Alcatel·Lucent

Alcatel-Lucent 7705

SERVICE AGGREGATION ROUTER OS | RELEASE 4.0

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
ACK	acknowledge
ACL	access control list
ACR	adaptive clock recovery
ADP	automatic discovery protocol
AFI	authority and format identifier
AIS	alarm indication signal
ANSI	American National Standards Institute
Apipe	ATM VLL
APS	automatic protection switching
ARP	address resolution protocol
A/S	active/standby
AS	autonomous system

Acronym	Expansion
ASAP	any service, any port
ASBR	autonomous system boundary router
ASN	autonomous system number
ATM	asynchronous transfer mode
ATM PVC	ATM permanent virtual circuit
B3ZS	bipolar with three-zero substitution
Batt A	battery A
B-bit	beginning bit (first packet of a fragment)
Bellcore	Bell Communications Research
BFD	bidirectional forwarding detection
BGP	border gateway protocol
BITS	building integrated timing supply
BMCA	best master clock algorithm
BMU	broadcast, multicast, and unknown traffic Traffic that is not unicast. Any nature of multipoint traffic: • broadcast (that is, all 1s as the destination IP to represent all destinations within the subnet) • multicast (that is, traffic typically identified by the destination address, uses special destination address); for IP, the destination must be 224.0.0.0 to 239.255.255.255 • unknown (that is, the destination is typically a valid unicast address but the destination port/interface is not yet known; therefore, traffic needs to be forwarded to all destinations; unknown traffic is treated as broadcast)
BOF	boot options file
BPDU	bridge protocol data unit
BRAS	Broadband Remote Access Server
BSC	Base Station Controller
BSTA	Broadband Service Termination Architecture

Acronym	Expansion
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
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). CSM management ports are referred to as CPM management ports in the CLI.
CPU	central processing unit
CRC	cyclic redundancy check
CRON	a time-based scheduling service (from chronos = time)

Acronym	Expansion
CSM	Control and Switching Module
CSNP	complete sequence number PDU
CSPF	constrained shortest path first
C-TAG	customer VLAN tag
CV	connection verification customer VLAN (tag)
CW	control word
DC	direct current
DC-C	DC return - common
DCE	data communications equipment
DC-I	DC return - isolated
DCO	digitally controlled oscillator
DDoS	distributed DoS
DES	data encryption standard
DF	do not fragment
DHB	decimal, hexadecimal, or binary
DHCP	dynamic host configuration protocol
DHCPv6	dynamic host configuration protocol for IPv6
DIS	designated intermediate system
DM	delay measurement
DNS	domain name server
DoS	denial of service
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
DPI	deep packet inspection

Acronym	Expansion
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
DUID	DHCP unique identifier
DV	delay variation
e911	enhanced 911 service
EAP	Extensible Authentication Protocol
EAPOL	EAP over LAN
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
E&M	ear and mouth earth and magneto exchange and multiplexer
Epipe	Ethernet VLL
EPL	Ethernet private line
ERO	explicit route object
ESD	electrostatic discharge
ESMC	Ethernet synchronization message channel
ETE	end-to-end

Acronym	Expansion
ETH-CFM	Ethernet connectivity fault management (IEEE 802.1ag)
EVDO	evolution - data optimized
EVPL	Ethernet virtual private link
EXP bits	experimental bits (currently known as TC)
FC	forwarding class
FCS	frame check sequence
FDB	forwarding database
FDL	facilities data link
FEAC	far-end alarm and control
FEC	forwarding equivalence class
FF	fixed filter
FIB	forwarding information base
FIFO	first in, first out
FNG	fault notification generator
FOM	figure of merit
FRR	fast reroute
FTN	FEC-to-NHLFE
FTP	file transfer protocol
GFP	generic framing procedure
GigE	Gigabit Ethernet
GRE	generic routing encapsulation
GSM	Global System for Mobile Communications (2G)
HCM	high capacity multiplexing
HDB3	high density bipolar of order 3
HEC	header error control
HMAC	hash message authentication code

Acronym	Expansion
HSDPA	high-speed downlink packet access
HSPA	high-speed packet access
HVPLS	hierarchical virtual private line service
IANA	internet assigned numbers authority
IBN	isolated bonding networks
ICMP	Internet control message protocol
ICMPv6	Internet control message protocol for IPv6
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
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
IPIP	IP in IP
Ipipe	IP interworking VLL
IPoATM	IP over ATM
IS-IS	Intermediate System-to-Intermediate System
IS-IS-TE	IS-IS-traffic engineering (extensions)
ISO	International Organization for Standardization

Acronym	Expansion
LB	loopback
lbf-in	pound force inch
LBM	loopback message
LBO	line buildout
LBR	loopback reply
LCP	link control protocol
LDP	label distribution protocol
LER	label edge router
LFIB	label forwarding information base
LIB	label information base
LLDP	link layer discovery protocol
LLDPDU	link layer discovery protocol data unit
LLF	link loss forwarding
LLID	loopback location ID
LM	loss measurement
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
LSU	link-state update
LT	linktrace
LTE	line termination equipment
LTM	linktrace message
LTN	LSP ID to NHLFE

Acronym	Expansion
LTR	linktrace reply
MA	maintenance association
MAC	media access control
MA-ID	maintenance association identifier
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
MDDB	multidrop data bridge
MDL	maintenance data link
ME	maintenance entity
MED	multi-exit discriminator
MEF	Metro Ethernet Forum
MEG	maintenance entity group
MEG-ID	maintenance entity group identifier
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

Acronym	Expansion
MIR	minimum information rate
MLPPP	multilink point-to-point protocol
MP	merge point multilink protocol
MP-BGP	multiprotocol border gateway 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
MTIE	maximum time interval error
MTSO	mobile trunk switching office
MTU	maximum transmission unit multi-tenant unit
M-VPLS	management virtual private line service
MW	microwave
N·m	newton meter
NBMA	non-broadcast multiple access (network)
NE	network element
NET	network entity title
NHLFE	next hop label forwarding entry
NHOP	next-hop
NLRI	network layer reachability information
NNHOP	next next-hop
NNI	network-to-network interface

Acronym	Expansion
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
ORF	outbound route filtering
OS	operating system
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
OSSP	Organization Specific Slow Protocol
OTP	one time password
PADI	PPPoE active discovery initiation
PADR	PPPoE active discovery request
PAE	port authentication entities
PCP	priority point code
PDU	protocol data units
PDV	packet delay variation
PDVT	packet delay variation tolerance
PE	provider edge router
PHB	per-hop behavior

Acronym	Expansion
PHY	physical layer
PID	protocol ID
PIR	peak information rate
PLCP	Physical Layer Convergence Protocol
PLR	point of local repair
POP	point of presence
POS	packet over SONET
PPP	point-to-point protocol
PPPoE	point-to-point protocol over Ethernet
PRC	primary reference clock
PSN	packet switched network
PSNP	partial sequence number PDU
PTP	precision time protocol performance transparency protocol
PVC	permanent virtual circuit
PVCC	permanent virtual channel connection
PW	pseudowire
PWE	pseudowire emulation
PWE3	pseudowire emulation edge-to-edge
QL	quality level
QoS	quality of service
RADIUS	Remote Authentication Dial In User Service
RAN	Radio Access Network
RBS	robbed bit signaling
RD	route distinguisher
RDI	remote defect indication

Acronym	Expansion
RED	random early discard
RESV	reservation
RIB	routing information base
RJ-45	registered jack 45
RNC	Radio Network Controller
RRO	record route object
RS-232	Recommended Standard 232 (also known as EIA/TIA-232)
RSHG	residential split horizon group
RSTP	Rapid Spanning Tree Protocol
RSVP-TE	resource reservation protocol - traffic engineering
RT	receive/transmit
RTM	routing table manager
RTN	battery return
RTP	real-time protocol
R&TTE	Radio and Telecommunications Terminal Equipment
RTU	remote terminal unit
RU	rack unit
SAA	service assurance agent
SAP	service access point
SAR-8	7705 Service Aggregation Router - 8-slot chassis
SAR-18	7705 Service Aggregation Router - 18-slot chassis
SAR-F	7705 Service Aggregation Router - fixed form-factor chassis
SAToP	structure-agnostic TDM over packet
SCADA	surveillance, control and data acquisition
SCP	secure copy
SD	signal degrade

Acronym	Expansion
SDH	synchronous digital hierarchy
SDI	serial data interface
SDP	service destination point
SE	shared explicit
SF	signal fail
SFP	small form-factor pluggable (transceiver)
SGT	self-generated traffic
SHA-1	secure hash algorithm
SHG	split horizon group
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
SPF	shortest path first
SPT	shortest path tree
SR	service router (includes 7710 SR, 7750 SR)
SRLG	shared risk link group
SSH	secure shell
SSM	synchronization status messaging
SSU	system synchronization unit
S-TAG	service VLAN tag
STM1	synchronous transport module, level 1
SVC	switched virtual circuit

Acronym	Expansion
SYN	synchronize
TACACS+	Terminal Access Controller Access-Control System Plus
TC	traffic class (formerly known as EXP bits)
TCP	transmission control protocol
TDEV	time deviation
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
TPID	tag protocol identifier
TPMR	two-port MAC relay
TTL	time to live
TTM	tunnel table manager
U-APS	unidirectional automatic protection switching
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

Acronym	Expansion
VID	VLAN ID
VLAN	virtual LAN
VLL	virtual leased line
VoIP	voice over IP
Vp	peak voltage
VP	virtual path
VPC	virtual path connection
VPI	virtual path identifier
VPLS	virtual private LAN service
VPN	virtual private network
VPRN	virtual private routed network
VRF	virtual routing and forwarding table
VSE	vendor-specific extension
VSO	vendor-specific option
WCDMA	wideband code division multiple access (transmission protocol used in UMTS networks)
WRED	weighted random early discard
WTR	wait to restore

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 Installation Guide
- 7705 SAR-F Installation Guide
- 7705 SAR-18 Installation Guide
- 7705 SAR 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
- 7705 SAR DS3/E3 Adapter Card Installation Guide
- 7705 SAR 6-port E&M Adapter Card Installation Guide
- 7705 SAR Auxiliary Alarm 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, and user services.
- 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.
- 7705 SAR OS OAM and Diagnostics Guide

  This guide provides information on Operations, Administration and Maintenance (OAM) tools.

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

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
	Adapter cards	Configuring Adapter Cards
	Ports	Configuring Ports
Reference	List of IEEE, IETF, and other proprietary entities	Standards and Protocol Support

Notes on 7705 SAR-8, 7705 SAR-18, and 7705 SAR-F

The 7705 SAR-8, 7705 SAR-18, and 7705 SAR-F run the same operating system software. The main difference between the products is their hardware platforms.

The 7705 SAR-8 is an 8-slot chassis that supports 2 CSMs, a Fan module, and 6 adapter cards. The 7705 SAR-18 chassis has 18 slots; in Release 4.0, it supports 2 CSMs, a Fan module, an Alarm module, and 12 adapter cards.

The 7705 SAR-F chassis has a fixed hardware configuration. The 7705 SAR-F replaces the CSM, Fan module, and the 16-port T1/E1 ASAP Adapter card and 8-port Ethernet Adapter card 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, 7705 SAR-18, and 7705 SAR-F Comparison

7705 SAR-8, 7705 SAR-18	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	

Table 2: 7705 SAR-8, 7705 SAR-18, and 7705 SAR-F Comparison (Continued)

7705 SAR-8, 7705 SAR-18	7705 SAR-F	Notes
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, version 1, except that the 16 T1/E1 ports on the 7705 SAR-F support multiple synchronization sources to support two timing references. The 16-port T1/E1 ASAP Adapter card, version 2, also supports two timing references. On the 7705 SAR-8 and 7705 SAR-18, the CLI indicates the MDA type for the 16-port T1/E1 ASAP Adapter card as `a16-chds1` for version 1 and `a16-chds1v2` for version 2. On the 7705 SAR-F, the CLI indicates the MDA type for the 7705 SAR-F ports as `i16-chds1`.
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 +24 VDC version of the 7705 SAR-8 supports only version 2 of the 8-port Ethernet Adapter card. The 7705 SAR-18 supports only version 2 of the card. The Ethernet ports on the 7705 SAR-F are functionally 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. 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-18, the CLI indicates the MDA type as `a8-ethv2`. On the 7705 SAR-F, the CLI indicates the MDA type for the 7705 SAR-F Ethernet ports as `i8-eth`.
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 Notes on page 84
- Configuring Physical Components with CLI on page 85
- Card, Adapter Card, and Port Command Reference on page 137

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-sar**.

On the 7705 SAR-8 and 7705 SAR-18, 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

Note: Unless otherwise specified, references to the 16-port T1/E1 ASAP Adapter card and 8-port Ethernet Adapter card include both version 1 and version 2 of the cards. References to the 32-port T1/E1 ASAP Adapter card imply version 2 of the card.

A chassis slot and card type must be specified and provisioned before an adapter card can be provisioned. A chassis slot is a physical slot designated with an MDA ID from 1 to 6 on the 7705 SAR-8. For Release 4.0, the MDA ID on the 7705 SAR-18 can be 1 to 12. An adapter card is provisioned when a card designated from the allowed adapter card types is inserted. A preprovisioned adapter card slot can remain empty without conflicting with populated slots.

A maximum of six adapter cards can be installed in the 7705 SAR-8 chassis. The following adapter cards are supported:

- 16-port T1/E1 ASAP Adapter card (maximum of 6)
- 32-port T1/E1 ASAP Adapter card (maximum of 6)
- 12-port Serial Data Interface card (maximum of 6)
- 8-port Ethernet Adapter card (maximum of 6)
- 6-port E&M Adapter card (maximum of 6)
- 4-port DS3/E3 Adapter card (maximum of 6)
- 4-port OC3/STM1 Clear Channel Adapter card (maximum of 6)
- 2-port OC3/STM1 Channelized Adapter card (maximum of 2)
- Auxiliary Alarm card (maximum of 6)

For Release 4.0, a maximum of 12 adapter cards can be installed in the 7705 SAR-18 chassis. The following adapter cards are supported:

- 16-port T1/E1 ASAP Adapter card (maximum of 12)
- 32-port T1/E1 ASAP Adapter card (maximum of 12)
- 8-port Ethernet Adapter card version 2 (maximum of 12)
- 4-port DS3/E3 Adapter card (maximum of 12)
- 4-port OC3/STM1 Clear Channel Adapter card (maximum of 12)
- 2-port OC3/STM1 Channelized Adapter card (maximum of 4)
- Auxiliary Alarm card (maximum of 12)

The adapter cards can be installed in the chassis in any combination that does not exceed the maximum number. However, network applications require at least one network-capable adapter card to be installed as part of the mix.

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 sample outputs display the administrative and operational states of adapter cards in a 7705 SAR-8 and 7705 SAR-18 chassis. A similar output for the 7705 SAR-F is also shown.

For the 7705 SAR-8:

```
ALU-1>show card state

===============================================================================
Card State
===============================================================================
Slot/  Provisioned      Equipped         Admin Operational   Num   Num Comments
Id     Type             Type             State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-sar          iom-sar          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    a4-chds3                          up    provisioned   4
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
===============================================================================
ALU-1>show#
```

For the 7705 SAR-18 (Release 4.0):

```
ALU-1>show card state

===============================================================================
Card State
===============================================================================
Slot/  Provisioned      Equipped         Admin Operational   Num   Num Comments
Id     Type             Type             State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-sar          iom-sar          up    up                  12
1/1    aux-alarm        aux-alarm        up    up
1/2    a8-ethv2         a8-ethv2         up    up            8
1/3    a8-ethv2         a8-ethv2         up    up            8
1/4    a8-ethv2                          up    provisioned   8
1/5    a8-ethv2                          up    provisioned   8
1/6    a32-chds1v2      a32-chds1v2      up    up            32
1/7    a32-chds1v2      a32-chds1v2      up    up            32
1/8    a32-chds1v2                       up    provisioned   32
1/9    a32-chds1v2                       up    provisioned   32
1/10   a4-oc3                            up    provisioned   4
1/11   a4-chds3                          up    provisioned   4
1/12   a2-choc3                          up    provisioned   2
A      csm-10g          csm-10g          up    up                      Active
B      csm-10g                           up    down                    Standby
==============================================================================
ALU-1>show#
```

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-sar          iom-sar          up    up            2
1/1    i16-chds1        i16-chds1        up    provisioned   16
1/2    i8-eth           i8-eth           up    provisioned   8
A      csm-1g           csm-1g           up    up                      Active
===============================================================================
ALU-1#
```

Channelized Adapter Card Support

Note: The 6-port E&M Adapter card and 12-port Serial Data Interface card are not supported on the 7705 SAR-18 in Release 4.0.

Each 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, 12-port Serial Data Interface card, 6-port E&M Adapter card, and 2-port OC3/STM1 Channelized Adapter card supports channelization down to channel group DS0.

On the 16-port T1/E1 ASAP Adapter card, 32-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 V.35 circuit, RS-232 (also known as EIA/TIA-232) circuit, or X.21 circuit. The 6-port E&M Adapter card supports a single channel group on a channelized E&M voice interface.

PPP Over Fractional T1/E1

The 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card each support fractional T1/E1 on a PPP channel group in network mode. Fractional T1/E1 allows one or more DS0 channels to be bundled together (up to the maximum bandwidth of the network link), allowing the customer to use only that portion of the link that is needed. This means that the PPP service can use a selected number of timeslots (octets) in the network T1 or E1 link, thus reducing the amount of T1 or E1 bandwidth that must be leased or purchased from the attached carrier. This leads to multiplexing efficiencies in the transport network.

Only one channel group can be configured per port. When the channel group is configured for ppp-auto encapsulation and network mode, all timeslots (channels) are automatically allocated to the channel group. The user can then configure the number of timeslots needed. Timeslots not selected cannot be used.

Configuring Ports

Note: Voice ports provided by the 6-port E&M Adapter card and serial ports provided by the 12-port Serial Data Interface card are not supported on the 7705 SAR-18 in Release 4.0.

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 card (the 7705 SAR-18 only supports version 2) has six RJ-45 ports for 10/100BASE-T (Ethernet and Fast Ethernet) connections. The card also has 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 8-port Ethernet Adapter card to be connected to different devices at the customer site, including wireless base stations, 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, 32-port T1/E1 ASAP Adapter card, 2-port OC3/STM1 Channelized Adapter card, and 4-port DS3/E3 Adapter card support TDM ports.

  On the 16-port T1/E1 ASAP Adapter card and 32-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 and 32-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 and 32-port T1/E1 ASAP Adapter card must be set to the same type.

  The 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card each support fractional T1/E1 on network ports configured for PPP. Fractional T1/E1 allows a portion of the link to be used for traffic (up to the full link bandwidth).

  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.

  The 4-port DS3/E3 Adapter card has four DS3/E3 clear channel ports. In access mode, the DS3 ports can be configured for ATM (E3 ports do not support ATM in Release 4.0). In network mode, the DS3/E3 ports can be configured for PPP. All ports must be set to DS3 or E3. Once the first port has been configured, all other ports on the same 4-port DS3/E3 Adapter card must be set to the same type.

To change between types, the ports must first be deleted. DS3 ports provide B3ZS (bipolar with three-zero substitution) zero code suppression and E3 ports provide HDB3 (high density bipolar of order 3) zero code suppression. B3ZS and HDB3 zero code suppression are line coding techniques used to maintain proper clock rate synchronization.

- 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 V.35, RS-232, or X.21 operation. When a port has been configured for a specific interface type, the other two ports in that same grouping can only be configured for the same type.

  Channelization on the 12-port Serial Data Interface card is supported down to the DS0 level. By setting the encapsulation type to circuit emulation (cem), the card can be configured to support TDM pseudowires.
- multilink bundles — the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, and 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, 32-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 — 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).
- voice — the 6-port E&M Adapter card card has six RJ-45 ports that support the transport of an analog voiceband signal between two analog devices over a digital network. The analog signals are converted into a 64 kb/s digital Pulse Code Modulation (PCM) format using either Mu-Law (North America) or A-Law (Rest of World) companding. The type of companding is selectable on a per-card basis. Companding conversion (that is, Mu-Law to A-Law or vice versa) is not supported.

  The signaling type is selectable on a per-card basis depending on companding type. When A-Law companding is configured, the signaling type is automatically Type V.

When Mu-Law companding is configured, either Type I or Type II signaling can be selected.

Each voice port can be configured to operate in either a two-wire or four-wire (default) mode. The ports (in groups of three – ports 1 to 3 and ports 4 to 6) can also be configured to operate in transmission-only mode, which provides a four-wire audio path with no signaling. A transmit and receive transmission level point (the analog-to-digital decibel level) can be configured for each port. See Table 3 for the signaling type, companding law and audio wires configuration options on the 6-port E&M Adapter card.

Table 3: Configuration Options for the 6-port E&M Adapter Card

Signaling Type	Companding Type	Number of Wires
Type I, Type II	Mu-Law	Two-wire or four-wire
Type V	A-Law	Two-wire or four-wire
Transmission-only (no signaling)	Mu-Law or A-Law	Four-wire

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, 16-port T1/E1 ASAP Adapter card, and 32-port 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 V.35, RS-232, or X.21 channel group; only one channel group is supported on the card, so the format would be 1/1/1.1. For the 6-port E&M Adapter card, the *channel-group-id* identifies the E&M voice channel group; only one channel group is supported on the card, so the format would be 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 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card can be ipcp, cem, or atm.

  On the 12-port Serial Data Interface card and 6-port E&M Adapter card, the encapsulation type must be cem.

  The encapsulation type on the 8-port Ethernet Adapter card can be set as null or dot1q.

  On the 4-port DS3/E3 Adapter card (DS3 ports only) and 4-port OC3/STM1 Clear Channel Adapter card, the encapsulation type must be atm.

  On the 2-port OC3/STM1 Channelized Adapter card, the encapsulation type can be cem or atm.
- network ports — configured for network-facing traffic. Network ports are used as uplinks for Ethernet, ATM, PPP, and TDM pseudowires. On Ethernet cards, the encapsulation type can be set as null or dot1q. On the 16-port T1/E1 ASAP Adapter card, 32-port 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 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card, the encapsulation type must be ppp-auto for fractional T1/E1. On the 4-port OC3/STM1 Clear Channel Adapter card configured for POS and on the 4-port DS3/E3 Adapter card, the encapsulation type must be ppp-auto.

The default mode for the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, 8-port Ethernet Adapter card, 4-port DS3/E3 Adapter card, and 2-port OC3/STM1 Channelized Adapter card is access. 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 and 6-port E&M Adapter card can operate in access mode only.

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.

Access Ports

Access ports on the 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter 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.

In access mode, PPP channels on the 16-port T1/E1 ASAP Adapter card and 32-port 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.

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.

Access ports on the 8-port 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.

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

The voice ports on the 6-port E&M Adapter card provide voice band transmission between two analog devices over a digital network. The 7705 SAR terminates the voice circuit and then transmits the data over a TDM-based network interface (SAP-to-SAP) or an MPLS packet-based network interface (SAP-to-SDP). For standard TDM, a T1 or E1 interface is used to transmit the data across the network. For MPLS, any network interface (that is, Ethernet or T1/E1 MLPPP, or OC3/STM1) can be used. The traffic originating from the 6-port E&M Adapter card can be mapped into a TDM pseudowire (Cpipe) for transport across the MPLS network. The 6-port E&M Adapter card supports one TDM pseudowire per port.

A voice circuit originating on the 7705 SAR can terminate on another 7705 SAR over an MPLS or T1/E1 TDM connection, on other TDM-capable equipment (such as a 3600 MainStreet node) over a T1/E1 TDM connection, or on other MPLS-capable equipment over an MPLS pseudowire emulation (PWE) connection.

Typical analog E&M applications are:

- electrical utilities, which utilize teleprotection equipment to relay protection control signals along portions of an electrical grid. When analog signaling is used, specific voice band tones are continuously transmitted between the protection devices. When a fault occurs, the tone frequency is changed, causing the far-end protection device to perform an action.
- railways, to connect remote radio base stations used for train control and train-to-train voice communications (similar to LMR radio)
- air traffic control networks, to interconnect remote radar and air/ground radio locations back to a regional air traffic control center. The air/ground radios use analog E&M voice interfaces between the central switch and the remote sites.
- utilities and police and fire departments, to interconnect LMR radio networks over an MPLS backbone

The DS3 access ports on the 4-port DS3/E3 Adapter card can be configured for ATM PW services (categories CBR, VBR-rt, VBR-nrt, UBR, and UBR+MCR).

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).

Access ports on the 2-port OC3/STM1 Channelized Adapter card can 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.

Network Ports

For network uplinks on the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, and 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.

On the 4-port DS3/E3 Adapter card, a DS3/E3 clear channel port can be configured for PPP as the network uplink. The encapsulation type must be set 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

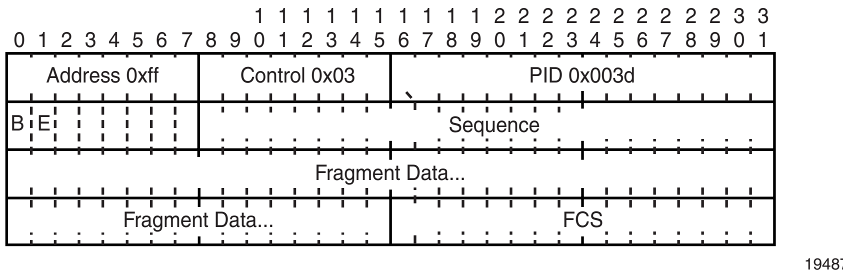
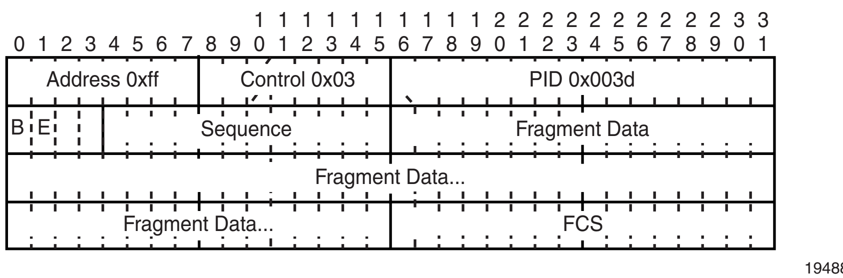


Figure 2: MLPPP 12-bit Fragment Format



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 in the sections that follow.

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

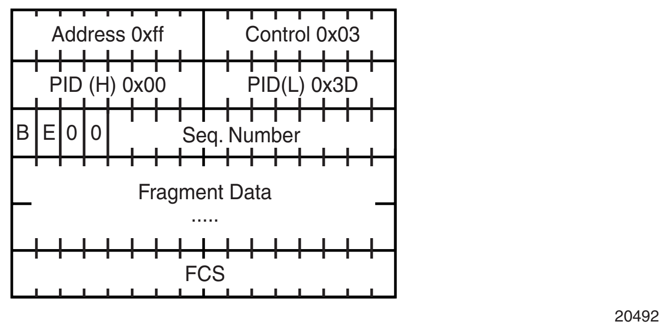
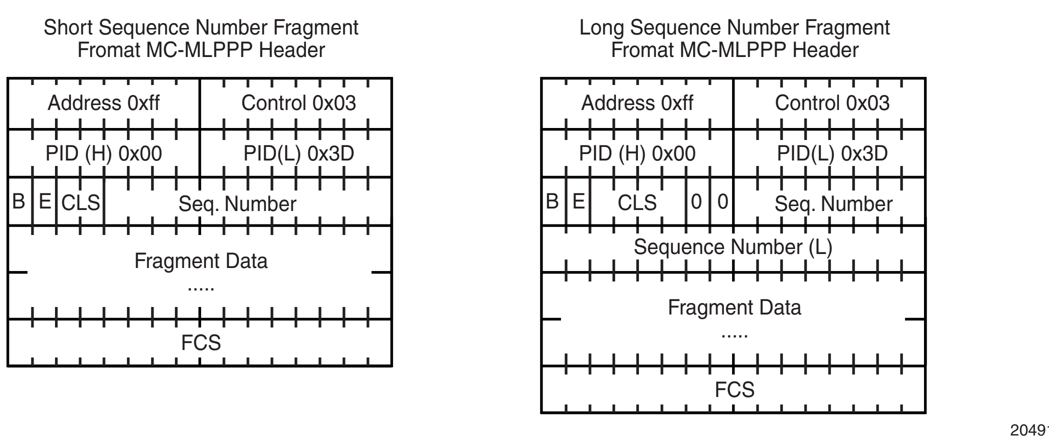


Figure 4: MC-MLPPP Header Format



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 4.

Table 4: 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 5.

Table 5: 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
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 16-port T1/E1 ASAP Adapter cards and 32-port T1/E1 ASAP Adapter 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 and Circuits

The 7705 SAR provides network synchronization on T1/E1 and Ethernet ports, and on SONET/SDH and DS3/E3 ports. The 7705 SAR also supports network synchronization on T1/E1 CES circuits.

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 and 7705 SAR-18, line timing is supported by the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, and by the 8-port Ethernet Adapter card version 2 on two Ethernet SFP ports with SFPs that support Synchronous Ethernet.

Synchronous Ethernet is a variant of line timing and is automatically enabled on ports and SFPs that support it. The operator can select a Synchronous Ethernet port as a candidate for the 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 loop-timed (recovered from an Rx line) or node-timed (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.

Network Synchronization on DS3/E3 Ports

Each DS3/E3 port on the 4-port DS3/E3 Adapter card can be loop-timed (recovered from an Rx line) or node-timed (recovered from the SSU in the active CSM). One loop-timed DS3/E3 port per card can be configured to be a timing source for the SSU.

Network Synchronization on T1/E1 Circuits

T1/E1 CES circuits on the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, and 2-port OC3/STM1 Channelized Adapter card can be loop-timed (recovered from an Rx line) or node-timed (recovered from the SSU in the active CSM). T1/E1 CES circuits on the 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card also support adaptive timing (clocking is derived from incoming TDM pseudowire packets).

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 FIFO buffers 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 or access 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 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 and access Ethernet ports, and is configured at the Ethernet port level. 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, IS-IS, or BGP 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, "Ethernet VLL (Epipe) Services", and the 7705 SAR OS OAM and Diagnostics Guide, "Ethernet OAM Capabilities".

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.

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

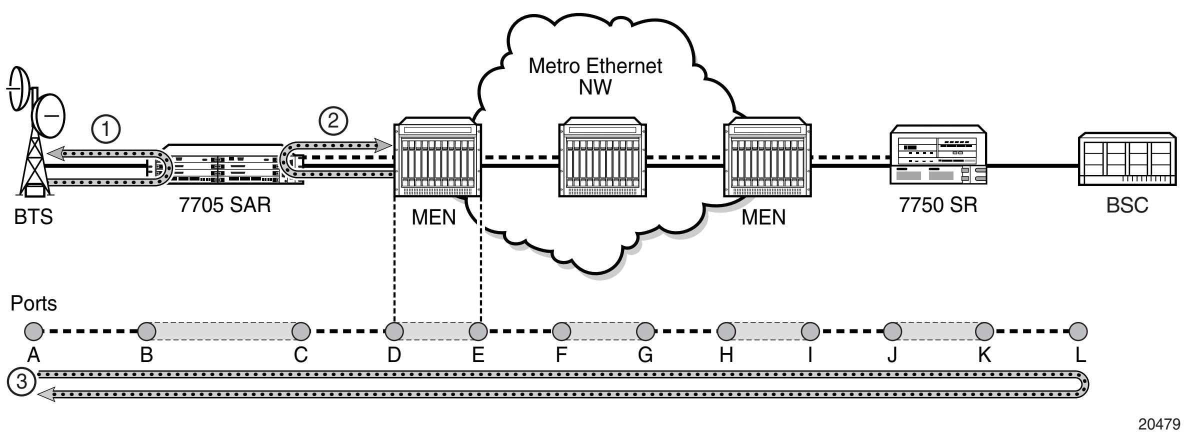
Customers who subscribe to Epipe service might have customer equipment running 802.3ah at both ends. The 7705 SAR can be configured to tunnel EFM OAMPDUs received from a customer device to the other end through the existing network using MPLS or GRE, or to terminate received OAMPDUs at a network or an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

When a dying gasp is received from a peer, the node logs the event and generates an SNMP trap to notify the operator.

Ethernet Loopbacks

The 7705 SAR supports the following loopbacks on Ethernet ports:

→ timed line loopbacks
→ timed line loopbacks with MAC address swapping
→ both timed and untimed internal loopbacks (equipment loopbacks)
→ CFM loopbacks for OAM

Line and Internal Ethernet Loopbacks

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.

Similarly, a line loopback with MAC addressing loops frames received on the corresponding port back towards the transmit direction, and swaps the source and destination MAC addresses before transmission. See MAC Swapping for more information.

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.

MAC Swapping

Typically, an Ethernet port loopback only echoes back received frames. That is, the received source and destination MAC addresses are not swapped. However, not all Ethernet equipment supports echo mode, where the original sender of the frame must support receiving its own port MAC address as the destination MAC address.

The MAC swapping feature on the 7705 SAR is an optional feature that will swap the received destination MAC address with the source MAC address when an Ethernet port loopback is in line mode. After the swap, the FCS is recalculated to ensure the validity of the Ethernet frame and to ensure that the frame is not dropped by the original sender due to CRC error.

Interaction of Ethernet Port Loopback with Other Features

EFM OAM and line loopback are mutually exclusive. If one of these functions is enabled, it must be disabled before the other can be used.

However, a line loopback precedes the dot1x behavior. That is, if the port is already dot1x-authenticated it will remain so. If it is not, EAP authentication will fail.

CFM Loopbacks for OAM on Ethernet Ports

Connectivity fault management (CFM) loopback support for loopback messages (LBMs) on Ethernet ports allows operators to run standards-based Layer 1 and Layer 2 OAM tests on ports receiving unlabeled packets.

Prior to Release 4.0, the 7705 SAR supported CFM MEPs associated with different endpoints (that is, spoke SDP down MEPs, and SAP up and SAP down MEPs). In addition, for traffic received from an uplink (network ingress), the 7705 SAR supported CFM only for labeled packets. Release 4.0 adds CFM LBM support for unlabeled packets. CFM loopbacks are applied to the Ethernet port.

Refer to the 7705 SAR OS OAM and Diagnostics Guide, “Ethernet OAM Capabilities”, for information on CFM MEPs.

Figure 6 shows an application where an operator leases facilities from a transport network provider in order to transport traffic from a cell site to their MTSO. The operator leases a certain amount of bandwidth between the two endpoints (the cell site and the MTSO) from the transport provider, who offers Ethernet Virtual Private Line (EVPL) or Ethernet Private Line (EPL) PTP service. Before the operator offers services on the leased bandwidth, the operator runs OAM tests to verify the SLA. Typically, the transport provider (MEN provider) requires that the OAM tests be run in the direction of (towards) the first Ethernet port that is connected to the transport network. This is done in order to eliminate the potential effect of queuing, delay, and jitter that may be introduced by a spoke SDP or SAP.

Figure 6: CFM Loopback on Ethernet Ports

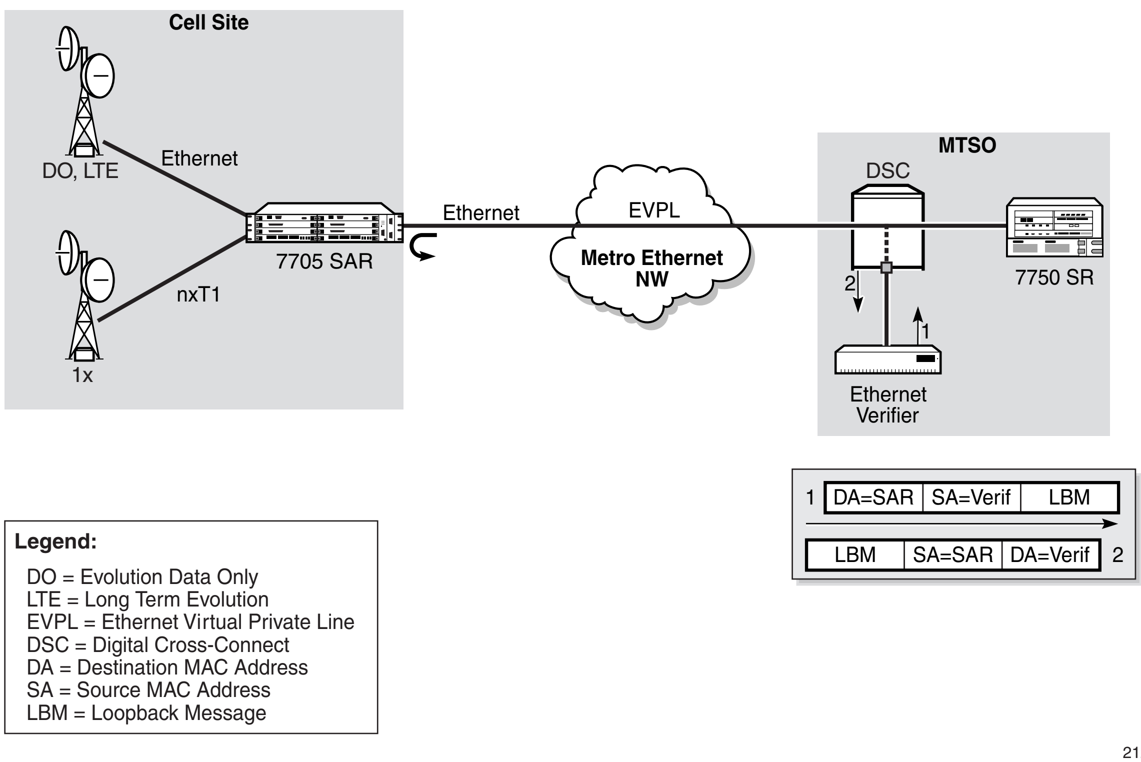


Figure 6 shows an Ethernet verifier at the MTSO that is directly connected to the transport network (in front of the 7750 SR). Thus, the Ethernet OAM frames are not label-encapsulated. Given that Ethernet verifiers do not support label operations and the transport provider mandates that OAM tests be run between the two hand-off Ethernet ports, the verifier cannot be relocated behind the 7750 SR node at the MTSO. Therefore, CFM loopback frames received are not MPLS-encapsulated, but are simple Ethernet frames where the `type` is set to CFM (dot1ag or Y.1731).

CFM Loopback Mechanics

The following list contains important facts to consider when working with CFM loopbacks:

- CFM loopbacks can be enabled on a per-port basis, and:
  - → the port can be in access or network mode
  - → once enabled on a port, all received LBM frames are processed, regardless of the VLAN and the service that the VLAN or SAP is bound to
  - → there is no associated MEP creation involved with this feature; therefore, no domain, association, or similar checks are performed on the received frame
  - → upon finding a destination address MAC match, the LBM frame is sent to the CFM process
- received LBM frames undergo no queuing or scheduling in the ingress direction
- at egress, loopback reply (LBR) frames are stored in their own queue; that is, a separate new queue is added exclusively for LBR frames
- users can configure the way a response frame is treated among other user traffic stored in network queues; the configuration options are high-priority or low-priority
- for network egress, where profiled scheduling is enabled, the following conditions apply:
  - → **high-priority**: either cir = port_speed, which applies to all frames that are scheduled via an in-profile scheduler; or round-robin (RR) for all other (network egress queue) frames that are in-profile
  - → **low-priority**: either cir = 0, pir = port_speed, which applies to all frames that are scheduled as out-of-profile, or RR for all other frames that are out-of-profile
- for network egress or access egress, where 4-priority scheduling is enabled:
  - → **high-priority**: either cir = port_speed, which applies to all frames that are scheduled via an expedited in-profile scheduler, or RR for all other (network egress queue) frames that reside in expedited queues and are in an in-profile state
  - → **low-priority**: either cir = 0, pir = port_speed, which applies to all frames that are scheduled via a best effort out-of-profile scheduler, or RR for all other frames that reside in best-effort queues and are in an out-of-profile state
- the above queue parameters and scheduler mappings are all preconfigured and cannot be altered. The desired QoS treatment is selected by enabling the CFM loopback and specifying high priority or low priority.

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.

For IPv4, 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.

For IPv6, the router cannot fragment the packet so must discard it. An ICMP message “Packet too big” is sent back to the source node and it performs the fragmentation.

As a source of self-generated traffic, the 7705 SAR can perform packet fragmentation.

Default MTU Values

Table 6 displays the default and maximum port MTU values that are dependent upon the port type, mode, and encapsulation type.

Table 6: 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
TDM (PPP/MLPPP)	Network	ppp-auto	1572	2090
SONET/SDH	Access	atm	1524	1524
SONET/SDH	Network	ppp-auto	1572	2090

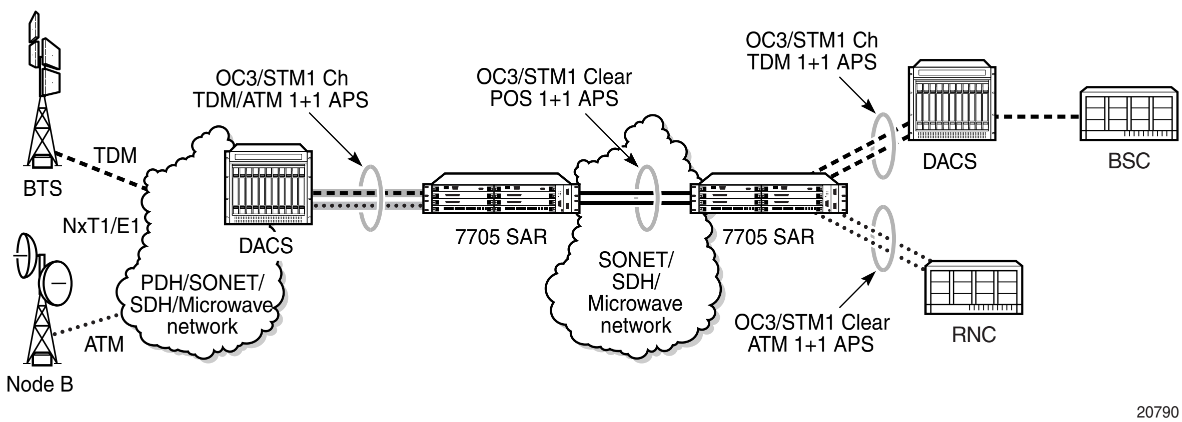
For more information on MTU (in particular, as they apply to services), refer to the 7705 SAR OS Services Guide. For information on encapsulation, refer to the 7705 SAR OS Quality of Service Guide.

Automatic Protection Switching

Automatic Protection Switching (APS) allows users to protect a SONET/SDH port or link with a backup (protection) facility of the same speed but from a different adapter card in the same chassis. APS provides protection against a port, signal, or adapter card failure. The 7705 SAR supports 1+1 APS protection in compliance with GR-253-CORE and ITU-T Recommendation G.841 to provide SONET/SDH carrier-grade reliability. All SONET/SDH paths and channels within a SONET/SDH port are protected.

Figure 7 shows a packet network that uses APS. The APS equipment constantly monitors the health of the APS links, APS ports, and APS-equipped adapter cards. If the signal on the active (working) port degrades or fails, the network proceeds through a predefined sequence of steps to transfer (or switch over) traffic processing to the protection port. This switchover is done very quickly to minimize lost traffic. Traffic is streamed from the protection port until the working port fault is cleared, at which time the traffic may optionally be reverted to the working port.

Figure 7: 1+1 APS



Note: In Release 4.0, 1+1 APS is supported only on the 4-port OC3/STM1 Clear Channel Adapter card network side (configured for POS operation). Support for 1+1 APS on other cards and other port modes is shown in Figure 7 as an example of future functionality.

1+1 APS is supported on the 4-port OC3/STM1 Clear Channel Adapter card when configured for POS. Unidirectional and bidirectional APS modes are supported:

- unidirectional APS (Uni-1Plus1) — in unidirectional mode, only the port in the failed direction switches to the protection port
- bidirectional APS — in bidirectional mode, a failure in either direction causes both the near-end and far-end equipment to switch to the protection port in each direction. Bidirectional mode is the default mode.

K1 and K2 bytes

The APS protocol uses the K1 and K2 bytes of the SONET/SDH header to exchange commands and replies between the near and far end.

The switch priority of a request is assigned by bits 1 through 4 of the K1 byte, as shown in Table 7.

Table 7: K1 Byte Switch Priorities

Bits	Condition
1111	Lockout of Protection
1110	Forced Switch
1101	SF - High Priority (not used in 1+1 APS)
1100	SF - Low Priority
1011	SD - High Priority (not used in 1+1 APS)
1010	SD - Low Priority
1001	Not used
1000	Manual Switch
0111	Not used
0110	Wait-to-Restore
0101	Not used
0100	Exercise
0011	Not used
0010	Reverse Request

Table 7: K1 Byte Switch Priorities (Continued)

Bits	Condition
0001	Do Not Revert
0000	No Request

In unidirectional mode, the K1 and K2 bytes are not used to coordinate switch action; however, the K1 byte is still used to inform the other end of the local action, and bit 5 of the K2 byte is set to 0 to indicate 1+1 APS mode (see Table 8).

In bidirectional mode, the highest-priority local request is compared to the remote request (received from the far-end node using an APS command), and whichever request has the greater priority is selected. The requests can be automatically initiated (such as Signal Failure or Signal Degrade), external (such as Lockout, Forced Switch, Request Switch), or state requests (such as Revert-Time timers).

The channels requesting the switch action are assigned by bits 5 through 8. Only channel number codes 0 and 1 are supported on the 7705 SAR. If channel 0 is selected, the condition bits show the received protection channel status. If channel 1 is selected, the condition bits shows the received working channel status.

The K2 byte is used to indicate bridging actions performed at the line termination equipment (LTE), the provisioned architecture, and mode of operation, as shown in Table 8.

Table 8: K2 Byte Functions

Bits	Function	
1 to 4	—	Channel number codes
5	0	Provisioned for 1+1 mode
	1	Provisioned for 1:n mode
6 to 8	111	Line AIS
	110	Line RDI
	101	Provisioned for bidirectional switching
	100	Provisioned for unidirectional switching
	011	Reserved for future use
	010	Reserved for future use

Table 8: K2 Byte Functions (Continued)

Bits	Function	
	001	Reserved for future use
	000	Reserved for future use

Bidirectional 1+1 APS example

Table 9 outlines the steps that the bidirectional APS process will go through during a typical automatic switching event. The example is read row by row, from left to right, to provide the complete process of the bidirectional switching event.

Table 9: 1+1 APS for Bidirectional Mode – Actions Taken

Status	APS Commands Sent in K1 and K2 Bytes on Protection Line		Action	
	B to A	A to B	At Site B	At Site A
No failure (protection line is not in use)	"No request"	"No request"	No action	No action
Working line degraded in direction A to B	"SD" on working channel 1	"No request"	Failure detected, notify A and switch to protection line	No action
Site A receives SD failure condition	Same	"Reverse request"	No action	Remote failure detected, acknowledge and switch to protection line
Site B receives "Reverse request"	Same	Same	No action	No action

Revertive Mode

1+1 APS provides revertive and non-revertive modes; non-revertive mode is the default option. In revertive mode, the activity is switched back to the working port after the working line has recovered from a failure (or the manual switch is cleared). In non-revertive mode, a switch to the protection line is maintained even after the working line has recovered from a failure (or the manual switch is cleared).

To prevent frequent automatic switches that result from intermittent failures, a revert-time is defined for revertive switching. The revert-time is configurable from 1 to 60 min in increments of 1 min; the default value is 5 min. Any change in the revert-time value takes effect upon the next initiation of the wait-to-restore (WTR) timer. The change does not modify the length of a WTR timer that has already been started. The WTR timer of a non-revertive switch can be assumed to be infinite.

If both working and protection lines fail, the line that has less-severe errors will be active. If there is signal degradation on both ports, the active port that failed last will stay active. If there is signal failure on both ports, the working port will always be active because signal failure on the protection line is a higher priority than on the working line.

Lockout Protection

The lockout protection command (`tools>perform>aps>lockout`) disables use of the protection line. Since the command has the highest priority, a failed working line using the protection line is switched back to itself even if it is in a fault condition. No switches to the protection line are allowed when the line is locked out. Refer to the 7705 SAR OS OAM and Diagnostics Guide, “Tools”, for information on the APS lockout command.

Request Switch of Active to Protection

The request or manual switch of active to protection command (`tools>perform>aps>request`) switches the active line to use the protection line (by issuing a manual switch request) unless a request of equal or higher priority is already in effect. If the active line is already on the protection line, no action takes place. Refer to the 7705 SAR OS OAM and Diagnostics Guide, “Tools”, for information on the APS request command.

Request Switch of Active to Working

The request or manual switch of active to working command (`tools>perform>aps>request`) switches the active line back from the protection line to the working line (by issuing a manual switch request) unless a request of equal or higher priority is already in effect. If the active line is already on the working line, no action takes place. Refer to the 7705 SAR OS OAM and Diagnostics Guide, “Tools”, for information on the APS request command.

Forced Switch of Working to Protection

The forced switch of working to protection command (`tools>perform>aps>force`) switches the active line to the protection line (by issuing a forced switch request) unless a request of equal or higher priority is already in effect. When the forced switch of working to protection command is in effect, it may be overridden either by a lockout of protection command or by detecting a signal fault on the protection line. If the active line is already on the protection line, no action takes place. Refer to the 7705 SAR OS OAM and Diagnostics Guide, “Tools”, for information on the APS force command.

Forced Switch of Active to Working

The forced switch of active to working command (`tools>perform>aps>force`) switches the active line back from the protection line to the working line (by issuing a forced switch request) unless a request of equal or higher priority is already in effect. Refer to the 7705 SAR OS OAM and Diagnostics Guide, “Tools”, for information on the APS force command.

Exercise

The exercise command (`tools>perform>aps>exercise`) is only supported in 1+1 APS bidirectional mode. The Exercise command exercises the protection line by sending an exercise request over the protection line to the far end and expecting a reverse request response back. The switch is not completed during the exercise routine. Refer to the 7705 SAR OS OAM and Diagnostics Guide, “Tools”, for information on the APS exercise command.

1+1 APS Failure Codes

Protection Switching Byte Failure (APS-PSB)

This failure indicates that the received K1 byte is either invalid or inconsistent. An invalid code defect occurs if the same K1 value is received for three consecutive frames and is either an unused code or irrelevant for the specific switching operation. An inconsistent code defect occurs when no 3 consecutive received K1 bytes of the last 12 frames are the same.

If the failure persists for 2.5 s, a Protection Switching Byte alarm is raised. When this failure is declared, the protection line is treated as if it were in the SF state. The received signal is then selected from the working line.

When the failure is absent for 10 s, the alarm is cleared and the SF state of the protection line is removed.

This alarm can only be raised by the active port operating in bidirectional mode.

Channel Mismatch Failure (APS-CM)

This failure indicates that there is a channel mismatch between the transmitted K1 bytes and the received K2 bytes. A defect is declared when the received K2 channel number differs from the transmitted K1 channel number for more than 50 ms after 3 identical K1 bytes are sent. The monitoring for this condition is continuous, not just when the transmitted value of K1 changes.

If the failure persists for 2.5 s, a Channel Mismatch Failure alarm is raised. When this failure is declared, the protection line is treated as if it were in the SF state. The received signal is then selected from the working line.

When the failure is absent for 10 s, the alarm is cleared and the SF state of the protection line is removed.

This alarm can only be raised by the active port operating in bidirectional mode.

APS Mode Mismatch Failure (APS-MM)

This failure can occur for two reasons. The first reason is that the received K2 byte indicates that 1:N protection switching is being used by the far end of the OC-N line, rather than 1+1 protection switching. The second reason is that the received K2 byte indicates that unidirectional mode is being used by the far end while the near end is using bidirectional mode. This defect is detected within 100 ms of receiving a K2 byte that indicates either of these conditions.

If the failure persists for 2.5 s, a Mode Mismatch Failure alarm is raised. When this failure is declared, if the defect indicates that the far end is configured for unidirectional mode, then the OC-N port reverts from its current bidirectional mode to unidirectional mode. However, the port continues to monitor the received K2 byte, and if the K2 byte indicates that the far end has switched to bidirectional mode, the OC-N port then reverts to bidirectional mode as well. The monitoring stops if the user explicitly reconfigures the local port to operate in unidirectional mode.

When the failure is absent for 10 s, the alarm is cleared, and the configured mode, which is 1+1 bidirectional, is used.

This alarm can only be raised by the active port operating in bidirectional mode.

Far-End Protection Line Failure (APS-FEPL)

This failure occurs when a K1 byte is received in three consecutive frames that indicates a signal fail (SF) at the far end of the protection line. This failure forces the received signal to be selected from the working line.

If the failure persists for 2.5 s, a Far-End Protection Line Failure alarm is raised.

When the failure is absent for 10 s, the alarm is cleared.

This alarm can only be raised by the active port operating in bidirectional mode.

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 are displayed if there are inconsistencies, and the card will not initialize. When the proper preprovisioned cards are installed into the appropriate chassis slot, then alarm, status, and performance details will be displayed on the CLI.

802.1x Network Access Control

The 7705 SAR supports network access control over client devices on an Ethernet network using the IEEE 802.1x standard. 802.1x is a standard for authenticating Ethernet devices before they can access the network. In the case of the 7705 SAR, authentication is performed using Extensible Authentication Protocol (EAP) over LAN (EAPOL).

802.1x provides protection against unauthorized access by forcing the device connected to the 7705 SAR to go through an authentication phase before it is able to send any non-EAP packets. Only EAPOL frames can be exchanged between the aggregation device (called the authenticator; for example, the 7705 SAR) and the customer device (called the supplicant) until authentication is successfully completed. The 7705 SAR enables the port after successful authentication. While the port is unauthenticated, the port will be "down" to all upper layer protocols or services.

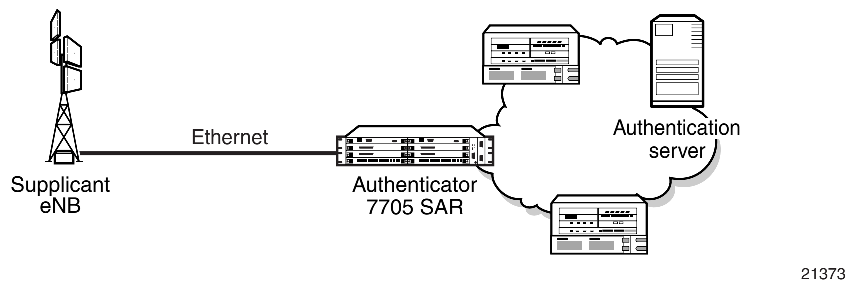
A typical use for EAPOL would involve a 7705 SAR and some type of Ethernet device, such as a laptop, a set-top box, or a Node B. An authentication server would negotiate with the Ethernet device through the 7705 SAR (whose role is authenticator). For example, a technician using a laptop to gain access to his or her network at a cell site would have his or her laptop subject to the 802.1x access control, just as the Node B would. In every case, the Ethernet device connected to the 7705 SAR must negotiate for network access. Essentially, with EAPOL in use, any Ethernet device that connects to the 7705 SAR must negotiate for permission to send traffic through the 7705 SAR Ethernet port.

802.1x Basics

The IEEE 802.1x standard defines three participants in an authentication conversation (see Figure 8):

- the supplicant — the end-user device that requests access to the network
- the authenticator — controls access to the network. Both the supplicant and the authenticator are referred to as Port Authentication Entities (PAEs).
- the authentication server — performs the actual processing of the user information

Figure 8: 802.1x Architecture



The authentication exchange is carried out between the supplicant and the authentication server; the authenticator acts only as a bridge. The communication between the supplicant and the authenticator is done using EAPOL. The communication between the authenticator and the authentication server is done using the RADIUS protocol. The authenticator is therefore a RADIUS client, and the authentication server is a RADIUS server.

Figure 9 shows an example of the messages transmitted during an authenticator-initiated One Time Password (OTP) authentication process.

Note: OTP is one of many authentication mechanisms that are available for use between the supplicant and the authentication server. These authentication mechanisms (protocols) are transparent to the 7705 SAR.

The authenticator initiates the procedure when the Ethernet port becomes operationally up, by sending a special PDU called an EAP-Request/ID to the supplicant. The supplicant can also initiate the exchange by sending an EAPOL-start PDU, if it doesn't receive the EAP-Request/ID frame during bootup. The supplicant responds to the EAP-Request/ID with an EAP-Response/ID frame containing its identity (typically username + password).

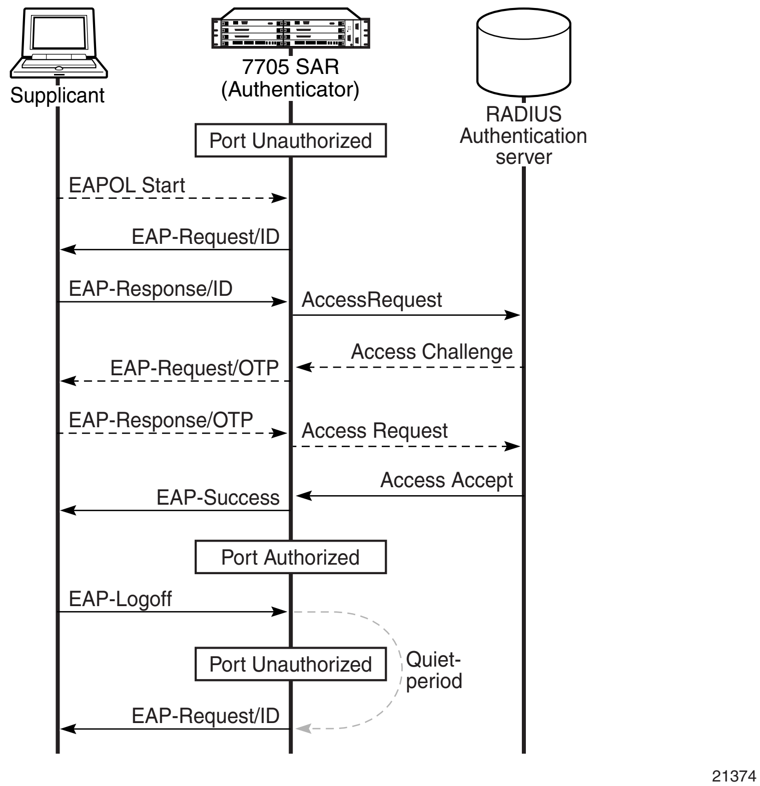
After receiving the EAP-Response/ID frame, the authenticator encapsulates the identity information into a RADIUS AccessRequest packet, and sends it off to the configured RADIUS server.

The RADIUS server checks the supplied credentials using an authentication algorithm to verify the supplicant's identity. If approved, the RADIUS server returns an Access Accept message to the authenticator. The authenticator notifies the supplicant with an EAP-Success message and puts the port in the authorized state.

If the supplicant sends and EAP-logoff message, the authenticator puts the supplicant in an unauthorized state. After waiting a number of seconds defined by the quiet-period timer, the authenticator continues searching for supplicants to authenticate.

The 7705 SAR conforms to the relevant sections of the 802.1X-2001 implementation.

Figure 9: Authentication Scenario



802.1x Modes

The 7705 SAR supports port-based network access control for Ethernet ports only. Each Ethernet port can be configured to operate in one of three different modes, controlled by the `port-control` command:

- auto — enables 802.1x authentication. The port starts in the unauthorized state, allowing only EAPOL frames to be sent and received through the port. Both the authenticator and the host (supplicant) can initiate an authentication process as described earlier. The port will remain in the unauthorized state until the first supplicant is authenticated successfully. After this, traffic is allowed on the port for all connected hosts.

- force-auth — disables 802.1x authentication and causes the port to transition to the authorized state without requiring any authentication exchange. The port transmits and receives normal traffic without requiring 802.1x-based host authentication. This is the default setting.
- force-unauth — causes the port to remain in the unauthorized state, ignoring all attempts by the hosts to authenticate. The authenticator cannot provide authentication services to the host through the interface.

802.1x Timers

The 802.1x authentication process is controlled by a number of configurable timers. There are two separate sets, one for the EAPOL message exchange and one for the RADIUS message exchange. Figure 10 shows an example of the timers.

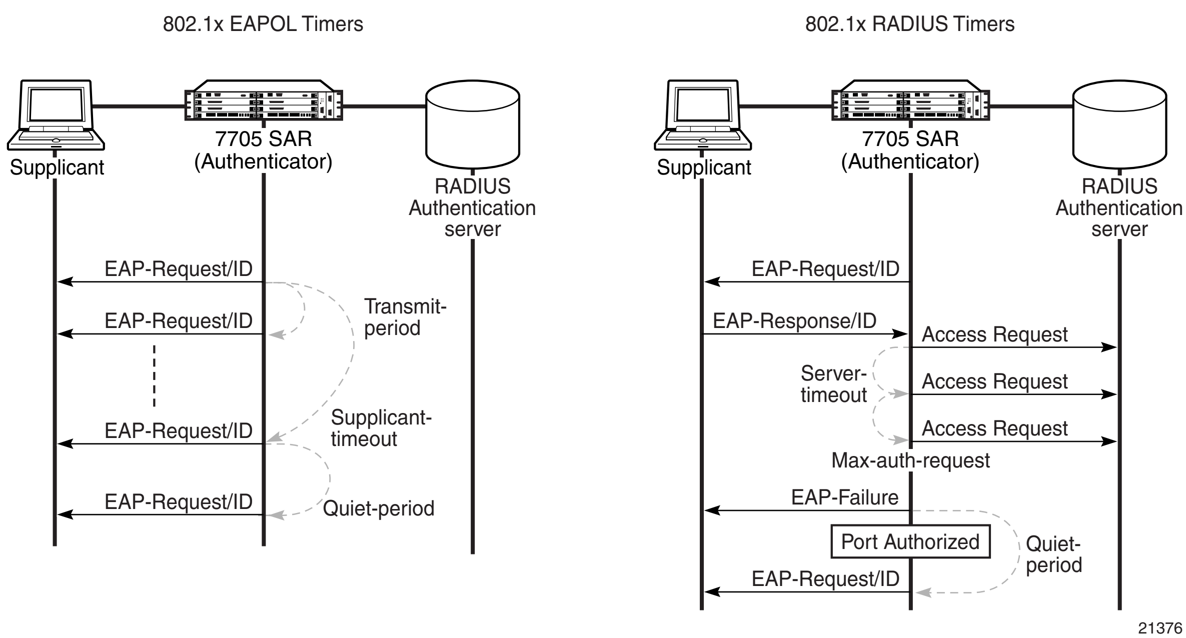
EAPOL timers:

- transmit-period — indicates how many seconds after sending an EAP-Request/ID frame that the 7705 SAR will listen for a supplicant to authenticate (by sending a EAP-Response/ID frame). If the timer expires before a response is received, a new EAP-Request/ID frame will be sent and the timer restarted. The default value is 30 s. The range is 1 to 3600 s.
- supplicant-timeout — indicates how many seconds to allow the 7705 SAR to complete the authentication process. This timer is started at the beginning of a new authentication process (transmission of first EAP-Request/ID frame and receipt of an EAP-Response/ID frame). If the timer expires, the 802.1x authentication session is considered to have failed and the 7705 SAR waits for the quiet-period timer to expire before processing another authentication request. The default value is 30 s. The range is 1 to 300 s.
- quiet-period — indicates the number of seconds between authentication sessions. The timer is started after logoff, after sending an EAP-Failure message, or after expiry of the supplicant timeout timer. The default value is 30 s. The range is 1 to 3600 s.

RADIUS timers:

- max-auth-req — indicates the maximum number of times that the authenticator will send an authentication request to the RADIUS server before the process is considered as to have failed. The default value is 2. The range is 1 to 10.
- server-timeout — indicates how many seconds the authenticator will wait for a RADIUS response message. If the timer expires, the access request message is sent again, up to the max-auth-req value, and the timer is reset. The default value is 30 s. The range is 1 to 300 s.

Figure 10: 802.1x EAPOL Timers and RADIUS Timers



The authenticator can also be configured to periodically trigger the authentication process automatically. This is controlled by the enable reauthentication and reauthentication period parameters. Re-auth-period indicates the time in seconds (since the last time that the authorization state was confirmed) before a new authentication process is started. The range of re-auth-period is 1 to 9000 s (the default is 3600 s). The port stays in an authorized state during the reauthentication process.

802.1x Configuration and Limitations

Configuration of 802.1x network access control on the authenticator consists of two parts:

- generic parameters, which are configured under `config>system>security>dot1x`.
  Refer to the Basic System Configuration Guide, “System Command Reference”.
- port-specific parameters, which are configured under `config>port>ethernet>dot1x`.

802.1x provides access to the port for any device, even if only a single client has been authenticated. Additionally, it can only be used to gain access to a predefined Service Access Point (SAP). It is not possible to dynamically select a service (such as a VPLS service) depending on the 802.1x authentication information.

Link Layer Discovery Protocol (LLDP)

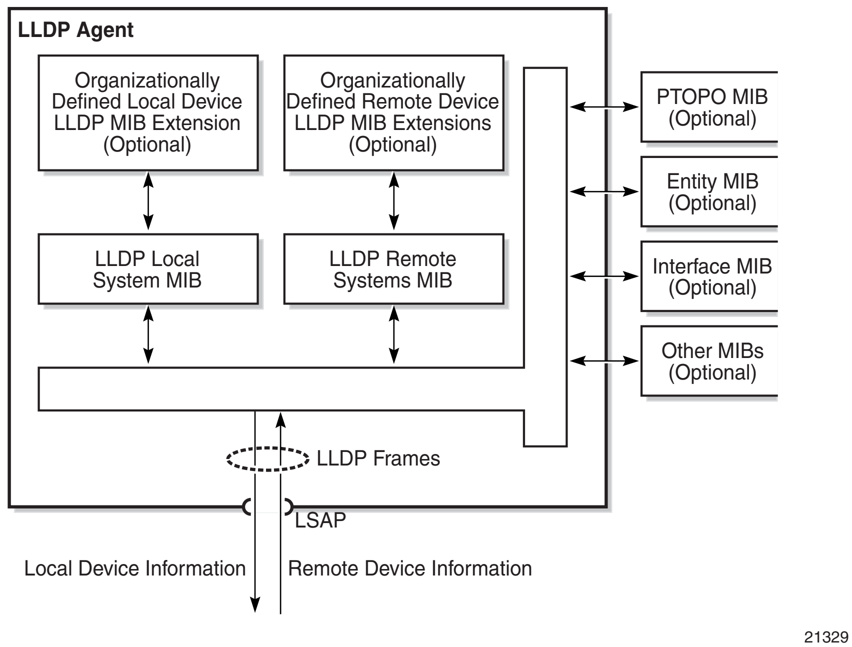
The IEEE 802.1ab Link Layer Discovery Protocol (LLDP) allows stations that are attached to the same IEEE 802 LAN (emulation) to advertise information for the purpose of populating physical or logical topology and device discovery management information databases. In other words, IEEE 802.1ab Link Layer Discovery Protocol allows an LLDP agent to learn connectivity and management information from adjacent stations. The information obtained via this protocol is stored in standard MIBs which can be accessed via management protocols such as SNMP.

LAN emulation and logical topology is applicable to customer bridge scenarios (enterprise or carrier of carrier) connected to a provider network offering a transparent LAN emulation service to their customers. LAN emulation helps customers detect intermediate provider misconnections by offering a view of the customer topology where the provider service is represented as a LAN interconnecting customer bridges.

The IEEE 802.1ab standard defines a protocol that:

- advertises connectivity and management information about the local station to adjacent stations on the same IEEE 802 LAN
- receives network management information from adjacent stations on the same IEEE 802 LAN
- operates with all IEEE 802 access protocols and network media
- establishes a network management information schema and object definitions that are suitable for storing connection information about adjacent stations
- provides compatibility with a number of MIBs as shown in Figure 11

Figure 11: LLDP Internal Architecture for a Network Node

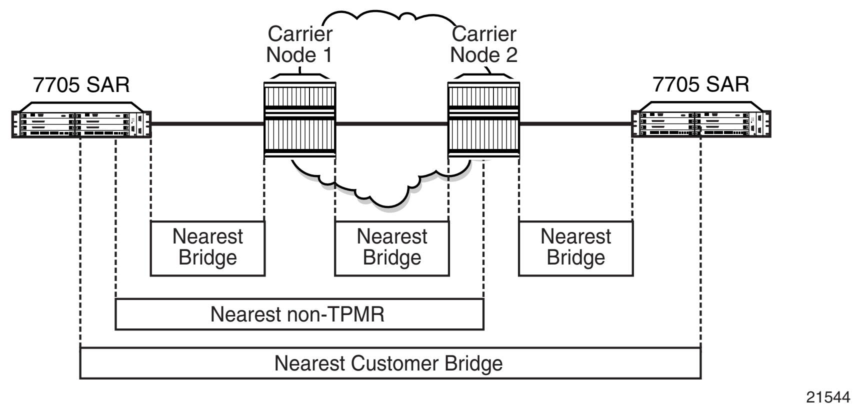


Network operators must be able to discover the topology information in order to detect and address network problems and inconsistencies in the configuration. Standards-based tools can address complex network scenarios where multiple devices from different vendors are interconnected using Ethernet interfaces.

On the 7705 SAR, each Ethernet port can be configured to run up to three LLDP sessions. Each session can have up to five peers and each peer can store up to three management addresses.The 7705 SAR can have a maximum of 720 peers configured.

Figure 12 shows the three scopes of LLDP that are supported on the 7705 SAR. The scopes are Nearest Bridge, Nearest non-TPMR Bridge, and Nearest Customer Bridge.

Figure 12: Network Example For LLDP



LLDP Protocol Features

LLDP allows stations attached to an IEEE 802 LAN to advertise to other stations attached to the same LAN, the major capabilities provided by the system incorporating that station, the management address or addresses of the entity or entities that manage these capabilities, and the identification of the station's point of attachment to the LAN required by the management entity or entities.

The information distributed via this protocol is stored on the receiving device in a standard MIB, so that the information can be accessed by a Network Management System (NMS).

The LLDP protocol uses an LLDP agent entity that implements LLDP for a particular MAC service access point (MSAP) associated with a port.

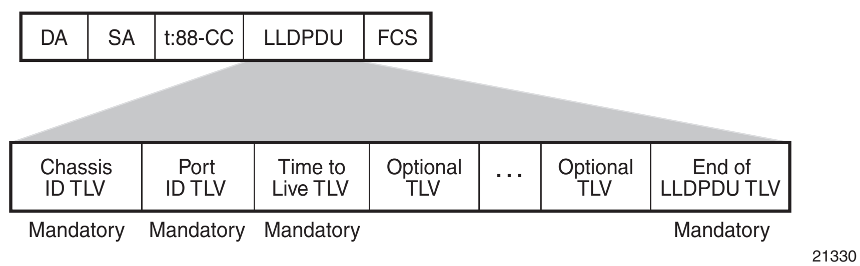
LLDP does not contain a mechanism for soliciting specific information from other LLDP agents, nor does it provide a specific means of confirming the receipt of information. LLDP allows the transmitter and the receiver to be enabled separately; therefore, the local LLDP agent can be configured to transmit only, receive only, or both transmit and receive LLDP information.

LLDP agents transmit and receive LLDP Data Units (LLDPDUs). The LLDPDU contains an LLDP frame whose information fields are a sequence of variable-length information elements. Each element includes type, length, and value fields (known as TLVs).

- Type identifies what kind of information is being sent.
- Length indicates the length of the information string in octets.
- Value is the actual information that needs to be sent; for example, a binary bit map or an alphanumeric string that can contain one or more fields.

Each LLDPDU contains four mandatory TLVs and can contain optional TLVs as selected by network management. Figure 13 shows the LLDPDU format.

Figure 13: LLDPDU Format



The chassis ID TLV identifies the chassis containing the Ethernet port responsible for transmitting the LLDPDU. The port ID TLV identifies the Ethernet port responsible for transmitting the LLDPDU. The chassis ID and the port ID values are concatenated to form a logical identifier (the MSAP identifier) that is used by the recipient to identify the sending LLDP agent and associated port. Both the chassis ID and port ID values can be defined in a number of ways. Once selected, however, the chassis ID and port ID value combination remains the same as long as the particular port remains operable.

The Time To Live TLV indicates the number of seconds (from 0 to 65535) that the receiving LLDP agent should consider the information contained in the received LLDPDU to be valid. The Time To Live TLV is calculated by the formula `tx-interval` × `tx-hold-multiplier`. The associated information is automatically discarded by the receiving LLDP agent if the sender fails to update it before this time. A zero value indicates that any information pertaining to this LLDPDU's identifier is to be discarded immediately. A TTL value of zero can be used, for example, to signal that the sending port has initiated a port shutdown procedure.

The End of LLDPDU TLV marks the end of the LLDPDU.

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-sar.

  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.

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-8 Installation Guide, “Establishing Router Management Connections” and the 7705 SAR-18 Installation Guide, “Establishing 7705 SAR-18 Management Connections”.

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

Note: Serial ports and voice ports are not supported on the 7705 SAR-18 in Release 4.0.

Before a port can be configured, 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 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, 2-port OC3/STM1 Channelized Adapter card, 12-port Serial Data Interface card (access mode only), and 6-port E&M Adapter 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 the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, and 2-port OC3/STM1 Channelized Adapter cards, after ports are preprovisioned, multilink bundles (MLPPP) or IMA groups can be configured to increase the bandwidth available between two nodes. Table 10 shows the capacity limits for the number of links that can be bundled in an IMA or MLPPP group, and the maximum number of bundles that can be configured on each adapter card.

Table 10: IMA Groups and MLPPP Bundles Capacity Limits

Adapter Card	Maximum Number of Links That can be Bundled in an IMA Group	Maximum Number of IMA Bundles That can be Configured on the Card	Maximum Number of Links That can be Bundled in an MLPPP Bundle	Maximum Number of MLPPP Bundles That can be Configured on the Card
16-port T1/E1 ASAP Adapter card	16	8	16 on network side; 8 on access side	8 on network side; 16 on access side
32-port T1/E1 ASAP Adapter card	16	16	16 on network side; 8 on access side	8 on network side; 32 on access side
2-port OC3/STM1 Channelized Adapter card	8	32 (16 per port)	8	32 (16 per port)

All physical links or channels in a 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 SONET/SDH Port Parameters.

For 12-port Serial Data Interface cards, some or all of a port 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.

Using Partial Bandwidth

The 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card each support fractional T1/E1 on a PPP channel group in network mode. Fractional T1/E1 allows one or more DS0 channels to be bundled together (up to the maximum bandwidth of the network link), allowing the customer to use only that portion of the link that is needed. This means that the PPP service can use a selected number of timeslots (octets) in the network T1 or E1 link, thus reducing the amount of T1 or E1 bandwidth that must be leased or purchased from the attached carrier. This leads to multiplexing efficiencies in the transport network.

Only one channel group can be configured per port. When the channel group is configured for ppp-auto encapsulation and network mode, all timeslots (channels) are automatically allocated to the channel group. The user can then configure the number of timeslots needed. Timeslots not selected cannot be used.

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 on the 7705 SAR-8.

Note: The 7705 SAR-18 displays similar output with the exception being that the MDA number continues to 12, and that the 6-port E&M Adapter card is not supported on the 7705 SAR-18 in Release 4.0.

```
ALU-A>config# info
.....
#--------------------------------------------------
echo "Card Configuration"
#--------------------------------------------------
    card 1
        card-type iom-sar
        mda 1
            mda-type a6-em
        exit
        mda 2
            mda-type a4-oc3
        exit
        mda 3
            mda-type a16-chds1
        exit
        mda 4
            mda-type a4-chds3
        exit
        mda 5
            mda-type a8-eth
        exit
        mda 6
            mda-type a2-choc3
        exit
    exit
#--------------------------------------------------
echo "Port Configuration"
#--------------------------------------------------
    port 1/1/1
        description "E&M"
        voice
            em
                no loopback
                signaling-mode em
                signaling-lead
```

```
                    m end-to-end
                    e end-to-end
                exit
                fault-signaling idle
                idle-code 13
                seized-code 5
                channel-group 1
                    description "DS0GRP"
                    mode access
                    encap-type cem
                    no shutdown
                exit
                no shutdown
            exit
            audio-wires four-wires
            tlp-rx 0.0
            tlp-tx 0.0
        exit
        no shutdown
    port 1/1/2
        shutdown
        voice
        exit
    .....
    port 1/1/6
        shutdown
        voice
        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
           ds3
               shutdown
               encap-type atm
               framing m23
               loopback line
               atm
               exit
           exit
       exit
   exit
   port 1/4/2
       shutdown
       tdm
       exit
   exit
   port 1/4/3
       shutdown
       tdm
       exit
   exit
```

```
   port 1/4/4
       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 are performed, as required.

- 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
  - → Configuring Adapter Card Voice Attributes
  - → Configuring Auxiliary Alarm Card External Alarm Parameters
  - → Displaying Adapter Card Information
- Configuring Ports
  - → Configuring APS Port Parameters
  - → Configuring Ethernet Port Parameters
  - → Configuring SONET/SDH Port Parameters
  - → Configuring Voice Ports
  - → Configuring TDM PPP
  - → Configuring Channelized Ports
  - → Configuring Fractional T1/E1 Ports for PPP Encapsulation
  - → Configuring T1 Line Buildout
  - → 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 cards on the 7705 SAR-8.

Example:

```
ALU-1>config# card 1
ALU-1>config>card# card-type iom-sar
ALU-1>config>card# mda 1
ALU-1>config>card>mda# mda-type a6-em
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 a4-chds3
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
ALU-1>config>card# exit
```

The following CLI syntax shows an example of configuring a chassis slot and card (to activate the IOM) and adapter cards on the 7705 SAR-18.

Example:

```
ALU-1>config# card 1
ALU-1>config>card# card-type iom-sar
ALU-1>config>card# mda 1
ALU-1>config>card>mda# mda-type aux-alarm
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 2
ALU-1>config>card>mda# mda-type a8-ethv2
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 2
ALU-1>config>card>mda# mda-type a8-ethv2
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 3
ALU-1>config>card>mda# mda-type a8-ethv2
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 4
ALU-1>config>card>mda# mda-type a8-ethv2
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 5
ALU-1>config>card>mda# mda-type a8-ethv2
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 6
ALU-1>config>card>mda# mda-type a32-chds1v2
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 7
ALU-1>config>card>mda# mda-type a32-chds1v2
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 8
ALU-1>config>card>mda# mda-type a32-chds1v2
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 9
ALU-1>config>card>mda# mda-type a32-chds1v2
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 10
ALU-1>config>card>mda# mda-type a4-oc3
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 11
ALU-1>config>card>mda# mda-type a4-chds3
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 12
ALU-1>config>card>mda# exit
ALU-1>config>card# 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, “Network QoS Policies”.

Queue policies do not apply to the Auxiliary Alarm card.

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.

Fabric statistics do not apply to the Auxiliary Alarm card.

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. For more information on fabric profiles, refer to the 7705 SAR OS Quality of Service Guide, “QoS Fabric Profiles”.

Fabric profiles do not apply to the Auxiliary Alarm card.

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 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, and 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
```

Configuring Adapter Card Voice Attributes

Use the following CLI syntax to assign the type of companding law and signaling to be used on a 6-port E&M Adapter card on the 7705 SAR-8 (voice ports are not supported on the 7705 SAR-18 in Release 4.0).

CLI Syntax:
```
config>card>mda#
    mda-type type
    voice
       companding-law {a-law | mu-law}
       signaling-type {type-i | type-ii | type-v}
    no shutdown
```

Configuring Auxiliary Alarm Card External Alarm Parameters

Use the following CLI syntax to configure the Auxiliary Alarm card external alarm parameters:

CLI Syntax:

```
config# external-alarms
     input alarm-input
        description description-string
        no description
        name name-string
        no name
        debounce seconds
        debounce detect detect-seconds clear clear-seconds
        no debounce
        [no]shutdown
     exit
     output alarm-output
        description description-string
        no description
        name name-string
        no name
        [no]shutdown
     exit
     [no] alarm alarm-id
        description description-string
        no description
        severity {critical | major | minor | warning}
        [no] chassis-alarming
        [no] log
        trigger [any | all] {alarm-input1 | alarm-input2...
          | alarm-input8}
        no trigger
        thresholds
           analog
              [no] level {lt | gt} millivolts
           exit
        exit
```

Example:

```
config# external-alarms input alarm-1/1.d-1 name dinput1
config# external-alarms input alarm-1/1.d-2 name dinput2
config# external-alarms input alarm-1/1.d-3 name dinput3
config# external-alarms input alarm-1/1.d-4 name dinput4
config# external-alarms input alarm-1/1.d-5 name dinput5
config# external-alarms input alarm-1/1.d-23 name dinput23
config# external-alarms input alarm-1/1.d-24 name dinput24
config# external-alarms output alarm-1/1.d-1 name dinput11
config# external-alarms output relay-1/1.d-2 name output2
config# external-alarms output relay-1/1.d-3 name output3
config# external-alarms output relay-1/1.d-4 name output4
```

```
config# external-alarms output relay-1/1.d-5 name output5
config# external-alarms output relay-1/1.d-2 name output2
config# external-alarms output relay-1/1.d-3 name output3
config# external-alarms output relay-1/1.d-4 name output4
config# external-alarms output relay-1/1.d-5 name output5
config>ext-alarms# alarm 1
config>ext-alarms>alarm# chassis-alarming
config>ext-alarms>alarm# log
config>ext-alarms>alarm# trigger all alarm-1/1.d-1
alarm-1/1.d-2 alarm-1/1.d-3 alarm-1/1.d-4 alarm-1/1.d-5
alarm-1/1.a-1
config>ext-alarms>alarm# exit
config>ext-alarms# alarm 2
config>ext-alarms>alarm# chassis-alarming
config>ext-alarms>alarm# no log
config>ext-alarms>alarm# trigger all alarm-1/1.d-1
alarm-1/1.d-2 alarm-1/1.d-3 alarm-1/1.d-4 alarm-1/1.d-23
alarm-1/1.d-24 alarm-1/1.a-1 alarm-1/1.a-2
config>ext-alarms>alarm# exit
config>ext-alarms# alarm 3
config>ext-alarms>alarm# chassis-alarming
config>ext-alarms>alarm# log
config>ext-alarms>alarm# trigger any alarm-1/1.d-1 alarm-
1/1.d-2 alarm-1/1.d-3 alarm-1/1.d-4 alarm-1/1.d-5
alarm-1/1.a-1 alarm-1/1.a-2
config>ext-alarms>alarm# exit
config>ext-alarms# alarm 4
config>ext-alarms>alarm# chassis-alarming
config>ext-alarms>alarm# log
config>ext-alarms>alarm# trigger any alarm-1/1.a-1
alarm-1/1.a-2
config>ext-alarms>alarm# severity major
config>ext-alarms>alarm# thresholds
config>ext-alarms>alarm>thresholds# analog level lt 4
config>ext-alarms>alarm>thresholds# exit
config>ext-alarms>alarm# exit
config>ext-alarms# exit
```

Displaying Adapter Card Information

After performing the adapter card configuration, you can use the `config info` command to display the information on the 7705 SAR-8.

```
ALU-A>config# info
.....
#--------------------------------------------------
echo "Card Configuration"
#--------------------------------------------------
    card 1
        card-type iom-sar
        mda 1
            mda-type a6-em
        exit
        mda 2
            mda-type a4-oc3
        exit
        mda 3
            mda-type a16-chds1
        exit
        mda 4
            mda-type a4-chds3
        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 on the 7705 SAR-8.

```
ALU-A>config# info detail
.....
#--------------------------------------------------
echo "Card Configuration"
#--------------------------------------------------
card 1
        card-type iom-sar
        mda 1
            mda-type a6-em
            voice
                companding-law a-law
                signaling-type type-v
            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
            no shutdown
            mda-type a4-chds3
            no fabric-stats-enabled
            network
                ingress
                    fabric-policy 1
```

```
                    queue-policy "default"
                exit
            exit
            access
                ingress
                    fabric-policy 1
                exit
            exit
        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
            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
        no shutdown
    exit
#--------------------------------------------------
......

ALU-A> config#
```

Configuring Ports

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

- Configuring APS Port Parameters
- Configuring Ethernet Port Parameters
  - → Configuring an Ethernet Network Port
  - → Configuring an Ethernet Access Port
  - → Configuring 802.1x Authentication Port Parameters
- Configuring SONET/SDH Port Parameters
  - → Configuring a SONET/SDH Access Port
  - → Configuring a SONET/SDH Network Port
- Configuring Voice Ports
- Configuring TDM PPP
- Configuring Channelized Ports
  - → Verifying the Adapter Card Type
- Configuring Fractional T1/E1 Ports for PPP Encapsulation
- Configuring T1 Line Buildout
- 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 for IMA Groups
  - → IMA Test Procedure

Configuring APS Port Parameters

APS has the following configuration rules.

- A working port must be added first. Then a protection port can be added or removed at any time.
- The protection port must be removed from the configuration before the working port is removed.
- A protection port must be shut down before being removed from an APS group.
- A path cannot be configured on a port before the port is added to an APS group.
- A working port cannot be removed from an APS group until the APS port path is removed.
- When ports are added to an APS group, all path-level configurations are available only at the APS port level and configuration on the physical member ports is blocked.
- When a port is a protection circuit of an APS group, the configuration options available in the **config>port** *port-id*>**sonet-sdh** context are not allowed for that port unless they are in the following exception list:
  - → clock-source
  - → [no] loopback
  - → [no] report-alarm
  - → section-trace
  - → [no] threshold

Use the following CLI syntax to configure APS port parameters.

CLI Syntax:
```
config# port aps-id
        aps
           hold-time-aps {[lsignal-fail sf-time] [lsignal-
             degrade sd-time]}
           protect-circuit port-id
           rdi-alarms {suppress | circuit}
           revert-time minutes
           switching-mode {bi-directional | uni-1plus1}
           working-circuit port-id
```

The following CLI syntax shows an example of configuring ports for APS.

Example:
```
config# port aps-1
config>port# aps
config>port>aps# switching-mode uni-1plus1
config>port>aps# working-circuit 1/2/4
config>port>aps# rdi-alarms circuit
config>port>aps# revert-time 5
config>port>aps# protect-circuit 1/3/4
```

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

```
ALU-B>config>port# info

          ----------------------------------------------
                    shutdown
                    aps
                         switching-mode uni-1plus1
                         revert-time 5
                         working-circuit 1/2/4
                         protect-circuit 1/3/4
                    exit
                    sonet-sdh
                    exit
          ----------------------------------------------
```

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
    cfm-loopback priority {high | low}
    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}
        [swap-src-dst-mac]
    no loopback
    mac ieee-address
    mode {access|network}
    mtu mtu-bytes
    network
        queue-policy name
        scheduler-mode {profile | 4-priority}
    report-alarm [signal-fail] [remote] [local]
        [no-frame-lock] [high-ber]
    speed {10|100|1000}
    ssm
        code-type {sonet | sdh}
        [no] shutdown
        [no] tx-dus
```

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
        scheduler-mode {profile | 4-priority}
```

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
---------------------------------------------
```

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 802.1x Authentication Port Parameters

The 7705 SAR supports network access control of client devices (for example, PCs and STBs) on an Ethernet network using the IEEE 802.1x standard. 802.1x is a standard for authenticating customer devices before they can access the network. Authentication is performed using Extensible Authentication Protocol (EAP) over LAN (EAPOL).

802.1x provides protection against unauthorized access by forcing the device connected to the 7705 SAR to go through an authentication phase before it is able to send any non-EAP packets. Only EAPOL frames can be exchanged between the aggregation device (authenticator; for example, the 7705 SAR) and the customer device (supplicant) until authentication is successfully completed

Use the following CLI syntax to configure an 802.1x Ethernet port:

CLI Syntax:
```
port port-id ethernet
     dot1x
        max-auth-req max-auth-request
        port-control {auto | force-auth | force-unauth}
        quiet-period seconds
        radius-plcy name
        re-authentication
        re-auth-period seconds
        server-timeout seconds
        supplicant-timeout seconds
        transmit-period seconds
```

The following CLI syntax shows an example of configuring an 802.1x Ethernet port:

Example:
```
config# port 1/5/2 ethernet dot1x
config>port>ethernet>dot1x# port-control auto
config>port>ethernet>dot1x# radius-plcy dot1xpolicy
config>port>ethernet>dot1x# re-auth-period 3500
config>port>ethernet>dot1x# transmit-period 30
config>port>ethernet>dot1x# quiet-period 50
config>port>ethernet>dot1x# supplicant-timeout 30
config>port>ethernet>dot1x# server-timeout 30
```

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

```
ALU-A>config>port>ethernet>dot1x# info detail
----------------------------------------------
             port-control auto
             radius-plcy dot1xpolicy
             re-authentication
             re-auth-period 3600
             max-auth-req 2
             transmit-period 30
             quiet-period 60
             supplicant-timeout 30
             server-timeout 30
----------------------------------------------
ALU-A>config>port>ethernet>dot1x#
```

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
      [no] no tx-dus
```

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

CLI Syntax:
```
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
      path
         no description
         report-alarm [pais] [plop] [prdi] [pplm] [prei]
         [puneq]
         no shutdown
         signal-label value
         no signal-label
         trace-string [trace-string]
         no trace-string
      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
      no tx-dus
```

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 SONET/SDH 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
```

Use the `config info` command to display SONET/SDH port 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 SONET/SDH port information for the configured port.

```
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 SONET/SDH port information for the configured port.

```
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 Voice Ports

Use the following CLI syntax to configure an analog voice port on a 6-port E&M Adapter card.

Note: Voice ports are not supported on the 7705 SAR-18 in Release 4.0.

CLI Syntax:
```
port port-id
     voice
        audio-wires {2-wires | 4-wires}
        [no] em
           [no] channel-group channel-group-id
              [no] description description-string
              [no] encap-type cem
              mode access
              [no] shutdown
           fault-signaling {idle | seized}
           [no] idle-code abcd-code
           [no] seized-code abcd-code
           [no] loopback {internal-analog |
           internal-digital}
           signaling-lead
              e {high | low | end-to-end}
              m {high | low | end-to-end}
           signaling-mode {em | transmission-only}
```

```
   [no] shutdown
tlp-rx {-16.0 | -15.9 | ... | 6.9 | 7.0}
tlp-tx {-16.0 | -15.9 | ... | 6.9 | 7.0}
```

The following CLI syntax shows an example of configuring an analog voice port on a 6-port E&M Adapter card. The default values are used for the commands that are not shown in the example.

Example:

```
config# port 1/1/1
config>port# voice
config>port>voice# em
config>port>voice# em# channel-group 1
config>port>voice# em# channel-group# mode access
config>port>voice# em# channel-group# encap-type cem
config>port>voice# em# channel-group# no shutdown
config>port>voice# em# channel-group# exit
config>port>voice# em# signaling-lead
config>port>voice# em# signaling-lead# e high
config>port>voice# em# signaling-lead# exit
config>port>voice# em# signaling-mode
config>port>voice# em# signaling-mode# em
config>port>voice# em# signaling-mode# exit
config>port>voice# em# no shutdown
config>port>voice# em# exit
config>port>voice# exit
config>port# no shutdown
config>port# exit
config#
```

Configuring TDM PPP

Use the following CLI syntax to configure PPP parameters for TDM DS3/E3 ports.

CLI Syntax:
```
port port-id
    tdm
       ds3
          encap-type ppp-auto
          mode network
          ppp
             keepalive time-interval [dropcount drop-
                count]
             no keepalive
       e3
          encap-type ppp-auto
          mode network
          ppp
             keepalive time-interval [dropcount drop-
                count]
             no keepalive
```

Configuring Channelized Ports

Channelized ports are supported on the 16-port T1/E1 ASAP Adapter card, the 32-port T1/E1 ASAP Adapter card, the 12-port Serial Data Interface card, the 6-port E&M Adapter card, and the 2-port OC3/STM1 Channelized Adapter card. Ethernet ports cannot be channelized.

Note: The 6-port E&M Adapter card and 12-port Serial Data Interface card are not supported on the 7705 SAR-18 in Release 4.0.

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 V.35, RS-232, or X.21 port.*channel-group*, where *channel-group* is 1

1 × DS0 in E&M voice 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 6 show channelized adapter cards on the 7705 SAR-8.

```
*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     a4-chds3              a4-chds3              up        up
      5     a8-eth                a8-eth                up        up
      6     a2-choc3              a2-choc3              up        up
===============================================================================
*A:ALU-1
```

Use the `show mda detail` command to show detailed information for the channelized adapter cards shown in the previous sample.

```
*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 1/6 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 16-port T1/E1 ASAP Adapter card, 32-port 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 6-port E&M Adapter card, a single DS0 channel group and its parameters are configured in the E&M context. On the 12-port Serial Data Interface card, DS0 channel groups and their parameters are configured in the V.35, RS-232, or X.21 context. For RS-232, a single timeslot is auto-configured when a channel group is created. For V.35 and X.21, the number of timeslots auto-configured when a channel group is created depends on the interface speed.

Note: Encapsulation type on the 16-port T1/E1 ASAP Adapter card, 32-port 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, V.35, or X.21 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. To change an encapsulation type, the channel group must be deleted and then recreated with the new 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
```

The following is an example of an E&M channel group configuration.

```
ALU-A>config>port 1/1/1
ALU-A>config>port# voice
ALU-A>config>port>voice# em
ALU-A>config>port>voice# em# channel-group 1
ALU-A>config>port>voice# em>channel-group# description "DS0GRP"
ALU-A>config>port>voice# em>channel-group# encap-type cem
ALU-A>config>port>voice# em>channel-group# mode access
ALU-A>config>port>voice# em>channel-group# no shutdown
ALU-A>config>port>voice# em>channel-group# exit
```

Services can now be applied to the configured channelized ports.

Configuring Fractional T1/E1 Ports for PPP Encapsulation

A T1 or E1 port can be configured to provide a subrate PPP service. That is, by using a channel group, the PPP service can be assigned to a subset of the timeslots that are available on the T1 or E1 port. Only one channel group can be configured per port for subrate PPP.

To configure PPP for use over a subrate (or fractional) T1/E1 port on a 16-port T1/E1 ASAP Adapter card or 32-port T1/E1 ASAP Adapter card, you must first configure a channel group, then set the port to network mode and encapsulation type ppp-auto. The node then automatically allocates all 24 T1 or 31 E1 channels (timeslots) to the channel group.

You must then change the value of the timeslot configuration to specify the number of timeslots you want to use. Any timeslots not selected cannot be used.

Use the following CLI syntax to configure a T1/E1 port for fractional T1/E1.

First, configure the port:

CLI Syntax:
```
port port-id
     tdm
        e1
           channel-group channel-group-id
           encap-type ppp-auto
           mode network
           no shutdown
        exit
        no shutdown
     exit
exit
no shutdown
```

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

```
*A:ALU-A>config>port# info detail
----------------------------------------------
        description "DS1/E1"
        tdm
            e1
                shutdown
                framing g704
                no loopback
                clock-source node-timed
                no signal-mode
                report-alarm ais los
                no report-alarm oof rai looped ber-sd ber-sf
                no hold-time
                channel-group 1
                    shutdown
                    description "DS0GRP"
                    mode network
```

```
                    encap-type ppp-auto
                    no mtu
                    network
                        queue-policy "default"
                    exit
                    timeslots 2-32
                    crc 16
                    idle-cycle-flag flags
                    no scramble
                    ppp
                        keepalive 10 dropcount 3
                    exit
                exit
            exit
            line-impedance 120
        exit
        no shutdown
----------------------------------------------
*A:ALU-A>config>port#
```

Next, change the value of the timeslots configuration (currently, all timeslots are allocated to this channel group):

CLI Syntax:
```
port port-id
     tdm
        e1
           channel-group 1
              timeslots 11-20
```

Use the `config port info` command to display the new port configuration information:

```
*A:ALU-A>config>port# info detail
----------------------------------------------
        description "DS1/E1"
        tdm
            e1
                shutdown
                framing g704
                no loopback
                clock-source node-timed
                no signal-mode
                report-alarm ais los
                no report-alarm oof rai looped ber-sd ber-sf
                no hold-time
                channel-group 1
                    shutdown
                    description "DS0GRP"
                    mode network
                    encap-type ppp-auto
                    no mtu
                    network
                        queue-policy "default"
                    exit
                    timeslots 11-20
```

```
                crc 16
                idle-cycle-flag flags
                no scramble
                ppp
                    keepalive 10 dropcount 3
                exit
            exit
        exit
        line-impedance 120
    exit
    no shutdown
----------------------------------------------
*A:ALU-A>config>port#
```

Configuring T1 Line Buildout

Telcordia GR-499 requirements indicate that a T1/E1 transmitter will typically support an LBO adjustment in order to maintain an equivalent interconnect distance of approximately 655 feet over the full range of cable lengths up to 655 ft (200 m).

Use the following CLI syntax to configure LBO functions for T1/E1 ports. The LBO function is implemented using the length command. To change the length of the port, you must first shut down the port and then configure the length.

CLI Syntax:

```
port port-id
     tdm
        length {133 | 266 | 399 | 533 | 655}
```

The following CLI syntax shows an example of configuring a length of 266 feet on a T1/E1 port.

Example:

```
config# port 1/1/1
config>port# shutdown
config>port# tdm
config>port>tdm# length 266
config>port>tdm# exit
config>port# no shutdown
```

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

```
ALU-A>config>port# info
#--------------------------------------------------
    tdm
        length 266
        ds1
            channel-group 1
                encap-type cem
                timeslots 1-24
                no shutdown
            exit
            no shutdown
```

```
    exit
exit
no shutdown
```

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 basic 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 basic ATM interface parameters for TDM DS3 ports. For Release 4.0, ATM is not supported on E3 ports on the 4-port DS3/E3 Adapter card.

CLI Syntax:
```
port port-id
    tdm
        ds3
            atm
                cell-format {uni|nni}
                min-vp-vpi value
                mapping direct
```

Use the following CLI syntax to configure basic ATM interface parameters for TDM DS1/E1 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 basic 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

Up to 32 multilink PPP bundles can be created on a 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, and 2-port OC3/STM1 Channelized Adapter card (depending on the adapter card). See Table 10 for MLPPP bundling capacity limits on these cards.

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. 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 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 2 ports.
- 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).
- 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

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.

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
```

Configuring Multilink ATM Inverse Multiplexing (IMA) Groups

IMA groups are supported on channelized 16-port T1/E1 ASAP Adapter cards, 32-port 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. See Table 10 for IMA groups capacity limits on these cards.

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 for IMA Groups

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, the member is automatically assigned an IMA link ID. IMA link IDs range from 0 to 16 and stay constant as long as the router does not reboot.

When configuring IMA groups, consider the following guidelines.

- All IMA links in an IMA group must belong to the same T1/E1 Adapter card or the same physical OC3 port.
- IMA bundles can only be aggregated on a single adapter card.
- 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 and 32-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.

   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 a16-chds1
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

Notes:
- The 6-port E&M Adapter card and 12-port Serial Data Interface card are not supported on the 7705 SAR-18 in Release 4.0.
- Voice ports and serial ports are not supported on the 7705 SAR-18 in Release 4.0.

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*
    - — **access**
      - — **ingress**
        - — **fabric-policy** *fabric-policy-id*
        - — **no fabric-policy**
    - — **clock-mode adaptive**
    - — [**no**] **fabric-stats-enabled**
    - — **mda-type** *mda-type*
    - — **no mda-type**
    - — **network**
      - — **ingress**
        - — **fabric-policy** *fabric-policy-id*
        - — **no fabric-policy**
        - — **queue-policy** *name*
        - — **no queue-policy**
    - — [**no**] **shutdown**
    - — **voice**
      - — **companding-law** {**a-law** | **mu-law**}
      - — **signaling-type** {**type-i** | **type-ii** | **type-v**}

Auxiliary Alarm Card Commands

```
config
    — external-alarms
        — [no] alarm alarm-id
            — [no] chassis-alarming
            — description description-string
            — no description
            — [no] log
            — severity {critical | major | minor | warning}
            — [no] shutdown
            — thresholds
                — analog
                    — [no] level {lt | gt} millivolts
            — trigger [any | all] {alarm-input1 | alarm-input2... | alarm-input8}
            — no trigger
        — input alarm-input
            — debounce seconds
            — debounce detect-seconds clear clear-seconds
            — no debounce
            — description description-string
            — no description
            — name name-string
            — no name
            — [no] shutdown
        — output alarm-output
            — description description-string
            — no description
            — name name-string
            — no name
            — [no] shutdown
```

APS Port Commands

config
— [**no**] **port** {**aps**-*id*}
— **aps**
— **hold-time-aps** ([**lsignal-fail** *sf-time*] [**lsignal-degrade** *sd-time*]}
— **no hold-time-aps**
— **protect-circuit** *port-id*
— **no protect-circuit**
— [**no**] **rdi-alarms** {**suppress** | **circuit**}
— **revert-time** *minutes*
— **no revert-time**
— **switching-mode** {**bi-directional** | **uni-1plus1**}
— **working-circuit** *port-id*
— **no working-circuit**

Note: Queue policies for APS are under the APS port hierarchy (**port** *aps-id*/**sonet-sdh/path/network/queue-policy** *name*), rather than under the physical port, similar to the configuration of regular SONET/SDH ports. See the SONET/SDH Commands hierarchy for more information.

Port Configuration Commands

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

Ethernet Commands

config
- — [**no**] **port** *port-id*
  - — **ethernet**
    - — **autonegotiate** [**limited**]
    - — [**no**] **autonegotiate**
    - — **cfm-loopback** **priority** {**low** | **high**}
    - — **no cfm-loopback**
    - — **dot1q-etype** *0x0600* to *0xffff*
    - — **no dot1q-etype**
    - — **duplex** {**full** | **half**}
    - — **efm-oam**
      - — [**no**] **accept-remote-loopback**
      - — **hold-time** *time-value*
      - — **no hold-time**
      - — **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**} [**swap-src-dest-mac**]
    - — **no loopback**
    - — **mac** *ieee-address*
    - — **no mac**
    - — **mode** {**access** | **network**}
    - — **no mode**
    - — **mtu** *mtu-bytes*
    - — **no mtu**
    - — **network**
      - — **queue-policy** *name*
      - — **no queue-policy**
      - — **scheduler-mode** {**profile** | **4-priority**)
    - — [**no**] **report-alarm** [**signal-fail**] [**remote**] [**local**] [**no-frame-lock**] [**high-ber**]
    - — **speed** {**10** | **100** | **1000**}
    - — **ssm**
      - — **code-type** {**sonet** | **sdh**}
      - — [**no**] **shutdown**
      - — [**no**] **tx-dus**

Note: For information on configuring scheduler mode on Ethernet ports, refer to the 7705 SAR OS Quality of Service Guide, “Network Egress Scheduling on 8-port Ethernet Adapter Cards”.

IEEE 802.1x Ethernet Port Commands

config
— **port** *port-id*
— **ethernet**
— **dot1x**
— **max-auth-req** *max-auth-request*
— **no max-auth-req**
— **port-control** {**auto** | **force-auth** | **force-unauth**}
— **no port-control**
— **quiet-period** *seconds*
— **no quiet-period**
— **radius-plcy** *name*
— **no radius-plcy**
— **re-auth-period** *seconds*
— **no re-auth-period**
— [**no**] **re-authentication**
— **server-timeout** *seconds*
— **no server-timeout**
— **supplicant-timeout** *seconds*
— **no supplicant-timeout**
— **transmit-period** *seconds*
— **no transmit-period**

LLDP Ethernet Port Commands

config
- — **port** *port-id*
  - — **ethernet**
    - — **lldp**
      - — **dest-mac** {**nearest-bridge** | **nearest-non-tpmr** | **nearest-customer**}
        - — **admin-status** {**rx** | **tx** | **tx-rx** | **disabled**}
        - — [**no**] **notification**
        - — **tx-mgmt-address** [**system**]
        - — **no tx-mgmt-address**
        - — **tx-tlvs** [**port-desc**] [**sys-name**] [**sys-desc**] [**sys-cap**]
        - — **no tx-tlvs**

Multilink Bundle and IMA Group Commands

config
— [**no**] **port** {*bundle-id*}
— **multilink-bundle**
— **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**}
— **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**
— [**no**] **magic-number**
— **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**

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
                    — mode {access | network}
                    — [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}
                — data-position {F0-B5 | F0-B6}
                — device-gender {dte | dce}
                — device-mode {synchronous | asynchronous}
                — duplex {half | full}
                — loopback {bidir-b | bidir-e}
                — no loopback
                — multi-drop {disabled | slave}
                — parity {odd | even | mark | space}
                — no parity
                — [no] report-alarm [hcmOof | hcmRai]
                — s-bit signaling {on | off}
                — [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
                    — mode {access | network}
                    — [no] shutdown
                — 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** {**half** | **full**}
— **loopback** {**bidir-b** | **bidir-e**}
— **no loopback**
— [**no**] **shutdown**
— **speed** {**64k** | **128k** | **256k** | **384k** | **512k** | **640k** | **768k** | **896k** | **1024k** | **1152k** | **1280k** | **1408k** | **1536k** | **1664k** | **1792k** | **1920k**}

- [**no**] **x21**
  - [**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**
    - **mode** {**access** | **network**}
    - [**no**] **shutdown**
  - **clock-source** {**slave**}
  - **control-lead** {**input** | **output**}
    - **input**
      - **c-i** {**high** | **low** | **end-to-end**}
    - **output**
      - **i-c** {**high** | **low** | **end-to-end**}
  - **device-gender** {**dte** | **dce**}
  - **device-mode** {**synchronous**}
  - **duplex** {**half** | **full**}
  - **loopback** {**bidir-b** | **bidir-e**}
  - **no loopback**
  - [**no**] **shutdown**
  - **speed** {**64k** | **128k** | **256k** | **384k** | **512k** | **640k** | **768k** | **896k** | **1024k** | **1152k** | **1280k** | **1408k** | **1536k** | **1664k** | **1792k** | **1920k**}

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**}
      - — **no encap-type**
      - — **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**}
    - — [**no**] **tx-dus**

TDM Commands

config
- [**no**] **port** {*port-id*}
  - **tdm**
    - **buildout** {**long** | **short**}
    - [**no**] **ds1**
    - [**no**] **ds3** [*sonet-sdh-index*]
    - [**no**] **e1**
    - [**no**] **e3**
    - **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**
        - — **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**
      - — [**no**] **report-alarm** {**ais** | **los** | **oof** | **rai** | **looped** | **ber-sd** | **ber-sf**}
      - — [**no**] **signal-mode** **cas**
      - — [**no**] **shutdown**

DS3 Commands

config
- — [**no**] **port** {*port-id*}
  - — **tdm**
    - — [**no**] **ds3** [*sonet-sdh-index*]
      - — **atm**
        - — **cell-format** *cell-format*
        - — **mapping** {**direct** | **plcp**}
        - — **no mapping**
        - — **min-vp-vpi** *value*
      - — **channelized** {**ds1** | **e1**}
      - — **no channelized**
      - — **clock-source** {**loop-timed** | **node-timed**}
      - — **crc** [**16** | **32**]
      - — **description** *description-string*
      - — **no description**
      - — **encap-type** {**atm** | **ppp-auto**}
      - — **no encap-type**
      - — [**no**] **feac-loop-respond**
      - — **framing (DS3)** {**c-bit** | **m23**}
      - — **idle-cycle-flag** {**flags** | **ones**}
      - — **no idle-cycle-flag**
      - — **loopback** {**line** | **internal** | **remote**}
      - — **no loopback**
      - — **mdl** {**eic** | **lic** | **fic** | **unit** | **pfi** | **port** | **gen**} *mdl-string*
      - — [**no**] **mdl**
      - — [**no**] **mdl-transmit** {**path** | **idle-signal** | **test-signal**}
      - — **mode** {**access** | **network**}
      - — **mtu** *mtu-bytes*
      - — **no mtu**
      - — **ppp**
        - — **keepalive** *time-interval* [**dropcount** *drop-count*]
        - — **no keepalive**
      - — [**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
                    — timeslots timeslots
                    — no timeslots
                — clock-source {adaptive-timed | loop-timed | node-timed}
                — framing (E1) {no-crc-g704 | g704 | e1-unframed}
                — hold-time [up hold-time-up] [down hold-time-down]
                — no hold-time
                — loopback (E1) {line | internal}
                — no loopback (E1)
                — [no] report-alarm {ais | los | oof | rai | looped | ber-sd | ber-sf}
                — [no] signal-mode cas
                — [no] shutdown
```

E3 Commands

config
- — [**no**] **port** {*port-id*}
  - — **tdm**
    - — [**no**] **e3** [*index*]
      - — **clock-source** {**loop-timed** | **node-timed**}
      - — **crc** [**16** | **32**]
      - — **description** *description-string*
      - — **no description**
      - — **encap-type** {**atm** | **ppp-auto**}
      - — **no encap-type**
      - — [**no**] **feac-loop-respond**
      - — **framing (E3)** **g751**
      - — **idle-cycle-flag** {**flags** | **ones**}
      - — **no idle-cycle-flag**
      - — **loopback** {**line** | **internal** | **remote**}
      - — **no loopback**
      - — **mode** {**network**}
      - — **mtu** *mtu-bytes*
      - — **no mtu**
      - — **ppp**
        - — **keepalive** *time-interval* [**dropcount** *drop-count*]
        - — **no keepalive**
      - — [**no**] **report-alarm** {**ais** | **los** | **oof** | **rai** | **looped**}
      - — [**no**] **shutdown**

Voice Commands

config
- — [**no**] **port** {*port-id*}
  - — **voice**
    - — **audio-wires** {**two-wires** | **four-wires**}
    - — [**no**] **em**
      - — **channel-group** *channel-group-id*
      - — **no channel-group** *channel-group-id*
        - — **description** *description-string*
        - — **no description**
        - — **encap-type** **cem**
        - — **no encap-type**
        - — **mode** **access**
        - — [**no**] **shutdown**
      - — **fault-signaling** {**idle** | **seized**}
      - — **idle-code** *abcd-code*
      - — **no idle-code**
      - — **loopback** {**internal-analog** | **internal-digital**}
      - — **no loopback**
      - — **seized-code** *abcd-code*
      - — **no seized-code**
      - — **signaling-lead**
        - — **e** {**high** | **low** | **end-to-end**}
        - — **m** {**high** | **low** | **end-to-end**}
      - — **signaling-mode** {**em** | **transmission-only**}
      - — [**no**] **shutdown**
    - — **tlp-rx** *decibels*
    - — **tlp-tx** *decibels*

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**
- — **external-alarms alarm** [*alarm-id*]
- — **external-alarms input** [*alarm-input*] [**detail**]
- — **external-alarms name** [*name-string*] [**detail**]
- — **external-alarms output** [*alarm-output*] [**detail**]
- — **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* [**statistics**] [**detail**]
- — **port** *port-id* **acr** [**detail**]
- — **port** *port-id* **description**
- — **port** *port-id* **dot1x** [**detail**]
- — **port** *port-id* **associations**
- — **port** *port-id* **ppp** [**detail**]
- — **port** *port-id* **ethernet** [**efm-oam** | **detail**]
  - — **lldp** [**nearest-bridge** | **nearest-non-tpmr** | **nearest-customer**] [**remote-info**] [**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

— **external-alarms alarm** [**all** | *alarm-id*]
— **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>external-alarms>alarm
config>external-alarms>input
config>external-alarms>output
config>port
config>port>tdm>ds1>channel-group
config>port>tdm>ds3
config>port>tdm>e3
config>port>tdm>e1>channel-group
config>port>sonet-sdh>path
config>port>serial>rs232>channel-group
config>port>serial>v35>channel-group
config>port>serial>x21>channel-group
config>port>voice>em>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 **n/a**

"DS0GRP" (for the serial context and the voice context)
"Discrete Digital Input" for digital input or **"Analog Input"** for analog input and **"Digital Output Relay"** for output (for Auxiliary Alarm card)

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>external-alarms>alarm
config>external-alarms>input
config>external-alarms>output
config>port
config>port>ethernet>efm-oam
config>port>ethernet>ssm
config>port>serial>rs232
config>port>serial>v35
config>port>serial>x21
config>port>serial>rs232>channel-group
config>port>serial>v35>channel-group
config>port>serial>x21>channel-group
config>port>sonet-sdh>path
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>tdm>e3
config>port>voice>em>
config>port>voice>em>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

input – no shutdown (for Auxiliary Alarm card)

alarm – shutdown (for Auxiliary Alarm card)

output – shutdown (for Auxiliary Alarm card)

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 **n/a**

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-sar**.

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 **n/a**

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

Values iom-sar

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 **n/a**

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

Values 1 to 6 (on the 7705 SAR-8)
1 to 12 (on the 7705 SAR-18)

clock-mode

Syntax **clock mode adaptive**

Context config>card>mda

Description This command defines the clocking mode on the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, and 2-port OC3/STM1 Channelized Adapter card. The only mode supported is adaptive.

Default **adaptive**

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.

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 6 adapter cards can be installed in a 7705 SAR-8 chassis; in Release 4.0, a maximum of 12 adapter cards can be installed in a 7705 SAR-18 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.

Default **n/a**

Parameters *mda-type* — the type of adapter card to be provisioned

Values

For the 7705 SAR-8:

a16-chds1 (16-port T1/E1 ASAP Adapter card version 1)
a16-chds1v2 (16-port T1/E1 ASAP Adapter card version 2)
a32-chds1v2 (32-port T1/E1 ASAP Adapter card version 2)
a12-sdi (12-port Serial Data Interface card)
a8-eth (8-port Ethernet Adapter card version1)
a8-ethv2 (8-port Ethernet Adapter card version 2)
a6-em (6-port E&M Adapter card)
a4-chds3 (4-port DS3/E3 Adapter card)
a4-oc3 (4-port OC3/STM1 Clear Channel Adapter card)
a2-choc3 (2-port OC3/STM1 Channelized Adapter card)
aux-alarm (Auxiliary Alarm card)

For the 7705 SAR-18:

a16-chds1 (16-port T1/E1 ASAP Adapter card version 1)
a16-chds1v2 (16-port T1/E1 ASAP Adapter card version 2)
a32-chds1v2 (32-port T1/E1 ASAP Adapter card version 2)
a8-ethv2 (8-port Ethernet Adapter card version 2)
a4-chds3 (4-port DS3/E3 Adapter card)
a4-oc3 (4-port OC3/STM1 Clear Channel Adapter card version 2)
a2-choc3 (2-port OC3/STM1 Channelized Adapter card)
aux-alarm (Auxiliary Alarm card)

voice

Syntax **voice**

Context config>card>mda

Description This command enables the context to configure voice parameters on the 6-port E&M Adapter card.

Default **n/a**

companding-law

Syntax **companding-law** {**a-law** | **mu-law** }

Context config>card>mda>voice

Description This command specifies the companding law to be used on the 6-port E&M Adapter card.

To change this parameter, all ports associated with the 6-port E&M Adapter card must be in shutdown mode and no channels can be defined on the card. A change in the companding law results in a corresponding change to the signaling-type default.

Default **mu-law**

Parameters **a-law** — A-Law companding

mu-law — Mu-Law companding

signaling-type

Syntax **signaling-type** {**type-i** | **type-ii** | **type-v**}

Context config>card>mda>voice

Description This command specifies the signaling type to be used on the 6-port E&M Adapter card.

To change this parameter, all ports associated with the 6-port E&M Adapter card must be in shutdown mode and no channels can be defined on the card.

When A-Law companding is configured, the signaling type is automatically type V. When Mu-Law companding is configured, either type I or type II signaling can be selected.

Default **type-i** (for Mu-Law companding)

type-v (for A-Law companding)

Parameters **type-i** — Type I signaling

type-ii — Type II signaling

type-v — Type V signaling

Interface QoS Commands

access

Syntax **access**

Context config>card>mda

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

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>access
config>card>mda>network

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

fabric-policy

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

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

Description This command configures the ingress fabric policy, in either an access or network 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

Values 1 to 256

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, “Network Queue QoS Policies”, for more information.

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

Default **“default”**

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

Auxiliary Alarm Card Commands

external-alarms

Syntax **external-alarms**

Context config

Description This command enables access to the context to configure external alarm attributes on the Auxiliary Alarm card.

alarm

Syntax [**no**] **alarm** *alarm-id*

Context config>external-alarms

Description This command creates or removes alarms.

The **no** form of this command disables the alarm attributes for the specified alarm. The alarm must be in the shutdown state before the **no** form of the command can be performed.

Default **n/a**

Parameters *alarm-id* — specifies the alarm identifier

Values 1 to 2147483647

chassis-alarming

Syntax [**no**] **chassis-alarming**

Context config>external-alarms>alarm

Description This command generates output to chassis alarm relays and LEDs for the specified alarm.

The **no** form of this command disables the generation of output to chassis alarm relays and LEDs.

Default **chassis-alarming**

log

Syntax [**no**] **log**

Context config>external-alarms>alarm

Description This command generates raise/clear log events for the specified alarm and controls SNMP trap generation for the raise/clear log events.

The **no** form of this command disables the generation of raise/clear log events.

Default **log**

severity

Syntax **severity** {**critical** | **major** | **minor** | **warning**}

Context config>external-alarms>alarm

Description This command configures the severity level for the specified alarm.

The alarm must be disabled before the severity level can be modified.

If the alarm generates raise/clear log events and SNMP traps (enabled by the log command), the severity of the raise log events and SNMP traps is controlled by this configuration. The severity level of the clear log events and SNMP traps is warning.

If the alarm generates output to chassis alarm relays and LEDs (enabled by the chassis-alarming command), the severity level of the alarm output is controlled by this configuration. For chassis relay alarms, only the critical, major and minor levels of severity apply. (There are three LEDs that represent each of them.)

Default **major**

Parameters **critical** — specifies a critical alarm

major — specifies a major alarm

minor — specifies a minor alarm

warning — specifies a warning (not applicable for chasssis relay alarms)

thresholds

Syntax **thresholds**

Context config>external-alarms>alarm

Description This command provides the context to configure the thresholds for the specified alarm.

Default **n/a**

analog

Syntax **analog**

Context config>external-alarms>alarm>thresholds

Description This command provides the context to configure analog trigger thresholds for the specified alarm.

Default **n/a**

level

Syntax [**no**] **level** {**lt** | **gt**} *millivolts*

Context config>external-alarms>alarm>thresholds>analog

Description This command configures the analog voltage level thresholds for the specified alarm.

The analog input level threshold cannot be changed from **no level** when there are no analog inputs configured as triggers. When all analog inputs are removed from the trigger list, the level is automatically changed to **no level**. The analog input level threshold cannot be changed to **no level** when there is analog input in the trigger list. When the first analog input is added to the alarm trigger, the level is automatically changed to **gt** 0.

The **no** form of this command removes the analog voltage level threshold.

Default **no level**

Parameters **lt —** specifies a less-than value

gt — specifies a greater-than value

millivolts — specifes the voltage level in millivolts

Values 0 to 75000

trigger

Syntax **trigger** [**any** | **all**] {*alarm-input1* | *alarm-input2...* | *alarm-input8*}
no trigger

Context config>external-alarms>alarm

Description This command configures the inputs that will trigger the alarm. An alarm can be configured to trigger on any configured input or only when all enabled configured inputs are active. Administratively disabled inputs are ignored for alarm triggering.

Digital inputs are considered normally open. This means that a digital input becomes active only if it closes. Analog inputs have a customizable voltage threshold. This threshold can be configured using the thresholds command. Analog inputs become active when this threshold is crossed.

The **no** form of this command removes the trigger.

Default **no trigger**

Parameters **any —** specifies that any configured input trigger will raise an alarm

all — specifies that all configured input triggers that are enabled are required to raise an alarm

alarm-input — identifies the input trigger, up to a maximum of eight, in the following format:

alarm-<*slot*>/<*mda*>.{**d** | **a**}-<*alarm-num*>
<*name*>

where:

slot = slot number of the card in the chassis (always 1 on the 7705 SAR)
mda = Auxiliary Alarm card slot number
d = digital input
a = analog input
alarm-num = alarm port number (1 to 24 for digital, 1 or 2 for analog)
name = optional name assigned to the input

for example:
alarm-1/3.d-3
windowOpen3

The *name* option lets users assign a more meaningful name (must be unique) to the alarm input; for example, windowOpen3 might be more meaningful to a user than the identifier alarm-1/3.d-3. Once the *name* has been configured, it can be used interchangeably with the alarm input identifier; for example, windowOpen3 can be used instead of alarm-1/3.d-3 as an alarm input trigger.

input

Syntax **input** *alarm-input*

Context config>external-alarms

Description This command provides the context to configure the external alarm inputs.

Default **n/a**

Parameters *alarm-input* — identifies the alarm input, in the following format:

alarm-<*slot*>/<*mda*>.{**d** | **a**}-<*alarm-num*>
<*name*>

where:

slot = slot number of the card in the chassis (always 1 on the 7705 SAR)
mda = Auxiliary Alarm card slot number
d = digital input
a = analog input
alarm-num = alarm port number (1 to 24 for digital, 1 or 2 for analog)
name = optional name assigned to the input

for example:
alarm-1/3.d-1
doorOpen1

The *name* option lets users assign a more meaningful name (must be unique) to the alarm input; for example, doorOpen1 might be more meaningful to a user than the alarm input identifier alarm-1/3.d-1. Once the *name* has been configured, it can be used interchangeably with the alarm input identifier; for example, doorOpen1 can be used instead of alarm-1/3.d-1 as an alarm input trigger for the trigger command, or when performing a **show>external-alarms>input** or **show>external-alarms>output** command.

debounce

Syntax **debounce** *seconds*
debounce detect *detect-seconds* **clear** *clear-seconds*
no debounce

Context config>external-alarms>input

Description This command configures the debounce time associated with detecting and clearing an alarm input.

The **no debounce** form of the command sets both the detect time and clear time to 0.

Default **2** (for both detect time and clear time)

Parameters *seconds* — specifies the amount of time that the input must be on or off before it is accepted as changed from on to off (or from off to on)

Values 1 to 60

detect-seconds — specifies the amount of time that the input must be on before it is accepted as on by the system

Values 0 to 60

clear-seconds — specifies the amount of time that the input must be off before it is accepted as off by the system

Values 0 to 60

output

Syntax **output** *alarm-output*

Context config>external-alarms

Description This command provides the context to configure the external alarm output relays.

Default **n/a**

Parameters *alarm-output* — identifies the output relay, in the following format:

relay-<*slot*>/<*mda*>.**d**-<*relay-num*>
<*name*>

where:

slot = slot number of the card in the chassis (always 1 on the 7705 SAR)
mda = Auxiliary Alarm card slot number
d = digital output
relay-num = output relay number (1to 8)
<*name*> = name assigned to the output relay

for example:
relay-1/3.d-5
doorHolder5

The *name* option lets users assign a more meaningful name (must be unique) to the output relay; for example, doorHolder5 might be more meaningful to a user than the output relay identifier relay-1/3.d-5. Once the *name* has been configured, it can be used interchangeably with the alarm identifier; for example, doorHolder5 can be used instead of relay-1/3.d-5 when performing a **show>external-alarms>output** command.

name

Syntax **name** *name-string*
no name

Context config>external-alarms>input
config>external-alarms>output

Description This command configures a name for the alarm input or output relay. The configured name must be unique within the external alarms context; therefore, it must not be the same as an *alarm-input* name configured for the trigger or input command, or an *alarm-output* name configured for the output command. For example, alarm-1/3.d-1 or doorOpen1 cannot be used as a name for any alarm input, and relay-1/3.d-5 or doorHolder5 cannot be used as a name for any output relay.

The **no** form of this command does not associate a name with the alarm input or output relay.

Default **no name**

Parameters *name-string* — specifies a unique name for the alarm input or output relay (maximum of 15 characters)

APS Port Commands

port

Syntax [**no**] **port** {**aps**-*id*}

Context configure

Description This command enables access to the context to configure APS on SONET/SDH ports and assigns an APS group ID. Both working and protection circuits must be configured on the same 7705 SAR with the same APS group ID.

Parameters **aps —** keyword

id — 1 to 8

aps

Syntax **aps**

Context configure>port

Description This command configures APS on SONET/SDH ports. Both working and protection circuits must be configured on the same 7705 SAR with the same APS group ID.

The working circuit must be connected to the peer working circuit, and the protection circuit must be connected to the peer protection circuit.

The **aps** command is only available for APS groups, not for physical ports.

hold-time-aps

Syntax **hold-time-aps** {[**lsignal-fail** *sf-time*] [**lsignal-degrade** *sd-time*]}
no hold-time-aps

Context configure>port>aps

Description This command configures hold-down timers to debounce signal failure conditions (lais, b2err-sf) and signal degrade conditions (b2err-sd) for 1+1 unidirectional APS switching mode. If the signal fail or signal degrade conditions exceed the configured hold-down time, APS is activated.

Default **no hold-time-aps** (values are 0)

Parameters *sf-time* — the signal failure hold-down time in milliseconds, from 1 to 100

sd-time — the signal degrade hold-down time in milliseconds, from 1 to 100

protect-circuit

Syntax **protect-circuit** *port-id*
no protect-circuit

Context configure>port>aps

Description This command configures a physical port that will act as the protection circuit for this APS group.

The protection circuit port must contain only the default configuration and cannot belong to another APS group. The protection circuit port must be of the same type as the working circuit (SONET/SDH) for the APS group; if it is not, the command will return an error.

A protection circuit can only be added if the working circuit already exists. The protection circuit must be removed from the configuration before the working circuit can be removed.

When a port is a protection circuit of an APS group, the configuration options available in the **config>port port-id>sonet-sdh** context are not allowed for that port unless they are in the following exception list:

- clock-source
- [no] loopback
- [no] report-alarm
- section-trace
- [no] threshold

When a port is configured as a protection circuit of an APS group, the configurations listed above and all service configurations related to the APS port are operationally inherited by the protection circuit. If the protection circuit cannot inherit the configurations (due to resource limitations), the configuration attempt fails and an error is returned to the user.

The protection circuit must be shut down before it can be removed from the APS group port. The inherited configuration for the circuit and APS operational commands for that circuit are not preserved when the circuit is removed from the APS group.

The **no** form of this command removes the protection circuit.

Default **n/a**

Parameters *port-id* — the physical port that will act as the protection circuit for this APS group in the format *slot/mda/port*

rdi-alarms

Syntax [**no**] **rdi-alarms** {**suppress** | **circuit**}

Context configure>port>aps

Description This command configures how RDI alarms (line, path, section) are generated on physical circuits of an APS port. The command is only supported in 1+1 unidirectional APS switching mode.

Default **circuit**

Parameters **suppress —** RDI hardware generation on working and protection circuits is suppressed. No alarms are generated upon an Rx failure of that circuit.

circuit — RDI alarms are hardware-generated independently on each working and protection circuit based on an Rx failure of that circuit, regardless of APS line status

revert-time

Syntax **revert-time** *minutes*
no revert-time

Context configure>port>aps

Description This command configures how long the 7705 SAR waits before switching back to the working circuit after it has been restored to service.

If the minutes value is changed, it takes effect at the next initiation of the wait-to-restore (WTR) timer.

This command does not modify the length of a WTR timer that has already been started. The WTR timer of a non-revertive switch can be assumed to be infinite.

The **no** form of this command restores the default (non-revertive) mode – the switch back does not occur unless the protection circuit fails or it is manually switched by the operator.

Parameters *minutes* — the time to wait, in minutes, before reverting back to the working circuit after it has been restored to service

Values 0 to 60

Default 5

switching-mode

Syntax **switching mode** {**bi-directional** | **uni-1plus1**}

Context configure>port>aps

Description This command configures the switching mode for the APS port.

Default **bi-directional**

Parameters **bi-directional —** provides protection in both directions

uni-1plus1 — provides protection in one direction

working-circuit

Syntax **working-circuit** *port-id*
no working-circuit

Context configure>port>aps

Description This command configures a physical port that will act as the working circuit for this APS group.

The working circuit port must contain only the default configuration and cannot be part of another APS group. The working circuit must be created before the protection circuit.

When a port is a working circuit of an APS group, the configuration options available in the **config>port port-id>sonet-sdh** context are not allowed for that port unless they are in the following exception list:

- clock-source
- [no] loopback
- [no] report-alarm
- section-trace
- [no] threshold

When a port is configured as a working circuit of an APS group, the configurations listed above and all service configurations related to the APS port are operationally inherited by the working circuit from the APS group ID. If the working circuit cannot inherit that configuration (for example, due to resource limitations), the configuration attempt fails and an error is returned to the user.

The working circuit must be shut down before it can be removed from an APS group. The inherited configuration for the circuit and APS operational commands for that circuit are not preserved when the circuit is removed from the APS group.

All configurations for the APS group under the **config>port** context and its submenus and all configuration for services that use this APS group ID are preserved as a non-activated configuration since the APS group no longer has any physical circuits assigned.

The **no** form of this command removes the working circuit. The working circuit can only be removed from the configuration after the protection circuit has been removed.

Parameters *port-id* — the physical port that will act as the working circuit for this APS group in the format *slot/mda/port*

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 **n/a**

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 8 MLPPP bundles can be configured on a 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card in network mode
- up to 16 MLPPP bundles can be configured on a 16-port T1/E1 ASAP Adapter card and up to 32 bundles can be configured on a 32-port T1/E1 ASAP Adapter card in access mode
- up to 8 IMA bundles can be configured on a 16-port T1/E1 ASAP Adapter card and up to 16 IMA bundles can be configured on a 32-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 32

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: For fiber SFP-based Gigabit Ethernet ports only, disabling autonegotiation is not supported as the IEEE 802.3 specification for Gigabit Ethernet requires that autonegotiation be enabled for far-end fault indication. Although disabling autonegotiation for fiber Gigabit Ethernet ports is not blocked through the CLI, it is ignored by the system. Users are cautioned that if autonegotiation **is** disabled and if the configured speed does not match the autonegotiated values, the port is automatically operationally shut down. Attempting to configure a speed and duplex mode to 1000 Mb/s, half-duplex, is an invalid combination and will be blocked in CLI.

For copper SFP-based Gigabit Ethernet ports, disabling autonegotiation and half-duplex operation is supported. Attempting to configure a speed and duplex mode to 1000 Mb/s, half-duplex, is an invalid combination and will be blocked in CLI.

As well, if autonegotiation is turned off, the reception and transmission of IEEE 802.3x flow control frames is enabled by default and cannot be disabled. For more information, see Flow Control on Ethernet Ports.

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**

cfm-loopback

Syntax **cfm-loopback priority** {**low** | **high**}
no cfm-loopback

Context config>port>ethernet

Description This command enables the port to respond to LBM messages and sets the queuing and scheduling conditions for handling CFM LBM frames. The user selects the desired QoS treatment by enabling the CFM loopback and including high or low priority with the **high** or **low** keyword. The queue parameters and scheduler mappings associated with the **high** and **low** keywords are preconfigured and cannot be altered by the user. These parameters and mappings have the following settings:

- for network egress, where profiled scheduling is the choice of scheduling:
  - → **high-priority**: either cir = port_speed, which applies to all frames that are scheduled via an in-profile scheduler, or round-robin (RR) for all other (network egress queue) frames that are in-profile
  - → **low-priority**: either cir = 0, pir = port_speed, which applies to all frames that are scheduled as out-of-profile, or RR for all other frames that are out-of-profile

- for network egress or access egress, where 4-priority scheduling is enabled:
  - → **high-priority**: either cir = port_speed, which applies to all frames that are scheduled via an expedited in-profile scheduler, or RR for all other (network egress queue) frames that reside in expedited queues and are in an in-profile state
  - → **low-priority**: either cir = 0, pir = port_speed, which applies to all frames that are scheduled via a best effort out-of-profile scheduler, or RR for all other frames that reside in best-effort queues and are in an out-of-profile state

The **no** form of the command disables the handling of CFM loopback frames.

Default **no cfm-loopback**

Parameters **low —** sets the queue parameters and scheduler mappings, as described above

high — sets the queue parameters and scheduler mappings, as described above

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

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.

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-duplex 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.

hold-time

Syntax **hold-time** *time-value*
no hold-time

Context config>port>ethernet>efm-oam

Description This command sets the amount of time that EFM-OAM will wait before going from a non-operational state to an operational state.

If EFM-OAM goes from an operational state to a non-operational state (other than link-fault), it enters the hold-time period. During this time, EFM-OAM continues to negotiate with the peer if possible, but will not transition to the “up” state until the hold time has expired.

If EFM-OAM goes down due to a lower-level fault (for example, the port goes down and EFM-OAM enters the link-fault state), the hold timer is not triggered. When the lower-level fault is cleared, EFM-OAM immediately starts running on the port and transitions to the operational state as soon as possible.

If EFM-OAM goes down because the user administratively disables the protocol, EFM-OAM immediately transitions to the disabled state. When the user re-enables EFM-OAM, the protocol enters the hold time period and EFM-OAM is not operational until the hold time expires.

A hold-time value of 0 indicates that EFM-OAM returns to the operational state without delay.

The hold time affects only the transition from a non-operational state to an operational state; it does not apply to a transition from an operational state to a non-operational state.

Parameters *time-value* — the number of seconds that EFM-OAM will wait before returning to an operational state from a non-operational state

Values 0 to 50

Default 0

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 seconds, used when an interface transitions from a down state to an up state

Values 0 to 900

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

Values 0 to 900

loopback

Syntax **loopback** {**line** | **internal**} **timer** {**0** | **30 .. 86400**} [**swap-src-dst-mac**]
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 (egress) direction before reaching the framer. Line loopbacks are supported on ports configured in network mode. In addition, line loopback mode provides the option to swap source and destination MAC addresses of the received frames using the **swap-src-dst-mac** keyword.

An internal loopback loops the frames that are coming in an egress direction from the fabric towards the framer, back to the fabric. This type of loopback is usually referred to as an equipment loopback. 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

swap-src-dst-mac — swaps source and destination MAC addresses for line loopback

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 **access**

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 Table 11.

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

Values 512 to 2106 bytes (see Table 11)

Table 11: MTU values

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)

ssm

Syntax **ssm**

Context config>port>ethernet

Description This command enables the Ethernet Synchronization Message Channel (ESMC) capability on a Synchronous Ethernet port on the 8-port Ethernet Adapter card, version 2.

Default **no ssm**

code-type

Syntax **code-type** {**sonet** | **sdh**}

Context config>port>ethernet>ssm

Description This command specifies whether to use SDH or SONET values for the encoding of synchronous status messages on a Synchronous Ethernet port on the 8-port Ethernet Adapter card, version 2 on the 7705 SAR-8 or on a Synchronous Ethernet port on the 7705 SAR-F.

Default **sdh**

Parameters **sonet —** specifies the values used on a G.781 option 1 compliant network

sdh — specifies the values used on a G.782 option 1 compliant network

tx-dus

Syntax [**no**] **tx-dus**

Context config>port>ethernet>ssm

Description This command sets the quality level value transmitted from the Synchronization Status Messaging (SSM) channel of a Synchronous Ethernet port on the 8-port Ethernet Adapter card, version 2 on the 7705 SAR-8 or a Synchronous Ethernet port on the 7705 SAR-F, to QL-DUS/QL-DNU (do not use for synchronization for timing purposes).

Default **no tx-dus**

IEEE 802.1x Ethernet Port Commands

dot1x

Syntax **dot1x**

Context config>port>ethernet

Description This command enables access to the context to configure port-specific 802.1x authentication attributes on an Ethernet port.

max-auth-req

Syntax **max-auth-req** *max-auth-request*
no max-auth-req

Context config>port>ethernet>dot1x

Description This command configures the maximum number of times that the 7705 SAR will send an access request RADIUS message to the RADIUS server. If a reply is not received from the RADIUS server after the specified number of attempts, the 802.1x authentication process is considered to have failed.

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

Default **2**

Parameters *max-auth-req* — the maximum number of RADIUS retries

Values 1 to 10

port-control

Syntax **port-control** {**auto** | **force-auth** | **force-unauth**}
no port-control

Context config>port>ethernet>dot1x

Description This command configures the 802.1x authentication mode.

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

Default **force-auth**

Parameters

auto — enables 802.1x authentication. The port starts in the unauthorized state, allowing only EAPOL frames to be sent and received through the port. Both the 7705 SAR and the host (supplicant) can initiate an authentication process. The port will remain in the unauthorized state until the first supplicant is authenticated successfully. After this, traffic is allowed on the port for all connected hosts.

force-auth — disables 802.1x authentication and causes the port to transition to the authorized state without requiring any authentication exchange. The port transmits and receives normal traffic without requiring 802.1x-based host authentication.

force-unauth — causes the port to remain in the unauthorized state, ignoring all attempts by the hosts to authenticate. The authenticator cannot provide authentication services to the host through the interface.

quiet-period

Syntax **quiet-period** *seconds*
no quiet-period

Context config>port>ethernet>dot1x

Description This command configures the time between two authentication sessions during which no EAPOL frames are sent by the 7705 SAR.

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

Default **30**

Parameters *seconds* — specifies the quiet period in seconds

Values 1 to 3600

radius-plcy

Syntax **radius-plcy** *name*
no radius-plcy

Context config>port>ethernet>dot1x

Description This command configures the RADIUS policy to be used for 802.1x authentication. An 802.1x RADIUS policy must be configured (under **config>system>security>dot1x**) before it can be associated with a port. If the RADIUS policy ID does not exist, an error is returned. Only one 802.1x RADIUS policy can be associated with a port at a time.

The **no** form of this command removes the RADIUS policy association.

Default **no radius-plcy**

Parameters *name* — specifies an existing 802.1x RADIUS policy name

re-auth-period

Syntax **re-auth-period** *seconds*
no re-auth-period

Context config>port>ethernet>dot1x

Description This command configures the number of seconds the system will wait before performing reauthentication. This value is only relevant if reauthentication is enabled with the re-authentication command.

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

Default **3600**

Parameters *seconds* — specifies the reauthentication delay period in seconds

Values 1 to 9000

re-authentication

Syntax [**no**] **re-authentication**

Context config>port>ethernet>dot1x

Description This command enables or disables periodic 802.1x reauthentication.

When reauthentication is enabled, the 7705 SAR will reauthenticate clients on the port after waiting the number of seconds defined by the re-auth-period command.

The **no** form of this command disables 802.1x reauthentication.

Default **no re-authentication**

server-timeout

Syntax **server-timeout** *seconds*
no server-timeout

Context config>port>ethernet>dot1x

Description This command configures the time during which the 7705 SAR waits for the RADIUS server to responds to its access request message. When this timer expires, the 7705 SAR will resend the access request message, up to the number of times specified by the max-auth-req command.

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

Default **30**

Parameters *seconds* — specifies the server timeout period in seconds

Values 1 to 300

supplicant-timeout

Syntax **supplicant-timeout** *seconds*
no supplicant-timeout

Context config>port>ethernet>dot1x

Description This command configures the time the 7705 SAR waits for a client to respond to its EAPOL messages. When the supplicant timeout period expires, the 802.1x authentication session is considered to have failed.

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

Default **30**

Parameters *seconds* — specifies the supplicant timeout period in seconds

Values 1 to 300

transmit-period

Syntax **transmit-period** *seconds*
no transmit-period

Context config>port>ethernet>dot1x

Description This command configures the time after which the 7705 SAR sends a new EAPOL request message.

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

Default **30**

Parameters *seconds* — specifies the server transmit period in seconds

Values 1 to 3600

LLDP Ethernet Port Commands

Refer to the 7705 SAR OS Basic System Configuration Guide, “System Management”, for LLDP system commands.

lldp

Syntax **lldp**

Context config>port>ethernet

Description This command enables the context to configure LLDP parameters on the specified port.

dest-mac

Syntax **dest-mac** {**nearest-bridge** | **nearest-non-tpmr** | **nearest-customer**}

Context config>port>ethernet>lldp

Description This command configures destination MAC address parameters.

Parameters **nearest-bridge** — configures the LLDP to use the nearest bridge

nearest-non-tpmr — configures the LLDP to use the nearest non-two-port MAC relay (TPMR) bridge

nearest-customer — configures the LLDP to use the nearest customer bridge

admin-status

Syntax **admin-status** {**rx** | **tx** | **tx-rx** | **disabled**}

Context config>port>ethernet>lldp>dest-mac

Description This command specifies the administratively desired status of the local LLDP agent.

Default **disabled**

Parameters **rx** — specifies that the LLDP agent will receive, but will not transmit, LLDP frames on this port

tx — specifies that the LLDP agent will transmit LLDP frames on this port and will not store any information about the remote systems connected to it

tx-rx — specifies that the LLDP agent will transmit and receive LLDP frames on this port

disabled — specifies that the LLDP agent will not transmit or receive LLDP frames on this port. If there is remote system information that was received on this port and stored in other tables before the port’s admin-status was disabled, the information will naturally age out.

notification

Syntax **[no] notification**

Context config>port>ethernet>lldp>dest-mac

Default **no notification**

Description This command enables LLDP notifications.

The **no** form of the command disables LLDP notifications.

tx-mgmt-address

Syntax **tx-mgmt-address** [**system**]
no tx-mgmt-address

Context config>port>ethernet>lldp>dest-mac

Description This command specifies which management address to transmit. The 7705 SAR can only be configured to send or not send the system address.

If the **no** form of the command is used, the port will not include the system management address TLV in any LLDPDUs it transmits.

Default **no tx-mgmt-address**

Parameters **system** — specifies to use the system IP address. The system address is only transmitted after it has been configured.

tx-tlvs

Syntax **tx-tlvs** [**port-desc**] [**sys-name**] [**sys-desc**] [**sys-cap**]
no tx-tlvs

Context config>port>ethernet>lldp>dest-mac

Description This command specifies which LLDP optional TLVs to transmit.

If the **no** form of the command is used, the port will not include any optional TLVs in any LLDPDUs it transmits.

Default **no tx-tlvs**

Parameters **port-desc** — indicates that the LLDP agent should transmit port description TLVs

sys-name — indicates that the LLDP agent should transmit system name TLVs

sys-desc — indicates that the LLDP agent should transmit system description TLVs

sys-cap — indicates that the LLDP agent should transmit system capabilities TLVs

Serial Commands

serial

Syntax **serial**

Context config>port

Description This command enables the context to configure RS-232, V.35, or X.21 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 **n/a**

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 **n/a**

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 **n/a**

x21

Syntax [no] **x21**

Context config>port>serial

Description This command enables the context to configure X.21 parameters for a channel. When one of the three ports on a connector has been configured for an X.21 channel, the other two ports on the connector can only be configured for X.21.

The **no** form of this command deletes the X.21 channel.

Default **n/a**

character-length

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

Context config>port>serial>rs232

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
config>port>serial>x21

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 12

Table 12: 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
config>port>serial>x21

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 **n/a**

input

Syntax **input**

Context config>port>serial>rs232>control-lead
config>port>serial>v35>control-lead
config>port>serial>x21>control-lead

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

Default **n/a**

output

Syntax **output**

Context config>port>serial>rs232>control-lead
config>port>serial>v35>control-lead
config>port>serial>x21>control-lead

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

Default **n/a**

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

c-i

Syntax **c-i** {**high** | **low** | **end-to-end**}

Context config>port>serial>x21>control-lead>input

Description This command configures the Control (C) or Indication (I) input control lead. The input signal that is sent depends on the device-gender setting. For a DCE device, the input signal is C. For a DTE device, the input signal is I.

This command is valid only for an X.21 interface.

Default **high**

Parameters

high — the input control lead is forced on

low — the input control lead is forced off

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

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

i-c

Syntax **i-c** {**high** | **low** | **end-to-end**}

Context config>port>serial>x21>control-lead>output

Description This command configures the Indication (I) or Control (C) output control lead. The output signal that is sent depends on the device-gender setting. For a DCE device, the output signal is I. For a DTE device, the output signal is C.

This command is valid only for an X.21 interface.

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

data-position

Syntax **data-position** {**F0-B5** | **F0-B6**}

Context config>port>serial>rs232

Description This command configures the HCM data start position for the RS-232 interface.

When s-bit signaling is on, the F0-B6 option is blocked. When the data position is set to F0-B6, S-bit signaling cannot be turned on.

Note: the HCM frame (10-row by 8-column matrix) cannot be displayed on the CLI.

Default **F0-B5**

Parameters

F0-B5 — HCM data start position is F0-B5

F0-B6 — HCM data start position is F0-B6

device-gender

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

Context config>port>serial>rs232
config>port>serial>v35
config>port>serial>x21

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
config>port>serial>x21

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 or X.21 channel; these channels 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** {**half** | **full**}

Context config>port>serial>rs232
config>port>serial>v35
config>port>serial>x21

Description This command configures the duplex mode. Half-duplex mode uses a single transmission path. Full-duplex mode uses two independent transmission paths, one in each direction, allowing two connected devices to transmit and receive data simultaneously.

Half-duplex mode is not user-selectable; an error message is displayed if this option is selected. Half-duplex mode is selected automatically if multidrop data bridge is enabled (applies to RS-232 only).

Default **full**

Parameters **half —** uses a single transmission path

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
config>port>serial>x21

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 system 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

multi-drop

Syntax **multi-drop** {**disabled** | **slave**}

Context config>port>serial>rs232

Description This command configures the multidrop data bridge (MDDB) mode. MDDB is a polling scheme used on SCADA networks (supervisory or control systems used in utility, oil and gas, and other vertical applications) to communicate with multiple remote terminal units (RTUs) over a single RS-232 link.

In an MDDB, several circuits take turns using the same bandwidth to communicate with one circuit. Each slave device transmits data in that bandwidth when requested by the master device. The master device sends polling messages to, and looks for data from, the slave devices in that bandwidth.

One example of a multidrop data bridge is several terminals taking turns to communicate with a host computer. The circuit that all the other circuits communicate with is connected to a master device (a computer) and is designated the master; the rest of the circuits are connected to slave devices (terminals) and are designated slaves.

When multidrop data bridge is enabled as slave, the duplex mode is automatically set to half-duplex and s-bit signaling is forced off. When multidrop data bridge is disabled, the duplex mode is set back to the default of full-duplex and S-bit signaling is turned on (but can be set back to off).

In Release 4.0, the Serial Data Interface card on the 7705 SAR can act only as a slave device; the master device is the 3600 MainStreet node.

Default **disabled**

Parameters **disabled** — MDDB mode is off

slave — the port is operating as an MDDB slave device

parity

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

Context config>port>serial>rs232

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 or X.21 interfaces, since those 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

s-bit signaling

Syntax **s-bit-signaling** {**on** | **off**}

Context config>port>serial>rs232

Description This command configures the S-bit signaling option on the RS-232 interface.

If multi-drop is configured as slave, the system automatically turns S-bit signaling off. The signaling mode cannot then be changed.

If multi-drop is disabled, the system automatically turns S-bit signaling on. When multi-drop is in disabled mode, S-bit signaling can be turned off or on.

Default **on**

Parameters

on — enables S-bit signaling

off — disables S-bit signaling

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
config>port>serial>x21

Description This command configures the speed of the V.35 or X.21 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

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, V.35, and X.21 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
config>port>serial>x21>channel-group

Description This command creates a DS0 channel group on a channelized RS-232, V.35, or X.21 circuit.

Channel groups cannot be further subdivided.

The **no** form of this command deletes the specified RS-232, V.35, or X.21 channel group.

Default **n/a**

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

Values RS-232: 1
V.35: 1
X.21: 1

encap-type

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

Context config>port>serial>rs232>channel-group
config>port>serial>v35>channel-group
config>port>serial>x21>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
config>port>serial>x21>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)

mode

Syntax **mode** {**access** | **network**}

Context config>port>serial>rs232>channel-group
config>port>serial>v35>channel-group
config>port>serial>x21>channel-group

Description This command configures a serial port for access mode operation. Serial ports do not support network mode; if the user selects the network option, the CLI returns an error message.

An access port or channel is used for customer-facing traffic on which services are configured. SAPs can only be configured on an access port or channel. When a serial port is configured for access mode, multiple services can be configured on the port.

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

Default **access**

Parameters **access —** configures the serial channel as service access

network — configures the serial channel for transport network use

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 **n/a**

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

internal — sets the port into an internal loopback state. An internal loopback loops the frames that are coming in an egress direction from the fabric towards the framer, back to the fabric. This type of loopback is usually referred to as an equipment loopback. Internal loopbacks are supported on ports configured in access mode.

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.

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})

tx-dus

Syntax [**no**] **tx-dus**

Context config>port>sonet-sdh

Description This command allows the Quality Level (QL) value transmitted from the Synchronization Status Messaging (SSM) channel of a SONET/SDH port to be set to QL-DUS/QL-DNU (do not use for synchronization for timing purposes).

Default **no tx-dus**

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** (if the encap-type is set to atm; this default cannot be changed)

16 (if the encap-type is set to ppp-auto; port is configured for POS)

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 **no encap-type**

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, “Global Service Command Reference”, 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 **n/a**

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 **n/a**

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 **n/a**

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-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, “Network Queue QoS Policies”, for more information.

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

Default **“default”**

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

scheduler-mode

Syntax **scheduler-mode** {**profile** | **4-priority**}
no scheduler-mode

Context config>port>ethernet>network

Description This command selects the network side scheduling option for the 8-port Ethernet Adapter card.

With profiled (or rate-based) scheduling, both in-profile and out-of-profile scheduling are supported. Packets with a flow rate that is less than or equal to the CIR value of a queue are scheduled as in-profile. Packets with a flow rate that exceeds the CIR value but is less than the PIR value of a queue are scheduled as out-of-profile. In-profile traffic has strict priority over out-of-profile traffic.

Profiled scheduling does not take queue type into consideration. With queue type-based scheduling, queues are divided into two categories – those that are serviced by the Expedited scheduler and those that are serviced by the Best Effort scheduler. The Expedited scheduler has precedence over the Best Effort scheduler.

Four-priority scheduling combines both profiled and queue type-based scheduling. The combination provides four scheduling priorities. Packets are scheduled in the following order, in strict priority fashion:

- Expedited in-profile packets
- Best-effort in-profile packets
- Expedited out-of-profile packets
- Best-effort out-of-profile packets

Default **profile**

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 **n/a**

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 to 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 multilink bundle, you must manually allocate all the timeslots to the channel group before adding it to the bundle.

On the 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card, up to 16 channel groups on network side ports and up to 8 channel groups on access side ports can be bound to a MLPPP bundle. Up to 16 channel groups can be bound to an IMA group on both the network and access side. All channel groups must be from the same adapter card and of the same type (either E1 or DS1). On the 2-port OC3/STM1 Channelized Adapter card, up to 8 channel groups can be bound to a MLPPP bundle or IMA group. 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 **n/a**

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 for MLPPP bundles and IMA groups (2-port OC3/STM1 Channelized Adapter card)
1 to 8 for MLPPP bundles (16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card) – access side
1 to 16 for MLPPP bundles (16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card) – network side
1 to 16 for IMA groups (16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card) – network and access side

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, 16-port T1/E1 ASAP Adapter card, or 32-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

magic-number

Syntax [**no**] **magic-number**

Context config>port>multilink-bundle>mlppp

Description This command allows loopback detection to be enabled and disabled for MLPPP bundles. The command is disabled by default. When the magic number option is disabled, the magic number option will not be requested when a member is trying to bring up the LCP layer on a member link; if the remote peer requests this option, it will be rejected. When transmitting echo-requests, a magic number of 0 is used. When responding to echo-requests, a magic number of 0 is sent.

If the magic-number option is enabled, the option is sent to the remote peer during protocol negotiation. If this option is rejected by the remote peer, the router will bring the link up but will be unable to detect loopbacks since the router will always send a magic number of 0 in the echo messages upon rejection. If this option is accepted by the remote peer, the router will send echo messages with randomly generated (non-zero) magic numbers. If the 7705 SAR receives a config-req with the same magic number that was sent out, the router will calculate a new magic number to use and send out another config-request. If the router persistently sees the randomly generated magic number in the received config-req, the router will declare a loopback.

The **no** form of the command disables the loopback detection.

Default **no magic-number**

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 **n/a**

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 and 32-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 **n/a**

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

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.

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>tdm>ds3
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>tdm>ds3>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 cell format)
nni (network-to-network interface cell format)

mapping

Syntax **mapping** {**direct** | **plcp**}
no mapping

Context config>port>tdm>ds3>atm

Description This command specifies the ATM cell mapping to be used on this DS3 ATM interface.

Default **direct**

Parameters **direct** — specifies direct cell mapping

plcp — specifies Physical Layer Convergence Protocol (PLCP) cell mapping

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>tdm>ds3>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 virtual path connection (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 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, or 2-port OC3/STM1 Channelized Adapter card, or DS3/E3 parameters for a port on a 4-port DS3/E3 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 **n/a**

buildout

Syntax **buildout** {**long** | **short**}

Context config>port>tdm

Description This command specifies the line buildout (cable length) for physical DS1 ports on the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, or for physical DS3/E3 ports on the 4-port DS3/E3 Adapter card.

Default **short** (this is the only option available for the 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card)

Parameters **long** — sets the line buildout for length runs up to 450 ft (for the 4-port DS3/E3 Adapter card only)

short — sets the line buildout for length runs up to 225 ft (for the 4-port DS3/E3 Adapter card only) or up to 655 ft (for the 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card)

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 16-port T1/E1 ASAP Adapter card, 32-port 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 **n/a**

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 or a 4-port DS3/E3 Adapter card.

DS3 lines carry 28 DS1 signals and a 44.736 Mb/s data rate.

If DS3 links are provisioned on a channelized SONET/SDH Adapter card, you must provision the parent STS-1 SONET/STM0 SDH path first (this requirement does not apply to the 4-port DS3/E3 Adapter card).

The **no** form of this command disables DS3 capabilities on the specified SONET/SDH path or DS3 port. The DS3 parameters must be disabled if a clear channel is enabled by default. A clear channel uses out-of-band signaling, not in-band signaling; therefore, the entire bit rate of the channel is available.

Default **n/a**

Parameters *sonet-sdh-index* — specifies the components making up the specified SONET/SDH path on the 2-port OC3/STM1 Channelized Adapter card

e1

Syntax [**no**] **e1**

Context config>port>tdm

Description This command enables the context to configure E1 parameters on a channelized 16-port T1/E1 ASAP Adapter card, 32-port 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 **n/a**

e3

Syntax [**no**] **e3**

Context config>port>tdm

Description This command enables the context to configure E3 parameters on a 4-port DS3/E3 Adapter card. E3 lines provide a speed of 34.368 Mb/s and are frequently used by service providers outside North America.

Default **n/a**

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 16-port T1/E1 ASAP Adapter card or 32-port T1/E1 ASAP Adapter card.

Line buildout settings must be adjusted with line length in order to ensure nominal operating voltage levels for receivers. Ideal receiver voltage levels should be < 3Vp.

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 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. T1/E1 CES circuits on the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, and 2-port OC3/STM1 Channelized Adapter card can be configured as loop-timed or node-timed. Adaptive timing is supported only on T1/E1 ASAP Adapter card circuits 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, “Node Timing”, for more information.

Note: If a timing reference from an external BITS clock is used on a dedicated T1/E1 port, the port must be configured as loop-timed.

Default **node-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

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 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, or 2-port OC3/STM1 Channelized 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 (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 a 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, or 2-port OC3/STM1 Channelized 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 that are coming in an egress direction from the fabric towards the framer, back to the fabric. 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 (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 that are coming in an egress direction from the fabric towards the framer, back to the fabric. 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

remote-loop-respond

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** | **ber-sd** | **ber-sf**}

Context config>port>tdm>ds1
config>port>tdm>e1

Description This command enables logging of DS1 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

ber-sd — reports BER line signal degradation errors

Default line signal degradation alarms are not issued

ber-sf — reports BER line signal failure errors

Default line signal failure 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 the signal mode before configuring the Cpipe service to support T1 or E1 with CAS.

Refer to the 7705 SAR OS Services Guide, "Creating a Cpipe Service", for information on configuring a Cpipe service.

This command is valid only on the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, or 2-port OC3/STM1 Channelized Adapter card when T1 framing is set to **esf** or **sf**, or E1 framing is set to **g704** or **no-crc-g704**.

Note: On the 7705 SAR, CAS/RBS is enabled at the port level, rather than at the 64 kb/s channel level. This means that control signals and voice and data signals are all carried in the same channels. However, T1 and E1 links with a mix of voice and data channels cannot be transported directly across a 7705 SAR/SR network. For a workaround, please contact your Alcatel-Lucent technical service representative.

This limitation does not apply to Serial Data Interface card and E&M card traffic transported over MPLS as the signaling is transported in individual pseudowires.

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 **n/a**

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 16-port T1/E1 ASAP Adapter card, 32-port 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 the 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card, and cem and atm for the 2-port OC3/STM1 Channelized Adapter card. For network mode, only ppp-auto encapsulation is supported.

To change the **encap-type**, the channel group must first be deleted and then reconfigured with the new **encap-type**.

Default **no encap-type**

Parameters **atm —** specifies the encapsulation type as atm for ATM pseudowires

cem — specifies the encapsulation type as circuit emulation mode for TDM pseudowires

ipcp — specifies the encapsulation type as IPCP for a PPP/MLPPP channel group in access mode on the 16-port T1/E1 ASAP Adapter card and 32-port 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, 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 0 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 (4-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 1111

pattern — transmits the user-defined pattern

Values 0 to 15 (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 Table 13)

Table 13: Default and Maximum MTU

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 **keepalive 10 dropcount 3**

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.

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.

If the port is configured for fractional T1/E1 (see Configuring Fractional T1/E1 Ports for PPP Encapsulation), this command is used to specify the number of timeslots to be used on the port. Only the specified timeslots can be used.

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 timeslots 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.

DS3 and E3 Commands

clock-source

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

Context config>port>tdm>ds3
config>port>tdm>e3

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 synchronization references (**config**>**system**>**sync-if-timing>**{**ref1** | **ref2**}> **source-port** command). Refer to the 7705 SAR OS Basic System Configuration Guide, "Node Timing", for more information.

Default **loop-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

crc

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

Context config>port>tdm>ds3
config>port>tdm>e3

Description This command configures the precision of the cyclic redundancy check (CRC). Non-ATM ports support a 16-bit checksum and ATM ports support a 32-bit checksum. In Release 4.0, CRC applies to PPP applications only on the 4-port DS3/E3 Adapter card.

Default **16** (non-ATM ports)
32 (ATM ports)

Parameters **16** — use 16-bit checksum for the associated port

32 — use 32-bit checksum for the associated port

encap-type

Syntax **encap-type** {**atm** | **ppp-auto**}
no encap-type

Context config>port>tdm>ds3
config>port>tdm>e3

Description This command configures the encapsulation method used on the specified DS3/E3 port.

To change the **encap-type**, the port must first be deleted and then reconfigured with the new **encap-type**.

Default **no encap-type**

Parameters **atm —** enables ATM on the specified port. In Release 4.0, ATM is only supported on DS3 ports in access mode.

ppp-auto — enables PPP on the specified port. The activation of ipcp and mplscp is automatically enabled depending on the protocol configuration. This encapsulation type is only valid on DS3 and E3 ports in network mode.

feac-loop-respond

Syntax [**no**] **feac-loop-respond**

Context config>port>tdm>ds3
config>port>tdm>e3

Description This command enables the DS3/E3 interface to respond to remote loop signals. The DS3/E3 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/E3 loopbacks at the far-end terminal from the local terminal are initiated.

The **no** form of this command prevents the DS3/E3 interface from responding to remote loop signals.

Default **no feac-loop-respond**

framing (DS3)

Syntax **framing** {**c-bit** | **m23**}

Context config>port>>tdm>ds3

Description This command specifies DS3 framing for the associated DS3 port.

Default **c-bit**

Parameters **c-bit** — configures the DS3 port for C-bit framing

m23 — configures the DS3 port for M23 framing

framing (E3)

Syntax **framing g751**

Context config>port>>tdm>e3

Description This command specifies E3 framing for the associated E3 port.

Default **g751** (this default cannot be changed)

Parameters **g751** — configures the E3 port for g751 framing

idle-cycle-flag

Syntax **idle-cycle-flag** {**flags** | **ones**}
no idle-cycle-flag

Context config>port>tdm>ds3
config>port>>tdm>e3

Description This command configures the value that the DS3/E3 interface transmits during idle cycles. This command is applicable only if the encapsulation type is ppp-auto. For ATM ports, the configuration does not apply and only the **no** form is accepted.

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

Default **flags** (0x7E)
no idle-cycle-flag (for ATM)

Parameters **flags** — use 0x7E as the idle cycle flag

ones — use 0xFF as the idle cycle flag

loopback

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

Context config>port>tdm>ds3
config>port>>tdm>e3

Description This command puts the specified DS3/E3 port into 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.

An internal loopback loops the frames that are coming in an egress direction from the fabric towards the framer, back to the fabric. This is usually referred to as an equipment loopback.

A remote loopback sends a signal to the remote device to provide a line loopback. To configure a remote loopback, you must enable feac-loop-respond on the far-end DS3/E3 interface, then set the loopback to **remote** on the near-end DS3/E3 interface. Remote loopback sends a loopback code to the far-end DS3/E3 interface 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 loopback on the DS3/E3 port.

Default **no loopback**

Parameters **line** — places the associated DS3/E3 port into line loopback mode

internal — places the associated DS3/E3 port into internal loopback mode

remote — places the associated DS3/E3 port 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 port or channel. This command is only applicable if the DS3 port or channel is using C-bit framing, specified using the framing (DS3) command.

The **no** form of this command removes the *mdl-string* association and stops the transmission of MDL messages.

Default **no mdl**

Parameters *mdl-string* — specifies an MDL message up to 38 characters long

eic — specifies the equipment ID code up to 10 characters long

lic — specifies the line ID code 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 port or channel. This command is only applicable if the DS3 port or channel is using C-bit framing, specified using the framing (DS3) command.

The **no** form of this command prevents the transmission of an MDL message on the DS3 port or channel.

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

mode

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

Context config>port>tdm>ds3
config>port>>tdm>e3

Description This command configures a DS3/E3 port for access or network mode of operation.

ATM port parameters and a Service Access Point (SAP) can only be configured on a access port Access mode applies to DS3 ports only. When a DS3 port is configured for access mode, the encap-type must be set to atm.

A network port is used as an uplink to connect to the packet network and transport the PPP services. Network mode applies to DS3 and E3 ports. When a DS3/E3 port is configured for network mode, the encap-type must be set to to ppp-auto.

The mode can be changed between access and network provided that encap-type has not been configured yet. If encap-type has been configured, the DS3/E3 port must be first deleted and then reconfigured with the required encap-type.

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

Default **access**

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

network — configures the port as a network uplink

mtu

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

Context config>port>tdm>ds3
config>port>>tdm>e3

Description This command configures the maximum payload MTU size for a DS3/E3 port configured for PPP. Packets that are received larger than the MTU are discarded. Packets that cannot be fragmented at egress and exceed the MTU are also discarded.

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

Default **1572** (for ppp-auto)

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

Values 512 to 2090 (in bytes)

ppp

Syntax **ppp**

Context config>port>tdm>ds3
config>port>>tdm>e3

Description This command enables access to the context to configure the LCP operational parameters for a DS3/E3 port.

keepalive

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

Context config>port>tdm>ds3>ppp
config>port>tdm>e3>ppp

Description This command sets the interval between keepalive messages.

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

Default **keepalive 10 dropcount 3**

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 before the port becomes operationally down

Values 1 to 255

report-alarm

Syntax [**no**] **report-alarm** {**ais** | **los** | **oof** | **rai** | **looped**}

Context config>port>tdm>ds3
config>port>>tdm>e3

Description This command enables logging of DS3 and E3 alarms for a DS3/E3 port or channel.

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

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

Voice Commands

voice

Syntax **voice**

Context config>port

Description This command enables the context to configure voice port parameters on the 6-port E&M Adapter card.

Default **n/a**

audio-wires

Syntax **audio-wires** {**two-wires** | **four-wires**}

Context config>port>voice

Description This command configures the number of audio wires to be used for audio transmission for an E&M interface.

A change in the number of audio wires may also require a change in the tlp-rx and tlp-tx values.

Default **four-wires**

Parameters **two-wires** — two-wire operation. This parameter is not valid if the corresponding port or channel's signaling type is 4W transmission.

four-wires — four-wire operation

em

Syntax [**no**] **em**

Context config>port>voice

Description This command enables the context to configure channel group parameters for a channelized E&M voice interface.

The **no** form of this command deletes the E&M channel group.

Default **n/a**

fault-signaling

Syntax **fault-signaling** {**idle** | **seized**}

Context config>port>voice>em

Description This command configures an E&M voice channel for idle or seized fault signaling.

This command is valid only if signaling-mode is configured for E&M signaling.

Default **idle**

Parameters **idle** — specifies idle fault signaling

seized — specifies seized fault signaling

idle-code

Syntax **idle-code** *abcd-code*
no idle-code

Context config>port>voice>em

Description This command defines the ABCD signaling code to be transmitted when the E&M voice channel is configured to transmit idle fault signaling. The command is also used for driving/scanning the E&M signaling leads.

This command is valid only if signaling-mode is configured for E&M signaling.

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

Default **0** (for Mu-Law companding)

13 (for A-Law companding)

Parameters *abcd-code* — the 4-bit ABCD value to be transmitted

loopback

Syntax **loopback** {**internal-analog** | **internal-digital**}
no loopback

Context config>port>voice>em

Description This command puts the specified port or channel in loopback mode.

The loopback command is not saved to the system configuration between boots.

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

Default **no loopback**

Parameters

internal-analog — places the associated port or channel into an internal analog loopback mode. The internal analog loopback resides in the CODEC, close to the line side. It loops the outgoing analog signals back towards the system.

internal-digital — places the associated port or channel into an internal digital loopback mode. The internal digital loopback resides in the CODEC, close to the system side. It loops the outgoing frames back towards the system.

seized-code

Syntax

seized-code *abcd-code*
no seized-code

Context

config>port>voice>em

Description

This command defines the ABCD signaling code to be transmitted when the E&M voice channel is configured to transmit seized fault signaling. The command is also used for driving/scanning the E&M signaling leads.

This command is valid only if signaling-mode is configured for E&M signaling.

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

Default

15 – (for Mu-Law companding)

5 – (for A-Law companding)

Parameters

abcd-code — the 4-bit ABCD value to be transmitted

signaling-lead

Syntax

signaling-lead

Context

config>port>voice>em

Description

This command enables the context to configure the input and output leads, which carry call control signals.

Default

n/a

e

Syntax **e** {**high** | **low** | **end-to-end**}

Context config>port>voice>em>signaling-lead

Description This command configures the output signaling lead known as the E-lead (Ear, Earth, or Exchange).

This command is valid only if signaling-mode is configured for E&M signaling.

Default **end-to-end**

Parameters **high** — specifies that the output signaling lead is forced on

low — specifies that the output signaling lead is forced off

end-to-end — specifies that the output signaling lead follows that of the remote end

m

Syntax **m** {**high** | **low** | **end-to-end**}

Context config>port>voice>em>signaling-lead

Description This command configures the input signaling lead known as the M-lead (Mouth, Magneto, or Multiplexer).

This command is valid only if signaling-mode is configured for E&M signaling.

Default **end-to-end**

Parameters **high** — specifies that the input signaling lead is forced on

low — specifies that the input signaling lead is forced off

end-to-end — specifies that the input signaling lead follows that of the connected equipment

signaling-mode

Syntax **signaling-mode** {**em** | **transmission-only**}

Context config>port>voice>em

Description This command configures the signaling mode for the specified port or channel. This configuration is done for groups of three ports (ports 1 to 3 and ports 4 to 6). The first port to be configured in the group sets the signaling mode for the other ports in the group. For example, if port 1 is set for transmission only, ports 2 and 3 must also be set for transmission only, and if port 4 is set for E&M signaling, ports 5 and 6 must also be set for E&M signaling. To change the signaling mode of a port, all ports in the group must first be deconfigured.

Default **em**

Parameters **em —** specifies E&M signaling mode

transmission-only — specifies transmission-only mode. This parameter is not valid if audio-wires is configured for two-wire operation.

tlp-rx

Syntax **tlp-rx** *decibels*

Context config>port>voice

Description This command configures the analog-to-digital receive transmission level point (TLP) for the specified port.

Default **0.0**

Parameters *decibels* — specifies the transmission level point expressed as an integer (in tenths)

Values -16.0 to +7.0 (for four-wires)
-10.0 to +6.0 (for two-wires)

tlp-tx

Syntax **tlp-tx** *decibels*

Context config>port>voice

Description This command configures the analog-to-digital transmit transmission level point (TLP) for the specified port.

Default **0.0**

Parameters *decibels* — specifies the transmission level point expressed as an integer (in tenths)

Values -16.0 to +7.0 (for four-wires)
-10.0 to +6.0 (for two-wires)

Voice Channel Group Commands

channel-group

Syntax **channel-group** *channel-group-id*
no channel-group *channel-group-id*

Context config>port>voice>em

Description This command creates a DS0 channel group for a channelized E&M voice interface.

Channel groups cannot be further subdivided.

The **no** form of this command deletes the specified channel group.

Default **n/a**

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

Values 1 (only a single DS0 channel group, the first one, can be configured)

encap-type

Syntax **encap-type cem**
no encap-type

Context config>port>voice>em>channel-group

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

Default **no encap-type**

Parameters **cem —** specifies the encapsulation method as circuit emulation (TDM)

mode

Syntax **mode access**

Context config>port>voice>em>channel-group

Description This command configures a channelized E&M voice port for access mode operation. Network mode is not supported.

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 specified (in this case, cem) to distinguish the services on the port.

Default **access**

Parameters **access** — specifies the channelized E&M voice port as service access

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 IOM information if used with the **card** *slot-number* option and displays detailed IOM and CSM card information if used without the *slot-number* option

Default displays summary information only

Output The following outputs are examples of card information:

- Card (Sample Output, Table 14)
- Card State (Sample Output, Table 15)
- Card Detailed (Sample Output, Table 16)
- CSM Card (Sample Output, Table 17)

Sample Output

```
*A:ALU-1># show card 1
===============================================================================
Card 1
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
1         iom-sar             iom-sar             up         up
===============================================================================
*A:ALU-1>#
```

Table 14: 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, 7705 SAR-18, and 7705 SAR-F.

Note: The `show card` command output 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-sar          iom-sar          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    a4-chds3                          up    provisioned    4
    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-18 (Release 4.0):

```
ALU-1>show card state

===============================================================================
Card State
===============================================================================
Slot/  Provisioned      Equipped         Admin Operational   Num   Num Comments
Id     Type             Type             State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-sar          iom-sar          up    up                  12
1/1    aux-alarm        aux-alarm        up    up
1/2    a8-ethv2         a8-ethv2         up    up
1/3    a8-ethv2         a8-ethv2         up    up            8
1/4    a8-ethv2                          up    provisioned   8
1/5    a8-ethv2                          up    provisioned   8
1/6    a32-chds1v2      a32-chds1v2      up    up            32
1/7    a32-chds1v2      a32-chds1v2      up    up            32
1/8    a32-chds1v2                       up    provisioned   8
1/9    a32-chds1v2                       up    provisioned   8
1/10   a4-oc3                            up    provisioned   4
1/11   a4-chds3                          up    provisioned   4
1/12   a2-choc3                          up    provisioned   2
A      csm-10g          csm-10g          up    up                      Active
B      csm-10g                           up    down                    Standby
==============================================================================
ALU-1>show#
```

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-sar          iom-sar          up    up            2
    1/1    i16-chds1        i16-chds1        up    provisioned   16
    1/2    i8-eth           i8-eth           up    provisioned   8
    A      csm-1g           csm-1g           up    up                      Active
===================================================================================
*A:ALU-1>#
```

Table 15: 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

The following example displays detailed card (IOM) and CSM information for the 7705 SAR-8.

```
*A:ALU-1># show card 1 detail

===============================================================================
Card 1
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
1         iom-sar             iom-sar             up         up


IOM Card Specific Data
    Clock source                  : none
    Named Pool Mode               : Disabled
    Available MDA slots           : 6
    Installed MDAs                : 2

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                   : 36C
    Temperature threshold         : 75C
    Software boot (rom) version   : simulated
    Software version              : TiMOS-B-0.0.I1070 both/i386 ALCATEL-LUCENT *
    Time of last boot             : 2010/08/05 20:57:10
    Current alarm state           : alarm cleared
    Base MAC address              : a4:58:01:00:00:00
    Last bootup reason            : hard boot
    Memory capacity               : 2,031 MB

=================================================================================
```

Table 16: Show Card (IOM) 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

Table 16: Show Card (IOM) Detailed 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 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              : 2010/08/05 20:57:10
    Current alarm state            : alarm cleared
    Base MAC address               : a4:58:02:00:00:00
    Memory capacity                : 2,039 MB
==========================================================================
*A:ALU-1>#
```

Table 17: 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 17: 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 (7705 SAR-8)
1 to 12 (7705 SAR-18)

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. For the 7705 SAR-8 and 7705 SAR-F, only one MDA can have fabric statistics enabled. For the 7705 SAR-18, multiple MDAs can have fabric statistics enabled.

Output The following outputs are examples of MDA information:

- MDA (Sample Output, Table 18)
- MDA Detailed (Sample Output, Table 19)
- MDA Fabric Statistics (Sample Output, Table 20)
- MDA With Fabric Statistics (Sample Output, Table 21)

Sample Output

Note: The samples pertaining to the 6-port E&M Adapter card and 12-port Serial Data Interface card do not apply to the 7705 SAR-18 in Release 4.0.

```
*A:ALU-1># show mda 1/1

MDA 1/1
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     1     a6-em                                       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>#
```

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

```
*A:ALU-1># show mda 1/4
===============================================================================

MDA 1/4
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     4     a4-chds3                                    up        provisioned
===============================================================================
*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              Unknown               up        failed
===============================================================================
*A:ALU-1>#
```

Table 18: 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

Note: The following example does not apply to the 7705 SAR-18.

.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 6-port E&M Adapter card in slot 1. (This example is for demonstration only, since the previous example shows slot 1 already provisioned by another adapter card. Also, this example does not apply to the 7705 SAR-18 in Release 4.0).

```
*A:ALU-1># show mda 1/1 detail
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------

1     1     a6-em                 a6-em                 up        provisioned

MDA Specific Data
    Maximum port count            : 6
    Number of ports equipped      : 6
    Network ingress queue policy  : default
    Network ingress fabric policy : 1
    Access ingress fabric policy  : 1
    Fabric Stats Enabled          : FALSE
    Capabilities                  : Voice, CEM
    Min channel size              : PDH DS0 Group
    Max channel size              : Voice E&M
    Max number of channels        : 6
    Channels in use               : 6

CEM MDA Specific Data
    Clock Mode                    : n/a

Voice MDA Specific Data
    Companding Law                : a-law
    Signaling Type                : type-v

Hardware Data
    Part number                   : 3HE03126AAAA0101
    CLEI code                     : IPUCAXU1AA
    Serial number                 : NS000L00065
    Manufacture date              : 10142009
    Manufacturing string          : E&M Init
    Manufacturing deviations      :
    Administrative state          : up
    Operational state             : up
    Temperature                   : 31C
    Temperature threshold         : 75C
    Software version              : N/A
    Time of last boot             : 2010/01/08 14:08:17
    Current alarm state           : alarm cleared
    Base MAC address              : 00:25:ba:c2:cb:fe
===============================================================================
*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               : 3

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 16-port T1/E1 ASAP Adapter card in slot 3.

```
*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                                   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               : 4

CEM MDA Specific Data
    Clock Mode                    : adaptive

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 active
    Base MAC address              :

===============================================================================
*A:ALU-1>#
```

The following example shows the details of a 4-port DS3/E3 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     a4-chds3              a4-chds3              up        up

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                  : TDM, PPP, ATM
    Min channel size              : PDH DS3
    Max channel size              : PDH DS3
    Max number of channels        : 2048
    Channels in use               : 4

Hardware Data
    Part number                   : 3HE04962AAAA0101
    CLEI code                     : IPUIBFXDAA
    Serial number                 : NS000L0007N
    Manufacture date              : 10272009
    Manufacturing string          : Initial release
    Manufacturing deviations      :
    Administrative state          : up
    Operational state             : up
    Temperature                   : 28C
    Temperature threshold         : 75C
    Software version              : N/A
    Time of last boot             : 2009/11/23 12:59:45
    Current alarm state           : alarm cleared
    Base MAC address              : 00:25:ba:33:2d:7c
===============================================================================
*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        failed

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, CEM
    Min channel size              : PDH DS0 Group
    Max channel size              : PDH DS3
    Max number of channels        : 512
    Channels in use               : 1

CEM MDA Specific Data
    Clock Mode                    : adaptive

Hardware Data
    Part number                   :
    CLEI code                     :
    Serial number                 :
    Manufacture date              :
    Manufacturing string          :
    Manufacturing deviations      :
    Administrative state          : up
    Operational state             : failed
    Failure Reason                : MDA type unknown in this build
    Software version              : N/A
    Time of last boot             : N/A
    Current alarm state           : alarm active
    Base MAC address              :
===============================================================================
A:ALU-1>#
```

Table 19: 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 19: 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 adapter card
Voice MDA Specific Data	
Companding Law	The companding law used on the adapter card (applies to the 6-port E&M Adapter card only)
Signaling Type	The signaling type used on the adapter card (applies to the 6-port E&M Adapter card only)
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

Table 19: Show MDA Detail Output Fields (Continued)

Label	Description
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
===============================================================================

-------------------------------------------------------------------------------
Unicast to 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
Unicast to 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
Unicast to 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
Unicast to 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
Unicast to 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
Unicast to 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
Multipoint                          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
===============================================================================

-------------------------------------------------------------------------------
Unicast from 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
Unicast from 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
Unicast from 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
Unicast from 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
Unicast from 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
Unicast from 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 Unicast Network forwarded  :  3376320              3431543788
Total Unicast Network dropped    :  561747               570981578
Total Unicast Access forwarded   :  9404907              2535711078
Total Unicast Access dropped     :  972047               259385870

Fabric Global Stats                 Packets              Octets
    Unicast Forwarded   :           1929191              N/A
    Multicast Forwarded :           1046297              N/A
    Total Forwarded     :           2975488              N/A
    Total Dropped       :           0                    N/A

===============================================================================
*A:ALU-1>#
```

Table 20: 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.
`Unicast to Destination MDA Packets/Octets`	`Network In Profile forwarded` — the number of unicast 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 (1)
	`Network In Profile dropped` — the number of unicast 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 (1)
	`Network Out Profile forwarded` — the number of unicast 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 (1)
	`Network Out Profile dropped` — the number of unicast 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 (1)
	`Access In Profile forwarded` — the number of unicast 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 (1)
	`Access Out Profile forwarded` — the number of unicast 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 (1)
	`Access dropped` — the number of unicast 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 (1)

Table 20: Show MDA Fabric Statistics Output Fields (Continued)

Label	Description
Multipoint (for source-mda)	Network In Profile forwarded — the number of multipoint 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 (1)
	Network In Profile dropped — the number of multipoint 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 (1)
	Network Out Profile forwarded — the number of multipoint 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 (1)
	Network Out Profile dropped — the number of multipoint 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 (1)
	Access In Profile forwarded — the number of multipoint 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 (1)
	Access Out Profile forwarded — the number of multipoint 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
	Access dropped — the number of multipoint 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 (1)
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

Table 20: Show MDA Fabric Statistics Output Fields (Continued)

Label	Description
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.
Unicast from Source MDA Packets/Octets	Network In Profile forwarded — the number of network in-profile packets/octets forwarded from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command (2)
	Network In Profile dropped — the number of network in-profile packets/octets dropped from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command (2)
	Network Out Profile forwarded — the number of network out-of-profile packets/octets forwarded from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command (2)
	Network Out Profile dropped — the number of network out-of-profile packets/octets dropped from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command (2)
	Access In Profile forwarded — the number of access in-profile packets/octets forwarded from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command (2)
	Access Out Profile forwarded — the number of access out-of-profile packets/octets forwarded from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command (2)
	Access dropped — the number of access in-profile packets/octets and out-of-profile packets/octets dropped from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command (2)

Table 20: Show MDA Fabric Statistics Output Fields (Continued)

Label	Description
`Total Unicast Network forwarded Packets/Octets`	The number of unicast network in-profile and out-of-profile packets/octets forwarded
`Total Unicast Network dropped Packets/Octets`	The number of unicast network in-profile and out-of-profile packets/octets dropped
`Total Unicast Access forwarded Packets/Octets`	The number of unicast access in-profile and out-of-profile packets/octets forwarded
`Total Unicast Access dropped Packets/Octets`	The number of unicast access in-profile and out-of-profile packets/octets dropped
`Fabric Global Stats Packets/Octets` (3)	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.
	`Unicast Forwarded` — the number of forwarded unicast packets/octets switched over the fabric
	`Multicast Forwarded` — the number of forwarded multicast packets/octets switched over the fabric
	`Total Forwarded` — the total number of forwarded packets/octets switched over the fabric
	`Total Dropped` — the total number of dropped packets/octets switched over the fabric

Notes:
1. Destination MDA 1/x in the output field, where x = 1 to 6 on the 7705 SAR-8 and 1 to 12 on the 7705 SAR-18.
2. Source MDA 1/*x* in the output field, where *x* = 1 to 6 on the 7705 SAR-8 and 1 to 12 on the 7705 SAR-18.
3. Octet counts are supported only on the 7705 SAR-18. For other 7705 SAR products, “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

===============================================================================
Summary of MDA's With Fabric Stats Enabled
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     1     a12-sdi                                     down      provisioned
===============================================================================
*A:ALU-1>show#
```

Table 21: Show MDA With Fabric Statistics

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

Show External Alarms Commands

external-alarms

Syntax
external-alarms alarm [*alarm-id*]
external-alarms input [*alarm-input*] [**detail**]
external-alarms name [*name-string*] [**detail**]
external-alarms output [*alarm-output*] [**detail**]

Context show

Description This command displays external alarm information for the Auxiliary Alarm card.

Parameters *alarm-id* — the alarm identifier

Values 1 to 2147483647

alarm-input — the alarm input identifier, in the following format:

alarm-<*slot*>/<*mda*>.{**d** | **a**}-<*alarm-num*>

where:

slot = slot number of the card in the chassis (always 1 on the 7705 SAR)
mda = Auxiliary Alarm card slot number
d = digital input
a = analog input
alarm-num = alarm port number (1 to 24 for digital, 1 or 2 for analog)

Note: If you configured a name for the *alarm-input* using the *name* option (see input command), you can use the configured name instead of the *alarm-input* identifier in the **show** command.

name-string — the name for the input port or output relay (maximum of 15 characters)

alarm-output — the output relay identifier, in the following format:

relay-<*slot*>/<*mda*>.**d**-<*relay-num*>

where:

slot = slot number of the card in the chassis (always 1 on the 7705 SAR)
mda = Auxiliary Alarm card slot number
d = digital output
relay-num = output relay number (1 to 8)

Note: If you configured a name for the *alarm-output* using the *name* option (see output command), you can use the configured name instead of the *alarm-output* identifier in the **show** command.

detail — displays detailed information for the external alarms

Output The following outputs are examples of external alarm information:

- Specific Alarm (Sample Output, Table 22)
- External Alarm Input (Sample Output, Table 23)
- External Alarm Input Detail (Sample Output, Table 24)
- External Alarm Output (Sample Output, Table 25)
- External Alarm Output Detail (Sample Output, Table 26)
- External Alarm Name (Sample Output, Table 27)

Sample Output

```
*A:ALU-1># show>external-alarms# alarm 1
===============================================================================
Alarm 1 Detail
===============================================================================
Admin Status       : up                 State              : ok
Severity           : critical

Thresholds
  Analog Voltage   :  0.000 V           Operation          : gt

Actions
  Log Alarm        : yes
  Chassis Alarming : yes

--------------------------------------------------------------------
Trigger             Type        Admin  Value     Threshold State
--------------------------------------------------------------------
alarm-1/1.a-2       analog-in   up      0.0 V    ok
--------------------------------------------------------------------
Triggers Req'd     : any
===============================================================================
*A:ALU-1># show>#
```

Table 22: Show Specific Alarm Fields

Label	Description
Admin Status	The adminstrative state of the alarm
State	The current state of the alarm: ghost — no trigger equipment presently installed
	ok — no triggers are detected
	alarm detected — alarm is outstanding
	not monitored — alarm or all triggers are administratively disabled
Severity	The severity level for the specified alarm

Table 22: Show Specific Alarm Fields (Continued)

Label	Description
Thresholds	
Analog Voltage	The analog voltage level threshold value for the specified alarm, in millivolts (0.000V)
Operation	The analog voltage level threshold operational value: lt — a less-than value
	gt — a greater-than value
Actions	
Log Alarm	Whether or not raise/clear log events and SNMP traps are generated for the specified alarm
Chassis Alarming	Whether or not output to chassis alarm relays and LEDs are generated for the specified alarm
Trigger	The digital or analog inputs that will trigger the alarm
Type	The type of trigger (either a digital input or analog input)
Admin	The administrative state of the trigger
Value	The current value of the alarm input: • for a digital input — the state of the digital circuit associated with the trigger (open or closed). A digital input of open indicates that the external equipment has not shorted this digital input to one of the four common ground pins. If no external equipment is connected to the Auxiliary Alarm card faceplate connector, all digital input ports read open. A digital alarm input of closed indicates that the external equipment has shorted this digital input to one of the four common ground pins. • for an analog input — the current voltage level of an analog trigger, in volts. If no external equipment is connected to the Auxiliary Alarm card faceplate connector, both analog inputs show no applied voltage (0.0V).
Threshold State	The threshold state: ghost — no threshold is present
	not monitored — the threshold is administratively disabled
	ok — the threshold is enabled
	detected — the threshold has been crossed

Table 22: Show Specific Alarm Fields (Continued)

Label	Description
`Triggers Req'd`	The trigger condition that is required to raise an alarm: `any` — any configured input trigger is required to raise an alarm
	`all` — all configured input triggers are required to raise an alarm

Sample Output

```
*A:ALU-1># show external-alarms input
===========================================================================
External Alarm Input Summary
===========================================================================
Input Id        Name            Type        Admin  Value     Alarm State
---------------------------------------------------------------------------
alarm-1/1.d-1   dd3             digital-in  up     open      ok
alarm-1/1.d-2                   digital-in  up     open      ok
alarm-1/1.d-3                   digital-in  up     open      ok
alarm-1/1.d-4                   digital-in  up     open      ok
alarm-1/1.d-5                   digital-in  up     open      ok
alarm-1/1.d-6                   digital-in  up     open      ok
alarm-1/1.d-7                   digital-in  up     open      ok
alarm-1/1.d-8                   digital-in  up     open      ok
alarm-1/1.d-9                   digital-in  up     open      ok
alarm-1/1.d-10                  digital-in  up     open      ok
alarm-1/1.d-11                  digital-in  up     open      ok
alarm-1/1.d-12                  digital-in  up     open      ok
alarm-1/1.d-13                  digital-in  up     open      ok
alarm-1/1.d-14                  digital-in  up     open      ok
alarm-1/1.d-15                  digital-in  up     open      ok
alarm-1/1.d-16                  digital-in  up     open      ok
alarm-1/1.d-17                  digital-in  up     open      ok
alarm-1/1.d-18                  digital-in  up     open      ok
alarm-1/1.d-19                  digital-in  up     open      ok
alarm-1/1.d-20                  digital-in  up     open      ok
alarm-1/1.d-21                  digital-in  up     open      ok
alarm-1/1.d-22                  digital-in  up     open      ok
alarm-1/1.d-23                  digital-in  up     open      ok
alarm-1/1.d-24                  digital-in  up     open      ok
alarm-1/1.a-1                   analog-in   up      0.0 V    ok
alarm-1/1.a-2                   analog-in   up      0.0 V    ok
===========================================================================
*A:ALU-1># show>#
```

Table 23: Show External Alarm Input Fields

Label	Description
`External Alarm Input Summary`	
`Input Id`	The alarm input identifier, in the format: **alarm**-<*slot*>/<*mda*>.{**d** | **a**}-<*alarm-num*> where: *slot* = slot number of the card in the chassis (always 1 on the 7705 SAR) *mda* = Auxiliary Alarm card slot number **d** = digital input **a** = analog input *alarm-num* = alarm port number (1 to 24 for digital, 1 or 2 for analog)
`Name`	The name of the alarm input
`Type`	The type of input, either digital or analog
`Admin`	The adminstrative state of the alarm input
`Value`	The current value of the alarm input: • for a digital input — the state of the digital circuit associated with the trigger (open or closed). A digital input of open indicates that the external equipment has not shorted this digital input to one of the four common ground pins. If no external equipment is connected to the Auxiliary Alarm card faceplate connector, all digital input ports read open. A digital alarm input of closed indicates that the external equipment has shorted this digital input to one of the four common ground pins. • for an analog input — the current voltage level of an analog trigger, in volts. If no external equipment is connected to the Auxiliary Alarm card faceplate connector, both analog inputs show no applied voltage (0.0V).
`Alarm State`	The current state of the alarm input: `ghost` — no trigger equipment presently installed
	`ok` — no triggers are detected
	`alarm detected` — alarm is outstanding
	`not monitored` — alarm or all triggers are administratively disabled

Sample Output

```
*A:ALU-1># show external-alarms input alarm-1/1.d-1 detail
===============================================================================
Input alarm-1/1.d-3 Detail
===============================================================================
Name               : dinput3
Admin Status       : up                 Alarm State        : ok
Detect Debounce    : 2 secs             Clear Debounce     : 2 secs
Value              : open

Description        : Discrete Digital Input

----------------------------------------------------------------
# Threshold         Severity  Alarm Id       Threshold State
----------------------------------------------------------------
1    closed         major     3              ok
----------------------------------------------------------------
*A:ALU-1># show>#
```

Table 24: Show External Alarm Input Detail Fields

Label	Description
Input alarm-x/x.x-x Detail	
Name	The name of the alarm input
Admin Status	The adminstrative state of the alarm input
Alarm State	The current state of the alarm input: ghost — no trigger equipment is presently installed
	ok — no triggers are detected
	alarm detected — alarm is outstanding
	not monitored — alarm or all triggers are administratively disabled
Detect Debounce	The debounce time associated with the detection of the specified alarm input
Clear Debounce	The debounce time associated with the clearance of the specified alarm input

Table 24: Show External Alarm Input Detail Fields (Continued)

Label	Description
`Value`	The current value of the alarm input: • for a digital input — the state of the digital circuit associated with the trigger (open or closed). A digital input of open indicates that the external equipment has not shorted this digital input to one of the four common ground pins. If no external equipment is connected to the Auxiliary Alarm card faceplate connector, all digital input ports read open. A digital alarm input of closed indicates that the external equipment has shorted this digital input to one of the four common ground pins. • for an analog input — the current voltage level of an analog trigger, in volts. If no external equipment is connected to the Auxiliary Alarm card faceplate connector, both analog inputs show no applied voltage (0.0V).
`Description`	A description of the alarm input
`#`	A summary of the alarms that are using this input as a trigger. Each input can be used for up to four alarms.
`Threshold`	The threshold value: • for a digital input — all digital inputs are considered normally open; therefore, the threshold for each alarm is monitoring the input closing • for an analog input — the voltage threshold for the alarm
`Severity`	The severity level for the specified alarm input: critical, major, minor, or warning
`Alarm Id`	The alarm identifier (1 to 2147483647)
`Threshold State`	The threshold state indicates whether the input state contributes to the alarm: `detected` – this input triggers the alarm into an alarm-detected state
	`ok` – this input does not trigger the alarm into an alarm-detected state

Sample Output

```
*A:ALU-1># show external-alarms output
=================================================================
Output Relay Summary
=================================================================
Output Id       Name            Type        Admin  State
-----------------------------------------------------------------
relay-1/1.d-1   output1         digital-out down   off
relay-1/1.d-2   output2         digital-out down   off
relay-1/1.d-3   output3         digital-out down   off
relay-1/1.d-4   output4         digital-out down   off
relay-1/1.d-5   output5         digital-out down   off
relay-1/1.d-6                   digital-out down   off
relay-1/1.d-7                   digital-out down   off
relay-1/1.d-8                   digital-out down   off
=================================================================
*A:ALU-1>show#
```

Table 25: Show External Alarm Output Fields

Label	Description
Output Relay Summary	
Output Id	The output relay identification, in the format: **relay**-<*slot*>/<*mda*>.**d**-<*relay-num*> where: *slot* = slot number of the card in the chassis (always 1 on the 7705 SAR) *mda* = Auxiliary Alarm card slot number **d** = digital output *relay-num* = the output relay number (1 to 8)
Name	The name of the output relay
Type	The output type is digital
Admin	The adminstrative state of the alarm output relay. When the digital output relay output state is set to no shutdown, the normally closed contacts open and the normally open contacts close. The digital output displays a digital output administrative status of up and the state of active (the output relay is energized). When the digital output relay output state is set to shutdown, the normally closed contacts close and the normally open contacts open. The digital output displays a digital output administrative status of down and the state of off (the output relay is not energized).

Table 25: Show External Alarm Output Fields (Continued)

Label	Description
State	The current state of the alarm output relay: ghost — no equipment is installed
	off — the output relay is not energized (it is administratively disabled)
	active — the output relay is energized (active)

Sample Output

```
*A:ALU-1># show external-alarms output relay-1/1.d-1 detail
===============================================================================
Output relay-1/1.d-1 Detail
===============================================================================
Name                : output1
Admin Status        : down               State              : off

Description         : Digital Output Relay
===============================================================================
*A:ALU-1>#
```

Table 26: Show External Alarm Output Detail Fields

Label	Description
Output relay-x/x.d-x Detail	
Name	The name of the output relay
Admin	The adminstrative state of the alarm output relay. When the digital output relay output state is set to no shutdown, the normally closed contacts open and the normally open contacts close. The digital output displays a digital output administrative status of up and the state of active (the output relay is energized). When the digital output relay output state is set to shutdown, the normally closed contacts close and the normally open contacts open. The digital output displays a digital output administrative status of down and the state of off (the output relay is not energized).
State	The current state of the alarm output relay: ghost — no equipment is installed
	off — the output relay is not energized (it is administratively disabled)
	active — the output relay is energized (active)

Table 26: Show External Alarm Output Detail Fields (Continued)

Label	Description
`Description`	The description for the output relay

Sample Output

```
*A:ALU-1># show external-alarms name
===========================================================================
External Alarm Names
===========================================================================
Name            Alarm/Relay     Type        Admin Value     State
---------------------------------------------------------------------------
ainput1         alarm-1/1.a-1   analog-in   up     0.0 V    ok
ainput2         alarm-1/1.a-2   analog-in   up     0.0 V    ok
dinput1         alarm-1/1.d-1   digital-in  up    open      ok
dinput2         alarm-1/1.d-2   digital-in  up    open      ok
dinput23        alarm-1/1.d-23  digital-in  up    open      ok
dinput24        alarm-1/1.d-24  digital-in  up    open      ok
dinput3         alarm-1/1.d-3   digital-in  up    open      ok
dinput4         alarm-1/1.d-4   digital-in  up    open      ok
output1         relay-1/1.d-1   digital-out down            off
output2         relay-1/1.d-2   digital-out down            off
output3         relay-1/1.d-3   digital-out down            off
output4         relay-1/1.d-4   digital-out down            off
output5         relay-1/1.d-5   digital-out down            off
===========================================================================
*A:ALU-1>show#
```

Table 27: Show External Alarm Name Fields

Label	Description
External Alarm Names	
`Name`	The alarm name
`Alarm/Relay`	The name of the alarm input or output relay
`Type`	The alarm input type (either digital input or analog input) or output relay type (digital output)
`Admin`	The adminstrative state of the alarm input or output relay

Table 27: Show External Alarm Name Fields (Continued)

Label	Description
`State`	The current state of the alarm input or output relay. For an alarm input: `ghost` — no trigger equipment is presently installed
	`ok` — no triggers are detected
	`alarm detected` — alarm is outstanding
	`not monitored` — alarm or all triggers are administratively disabled
	For an alarm output relay: `ghost` — no equipment is installed
	`off` — the output relay is not energized (it is administratively disabled)
	`active` — the output relay is energized (active)
`Value`	The current value of the alarm input (this field is not applicable to outputs because the value is based on how the Auxiliary Alarm card is wired to the external equipment): • for a digital input — the state of the digital circuit associated with the trigger (open or closed). A digital input of open indicates that the external equipment has not shorted this digital input to one of the four common ground pins. If no external equipment is connected to the Auxiliary Alarm card faceplate connector, all digital input ports read open. A digital alarm input of closed indicates that the external equipment has shorted this digital input to one of the four common ground pins. • for an analog input — the current voltage level of an analog trigger, in volts. If no external equipment is connected to the Auxiliary Alarm card faceplate connector, both analog inputs show no applied voltage (0.0V).

Show Port Commands

port

Syntax **port** *port-id* [**statistics**] [**detail**]
port *port-id* **acr** [**detail**]
port *port-id* **description**
port *port-id* **dot1x** [**detail**]
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 (7705 SAR-8)
1 to 12 (7705 SAR-18)

port 1 to 2 (2-port OC3/STM1 Channelized Adapter card ports)

1 to 4 (4-port OC3/STM1 Clear Channel Adapter card ports or 4-port DS3/E3 Adapter card ports)

1 to 6 (6-port E&M Adapter card ports)
(not supported on 7705 SAR-18)

1 to 8 (Ethernet Adapter card ports)

1 to 12 (12-port Serial Data Interface card ports)
(not supported on 7705 SAR-18)

1 to 16 (16-port T1/E1 ASAP Adapter card ports)

1 to 32 (32-port T1/E1 ASAP Adapter card ports)

channel ds1 or e1 (for **config>port>tdm** information)

em (for **config>port>voice** information)
(not supported on 7705 SAR-18)

rs232, v35, or x21 (for **config>port>serial** information)
(not supported on 7705 SAR-18)

1 to 24 (DS1) or 1 to 32 (E1)
(for **config>port>tdm>channel-group** information)

1 (E&M) (for **config>port>voice>em>channel-group** information)
(not supported on 7705 SAR-18)

1 (RS-232, V.35, or X.21) (for **config>port>serial> channel-group** information)
(not supported on 7705 SAR-18)

acr — displays ACR-capable port information

associations — displays a list of current router interfaces to which the port is associated

statistics — displays only port counter summary information

description — displays port description strings

dot1x — displays statistics and status information about 802.1x ports

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:

Note: Voice ports/channels and serial ports/channels are not supported on the 7705 SAR-18 in Release 4.0

- General (Sample Output, Table 28)
- Port Statistics (Sample Output, Table 29)
- Specific, Ethernet (Sample Output, Table 30)
- Specific, Serial (Sample Output, Table 31)
- Specific, SONET/SDH (Sample Output, Table 32)
- Specific, Voice (Sample Output, Table 33)
- Detail, SONET/SDH (Sample Output, Table 34)
- Detail, Ethernet (Sample Output, Table 35)
- Detail, TDM/DS1 (Sample Output, Table 36)
- Serial Channel (Sample Output, Table 37)
- Voice Channel (Sample Output, Table 38)
- Channel Group (Sample Output, Table 39)
- Channelized DS3 (Sample Output, Table 40)
- Clear Channel DS3 (Sample Output, Table 41)
- ACR Detail (Sample Output, Table 42)
- dot1x (Sample Output, Table 43)
- Descriptions (Sample Output, Table 44)

- Associations (Sample Output, Table 45)
- PPP (Sample Output, Table 46)
- CEM (Sample Output, Table 47)

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># 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 28: 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

Table 28: Show General Port Output Fields (Continued)

Label	Description
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 statistics 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 statistics 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 statistics 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 29: Show Port Statistics 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 1/2/8
===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100/Gig Ethernet SFP
Interface          : 1/2/8                      Oper Speed       : 1 Gbps
Link-level         : Ethernet                   Config Speed     : 1 Gbps
Admin State        : up                         Oper Duplex      : full
Oper State         : up                         Config Duplex    : full
Physical Link      : Yes                        MTU              : 1514
IfIndex            : 40108032                   Hold time up     : 0 seconds
Last State Change  : 11/24/2009 13:05:41        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
Auto-negotiate     : true                       MDI/MDX          : unknown
Egress Rate        : Default                    Ingress Rate     : n/a

Loopback           : none                       Swap Mac Addr    : Disabled
Loopback Time Left : unspecified

Sync. Status Msg.  : Enabled                    Rx Quality Level : 0xf(dus)
Code-Type          : SONET                      Tx Quality Level : 0x0(stu)
Tx DUS/DNU         : Disabled
Configured Address : 00:1a:f0:d4:09:de
Hardware Address   : 00:1a:f0:d4:09:de
Cfg Alarm          :
Alarm Status       :

Transceiver Type   : SFP
Model Number       : 3HE00027AAAA02  ALA  IPUIAELDAB
TX Laser Wavelength: 850 nm                     Diag Capable     : yes
Connector Code     : LC                         Vendor OUI       : 00:90:65
Manufacture date   : 2009/07/09                 Media            : Ethernet
Serial Number      : PFS3UTC
Part Number        : FTRJ8519P2BNL-A5
Optical Compliance : GIGE-SX
Link Length support: 300m for 50u MMF; 150m for 62.5u MMF
SFP Sync-E Capable : yes

===============================================================================
Transceiver Digital Diagnostic Monitoring (DDM), Internally Calibrated
===============================================================================
                              Value High Alarm  High Warn   Low Warn  Low Alarm
-------------------------------------------------------------------------------
Temperature (C)               +27.1     +95.0      +90.0      -20.0     -25.0
Supply Voltage (V)             3.31      3.90       3.70       2.90      2.70
Tx Bias Current (mA)            6.3      17.0       14.0        2.0       1.0
Tx Output Power (dBm)         -4.47     -2.00      -2.00     -11.02    -11.74
Rx Optical Power (avg dBm)   -20.51      1.00      -1.00     -18.01!   -20.00!
===============================================================================
```

```
===============================================================================
Traffic Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Octets                                          11076096               11075584
Packets                                            86532                  86529
Errors                                                 0                      0
===============================================================================

===============================================================================
Port Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Unicast Packets                                        0                      1
Multicast Packets                                  86532                  86528
Broadcast Packets                                      0                      0
Discards                                               0                      0
Unknown Proto Discards                                 0
===============================================================================

===============================================================================
Port Discard Statistics
===============================================================================
                                 Input                                  Output
Inv L2 Packets   :                   0
Inv IP 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 Collisns  :                   0
Too long Frames  :                   0  Int MAC Tx Errs  :                   0
Symbol Errors    :                   0  Int MAC Rx Errs  :                   0
In Pause Frames  :                   0  Out Pause Frames :                   0
===============================================================================
*A:ALU-1>#
```

Table 30: 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
`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

Table 30: Show Specific Port Output Fields (Ethernet Port) (Continued)

Label	Description
`Egress Rate`	The maximum amount of egress bandwidth (in kilobits per second) that this Ethernet interface can generate
`Ingress Rate`	The maximum amount of ingress 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
`Swap Mac Addr`	Indicates if MAC address swapping is enabled
`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
`Sync. Status Msg.`	Indicates whether or not Synchronization Status Messaging is enabled on the port
`Rx Quality Level`	The Synchronization Status Messaging quality level value received on the port
`Code-Type`	The Synchronization Status Messaging quality level code type
`Tx Quality Level`	The Synchronization Status Messaging quality level value transmitted on the port
`Tx DUS/DNU`	Indicates whether the transmission of the QL-DUS/DNU value in synchronization status messages is enabled or disabled on the port
`Configured Address`	The base chassis Ethernet MAC address
`Hardware Address`	The interface 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

Table 30: Show Specific Port Output Fields (Ethernet Port) (Continued)

Label	Description
`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
`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
`Transceiver Type`	The type of transceiver (SFP) The following information is provided for a configured SFP: • model number • TX laser wavelength • whether it is diagnostics capable • connector code • vendor organizationally unique identifier (OUI) • manufacture date • media • serial number • part number • optical compliance • link length support: • whether it is Sync-E capable

Table 30: Show Specific Port Output Fields (Ethernet Port) (Continued)

Label	Description
Transceiver Digital Diagnostic Monitoring (DDM), Externally Calibrated	
	SFP manufacturers specifications guidelines contained in specification SFF-8472, for the following: • temperature (C) • supply voltage (V) • Tx bias current (mA) • Tx output power (dBm) • Rx optical power (avg dBm) For the above categories, the following values are shown: • Value is the current measured value of each variable • High Alarm is the measurement of Value that will cause a DDM High Alarm to be output • High Warn is the measurement of Value that will cause a DDM High Warning Alarm to be output • Low Warn is the measurement of Value that will cause a DDM Low Warning Alarm to be output • Low Alarm is the measurement of Value that will cause a DDM Low Alarm to be output If alarms/warnings are raised, there will be an "!" in the output
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 30: Show Specific Port Output Fields (Ethernet Port) (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`	
`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.
`Discards Input/Output`	The number of inbound packets chosen to be discarded to possibly free up buffer space

Table 30: Show Specific Port Output Fields (Ethernet Port) (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.
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
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
In Pause Frames	The number of IEEE 802.3x pause frames received for flow control; traffic is momentarily disrupted
Sngl Collisions	The number of frames that are involved in a single collision, and are subsequently transmitted successfully

Table 30: Show Specific Port Output Fields (Ethernet Port) (Continued)

Label	Description
`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
`Out Pause Frames`	The number of IEEE 802.3x pause frames sent for flow control; traffic is momentarily disrupted

Sample Output

(This example is not supported on the 7705 SAR-18.)

```
*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 31: 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       : 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  : 11/24/2009 13:05:56    Port IfIndex          : 46170112
Last Cleared Time  : N/A                    DDM Events            : Enabled
J0 String          : 0x01                   Section Trace Mode    : byte
Rx S1 Byte         : 0x00 (stu)             Rx K1/K2 Byte         : 0x00/0x00
Tx S1 Byte         : 0x00 (stu)             Tx DUS/DNU            : Disabled
Rx J0 String (Hex) : 01 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

Transceiver Type   : SFP
Model Number       : 3HE00034AAAA02  ALA  IPUIAEXDAB
TX Laser Wavelength: 1310 nm                Diag Capable          : yes
Connector Code     : LC                     Vendor OUI            : 00:00:00
Manufacture date   : 2009/04/25             Media                 : SONET/SDH
Serial Number      : 1XX200083926037
Part Number        : FTM3101CSL2iAL
Optical Compliance : OC3-SR-MM
Link Length support: 2000m for 50u MMF; 2000m for 62.5u MMF
SFP Sync-E Capable : n/a

===============================================================================
Transceiver Digital Diagnostic Monitoring (DDM), Externally Calibrated
===============================================================================
                              Value High Alarm  High Warn   Low Warn  Low Alarm
-------------------------------------------------------------------------------
Temperature (C)              +36.6    +100.0      +95.0      -35.0     -40.0
Supply Voltage (V)            3.28      3.80       3.63       2.97      2.70
Tx Bias Current (mA)           8.2      60.0       50.0        0.2       0.1
Tx Output Power (dBm)       -15.44    -13.00     -14.00     -20.00    -21.02
Rx Optical Power (avg dBm)  -16.14     -9.00     -10.00     -33.00    -35.22
===============================================================================
```

```
===============================================================================
Port Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Packets                                                 0                     0
Discards                                                0                     0
Unknown Proto Discards                                  0
===============================================================================
*A:ALU-1># show
```

Table 32: 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
Clock Source	node — the link uses the internal clock when transmitting data loop — the link recovers the clock from the received data stream

Table 32: Show Specific Port Output Fields (SONET/SDH Port) (Continued)

Label	Description
`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 synchronization status message value of the received SONET/SDH S1 byte
`Rx K1/K2 Byte`	The value of the received SONET/SDH K1/K2 byte
`Tx S1 Byte`	The synchronization status message value of the transmitted SONET/SDH S1 byte
`Tx DUS/DNU`	Indicates whether the transmission of the QL-DUS/DNU value in synchronization status messages is enabled or disabled on the port
`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

Table 32: Show Specific Port Output Fields (SONET/SDH Port) (Continued)

Label	Description
`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
`Transceiver Type`	SFP The following information is provided for a configured SFP: • model number • TX laser wavelength • whether it is diagnostics capable • connector code • vendor organizationally unique identifier (OUI) • manufacture date • media • serial number • part number • optical compliance • link length support: • whether it is Sync-E capable

Table 32: Show Specific Port Output Fields (SONET/SDH Port) (Continued)

Label	Description
Transceiver Digital Diagnostic Monitoring (DDM), Externally Calibrated	
	SFP manufacturers specifications guidelines contained in specification SFF-8472, for the following: • temperature (C) • supply voltage (V) • Tx bias current (mA) • Tx output power (dBm) • Rx optical power (avg dBm) For the above categories, the following values are shown: • Value is the current measured value of each variable • High Alarm is the measurement of Value that will cause a DDM High Alarm to be output • High Warn is the measurement of Value that will cause a DDM High Warning Alarm to be output • Low Warn is the measurement of Value that will cause a DDM Low Warning Alarm to be output • Low Alarm is the measurement of Value that will cause a DDM Low Alarm to be output If alarms/warnings are raised, an "!" is included in the output
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

(This example is not supported on the 7705 SAR-18.)

```
*A:ALU-1># show port 1/1/1
===============================================================================
Voice Physical Interface
===============================================================================
Description        : E&M
Interface          : 1/1/1                  Port IfIndex         : 41975808
Admin Status       : up                     Oper Status          : up
Physical Link      : Yes
Type               : em
TLP Rx             : 0.0                    Audio Wires          : four-wires
TLP Tx             : 0.0
===============================================================================

===============================================================================
Port Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Packets                                            106012                105984
Discards                                                0                     0
Unknown Proto Discards                                  0
===============================================================================
*A:ALU-1>#
```

Table 33: Show Specific Port Output Fields (Voice Port)

Label	Description
Voice 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 operating state is up
	down — the operating state is down
Physical Link	Yes — a physical link is present
	No — a physical link is not present
Type	The type of voice interface
TLP Rx	The receive transmission level point value for the port

Table 33: Show Specific Port Output Fields (Voice Port) (Continued)

Label	Description
`Audio Wires`	Four-wire or two-wire
`TLP Tx`	The transmit transmission level point value for the port
`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 1/2/2 detail

===============================================================================
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  : 12/02/2009 11:14:23      Port IfIndex         : 46170112
Last Cleared Time  : N/A                      DDM Events           : Enabled
J0 String          : 0x01                     Section Trace Mode   : byte
Rx S1 Byte         : 0x00 (stu)               Rx K1/K2 Byte        : 0x00/0x00
Tx S1 Byte         : 0x00 (stu)               Tx DUS/DNU           : Disabled
Rx J0 String (Hex) : 01 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
Transceiver Type   : SFP
Model Number       : 3HE00034AAAA02  ALA  IPUIAEXDAB
TX Laser Wavelength: 1310 nm                Diag Capable         : yes
Connector Code     : LC                     Vendor OUI           : 00:00:00
Manufacture date   : 2009/04/25             Media                : SONET/SDH
Serial Number      : 1XX200083926037
Part Number        : FTM3101CSL2iAL
Optical Compliance : OC3-SR-MM
Link Length support: 2000m for 50u MMF; 2000m for 62.5u MMF
SFP Sync-E Capable : n/a

=========================
Sonet Section
=========================
ES-S     :            2
SES-S    :            1
SEFS-S   :            0
CV-S     :        65561
LOS      :            0
LOC      :            0
LOF      :            0
OOF      :            0
B1 Error :            0
=========================

===========================================
Sonet Line
===========================================
                                 Far End
-------------------------------------------
ES-L     :            2               3
SES-L    :            1               3
UAS-L    :            0               0
CV-L     :        49425               0
AIS-L    :            0
RDI-L    :            1
B2 Error :            0
S1 Error :            0
M1 Error :        24834
===========================================

===============================================================================
Port Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Packets                                                0                      0
Discards                                               0                      0
Unknown Proto Discards                                 0
===============================================================================
*A:ALU-1>#
```

Table 34: 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
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

Table 34: Show Port Detail Output Fields (SONET/SDH Port) (Continued)

Label	Description
`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 synchronization status message value of the received SONET/SDH S1 byte
`Rx K1/K2 Byte`	The value of the received SONET/SDH K1/K2 byte
`Tx S1 Byte`	The synchronization status message value of the transmitted SONET/SDH S1 byte
`Tx DUS/DNU`	Indicates whether the transmission of the QL-DUS/DNU value in synchronization status messages is enabled or disabled on the port
`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

Table 34: Show Port Detail Output Fields (SONET/SDH Port) (Continued)

Label	Description
	The following information is provided for a configured SFP: • model number • TX laser wavelength • whether it is diagnostics capable • connector code • vendor organizationally unique identifier (OUI) • manufacture date • media • serial number • part number • optical compliance • link length support: • whether it is Sync-E capable
`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
`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

Table 34: Show Port Detail Output Fields (SONET/SDH Port) (Continued)

Label	Description
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
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/Gig Ethernet SFP
Interface          : 1/5/1                      Oper Speed       : 1 Gbps
Link-level         : Ethernet                   Config Speed     : 1 Gbps
Admin State        : up                         Oper Duplex      : full
Oper State         : up                         Config Duplex    : full
Physical Link      : Yes                        MTU              : 1514
IfIndex            : 40108032                   Hold time up     : 0 seconds
Last State Change  : 12/02/2009 11:14:05        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
Auto-negotiate     : true                       MDI/MDX          : unknown
Egress Rate        : Default                    Ingress Rate     : n/a

Loopback           : none                       Swap Mac Addr.   : enabled
Loopback Time Left : unspecified
Cfm Loopback       : Disabled

Sync. Status Msg.  : Enabled                    Rx Quality Level : 0xf(dus)
Code-Type          : SONET                      Tx Quality Level : 0x0(stu)
Tx DUS/DNU         : Disabled

Configured Address : 00:1a:f0:d4:09:de
Hardware Address   : 00:1a:f0:d4:09:de
Cfg Alarm          :
Alarm Status       :

Transceiver Type   : SFP
Model Number       : 3HE00027AAAA02  ALA  IPUIAELDAB
TX Laser Wavelength: 850 nm                     Diag Capable     : yes
Connector Code     : LC                         Vendor OUI       : 00:90:65
Manufacture date   : 2009/07/09                 Media            : Ethernet
Serial Number      : PFS3UTC
Part Number        : FTRJ8519P2BNL-A5
Optical Compliance : GIGE-SX
Link Length support: 300m for 50u MMF; 150m for 62.5u MMF
SFP Sync-E Capable : yes

===============================================================================
Transceiver Digital Diagnostic Monitoring (DDM), Internally Calibrated
===============================================================================
                              Value High Alarm  High Warn   Low Warn  Low Alarm
-------------------------------------------------------------------------------
Temperature (C)               +26.6     +95.0      +90.0      -20.0     -25.0
Supply Voltage (V)             3.31      3.90       3.70       2.90      2.70
Tx Bias Current (mA)            6.3      17.0       14.0        2.0       1.0
Tx Output Power (dBm)         -4.47     -2.00      -2.00     -11.02    -11.74
Rx Optical Power (avg dBm)   -20.60      1.00      -1.00     -18.01!   -20.00!
===============================================================================
```

```
===============================================================================
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 Discard Statistics
===============================================================================
                                 Input                                   Output
Inv L2 Packets   :                    0
Inv IP Packets   :                    0
CSM Ingress Queues                       CSM Egress Queues
  Hi             :                    0    Common         :                   0
  Medium         :                    0
  Low            :                    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 Collisns  :                   0
Too long Frames  :                    0  Int MAC Tx Errs  :                   0
Symbol Errors    :                    0  Int MAC Rx Errs  :                   0
===============================================================================

===============================================================================
Ethernet CFM Loopback Statistics
===============================================================================
Cfm LbmRx        :                    0
Cfm LbReplyTx    :                    0  Cfm LbmDropped   :                   0
===============================================================================
*A:ALU-1>#
```

Table 35: Show Port Detail Output Fields (Ethernet)

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 35: Show Port Detail Output Fields (Ethernet) (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
`Swap Mac Addr.`	Indicates if MAC address swapping is enabled
`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
`Cfm Loopback`	Indicates if the CFM loopback is enabled
`Sync. Status Msg.`	Whether or not Synchronization Status Messaging is enabled on the port
`Rx Quality Level`	The Synchronization Status Messaging quality level value received on the port
`Code-Type`	The Synchronization Status Messaging quality level code type, either SONET or SDH
`Tx Quality Level`	The Synchronization Status Messaging quality level value transmitted on the port
`Tx DUS/DNU`	Indicates whether the transmission of the QL-DUS/DNU value in synchronization status messages is enabled or disabled on the port
`Configured Address`	The base chassis Ethernet MAC address
`Hardware Address`	The interface hardware- or system-assigned MAC address at its protocol sub-layer

Table 35: Show Port Detail Output Fields (Ethernet) (Continued)

Label	Description
`Cfg Alarm`	The type of alarms to be logged and reported for the port
`Alarm Status`	The current alarm state
`Transceiver type`	The following information is provided for a configured SFP: • model number • TX laser wavelength • whether it is diagnostics capable • connector code • vendor organizationally unique identifier (OUI) • manufacture date • media • serial number • part number • optical compliance • link length support: • whether it is Sync-E capable
`Transceiver Digital Diagnostic Monitoring (DDM), Externally Calibrated`	
	SFP manufacturers specifications guidelines contained in specification SFF-8472, for the following: • temperature (C) • supply voltage (V) • Tx bias current (mA) • Tx output power (dBm) • Rx optical power (avg dBm) For the above categories, the following values are shown: • Value is the current measured value of each variable • High Alarm is the measurement of Value that will cause a DDM High Alarm to be output • High Warn is the measurement of Value that will cause a DDM High Warning Alarm to be output • Low Warn is the measurement of Value that will cause a DDM Low Warning Alarm to be output • Low Alarm is the measurement of Value that will cause a DDM Low Alarm to be output If alarms/warnings are raised, there will be an "!" in the output

Table 35: Show Port Detail Output Fields (Ethernet) (Continued)

Label	Description
`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.
`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

Table 35: Show Port Detail Output Fields (Ethernet) (Continued)

Label	Description
	`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)
	`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.

Table 35: Show Port Detail Output Fields (Ethernet) (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

Table 35: Show Port Detail Output Fields (Ethernet) (Continued)

Label	Description
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
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
In Pause Frames	The number of IEEE 802.3x pause frames received for flow control; traffic is momentarily disrupted
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
Out Pause Frames	The number of IEEE 802.3x pause frames sent for flow control; traffic is momentarily disrupted

Table 35: Show Port Detail Output Fields (Ethernet) (Continued)

Label	Description
Ethernet CFM Loopback Statistics	
Cfm LbmRx	The number of LBMs received
Cfm LbReplyTx	The number of LBRs transmitted
Cfm LbmDropped	The number of LBMs dropped

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 36: Show Port Detail Output Fields (TDM DS1 Interface)

Label	Description
TDM DS1 Interface	
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
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

Table 36: Show Port Detail Output Fields (TDM DS1 Interface) (Continued)

Label	Description
`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
`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

Table 36: Show Port Detail Output Fields (TDM DS1 Interface) (Continued)

Label	Description
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
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

(This example is not supported on the 7705 SAR-18.)

```
*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                     Multi-Drop           : slave
Device Gender      : dce                     Duplex               : half
Data Position      : F0-B5                   S-Bit-Signaling      : on
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
===============================================================================
```

```
*A:ALU-1># show port 1/1/5.x21

===============================================================================
Serial RS-232 Interface
===============================================================================
Description        : X21
Interface          : 1/1/5.x21
Type               : x21
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
-------------------------------------------------------------------------------
c-i [C]      : high                         i-c [I]        : 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
===============================================================================
```

Table 37: Show Port Serial Channel Output Fields

Label	Description
Serial RS-232 Interface	
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 and X.21 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 37: Show Port Serial Channel Output Fields (Continued)

Label	Description
Multi-Drop	The MDDB mode: disabled — MDDB mode is off
	slave — device operates as an MDDB slave device
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 mode: half — single transmission path (supported only if multidrop data bridge is enabled)
	full — two independent transmission paths, one in each direction
Data Position	The HCM data start position
S-Bit-Signaling	Indicates whether S-bit signaling is turned on or off
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

Table 37: Show Port Serial Channel Output Fields (Continued)

Label	Description
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
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
c-i [C]	The Control/Indication input control lead; applicable only for X.21 interfaces: 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
Outputs	The output control leads

Table 37: Show Port Serial Channel Output Fields (Continued)

Label	Description
`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
`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
`i-c [I]`	The Indication/Control output control lead; applicable only for X.21 interfaces: `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 37: Show Port Serial Channel Output Fields (Continued)

Label	Description
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.
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

(This example is not supported on the 7705 SAR-18.)

```
*A:ALU-1># show port 1/1/1.em detail

===============================================================================
Voice Interface
===============================================================================
Description        : EM
Interface          : 1/1/1.em
Type               : em
Admin Status       : up                      Oper Status          : up
Physical Link      : yes                     Clock Source         : node-timed
Signaling Mode     : em                      Signal Mode          : cas
Fault Signaling    : idle
Idle Code          : 13 (0b1101)             Seized Code          : 5 (0b0101)
Last State Change  : 01/08/2010 14:23:28     Channel IfIndex      : 578846721
Loopback           : none
===============================================================================

===============================================================================
Voice E&M Signaling Leads
===============================================================================
Inputs          Cfg         Scans            Outputs         Cfg         Drives
-------------------------------------------------------------------------------
m             : end-to-end  0                e             : end-to-end  0
===============================================================================

===============================================================================
Voice Signalling Bits
===============================================================================
          Rx    Tx
DS0       ABCD  ABCD
-------------------------------------------------------------------------------
1         1101  1101
===============================================================================


===================================================
Voice Call Usage Statistics (state: idle)
===================================================
                                        Accumulated
---------------------------------------------------
I/C Call Count                                    0
I/C Call Count, Ans                               0
I/C Call Time                                     0
I/C Call Time, Ans                                0
O/G Call Count                                    0
O/G Call Count, Ans                               0
O/G Call Time                                     0
O/G Call Time, Ans                                0
Out Of Service Time                              10
Idle Time                                        39

Total Call Count                                  0
Total Call Time                                   0
===================================================
```

```
===============================================================================
Traffic Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Octets                                            388432                 388256
Packets                                            24277                  24266
Errors                                                 0                      0
===============================================================================
Port Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Packets                                            30868                  30857
Discards                                               0                      0
Unknown Proto Discards                                 0
===============================================================================
```

Table 38: Show Port Voice Channel Output Fields

Label	Description
Voice Interface	
Description	The description of the port
Interface	The port ID displayed in the *slot/mda/port.channel* format
Type	The type of voice 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	node-timed — the link uses the internal clock when transmitting data
Signaling Mode	The signaling mode used by the interface, either em or transmission-only
Signal Mode	The network signaling transport scheme, either cas for em signaling or none for transmission-only signaling
Fault Signaling	The type of fault signaling used by the channel, either idle or seized
Idle Code	The ABCD signaling code to be transmitted when the channel is configured to transmit idle fault signaling

Table 38: Show Port Voice Channel Output Fields (Continued)

Label	Description
`Seized Code`	The ABCD signaling code to be transmitted when the channel is configured to transmit seized fault signaling
`Last State Change`	The last time the operational status of the channel changed state
`Channel IfIndex`	The channel index number
`Loopback`	The loopback mode for the channel: internal-analog, internal-digital, or none
`Voice E&M Signaling Leads`	
`Inputs`	The type of input signaling lead (M-lead), shown only if the signaling mode is E&M
`Cfg`	The manner in which the input signaling lead is configured: `high` — (the input signaling lead is assumed on)
	`low` — (the input signaling lead is assumed off)
	`end-to-end` — (the input signaling lead follows that of the remote end)
`Scans`	The current scanned value of the input lead, which can either be 0 (idle) or 1 (seized)
`Outputs`	The type of output lead (E-lead), shown only if the signaling mode is E&M
`Cfg`	The manner in which the output signaling lead is configured: `high` — (the output signaling lead is forced on)
	`low` — (the output signaling lead is forced off)
	`end-to-end` — (the output signaling lead follows that of the remote end)
`Drives`	The current value set on the output lead, which can either be 0 (idle) or 1 (seized)
`Voice Signalling Bits`	
`DS0`	The number of DS0 voice signaling bits
`Rx ABCD`	The signaling bits received from the network side
`Tx ABCD`	The signaling bits transmitted to the network side

Table 38: Show Port Voice Channel Output Fields (Continued)

Label	Description
`Voice Call Usage Statistics`	
	The state of the channel (non-forwarding, out-of-service, idle, incoming, or outgoing), and voice call usage statistics **Note**: Non-forwarding means that the channel is in shutdown mode or has no SAP configured; incoming means that the call was received by the channel; outgoing means that the call was originated by the channel Accumulated: the total accumulated statistics since the last time the statistics were cleared I/C Call Count: the number of incoming calls I/C Call Count, Ans: the number of incoming calls that were answered I/C Call Time: the total duration (in seconds) of all incoming calls I/C Call Time: the total duration (in seconds) of all incoming calls that were answered 1O/G Call Count: the number of outgoing calls O/G Call Count: the number of outgoing calls that were answered O/G Call Time: the total duration (in seconds) of all outgoing calls O/G Call Time: the total duration (in seconds) of all outgoing calls that were answered Out-Of-Service Time: the time (in seconds) for which the circuit had alarms raised against the service Idle Time: the total duration the circuit was in an idle state (that is, on-hook) Total Call Count: the sum of I/C Call Count and O/G Call Count Total Call Time: the sum of I/C Call Time and O/G Call Time **Note**: The only valid statistics for transmission-only mode are Idle Time and Out Of Service Time. When the system is in transmission-only mode and in a forwarding state, there is no signaling. To show that the system is active (that is, not in an out-of-service state) the "Idle Time" counter is incremented. This is a design intent.

Table 38: Show Port Voice Channel Output Fields (Continued)

Label	Description
Traffic Statistics	
Octets Input/Output	The total number of octets received and transmitted on the channel
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.
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 1/1/1.1
===============================================================================
Voice DS0 Chan Group
===============================================================================
Description        : DS0GRP
Interface          : 1/1/1.1
Admin Status       : up                       Oper Status          : up
Last State Change  : 01/08/2010 14:23:29     Chan-Grp IfIndex     : 578846781

Configured Mode    : access                   Encap Type           : cem
Admin MTU          : 1514                     Oper MTU  : 1514
Physical Link      : Yes
===============================================================================

===============================================================================
Traffic Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Octets                                            611744                 611584
Packets                                            38234                  38224
Errors                                                 0                      0
===============================================================================
Port Statistics
==============================================================================
                                                  Input                 Output
-------------------------------------------------------------------------------
Packets                                            38234                  38224
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 39: 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 39: 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 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 39: Show Port Channel Group 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.ds3

===============================================================================
TDM Interface
===============================================================================
Description        : DS3
Interface          : 1/4/1.ds3
Type               : ds3                        Framing              : m23
Admin Status       : up                         Oper Status          : up
Physical Link      : No                         Clock Source         : node-timed
Last State Change  : 10/02/2009 19:21:59        Port IfIndex         : 578846721

Configured mode    : access                     Encap Type           : atm
Admin MTU          : 1524                       Oper MTU             : 1524
Scramble           : true
Ing. Pool % Rate   : 100                        Egr. Pool % Rate     : 100
Egr. Sched. Pol    : N/A
CRC                : 32                         Channelized          : DS1
Idle Cycle Flags   : n/a                        Loopback             : line
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 40: Show Port Channelized DS3 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)
`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)

Table 40: Show Port Channelized DS3 Output Fields (Continued)

Label	Description
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
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

Table 40: Show Port Channelized DS3 Output Fields (Continued)

Label	Description
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.
	`Discards input/output` — the number of inbound packets chosen to be discarded to possibly free up buffer space

Table 40: Show Port Channelized DS3 Output Fields (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. 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

===============================================================================
TDM DS3 Physical Interface
===============================================================================
Description        : DS3/E3
Interface          : 1/4/1                    Port IfIndex         : 41975808
Admin Status       : down                     Oper Status          : down
Physical Link      : No
Type               : ds3                      Buildout             : short
===============================================================================

===============================================================================
Port Statistics
===============================================================================
                                                   Input                 Output
-------------------------------------------------------------------------------
Packets                                                0                      0
Discards                                               0                      0
Unknown Proto Discards                                 0
===============================================================================
```

Table 41: Show Port Clear Channel DS3 Output Fields

Label	Description
Description	A text description of the port
Interface	The port ID displayed in the format *slot/mda/port*
Port IfIndex	The interface's index number, which reflects its initialization sequence

Table 41: Show Port Clear Channel DS3 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
`Physical Link`	`Yes` — a physical link is present
	`No` — a physical link is not present
`Type`	The type of interface
`Buildout`	The line buildout (cable length) for the DS3 physical 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 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
Jitter Buffer Depth  :  0

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 42: 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 42: 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-s intervals
	`frequency offset stddev` — the ACR frequency offset standard deviation for the previous 15 sets of 60-s intervals
	`phase error mean` — the ACR input phase error mean and output DCO mean for the previous 15 sets of 60-s intervals
	`phase error stddev` — the ACR input phase error standard deviation and output DCO standard deviation for the previous 15 sets of 60-s intervals
`ACR State Statistics`	
`Algorithm State Counts`	`normal` — the number of 2-s intervals the ACR algorithm was in the normal state
	`Phase-tracking` — the number of 2-s intervals the ACR algorithm was in the phase-tracking state
	`Freq-tracking` — the number of 2-s intervals the ACR algorithm was in the frequency tracking state
	`Holdover` — the number of 2-s intervals the ACR algorithm was in the holdover state
	`Free-run` — the number of 2-s intervals the ACR algorithm was in the free-run state

Table 42: 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 dot1x 1/5/2 detail
===============================================================================
802.1x Port Status
===============================================================================

Port control             : force-auth
Port status              : authorized
Authenticator PAE state : force-auth
Backend state            : initialize
Reauth enabled           : yes          Reauth period          : 3500
Max auth requests        : 2            Transmit period        : 30
Supplicant timeout       : 30           Server timeout         : 30
Quiet period             : 60
Radius-plcy              : N/A

===============================================================================
802.1x Session Statistics
===============================================================================

authentication method    : remote-radius
last session id          : PAC-02A10000-8A61E689
last session time        : 0497d02h
last session username    : N/A
last session term cause : N/A
user tx octets           : 0            user tx frames         : 0
user rx octets           : 0            user rx frames         : 0
```

```
===============================================================================
802.1x Authentication Statistics
===============================================================================

tx frames              : 0          rx frames            : 0
tx req/id frames       : 0          rx resp/id frames    : 0
tx request frames      : 0          rx response frames   : 0
rx start frames        : 0          rx logoff frames     : 0
rx unknown frame type  : 0          rx bad eap length    : 0
rx last version        : 0          rx last source mac   :

===============================================================================
802.1x Authentication Diagnostics
===============================================================================

Enters Connecting                     : 0
EapLogoffs While Connecting           : 0
Success While Authenticating          : 0
Timeouts While Authenticating         : 0
Failures While Authenticating         : 0
Reauths While Authenticating          : 0
EapStarts While Authenticating        : 0
EapLogoffs While Authenticating       : 0
Reauths While Authenticated           : 0
EapStarts While Authenticated         : 0
EapLogoffs While Authenticated        : 0
Backend Responses                     : 0
Backend Access Challenges             : 0
Backend Requests To Supplicant        : 0
Backend Non Nak Responses             : 0
Backend Auth Successes                : 0
Backend Auth Failures                 : 0

*A:ALU-1>#
```

Table 43: Show Port dot1x Output Fields

Label	Description
802.1x Port Status	
Port control	auto — the 802.1x authentication mode is configured as automatic. The port starts in an unauthorized state and stays in that state until the first supplicant is authenticated successfully.
	force-auth — 802.1 authentication is disabled and the port is automatically authorized
	force-unauth — the port will always remain in the unauthorized state
Port status	authorized — the 802.1 port is authorized
	unauthorized — the 802.1 port is unauthorized

Table 43: Show Port dot1x Output Fields (Continued)

Label	Description
Authenticator PAE state	auto — the authenticator is set to the unauthorized state
	force-auth — the authenticator is set to the authorized state
	force-unauth — the authenticator is set to the unauthorized state
Backend state	request — the backend authentication machine is in the request state
	response — the backend authentication machine is in the response state
	success — the backend authentication machine is in the success state
	fail — the backend authentication machine is in the fail state
	timeout — the backend authentication machine is in the timeout state
	idle — the backend authentication machine is in the idle state
	initialize — the backend authentication machine is in the initialize state
Reauth enabled	Indicates whether reauthentication is enabled
Max auth requests	The maximum number of authentication requests the 7705 SAR sends to the RADIUS server before declaring the port unauthorized
Supplicant timeout	The number of seconds the 7705 SAR waits for a client to respond to an EAPOL message before considering the 802.1x authentication to have failed
Quiet period	The period, in seconds, between two authentication sessions during which no EAPOL frames are sent by the 7705 SAR
Radius-plcy	The name of the RADIUS policy used for 802.1x authentication
Reauth period	The delay, in seconds, before the 7705 SAR attempts reauthentication
Transmit period	The time, in seconds, that the 7705 SAR waits before sending a new EAPOL message

Table 43: Show Port dot1x Output Fields (Continued)

Label	Description
Server timeout	The time, in seconds, that the 7705 SAR waits for the RADIUS server to respond to the access request message before resending the request message the number of times specified by the max-auth-req command
802.1x Session Statistics	
authentication method	remote-radius — the authentication method used to establish the session
last session id	A unique identifier for the session, in the form of a printable ASCII string of at least three characters
last session time	The duration of the session in seconds
last session username	The username representing the identity of the supplicant PAE
last session term cause	The reason for the session termination: supplicantLogoff — the supplicant logged off
	portFailure — there was a port failure
	supplicantRestart — the supplicant state machine reinitialized
	reauthFailed — the reauthentication attempt failed
	authControlForceUnauth — the authentication mode was changed to always force unauthorized after being authorized
	portReInit — the port was reinitialized
	portAdminDisabled — the port was administratively disabled
	notTerminatedYet — the session has not been terminated
user tx octets	The number of octets transmitted in user data frames on this port during the session
user rx octets	The number of octets received in user data frames on this port during the session
user tx frames	The number of user data frames transmitted on this port during the session
user rx frames	The number of user data frames received on this port during the session

Table 43: Show Port dot1x Output Fields (Continued)

Label	Description
802.1x Authentication Statistics	
tx frames	The number of EAPOL frames of any type that have been transmitted by this authenticator
tx req/id frames	The number of EAP-Request/ID frames that have been transmitted by this authenticator
tx request frames	The number of EAP request frames (other than Request/ID frames) that have been transmitted by this authenticator
rx start frames	The number of EAPOL-Start frames that have been received by this authenticator
rx unknown frame type	The number of EAPOL frames that have been received by this authenticator in which the frame type is not recognized
rx last version	The protocol version number carried in the most recently received EAPOL frame
rx frames	The number of valid EAPOL frames of any type that have been received by this authenticator
rx resp/id frames	The number of EAP-Response/ID frames that have been received by this authenticator
rx response frames	The number of valid EAP response frames (other than Resp/ID frames) that have been received by this authenticator
rx logoff frames	The number of EAP-Logoff frames that have been received by this authenticator
rx bad eap length	The number of EAPOL frames that have been received by this authenticator in which the packet body length field is invalid
rx last source mac	The source MAC address carried in the most recently received EAPOL frame
802.1x Authentication Diagnostics	
Enters Connecting	Counts the number of times that the state machine transitions to the CONNECTING state from any other state
EapLogoffs While Connecting	Counts the number of times that the state machine transitions from CONNECTING to DISCONNECTED as a result of receiving an EAPOL-logoff message

Table 43: Show Port dot1x Output Fields (Continued)

Label	Description
Success While Authenticating	Counts the number of times that the state machine transitions from AUTHENTICATING to AUTHENTICATED, as a result of the backend authentication state machine indicating successful authentication of the supplicant (authSuccess = TRUE)
Timeouts While Authenticating	Counts the number of times that the state machine transitions from AUTHENTICATING to ABORTING, as a result of the backend authentication state machine indicating authentication timeout (authTimeout = TRUE)
Failures While Authenticating	Counts the number of times that the state machine transitions from AUTHENTICATING to HELD, as a result of the backend authentication state machine indicating authentication failure (authFail = TRUE)
Reauths While Authenticating	Counts the number of times that the state machine transitions from AUTHENTICATING to ABORTING, as a result of a reauthentication request (reAuthenticate = TRUE)
EapStarts While Authenticating	Counts the number of times that the state machine transitions from AUTHENTICATING to ABORTING, as a result of an EAPOL-Start message being received from the supplicant
EapLogoffs While Authenticating	Counts the number of times that the state machine transitions from AUTHENTICATING to ABORTING, as a result of an EAPOL-Logoff message being received from the supplicant
Reauths While Authenticated	Counts the number of times that the state machine transitions from AUTHENTICATED to CONNECTING, as a result of a reauthentication request (reAuthenticate = TRUE)
EapStarts While Authenticated	Counts the number of times that the state machine transitions from AUTHENTICATED to CONNECTING, as a result of an EAPOL-Start message being received from the supplicant
EapLogoffs While Authenticated	Counts the number of times that the state machine transitions from AUTHENTICATED to DISCONNECTED, as a result of an EAPOL-Logoff message being received from the supplicant
Backend Responses	Counts the number of times that the state machine sends an initial Access-Request packet to the authentication server (that is, executes sendRespToServer on entry to the RESPONSE state) Indicates that the authenticator attempted communication with the authentication server

Table 43: Show Port dot1x Output Fields (Continued)

Label	Description
`Backend Access Challenges`	Counts the number of times that the state machine receives an initial Access-Challenge packet from the authentication server (that is, aReq becomes TRUE, causing an exit from the RESPONSE state) Indicates that the authentication server has communication with the authenticator
`Backend Requests To Supplicant`	Counts the number of times that the state machine sends an EAP-Request packet (other than an Identity, Notification, Failure, or Success message) to the supplicant (that is, executes txReq on entry to the REQUEST state) Indicates that the authenticator chose an EAP-method
`Backend Non Nak Responses`	Counts the number of times that the state machine receives a response from the supplicant to an initial EAP-Request, and the response is something other than EAP-NAK (that is, rxResp becomes TRUE, causing the state machine to transition from REQUEST to RESPONSE, and the response is not an EAP-NAK) Indicates that the supplicant can respond to the authenticator's chosen EAP-method
`Backend Auth Successes`	Counts the number of times that the state machine receives an EAP-Success message from the authentication server (that is, aSuccess becomes TRUE, causing a transition from RESPONSE to SUCCESS) Indicates that the supplicant has successfully authenticated to the authentication server
`Backend Auth Failures`	Counts the number of times that the state machine receives an EAP-Failure message from the authentication server (that is, aFail becomes TRUE, causing a transition from RESPONSE to FAIL) Indicates that the supplicant has not authenticated to the authentication server

Sample Output

```
*A:ALU-1># show port 1/4/1 description

===============================================================================
Port Descriptions on Slot 1
===============================================================================
Port Id        Description
-------------------------------------------------------------------------------
1/4/1          DS3/E3
===============================================================================
*A:ALU-1>
```

Table 44: 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 45: 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 46: 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
PPP Statistics	
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

Table 46: Show Port PPP Output Fields (Continued)

Label	Description
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
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
...
-------------------------------------------------------------------------------
```

Table 47: Show Port CEM Output Fields

Label	Description
`Port Id`	The port ID, in the *slot/mda/port* format
`Admin State`	The administrative state of the interface connection
`Link`	Indicates 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

lldp

Syntax **lldp** [**nearest-bridge** | **nearest-non-tpmr** | **nearest-customer**] [**remote-info**] [**detail**]

Context show>port>ethernet

Description This command displays LLDP information.

Parameters **nearest-bridge** — displays nearest bridge information

nearest-non-tpmr — displays nearest non-two-port MAC relay (TPMR) information

nearest-customer — displays nearest customer information

remote-info — displays remote information on the bridge MAC

detail — displays detailed LLDP information

Output The following outputs are examples of LLDP information:

- LLDP (Sample Output, Table 48)
- LLDP Detail (Sample Output, Table 49)

Sample Output

```
*A:ALU-1># show port 1/2/2 ethernet lldp
===============================================================================
Link Layer Discovery Protocol (LLDP) Port Information
===============================================================================
Port 1/2/2 Bridge nearest-bridge
-------------------------------------------------------------------------------
Admin State : txAndRx Notifications : Disabled
Transmit TLVs : portDesc sysCap
Management Address Transmit Configuration:
Index 1 (system) : Enabled Address : 10.20.30.40
Port 1/2/2 Bridge nearest-non-tpmr
-------------------------------------------------------------------------------
Admin State : disabled Notifications : Disabled
Transmit TLVs : None
Management Address Transmit Configuration:
Index 1 (system) : Disabled Address : 10.20.30.40
Port 1/2/2 Bridge nearest-customer
-------------------------------------------------------------------------------
Admin State : disabled Notifications : Disabled
Transmit TLVs : None
Management Address Transmit Configuration:
Index 1 (system) : Disabled Address : 10.20.30.40
===============================================================================
*A:ALU-1>#
```

Table 48: Show Port LLDP Output Fields

Label	Description
Admin State	The LLDP transmission/reception frame handling
Notifications	Indicates if LLDP notifications are Enabled or Disabled
Transmit TLVs	The optional TLVs that are transmitted by this port
Management Address Transmit Configuration	
Index 1 (system)	Details of the management address configuration. The 7705 SAR can only be configured to send or not send the system address. Enabled — the management address TLV is included in LLDPDUs sent by the port
	Disabled — the management address TLV is not included in LLDPDUs sent by the port
Address	The address transmitted by the port when tx-mgmt-address command is enabled

Sample Output

```
*A:ALU-1># show port 1/2/2 ethernet lldp nearest-bridge detail
===============================================================================
Link Layer Discovery Protocol (LLDP) Port Information
===============================================================================
Port 1/2/2 Bridge nearest-bridge
-------------------------------------------------------------------------------
Admin State : txAndRx Notifications : Disabled
Transmit TLVs : portDesc sysCap
Management Address Transmit Configuration:
Index 1 (system) : Enabled Address : 10.20.30.40
Port LLDP Stats:
Tx Frames : 13 Tx Length Err Frames : 0
Rx Frames : 0 Rx Frame Discard : 0
Rx Frame Errors : 0 Rx TLV Discard : 0
Rx TLV Unknown : 0 Rx Ageouts : 0
===============================================================================
*A:ALU-1>#
```

```
*A:ALU-1># show port 1/2/2 ethernet lldp nearest-bridge remote-info detail
===============================================================================
Link Layer Discovery Protocol (LLDP) Port Information
===============================================================================
Port 1/2/2 Bridge nearest-bridge Remote Peer Information
-------------------------------------------------------------------------------
Remote Peer Index 2 at timestamp 12/02/2008 16:08:14:
Supported Caps : (Not Specified)
Enabled Caps : (Not Specified)
Chassis Id Subtype : 4 (macAddress)
Chassis Id : ac:fa:ff:00:00:00
PortId Subtype : 7 (local)
Port Id : 37814272
Port Description : n/a
System Name : n/a
System Description : n/a
Remote Peer Index 2 management addresses at time 12/02/2008 16:08:14:
No remote management addresses found
===============================================================================
*A:ALU-1>#
```

Table 49: Show Port LLDP Detail Output Fields

Label	Description
Admin State	The LLDP transmission/reception frame handling
Notifications	Indicates if LLDP notifications are Enabled or Disabled
Transmit TLVs	The optional TLVs that are transmitted by this port
Index 1 (system)	Details of the management address configuration. The 7705 SAR can only be configured to send or not send the system address. Enabled — the management address TLV is included in LLDPDUs sent by the port
	Disabled — the management address TLV is not included in LLDPDUs sent by the port
Address	The address transmitted by the port when the management address TLV is included in LLDPDUs sent by the port
Tx Frames	The number of LLDP frames transmitted
Tx Length Err Frames	The number of frames with LLDPDU length violations caused by too many TLVs selected by the network manager. The packets are sent containing the mandatory TLVs and the maximum number of optional TLVs that will fit in the LLDP frame.
Rx Frames	The number of LLDP frames received

Table 49: Show Port LLDP Detail Output Fields (Continued)

Label	Description
Rx Frame Discard	The number of LLDP frames received by the LLDP agent that were discarded for any reason. This counter can provide an indication that LLDP header formatting problems may exist with the local LLDP agent in the sending system, or that LLDPDU validation problems may exist with the local LLDP agent in the receiving system.
`Rx Frame Errors`	The number of invalid LLDP frames received by the LLDP agent on the indicated port while the LLDP agent is enabled
`Rx TLV Discard`	The number of LLDP TLVs discarded for any reason by the LLDP agent on the indicated port
`Rx TLV Unknown`	The number of LLDP TLVs received that are not recognized by the LLDP agent
`Rx Ageouts`	The number of age-outs that have occurred on the port
Supported Caps	Describes the system capabilities supported by the remote peer
Enabled Caps	Describes the system capabilities enabled on the remote peer
Chassis Id Subtype	An integer value and text definition that indicates the basis for the chassis ID entity listed in the chassis ID field
Chassis Id	The chassis identifier of the chassis containing the ethernet port that sent the LLDPDU
PortId Subtype	An integer value and text definition that indicates the basis for the port ID entity listed in the port ID field
PortId	The port identifier of the ethernet port that sent the LLDPDU
Port Description	Describes the port that sent the LLDPDU
System Description	Describes the system that sent the LLDPDU

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	*slot*:	1
	mda:	1 to 6 (7705 SAR-8) or 1 to 12 (7705 SAR-18)
	port:	1 to 2 (on the 2-port OC3/STM1 Channelized Adapter card) 1 to 4 (on the 4-port OC3/STM1 Clear Channel Adapter card or 4-port DS3/E3 Adapter card) 1 to 16 (on the 16-port T1/E1 ASAP Adapter card) 1 to 32 (on the 32-port T1/E1 ASAP Adapter card)
	channel:	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 50)
- ATM Connections (Sample Output, Table 51)
- ATM PVC (Sample Output, Table 52)
- ATM PVC VPI/VCI (Sample Output, Table 53)
- ATM PVC VPI/VCI Detail (Sample Output, Table 54)
- ATM PVP (Sample Output, Table 55)
- ATM PVP Detail (Sample Output, Table 56)

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 50: 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
`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

Table 50: Show Port ATM Output Fields (Continued)

Label	Description
`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
`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 51: 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
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 52: 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

Table 52: Show Port ATM PVC Output Fields (Continued)

Label	Description
`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 53: 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

Table 53: Show Port ATM PVC VPI/VCI 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

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 54: 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
`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

Table 54: Show Port ATM PVC VPI/VCI Detail Output Fields (Continued)

Label	Description
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 55: 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 56: 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 56: 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 57 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 57: 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
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 32

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 58)
- Multilink Bundle IMA Group (Sample Output, Table 59)
- Multilink Bundle IMA Group Detailed (Sample Output, Table 60)
- Multilink Bundle MLPPP (Sample Output, Table 61)
- Multilink Bundle Multi-class (Sample Output, Table 61)
- Multilink Bundle MLPPP Detail (Sample Output, Table 62)

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 58: 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 58: 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 59: 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 60: 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 60: 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 60: 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 61: 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 61: 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 62: 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	Indicates 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

Table 62: Show Multilink Bundle MLPPP Detail Fields (Continued)

Label	Description
Oper MRRU	The operating maximum frame size that can be reconstructed from multilink fragments
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.

Table 62: Show Multilink Bundle MLPPP Detail Fields (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.

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 63)
- Multilink Bundle IMA ATM Connections (Sample Output, Table 64)
- Multilink Bundle IMA ATM PVC (Sample Output, Table 65)
- Multilink Bundle IMA ATM PVP (Sample Output, Table 66)

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 63: 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 64: 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 65: 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 66: 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 on page 434
- Fabric Profile Statistics Monitor Commands on page 439

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 10

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

external-alarms

Syntax **external-alarms alarm** [**all** | *alarm-id*]

Context clear

Description This command clears remote site external alarm information.

Parameters **all** — clears the status for all alarms

alarm-id — clears the status for a specific alarm

Values 1 to 2147483647

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
ITU-T Y.1731 OAM functions and mechanisms for Ethernet-based networks

Telecom Compliance

IC CS-03 Issue 9 Spectrum Management and Telecommunications
ACTA TIA-968-A
AS/ACIF S016 (Australia/New Zealand) Requirements for Customer Equipment for connection to hierarchical digital interfaces
ITU-T G.703 Physical/electrical characteristics of hierarchical digital interfaces
ITU-T G.707 Network node interface for the Synchronous Digital Hierarchy (SDH)
ITU-T G.712-2001 Transmission performance characteristics of pulse code modulation channels
ITU-T G.957 Optical interfaces for equipments and systems relating to the synchronous digital hierarchy
ITU-T V.24 List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)
ITU-T V.36 Modems for synchronous data transmission using 60-108 kHz group band circuits
ITU-T X.21 Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment for Synchronous Operation on Public Data Networks

Protocol Support

ATM

RFC 2514 Definitions of Textual Conventions and OBJECT_IDENTITIES for ATM Management, February 1999
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
ITU-T Recommendation I.432.1 - B-ISDN user-network interface - Physical layer specification: General characteristics
GR-1248-CORE - Generic Requirements for Operations of ATM Network Elements (NEs). Issue 3 June 1996
GR-1113-CORE - Bellcore, Asynchronous Transfer Mode (ATM) and ATM Adaptation Layer (AAL) Protocols Generic Requirements, Issue 1, July 1994
AF-PHY-0086.001 Inverse Multiplexing for ATM (IMA)

BFD

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draft-ietf-bfd-base-o5.txt Bidirectional Forwarding Detection
draft-ietf-bfd-v4v6-1hop-06.txt BFD IPv4 and IPv6 (Single Hop)
draft-ietf-bfd-multihop-06.txt BFD for Multi-hop Paths

BGP

RFC 1397 BGP Default Route Advertisement
RFC 1997 BGP Communities Attribute
RFC 2385 Protection of BGP Sessions via MDS
RFC 2439 BGP Route Flap Dampening
RFC 2547bis BGP/MPLS VPNs
RFC 2918 Route Refresh Capability for BGP-4
RFC 3107 Carrying Label Information in BGP-4
RFC 3392 Capabilities Advertisement with BGP-4
RFC 4271 BGP-4 (previously RFC 1771)
RFC 4360 BGP Extended Communities Attribute
RFC 4364 BGP/MPLS IP Virtual Private Networks (VPNs) (previously RFC 2574bis BGP/MPLS VPNs)
RFC 4456 BGP Route Reflection: Alternative to Full-mesh IBGP (previously RFC 1966 and RFC 2796)
RFC 4724 Graceful Restart Mechanism for BGP - GR Helper
RFC 4760 Multi-protocol Extensions for BGP (previously RFC 2858)
RFC 4893 BGP Support for Four-octet AS Number Space

DHCP/DHCPv6

RFC 1534 Interoperation between DHCP and BOOTP
RFC 2131 Dynamic Host Configuration Protocol (REV)
RFC 3046 DHCP Relay Agent Information Option (Option 82)
RFC 3315 Dynamic Host Configuration Protocol for IPv6

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)

GRE

RFC 2784 Generic Routing Encapsulation (GRE)

IPv6

RFC 2460 Internet Protocol, Version 6 (IPv6) Specification
RFC 2462 IPv6 Stateless Address Autoconfiguration
RFC 2464 Transmission of IPv6 Packets over Ethernet Networks
RFC 3587 IPv6 Global Unicast Address Format
RFC 3595 Textual Conventions for IPv6 Flow Label
RFC 4007 IPv6 Scoped Address Architecture
RFC 4193 Unique Local IPv6 Unicast Addresses
RFC 4291 IPv6 Addressing Architecture
RFC 4443 Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 Specification
RFC 4649 DHCPv6 Relay Agent Remote-ID Option
RFC 4861 Neighbor Discovery for IP version 6 (IPv6)

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 4205 for Shared Risk Link Group (SRLG) TLV
draft-ietf-isis-igp-p2p-over-lan-05.txt
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.721: Information technology- OSI-Structure of Management Information
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-ospf-mib-update-04.txt
draft-ietf-mpls-lsr-mib-06.txt
draft-ietf-mpls-te-mib-04.txt
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OSPF

RFC 1765 OSPF Database Overflow
RFC 2328 OSPF Version 2
RFC 2370 Opaque LSA Support
RFC 3101 OSPF NSSA Option
RFC 3137 OSPF Stub Router Advertisement
RFC 3630 Traffic Engineering (TE) Extensions to OSPF
RFC 4203 Shared Risk Link Group (SRLG) sub-TLV

PPP

RFC 1332 PPP Internet Protocol Control Protocol (IPCP)
RFC 1570 PPP LCP Extensions
RFC 1619 PPP over SONET/SDH
RFC 1661 The Point-to-Point Protocol (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

RFC 3550 RTP: A Transport Protocol for Real-Time Applications
RFC 3985 Pseudo Wire Emulation Edge-to-Edge (PWE3) Architecture
RFC 4385 Pseudowire Emulation Edge-to-Edge (PWE3) Control Word for Use over an MPLS PSN
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 5085 Pseudowire Virtual Circuit Connectivity Verification (VCCV): A Control Channel for Pseudowires
RFC 5086 Structure-Aware Time Division Multiplexed (TDM) Circuit Emulation Service over Packet Switched Network (CESoPSN)
draft-ietf-pwe3-redundancy-02 Pseudowire (PW) Redundancy

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 2702 Requirements for Traffic Engineering over MPLS
RFC 2747 RSVP Cryptographic Authentication
RFC 3097 RSVP Cryptographic Authentication - Updated Message Type Value
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

GR-253-CORE SONET Transport Systems: Common Generic Criteria. Issue 3, September 2000
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SSH

draft-ietf-secsh-architecture.txt SSH Protocol Architecture
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)
G.8261 Timing and synchronization aspects in packet networks
G.8262 Timing characteristics of synchronous Ethernet equipment slave clock
GR 1244 CORE Clocks for the Synchronized Network: Common Generic Criteria
IEEE 1588v2 1588 PTP 2008

TACACS+

IETF draft-grant-tacacs-02.txt The TACACS+ Protocol

TCP/IP

RFC 768 User Datagram Protocol
RFC 791 Internet Protocol
RFC 792 Internet Control Message Protocol
RFC 793 Transmission Control Protocol
RFC 826 Ethernet Address Resolution Protocol
RFC 854 Telnet Protocol Specification
RFC 1350 The TFTP Protocol (Rev. 2)
RFC 1812 Requirements for IPv4 Routers

VPLS

RFC 4762 Virtual Private LAN Services Using LDP

Proprietary MIBs

TIMETRA-ATM-MIB.mib
TIMETRA-CAPABILITY-7705-V1.mib
TIMETRA-CFLOWD-MIB.mib
TIMETRA-CHASSIS-MIB.mib
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TIMETRA-FILTER-MIB.mib
TIMETRA-GLOBAL-MIB.mib
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
TIMETRA-QOS-MIB.mib
TIMETRA-ROUTE-POLICY-MIB.mib
TIMETRA-RSVP-MIB.mib
TIMETRA-SAP-MIB.mib
TIMETRA-SDP-MIB.mib
TIMETRA-SECURITY-MIB.mib
TIMETRA-SERV-MIB.mib
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Customer documentation and product support

Customer documentation

http://www.alcatel-lucent.com/myaccess

Product manuals and documentation updates are available at alcatel-lucent.com. If you are a new user and require access to this service, please contact your Alcatel-Lucent sales representative.

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