters **ber-sd** — specifies the BER for signal degradation

ber-sf — specifies the BER for signal failure

threshold-rate — specifies the BER negative exponent (n in 10^{-n}), expressed as a decimal integer

Values 3 to 9 (10^{-3} to 10^{-9})

SONET/SDH Path Commands

path

Syntax [**no**] **path** [*sonet-sdh-index*]

Context config>port>sonet-sdh

Description This command defines the SONET/SDH path.

The **no** form of this command removes the specified SONET/SDH path.

Default no index

Parameters *sonet-sdh-index* — specifies the components making up the specified SONET/SDH path

On the 4-port OC3/STM1 Clear Channel Adapter card, *sonet-sdh-index* is optional; if used, the value must be sts3.

Syntax: sts1-x.x

crc

Syntax **crc** {**16** | **32**}

Context config>port>sonet-sdh>path

Description This command specifies a cyclic redundancy check on the SONET/SDH path on a 4-port OC3/STM1 Clear Channel Adapter card.

Default **32** (this default cannot be changed when the encap-type is set to atm)

Parameters **16** — specifies that a 16-bit checksum be used for the associated port/channel

32 — specifies that a 32-bit checksum be used for the associated port/channel

encap-type

Syntax **encap-type** {**atm** | **ppp-auto**}

Context config>port>sonet-sdh>path

Description This command configures the encapsulation method used to distinguish customer traffic on a SONET/SDH path on a 4-port OC3/STM1 Clear Channel Adapter card.

The **encap-type** of atm is used for access mode, and the **encap-type** of ppp-auto is used for network mode.

When **encap-type** is atm**,** the crc default of 32 cannot be changed.

When **encap-type** is atm, ATM sub-layer verification specified in GR-1248-CORE, *Generic Requirements for Operations of ATM Network Element*s, is automatically enabled. The result of the verification includes:

- Out of Cell Delineation (OCD) event count — the OCD event count is described in RFC 2515, *Definitions of Managed Objects for ATM Management*. Multiple events occurring within 1 s will be counted as one event for ATM and ASAP adapter cards as a result of a hardware limit.
- Loss of Cell Delineation (LCD) defect/alarm — the LCD defect/alarm is defined in RFC 2515, *Definitions of Managed Objects for ATM Management*. When a path is in an LCD defect state, the path's operational status is down. When a path exits the LCD state, the path's operational status will change to up (assuming nothing else causes the path to stay down). A trap is raised to indicate the LCD status change, and a Path Remote Defect Indicator (PRDI) is sent to indicate the defect to the remote end.

To change the **encap-type**, the path must first be removed and then recreated with the new **encap-type**. For example, to change the **encap-type** from **atm** to **ppp-auto**:

```
config>port>sonet-sdh>path# back
config>port>sonet-sdh# no path
config>port>sonet-sdh# path
config>port>sonet-sdh>path# mode network
config>port>sonet-sdh>path# encap-type ppp-auto
config>port>sonet-sdh>path#
```

Default **atm**

Parameters **atm —** specifies that the encapsulation on the port is ATM

ppp-auto — enables PPP on the associated port or channel. The activation of ipcp and mplscp is automatic depending on the protocol configuration.

mode

Syntax **mode {access | network}**

Context config>port>sonet-sdh>path

Description This command configures the mode of operation for a SONET/SDH port or channel on a 4-port OC3/STM1 Clear Channel Adapter card.

An access port or channel is used for customer-facing traffic on which services are configured. A Service Access Point (SAP) can only be configured on an access port or channel. When a port or channel is configured for access mode, the encap-type must be set to atm.

A network port or channel configured for Packet over SONET (POS) is used as an uplink to connect to the packet network and transport the configured services. When a port or channel is configured for network mode, the encap-type must be set to ppp-auto.

To change the mode, the path must first be removed and then recreated with the new mode. For example, to change the mode from **access** to **network**:

```
config>port>sonet-sdh>path# back
config>port>sonet-sdh# no path
config>port>sonet-sdh# path
config>port>sonet-sdh>path# mode network
config>port>sonet-sdh>path#
```

Default **access**

Parameters **access —** configures the port or channel for access mode

network — configures the port or channel for network mode

mtu

Syntax **mtu** *mtu*
no mtu

Context config>port>sonet-sdh>path

Description This command configures the maximum payload MTU size for a SONET/SDH port on a 4-port OC3/STM1 Clear Channel Adapter card.

When encap-type is atm, the path MTU value cannot be changed. Refer to the 7705 SAR OS Services Guide for information on configuring the path MTU.

The **no** form of this command restores the default value.

Default **1524** (for access mode)

1572 (for network mode)

Parameters *mtu* — sets the maximum allowable size of the MTU, expressed as an integer

Values 578 to 2090 (in bytes)

payload

Syntax **payload** {**sts3** | **tug3** | **ds3** | **vt2** | **vt15** | **ds1** | **e1**}

Context config>port>sonet-sdh>path

Description This command configures the SONET/SDH path on a 2-port OC3/STM1 Channelized Adapter card as an asynchronous circuit or a virtual tributary group.

Default **none**

Parameters

sts3 — configures the STS3/STM1 payload as clear channel

tug3 — configures the STS3/STM1 payload as tributary unit group 3 (TUG3)

ds3 — configures the port or channel as D3 STS1/VC3

vt2 — configures the path STS1 payload as virtual tributary group 2

vt15 — configures the path as virtual tributary group 15

ds1 — configures the port or channel VT15 or VT2 payload as DS1

e1 — configures the VT2 payload as E1

ppp

Syntax **ppp**

Context config>port>sonet-sdh>path

Description This command enables access to the context to configure the Link Control Protocol (LCP) operational parameters for a Packet over Sonet (POS) Point-to-Point Protocol (PPP) link on a 4-port OC3/STM1 Clear Channel Adapter card.

Default **none**

keepalive

Syntax **keepalive** *time-interval* [**dropcount** *drop-count*]
no keepalive

Context config>port>sonet-sdh>path>ppp

Description This command enables the sending of keepalive echo messages on a 4-port OC3/STM1 Clear Channel Adapter card and configures the time between messages and how many reports can be missed before the link is brought down.

The **no** form of this command disables the sending of echo requests.

Default **keepalive 10 dropcount 3**

Parameters *time-interval* — the time interval, in seconds, that echo requests are issued

Values 1 to 60

Default 10

drop-count — the number of keepalive messages that can be missed before the link is brought down

Values 1 to 255

Default 3

report-alarm

Syntax [**no**] **report-alarm** [**pais**] [**plop**] [**prdi**] [**pplm**] [**prei**] [**puneq**]

Context config>port>sonet-sdh>path

Description This command enables logging of SONET/SDH path alarms for a SONET/SDH port.

The **no** form of this command disables logging of the specified alarms.

Parameters **pais —** reports path alarm indication signal errors. When configured, path alarm indication signal alarms are raised and cleared.

Default path alarm indication signal alarms are not issued

plop — reports path loss of pointer errors, per tributary. When configured, path loss of pointer traps are raised but not cleared.

Default path loss of pointer traps are issued

prdi — reports path remote defect indication errors. When configured, path remote defect indication alarms are raised and cleared.

Default path remote defect indication alarms are not issued

pplm — reports a path payload mismatch, which places the channel operationally down. When configured, path payload mismatch traps are raised but not cleared.

Default path payload mismatch traps are issued

prei — reports a path error condition raised by the remote end as a result of b3 errors received from this node. When configured, path error traps are raised but not cleared. (This parameter is not supported on the 4-port OC3/STM1 card.)

Default path error traps are not issued

puneq — reports path unequipped errors

Default path unequipped traps are issued

scramble

Syntax [**no**] **scramble**

Context config>port>sonet-sdh>path

Description This command enables SONET/SDH payload scrambling on a 4-port OC3/STM1 Clear Channel Adapter card.

Scrambling randomizes the pattern of 1s and 0s carried in a SONET frame. Scrambling, or rearranging, the pattern prevents continuous strings of all 1s or all 0s and meets the needs of physical layer protocols that rely on sufficient transitions between 1s and 0s to maintain clocking.

For ATM, this command enables or disables ATM cell-level payload scrambling or descrambling using the x43+1 polynomial as defined in ITU-T I.432.1. Scrambling is enabled by default for the ATM path or channel. This scrambling is done in addition to SONET/SDH frame scrambling or descrambling, which is always enabled in the framer.

The **no** form of this command disables scrambling.

Default **scramble**

signal-label

Syntax **signal-label** *value*
no signal-label

Context config>port>sonet-sdh>path

Description This command sets the C2 byte value. The purpose of this byte is to communicate the payload type being encapsulated by SONET framing.

Default **0xcf**

Parameters *value* — specifies the C2 byte value, expressed as a decimal integer or a hexadecimal value

Values 1 to 254 or 0x01 to 0xfe

trace-string

Syntax **trace-string** [*trace-string*]
no trace-string

Context config>port>sonet-sdh>path

Description This command specifies that a J1-path-trace that identifies the circuit be continuously inserted at source. The specified trace string can be checked against the expected value by the receiver. If no trace string is entered, a null string is used.

The **no** form of this command resets the string to its default.

Default The default J1 value is **ALU 7705 SAR**. The value does not change when the encap-type changes. The J1 string contains all zeros for a non-provisioned path.

Parameters *trace-string* — specifies an alphanumeric string value. If the string contains spaces, enclose it in quotation marks.

Values 1 to 62 bytes for SONET or 1 to 15 bytes for SDH

Network Port Commands

network

Syntax **network**

Context config>port>ethernet
config>port>tdm>ds1
config>port>tdm>e1
config>port>sonet-sdh>path

Description This command enables access to the context to configure network port parameters.

Default **none**

queue-policy

Syntax **queue-policy** *name*
no queue-policy

Context config>port>ethernet>network
config>port>tdm>ds1>network
config>port>tdm>e1>network
config>port>sonet-sdh>path>network

Description This command specifies the network queue policy that defines queue parameters such as CBS, high-priority-only burst size, MBS, CIR, and PIR rates, as well as forwarding class-to- queue mappings. The network queue policy is defined in the **config>qos>network-queue** context. Refer to the 7705 SAR OS Quality of Service Guide for more information.

The **no** form of this command reverts to the default.

Default **"default"**

Parameters *name* — specifies an existing network queue policy name

Multilink Bundle and IMA Group Commands

Note: Unless otherwise specified, references to multilink bundles refer to both multilink (MLPPP) bundles and IMA groups.

multilink-bundle

Syntax [**no**] **multilink-bundle**

Context config>port

Description This command creates the context to configure bundle properties for this bundle port.

Default **none**

fragment-threshold

Syntax **fragment-threshold** *fragment-threshold*
no fragment-threshold

Context config>port>multilink-bundle

Description This command sets the maximum length (in bytes) of a fragment transmitted across the specified MLPPP bundle or sets the length of a Tx frame across the specified IMA group bundle in ATM cells.

The **no** form of this command resets the fragment threshold back to the default value.

Default **128**

Parameters *fragment-threshold* — specifies the maximum fragment length in bytes (for MLPPP bundles) or the Tx frame size (for IMA bundles)

Values 128, 256, or 512 bytes (MLPPP)

128 cells (IMA)

member

Syntax [**no**] **member** *port-id*

Context config>port>multilink-bundle

Description This command binds a channel group to a multilink bundle.

To bind a channel group to a multilink bundle, all the timeslots on the channel group must be allocated. When you configure a channel group on the network side with ppp-auto encapsulation, the system automatically allocates all timeslots to the channel group. When you configure a channel group on the access side with IPCP encapsulation, the system does not automatically allocate all timeslots to the channel group. In order to use the port or channel group as a member in an MLPPP, you must manually allocate all the timeslots to the channel group before adding it to the bundle.

Up to eight channel groups can be bound to a given multilink bundle. For the 16-port T1/E1 ASAP Adapter card, all channel groups must be from the same adapter card and of the same type (either E1 or DS1). For the 2-port OC3/STM1 Channelized Adapter card, all channel groups must be from the same port and of the same type (either E1 or DS1).

The **no** form of this command removes the specified channel group from the multilink bundle.

Default **none**

Parameters *port-id* — the physical port ID

Syntax: *slot/mda/port.channel*

minimum-links

Syntax **minimum-links** *minimum-links*
no minimum-links

Context config>port>multilink-bundle

Description This command sets the minimum number of links that must be active for the bundle to be active.

If the number of active links drops below the configured minimum, then the multilink bundle will transition to an operationally down state.

The **no** form of this command removes the minimum link limit.

Default **1**

Parameters *minimum-links* — the minimum link limit, expressed as an integer

Values 1 to 8

mlppp

Syntax **mlppp**

Context config>port>multilink-bundle

Description This command enables the context to configure MLPPP bundle attributes on a 2-port OC3/STM1 Channelized Adapter card or 16-port T1/E1 ASAP Adapter card.

endpoint-discriminator

Syntax **endpoint-discriminator class** {**ip-address** | **global-mac-address** | **null**} [**discriminator-id** *discriminator-id*]
no endpoint-discriminator

Context config>port>multilink-bundle>mlppp

Description This command configures the endpoint-discriminator class and ID. The port must be shut down to modify the endpoint-discriminator parameters.

The **no** form of this command removes the configured parameters.

Parameters **class** — specifies the link control protocol endpoint-discriminator class field

Default global-mac-address (for physical MLPPP bundle)

ip-address (for physical MLPPP bundle protection group)

null (when the endpoint-discriminator option is not present in a received configure request)

discriminator-id — specifies the endpoint-discriminator identifier value within the specified endpoint-discriminator class

Values any valid IP address

multiclass

Syntax **multiclass** *count*
no multiclass

Context config>port>multilink-bundle>mlppp

Description This command enables multi-class MLPPP (MC-MLPPP) as defined by RFC 2686, *The Multi-Class Extension to Multi-Link PPP.* The 7705 SAR supports MC-MLPPP bundles with 2, 3 or 4 classes. To change the number of classes, all member links must be removed and then the bundle must be shut down.

The packets transmitted on the MC-MLPPP bundle are sent with class values from 0 to one less than the configured class size. For example, a 4-class MLPPP bundle has 4 classes and transmits packets with class numbers 0, 1, 2, and 3. A 4-class bundle transmits packets with class numbers 0, 1 and 2 and a 2-class bundle transmits packets with class numbers 0 and 1. A 0-class MLPPP bundle has the highest priority.

Entries are created and deleted by the system depending on the number of classes being used by a given MLPPP bundle. The **no** form of the command disables multi-class MLPPP.

Default **no multiclass**

Parameters *count* — specifies the number of classes in an MLPPP bundle

Values 2 to 4

mrru

Syntax **mrru** *mrru*
no mrru

Context config>port>multilink-bundle

Description This command specifies the maximum received reconstructed unit (MRRU), which is similar to a maximum transmission unit (MTU) but applies only to MLPPP multilink bundles. The MRRU is the maximum frame size that can be reconstructed from multilink fragments. This command is only valid for MLPPP bundles.

The **no** form of this command resets the MRRU to the default.

Default **1524**

Parameters *mrru* — the maximum received reconstructed unit size, expressed as an integer

Values 1500 to 2088 bytes

red-differential-delay

Syntax **red-differential-delay** *red-diff-delay* [**down**]
no red-differential-delay

Context config>port>multilink-bundle

Description This command sets the maximum acceptable differential delay for individual circuits within a multilink bundle.

The **no** form of this command restores the red-differential-delay defaults.

Default **none**

Parameters *red-diff-delay* — the maximum red differential delay value, in milliseconds

Values 2 to 25 ms for MLPPP bundles
2 to 75 ms for IMA bundles on the 16-port T1/E1 ASAP Adapter card
2 to 50 ms for IMA bundles on the 2-port OC3/STM1 Channelized Adapter card

down — transition the circuit that exceeded the differential delay to a down state (for example, remove it from the multilink bundle from an operational perspective)

short-sequence

Syntax [**no**] **short-sequence**

Context config>port>multilink-bundle

Description This command specifies that the MLPPP bundle should use short (12 bit) sequence numbers instead of the default 24-bit sequence number. This command is only valid for MLPPP bundles.

The **no** form of this command disables the short-sequence feature.

Default **no short-sequence**

yellow-differential-delay

Syntax **yellow-differential-delay** *yellow-diff-delay*
no yellow-differential-delay

Context config>port>multilink-bundle

Description This command sets the yellow warning threshold for the differential delay for members within a multilink bundle. If circuit's delay exceeds the yellow-differential delay value, a log message and SNMP trap is sent. This command is only valid for MLPPP bundles.

The **no** form of this command removes the yellow-differential-delay.

Default **none**

Parameters *yellow-diff-delay* — the maximum yellow differential delay threshold value, in milliseconds

Values 1 to 25

ima

Syntax **ima**

Context config>port>multilink-bundle

Description This command enables the context to configure parameters for an IMA group. An IMA group is a collection of physical links bundled together and assigned to an ATM port. IMA enables a high-speed channel that is composed of ATM cells to be transported as a number of lower-speed circuits. They are then reassembled as the original high-speed ATM channel.

This command is only valid for IMA bundles.

link-delay

Syntax **link-delay** {**activate** | **deactivate**} *milliseconds*
no link-delay {**activate** | **deactivate**}

Context config>port>multilink-bundle>ima

Description This command specifies the time delay between detection of a link activation/deactivation condition and acting upon it (going in/out of the Rx failure state on a link).

Parameters **activate** *milliseconds* **—** the time, in milliseconds, used to clear an existing LIF, LODS, or FRI-IMA alarm. The time specified determines how long is needed for member links to stabilize before being activated.

Values 1 to 30000 ms

Default 1000

deactivate *milliseconds* **—** the time, in milliseconds, used to raise an LIF, LODS, or FRI-IMA alarm. The time specified determines how long before a member link is declared in error and is deactivated.

Values 1 to 30000 ms

Default 2000

max-bandwidth

Syntax **max bandwidth** *number-links*

Context config>port>multilink-bundle>ima

Description This command specifies the number of links that are used to determine the maximum configurable ATM bandwidth that is allowed to be used for this IMA group. The formula to calculate the maximum configurable bandwidth is:

- maximum configurable ATM bandwidth = *number-links* × (M-1)/M × (2048/2049) × primary member link speed

M is the IMA frame size (128) and the primary link speed is either E1 (1920 kb/s) or DS1 (1539 kb/s). E1 is used for a group with no members.

The total ATM bandwidth of services over shaped VCs cannot exceed the maximum configurable ATM bandwidth.

The **no** form of this command resets the number of links to the default value.

Default **8**

Parameters *number-links* — specifies the number of links used to dertmine the maximum configurable ATM bandwidth allowed for this IMA group

Values 1 to 8

test-pattern-procedure

Syntax **test-pattern-procedure**

Context config>port>multilink-bundle>ima

Description This command enables the context to configure IMA test pattern procedures. Note that this command and sub-commands are not saved in the router configuration between reboots.

test-link

Syntax **test-link** *port-id*
no test-link

Context config>port>multilink-bundle>ima>test-pattern-procedure

Description This command specifies IMA members on which an IMA test pattern procedure is to be performed.

The **no** form of this command deletes the link from the test-pattern procedure. The test-pattern procedure must be shut down first.

Default **no test-link**

Parameters *port-id* — the port ID to be used to verify link connectivity within an IMA group

test-pattern

Syntax **test-pattern** *pattern*
no test-pattern

Context config>port>multilink-bundle>ima>test-pattern-procedure

Description This command specifies the transmit test pattern in an IMA group loopback operation. This value can only be changed when the **test-pattern-procedure** command is shut down.

The **no** form of this command restores the test pattern to the default.

Default **0**

Parameters *pattern* — specifies an integer taking the following values:

Values 0 to 255

shutdown

Syntax [**no**] **shutdown**

Context config>port>multilink-bundle>ima>test-pattern-procedure

Description This command enables a configured IMA test pattern procedure.

The **no** form of this command disables the IMA test pattern procedure.

version

Syntax **version** *IMA-version*
no version

Context config>port>multilink-bundle>ima>

Description This command configures the IMA version for the multilink bundle group. If there is a version mismatch between this IMA group and the far-end IMA group, the IMA group will go operationally down. To change the IMA version, you must first remove all member links from the group. In Release 2.1 of the 7705 SAR, only IMA version 1.1 is supported.

Default **1-1**

Parameters *IMA-version* — specifies the IMA version for this group

Values 1-1 — IMA version 1.1

ATM Interface Commands

atm

Syntax **atm**

Context config>port>multilink-bundle>ima
config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group
config>port>sonet-sdh>path

Description This command enables the context to configure ATM interface properties.

cell-format

Syntax **cell-format** *cell-format*

Context config>port>multilink-bundle>ima>atm
config>port>tdm>ds1>channel-group>atm
config>port>tdm>e1>channel-group>atm
config>port>sonet-sdh>path>atm

Description This command configures the ATM cell format.

Parameters *cell-format* — the ATM cell format, either UNI or NNI (SONET/SDH ports do not support the NNI format)

Values uni (user-to-network interface)
nni (network-to-network interface cell format)

min-vp-vpi

Syntax **min-vp-vpi** *value*

Context config>port>multilink-bundle>ima>atm
config>port>tdm>ds1>channel-group>atm
config>port>tdm>e1>channel-group>atm
config>port>sonet-sdh>path>atm

Description This command sets the minimum allowable virtual path identifier (VPI) value that can be used on the ATM interface for a VPC.

Default **0**

Parameters *value* — the minimum allowable VPI value that can be used on the ATM interface for a VPC

Values 0 to 4095 (NNI) (not supported on SDH/SONET ports)
0 to 255 (UNI)

TDM Commands

tdm

Syntax **tdm**

Context config>port

Description This command enables the context to configure DS1/E1 parameters for a port on a channelized T1/E1 ASAP Adapter card or 2-port OC3/STM1 Channelized Adapter card.

TDM is a mechanism that divides the bandwidth of a stream into separate channels or timeslots by assigning each stream a different timeslot in a set. TDM repeatedly transmits a fixed sequence of timeslots over a single transmission channel. Each individual data stream is reassembled at the receiving end based on the timing.

Default **none**

buildout

Syntax **buildout short**

Context config>port>tdm

Description This command specifies the line buildout (cable length) for DS1 interfaces on the T1/E1 ASAP Adapter card.

Default **short**

Parameters **short** — sets the line buildout for length runs up to 655 ft

ds1

Syntax [**no**] **ds1**

Context config>port>tdm

Description This command enables the context to configure digital signal level 1 (DS1) frame parameters on a channelized T1/E1 ASAP Adapter card or 2-port OC3/STM1 Channelized Adapter card.

T1 transmits DS1-formatted data at 1.544 Mb/s through the network.

Once a channel has been configured for DS1 on a T1/E1 ASAP Adapter card, all ports on the card can only be configured for DS1. There cannot be a mix of DS1 and E1 channels on the same card.

The **no** form of this command deletes the specified DS1 channel.

Default **none**

ds3

Syntax [**no**] **ds3** [*sonet-sdh-index*]

Context config>port>tdm

Description This command enables the context to configure DS3 parameters on a 2-port OC3/STM1 Channelized Adapter card.

North America uses the T-Carrier system while Europe uses the E-Carrier system of transmission, using multiples of the DS system. Digital signals are carried inside the carrier systems. DS3 lines carry 28 DS1 signals and a 44.736 Mb/s data rate. A T3 line consists of 672 individual channels, each supporting 64 Kb/s. T3 lines are used mainly by service providers to connect to the Internet backbone and for the backbone itself.

If DS3 nodes are provisioned on a channelized SONET/SDH Adapter card, you must provision the parent STS-1 SONET/STM0 SDH path.

The **no** form of this command deletes the specified DS3 channel.

Default **none**

Parameters *sonet-sdh-index* — specifies the components making up the specified SONET/SDH path

e1

Syntax [**no**] **e1**

Context config>port>tdm

Description This command enables the context to configure E1 parameters on a channelized T1/E1 ASAP Adapter card or 2-port OC3/STM1 Channelized Adapter card. E1 is a basic time-division multiplexing scheme used to carry digital circuits. It is also a standard WAN digital communication format designed to operate over copper facilities at a rate of 2.048 Mb/s.

Once a channel has been configured for E1 on a T1/E1 ASAP Adapter card, all ports on the card can only be configured for E1. There cannot be a mix of DS1 and E1 channels on the same card.

The **no** form of this command deletes the specified E1 channel.

Default **none**

length

Syntax **length** {**133** | **266** | **399** | **533** | **655**}

Context config>port>tdm

Description This command configures the line length for the physical DS1 port on the T1/E1 ASAP Adapter card.

Default **133**

line-impedance

Syntax **line-impedance** {**75** | **100** | **120**}

Context config>port>tdm

Description This command configures the line impedance of a port. Line impedance is set on a per-port basis and ports on the same card can have different values. Before changing the line impedance of a port, the port must be shut down.

Default **100 for DS1**

120 for E1

Parameters **Values** 100 for DS1

120 or 75 for E1

DS1, DS3, and E1 Commands

channelized

Syntax **channelized** {**ds1** | **e1**}
no channelized

Context config>port>tdm>ds3

Description This command configures the associated DS3 channel as a channelized DS3 with DS1/E1 sub-channels.

The **no** form of this command disables channelization. The sub-channels must be deleted first before the **no** command is executed.

Default **no channelized**

Parameters **ds1** — specifies that the channel is DS1

e1 — specifies that the channel is E1

clock-source

Syntax **clock-source** {**adaptive-timed** | **loop-timed** | **node-timed**}

Context config>port>tdm>ds1
config>port>tdm>e1

Description This command specifies the clock source to be used for the link transmit timing. Adaptive timing is supported only on T1/E1 ASAP Adapter card ports used for TDM pseudowires.

The clock source setting also determines the node sync reference if the port is configured as one of the node sync references (**config>system>sync-if-timing>{ref1 | ref2}> source-port** command). Refer to the 7705 SAR OS Basic System Configuration Guide for more information.

Note: If BITS is used as a timing reference on a dedicated T1/E1 port, the port must be configured as loop-timed.

Default **loop-timed**

Parameters **adaptive-timed** — clocking is derived from the incoming pseudowire packets from the MPLS network

loop-timed — the link recovers the clock from the received data stream

node-timed — the link uses the internal clock when transmitting data

clock-source (ds3)

Syntax **clock-source** {**loop-timed | free-run**}

Context config>port>tdm>ds3

Description This command specifies the clock source to be used for the link transmit timing.

The clock source setting also determines the node sync reference if the port is configured as one of the node sync references (**config>system>sync-if-timing>{ref1 | ref2}> source-port** command). Refer to the 7705 SAR OS Basic System Configuration Guide for more information.

Default **loop-timed**

Parameters **loop-timed** — the link recovers the clock from the received data stream

free-run — the link uses the internal clock on the MDA when transmitting data

feac-loop-respond

Syntax [**no**] **feac-loop-respond**

Context config>port>tdm>ds3

Description This command enables the associated DS3 interface to respond to remote loop signals. The DS3 far-end alarm and control (FEAC) signal is used to send alarm or status information from the far-end terminal back to the local terminal. DS3 loopbacks at the far-end terminal from the local terminal are initiated.

The **no** form of this command prevents the associated DS3 interface from responding to remote loop signals.

Default **no feac-loop-respond**

framing (DS1)

Syntax **framing** {**esf | sf | ds1-unframed**}

Context config>port>>tdm>ds1

Description This command specifies the DS1 framing to be used for the port.

The **ds1-unframed** parameter allows the configuration of an unstructured DS1 channel on a T1/E1 ASAP Adapter card. When a DS1 unframed channel is shut down, it sends the AIS pattern to the far-end DS1. The far end does not react to the AIS pattern if the far-end DS1 is configured as unframed. If the far-end DS1 is configured as framed, the far end declares AIS. The operational status remains up and no alarms are generated while the near end is operationally down. This is normal behavior for unframed G.703 mode.

Default **esf**

Parameters **esf** — configures the DS1 port for extended superframe framing

sf — configures the DS1 port for superframe framing

ds1-unframed — specifies DS1 unframed (G.703) mode for DS1 interfaces. DS1 unframed mode is only applicable if the encapsulation type is set to cem or ppp-auto.

framing (DS3)

Syntax **framing** {**c-bit** | **m23**}

Context config>port>>tdm>ds3

Description This command specifies the DS3 framing to be used for the port or channel.

Default **c-bit**

Parameters **c-bit** — configures the DS3 port or channel for C-bit framing

m23 — configures the DS3 port or channel for M23 framing

framing (E1)

Syntax **framing** {**no-crc-g704** | **g704** | **e1-unframed**}

Context config>port>tdm>e1

Description This command specifies the E1 framing to be used for the port.

The **e1-unframed** parameter allows the configuration of an unstructured E1 channel on a T1/E1 ASAP Adapter card. When an E1 unframed channel is shut down, it sends the AIS pattern to the far-end E1. The far end does not react to the AIS pattern if the far-end E1 is configured as unframed. If the far-end E1 is configured as framed, the far end declares AIS. The operational status remains up and no alarms are generated while the near end is operationally down. This is normal behavior for unframed G.703 mode.

Default **no-crc-g704**

Parameters **g704** — configures the E1 port for G.704 framing

no-crc-g704 — configures the E1 port for G.704 framing with no CRC4

e1-unframed — specifies E1 unframed (G.703) mode for E1 interfaces. E1 unframed mode is only applicable if the encapsulation type is set to cem.

hold-time

Syntax **hold-time** [**up** *hold-time-up*] [**down** *hold-time-down*]
no hold-time

Context config>port>tdm>ds1
config>port>tdm>e1

Description This command configures the DS1/E1 link dampening timers in 100s of milliseconds, which guards against reporting excessive interface transitions. This is implemented by not advertising subsequent transitions of the interface to upper layer protocols until the configured timer has expired.

Default **no hold-time**

Parameters *hold-time-up* — configures the hold-timer for link-up event dampening. A value of zero (0) indicates that an up transition is reported immediately.

Values 0 to 100 (in 100 ms)

hold-time-down — configures the hold-timer for link-down event dampening. A value of zero (0) indicates that a down transition is reported immediately.

Values 0 to 100 (in 100 ms)

loopback (DS1)

Syntax **loopback** {**line** | **internal** | **fdl-ansi** | **fdl-bellcore** | **payload-ansi**}
no loopback

Context config>port>tdm>ds1

Description This command puts the specified port or channel in a loopback mode.

A line loopback loops frames received on the corresponding port or channel back towards the transmit (egress) direction before reaching the framer. The bit stream is not reframed. The electrical signal is regenerated by the Tx line interface unit (LIU) and the timing is provided by the Rx LIU.

An internal loopback loops the frames from the local router back at the framer. This is usually referred to as an equipment loopback. The Tx signal is looped back and received by the interface.

The **fdl-ansi** loopback command sends a repeating 16-bit ESF data link code word to the remote end requesting that it enter into a network line loopback. The **ansi** keyword enables the remote line FDL ANSI bit loopback on the T1 line, in accordance with the ANSI T1.403 specification.

The **fdl-bellcore** loopback command sends a repeating 16-bit ESF data link code word to the remote end requesting that it enter into a network line loopback. The **bellcore** keyword enables the remote line FDL Bellcore bit loopback on the T1 line, in accordance with the Bellcore TR-TSY-000312 specification.

The **payload-ansi** loopback command sends a repeating 16-bit ESF data link code word to the remote end requesting that it enter into a network payload loopback. A payload loopback loops frames back towards the transmit (egress) direction after reaching the framer. The bit stream is reframed. The electrical signal is regenerated by the Tx LIU and the timing is provided by the Rx LIU.

The loopback command is not saved to the system configuration.

The **no** form of this command disables the specified type of loopback.

Note: The fdl-ansi, fdl-bellcore and payload-ansi options can only be configured if DS1 framing is set to ESF.

Default **no loopback**

Parameters **line** — places the associated port or channel into line loopback mode

internal — places the associated port or channel into internal loopback mode

fdl-ansi — requests an FDL line loopback in accordance with the ANSI T1.403 specification

fdl-bellcore — requests an FDL line loopback in accordance with the Bellcore TR-TSY-000312 specification

payload-ansi — requests a payload loopback using ANSI signaling

loopback (E1)

Syntax **loopback** {**line** | **internal**}
no loopback

Context config>port>tdm>e1

Description This command puts the specified port or channel in a loopback mode.

A line loopback loops frames received on the corresponding port or channel back towards the transmit direction.

An internal loopback loops the frames from the local router back at the framer. This is usually referred to as an equipment loopback. The Tx signal is looped back and received by the interface.

The loopback command is not saved to the system configuration.

The **no** form of this command disables the specified type of loopback.

Default **no loopback**

Parameters **line** — places the associated port or channel into line loopback mode

internal — places the associated port or channel into internal loopback mode

loopback (DS3)

Syntax **loopback** {**line** | **internal** | **remote**}
no loopback

Description This command puts the specified port or channel in a loopback mode.

A line loopback loops frames received on the corresponding port or channel back towards the transmit direction.

An internal loopback loops the frames from the local router back at the framer. This is usually referred to as an equipment loopback. The Tx signal is looped back and received by the interface.

To configure a remote loopback, you must enable feac-loop-respond on the far-end DS3, then set the loopback to **remote** on the near-end DS3. Remote loopback sends a loopback code to the far-end DS3 that results in the far end sending out a line loopback.

The loopback command is not saved to the system configuration.

The **no** form of this command disables the specified type of loopback.

Default **no loopback**

Parameters **line** — places the associated port or channel into line loopback mode

internal — places the associated port or channel into internal loopback mode

remote — places the associated port or channel into remote loopback mode

mdl

Syntax **mdl** {**eic** | **lic** | **fic** | **unit** | **pfi** | **port** | **gen**} *mdl-string*
no mdl

Context config>port>tdm>ds3

Description This command configures the maintenance data link (MDL) message for a DS3 channel.

This command is only applicable if the DS3 channel is using C-bit framing (see the framing (DS3) command). The **no** form of this command removes the MDL string association and stops the transmission of any IDs.

Default **no mdl**

Parameters *mdl-string* — specifies an MDL message up to 38 charcters long

eic — specifies the equipment ID code up to 10 characters long

lic — specifies the line ID clode up to 11 characters long

fic — specifies the frame ID code up to 10 characters long

unit — specifies the unit ID code up to 6 characters long

pfi — specifies the facility ID code up to 38 characters long

port — specifies the port ID code up to 38 characters long

gen — specifies the generator number to send in the MDL test signal message, up to 38 characters long

mdl-transmit

Syntax [**no**] **mdl-transmit** {**path** | **idle-signal** | **test-signal**}

Context config>port>tdm>ds3

Description This command enables the transmission of an MDL message on a DS3 channelized interface.

The **no** form of this command disables transmission of the specified message or all messages.

Default **no mdl-transmit**

Parameters **path** — specifies the MDL path message

idle-signal — specifies the MDL idle signal message

test-signal — specifies the MDL test signal message

remote-loop-respond (DS1)

Syntax [**no**] **remote-loop-respond**

Context config>port>tdm>ds1

Description This command configures the DS1 channel response to remote loopbacks. When enabled, the channel responds to remote loopbacks; when disabled, the channel does not respond.

Default **no remote-loop-respond**

report-alarm

Syntax [**no**] **report-alarm** {**ais** | **los** | **oof** | **rai** | **looped**}

Context config>port>tdm>ds1
config>port>tdm>ds3
config>port>tdm>e1

Description This command enables logging of DS1, DS3, or E1 alarms.

The **no** form of this command disables logging of the specified alarms.

Parameters **ais —** reports alarm indication signal errors. When configured, **ais** alarms are not raised and cleared.

Default ais alarms are issued

los — reports loss of signal errors. When configured, **los** traps are not raised and cleared.

Default los traps are issued

oof — reports out-of-frame errors. When configured, **oof** alarms are not raised and cleared.

Default oof alarms are not issued

rai — reports remote alarm indication signal errors. When configured, **rai** alarms are not raised and cleared.

Default rai alarms are not issued

looped — reports looped packets errors

Default looped alarms are not issued

signal-mode

Syntax [**no**] **signal-mode** {cas}

Context config>port>tdm>ds1
config>port>tdm>e1

Description This command activates the signal mode on the channel. When enabled, control signals (such as those for synchronizing and bounding frames) are carried in the same channels as voice and data signals. Configure signal mode before configuring the Cpipe service to support T1 or E1 with CAS. Refer to the 7705 SAR OS Services Guide for information on configuring Cpipe service.

This command is valid only on the T1/E1 ASAP Adapter card when T1 framing is set to **esf** or **sf**, or E1 framing is set to **g704** or **no-crc-g704**.

Parameters **cas —** specifies channel associated signaling

DS1 and E1 Channel Group Commands

channel-group

Syntax [**no**] **channel-group** *channel-group-id*

Context config>port>tdm>ds1
config>port>tdm>e1

Description This command creates DS0 channel groups in a channelized DS1 or E1 circuit. Channel groups cannot be further subdivided.

The **no** form of this command deletes the specified DS1 or E1 channel.

Default **none**

Parameters *channel-group-id* — identifies the channel group ID number

Values DS1: 1 to 24
E1: 1 to 32

crc

Syntax **crc** {**16** | **32**}

Context config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

Description This command configures the precision of the cyclic redundancy check (CRC). Non-ATM channel groups configured under DS1 or E1 support 16-bit checksum. ATM channel groups support a 32-bit checksum.

Default **16**

Parameters **16** — use 16-bit checksum for the associated port/channel

32 — use 32-bit checksum for the associated port/channel

encap-type

Syntax **encap-type** {**atm** | **cem** | **ipcp** | **ppp-auto**}
no encap-type

Context config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

Description This command configures the encapsulation method used for the port on the T1/E1 ASAP Adapter card or 2-port OC3/STM1 Channelized Adapter card. This parameter can be set on both access and network ports.

For access mode, the supported encapsulation types are cem, atm, and ipcp. For network mode, only ppp-auto encapsulation is supported. The ppp-auto encapsulation type does not support fractional DS1 or E1.

Default **cem —** for T1/E1 ASAP Adapter card

atm — for 2-port OC3/STM1 Channelized Adapter card

Parameters **atm —** specifies the encapsulation type as atm for ATM pseudowires

cem — specifies the encapsulation type as circuit emulation mode for TDM pseudowires on the T1/E1 ASAP Adapter card

ipcp — specifies the encapsulation type as IPCP for a PPP/MLPPP channel group in access mode on the T1/E1 ASAP Adapter card

ppp-auto — specifies the encapsulation type as PPP for PPP/MLPPP bundles in network mode

idle-cycle-flag

Syntax **idle-cycle-flag** {**flags** | **ones**}
no idle-cycle-flag

Context config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

Description This command configures the value that the DS0, DS1, DS3, E1, E3, HDLC, or TDM interface transmits during idle cycles. This command is applicable only if the encapsulation type is ppp-auto.

The **no** form of this command changes the idle cycle flag to the default value.

Default **flags** (0x7E)

Parameters **flags —** use 0x7E as the idle cycle flag

ones — use 0xFF as the idle cycle flag

idle-payload-fill

Syntax **idle-payload-fill** {**all-ones | pattern** *pattern*}
no idle-payload-fill

Context config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

Description This command defines the data pattern to be transmitted (8-bit value) when the circuit emulation service is not operational or temporarily experiences underrun conditions. This command is only valid for CESoPSN services.

Note: See the 7705 SAR OS Services Guide for information on CESoPSN services.

Default **all-ones**

Parameters **all-ones** — transmits 11111111

pattern — transmits the user-defined pattern

Values 1 to 255 (can be entered in decimal, binary, or hexadecimal format)

idle-signal-fill

Syntax **idle-signal-fill** {**all-ones | pattern** *pattern*}
no idle-signal-fill

Context config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

Description This command defines the signaling pattern to be transmitted (8-bit value) when the circuit emulation service is not operational or temporarily experiences underrun conditions. This command is only valid for CES with CAS.

Note: See the 7705 SAR OS Services Guide for information on CESoPSN services.

Default **all-ones**

Parameters **all-ones** — transmits 11111111

pattern — transmits the user-defined pattern

Values 1 to 255 (can be entered in decimal, binary, or hexadecimal format)

mode

Syntax **mode** {**access** | **network**}
no mode

Context config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

Description This command configures a TDM channel for access or network mode operation.

An **access** port or channel is used for customer-facing traffic on which services are configured. A Service Access Point (SAP) can only be configured on an access port or channel.

When a port is configured for access mode, the appropriate **encap-type** (atm, cem or ipcp) must be specified to distinguish the services on the port. Once a TDM channel has been configured for access mode, multiple services can be configured on the TDM channel.

A **network** port or channel participates in the service provider transport or infrastructure network when a network mode is selected. When the network option is configured, only the ppp-auto **encap-type** can be configured for the port or channel.

The **no** form of this command restores the default.

Default **access**

Parameters **access —** configures the port or channel as service access

network — configures the port or channel for transport network use

mtu

Syntax **mtu** *mtu-bytes*
no mtu

Context config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

Description This command configures the maximum payload MTU size for a port.

Packets received that are larger than the MTU will be fragmented or discarded, depending on whether the DF bit is set in the packet header.

If the port mode or encapsulation type is changed, the MTU assumes the default values of the new mode or encapsulation type.

The **no** form of this command restores the default values.

Default The default MTU value depends on the port type, mode and encapsulation as listed in the following table.

Parameters *mtu-bytes* — sets the maximum allowable size of the MTU, expressed as an integer

Values 512 to 2090 bytes (see the folowing table)

Type	Mode	Encap Type	Default (Bytes)	Max MTU (Bytes)
TDM (PW)	Access	cem	1514	1514
TDM (ATM PW)	Access	atm	1524	1524
TDM (PPP/MLPPP)	Access	ipcp	1502	2090
TDM (PPP/MLPPP)	Network	ppp-auto	1572	2090
SONET/SDH	Access	atm	1524	1524
SONET/SDH	Network	ppp-auto	1572	2090

ppp

Syntax [**no**] **ppp**

Context config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

Description This command enables access to the context to configure the LCP operational parameters for a DS1 or E1 channel or a DS0 channel.

The **no** form of the command removes the LCP operational parameters.

Default **no ppp**

keepalive

Syntax **keepalive** *time-interval* [**dropcount** *drop-count*]
no keepalive

Context config>port>tdm>ds1>channel-group>ppp
config>port>tdm>e1>channel-group>ppp

Description This command sets the keepalive interval.

The **no** form of this command returns the interval to the default value.

Default **10**

Parameters *time-interval* — the time in seconds between keepalive messages, expressed as a decimal integer

Values 1 to 60

drop-count — the number of consecutive keepalive failed request attempts or remote replies that can be missed after which the port is operationally downed

Values 1 to 255

scramble

Syntax [**no**] **scramble**

Context config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

Description This command enables payload scrambling on channel groups. The command is applicable only if the encapsulation type is atm.

speed

Syntax **speed** {**56** | **64**}

Context config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

Description This command configures the speed of the DS0 channels used in the associated channel group.

Default **64**

Parameters **56** — configures the DS0 channels to use 56 kbyte encoding

64 — configures the DS0 channels to use 64 kbyte encoding

timeslots

Syntax **timeslots** *timeslots*
no timeslots

Context config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

Description This command defines the list of DS0 timeslots to be used in the DS1 or E1 channel group. The timeslots do not need to be consecutive. If the encapsulation type is changed to or from atm, the timeslots are reset to the default. If the encapsulation type is set to atm, the timeslot ranges are automatically configured and cannot be changed.

The **no** form of this command removes DS0 timeslots from a channel group.

Default

no timeslots — non-ATM channel groups
1 to 24 — channel groups configured under DS1 with atm encapsulation
2 to 16, 18 to 32 — channel groups configured under E1 with atm encapsulation
2 to 32 — channel groups configured under E1 (ppp-auto)

Parameters

timeslots — specifies the timeslot(s) to be associated with the channel group. The value can consist of a list of timeslots. Each member of the list can either be a single timeslot or a range of timeslots.

Values 1 to 24 for DS1 interfaces. The full range is automatically configured for ATM channel groups and cannot be changed.
2 to 32 for E1 interfaces. The 2 to 16 and 18 to 32 ranges are automatically configured for ATM channel groups and cannot be changed.

Show Commands

Note: Outputs for the show commands are examples only. Actual screen output may differ depending on card and port type, port mode (network or access) and encapsulation type configured.

Show Card Commands

card

Syntax **card** [*slot-number*] [**detail**]
card state

Context show

Description This command displays IOM information.

Parameters *slot-number* — displays information for the specified card slot (always 1)

Values 1

state — displays provisioned and equipped card and adapter card information

detail — displays detailed card information

Default Displays summary information only

Output The following outputs are examples of card information:

- Card (Sample Output, Table 7)
- Card State (Sample Output, Table 8)
- Card Detailed (Sample Output, Table 9)
- CSM Card (Sample Output, Table 10)

Sample Output

```
*A:ALU-1># show card 1
===============================================================================
Card 1
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
1         iom-1g              iom-1g              up         up
===============================================================================
*A:ALU-1>#
```

Table 7: Show Card Output Fields

Label	Description
Slot	The slot number of the card in the chassis
Provisioned Card-type	The card type that is configured for the slot
Equipped Card-type	The card type that is actually populated in the slot
Admin State	up — the card is administratively up
	down — the card is administratively down
Operational State	up — the card is operationally up

Sample Output

The following examples display the card state for a 7705 SAR-8 and a 7705 SAR-F.

Note: The `show card` command for the 7705 SAR-F will always appear as shown because it has a fixed physical configuration.

For the 7705 SAR-8:

```
*A:ALU-1># show card state
===============================================================================
Card State
===============================================================================
Slot/  Provisioned      Equipped         Admin Operational    Num  Num Comments
Id     Type             Type             State State          Ports MDA
-------------------------------------------------------------------------------
1      iom-1g           iom-1g           up    up                  6
1/1    a12-sdi                           up    provisioned    12
1/2    a4-oc3                            up    provisioned    4
1/3    a16-chds1                         up    provisioned    16
1/4    a16-chds1                         up    provisioned    16
1/5    a8-eth                            up    provisioned    8
1/6    a2-choc3                          up    provisioned    2
A      csm-1g           csm-1g           up    up                      Active
B      csm-1g                            up    down                    Standby
===============================================================================
```

For the 7705 SAR-F:

```
*A:ALU-1># show card
===============================================================================
Card State
===============================================================================
Slot/  Provisioned      Equipped         Admin Operational   Num   Num Comments
Id     Type             Type             State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-1g           iom-1g           up    up            2
1/1    a16-chds1        a16-chds1        up    provisioned   16
1/2    a8-ethv2         a8-ethv2         up    provisioned   8
A      csm-1g           csm-1g           up    up                      Active
================================================================================
*A:ALU-1>#
```

Table 8: Show Card State Output Fields

Label	Description
Slot/Id	The slot number of the card in the chassis
Provisioned Type	The card type that is configured for the slot
Equipped Type	The card type that is actually populated in the slot
Admin State	up — the card is administratively up
	down — the card is administratively down
Operational State	up — the card is operationally up down — the card is operationally down provisioned — there is no card in the slot but it has been preconfigured failed — the installed card has operationally failed
Num Ports	The number of ports available on the provisioned card
Num MDA	The number of adapter cards installed
Comments	Indicates which CSM is the active card and which is in standby mode (for redundancy)

Sample Output

```
*A:ALU-1># show card 1 detail

===============================================================================
Card 1
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
1         iom-1g              iom-1g              up         up
IOM Card Specific Data
    Clock source                  : none
    Available MDA slots           : 6
    Installed MDAs                : 4
Hardware Data
    Part number                   : Sim Part#
    CLEI code                     : Sim CLEI
    Serial number                 : card-1
    Manufacture date              : 01012003
    Manufacturing string          : Sim MfgString card-1
    Manufacturing deviations      : Sim MfgDeviation card-1
    Administrative state          : up
    Operational state             : up
    Temperature                   : 34C
    Temperature threshold         : 75C
    Software boot (rom) version   : simulated
    Software version              : TiMOS-B-0.0.I536 both/i386 ALCATEL-LUCENT *
    Time of last boot             : 2008/10/30 15:01:12
    Current alarm state           : alarm cleared
    Base MAC address              : a4:58:01:00:00:00
    Memory capacity               : 2,039 MB
===============================================================================
```

Table 9: Show Card Detailed Output Fields

Label	Description
Clock source	The system's clock source
Available MDA slots	The number of card slots available
Installed MDAs	The number of cards installed
Part number	The chassis part number
CLEI code	The Common Language Equipment Identifier (CLEI) code string for the router
Serial number	The chassis serial number
Manufacture date	The chassis manufacture date
Manufacturing string	A factory-inputted manufacturing text string
Manufacturing deviations	A record of changes done to the hardware or software that is outside the normal revision control process

Table 9: Show Card Detailed Output Fields (Continued)

Label	Description
`Administrative state`	`up` — the card is administratively up
	`down` — the card is administratively down
`Operational State`	`up` — the card is operationally up `down` — the card is operationally down `provisioned` — there is no card in the slot but it has been preconfigured `failed` — the provisioned card has operationally failed
`Temperature`	The internal chassis temperature
`Temperature threshold`	The value above which the internal temperature must rise in order to indicate that the temperature is critical
`Software boot (rom) version`	The version of the boot rom image
`Software boot version`	The version of the boot image
`Software version`	The software version number
`Time of last boot`	The date and time the most recent boot occurred
`Current alarm state`	The alarm conditions for the adapter card
`Base MAC address`	The base MAC address of the hardware component
`Memory capacity`	The memory capacity of the adapter card

Sample Output

```
*A:ALU-1># show card a detail

===============================================================================
Card A
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
A         csm-1g              csm-1g              up         up/active

BOF last modified                 : N/A
Config file version               : WED SEP 01 15:49:15 2004 UTC
Config file last modified         : 2009/01/12 21:08:27
Config file last saved            : 2008/11/14 18:14:07
M/S clocking ref state            : primary

Flash - cf3:
    Administrative State          : up
    Operational state             : up
    Serial number                 : serial-3
    Firmware revision             : v1.0
    Model number                  : PC HD 3
    Size                          : 18,432 Bytes
    Free space                    : 8,192 Bytes

Hardware Data
    Part number                   : Sim Part#
    CLEI code                     : Sim CLEI
    Serial number                 : card-2
    Manufacture date              : 01012003
    Manufacturing string          : Sim MfgString card-2
    Manufacturing deviations      : Sim MfgDeviation card-2
    Administrative state          : up
    Operational state             : up
    Temperature                   : 25C
    Temperature threshold         : 75C
    Software boot (rom) version   : simulated
    Software version              : TiMOS-B-0.0.I536 both/i386 ALCATEL-LUCENT *
    Time of last boot             : 2008/10/30 15:01:08
    Current alarm state           : alarm cleared
    Base MAC address              : a4:58:02:00:00:00
    Memory capacity               : 2,039 MB
==========================================================================
*A:ALU-1>#
```

Table 10: Show CSM Card Output Fields

Label	Description
`Slot`	The slot of the card in the chassis
`Provisioned Card-type`	The CSM type that is configured for the slot
`Equipped Card-type`	The CSM type that is actually populated in the slot
`Admin State`	`up` — the CSM is administratively up
	`down` — the CSM is administratively down
`Operational State`	`up/active` — the CSM is operationally up and active
	`down` — the CSM is operationally down
`BOF last modified`	The date and time of the most recent BOF modification
`Config file version`	The configuration file version
`Config file last modified`	The date and time of the most recent config file modification
`Config file last saved`	The date and time of the most recent config file save
`M/S clocking ref state`	`primary` — the card is acting as the primary (active) CSM in a redundant system
	`secondary` — the card is acting as the standby (secondary) CSM in a redundant system
`Admin State`	`up` — the compact flash is administratively up
	`down` — the compact flash is administratively down
`Operational State`	`up` — the compact flash is operationally up
	`down` — the compact flash is operationally down
`Serial number`	The compact flash serial number
`Firmware revision`	The compact flash firmware version number
`Model number`	The compact flash model number
`Size`	The memory capacity on the compact flash, in bytes
`Free space`	The amount of free space on the compact flash, in bytes
`Part number`	The CSM part number
`CLEI code`	The code used to identify the router
`Serial number`	The CSM serial number

Table 10: Show CSM Card Output Fields (Continued)

Label	Description
`Manufacture date`	The chassis manufacture date
`Manufacturing string`	A factory-inputted manufacturing text string
`Manufacturing deviations`	A record of changes done to the hardware or software that is outside the normal revision control process
`Administrative state`	`up` — the CSM is administratively up
	`down` — the CSM is administratively down
`Operational state`	`up` — the CSM is operationally up
	`down` — the CSM is operationally down
`Temperature`	The internal chassis temperature
`Temperature threshold`	The value above which the internal temperature must rise in order to indicate that the temperature is critical
`Software boot (rom) version`	The version of the boot image
`Software version`	The software version number
`Time of last boot`	The date and time the most recent boot occurred
`Current alarm state`	The alarm conditions for the specific card
`Base MAC address`	The base MAC address of the hardware component
`Memory capacity`	The total amount of memory on the CSM, in bytes

mda

Syntax **mda** [*slot* [/*mda*]] [**detail**]
mda [*slot* [/*mda*]] **statistics** [**source-mda** | **dest-mda**]
mda with-fabric-stats

Context show

Description This command displays adapter card information and statistics collected from a specified adapter card and associated fabric ports.

If no command line options are specified, a summary output of all adapter cards is displayed.

Parameters *slot* — the slot number of the CSM/IOM

Values 1

mda — the slot number of the adapter card

Values 1 to 6

source-mda — displays network and access ingress traffic statistics from the specified adapter card going towards the fabric and towards a destination adapter card. The sum of traffic forwarded or dropped is also displayed.

Statistics from the fabric are not displayed when this keyword is used.

dest-mda — displays network and access ingress statistics for all adapter cards going towards the fabric and destined for the specified destination adapter card. Global fabric statistics are also displayed, as well as the fabric port statistics if the destination adapter card has the collection of fabric statistics enabled.

The sum of traffic forwarded or dropped is also displayed.

with-fabric-stats — displays all adapter cards that have been configured to collect fabric port statistics

Output The following outputs are examples of MDA information:

- MDA (Sample Output, Table 11)
- MDA Detailed (Sample Output, Table 12)
- MDA Fabric Statistics (Sample Output, Table 13)
- MDA With Fabric Statistics (Sample Output, Table 14)

Sample Output

```
*A:ALU-1># show mda 1/1

MDA 1/1
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     1     a12-sdi                                     up        provisioned
===============================================================================
*A:ALU-1>#


*A:ALU-1># show mda 1/2
===============================================================================
MDA 1/2
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     2     a4-oc3                                      up        provisioned
===============================================================================


*A:ALU-1># show mda 1/4
===============================================================================

MDA 1/4
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     4     a16-chds1             a16-chds1             up        up
===============================================================================

*A:ALU-1>#


*A:ALU-1># show mda 1/6
===============================================================================
MDA 1/6
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     6     a2-choc3                                    up        provisioned
===============================================================================
*A:ALU-1>#
```

Table 11: Show MDA Output Fields

Label	Description
`Slot`	The chassis slot number
`MDA`	The adapter card slot number
`Provisioned MDA-type`	The provisioned adapter card type
`Equipped MDA-type`	The adapter card type actually installed
`Admin State`	`up` — the adapter card is administratively up
	`down` — the adapter card is administratively down
`Operational State`	`up` — the adapter card is operationally up `down` — the adapter card is operationally down `provisioned` — there is no adapter card in the slot but it has been preconfigured `failed` — the provisioned adapter card has operationally failed

Sample Output

The following example shows the details of a 12-port Serial Data Interface card in slot 1.

```
*A:ALU-1># show mda 1/1 detail
===============================================================================
MDA 1/1 detail
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     1     a12-sdi                                     up        provisioned


MDA Specific Data
    Maximum port count            : 12
    Number of ports equipped      : 12
    Network ingress queue policy  : default
    Network ingress fabric policy : 1
    Access ingress fabric policy  : 1
    Fabric Stats Enabled          : FALSE
    Capabilities                  : Serial, CEM
    Min channel size              : PDH DS0 Group
    Max channel size              : Serial RS-232
    Max number of channels        : 12
    Channels in use               : 2


CEM MDA Specific Data
    Clock Mode                    : n/a

Hardware Data
    Part number                   :
    CLEI code                     :
    Serial number                 :
    Manufacture date              :
    Manufacturing string          :
    Manufacturing deviations      :
    Administrative state          : up
    Operational state             : provisioned
    Software version              : N/A
    Time of last boot             : N/A
    Current alarm state           : alarm cleared
    Base MAC address              :
===============================================================================
*A:ALU-1>#
```

The following example shows the details of a 2-port OC3/STM1 Channelized Adapter card in slot 6.

```
A:ALU-1># show mda 1/6 detail

===============================================================================
MDA 1/6 detail
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     6     a2-choc3              Unknown               up        provisioned


MDA Specific Data
    Maximum port count            : 2
    Number of ports equipped      : 2
    Network ingress queue policy  : default
    Network ingress fabric policy : 1
    Access ingress fabric policy  : 1
    Fabric Stats Enabled          : FALSE
    Capabilities                  : Sonet, TDM, PPP, ATM, cHDLC
    Min channel size              : PDH DS0 Group
    Max channel size              : PDH DS3
    Max number of channels        : 512
    Channels in use               : 0

Hardware Data
    Part number                   : 3HE03127AAAB0102
    CLEI code                     : IPU3AFPEAA
    Serial number                 : NS092040281
    Manufacture date              : 05192009
    Manufacturing string          : ECO C03759
    Manufacturing deviations      :
    Administrative state          : up
    Operational state             : up
    Temperature                   : 37C
    Temperature threshold         : 75C
    Software version              : N/A
    Time of last boot             : 2009/06/28 18:47:04
    Current alarm state           : alarm cleared
    Base MAC address              : 00:23:3e:99:7a:12
===============================================================================
A:ALU-1>#
```

The following example shows the details of a 4-port OC3/STM1 Clear Channel Adapter card in slot 2.

```
*A:ALU-1># show mda 1/2 detail
===============================================================================
MDA 1/2 detail
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     2     a4-oc3                                      up        provisioned

MDA Specific Data
    Maximum port count            : 4
    Number of ports equipped      : 4
    Network ingress queue policy  : default
    Network ingress fabric policy : 1
    Access ingress fabric policy  : 1
    Fabric Stats Enabled          : FALSE
    Capabilities                  : Sonet, PPP, ATM
    Min channel size              : Sonet STS-3
    Max channel size              : Sonet STS-3
    Max number of channels        : 4
    Channels in use               : 2

Hardware Data
    Part number                   : 3HE03127AAAB0102
    CLEI code                     : IPU3AFPEAA
    Serial number                 : NS092040281
    Manufacture date              : 05192009
    Manufacturing string          : ECO C03759
    Manufacturing deviations      :
    Administrative state          : up
    Operational state             : up
    Temperature                   : 37C
    Temperature threshold         : 75C
    Software version              : N/A
    Time of last boot             : 2009/06/28 18:47:04
    Current alarm state           : alarm cleared
    Base MAC address              : 00:23:3e:99:7a:12
===============================================================================

A:ALU-1>#
```

The following example shows the details of a 16-port T1/E1 ASAP Adapter card in slot 4.

```
*A:ALU-1># show mda 1/4 detail

===============================================================================
MDA 1/4 detail
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     4     a16-chds1                                   up        provisioned

MDA Specific Data
    Maximum port count            : 16
    Number of ports equipped      : 16
    Network ingress queue policy  : default
    Network ingress fabric policy : 1
    Access ingress fabric policy  : 1
    Fabric Stats Enabled          : FALSE
    Capabilities                  : TDM, PPP, ATM, CEM
    Min channel size              : PDH DS0 Group
    Max channel size              : PDH DS1
    Max number of channels        : 256
    Channels in use               : 0

CEM MDA Specific Data
    Clock Mode                    : adaptive

Hardware Data
    Part number                   : Sim Part#
    CLEI code                     : Sim CLEI
    Serial number                 : mda-4
    Manufacture date              : 01012003
    Manufacturing string          : Sim MfgString mda-4
    Manufacturing deviations      : Sim MfgDeviation mda-4
    Administrative state          : up
    Operational state             : failed
    Failure Reason                : Mda initialisation complete failed mda 4
    Software version              : N/A
    Time of last boot             : N/A
    Current alarm state           : alarm active
    Base MAC address              : a4:58:01:04:00:01
===============================================================================
*A:ALU-1>#
```

Table 12: Show MDA Detail Output Fields

Label	Description
`Slot`	The chassis slot number
`Mda`	The adapter card slot number
`Provisioned Mda-type`	The provisioned adapter card type
`Equipped Mda-type`	The adapter card type actually installed
`Admin State`	`up` — the adapter card is administratively up
	`down` — the adapter card is administratively down
`Operational State`	`up` — the adapter card is operationally up
	`down` — the adapter card is operationally down
	`provisioned` — there is no adapter card in the slot but it has been preconfigured
	`failed` — the provisioned adapter card has operationally failed
`MDA Specific Data`	
`Maximum port count`	The maximum number of ports that can be equipped on the adapter card
`Number of ports equipped`	The number of ports that are actually equipped on the adapter card
`Network Ingress Queue Policy`	The network ingress queue policy applied to the adapter card to define the queuing structure for this object
`Network ingress fabric policy`	The network ingress fabric policy applied to the adapter card
`Access ingress fabric policy`	The access ingress fabric policy applied to the adapter card
`Fabric Stats Enabled`	`TRUE` — the collection of fabric statistics is enabled on the adapter card
	`FALSE` — the collection of fabric statistics is disabled on the adapter card
`Capabilities`	The protocols that can be run on the adapter card
`Min channel size`	The minimum channel size on the adapter card
`Max channel size`	The maximum channel size on the adapter card

Table 12: Show MDA Detail Output Fields (Continued)

Label	Description
Max number of channels	The maximum number of channels supported on the adapter card
Channels in use	The number of channels being used on the adapter card
CEM MDA Specific Data	
Clock mode	The clocking mode used on the T1/E1 ASAP Adapter card
Hardware Data	
Part number	The hardware part number
CLEI code	The code used to identify the adapter card
Serial number	The adapter card part number
Manufacture date	The adapter card manufacture date
Manufacturing string	A factory-inputted manufacturing text string
Manufacturing deviations	A record of changes done to the hardware or software that is outside the normal revision control process
Administrative state	up — the adapter card is administratively up
	down — the adapter card is administratively down
Operational State	up — the adapter card is operationally up
	down — the adapter card is operationally down
	provisioned — there is no adapter card in the slot but it has been preconfigured
	failed — the provisioned adapter card has operationally failed
Temperature	The internal chassis temperature
Temperature threshold	The value above which the internal temperature must rise in order to indicate that the temperature is critical
Software version	The software version number
Time of last boot	The date and time the most recent boot occurred
Current alarm state	The alarm conditions for the specific adapter card
Base MAC address	The base MAC address of the hardware component

Sample Output

The following example shows an MDA fabric statistics display if the `source-mda` keyword is used.

```
*A:ALU-1># show mda 1/5 statistics source-mda

===============================================================================
Statistic of Source MDA 1/5
===============================================================================

-------------------------------------------------------------------------------
Destination MDA  1/1              Packets              Octets
    Network In Profile forwarded :  4203305              311044570
    Network In Profile dropped   :  933497               69078778
    Network Out Profile forwarded:  934317               69139458
    Network Out Profile dropped  :  700120               51808880
    Access In Profile forwarded  :  4246150              314215100
    Access Out Profile forwarded :  708419               52423006
    Access dropped               :  1885052              139493848
Destination MDA  1/2              Packets              Octets
    Network In Profile forwarded :  187130               13847620
    Network In Profile dropped   :  41164                3046136
    Network Out Profile forwarded:  41766                3090684
    Network Out Profile dropped  :  30873                2284602
    Access In Profile forwarded  :  640974               47432076
    Access Out Profile forwarded :  108549               8032626
    Access dropped               :  279832               20707568
Destination MDA  1/3              Packets              Octets
    Network In Profile forwarded :  229693               16997282
    Network In Profile dropped   :  50499                3736926
    Network Out Profile forwarded:  51280                3794720
    Network Out Profile dropped  :  37872                2802528
    Access In Profile forwarded  :  140170               10372580
    Access Out Profile forwarded :  24595                1820030
    Access dropped               :  58680                4342320
Destination MDA  1/4              Packets              Octets
    Network In Profile forwarded :  403805               29881570
    Network In Profile dropped   :  89105                6593770
    Network Out Profile forwarded:  90008                6660592
    Network Out Profile dropped  :  66827                4945198
    Access In Profile forwarded  :  256362               18970788
    Access Out Profile forwarded :  44097                3263178
    Access dropped               :  109920               8134080
Destination MDA  1/5              Packets              Octets
    Network In Profile forwarded :  396270               403402860
    Network In Profile dropped   :  87752                89331536
    Network Out Profile forwarded:  88190                89777420
    Network Out Profile dropped  :  65817                67001706
    Access In Profile forwarded  :  2719693              201257282
    Access Out Profile forwarded :  455549               33710626
    Access dropped               :  1202105              88955770
Destination MDA  1/6              Packets              Octets
    Network In Profile forwarded :  585296               595831328
    Network In Profile dropped   :  129704               132038672
    Network Out Profile forwarded:  130222               132565996
    Network Out Profile dropped  :  97278                99029004
    Access In Profile forwarded  :  5948753              440207722
    Access Out Profile forwarded :  995919               73698006
    Access dropped               :  2630809              194679866
```

```
-------------------------------------------------------------------------------
    Total Network forwarded :       7341282              1676034100
    Total Network dropped   :       2330508              531697736
    Total Access forwarded  :       16289230             1205403020
    Total Access dropped    :       6166398              456313452
===============================================================================
*A:ALU-1>#
```

The following example shows an MDA fabric statistics display if the `dest-mda` keyword is used.

```
*A:ALU-1># show mda 1/5 statistics dest-mda

===============================================================================
Statistic of Destination MDA 1/ 5
===============================================================================

-------------------------------------------------------------------------------
Source MDA    1/1                Packets              Octets
    Network In Profile forwarded :  520148               529510664
    Network In Profile dropped   :  64852                66019336
    Network Out Profile forwarded:  65075                66246350
    Network Out Profile dropped  :  32425                33008650
    Access In Profile forwarded  :  5614550              415476700
    Access Out Profile forwarded :  661714               48966836
    Access dropped              :  657705               48670170
Source MDA    1/2                Packets              Octets
    Network In Profile forwarded :  4146                 1733028
    Network In Profile dropped   :  480                  200640
    Network Out Profile forwarded:  531                  221958
    Network Out Profile dropped  :  240                  100320
    Access In Profile forwarded  :  204744               15151056
    Access Out Profile forwarded :  15318                1133532
    Access dropped              :  25565                1891810
Source MDA    1/3                Packets              Octets
    Network In Profile forwarded :  32470                30617292
    Network In Profile dropped   :  3890                 3664068
    Network Out Profile forwarded:  4127                 3894682
    Network Out Profile dropped  :  1933                 1818878
    Access In Profile forwarded  :  510301               37762274
    Access Out Profile forwarded :  34691                2567134
    Access dropped              :  66951                4954374
Source MDA    1/4                Packets              Octets
    Network In Profile forwarded :  0                    0
    Network In Profile dropped   :  0                    0
    Network Out Profile forwarded:  0                    0
    Network Out Profile dropped  :  0                    0
    Access In Profile forwarded  :  491695               126976722
    Access Out Profile forwarded :  24867                7435050
    Access dropped              :  23790                2271932
Source MDA    1/5                Packets              Octets
    Network In Profile forwarded :  950101               967202818
    Network In Profile dropped   :  118649               120784682
    Network Out Profile forwarded:  118803               120941454
    Network Out Profile dropped  :  59322                60389796
    Access In Profile forwarded  :  187631               191008358
    Access Out Profile forwarded :  12594                12820692
    Access dropped              :  24894                25342092
```

```
Source MDA    1/6                 Packets              Octets
    Network In Profile forwarded :  1494108              1521001944
    Network In Profile dropped   :  186642               190001556
    Network Out Profile forwarded:  186811               190173598
    Network Out Profile dropped  :  93314                94993652
    Access In Profile forwarded  :  1473381              1499873582
    Access Out Profile forwarded :  173421               176539142
    Access dropped               :  173142               176255492
-------------------------------------------------------------------------------
    Total Network forwarded :       3376320              3431543788
    Total Network dropped   :       561747               570981578
    Total Access forwarded  :       9404907              2535711078
    Total Access dropped    :       972047               259385870


Fabric Port Stats                 Packets              Octets
    Forwarded :                     2655130              1288890384
    Dropped   :                     0                    N/A


Fabric Global Stats               Packets              Octets
    Forwarded :                     44372441             N/A
    Dropped   :                     0                    N/A

===============================================================================
*A:ALU-1>#
```

Table 13: Show MDA Fabric Statistics Output Fields

Label	Description
`Statistic of Source MDA`	If the `source-mda` keyword is specified in the `show statistics` command, displays the network and access ingress traffic statistics from the specified adapter card towards the fabric and towards a destination adapter card. The sum of traffic forwarded or dropped is also displayed.
`Destination MDA Packets/Octets`	`Network In Profile forwarded` — the number of network in-profile packets/octets forwarded from the adapter card specified in the `show mda` command towards the fabric, then to the output destination adapter card (Destination MDA 1/x in the output field, where x = 1 to 6)
	`Network In Profile dropped` — the number of network in-profile packets/octets dropped from the adapter card specified in the `show mda` command towards the fabric, then to the output destination adapter card (Destination MDA 1/x in the output field, where x = 1 to 6)
	`Network Out Profile forwarded` — the number of network out-of-profile packets/octets forwarded from the adapter card specified in the `show mda` command towards the fabric, then to the output destination adapter card (Destination MDA 1/x in the output field, where x = 1 to 6)
	`Network Out Profile dropped` — the number of network out-of-profile packets/octets dropped from the adapter card specified in the `show mda` command towards the fabric, then to the output destination adapter card (Destination MDA 1/x in the output field, where x = 1 to 6)
	`Access In Profile forwarded` — the number of access in-profile packets/octets forwarded from the adapter card specified in the `show mda` command towards the fabric, then to the output destination adapter card (Destination MDA 1/x in the output field, where x = 1 to 6)
	`Access Out Profile forwarded` — the number of access out-of-profile packets/octets forwarded from the adapter card specified in the `show mda` command towards the fabric, then to the output destination adapter card (Destination MDA 1/x in the output field, where x = 1 to 6)

Table 13: Show MDA Fabric Statistics Output Fields (Continued)

Label	Description
	`Access dropped` — the number of access out-of-profile packets/octets and access in-profile packets/octets dropped from the adapter card specified in the `show mda` command towards the fabric, then to the output destination adapter card (Destination MDA 1/x in the output field, where x = 1 to 6)
`Total Network forwarded Packets/Octets`	The number of network in-profile and out-of-profile packets/octets forwarded
`Total Network dropped Packets/Octets`	The number of network in-profile and out-of-profile packets/octets dropped
`Total Access forwarded Packets/Octets`	The number of access in-profile and out-of-profile packets/octets forwarded
`Total Access dropped Packets/Octets`	The number of access in-profile and out-of-profile packets/octets dropped
`Statistic of Destination MDA`	If the `dest-mda` keyword is specified in the `show statistics` command, displays the network and access ingress statistics from all source adapter cards going towards the fabric and destined for the specified adapter card. Global fabric statistics are also displayed, as well as the fabric port statistics if the destination adapter card has the collection of fabric statistics enabled. The sum of traffic forwarded or dropped is also displayed
`Source MDA Packets/Octets`	`Network In Profile forwarded` — the number of network in-profile packets/octets forwarded from the adapter card specified in the `show mda` command towards the fabric, then to the output adapter card (Source MDA 1/x in the output field, where x = 1 to 6)
	`Network In Profile dropped` — the number of network in-profile packets/octets dropped from the adapter card specified in the `show mda` command towards the fabric, then to the output adapter card (Source MDA 1/x in the output field, where x = 1 to 6)
	`Network Out Profile forwarded` — the number of network out-of-profile packets/octets forwarded from the adapter card specified in the `show mda` command towards the fabric, then to the output adapter card (Source MDA 1/x in the output field, where x = 1 to 6)

Table 13: Show MDA Fabric Statistics Output Fields (Continued)

Label	Description
	`Network Out Profile dropped` — the number of network out-of-profile packets/octets dropped from the adapter card specified in the `show mda` command towards the fabric, then to the output adapter card (Source MDA 1/x in the output field, where x = 1 to 6)
	`Access In Profile forwarded` — the number of access in-profile packets/octets forwarded from the adapter card specified in the `show mda` command towards the fabric, then to the output adapter card (Source MDA 1/x in the output field, where x = 1 to 6)
	`Access Out Profile forwarded` — the number of access out-of-profile packets/octets forwarded from the adapter card specified in the show mda command towards the fabric, then to the output adapter card (Source MDA 1/x in the output field, where x = 1 to 6)
	`Access dropped` — the number of access in-profile packets/octets and out-of-profile packets/octets dropped from the adapter card specified in the `show mda` command towards the fabric, then to the output adapter card (Source MDA 1/x in the output field, where x = 1 to 6)
`Total Network forwarded Packets/Octets`	The number of network in-profile and out-of-profile packets/octets forwarded
`Total Network dropped Packets/Octets`	The number of network in-profile and out-of-profile packets/octets dropped
`Total Access forwarded Packets/Octets`	The number of access in-profile and out-of-profile packets/octets forwarded
`Total Access dropped Packets/Octets`	The number of access in-profile and out-of-profile packets/octets dropped
`Fabric Port Stats`	If the `dest-mda` keyword is specified in the `show mda statistics` command and `fabric-stats-enabled` is configured on an adapter card, displays the egress traffic statistics toward the specified adapter card
	`Forwarded Packets/Octets` — the number of forwarded packets/octets switched from the fabric toward an adapter card
	`Dropped Packets/Octets` — the number of dropped packets/octets switched from the fabric toward an adapter card

Table 13: Show MDA Fabric Statistics Output Fields (Continued)

Label	Description
Fabric Global Stats	If the dest-mda keyword is specified in the show mda statistics command, displays the global fabric statistics collected from the fabric. The statistics include all traffic switched over the fabric, which includes traffic to all adapter cards and all internal traffic such as traffic destined for the CSM.
	Forwarded Packets/Octets — the number of forwarded packets/octets switched over the fabric
	Dropped Packets/Octets — the number of dropped packets/octets switched over the fabric
Note: The following octet counts are not supported: Fabric Port Dropped, Fabric Global Forwarded, and Fabric Global Dropped. N/A is displayed in these fields.	

Sample Output

The following example shows an MDA fabric statistics display if the `with-fabric-stats` keyword is used.

```
*A:ALU-1># show mda with-fabric-stats

Fabric Port Stats enabled    : MDA 1/1

*A:ALU-1>#
```

Table 14: Show MDA With Fabric Statistics

Label	Description
Fabric Port Stats enabled	The adapter card slot numbers that have been configured to collect fabric port statistics

Show Port Commands

port

Syntax **port** *port-id* [**count**] [**detail**]
port *port-id* **acr** [**detail**]
port *port-id* **description**
port *port-id* **associations**
port *port-id* **ppp** [**detail**]
port *port-id* **ethernet** [**efm-oam** | **detail**]

Context show

Description This command displays port or channel information. If no command line options are specified, the **show port** command displays summary information for all ports on provisioned adapter cards.

Parameters *port-id* — specifies the physical port ID

Syntax	port-id	*slot*[/*mda*[/*port*]] or *slot*/*mda*/*port*[.*channel*]
Values	slot	1
	mda	1 to 6
	port	1 to 2 (2-port OC3/STM1 Channelized Adapter card ports)
		1 to 4 (4-port OC3/STM1 Clear Channel Adapter card ports)
		1 to 16 (T1/E1 ASAP Adapter card ports)
		1 to 8 (Ethernet Adapter card ports)
		1 to 12 (Serial Data Interface card ports)
	channel	ds1 or e1 (for **config>port>tdm** information)
		rs232 or v35 (for **config>port>serial** information)
		1 to 24 (DS1) or 1 to 32 (E1) (for **config>port>tdm>channel-group** information)
		1 (V.35 or RS-232) (for **config>port>serial>channel-group** information)

acr — displays ACR-capable port information

associations — displays a list of current router interfaces to which the port is associated

count — displays only port counter summary information

description — displays port description strings

ethernet — displays Ethernet port information

efm-oam — displays EFM OAM information

detail — displays detailed information about the Ethernet port

ppp — displays PPP protocol information for the port

detail — provides detailed information

Output The following outputs are examples of port information:

- General (Sample Output, Table 15)
- Port Count (Sample Output, Table 16)
- Specific, Serial (Sample Output, Table 17)
- Specific, SONET/SDH (Sample Output, Table 18)
- Specific, Ethernet (Sample Output, Table 19)
- Detail, SONET/SDH (Sample Output, Table 20)
- Detail, Ethernet (Sample Output, Table 21)
- Detail, TDM/DS1 (Sample Output, Table 22)
- Serial Channel (Sample Output, Table 23)
- Channel Group (Sample Output, Table 24)
- DS3 Payload (Sample Output, Table 25)
- ACR Detail (Sample Output, Table 26)
- Descriptions (Sample Output, Table 27)
- Associations (Sample Output, Table 28)
- PPP (Sample Output, Table 29)
- CEM (Sample Output, Table 30)

Sample Output

```
*A:ALU-1># show port 1/1

==============================================================================
Ports on Slot 1
==============================================================================
Port        Admin Link Port    Cfg  Oper LAG/ Port Port Port   SFP/XFP/
Id          State      State   MTU  MTU  Bndl Mode Encp Type   MDIMDX
------------------------------------------------------------------------------
1/1/1       Down  No   Ghost
1/1/2       Down  No   Ghost
1/1/2.1     Down  No   Ghost   1514 1514    - accs cem  serial
1/1/3       Down  No   Ghost
1/1/4       Down  No   Ghost
1/1/4.1     Down  No   Ghost   1514 1514    - accs cem  serial
1/1/5       Down  No   Ghost
1/1/6       Down  No   Ghost
1/1/7       Down  No   Ghost
1/1/8       Down  No   Ghost
1/1/9       Down  No   Ghost
1/1/10      Down  No   Ghost
1/1/11      Down  No   Ghost
1/1/12      Down  No   Ghost
==============================================================================
*A:ALU-1>#
```

```
*A:ALU-1># show port 1/2

===============================================================================
Ports on Slot 1
===============================================================================
Port        Admin Link Port    Cfg  Oper LAG/ Port Port Port   SFP/XFP/
Id          State      State   MTU  MTU  Bndl Mode Encp Type   MDIMDX
-------------------------------------------------------------------------------
1/2/1       Down  No   Ghost
1/2/1.sts3  Up    No   Ghost   1524 1524    - accs atm  sonet
1/2/2       Up    No   Ghost
1/2/2.sts3  Down  No   Ghost   1572 1572    - netw pppa sonet
1/2/3       Down  No   Ghost
1/2/4       Down  No   Ghost
===============================================================================
*A:ALU-1>#
```

```
A:ALU-1># show port 1/3

===============================================================================
Ports on Slot 1
===============================================================================
Port        Admin Link Port    Cfg  Oper LAG/ Port Port Port   SFP/XFP/
Id          State      State   MTU  MTU  Bndl Mode Encp Type   MDIMDX
-------------------------------------------------------------------------------
1/3/1       Down  No   Ghost
1/3/1.1     Down  No   Ghost   1514 1514    - accs cem  tdm
1/3/2       Down  No   Ghost
1/3/2.1     Down  No   Ghost   1514 1514    - accs cem  tdm
1/3/3       Down  No   Ghost
1/3/4       Down  No   Ghost
1/3/5       Down  No   Ghost
1/3/6       Down  No   Ghost
1/3/7       Down  No   Ghost
1/3/8       Down  No   Ghost
1/3/9       Down  No   Ghost
1/3/10      Down  No   Ghost
1/3/11      Down  No   Ghost
1/3/12      Down  No   Ghost
1/3/13      Down  No   Ghost
1/3/14      Down  No   Ghost
1/3/15      Down  No   Ghost
1/3/16      Down  No   Ghost
1/3/16.1    Down  No   Ghost   1572 1572    - netw unkn tdm
===============================================================================
*A:ALU-1>#
```

Table 15: Show General Port Output Fields

Label	Description
Port ID	The port ID configured or displayed in the *slot/mda/port* format
Admin State	Up — the administrative state is up
	Down — the administrative state is down
Link	Yes — a physical link is present
	No — a physical link is not present
Port State	Up — the port is physically present and has a physical link
	Down — the port is physically present but does not have a link
	Ghost — the port is not physically present
	None — the port is in its initial creation state or about to be deleted
	Link Up — the port is physically present and has a physical link. When Link Up appears at the lowest level of a TDM tributary, it means the physical connection is active but the port is waiting before data traffic can flow. It is a waiting state and indicates that data traffic will not flow until it transitions to the Up state.
	Link Down — the port is physically present but does not have a link
Cfg MTU	The configured MTU
Oper MTU	The negotiated size of the largest packet that can be sent on the port or channel specified in octets
LAG/Bndl	The Link Aggregation Group (LAG) or multilink bundle to which a TDM port is assigned
Port Mode	network — the port is configured for transport network use
	access — the port is configured for service access
Port Encp	The encapsulation type on the port
Port Type	The type of port or optics installed
SFP/MDI MDX	The SFP type on an Ethernet port (Ethernet, Fast Ethernet, or GigE)

Sample Output

```
*A:ALU-1># show port 1/1 count detail

===============================================================================
Port Statistics on Slot 1
===============================================================================
Port                    Ingress         Ingress          Egress          Egress
Id                      Packets          Octets         Packets          Octets
-------------------------------------------------------------------------------
1/1/1                         0               0               0               0
1/1/1.rs232                   0               0               0               0
1/1/2                         0               0               0               0
1/1/2.rs232                   0               0               0               0
1/1/2.1                       0               0               0               0
1/1/3                         0               0               0               0
1/1/4                         0               0               0               0
1/1/4.v35                     0               0               0               0
1/1/4.1                       0               0               0               0
1/1/5                         0               0               0               0
1/1/6                         0               0               0               0
1/1/7                         0               0               0               0
1/1/8                         0               0               0               0
1/1/9                         0               0               0               0
1/1/10                        0               0               0               0
1/1/11                        0               0               0               0
1/1/12                        0               0               0               0
===============================================================================
*A:ALU-1>#


*A:ALU-1># show port 1/2 count detail

===============================================================================
Port Statistics on Slot 1
===============================================================================
Port                    Ingress         Ingress          Egress          Egress
Id                      Packets          Octets         Packets          Octets
-------------------------------------------------------------------------------
1/2/1                         0               0               0               0
1/2/1.sts3                    0               0               0               0
1/2/2                         0               0               0               0
1/2/2.sts3                    0               0               0               0
1/2/3                         0               0               0               0
1/2/4                         0               0               0               0
===============================================================================
*A:ALU-1>#
```

```
*A:ALU-1># show port 1/5 count detail

===============================================================================
Port Statistics on Slot 1
===============================================================================
Port                    Ingress         Ingress          Egress          Egress
Id                      Packets          Octets         Packets          Octets
-------------------------------------------------------------------------------
1/5/1                         0               0               0               0
1/5/2                         0               0               0               0
1/5/3                         0               0               0               0
1/5/4                         0               0               0               0
1/5/5                         0               0               0               0
1/5/6                         0               0               0               0
1/5/7                         0               0               0               0
1/5/8                         0               0               0               0
===============================================================================
*A:ALU-1>#
```

Table 16: Show Port Count Output Fields

Label	Description
Port ID	The port ID configured or displayed in the *slot/mda/port* format
Ingress Packets	The number of ingress packets coming into the port
Ingress Octets	The number of ingress octets coming into the port
Egress Packets	The number of egress packets transmitted from the port
Egress Octets	The number of egress octets transmitted from the port

Sample Output

```
*A:ALU-1># show port 1/1/1
===============================================================================
Serial RS-232 Physical Interface
===============================================================================
Description        : RS-232/V.35/X.21
Interface          : 1/1/1                 Port IfIndex         : 35684352
Admin Status       : down                  Oper Status          : down
Physical Link      : No
Type               : rs232
===============================================================================

===============================================================================
Port Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Packets                                                0                      0
Discards                                               0                      0
Unknown Proto Discards                                 0
===============================================================================
*A:ALU-1>#
```

Table 17: Show Specific Port Output Fields (Serial Port)

Label	Description
Serial RS-232 Physical Interface	
Description	A text description of the port
Interface	The port ID displayed in the *slot/mda/port* format
Port IfIndex	The interface's index number, which reflects its initialization sequence
Admin Status	up — the administrative state is up
	down — the administrative state is down
Oper Status	up — the operational state is up
	down — the operational state is down
Physical Link	Yes — a physical link is present
	No — a physical link is not present
Type	The type of serial interface
Port Statistics	
Packets input/output	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.
Discards input/output	The number of inbound packets chosen to be discarded to possibly free up buffer space
Unknown proto discards input/output	For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0.

Sample Output

```
*A:ALU-1># show port 1/2/1

===============================================================================
SONET/SDH Interface
===============================================================================
Description        : OC-3 SONET/SDH
Interface          : 1/2/1                    Speed                : oc3
Admin Status       : down                     Oper Status          : down
Physical Link      : No                       Loopback Mode        : none
Single Fiber Mode  : No
Ing. Pool % Rate   : 100                      Egr. Pool % Rate     : 100
Clock Source       : node                     Framing              : sonet
Last State Change  : 12/23/2008 20:22:25      Port IfIndex         : 35684352
Last Cleared Time  : N/A                      DDM Events           : Enabled
J0 String          : 0x01                     Section Trace Mode   : byte
Rx S1 Byte         : 0x00                     Rx K1/K2 Byte        : 0x00/0x00
Rx J0 String (Hex) : 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Cfg Alarm          : loc lrdi lb2er-sf slof slos
Alarm Status       :
BER SD Threshold   : 6                        BER SF Threshold     : 3
Hold time up       : 500 milliseconds
Hold time down     : 0 milliseconds

===============================================================================
Port Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Packets                                                 0                     0
Discards                                                0                     0
Unknown Proto Discards                                  0
===============================================================================
*A:ALU-1>#

A:SwSim# show port 1/2/2

===============================================================================
SONET/SDH Interface
===============================================================================
Description        : OC-3 SONET/SDH
Interface          : 1/2/2                    Speed                : oc3
Admin Status       : up                       Oper Status          : up
Physical Link      : Yes                      Loopback Mode        : none
Single Fiber Mode  : No
Ing. Pool % Rate   : 100                      Egr. Pool % Rate     : 100
APS Group          : none                     APS Role             : none
Clock Source       : node                     Framing              : sonet
Last State Change  : 01/26/2009 15:33:22      Port IfIndex         : 37814272
Last Cleared Time  : N/A                      DDM Events           : Enabled
J0 String          : 0x01                     Section Trace Mode   : byte
Rx S1 Byte         : 0x00                     Rx K1/K2 Byte        : 0x00/0x00
Rx J0 String       : C
Rx J0 String (Hex) : 43 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Cfg Alarm          : loc lrdi lb2er-sf slof slos
Alarm Status       : lb2er-sd
BER SD Threshold   : 6                        BER SF Threshold     : 3
Hold time up       : 500 milliseconds
```

```
Hold time down     : 0 milliseconds

===============================================================================
Port Statistics
===============================================================================
                                                   Input                Output
-------------------------------------------------------------------------------
Packets                                                0                     0
Discards                                               0                     0
Unknown Proto Discards                                 0
===============================================================================

---------------------------------------------------------------------------------
```

Table 18: Show Specific Port Output Fields (SONET/SDH Port)

Label	Description
SONET/SDH interface	
Description	A text description of the port
Interface	The port ID displayed in the *slot/mda/port* format
Speed	The speed of a SONET/SDH port
Admin Status	up — the administrative state is up
	down — the administrative state is down
Oper Status	up — the operational state is up
	down — the operational state is down
Physical Link	Yes — a physical link is present
	No — a physical link is not present
Loopback Mode	The loopback mode on the port
Single Fiber Mode	Yes — single fiber mode No — not single fiber mode
Ing. Pool % Rate	The amount of ingress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for ingress buffering
Egr. Pool % Rate	The amount of egress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for egress buffering
APS group	The automatic protection switching group
APS role	The automatic protection switching group role

Table 18: Show Specific Port Output Fields (SONET/SDH Port) (Continued)

Label	Description
`Clock Source`	`node` — the link uses the internal clock when transmitting data `loop` — the link recovers the clock from the received data stream
`Framing`	`sonet` — the port is configured for SONET framing `sdh` — the port is configured for SDH framing
`Last State Change`	The last time that the operational status of the port changed state
`Port IfIndex`	The interface's index number, which reflects its initialization sequence
`Last Cleared Time`	The time since the last clear
`DDM Events`	`Enabled` — digital diagnostic monitoring events is enabled for the port `Disabled` — digital diagnostic monitoring events is disabled for the port
`J0 String`	The section trace value that is sent to the far-end port
`Section Trace Mode`	`byte` — the section trace in the SONET section header is set in bytes `string` — a text string is used to identify the SONET section header `increment-z0` — an incremental STM ID is configured instead of a static value
`Rx S1 Byte`	The value of the received SONET/SDH S1 byte
`Rx K1/K2 Byte`	The value of the received SONET/SDH K1/K2 byte
`Rx J0 String (Hex)`	The hex value of the received J0
`Cfg Alarm`	The type of alarms to be logged and reported for the SONET/SDH port
`Alarm Status`	The current alarm state
`BER SD Threshold`	The configured threshold for line signal degradation BER error rate, that when crossed determines the signal degradation and signal failure
`BER SF Threshold`	The configured threshold for line signal failure BER error rate, that when crossed determines the signal degradation and signal failure
`Hold time up`	The hold-timer value for link-up event dampening

Table 18: Show Specific Port Output Fields (SONET/SDH Port) (Continued)

Label	Description
Hold time down	The hold-timer value for link-down event dampening
Port Statistics	
Packets input/output	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.
Discards input/output	The number of inbound packets chosen to be discarded to possibly free up buffer space
Unknown proto discards input/output	For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0.

Sample Output

```
*A:ALU-1># show port 1/2/8

===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100/Gig Ethernet SFP
Interface          : 1/2/8                      Oper Speed       : N/A
Link-level         : Ethernet                   Config Speed     : 1 Gbps
Admin State        : up                         Oper Duplex      : N/A
Oper State         : down                       Config Duplex    : full
Reason Down        : linkLossFwd
Physical Link      : No                         MTU              : 1514
IfIndex            : 38010880                   Hold time up     : 0 seconds
Last State Change  : 10/30/2008 14:40:56        Hold time down   : 0 seconds
Last Cleared Time  : N/A                        DDM Events       : Enabled

Configured Mode    : access                     Encap Type       : null
Dot1Q Ethertype    : 0x8100
Ing. Pool % Rate   : 100                        Egr. Pool % Rate : 100
Net. Egr. Queue Pol: default
Egr. Sched. Pol    : n/a
Auto-negotiate     : true                       MDI/MDX          : unknown
Egress Rate        : Default                    Ingress Rate     : n/a

Loopback           : none
```

```
Loopback Time Left : unspecified

Configured Address : 00:21:05:6e:5b:93
Hardware Address   : 00:21:05:6e:5b:93
Cfg Alarm          :
Alarm Status       :

Transceiver Data

Transceiver Type   : SFP
Model Number       : 3HE00062AAAA01  ALU  IPUIAEHDAA
TX Laser Wavelength: 0 nm                        Diag Capable     : no
Connector Code     : Unknown                     Vendor OUI       : 00:90:65
Manufacture date   : 2008/08/05                  Media            : Ethernet
Serial Number      : PE610NK
Part Number        : FCMJ-8521-3-A5
Optical Compliance : GIGE-T
Link Length support: 100m for copper
SFP Sync-E Capable : no

===============================================================================
Traffic Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Octets                                                 0                      0
Packets                                                0                      0
Errors                                                 0                      0
===============================================================================

===============================================================================
Port Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Unicast Packets                                        0                      0
Multicast Packets                                      0                      0
Broadcast Packets                                      0                      0
Discards                                               0                      0
Unknown Proto Discards                                 0
===============================================================================

===============================================================================
Port Discard Statistics
===============================================================================
                                 Input                                  Output
Unk L2 Packets   :                   0

CSM Ingress Queues                       CSM Egress Queues
  Hi             :                   0     Common         :                   0
  Low            :                   0
  Ftp            :                   0
===============================================================================
```

```
===============================================================================
Ethernet-like Medium Statistics
===============================================================================

Alignment Errors :                    0  Sngl Collisions  :                    0
FCS Errors       :                    0  Mult Collisions  :                    0
SQE Test Errors  :                    0  Late Collisions  :                    0
CSE              :                    0  Excess Collisions:                    0
Too long Frames  :                    0  Int MAC Tx Errs  :                    0
Symbol Errors    :                    0  Int MAC Rx Errs  :                    0
===============================================================================
*A:ALU-1>#
```

Table 19: Show Specific Port Output Fields (Ethernet Port)

Label	Description
Ethernet Interface	
Description	A text description of the port
Interface	The port ID displayed in the *slot/mda/port* format
Link-level	The type of link for which the port is configured
Admin State	up — the administrative state is up
	down — the administrative state is down
Oper State	up — the operating state is up
	down — the operating state is down
Reason Down	Indicates that the port has gone down due to Link Loss Forwarding
Physical Link	Yes — a physical link is present
	No — a physical link is not present
IfIndex	The interface's index number, which reflects its initialization sequence
Last State Change	The last time that the operational status of the port changed state
Last Cleared Time	The time since the last clear
Configured Mode	network — the port is configured for transport network use
	access — the port is configured for service access
Dot1Q Ethertype	The Ethertype expected when the port's encapsulation type is dot1q

Table 19: Show Specific Port Output Fields (Ethernet Port) (Continued)

Label	Description
`Ing. Pool % Rate`	The amount of ingress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port or channel for ingress buffering
`Net. Egr. Queue Pol`	`default` — the default policy is used
	`network` — the network egress queue policy is used
`Egr. Sched. Pol`	The egress scheduling policy
`Auto-negotiate`	`true` — the link attempts to automatically negotiate the link speed and duplex parameters
	`false` — the duplex and speed values are used for the link
`Egress Rate`	The maximum amount of egress bandwidth (in kilobits per second) that this Ethernet interface can generate
`Loopback`	The type of loopback configured on the port, either line, internal, or none
`Loopback Time Left`	The number of seconds left in a timed loopback If there is no loopback configured or the configured loopback is latched, the value is unspecified
`Configured Address`	The base chassis Ethernet MAC address
`Hardware Address`	The interface's hardware or system assigned MAC address at its protocol sub-layer
`Cfg Alarm`	The type of alarms to be logged and reported for the Ethernet port
`Alarm Status`	The current alarm state
`Oper Speed`	The operating speed of the interface
`Config Speed`	The configured speed of the interface
`Oper Duplex`	`full` — the link is operating at full duplex mode `half` — the link is operating at half duplex mode
`Config Duplex`	`full` — the link is set at full duplex mode `half` — the link is set at half duplex mode
`MTU`	The size of the largest packet that can be sent/received on the Ethernet physical interface, specified in octets
`Hold time up`	The link-up dampening time in seconds
`Hold time down`	The link-down dampening time in seconds

Table 19: Show Specific Port Output Fields (Ethernet Port) (Continued)

Label	Description
`Encap Type`	`null` — ingress frames will not use any tags or labels to delineate a service `dot1q` — ingress frames carry 802.1Q tags where each tag signifies a different service
`Egr. Pool % Rate`	The amount of egress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port or channel for egress buffering
`MDI/MDX`	Ethernet type
`Ingress Rate`	The maximum amount of ingress bandwidth (in kilobits per second) that this Ethernet interface can generate
`Traffic Statistics`	
`Octets Input/Output`	The total number of octets received and transmitted on the port
`Packets Input/Output`	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.
`Errors Input/Output`	For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol. For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.
`Port Statistics`	
`Unicast packets Input/Output`	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.

Table 19: Show Specific Port Output Fields (Ethernet Port) (Continued)

Label	Description
Multicast packets Input/Output	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a unicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sub-layer, including those that were discarded or not sent.
Broadcast packets Input/Output	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a unicast or multicast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sub-layer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound packets chosen to be discarded to possibly free up buffer space
Unknown proto discards Input/Output	For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. Unknown proto discards do not show up in the packet counts.
Port Discard Statistics	
Unk L2 Packets Input/Output	The number of packets discarded due to an unknown L2 ID
CSM Ingress Queues Input/Output	The number of incoming control packets discarded
CSM Egress Queues Output	The number of outgoing control packets discarded
Ethernet-like Medium Statistics	
Alignment Errors	The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets

Table 19: Show Specific Port Output Fields (Ethernet Port) (Continued)

Label	Description
`FCS Errors`	The number of frames received that are an integral number of octets in length but do not pass the FCS check
`SQE Errors`	The number of times that the SQE TEST ERROR is received
`CSE`	The number of times that the carrier sense condition was lost or never asserted when attempting to transmit a frame
`Too long Frames`	The number of frames received that exceed the maximum permitted frame size
`Symbol Errors`	For an interface operating at 100 Mb/s, the number of times there was an invalid data symbol when a valid carrier was present
`Sngl Collisions`	The number of frames that are involved in a single collision, and are subsequently transmitted successfully
`Mult Collisions`	The number of frames that are involved in more than one collision and are subsequently transmitted successfully
`Late Collisions`	The number of times that a collision is detected later than one slotTime into the transmission of a packet
`Excess Collisns`	The number of frames for which a transmission fails due to excessive collisions
`Int MAC Tx Errs`	The number of frames for which a transmission fails due to an internal MAC sublayer transmit error
`Int MAC Rx Errs`	The number of frames for which a reception fails due to an internal MAC sublayer receive error

Sample Output

```
*A:ALU-1># show port 1/2/2 detail

===============================================================================
SONET/SDH Interface
===============================================================================
Description        : OC-3 SONET/SDH
Interface          : 1/2/2                    Speed                : oc3
Admin Status       : up                       Oper Status          : down
Physical Link      : No                       Loopback Mode        : none
Single Fiber Mode  : No
Ing. Pool % Rate   : 100                      Egr. Pool % Rate     : 100
Clock Source       : node                     Framing              : sonet
Last State Change  : 06/20/2009 19:09:58      Port IfIndex         : 37814272
Last Cleared Time  : N/A                      DDM Events           : Enabled
J0 String          : 0x01                     Section Trace Mode   : byte
Rx S1 Byte         : 0x00                     Rx K1/K2 Byte        : 0x00/0x00
Rx J0 String (Hex) : 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Cfg Alarm          : loc lrdi lb2er-sf slof slos
Alarm Status       :
BER SD Threshold   : 6                        BER SF Threshold     : 3
Hold time up       : 500 milliseconds
Hold time down     : 0 milliseconds

=========================
Sonet Section
=========================
ES-S     :            0
SES-S    :            0
SEFS-S   :            0
CV-S     :            0
LOS      :            0
LOC      :            0
LOF      :            0
OOF      :            0
B1 Error :            0
=========================

===========================================
Sonet Line
===========================================
                                  Far End
-------------------------------------------
ES-L     :            0               0
SES-L    :            0               0
UAS-L    :            0               0
CV-L     :            0               0
AIS-L    :            0
RDI-L    :            0
B2 Error :            0
S1 Error :            0
M1 Error :            0
===========================================
```

```
===============================================================================
Port Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Packets                                                 0                     0
Discards                                                0                     0
Unknown Proto Discards                                  0
===============================================================================
*A:ALU-1>#
```

Table 20: Show Port Detail Output Fields (SONET/SDH Port)

Label	Description
SONET/SDH interface	
Description	A text description of the port
Interface	The port ID displayed in the *slot/mda/port* format
Speed	The speed of a SONET/SDH port
Admin Status	up — the administrative state is up
	down — the administrative state is down
Oper Status	up — the operational state is up
	down — the operational state is down
Physical Link	Yes — a physical link is present
	No — a physical link is not present
Loopback Mode	The loopback mode on the port
Single Fiber Mode	Yes — single fiber mode No — not single fiber mode
Ing. Pool % Rate	The amount of ingress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for ingress buffering
Egr. Pool % Rate	The amount of egress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for egress buffering
Clock Source	node — the link uses the internal clock when transmitting data loop — the link recovers the clock from the received data stream
Framing	sonet — the port is configured for SONET framing sdh — the port is configured for SDH framing
Last State Change	The last time that the operational status of the port changed state

Table 20: Show Port Detail Output Fields (SONET/SDH Port) (Continued)

Label	Description
`Port IfIndex`	The interface's index number, which reflects its initialization sequence
`Last Cleared Time`	The time since the last clear
`DDM Events`	`Enabled` — digital diagnostic monitoring events is enabled for the port `Disabled` — digital diagnostic monitoring events is disabled for the port
`J0 String`	The section trace value that is sent to the far-end port
`Section Trace Mode`	`byte` — the section trace in the SONET section header is set in bytes `string` — a text string is used to identify the SONET section header `increment-z0` — an incremental STM ID is configured instead of a static value
`Rx S1 Byte`	The value of the received SONET/SDH S1 byte
`Rx K1/K2 Byte`	The value of the received SONET/SDH K1/K2 byte
`Rx J0 String (Hex)`	The hex value of the received J0
`Cfg Alarm`	The type of alarms to be logged and reported for the SONET/SDH port
`Alarm Status`	The current alarm state
`BER SD Threshold`	The configured threshold for line signal degradation BER error rate, that when crossed determines the signal degradation and signal failure
`BER SF Threshold`	The configured threshold for line signal failure BER error rate, that when crossed determines the signal degradation and signal failure
`Hold time up`	The hold-timer value for link-up event dampening
`Hold time down`	The hold-timer value for link-down event dampening
`Sonet Section`	
`ES-S`	The number of Errored Seconds errors
`SES-S`	The number of Severely Errored Seconds errors
`SEFS-S`	The number of Severely Errored Framing Seconds errors
`CV-S`	The number of Code Violations errors

Table 20: Show Port Detail Output Fields (SONET/SDH Port) (Continued)

Label	Description
`LOS`	The number of Loss of Signal errors
`LOC`	The number of Loss of Clock errors
`LOF`	The number of Loss of Frame errors
`OOF`	The number of Out of Frame errors
`B1 Error`	The number of B1 errors
`Sonet Line`	
`ES-L`	The number of Errored Seconds errors, at the near end and far end
`SES-L`	The number of Severely Errored Seconds errors, at the near end and far end
`UAS-L`	The number of Unavailable Seconds errors, at the near end and far end
`CV-L`	The number of Code Violations errors, at the near end and far end
`AIS-L`	The number of Alarm Indication Signal errors
`RDI-L`	The number of Remote Defect Indication errors
`B2 Error`	The number of B2 errors
`S1 Error`	The number of S1 errors
`M1 Error`	The number of M1 errors
`Port Statistics`	
`Packets input/output`	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.
`Discards input/output`	The number of inbound packets chosen to be discarded to possibly free up buffer space

Table 20: Show Port Detail Output Fields (SONET/SDH Port) (Continued)

Label	Description
Unknown proto discards input/output	For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0.

Sample Output

```
*A:ALU-1># show port 1/5/1 detail
===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100 Ethernet TX
Interface          : 1/5/1                        Oper Speed       : N/A
Link-level         : Ethernet                     Config Speed     : 100 mbps
Admin State        : down                         Oper Duplex      : N/A
Oper State         : down                         Config Duplex    : full
Physical Link      : No                           MTU              : 1514
IfIndex            : 37781504                     Hold time up     : 0 seconds
Last State Change  : 06/30/2009 15:41:21          Hold time down   : 0 seconds
Last Cleared Time  : N/A
Last Cleared Time  : N/A

Configured Mode    : access                       Encap Type       : null
Dot1Q Ethertype    : 0x8100
Ing. Pool % Rate   : 100                          Egr. Pool % Rate : 100
Net. Egr. Queue Pol: default
Egr. Sched. Pol    : n/a
Auto-negotiate     : true                         MDI/MDX          : unknown
Egress Rate        : Default                      Ingress Rate     : n/a

Loopback           : none
Loopback Time Left : unspecified

Configured Address : 68:83:01:02:00:01
Hardware Address   : 68:83:01:02:00:01
Cfg Alarm          :
Alarm Status       :

===============================================================================
Traffic Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Octets                                                  0                     0
Packets                                                 0                     0
Errors                                                  0                     0

===============================================================================
```

```
Ethernet Statistics
===============================================================================

Broadcast Pckts  :                    0  Drop Events      :                   0
Multicast Pckts  :                    0  CRC/Align Errors :                   0
Undersize Pckts  :                    0  Fragments        :                   0
Oversize Pckts   :                    0  Jabbers          :                   0
Collisions       :                    0

Octets                         :                   0
Packets                        :                   0
Packets of 64 Octets           :                   0
Packets of 65 to 127 Octets    :                   0
Packets of 128 to 255 Octets   :                   0
Packets of 256 to 511 Octets   :                   0
Packets of 512 to 1023 Octets  :                   0
Packets of 1024 to 1518 Octets :                   0
Packets of 1519 or more Octets :                   0
===============================================================================
===============================================================================
Port Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Unicast Packets                                        0                      0
Multicast Packets                                      0                      0
Broadcast Packets                                      0                      0
Discards                                               0                      0
Unknown Proto Discards                                 0
===============================================================================

===============================================================================
Port Discard Statistics
===============================================================================
                                 Input                                  Output
Unk VLAN Id
===============================================================================
*A:ALU-1>#
```

Table 21: Show Port Detail Output Fields (Ethernet - Access Mode)

Label	Description
`Ethernet Interface`	
`Description`	A text description of the port
`Interface`	The port ID displayed in the *slot/mda/port* format
`Oper Speed`	The operating speed of the interface
`Link-level`	`Ethernet` — the port is configured as Ethernet
`Config Speed`	The configured speed of the interface
`Admin State`	`up` — the port is administratively up
	`down` — the port is administratively down
`Oper Duplex`	The operating duplex mode of the interface
`Oper State`	`up` — the port is operationally up
	`down` — the port is operationally down
`Config Duplex`	`full` — the link is configured to full duplex mode
	`half` — the link is configured to half duplex mode
`Physical Link`	`Yes` — a physical link is present
	`No` — a physical link is not present
`MTU`	The size of the largest packet that can be sent/received on the Ethernet physical interface, specified in octets
`IfIndex`	The interface's index number, which reflects its initialization sequence
`Hold time up`	The link-up dampening time in seconds. The port link dampening timer value that reduces the number of link transitions reported to upper layer protocols.
`Last State Change`	The last time that the operational status of the port changed state
`Hold time down`	The link-down dampening time in seconds. The down timer controls the dampening timer for link down transitions.
`Configured Mode`	`network` — the port is configured for transport network use
	`access` — the port is configured for service access

Table 21: Show Port Detail Output Fields (Ethernet - Access Mode) (Continued)

Label	Description
`Encap Type`	`null` — ingress frames will not use any tags or labels to delineate a service
	`dot1q` — ingress frames carry 802.1Q tags where each tag signifies a different service
`Dot1Q Ethertype`	The protocol carried in an Ethernet frame
`Net.Egr. Queue Pol.`	The number of the associated network egress queue QoS policy, or `default` if the default policy is used
`Auto-negotiate`	`true` — the link attempts to automatically negotiate the link speed and duplex parameters
	`false` — the duplex and speed values are used for the link
`Egress Rate`	The maximum amount of egress bandwidth (in kilobits per second) that this Ethernet interface can generate
`Loopback`	The type of loopback configured on the port, either line, internal, or none
`Loopback Time Left`	The number of seconds left in a timed loopback If there is no loopback configured or the configured loopback is latched, the value is unspecified
`Configured Address`	The base chassis Ethernet MAC address
`Hardware Address`	The interface's hardware or system assigned MAC address at its protocol sub-layer
`Traffic Statistics`	`Octets input/output` – the total number of octets received and transmitted on the port
	`Packets input/output` – the number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.

Table 21: Show Port Detail Output Fields (Ethernet - Access Mode) (Continued)

Label	Description
	`Errors input/output` – for packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol. For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.
`Ethernet Statistics`	`Broadcast Pckts` — the number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a unicast or multicast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sub-layer, including those that were discarded or not sent.
	`Multicast Pckts` — the number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a unicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sub-layer, including those that were discarded or not sent.
	`Undersize Pckts` — the total number of packets received that were shorter than 64 octets (excluding framing bits, but including FCS octets) but were otherwise well formed.
	`Oversize Pckts` — the total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) but were otherwise well formed.
	`Collisions` — the best estimate of the total number of collisions on this Ethernet segment
	`Drop Events` — the total number of times that packets were detected as being dropped due to a lack of resources (not necessarily the total number of packets dropped)

Table 21: Show Port Detail Output Fields (Ethernet - Access Mode) (Continued)

Label	Description
	`CRC Align Errors` — the total number of packets received that were between 64 and 1518 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)
	`Fragments` — the total number of packets received that were shorter than 64 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)
	`Jabbers` — the total number of packets received that were longer than 1518 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)
	`Octets` — total number of octets received
	`Packets` — number of packets received, broken down by size
`Port Statistics`	`Unicast packets input/output` — the number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.
	`Multicast packets input/output` — the number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a unicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sub-layer, including those that were discarded or not sent.
	`Broadcast packets input/output` — the number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a unicast or multicast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sub-layer, including those that were discarded or not sent.

Table 21: Show Port Detail Output Fields (Ethernet - Access Mode) (Continued)

Label	Description
	`Discards input/output` — the number of inbound packets chosen to be discarded to possibly free up buffer space
	`Unknown proto discards input/output` — for packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. Unknown proto discards do not show up in the packet counts.
`Port Discard Statistics`	`Unk VLAN Id input/output` — number of packets discarded due to an unknown VLAN ID

Note: The 7705 SAR counts both Ethernet packets with errors and valid Ethernet packets under Ethernet port statistics. For each received errored packet, both aggregate Ethernet statistics and the errored Ethernet statistics are incremented.

Sample Output

```
*A:ALU-1>config# show port 1/3/1.e1 detail

===============================================================================
TDM DS1 Interface
===============================================================================
Description        : E1
Interface          : 1/3/1.e1
Type               : e1                      Framing             : g704
Admin Status       : down                    Oper Status         : down
Physical Link      : no                      Clock Source        : node-timed
Signal Mode        : cas
Last State Change  : 10/30/2008 14:40:26     Channel IfIndex     : 576749569
Loopback           : none
Remote Loop respond: N/A                     In Remote Loop      : N/A
Load-balance-algo  : default                 Egr. Sched. Pol     : N/A
Cfg Alarm          : ais los
Alarm Status       :
Hold time up       : 0 milliseconds
Hold time down     : 0 milliseconds

===============================================================================
```

```
Traffic Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Octets                                                 0                      0
Packets                                                0                      0
Errors                                                 0                      0
===========================
DS1/E1 Line
===========================

---------------------------
ES                     0
SES                    0
SEFS                   0
UAS                    0
CSS                    0
PCV                    0
LES                    0
BES                    0
LCV      :             0

=========================

Transmit:

FE-LOF   :             0
AIS      :             0

Receive:

FE-LOF   :             0
AIS      :             0
LOS      :             0
LOF      :             0

Looped   :             0
=========================

===============================================================================
DS1/E1 CAS Signalling Bits
===============================================================================
          Rx    Tx                                        Rx    Tx
Timeslot  ABCD  ABCD                            Timeslot  ABCD  ABCD
-------------------------------------------------------------------------------
1         n/a   n/a                             13        n/a   n/a
2         n/a   n/a                             14        n/a   n/a
3         n/a   n/a                             15        n/a   n/a
4         n/a   n/a                             16        n/a   n/a
5         n/a   n/a                             17        n/a   n/a
6         n/a   n/a                             18        n/a   n/a
7         n/a   n/a                             19        n/a   n/a
8         n/a   n/a                             20        n/a   n/a
9         n/a   n/a                             21        n/a   n/a
10        n/a   n/a                             22        n/a   n/a
11        n/a   n/a                             23        n/a   n/a
12        n/a   n/a                             24        n/a   n/a
===============================================================================
```

```
===============================================================================
Port Statistics
===============================================================================
                                                     Input                Output
-------------------------------------------------------------------------------
Packets                                                  0                     0
Discards                                                 0                     0
Unknown Proto Discards                                   0
===============================================================================
*A:ALU-1>
```

Table 22: Show Port Detail Output Fields (TDM DS1 Interface)

Label	Description
Description	A text description of the port
Interface	The port ID displayed in the *slot/mda/port* format
Type	The type of interface
Admin Status	up — the port is administratively up
	down — the port is administratively down
Physical Link	yes — a physical link is present
	no — a physical link is not present
Signal Mode	The port signaling mode
Last State Change	The last time that the operational status of the port changed state
Loopback	The port loopback mode
Remote Loop respond	The DS1 channel response to remote loopbacks
Load-balance-algo	The load balance algorithm used on the port
Cfg Alarm	The type of alarms to be logged and reported for the port
Alarm Status	The current alarm state
Hold time up	The hold-timer value for link-up event dampening
Hold time down	The hold-timer value for link-down event dampening
Framing	The DS1 framing to be used for the port
Oper Status	up — the port is operationally up
	down — the port is operationally down

Table 22: Show Port Detail Output Fields (TDM DS1 Interface) (Continued)

Label	Description
Clock Source	adaptive-timed — clocking is derived from the incoming pseudowire packets loop-timed — the link recovers the clock from the received data stream node-timed — the link uses the internal clock when transmitting data
Channel IfIndex	The channel interface index number
In Remote Loop	Whether incoming remote loopback is enabled
Egr. Sched. Pol	The egress scheduling policy
Traffic Statistics	
Octets input/output	The total number of octets received and transmitted on the port
Packets input/output	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.
Errors input/output	For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol. For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.
DS1/E1 Line	The DS1/E1 Line statistics
ES	The number of Errored Seconds errors
SES	The number of Severely Errored Seconds errors
SEFS	The number of Severely Errored Framing Seconds errors
UAS	The number of Unavailable Seconds errors
CSS	The number of Controlled Slip Seconds errors

Table 22: Show Port Detail Output Fields (TDM DS1 Interface) (Continued)

Label	Description
PCV	The number of Path Code Violations errors
LES	The number of Line Errored Seconds errors
BES	The number of Bursty Errored Seconds alarms
LCV	The number of Line Code Violations errors
Transmit	The transmit statistics: FE-LOF — the number of far-end loss of frame errors AIS — the number of alarm indication signal errors
Receive	The receive statistics: FE-LOF — the number of far-end loss of frame errors AIS — the number of alarm indication signal errors LOS — the number of loss of signal errors LOF — the number of loss of frame errors
Looped	The number of looped packet errors
DS1/E1 CAS Signalling Bits	The CAS signaling bit information
Timeslot	The timeslot number (1 to 24 for DS1, 2 to 32 for E1)
Rx ABCD	The signaling bits received in the timeslot, where each signaling bit is represented by a 1 (set) or a 0 (not set), and 0000 represents a timeslot that is in use but not receiving any signaling bits (for example, 1000 means that the A bit is set); “n/a” indicates timeslots not in use
Tx ABCD	The signaling bits transmitted from the timeslot, where each signaling bit is represented by a 1 (set) or a 0 (not set), and 0000 represents a timeslot that is in use but not transmitting any signaling bits (for example, 1000 means that the A bit is set); “n/a” indicates timeslots not in use
Port Statistics	
Packets input/output	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a unicast, multicast, or broadcast address at this sub-layer
Discards input/output	The number of inbound packets chosen to be discarded to possibly free up buffer space

Table 22: Show Port Detail Output Fields (TDM DS1 Interface) (Continued)

Label	Description
`Unknown proto discards input/output`	For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. Unknown proto discards do not show up in the packet counts.

Sample Output

```
*A:ALU-1># show port 1/1/4.v35

===============================================================================
Serial RS-232 Interface
===============================================================================
Description        : V35
Interface          : 1/1/4.v35
Type               : v35
Admin Status       : down                    Oper Status          : down
Physical Link      : no                      Clock Source         : slave
Device Mode        : synchronous             Speed                : 256k
Character Length   : N/A                     Parity               : N/A
Stop Bits          : N/A
Device Gender      : dce                     Duplex               : full
Last State Change  : 04/30/2009 13:49:50     Channel IfIndex      : 572653572
Loopback           : bidir-b
Cfg Alarm          :
Alarm Status       :
===============================================================================

===============================================================================
Serial Control Leads
===============================================================================
Inputs                                       Outputs
-------------------------------------------------------------------------------
dtr-dsr [DTR]      : high                    dsr-dtr [DSR]        : high
rts-dcd [RTS]      : high                    dcd-rts [DCD]        : high
alb-cts [ALB]      : high                    cts-alb [CTS]        : high
===============================================================================

===============================================================================
Traffic Statistics
===============================================================================
                                                   Input                Output
-------------------------------------------------------------------------------
Octets                                                 0                     0
Packets                                                0                     0
Errors                                                 0                     0
```

```
===============================================================================
Port Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Packets                                                0                      0
Discards                                               0                      0
Unknown Proto Discards                                 0
===============================================================================


*A:ALU-1># show port 1/1/2.rs232

===============================================================================
Serial RS-232 Interface
===============================================================================
Description        : RS232
Interface          : 1/1/2.rs232
Type               : rs232
Admin Status       : down                     Oper Status          : down
Physical Link      : no                       Clock Source         : slave
Device Mode        : synchronous              Speed                : 9600
Character Length   : N/A                      Parity               : N/A
Stop Bits          : N/A
Device Gender      : dce                      Duplex               : full
Last State Change  : 04/30/2009 13:49:49      Channel IfIndex      : 572588034
Loopback           : bidir-b
Cfg Alarm          : hcmOof hcmRai
Alarm Status       :
===============================================================================

===============================================================================
Serial Control Leads
===============================================================================
Inputs                                        Outputs
-------------------------------------------------------------------------------
dtr-dsr [DTR]      : high                     dsr-dtr [DSR]        : high
rts-dcd [RTS]      : end-to-end               dcd-rts [DCD]        : end-to-end
alb-cts [ALB]      : end-to-end               cts-alb [CTS]        : end-to-end
rdl-ri  [RDL]      : low                      ri-rdl  [RI]         : low
===============================================================================

===============================================================================
Traffic Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Octets                                                 0                      0
Packets                                                0                      0
Errors                                                 0                      0

===============================================================================
Port Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Packets                                                0                      0
Discards                                               0                      0
```

```
Unknown Proto Discards                                     0
===============================================================================
```

Table 23: Show Port Serial Channel Output Fields

Label	Description
Description	The description of the port
Interface	The port ID displayed in the *slot/mda/port.channel* format
Type	The type of serial interface
Admin Status	up — the administrative state is up
	down — the administrative state is down
Oper Status	up — the operational state is up
	down — the operational state is down
Physical Link	yes — a physical link is present
	no — a physical link is not present
Clock source	The source of the transmit clock: slave — the source is remote
Device Mode	The operational mode of the device: synchronous — the device transmits data continuously based on timing
	asynchronous — the device transmits data one character at a time; applies to RS-232 interfaces only
Speed	The speed of the interface: 1200, 2400, 9600, 19200, 38400, 56000 — for RS-232 interfaces, in b/s
	64k, 128k, 256k, 384k, 512k, 640k, 768k, 896k, 1024k, 1152k, 1280k, 1408k, 1536k, 1664k, 1792k, 1920k — for V.35 interfaces, in kb/s
Character Length	The number of data bits used to transmit a character; for asynchronous devices only
Parity	The parity bit in a character; for asynchronous devices only
Stop Bits	The number of stop bits used signify the end of a character; for asynchronous devices only

Table 23: Show Port Serial Channel Output Fields (Continued)

Label	Description
Device Gender	The gender of the device: dce — the device is performing the role of the data communications equipment
	dte — the device is performing the role of the data terminal equipment
Duplex	The duplex method: half — single transmission path (not supported in Release 2.1) full — two independent transmission paths, one in each direction
Last State Change	The last time the operational status of the port changed state
Channel IfIndex	The channel group index number
Loopback	The loopback mode for the port or channel: bidir-b — bidirectional loopback B takes place on the control card (CSM) side of the adapter card, and is closer to the system
	bidir-e — bidirectional loopback E takes place on the data device side of the adapter card, and is closer to the line
	none — there is no loopback done at the associated port or channel
Cfg Alarm	The HCM alarms to be reported for RS-232 interfaces: hcmOof — local HCM out-of-frame errors are raised and cleared
	hcmRai — HCM remote alarm indication events are raised and cleared
Alarm Status	The current alarm status
Serial Control Leads	The input and output leads, which carry control signals
Inputs	The input control leads
dtr-dsr [DTR]	The Data Terminal Ready/Data Set Ready input control lead: high — the input control lead is assumed to be on
	low — the input control lead is assumed to be off

Table 23: Show Port Serial Channel Output Fields (Continued)

Label	Description
rts-dcd [RTS]	The Request To Send/Data Carrier Detect input control lead: high — the input control lead is assumed to be on
	low — the input control lead is assumed to be off
	end-to-end — the input control lead follows that of the remote end. This lead is not supported for interface speeds ≥ 64 kb/s.
alb-cts [ALB]	The Analog Loopback/Clear To Send input control lead: high — the input control lead is assumed to be on
	low — the input control lead is assumed to be off
	end-to-end — the input control lead follows that of the remote end. This lead is not supported for interface speeds ≥ 64 kb/s.
rdl-ri [RDL]	The Remote Digital Loopback/Ring Indicator input control lead; applicable only for RS-232 interfaces: high — the input control lead is assumed to be on
	low — the input control lead is assumed to be off
Outputs	The output control leads
dsr-dtr [DSR]	The Data Set Ready/Data Terminal Ready output control lead: high — the output control lead is forced on
	low — the output control lead is forced off
dcd-rts [DCD]	The Data Carrier Detect/Request To Send output control lead: high — the output control lead is forced on
	low — the output control lead is forced off
	end-to-end — the output control lead follows that of the remote end
cts-alb [CTS]	The Clear To Send/Analog LoopBack output control lead: high — the output control lead is forced on
	low — the output control lead is forced off
	end-to-end — the output control lead follows that of the remote end

Table 23: Show Port Serial Channel Output Fields (Continued)

Label	Description
ri-rdl [RI]	The Ring Indicator (RI)/Remote Digital Loopback (RDL) output control lead; applicable only for RS-232 interfaces: high — the output control lead is forced on
	low — the output control lead is forced off
Traffic Statistics	
Octets Input/Output	The total number of octets received and transmitted on the port
Packets Input/Output	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.
Errors Input/Output	For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol. For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.
Port Statistics	
Packets Input/Output	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.

Table 23: Show Port Serial Channel Output Fields (Continued)

Label	Description
Discards Input/Output	The number of inbound packets chosen to be discarded to possibly free up buffer space
Unknown Proto Discards Input/Output	For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0.

Sample Output

```
*A:ALU-1># show port 1/4/1.5

===============================================================================
TDM DS0 Chan Group
===============================================================================
Description        : DS0GRP
Interface          : 1/4/1.5
TimeSlots          :
Speed              : 64                      CRC                   : 16
Admin Status       : down                    Oper Status           : down
Last State Change  : 06/22/2009 12:29:42     Chan-Grp IfIndex      : 578846785

Configured mode    : access                  Encap Type            : atm
Admin MTU          : 1524                    Oper MTU              : 1524
Scramble           : true
Physical Link      : Yes                     Bundle Number         : none
Idle Cycle Flags   : n/a                     Load-balance-algo     : n/a
Payload Fill Type  : n/a                     Payload Pattern       : n/a
Signal Fill Type   : n/a                     Signal Pattern        : n/a
Ing. Pool % Rate   : 100                     Egr. Pool % Rate      : 100
Egr. Sched. Pol    : n/a
===============================================================================

===============================================================================
Traffic Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Octets                                                 0                      0
Packets                                                0                      0
Errors                                                 0                      0

===============================================================================
Port Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
```

```
Packets                                                  0                       0
Discards                                                 0                       0
Unknown Proto Discards                                   0
===============================================================================
*A:ALU-1#

*A:ALU-1># show port 1/1/2.1
===============================================================================
Serial DS0 Chan Group
===============================================================================
Description        : DS0GRP
Interface          : 1/1/2.1
TimeSlots          : 1
Admin Status       : down                        Oper Status          : down
Last State Change  : 06/28/2009 15:32:14         Chan-Grp IfIndex     : 572588095

Configured Mode    : access                      Encap Type           : cem
Admin MTU          : 1514                        Oper MTU             : 1514
Physical Link      : No                          Bundle Number        : none
Idle Cycle Flags   : n/a
Payload Fill Type  : all-ones                    Payload Pattern      : n/a
===============================================================================

===============================================================================
Traffic Statistics
===============================================================================
                                                     Input                  Output
-------------------------------------------------------------------------------
Octets                                                   0                       0
Packets                                                  0                       0
Errors                                                   0                       0

===============================================================================
Port Statistics
===============================================================================
                                                     Input                  Output
-------------------------------------------------------------------------------
Packets                                                  0                       0
Discards                                                 0                       0
Unknown Proto Discards                                   0
===============================================================================
*A:ALU-1#
```

```
A:ALU-1# show port 1/2/2.1.1

===============================================================================
TDM DS1 Interface
===============================================================================
Description        : DS1
Interface          : 1/2/2.1.1
Type               : ds1                      Framing              : esf
Admin Status       : up                       Oper Status          : down
Physical Link      : no                       Clock Source         : node-timed
Last State Change  : 01/26/2009 15:35:50     Channel IfIndex      : 574685991
Loopback           : none
Remote Loop respond: false                    In Remote Loop       : false
Load-balance-algo  : default                  Egr. Sched. Pol      : N/A
Cfg Alarm          : ais los
Alarm Status       :
Hold time up       : 0 milliseconds
Hold time down     : 0 milliseconds
===============================================================================

===============================================================================
Traffic Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Octets                                                 0                      0
Packets                                                0                      0
Errors                                                 0                      0

===============================================================================
Port Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Packets                                                0                      0
Discards                                               0                      0
Unknown Proto Discards                                 0
===============================================================================

---------------------------------------------------------------------------------
```

Table 24: Show Port Channel Group Output Fields

Label	Description
`Description`	A text description of the port
`Interface`	The port ID displayed in the format *slot/mda/port.channel-group-id*
`Timeslots`	The number of timeslots that are part of this channel group
`Speed`	The speed of the interface
`CRC`	The checksum used for the channel group (16 or 32)
`Admin Status`	`Up` — the port is administratively up
	`Down` — the port is administratively down
`Oper Status`	`Up` — the port is operationally up
	`Down` — the port is operationally down
`Remote Loop respond`	Indicates if the channel will respond to requests for remote loopbacks
`Last State Change`	The last time the operational status of the port changed state
`Chan Grp IfIndex`	The channel group index number
`Channel IfIndex`	The channel interface index number
`Configured Mode`	`network` — the port is configured for transport network use
	`access` — the port is configured for service access
`Encap Type`	The encapsulation type for the channel group (atm, cem, ipcp, or ppp-auto)
`Admin MTU`	The configured MTU
`Oper MTU`	The negotiated size of the largest packet that can be sent on the port or channel specified in octets
`Scramble`	Whether payload scrambling is enabled on channel groups (only applicable if encap type is atm)
`Hold time up`	The hold-timer value for link-up event dampening
`Hold time down`	The hold-timer value for link-down event dampening
`Physical Link`	`Yes` — a physical link is present
	`No` — a physical link is not present
`Bundle Number`	The number assigned to the multilink bundle

Table 24: Show Port Channel Group Output Fields (Continued)

Label	Description
`Idle Cycle Flags`	The value transmitted by the DS0, DS1, or E1 interface during idle cycles
`Clock Source`	`adaptive-timed` — clocking is derived from the incoming pseudowire packets `loop-timed` — the link recovers the clock from the received data stream `node-timed` — the link uses the internal clock when transmitting data
`Payload Fill Type`	The payload type to be transmitted when the circuit emulation service is not operational or temporarily experiences underrun conditions (only valid for CESoPSN services)
`Payload Pattern`	The user-defined pattern transmitted if the payload fill type is pattern
`Signal Fill Type`	The signaling type to be transmitted when the circuit emulation service is not operational or temporarily experiences underrun conditions (only valid for CESoPSN with CAS)
`Signal Pattern`	The user-defined pattern transmitted if the payload fill type is pattern
`Traffic stats`	`Octets input/output` — the total number of octets received and transmitted on the port
	`Packets input/output` — the number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.
	`Errors input/output` — for packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol. For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.

Table 24: Show Port Channel Group Output Fields (Continued)

Label	Description
`Port stats`	`Packets input/output` — the number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.
	`Discards input/output` — the number of inbound packets chosen to be discarded to possibly free up buffer space
	`Unknown proto discards input/output` — for packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. For ATM, this field displays cells discarded on an invalid vpi/vci. Unknown proto discards do not show up in the packet counts.

Sample Output

```
A:SwSim# show port 1/2/2.1

===============================================================================
TDM Interface
===============================================================================
Description        : DS3
Interface          : 1/2/2.1
Type               : ds3                      Framing              : c-bit
Admin Status       : up                       Oper Status          : down
Physical Link      : No                       Clock Source         : node-timed
Last State Change  : 01/26/2009 15:33:15      Port IfIndex         : 574685252

Configured mode    : N/A                      Encap Type           : N/A
Admin MTU          : N/A                      Oper MTU             : N/A
Scramble           : false
CRC                : N/A                      Channelized          : ds1
Idle Cycle Flags   : N/A                      Loopback             : none
FEAC Loop Respond  : Disabled                 In FEAC Loop         : No
BERT Duration      : N/A                      BERT Pattern         : none
BERT Synched       : 00h00m00s                Err Insertion Rate   : 0
BERT Errors        : 0                        BERT Status          : idle
BERT Total Bits    : N/A
Cfg Alarm          : ais los
Alarm Status       :
Subrate CSU Mode   : none                     Subrate Step         : 0
```

```
MDL Transmit       : none
-------------------------------------------------------------------------------
Local MDL Information
-------------------------------------------------------------------------------
EIC                :                          LIC                :
FIC                :                          Unit               :
PFI                :
Idle Signal Port   :
Test Signal Gen    :
-------------------------------------------------------------------------------
Far End MDL Information
-------------------------------------------------------------------------------
EIC                :                          LIC                :
FIC                :                          Unit               :
PFI                :
Idle Signal Port   :
Test Signal Gen    :
===============================================================================

===============================================================================
Traffic Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Octets                                                 0                      0
Packets                                                0                      0
Errors                                                 0                      0

===============================================================================
Port Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Packets                                                0                      0
Discards                                               0                      0
Unknown Proto Discards                                 0
==============================================================================
```

Table 25: Show Port DS3 Payload Output Fields

Label	Description
`Description`	A text description of the port
`Interface`	The port ID displayed in the format *slot/mda/port.channel-group-id*
`Type`	The type of interface
`Timeslots`	The number of timeslots that are part of this channel group
`Speed`	The speed of the interface
`CRC`	The checksum used for the channel group (16 or 32)

Table 25: Show Port DS3 Payload Output Fields (Continued)

Label	Description
Admin Status	Up — the port is administratively up
	Down — the port is administratively down
Oper Status	Up — the port is operationally up
	Down — the port is operationally down
Last State Change	The last time the operational status of the port changed state
Chan Grp IfIndex	The channel group index number
Configured Mode	network — the port is configured for transport network use
	access — the port is configured for service access
Encap Type	The encapsulation type for the channel group (atm, cem, ipcp, or ppp-auto)
Admin MTU	The configured MTU
Oper MTU	The negotiated size of the largest packet that can be sent on the port or channel specified in octets
Scramble	Indicates whether payload scrambling is enabled on channel groups (only applicable if encap type is atm)
CRC	Indicates the precision of the cyclic redundancy check: 16 — A 16-bit CRC calculation 32 — A 32-bit CRC calculation; 32-bit CRC increases the error detection ability, but it also adds some performance overhead
Physical Link	Yes — a physical link is present
	No — a physical link is not present
Idle Cycle Flags	The value transmitted by the DS0, DS1, or E1 interface during idle cycles
FEAC Loop Respond	Indicates whether the associated DS3 interface can respond to remote loop signals
Cfg Alarm	The alarms that have alarm reporting enabled
Alarm Status	The current alarm state (for example, stray, malformed, packet loss, overrun, underrun, remote packet loss, remote fault, or remote RDI)
Framing	The DS3 framing mode

Table 25: Show Port DS3 Payload Output Fields (Continued)

Label	Description
Clock Source	adaptive-timed — clocking is derived from the incoming pseudowire packets loop-timed — the link recovers the clock from the received data stream node-timed — the link uses the internal clock when transmitting data
Port IfIndex	The interface's index number, which reflects its initialization sequence
Encap Type	The encapsulation type for the channel group (atm, cem, ipcp, or ppp-auto)
oper MTU	The negotiated size of the largest packet that can be sent on the port or channel specified in octets
Channelized	The level of channelization on the port
Loopback	The port loopback mode
In FEAC Loop	The remote loopback state
Local MDL Information	The MDL strings sent by the near-end
Far End MDL Information	The MDL strings received from the far-end
Traffic Statistics	Octets input/output — the total number of octets received and transmitted on the port
	Packets input/output — the number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.

Table 25: Show Port DS3 Payload Output Fields (Continued)

Label	Description
	`Errors input/output` — for packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol. For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.
`Port Statistics`	`Packets input/output` — the number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.
	`Discards input/output` — the number of inbound packets chosen to be discarded to possibly free up buffer space
	`Unknown proto discards input/output` — for packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. For ATM, this field displays cells discarded on an invalid vpi/vci. Unknown proto discards do not show up in the packet counts.

Sample Output

```
*A:ALU-1># show port 1/4/1.e1 acr detail
=======================================================================
Adaptive Clock Recovery (ACR) Configuration
=======================================================================
Clock Master PW  : 1/4/1.1
Clock Sync State : normal
-----------------------------------------------------------------------
CEM SAP Configuration Information
-----------------------------------------------------------------------
Endpoint Type  : NxDS0                    Bit-rate       : 16
Payload Size   : 32                       Jitter Buffer  : 5
Use RTP Header : No                       Differential   : No
Timestamp Freq : 0                        CAS Framing    : No CAS
Effective PDVT : +/-2.500 ms

Cfg Alarm      : stray malformed pktloss overrun underrun
Alarm Status   :
-----------------------------------------------------------------------
CEM SAP Statistics
-----------------------------------------------------------------------
                         Packets          Seconds          Events
Egress Stats
Forwarded            :  32993106
Dropped              :  0
Missing              :  0
Reordered Forwarded  :  0
Underrun             :  8058                               0
Overrun              :  0                                  0
Misordered Dropped   :  0
Malformed Dropped    :  0
LBit Dropped         :  0
Error                :                    3
Severely Error       :                    2
Unavailable          :                    0
Failure Count        :                                     1

Ingress Stats
Forwarded            :  32995595
Dropped              :  0
=======================================================================
=======================================================================
Adaptive Clock Recovery (ACR)
  - Internal Digital Phase Locked Loop (DPLL) Statistics
=======================================================================
                    frequency   frequency       phase       phase
                       offset      offset       error       error
                         mean      stddev        mean      stddev
time                    (ppb)       (ppb)        (ns)        (ns)
-----------------------------------------------------------------------
10/08/2008 11:27:11       220           1         273          94
10/08/2008 11:26:11       217           1         240         120
10/08/2008 11:25:11       214           1          79         157
10/08/2008 11:24:11       214           1         -15         102
10/08/2008 11:23:11       214           1          82         117
10/08/2008 11:22:11       213           1          12         113
10/08/2008 11:21:11       213           1         -64         119
10/08/2008 11:20:11       213           1         -66         126
```

```
10/08/2008 11:19:11        214          1         -41         117
10/08/2008 11:18:11        215          1          72         125
10/08/2008 11:17:11        214          1         -34          95
10/08/2008 11:16:11        214          1         -28         115
10/08/2008 11:15:11        215          1          30          89
10/08/2008 11:14:11        214          1          12          95
10/08/2008 11:13:11        214          1          19         144
-----------------------------------------------------------------------
Current
24 Hour
(137 min)           214         19
=======================================================================

=======================================================================
ACR State Statistics
=======================================================================
Algorithm State Counts
  normal                : 4121
  Phase-tracking        : 3
  Freq-tracking         : 0
  Holdover              : 0
  Free-run              : 8
Events
  ACR Calc Out of Range : 0
  Prolonged ACR Failure : 1
  Excessive Packet Loss : 0
  Excessive Phase Shift : 0
=======================================================================
```

Table 26: Show Port ACR Detail Output Fields

Label	Description
Adaptive Clock Recovery (ACR) Configuration	
Clock Master PW	The SAP being used by the port for recovering the clock
Clock Sync State	The current state of the ACR adaptive algorithm
CEM SAP Configuration Information	
Endpoint Type	The type of endpoint
Bit-rate	The number of DS0s or timeslots in the channel group
Payload Size	The number of octets contained in the payload of a TDM PW packet when the packet is transmitted
Jitter Buffer	The size of the receive jitter buffer, expressed in milliseconds
Use RTP Header	Whether RTP headers are used in CES packets (Yes or No)
CAS Framing	The type of CAS framing

Table 26: Show Port ACR Detail Output Fields (Continued)

Label	Description
`Effective PDVT`	The peak-to-peak packet delay variation (PDV) used by the circuit emulation service Since the operating system may adjust the jitter buffer setting in order to ensure no packet loss, the configured jitter buffer value may not be the value used by the system. The effective PDVT provides an indication that the PDV has been adjusted by the operating system.
`Cfg Alarm`	The alarms that have alarm reporting enabled
`Alarm Status`	The current alarm state (for example, stray, malformed, packet loss, overrun, underrun, remote packet loss, remote fault, or remote RDI)
`Internal Digital Phase Locked Loop (DPLL) Statistics`	
`ACR DPLL Statistics`	`frequency offset mean` — the ACR frequency offset mean for the previous 15 sets of 60-second intervals
	`frequency offset stddev` — the ACR frequency offset standard deviation for the previous 15 sets of 60-second intervals
	`phase error mean` — the ACR input phase error mean and output DCO mean for the previous 15 sets of 60-second intervals
	`phase error stddev` — the ACR input phase error standard deviation and output DCO standard deviation for the previous 15 sets of 60-second intervals
`ACR State Statistics`	
`Algorithm State Counts`	`normal` — the number of 2-second intervals the ACR algorithm was in the normal state
	`Phase-tracking` — the number of 2-second intervals the ACR algorithm was in the phase-tracking state
	`Freq-tracking` — the number of 2-second intervals the ACR algorithm was in the frequency tracking state
	`Holdover` — the number of 2-second intervals the ACR algorithm was in the holdover state
	`Free-run` — the number of 2-second intervals the ACR algorithm was in the free-run state

Table 26: Show Port ACR Detail Output Fields (Continued)

Label	Description
Events	ACR Calc Out of Range — the number of times the ACR algorithm was internally reset
	Prolonged ACR failure — the number of times the ACR algorithm was in the phase-tracking or holdover state for an extended period of time
	Excessive Packet Loss — increments every 2-second interval that ACR is in the phase-tracking state and the tolerated packet loss threshold is exceeded
	Excessive Phase Shift — increments each time the ACR algorithm transitions to the phase-tracking state from normal as a result of a phase shift above the tolerated shift level

Sample Output

```
*A:ALU-1># show port 1/4/1 description

===============================================================================
Port Descriptions on Slot 1
===============================================================================
Port Id        Description
-------------------------------------------------------------------------------
1/4/1          DS1/E1
===============================================================================
*A:ALU-1>
```

Table 27: Show Port Description Output Fields

Label	Description
Port Id	The port identifier
Description	A text description of the port

Sample Output

```
*A:ALU-1># show port 1/5/1 associations
===============================================================================
Interface Table
===============================================================================
Router/ServiceId                Name                            Encap Val
-------------------------------------------------------------------------------
Router: Base                    if1000                          1000
Router: Base                    if2000                          2000
-------------------------------------------------------------------------------
Interfaces
===============================================================================
*A:ALU-1>
```

Table 28: Show Port Associations Output Fields

Label	Description
Router/ServiceId	The service identifier
Name	The name of the IP interface
Encap Val	The dot1q or null encapsulation value on the port for this IP interface

Sample Output

```
*A:ALU-1># show port 1/4/1.5 ppp

===============================================================================
PPP Protocols for 1/4/1.5
===============================================================================
Protocol  State         Last Change         Restart Count   Last Cleared
-------------------------------------------------------------------------------
lcp       initial       10/12/2007 20:15:54         0       10/12/2007 20:15:54
ipcp      initial       10/12/2007 20:15:54         0       10/12/2007 20:15:54
mplscp    initial       10/12/2007 20:15:54         0       10/12/2007 20:15:54
bcp       initial       10/12/2007 20:15:54         0       10/12/2007 20:15:54
osicp     initial       10/12/2007 20:15:54         0       10/12/2007 20:15:54
ipv6cp    initial       10/12/2007 20:15:54         0       10/12/2007 20:15:54
===============================================================================

===============================================================================
PPP Statistics
===============================================================================
Local Mac address  : 68:83:01:04:00:01  Remote Mac address :
Local Magic Number : 0x0                Remote Magic Number: 0x0
Local address      : 0.0.0.0            Remote address     : 0.0.0.0

Line Monitor Method: keepalive

Keepalive statistics

Request interval   : 10           Threshold exceeded : 0
```

```
Drop Count         : 3            In packets        : 0
Time to link drop  : 00h00m30s    Out packets       : 0
Last cleared time  : 10/12/2007 20:15:54

===============================================================================
*A:ALU-1>#
```

Table 29: Show Port PPP Output Fields

Label	Description
Protocol	The applicable protocols for the specified port
State	The current status of a PPP link. Values are initial, starting, closed, stopped, closing, stopping, requestSent, ackReceived, ackSent, opened.
Last Change	The last time the PPP link state changed
Restart Count	The number of times that this Control Protocol has reached the open state
Last Cleared	The date and time the restart count was set to zero
Local Mac address	The MAC address assigned to the local end of the PPP link
Remote Mac address	The Ethernet MAC address sent by the remote end of the PPP link
Local Magic Number	The local magic number to be sent to the peer. The magic number provides a method to detect loopbacks. If the value of the local magic number is the same as the value of the remote magic number, then it is possible that the link might be looped back. If the two magic numbers do not match, the link is not looped back.
Remote Magic Number	The magic number sent by the peer. If the value of the remote magic number is the same as the value of the local magic number, then it is possible that the link might be looped back. If the two magic numbers do not match, the link is not looped back.
Local Address	The IP address at the local end of the link
Remote Address	The IP address at the remote end of the link
Line Monitor Method	The type of line monitoring packets being sent and received on this PPP link
Request Interval	The time interval in seconds at which keepalive requests are issued
Threshold exceeded	The number of times that the drop count was reached

Table 29: Show Port PPP Output Fields (Continued)

Label	Description
Drop Count	The number of keepalive or LQR messages that were missed before the line was brought down
In packets	The number of echo-reply packets received
Time to link drop	The time remaining before the link will be declared dropped if a keepalive echo reply packet is not received
Out packets	The number of echo-request packets sent
Last cleared time	The time since the last clear

Sample Output

```
*A:ALU-1># show port cem
===============================================================================
Ports on Slot 1
===============================================================================
Port         Admin  Link   Port   Clock          Master           Clock
Id           State         State  Src            Port Id          State
-------------------------------------------------------------------------------
1/9/1.1.2    Up     No     Down   differential   1/9/1.1.2.1      hold-over
1/9/1.1.3    Up     No     Down   node-timed
1/9/1.1.4    Up     No     Down   node-timed
...
-------------------------------------------------------------------------------
*A:ALU-1>#
```

Table 30: Show Port CEM Output Fields

Label	Description
Port Id	The port ID configured or displayed in the *slot/mda/port* format
Admin State	The administrative state of the interface connection
Link	Whether the link is active
Port State	The state level of the port
Clock Src	The clock source
Master Port Id	The master port ID
Clock State	The clock state

Show ATM Port Commands

port

Syntax **port** *port-id* **atm**
port *port-id* **atm connections**
port *port-id* **atm pvc** [*vpi/vci*] [**detail**]
port *port-id* **atm pvp** [*vpi*] [**detail**]

Context show

Description This command displays ATM port information.

If no command line options are specified, the command port displays summary information for all ports on provisioned adapter cards.

Parameters *port-id* — specifies the physical port ID

Syntax port-id *slot*[/*mda*[/*port*]] or *slot*/*mda*/*port*[.*channel*]

Values 1 (slot)

1 to 6 (mda)

1 to 2 (SONET/SDH ports on the 2-port OC3/STM1 Channelized Adapter card)

1 to 4 (SONET/SDH ports on the 4-port OC3/STM1 Clear Channel Adapter card)

1 to 16 (T1/E1 ASAP Adapter card ports); 1 to 8 (Ethernet Adapter card ports)

1 to 24 (DS1 channels); 1 to 32 (E1 channels)

atm — displays ATM information

connections — displays ATM connection information

pvc — displays ATM port PVC information

pvp — displays ATM port PVP information

vpi/vci — vpi: 0 to 4095 (NNI; not supported on SONET/SDH ports)
0 to 255 (UNI)

vci: 1, 2, 5 to 65534

detail — provides detailed information

Output The following outputs are examples of ATM information:

- ATM (Sample Output, Table 31)
- ATM Connections (Sample Output, Table 32)
- ATM PVC (Sample Output, Table 33)
- ATM PVC VPI/VCI (Sample Output, Table 34)
- ATM PVC VPI/VCI Detail (Sample Output, Table 35)

- ATM PVP (Sample Output, Table 36)
- ATM PVP Detail (Sample Output, Table 37)

Sample Output

```
*A:ALU-1># show port 1/1/3.sts3 atm

===============================================================================
ATM Info for 1/1/3
===============================================================================
Cell Mode             : UNI               Mapping             : Direct
Configured VCs        : 0                 Configured VPs      : 0
Configured VTs        : 0                 Configured IFCs     : 0
Configured minimum VPI: 0
Last Unknown VPI/VCI  : none

===============================================================================
TC Sublayer Information
===============================================================================
TC Alarm State        : LCD Failure       Number OCD Events   : 0
HEC Errors (Dropped)  : 0                 HEC Errors (Fixed)  : 0

=================================================================================
ATM Bandwidth Info
=================================================================================
                     kbps       %                             kbps       %
---------------------------------------------------------------------------------
Ingress CBR        : 0           0%      Egress CBR         : 0           0%
Ingress RT-VBR     : 0           0%      Egress RT-VBR      : 0           0%
Ingress NRT-VBR    : 0           0%      Egress NRT-VBR     : 0           0%
Ingress UBR        : 0           0%      Egress UBR         : 0           0%
---------------------------------------------------------------------------------
Ingress Total      : 0           0%      Egress Total       : 0           0%
ATM Link Bandwidth : 149760 kbps
Shaped Bandwidth   : 0 kbps
=================================================================================
```

Table 31: Show Port ATM Output Fields

Label	Description
Cell Mode	The cell format (UNI or NNI) that is used on the ATM interface (NNI is not supported on SONET/SDH ports)
Configured VCs	The number of configured VCs
Configured VTs	The number of configured VTs
Configured minimum VPI	The configured minimum allowable VPI value that can be used on the ATM interface for a VPC
Last Unknown VPI/VCI	The last unknown VPI/VCI that was received on this interface

Table 31: Show Port ATM Output Fields (Continued)

Label	Description
Mapping	Direct — direct ATM cell mapping is used PLCP — PLCP ATM cell mapping is used
Configured VPs	The number of configured VPs
Configured IFCs	The number of configured IFCs
TC Alarm State	The ATM interface notifications indicating that the TC sublayer is currently in the Loss of Cell Delineation (LCD) defect maintenance state or that the TC sublayer is currently not in the Loss of Cell Delineation (LCD) defect maintenance state
HEC Errors (Dropped)	The number of cells with uncorrectable HEC errors on this interface
Number OCD Events	The number of times the Out of Cell Delineation (OCD) events occurred
HEC Errors (Fixed)	The number of cells with correctable HEC errors on this interface
Ingress CBR	The total CBR bandwidth consumed on this interface in the ingress direction
Ingress RT-VBR	The total real-time variable bit rate (rt-VBR) bandwidth consumed on this interface in the ingress direction
Ingress NRT-VBR	The total non-real-time variable bit rate (nrt-VBR) bandwidth consumed on this interface in the ingress direction
Ingress UBR	The total unspecified bit rate (UBR) bandwidth consumed on this interface in the ingress direction
Egress CBR	The total CBR bandwidth consumed on this interface in the egress direction
Egress RT-VBR	The total real-time variable bit rate (rt-VBR) bandwidth consumed on this interface in the egress direction
Egress NRT-VBR	The total non-real-time variable bit rate (nrt-VBR) bandwidth consumed on this interface in the egress direction
Egress UBR	The total unspecified bit rate (UBR) bandwidth consumed on this interface in the egress direction
Ingress Total	The total bandwidth of all service categories consumed on this interface in the ingress direction
Egress Total	The total bandwidth of all service categories consumed on this interface in the egress direction

Table 31: Show Port ATM Output Fields (Continued)

Label	Description
ATM Link Bandwidth	The total ATM link bandwidth accepted on this interface
Shaped Bandwidth	The total shaped bandwidth consumed on this interface in the egress direction

Sample Output

```
A:ALU-1># show port 1/1/1.1 atm connections

===============================================================
ATM Connections, Port 1/1/1.1
===============================================================
           Owner  Type     Ing.TD  Egr.TD  Adm  OAM         Opr
---------------------------------------------------------------
0/100      SAP    PVC      101     201     up   up          up
0/101      SAP    PVC      101     201     up   up          up
0/102      SAP    PVC      101     201     up   up          up
0/103      SAP    PVC      101     201     up   up          up
0/104      SAP    PVC      101     201     up   up          up
0/105      SAP    PVC      101     201     up   up          up
0/106      SAP    PVC      101     201     up   up          up
0/107      SAP    PVC      101     201     up   up          up
0/108      SAP    PVC      101     201     up   up          up
0/109      SAP    PVC      101     201     up   up          up
0/110      SAP    PVC      101     201     up   up          up
0/111      SAP    PVC      101     201     up   up          up
0/112      SAP    PVC      101     201     up   up          up
0/113      SAP    PVC      101     201     up   up          up
0/114      SAP    PVC      101     201     up   up          up
===============================================================
```

Table 32: Show Port ATM Connections Output Fields

Label	Description
Owner	The system entity that owns a specific ATM connection
Type	The connection type
Ing. TD	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr. TD	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Adm	The administrative state of the interface connection

Table 32: Show Port ATM Connections Output Fields (Continued)

Label	Description
OAM	The OAM operational status of ATM connections: Up — the interface is operationally up
	ETE-AIS — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Opr	The status of the ATM interface

Sample Output

```
*A:ALU-1># show port 1/1/1.1 atm pvc

===============================================================
ATM PVCs, Port 1/1/1.1
===============================================================
VPI/VCI    Owner  Type     Ing.TD  Egr.TD  Adm  OAM         Opr
---------------------------------------------------------------
0/32       SAP    PVC      1       1       up   ETE-AIS     dn
===============================================================
*A:ALU-1>
```

Table 33: Show Port ATM PVC Output Fields

Label	Description
VPI/VCI	The VPI/VCI values
Owner	The system entity that owns a specific ATM connection
Type	The connection type
Ing. TD	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr. TD	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Adm	The administrative state of the interface connection
OAM	The OAM operational status of ATM connections:
	Up — the interface is operationally up
	ETE-AIS — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Opr	The status of the ATM interface

Sample Output

```
*A:ALU-1># show port 1/1/1.1 atm pvc 0/32

===============================================================================
ATM PVC
===============================================================================
Port Id            : 1/1/1.1             VPI/VCI            : 0/32
Admin State        : up                  Oper state         : down
OAM State          : ETE-AIS             Encap Type         : n/a
Owner              : SAP                 AAL Type           : n/a
Endpoint Type      : PVC                 Cast Type          : P2P
Ing. Td Idx        : 1                   Egr. Td Idx        : 1
Last Changed       : 11/08/2007 17:02:36 ILMI Vpi/Vci Range : n/a
===============================================================================
*A:ALU-1>#
```

Table 34: Show Port ATM PVC VPI/VCI Output Fields

Label	Description
`Port Id`	The port ID configured or displayed in the *slot/mda/port* format
`VPI/VCI`	The VPI/VCI values
`Admin State`	The administrative state of the interface connection
`Oper State`	The status of the ATM interface
`OAM State`	The OAM operational status of ATM connections: `Up` — the interface is operationally up
	`ETE-AIS` — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
`Encap Type`	The encapsulation type
`Owner`	The system entity that owns a specific ATM connection
`Endpoint Type`	The endpoint type
`Cast Type`	The connection topology type
`Ing. TD Idx`	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
`Egr. TD Idx`	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection

Sample Output

```
*A:ALU-1># show port 1/1/1.1 atm pvc 0/32 detail

===============================================================================
ATM PVC
===============================================================================
Port Id            : 1/1/1.1            VPI/VCI            : 0/32
Admin State        : up                 Oper state         : down
OAM State          : up                 Encap Type         : n/a
Owner              : SAP                AAL Type           : n/a
Endpoint Type      : PVC                Cast Type          : P2P
Ing. Td Idx        : 1                  Egr. Td Idx        : 1
Last Changed       : 11/08/2007 17:02:36 ILMI Vpi/Vci Range : n/a
===============================================================================

===============================================================================
ATM Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Octets                                               1643                  1643
Cells                                                  31                    31
CLP=0 Cells                                            31                    31
Dropped CLP=0 Cells                                     0                     0
Dropped Cells (CLP=0+1)                                 0
Tagged Cells                                            0
===============================================================================

===============================================================================
ATM OAM Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Loopback                                                0                     0
OAM Cells (generated)                                   0
===============================================================================
```

Table 35: Show Port ATM PVC VPI/VCI Detail Output Fields

Label	Description
Port Id	The port ID configured or displayed in the *slot/mda/port* format
VPI/VCI	The VPI/VCI values
Admin State	The administrative state of the interface connection
Oper State	The status of the ATM interface
OAM State	The OAM operational status of ATM connections: Up — the interface is operationally up
	ETE-AIS — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down

Table 35: Show Port ATM PVC VPI/VCI Detail Output Fields (Continued)

Label	Description
Encap Type	The encapsulation type
Owner	Identifies the system entity that owns a specific ATM connection
AAL Type	The ATM Adaptation Layer 5 (AAL5) information
Endpoint Type	The endpoint type
Cast Type	The connection topology type
Ing. Td Idx	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr. Td Idx	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Last Changed	The date and time that the interface connection entered its current operational state
Octets	The number of input and output octets HEC discarded cells are not included in the input octet numbers
Cells	The number of input and output cells HEC discarded cells are not included in the input cell numbers
CLP=0 Cells	The number of CLP=0 cells
Dropped CLP=0 Cells	The number of dropped CLP=0 cells
Dropped Cells (CLP=0+1)	The number of dropped CLP=0+1 cells
Tagged Cells	The number of tagged cells
Loopback	The number of loopback requests and responses transmitted and received on this connection for both end-to-end and segment
OAM Cells (generated)	The number of OAM cells generated at the endpoint and sent towards the network

Sample Output

```
*A:ALU-1># show port 1/1/1.1 atm pvp

===============================================================
ATM PVPs, Port 1/1/1.1
===============================================================
VPI        Owner  Type     Ing.TD  Egr.TD  Adm  OAM         Opr
---------------------------------------------------------------
2          SAP    PVP      1       1       up   up          up
===============================================================
*A:ALU>
```

Table 36: Show Port ATM PVP Output Fields

Label	Description
VPI	The VPI value
Owner	The system entity that owns a specific ATM connection
Type	The type of connection
Ing.TD	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr.TD	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Adm	Up — the interface is administratively up
	Down — the interface is administratively down
OAM	The OAM operational status of ATM connections: Up — the interface is operationally up
	ETE-AIS — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Opr	Up — the interface is operationally up
	Down — the interface is operationally down

Sample Output

```
*A:ALU-1>show port 1/1/1.1 atm pvp 11 detail

===============================================================================
ATM PVP
===============================================================================
Port Id             : 1/1/1.1             VPI                 : 11
Admin State         : up                  Oper state          : up
OAM State           : up
Owner               : SAP
Endpoint Type       : PVP                 Cast Type           : P2P
Ing. Td Idx         : 1                   Egr. Td Idx         : 1
Last Changed        : 02/01/2000 00:37:25 ILMI Vpi Range      : n/a
===============================================================================

================================================================================
ATM Statistics
================================================================================
                                                   Input                 Output
--------------------------------------------------------------------------------
Octets                                              1007                   1007
Cells                                                 19                     19
CLP=0 Cells                                           19                     19
Dropped CLP=0 Cells                                    0                      0
Dropped Cells (CLP=0+1)                                0
Tagged Cells                                           0
================================================================================

================================================================================
ATM OAM Statistics
================================================================================
                                                   Input                 Output
--------------------------------------------------------------------------------
Loopback                                              0                      0
OAM Cells (generated)                            0
================================================================================
*A:ALU-1>#
```

Table 37: Show Port ATM PVP Detail Output Fields

Label	Description
`Port Id`	The port ID configured or displayed in the *slot/mda/port* format
`VPI`	The VPI values
`Admin State`	The administrative state of the interface connection
`Oper State`	The status of the ATM interface
`OAM State`	The OAM operational status of ATM connections: `Up` — the interface is operationally up
	`ETE-AIS` — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down

Table 37: Show Port ATM PVP Detail Output Fields (Continued)

Label	Description
`Owner`	The system entity that owns a specific ATM connection
`Endpoint Type`	The endpoint type
`Cast Type`	The connection topology type
`Ing. Td Idx`	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
`Egr. Td Idx`	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
`Last Changed`	The date and time that the interface connection entered its current operational state
`Octets`	The number of input and output octets HEC discarded cells are not included in the input octet numbers
`Cells`	The number of input and output cells HEC discarded cells are not included in the input cell numbers
`CLP=0 Cells`	The number of CLP=0 cells
`Dropped CLP=0 Cells`	The number of dropped CLP=0 cells
`Dropped Cells (CLP=0+1)`	The number of dropped CLP=0+1 cells
`Tagged Cells`	The number of tagged cells
`Loopback`	The number of loopback requests and responses transmitted and received on this connection for both end-to-end and segment
`OAM Cells (generated)`	The number of OAM cells generated at the endpoint and sent towards the network

Show Port-tree Commands

port-tree

Syntax **port-tree** *port-id*

Context show

Description This command displays the tree for SONET/SDH ports or channels.

Parameters *port-id* — specifies the physical port ID

Syntax *slot*[/*mda*[/*port*]] or *slot*/*mda*/*port*[.*channel*]

Output The following output is an example of port-tree information, and Table 38 describes the fields.

Sample Output

```
*A:ALU-A# show port-tree 1/5/1

ifIndex     type, sonet-sdh-index (* = provisioned)
========    =========================================
 44072960   Port, N/A *
580943873       STS3, none
580943933           STS1, sts1-1
N/A                     VTG, 1.1
580943945                   VT2, vt2-1.1.1
580943946                       E1, 1.1.1
580943979                   VT2, vt2-1.1.2
580943980                       E1, 1.1.2
580944013                   VT2, vt2-1.1.3
580944014                       E1, 1.1.3

...

N/A                     VTG, 3.7
580946003                   VT2, vt2-3.7.1
580946004                       E1, 3.7.1
580946037                   VT2, vt2-3.7.2
580946038                       E1, 3.7.2
580946071                   VT2, vt2-3.7.3
580946072                       E1, 3.7.3
*A:ALU-A#
```

Table 38: Show Port-tree Output Fields

Label	Description
`IfIndex`	Displays the interface number of the index, which reflects its initialization sequence
`type`	Specifies the OC3 bandwidth subdivision

Table 38: Show Port-tree Output Fields (Continued)

Label	Description
sonet-sdh-index	Specifies the sonet-sdh-index
*	Indicates that the port or channel is provisioned

Show Multilink Bundle and IMA Group Commands

multilink-bundle

Syntax **multilink-bundle** [*bundle-id* | *slot/mda* | **type** {**mlppp** | **ima-grp**}] [**detail**]
multilink-bundle [{*bundle-id* | *slot/mda*} | [**ppp** [**multiclass**] | **ima**]]

Context show

Description This command displays multilink bundle information. An operator can display:

- all bundles on the system/adapter card or all bundles of a given type on the system by specifying the value of type filter to be either mlppp or ima-grp
- bundle-specific information in summary (no detail option) or detailed format (detail option specified) for one or more bundles
- protocol-specific information (for example, PPP or IMA) for the specified bundle

Parameters *bundle-id* — the multilink (PPP or IMA) bundle to be associated with this IP interface. The command syntax must be used as follows:

Syntax: bundle-*type-slot/mda.bundle-num*
bundle-ppp-*slot/mda.bundle-num* (a multilink PPP bundle)
bundle-ima-*slot/mda.bundle-num* (an IMA group bundle)

bundle:	keyword
slot:	MDA slot numbers
bundle-num:	1 to 16 (up to 8 for MLPPP and IMA)

ppp — displays PPP bundle information

ppp multiclass — displays multi-class MLPPP information

ima, ima-grp — displays IMA-type groups

mlppp — displays MLPPP-type groups

detail — provides detailed information

Output The following outputs are examples of multilink bundle information:

- Multilink Bundle (Sample Output, Table 39)
- Multilink Bundle IMA Group (Sample Output, Table 40)
- Multilink Bundle IMA Group Detailed (Sample Output, Table 41)
- Multilink Bundle MLPPP (Sample Output, Table 42)
- Multilink Bundle Multi-class (Sample Output, Table 42)
- Multilink Bundle MLPPP Detail (Sample Output, Table 43)

Sample Output

```
*A:ALU-1># show multilink-bundle

===============================================================================
Bundle Summary
===============================================================================
Bundle               Type    Admin      Oper       Port       Min    Total/
Id                           State      State      State      Links  Active Links
-------------------------------------------------------------------------------
bundle-ppp-1/1.1     mlppp   Down       Down       Ghost      1      0/0
bundle-ppp-1/4.8     mlppp   Up         Down       Ghost      1      0/0
bundle-ima-1/6.3     ima-grp Down       Down       Ghost      1      0/0
-------------------------------------------------------------------------------
Bundles : 3
===============================================================================
*A:ALU-1>
```

Table 39: Show Multilink Bundle Output Fields

Label	Description
Bundle Id	The port ID for this bundle
Type	The type of this multilink bundle: mlppp — the bundle is of type MLPPP ima — the bundle is of type IMA group
Admin State	Up — the bundle is administratively up
	Down — the bundle is administratively down
Oper State	Up — the bundle is operationally up
	Down — the bundle is operationally down
Port State	The state level of the port: none — the port is either in its initial creation state or is just about to be deleted
	ghost — no member links are configured as part of this bundle
	down — all member links are in “none”, “ghost”, or “down” state
	linkUp — at least one member link is in port state “link up” but the bundle protocol is not yet operationally up (due to the bundle protocol still coming up; for example, due to insufficient number of member links in “link up” state yet or to bundle being shut down)

Table 39: Show Multilink Bundle Output Fields (Continued)

Label	Description
	Up — the bundle is ready to pass some kinds of traffic as the bundle protocol has come up (at least “minimum links” member links are in the port state up and the bundle protocol is up)
Min Links	The minimum number of links that must be active for a bundle to be active. If the number of links drop below the given minimum, then the multilink bundle will transition to an operation down state.
Total Links	The total number active of member links configured for this bundle
Active Links	The total number of active links for the bundle

Sample Output

```
*A:ALU-1># show multilink-bundle type ima-grp

===============================================================================
Bundle Summary
===============================================================================
Bundle              Type    Admin     Oper      Port      Min    Total/
Id                          State     State     State     Links  Active Links
-------------------------------------------------------------------------------
bundle-ima-1/6.3    ima-grp Down      Down      Ghost     1      0/0
-------------------------------------------------------------------------------
Bundles : 1
===============================================================================
*A:ALU-1>#


*A:ALU-1># show multilink-bundle bundle-ima-1/6.3

===============================================================================
Bundle Summary
===============================================================================
Bundle              Type    Admin     Oper      Port      Min    Total/
Id                          State     State     State     Links  Active Links
-------------------------------------------------------------------------------
bundle-ima-1/6.3    ima-grp Down      Down      Ghost     1      0/0
-------------------------------------------------------------------------------
Bundles : 1
===============================================================================
*A:ALU-1>
```

Note: The ima-grp command shows all bundles in the IMA group. The bundle-ima command shows information on the specified bundle. The fields for both commands are the same.

Table 40: Show Multilink Bundle IMA Group Output Fields

Label	Description
`Bundle Id`	The port ID for this bundle
`Type`	The type of this multilink bundle: `ima` — the bundle is of type IMA group
`Admin State`	`Up` — the bundle is administratively up
	`Down` — the bundle is administratively down
`Oper State`	`Up` — the bundle is operationally up
	`Down` — the bundle is operationally down
`Port State`	The state level of the port: `none` — the port is either in its initial creation state or is just about to be deleted
	`ghost` — no member links are configured as part of this bundle
	`down` — all member links are in “none”, “ghost”, or “down” state
	`linkUp` — at least one member link is in port state “link up” but the bundle protocol is not yet operationally up (due to the bundle protocol still coming up; for example, due to insufficient number of member links in “link up” state yet or to bundle being shut down)
	`Up` — the bundle is ready to pass some kinds of traffic as the bundle protocol has come up (at least “minimum links” member links are in the port state up and the bundle protocol is up)
`Min Links`	The minimum number of links that must be active for a bundle to be active. If the number of links drop below the given minimum, then the multilink bundle will transition to an operation down state.
`Total Links`	The total number active of member links configured for this bundle
`Active Links`	The total number of active links for the bundle
`Bundles`	The number of bundles on the port

Sample Output

```
*A:ALU-1># show multilink-bundle type ima-grp detail

===============================================================================
Bundle bundle-ima-1/6.3 Detail
===============================================================================
Description        : MultiLink Bundle
Bundle Id          : bundle-ima-1/6.3   Type               : ima-grp
Admin Status       : down               Oper Status        : down
Minimum Links      : 1                  Bundle IfIndex     : 583012355
Total Links        : 0                  Active Links       : 0
Red Diff Delay     : 25                 Yellow Diff Delay  : N/A
Red Diff Delay Act : down               MRRU               : N/A
Short Sequence     : N/A                Oper MRRU          : N/A
Oper MTU           : 1524               Fragment Threshold : 128 bytes
Up Time            : N/A                Bandwidth          : 0 KBit
PPP Input Discards : N/A                Primary Member Port: None
Mode               : access

===============================================================================
Traffic Statistics
===============================================================================
                                                  Input                 Output
-------------------------------------------------------------------------------
Octets                                                0                      0
Packets                                               0                      0
Errors                                                0                      0

===============================================================================
Port Statistics
===============================================================================
                                                  Input                 Output
-------------------------------------------------------------------------------
Unicast Packets                                       0                      0
Multicast Packets                                     0                      0
Broadcast Packets                                     0                      0
Discards                                              0                      0
Unknown Proto Discards                                0
===============================================================================

*A:ALU-1>
```

```
*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 detail

===============================================================================
Bundle bundle-ima-1/6.3 Detail
===============================================================================
Description         : MultiLink Bundle
Bundle Id           : bundle-ima-1/6.3   Type                : ima-grp
Admin Status        : down               Oper Status         : down
Minimum Links       : 1                  Bundle IfIndex      : 583012355
Total Links         : 0                  Active Links        : 0
Red Diff Delay      : 25                 Yellow Diff Delay   : N/A
Red Diff Delay Act  : down               MRRU                : N/A
Short Sequence      : N/A                Oper MRRU           : N/A
Oper MTU            : 1524               Fragment Threshold  : 128 bytes
Up Time             : N/A                Bandwidth           : 0 KBit
PPP Input Discards  : N/A                Primary Member Port: None
Mode                : access

===============================================================================
Traffic Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Octets                                                 0                      0
Packets                                                0                      0
Errors                                                 0                      0

===============================================================================
Port Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Unicast Packets                                        0                      0
Multicast Packets                                      0                      0
Broadcast Packets                                      0                      0
Discards                                               0                      0
Unknown Proto Discards                                 0
===============================================================================
*A:ALU-1>
```

Note: The `ima-grp detail` command shows all bundles in the IMA group. The `bundle-ima detail` command shows information on the specified bundle. The fields for both commands are the same.

Table 41: Show Multilink Bundle IMA Group Detailed Output Fields

Label	Description
Description	The configured description for this bundle
Bundle Id	The port ID for this bundle
Admin Status	Up — the bundle is administratively up
	Down — the bundle is administratively down
Minimum Links	The minimum number of links that must be active for a bundle to be active. If the number of links drop below the given minimum, then the multilink bundle will transition to an operation down state.
Total Links	The total number of active member links configured for this bundle
Red Diff Delay	The maximum acceptable differential delay for individual circuits within this multilink bundle. If the delay exceeds this threshold, a trap is issued.
Red Diff Delay Act	The action that will be taken on the IMA group once the Red Diff Delay is exceeded
Oper MTU	The negotiated size of the largest packet that can be sent on the port or channel, specified in octets
Mode	network — the port is configured for transport network use
	access — the port is configured for service access
Type	Indicates that this bundle is of type IMA group
Oper Status	The operational port status of a member link
Bundle IfIndex	The bundle's interface index number, which reflects its initialization sequence
Active Links	The total number of active links for the bundle
Bandwidth	The bandwidth configured for this IMA group bundle in kb/s
Traffic Statistics	
Octets Input/Output	The total number of octets received and transmitted on the port

Table 41: Show Multilink Bundle IMA Group Detailed Output Fields (Continued)

Label	Description
Packets Input/Output	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.
Errors Input/Output	For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol. For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.
Port Statistics	
Unicast packets Input/Output	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.
Multicast packets Input/Output	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a unicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sub-layer, including those that were discarded or not sent.
Broadcast packets Input/Output	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a unicast or multicast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sub-layer, including those that were discarded or not sent.

Table 41: Show Multilink Bundle IMA Group Detailed Output Fields (Continued)

Label	Description
`Discards Input/Output`	The number of inbound packets chosen to be discarded to possibly free up buffer space
`Unknown proto discards Input/Output`	For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. Unknown proto discards do not show up in the packet counts.

Sample Output

```
*A:ALU-1># show multilink-bundle type mlppp

===============================================================================
Bundle Summary
===============================================================================
Bundle              Type    Admin     Oper      Port      Min    Total/
Id                          State     State     State     Links  Active Links
-------------------------------------------------------------------------------
bundle-ppp-1/1.1    mlppp   Down      Down      Ghost     1      0/0
bundle-ppp-1/4.8    mlppp   Up        Down      Ghost     1      0/0
-------------------------------------------------------------------------------
Bundles : 2
===============================================================================
*A:ALU-1>#

*A:ALU-1># show multilink-bundle bundle-ppp-1/4.8

===============================================================================
Bundle Summary
===============================================================================
Bundle              Type    Admin     Oper      Port      Min    Total/
Id                          State     State     State     Links  Active Links
-------------------------------------------------------------------------------
bundle-ppp-1/4.8    mlppp   Up        Down      Ghost     1      0/0
-------------------------------------------------------------------------------
Bundles : 1
===============================================================================
*A:ALU-1>#
```

```
A:ALU-1# show multilink-bundle bundle-ppp-1/1.13 ppp multiclass

===============================================================================
MLPPP Per Class Traffic Statistics for bundle-ppp-1/1.13
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Class  0
  Octets                                      2993101300             2993220860
  Packets                                        3054185                3054307
  Errors                                               0                      0
Class  1
  Octets                                      2987258540             2993219880
  Packets                                        3048223                3054306
  Errors                                               0                      0
Class  2
  Octets                                      2987255600             2993220860
  Packets                                        3048220                3054307
  Errors                                               0                      0
Class  3
  Octets                                      2987257560             2993220860
  Packets                                        3048222                3054307
  Errors                                               0                      0
===============================================================================
```

Note: The mlppp command shows all bundles in the MLPPP group. The bundle-ppp command shows information on the specified bundle. The fields for both commands are the same.

Table 42: Show Multilink Bundle MLPPP Output Fields

Label	Description
Bundle Id	The port ID for this bundle
Type	The type of this multilink bundle: mlppp — the bundle is of type MLPPP
Admin State	Up — the bundle is administratively up
	Down — the bundle is administratively down
Oper State	Up — the bundle is operationally up
	Down — the bundle is operationally down

Table 42: Show Multilink Bundle MLPPP Output Fields (Continued)

Label	Description
Port State	The state level of the port: none — the port is either in its initial creation state or is just about to be deleted
	ghost — no member links are configured as part of this bundle
	down — all member links are in the “none”, “ghost”, or “down” state
	linkUp — at least one member link is in the port state “link up” but the bundle protocol is not yet operationally up (due to the bundle protocol still coming up; for example, due to an insufficient number of member links in the “link up” state or to the bundle being shut down)
	Up — the bundle is ready to pass some kinds of traffic as the bundle protocol has come up (at least “minimum links” member links are in the port state up and the bundle protocol is up)
Min Links	The minimum number of links that must be active for a bundle to be active. If the number of links drops below the given minimum, then the multilink bundle will transition to an operation down state.
Total Links	The total number of active member links configured for this bundle
Active Links	The total number of active links for the bundle
Bundles	Number of bundles on the port
Class	The MC-MLPPP service class
Octets Input/Output	The total number of octets received and transmitted on the port
Packets Input/Output	The total number of packets received and transmitted on the port
Errors Input/Output	The number of packets that contained errors preventing them from being deliverable

Sample Output

```
*A:ALU-1># show multilink-bundle type mlppp detail

===============================================================================
Bundle bundle-ppp-1/1.1 Detail
===============================================================================
Description        : MultiLink Bundle
Bundle Id          : bundle-ppp-1/1.1   Type               : mlppp
Admin Status       : down               Oper Status        : down
Minimum Links      : 1                  Bundle IfIndex     : 572522497
Total Links        : 0                  Active Links       : 0
Red Diff Delay     : 0                  Yellow Diff Delay  : 0
Red Diff Delay Act : none               MRRU               : 1524
Short Sequence     : false              Oper MRRU          : 1524
Oper MTU           : 1526               Fragment Threshold : 128 bytes
Up Time            : N/A                Bandwidth          : 0 KBit
PPP Input Discards : 0                  Primary Member Port: None
Mode               : network            Net. Egr. Queue Pol:

===============================================================================
Traffic Statistics
===============================================================================
                                                  Input                 Output
-------------------------------------------------------------------------------
Octets                                                0                      0
Packets                                               0                      0
Errors                                                0                      0

===============================================================================
Port Statistics
===============================================================================
                                                  Input                 Output
-------------------------------------------------------------------------------
Unicast Packets                                       0                      0
Multicast Packets                                     0                      0
Broadcast Packets                                     0                      0
Discards                                              0                      0
Unknown Proto Discards                                0
===============================================================================
```

```
*A:ALU-1># show multilink-bundle bundle-ppp-1/4.8 detail

===============================================================================
Bundle bundle-ppp-1/4.8 Detail
===============================================================================
Description         : MultiLink Bundle
Bundle Id           : bundle-ppp-1/4.8   Type               : mlppp
Admin Status        : up                 Oper Status        : down
Minimum Links       : 1                  Bundle IfIndex     : 578813960
Total Links         : 0                  Active Links       : 0
Red Diff Delay      : 0                  Yellow Diff Delay  : 0
Red Diff Delay Act  : none               MRRU               : 1524
Short Sequence      : false              Oper MRRU          : 1524
Oper MTU            : 1526               Fragment Threshold : 128 bytes
Up Time             : N/A                Bandwidth          : 0 KBit
PPP Input Discards  : 0                  Primary Member Port: None
Mode                : network            Net. Egr. Queue Pol:

===============================================================================
Traffic Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Octets                                                 0                      0
Packets                                                0                      0
Errors                                                 0                      0

===============================================================================
Port Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Unicast Packets                                        0                      0
Multicast Packets                                      0                      0
Broadcast Packets                                      0                      0
Discards                                               0                      0
Unknown Proto Discards                                 0
===============================================================================
*A:ALU-1>#
```

Note: The `mlppp detail` command shows all bundles in the MLPPP group. The `bundle-ppp detail` command shows information on the specified bundle. The fields for both commands are the same.

Table 43: Show Multilink Bundle MLPPP Detail Fields

Label	Description
`Description`	The configured description for this bundle
`Bundle Id`	The port ID for this bundle
`Admin Status`	`Up` — the bundle is administratively up
	`Down` — the bundle is administratively down
`Minimum Links`	The minimum number of links that must be active for a bundle to be active. If the number of links drop below the given minimum, then the multilink bundle will transition to an operation down state.
`Total Links`	The total number of active member links configured for this bundle
`Red Diff Delay`	The maximum acceptable differential delay for individual circuits within this multilink bundle. If the delay exceeds this threshold, a trap is issued.
`Red Diff Delay Act`	The action that will be taken on the MLPPP bundle once the Red Diff Delay is exceeded
`Short Sequence`	Whether the MLPPP bundle uses short (12 bit) sequence numbers instead of the default 24-bit sequence number
`Oper MTU`	The negotiated size of the largest packet that can be sent on the port or channel, specified in octets
`Mode`	`network` — the port is configured for transport network use
	`access` — the port is configured for service access
`Type`	The bundle type
`Oper Status`	The operational port status of a member link
`Bundle IfIndex`	The bundle’s interface index number, which reflects its initialization sequence
`Active Links`	The total number of active links for the bundle
`Yellow Diff Delay`	The yellow warning threshold for the differential delay for members within a multilink bundle
`MRRU`	The configured maximum frame size that can be reconstructed from multilink fragments
`Oper MRRU`	The operating maximum frame size that can be reconstructed from multilink fragments

Table 43: Show Multilink Bundle MLPPP Detail Fields (Continued)

Label	Description
Bandwidth	The bandwidth configured for this MLPPP bundle in kb/s
Traffic and Port statistics	The traffic and port statistics information displayed for bundles when the detail option is selected is the same as information displayed for physical ports
Traffic Statistics	
Octets Input/Output	The total number of octets received and transmitted on the port
Packets Input/Output	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.
Errors Input/Output	For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol. For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors.
Port Statistics	
Unicast packets Input/Output	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.
Multicast packets Input/Output	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a unicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sub-layer, including those that were discarded or not sent.

Table 43: Show Multilink Bundle MLPPP Detail Fields (Continued)

Label	Description
`Broadcast packets Input/Output`	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a unicast or multicast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sub-layer, including those that were discarded or not sent.
`Discards Input/Output`	The number of inbound packets chosen to be discarded to possibly free up buffer space
`Unknown proto discards Input/Output`	For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. Unknown proto discards do not show up in the packet counts.

Show ATM IMA Group Commands

multilink-bundle

Syntax **multilink-bundle** *bundle-id* **ima atm** [**detail**]
multilink-bundle *bundle-id* **ima atm connections**
multilink-bundle *bundle-id* **ima atm pvc** [*vpi*/*vci*] [**detail**]
multilink-bundle *bundle-id* **ima atm pvp** [*vpi*] [**detail**]

Context show

Description This command displays ATM port information for IMA group bundles. The information displayed is equivalent to that displayed for the **show port (atm)** command.

Parameters *bundle-id* — specifies the IMA port ID

atm — displays ATM information

connections — displays ATM connection information

pvc — displays ATM port PVC information

pvp — displays ATM port PVP information

vpi/vci — displays the VPI/VCI values

Values vpi: 0 to 4095 (NNI)
0 to 255

vci: 1, 2, 5 to 65534

detail — provides detailed information

Output The following outputs are examples of IMA ATM information:

- Multilink Bundle IMA ATM (Sample Output, Table 44)
- Multilink Bundle IMA ATM Connections (Sample Output, Table 45)
- Multilink Bundle IMA ATM PVC (Sample Output, Table 46)
- Multilink Bundle IMA ATM PVP (Sample Output, Table 47)

Sample Output

```
*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 ima atm

===============================================================================
ATM Info for bundle-ima-1/6.3
===============================================================================
Cell Mode              : UNI               Mapping            : n/a
Configured VCs         : 0                 Configured VPs     : 0
Configured VTs         : 0                 Configured IFCs    : 0
Configured minimum VPI: 0
Last Unknown VPI/VCI   : none

===============================================================================

*A:ALU-1>#
```

Table 44: Show Multilink Bundle IMA ATM Output Fields

Label	Description
Cell Mode	The cell format (UNI or NNI) that is used on the ATM interface
Configured VCs	The number of configured VCs
Configured VTs	The number of configured VTs
Configured minimum VPI	The minimum VPI configured for this bundle
Last Unknown VPI/VCI	The last unknown VPI/VCI that was received on this interface
Configured VPs	The number of configured VPs

Sample Output

```
*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 ima atm connections

================================================================
ATM Connections, Port bundle-ima-1/6.3
================================================================
           Owner  Type     Ing.TD  Egr.TD  Adm  OAM         Opr
----------------------------------------------------------------
1/100      SAP    PVC      2       2       up   up          up
================================================================
*A:ALU-1>#
```

Table 45: Show Multilink Bundle IMA ATM Connections Output Fields

Label	Description
Owner	The system entity that owns a specific ATM connection
Type	The type of connection
Ing.TD	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr.TD	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Adm	Up — the bundle is administratively up
	Down — the bundle is administratively down
OAM	The OAM operational status of ATM connections:
	Up — the interface is operationally up
	ETE-AIS — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Opr	Up — the bundle is operationally up
	Down — the bundle is operationally down

Sample Output

```
*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 ima atm pvc

================================================================
ATM PVCs, Port bundle-ima-1/6.3
================================================================
VPI/VCI    Owner  Type     Ing.TD  Egr.TD  Adm  OAM         Opr
----------------------------------------------------------------
1/100      SAP    PVC      2       2       up   up          up
================================================================
*A:ALU-1>#

*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 ima atm pvc detail

================================================================
ATM PVCs, Port bundle-ima-1/6.3
================================================================
VPI/VCI    Owner  Type     Ing.TD  Egr.TD  Adm  OAM         Opr
----------------------------------------------------------------
1/100      SAP    PVC      2       2       up   up          up
===============================================================================
ATM Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Octets                                                 0                      0
Cells                                                  0                      0
===============================================================================

===============================================================================
AAL-5 Packet Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Packets                                                0                      0
Dropped Packets                                        0                      0
CRC-32 Errors                                          0
Reassembly Timeouts                                    0
Over Sized SDUs                                        0
===============================================================================

===============================================================================
ATM OAM Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Loopback                                               0                      0
OAM Cells (generated)                            0
===============================================================================
*A:ALU-1>#
```

Table 46: Show Multilink Bundle IMA ATM PVC Output Fields

Label	Description
VPI/VCI	The VPI/VCI value
Owner	The system entity that owns a specific ATM connection
Type	The type of connection
Ing.TD	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr.TD	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Adm	Up — the bundle is administratively up
	Down — the bundle is administratively down
OAM	The OAM operational status of ATM connections: Up — the interface is operationally up
	ETE-AIS — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Opr	Up — the bundle is operationally up
	Down — the bundle is operationally down

Sample Output

```
*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 ima atm pvp

===============================================================
ATM PVPs, Port bundle-ima-1/6.3
===============================================================
VPI        Owner  Type     Ing.TD  Egr.TD  Adm  OAM         Opr
---------------------------------------------------------------
2          SAP    PVP      1       1       up   up          up
===============================================================
*A:ALU-1>#
```

Table 47: Show Multilink-bundle IMA ATM PVP Output Fields

Label	Description
VPI	The VPI value
Owner	The system entity that owns a specific ATM connection
Type	The type of connection
Ing.TD	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr.TD	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Adm	Up — the bundle is administratively up
	Down — the bundle is administratively down
OAM	The OAM operational status of ATM connections: Up — the interface is operationally up
	ETE-AIS — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Opr	Up — the bundle is operationally up
	Down — the bundle is operationally down

Monitor Commands

- Port Monitor Commands
- Fabric Profile Statistics Monitor Commands

Port Monitor Commands

port

Syntax **port** *port-id* [*port-id*...(up to 5 max)] [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**] [**multiclass**]

Context monitor

Description This command enables port traffic monitoring. The specified port(s) statistical information is shown at the configured interval until the configured count is reached.

The first screen displays the current statistics related to the specified port(s). The subsequent statistical information listed for each interval is displayed as a delta to the previous screen.

When the keyword **rate** is specified, the “rate per second” for each statistic is displayed instead of the delta.

Monitor commands are similar to **show** commands, but only statistical information is shown. Monitor commands display the selected statistics according to the configured number of times at the interval specified.

Parameters *port-id* — specifies up to 5 port IDs

Syntax: *port-id* slot/mda/port[.channel]
bundle IDbundle-*type-slot/mda.bundle-num*
bundle keyword
bundle-num: 1 to 16 (up to 8 for MLPPP and IMA)
type ima, ppp

seconds — configures the interval for each display in seconds

Values 3 to 60

Default 5

repeat — configures how many times the command is repeated

Values 1 to 999

Default 10

absolute — when the **absolute** keyword is specified, the raw statistics are displayed without processing. No calculations are performed on the delta or rate statistics.

rate — when the **rate** keyword is specified, the rate-per-second for each statistic is displayed instead of the delta

multiclass — displays statistics for multi-class MLPPP bundles

Output The following outputs are examples of port monitoring information.

Sample Output

```
*A:ALU-1# monitor port 1/1/1.1 interval 3 repeat 3 absolute

===============================================================================
Monitor statistics for Port 1/1/1.1
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
At time t = 0 sec (Base Statistics)
-------------------------------------------------------------------------------
Octets                                         330161274              330161274
Packets                                          6229458                6229458
Errors                                                 0                      0

-------------------------------------------------------------------------------
At time t = 3 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                         330162917              330162917
Packets                                          6229489                6229489
Errors                                                 0                      0

-------------------------------------------------------------------------------
At time t = 6 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                         330164560              330164560
Packets                                          6229520                6229520
Errors                                                 0                      0

-------------------------------------------------------------------------------
At time t = 9 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                         330166203              330166203
Packets                                          6229551                6229551
Errors                                                 0                      0

===============================================================================
*A:ALU-1#

A:ALU-1# monitor port bundle-ppp-1/1.13 interval 5 repeat 2 rate multiclass

===============================================================================
Monitor multiclass statistics for Bundle bundle-ppp-1/1.13
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
At time t = 0 sec (Base Statistics)
-------------------------------------------------------------------------------
Class 0
    Octets                                    2990779680             2990899240
    Packets                                      3051816                3051938
    Errors                                             0                      0
Class 1
    Octets                                    2984941820             2990898260
    Packets                                      3045859                3051937
    Errors                                             0                      0
Class 2
```

```
    Octets                                    2984939860          2990899240
    Packets                                      3045857             3051938
    Errors                                             0                   0
Class 3
    Octets                                    2984940840          2990899240
    Packets                                      3045858             3051938
    Errors                                             0                   0

-------------------------------------------------------------------------------
At time t = 5 sec (Mode: Rate)
-------------------------------------------------------------------------------
Class 0
    Octets                                          9408                9408
    Packets                                           10                  10
    Errors                                             0                   0
Utilization (% of port capacity)                    1.89                1.89
Class 1
    Octets                                          9408                9408
    Packets                                           10                  10
    Errors                                             0                   0
Utilization (% of port capacity)                    1.89                1.89
Class 2
    Octets                                          9212                9408
    Packets                                            9                  10
    Errors                                             0                   0
Utilization (% of port capacity)                    1.85                1.89
Class 3
    Octets                                          9408                9408
    Packets                                           10                  10
    Errors                                             0                   0
Utilization (% of port capacity)                    1.89                1.89

-------------------------------------------------------------------------------
At time t = 10 sec (Mode: Rate)
-------------------------------------------------------------------------------
Class 0
    Octets                                          9408                9408
    Packets                                           10                  10
    Errors                                             0                   0
Utilization (% of port capacity)                    1.89                1.89
Class 1
    Octets                                          9408                9408
    Packets                                           10                  10
    Errors                                             0                   0
Utilization (% of port capacity)                    1.89                1.89
Class 2
    Octets                                          9408                9408
    Packets                                           10                  10
    Errors                                             0                   0
Utilization (% of port capacity)                    1.89                1.89
Class 3
    Octets                                          9212                9408
    Packets                                            9                  10
    Errors                                             0                   0
Utilization (% of port capacity)                    1.85                1.89

===============================================================================
A:ALU-1#
```

port

Syntax **port** *port-id* **atm** [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]

Context monitor

Description This command enables ATM port traffic monitoring.

Parameters *port-id* — specifies the physical port ID

Syntax: *port-id* slot/mda/port.channel
bundle-*type-slot/mda.bundle-num*
bundle keyword
bundle-num: 1 to 16 (up to 8 for MLPPP and IMA)
type ima, ppp

seconds **—** configures the interval for each display in seconds

Values 3 to 60

Default 5

repeat — configures how many times the command is repeated

Values 1 to 999

Default 10

absolute — when the **absolute** keyword is specified, the raw statistics are displayed without processing. No calculations are performed on the delta or rate statistics.

rate — when the **rate** keyword is specified, the rate-per-second for each statistic is displayed instead of the delta

Output The following output is an example of ATM port monitoring information.

Sample Output

```
*A:ALU-1# monitor port 1/1/1.1 atm interval 3 repeat 3 absolute

===============================================================================
Monitor ATM statistics for Port 1/1/1.1
===============================================================================
                                                  Input                  Output
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
At time t = 0 sec (Base Statistics)
-------------------------------------------------------------------------------
Octets                                        330260861               330260861
Cells                                           6231337                 6231337
Unknown VPI/VCI Cells                                 0

-------------------------------------------------------------------------------
At time t = 3 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                        330262504               330262504
Cells                                           6231368                 6231368
Unknown VPI/VCI Cells                                 0
```

```
-------------------------------------------------------------------------------
At time t = 6 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                             330264147             330264147
Cells                                                6231399               6231399
Unknown VPI/VCI Cells                                      0

-------------------------------------------------------------------------------
At time t = 9 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                             330265790             330265790
Cells                                                6231430               6231430
Unknown VPI/VCI Cells                                      0

===============================================================================
*A:ALU-1#
```

Fabric Profile Statistics Monitor Commands

fabric-profile

Syntax **fabric-profile mda** {*mda-id* | **with-stats-enabled**} {**dest-mda** | **source-mda**} [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]

Context monitor

Description This command enables monitoring of adapter card fabric profile statistics. The specified adapter card statistical information displays and automatically refreshes at the configured interval.

Parameters *mda-id* — the slot number of the adapter card

with-stats-enabled — if used, this keyword replaces the *mda-id* parameter, in which case the adapter card that has fabric-stats-enabled configured will be the one which is monitored; that is, the command will be **monitor fabric-profile mda with-stats-enabled dest-mda** | **source-mda**. If there are no adapter cards that have fabric-stats-enabled configured, no statistics will be displayed.

dest-mda — displays network and access ingress statistics for all adapter cards going towards the fabric and destined for the specific destination adapter card. Global fabric statistics are also displayed, as well as the fabric port statistics if the destination adapter card has the collection of fabric statistics enabled. The sum of traffic forwarded or dropped is also displayed.

source-mda — displays network and access ingress traffic statistics from the specified adapter card going towards the fabric and towards a destination adapter card. The sum of traffic forwarded or dropped is also displayed.

seconds — configures the interval for each display in seconds

Values 3 to 60

Default 5

repeat — configures how many times the command is repeated

Values 1 to 999

Default 10

absolute — displays the raw statistics without processing. No calculations are performed on the delta or rate statistics.

rate — displays the rate-per-second for each statistic instead of the delta

Clear Commands

mda

Syntax **mda** *mda-id*
mda *mda-id* **statistics** [**source-mda** | **destination-mda** | **fabric-port** | **fabric-global** | **all**]

Context clear

Description The **clear mda** form of this command reinitializes the specified adapter card and clears all the collected fabric statistics related to the specified adapter card. The **clear mda statistics** form of this command clears all the collected fabric statistics related to the specified adapter card.

Parameters *mda-id* — the slot number of the specified adapter card

statistics — specifies that fabric statistics will be cleared for the specified adapter card

source-mda — clears all the network and access ingress traffic statistics in the fabric direction from the specified adapter card towards all other destination adapter cards

destination-mda — clears all the network and access ingress traffic statistics towards the specified adapter card fabric port, from all other adapter cards

fabric-port — clears the fabric port statistics towards the specified destination adapter card, if the specified adapter card has fabric-stats-enabled. If the specified adapter card does not have fabric-stats-enabled, no statistics will be cleared.

fabric-global — clears global fabric statistics collected for all egress traffic from the fabric

all — clears all the collected fabric statistics related to the specified adapter card. This command is equivalent to clearing the specified adapter card using all keywords above (**source-mda**, **destination-mda**, **fabric-port**, **fabric-global**).

port

Syntax **port** *port-id* **statistics**
port *port-id* **atm pvc** [*vpi[/vci*]] **statistics**
port *port-id* **atm pvp** [*vpi*] **statistics**

Context **clear**

Description This command clears port statistics for the specified port(s).

Parameters *port-id* — specifies the physical port ID

Syntax *slot*[/*mda*[/*port*]] or *slot*/*mda*/*port*[.*channel*]

bundle-type-slot/mda.bundle-num

bundle	keyword
type	ima, ppp
bundle-num	1 to 16 (up to 8 for MLPPP and IMA)

statistics — specifies that port statistics will be cleared

atm — specifies that ATM port statistics will be cleared

vpi — specifies the ATM network virtual path identifier (VPI) for this PVC

vci — specifies the ATM network virtual channel identifier (VCI) for this PVC

pvc — clears PVC statistics

pvp — clears PVP statistics

Standards and Protocol Support

Standards Compliance

IEEE 802.1ag	Service Layer OAM
IEEE 802.1p/q	VLAN Tagging
IEEE 802.3	10BaseT
IEEE 802.3ah	Ethernet OAM
IEEE 802.3u	100BaseTX
IEEE 802.3x	Flow Control
IEEE 802.3z	1000BaseSX/LX
IEEE 802.3-2008	Revised base standard

Protocol Support

ATM

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RFC 2515 Definition of Managed Objects for ATM Management, February 1999

RFC 2684 Multiprotocol Encapsulation over ATM Adaptation Layer 5

af-tm-0121.000 Traffic Management Specification Version 4.1, March 1999

ITU-T Recommendation I.610 - B-ISDN Operation and Maintenance Principles and Functions version 11/95

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GR-1113-CORE - Bellcore, Asynchronous Transfer Mode (ATM) and ATM Adaptation Layer (AAL) Protocols Generic Requirements, Issue 1, July 1994

GR-253-CORE - SONET Transport Systems: Common Generic Criteria. Issue 3, September 2000

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DIFFERENTIATED SERVICES

RFC 2474 Definition of the DS Field in the IPv4 and IPv6 Headers

RFC 2597 Assured Forwarding PHB Group

RFC 2598 An Expedited Forwarding PHB

RFC 3140 Per-Hop Behavior Identification Codes

DIGITAL DATA NETWORK MANAGEMENT

V.35

RS-232 (also known as EIA/TIA-232)

LDP

RFC 5036 LDP Specification

IS-IS

RFC 1142 OSI IS-IS Intra-domain Routing Protocol (ISO 10589)

RFC 1195 Use of OSI IS-IS for routing in TCP/IP & dual environments

RFC 2763 Dynamic Hostname Exchange for IS-IS

RFC 2966 Domain-wide Prefix Distribution with Two-Level IS-IS

RFC 2973 IS-IS Mesh Groups

RFC 3373 Three-Way Handshake for Intermediate System to Intermediate System (IS-IS) Point-to-Point Adjacencies

RFC 3567 Intermediate System to Intermediate System (IS-IS) Cryptographic Authentication

RFC 3719 Recommendations for Interoperable Networks using IS-IS

RFC 3784 Intermediate System to Intermediate System (IS-IS) Extensions for Traffic Engineering (TE)

RFC 3787 Recommendations for Interoperable IP Networks

RFC 5309 Point-to-Point Operation over LAN in Link State Routing Protocols

MPLS

RFC 3031 MPLS Architecture
RFC 3032 MPLS Label Stack Encoding
RFC 3815 Definitions of Managed Objects for the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP)
RFC 4379 Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures

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ITU-T X.734: Information technology- OSI-Systems Management: Event Report Management Function
M.3100/3120 Equipment and Connection Models
TMF 509/613 Network Connectivity Model
RFC 1157 SNMPv1
RFC 1305 Network Time Protocol (Version 3) Specification, Implementation and Analysis
RFC 1850 OSPF-MIB
RFC 1907 SNMPv2-MIB
RFC 2011 IP-MIB
RFC 2012 TCP-MIB
RFC 2013 UDP-MIB
RFC 2030 Simple Network Time Protocol (SNTP) Version 4 for IPv4, IPv6 and OSI
RFC 2096 IP-FORWARD-MIB
RFC 2138 RADIUS
RFC 2206 RSVP-MIB
RFC 2571 SNMP-FRAMEWORKMIB
RFC 2572 SNMP-MPD-MIB
RFC 2573 SNMP-TARGET-&-NOTIFICATION-MIB
RFC 2574 SNMP-USER-BASED-SMMIB
RFC 2575 SNMP-VIEW-BASED ACM-MIB
RFC 2576 SNMP-COMMUNITY-MIB
RFC 2588 SONET-MIB
RFC 2665 EtherLike-MIB
RFC 2819 RMON-MIB
RFC 2863 IF-MIB
RFC 2864 INVERTED-STACK-MIB
RFC 3014 NOTIFICATION-LOG MIB
RFC 3164 The BSD Syslog Protocol
RFC 3273 HCRMON-MIB
RFC 3411 An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks
RFC 3412 Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
RFC 3413 Simple Network Management Protocol (SNMP) Applications
RFC 3414 User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)
RFC 3418 SNMP MIB
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draft-ietf-mpls-lsr-mib-06.txt
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IANA-IFType-MIB

OSPF

RFC 1765 OSPF Database Overflow
RFC 2328 OSPF Version 2
RFC 2370 Opaque LSA Support
RFC 3101 OSPF NSSA Option
RFC 3630 Traffic Engineering (TE) Extensions to OSPF

PPP

RFC 1332 PPP IPCP
RFC 1570 PPP LCP Extensions
RFC 1619 PPP over SONET/SDH
RFC 1661 PPP
RFC 1662 PPP in HDLC-like Framing
RFC 1989 PPP Link Quality Monitoring
RFC 1990 The PPP Multilink Protocol (MP)
RFC 2686 The Multi-Class Extension to Multi-Link PPP

PSEUDOWIRES

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RFC 3985 Pseudo Wire Emulation Edge-to-Edge (PWE3) Architecture
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RFC 4446 IANA Allocation for PWE3
RFC 4447 Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP)
RFC 4448 Encapsulation Methods for Transport of Ethernet over MPLS Networks
RFC 4553 Structure-Agnostic Time Division Multiplexing (TDM) over Packet (SAToP)
RFC 4717 Encapsulation Methods for Transport of Asynchronous Transfer Mode (ATM) over MPLS Networks

RFC 5086 Structure-Aware Time Division Multiplexed (TDM) Circuit Emulation Service over Packet Switched Network (CESoPSN)

RFC 5085 Pseudowire Virtual Circuit Connectivity Verification (VCCV): A Control Channel for Pseudowires

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RADIUS

RFC 2865 Remote Authentication Dial In User Service

RFC 2866 RADIUS Accounting

RSVP-TE and FRR

RFC 2430 A Provider Architecture for DiffServ & TE

RFC 2961 RSVP Refresh Overhead Reduction Extensions

RFC 3209 Extensions to RSVP for LSP Tunnels

RFC 3210 Applicability Statement for Extensions to RSVP for LSP Tunnels

RFC 4090 Fast Reroute Extensions to RSVP-TE for LSP Tunnels

SONET/SDH

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SSH

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draft-ietf-secsh-userauth.txt SSH Authentication Protocol

draft-ietf-secsh-transport.txt SSH Transport Layer Protocol

draft-ietf-secsh-connection.txt SSH Connection Protocol

draft-ietf-secsh- newmodes.txt SSH Transport Layer Encryption Modes

SYNCHRONIZATION

G.813 Timing characteristics of SDH equipment slave clocks (SEC)

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TACACS+

draft-grant-tacacs-02.txt The TACACS+ Protocol

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RFC 768 UDP

RFC 791 IP

RFC 792 ICMP

RFC 793 TCP

RFC 826 ARP

RFC 854 Telnet

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TIMETRA-LDP-MIB.mib
TIMETRA-LOG-MIB.mib
TIMETRA-MPLS-MIB.mib
TIMETRA-OAM-TEST-MIB.mib
TIMETRA-PORT-MIB.mib
TIMETRA-PPP-MIB.mib
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