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Interface Configuration Guide

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1 Preface

1.1 About This Guide

This guide describes system concepts and provides configuration examples to provision CSM cards, adapter cards, modules and ports for the 7705 SAR.

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.



Note: This manual generically covers Release 21.x content and may contain some content that will be released in later maintenance loads. Please refer to the 7705 SAR 21.x.Rx Software Release Notes, part number 3HE17436000xTQZZA, for information on features supported in each load of the Release 21.x software.



Note: As of Release 21.4, software support for the following hardware has been deprecated:

- 7705 SAR-M 6-port DSL Combination module (3HE05914AA)
- 7705 SAR-M 8-port xDSL module (3HE05577AA)
- 7705 SAR-M GPON module (3HE05126AA)
- 7705 SAR-Wx xDSL variants (3HE07618AA, 3HE07619AA)

These components are no longer recognized in the release.

1.1.1 Audience

This guide is intended for network administrators who are responsible for configuring the 7705 SAR routers. It is assumed that the network administrators have an understanding of networking principles and configurations. Concepts described in this guide include the following:

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

1.1.2 Technical Support

If you purchased a service agreement for your 7705 SAR router and related products from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller for assistance. If you purchased a Nokia service agreement, follow this link to contact a Nokia support representative and to access product manuals and documentation updates:

[Product Support Portal](#)

2 7705 SAR Interface Configuration Process

[Table 1](#) lists the tasks that are required to provision CSM cards, adapter cards, ports, and SCADA bridges.

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/Description	Chapter
Provisioning	Configure chassis slots and cards	Configuring the IOM and Card Slot
	Configure adapter cards	Configuring Adapter Cards and Modules
	Configure ports and bridges	Configuring Ports Configuring SCADA Bridges
Reference	List of IEEE, IETF, and other proprietary entities	Standards and Protocol Support

3 7705 SAR Interfaces

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

Topics in this chapter include:

- [Configuration Overview](#)
- [Port Features](#)
- [802.1x Network Access Control](#)
- [MAC Authentication](#)
- [Link Layer Discovery Protocol \(LLDP\)](#)
- [Surveillance, Control, and Data Acquisition \(SCADA\) Support](#)
- [Configuration Notes](#)
- [Configuring Physical Components with CLI](#)
- [Configuration Command Reference](#)
- [Show, Monitor, Clear, and Debug Command Reference](#)

3.1 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.

Nokia 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 cards can be inserted into the appropriate chassis slots as required.

The following sections are discussed:

- [Configuring the IOM and Card Slot](#)
- [Configuring Adapter Cards and Modules](#)
- [Configuring Ports](#)
- [Configuring SCADA Bridges](#)

3.1.1 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 Shelf V2 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, ports, and SCADA bridges 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.



Note: On the 7705 SAR-8 Shelf V2, the CSM is called the CSMv2; both terms are used interchangeably in these guides. The CSMv2 supports bandwidth of 10 Gb/s, 2.5 Gb/s and 1 Gb/s in the first two adapter card slots and 2.5 Gb/s and 1 Gb/s in the remaining four adapter card slots.

The 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, and 7705 SAR-X have a fixed physical configuration and each router 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 at the adapter card level.

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

3.1.2 Configuring Adapter Cards and Modules

This section contains information on the following topics:

- [Provisioning Chassis Slots for Adapter Cards](#)
- [Maximum Number of Adapter Cards in a Chassis](#)
- [Evolution of Ethernet Adapter Cards, Modules, and Platforms](#)
- [Channelized Adapter Card Support](#)

3.1.2.1 Provisioning Chassis Slots for Adapter Cards

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. On the 7705 SAR-8 Shelf V2, the MDA ID is from 1 to 6. On the 7705 SAR-18, the MDA ID is from 1 to 12 for the MDA slots and from X1 to X4 for the XMDA slots. 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.

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.

3.1.2.2 Maximum Number of Adapter Cards in a Chassis



Note: Unless otherwise specified, references to adapter cards with multiple versions include all versions of the cards.

A maximum of six adapter cards can be installed in the 7705 SAR-8 Shelf V2 chassis. The following adapter cards are supported:

- 2-port 10GigE (Ethernet) Adapter card (maximum of 4)
- 2-port OC3/STM1 Channelized Adapter card (maximum of 6, depending on channelization – see note below)
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card (maximum of 6)
- 4-port OC3/STM1 Clear Channel Adapter card (maximum of 6)
- 4-port DS3/E3 Adapter card (maximum of 6, depending on channelization – see note below)
- 6-port E&M Adapter card (maximum of 6)
- 6-port FXS Adapter card (maximum of 6)
- 6-port Ethernet 10Gbps Adapter card (maximum of 6)
- 8-port Ethernet Adapter card (maximum of 6)
- 8-port FXO Adapter card (maximum of 6)
- 8-port Gigabit Ethernet Adapter card (maximum of 6)
- 8-port Voice & Teleprotection card (maximum of 6)
- 8-port C37.94 Teleprotection card (maximum of 6)
- 12-port Serial Data Interface card (maximum of 6)
- 16-port T1/E1 ASAP Adapter card (maximum of 6)
- 32-port T1/E1 ASAP Adapter card (maximum of 6)
- Auxiliary Alarm card (maximum of 6)
- CWDM OADM Adapter card (maximum of 6)
- Integrated Services card (maximum of 6)
- Packet Microwave Adapter card (maximum of 6)
- Power Injector card (maximum of 4)

A maximum of 12 MDA adapter cards and 4 XMDA adapter cards can be installed in the 7705 SAR-18 chassis. The following adapter cards are supported:

- 2-port 10GigE (Ethernet) Adapter card (maximum of 6)
- 2-port OC3/STM1 Channelized Adapter card (maximum of 12, depending on channelization – see note below)
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card (maximum of 12)
- 4-port OC3/STM1 Clear Channel Adapter card (maximum of 12)
- 4-port DS3/E3 Adapter card (maximum of 12, depending on channelization – see note below)
- 6-port E&M Adapter card (maximum of 12)
- 6-port FXS Adapter card (maximum of 12)
- 6-port Ethernet 10Gbps Adapter card (maximum of 12)
- 8-port Ethernet Adapter card (maximum of 12)
- 8-port FXO Adapter card (maximum of 12)
- 8-port Gigabit Ethernet Adapter card (maximum of 12)
- 8-port Voice & Teleprotection card (maximum of 12)
- 8-port C37.94 Teleprotection card (maximum of 6)
- 10-port 1GigE/1-port 10GigE X-Adapter card (maximum of 4)
- 12-port Serial Data Interface card (maximum of 12)
- 16-port T1/E1 ASAP Adapter card (maximum of 12)
- 32-port T1/E1 ASAP Adapter card (maximum of 12)
- Auxiliary Alarm card (maximum of 12)
- CWDM OADM Adapter card (maximum of 12)
- Integrated Services card (maximum of 12)
- Packet Microwave Adapter card (maximum of 12)
- Power Injector card (maximum of 8)

**Note:**

- On a 7705 SAR-8 Shelf V2 chassis:
 - a maximum of six 2-port OC3/STM1 Channelized Adapter cards can be installed in MDA slots 1 to 6 if DS3 channelization is being used. If DS1/E1 or DS0 (64 kb/s) channelization is being used, a maximum of four 2-port OC3/STM1 Channelized Adapter cards can be installed in MDA slots 1 to 6.
 - a maximum of six 4-port DS3/E3 Adapter cards can be installed in MDA slots 1 to 6 if DS3/E3 or DS1/E1 channelization is being used. If DS0 (64 kb/s) channelization is being used, a maximum of four 4-port DS3/E3 Adapter cards can be installed in MDA slots 1 to 6.
 - a maximum of six 4-port OC3/STM1 / 1-port OC12/STM4 Adapter cards can be installed in MDA slots 1 to 6 if DS1/E1 channelization is being used. DS0 and DS3/E3 channelization is not supported on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.
 - a maximum of six 6-port Ethernet 10Gbps Adapter cards can be installed in MDA slots 1 to 6. When installed in MDA slot 1 or 2, the 6-port Ethernet 10Gbps Adapter card supports a 10-Gb/s fabric rate. When installed in MDA slots 3 through 6, the aggregate fabric rate is 2.5 Gb/s.
- On a 7705 SAR-18 chassis:
 - a maximum of twelve 2-port OC3/STM1 Channelized Adapter cards can be installed in MDA slots 1 to 12 if DS3 channelization is being used. If DS1/E1 or DS0 (64 kb/s) channelization is being used, a maximum of four 2-port OC3/STM1 Channelized Adapter cards can be installed in MDA slots 1 to 12.
 - a maximum of twelve 4-port DS3/E3 Adapter cards can be installed in MDA slots 1 to 12 if DS3/E3 or DS1/E1 channelization is being used. If DS0 (64 kb/s) channelization is being used, a maximum of four 4-port DS3/E3 Adapter cards can be installed in MDA slots 1 to 12.
 - a maximum of twelve 4-port OC3/STM1 / 1-port OC12/STM4 Adapter cards can be installed in MDA slots 1 to 12 if DS1/E1 channelization is being used. DS0 and DS3/E3 channelization is not supported on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.
- The total number of channel groups that can be configured per card and per node is bound by release-specific system limits. For more information, please contact your Nokia technical support representative.



Note: Because the 6-port E&M Adapter card, 12-port Serial Data Interface card, 8-port Voice & Teleprotection card, 8-port C37.94 Teleprotection card, 8-port FXO Adapter card, and 6-port FXS Adapter card support access mode only, and the Integrated Services card is a resource card that supports an access functionality only, for network applications, the maximum number of each of these adapter cards that can be installed in a 7705 SAR-8 Shelf V2 chassis is 5, and the maximum number that can be installed in a 7705 SAR-18 chassis is 11.

3.1.2.3 Evolution of Ethernet Adapter Cards, Modules, and Platforms

The 7705 SAR hardware components have improved as technology has developed. [Table 2](#) lists the Ethernet adapter cards, modules, and platforms according to their generation. Second-generation (Gen-2) components have additional features, increased card memory and/or improved QoS mechanisms over first-generation (Gen-1) components. Similarly, third-generation (Gen-3) components improve upon second-generation components.

Table 2 Ethernet Adapter Card, Module, and Platform Generations

Generation	Card, Module, and Platform
First Generation	8-port Ethernet Adapter card
Second Generation	2-port 10GigE (Ethernet) Adapter card (v-port)
	2-port 10GigE (Ethernet) module (v-port) (for 7705 SAR-M)
	8-port Gigabit Ethernet Adapter card
	10-port 1GigE/1-port 10GigE X-Adapter card
	Packet Microwave Adapter card
	7705 SAR-A
	7705 SAR-Ax
	7705 SAR-H
	7705 SAR-Hc
	7705 SAR-M
	7705 SAR-W
	7705 SAR-Wx
	4-port SAR-H Fast Ethernet module
6-port SAR-M Ethernet module	

Table 2 Ethernet Adapter Card, Module, and Platform Generations

Generation	Card, Module, and Platform
Third Generation	6-port Ethernet 10Gbps Adapter card
	7705 SAR-X

3.1.2.4 Channelized Adapter Card Support

The following cards and modules support channelization down to the DS0 level:

- 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
- 2-port OC3/STM1 Channelized Adapter card
- 4-port DS3/E3 Adapter card
- 8-port Voice & Teleprotection card
- 8-port C37.94 Teleprotection card
- 8-port FXO Adapter card
- 6-port FXS Adapter card
- 4-port T1/E1 and RS-232 Combination module

On 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 (DS3 ports only), and on the T1/E1 ports of the 4-port T1/E1 and RS-232 Combination module, 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-530, RS-232 (also known as EIA/TIA-232) circuit, or X.21 circuit. The RS-232 ports on the 4-port T1/E1 and RS-232 Combination module also support a single channel group on a channelized RS-232 circuit.

The 6-port E&M Adapter card supports a single channel group on a channelized E&M voice interface.

The 8-port Voice & Teleprotection card supports a single channel group on a channelized G.703 (codirectional) circuit, an IEEE C37.94 teleprotection interface (TPIF) circuit, FXS circuit, or FXO circuit.

The 8-port C37.94 Teleprotection card supports a single channel group on an IEEE C37.94 teleprotection interface (TPIF) circuit.

The 8-port FXO Adapter card supports a single channel group on an FXO circuit.

The 6-port FXS Adapter card supports a single channel group on an FXS circuit.

The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card supports channelization at the DS1/E1 level only.

3.1.2.4.1 PPP Over Fractional T1/E1

The 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, and the T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module 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.

3.1.3 Configuring Ports

A port can be configured after the IOM is activated (the card slot and card type are designated) and the adapter card slot is preprovisioned with an allowed adapter card type.

The 7705 SAR supports the port types listed below:

- [Ethernet](#)
- [TDM](#)
- [GNSS Receiver](#)
- [Multilink Bundles](#)
- [IMA](#)
- [SONET/SDH](#)

- [Voice](#)
- [Microwave Link](#)

In addition, this section contains information on the following topics:

- [CLI Identifiers for Adapter Cards, Modules and Platforms](#)
- [Access, Network, and Hybrid Ports](#)

3.1.3.1 Ethernet

Ethernet ports are supported on the following cards, modules, and platforms:

- [6-port Ethernet 10Gbps Adapter Card](#)
- [8-port Ethernet Adapter Card](#)
- [8-port Gigabit Ethernet Adapter Card](#)
- [10-port 1GigE/1-port 10GigE X-Adapter Card](#)
- [2-port 10GigE \(Ethernet\) Adapter Card/Module](#)
- [Packet Microwave Adapter Card](#)
- [4-port SAR-H Fast Ethernet Module](#)
- [6-port SAR-M Ethernet Module](#)
- [7705 SAR-A](#)
- [7705 SAR-Ax](#)
- [7705 SAR-H](#)
- [7705 SAR-Hc](#)
- [7705 SAR-M](#)
- [7705 SAR-W](#)
- [7705 SAR-Wx](#)
- [7705 SAR-X](#)

3.1.3.1.1 6-port Ethernet 10Gbps Adapter Card

The 6-port Ethernet 10Gbps Adapter card has four SFP ports for 1-Gb/s fiber or copper SFP transceivers and two SFP+ ports for 10-Gb/s fiber or copper SFP+ transceivers. The card also supports synchronous Ethernet timing. The 6-port Ethernet 10Gbps Adapter card is designed to complement or replace the 8-port Ethernet Adapter card or the 8-port Gigabit Ethernet Adapter card in situations where greater processing power and higher throughput capacity are required.

There are two versions of this card: 6-port Ethernet 10Gbps Adapter card and 6-port Ethernet 10Gbps Adapter card-E. The versions have identical functionality except that the 6-port Ethernet 10Gbps Adapter card-E does not have encryption functionality.

The ports and features on the 6-port Ethernet 10Gbps Adapter card are identical to the ports and features on the 8-port Gigabit Ethernet Adapter card, version 3, except that the 6-port Ethernet 10Gbps Adapter card uses only 4-priority schedulers for QoS instead of 4-priority or 16-priority schedulers.

3.1.3.1.2 8-port Ethernet Adapter Card

The 8-port Ethernet Adapter card 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 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. The adapter card also supports synchronous Ethernet timing.

3.1.3.1.3 8-port Gigabit Ethernet Adapter Card

The 8-port Gigabit Ethernet Adapter card has eight SFP ports for fiber or copper SFPs. The card supports dual rate (100 Mb/s and 1000 Mb/s) and Gigabit (1000 Mb/s) fiber connections and 10/100/1000Base-T copper connections. The card also supports synchronous Ethernet timing. The 8-port Gigabit Ethernet Adapter card is designed to complement or replace the 8-port Ethernet Adapter card in situations where greater processing power and higher throughput capacity are required.

There are three versions of the 8-port Gigabit Ethernet Adapter card. Version 1 and version 2 are identical except that version 2 provides larger table space for FIBs, ACLs, and so on. Version 2 also supports the full IPv6 subnet range for IPv6 static routes and interface IP addresses. The static route range is from /1 to /128, and the default route is ::/0. Supported interface IP address prefixes are from /4 to /127, and /128 on system or loopback interfaces. Version 3 is identical to version 2 except that it is equipped with a hardware-based encryption engine to support features such as IPsec.

Higher limits and full subnet ranges are supported only when all the adapter cards in a particular node are equipped with hardware for larger table support.

Gigabit Ethernet optical ports offer significant advantages over fast Ethernet ports, even where lower-speed services are currently offered. With Gigabit Ethernet, service providers have the opportunity to standardize access infrastructure, ensure that capacity is available to accommodate growing bandwidth requirements, and minimize the operational costs associated with future service upgrades to hardware and software.

3.1.3.1.4 10-port 1GigE/1-port 10GigE X-Adapter Card

There are two versions of the 10-port 1GigE/1-port 10GigE X-Adapter card. Both versions are identical except that version 2 is equipped with a hardware-based encryption engine to support features such as IPSec. The card is supported only on the 7705 SAR-18.

The 10-port 1GigE/1-port 10GigE X-Adapter card has 10 small form-factor pluggable (SFP) ports on its faceplate.

When the 10-port 1GigE/1-port 10GigE X-Adapter card is configured in 10-port GigE mode, the 10 SFP ports are available for fiber SFP transceivers. In this mode, the card supports dual-rate (100 Mb/s and 1000 Mb/s) and Gigabit (1000 Mb/s) fiber connections. The card also supports synchronous Ethernet timing.

When the 10-port 1GigE/1-port 10GigE X-Adapter card is configured in 1-port GigE mode, only one SFP+ (port 1) of the 10 ports is active and available for use with fiber SFP+ transceivers. The card supports 10-Gb/s fiber connections. The card also supports synchronous Ethernet timing. The 1-port GigE mode is designed for use in situations where greater processing power and higher throughput capacity are required.

The 10-port 1GigE/1-port 10GigE X-Adapter card provides larger table space for FIBs, ACLs, and so on. The card also supports the full IPv6 subnet range for IPv6 static routes and interface IP addresses. The static route range is from /1 to /128, and the default route is ::/0. Supported interface IP address prefixes are from /4 to /127, and /128 on system or loopback interfaces.

Higher limits and full subnet ranges are supported only when all the adapter cards in a particular node are equipped with hardware for larger table support.

3.1.3.1.5 2-port 10GigE (Ethernet) Adapter Card/Module

The 2-port 10GigE (Ethernet) Adapter card/module is used to connect to and from access rings carrying a high concentration of traffic. [Table 3](#) lists the maximum number of cards or modules that are supported on each platform. A single card can be installed in the 7705 SAR-8 Shelf V2 or the 7705 SAR-18; however, it is strongly recommended that a minimum of two cards be installed for redundancy.

Table 3 Maximum Number of Cards/Modules Supported in Each Chassis

Chassis	Maximum Number of Cards or Modules
7705 SAR-8 Shelf V2	Up to four cards
7705 SAR-18	Up to six cards
7705 SAR-M	One module

The 2-port 10GigE (Ethernet) Adapter card/module has two small form-factor pluggable (XFP) ports on its faceplate. The two XFP ports are for 10-Gigabit Ethernet XFPs. The card provides high processing power and throughput capacity and operates at 10 Gb/s for Ethernet ports and 2.5 Gb/s for the virtual port (v-port).

The 2-port 10GigE (Ethernet) Adapter card provides larger table space for FIBs, ACLs, and so on. The card also supports the full IPv6 subnet range for IPv6 static routes and interface IP addresses on the v-port. The supported range for statically provisioned or dynamically learned routes is from /1 to /128. Supported interface IP address prefixes are from /4 to /127, and /128 on system or loopback interfaces.

The 2-port 10GigE (Ethernet) module supports IPv6 on the v-port. The supported range for statically provisioned or dynamically learned routes is from /1 to /64 or is /128 (indicating a host route). Supported interface IP address prefixes are from /4 to /64, and /128 on system or loopback interfaces.

The 2-port 10GigE (Ethernet) Adapter card/module supports LLDP on the Ethernet ports but not on the v-port.

3.1.3.1.6 Packet Microwave Adapter Card

The Packet Microwave Adapter card has two RJ-45 ports (ports 1 and 2) and six SFP ports (ports 3 through 8). All ports provide 10/100/1000 Mb/s connections (when connected to an MPR-e radio, they are always in Gigabit Ethernet (1-Gb/s) mode). Ports 1 through 4 support Microwave Awareness (MWA) and Ethernet/IP/MPLS networking; ports 5 through 8 support Ethernet/IP/MPLS networking only.

All Gigabit Ethernet ports provide the same networking feature capability as the 8-port Gigabit Ethernet Adapter card. For frequency synchronization, synchronous Ethernet and SSM are the mechanisms that are applied when using optical 1000Base-SX to connect to an MPR-e radio. When using electrical 1000Base-T to connect the Packet Microwave Adapter card and an MPR-e radio, Proprietary Clock Recovery (PCR) is used (a copper SFP is mandatory on ports 3 and 4).

3.1.3.1.7 4-port SAR-H Fast Ethernet Module

The 4-port SAR-H Fast Ethernet module has four RJ-45 Fast Ethernet ports (10/100 Mb/s) on its faceplate. Any functionality supported on the 7705 SAR-H Ethernet ports is also supported on the 4-port SAR-H Fast Ethernet module, with the exception of hierarchical QoS (H-QoS) functionality and hybrid mode.

3.1.3.1.8 6-port SAR-M Ethernet Module

The 6-port SAR-M Ethernet module has six Ethernet ports:

- two SFP Fast Ethernet ports (10/100 Mb/s) (ports 1 and 2)
- two XOR (combination) SFP/RJ point five Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 3a/3b and 4a/4b)
- two PoE-capable RJ point five copper Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 5 and 6)

Ports 5 and 6 can each support Power over Ethernet (PoE). Port 5 can also support PoE+, but if it is configured for PoE+, then port 6 cannot support PoE power.

Any functionality supported on the 7705 SAR-M Ethernet ports is also supported on the 6-port SAR-M Ethernet module, with the exception of half-duplex mode (all ports) and hybrid mode (Fast Ethernet ports only).

3.1.3.1.9 7705 SAR-A

The 7705 SAR-A has two variants with fixed physical configurations. Both variants have 12 Ethernet ports:

- four XOR (combination) Gigabit Ethernet ports, either 10/100/1000Base-T RJ-45 (ports 1A to 4A) or 100/1000 Mb/s SFP (ports 1B to 4B)
- four SFP Gigabit Ethernet ports (100/1000 Mb/s) (ports 5 to 8)
- four RJ-45 Fast Ethernet ports (10/100 Mb/s) (ports 9 to 12)

3.1.3.1.10 7705 SAR-Ax

The 7705 SAR-Ax has a fixed physical configuration that has 12 Ethernet ports:

- four XOR (combination) Gigabit Ethernet ports, either 10/100/1000Base-T RJ-45 (ports 1A to 4A) or 100/1000 Mb/s SFP (ports 1B to 4B)
- eight SFP Gigabit Ethernet ports (100/1000 Mb/s) (ports 5 to 12)

3.1.3.1.11 7705 SAR-H

The 7705 SAR-H has a fixed physical configuration that has eight Ethernet ports:

- two SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 1 and 2)
- two XOR (combination) RJ-45/SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 3 and 4)
- four PoE-capable RJ-45 Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 5 to 8)

The 7705 SAR-H also has two module slots.

If a PoE Power Supply is connected, it increases the number of Ethernet ports that can supply PoE to a connected device.

3.1.3.1.12 7705 SAR-Hc

The 7705 SAR-Hc has a fixed physical configuration that has six Ethernet ports:

- two SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 1 and 2)
- two Gigabit Ethernet RJ-45 ports (10/100/1000 Mb/s) (ports 3 and 4)
- two PoE-capable RJ-45 Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 5 and 6)

3.1.3.1.13 7705 SAR-M

The 7705 SAR-M has four variants with fixed physical configurations. All variants have seven Ethernet ports:

- four SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 1 to 4)
- three Gigabit Ethernet RJ-45 ports (10/100/1000 Mb/s) (ports 5 to 7)

Two variants of the 7705 SAR-M also have a module slot.

3.1.3.1.14 7705 SAR-W

The 7705 SAR-W has a fixed physical configuration that has five Ethernet ports:

- three SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 1 to 3)
- two PoE+ capable Gigabit Ethernet RJ-45 ports (10/100/1000 Mb/s) (ports 4 and 5)

3.1.3.1.15 7705 SAR-Wx

The 7705 SAR-Wx has four variants with fixed physical configurations that provide the following Ethernet interfaces.

Two variants have the following five Gigabit Ethernet ports:

- three SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 1 to 3)
- two Gigabit Ethernet RJ-45 ports (10/100/1000 Mb/s) (ports 4 and 5)

Two variants have the following five Gigabit Ethernet ports:

- three SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 1 to 3)
- one Gigabit Ethernet RJ-45 port (10/100/1000 Mb/s) (port 4)
- one PoE+ Gigabit Ethernet RJ-45 port (10/100/1000 Mb/s) (port 5)



Note: The DSL variants of the 7705 SAR-Wx are no longer supported.

3.1.3.1.16 7705 SAR-X

The 7705 SAR-X has a fixed physical configuration that has 14 Ethernet ports:

- four XOR (combination) RJ-45/SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 2/1A, 2/2A, 3/1A, 3/2A for RJ-45 and 2/1B, 2/2B, 3/1B, 3/2B for SFP)
- eight SFP Gigabit Ethernet ports (10/100/1000 Mb/s) (ports 2/3 to 2/6 and 3/3 to 3/6)
- two SFP+ 10-Gigabit Ethernet ports (ports 2/7 and 3/7)

3.1.3.2 TDM

TDM ports are supported on the following cards, modules, and platforms:

- [16-port T1/E1 ASAP Adapter Card](#)
- [32-port T1/E1 ASAP Adapter Card](#)
- [2-port OC3/STM1 Channelized Adapter Card](#)
- [4-port OC3/STM1 / 1-port OC12/STM4 Adapter Card](#)
- [4-port DS3/E3 Adapter Card](#)
- [8-port Voice & Teleprotection Card](#)
- [8-port C37.94 Teleprotection Card](#)
- [12-port Serial Data Interface Card](#)
- [4-port T1/E1 and RS-232 Combination Module](#)
- [7705 SAR-A](#)
- [7705 SAR-Hc](#)
- [7705 SAR-M](#)
- [7705 SAR-X](#)

3.1.3.2.1 16-port T1/E1 ASAP Adapter Card

On the 16-port T1/E1 ASAP Adapter card, channelization is supported down to the DS0 level. To change port types, all ports must first be shut down. The ports can be configured for DS1 (T1) or E1 operation. All ports on the card must be either T1 or E1; there cannot be a mix of the two types. When the first port is configured on a card, all other ports on the card must be set to the same type.

The 16-port T1/E1 ASAP Adapter card supports 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).

DS1 ports on the adapter card can be configured for either B8ZS (bipolar with eight-zero substitution) zero code suppression or AMI (alternate mark inversion). B8ZS and AMI are line coding techniques.

3.1.3.2.2 32-port T1/E1 ASAP Adapter Card

On the 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 can be configured for DS1 (T1) or E1 operation. All ports on the card must be either T1 or E1; there cannot be a mix of the two types. When the first port is configured on a card, all other ports on the card must be set to the same type.

The 32-port T1/E1 ASAP Adapter card supports 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).

DS1 ports on the card can be configured for either B8ZS (bipolar with eight-zero substitution) zero code suppression or AMI (alternate mark inversion). B8ZS and AMI are line coding techniques.

3.1.3.2.3 2-port OC3/STM1 Channelized Adapter Card

On the 2-port OC3/STM1 Channelized Adapter card, channelization is supported down to the DS0 level. To change port types, all ports must first be shut down. The ports can be configured for DS1 (T1) or E1 channelization. All ports on the card must be either SONET or SDH; there cannot be a mix of the two types. When the first port is configured on a card, all other ports on the card must be set to the same type.

The 2-port OC3/STM1 Channelized Adapter card also supports DS3 channelization on access for TDM services as well as network mode with PPP.

3.1.3.2.4 4-port OC3/STM1 / 1-port OC12/STM4 Adapter Card

The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card can be configured to be in 4-port OC3/STM1 mode or 1-port OC12/STM4 mode (using the **mda-mode** command).

When the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card is configured in 4-port OC3/STM1 mode, four SFP ports are available for optical and electrical SFP transceivers. In this mode, the card supports OC3 SONET or STM1 SDH transmission.

When the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card is configured in 4-port OC3/STM1 mode, channelization is supported down to the DS1 level. To change port types, all ports must first be shut down. The ports can be configured for DS1 (T1) or E1 channelization in access mode, or PPP/MLPPP or POS in network mode. All ports on the card must be either SONET or SDH; there cannot be a mix of the two types. When the first port is configured on a card, all other ports on the card must be set to the same type. Switching between port types causes the adapter card to reset.

When the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card is configured in 1-port OC12/STM4 mode, SFP port 1 is available for optical SFP transceivers. Ports 2 through 4 are not available. In this mode, the card supports OC12 SONET and STM4 SDH transmission. The 1-port OC12/STM4 mode is designed for use in situations where greater bandwidth is required on a single port.

3.1.3.2.5 4-port DS3/E3 Adapter Card

The 4-port DS3/E3 Adapter card has two versions. Both versions have the same functionality; version 2 of the adapter card is a replacement for version 1.

The 4-port DS3/E3 Adapter card has four TDM DS3/E3 ports. The port type must be configured to be either DS3 or E3. Each DS3 port can be clear channel or channelized down to DS0 (64 kb/s). E3 ports can be clear channel only. Once the first port type 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.

Channelization is supported down to the DS0 level (for DS3 ports only). To change port types, all ports must first be shut down. The ports can be configured for DS1 (T1) or E1 operation. All ports on the card must be either T1 or E1; there cannot be a mix of the two types. When the first port is configured on a card, all other ports on the card must be set to the same type.

3.1.3.2.6 8-port Voice & Teleprotection Card

On the 8-port Voice & Teleprotection card, channelization is supported down to the DS0 level. To change port types, all ports must first be shut down. The ports can be configured for DS1 (T1) or E1 operation. All ports on the card must be either T1 or E1; there cannot be a mix of the two types. When the first port is configured on a card, all other ports on the card must be set to the same type.

Channelization is supported on the two codirectional G.703 ports and two IEEE C37.94 teleprotection interface ports.

3.1.3.2.7 8-port C37.94 Teleprotection Card

On the 8-port C37.94 Teleprotection card, channelization is supported down to the DS0 level on the eight IEEE C37.94 teleprotection interface (TPIF) ports.

3.1.3.2.8 12-port Serial Data Interface Card

There are three versions of the 12-port Serial Data Interface card.

Version 1 and version 2 each have four connectors that support three serial data ports each. Each port grouping can 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 must be configured for the same type. The card also supports an RS-530 interface with the use of an adapter cable that connects to a DB15 connector on the front of the X.21 distribution panel. There is no configuration specifically for the RS-530 interface; configuration is done in X.21 mode and applies to the RS-530 interface when it is physically enabled through hardware. All X.21 functionality is available on the RS-530 interface, except that only DCE operation is supported for RS-530. However, because X.21 does not support all the control leads available for RS-530, only a subset of the RS-530 control leads are supported.

The 12-port Serial Data Interface card, version 3, has six connectors that support two data ports each. Each port grouping can be configured for V.35, RS-232, X.21, or RS-530 operation. When a port has been configured for a specific interface type, the other port in the group must be configured for the same type.

Channelization on the 12-port Serial Data Interface card is supported down to the DS0 level.

3.1.3.2.9 4-port T1/E1 and RS-232 Combination Module

T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (supported on the 7705 SAR-H) support channelization down to the DS0 level. To change port types, all ports must first be shut down. The ports can be configured for DS1 (T1) or E1 operation. All ports on the module must be either T1 or E1; there cannot be a mix of the two types. When the first port is configured on a module, all other ports on the card must be set to the same type.

3.1.3.2.10 7705 SAR-A

The 7705 SAR-A has two variants with fixed physical configurations. One variant supports both Ethernet and T1/E1 ports. The variant that supports T1/E1 ports includes eight RJ-45 T1/E1 ports. All ports must be configured as either T1 or E1 ports; a mix of T1 and E1 ports is not allowed.

DS1 (T1) ports on the chassis can be configured for either B8ZS (bipolar with eight-zero substitution) zero code suppression or AMI (alternate mark inversion). B8ZS and AMI are line coding techniques.

3.1.3.2.11 7705 SAR-Hc

The 7705 SAR-Hc has a fixed physical configuration that includes two RS-232 RJ-45 ports. The chassis also includes Gigabit Ethernet/Ethernet support via SFP and RJ-45 ports.

3.1.3.2.12 7705 SAR-M

The 7705 SAR-M has four variants with fixed physical configurations. Two variants support both Ethernet and T1/E1 ports. These variants include 16 RJ-45 T1/E1 ports. All ports must be configured as either T1 or E1 ports; a mix of T1 and E1 ports is not allowed.

DS1 (T1) ports on the chassis can be configured for either B8ZS (bipolar with eight-zero substitution) zero code suppression or AMI (alternate mark inversion). B8ZS and AMI are line coding techniques.

3.1.3.2.13 7705 SAR-X

The 7705 SAR-X has a fixed physical configuration that provides TDM pseudowire services via eight T1/E1 RJ-45 ports.

3.1.3.3 GNSS Receiver

The 7705 SAR-H GPS Receiver module is equipped with a GPS RF port for retrieval and recovery of GPS and GLONASS signals. The 7705 SAR-Ax and two variants of the 7705 SAR-Wx are equipped with an integrated GNSS receiver and a GNSS RF port for retrieval and recovery of GPS and GLONASS signals.

The GNSS Receiver card installed in the 7705 SAR-8 Shelf V2 or 7705 SAR-18 is equipped with a GNSS RF port for retrieval and recovery of both GPS and GLONASS signals.



Note: GLONASS-only signal recovery is not supported in this release.

3.1.3.4 Multilink Bundles

A multilink bundle is a collection of channels on channelized ports that physically reside on the same adapter card. 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). All member links of an MLPPP group must be of the same type (either E1 or DS1).

The following cards, modules, and platforms support multilink bundles:

- T1/E1 ports on the 7705 SAR-A
- T1/E1 ports on the 7705 SAR-M
- T1/E1 ports on the 7705 SAR-X

The following must have all member links of an MLPPP bundle configured on the same card or module:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)

The following must have all member links of an MLPPP bundle configured on the same card or module, and on the same port:

- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card

3.1.3.5 IMA

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

3.1.3.6 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). All ports on the 2-port OC3/STM1 Channelized Adapter card must be of the same type (either SONET or SDH).

The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card has four hot-pluggable, SFP-based ports that can be configured to be SONET (OC3 or OC12) or SDH (STM1 or STM4). The card can be configured to be in either 4-port mode or 1-port mode (using the **mda-mode** command). In 4-port mode, all four ports can be configured as OC3 or STM1. In 1-port mode, only port 1 can be configured as OC12 or STM4. All ports on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card must be of the same type (either SONET or SDH).

3.1.3.7 Voice

Voice ports are supported on the following cards:

- [6-port E&M Adapter Card](#)
- [8-port Voice & Teleprotection Card](#)
- [8-port FXO Adapter Card](#)
- [6-port FXS Adapter Card](#)

3.1.3.7.1 6-port E&M Adapter Card

The 6-port E&M Adapter 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. When either A-Law or Mu-Law companding is configured, Type I, Type II, or Type V signaling can be selected. However, the only supported configurations are both ends of the connection operating in the same mode (for example, Type I to Type I) or one end operating in Type I mode and the other in Type V mode. The default signaling type for Mu-Law is Type I and the default signaling type for A-Law is Type V.

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 4](#) for the signaling type, companding law, and audio wires configuration options on the 6-port E&M Adapter card.

Table 4 Configuration Options for the 6-port E&M Adapter Card

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

3.1.3.7.2 8-port Voice & Teleprotection Card

The 8-port Voice & Teleprotection card supports the transport of an analog voiceband signal between two analog devices over a digital network.

The card has two FXS RJ-45 ports and two FXO RJ-45 ports that support analog voiceband signals. 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 at the port level on a per-port basis depending on companding type.

FXO supports:

- 1511profile1 (1511 Loop Start) – A-Law companding
- 3600ls (Loop Start) – Mu-Law companding
- 3600re (Remote Extension) – A-Law companding
- 1511sn137 (1511 profile 137) – A-Law companding

FXS supports:

- 3600plar (Private Line Automatic Ringdown) – A-Law and Mu-Law companding
- 1511plar – A-Law companding
- 1511profile1 (Loop Start) – A-Law companding
- 3600ls (Loop Start) – Mu-Law companding
- 3600re (Remote Extension) – A-Law companding
- 1511sn137 (1511 profile 137) – A-Law companding

The default signaling type for FXO and FXS is 3600ls for Mu-Law companding and 3600re for A-Law companding.

3.1.3.7.3 8-port FXO Adapter Card

The 8-port FXO Adapter card supports the transport of an analog voiceband signal between two analog devices over a digital network.

The card supports analog voiceband signals through four RJ-45 connectors that provide eight Foreign Exchange Office (FXO) ports, with two ports supported per connector. 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 at the port level on a per-port basis depending on companding type.

FXO supports:

- 1511profile1 (1511 loop start) – A-Law companding
- 3600ls (loop start) – Mu-Law companding
- 3600re (remote extension) – A-Law companding
- 1511sn137 (1511 profile 137) – A-Law companding

The default signaling type is 3600ls for Mu-Law companding and 3600re for A-Law companding.

3.1.3.7.4 6-port FXS Adapter Card

The 6-port FXS Adapter card provides the capability of transporting a large number of voice circuits from one 7705 SAR location and terminating them at another 7705 SAR location that is connected to a PBX.

The card can also be configured for a Private Line Automatic Ringdown (PLAR) application, which is typically used outside of a PBX network, in order to provide a site-to-site or remote site-to-control center hotline functionality.

The card has six Foreign Exchange Subscriber (FXS) ports. Each port provides a short-reach, on-premises analog interface to an analog telephone set. After an incoming analog signal from a set is terminated on one of the FXS interfaces, it is converted into a digital 64 kb/s Pulse Code Modulation (PCM) format using either Mu-Law companding (North America) or A-Law companding (Rest of World).

The signal is then mapped into the E1 Channel Associated Signaling (CAS) transport scheme for A-Law or the T1 Robbed Bit Signaling (RBS) transport scheme for Mu-Law and transmitted using a Cpipe over any 7705 SAR network interface that supports the Cpipe service. For standard TDM, the network interface can be a T1/E1 or OC3/STM1 channelized interface. For MPLS, an Ethernet, T1/E1, OC3/STM1 channelized MLPPP, or OC3/STM1 clear channel interface can be used.

For a PBX application, the signal is terminated at the 7705 SAR hub location that is connected to a PBX by either an FXO interface or a T1/E1 interface (assuming the signaling formats are compatible). The FXO interface can be provided by either an 8-port FXO Adapter card or 8-port Voice & Teleprotection card that is installed in a 7705 SAR-8 Shelf V2 or 7705 SAR-18 chassis at the 7705 SAR hub location.

For a PLAR application, the signal is terminated on an FXS interface on either another 6-port FXS Adapter card or an 8-port Voice & Teleprotection card that is installed in a 7705 SAR-8 Shelf V2 or 7705 SAR-18 chassis that is located at a remote location, or terminated on a 3600 MainStreet or 1511 MAX. The connection is made over an E1 interface (3600 MainStreet or 1511 MAX) or a T1 interface (3600 MainStreet). A hotline call can originate from a 3600 MainStreet or 1511 MAX and terminate on an FXS interface on a 6-port FXS Adapter card (or on an FXS interface on an 8-port Voice & Teleprotection card).

[Table 5](#) shows the configuration options available on a 6-port FXS Adapter card. The companding law type is configured at the card level; the other options are configured at the voice port level.

Table 5 Configuration Options for the 6-port FXS Adapter Card

Configuration	Supported Options
Companding type	Mu-Law (the default) A-Law
Fault signaling	Idle (the default) Seized
Line balance	Nominal (the default) 800
Ring generation	16 Hz (the default) 20 Hz 25 Hz
Signaling type	3600 Private Line Automatic Ringdown (PLAR) (if Mu-Law or A-Law is used) 1511 PLAR (if A-Law is used) 1511 Profile1 (if A-Law is used) 3600 Loop Start (LS) (if Mu-Law is used; this is the default) 3600 Remote Extension (RE) (if A-Law is used; this is the default) 1511sn137 (1511 profile 137) (if A-Law is used)
Transmission level point (TLP)	Rx: -7 dB to 0 dB (1-dB increments; the default is -3 dB) Tx: -4 dB to +3 dB (1-dB increments; the default is 0 dB)

3.1.3.8 Microwave Link

A microwave link can be configured as a virtual port object on a 7705 SAR-8 Shelf V2 or 7705 SAR-18 in order to provide a basic microwave connection or the Microwave Awareness (MWA) capability to an MPR-e node.

For more information, see [Microwave Link](#).

3.1.3.9 CLI Identifiers for Adapter Cards, Modules and Platforms

On the CLI, the adapter cards are referred to as MDAs. 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. Adapter cards are configured at the card and port level.

On the fixed platforms, no configuration is required at the adapter card level in order to provision the ports.

On the CLI for the 7705 SAR-A, the *slot/mda* identifier for the T1/E1 ports is 1/2 and for the Ethernet ports is 1/1. T1/E1 ports are identified as 1/2/1 through 1/2/8 for the variant of the chassis with T1/E1 ports. Ethernet ports for both variants of the 7705 SAR-A are identified as 1/1/1 through 1/1/12.

On the CLI for the 7705 SAR-Ax, the *slot/mda* identifier for the Ethernet ports is 1/1 and for the GNSS RF port is 1/2.

On the CLI for the 7705 SAR-H, the *slot/mda* identifier for the Ethernet ports is 1/1. The chassis has two slots for modules (the 4-port T1/E1 and RS-232 Combination module, the GPS Receiver module, and the 4-port SAR-H Fast Ethernet module). On the CLI, the *slot/mda* identifier for a module installed in the first slot position is 1/2 and for a module installed in the second slot position is 1/3. Ethernet ports are identified as 1/1/1 through 1/1/8. Module ports are identified as *1/2/port-num* for modules installed in the first slot position and *1/3/port-num* for modules installed in the second slot position.

On the CLI for the 7705 SAR-Hc, the *slot/mda* identifier for the Ethernet ports is 1/1 and for the RS-232 ports is 1/2. Ethernet ports are identified as 1/1/1 through 1/1/6 and RS-232 ports are identified as 1/2/1 and 1/2/2.

On the CLI for the 7705 SAR-M, the *slot/mda* identifier for the Ethernet ports is 1/1 and for the T1/E1 ports is 1/2. For those variants of the chassis that have a module slot, the *slot/mda* identifier for the module is 1/3. The 7705 SAR-M supports the following modules: CWDM OADM module, 2-port 10GigE (Ethernet) module, and 6-port SAR-M Ethernet module. Ethernet ports for all variants of the 7705 SAR-M are identified as 1/1/1 through 1/1/7. T1/E1 ports are identified as 1/2/1 through 1/2/16 for the variants with T1/E1 ports. Module ports are identified as *1/3/port-num* for the variants with module slots.

On the CLI for the 7705 SAR-W, the *slot/mda* identifier for the Ethernet ports is 1/1. Ethernet ports are identified as 1/1/1 through 1/1/5. The 7705 SAR-W also has an internal (virtual) port used for in-band Ethernet management connection. The virtual port is identified as **vrtl-mgmt** on the CLI and as 1/1/6 via SNMP.

On the CLI for the 7705 SAR-Wx, the *slot/mda* identifier for the Ethernet ports is 1/1 and for the GPS connector is 1/3. Ethernet ports for the Ethernet-only variant and the Ethernet and PoE+ variant are identified as 1/1/1 through 1/1/5. For the variant supporting Ethernet ports and a GPS connector, the GPS connector is identified as 1/3/1.

On the CLI for the 7705 SAR-X, the *slot/mda* identifier for the T1/E1 ports is specified as 1/1 and for the Ethernet ports is 1/2 or 1/3. T1/E1 ports are identified as 1/1/1 to 1/1/8. Ethernet ports are identified as 1/2/*port-num* or 1/3/*port-num*, where the port number has a value from 1 to 7, depending on how the port is configured.

For the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, and 4-port DS3/E3 Adapter card, the *channel-group-id* identifies the DS1 or E1 channel group; for example, 1/5/1.20. For the 2-port OC3/STM1 Channelized Adapter card, the *channel-group-id* identifies the DS1, E1, or DS3 channel group. For the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, the *channel-group-id* identifies the DS1 or E1 channel group. For the 12-port Serial Data Interface card, the *channel-group-id* identifies the V.35, RS-530, RS-232, or X.21 channel group; only one channel group per port 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 per port is supported on the card, so the format would be 1/1/1.1. For the 8-port Voice & Teleprotection card, the 8-port C37.94 Teleprotection card, the 8-port FXO Adapter card, and the 6-port FXS Adapter card, the *channel-group-id* identifies the DS0 channel group; only one channel group per port is supported on the card, so the format would be 1/1/1.1.

For the 4-port T1/E1 and RS-232 Combination module, the *channel-group-id* identifies the DS1 or E1 channel group for the T1/E1 ports (for example, 1/2/3.5) or the channel group for the RS-232 ports (for example, 1/2/2.1).

On the CLI for the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module, for virtual-port configuration, an Ethernet port is identified as v-port.

The following output examples display the administrative and operational states of adapter cards for all platforms.

For the 7705 SAR-8 Shelf V2:

```
NOK-1>show card state
=====
Card State
=====
Slot/  Provisioned Type           Admin Operational  Num  Num Comments
Id     Equipped Type (if different) State State             Ports MDA
-----
1      iom-sar                    up    up                6
1/1    a12-sdiv2                  up    provisioned       12
1/2    a4-oc3                     up    provisioned       4
```

```

1/3  a16-chds1v2          up  provisioned  16
1/4  a4-chds3v2           up  provisioned   4
1/5  a8-ethv2             up  provisioned   8
1/6  a2-choc3            up  provisioned   2
A    csmv2-10g          up  up                Active
B    csmv2-10g          up  down             Standby
=====
NOK-1>#
    
```

For the 7705 SAR-18:

```

*A:NOK-1# show card state
=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num  Num  Comments
Id     Equipped Type (if different) State State           Ports MDA
-----
1      iom-sar                    up    up                12
1/1    aux-alarm                  up    up
1/2    a8-ethv2                   up    up                8
1/3    a8-ethv2                   up    up                8
1/4    a8-ethv2                   up    provisioned       8
1/5    a8-ethv2                   up    provisioned       8
1/6    a32-chds1v2                up    up                32
1/7    a32-chds1v2                up    up                32
1/8    a8-pmc                     up    up                8
1/9    mw-pic-2                   up    up                2
1/10   a4-oc3                     up    provisioned       4
1/11   a4-chds3v2                 up    provisioned       4
1/12   a2-choc3                   up    provisioned       2
1/X1   x-10GigE-v2                up    provisioned       1
1/X2   x-10GigE-v2                up    provisioned       1
1/X3   x-10GigE-v2                up    provisioned       1
1/X4   x-10GigE-v2                up    provisioned       1
A      csm-10g                    up    up                Active
B      csm-10g                    up    down             Standby
=====
*A:NOK-1#
    
```

For the 7705 SAR-A:

```

*A:NOK-1# show card state
=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num  Num  Comments
Id     Equipped Type (if different) State State           Ports MDA
-----
1      iom-sar                    up    up                2
1/1    i12-eth-xor                up    up                12
1/2    i8-chds1                   up    up                8
A      csm-2.5g                   up    up                Active
=====
*A:NOK-1#
    
```


For the 7705 SAR-Ax:

```
*A:sar-Ax# show card state
=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num  Num Comments
Id     Equipped Type (if different) State State           Ports MDA
-----
1      iom-sar                    up   up                2
1/1    i12-1gb-xor                up   up                12
1/2    i1-gnss                    up   up                1
A      csm-2.5g                   up   up                Active
=====
```

For the 7705 SAR-H:

```
*A:NOK-1# show card state
=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num  Num Comments
Id     Equipped Type (if different) State State           Ports MDA
-----
1      iom-sar                    up   up                3
1/1    i8-1gb                     up   up                8
1/2    p4-combo                   up   up                4
1/3    p4-combo                   up   up                4
A      csm-2.5g                   up   up                Active
=====
*A:NOK-1#
```

For the 7705 SAR-Hc:

```
*A:NOK-1# show card state
=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num  Num Comments
Id     Equipped Type (if different) State State           Ports MDA
-----
1      iom-sar                    up   up                2
1/1    i6-1gb                     up   up                6
1/2    i2-sdi                     up   up                2
A      csm-2.5g                   up   up                Active
=====
*A:NOK-1#
```

For the 7705 SAR-M:

*A:NOK-1# show card state

```

=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num  Num Comments
Id     Equipped Type (if different) State State           Ports MDA
-----
1      iom-sar                    up    up                3
1/1    i7-1gb                     up    up                7
1/2    i16-chds1                  up    up               16
1/3    p6-eth                     up    up                6
A      csm-2.5g                   up    up                Active
=====

```

*A:ALU-1#

For the 7705 SAR-W:

*A:NOK-1# show card state

```

=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num  Num Comments
Id     Equipped Type (if different) State State           Ports MDA
-----
1      iom-sar                    up    up                1
1/1    i5-1gb                     up    up                6
A      csm-2.5g                   up    up                Active
=====

```

*A:NOK-1#

For the 7705 SAR-Wx Ethernet variant:

*A:NOK-1# show card state

```

=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num  Num Comments
Id     Equipped Type (if different) State State           Ports MDA
-----
1      iom-sar                    up    up                1
1/1    i5-1gb-b                   up    up                5
A      csm-2.5g                   up    up                Active
=====

```

*A:NOK-1#

For the 7705 SAR-X:

*A:NOK-1# show card state

```

=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num  Num Comments
Id     Equipped Type (if different) State State           Ports MDA
-----

```

```

-----
1      iom-sar                up    up                3
1/1    i8-chdsl-x            up    up                8
1/2    i7-mix-eth           up    up                7
1/3    i7-mix-eth           up    up                7
A      csm-2.5g              up    up                Active
=====
*A:NOK-1#

```

3.1.3.10 Access, Network, and Hybrid Ports

All ports must be set to access (customer-facing), network, or hybrid mode. When the mode is configured on a port, the appropriate encapsulation type must be configured to distinguish the services on the port or channel (for access mode), or to define the transport mode (for network mode).

For the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, and 4-port DS3/E3 Adapter card, the card must be enabled to support a set of software services before the encapsulation type is configured. This support is enabled using the **mda-mode** command (see the [mda-mode](#) command in the [Configuration Command Reference](#) section):

- **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.

The encapsulation type on the 16-port T1/E1 ASAP Adapter card and the 32-port T1/E1 ASAP Adapter card can be ipcp, cem, atm, frame-relay, hdlc, or cisco-hdlc.

On the 12-port Serial Data Interface card, the encapsulation type can be cem, ipcp, frame-relay, hdlc, or cisco-hdlc, depending on the interface type. V.35 ports and X.21 ports at super-rate speeds (64 kb/s and above) support all of the above encapsulation types. RS-232 ports and X.21 ports operating at subrate speeds support only cem encapsulation. RS-530 ports support only cem encapsulation.

On the 4-port T1/E1 and RS-232 Combination module, the encapsulation type for T1/E1 ports can be ipcp or cem. RS-232 ports operating at subrate speeds support only cem encapsulation.

On the 6-port E&M Adapter card, 8-port Voice & Teleprotection card, 8-port C37.94 Teleprotection card, 8-port FXO Adapter card, and 6-port FXS Adapter card, the encapsulation type must be cem.

On the 8-port Ethernet Adapter card, 8-port Gigabit Ethernet Adapter card, 6-port Ethernet 10Gbps Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card, Packet Microwave Adapter card, 4-port SAR-H Fast Ethernet module, 6-port SAR-M Ethernet module, and the Ethernet ports on all fixed platforms with Ethernet ports, the encapsulation type can be set as null, dot1q, or qinq.

**Note:**

- The 10-port 1GigE/1-port 10GigE X-Adapter card supports qinq only when it is in 10-port 1GigE mode.
- The Packet Microwave Adapter card supports qinq only when the port is not in mw-link mode.

On the 4-port OC3/STM1 Clear Channel Adapter card, the encapsulation type must be atm.

On the 4-port DS3/E3 Adapter card, the encapsulation type for DS3/E3 clear channel ports can be atm, cem, or frame-relay. The encapsulation type for DS3 channelized ports can be cem or frame-relay.

On the 2-port OC3/STM1 Channelized Adapter card, the encapsulation type can be ipcp, cem, or atm.

On the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, the encapsulation type must be cem.

- **network ports** — configured for network-facing traffic. Network ports are used as uplinks for Ethernet, ATM, PPP, and TDM pseudowires.

On the Ethernet cards, the Packet Microwave Adapter card, the 2-port 10GigE (Ethernet) Adapter card, and 2-port 10GigE (Ethernet) module, the encapsulation type can be set as null or dot1q.



Note: QinQ encapsulation is not supported on a port in network mode.

The encapsulation type must be ppp-auto for PPP/MLPPP bundles on the following:

- T1/E1 ports on the 7705 SAR-A
- T1/E1 ports on the 7705 SAR-M
- T1/E1 ports on the 7705 SAR-X
- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 2-port OC3/STM1 Channelized Adapter card

- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)

Network PPP (encapsulation type ppp-auto) can be configured to use some with fractional ppp or all the timeslots on T1/E1 ports on the following cards:

- T1/E1 ports on the 7705 SAR-A
- T1/E1 ports on the 7705 SAR-M
- T1/E1 ports on the 7705 SAR-X
- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)

On the 4-port OC3/STM1 Clear Channel Adapter card, 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, 4-port DS3/E3 Adapter card, and 2-port OC3/STM1 Channelized Adapter card, the encapsulation type must be ppp-auto. Fractional PPP is not supported on these cards; all timeslots of the DS1 channel will be used.

- **hybrid ports** — configured for access (customer-facing) and network-facing traffic. Hybrid ports can support access and network modes simultaneously over different VLANs. Within the span of a port, some of the VLANs can be in access mode and associated with SAPs for various services, while other VLANs can be in network mode and support any of the network-side operations, including label switching, IP forwarding (GRT IP routing), GRE SDPs, and so on.

The default modes are listed in [Table 6](#). 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.

Table 6 Default Port Mode per Adapter Card, Module, or Platform

Default Mode	Adapter Card, Module, or Platform
Network	2-port 10GigE (Ethernet) Adapter card 2-port 10GigE (Ethernet) module 10-port 1GigE/1-port 10GigE X-Adapter card (in 1-port 10GigE mode, the port operates in network mode only)

Table 6 Default Port Mode per Adapter Card, Module, or Platform

Default Mode	Adapter Card, Module, or Platform
Access	2-port OC3/STM1 Channelized Adapter card 4-port DS3/E3 Adapter card 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card 4-port OC3/STM1 Clear Channel Adapter card 4-port SAR-H Fast Ethernet module 4-port T1/E1 and RS-232 Combination module is access for the T1/E1 ports; the RS-232 ports operate in access mode only 6-port E&M Adapter card 6-port Ethernet 10Gbps Adapter card 6-port FXS Adapter card 6-port SAR-M Ethernet module 8-port Ethernet Adapter card 8-port FXO Adapter card 8-port Gigabit Ethernet Adapter card 8-port Voice & Teleprotection card 8-port C37.94 Teleprotection card 12-port Serial Data Interface card 16-port T1/E1 ASAP Adapter card 32-port T1/E1 ASAP Adapter card Auxiliary Alarm card CWDM OADM Adapter card GNSS Receiver card GPS Receiver module Integrated Services card Packet Microwave Adapter card Power Injector card 7705 SAR-A 7705 SAR-Ax 7705 SAR-H 7705 SAR-Hc 7705 SAR-M 7705 SAR-W 7705 SAR-Wx 7705 SAR-X

3.1.3.10.1 Rate Limiting

The 7705 SAR supports egress-rate limiting and ingress-rate limiting on Ethernet ports.

The egress rate is set at the port level in the **config>port>ethernet** context.

Egress-rate limiting sets a limit on the amount of traffic that can leave the port to control the total bandwidth on the interface. If the egress-rate limit is reached, the port applies backpressure on the queues, which stops the flow of traffic until the queue buffers are emptied. This feature is useful in scenarios where there is a fixed amount of bandwidth; for example, a mobile operator who has leased a fixed amount of bandwidth from the service provider.

The **ingress-rate** command configures a policing action to rate-limit the ingress traffic. Ingress-rate enforcement uses dedicated hardware for rate limiting; however, software configuration is required at the port level (ingress-rate limiter) to ensure that the network processor or the adapter card or port never receives more traffic than they are optimized for.

The configured ingress rate ensures that the network processor does not receive traffic greater than this configured value on a per-port basis. Once the ingress-rate value is reached, all subsequent frames are dropped. The ingress-rate limiter drops excess traffic without determining whether the traffic has a higher or lower priority.

3.1.3.10.2 Access Ports

Access ports on the following can be configured for PPP/MLPPP channel groups:

- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
- 12-port Serial Data Interface card
- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)
- T1/E1 ports on the 7705 SAR-A
- T1/E1 ports on the 7705 SAR-M
- T1/E1 ports on the 7705 SAR-X

Customer IP traffic can be transported directly over PPP or MLPPP links. Access ports on the following can also be configured for TDM to transport 2G traffic from BTSs or ATM/IMA to transport 3G UMTS traffic from Node Bs:

- 2-port OC3/STM1 Channelized Adapter card
- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 7705 SAR-M

In access mode, PPP channels can be associated with $n \times$ 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 2-port OC3/STM1 Channelized Adapter card supports ipcp encapsulation of PPP/MLPPP packets for transport over an lpipe.

The data ports on the 12-port Serial Data Interface card and the RS-232 ports on the 4-port T1/E1 and RS-232 Combination module 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 supports frame-relay encapsulation of data on V.35 and X.21 channel groups for transport over a frame relay pseudowire (Fpipe) or IP interworking pseudowire (lpipe). The 12-port Serial Data Interface card also supports ipcp and cisco-hdlc encapsulation of PPP and Cisco HDLC packets, respectively, for transport over an lpipe.

The 12-port Serial Data Interface card and the 4-port T1/E1 and RS-232 Combination module 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 and the 4-port T1/E1 and RS-232 Combination module 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, 8-port Gigabit Ethernet Adapter card, 6-port Ethernet 10Gbps Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card (10-port 1GigE mode only), and the Packet Microwave 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 Services Guide, “VLL Services”.

A microwave link from a Packet Microwave Adapter card port in access mode can peer with user equipment such as a node B or MPR-e radio. The 7705 SAR-8 Shelf V2 or the 7705 SAR-18 treat the microwave access link as a normal SAP into a service such as Epipe, Ipipe, or VPLS/VPRN.

Voice ports on the 6-port E&M Adapter card, 8-port Voice & Teleprotection card, and 8-port FXO Adapter card provide voiceband transmission between two analog devices over a digital network. A 7705 SAR-8 Shelf V2 or 7705 SAR-18 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, T1/E1 MLPPP, or OC3/STM1) can be used. The traffic originating from the 6-port E&M Adapter card, 8-port Voice & Teleprotection card, or 8-port FXO Adapter card can be mapped into a TDM pseudowire (Cpipe) for transport across the MPLS network. The 6-port E&M Adapter card, and 8-port FXO Adapter card support one TDM pseudowire per port.

The voice circuit can terminate on another 7705 SAR-8 Shelf V2 or 7705 SAR-18 over the 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. A 3600 MainStreet or 1511 MAX can also connect to an FXO port on the 8-port Voice & Teleprotection card.

Voice ports on a 6-port FXS Adapter card can be configured for a PBX application or a PLAR (hotline) application. For a PBX application, the voice circuits are terminated on an FXO interface at a 7705 SAR hub location that is connected to a PBX. The FXO interface can be provided by either an 8-port FXO Adapter card or 8-port Voice & Teleprotection card that is installed in a 7705 SAR-8 Shelf V2 or 7705 SAR-18 chassis at the 7705 SAR hub location.

For a PLAR application, voice circuits are terminated on an FXS interface on either another 6-port FXS Adapter card or an 8-port Voice & Teleprotection card that is installed in a 7705 SAR-8 Shelf V2 or 7705 SAR-18 chassis located at a remote location, or terminated on a 3600 MainStreet or 1511 MAX. A hotline call can also originate from a 3600 MainStreet or 1511 MAX and terminate on an FXS interface on a 6-port FXS Adapter card (or on an FXS interface on an 8-port Voice & Teleprotection card).

On an 8-port C37.94 Teleprotection card, access traffic over the TPIF interfaces can be mapped into a TDM pseudowire (Cpipe) for transport across an MPLS network. The TPIF interfaces connect teleprotection relays used by utilities. They can also be used with a relay to connect to a TPIF interface on an 8-port Voice & Teleprotection card or to a TPIF interface on a 1511 Media Access Cross-Connect (1511 MAX).

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

The DS3/E3 clear channel 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), for TDM PW services to transport 2G traffic from BTSs, and for frame relay PW service.

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. Access ports on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card can only be configured for TDM.

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, dot1q, or qinq. For TDM VLLs, the encapsulation type must be cem. For ATM VLLs, the encapsulation type must be atm.

H-QoS for Access Egress Ethernet Ports

To support hierarchical QoS (H-QoS) on second-generation Ethernet adapter cards, the 7705 SAR supports the configuration of one aggregate CIR rate for all the unshaped 4-priority access egress Ethernet SAPs on a port, thereby ensuring that all the unshaped SAPs can compete with the shaped SAPs on the port for fabric bandwidth. Use the **config>port>ethernet>access>egress>unshaped-sap-cir** command to set the aggregate CIR rate.

Third-generation (Gen-3) Ethernet adapter cards and platforms have 4-priority schedulers, and all SAPs are shaped SAPs. See [Table 2](#) for a list of first-, second-, and third-generation adapter cards, modules, and platforms. Refer to the “QoS for Gen-3 Adapter Cards and Platforms” section in the 7705 SAR Quality of Service Guide for more information on 4-priority schedulers for Gen-3 hardware.

Ports on the 4-port SAR-H Fast Ethernet module do not support H-QoS.

For more information on H-QoS and on shaped and unshaped Ethernet SAPs, refer to the “Per-SAP Aggregate Shapers (H-QoS)” section in the 7705 SAR Quality of Service Guide.

3.1.3.10.3 Network Ports

Network uplinks can be configured as standalone PPP ports, or MLPPP can be configured on T1/E1 ports or channels. All member links of an MLPPP group must be of the same type (either E1 or Ds1).

The following cards, modules, and platforms support multilink bundles:

- T1/E1 ports on the 7705 SAR-A
- T1/E1 ports on the 7705 SAR-M
- T1/E1 ports on the 7705 SAR-X

The following must have all member links of an MLPPP bundle configured on the same card or module:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)

The following must have all member links of an MLPPP bundle configured on the same card or module, and on the same port:

- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card

Ethernet ports on the 8-port Ethernet Adapter card, 8-port Gigabit Ethernet Adapter card, 6-port Ethernet 10Gbps Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card, and Packet Microwave Adapter card can be configured for network mode. Ethernet uplinks can be used as a cost-effective alternative to T1/E1 links.

On the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module, the Ethernet ports and the v-port can be configured for network mode only.

A microwave link from a Packet Microwave Adapter card port in network mode provides a network uplink to an MPR-e radio. The 7705 SAR-8 Shelf V2 or 7705 SAR-18 treats the microwave link as a Gigabit Ethernet network link with MPLS always running over it. All standard MPLS/IP functions available on a network port or SDP are also available on the microwave link.

For network uplinks on the 4-port OC3/STM1 Clear Channel Adapter card and 4-port OC3/STM1 / 1-port OC12/STM4 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 2-port OC3/STM1 Channelized Adapter card, DS3 clear channels within OC3 or STM1 can be configured for PPP as the network uplink. The encapsulation type must be set 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.

Aggregate CIR for Unshaped VLANs on Network Egress Ethernet Ports

The 7705 SAR supports the configuration of one aggregate CIR rate for all the unshaped network egress Ethernet VLANs on a port, thereby ensuring that all the unshaped VLANs can compete with the shaped VLANs (that is, network interfaces) at the port level for egress bandwidth. Use the **config>port>ethernet>network>egress>unshaped-if-cir** command to set the aggregate CIR rate.



Note: The **unshaped-if-cir** command does not apply to Gen-3 Ethernet adapter cards and platforms, except for network egress in hybrid mode. In this case, the **shaper-if-cir** command applies.

For more information on shaped and unshaped Ethernet VLANs, refer to the “Per-VLAN Network Egress Shapers” and “QoS for Gen-3 Adapter Cards and Platforms” sections in the 7705 SAR Quality of Service Guide.

3.1.3.10.4 Hybrid Ports

Hybrid ports are supported on Ethernet ports, where they provide the capabilities and features of access and network mode ports on a per-VLAN basis. The following services support hybrid port functionality: Epipe PW, Ipipe PW, IP-VPN, VPLS, and IES.

For ingress traffic, QoS and traffic management on a hybrid port functions in the same way for access and network port modes. Refer to the 7705 SAR Quality of Service Guide, “QoS for Hybrid Ports on Gen-2 Hardware” and “QoS for Gen-3 Adapter Cards and Platforms” for details.

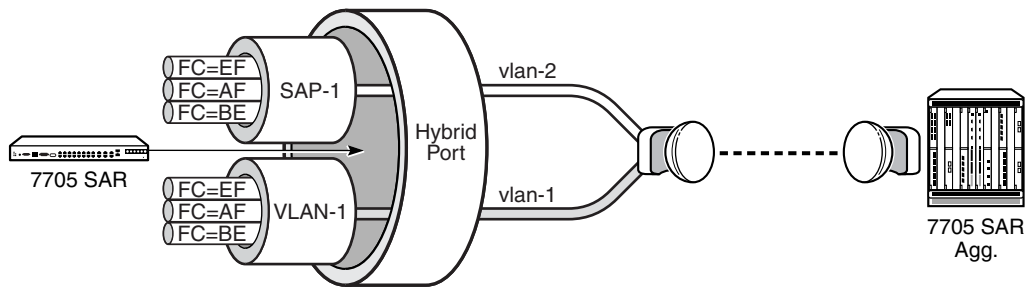
Network VLANs on a hybrid port provide OAM down MEP support, as well as port loopback support (in line mode with latched timers only).

The following hardware supports hybrid ports:

- 6-port SAR-M Ethernet module (except for the Fast Ethernet ports (ports 1 and 2))
- 6-port Ethernet 10Gbps Adapter card
- 8-port Gigabit Ethernet Adapter card
- 10-port 1GigE/1-port 10GigE X-Adapter card (only in 10-port 1GigE mode)
- Packet Microwave Adapter card (only in Ethernet port mode (not mw-link mode))
- 7705 SAR-A Ethernet ports (except for the Fast Ethernet ports (ports 9 to 12))
- 7705 SAR-Ax Ethernet ports
- 7705 SAR-M Ethernet ports
- 7705 SAR-H Ethernet ports
- 7705 SAR-Hc Ethernet ports
- 7705 SAR-W Ethernet ports
- 7705 SAR-Wx Ethernet ports
- 7705 SAR-X Ethernet ports

In some scenarios, combining the access and network capabilities under the same port is beneficial. A typical scenario is shown in [Figure 1](#), where a single port hosts both access-side services and a traffic management model together with network-side IP/MPLS routing and switching capabilities simultaneously.

In this scenario, a network interface is configured to ensure connectivity between the cell site 7705 SAR and the aggregation site 7705 SAR. The network interface is used for all IP/MPLS traffic and is bound to VLAN-1. Another VLAN (VLAN-2) is configured to bind the management traffic of a microwave radio (an MPR-e) to an access-side service such as an Ethernet PW or VPLS. For security reasons, many mobile operators prefer to transport management traffic of network elements under a service construct as opposed to basic GRT-based routing. To accommodate this preference, an access-side service and a network interface can be configured to coexist on the same port when the port is configured for hybrid mode.

Figure 1 Hybrid Port Application

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3.1.4 Configuring SCADA Bridges

Surveillance, Control, and Data Acquisition (SCADA) bridges are configured on an Integrated Services card as part of the multidrop data bridge (MDDB), pulse code modulation (PCM) multidrop bridge, and voice conference bridge (VCB) functionality. MDDB, PCM, and VCB are used to support SCADA systems on a 7705 SAR-8 Shelf V2 or 7705 SAR-18.

For information on MDDB, see [Multidrop Data Bridge](#). For information on PCM multidrop bridge, see [PCM Multidrop Bridge](#). For information on VCB, see [Voice Conference Bridge](#).

A SCADA bridge can be configured after the IOM is activated (the card slot and card type are designated) and the adapter card slot is preprovisioned with the Integrated Services card **mda-type**.

3.2 Port Features

This section contains information on the following topics:

- [Multilink Point-to-Point Protocol](#)
- [Multi-Class MLPPP](#)
- [cHDLC](#)
- [Inverse Multiplexing Over ATM \(IMA\)](#)
- [Network Synchronization on Ports and Circuits](#)
- [Node Synchronization From GNSS Receiver Ports](#)
- [Flow Control on Ethernet Ports](#)
- [Ethernet OAM](#)
- [Ethernet Loopbacks](#)
- [Ethernet Port Down-When-Looped](#)
- [Ethernet Ring \(Adapter Card and Module\)](#)
- [MTU Configuration Guidelines](#)
- [LAG](#)
- [LAG and ECMP Hashing](#)
- [SONET/SDH](#)
- [Automatic Protection Switching](#)
- [T1/E1 Line Card Redundancy](#)
- [Deploying Preprovisioned Components](#)
- [Microwave Link](#)
- [Custom Alarms on Ethernet Ports](#)

3.2.1 Multilink Point-to-Point Protocol

This section contains information on the following topics:

- [MLPPP Overview](#)
- [Protocol Field \(PID\)](#)
- [B&E Bits](#)
- [Sequence Number](#)
- [Information Field](#)
- [Padding](#)
- [FCS](#)
- [LCP](#)
- [T1/E1 Link Hold Timers](#)

3.2.1.1 MLPPP Overview

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.

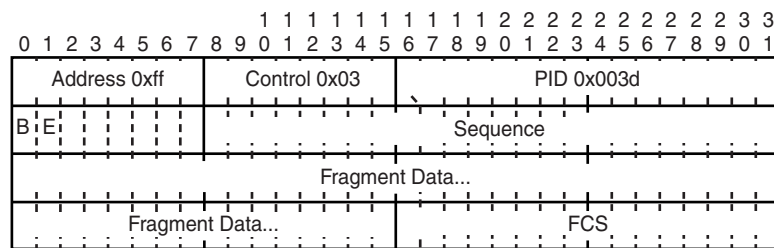
- The system offering the option is capable of combining multiple physical links into one logical link.
- The system is capable of receiving upper layer protocol data units (PDUs) that are fragmented using the MP header and then reassembling the fragments back into the original PDU for processing.
- 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 2](#) and [Figure 3](#) 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*.

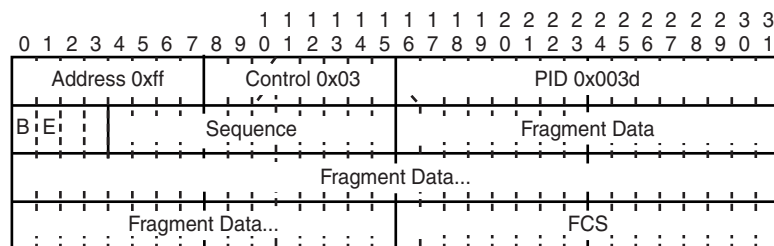
MP frames use the same HDLC address and control pair value as PPP: Address – 0xFF and Control – 0x03. The 2-octet protocol field is also structured the same way as in PPP encapsulation.

Figure 2 MLPPP 24-bit Fragment Format



19487

Figure 3 MLPPP 12-bit Fragment Format



19488

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.

3.2.1.2 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.

3.2.1.3 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).

3.2.1.4 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.

3.2.1.5 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.

3.2.1.6 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).

3.2.1.7 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.

3.2.1.8 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.

3.2.1.9 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.

3.2.2 Multi-Class MLPPP

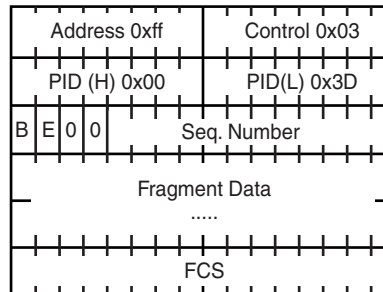
The 7705 SAR supports multi-class MLPPP (MC-MLPPP) to address end-to-end delay caused by low-speed links transporting a mix of small and large packets. With MC-MLPPP, large, low-priority packets are fragmented to allow opportunities to send high-priority packets. QoS for MC-MLPPP is described in [QoS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

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. MC-MLPPP is supported on access ports wherever PPP/MLPPP is supported, except on the 2-port OC3/STM1 Channelized Adapter card. It allows multiple classes of fragments 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 4](#) 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.

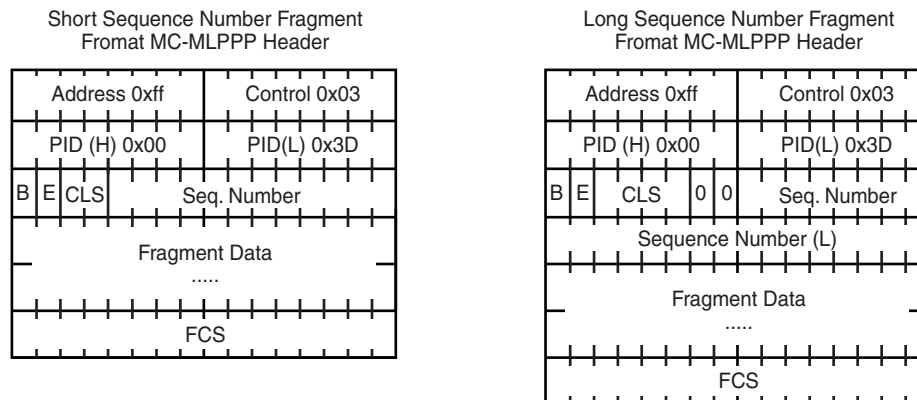
[Figure 5](#) shows the short and long sequence number fragment format MC-MLPPP headers. The short sequence number fragment format header includes two class bits to allow for up to four classes of service. Four class bits are available in the long sequence number fragment format header, but a maximum of four classes are still supported. This extension to the MLPPP header format is detailed in RFC 2686.

Figure 4 Original MLPPP Header Format



20492

Figure 5 MC-MLPPP Header Format



20491

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.

3.2.2.1 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 7](#).

Table 7 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 8](#).

Table 8 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.

3.2.3 cHDLC

The 7705 SAR supports Cisco HDLC, which is an encapsulation protocol for information transfer. Cisco HDLC is a bit-oriented synchronous data-link layer protocol that specifies a data encapsulation method on synchronous serial links using frame characters and checksums.

Cisco HDLC monitors line status on a serial interface by exchanging keepalive request messages with peer network devices. The protocol also allows routers to discover IP addresses of neighbors by exchanging SLARP address-request and address-response messages with peer network devices.

The basic frame structure of a cHDLC frame is shown in [Table 9](#).

Table 9 cHDLC Information Frame

Flag	Address	Control	Protocol	Information	FCS
0x7E	0x0F, 0x8F	0x00	0x0800, 0x8035	—	16 or 32 bit

The fields in the cHDLC frame have the following characteristics:

- Address field—supports unicast (0x0F) and broadcast (0x8F) addresses
- Control field—always set to 0x00
- Protocol field—supports IP (0x0800) and SLARP (0x8035; see [SLARP](#) for information about limitations)
- Information field—the length can be 0 to 9 kbytes
- FCS field—can be 16 or 32 bits. The default is 16 bits for ports with a speed equal to or lower than OC3, and 32 bits for all other ports. The FCS for cHDLC is calculated with the same method and same polynomial as PPP.

3.2.3.1 SLARP

The 7705 SAR supports only the SLARP keepalive protocol.

For the SLARP keepalive protocol, each system sends the other a keepalive packet at a user configurable interval. The default interval is 10 seconds. Both systems must use the same interval to ensure reliable operation. Each system assigns sequence numbers to the keepalive packets it sends, starting with zero, independent of the other system. These sequence numbers are included in the keepalive packets sent to the other system. Also included in each keepalive packet is the sequence number of the last keepalive packet received from the other system, as assigned by the other system. This number is called the returned sequence number. Each system keeps track of the last returned sequence number it has received. Immediately before sending a keepalive packet, the system compares the sequence number of the packet it is about to send with the returned sequence number in the last keepalive packet it has received. If the two differ by 3 or more, it considers the line to have failed, and will not route higher-level data across it until an acceptable keepalive response is received.

3.2.4 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 the 16-port T1/E1 ASAP Adapter card and 32-port T1/E1 ASAP Adapter card and 50 ms on the 2-port OC3/STM1 Channelized Adapter card.

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.

3.2.5 Network Synchronization on Ports and Circuits

The 7705 SAR provides network synchronization on the following ports and CES circuits:

- [Network Synchronization on T1/E1 and Ethernet Ports](#)
- [Network Synchronization on SONET/SDH Ports](#)
- [Network Synchronization on DS3/E3 Ports](#)
- [Network Synchronization on DS3 CES Circuits](#)
- [Network Synchronization on T1/E1 Ports and Circuits](#)

3.2.5.1 Network Synchronization on T1/E1 and Ethernet Ports

Line timing mode provides physical layer timing (Layer 1) that can be used as an accurate reference for nodes in the network. This mode is immune to any packet delay variation (PDV) occurring on a Layer 2 or Layer 3 link. Physical layer timing provides the best synchronization performance through a synchronization distribution network.

On the 7705 SAR-A variant with T1/E1 ports, line timing is supported on T1/E1 ports. Line timing is also supported on all synchronous Ethernet ports on both 7705 SAR-A variants. Synchronous Ethernet is supported on the XOR ports (1 to 4), configured as either RJ-45 ports or SFP ports. Synchronous Ethernet is also supported on SFP ports 5 to 8. Ports 9 to 12 do not support synchronous Ethernet and therefore do not support line timing.

On the 7705 SAR-Ax, line timing is supported on all Ethernet ports.

On the 7705 SAR-H, line timing is supported on:

- all Ethernet ports
- T1/E1 ports on a chassis equipped with a 4-port T1/E1 and RS-232 Combination module

On the 7705 SAR-Hc, line timing is supported on all Ethernet ports.

On the 7705 SAR-M variants with T1/E1 ports, line timing is supported on T1/E1 ports. Line timing is also supported on all RJ-45 Ethernet ports and SFP ports on all 7705 SAR-M variants.

In addition, line timing is supported on the following 7705 SAR-M modules:

- 2-port 10GigE (Ethernet) module
- 6-port SAR-M Ethernet module

On the 7705 SAR-W, line timing is supported on:

- RJ-45 Ethernet ports and optical SFP ports (these ports support synchronous Ethernet and IEEE 1588v2 PTP)

On the 7705 SAR-Wx, line timing is supported on:

- RJ-45 Ethernet ports and optical SFP ports (these ports support synchronous Ethernet and IEEE 1588v2 PTP)

On the 7705 SAR-X, line timing is supported on T1/E1 ports and Ethernet ports.

On the 7705 SAR-8 Shelf V2 and 7705 SAR-18, line timing is supported on:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 8-port Ethernet Adapter card on the two Ethernet SFP ports with SFPs that support synchronous Ethernet
- 6-port Ethernet 10Gbps Adapter card
- 8-port Gigabit Ethernet Adapter card (dual-rate and copper SFPs do not support synchronous Ethernet)
- 2-port 10GigE (Ethernet) Adapter card
- 10-port 1GigE/1-port 10GigE X-Adapter card (supported on the 7705 SAR-18 only)
- 4-port DS3/E3 Adapter card
- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
- 4-port OC3/STM1 Clear Channel Adapter card
- Packet Microwave Adapter card on ports that support synchronous Ethernet and on ports that support PCR

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.

3.2.5.2 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.

3.2.5.3 Network Synchronization on DS3/E3 Ports

Each clear channel DS3/E3 port on a 4-port DS3/E3 Adapter card can be independently configured to be loop-timed (recovered from an Rx line), node-timed (recovered from the SSU in the active CSM), or differential-timed (derived from the comparison of a common clock to the received RTP timestamp in TDM pseudowire packets). When a DS3 port is channelized, each DS1 or E1 channel can be independently configured to be loop-timed, node-timed, or differential-timed (differential timing on DS1/E1 channels is supported only on the first three ports of the card). When not configured for differential timing, a DS3/E3 port can be configured to be a timing source for the node.

3.2.5.4 Network Synchronization on DS3 CES Circuits

Each DS3 CES circuit on a 2-port OC3/STM1 Channelized Adapter card can be loop-timed (recovered from an Rx line) or free-run (timing source is from its own clock). A DS3 circuit can be configured to be a timing source for the node.

3.2.5.5 Network Synchronization on T1/E1 Ports and Circuits

Each T1/E1 port can be independently configured for loop-timing (recovered from an Rx line) or node-timing (recovered from the SSU in the active CSM).

In addition, T1/E1 CES circuits on the following can be independently configured for adaptive timing (clocking is derived from incoming TDM pseudowire packets):

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 7705 SAR-M (variants with T1/E1 ports)
- 7705 SAR-X
- 7705 SAR-A (variant with T1/E1 ports)
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module

T1/E1 CES circuits on the following can be independently configured for differential timing (recovered from RTP in TDM pseudowire packets):

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card (DS1/E1 channels)

- 4-port DS3/E3 Adapter card (DS1/E1 channels on DS3 ports; E3 ports cannot be channelized); differential timing on DS1/E1 channels is supported only on the first three ports of the card
- 7705 SAR-M (variants with T1/E1 ports)
- 7705 SAR-X
- 7705 SAR-A (variant with T1/E1 ports)
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module

A T1/E1 port can be configured to be a timing source for the node.



Note: Adaptive timing and differential timing are not supported on DS1 or E1 channels that have CAS signaling enabled.

3.2.6 Node Synchronization From GNSS Receiver Ports

The GNSS receiver port on the 7705 SAR-Ax, 7705 SAR-Wx, or 7705 SAR-H GPS Receiver module, and the GNSS Receiver card installed in a 7705 SAR-8 Shelf V2 or 7705 SAR-18, can provide a synchronization clock to the SSU in the router with the corresponding QL for SSM. This frequency can then be distributed to the rest of the router from the SSU as configured with the **ref-order** and **ql-selection** commands; refer to the 7705 SAR Basic System Configuration Guide for information. The GNSS reference is qualified only if the GNSS receiver port is operational, has sufficient satellites locked, and has a frequency successfully recovered. A PTP master/boundary clock can also use this frequency reference with PTP peers.

In the event of GNSS signal loss or jamming resulting in the unavailability of timing information, the GNSS receiver automatically prevents output of clock or synchronization data to the system, and the system can revert to alternate timing sources.

A 7705 SAR using GNSS or IEEE 1588v2 PTP for time of day/phase recovery can perform high-accuracy OAM timestamping and measurements. Refer to the 7705 SAR Basic System Configuration Guide for information about node timing sources.

3.2.7 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, Gigabit Ethernet, and 10-Gigabit Ethernet (SFP+) 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.

Ingress flow control for the 6-port SAR-M Ethernet module is Ethernet link-based and not port-based. When IEEE 802.3x Flow Control is enabled on the 6-port SAR-M Ethernet module, pause frames are multicast to all ports on the Ethernet link. There are two Ethernet links on the 6-port SAR-M Ethernet module: one for ports 1, 3, and 5, and one for ports 2, 4, and 6. Pause frames are sent to either ports 1, 3, and 5, or to ports 2, 4, and 6, depending on which link the pause frame originates.

3.2.8 Ethernet OAM

This section contains information on the following topics:

- [Ethernet OAM Overview](#)
- [CRC \(Cyclic Redundancy Check\) Monitoring](#)
- [Remote Loopback](#)
- [802.3ah OAMPDU Tunneling and Termination for Epipe Service](#)
- [Dying Gasp](#)

For more information on Ethernet OAM, refer to the 7705 SAR OAM and Diagnostics Guide, “Ethernet OAM Capabilities”.

3.2.8.1 Ethernet OAM Overview

802.3ah Clause 57 (EFM OAM) defines the Operations, Administration, and Maintenance (OAM) sublayer, which is a link level Ethernet OAM. 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 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
- non-zero vendor-specific information field — the 32-bit field is encoded using the format 00:PP:CC:CC and references TIMETRA-CHASSIS-MIB
 - 00 — must be zeros
 - PP — the platform type from `tmnxHwEquippedPlatform`

- CC:CC — the chassis type index value from `tmnxChassisType` that is indexed in `tmnxChassisTypeTable`. The table identifies the specific chassis backplane.

The value 00:00:00:00 is sent for all releases that do not support the non-zero value or are unable to identify the required elements. There is no decoding of the peer or local vendor information fields on the network element. The hexadecimal value is included in the **show port port-id ethernet efm-oam** output.

With **ignore-efm-state** configured, if the EFM OAM protocol cannot negotiate a peer session or an established session fails, the port will enter the link up state. The link up state is used by many protocols to indicate that the port is administratively up and there is physical connectivity but a protocol (such as EFM OAM) has caused the port operational state to be down. The **show port slot/mda/port** command output includes a Reason Down field to indicate if the protocol is the underlying reason for the link up state. For EFM OAM, the Reason Down code is `efmOamDown`. This is shown in the following command output example, where port 1/1/3 is in a link up state.

```
*A:ALU-1># show port
=====
Ports on Slot 1
=====
```

Port Id	Admin State	Link State	Port State	Cfg MTU	Oper MTU	LAG/ Bndl Mode	Port Encp	Port Type	C/QS/S/XFP/ MDIMDX
1/1/1	Down	No	Down	1578	1578	- netw	null	xcme	
1/1/2	Down	No	Down	1578	1578	- netw	null	xcme	
1/1/3	Up	Yes	Link Up	1522	1522	- accs	qinq	xcme	
1/1/4	Down	No	Down	1578	1578	- netw	null	xcme	
1/1/5	Down	No	Down	1578	1578	- netw	null	xcme	
1/1/6	Down	No	Down	1578	1578	- netw	null	xcme	

```

=====
*A:ALU-1># show port 1/1/3
=====
Ethernet Interface
=====
Description      : 10/100/Gig Ethernet SFP
Interface        : 1/1/3
Link-level       : Ethernet
Admin State      : up
Oper State       : down
Reason Down      : efmOamDown
Physical Link    : Yes
Single Fiber Mode : No
IfIndex          : 35749888
Last State Change : 12/18/2012 15:58:29
Last Cleared Time : N/A
Phys State Chng Cnt: 1
MTU              : 1522
Min Frame Length : 64 Bytes
Hold time up     : 0 seconds
Hold time down   : 0 seconds
DDM Events       : Enabled
Oper Speed       : N/A
Config Speed     : 1 Gbps
Oper Duplex      : N/A
Config Duplex    : full
.....

```


The EFM OAM protocol can be decoupled from the port state and operational state. In cases where an operator wants to remove the protocol, monitor only the protocol, migrate, or make changes, the **ignore-efm-state** command can be configured under the **config>port>ethernet>efm-oam** context.

When the **ignore-efm-state** command is configured on a port, the protocol behavior is normal. However, any failure in the EFM protocol state (discovery, configuration, time-out, loops, and so on) will not affect the port. Only a protocol warning message will be raised to indicate issues with the protocol. When the **ignore-efm-state** command is not configured on a port, the default behavior is that the port state will be affected by any EFM OAM protocol fault or clear conditions.

Enabling and disabling this command will immediately affect the port state and operating state based on the active configuration, and this will be displayed in the **show port** command output. For example, if the **ignore-efm-state** command is configured on a port that is exhibiting a protocol error, that protocol error does not affect the port state or operational state and there is no Reason Down code in the output. If the **ignore-efm-state** command is disabled on a port with an existing EFM OAM protocol error, the port will transition to port state link up, operational state down with reason code `efmOamDown`.

If the port is a member of a microwave link, the **ignore-efm-state** command must be enabled before the EFM OAM protocol can be activated. This restriction is required because EFM OAM is not compatible with microwave links.

3.2.8.2 CRC (Cyclic Redundancy Check) Monitoring

CRC errors typically occur when Ethernet links are compromised due to optical fiber degradation, weak optical signals, bad optical connections, or problems on a third-party networking element. As well, higher-layer OAM options such as EFM and BFD may not detect errors and trigger appropriate alarms and switchovers if the errors are intermittent, since this does not affect the continuous operation of other OAM functions.

CRC error monitoring on Ethernet ports allows degraded links to be alarmed or failed in order to detect network infrastructure issues, trigger necessary maintenance, or switch to redundant paths. This is achieved through monitoring ingress error counts and comparing them to the configured error thresholds. The rate at which CRC errors are detected on a port can trigger two alarm states. Crossing the configured signal degrade (SD) threshold (**sd-threshold**) causes an event to be logged and an alarm to be raised, which alerts the operator to a potential issue on a link. Crossing the configured signal failure (SF) threshold (**sf-threshold**) causes the affected port to enter the operationally down state, and causes an event to be logged and an alarm to be raised.

The CRC error rates are calculated as $M \times 10E-N$, which is the ratio of errored frames allowed for total frames received. The operator can configure both the threshold (N) and a multiplier (M). If the multiplier is not configured, the default multiplier (1) is used.

For example, setting the SD threshold to 3 results in a signal degrade error rate threshold of $1 \times 10E-3$ (1 errored frame per 1000 frames). Changing the configuration to an SD threshold of 3 and a multiplier of 5 results in a signal degrade error rate threshold of $5 \times 10E-3$ (5 errored frames per 1000 frames). The signal degrade error rate threshold must be lower than the signal failure error rate threshold because it is used to notify the operator that the port is operating in a degraded but not failed condition.

A sliding window (**window-size**) is used to calculate a statistical average of CRC error statistics collected every second. Each second, the oldest statistics are dropped from the calculation. For example, if the default 10-s sliding window is configured, at the 11th second the oldest second of statistical data is dropped and the 11th second is included. This sliding average is compared against the configured SD and SF thresholds to determine if the error rate over the window exceeds one or both of the thresholds, which will generate an alarm and log event.

When a port enters the failed condition as a result of crossing an SF threshold, the port is not automatically returned to service. Because the port is operationally down without a physical link, error monitoring stops. The operator can enable the port by using the **shutdown** and **no shutdown** port commands or by using other port transition functions such as clearing the MDA (**clear mda** command) or removing the cable. A port that is down due to crossing an SF threshold can also be re-enabled by changing or disabling the SD threshold. The SD state is self-clearing, and it clears if the error rate drops below 1/10th of the configured SD rate.

3.2.8.3 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.

3.2.8.4 802.3ah OAMPDU Tunneling and Termination for Epipe Service

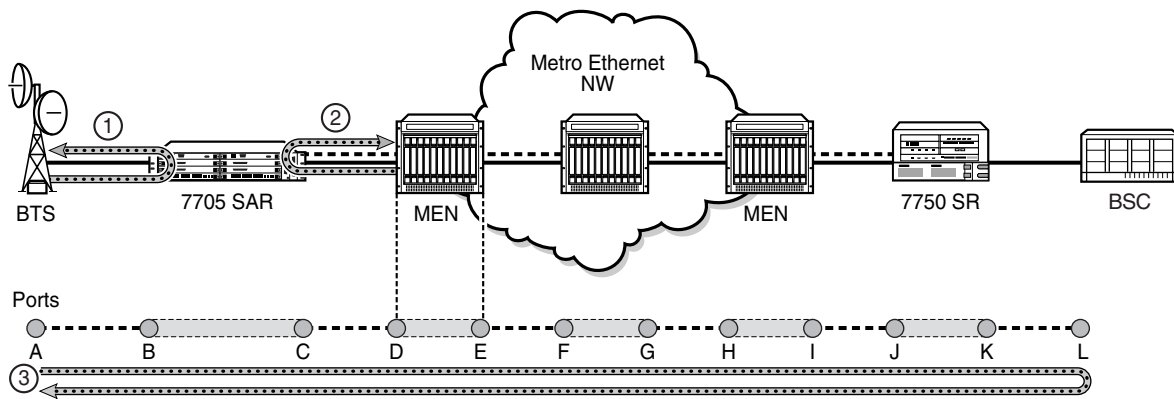
Customers who subscribe to Epipe service might have customer equipment running 802.3ah at both ends. The 7705 SAR can be configured to tunnel EFM OAMPDUs received from a customer device to the other end through the existing network using MPLS or GRE, or to terminate received OAMPDUs at a network or an 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 6](#), 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 6 EFM Capability on the 7705 SAR

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3.2.8.5 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.

3.2.9 Ethernet Loopbacks

The following loopbacks are supported on Ethernet ports:

- timed network line loopback
- timed and untimed access line loopbacks
- timed and untimed access internal loopbacks
- persistent access line loopback
- persistent access internal loopback
- MAC address swapping
- CFM loopback on network and access ports
- CFM loopback on ring ports and v-port

3.2.9.1 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 for access or 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 a 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 s to 86400 s. All non-zero timed loopbacks are turned off automatically under the following conditions: an adapter card reset, an activity switch, or timer expiry. Line or internal loopback timers can also be configured as a latched loopback by setting the timer to 0 s, or as a persistent loopback with the **persistent** keyword. Latched and persistent loopbacks are enabled indefinitely until turned off by the user. Latched loopbacks survive adapter card resets and activity switches, but are lost if there is a system restart. Persistent loopbacks survive adapter card resets and activity switches and can survive a system restart if the `admin-save` or `admin-save-detail` command was executed prior to the restart. Latched loopbacks (untimed) and persistent loopbacks can be enabled only on Ethernet access ports.

Persistent loopbacks are the only Ethernet loopbacks saved to the database by the **admin-save** and **admin-save-detail** commands.

An Ethernet port loopback may interact with other features. See [Interaction of Ethernet Port Loopback with Other Features](#) for more information.

3.2.9.1.1 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 is in loopback 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 a CRC error.

3.2.9.1.2 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.

Ethernet port-layer line loopback and Ethernet port-layer internal loopback can be enabled on the same port with the down-when-looped feature. EFM OAM cannot be enabled on the same port with the down-when-looped feature. For more information, see [Ethernet Port Down-When-Looped](#).

3.2.9.2 CFM Loopbacks for OAM on Ethernet Ports

This section contains information on the following topics:

- [CFM Loopback Overview](#)
- [CFM Loopback Mechanics](#)

3.2.9.2.1 CFM Loopback Overview

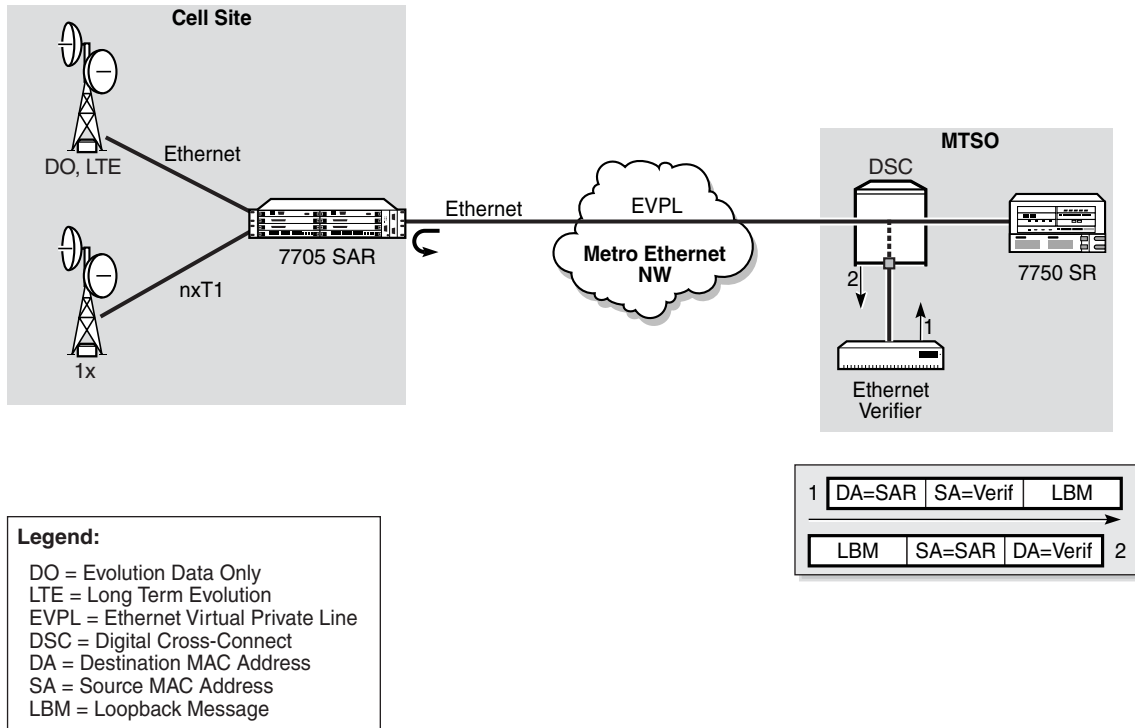
Connectivity fault management (CFM) loopback support for loopback messages (LBMs) on Ethernet ports allows operators to run standards-based Layer 1 and Layer 2 OAM tests on ports receiving unlabeled packets.

The 7705 SAR supports CFM MEPs associated with different endpoints (that is, spoke SDP Down MEPs, network interface facility MEPs, and SAP Up and SAP Down MEPs). In addition, for traffic received from an uplink (network ingress), the 7705 SAR supports CFM LBM for both labeled and unlabeled packets. CFM loopbacks are applied to the Ethernet port.

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

[Figure 7](#) 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 7 CFM Loopback on Ethernet Ports



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Figure 7 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).

3.2.9.2.2 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
- CFM loopback support on a physical ring port on the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module differs from other Ethernet ports. For these ports, **cfm-loopback** is configured, optionally, using **dot1p** and **match-vlan** to create a list of up to 16 VLANs. The null VLAN is always applied. The CFM Loopback Message will be processed if it does not contain a VLAN header, or if it contains a VLAN header with a VLAN ID that matches one in the configured **match-vlan** list.
- 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, low-priority, or dot1p, where dot1p applies only to physical ring ports
- 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
- for the 8-port Gigabit Ethernet Adapter card, the 10-port 1GigE/1-port 10GigE X-Adapter card, and the v-port on the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module, for network egress, where 16-priority scheduling is enabled:
 - **high-priority**: has higher priority than any user frames
 - **low-priority**: has lower priority than any user frames

- for the physical ring ports on the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module, which can only operate as network egress, the priority of the LBR frame is derived from the dot1p setting of the received LBM frame. Based on the assigned ring-type network queue policy, dot1p-to-queue mapping is handled using the same mapping rule that applies to all other user frames.
- 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**, **low-priority**, or **dot1p**.

3.2.10 Ethernet Port Down-When-Looped

Newly provisioned circuits are often put into loopback with a physical loopback cable for testing and to ensure the ports meet the SLA. If loopbacks are not cleared, or physically removed, by the operator when the testing is completed, they can adversely affect the performance of all other SDPs and customer interfaces (SAPs). This is especially problematic for point-to-multipoint services such as VPLS, since Ethernet does not support TTL, which is essential in terminating loops.

The down-when-looped feature is used on the 7705 SAR to detect loops within the network and to ensure continued operation of other ports. When the down-when-looped feature is activated, a keepalive loop PDU is transmitted periodically toward the network. The Ethernet port then listens for returning keepalive loop PDUs. In unicast mode, a loop is detected if any of the received PDUs have an Ethertype value of 9000, which indicates a loopback (Configuration Test Protocol), and the source (SRC) and destination (DST) MAC addresses are identical to the MAC address of the Ethernet port. In broadcast mode, a loop is detected if any of the received PDUs have an Ethertype value of 9000 and the SRC MAC address matches the MAC address of the Ethernet port and the DST MAC address matches the broadcast MAC address. When a loop is detected, the Ethernet port is immediately brought down.

Ethernet port-layer line loopbacks and the down-when-looped feature can be enabled on the same port. The keepalive loop PDU is still transmitted; however, if the port receives its own keepalive loop PDU, the keepalive PDU is extracted and processed to avoid infinite looping.

Ethernet port-layer internal loopbacks and the down-when-looped feature can also be enabled on the same port. When the keepalive PDU is internally looped back, it is extracted and processed as usual. If the SRC MAC address matches the port MAC address, the port is disabled due to detection of a loop. If the SRC MAC address is a broadcast MAC address because the **swap-src-dst-mac** option in the **loopback** command is enabled, then there is no change to port status and it remains operationally up.

EFM OAM and down-when-looped cannot be enabled on the same port.

3.2.11 Ethernet Ring (Adapter Card and Module)

The 2-port 10GigE (Ethernet) Adapter card can be installed in a 7705 SAR-8 Shelf V2 or 7705 SAR-18 chassis and the 2-port 10GigE (Ethernet) module can be installed in a 7705 SAR-M to connect to and from access rings carrying a high concentration of traffic. For the maximum number of cards or modules supported per chassis, see [Table 3](#).

A number of 7705 SAR nodes in a ring typically aggregate traffic from customer sites, map the traffic to a service, and connect to an SR node. The SR node acts as a gateway point out of the ring. A 10GigE ring allows for higher bandwidth services and aggregation on a per-7705 SAR basis. The 2-port 10GigE (Ethernet) Adapter card/module increases the capacity of backhaul networks by providing 10GigE support on the aggregation nodes, thus increasing the port capacity.

In a deployment of a 2-port 10GigE (Ethernet) Adapter card/module, each 7705 SAR node in the ring is connected to the east and west side of the ring over two different 10GigE ports. If 10GigE is the main uplink, the following are required for redundancy:

- two cards per 7705 SAR-8 Shelf V2
- two cards per 7705 SAR-18
- two 7705 SAR-M nodes, each equipped with 2-port 10GigE (Ethernet) module

With two cards per 7705 SAR-8 Shelf V2 or 7705 SAR-18 node, for example, east and west links of the ring can be terminated on two different adapter cards, reducing the impact of potential hardware failure.

The physical ports on the 2-port 10GigE (Ethernet) Adapter card/module boot up in network mode and this network setting cannot be disabled or altered. At boot-up, the MAC address of the virtual port (v-port) is programmed automatically for efficiency and security reasons.

There is native built-in Ethernet bridging among the ring ports and the v-port. Bridging destinations for traffic received from one of the ring ports include the 10GigE ring port and the network interfaces on the v-port. Bridging destinations for traffic received from the v-port include one or both of the 10GigE ring ports.

With bridging, broadcast and multicast frames are forwarded over all ports except the received one. Unknown frames are forwarded to both 10GigE ports if received from the v-port or forwarded to the other 10GigE port only if received from one of the 10GigE ports (the local v-port MAC address is always programmed).

The bridge traffic of the physical 10GigE ports is based on learned and programmed MAC addresses.

3.2.12 MTU Configuration Guidelines

This section contains information on the following topics:

- [MTU Configuration Overview](#)
- [IP Fragmentation](#)
- [Jumbo Frames](#)
- [Default Port MTU Values](#)

3.2.12.1 MTU Configuration Overview

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

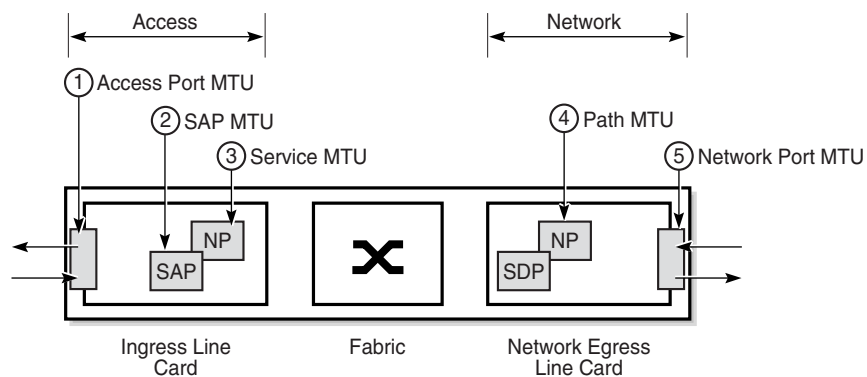
Observe the following general rules when planning your service and physical Maximum Transmission Unit (MTU) configurations.

- 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. [Figure 8](#) identifies the various MTU points on the 7705 SAR.
- 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
- When the **allow-fragmentation** command is enabled on an SDP, the current MTU algorithm is overwritten with the configured path MTU. The administrative MTU and operational MTU both show the specified MTU value. If the path MTU is not configured or available, the operational MTU is set to 2000 bytes, and the administrative MTU displays a value of 0. When **allow-fragmentation** is disabled, the operational MTU reverts to the previous value.

For more information, refer to the “MTU Settings” section in the 7705 SAR Services Guide. To configure various MTU points, use the following commands:

- port MTUs are set with the **mtu** command, under the **config>port** context, where the port type can be Ethernet, TDM, serial, or SONET/SDH
- service MTUs are set in the appropriate **config>service** context
- path MTUs are set with the **path-mtu** command under the **config>service>sdp** context

Figure 8 MTU Points on the 7705 SAR



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Frame size configuration is supported for an Ethernet port configured as an access or a network port.

For an Ethernet adapter card that does not support jumbo frames, all frames received at an ingress network or access port are policed against 1576 bytes (1572 + 4 bytes of FCS), regardless of the port MTU. Any frames longer than 1576 bytes are discarded and the “Too Long Frame” and “Error Stats” counters in the port statistics display are incremented. See [Jumbo Frames](#) for more information.

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 is incremented.

When the network group encryption (NGE) feature is used, additional bytes due to NGE packet overhead must be considered. Refer to the “NGE Packet Overhead and MTU Considerations” section in the 7705 SAR Services Guide for more information.

3.2.12.2 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.

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

Fragmentation can be enabled for GRE tunnels. Refer to the “GRE Fragmentation” section in the 7705 SAR Services Guide for more information.

3.2.12.3 Jumbo Frames

Jumbo frames are supported on all Ethernet ports.

The maximum MTU size for a jumbo frame on the 7705 SAR is 9732 bytes. The maximum MTU for a jumbo frame may vary depending on the Ethernet encapsulation type, as shown in [Table 10](#). The calculations of the other MTU values (service MTU, path MTU, and so on) are based on the port MTU. The values in [Table 10](#) are also maximum receive unit (MRU) values. MTU values are user-configured values. MRU values are the maximum MTU value that a user can configure on an adapter card that supports jumbo frames.

Table 10 Maximum MTU (or MRU) per Ethernet Encapsulation Type

Encapsulation	Maximum MTU (bytes)
Null	9724
Dot1q	9728
QinQ	9732

For an Ethernet adapter card, all frames received at an ingress network or access port are policed against the MRU for the ingress adapter card, regardless of the configured MTU. Any frames larger than the MRU are discarded and the “Too Long Frame” and “Error Stats” counters in the port statistics display are incremented.

At network egress, frames are checked against the configured port MTU. If the frame exceeds the configured port MTU and the DF bit is set, then the “MTU Exceeded” discard counter will be incremented on the ingress IP interface statistics display, or on the MPLS interface statistics display if the packet is an MPLS packet.

For example, on adapter cards that do not support an MTU greater than 2106 bytes, fragmentation is not supported for frames greater than the maximum supported MTU for that card (that is, 2106 bytes). If the maximum supported MTU is exceeded, the following occurs.

- An appropriate ICMP reply message (Destination Unreachable) is generated by the 7705 SAR. The router ensures that the ICMP generated message cannot be used as a DOS attack (that is, the router paces the ICMP message).
- The appropriate statistics are incremented.

Jumbo frames offer better utilization of an Ethernet link because as more payload is packed into an Ethernet frame of constant size, the ratio of overhead to payload is minimized.

From the traffic management perspective, large payloads may cause long delays, so a balance between link utilization and delay must be found. For example, for ATM VLLs, concatenating a large number of ATM cells when the MTU is set to a very high value could generate a 9-kbyte ATM VLL frame. Transmitting a frame that large would take more than 23 ms on a 3-Mb/s policed Ethernet uplink.

3.2.12.3.1 Behavior of Adapter Cards Not Supporting Jumbo Frames on 7705 SAR-8 Shelf V2 and 7705 SAR-18 only

The 7705 SAR-8 Shelf V2 and the 7705 SAR-18 do not support ingress fragmentation, and this is true for jumbo frames. Therefore, any jumbo frame packet arriving on one of these routers that gets routed to an adapter card that does not support jumbo frame MTU (for example, a 16-port T1/E1 ASAP Adapter card or a 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card) is discarded if the packet size is greater than the TDM port's maximum supported MTU. If the maximum supported MTU is exceeded, the following occurs.

- An appropriate ICMP reply message (Destination Unreachable) is generated by the 7705 SAR. The router ensures that the ICMP-generated message cannot be used as a DOS attack (that is, the router paces the ICMP message).
- The port statistics show IP or MPLS Interface MTU discards, for IP or MPLS traffic, respectively. MTU Exceeded Packets and Bytes counters exist separately for IPv4/6 and MPLS under the IP interface hierarchy for all discarded packets where ICMP Error messages are not generated.

For example, if a packet arrives on an 8-port Gigabit Ethernet Adapter card and is to be forwarded to a 16-port T1/E1 ASAP Adapter card with a maximum port MTU of 2090 bytes and a channel group configured for PPP with the port MTU of 1000 bytes, the following may occur.

- If the arriving packet is 800 bytes, then forward the packet.
- If the arriving packet is 1400 bytes, then forward the packet, which will be fragmented by the egress adapter card.
- If the arriving packet is fragmented and the fragments are 800 bytes, then forward the packet.
- If the arriving packet is 2500 bytes, then send an ICMP error message (because the egress adapter card has a maximum port MTU of 2090 bytes).
- If the arriving packet is fragmented and the fragment size is 2500 bytes, then there is an ICMP error.

3.2.12.3.2 Jumbo Frame Behavior on the Fixed Platforms

The 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-M, 7705 SAR-W, 7705 SAR-Wx, and 7705 SAR-X are able to fragment packets between Ethernet ports (which support jumbo frames) and TDM ports (which do not support jumbo frames). In this case, when a packet arrives from a port that supports jumbo frames and is routed to a port that does not support jumbo frames (that is, a TDM port) the packet will get fragmented to the port MTU of the TDM port.

For example, if a packet arrives on a 7705 SAR-A and is to be forwarded to a TDM port that has a maximum port MTU of 2090 bytes and a channel group configured for PPP with the port MTU of 1000 bytes (PPP port MTU), the following may occur.

- If the arriving packet is 800 bytes, then forward the packet.
- If the arriving packet is 1400 bytes and the DF bit is 0, then forward the packet, which will be fragmented to the PPP port MTU size.
- If the arriving packet is 2500 bytes and the DF bit is 0, then forward the packet, which will be fragmented to the PPP port MTU size.

3.2.12.3.3 Multicast Support for Jumbo Frames

Jumbo frames are supported in a multicast configuration as long as all adapter cards in the multicast group support jumbo frames. If an adapter card that does not support jumbo frames is present in the multicast group, the replicated multicast jumbo frame packet will be discarded by the fabric because of an MRU error of the fabric port (Rx).

The multicast group replicates the jumbo frame for all adapter cards, regardless of whether they support jumbo frames, only when forwarding the packet through the fabric. The replicated jumbo frame packet is discarded on adapter cards that do not support jumbo frames.

3.2.12.3.4 PMC Jumbo Frame Support

For the Packet Microwave Adapter card (PMC), ensure that the microwave hardware installed with the card supports the corresponding jumbo frame MTU. If the microwave hardware does not support the jumbo frame MTU, it is recommended that the MTU of the PMC port be set to the maximum frame size that is supported by the microwave hardware.

3.2.12.4 Default Port MTU Values

[Table 11](#) displays the default and maximum port MTU values that are dependent upon the port type, mode, and encapsulation type.



Note: The 7705 SAR now supports a lower IP MTU value of 128 bytes (from the original 512-byte minimum). The IP MTU is derived from the port MTU configuration for network ports. This lower IP MTU is supported only on Ethernet encapsulated ports. Refer to the 7705 SAR Services Guide, “Bandwidth Optimization for Low-speed Links” for information.

Table 11 Port MTU Default and Maximum Values

Port Type	Mode	Encap Type	Default (bytes)	Max MTU (bytes)
10/100 Ethernet ¹	Access/ Network	null	1514	9724 ²
		dot1q	1518	9728 ²
		qinq ³	1522 (access only)	9732 (access only) ²
GigE SFP ¹ and 10-GigE SFP+	Access/ Network	null	1514 (access) 1572 (network)	9724 (access and network)
		dot1q	1518 (access) 1572 (network)	9728 (access and network)
		qinq ³	1522 (access only)	9732 (access only)
Ring port	Network	null	9728 (fixed)	9728 (fixed)
v-port (on Ring adapter card)	Network	null	1572	9724
		dot1q	1572	9728
TDM (PW)	Access	cem	1514	1514
TDM (ATM PW)	Access	atm	1524	1524
TDM (FR PW)	Access	frame-relay	1514	2090
TDM (HDLC PW)	Access	hdlc	1514	2090
TDM (IW PW)	Access	cisco-hdlc	1514	2090
TDM (PPP/MLPPP)	Access	ipcp	1502	2090
	Network	ppp-auto	1572	2090
Serial V.35 or X.21 ⁴ (FR PW)	Access	frame-relay	1514	2090
Serial V.35 or X.21 ⁴ (HDLC PW)	Access	hdlc	1514	2090
Serial V.35 or X.21 ⁴ (IW PW)	Access	frame-relay	1514	2090
		ipcp	1502	2090
		cisco-hdlc	1514	2090
SONET/SDH	Access	atm	1524	1524
SONET/SDH	Network	ppp-auto	1572	2090

Notes:

1. The maximum MTU value is supported only on cards that have buffer chaining enabled.
2. On the Packet Microwave Adapter card, the MWA ports support 4 bytes less than the Ethernet ports. Thus, MWA ports support a maximum MTU of 9720 bytes (null) or 9724 bytes (dot1q). MWA ports do not support QinQ.
3. QinQ is supported only on access ports.
4. For X.21 serial ports at super-rate speeds.

For more information, refer to the “MTU Settings” section in the 7705 SAR Services Guide.

3.2.13 LAG

This section contains information on the following topics:

- [LAG Overview](#)
- [LACP and Active/Standby Operation](#)
- [QoS Adaptation for LAG on Access](#)
- [QoS for LAG on Network](#)
- [Access Ingress Fabric Shaping](#)
- [Hold-down Timers](#)
- [Multi-Chassis LAG](#)
- [Static LAG \(Active/Standby LAG Operation without LACP\)](#)
- [LAG Support on Mixed-Generation Hardware](#)

3.2.13.1 LAG Overview

The 7705 SAR supports Link Aggregation Groups (LAGs) based on the IEEE 802.1ax standard (formerly 802.3ad). Link aggregation provides:

- increased bandwidth by combining multiple links into one logical link (in active/active mode)
- load sharing by distributing traffic across multiple links (in active/active mode)
- redundancy and increased resiliency between devices by having a standby link to act as backup if the active link fails (in active/standby mode)

In the 7705 SAR implementation, all links must operate at the same speed.

Packet sequencing must be maintained for any given session. The hashing algorithm deployed by Nokia routers is based on the type of traffic transported to ensure that all traffic in a flow remains in sequence while providing effective load sharing across the links in the LAG. See [LAG and ECMP Hashing](#) for more information.

LAGs must be statically configured or formed dynamically with Link Aggregation Control Protocol (LACP). See [LACP and Active/Standby Operation](#) for information on LACP.

All Ethernet-based supported services can benefit from LAG, including:

- network interfaces and SDPs
- spoke SDPs, mesh SDPs, and EVPN endpoints

- IES and VPRN interfaces and SAPs
- Ethernet and IP pseudowire SAPs
- routed VPLS (r-VPLS) SAPs

LAGs are supported on access, network, and hybrid ports. A LAG can be in active/active mode or in active/standby mode for access, network, or hybrid ports. Active/standby mode is a subset of active/active mode if subgroups are enabled.

LAGs are supported on access ports on the following:

- 8-port Ethernet Adapter card
- 8-port Gigabit Ethernet Adapter card
- 10-port 1GigE/1-port 10GigE X-Adapter card (10-port GigE mode)
- 6-port Ethernet 10Gbps Adapter card
- 4-port SAR-H Fast Ethernet module
- 6-port SAR-M Ethernet module
- Packet Microwave Adapter card (for ports not in a microwave link)
- all fixed platforms

LAGs are supported on network ports on the following:

- 8-port Ethernet Adapter card
- 8-port Gigabit Ethernet Adapter card
- 10-port 1GigE/1-port 10GigE X-Adapter card
- 6-port Ethernet 10Gbps Adapter card
- 4-port SAR-H Fast Ethernet module
- 6-port SAR-M Ethernet module
- Packet Microwave Adapter card (for ports not in a microwave link and ports in a 1+0 network microwave link; LAGs are not supported on ports in a 1+1 HSB microwave link)
- all fixed platforms

LAGs are supported on hybrid ports on the following:

- 8-port Gigabit Ethernet Adapter card
- 10-port 1GigE/1-port 10GigE X-Adapter card (10-port GigE mode)
- 6-port Ethernet 10Gbps Adapter card
- 6-port SAR-M Ethernet module
- Packet Microwave Adapter card (for ports not in a microwave link)
- all fixed platforms

On access ports, a LAG supports active/active and active/standby operation. For active/standby operation the links must be in different subgroups. Links can be on the same platform or adapter card/module or distributed over multiple components. Load sharing is supported among the active links in a LAG group.

On network ports, a LAG supports active/active and active/standby operation. For active/standby operation the links must be in different subgroups. Links can be on the same platform or adapter card/module or distributed over multiple components. Load sharing is supported among the active links in a LAG group. Any tunnel type (for example, IP, GRE, or MPLS) transporting any service type, any IP traffic, or any labeled traffic (LER, LSR) can use the LAG load-sharing, active/active, and active/standby functionality.

LAGs are supported on network 1+0 microwave links. Ports that are in a microwave link can be added to the same LAG as ports that are not in a microwave link. Ports belonging to a microwave link must have limited autonegotiation enabled before the link can be added to a LAG.

A LAG that contains ports in a microwave link must have LACP enabled for active/standby operation. Static LAG configuration (without LACP) is not supported for active/standby LAGs with microwave-enabled ports.

On hybrid ports, a LAG supports active/active and active/standby operation. For active/standby operation the links must be in different subgroups. Links can be on the same platform or adapter card/module or distributed over multiple components. Load sharing is supported among the active links in a LAG group.

A LAG group with assigned members can be converted from one mode to another as long as the number of member ports are supported in the new mode and the ports all support the new mode, none of the members belong to a microwave link, and the LAG group is not associated with a network interface or a SAP.



Note: For details on LAG scale per platform or adapter card, contact your Nokia Technical support representative.

A subgroup is a group of links within a LAG. On access, network, or hybrid ports, a LAG can have a maximum of four subgroups and a subgroup can have links up to the maximum number supported on the LAG. The LAG is active/active if there is only one sub-group and is active/standby if there is more than one subgroup.

When configuring a LAG, most port features (port commands) can only be configured on the primary member port. The configuration, or any change to the configuration, is automatically propagated to any remaining ports within the same LAG. Operators cannot modify the configurations on non-primary ports. For more information, see [Configuring LAG Parameters](#).

If the LAG has one member link on a first- or second-generation (Gen-1 or Gen-2) Ethernet adapter card, and the other link on a third-generation (Gen-3) Ethernet adapter card or platform, a mix-and-match scenario exists for traffic management on the LAG SAP. In this case, all QoS parameters for the LAG SAP are configured but only those parameters applicable to the active member link are used. See [LAG Support on Mixed-Generation Hardware](#) for more information.

Configuring a multiservice site (MSS) aggregate rate can restrict the use of LAG SAPs. For more information, refer to the “MSS and LAG Interaction on the 7705 SAR-8 Shelf V2 and 7705 SAR-18” section in the 7705 SAR Quality of Service Guide.

3.2.13.2 LACP and Active/Standby Operation

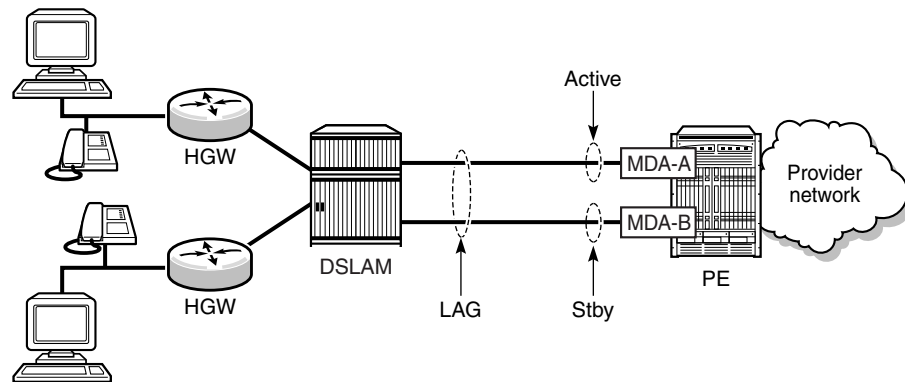
On access, network, and hybrid ports, where multiple links in a LAG can be active at the same time, normal operation is that all non-failing links are active and traffic is load-balanced across all the active links. In some cases, however, it is desirable to have only some of the links active and the other links kept in standby mode. The Link Aggregation Control Protocol (LACP) is used to make the selection of the active links in a LAG predictable and compatible with any vendor equipment. The mechanism is based on the IEEE 802.1ax standard so that interoperability is ensured.



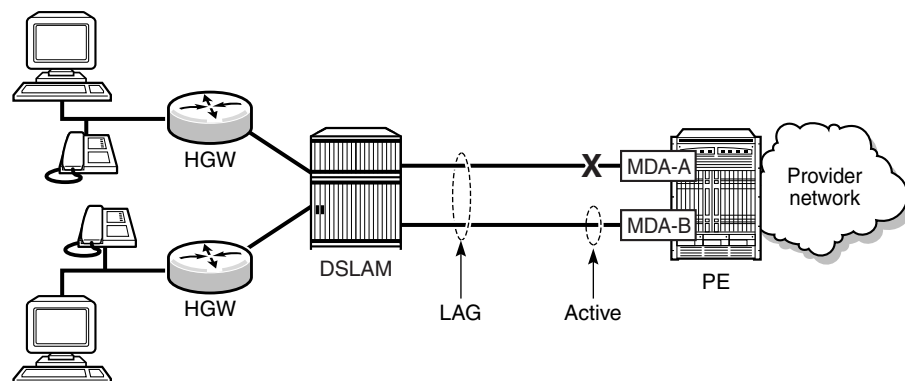
Note: LACP cannot be configured for static LAG. For more information on static LAG, see [Static LAG \(Active/Standby LAG Operation without LACP\)](#).

LACP is disabled by default and therefore must be enabled on the LAG if required. LACP can be used in either active mode or passive mode. The mode must match with connected CE devices for proper operation. For example, if the LAG on the 7705 SAR end is configured to be active, the CE end must be passive.

[Figure 9](#) shows the interconnection between a DSLAM and a LAG aggregation node. In this configuration, LAG is used to protect against hardware failure. If the active link goes down, the link on standby takes over (see [Figure 10](#)). The links are distributed across two different adapter cards to eliminate a single point of failure.

Figure 9 LAG on Access Interconnection

22319

Figure 10 LAG on Access Failure Switchover

22320

LACP handles active/standby operation of LAG subgroups as follows.

- Each link in a LAG is assigned to a subgroup. On access, network, and hybrid ports, a LAG can have a maximum of four subgroups and a subgroup can have up to the maximum number of links supported for the LAG. The selection algorithm implemented by LACP ensures that only one subgroup in a LAG is selected as active.
- The algorithm selects the active link as follows.
 - If multiple subgroups satisfy the selection criteria, the subgroup currently active remains active. Initially, the subgroup containing the highest-priority (lowest value) eligible link is selected as active.

- An eligible member is a link that can potentially become active. This means it is operationally up, and if the **slave-to-partner** flag is set, the remote system did not disable its use (by signaling standby).
- The selection algorithm works in a revertive mode (for details, refer to the IEEE 802.1ax standard). This means that every time the configuration or status of a subgroup changes, the selection algorithm reruns. If multiple subgroups satisfy the selection criteria, the subgroup currently active remains active. This behavior does not apply if the **selection-criteria** *hold-time* parameter is set to infinite.

Log events and traps are generated at both the LAG and link level to indicate any LACP changes. See the TIMETRA-LAG-MIB for details.

3.2.13.3 QoS Adaptation for LAG on Access

QoS on access port LAGs (access ports and hybrid ports in access mode) is handled differently from QoS on network port LAGs (see [QoS for LAG on Network](#)). Based on the configured hashing, traffic on a SAP can be sent over multiple LAG ports or can use a single port of a LAG. There are two user-selectable adaptive QoS modes (distribute and link) that allow the user to determine how the configured QoS rate is distributed to each of the active LAG port SAP queue schedulers, SAP schedulers (H-QoS), and MSS schedulers. These modes are:

- **adapt-qos distribute**

For SAP queue schedulers, SAP schedulers (H-QoS), and SAP egress MSS schedulers, distribute mode divides the QoS rates (as specified by the SLA) equally among the active LAG links (ports). For example, if a SAP queue PIR and CIR are configured on an active/active LAG SAP to be 200 Mb/s and 100 Mb/s respectively, and there are four active LAG ports, the SAP queue on each LAG port will be configured with a PIR of 50 Mb/s ($200/4$) and a CIR of 25 Mb/s ($100/4$).

For the SAP ingress MSS scheduler, the scheduler rate is configured on an MDA basis. Distributive adaptive QoS divides the QoS rates (as specified by the SLA) among the active link MDAs proportionally to the number of active links on each MDA. For example, if an MSS shaper group with an aggregate rate of 200 Mb/s and a CIR of 100 Mb/s is assigned to an active/active LAG SAP where the LAG has two ports on MDA 1 and three ports on MDA 2, the MSS shaper group on MDA 1 will have an aggregate rate of 80 Mb/s ($200 \times 2/5$ of the SLA) and a CIR of 40 Mb/s ($100 \times 2/5$ of the SLA). MDA 2 will have an aggregate rate of 120 Mb/s ($200 \times 3/5$) and a CIR of 60 Mb/s ($100 \times 3/5$).

- **adapt-qos link** (default)

For SAP queue schedulers, SAP schedulers (H-QoS), and SAP egress MSS schedulers, link mode forces the full QoS rates (as specified by the SLA) to be configured on each of the active LAG links. For example, if a SAP queue PIR and CIR are configured on an active/active LAG SAP to be 200 Mb/s and 100 Mb/s respectively, and there are two active LAG ports, the SAP queue on each LAG port will be configured to the full SLA, which is a PIR of 200 Mb/s and a CIR of 100 Mb/s.

For the SAP ingress MSS scheduler, the scheduler rate is configured on an MDA basis. In LAG link mode, each active LAG link MDA MSS shaper scheduler is configured with the full SLA. For example, if an MSS shaper group is configured with an aggregate rate of 200 Mb/s and CIR of 100 Mb/s and is assigned to an active/active LAG SAP with three ports on MDA 1 and two ports on MDA 2, the MSS shaper group on MDA 1 and MDA 2 are each configured with the full SLA of 200 Mb/s for the aggregate rate and 100 Mb/s for the CIR.

Table 12 shows examples of rate and bandwidth distributions based on the **adapt-qos** mode configuration.

Table 12 Adaptive QoS Rate and Bandwidth Distribution

	Distribute	Link
SAP queue scheduler	Rate distributed = rate / number of active links	100% rate configured on each LAG SAP queue
SAP scheduler (H-QoS)	Rate distributed = rate / number of active links	100% rate configured on each SAP scheduler
SAP egress MSS scheduler	Rate distributed = rate / number of active links	100% rate configured on each port's MSS scheduler
SAP ingress MSS scheduler	Rate distributed per active LAG MDA = rate × (number of active links on MDA / total number of active links)	100% rate configured on each active LAG MDA MSS scheduler

The following restrictions apply to ingress MSS LAG adaptive QoS (distribute mode).

- A unique MSS shaper group must be used per LAG when a non-default ingress MSS shaper group is assigned to a LAG SAP using adaptive QoS.
- When a shaper group is assigned to a LAG SAP using adaptive QoS, all ports in the LAG group must have their MDAs assigned to the same shaper policy.

The following restrictions apply to egress MSS LAG.

- The shaper policy for all LAG ports in a LAG must be the same and can only be configured on the primary LAG port member.

The following limitations apply to adaptive QoS (distribute mode).

- The QoS rates for an ingress LAG using adaptive QoS are only distributed among the active links when a non-default shaper group is used. If a default shaper group is used, the full QoS rates are configured for each port in the LAG as if link mode is being used.
- The QoS rates for an ingress or egress LAG using adaptive QoS will not be distributed among the active links when a user sets the PIR/CIR on a SAP queue, or aggregate rate/CIR on a SAP scheduler or MSS scheduler, to the default values (max and 0).
- A port on an 8-port Ethernet Adapter card can be added to a LAG group but does not support H-QoS or MSS. If distributed mode is applied to a LAG SAP with a port on an 8-port Ethernet Adapter card, the H-QoS and MSS bandwidth distribution is determined based on all active links including the 8-port Ethernet Adapter card port. However, the H-QoS or MSS bandwidth share for this port cannot be configured. Ports on other adapter cards, modules, or platforms will have their H-QoS or MSS bandwidth share configured.

3.2.13.3.1 Adaptive QoS Examples (Distribute Mode)

The following examples can be used as guidelines for configuring **adapt-qos distribute**.

SLA distribution for SAP queue-level PIR/CIR configuration

- Configure a **qos sap-ingress** policy with a queue ID of 2, a PIR of 200 Mb/s, and a CIR of 100 Mb/s. Assign it to an active/active LAG SAP with five active ports.
- For each port, the PIR/CIR configuration of SAP queue 2 is calculated so that the PIR = 40 Mb/s and CIR = 20 Mb/s.
- If one link goes down, the PIR/CIR configuration of SAP queue 2 on each active port is recalculated so that the PIR = 50 Mb/s and CIR = 25 Mb/s.

SLA distribution for ingress/egress (H-QoS)

- Create a LAG SAP with two different ports (for example, port 1/1/1 and port 1/1/2) in a LAG subgroup.
- Configure a LAG SAP aggregate rate of 200 Mb/s and a CIR of 100 Mb/s.
- To maintain the SLA, the SAP aggregate rate and CIR must be divided by the number of operational links in the LAG group.
- Because there are two active ports (links) in this LAG, the H-QoS aggregate rate and CIR are divided evenly between the two ports.
- The port 1/1/1 SAP scheduler (H-QoS) aggregate rate is 100 Mb/s and the CIR is 50 Mb/s.
- The port 1/1/2 SAP scheduler (H-QoS) aggregate rate is 100 Mb/s and the CIR is 50 Mb/s.

SLA distribution for Ingress MSS

- Configure a shaper group with an ID of 2 with an aggregate rate of 200 Mb/s and a CIR of 100 Mb/s.
- Create a LAG SAP using shaper group 2 that has two ports from one MDA (for example, ports 1/1/1 and 1/1/2) and three ports from a different MDA (for example, ports 1/2/1, 1/2/2, and 1/2/3) in its LAG group.
- The ingress MSS scheduler rate is configured on an MDA basis. Adaptive QoS divides the QoS rates among the active link MDAs, proportionally to the number of active links on each MDA.
- For MDA 1, the MSS shaper group aggregate rate is 80 Mb/s and the CIR is 40 Mb/s (2/5 of the bandwidth with two active links on MDA 1).
- For MDA 2, the MSS shaper group aggregate rate is 120 Mb/s and the CIR is 60 Mb/s (3/5 of the bandwidth with three active links on MDA 2).

3.2.13.4 QoS for LAG on Network

QoS on network port LAGs is handled differently from QoS on access port LAGs. The **adapt-qos** command is not supported on network port LAGs. However, QoS behavior on network port LAGs is similar to QoS on access port LAGs configured for **adapt-qos link** mode.

For network queue and per-VLAN shapers, the full QoS rates are configured on each of the active LAG links. For example, if a per-VLAN shaper **agg-rate-limit** aggregate rate (PIR) and CIR are configured on an active/active LAG interface to be 200 Mb/s and 100 Mb/s respectively, and there are two active LAG ports, the per-VLAN shaper on each LAG port will be configured to an aggregate rate of 200 Mb/s and a CIR of 100 Mb/s.

3.2.13.5 Access Ingress Fabric Shaping

In order to avoid traffic congestion and ease the effects of possible bursts, a fabric shaper is implemented on each adapter card. Traffic being switched to a LAG SAP on an access interface goes through fabric shapers that are either in aggregate mode or destination mode. When in destination mode, the multipoint shaper is used to set the rate on all adapter cards. For more information on the modes used in fabric shaping, refer to the 7705 SAR Quality of Service Guide, “Configurable Ingress Shaping to Fabric (Access and Network)”.



Note: Even though the multipoint shaper is used to set the fabric shaping rate for traffic switched to a LAG SAP, it is the per-destination unicast counters that are incremented to show the fabric statistics rather than the multipoint counter. Only the fabric statistics of the active port of the LAG are incremented, not the standby port.

3.2.13.6 Hold-down Timers

Hold-down timers control how quickly a LAG responds to operational port state changes. The following timers are supported:

- port-level hold-time (up/down) timer

This timer controls the delay before a port is added to or removed from a LAG when the port comes up or goes down. Each port in the LAG has the same timer value, which is configured on the primary LAG link (port). The timer is set with the **config>port>ethernet>hold-time** command.

- subgroup-level hold-down timer

This timer controls the delay before a switch from the current subgroup to a new candidate subgroup, selected by the LAG subgroup selection algorithm. The timer is set with the **config>lag>selection-criteria** command.

The timer can be configured to never expire, which prevents a switch from an operationally up subgroup to a new candidate subgroup. This setting can be manually overridden by using the **tools>perform>force>lag-id** command (refer to the 7705 SAR OAM and Diagnostics Guide, “Tools Command Reference”, for information on this command).

If the port-level timer is set, it must expire before the subgroup selection occurs and this timer is started. The subgroup-level timer is supported only for LAGs running LACP.

- LAG-level hold-down timer

This timer controls the delay before a LAG is declared operationally down when the available links fall below the required port or bandwidth minimum. This timer is recommended for MC-LAG operation. The timer prevents a LAG from being brought down when an MC-LAG switchover executes a make-before-break switch. The LAG-level timer is set with the **config>lag>hold-time** down command.

If the port-level timer is set, it must expire before the LAG operational status is processed and this timer is started.

3.2.13.7 Multi-Chassis LAG

Multi-chassis LAG (MC-LAG) is a redundancy feature on the 7705 SAR, useful for nodes that are taken out of service for maintenance, upgrades, or relocation. MC-LAG also provides redundancy for incidents of peer nodal failure. Refer to the “Multi-Chassis LAG Redundancy” section in the 7705 SAR Basic System Configuration Guide.

3.2.13.8 Static LAG (Active/Standby LAG Operation without LACP)

Some Layer 2 capable network equipment devices support LAG protected links in an active/standby mode but without LACP. This is commonly referred to as static LAG. In order to interwork with these products, the 7705 SAR supports configuring LAG without LACP.

LACP provides a standard means of communicating health and status information between LAG peers. If LACP is not used, the peers must be initially configured in a way that ensures that the ports on each end are connected and communicating. Otherwise, LAG will not be active. Which LAG peer is made active is a local decision. If the port **priority** settings are the same for all ports, it is possible that the two ends will select ports on different physical links and LAG will not be active. Decide the primary link by setting the port **priority** for the LAG on each peer to ensure that the active ports on each end coincide with the same physical link.

The key parameters for configuring static LAG are **selection-criteria** (set to **best-port**) and **standby-signaling** (set to **power-off**). The selection criteria is used to determine which selection algorithm decides the primary port (the active port in a no-fault condition). It is always the subgroup with the **best-port** (the highest-priority port - lowest configured value) that is chosen as the active subgroup. The selection criteria must be set to **best-port** before standby signaling can be placed in **power-off** mode. Once the selection criteria is set to **best-port**, setting the **standby-signaling** parameter to **power-off** causes the transmitters on the standby ports to be powered down.

After a switchover caused by a failure on the active link, the transmitters on the standby link are powered on. The switch time for static LAG is typically longer than it is with LACP, due to the time it takes for the transmitters to come up and transmission to be established. When the fault is restored, static LAG causes a revertive switch to take place. The revertive switch is of shorter duration than the initial switchover since the system is able to prepare the other side for the switch and initiate the switchover once it is ready.



Note: Since the transmitters on the standby link are off, it is not possible for the LAG to respond to a physical disconnect (fault) on the standby link. This means that it is possible to have a failure on the active link result in a switch to a failed standby link.

3.2.13.9 LAG Support on Mixed-Generation Hardware

This section contains information on the following topics:

- [LAG Configuration at SAP Level](#)
- [LAG Configuration at Port Level](#)

3.2.13.9.1 LAG Configuration at SAP Level

The 6-port Ethernet 10Gbps Adapter card and the 7705 SAR-X are third-generation (Gen-3) hardware components. All other Ethernet cards are second-generation (Gen-2) adapter cards, except the 8-port Ethernet Adapter card, which is a first-generation (Gen-1) adapter card. See [Table 2](#) for a list of first-, second-, and third-generation Ethernet adapter cards, ports, and platforms.

The 7705 SAR supports mix-and-match traffic management (TM) across LAG members, where one member is a port on a Gen-3 adapter card or platform and the other member is a port on either a Gen-2 or Gen-1 adapter card or platform. Mix-and-match LAG does not apply to the 7705 SAR-X because it has only Gen-3 Ethernet ports.

For mix-and-match LAG TM scenarios, the 7705 SAR supports a generic QoS configuration, where the operator can configure all the settings available on each generation adapter card, but it is the card responsible for transporting traffic that determines which settings are applicable. That is, only the settings that apply to the active member port are used. The only exception is if there is a Gen-1 adapter card in the mix. In this case **scheduling-mode** cannot be changed to 16-priority scheduling. Only 4-priority scheduling is applicable.

For example, configuring **scheduling-mode** applies to Gen-2 adapter card SAPs but does not apply to the Gen-3 adapter card SAPs because Gen-3 cards support only one scheduling mode (4-priority), which is its implicit (default) scheduler mode and is not configurable. In another example, although per-SAP (second-tier) shaper rates can be configured for Gen-2 and Gen-3 cards, they will not be applied to Gen-1 cards.

Since it cannot be known whether SAP traffic rides over a Gen-2 or a Gen-3 adapter card and whether both adapter cards support H-QoS (tier 2, per-SAP shapers), the operator can choose to configure per-SAP aggregate CIR and PIR shaper rates. When the active link is on a Gen-2- or Gen-3-based port, per-SAP aggregate CIR and PIR rates are both used to enforce shaper rates, except when the active link is on a Gen-3-based port and traffic is in the network egress direction. In this case, only the PIR portion of the per-SAP aggregate rate is used to enforce shaper rates.

In the following descriptions of LAG configuration, **scheduler-mode**, *agg-rate*, and *cir-rate* refer to SAP configuration, as shown below for an Epipe SAP. Similar commands exist for SAPs in other services as well as for egress traffic.

```
config>service>epipe>sap lag-id>ingress#
  scheduler-mode {4-priority | 16-priority}
  agg-rate-limit agg-rate [cir cir-rate]
```


**Note:**

- The SAP identifier in the previous command has a *lag-id* (LAG SAP), not a *port-id* (regular SAP). A LAG SAP references two ports (one active and one standby), but only one port at a time carries traffic.
- The *agg-rate* is a PIR rate.

For information on traffic management for Gen-3 adapter cards and platforms, refer to the “QoS for Gen-3 Adapter Cards and Platforms” section in the 7705 SAR Quality of Service Guide.

For mix-and-match LAG configurations, the following behaviors apply.

- The configured aggregate rate on the LAG SAP is used to dictate the per-SAP aggregate rate on the active LAG port, regardless of which generation of adapter card is used (Gen-3 or Gen-2) or the configured scheduler mode. On a Gen-2 adapter card, the aggregate rate only applies when the port is in 16-priority scheduler mode. This behavior implies the following points.
 - The scheduler mode can be set to 16-priority or 4-priority. When servicing packets, the Gen-2-based datapath uses the configured scheduler mode (16-priority or 4-priority), while the Gen-3-based datapath always uses 4-priority scheduling.
 - When the traffic is transported over a Gen-3-based port (that is, the active link is on a Gen-3-based adapter card), the aggregate rate (*agg-rate*) is used to enforce a maximum shaper rate, as is the aggregate rate CIR (*cir-rate*).
 - When the active link is on a Gen-2-based adapter card, both aggregate rate CIR and PIR (*cir-rate* and *agg-rate*) are used. The aggregate rate (PIR) enforces the per-SAP bandwidth limit, and the CIR is used to identify in-profile and out-of-profile packets for aggregate scheduling purposes.
 - When the active link is on a Gen-1-based adapter card, aggregate rate CIR and PIR do not apply.

In addition, the following items describe mix-and-match LAG configuration behavior (that is, how the LAG SAP settings are applied or ignored depending on the active member port).

- For a LAG SAP, **scheduler-mode**, *agg-rate*, and *cir-rate* are all configurable on a per-SAP basis, regardless of the LAG member port combination (that is, both Gen-2 ports, both Gen-3 ports, or a Gen-2-/Gen-3 port mix).
- **Scheduler-mode** can be set to 4-priority or 16-priority, regardless of the LAG member port combination, except when one member is a port on a Gen-1 adapter card. In this case, only 4-priority scheduling is available.

- *Agg-rate* and *cir-rate* can be set whether **scheduler-mode** is set to 4-priority or 16-priority.
- The configured **scheduler-mode** applies to Gen-2-based LAG member ports only, and is not used for Gen-3-based LAG member ports. Gen-3 cards always use 4-priority scheduler mode and Gen-1 cards always use 4-priority scheduler mode. The **unshaped-sap-cir** keyword does not apply to Gen-3 SAPs because Gen-3 SAPs are all shaped SAPs.
- If **scheduler-mode** is 4-priority on the LAG SAP, where the LAG has one Gen-1-based or Gen-2-based port member and one Gen-3-based port member, the following points apply.
 - The Gen-1-based or Gen-2-based adapter card is configured with 4-priority scheduling, while *agg-rate* and *cir-rate* are not applied, and H-QoS is not enabled.
 - The Gen-3-based adapter card is configured with *agg-rate* and *cir-rate*, while **scheduler-mode** is ignored.
 - When LAG active/standby switching occurs from an active Gen-3-based port to an active Gen-1-based or Gen-2-based port, traffic management is changed from a 4-priority scheduler with H-QoS to a 4-priority scheduler without H-QoS that functions like an unshaped SAP.
 - For the reverse case, when LAG active/standby switching occurs from an active Gen-1-based or Gen-2-based port to an active Gen-3-based port, traffic management is changed from a 4-priority scheduler without H-QoS to a 4-priority scheduler with H-QoS.
- If **scheduler-mode** is 16-priority on the LAG SAP, where the LAG has one Gen-2-based port member and one Gen-3-based port member, the following points apply.
 - The Gen-2-based adapter card is configured with 16-priority scheduling mode, *agg-rate* and *cir-rate*. This means that H-QoS is enabled.
 - The Gen-3-based adapter card is configured with *agg-rate* and *cir-rate*, while **scheduler-mode** is ignored.
 - When LAG active/standby switching occurs from an active Gen-3-based port to an active Gen-2-based port, traffic management is changed from a 4-priority scheduler with H-QoS using the *agg-rate* and *cir-rate*, to a 16-priority scheduler with H-QoS using the *agg-rate* and the *cir-rate* (that is, from 4-priority (Gen-3) mode to 16-priority mode for shaped SAPs).
 - For the reverse case, when LAG active/standby switching occurs from an active Gen-2-based port to an active Gen-3-based port, traffic management is changed from a 16-priority scheduler with H-QoS using the *agg-rate* and the *cir-rate*, to a 4-priority (Gen-3) scheduler with H-QoS enabled using the *agg-rate* and the *cir-rate*.

- If **scheduler-mode** is 16-priority mode on the LAG SAP, the combination of a Gen-1-based port with a Gen-2-based or Gen-3-based port is blocked because Gen-1 adapter cards do not support 16-priority mode. The only valid option for this combination of ports is 4-priority scheduling mode.

Lastly, for LAG on access ports, the primary port configuration settings are applied to both the primary and secondary LAG ports. Therefore, in order to support unshaped SAPs when the primary port is a Gen-3-based port and the secondary port is a Gen-2-based port, configuring the **unshaped-sap-cir** on the Gen-3-based port is allowed, even though it does not apply to the Gen-3-based port. This is because **unshaped-sap-cir** is needed by the secondary Gen-2-based port when it becomes the active port. The full command is **config>port>ethernet>access>egress>unshaped-sap-cir** *cir-rate*.

3.2.13.9.2 LAG Configuration at Port Level

The 7705 SAR allows all configurations on Gen-1, Gen-2, and Gen-3 ports, even if some or all of the configuration is not applicable to all the ports. The software uses only the settings that are applicable to the particular port and ignores those that are not applicable. Any change to the primary LAG member configuration propagates to all non-primary ports.

[Table 13](#) lists the port commands that can be affected by LAG configuration, indicates the command's applicability to Gen-1, Gen-2, and Gen-3 ports, and describes the LAG behavior for mixed LAG configuration.



Note: For LAG on network ports, the **egress-rate**, **unshaped-if-cir**, and **network-queue** policy can only be configured on the primary LAG port and this configuration is propagated to the other LAG members.

Table 13 Port Command Applicability for LAG Configurations on Mixed-Generation Hardware

CLI Command	Gen-1 Port	Gen-2 Port	Gen-2 Port on Module ¹	Gen-3 Port	Configuration Behavior
unshaped-if-cir	Supported ²	Supported ²	Supported ²	Supported ³	Allowed on Gen-1, Gen-2, and Gen-3 hardware, but not on Fast Ethernet ports. All port members of the same LAG must have the same value.

Table 13 Port Command Applicability for LAG Configurations on Mixed-Generation Hardware (Continued)

CLI Command	Gen-1 Port	Gen-2 Port	Gen-2 Port on Module ¹	Gen-3 Port	Configuration Behavior
unshaped-sap-cir	N/A	Supported	Supported	N/A	Allowed on Gen-2 and Gen-3 hardware, but not on Gen-1 hardware. This means LAGs with Gen-1 members and Gen-2 or Gen-3 members do not allow the unshaped-sap-cir command to be configured to a non-zero value on Gen-2 or Gen-3 ports. LAGs with Gen-2 and Gen-3 members are allowed if all member ports have the same unshaped-sap-cir value. Change the value only on the primary member. The value is propagated to all other members.
shaper-policy	N/A	Supported	Supported	Supported	Allowed on Gen-2 and Gen-3 hardware, but not on Gen-1 hardware. The same restrictions described above for the unshaped-sap-cir command for LAG members apply.
cbs	Supported	Supported	Supported	Supported	Allowed on all hardware generations. All LAG members must have the same value. Change the value only on the primary member. The value is propagated to all other members.
src-pause	Enable or disable	Enable or disable	Disable	Enable or disable	Allowed to change enable/disable on Gen-1, Gen-2, and Gen-3 hardware, except for a Gen-3 port on a 6-port SAR-M Ethernet Module, where only the no src-pause command is supported and cannot be changed. All LAG members must have same value. Change the value only on the primary member. The value is propagated to all other members.
include-fcs	N/A	Enable or disable	Always enabled	Enable or disable	Allowed on Gen-2 and Gen-3 hardware, but not on Gen-1 hardware. The same restrictions described above for the unshaped-sap-cir command for LAG members apply.
scheduler-mode (for port)	Profile or 4-priority	16-priority	16-priority	4-priority	Allowed to configure per-port independently, whether the port is a standalone or an active/standby member. There is no propagation among ports within the same LAG.

Notes:

1. Refers to the 6-port SAR-M Ethernet module.
2. Not supported on Fast Ethernet ports.
3. If the port is in network mode, the **unshaped-if-cir** command can be configured but does not take effect. If the port is in hybrid mode, the command takes effect.

As indicated in [Table 13](#), each generation of adapter card uses its own configured scheduler mode, or uses the only command option available for Gen-2 and Gen-3 adapter cards, whereas Gen-1 adapter cards use their own adapter card configuration. For example, on a LAG where:

- one member link is on Gen-2 hardware
 - this port uses 16-priority scheduler mode, which is the default mode and cannot be changed
- one member link is on Gen-3 hardware
 - this port uses 4-priority (Gen-3) scheduler mode, which is the default mode and cannot be changed
- one member link is on Gen-1 hardware
 - this port uses its configured scheduler mode (profiled or 4-priority), which is dictated via the configuration applied to the port

3.2.14 LAG and ECMP Hashing

If it is necessary to increase the available bandwidth for a logical link that exceeds the physical bandwidth or to add redundancy for a physical link, typically one of two methods is applied: LAG or ECMP. A system can also deploy both at the same time using ECMP of two or more LAGs and/or single links.

The 7705 SAR supports per-flow and per-service hashing, as described in the following sections:

- [Per-Flow Hashing](#)
- [Per-Service Hashing](#)
- [LSR Hashing](#)
- [Layer 4 Load Balancing](#)
- [TEID Hashing for GTP-encapsulated Traffic](#)
- [Entropy Labels](#)
- [Security Parameter Index \(SPI\) Load Balancing](#)



Note: For general information on LAG, see [LAG](#). For general information on ECMP, refer to the 7705 SAR Router Configuration Guide, “Static Routes, Dynamic Routes, and ECMP”.

3.2.14.1 Per-Flow Hashing

The 7705 SAR supports per-flow hashing for LAG and ECMP. Per-flow hashing uses information in a packet as an input to the hash function, ensuring that any given traffic flow maps to the same egress LAG port or ECMP path.

Depending on the type of traffic that needs to be distributed in an ECMP or LAG path, different variables are used as the input to the hashing algorithm that determines the selection of the next hop (ECMP) or port (LAG). The hashing result can be changed using the options described in [Per-Service Hashing](#), [LSR Hashing](#), [Layer 4 Load Balancing](#), [TEID Hashing for GTP-encapsulated Traffic](#), and [Entropy Labels](#).

[Table 14](#) summarizes the possible inputs to the hashing algorithm for ECMP and LAG.

Fragmented packets cannot use Layer 4 UDP/TCP ports or tunnel endpoint IDs (TEIDs). The datapath looks at IP source address and destination address only, even if configured to use Layer 4 UDP/TCP ports or TEID.

In [Table 14](#), the hashing inputs in the Service ID column and the inputs in the other columns are mutually exclusive. Where checkmarks appear on both the per-service and per-flow sides of the table, refer to the table note in the Service ID column to determine when per-service hashing is used.

Table 14 Hashing Algorithm Inputs (ECMP and LAG)

Traffic Type	Per-Service	Per-Flow								
	Service ID	System IPv4 Address ¹	Ingress Port ²	Source and Destination			TEID ⁴	Internal Multicast Group ID ⁵	MPLS Label Stack	Entropy Label
				MAC Address	IP Address	UDP/TCP Port ³				
ECMP										
IPv4 routed	✓ ⁶	✓			✓	✓	✓	✓		
IPv6 routed	✓ ⁶	✓			✓	✓	✓	✓		
MPLS LSR		✓	✓		✓ ^{7,8}	✓	✓		✓ ⁹	✓ ⁹
MPLS MVPN (LSR, eLER)										
VPLS	✓									
Epipe	✓									
Apipe, Cpipe, Fpipe, Ipipe, Hpipe	✓									

Table 14 Hashing Algorithm Inputs (ECMP and LAG) (Continued)

Traffic Type	Per-Service	Per-Flow								
	Service ID	System IPv4 Address ¹	Ingress Port ²	Source and Destination			TEID ⁴	Internal Multicast Group ID ⁵	MPLS Label Stack	Entropy Label
				MAC Address	IP Address	UDP/TCP Port ³				
LAG										
IPv4 routed		✓			✓	✓	✓	✓		
IPv6 routed		✓			✓	✓	✓	✓		
MPLS LSR		✓	✓		✓ ^{7,8}	✓	✓		✓ ⁹	✓ ⁹
MPLS MVPN (LSR, eLER)		✓	✓		✓			✓	✓	
VPLS	✓ ¹⁰			✓	✓	✓	✓	✓		
Epipe	✓ ¹⁰			✓	✓	✓	✓			
Apipe, Cpipe, Fpipe, Ipipe, Hpipe	✓									

Notes:

1. The system IP address can be included as a hashing input for both IP and LDP ECMP using the **system-ip-load-balancing** command at the system level.
2. Optional hashing input that is included when the **use-ingress-port** command is enabled.
3. Optional hashing input that is included when the **l4-load-balancing** command is enabled (for IP ECMP) or when the hashing algorithm is configured as **lbi-ip-l4-teid** in the **lsr-load-balancing** command (for LDP ECMP). Layer 4 load balancing at the service level is not affected by Layer 4 load balancing at the system, router interface, or service interface levels (IES and VPRN).
4. Optional hashing input that is included when the **teid-load-balancing** command is enabled (for IP ECMP) or when the hashing algorithm is configured as **lbi-ip-l4-teid** in the **lsr-load-balancing** command (for LDP ECMP). TEID load balancing at the service level is not affected by TEID load balancing at the router interface or service interface levels (IES and VPRN).
5. Only applies to multicast traffic. The internal multicast group ID is generated from either the (S,G) record (IGMP snooping, MLD snooping, and PIM snooping), the point-to-multipoint label binding, or the VPLS service creation.
6. Only for Layer 3 traffic going to a Layer 3 spoke SDP interface.
7. Only included when the first nibble after the bottom of stack (BoS) bit is "4", in which case the next header encapsulation is considered to be an IPv4 header.
8. Optional hashing input that is included when LSR hashing is configured as **label-ip**.
9. MPLS label stack and entropy label are mutually exclusive hashing inputs. When an entropy label indicator (ELI) and entropy label (EL) are found in the label stack, the MPLS labels are not used as hashing inputs.
10. Optional hashing input that is included when the **per-service-hashing** command is enabled in a service (VPLS or Epipe). The default setting is disabled, which should be changed to enabled if pre-Release 8.0.R4 behavior is needed.

3.2.14.2 Per-Service Hashing

The 7705 SAR supports load balancing based on service ID, as shown in [Table 14](#). The 7705 SAR uses the service ID as the input to the hash function. Per-service and per-flow hashing are mutually exclusive features.

For IPv4 and IPv6 routed traffic under ECMP operation, the service ID is used as the hashing input for Layer 3 traffic going to a Layer 3 spoke SDP interface. Otherwise, per-flow load balancing is used.

For Epipe and VPLS services under LAG operation, the **per-service-hashing** command and the **l4-load-balancing** and **teid-load-balancing** commands are mutually exclusive. Load balancing via per-service hashing is configured under the **config>service>epipe>load-balancing** and **config>service>vpls>load-balancing** contexts.



Note:

- Prior to Release 8.0.R4 of the 7705 SAR, load balancing for an Epipe service was implicitly defaulted to be enabled (that is, hashing was always on the service ID). Release 8.0.R4 adds the **per-service-hashing** command, which is disabled by default. The **per-service-hashing** command must be explicitly enabled if pre-Release 8.0.R4 behavior is needed.
- Starting with Release 8.0.R4, unless **per-service-hashing** is enabled, a 4-byte hash value will be appended to internal overhead for VPLS multicast traffic at ingress. The egress internal hash value is discarded at egress before scheduling. Therefore, shaping rates at access and network ingress and for fabric policies may need to be adjusted accordingly. In addition, the 4-byte internal hash value may be included in any affected statistics counters.
- Starting with Release 9.0.R4, support for multiple LSPs (RSVP-TE or segment routing TE (SR-TE)) in the same SDP is added as part of the mixed-LSP SDP feature (refer to the “Mixed-LSP SDPs” section in the 7705 SAR Services Guide for details). When an SDP is configured with multiple LSPs of the same type, it allows load balancing of the traffic in a similar manner as load-balancing for LDP ECMP, but only at the iLER point. Therefore, the per-flow hashing and per-service hashing behavior described in this section for LDP ECMP at the iLER also applies to multiple LSPs (RSVP-TE or SR-TE) in the same SDP.

3.2.14.3 LSR Hashing

LSR hashing operates on the label stack and can also include hashing on the IP header if the packet is an IPv4 packet. The label-IP hashing algorithm can also include the Layer 4 header and the TEID field. The default hash is on the label stack only. IPv4 is the only IP hashing supported on a 7705 SAR LSR.

When a 7705 SAR is acting as an LSR, it considers a packet to be IP if the first nibble following the bottom of the label stack is 4 (IPv4). This allows the user to include an IP header in the hashing routine at an LSR in order to spray labeled IP packets over multiple equal-cost paths in ECMP in an LDP LSP and/or over multiple links of a LAG group in all types of LSPs.

Other LSR hashing options include label stack profile options on the significance of the bottom-of-stack label (VC label), the inclusion or exclusion of the ingress port, and the inclusion or exclusion of the system IP address.



Note: The global IF index is no longer a hash input for LSR ECMP load balancing. It has been replaced with the **use-ingress-port** configurable option in the **lsr-load-balancing** command. As well, the default treatment of the MPLS label stack has changed to focus on the bottom-of-stack label (VC label). In previous releases, all labels had equal influence.

LSR load balancing is configured using the **config>system>lsr-load-balancing** or **config>router>if>load-balancing>lsr-load-balancing** command. Configuration at the router interface level overrides the system-level configuration for the specified interface.

If an ELI is found in the label stack, the entropy label is used as the hash result. Hashing continues based on the configuration of label-only (**lbl-only**), label-IP (**lbl-ip**), or label-IP with Layer 4 header and TEID (**lbl-ip-l4-teid**) options.

3.2.14.3.1 LSR Label-only Hashing

ECMP operation consists of an initial hash based on the system IP address, then on the global port number if the **use-ingress-port** option is enabled.

Each label in the stack is then hashed separately with the result of the previous hash, up to a maximum of 16 labels. The net result is used to select which LDP FEC next hop to send the packet to using a threshold hashing operation of the net result with the number of next hops. Threshold hashing is described in RFC 2992, *Analysis of an Equal-Cost Multi-Path Algorithm*.

If an ELI is found in the label stack, the entropy label replaces the MPLS label stack hashing result and hashing continues.

If the selected LDP FEC or LSP has its NHLFE programmed with a LAG interface, a second round of hashing is needed, using the net result of the first round of hashing as the hashing input.

3.2.14.3.2 LSR Label-IP Hashing

In the first round of hashing for LSR label IP hashing, the algorithm parses down the label stack as described in [LSR Label-only Hashing](#).

When the algorithm reaches the bottom of the stack, it checks the next nibble. If the nibble value is 4, the packet is assumed to be an IPv4 packet and the result of the label hash is fed into another hash along with the source and destination address fields in the IP packet header. If the nibble value is not 4, the algorithm will just use the label stack hash already calculated for the ECMP path selection.

The second round of hashing for LAG reuses the net result of the first round of hashing.

3.2.14.3.3 LSR Label-IP Hashing with Layer 4 Header and TEID

If the **lbl-ip-l4-teid** option is configured, the Layer 4 source and destination UDP or TCP port fields and the TEID field in the GTP header are included in the label-IP hashing calculation. See [Layer 4 Load Balancing](#) and [TEID Hashing for GTP-encapsulated Traffic](#) for more information.

3.2.14.3.4 Label Stack Profile Options

The **lsp-load-balancing** command includes a **bottom-of-stack** option that determines the significance of the bottom-of-stack label (VC label) based on which label stack profile option is specified. The profiles are:

- profile 1: favors better load balancing for pseudowires when the VC label distribution is contiguous (default)
- profile 2: similar to profile 1 where the VC labels are contiguous, but provides an alternate distribution
- profile 3: all labels have equal influence in hash key generation

3.2.14.3.5 Ingress Port

The **use-ingress-port** option, when enabled, specifies that the ingress port will be used by the hashing algorithm at the LSR. This option should be enabled for ingress LAG ports because packets with the same label stack can arrive on all ports of a LAG interface. In this case, using the ingress port in the hashing algorithm will result in better egress load balancing, especially for pseudowires.

The option should be disabled for LDP ECMP so that the ingress port is not used by the hashing algorithm. For ingress LDP ECMP, if the ingress port is used by the hashing algorithm, the hash distribution could be biased, especially for pseudowires.

3.2.14.4 Layer 4 Load Balancing

The IP Layer 4 load-balancing option includes the TCP/UDP source and destination port numbers in addition to the source and destination IP addresses in per-flow hashing of IP packets. By including the Layer 4 information, a source address/destination address default hash flow can be subdivided into multiple finer-granularity flows if the ports used between a source address and destination address vary.

Layer 4 load balancing is configured at the system level using the **config>system>I4-load-balancing** command. It can also be configured at the router interface level or the service interface level (IES and VPRN). Configuration at the router interface or service interface level overrides the system-level configuration for the specified interface or service.

For LSR LDP ECMP, Layer 4 load balancing is configured using the **lbl-ip-I4-teid** option in the **lsr-load-balancing command** at the system level or router interface level. Configuration at the router interface level overrides the system-level configuration for the specified interface.

Layer 4 load balancing can also be configured at the service level for Epipe and VPLS services. Layer 4 load balancing at the service level is not impacted by Layer 4 load balancing at the system, router interface, or service interface levels.

3.2.14.5 TEID Hashing for GTP-encapsulated Traffic

GTP is the GPRS (general packet radio service) tunneling protocol. The tunnel endpoint identifier (TEID) is a field in the GTP header. TEID hashing can be enabled on Layer 3 interfaces. The hash algorithm identifies the GTP-U protocol by checking the UDP destination port (2152) of an IP packet to be hashed. If the value of the port matches, the packet is assumed to be GTP-U. For GTPv1 packets, the TEID value from the expected header location is then included in the hash. For GTPv2 packets, the TEID flag value in the expected header is additionally checked to verify whether the TEID is present. If the TEID is present, it is included in the hash algorithm inputs.

TEID load balancing is configured at the router interface level using the **config>router>if>teid-load-balancing** command. It can also be configured at the IES or VPRN service interface level.

For LSR LDP ECMP, TEID load balancing is configured using the **lbl-ip-l4-teid** option in the **lsr-load-balancing command** at the system level or router interface level. Configuration at the router interface level overrides the system-level configuration for the specified interface.

TEID load balancing can also be configured at the service level for Epipe and VPLS services. TEID load balancing at the service level is not impacted by TEID load balancing at the router interface or service interface levels.

3.2.14.6 Entropy Labels

The 7705 SAR supports MPLS entropy labels on RSVP-TE and SR-TE LSPs, as per RFC 6790. The entropy label provides greater granularity for load balancing on an LSR where load balancing is typically based on the MPLS label stack.

If an ELI is found in the label stack, the entropy label is used as the hash result and hashing continues based on the configuration of label-only (**lbl-only**) or label-IP (**lbl-ip**) options. For information on the behavior of LSR hashing when entropy label is enabled, see [LSR Hashing](#).

To support entropy labels on RSVP-TE and SR-TE LSPs:

- the eLER must signal to the ingress node that entropy label capability (ELC) is enabled, meaning that the eLER can receive and process an entropy label for an LSP tunnel. Entropy labels are supported on RSVP-TE and SR-TE tunnels. Entropy labels are not supported on point-to-multipoint LSPs, BGP tunnels, or LDP FECs.

- the iLER must receive the entropy label capability signal and be configured to enable the insertion of entropy labels for the spoke SDP, mesh SDP, or EVPN endpoint. Inserting an entropy label adds two labels in the MPLS label stack: the entropy label itself and the ELI.

At the eLER, use the **config>router>rsvp>entropy-label-capability** command to enable entropy label capability on RSVP-TE LSPs.

At the iLER, use the **entropy-label** command to enable the insertion of the entropy label into the label stack. The command is found under the following services and protocols:

- Epipe and VPLS
 - **config>service>epipe>spoke-sdp**
 - **config>service>epipe>bgp-evpn>mpls**
 - **config>service>vpls>spoke-sdp**
 - **config>service>vpls>mesh-sdp**
 - **config>service>vpls>bgp-evpn>mpls**
- IS-IS, OSPF, and MPLS
 - **config>router>isis>segment-routing**
 - **config>router>ospf>segment-routing**
 - **config>router>mpls**

For details on entropy labels, refer to the “MPLS Entropy Labels” section in the 7705 SAR MPLS Guide.

3.2.14.7 Security Parameter Index (SPI) Load Balancing

SPI load balancing provides a mechanism to improve the hashing performance of IPsec encrypted traffic. IPsec-tunneled traffic transported over a LAG typically relies on IP header hashing only. For example, in LTE deployments, TEID hashing cannot be performed because of encryption, and the system performs IP-only tunnel-level hashing. Because each SPI in the IPsec header identifies a unique SA, and therefore a unique flow, these flows can be hashed individually without impacting packet ordering. In this way,

The 7705 SAR allows enabling SPI hashing per Layer 3 interface (this is the incoming interface for hash on system egress) or per Layer 2 VPLS service. When SPI hashing is enabled, an SPI value from the ESP/AH header is used in addition to any other IP hash input based on the per-flow hash configuration: source/destination IPv4/IPv6 addresses and Layer 4 source/destination ports in case NAT traversal is required and Layer 4 load balancing is enabled. If the ESP/AH header is not present in a packet received on a given interface, the SPI will not be part of the hash inputs and the packet is hashed as per other hashing configurations. SPI hashing is not used for fragmented traffic in order to ensure that first and subsequent fragments use the same hash inputs.

SPI hashing is supported for IPv4 and IPv6 tunnel unicast traffic.

3.2.15 SONET/SDH

This section contains information on the following topics:

- [SONET](#)
- [SDH](#)
- [SONET/SDH Path Support](#)

The 7705 SAR supports SONET/SDH ports on the following adapter cards:

- 4-port OC3/STM1 Clear Channel Adapter card
- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card

SONET/SDH ports can be clear channel (non-channelized) and channelized. The 4-port OC3/STM1 Clear Channel Adapter card supports only clear channel ports. The 2-port OC3/STM1 Channelized Adapter card supports channelized ports. The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card is a mixed-use adapter card that supports clear channel and channelized ports. The **mda-mode** command is used to configure the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card for 4-port or 1-port mode. See [Configuring Cards](#) for details.

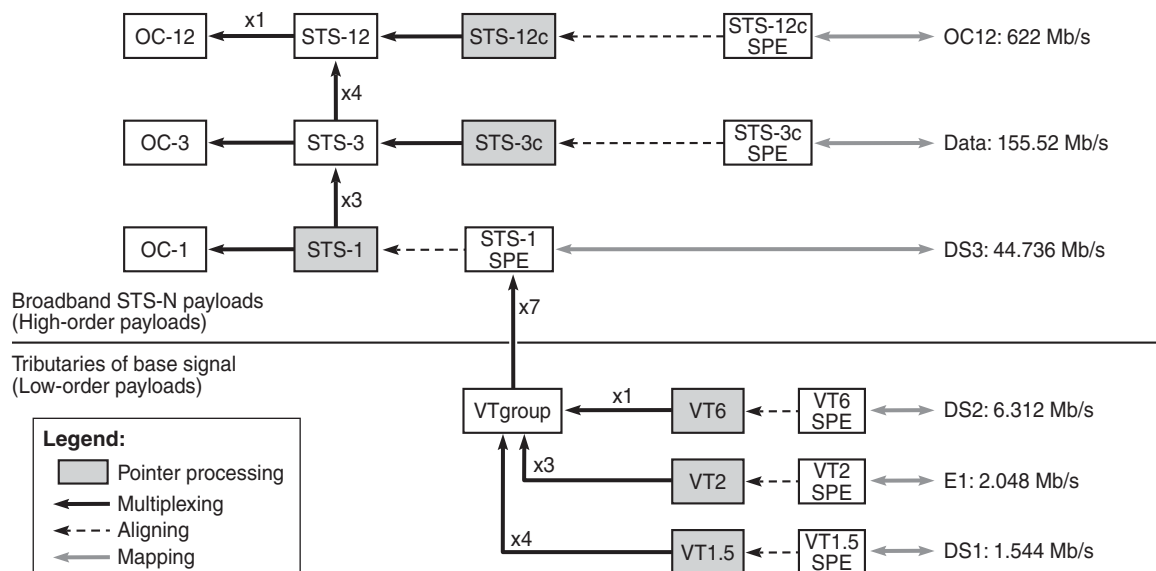
Clear channel ports use the whole port—other than overhead bytes—as a single stream of bits. Channelized ports use various channel hierarchies to split the larger bandwidth into smaller channels, such as DS1, E1, DS3, or E3. [Figure 11](#) and [Figure 12](#) show the standards-based channel mapping for SONET and SDH, respectively. Channelized ports on the 2-port OC3/STM1 Channelized Adapter card and the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card support a subset of the standards-based mapping options, as shown in [Table 15](#).

For SONET, the basic frame format unit is STS-1 (51.84 Mb/s), which is carried in the optical carrier level 1 (OC-1) signal, and three STS-1 frames can be carried in an STS-3 frame at the OC-3 level. For SDH, the basic frame format unit is STM-1 (155.52 Mb/s), which is carried in an OC-3 signal. SDH STM-1 using OC-3 and SONET STS-3 are functionally equivalent.

3.2.15.1 SONET

Figure 11 shows the SONET hierarchy at STS-12 (OC-12).

Figure 11 SONET Hierarchy at STS-12



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A SONET multiplexing structure allows several combinations of signal transportation. For example, at the STS-3 (OC-3) level:

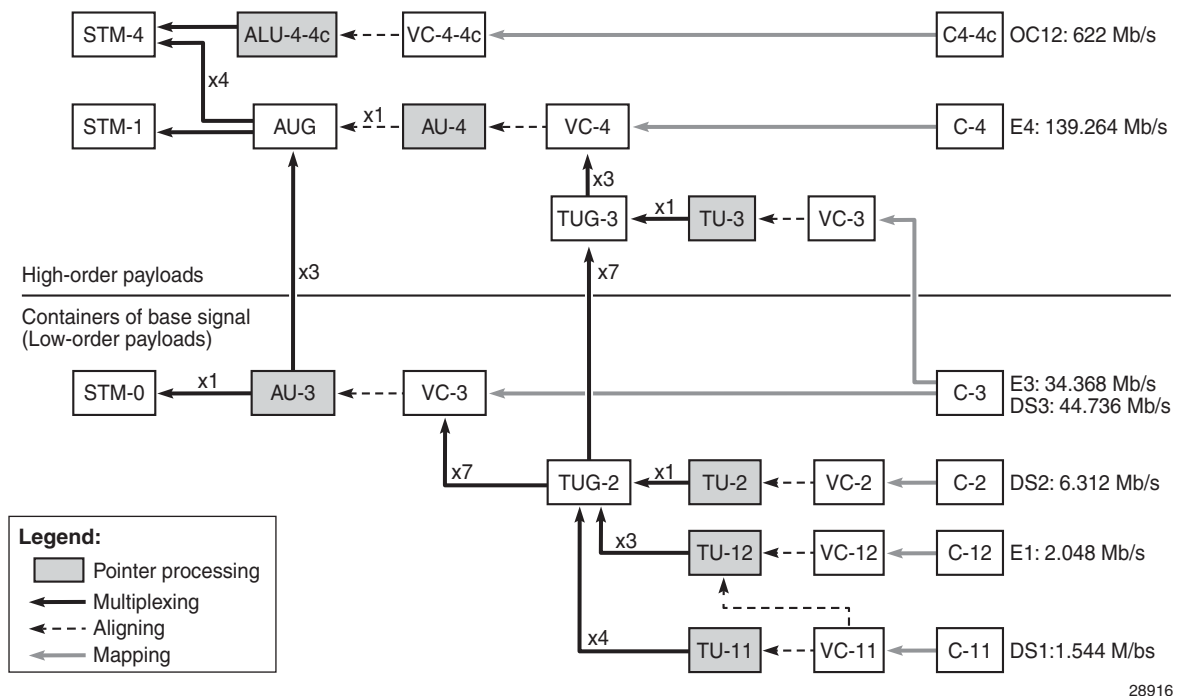
- STS-3 is achieved by interleaving three STS-1s byte by byte
- an STS-1 payload can be subdivided into virtual tributary groups (VTGs) and virtual tributaries (VTs). Each STS-1 may contain seven VTGs, which in turn carry sub-STS traffic in VTs. There are four VT sizes:
 - VT1.5 (1.728 Mb/s) (typically used for DS1, indicated in the CLI as **vt15**)
 - VT2 (2.304 Mb/s) (typically transports one E1)
 - VT3 (3.456 Mb/s) (not shown in Figure 11)
 - VT6 (6.912 Mb/s)

- each VTG can contain four VT1.5s, three VT2s, two VT3s, or one VT6
- each VTG can carry only VTs of the same size

3.2.15.2 SDH

Figure 12 shows the SDH hierarchy at STM-4 (OC-12).

Figure 12 SDH Hierarchy at STM-4



An SDH multiplexing structure allows several combinations of signal transportation. For example, at the STM-1 (OC-3) level:

- one STM-1 payload supports one administrative unit group (AUG)
- each AUG can contain either three administrative units (AU-3s) or a single AU-4

For example, the hierarchical possibilities for a single AU-4 are:

- each AU-4 transports data via a virtual container (VC-4)
- a VC-4 consists of three tributary unit groups (TUG-3s), where either:
 - a single tributary unit (TU-3) can be multiplexed via a TUG-3, containing a VC-3 plus the VC-3 path overhead (POH) and TU-3 pointer

- seven TUG-2s can be multiplexed via a TUG-3, where each TUG-2 can contain one TU-2, three TU-12s, or four TU-11s
- the AU-4 structure addresses the data as (K, L, M), where K is the TUG-3 number, L is the TUG-2 number, and M is the TU-11/TU-12 number

3.2.15.3 SONET/SDH Path Support

The 7705 SAR supports a subset of the standards-based channel mapping options. [Table 15](#) shows path support on the 7705 SAR.



Note: When configuring a port for SDH framing, the 7705 SAR CLI uses SONET STS-*n* frame conventions. That is, SONET command syntax and nomenclature is used to configure both a SONET port and an SDH port.

The 7705 SAR CLI always uses the SONET VT frame convention. For example, the same SONET CLI syntax and nomenclature would be used to configure both a VT1.5 and a VC11. The **framing {sonet | sdh}** command determines whether VTs or VCs are being configured. Use the **show>port-tree port-id** command to display the SONET/SDH path containers.

Table 15 SONET/SDH Paths Supported on the 7705 SAR

Path Type	Port Framing	Path Configuration	2-port OC3/ STM1 Channelized Adapter Card	4-port OC3/STM1 / 1-port OC12/STM4 Adapter Card	
				4-port Mode	1-port Mode
OC3 clear channel	SDH	STM1>AUG1>VC4		Yes	
OC3 clear channel	SONET	OC3>STS3>STS3c SPE		Yes	
E1	SDH	STM1>AUG1>VC4>TUG3>TUG2>VC12	Yes	Yes	
E1	SDH	STM1>AUG1>VC3>TUG2>VC12	Yes	Yes	
E1	SDH	STM1>AUG1>VC4>TUG3>VC3>DS3	Yes		
E1	SDH	STM1>AUG1>VC3>DS3	Yes		
E1	SONET	OC3>STS1 SPE>DS3	Yes		
DS1	SDH	STM1>AUG1>VC4>TUG3>TUG2>TU11>VC11	Yes	Yes	
DS1	SDH	STM1>AUG1>VC3>TUG2>VC11	Yes	Yes	
DS1	SDH	STM1>AUG1>VC4>TUG3>VC3>DS3	Yes		
DS1	SDH	STM1>AUG1>VC3>DS3	Yes		

Table 15 SONET/SDH Paths Supported on the 7705 SAR (Continued)

Path Type	Port Framing	Path Configuration	2-port OC3/ STM1 Channelized Adapter Card	4-port OC3/STM1 / 1-port OC12/STM4 Adapter Card	
				4-port Mode	1-port Mode
DS1	SONET	OC3>STS1 SPE>VT GROUP>VT1.5 SPE	Yes	Yes	
DS1	SONET	OC3>STS1 SPE>DS3	Yes		
OC12 clear channel	SDH	STM4>AUG4>VC4-C4			Yes
OC12 clear channel	SONET	OC12>STS12>STS12c SPE			Yes
E1 using STS-3	SDH	STM4>AUG4>AUG1>VC4>TUG3>TUG2>VC12			Yes
E1 using STS-1	SDH	STM4>AUG4>AUG1>VC3>TUG2>VC12			Yes
DS1 using STS-3	SDH	STM4>AUG4>AUG1>VC4>TUG3>TUG2>TU11>VC11			Yes
DS1 using STS-1	SDH	STM4>AUG4>AUG1>VC3>TUG2>VC11			Yes
DS1 using STS-1	SONET	OC12>STS12>STS1 SPE >VT GROUP >VT1.5 SPE			Yes

3.2.15.3.1 SONET/SDH Channelized Port ID

When configuring a SONET/SDH port, users configure both SONET/SDH and TDM aspects of a channel. The CLI uses the *sonet-sdh-index* variable to identify a channel in order to match SONET/SDH parameters with TDM parameters for the channel.

A channelized port ID has one of the syntaxes shown in [Table 16](#), as applicable to channelization and mapping options. In [Table 16](#), the syntax contains port and path components, where the port is *slot/mda/port* and the path is the *sonet-sdh-index*. The *sonet-sdh-index* has one or more indexes (indicated by braces separated by a dot) and can have a high-level path label (indicated by bold text).

For example, in the highlighted row, *port.sts1*-{1 to 3} represents a SONET/SDH port divided into STS-1 (or STM-0) payloads identified as **sts1-1**, **sts1-2**, and **sts1-3**.

Table 16 SONET/SDH Channelized Port Syntax Examples

Port ID for Physical Port Speed			
Channel Speed	OC12/STM4	OC3/STM1	DS3/E3
SONET/SDH			
STS12/STM4	<i>port.sts12</i>	N/A	N/A
STS3/STM1	<i>port.sts3</i> -{1 to 4}	<i>port.sts3</i>	N/A
STS1/STM0	<i>port.sts1</i> -{1 to 4}.{1 to 3}	<i>port.sts1</i> -{1 to 3}	N/A
TUG3	<i>port.tug3</i> -{1 to 4}.{1 to 3}	<i>port.tug3</i> -{1 to 3}	N/A
TU3	N/A	<i>port.tu3</i> -{1 to 3}	N/A
VT1.5/VC1.1 ¹	<i>port.vt15</i> -{1 to 4}.{1 to 3}.{1 to 4}.{1 to 7}	<i>port.vt15</i> -{1 to 3}.{1 to 4}.{1 to 7}	N/A
VT2/VC12 ¹	<i>port.vt2</i> -{1 to 4}.{1 to 3}.{1 to 3}.{1 to 7}	<i>port.vt2</i> -{1 to 3}.{1 to 3}.{1 to 7}	N/A
TDM			
DS3/E3	N/A	<i>port</i> .{1 to 3}	<i>port</i>
DS1 in DS3	N/A	<i>port</i> .{1 to 3}.{1 to 28}	<i>port</i> .{1 to 28}
DS1 in VT2	<i>port</i> .{1 to 4}.{1 to 3}.{1 to 3}.{1 to 7}	<i>port</i> .{1 to 3}.{1 to 3}.{1 to 7}	N/A
DS1 in VT1.5	<i>port</i> .{1 to 4}.{1 to 3}.{1 to 4}.{1 to 7}	<i>port</i> .{1 to 3}.{1 to 4}.{1 to 7}	N/A
E1 in DS3	N/A	<i>port</i> .{1 to 3}.{1 to 21}	<i>port</i> .{1 to 21}
E1 in VT2	<i>port</i> .{1 to 4}.{1 to 3}.{1 to 3}.{1 to 7}	<i>port</i> .{1 to 3}.{1 to 3}.{1 to 7}	N/A
N*DS0 in DS1 in DS3	N/A	<i>port</i> .{1 to 3}.{1 to 28}.{1 to 24}	<i>port</i> .{1 to 28}.{1 to 24}
N*DS0 in DS1 in VT2	<i>port</i> .{1 to 4}.{1 to 3}.{1 to 3}.{1 to 7}.{1 to 24}	<i>port</i> .{1 to 3}.{1 to 3}.{1 to 7}.{1 to 24}	N/A
N*DS0 in DS1 in VT1.5	<i>port</i> .{1 to 4}.{1 to 3}.{1 to 4}.{1 to 7}.{1 to 24}	<i>port</i> .{1 to 3}.{1 to 4}.{1 to 7}.{1 to 24}	N/A
N*DS0 in E1 in DS3	N/A	<i>port</i> .{1 to 3}.{1 to 21}.{2 to 32}	<i>port</i> .{1 to 21}.{2 to 32}
N*DS0 in E1 in VT2	<i>port</i> .{1 to 4}.{1 to 3}.{1 to 3}.{1 to 7}.{2 to 32}	<i>port</i> .{1 to 3}.{1 to 3}.{1 to 7}.{2 to 32}	N/A

Note:

1. Supported by TDM satellite.

3.2.16 Automatic Protection Switching

This section contains information on the following topics:

- [APS Overview](#)
- [SC-APS](#)
- [MC-APS](#)
- [K1 and K2 Bytes](#)
- [Revertive Mode](#)
- [APS Tools Commands](#)
- [APS Failure Codes](#)

3.2.16.1 APS Overview

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. 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.

When APS is enabled, the 7705 SAR 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 traffic loss. Traffic is streamed from the protection port until the fault on the working port is cleared, at which time the traffic may optionally revert to the working port.

The 7705 SAR supports 1+1 single-chassis APS (SC-APS) and 1+1 multi-chassis APS (MC-APS). In an SC-APS group, both the working and protection circuit must be configured on the same node. In an MC-APS group, the working and protection circuits are configured on two separate nodes, providing protection from node failure in addition to protection from link and hardware failure.

Unidirectional and bidirectional modes are supported:

- unidirectional APS (Uni-1Plus1) — in unidirectional mode, only the port in the failed direction switches to the protection port. Unidirectional mode is supported only on SC-APS.

- **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 and is supported on both SC-APS and MC-APS.

For SC-APS and MC-APS with MEF 8 services where the remote device performs source MAC validation, the MAC address of the channel group in each of the redundant interfaces may be configured to the same MAC address using the **mac** CLI command.

3.2.16.2 SC-APS

In an SC-APS group, both the working and protection circuits terminate on the same node. SC-APS is supported in unidirectional or bidirectional mode on:

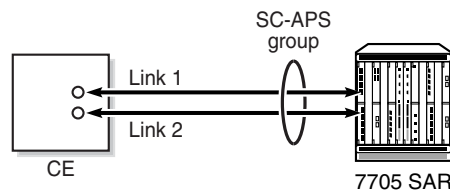
- 2-port OC3/STM1 Channelized Adapter cards for TDM CES (Cpipes) and TDM CESoETH with MEF 8 with DS3/DS1/E1/DS0 channels
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter cards for MLPPP access ports or TDM CES (Cpipes) and TDM CESoETH (MEF 8) access ports with DS1/E1 channels, or on a network port configured for POS
- 4-port OC3/STM1 Clear Channel Adapter cards network side (configured for POS operation)

SC-APS with TDM access is supported on DS3, DS1, E1, and DS0 (64 kb/s) channels.

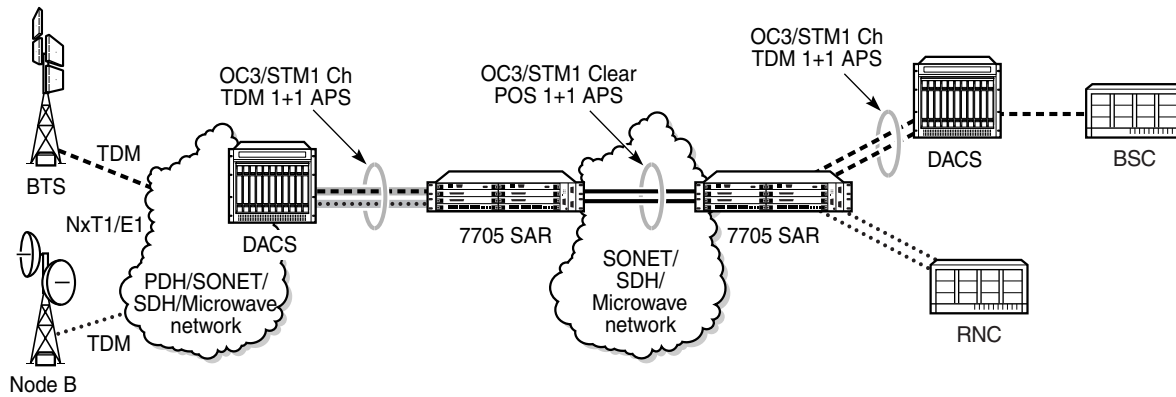
The working and protection circuits of an SC-APS group must be on two ports on different adapter cards.

[Figure 13](#) shows an SC-APS group with physical port and adapter card failure protection. [Figure 14](#) shows a packet network using SC-APS.

Figure 13 SC-APS with Physical Port and Adapter Card Protection



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Figure 14 SC-APS Application

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3.2.16.3 MC-APS

MC-APS extends the functionality offered by SC-APS to include protection against 7705 SAR node failure. MC-APS is supported in bidirectional mode on:

- 2-port OC3/STM1 Channelized Adapter cards for TDM CES (Cpipes) and TDM CESoETH with MEF 8 with DS3/DS1/E1/DS0 channels
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter cards for MLPPP access ports or CES (Cpipes) and TDM CESoETH (MEF 8) access ports with DS1/E1 channels

MC-APS with TDM access is supported on DS3, DS1, E1, and DS0 (64 kb/s) channels. TDM SAP-to-SAP with MC-APS is not supported.

With MC-APS, the working circuit of an APS group can be configured on one 7705 SAR node while the protection circuit of the same APS group is configured on a different 7705 SAR node. The working and protection nodes are connected by an IP link that establishes an MC-APS signaling path between the nodes.

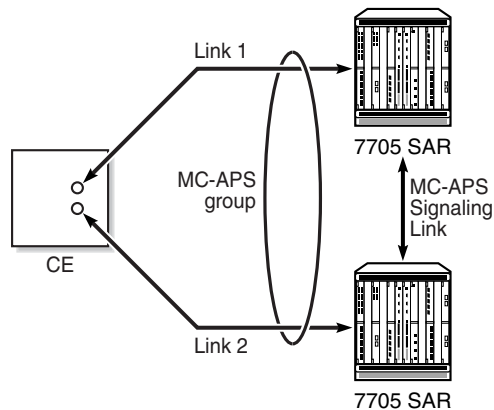
The working and protection circuits must have compatible configurations, such as the same speed, framing, and port type. The circuits in an APS group on both the working and protection nodes must also have the same group ID, but they can have different port descriptions. In order for MC-APS to function correctly, pseudowire redundancy must be configured on both the working and protection circuits. For more information, refer to 7705 SAR Services Guide. MC-APS with pseudowire redundancy also supports Inter-Chassis Backup (ICB); see [MC-APS and Inter-Chassis Backup](#) for more information.

The working and protection nodes can be different platforms, such as a 7705 SAR-8 Shelf V2 and a 7705 SAR-18. However, to prevent possible switchover performance issues, avoid mixing different platform types in the same MC-APS group. The 7705 SAR does not enforce configuration consistency between the working circuit and the protection circuit. Additionally, no service or network-specific configuration data is signaled or synchronized between the two routers.

An MC-APS signaling path is established using the IP link between the two routers by matching APS group IDs. A heartbeat protocol can also be used to add robustness. The signaling path verifies that one router is configured as the working circuit and the other is configured as the protection circuit. In case of a mismatch, an incompatible neighbor trap is generated. The protection router uses K1/K2 byte data, member circuit status, and the settings configured for the [APS Tools Commands](#) to select the working circuit. Changes in working circuit status are sent across the MC-APS signaling link from the working router to keep the protection router synchronized. External requests such as lockout, force, and manual switches are allowed only on the node with the protection circuit.

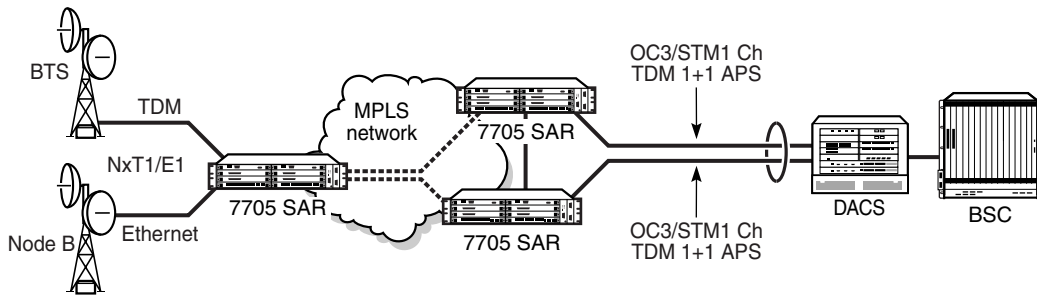
[Figure 15](#) shows an MC-APS group with physical port, adapter card, and node protection. [Figure 16](#) shows a packet network using MC-APS.

Figure 15 MC-APS with Physical Port, Adapter Card and Node Protection



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Figure 16 MC-APS Application

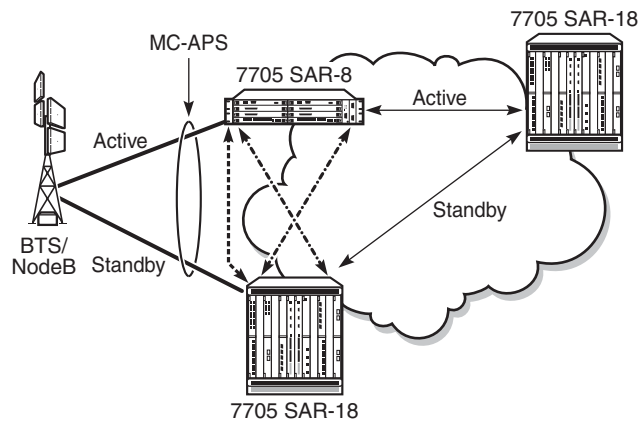


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3.2.16.3.1 MC-APS and Inter-Chassis Backup

Inter-Chassis Backup (ICB) spoke SDPs are supported for use with Cpipe services in an MC-APS configuration. ICB improves switch times, provides additional protection in case of network failures, and reduces packet loss when an active endpoint is switched from a failed MC-APS node to the protection node. [Figure 17](#) shows an MC-APS group with pseudowire redundancy and ICB protection.

Figure 17 MC-APS with Pseudowire Redundancy and ICB



Legend:

- - - - - Optional ICB Spoke SDP
- - - - - MC Protocol
- Redundant PWs

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If the active link on the access side fails, an MC-APS switchover is triggered and a pseudowire switchover occurs. A failure on the network side triggers a pseudowire switchover but not an MC-APS switchover. For detailed information on pseudowire redundancy with ICB protection, refer to the 7705 SAR Services Guide, “PW Redundancy and Inter-Chassis Backup”.

3.2.16.4 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 end and far end.

The switch priority of a request is assigned by bits 1 through 4 of the K1 byte, as shown in [Table 17](#).

Table 17 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
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 18](#)).

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 18](#).

Table 18 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
	001	Reserved for future use
	000	Reserved for future use

3.2.16.4.1 Bidirectional 1+1 APS example

Table 19 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 19 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

3.2.16.5 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 0 to 60 min in increments of 1 min; the default value is 5 min. In some scenarios, performance issues can occur if the **revert-time** is set to 0; therefore, it is recommended that the **revert-time** always be set to a value of 1 or higher. 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 duration 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.

3.2.16.6 APS Tools Commands

3.2.16.6.1 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 OAM and Diagnostics Guide, "Tools", for information on the APS lockout command.

3.2.16.6.2 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 OAM and Diagnostics Guide, "Tools", for information on the APS request command.

3.2.16.6.3 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 OAM and Diagnostics Guide, “Tools”, for information on the APS request command.

3.2.16.6.4 Forced Switch from Working to Protection

The command **tools>perform>aps>force>working** forces an activity switch away from the working line to the protection line 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** command or by 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 OAM and Diagnostics Guide, “Tools”, for information on the APS **force** command.

3.2.16.6.5 Forced Switch from Protection to Working

The command **tools>perform>aps>force>protect** forces an activity switch away from the protection line and back to the working line unless a request of equal or higher priority is already in effect. Refer to the 7705 SAR OAM and Diagnostics Guide, “Tools”, for information on the APS **force** command.

3.2.16.6.6 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 OAM and Diagnostics Guide, “Tools”, for information on the APS exercise command.

3.2.16.7 APS Failure Codes

3.2.16.7.1 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.

3.2.16.7.2 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.

3.2.16.7.3 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.

3.2.16.7.4 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. This alarm can only be raised by the active port operating in bidirectional mode. When the failure is absent for 10 s, the alarm is cleared.

3.2.17 T1/E1 Line Card Redundancy

This section contains information on the following topics:

- [T1/E1 LCR Overview](#)
- [SC-LCR](#)
- [MC-LCR](#)
- [Revertive Mode](#)
- [LCR Tools Commands](#)

3.2.17.1 T1/E1 LCR Overview

T1/E1 Line Card Redundancy (LCR) uses redundant adapter cards to protect T1/E1 services in case of hardware failures. T1/E1 LCR provides protection against adapter card or node failures. When T1/E1 LCR is used in conjunction with pseudowire redundancy, the network path between the endpoints is also protected. Protection is provided specifically for Cpipe services at the clear channel level and at the channelized level.

When T1/E1 LCR is enabled, the 7705 SAR constantly monitors the health of the adapter cards. If the active (working) adapter card fails (for example, because a card has been removed or due to a bus error), the system proceeds through a predefined sequence of steps to transfer (or switch over) traffic processing to the protection MDA. This switchover is done very quickly to minimize traffic loss. Traffic is moved to the protection adapter card until the fault on the working adapter card is cleared, at which time the traffic may optionally revert to the working adapter card.

T1/E1 LCR is supported on the following cards on the 7705 SAR-8 Shelf V2 and the 7705 SAR-18:

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

T1/E1 LCR includes support for single-chassis LCR (SC-LCR) and multi-chassis LCR (MC-LCR). In an SC-LCR group, both the working and protection adapter cards must be configured on the same node. In an MC-LCR group, the working adapter card and protection adapter card are configured on two separate nodes, providing protection from node failure in addition to protection from adapter card hardware failure.

3.2.17.2 SC-LCR

In an SC-LCR group, both the working and protection adapter cards are configured with the same LCR group ID on the same node. The working and protection adapter cards are required to be the same type.

SC-LCR is supported for TDM CES (Cpipes). SC-LCR with TDM access is supported on DS1, E1, and DS0 (64 kb/s) channels.

SC-LCR supports TDM SAP-to-SAP connections when both SAPs are configured as LCR SAPs.

SC-LCR also supports TDM SAP-to-spoke SDP connections over an MPLS network. In this configuration, the far-end connection may or may not be configured for LCR.

3.2.17.3 MC-LCR

MC-LCR extends the functionality offered by SC-LCR to include protection against 7705 SAR node failure. With MC-LCR, the working adapter card of an LCR group is configured on one 7705 SAR node while the protection adapter card of the same LCR group is configured on a different 7705 SAR node. The working and protection nodes are connected by an IP link (directly or indirectly) that establishes a multi-chassis protocol (MCP) link between the nodes.

MC-LCR is supported for TDM CES (Cpipes). MC-LCR with TDM access is supported on DS1, E1, and DS0 (64 kb/s) channels.

MC-LCR supports TDM SAP-to-SAP connections when both LCR SAPs are configured using the same adapter card on each node.

MC-LCR also supports TDM SAP-to-spoke SDP connections over an MPLS network. In this configuration, the far-end connection may or may not be configured for LCR.

The working and protection adapter cards must be the same type and must have compatible configurations, such as the same speed, framing, and port type. The adapter cards in an LCR group on both the working and protection nodes must also have the same group ID. The LCR groups can have different descriptions. In order for MC-LCR to function correctly, pseudowire redundancy must be configured on both the working and protection adapter cards. For information about pseudowire redundancy, refer to the 7705 SAR Services Guide, "Pseudowire Redundancy". MC-LCR with pseudowire redundancy also supports Inter-Chassis Backup (ICB); see [MC-LCR and Inter-Chassis Backup](#) for more information.



Note: The working and protection nodes can be different platforms, such as a 7705 SAR-8 Shelf V2 and a 7705 SAR-18. However, to prevent possible switchover performance issues, avoid mixing different adapter card types in the same MC-LCR group. The 7705 SAR does not enforce configuration consistency between the working adapter card and the protection adapter card. Additionally, no service or network-specific configuration data is signaled or synchronized between the two nodes.

An MCP link can be established using the IP link between the two nodes by matching LCR group IDs. The signaling path verifies that one node is configured as the working adapter card and the other is configured as the protection adapter card. In case of a mismatch, an incompatible neighbor trap is generated. The protection node uses member adapter card status and the settings configured in the [LCR Tools Commands](#) to select the working adapter card. Changes in working adapter card status are sent across the MC-LCR signaling link from the working node to keep the protection node synchronized. External requests such as lockout and force switch are allowed only on the node with the protection adapter card.

3.2.17.3.1 MC-LCR and Inter-Chassis Backup

ICB spoke SDPs are supported for use with Cpipe services in an MC-LCR configuration. ICB improves switch times, provides additional protection in case of network failures, and reduces packet loss when an active endpoint is switched from a failed MC-LCR node to the protection node.

If the active link on the access side fails, an MC-LCR switchover is triggered and a pseudowire switchover is subsequently triggered. A failure on the network side triggers a pseudowire switchover but not an MC-LCR switchover. For detailed information on pseudowire redundancy with ICB protection, refer to the *7705 SAR Services Guide*, “PW Redundancy and Inter-Chassis Backup”.

3.2.17.4 Revertive Mode

T1/E1 LCR provides revertive and non-revertive modes; non-revertive mode is the default option. In revertive mode, the activity is switched back to the working adapter card after it has recovered from a failure. In non-revertive mode, a switch to the protection adapter card is maintained even after the working adapter card has recovered from a failure.

To prevent frequent automatic switches that result from intermittent failures, a **revert-time** is defined for revertive switching. The **revert-time** is configurable from 0 to 60 min in increments of 1 min; the default value is 5 min. In some scenarios, performance issues can occur if the **revert-time** is set to 0; therefore, it is recommended that the **revert-time** always be set to a value of 1 or higher. 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 duration of a WTR timer that has already been started. The WTR timer of a non-revertive switch can be assumed to be infinite.

3.2.17.5 LCR Tools Commands

The LCR **tools** commands can only be executed on the node used in an SC-LCR group or on the protection node of an MC-LCR group. The commands can not be executed on the working node of an MC-LCR group.

3.2.17.5.1 Force Activity from Working Card

The **tools>perform>lcr>force>working** command forces activity away from the working adapter card to the protection adapter card so that the protection adapter card becomes active unless an internal request of equal or higher priority is already in effect. When this command is in effect, it can be overridden either by a **tools>perform>lcr>lockout** command or by a signal fault on the protection adapter card. If the protection adapter card is already the active adapter card, no action takes place. Refer to the 7705 SAR OAM and Diagnostics Guide, "Tools", for information on the LCR **force** command.

3.2.17.5.2 Force Activity from Protection Card

The **tools>perform>lcr>force>protect** command forces activity away from the protection adapter card to the working adapter card so that the working adapter card becomes active unless an internal request of equal or higher priority is already in effect. Refer to the 7705 SAR OAM and Diagnostics Guide, "Tools", for information on the LCR **force** command.

3.2.18 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.

3.2.19 Microwave Link

This section contains information on the following topics:

- [Microwave Link Overview](#)
- [Standalone Mode](#)
- [Single NE Mode](#)
- [Frequency Synchronization](#)
- [RSL History](#)

3.2.19.1 Microwave Link Overview

A microwave link allows a 7705 SAR-8 Shelf V2 or 7705 SAR-18 to be connected to a 9500 MPR-e radio node. The MPR-e is the zero-footprint (outdoor) microwave solution offered by Nokia that allows customers to migrate from TDM microwave to pure packet microwave. The following MPR-e radio variants are supported:

- MPT-MC - Microwave Packet Transport, Medium Capacity (ODU)
- MPT-HC V2/9558HC - Microwave Packet Transport, High Capacity Version 2 (ODU)
- MPT-XP - Microwave Packet Transport, High Capacity (very high power version of the MPT-HC V2/9558HC) (ODU)
- MPT-HQAM - Microwave Packet Transport, High Capacity (MPT-HC-QAM) or Extended Power (MPT-XP-QAM) with 512/1024 QAM (ODU)
- MPT-HLC and MPT-HLC plus - Microwave Packet Transport, High-Capacity Long-Haul Cubic (ANSI) (IDU)

A microwave link is configured on a 7705 SAR-8 Shelf V2 or 7705 SAR-18 as a virtual port object (not as a physical port) using the CLI command **mw-link-id** (for more information on how to configure a microwave link, see [Microwave Link Commands](#)).



Note: Before a microwave link can be configured, the current 7705 SAR software package that includes the MPR-e radio software must be downloaded from OLCS to the 7705 SAR-8 Shelf V2 or 7705 SAR-18. See [MPR-e Radio Software and Upgrade Management](#) for more information.

The supported microwave link types are 1+0 and 1+1 Hot Standby (HSB). To deploy an N+0 link (with $N \geq 2$), multiple links of 1+0 can be configured separately.

A microwave link connection is made from ports 1 through 4 on a Packet Microwave Adapter card to an MPR-e radio using one of the methods described in the 7705 SAR Packet Microwave Adapter Card Installation Guide, “Delivering Data to an MPR-e Radio”. The radio can be configured in standalone mode to provide a basic microwave connection as described in [Standalone Mode](#) or in Single Network Element (Single NE) mode to provide the advanced networking capabilities described in [Single NE Mode](#). The default configuration is Single NE mode.

When connected to an MPR-e radio, these ports, with microwave link configured, operate as Gigabit Ethernet ports and provide the same features as the other ports (ports 5 through 8), except for the following:

- 802.1x authentication
- active/standby operation on Ethernet access ports configured as LAGs
- hard policing on Ethernet ports

If a microwave link is not configured on ports 1 through 4, they provide all of the same features as the other Gigabit Ethernet ports (ports 5 through 8).

3.2.19.2 Standalone Mode

A microwave link from ports 1 through 4 on a Packet Microwave Adapter card to an MPR-e radio that is configured in standalone mode provides a basic microwave connection to the MPR-e radio. In standalone mode, each MPR-e radio that is connected to a 7705 SAR-8 Shelf V2 or 7705 SAR-18 is managed as a separate standalone NE by the MPT Craft Terminal (MCT) Element Manager.

3.2.19.3 Single NE Mode

A microwave link from ports 1 through 4 on a Packet Microwave Adapter card to an MPR-e radio that is configured in Single NE mode provides the following networking capabilities to the radio over the microwave link:

- [Single NE Management](#)
- [Microwave Link Fast Fault Detection \(FFD\)](#)
- [1+1 HSB](#)
- [1+1 Switching Operation](#)

3.2.19.3.1 Single NE Management

MWA allows the 7705 SAR-8 Shelf V2 or 7705 SAR-18 and the MPR-e radios to which it is connected to be integrated and managed as a Single NE. The following features are part of Single NE management:

- [One Management IP Address](#)
- [MPR-e Radio Configuration Management](#)
- [MPR-e Radio Alarm Management](#)
- [MPR-e Radio Software and Upgrade Management](#)
- [MPR-e Radio Configuration Database File Management](#)
- [MPR-e Radio Inventory and Microwave Link Performance Statistics](#)
- [MPR-e Radio Reset Control](#)
- [MPR-e Radio Mute Control](#)

One Management IP Address

The individual management and IP address of the MPR-e radios are no longer required for network management. When managing a microwave network (consisting of a 7705 SAR-8 Shelf V2 or 7705 SAR-18 that is connected to one or more MPR-e radios) using an element/network manager, only the IP address of the 7705 SAR-8 Shelf V2 or 7705 SAR-18 needs to be entered. This capability optimizes the microwave network's IP addressing plan.

MPR-e Radio Configuration Management

For an MPR-e configuration, the required MWA-specific parameters are configured on the 7705 SAR side using the CLI and the required non-MWA parameters are configured on the MPR-e side using the MCT.

The following MWA-specific parameters are configured on the 7705 SAR side:

- 1+1 HSB parameters
- Epipe VLAN SAP parameters (in a mixed microwave link scenario, where there is interworking between a 7705 SAR MPR-e system and a Wavence MSS system using a TDM2Ethernet service, specific MPR-e system parameters are configured under the Epipe VLAN SAP; for more information, refer to the 7705 SAR Services Guide, “Configuring Epipe SAP Microwave Link Parameters for Interworking with TDM2 Ethernet”).

The following parameters are configured on the MPR-e side:

- radio link parameters
- QoS classification parameters

Configuration done on the MPR-e side is collected in a configuration file; this file can be saved to a 7705 SAR-8 Shelf V2 or 7705 SAR-18 using the Commit button function on the MCT or an **admin>save** CLI command on the 7705 SAR-8 Shelf V2 or 7705 SAR-18.

MPR-e Radio Alarm Management

An MPR-e radio generates alarms for fault conditions pertaining to the MPR-e hardware and to the microwave link over which it is connected. The alarms are sent to the 7705 SAR-8 Shelf V2 or 7705 SAR-18, which turns the alarm notifications into SNMP traps and log events. These log events are controlled in the same way as all other events on the 7705 SAR-8 Shelf V2 and 7705 SAR-18 and can be displayed using the **show>log>event-control>mwmgr** command. Refer to the 7705 SAR System Management Guide, “Event and Accounting Logs”, for more information.

MPR-e Radio Software and Upgrade Management

The Single NE capability optimizes the MPR-e radio software installation and upgrade process. The MPR-e radio software is bundled with the 7705 SAR software as one package, there is no need to look for and download the MPR-e radio software separately. The 7705 SAR software package containing the MPR-e radio software can be downloaded from a directory on OLCS. The operator can copy the software package onto a compact flash or network store on the 7705 SAR-8 Shelf V2 or 7705 SAR-18.



Note: There are two TiMOS .zip files on OLCS that contain the current 7705 SAR software package; the file that contains the MPR-e radio software has the .MWA annotation in the filename. Only the MPR-e radio software that is bundled with this 7705 SAR software package is recognized as being valid by the 7705 SAR-8 Shelf V2 or 7705 SAR-18.

MPR-e Radio Configuration Database File Management

An MPR-e radio's database file is stored and backed up on a 7705 SAR-8 Shelf V2 or 7705 SAR-18. If an old MPR-e radio is replaced by a new one, the new MPR-e radio downloads the MPR-e radio software from the 7705 SAR-8 Shelf V2 or 7705 SAR-18, along with the backed-up database file of the old MPR-e radio. This means that the MPR-e radio does not need to be reconfigured after a radio hardware replacement.

A separate database file is required for each managed MPR-e radio. The user specifies the filename of the database file to be used during provisioning of the radio on the 7705 SAR-8 Shelf V2 or 7705 SAR-18 using the **config>port>mw>radio>database** CLI command.

MPR-e Radio Inventory and Microwave Link Performance Statistics

The following MPR-e radio system information and microwave link information and statistics can be accessed through a CLI session on the 7705 SAR-8 Shelf V2 or 7705 SAR-18:

- MPR-e radio system information
 - equipment type
 - inventory information
 - radio frequency band
 - temperature
 - radio transmit status

- microwave link statistics
 - MPR-e radio Ethernet statistics
 - local Tx power
 - local Rx power
 - remote Tx power
 - remote Rx power



Note: Local/remote Rx power monitoring and local/remote Tx power monitoring are also known as Receive Signal Level (RSL) monitoring and Transmit Signal Level (TSL) monitoring, respectively.

MPR-e Radio Reset Control

MPR-e radio reset control is provided on the 7705 SAR-8 Shelf V2 or 7705 SAR-18. During an MPR-e radio reset, the microwave link is brought down and an upper layer applications action is triggered, such as message rerouting and clock source switching by the System Synchronization Unit (SSU).

MPR-e Radio Mute Control

MPR-e radio mute control can be enabled through the CLI/SNMP or by using the MCT. The MCT and CLI are synchronized to show the current state of the MPR-e radio mute function.



Note: Administratively disabling the microwave link with which the MPR-e radio is associated (using the `config>port>mw-link-id>shutdown` command) causes the main and spare MPR-e radios to be muted.

3.2.19.3.2 Microwave Link Fast Fault Detection (FFD)

The microwave link Fast Fault Detection (FFD) capability allows a 7705 SAR-8 Shelf V2 or 7705 SAR-18 to directly detect MPR-e radio or microwave link faults using proprietary messaging. The following fault types are detected by FFD:

- a radio signal failure
- an MPR-e radio hardware failure
- an incompatible MPR-e radio setting

- a High Bit Error Rate (HBER) condition
- a Remote Defect Indication (RDI) condition

**Note:**

- FFD does not cause the SSU to disqualify the microwave link as a clock source if a fault condition is detected; SSM must be enabled in order to provide this function.
- The microwave link hold time (hold-up time and hold-down time) must be configured in order to suppress link flapping. The hold-up and hold-down times delay advertising the transition of the microwave link status to the upper layer applications, including IP/ MPLS and SSU. The hold-time range is between 0 and 900 s.

If microwave link faults are detected, an event is logged and the link is disabled. Some detected faults may be selectively suppressed using the **suppress-faults** command. When faults are suppressed, the event is still logged, but the microwave link is not disabled. Operators can suppress HBER faults, RSL threshold crossing faults, and/or RDI faults. By default, the system does not suppress faults for FFD.

3.2.19.3.3 1+1 HSB

MWA uses 1+1 HSB to protect against microwave link, MPR-e radio, and Packet Microwave Adapter card failures, as well as frequency channel selective fading. Additionally, hitless (errorless) switching provides zero packet loss if a switchover occurs from a main to a spare MPR-e radio.

The following are required for 1+1 HSB:

- one frequency channel
- two MWA Gigabit Ethernet ports (configured in network mode) on two different Packet Microwave Adapter cards installed in adjacent slots (for example, slot 1/ 2 or slot 5/6); port 1 on one card protects port 1 on the adjacent card, port 2 protects port 2 on the adjacent card, and so on.
- two MPR-e radios (one main and one spare), each connected to one of the MWA Gigabit Ethernet ports on a Packet Microwave Adapter card



Note: An MPR-e radio that is connected to an odd-numbered port on the Packet Microwave Adapter card must be configured as the main radio.

The following protection schemes make up 1+1 HSB:

- [1+1 Equipment Protection Switching \(EPS\)](#)
- [1+1 Transmission Protection Switching \(TPS\)](#)
- [1+1 Radio Protection Switching \(RPS\)](#)
- [1+1 HSB Transmit Diversity Antenna \(TDA\)](#)

These protection schemes are enabled using the **config>port>mw>protection** command, with the exception of Transmit Diversity Antenna, which is enabled via the MCT. They interwork with each other as described in the sections that follow.

1+1 Equipment Protection Switching (EPS)

EPS protects against MPR-e radio, MWA Gigabit Ethernet link, and Packet Microwave Adapter card failures. After the radio frames are processed by the active EPS MPR-e radio, the radio sends the Ethernet traffic down to the 7705 SAR-8 Shelf V2 or 7705 SAR-18. The standby EPS MPR-e radio does not send any Ethernet traffic down to the 7705 SAR-8 Shelf V2 or 7705 SAR-18.

The switching criteria for EPS are:

- an MPR-e radio hardware failure
- an MWA Gigabit Ethernet link failure between the 7705 SAR-8 Shelf V2 or 7705 SAR-18 and an MPR-e radio
- a Packet Microwave Adapter card connected to an active EPS MPR-e going into a missing or failure state

1+1 Transmission Protection Switching (TPS)

In a 1+1 HSB configuration, TPS protects against a microwave link transmission failure by ensuring that only one MPR-e radio at a time uses the antenna for signaling. The 7705 SAR-8 Shelf V2 or 7705 SAR-18 sends traffic to both the active and standby TPS MPR-e radios. Upon receiving the baseband traffic, both radios modulate it and up-convert it to signals. However, only the active TPS MPR-e radio transmits the RF signals; the standby TPS MPR-e radio suppresses the signals. When the active TPS MPR-e radio fails, standby radio becomes active and restores the microwave link channel.

The switching criteria for TPS are identical to EPS.

**Note:**

- The state of the EPS and TPS MPR-e radios are linked to each other. If an alarm occurs, an automatic switchover for EPS and TPS is activated simultaneously. However, if a manual switchover is configured, the switchover is decoupled and the state of the EPS and TPS MPR-e radios is no longer identical.
- A manual switchover can be configured for EPS but not for TPS.

1+1 Radio Protection Switching (RPS)

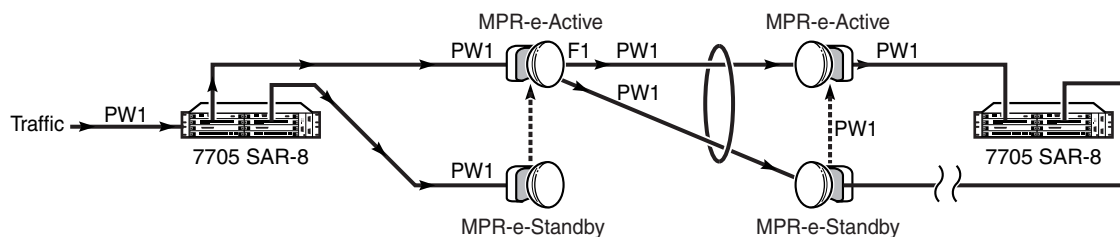
RPS is a hitless radio function that provides space diversity protection for the microwave channel. On the receive side, each MPR-e radio monitors the same radio frequency channel, with the main MPR-e radio being the active receiver by default. Both active and standby RPS MPR-e radios receive both streams of radio frames. The standby RPS MPR-e radio sends the stream of radio frames that it receives to the active EPS MPR-e radio.



Note: In order to provide space diversity (SD) for the two radio frequency channels, RPS requires that a separate antenna be mounted for each MPR-e radio.

Figure 18 shows a typical application of 1+1 HSB with SD deployment. Only one microwave frequency channel is active and only the main MPR-e radio is transmitting data to the remote ends; the spare MPR-e radio is acting as a standby.

Figure 18 1+1 HSB with SD Deployment



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1+1 HSB Transmit Diversity Antenna (TDA)

The TDA feature provides another layer of protection over a microwave link. The TDA configuration uses a main antenna mounted on one MPT-HLC or HLC plus radio and a diversity antenna mounted on another MPT-HLC or HLC plus radio. In combination with the 1+1 HSB radio configuration (redundant MPR-e radios), the traffic is transmitted on either the main antenna or the diversity antenna to achieve the Space Diversity (SD) receiver configuration.

TDA provides protection switching independent of TPS. TDA is capable of counter-acting either negative propagation conditions or permanent antenna failure.

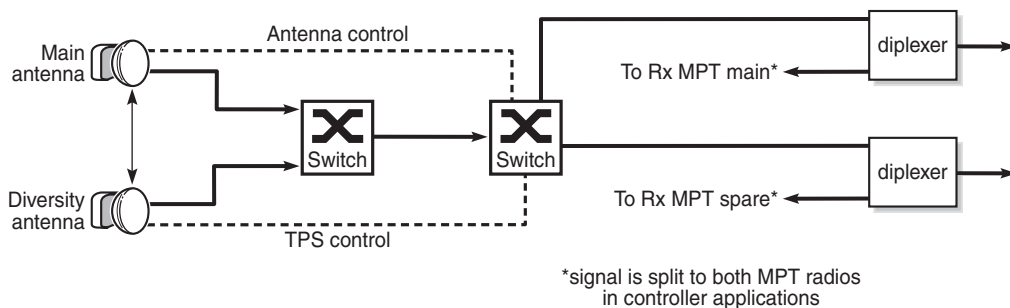
The main antenna is the default main unit that controls the antenna traffic flow using the TDA algorithm. If the main unit fails, the TDA algorithm is no longer operational on the main unit; its transmission switches over to the diversity antenna.

The non-operation of the main antenna switch does not affect transmission, even while the TDA algorithm is being transmitted on the diversity antenna.

TDA configuration is done via the MCT. TDA status is available using the 7705 SAR CLI/SNMP and via the MCT. The CLI command that is used is **show>mw>link**. The status information includes the current TDA configuration, which antenna is active, and the active antenna position.

Figure 19 shows an example of a TDA application.

Figure 19 Example of a TDA Application



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Communication Method Between the Main and Spare MPR-e Radio

In a 1+1 HSB configuration, the communication path between the main (active) and spare (standby) MPR-e radios installed on a tower is set up using a tight cable.



Note: A tight cable is required with MPT-HC V2, MPT-XP, MPT-HLC, MPT-HLC plus, and MPT-QAM radios (1+ 1 HSB is not supported on MPT-MC radios).

3.2.19.3.4 1+1 Switching Operation

The following list defines the types of EPS, TPS, and RPS MPR-e radio switching operations that can be enabled using the **tools>perform>mw>link** command. Refer to the 7705 SAR OAM and Diagnostics Guide, “Tools Command Reference”, “Tools Perform Commands”, for more information.



Note: TDA switching operation is enabled via the MCT.

- lockout—prevents the spare MPR-e radio from ever becoming the main radio, even when the main MPR-e radio fails; this operation overrides any forced, automatic, or manual operation
- forced —forces the spare MPR-e radio to become the main MPR-e radio, even though it might not be in a fit state to assume the role. A forced switch operation overrides any automatic or manual switch operation that is in place.
- automatic—allows an MPR-e radio to perform an automatic switchover if a fault condition exists. An automatic switch operation overrides any manual switch operation that is in place.
- manual—attempts to switch the main/spare status of an MPR-e radio; however, if port failures, equipment failures, and reception failures do not allow the switchover, an automatic switch operation is triggered.

You can also configure revertive switching for RPS and EPS/TPS (when revertive switching is configured for EPS, it is also applied to TPS; revertive switching for TPS cannot be configured separately). Revertive switching occurs when the MPR-e radio operation switches from the spare radio back to the main radio after a fault condition is cleared.

3.2.19.4 Frequency Synchronization

Depending on the type of Gigabit Ethernet microwave link used to connect the Packet Microwave Adapter card and an MPR-e radio, different frequency synchronization mechanisms can be used.

When using optical 1000Base-SX to connect the Packet Microwave Adapter card and an MPR-e radio, synchronous Ethernet and SSM are the frequency synchronization mechanisms that are used. SSM is used as the mechanism to detect a microwave link failure, including loss of frame and MPR-e radio hardware failure.

When using electrical 1000Base-T to connect the Packet Microwave Adapter card and an MPR-e radio, PCR is the frequency synchronization mechanism that is used (a copper SFP is mandatory on ports 3 and 4).

For more information on PCR, synchronous Ethernet, and SSM, refer to the 7705 SAR Basic System Configuration Guide, “Node Timing”.

3.2.19.5 RSL History

An MPR-e radio that is connected to the 7705 SAR can automatically upload its received signal level (RSL) history file to the 7705 SAR host. The RSL file contains a history of radio attributes and alarms that radio operators can use to isolate and diagnose radio-layer problems that might exist in the network.

Up to 24 MPR-e radios can independently upload their RSL history file every 15 minutes when the **rsl-history** command is configured on the 7705 SAR for each radio. When uploaded, the file is stored on the 7705 SAR compact flash. Each RSL file can be up to 1 Mbyte and contain up to 10 000 lines. Each time a new file from a specific MPR-e radio is sent to the 7705 SAR, the new file overwrites the previous version for that radio. Once uploaded to the 7705 SAR, the operator can view the file in its raw format using the **file>type** command or FTP it to an external server.

[Table 20](#) lists the attributes in the RSL history file.

Table 20 RSL History Attributes

Attribute	Description
Time	Time of record
LocTxPower	Local transmit power
RemTxPower	Remote transmit power

Table 20 RSL History Attributes (Continued)

Attribute	Description
LocRxPower	Local received power
RemRxPower	Remote received power
LocDivRxPower	Local diversity received power (significant for diversity configuration only)
RemDivRxPower	Remote diversity received power (significant for diversity configuration only)
LocXPD	Local cross-polar discrimination (significant for XPIC configuration only)
RemXPD	Remote cross-polar discrimination (significant for XPIC configuration only)
LocMSE	Local mean squared error
RemMSE	Remote mean squared error
TxMod	Transmitter modulation
RxMod	Receiver modulation
LocEPS	Local equipment protection switching
RemEPS	Remote equipment protection switching
LocRPS	Local radio protection switching
RemRPS	Remote radio protection switching
LocTPS	Local transmit protection switching
RemTPS	Remote transmit protection switching
LocHBERAlm	Local high bit error rate alarm
RemHBERAlm	Remote high bit error rate alarm
LocEWAIm	Local early warning alarm
RemEWAIm	Remote early warning alarm
LocDemFailAlm	Local demodulation failure alarm
RemDemFailAlm	Remote demodulation failure alarm

3.2.20 Custom Alarms on Ethernet Ports

The 7705 SAR supports custom alarms on Ethernet ports without the need to deploy a dry-contact alarm aggregator. Custom alarms can be created and assigned to any RJ-45 port; the port must be configured for 100Base-Tx operation with autonegotiation disabled. One alarm input can be configured for each port with the following:

- name
- description
- association with a user-defined alarm

Alarm inputs must be associated with an alarm in order for them to be triggered. Alarm inputs consist of an Ethernet LOS event caused by breaking contact loops between pins 1 and 3 or 2 and 6 on the Ethernet port. Breaking either loop will trigger the port alarm, and reconnecting the loops will clear the alarm.

For information on configuring the alarm inputs, see [Configuring Auxiliary Alarm Card, Chassis, and Ethernet Port External Alarm Parameters](#).

3.3 802.1x 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.

The 7705 SAR supports the following EAP methods: MD5, TLS, TTLS, and PEAPv0.

MAC authentication can be used to authenticate client devices that do not support EAP. For more information, see [MAC Authentication](#).

This section describes the following:

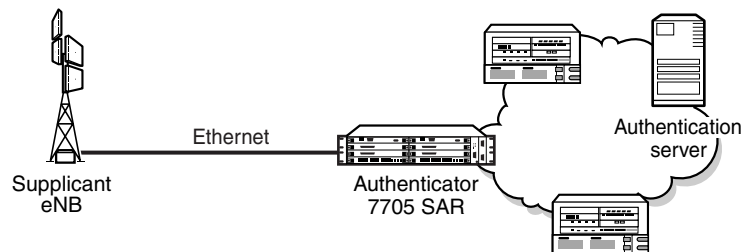
- [802.1x Basics](#)
- [802.1x Modes](#)
- [802.1x Timers](#)
- [802.1x Tunneling](#)
- [802.1x Configuration and Limitations](#)

3.3.1 802.1x Basics

The IEEE 802.1x standard defines three participants in an authentication conversation (see [Figure 20](#)):

- 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 20 802.1x Architecture



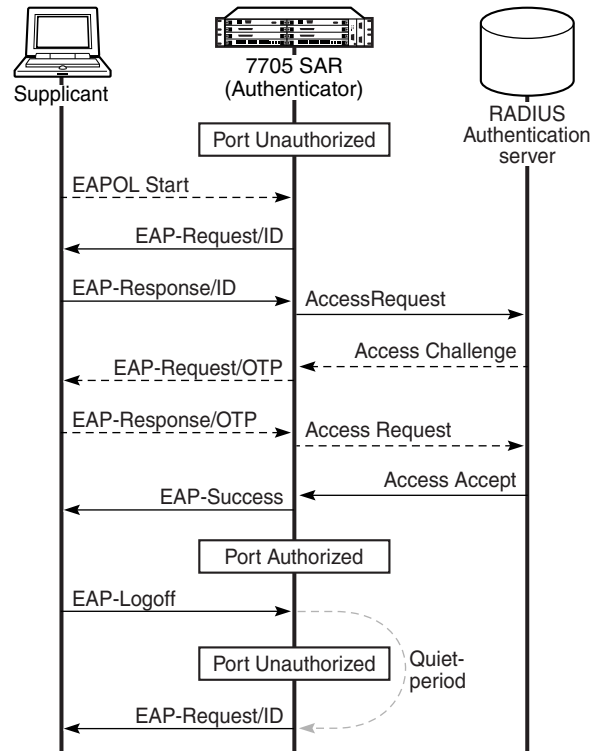
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The authentication exchange is carried out between the supplicant and the authentication server; the authenticator acts only as a bridge. The communication between the supplicant and the authenticator is done using EAPOL. The communication between 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 21](#) 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.

Figure 21 Authentication Scenario

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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 does not receive the EAP-Request/ID frame during boot-up. 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 Access Request packet, and sends it off to the configured RADIUS server. The RADIUS Access Request packet contains the following attributes:

- User-Name – the name of the supplicant to be authenticated
- Calling-Station-Id – the MAC address of the supplicant
- NAS-IP-Address – the IP address of the device acting as the authenticator
- NAS-Port – the physical port number of the device acting as the authenticator
- State – allows state information to be maintained between the authenticator and the RADIUS server

- EAP-Message – used to encapsulate EAP packets for transmission from the authenticator to the RADIUS server
- Message-Authenticator – used to authenticate and protect the integrity of Access Request messages in order to prevent spoofing attacks

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 an EAP-Logoff message, the authenticator puts the supplicant in an unauthorized state and continues searching for supplicants to authenticate.

After sending an EAP-Failure message, the authenticator puts the supplicant in an unauthorized state, waits for the number of seconds defined by the quiet-period timer, then continues searching for supplicants to authenticate.

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

3.3.2 802.1x Modes

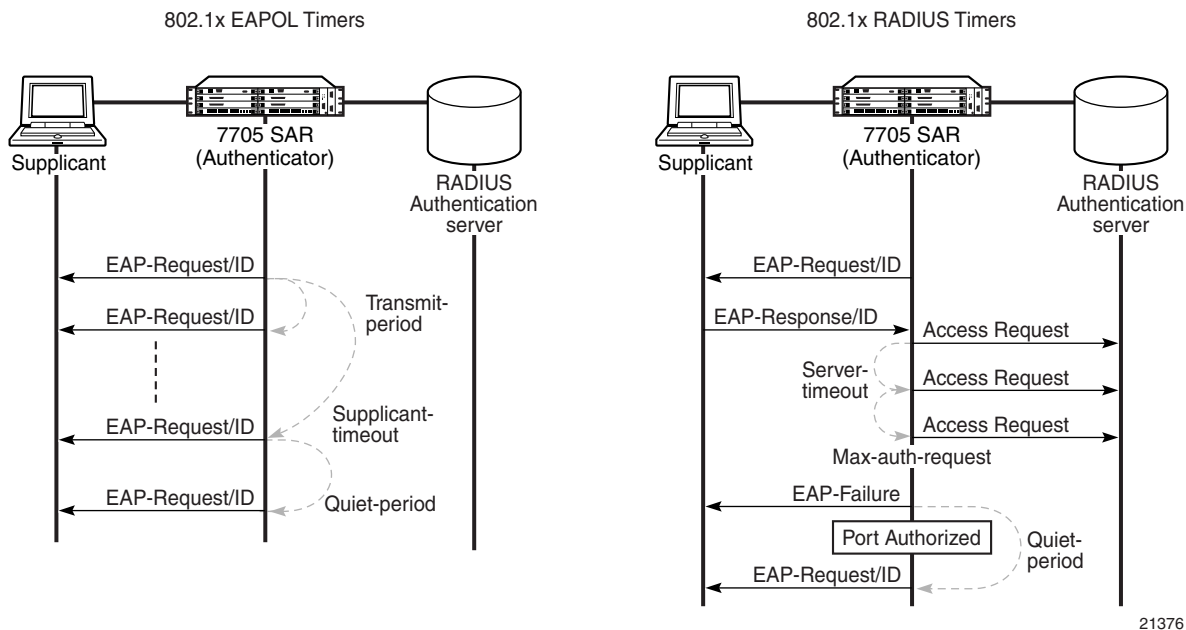
The 7705 SAR supports port-based network access control for Ethernet ports only. Each Ethernet port can be configured to operate in one of three different modes, controlled by the **port-control** command:

- 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.

3.3.3 802.1x 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 22](#) shows an example of the timers.

Figure 22 802.1x EAPOL Timers and RADIUS Timers



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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 that the authenticator will not search for clients after an unsuccessful EAP authentication. The timer is started after sending an EAP-Failure message or after expiry of the supplicant timeout timer. The default value is 60 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.

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.

3.3.4 802.1x Tunneling

The 7705 SAR supports tunneling of untagged 802.1x frames received on a port for both Epipe and VPLS services using either null or default SAPs (for example 1/1/1:0 or 1/1/1:*) when the **port-control** command is set to **force-auth**.

When tunneling is enabled on a port, untagged 802.1x frames are treated like user frames and are switched into Epipe or VPLS services that have a corresponding null SAP or default SAP on that port. If a port has a default SAP, other non-default SAPs could also be on the port. When received on a spoke SDP or mesh SDP, untagged 802.1x frames are tunneled by default. Untagged 802.1x frames received on other service types, or on network ports, are dropped.

802.1x tunneling must be enabled consistently across all ports in the LAG where 802.1x frames are expected. This is not enforced by the system.

3.3.5 802.1x 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.

3.4 MAC Authentication

The 7705 SAR supports the 802.1x EAP standard for authenticating Ethernet devices before they can access the network. However, if a client device does not support 802.1x EAP, MAC authentication can be used to prevent unauthorized traffic from being transmitted through the 7705 SAR.

802.1x EAP must be enabled for MAC authentication to be used, as MAC authentication is a fallback mechanism. To authenticate a port using MAC authentication, 802.1x authentication must first be configured on the 7705 SAR by enabling **port-control auto**, and then **mac-auth** must be configured on the 7705 SAR to enable MAC authentication.

When a port becomes operationally up with MAC authentication enabled, the following steps are performed by the 7705 SAR (as the authenticator):

1. After transmission of the first EAP-Request/ID PDU, the 7705 SAR starts the **mac-auth-wait** timer and begins listening on the port for EAP-Response/ID PDUs. At this point, the 7705 SAR only listens to EAPOL frames. If EAPOL frames are received, 802.1x authentication is chosen.



Note: If it is known that the attached equipment does not support EAP, **no mac-auth-wait** can be configured so that MAC authentication can be used as soon as the port is operationally up.

2. If the **mac-auth-wait** timer expires, and no EAPOL frames have been received, the 7705 SAR begins listening on the port for any Ethernet frames.
3. If the 7705 SAR receives an Ethernet frame, the 7705 SAR scans the client source MAC address in the frame and transmits the MAC address to the configured RADIUS server for comparison against the MAC addresses configured in its database.

The following attributes are contained in the RADIUS message:

- User-Name – the source MAC address of the client device
- User-Password – the source MAC address of the client device in an encrypted format
- Service-Type – the type of service that the client has requested; the value is set to 10 (call-check) for MAC authentication requests
- Calling-Station-Id – the source MAC address of the client device
- NAS-IP-Address – the IP address of the device acting as the authenticator
- NAS-Port – the physical port of the device acting as the authenticator

-
- Message-Authenticator – used to authenticate and protect the integrity of Access Request messages in order to prevent spoofing attacks
4. If the MAC address is approved by the RADIUS server, the 7705 SAR enables the port for traffic transmission.
If the MAC address is rejected by the RADIUS server, the 7705 SAR enters a quiet period, configured using the **quiet-period** command, and will not authenticate the port via either 802.1x or MAC authentication. After the quiet period expires, the 7705 SAR returns to step 1.
 5. If a port that was previously authenticated with MAC authentication receives an EAPOL-Start frame, the port will reauthenticate using 802.1x EAPOL.

While the port is unauthenticated, the port will be “down” to all upper layer protocols or services.

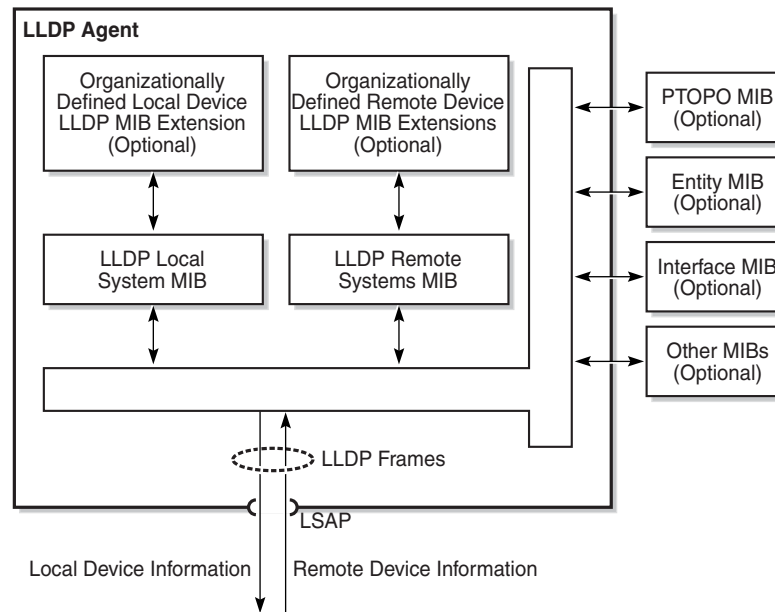
3.5 Link Layer Discovery Protocol (LLDP)

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 23](#)

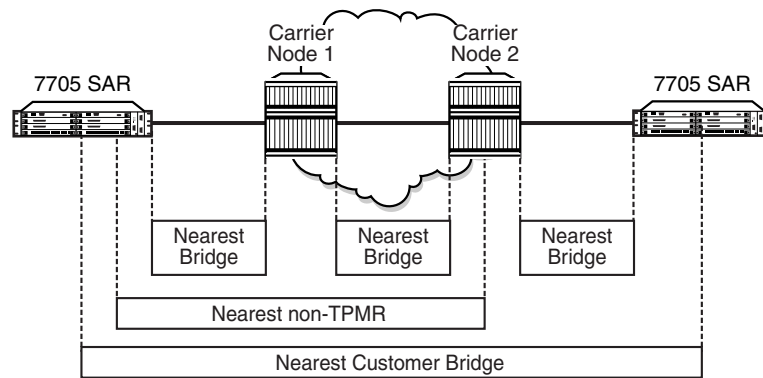
Figure 23 LLDP Internal Architecture for a Network Node

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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.

The 7705 SAR platforms, cards, and modules support LLDP on all Ethernet datapath ports. On the 2-port 10GigE (Ethernet) Adapter card/module, LLDP is supported on the Ethernet ports, but not on the v-port. 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 24 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 24 Network Example For LLDP

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3.5.1 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.

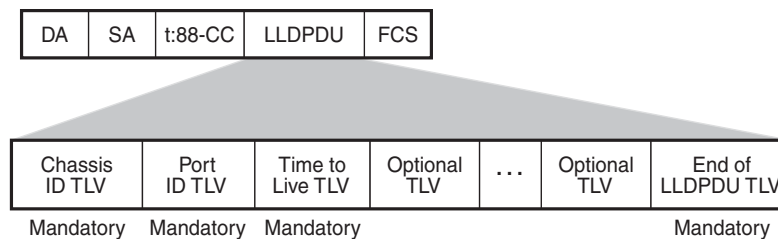
LLDP does not contain a mechanism for soliciting specific information from other LLDP agents, nor does it provide a specific means of confirming the receipt of information. LLDP allows the transmitter and the receiver to be enabled separately; therefore, the local LLDP agent can be configured to transmit 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 25](#) shows the LLDPDU format.

Figure 25 LLDPDU Format



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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 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.

The implementation defaults to setting the port-id field in the LLDP OAMPDU to **tx-local**. This encodes the port-id field as ifindex (subtype 7) of the associated port, which is required to support some releases of the NSP NFM-P. The NSP NFM-P may use the ifindex value to properly build the Layer 2 topology network map. However, this numerical value is difficult to interpret or readily identify the LLDP peer when reading the CLI or MIB value without using the NSP NFM-P. Including the **port-desc** option as part of the **tx-tlv** configuration allows a Nokia remote peer supporting **port-desc** preferred display logic to display the value in the port description TLV instead of the port-id field value. This does not change the encoding of the port-id field. The port-id field value continues to represent the ifindex. In some environments, it may be important to select the specific port information that is carried in the port-id field. The operator has the ability to control the encoding of the port-id information and the associated subtype using the **port-id-subtype** option. Three options are supported for the **port-id-subtype**:

- **tx-if-alias** — transmits the ifAlias string (subtype 1) that describes the port as stored in the IF-MIB, either a user-configured description or the default entry (that is, 10/100/Gig Ethernet SFP)
- **tx-if-name** — transmits the ifName string (subtype 5) that describes the port as stored in the IF-MIB, ifName information
- **tx-local** — the interface ifindex value (subtype 7)

IPv6 (address subtype 2) and IPv4 (address subtype 1) LLDP system management addresses are supported.

3.6 Surveillance, Control, and Data Acquisition (SCADA) Support

SCADA systems are used in many strategic industry networks, such as utility and transportation, to monitor and maintain the networks from remote monitoring locations. SCADA systems use a master/slave architecture with a single master that supports multiple slave remote terminal units (RTUs).

Nokia addresses the needs of SCADA customers with the Integrated Services card. The Integrated Services card is a resource card that is capable of supporting software applications that specifically meet the requirements of TDM-based SCADA systems. The card is supported on the 7705 SAR-8 Shelf V2 and the 7705 SAR-18.

The Integrated Services card supports the following SCADA applications:

- multidrop data bridge (MDDB)
- pulse code modulation (PCM) multidrop bridge
- voice conference bridge (VCB)

Only one application can be active on the card at a time.

The MDDB and PCM multidrop bridge applications feature similar architecture and functionality, with the main exception being that the MDDB application uses a serial RS-232, RS-530, or X.21 interface, while the PCM multidrop bridge application uses an E&M analog interface. The VCB application builds on the PCM architecture, using A-Law or Mu-Law encoding and an E&M analog interface.

3.6.1 Multidrop Data Bridge

The MDDB application provides a centralized digital bridging functionality that allows a SCADA bridge to be configured between a master and remote slaves. The bridge allows a single data message stream to be broadcast from a master to multiple slaves and allows a single slave to communicate back to the master.

In a SCADA network, the 7705 SAR provides the communications infrastructure to connect the central masters to multiple RTUs at remote locations, where the masters and RTUs communicate over serial RS-232, RS-530, or X.21 links (synchronous or asynchronous). The 7705 SAR-8 Shelf V2 or 7705 SAR-18 located at the master site contains the Integrated Services card, which provides the MDDB bridge functionality and acts as the MDDB master. Remote 7705 SAR nodes connected to RTUs are referred to as MDDB slaves.

For both master and slave applications, the 7705 SAR must be physically connected to the SCADA device by one of the following:

- a 7705 SAR-8 Shelf V2 or 7705 SAR-18 using the 12-port Serial Data Interface card (supports RS-232, RS-530, and X.21 links)
- a 7705 SAR-H using the 4-port T1/E1 and RS-232 Combination module (supports RS-232 links only)
- a 7705 SAR-Hc using an on-board RS-232 serial port (supports RS-232 links only)

The 12-port Serial Data Interface card (version 1 and version 2) supports the RS-530/RS-422 interface with the use of an adapter cable that connects to a DB15 connector on the front of the X.21 distribution panel. There is no configuration specifically for the RS-530/RS-422 interface; configuration is done in X.21 mode and applies to the RS-530/RS-422 interface when it is physically enabled through hardware. The 12-port Serial Data Interface card, version 3, provides RS-530 interface capability without the need for an adapter cable. For information about 12-port Serial Data Interface card adapter cables, refer to the 7705 SAR Serial Data Interface Card Installation Guide.

The remote nodes are connected to the SCADA bridge over an IP/MPLS network.

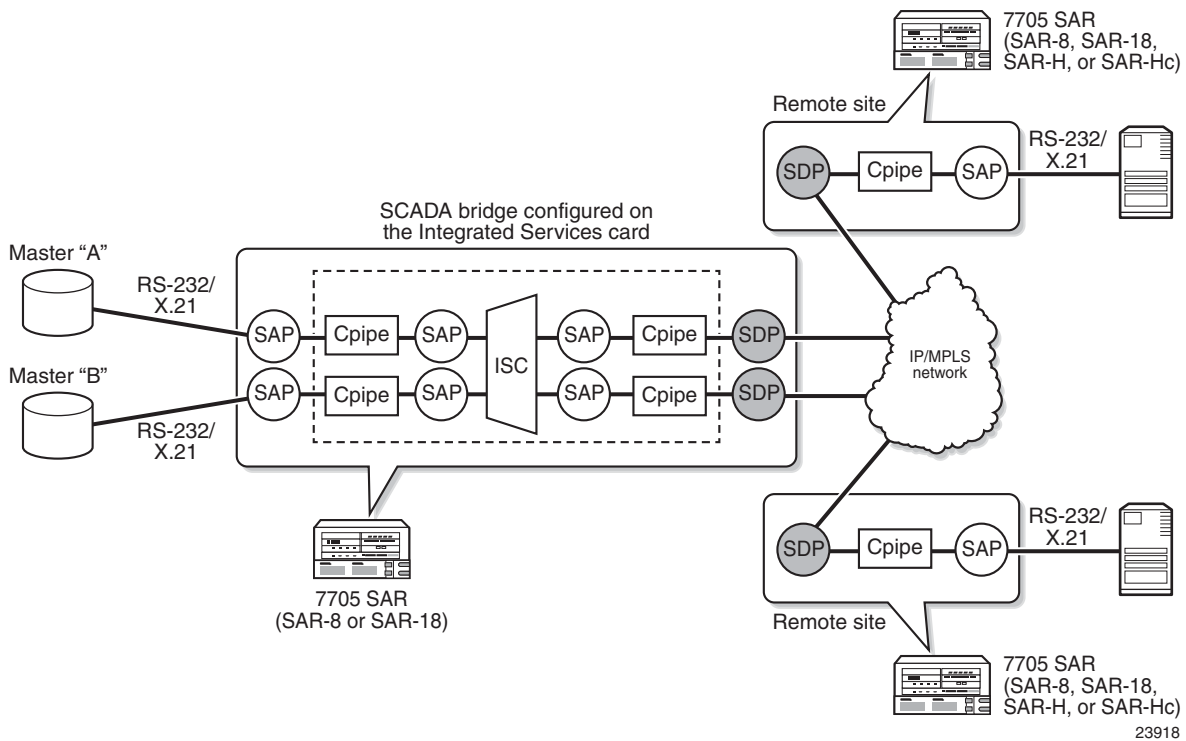
An Integrated Services card supports up to 16 SCADA bridges. Each bridge supports 32 branches. Two branches (branch 1 and branch 2) are dedicated connections to the SCADA masters; the other 30 branches connect to the slaves. An MDDB SCADA bridge is created using the **config>scada** *bridge-id* command and a branch is created using the **config>scada>branch** *branch-id* command.



Note: Larger bridges can be built by cascading individual bridges internally within a single Integrated Services card and using the master output from one bridge as the slave input to another bridge. Larger bridges can be cascaded across multiple Integrated Services cards by using an RS-232, RS-530, or X.21 link.

[Figure 26](#) shows a typical SCADA MDDB network. A Cpipe SAP is configured for each master and slave branch in order to transmit data to the bridge. The RS-232/X.21 traffic is converted to a 64 kb/s Cpipe using high capacity multiplexing (HCM). The Integrated Services card terminates the Cpipe (the slaves send data back over the IP/MPLS network), recovers the data directly from the Cpipe as an HCM frame, and sends the data to the bridge.

Figure 26 SCADA MDDB Network



3.6.2 PCM Multidrop Bridge

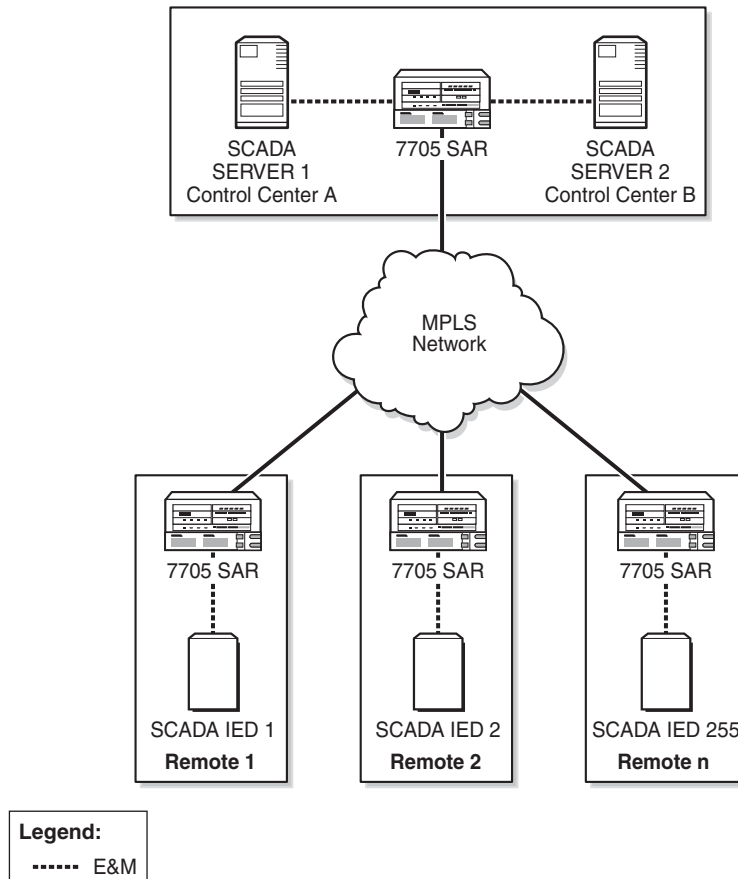
The pulse code modulation (PCM) multidrop bridge application provides multidrop bridging for SCADA systems that use 4-wire analog modems to connect remote slaves to a master. Incoming analog signals from the master are converted to PCM (Mu-Law or A-Law) for transport between a remote slave and the master. The Integrated Services card broadcasts the master stream to all remote slaves. Only the addressed remote unit will respond to the broadcast and the response must be transported through the bridge back to the master via an E&M interface. If the network RTUs support two SCADA systems over the same interface by separating them into high-frequency and low-frequency bands, the PCM multidrop bridge always selects the two loudest branches to be passed through the bridge for communication with the master.

Note: E&M signaling transport through the bridge is not supported.



Figure 27 shows a typical SCADA PCM multidrop bridge network.

Figure 27 SCADA PCM Multidrop Bridge Network



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The PCM multidrop bridge application uses Mu-Law and A-Law encoding; therefore, the modularity is different from MDDDB modularity. Table 21 shows the modularity for a PCM multidrop bridge on the Integrated Services card.

Table 21 PCM Multidrop Bridge Modularity

Encoding Scheme	Number of Bridges per Integrated Services Card	Number of Branches per Bridge	Total Number of Branches per Integrated Services Card
Mu-Law (North America)	16	22	352
A-Law (rest of world)	16	30	480

A PCM SCADA bridge is created using the **config>scada** *bridge-id* command and a branch is created using the **config>scada>branch** *branch-id* command.



Note: Larger bridges can be built by cascading individual bridges internally within a single Integrated Services card and using the master output from one bridge as the slave input to another bridge. Larger bridges can be cascaded across multiple Integrated Services cards by using an E&M link.

3.6.3 Redundant Masters

The MDDB and PCM multidrop bridge applications support redundant masters, where both masters listen to all traffic that is being transmitted from the slaves but only the active master broadcasts data to the slaves.

There are two modes for master redundancy:

- manual (default mode)

In manual mode, if a master branch fails, the second master branch must be made active manually with the **force-active** command in order to receive data from the master input. The bridge always broadcasts to both master branches.

- auto

In auto mode, both master branch inputs are received simultaneously. This requires the master input behavior to be similar to an RTU; that is, only the active master transmits data and the standby master transmits either all 1s (MDDB) or no data (PCM). If the bridge is in auto mode, the **force-active** command cannot be used.

3.6.4 Squelch Functionality

A condition may occur where a single slave continues to send data to the master after the normal response period has expired. This condition locks up the bridge so that no other slave can transmit data back to the master. To resolve this condition, the **squelch** command can be enabled on a bridge or on an individual slave or master branch. Squelch is enabled by configuring a timeout period that, once expired, raises an alarm and triggers the squelching function. A normal quiescent traffic pattern (all 1s for MDDB and low volume for PCM multidrop) is inserted towards the bridge. This blocks the problematic slave so that other slaves can continue to use the bridge.

In order to put the bridge into the normal state, it must be reset. This can be manually initiated by the operator with the **squelch reset** command, or it can occur automatically after a configured time if the **squelch-recovery** command is set to **auto**.

For MDDB, because different algorithms are needed to detect squelch conditions at low-speed and high-speed rates, interface speed selection is required. The interface speed is set at the bridge level.

3.6.5 Voice Conference Bridge

The voice conference bridge (VCB) application provides a simultaneous communication path between two or more voice circuits. VCBs are deployed in a central location with remote devices connected to the bridge via the 7705 SAR over an IP/MPLS or TDM network. Inputs to the VCB are 4-wire E&M analog interfaces.

VCBs can be used as a conference bridge with any-to-any connectivity (all branches participate) or as a bridge in broadcast mode where one branch broadcasts to the other branches that are in listen-only mode.

The main VCB applications are:

- Land Mobile Radio (LMR) interconnection
Both voice conference mode and broadcast mode can be used for this application.
- analog multi-terminal teleprotection interconnect for electrical utilities
For multi-terminal teleprotection applications, VCBs allow all teleprotection relays to communicate with each other in order to make the appropriate switching decision in the event of a fault.

The VCB application uses Mu-Law and A-Law encoding, similar to PCM. [Table 22](#) shows the modularity for a VCB on the Integrated Services card.

Table 22 VCB Modularity

Encoding Scheme	Number of Bridges per Integrated Services Card	Number of Branches per Bridge	Total Number of Branches per Integrated Services Card
Mu-Law (North America)	16	24	384
A-Law (rest of world)	16	32	512

A VCB SCADA bridge is created using the **config>scada** *bridge-id* command and a branch is created using the **config>scada>branch** *branch-id* command.



Note: Larger bridges can be built by cascading individual bridges internally within a single Integrated Services card. Larger bridges can be cascaded across multiple Integrated Services cards by using an E&M link or a channel group encapsulated for **cem** (TDM).

3.6.5.1 VCB Applications

VCB can be configured in one of four applications. These applications are set at the card level. Each application uses a bridging algorithm that determines which branches control the management of the bridge and transmission of signals:

- VCB

One branch talks and all other branches on the bridge can hear.

- broadcast

Only one branch on the bridge (fixed as branch 1) has control of the bridge to transmit, and all other branches are in listen-only mode.

- VCB branch initiate

Branches on the bridge are only enabled (unmuted) when the attached base station signals its presence by grounding the M-lead on the interface connected to the bridge. Upon receiving the grounded M-lead via T1/E1 ABCD bits or TDM PW signaling, the bridge unmutes the associated branch. When the ground is removed, the branch is muted again.

- teleprotection

Each teleprotection relay transmits state information on discrete frequencies so that each relay can both hear what the other relays are transmitting as well as transmit its own information to the other relays.

3.6.5.2 Gain

Gain is the increase or decrease in signal power or voltage that occurs in transmitting a signal from one point to another. The two types of gain are:

- input

- output

Gain is configured at the branch level.

The input gain defines the magnitude of the increase or decrease of the signal transmitted into the bridge. The input gain range is –16 to +9 dB in 1-dB increments (the default is 0 dB).

The output gain defines the magnitude of the increase or decrease of the signal received from the bridge. The output gain range is –16 to +9 dB in 1-dB increments (the default is 0 dB).

3.6.6 Serial Transport Over Raw Sockets

Serial transport over raw sockets provides the capability of transporting serial data, in the form of characters, over an IP transport service within a Layer 3 IP/MPLS service (IES or VPRN). A raw socket allows direct sending and receiving of IP packets without any protocol-specific transport layer formatting. For information about raw socket IP transport services, refer to the 7705 SAR Services Guide, Service Overview chapter, “Raw Socket IP Transport Service”.

The feature provides the functionality for a local host to listen to and open raw socket sessions from remote hosts, and for a remote host to initiate and open raw socket sessions to local hosts. The local and remote host functions support TCP or UDP sessions (but not both concurrently) over the IP transport service.

Raw sockets are supported on the following hardware:

- RS-232 ports on the 12-port Serial Data Interface card, version 2 and version 3
- RS-232 ports on the 7705 SAR-Hc
- RS-232 ports on the 4-port T1/E1 and RS-232 Combination module



Note:

- RS-232 serial data can be carried over Cpipes or over raw sockets using IP transport. To use Cpipes, the RS-232 port must be configured with a channel ID. To use raw sockets, the RS-232 port must be configured with a socket ID.
- The 12-port Serial Data Interface card supports a mix of Cpipes and raw socket serial links on the same card.

Figure 28 shows an example of a raw socket application, where serial data is transferred between RTUs and a utility’s SCADA management system using an IP transport service across a Layer 3 service (IES or VPRN), that includes 7705 SAR-H or 7705 SAR-Hc and 7705 SAR-8 Shelf V2 or 7705 SAR-18 nodes.

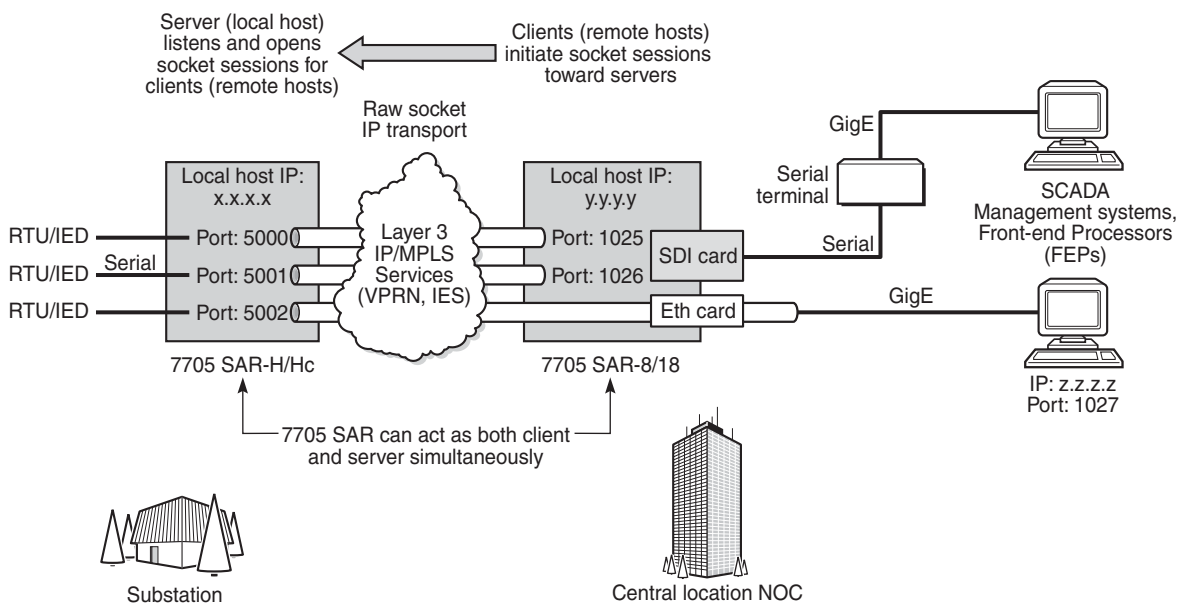
A raw socket local host (acting as a server) at the 7705 SAR-H/SAR-Hc substation listens to TCP sessions that originate at the 7705 SAR-8 Shelf V2/SAR-18 central location network operations center (NOC). The 7705 SAR-8 Shelf V2/SAR-18 at the NOC is connected to two front-end processors (FEPs), one via a serial port and another via an Ethernet port. The serial port on the 7705 SAR-8 Shelf V2/SAR-18 is configured as a remote host (acting as a client) that initiates TCP/UDP sessions towards the RTU at the 7705 SAR-H/SAR-Hc substation when traffic is received from the FEP over the serial port. These TCP/UDP sessions are transported over the IP/MPLS network using IP transport service over an IES or VPRN service. The serial data that is transported over the TCP/UDP session and received at the 7705 SAR-H/SAR-Hc is then sent over the serial link towards the RTU. TCP/UDP sessions received from the FEP over the Ethernet port are transported over an IES or VPRN service (that is, there is no need for serial remote host configuration in this case).

Multiple FEPs can poll a single RTU. If multiple sessions attempt to transmit serial data on the serial port simultaneously, the 7705 SAR queues packets per session and ensures that all data for one session is sent out before processing another session's data, ensuring that sessions do not overlap one another.



Note: A serial port can be concurrently configured as both a server (local host) and a client (remote host). This is accomplished with the **local-host** command configuration to support the server function and the **remote-host** command configuration to set up client sessions to far-end remote hosts.

Figure 28 Serial Transport Over Raw Socket Application



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3.6.6.1 Raw Socket Configuration

A raw socket IP transport interface can be configured for each RS-232 serial port on a node. This allows the serial port to receive TCP connections or UDP session packets from multiple remote hosts, or to create new sessions to remote hosts in order to send and receive serial data to and from those remote hosts.

There are port-level and service-level configuration requirements for a raw socket serial port to send and receive serial data in either server mode, client mode, or both.

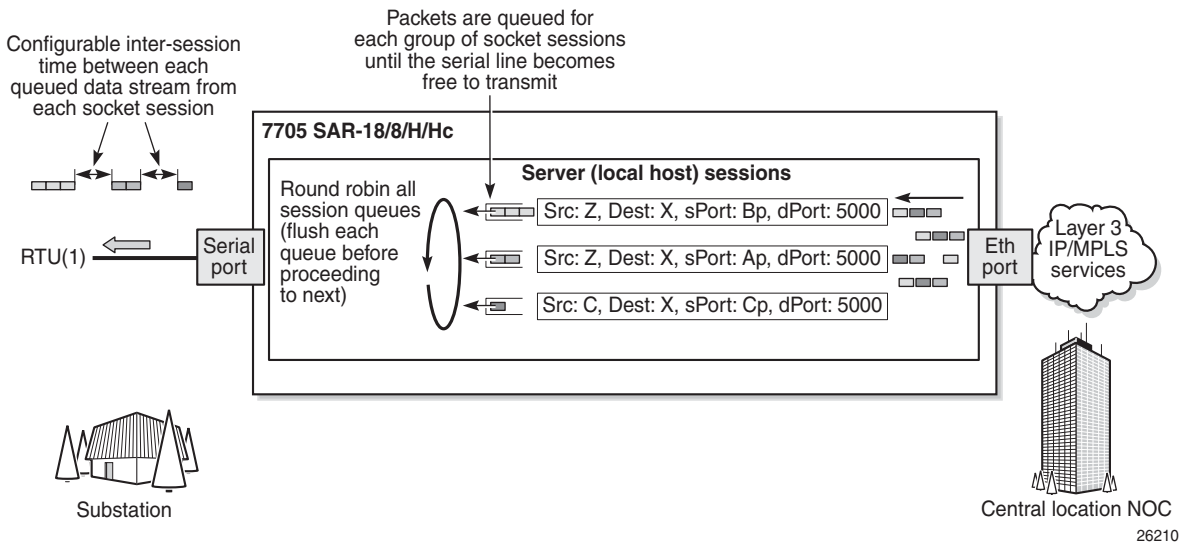
Raw socket port-level configuration includes defining the end-of-packet checking parameters (idle-time, length, special character) and the inter-session delay for transmitting session data over the serial link. See [Serial Commands](#) for the required information.

At the service level, an IP transport subservice is created within an IES or VPRN service to associate the serial port with the respective IES or VPRN service. TCP/UDP encapsulated serial data is routed within the corresponding Layer 3 IES or VPRN service. The required configuration includes IP transport subservice local-host and remote-host configuration, TCP timers, and session control. Refer to the 7705 SAR Services Guide, “IES Raw Socket IP Transport Configuration Commands” and “VPRN Raw Socket IP Transport Configuration Commands” for the required information.

3.6.6.2 Raw Socket Packet Processing

[Figure 29](#) illustrates how raw socket packets are processed over a serial link.

Session data attempting to access the serial port is queued. One queue is maintained per session. The purpose of the session queue is to prevent two different flows of packets from interleaving out the serial port and creating unreadable messages. When data is being transmitted over the serial link for a session, any other session’s data is queued until the first session has emptied its queue. The next session’s data is transmitted over the serial link only after the **inter-session-delay** timer expires. Each session’s data is sent out in round-robin fashion.

Figure 29 Raw Socket Packet Processing

3.6.6.2.1 Raw Socket Processing for UDP Sessions

When the local host receives a UDP packet from a remote host, it queues the packet and sends it over the serial link. The local host remembers the UDP session while there is still data to send from the serial link. If further packets are received for the same session, they are queued behind the already queued packet. After all the queued data has been sent over the serial link, the session is removed from the system. An associated UDP remote host for the serial link must be configured to have serial data sent back to the remote host from the serial port.

When a packet is received from the serial link based on end-of-packet (EOP) requirements, the data is copied and sent in a UDP packet to each configured remote host.

3.6.6.2.2 Raw Socket Processing for TCP Sessions

An open TCP session from a remote host to a raw socket's local host is kept open until either the remote host terminates the session or the TCP inactivity timer expires. When a TCP session is open, all packets received from the remote host are queued for the raw socket serial link and sent over the serial link until no packets remain in the queue.

If multiple sessions are open towards the local host, and each is receiving data, each session's data is queued and then sent over the serial link in round-robin fashion for each session until no packets remain. When a packet is received over the serial link, it is copied to each open TCP session and transmitted to the remote host.

3.6.6.3 Raw Socket Squelch Functionality

A condition may occur where the end device connected to the serial port continues to send out a continuous stream of data after the normal response period has expired. This can prevent the far-end remote host or master equipment from receiving data from other end devices in the network. To resolve this condition, the **squelch** command can be used on the raw socket at the port level (it is disabled by default). This stops the socket from receiving any more data from the problematic device.

If the command is enabled, the 7705 SAR will monitor the serial port for a constant character stream. A configurable squelch delay period, using the **squelch-delay** command, is used to determine how long to measure the constant character stream before initiating the squelch function. If the squelch function is initiated, the port is considered locked up and an alarm is raised indicating the lock-up and that the squelching function has been triggered.

The serial port can be forced out of squelch and put back to normal, either manually using the **squelch-reset** command or automatically using the **unsquelch-delay** command. The **unsquelch-delay** command defines the time to wait after squelch is initiated before it is removed.

3.7 Configuration Notes

The following information describes provisioning guidelines and 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.

3.7.1 Reference Sources

For information on supported IETF drafts and standards as well as standard and proprietary MIBs, refer to [Standards and Protocol Support](#).

3.8 Configuring Physical Components with CLI

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

Topics in this section include:

- [Preprovisioning Guidelines](#)
- [Basic Configuration](#)
- [Common Configuration Tasks](#)
- [Service Management Tasks](#)

3.9 Preprovisioning Guidelines

The 7705 SAR platforms each have 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 about management connections, refer to the appropriate chassis installation guide, in the section on router management connections.

3.9.1 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.

3.9.2 Preprovisioning a Port or SCADA Bridge

Before a port or SCADA bridge can be configured, the adapter card slot must be preprovisioned with an allowed adapter card type (for a SCADA bridge, the only type allowed is **isc**, for the Integrated Services card).

Preprovisioning recommendations (for ports only) 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.

- SONET/SDH

- SONET/SDH can be used only when configuring an OC-3 or OC-12 SONET path on an appropriate adapter card.
- Configure a network port or channel to participate in the service provider transport or infrastructure network.

To configure a SONET path, see [Configuring SONET/SDH Port Parameters](#).

- Channelized

- Channelized ports can be configured on the following adapter cards and modules:
 - 16-port T1/E1 ASAP Adapter card
 - 32-port T1/E1 ASAP Adapter card
 - 2-port OC3/STM1 Channelized Adapter card
 - 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
 - 8-port Voice & Teleprotection card (access mode only)
 - 8-port C37.94 Teleprotection card (access mode only)
 - 8-port FXO Adapter card (access mode only)
 - 6-port FXS Adapter card (access mode only)
 - 4-port DS3/E3 Adapter card (DS3 ports only)
 - 12-port Serial Data Interface card (access mode only)
 - 6-port E&M Adapter card (access mode only)
 - 4-port T1/E1 and RS-232 Combination module
- 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.

3.9.3 Maximizing Bandwidth Use

After ports are preprovisioned, multilink bundles (MLPPP) or IMA groups can be configured to increase the bandwidth available between two nodes.

The following cards, modules, and platforms support multilink bundles:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)
- T1/E1 ports on the 7705 SAR-A
- T1/E1 ports on the 7705 SAR-M
- T1/E1 ports on the 7705 SAR-X

The following cards, modules, and platforms support IMA groups:

- 2-port OC3/STM1 Channelized Adapter card
- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 7705 SAR-M

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 Channelized Ports](#).

For 12-port Serial Data Interface cards and the RS-232 ports on the 4-port T1/E1 and RS-232 Combination module, 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 or X.21 mode.



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

3.9.4 Using Partial Bandwidth

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.

The following cards and platforms support fractional T1/E1 on a PPP channel group (encapsulation type ppp-auto), or all timeslots on T1/E1 ports, in network mode:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)
- T1/E1 ports on the 7705 SAR-A
- T1/E1 ports on the 7705 SAR-M
- T1/E1 ports on the 7705 SAR-X

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.

3.10 Basic Configuration

The basic 7705 SAR 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 (**mda-type**) (must be an allowed adapter card type)
- specify adapter card mode (**mda-mode**) (supported on the 4-port DS3/E3 Adapter card, 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card, 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, and Integrated Services card)
- identify specific port to configure

The following example displays some card and port configurations on the 7705 SAR-8 Shelf V2.



Note: The 7705 SAR-18 displays similar output with the exception being that the MDA number goes from 1 to 12 and from X1 to X4 (for XMDA cards).

```
NOK-1>config# card 1
NOK-1>config>card# 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-chds1v2
  exit
  mda 4
    mda-type a4-chds3v2
    mda-mode cem-atm-ppp
  exit
  mda 5
    mda-type a8-ethv2
  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 "DSOGRP"
        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
#-----
```

3.11 Common Configuration Tasks

The following basic system tasks are performed, as required:

- [Configuring Cards and Adapter Cards](#)
- [Configuring Ports](#)
- [Configuring SCADA Bridge Parameters](#)

3.11.1 Configuring Cards and Adapter Cards

This section contains the following topics:

- [Configuring Cards](#)
- [Configuring Adapter Card Network Queue QoS Policies](#)
- [Configuring Ring Adapter Card or Module Network and Network Queue QoS Policies](#)
- [Configuring Adapter Card Fabric Statistics](#)
- [Configuring Adapter Card Fabric Profile](#)
- [Configuring Adapter Card Clock Mode](#)
- [Configuring Adapter Card Voice Attributes](#)
- [Configuring Ring Adapter Card or Module Parameters](#)
- [Configuring Auxiliary Alarm Card, Chassis, and Ethernet Port External Alarm Parameters](#)
- [Displaying Adapter Card Information](#)

3.11.1.1 Configuring 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 **mda-mode** command is used on the following adapter cards to configure the appropriate encapsulation methods (**cem-atm-ppp** or **cem-fr-hdlc-ppp**) that are required to support pseudowire services:

- 4-port DS3/E3 Adapter card
- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card

The **mda-mode** command is used on the 10-port 1GigE/1-port 10GigE X-Adapter card to configure the card for either 10-port 1GigE mode or 1-port 10GigE mode (**x10-1gb-sfp** or **x1-10gb-sf+**).

The **mda-mode** command is used on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card to configure the card for either 4-port OC3/STM1 mode or 1-port OC12/STM4 mode (**p4-oc3** or **p1-oc12**).

The **mda-mode** command is used on the Integrated Services card to configure the card for a SCADA application: (**mddb**, **pcm**, or **vcb**).

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 Shelf V2.

```
Example: NOK-1>config# card 1
NOK-1>config>card# card-type iom-sar
NOK-1>config>card# mda 1
NOK-1>config>card>mda# mda-type a6-em
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 2
NOK-1>config>card>mda# mda-type a4-oc3
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 3
NOK-1>config>card>mda# mda-type a16-chds1v2
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 4
NOK-1>config>card>mda# mda-type a4-chds3v2
NOK-1>config>card>mda# mda-mode cem-fr-hdlc-ppp
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 5
NOK-1>config>card>mda# mda-type a8-ethv2
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 6
```

```
NOK-1>config>card>mda# mda-type a2-choc3
NOK-1>config>card>mda# exit
NOK-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:

```
NOK-1>config# card 1
NOK-1>config>card# card-type iom-sar
NOK-1>config>card# mda 1
NOK-1>config>card>mda# mda-type aux-alarm
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 2
NOK-1>config>card>mda# mda-type a8-ethv2
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 2
NOK-1>config>card>mda# mda-type a8-ethv2
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 3
NOK-1>config>card>mda# mda-type a8-ethv2
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 4
NOK-1>config>card>mda# mda-type a8-ethv2
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 5
NOK-1>config>card>mda# mda-type a8-ethv2
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 6
NOK-1>config>card>mda# mda-type a32-chds1v2
NOK-1>config>card>mda# mda-mode cem-atm-ppp
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 7
NOK-1>config>card>mda# mda-type a32-chds1v2
NOK-1>config>card>mda# mda-mode cem-atm-ppp
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 8
NOK-1>config>card>mda# mda-type a32-chds1v2
NOK-1>config>card>mda# mda-mode cem-atm-ppp
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 9
NOK-1>config>card>mda# mda-type a32-chds1v2
NOK-1>config>card>mda# mda-mode cem-atm-ppp
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 10
NOK-1>config>card>mda# mda-type a4-oc3
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 11
NOK-1>config>card>mda# mda-type a4-chds3v2
NOK-1>config>card>mda# mda-mode cem-fr-hdlc-ppp
```



```
NOK-1>config>card>mda# exit
NOK-1>config>card# mda 12
NOK-1>config>card>mda# exit
NOK-1>config>card# mda X1
NOK-1>config>card>mda# mda-type x-10GigE-v2
NOK-1>config>card>mda# mda-mode x1-10gb-sfp+
NOK-1>config>card>mda# exit
NOK-1>config>card# mda X2
NOK-1>config>card>mda# mda-type x-10GigE-v2
NOK-1>config>card>mda# mda-mode x10-1gb-sfp
NOK-1>config>card>mda# exit
NOK-1>config>card# mda X3
NOK-1>config>card>mda# mda-type x-10GigE-v2
NOK-1>config>card>mda# mda-mode x1-10gb-sfp+
NOK-1>config>card>mda# exit
NOK-1>config>card# mda X4
NOK-1>config>card>mda# mda-type x-10GigE-v2
NOK-1>config>card>mda# mda-mode x10-1gb-sfp
NOK-1>config>card>mda# exit
NOK-1>config>card# exit
```

3.11.1.2 Configuring Adapter Card Network Queue QoS Policies

Network queue QoS 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 Quality of Service Guide, “Network Queue 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
```

3.11.1.3 Configuring Ring Adapter Card or Module Network and Network Queue QoS Policies

Network and network queue QoS policies can optionally be applied to a ring adapter card or module, such as the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module.

Network policies define ring type network policies to a ring adapter card, where a ring type is a **network-policy-type**. Network queue policies define the add/drop port network queuing at the adapter card node level.

Network and network queue policy parameters are configured in the **config>qos** context. For more information on network queue policies, refer to the 7705 SAR Quality of Service Guide, “Network QoS Policies” and “Network Queue QoS Policies”.

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

```
CLI Syntax:  config>card>mda#
                network
                ring
                add-drop-port-queue-policy name
                qos-policy network-policy-id
                no shutdown
```

3.11.1.4 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
```

3.11.1.5 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 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
```

3.11.1.6 Configuring Adapter Card Clock Mode

Clocking mode is defined at the adapter card level. There are three clocking modes available: **differential**, **adaptive**, and **dcr-acr**, which is a mixture of both differential and adaptive. The **dcr-acr** option enables differential and adaptive clocking on different ports of the same card or chassis. Differential and dcr-acr clocking modes also support a configurable timestamp frequency. In order to carry differential clock recover information, the RTP header must be enabled on the SAP.

The following chassis, cards, and modules support all clocking modes:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 7705 SAR-M (variants with T1/E1 ports)
- 7705 SAR-X
- 7705 SAR-A (variant with T1/E1 ports)
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module

When the timestamp frequency is configured for **differential** or **dcr-acr** mode on a 4-port T1/E1 and RS-232 Combination module, the configured value will take effect on both modules installed in the 7705 SAR-H.

The following cards support differential clocking mode only:

- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card (DS1/E1 channels)
- 4-port DS3/E3 Adapter card (clear channel DS3/E3 ports and DS1/E1 channels on channelized DS3 ports (E3 ports cannot be channelized)); differential clocking mode on DS1/E1 channels is supported only on the first three ports of the card

Use the following CLI syntax to configure adaptive clocking mode.

CLI Syntax:

```
config>card>mda#
  clock-mode adaptive
  no shutdown
```

Use the following CLI syntax to configure differential clocking mode or a combination of differential and adaptive clocking modes with a timestamp frequency.

CLI Syntax:

```
config>card>mda#
  clock-mode {differential | dcr-acr} [timestamp-freq
    {19440 | 25000 | 77760 | 103680}]
  no shutdown
```

3.11.1.7 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 installed in a 7705 SAR-8 Shelf V2 or 7705 SAR-18 chassis.

CLI Syntax:

```
config>card>mda#
  mda-type a6-em
  voice
    companding-law {a-law | mu-law}
    signaling-type {type-1 | type-2 | type-v}
  no shutdown
```

Use the following CLI syntax to assign the type of companding law to be used on the FXO and FXS ports on an 8-port Voice & Teleprotection card installed in a 7705 SAR-8 Shelf V2 or 7705 SAR-18 chassis.

CLI Syntax:

```
config>card>mda#
mda-type a8-vt
voice
    companding-law {a-law | mu-law}
no shutdown
```

Use the following CLI syntax to assign the type of companding law to be used on the FXO ports on an 8-port FXO Adapter card installed in a 7705 SAR-8 Shelf V2 or 7705 SAR-18 chassis.

CLI Syntax:

```
config>card>mda#
mda-type a8-fxo
voice
    companding-law {a-law | mu-law}
no shutdown
```

Use the following CLI syntax to assign the type of companding law to be used on the FXS ports on a 6-port FXS Adapter card installed in a 7705 SAR-8 Shelf V2 or 7705 SAR-18 chassis.

CLI Syntax:

```
config>card>mda#
mda-type a6-fxs
voice
    companding-law {a-law | mu-law}
no shutdown
```

3.11.1.8 Configuring Ring Adapter Card or Module Parameters

Use the following CLI syntax to configure the adapter card or module parameters on the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module.

CLI Syntax:

```
config>card>mda#
ring
    [no] disable-aging
    [no] disable-learning
    [no] discard-unknown-source
    fdb-table-high-wmark high-water-mark
    no fdb-table-high-wmark
    fdb-table-size table-size
    no fdb-table-size
    [no] mac-pinning port port-id
    remote-age aging-timer
    no remote-age
    [no] static-mac mac ieee-address port port-id
    [create]
    [no] shutdown
```

After configuring the adapter card or module, you can use the **config>card>mda>ring>info detail** command to display the information on the ring adapter card or module.

```
*A:7705:Sar18>config>card>mda>ring# info detail
-----
no disable-aging
no disable-learning
no discard-unknown-source
no remote-age
no fdb-table-size
no fdb-table-high-wmark
no mac-pinning port 1/11/1
no mac-pinning port 1/11/2
-----
*A:7705:Sar18>config>card>mda>ring#
```

3.11.1.9 Configuring Auxiliary Alarm Card, Chassis, and Ethernet Port External Alarm Parameters

Use the following CLI syntax to configure the external alarm parameters for the Auxiliary Alarm card, 7705 SAR Ethernet ports (supported on all platforms with Ethernet ports), and for the four alarm inputs on the fan module (for the 7705 SAR-8 Shelf V2), alarm connector (for the 7705 SAR-M, 7705 SAR-Wx, 7705 SAR-H, 7705 SAR-Hc, and 7705 SAR-X), and alarm module (for the 7705 SAR-18).

The output commands apply to the Auxiliary Alarm card only. The **debounce** and **normally** commands do not apply to external alarm parameters configured on an Ethernet port.

```
CLI Syntax: config# external-alarms
alarm alarm-id
chassis-alarms
description description-string
log
severity {critical | major | minor | warning}
thresholds
analog
    level {lt | gt} millivolts
exit
trigger [any | all] {alarm-input1 | alarm-input2...
| alarm-input8}
exit
input alarm-input
debounce seconds
debounce detect detect-seconds clear clear-seconds
description description-string
name name-string
```

```

normally {open | closed}
shutdown
exit
output alarm-output
description description-string
name name-string
shutdown

```

Example:

```

config# external-alarms input alarm.d-1
config# external-alarms input alarm.d-2
config# external-alarms input alarm.d-3
config# external-alarms input alarm.d-4
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-alarms
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-alarms
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-alarms
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 alarm.d-1 alarm.d-2
config>ext-alarms>alarm# exit
config>ext-alarms# alarm 4
config>ext-alarms>alarm# chassis-alarms
config>ext-alarms>alarm# log
config>ext-alarms>alarm# trigger any alarm-1/1.a-1
alarm-1/1.a-2 alarm.d-1 alarm.d-2 alarm.d-3 alarm.d-4
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

```

The following CLI syntax shows an example of configuring custom alarms on Ethernet ports.

```

Example: config# external-alarms input port-1/1/5
config>ext-alarms>in# name "CABINET-DOOR"
config>ext-alarms>in# description "Front Panel Access
Door Sensor"
config>ext-alarms>in# exit
config# external-alarms input port-1/1/6
config>ext-alarms>in# name "REAR-PANEL"
config>ext-alarms>in# description "Rear Maintenance
Panel Sensor"
config>ext-alarms>in# exit
config# external-alarms alarm 1
config>ext-alarms>alarm# description "Local Security
Breach"
config>ext-alarms>alarm# trigger "CABINET-DOOR"
"REAR-PANEL"
config>ext-alarms>alarm# severity critical
config>ext-alarms>alarm# no shutdown
config>ext-alarms>alarm# exit

```

Use the **show external-alarms input** command to display Ethernet port alarm input information.


```
*NOK-A# show external-alarms input
=====
External Alarm Input Summary
=====
Input Id          Name                Type                Admin Value        Alarm State
-----
alarm.d-1         alarm.d-1           Digital-In          Up                 Open              Ok
alarm.d-2         alarm.d-2           Digital-In          Up                 Open              Ok
alarm.d-3         alarm.d-3           Digital-In          Up                 Open              Ok
alarm.d-4         alarm.d-4           Digital-In          Up                 Open              Ok
port-1/5/1        CABINET-DOOR       Oper-State          Up                 Down              Alarm-Detected
port-1/6/1        REAR-PANEL         Oper-State          Up                 Up                Ok
=====
```

3.11.1.10 Displaying Adapter Card Information

After performing the adapter card configuration, you can use the **config>card 1** and the **info** commands to display the information on the 7705 SAR-8 Shelf V2.

```
NOK-1>config# card 1
NOK-1>config>card# 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-chdslv2
  exit
  mda 4
    mda-type a4-chds3v2
  exit
  mda 5
    mda-type a8-ethv2
  exit
  mda 6
    mda-type a2-choc3
  exit
exit
#-----
.....
NOK-1> config#
```

Use the **config>card 1** and the **info detail** commands to display the adapter card detailed configuration information on the 7705 SAR-8 Shelf V2.

```
NOK-1>config# card 1
NOK-1>config>card# 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-chdslv2
  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-chds3v2
  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-ethv2
    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
#-----
.....
NOK-1> config#
```

3.11.2 Configuring Ports

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

- [Configuring APS Port Parameters](#)
- [Configuring LCR Parameters](#)
- [Configuring a Microwave Link](#)
- [Configuring Ethernet Port Parameters](#)
- [Configuring SONET/SDH Port Parameters](#)
- [SONET/SDH Channelized Port Configuration Examples](#)
- [Configuring Voice Ports](#)
- [Configuring Codirectional G.703 Ports](#)
- [Configuring Teleprotection Ports](#)
- [Configuring TDM PPP](#)
- [Configuring Channelized Ports](#)
- [Configuring Fractional T1/E1 Ports for PPP Encapsulation](#)
- [Configuring T1 Line Buildout](#)
- [Configuring TDM E1 SSM](#)
- [Configuring ATM Interface Parameters](#)
- [Configuring Multilink PPP Bundles](#)
- [Configuring MC-MLPPP](#)
- [Configuring LAG Parameters](#)
- [Configuring Multilink ATM Inverse Multiplexing \(IMA\) Groups](#)
- [Configuring SDI Ports for IPCP Encapsulation](#)
- [Configuring TDM and SDI Ports for Frame Relay Encapsulation](#)
- [Configuring TDM and SDI Ports for HDLC Encapsulation](#)
- [Configuring TDM and SDI Ports for Cisco HDLC Encapsulation](#)
- [Configuring GNSS Receiver Port Parameters](#)
- [Configuring Serial Ports for Raw Socket Transport](#)

3.11.2.1 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 or working port must be shut down in the **config>port** *port-id* context 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

SC-APS is supported in unidirectional or bidirectional mode on:

- 2-port OC3/STM1 Channelized Adapter cards for TDM CES (Cpipes) and TDM CESoETH with MEF 8 with DS3/DS1/E1/DS0 channels
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter cards for MLPPP access ports or TDM CES (Cpipes) and TDM CESoETH (MEF 8) access ports with DS1/E1 channels, or on a network port configured for POS
- 4-port OC3/STM1 Clear Channel Adapter cards network side (configured for POS operation).

SC-APS with TDM access is supported on DS3, DS1, E1, and DS0 (64 kb/s) channels.

MC-APS is supported in bidirectional mode on:

- 2-port OC3/STM1 Channelized Adapter cards for TDM CES (Cpipes) and TDM CESoETH with MEF 8 with DS3/DS1/E1/DS0 channels
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter cards for MLPPP access ports or CES (Cpipes) and TDM CESoETH (MEF 8) access ports with DS1/E1 channels.

MC-APS with TDM access is supported on DS3, DS1, E1, and DS0 (64 kb/s) channels. TDM SAP-to-SAP with MC-APS is not supported.

APS can be configured in SC-APS mode with both working and protection circuits on the same node, or in MC-APS mode with the working and protection circuits configured on separate nodes.

For SC-APS and MC-APS with MEF 8 services where the remote device performs source MAC validation, the MAC address of the channel group in each of the redundant interfaces may be configured to the same MAC address using the **mac** CLI command.

Use the following CLI syntax to configure APS port parameters for an SC-APS group.

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 SC-APS. The only mandatory configuration required to create an SC-APS group is to configure the working and protection circuit.

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
-----

```

Use the following CLI syntax to configure APS port parameters for an MC-APS group.

CLI Syntax:

```

config# port aps-id
aps
  advertise-interval advertise-interval
  hold-time hold-time
  neighbor ip-address
  protect-circuit port-id
  rdi-alarms {suppress | circuit}
  revert-time minutes
  working-circuit port-id

```

The following CLI syntax shows an example of configuring an MC-APS working circuit on a node. The only mandatory configuration required to create an MC-APS group is to configure the working and protection circuit, and the neighbor address.

Example:

```

config# port aps-2
config>port# aps
config>port>aps# advertise-interval 25
config>port>aps# hold-time 75
config>port>aps# working-circuit 1/2/4
config>port>aps# neighbor 10.10.10.101
config>port>aps# rdi-alarms circuit
config>port>aps# revert-time 5

```

To complete the MC-APS configuration, log on to the protection node, configure an APS group with the same APS ID as the working group, and configure the protection circuit. The MC-APS signaling path is established automatically when APS groups with matching IDs are both configured.

The following CLI syntax shows an example of configuring an MC-APS protection circuit on a node.

Example:

```

config# port aps-2
config>port# aps
config>port>aps# protect-circuit 1/3/2

```

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

```
*A:7705:Dut-D# configure port aps-2
*A:7705:Dut-D>config>port# info
-----
aps
  neighbor 10.10.10.2
  protect-circuit 1/3/2
exit
sonet-sdh
  path sts1-1
    payload vt15
    no shutdown
  exit
  path vt15-1.1.1
    no shutdown
  exit
exit
tdm
  ds1 1.1.1
    channel-group 1
    encap-type cem
    timeslots 1-24
    no shutdown
  exit
  no shutdown
  exit
exit
no shutdown
-----
```

SC-APS and MC-APS on the 2-port OC3/STM1 Channelized Adapter card (access side) normally support only TDM CES (Cpipes). SC-APS and MC-APS support Epipes with TDM SAPs when the MEF 8 service is used.

The following CLI syntax shows an example of TDM CESoETH with MEF 8 for APS.

```
*A:7705:Dut-D# configure service epipe 1
*A:7705:Dut-D>config>epipe# info
-----
epipe 1 customer 1 vpn 1 create
  description "Default epipe description for service id 1"
  endpoint "X" create
  exit
  endpoint "Y" create
  exit
  sap aps-1.1.1.1.1 endpoint "X" create
    description "Default sap description for service id 1"
    cem
      local-ecid 1
      remote-ecid 2
      remote-mac a4:8d:01:06:00:01
    exit
  exit
  spoke-sdp 2003:1 endpoint "Y" create
  exit
  spoke-sdp 2004:1001 endpoint "X" icb create
```



```

        exit
        spoke-sdp 2004:2001 endpoint "Y" icb create
        exit
        no shutdown
    exit
-----

```

The following CLI syntax shows examples of typical configurations of SC-APS and MC-APS on MC-MLPPP access ports on a 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.

SC-APS node:

```

=====
    port bpggrp-ppp-1
        multilink-bundle
            working-bundle bundle-ppp-1/5.1
            protect-bundle bundle-ppp-1/6.1
        exit
    exit

    port aps-1
        aps
            working-circuit 1/5/1
            protect-circuit 1/6/4
        exit
        sonet-sdh
            path sts1-1
                no shutdown
            exit
            path vt15-1.1.1
                no shutdown
            exit
            path vt15-1.1.2
                no shutdown
            exit
            path vt15-1.1.3
                no shutdown
            exit
            path vt15-1.1.4
                no shutdown
            exit
            path vt15-1.2.1
                no shutdown
            exit
            path vt15-1.2.2
                no shutdown
            exit
            path vt15-1.2.3
                no shutdown
            exit
            path vt15-1.2.4
                no shutdown
            exit
        tdm
            ds1 1.1.1
                channel-group 1

```

```
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.1.2
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.1.3
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.1.4
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.2.1
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.2.2
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.2.3
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.2.4
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit

port bpgrp-ppp-1
    multilink-bundle
        mlppp
            endpoint-discriminator class ip-address discriminator-id 1.2.3.4
```

```

        multiclass 4
        exit
        member aps-1.1.1.1.1
        member aps-1.1.1.2.1
        member aps-1.1.1.3.1
        member aps-1.1.1.4.1
        member aps-1.1.2.1.1
        member aps-1.1.2.2.1
        member aps-1.1.2.3.1
        member aps-1.1.2.4.1
    exit
    no shutdown
exit
port bundle-ppp-1/5.1
    no shutdown
exit
port bundle-ppp-1/6.1
    no shutdown
exit
service
    customer 1 create
        description "Default customer"
    exit
    ipipe 1 customer 1 vpn 1 create
        description "Default ipipe description for service id 1"
        sap 1/2/8:501 create
            description "Default sap description for service id 1"
            ce-address 172.16.0.1
        exit
        sap bpgrp-ppp-1 create
            description "Default sap description for service id 1"
            ce-address 172.16.0.0
            ipcp
            exit
        exit
    no shutdown
exit

```

MC-APS working node:

```

=====
port bpgrp-ppp-1
    multilink-bundle
        working-bundle bundle-ppp-1/9.1
    exit
exit
port aps-1
    aps
        neighbor 10.10.10.4
        working-circuit 1/9/2
    exit
sonet-sdh
    path sts1-1
        no shutdown
    exit
    path vt15-1.1.1
        no shutdown
    exit

```

```
path vt15-1.1.2
  no shutdown
exit
path vt15-1.1.3
  no shutdown
exit
path vt15-1.1.4
  no shutdown
exit
path vt15-1.2.1
  no shutdown
exit
path vt15-1.2.2
  no shutdown
exit
path vt15-1.2.3
  no shutdown
exit
path vt15-1.2.4
  no shutdown
exit
tdm
dsl 1.1.1
  channel-group 1
  encap-type ipcp
  no shutdown
  exit
  no shutdown
exit
dsl 1.1.2
  channel-group 1
  encap-type ipcp
  no shutdown
  exit
  no shutdown
exit
dsl 1.1.3
  channel-group 1
  encap-type ipcp
  no shutdown
  exit
  no shutdown
exit
dsl 1.1.4
  channel-group 1
  encap-type ipcp
  no shutdown
  exit
  no shutdown
exit
dsl 1.2.1
  channel-group 1
  encap-type ipcp
  no shutdown
  exit
  no shutdown
exit
dsl 1.2.2
  channel-group 1
```

```

        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.2.3
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.2.4
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
port bpggrp-ppp-1
    multilink-bundle
        mlppp
            endpoint-discriminator class ip-address discriminator-id 1.2.3.4
            multiclass 4
        exit
        member aps-1.1.1.1.1
        member aps-1.1.1.2.1
        member aps-1.1.1.4.1
        member aps-1.1.1.3.1
        member aps-1.1.2.1.1
        member aps-1.1.2.2.1
        member aps-1.1.2.3.1
        member aps-1.1.2.4.1
    exit
    no shutdown
exit
port bundle-ppp-1/9.1
    no shutdown
exit
service
    sdp 3001 create
        description "LDP_SdpToDut-A"
        far-end 10.10.10.1
        ldp
        keep-alive
        shutdown
    exit
    no shutdown
exit
    sdp 3004 create
        description "LDP_SdpToDut-D"
        far-end 10.10.10.4
        ldp
        keep-alive
        shutdown
    exit
    no shutdown
exit
customer 1 create

```

```

        description "Default customer"
    exit
    ipipe 1 customer 1 vpn 1 create
        description "Default ipipe description for service id 1"
        endpoint "X" create
    exit
        endpoint "Y" create
    exit
    sap bgrp-ppp-1 endpoint "X" create
        description "Default sap description for service id 1"
        ce-address 172.16.0.1
        ipcp
    exit
    exit
    spoke-sdp 3001:1 endpoint "Y" create
        ce-address 172.16.0.0
        no shutdown
    exit
    spoke-sdp 3004:1001 endpoint "X" icb create
        no shutdown
    exit
    spoke-sdp 3004:2001 endpoint "Y" icb create
        no shutdown
    exit
    no shutdown
exit

```

MC-APS protection node:

```

=====
port bgrp-ppp-1
    multilink-bundle
        protect-bundle bundle-ppp-1/9.1
    exit
exit
port aps-1
    aps
        neighbor 10.10.10.3
        protect-circuit 1/9/4
    exit
sonet-sdh
    path sts1-1
        no shutdown
    exit
    path vt15-1.1.1
        no shutdown
    exit
    path vt15-1.1.2
        no shutdown
    exit
    path vt15-1.1.3
        no shutdown
    exit
    path vt15-1.1.4
        no shutdown
    exit
    path vt15-1.2.1
        no shutdown

```

```
exit
path vt15-1.2.2
    no shutdown
exit
path vt15-1.2.3
    no shutdown
exit
path vt15-1.2.4
    no shutdown
exit
tdm
dsl 1.1.1
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.1.2
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.1.3
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.1.4
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.2.1
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.2.2
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
exit
dsl 1.2.3
    channel-group 1
        encap-type ipcp
        no shutdown
    exit
    no shutdown
```

```

        exit
        ds1 1.2.4
            channel-group 1
                encap-type ipcp
                no shutdown
            exit
        no shutdown
    exit
port bpgroup-ppp-1
    multilink-bundle
        mlppp
            endpoint-discriminator class ip-address discriminator-id 1.2.3.4
            multiclass 4
        exit
        member aps-1.1.1.1.1
        member aps-1.1.1.2.1
        member aps-1.1.1.3.1
        member aps-1.1.1.4.1
        member aps-1.1.2.1.1
        member aps-1.1.2.2.1
        member aps-1.1.2.3.1
        member aps-1.1.2.4.1
    exit
    no shutdown
exit
port bundle-ppp-1/9.1
    no shutdown
exit
service
    sdp 4001 create
        description "LDP_SdpToDut-A"
        far-end 10.10.10.1
        ldp
        keep-alive
        shutdown
    exit
    no shutdown
    exit
    sdp 4003 create
        description "LDP_SdpToDut-C"
        far-end 10.10.10.3
        ldp
        keep-alive
        shutdown
    exit
    no shutdown
    exit
    customer 1 create
        description "Default customer"
    exit
    ipipe 1 customer 1 vpn 1 create
        description "Default ipipe description for service id 1"
        endpoint "X" create
    exit
    endpoint "Y" create
    exit
    sap bpgroup-ppp-1 endpoint "X" create
        description "Default sap description for service id 1"
        ce-address 172.16.0.1

```



```

        ipcp
        exit
    exit
    spoke-sdp 4001:1 endpoint "Y" create
        ce-address 172.16.0.0
        no shutdown
    exit
    spoke-sdp 4003:1001 endpoint "Y" icb create
        no shutdown
    exit
    spoke-sdp 4003:2001 endpoint "X" icb create
        no shutdown
    exit
    no shutdown
exit

```

Pseudowire redundancy node:

```

=====
    service
        sdp 1003 create
            description "LDP_SdpToDut-C"
            far-end 10.10.10.3
            ldp
            keep-alive
            shutdown
        exit
        no shutdown
    exit
    sdp 1004 create
        description "LDP_SdpToDut-D"
        far-end 10.10.10.4
        ldp
        keep-alive
        shutdown
    exit
    no shutdown
    exit
    customer 1 create
        description "Default customer"
    exit
    ipipe 1 customer 1 vpn 1 create
        description "Default ipipe description for service id 1"
        endpoint "Y" create
            revert-time 5
            standby-signaling-master
    exit
    sap 1/2/1:501 create
        description "Default sap description for service id 1"
        ce-address 172.16.1.1
    exit
    spoke-sdp 1003:1 endpoint "Y" create
        ce-address 172.16.1.2
        precedence primary
        no shutdown
    exit
    spoke-sdp 1004:1 endpoint "Y" create
        ce-address 172.16.1.2

```

```

precedence 1
no shutdown
exit
no shutdown
exit

```

3.11.2.2 Configuring LCR Parameters

LCR has the following configuration rules.

- The working and protection adapter cards in an LCR group must be configured with the same setting for the **mda-mode** command. In addition, the **clock-mode** for each card must be set to **dcr-acr** before the adapter card can be added to an LCR group.
- In an SC-LCR group, both the working and protection adapter cards are configured with the same LCR group ID on the same node. The working and protection adapter cards must be the same type.
- In an MC-LCR group, the working and protection adapter cards are configured on separate nodes. Users must ensure that the working and protection adapter cards are the same type.
- A working adapter card must be created first in an LCR group. Then a protection adapter card can be added to or removed from an LCR group at any time.
- The protection adapter card must be removed from the configuration before the working adapter card is removed.
- A protection adapter card or working adapter card must be shut down in the **config>card>mda mda-slot** context before being removed from an LCR group.
- A channel cannot be configured on a T1/E1 port before its associated adapter card is added to an LCR group.
- A working adapter card cannot be removed from an LCR group until the associated T1/E1 channel is removed.
- When adapter cards are added to an LCR group, all channel-level configurations are available only on the associated LCR ports and configuration on the physical member ports is blocked.

LCR is supported on the following cards on the 7705 SAR-8 Shelf V2 and the 7705 SAR-18:

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

To create an SC-LCR group, it is mandatory to configure a group ID and the working and protection adapter cards. Use the following CLI syntax to configure SC-LCR.

CLI Syntax:

```
config# lcr lcr-id
      working-mda mda-id
      protect-mda mda-id
```

The following CLI syntax shows an example of configuring SC-LCR.

Example:

```
config# lcr lcr-1
config>lcr# working-mda 1/1
config>lcr# protect-mda 1/2
config>lcr# revert-time 5
```

Use the **info** command to display SC-LCR configuration information.

```
*A:7705:DUT-A>config>lcr lcr-1
*A:7705:DUT-A>config>lcr# info
-----
      revert-time 5
      working-mda 1/1
      protect-mda 1/2
-----
```

To create an MC-LCR group, it is mandatory to configure the LCR ID, the working adapter card and neighbor address, and protection adapter card and neighbor address. Use the following CLI syntax to configure LCR parameters for an MC-LCR group.

CLI Syntax:

```
config# lcr lcr-id
      advertise-interval advertise-interval
      hold-time hold-time
      neighbor ip-address
      protect-mda mda-id
      revert-time minutes
      working-mda mda-id
```

The following CLI syntax shows an example of configuring a working adapter card on a node in an MC-LCR group.

Example:

```
config# lcr lcr-2
config>lcr# neighbor 25.25.25.25
config>lcr# working-mda 1/1
```

To complete the MC-LCR configuration, log on to the protection node, configure an LCR group with the same LCR ID as the working adapter card, and configure the protection adapter card and the neighbor address. An IP link establishes a multi-chassis protocol (MCP) link between the two nodes.

The following CLI syntax shows an example of configuring a protection adapter card on a node in an MC-LCR group.

Example:

```
config# lcr lcr-2
config>lcr# neighbor 14.14.14.14
config>lcr# protect-mdm 1/1
config>lcr# revert-time 5
```

Use the **info** command to display MC-LCR configuration information.

```
*A:7705:Dut-D# configure lcr lcr-2
*A:7705:Dut-D>config>lcr# info
-----
      neighbor 14.14.14.14
      revert-time 5
      protect-mdm 1/1
-----
```

3.11.2.3 Configuring a Microwave Link

A microwave link can be configured on a 7705 SAR-8 Shelf V2 or 7705 SAR-18 in order to support a microwave connection from ports 1 through 4 on a Packet Microwave Adapter card to an MPR-e radio that may be configured in standalone mode or Single Network Element (Single NE) mode.

Use the following CLI syntax to configure a microwave link (in the example, the MPR-e radios are configured in standalone mode):

CLI Syntax:

```
config# port mw-link-id
[no] shutdown
      mw
          [no] hold-time {up hold-time-up | down
                        hold-time-down}
          [no] peer-discovery
          [no] protection
          radio port-id main create
              [no] database filename
              name name-string
              standalone
              [no] tx-mute
          radio port-id spare create
              [no] database filename
              name name-string
              standalone
              [no] tx-mute
          [no] revert rps eps
```

The following CLI syntax shows an example of configuring a microwave link on the 7705 SAR-8 Shelf V2; the MPR-e radios are in standalone mode.

Example:

```

config# port mw-link-24
config>port# no shutdown
config>port# mw
config>port>mw# hold-time up 0 down 0
config>port>mw# no peer-discovery
config>port>mw# protection
config>port>mw# radio 1/2/3 main create
config>port>mw>radio# database mwLink1.tar
config>port>mw>radio# name radiomain
config>port>mw>radio# standalone
config>port>mw>radio# tx-mute
config>port>mw>radio# exit
config>port>mw# radio 1/2/3 spare create
config>port>mw>radio# database mwLink1.tar
config>port>mw>radio# name radiospare
config>port>mw>radio# standalone
config>port>mw>radio# tx-mute
config>port>mw>radio# exit
config>port>mw# revert rps eps
config>port>mw# exit
config>port# exit

```

3.11.2.4 Configuring Ethernet Port Parameters

Use the following CLI syntax to configure Ethernet network and access port parameters. For more information on the **dot1x** command, see [Configuring 802.1x Authentication Port Parameters](#). For more information on the **mac-auth** and **mac-auth-wait** commands, see [Configuring MAC Authentication Port Parameters](#).

When an Ethernet port is configured in WAN mode (**xgig wan** command), users can change certain SONET/SDH parameters to reflect the SONET/SDH requirements for the port. For more information, see [Configuring SONET/SDH Parameters on an Ethernet XGIG WAN Port](#).

CLI Syntax:

```

config# port port-id
ethernet
  access
    egress
      unshaped-sap-cir cir-rate
    autonegotiate limited
    cfm-loopback priority {low | high | dot1p} [match-vlan
      {vlan-range | none}]
    crc-monitor
      sd-threshold threshold [multiplier multiplier]
      no sd-threshold
      sf-threshold threshold [multiplier multiplier]

```

```

    no sf-threshold
    window-size seconds
    no window-size
dot1q-etype 0x0600..0xffff
dot1x
    [no] mac-auth
    mac-auth-wait seconds
    no mac-auth-wait
    [no] max-auth-req max-auth-request
    [no] port-control {auto | force-auth | force-unauth}
    [no] quiet-period seconds
    [no] radius-plcy name
    [no] re-auth-period seconds
    [no] re-authentication
    [no] server-timeout seconds
    [no] supplicant-timeout seconds
    [no] transmit-period seconds
down-when-looped
    [no] keep-alive timer
    [no] retry-timeout timer
    [no] shutdown
    [no] use-broadcast-address
duplex {full|half}
efm-oam
    [no] accept-remote-loopback
    hold-time time-value
    [no] ignore-efm-state
    mode {active | passive}
    [no] shutdown
    transmit-interval interval [multiplier multiplier]
    [no] tunneling
egress-rate sub-rate [include-fcs]
    [allow-eth-bn-rate-changes] [hold-time hold-time]
encap-type {dot1q|null|qinq}
hold-time hold-time [up hold-time-up | down
hold-time-down]
ingress-rate ingress-rate cbs {size [bytes |
kilobytes] | default}
no ingress-rate
    src-pause
    no src-pause
lACP-tunnel
lldp
    dest-mac
loopback {line | internal} {timer {0 | 30..86400} |
    persistent} [swap-src-dst-mac]
no loopback
mac ieee-address
mode {access | network | hybrid}

```

```

mtu mtu-bytes
network
  accounting-policy policy-id
  [no] collect-stats
  queue-policy name
  scheduler-mode {profile | 4-priority | 16-priority}
phy-tx-clock {auto-pref-master | auto-pref-slave |
  slave | master}
no phy-tx-clock
poe {plus}
no poe
ptp-asymmetry nano-seconds
no ptp-asymmetry
qinq-etype 0x0600..0xffff
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
vlan-filter filter-id
no vlan-filter
xgig {lan | wan}
xor-mode {rj45 | sfp}

```

3.11.2.4.1 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
      accounting-policy policy-id
      [no] collect-stats
      queue-policy name
      scheduler-mode {profile | 4-priority | 16-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
-----

```

3.11.2.4.2 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 | qinq}

```

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#

```

3.11.2.4.3 Configuring a Hybrid Ethernet Port

A hybrid Ethernet port allows the combination of network and access modes of operation on a per-VLAN basis and must be configured for either dot1q or qinq encapsulation.

A hybrid mode port must use dot1q encapsulation to be configured as a network IP interface. Attempting to specify a qinq-encapsulated hybrid port as the port of a network interface is blocked.

Once a port has been configured for hybrid mode, multiple services may be configured on the port.

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

CLI Syntax:

```

port port-id
  mode {hybrid}
  encap-type {dot1q | qinq}

```

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

Example:

```

config# port 1/1/5
config>port# description "hybrid Ethernet port"
config>port# ethernet
config>port>ethernet# mode hybrid
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 "hybrid Ethernet port"
      ethernet
        mode hybrid
        encap-type dot1q
-----

```

```

        exit
        no shutdown
    -----
ALU-A>config>port#

```

3.11.2.4.4 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
      no mac-auth
      no mac-auth-wait
-----
ALU-A>config>port>ethernet>dot1x#

```

3.11.2.4.5 Configuring MAC Authentication Port Parameters

The 7705 SAR supports a fallback MAC authentication mechanism for client devices (for example, PCs and STBs) on an Ethernet network that do not support 802.1x EAP.

MAC authentication provides protection against unauthorized access by forcing the device connected to the 7705 SAR to have its MAC address authenticated by a RADIUS server before it is able to transmit packets through the 7705 SAR.

Use the following CLI syntax to configure MAC authentication for an Ethernet port:

CLI Syntax:

```

port port-id ethernet
  dot1x
    mac-auth
    mac-auth-wait seconds
    port-control auto
    quiet-period seconds
    radius-plcy name

```

The following CLI syntax shows an example of configuring MAC authentication for an Ethernet port:

Example:

```

config# port 1/5/2 ethernet dot1x
config>port>ethernet>dot1x# mac-auth
config>port>ethernet>dot1x# mac-auth-wait 20
config>port>ethernet>dot1x# port-control auto
config>port>ethernet>dot1x# quiet-period 60
config>port>ethernet>dot1x# radius-plcy dot1xpolicy

```

Use the **info detail** 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
      mac-auth
      mac-auth-wait 20
-----
ALU-A>config>port>ethernet>dot1x#

```

3.11.2.5 Configuring SONET/SDH Port Parameters

When configuring a SONET/SDH port, users configure both SONET/SDH and TDM aspects of a channel. The CLI uses the *sonet-sdh-index* variable to identify a channel in order to match SONET/SDH parameters with TDM parameters for the channel. Configuring TDM on a SONET/SDH port is similar to configuring it on a TDM port. See [Configuring Channelized Ports](#) for additional information.

This section shows the CLI syntax for the following adapter cards and provides examples for configuring SONET/SDH access and network ports:

- 4-port OC3/STM1 Clear Channel Adapter card
- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card

4-port OC3/STM1 Clear Channel Adapter Card

Use the following CLI syntax to configure SONET/SDH port parameters on a 4-port OC3/STM1 Clear Channel Adapter card. On the 4-port OC3/STM1 Clear Channel Adapter card, the *sonet-sdh-index* variable in the **path** command is optional and defaults to **sts3**, which cannot be changed.

```

CLI Syntax:  port port-id
                sonet-sdh
                  clock-source {loop-timed | node-timed}
                  framing {sonet | sdh}
                  hold-time {[up hold-time-up] [down hold-time-down]}
                  loopback {line | internal}
                  path [sonet-sdh-index]
                    atm
                      cell-format cell-format
                      min-vp-vpi value

```

```

crc {16 | 32}
description long-description-string
encap-type {atm | ppp-auto}
mode {access | network}
mtu mtu
network
    accounting-policy policy-id
    collect-stats
    queue-policy name
payload
ppp
    keepalive time-interval [dropcount drop-count]
report-alarm [pais] [plop] [prdi] [pplm] [prei]
    [puneq]
scramble
[no] shutdown
signal-label value
trace-string [trace-string]
report-alarm [loc] [lais] [lrldi] [lb2er-sd]
    [lb2er-sf] [slof] [slos] [lrei]
section-trace {increment-z0 | byte value | string
    string}
speed {oc3}
threshold {ber-sd | ber-sf} rate threshold
tx-dus

```

2-port OC3/STM1 Channelized Adapter Card and 4-port OC3/STM1 / 1-port OC12/STM4 Adapter Card

Use the following CLI syntax to configure SONET/SDH port parameters on a 2-port OC3/STM1 Channelized Adapter card or a 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card. The *sonet-sdh-index* values are different for each of these adapter cards (see [SONET/SDH](#) for more information). The syntax includes the TDM port parameters.

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]}
    loopback {line | internal}
    path sonet-sdh-index
        atm description-string
            cell-format cell-format
            min-vp-vpi value
        crc {16|32}
        description long-description-string

```

```

encap-type encap-type
mode {access | network}
mtu mtu
network
    accounting-policy policy-id
    collect-stats mtu
    queue-policy name
ppp
    keepalive time-interval [dropcount drop-count]
    report-alarm [pais] [plop] [prdi] [pplm] [prei]
        [puneq] [plcd]
scramble
[no] shutdown
signal-label value
trace-string [trace-string]
report-alarm [loc] [lais] [lrldi] [ss1f] [lb2er-sd]
    [lb2er-sf] [slof] [slos] [lrei]
section-trace {increment-z0 | byte value | string
    string}
speed {oc3 | oc12}
tx-dus

tdm
ds1 [ds1-id]
    channel-group channel-group
        atm
            cell-format cell-format
            min-vp-vpi value
        cisco-hdlc
            down-count down-count
            keepalive time-interval
            up-count up-count
        crc {16|32}
        description long-description-string
        encap-type {atm|bcp-null|
            bcp-dot1q|ipcp|ppp-auto|
            frame-relay|wan-mirror|
            cisco-hdlc|cem|hdlc}
        frame-relay
            lmi-type {ansi|itu|none|rev1}
            mode {dce|dte|bidir}
            n391dte intervals
            n392dce threshold
            n392dte threshold
            n393dce count
            n393dte count
            t391dte keepalive
            t392dce keepalive
            idle-cycle-flag {flags|ones}

```

```

idle-payload-fill {all-ones| pattern}
idle-signal-fill {all-ones| pattern}
loopback {line|internal}
mac ieee-address
mode {access|network}
mtu mtu-bytes
network
    accounting-policy policy-id
    collect-stats
    queue-policy name
ppp
    ber-sf-link-down
    keepalive time-period [dropcount drop-count]
scramble
[no] shutdown
signal-mode cas
timeslots timeslots
clock-source {loop-timed|node-timed| adaptive|
differential}
framing {esf|sf|ds1-unframed}
hold-time {[up hold-time-up] [down
hold-time-down]}
loopback {line|internal|
fdl-ansi|fdl-bellcore|payload-ansi}
remote-loop-respond
report-alarm [ais] [los] [oof] [rai] [looped]
[ber-sd] [ber-sf]
[no] shutdown
signal-mode cas
threshold {ber-sd|ber-sf} rate {1|5|10|50|100}
ds3 [sonet-sdh-index]
atm
    cell-format cell-format
    mapping mapping
    min-vp-vpi value
channelized {ds1|e1}
clock-source {loop-timed|node-timed|
differential|free-run}
crc {16|32}
description long-description-string
encap-type {atm|bcp-null|bcp-dot1q|
ipcp|ppp-auto|frame-relay|wan-mirror|
cisco-hdlc|cem}
feac-loop-respond
frame-relay
    lmi-type {ansi|itu|none|rev1}
    mode {dce|dte|bidir}
    n391dte intervals
    n392dce threshold

```

```

n392dte threshold
n393dce count
n393dte count
t391dte keepalive
t392dce keepalive
framing {c-bit|m23|ds3-unframed}
idle-cycle-flag {flags|ones}
loopback {line|internal|remote}
mac ieee-address
mdl {eic|lic|fic|unit|pfi|port|gen} mdl-string
mdl-transmit {path|idle-signal| test-signal}
mode {access|network}
mtu mtu-bytes
network
    accounting-policy policy-id
    collect-stats
    queue-policy name
ppp
    keepalive time-period [dropcount drop-count]
report-alarm [ais] [los] [oof] [rai] [looped]
scramble
[no] shutdown

```

3.11.2.5.1 Configuring a SONET/SDH Access Port

This section provides examples of configuring a SONET/SDH access port on the following adapter cards:

- 4-port OC3/STM1 Clear Channel Adapter Card
- 2-port OC3/STM1 Channelized Adapter Card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter Card

4-port OC3/STM1 Clear Channel Adapter Card

Use the following CLI syntax to configure a SONET/SDH access port on a 4-port OC3/STM1 Clear Channel Adapter card. The default setting for the **mode** command is access.

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

```

Use the **config port info** command to display SONET/SDH port configuration information.

```

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

```

2-port OC3/STM1 Channelized Adapter Card

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
                  sonet-sdh
                    path sonet-sdh-index
                    path sonet-sdh-index
                    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# sonet-sdh

```

```

config>port>sonet-sdh# path sts1-1
config>port>sonet-sdh>path# no shutdown
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# path vt15-1.1.1
config>port>sonet-sdh>path# no shutdown
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# exit
config>port# tdm
config>port>tdm# ds1 1.1.1
config>port>tdm>ds1# channel-group 1
config>port>tdm>ds1>channel-group# encap-type atm
config>port>tdm>ds1>channel-group# mode access
config>port>tdm>ds1>channel-group# no shutdown
config>port>tdm>ds1>channel-group# exit
config>port>tdm>ds1# exit
config>port>tdm># exit
config>port# exit

```

4-port OC3/STM1 / 1-port OC12/STM4 Adapter Card

Use the following CLI syntax to configure a SONET/SDH access port on a 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.

CLI Syntax:

```

port port-id
  sonet-sdh
    path sonet-sdh-index
    path sonet-sdh-index
  tdm
    ds1 ds1-id
      channel-group channel-group
      encap-type cem
      mode access
      [no] shutdown

```

The following CLI syntax shows an example of configuring a SONET/SDH access port on a 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card (4-port mode).

Example:

```

config# port 1/2/3
config>port# sonet-sdh
config>port>sonet-sdh# path sts1-1
config>port>sonet-sdh>path# no shutdown
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# path vt15-1.1.1
config>port>sonet-sdh>path# no shutdown
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# exit
config>port# tdm
config>port>tdm# ds1 1.1.1

```

```

config>port>tdm>dsl# channel-group 1
config>port>tdm>dsl>channel-group# encap-type cem
config>port>tdm>dsl>channel-group# mode access
config>port>tdm>dsl>channel-group# no shutdown
config>port>tdm>dsl>channel-group# exit
config>port>tdm>dsl# exit
config>port>tdm># exit
config>port# exit

```

The following display shows the configuration when the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card is in 4-port mode. Use the **config port info** command to display SONET/SDH port information.

```

ALU-B>config>port# info
....
#-----
echo "Port Configuration"
#-----
....
sonet-sdh
    path sts1-1
        payload vt15
        no shutdown
    exit
    path vt15-1.1.1
        no shutdown
    exit
exit
tdm
    dsl 1.1.1
        channel-group 1
        encap-type cem
        no shutdown
    exit
    no shutdown
    exit
exit
....

```

The following display shows the configuration when the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card is in 1-port mode. Use the **config port info** command to display SONET/SDH port information.

```

ALU-B>config>port# info
....
#-----
echo "Port Configuration"
#-----
....
sonet-sdh
    path sts1-1.1
        payload vt15
        no shutdown
    exit
    path vt15-1.1.1.1

```

```

        no shutdown
    exit
exit
tdm
    ds1 1.1.1.1
        channel-group 1
        encap-type cem
        no shutdown
    exit
    no shutdown
exit
exit
....

```

3.11.2.5.2 Configuring a SONET/SDH Network Port

This section provides examples of configuring a SONET/SDH network port on the following adapter cards:

- 4-port OC3/STM1 Clear Channel Adapter card
- 2-port OC3/STM1 Channelized Adapter card

4-port OC3/STM1 Clear Channel Adapter Card

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
    network
        accounting-policy policy-id
        [no] collect-stats
        queue-policy name
        [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 port info** command to display SONET/SDH port information for the configured port.

```

ALU-B>config>port# 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
....

```

2-port OC3/STM1 Channelized Adapter Card

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
  sonet-sdh
    path sonet-sdh-index
      payload ds3
      [no] shutdown
    tdm
      ds3 [sonet-sdh-index]
        channelized ds1
        [no] shutdown
      ds1 ds1-id
        channel-group channel-group
        encap-type ppp-auto
        mode network
        [no] shutdown
      [no] shutdown

```

The following CLI syntax shows an example of configuring a SONET/SDH DS1 network port on a 2-port OC3/STM1 Channelized Adapter card. Configuring a SONET/SDH DS3 port is similar but without a channel group.

```

Example:    config# port 1/2/2
                config>port# sonet-sdh
                config>port>sonet-sdh# path sts1-1
                config>port>sonet-sdh>path# payload ds3
                config>port>sonet-sdh>path# no shutdown
                config>port>sonet-sdh>path# exit
                config>port>sonet-sdh># exit
                config>port# tdm
                config>port>tdm# ds3 1
                config>port>tdm>ds3# channelized ds1
                config>port>tdm>ds3# no shutdown
                config>port>tdm>ds3# exit
                config>port>tdm# ds1 1.22
                config>port>tdm>ds1# channel-group 5
                config>port>tdm>ds1>channel-group# mode network
                config>port>tdm>ds1>channel-group# encap-type ppp-auto
                config>port>tdm>ds1>channel-group# no shutdown
                config>port>tdm>ds1>channel-group# exit
                config>port>tdm>ds1# exit
                config>port>tdm># exit
                config>port# exit
                config#
  
```

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

```

ALU-B>config>port# info
....
#-----
echo "Port Configuration"
#-----
....
    port 1/2/2
      shutdown
      sonet-sdh
        path sts1-1
          no shutdown
        exit
      exit
      tdm
        ds3 1
          channelized ds1
          no shutdown
        exit
        ds1 1.22
          shutdown
          channel-group 5
            mode network
  
```

```

        encap-type ppp-auto
        no shutdown
    exit
exit
exit
....

```

3.11.2.5.3 Configuring the SONET/SDH Port group and path Commands

The **group** and **path** commands in the **config>port>sonet-sdh** context both use the *sonet-sdh-index* variable. However, the *sonet-sdh-index* format for each command is different. The full commands are as follows:

- **group** *sonet-sdh-index* **payload** {**tu3** | **vt2** | **vt15**}
- **path** [*sonet-sdh-index*]

The **group** command is only available on SONET/SDH adapter cards that support STS-3 channelization (that is, **path sts3** or **path sts3-1** commands). The payload is **tug-index** for the STS-3 path. The **group** command is available with SDH framing when an STS-3 path is configured with a payload of **tug3**. The payload of the group determines the next path layer.

The **path** [*sonet-sdh-index*] command is available on all SONET/SDH adapter cards. The *sonet-sdh-index* variable is optional for the 4-port OC3/STM1 Clear Channel Adapter card because the card defaults to **sts3** and no further channelization is possible.

The 7705 SAR SONET/SDH implementation has options for clear channel OC3 and OC12.

The 2-port OC3/STM1 Channelized Adapter card supports DS3/DS1/E1 channelization (not E3), as well as $n \times$ DS0 channelization.

The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card supports DS1/E1 channelization but not DS3/E3 and not $n \times$ DS0 channelization. In addition, DS1/E1 channels cannot be in DS3/E3 channels. To configure clear channel OC3 and clear channel OC12 on this adapter card, use the **config card 1 mda slot mda-mode** command to configure either 4-port OC3 mode (**mda-mode p4-oc3**) or 1-port OC12 mode (**mda-mode p1-oc12**).

Use the following CLI syntax to configure the basic channelized OC3/STM1 parameters:

```

CLI Syntax:  config# port port-id
                sonet-sdh
                framing {sonet|sdh}

```

```

group sonet-sdh-index payload {tu3|vt2|vt15}
path [sonet-sdh-index]
    payload {sts3|tug3|ds3|e3}
    trace-string [trace-string]
no shutdown

```

The following CLI syntax shows an example of configuring the basic channelized OC3/STM1 parameters.

```

Example: config# port 5/2/1
config>port# sonet-sdh
config>port>sonet-sdh# framing sdh
config>port>sonet-sdh# path sts3
config>port>sonet-sdh>path# trace-string "HO-path"
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# group tug3-1 payload vt2
config>port>sonet-sdh# group tug3-3 payload vt2
config>port>sonet-sdh# path vt2-1.1.1
config>port>sonet-sdh>path# trace-string "LO-path 3.7.3"
config>port>sonet-sdh>path# no shutdown
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# exit
config>port# tdm
config>port>tdm# e1 1.1.1
config>port>tdm>e1# channel-group 1
config>port>tdm>e1>channel-group# timeslots 2-32
config>port>tdm>e1>channel-group# no shutdown
config>port>tdm>e1>channel-group# exit
config>port>tdm# e1 3.7.3
config>port>tdm>e1# channel-group 2
config>port>tdm>e1>channel-group# timeslots 2-32
config>port>tdm>e1>channel-group# no shutdown
config>port>tdm>e1>channel-group# exit

```

Use the **info** command to display configuration information.

```
A:ALA-49>config>port# info
```

```

-----
sonet-sdh
  framing sdh
  path sts3
    trace-string "HO-path"
    no shutdown
  exit
  group tug3-1 payload vt2
  group tug3-3 payload vt2
  path vt2-1.1.1
    trace-string "LO-path 3.7.3"
    no shutdown
  exit
  path vt2-3.7.3

```



```

        no shutdown
    exit
exit
tdm
    e1 1.1.1
        channel-group 1
            timeslots 2-32
            no shutdown
        exit
        no shutdown
    exit
    e1 3.7.3
        channel-group 2
            timeslots 2-32
            no shutdown
        exit
        no shutdown
    exit
exit
no shutdown
-----
A:ALA-49>config>port#

```

3.11.2.5.4 Configuring SONET/SDH Parameters on an Ethernet XGIG WAN Port

When an Ethernet port is configured in WAN mode (**xgig wan** command), you can change certain SONET/SDH parameters to reflect the SONET/SDH requirements for the port.

The following CLI output shows an example of a SONET/SDH configuration for a WAN PHY Ethernet port.

```

*A:7705>config>port# info
-----
    shutdown
    ethernet
        xgig wan
    exit
    sonet-sdh
        tx-dus
        suppress-lo-alarm
        threshold ber-sd rate 4
        section-trace increment-z0
        path
            trace-string "hello"
            report-alarm pais
            signal-label 0x20
        exit
    exit
-----

```

3.11.2.6 SONET/SDH Channelized Port Configuration Examples

This section contains information on the following topics:

- [OC3 Channelization using SONET and SDH](#)
- [Configuring DS1/E1 on a Channelized OC3 Port with STS1 Path](#)
- [Configuring DS1/E1 on a Channelized OC3 Port with STM Path](#)
- [Configuring DS1/E1 on a Channelized OC3 Port with STS3 Path](#)
- [Configuring a SONET/SDH Port with Multiple DS1s in an MLPPP Bundle](#)



Note: The following sections show examples of OC3 configurations. Similar examples for OC12 configurations would require an extra level in the *sonet-sdh-index*. See [Table 16](#) in [SONET/SDH Channelized Port ID](#) for port syntax examples.

3.11.2.6.1 OC3 Channelization using SONET and SDH

In SONET, the base signal is referred to as synchronous transport signal–level 1 (STS-1), which operates at 51.84 Mb/s. Higher-level signals are integer multiples of STS-1, for example, STS-3/OC3 = 3 x STS-1 = 155.52 Mb/s. The SDH equivalent of the SONET STS-1 and STS-3 frames are STM-0 and STM-1, respectively.

In addition to the STS-1 base format, SONET also defines synchronous formats at sub-STs-1 levels. The STS-1 payload can be subdivided into virtual tributaries (VTs) for SONET or virtual containers (VCs) for SDH. VTs and VCs are synchronous signals used to transport lower-speed transmissions. Two VTs are VT1.5 and VT2, where:

- VT1.5 = 1.728 Mb/s (enough to carry a T1)
- VT2 = 2.304 Mb/s (enough to carry an E1)

The SDH equivalents to VT1.5 and VT2 are VC11 and VC12, respectively.



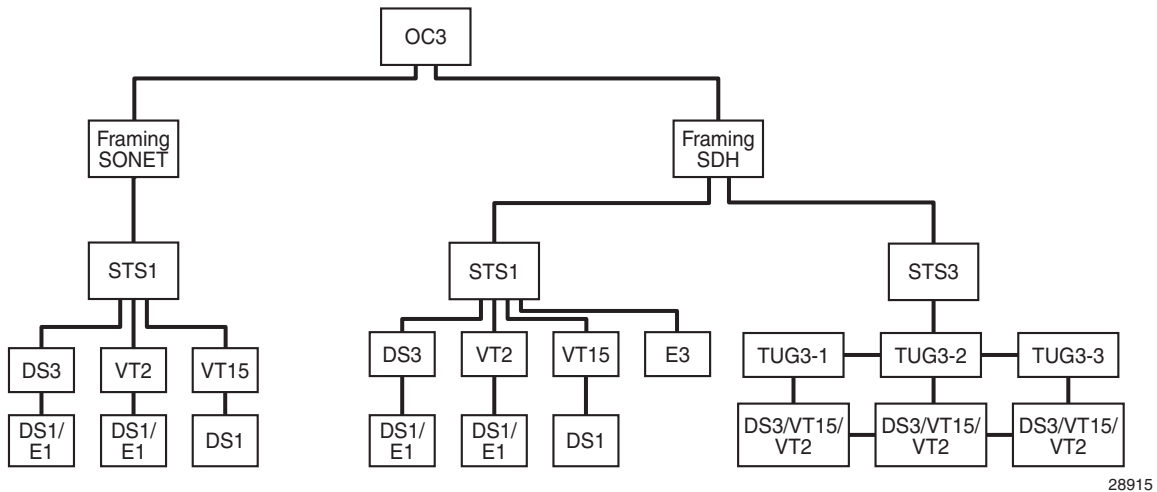
Note: The 7705 SAR CLI always uses the SONET command syntax and nomenclature, even when configuring an SDH port. For example, the same SONET CLI syntax and nomenclature would be used to configure both a VT1.5 and a VC11. The **framing {sonet | sdh}** command determines whether VTs or VCs are being configured. Use the **show>port-tree** command to display SONET/SDH containers.

[Figure 30](#) shows various possibilities for OC3 channelization using SONET and SDH framing. The VT1.5 and VT2 labels under the SDH STS1 path illustrate that SONET conventions are used for SDH configuration.



Note: The 7705 SAR does not allow a payload of VT1.5 for VT2 paths. The payload for a VT1.5 path is **ds1** and the payload for a VT2 path is **vt2**.

Figure 30 OC3 Channelization using SONET and SDH



3.11.2.6.2 Configuring DS1/E1 on a Channelized OC3 Port with STS1 Path

This section provides several examples of configuring DS1/E1 channels and the use of the *sonet-sdh-index* parameter:

- 1. DS1 (SONET Framing, STS1)
- 2. E1 (SONET Framing, STS1)

1. DS1 (SONET Framing, STS1)

There are three STS1 paths per OC3. The following examples use sts1-1.

There are two ways to configure a DS1 channel on a SONET framed port (see [Figure 30](#), SONET framing branch):

- 1.1 STS1 with channelized DS3 payload
- 1.2 STS1 with VT1.5 payload

1.1 STS1 with channelized DS3 payload

To configure a DS1 on an STS1 with a channelized DS3 payload:

- Step 1.** Create the STS1 path and set the payload to DS3.
- Step 2.** Create the channelized DS3 on the STS1 path.
- Step 3.** Create the DS1 on the DS3.

Use the **info** command to display configuration information.

```
sonet-sdh
  path sts1-1
    payload ds3
    no shutdown
  exit
exit
tdm
  ds3 1
    channelized ds1
    no shutdown
  exit
  ds1 1.1
    no shutdown
  exit
exit
no shutdown
```

Notes:

- the CLI identifier for the **path** command is **sts1-stsNum**, where:
 - *stsNum* is the STS number, which can be 1, 2, or 3
- the CLI identifier for the TDM **ds3** command is *ds3Num*, where:
 - *ds3Num* is equal to *stsNum*

In the example above, DS3 is configured on **sts1-1**, hence the numbering **ds3 1**. If **sts1-2** or **sts1-3** was configured instead of **sts1-1**, the corresponding DS3 configuration would be **ds3 2** or **ds3 3**, respectively.
- the CLI identifier for the TDM **ds1** command is *ds3Num.ds1Num*, where:
 - *ds1Num* is the DS1 number. Because a DS3 can carry 28 T1s, *ds1Num* can be between 1 and 28.

1.2 STS1 with VT1.5 payload

To configure a DS1 on an STS1 with a VT1.5 payload:

- Step 1.** Create the STS1 path and set the payload to VT1.5.
- Step 2.** Create the VT1.5 path on the STS1 path.

Step 3. Create the DS1 on the VT1.5 path.

Note: There is one DS1 per VT1.5 path.

Use the **info** command to display configuration information. The example below creates two VT1.5 paths, each with its own DS1.

```
sonet-sdh
  path sts1-1
    payload vt15
    no shutdown
  exit
  path vt15-1.1.1
    payload ds1
    no shutdown
  exit
  path vt15-1.7.4
    payload ds1
    no shutdown
  exit
exit
tdm
  ds1 1.1.1
    no shutdown
  exit
  ds1 1.7.4
    no shutdown
  exit
exit
no shutdown
```

Notes:

- the CLI identifier for the VT1.5 **path** command is **vt15-stsNum.vtGroupNum.vtNum**, where:
 - **vt15-** is a keyword
 - *stsNum* is the STS1 number, which can be 1, 2, or 3
 - *vtGroupNum* is the VT group number. An STS1 frame contains seven VT groups, so *vtGroupNum* can be from 1 to 7
 - *vtNum* is the VT1.5 number. A VT group can hold four VT1.5 paths, so *vtNum* can be from 1 to 4
- the CLI identifier for the TDM **ds1** command is similar to the **path** command, namely, *stsNum.vtGroupNum.ds1Num*, where:
 - *ds1Num* is equal to *vtNum*

2. E1 (SONET Framing, STS1)

A DS3 can be configured to carry an E1 payload (see [Figure 30](#), SONET framing branch).

To configure an E1 on an STS1 with a DS3 payload:

Step 1. Create the STS1 path and set the payload to DS3.

Step 2. Create the TDM DS3 with channelized E1.

Step 3. Create the TDM E1.

Use the **info** command to display configuration information. In the example below, which applies only to the 2-port OC3/STM1 Channelized Adapter card, DS3 1 carries two E1 channels.

```
sonet-sdh
  path sts1-1
    payload ds3
    no shutdown
  exit
exit
tdm
  ds3 1
    no shutdown
    channelized e1
  exit
  e1 1.1
    no shutdown
  exit
  e1 1.21
    no shutdown
  exit
exit
no shutdown
```

Notes:

- the CLI identifier for the **path** command is **sts1-stsNum**, where:
 - *stsNum* is between 1 and 3
- the CLI identifier for the TDM **ds3** command is **ds3Num**, where:
 - *ds3Num* is equal to *stsNum*

In the example above, DS3 is configured on **sts1-1**, hence the command **ds3 1**. If **sts1-2** or **sts1-3** was configured instead of **sts1-1**, the corresponding **ds3** configuration would be **ds3 2** or **ds3 3**, respectively.

- the CLI identifier for the TDM **e1** command is **ds3Num.e1Num**, where:
 - *e1Num* is between 1 and 21 because a DS3 can carry 21 E1s

3.11.2.6.3 Configuring DS1/E1 on a Channelized OC3 Port with STM Path

A SONET framed port—as well as an SDH framed port—can be divided into three STS1 paths. Each SONET port can be subdivided further into lower-speed virtual tributaries (VTs). Similarly, each SDH port can be subdivided into lower-speed virtual containers (VCs). As stated in [OC3 Channelization using SONET and SDH](#), the CLI uses SONET STS1/VT configuration conventions to configure SDH VC paths.

The following examples illustrate the use of SONET CLI terminology to configure SDH paths. See the STS1 branch under SDH framing in [Figure 30](#).

- [1. DS1 \(SDH Framing, STS1\)](#)
- [2. E1 \(SDH Framing, STS1\)](#)

1. DS1 (SDH Framing, STS1)

There are two ways to configure a DS1 channel on an SDH-framed port with STS1 paths:

- [1.1 STS1 with channelized DS3 payload](#)
- [1.2 STS1 with VT1.5 payload](#)

1.1 STS1 with channelized DS3 payload

To configure a DS1 on an STS1 with a channelized DS3 payload:

Step 1. Create the STS1 path and set the payload to DS3.

Step 2. Create the TDM DS3 with channelized DS1.

Step 3. Create the TDM DS1.

Use the **info** command to display configuration information.

```
sonet-sdh
  framing sdh
  path sts1-1
    payload ds3
    no shutdown
  exit
exit
tdm
  ds3 1
    channelized ds1
    no shutdown
  exit
  ds1 1.1
    no shutdown
```

```

        exit
    exit
no shutdown

```

Notes:

- the CLI identifier for the **path** command is **sts1-stsNum**:
 - where *stsNum* is between 1 and 3
- the CLI identifier for the TDM **ds3** command is *ds3Num*, where:
 - *ds3Num* is equal to *stsNum*

In the example above, DS3 is configured on **sts1-1**, hence the command **ds3 1**. If **sts1-2** or **sts1-3** was configured instead of **sts1-1**, the corresponding **ds3** configuration would be **ds3 2** or **ds3 3**, respectively.

- the CLI identifier for the TDM **ds1** command is *ds3Num.ds1Num*, where:
 - *ds1Num* is between 1 and 28 because a DS3 can carry 28 T1s

1.2 STS1 with VT1.5 payload

To configure a DS1 on an STS1 with a VT1.5 payload:

- Step 1.** Create the STS1 path and set the payload to VT1.5.
- Step 2.** Create the VT1.5 path and set the payload to DS1.
- Step 3.** Create the corresponding TDM DS1.



Note: There is one DS1 per VT1.5 path.

Use the **info** command to display configuration information. This example creates two VT1.5 payloads, each having a corresponding DS1 channel.

```

sonet-sdh
  framing sdh
  path sts1-1
    payload vt15
    no shutdown
  exit
  path vt15-1.1.1
    payload ds1
    no shutdown
  exit
  path vt15-1.7.4
    payload ds1
    no shutdown
  exit
exit

```



```

tdm
  ds1 1.1.1
    no shutdown
  exit
  ds1 1.7.4
    no shutdown
  exit
exit
no shutdown

```

Notes:

- the CLI identifier for the VT1.5 **path** command is **vt15-stsNum.vtGroupNum.vtNum**
 - **vt15-** is a keyword
 - *stsNum* is the STS1 number, which can be 1, 2, or 3
 - *vtGroupNum* is the VT group number. An STS1 frame contains seven VT groups, so *vtGroupNum* can be from 1 to 7
 - *vtNum* is the VT1.5 number. A VT group can hold four VT1.5 paths, so *vtNum* can be from 1 to 4
- the CLI identifier for the TDM **ds1** command is similar to the **path** command, namely, *stsNum.vtGroupNum.ds1Num*, where:
 - *ds1Num* is equal to *vtNum*

2. E1 (SDH Framing, STS1)

There are two ways to configure an E1 channel on an SDH-framed port with STS1 paths (see the STS1 branch under SDH framing in [Figure 30](#)):

- [2.1 STS1 with channelized DS3 payload](#)
- [2.2 STS1 with VT2 payload](#)

2.1 STS1 with channelized DS3 payload

To configure an E1 on an STS1 with a DS3 payload:

- Step 1.** Create the STS1 path with SDH framing and set the payload to DS3.
- Step 2.** Create a TDM DS3 with a channelized E1.
- Step 3.** Create the corresponding E1.

Use the **info** command to display configuration information. In the example below, DS3 1 carries two E1 channels.

```

sonet-sdh
  framing sdh
  path sts1-1
    payload ds3
    no shutdown
  exit
exit
tdm
  ds3 1
    no shutdown
    channelized e1
  exit
  e1 1.1
    no shutdown
  exit
  e1 1.21
    no shutdown
  exit
exit
no shutdown

```

Notes:

- the CLI identifier for the **path** command is **sts1-stsNum**, where:
 - *stsNum* is between 1 and 3
- the CLI identifier for the TDM **ds3** command is *ds3Num*, where:
 - *ds3Num* is equal to *stsNum*

In the example above, DS3 is configured on **sts1-1**, hence the command **ds3 1**. If **sts1-2** or **sts1-3** was configured instead of **sts1-1**, the corresponding **ds3** configuration would be **ds3 2** or **ds3 3**, respectively.

- the CLI identifier for the TDM **e1** command is *ds3Num.e1Num*, where:
 - *e1Num* is between 1 and 21 because a DS3 can carry 21 E1s

2.2 STS1 with VT2 payload

To configure an E1 on an STS1 with a VT2 payload:

- Step 1.** Create the STS1 path and set the payload to VT2.
- Step 2.** Create the VT2 path and set the payload to E1.
- Step 3.** Create the corresponding TDM E1.

Note: There is one E1 per VT2 path.



Use the **info** command to display configuration information.

```
sonet-sdh
  framing sdh
  path sts1-1
    no shutdown
    payload vt2
  exit
  path vt2-1.6.3
    payload e1
    no shutdown
  exit
exit
tdm
  e1 1.6.3
    no shutdown
  exit
exit
no shutdown
```

Notes:

- the CLI identifier for the VT2 **path** command is **vt2-stsNum.vtGroupNum.vtNum**, where:
 - **vt2-** is a keyword
 - *stsNum* is the STS1 number, which can be 1, 2, or 3
 - *vtGroupNum* is the VT group number. An STS1 frame contains seven VT groups, so *vtGroupNum* can be from 1 to 7
 - *vtNum* is the VT2 number. A VT group can hold three VT2 paths, so *vtNum* can be from 1 to 3
- the CLI identifier for the TDM **e1** command is similar to the **path** command, namely, *stsNum.vtGroupNum.e1Num*, where:
 - *e1Num* is equal to *vtNum*

3.11.2.6.4 Configuring DS1/E1 on a Channelized OC3 Port with STS3 Path

Unique to an SDH framed port is the ability to configure a single STS3 path instead of three STS1 paths. When an STS3 path is configured, the VTs are configured using tributary units (TUs). One or more TUs can be combined into a tributary unit group (TUG) (see the STS3 branch in [Figure 30](#)).

When an STS3 path is configured on an SDH port, the three TUGs in the following configuration are created by default. Each TUG can be considered the equivalent of an STS1 path.

```

port 1/1/1
  sonet-sdh
    framing sdh
    path sts3
  exit
  group tug3-1 payload tu3
  group tug3-2 payload tu3
  group tug3-3 payload tu3

```

This section provides information on the following topics:

- [1. DS1 \(SDH Framing, STS3\)](#)
- [2. E1 \(SDH Framing, STS3\)](#)

1. DS1 (SDH Framing, STS3)

There are two ways to configure a DS1 on an SDH framed port with an STS3 path:

- [1.1 STS3 / TUG with VT1.5 payload](#)
- [1.2 STS3 / TUG with TU3 payload](#)

1.1 STS3 / TUG with VT1.5 payload

To configure a DS1 on an STS3 / TUG with a VT1.5 payload:

- Step 1.** Configure an STS3 path on the port.
- Step 2.** Configure one of the three TUGs for a VT1.5 payload.
- Step 3.** Create a VT1.5 path with a DS1 payload on the STS3 path / TUG.
- Step 4.** Create a DS1 on the VT1.5 path.

Use the **info** command to display configuration information.

```

sonet-sdh
  framing sdh
  path sts3
    no shutdown
  exit
  group tug3-1 payload vt15
  path vt15-1.2.3
    payload ds1
    no shutdown
  exit
exit
tdm
  ds1 1.2.3
  no shutdown
exit

```

Notes:

- the CLI identifier for the VT1.5 path is **vt15-tugNum.vtGroupNum.vtNum**, where:
 - **vt15-** is a keyword
 - *tugNum* is the TUG number, which can be 1, 2, or 3
 - *vtGroupNum* is the VT group number. A TUG3 contains seven VT groups, so *vtGroupNum* can be from 1 to 7
 - *vtNum* is the VT1.5 number. A VT group can hold four VT1.5 paths, so *vtNum* can be from 1 to 4
- the CLI identifier for the TDM **ds1** command is similar to that of the **path** command, namely, *tugNum.vtGroupNum.ds1Num*, where:
 - *ds1Num* is equal to *vtNum*

1.2 STS3 / TUG with TU3 payload

To configure a DS1 on an STS3 / TUG with a TU3 payload:

- Step 1.** Configure an STS3 path on the port.
- Step 2.** Create a TU3 path with the default payload.
- Step 3.** Create the TDM DS3 with channelized DS1.
- Step 4.** Create the TDM DS1.

Use the **info** command to display configuration information.

```
sonet-sdh
  framing sdh
  path sts3
    no shutdown
  exit
  path tu3-1
    no shutdown
  exit
exit
tdm
  ds3 1
    channelized ds1
    no shutdown
  exit
  ds1 1.1
    no shutdown
  exit
exit
```

Notes:

- The CLI identifier for the TDM **ds1** command is similar to that of the **path** command, namely, *tugNum.vtGroupNum.ds1Num*, where:
 - *ds1Num* is equal to *vtNum*

2. E1 (SDH Framing, STS3)

To configure an E1 on an SDH framed port with an STS3 path:

- Step 1.** Configure an STS3 path on the port.
- Step 2.** Configure one of the three TUGs for a VT2 payload.
- Step 3.** Create a VT2 path with an E1 payload on the STS3 path / TUG.
- Step 4.** Create an E1 on the VT2 path.

Use the **info** command to display configuration information.

```
sonet-sdh
  framing sdh
  path sts3
    no shutdown
  exit
  group tug3-1 payload vt2
  path vt2-1.2.3
    payload e1
    no shutdown
  exit
exit
tdm
  e1 1.2.3
    no shutdown
  exit
exit
```

Notes:

- the CLI identifier for the VT2 **path** command is **vt2-tugNum.vtGroupNum.vtNum**, where:
 - *tugNum* is the TUG number, which can be 1, 2, or 3
 - *vtGroupNum* is the VT group number. A TUG3 contains seven VT groups, so *vtGroupNum* can be from 1 to 7
 - *vtNum* is the VT2 number. A VT group can hold three VT2 paths, so *vtNum* can be from 1 to 3

- the CLI identifier for the TDM **e1** command is similar to the **path** command, namely, *tugNum.vtGroupNum.e1Num*, where:
 - *e1Num* is equal to *vtNum*

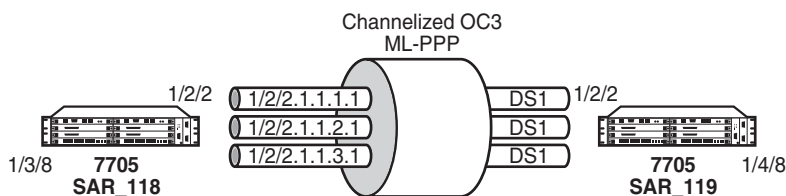
3.11.2.6.5 Configuring a SONET/SDH Port with Multiple DS1s in an MLPPP Bundle

Figure 31 illustrates the setup to configure port 1/2/2 on 7705 SAR_118 as a SONET/SDH port with three DS1s on a channelized OC3/STM1 adapter card using SDH or SONET framing, and to configure the three DS1s for use in an MLPPP bundle on the network side.

This section provides information on the following topics:

- [Configuring the Network Port](#)
- [Verifying the Configured Network Ports](#)
- [Verifying the Available Channelization](#)

Figure 31 Configuring SONET/SDH Network Port



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Configuring the Network Port

Step 1. Configure the DS1s.

The following CLI syntax shows an example of configuring three DS1s on a channelized OC3/STM1 adapter card using SDH framing. The framing must match on both ends.

If SONET framing is needed, use the CLI syntax after this SDH syntax.

CLI Syntax:

```
configure port 1/2/2
config>port# description "to-SAR119"
config>port# sonet-sdh
config>port>sonet-sdh# framing sdh
config>port>sonet-sdh# path sts3 no shutdown
config>port>sonet-sdh# group tug3-1 payload vt15
config>port>sonet-sdh# path vt15-1.1.1
```

```

config>port>sonet-sdh>path# no shutdown
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# path vt15-1.1.2
config>port>sonet-sdh>path# no shutdown
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# path vt15-1.1.3
config>port>sonet-sdh>path# no shutdown
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# exit
config>port# tdm
config>port>tdm# ds1 1.1.1
config>port>tdm>ds1# channel-group 1
config>port>tdm>ds1>channel-group# mode network
config>port>tdm>ds1>channel-group# encap-type ppp-auto
config>port>tdm>ds1>channel-group# no shutdown
config>port>tdm>ds1>channel-group# exit
config>port>tdm>ds1# no shutdown
config>port>tdm>ds1# exit
config>port>tdm# ds1 1.1.2
config>port>tdm>ds1# channel-group 1
config>port>tdm>ds1>channel-group# mode network
config>port>tdm>ds1>channel-group# encap-type ppp-auto
config>port>tdm>ds1>channel-group# no shutdown
config>port>tdm>ds1>channel-group# exit
config>port>tdm>ds1# no shutdown
config>port>tdm>ds1# exit
config>port>tdm# ds1 1.1.3
config>port>tdm>ds1# channel-group 1
config>port>tdm>ds1>channel-group# mode network
config>port>tdm>ds1>channel-group# encap-type ppp-auto
config>port>tdm>ds1>channel-group# no shutdown
config>port>tdm>ds1>channel-group# exit
config>port>tdm>ds1# no shutdown
config>port>tdm>ds1# exit
config>port>tdm# exit
config>port# exit
*A:SAR118#

```

The following CLI syntax shows the configuration of the same example using SONET framing. The framing must match on both ends.

```

CLI Syntax: configure port 1/2/2
config>port# description "to-SAR119"
config>port# sonet-sdh
config>port>sonet-sdh# framing sonet
config>port>sonet-sdh# path sts1-1
config>port>sonet-sdh>path# payload vt15
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# path vt15-1.1.1

```



```

config>port>sonet-sdh>path# no shutdown
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# path vt15-1.1.2
config>port>sonet-sdh>path# no shutdown
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# path vt15-1.1.3
config>port>sonet-sdh>path# no shutdown
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# exit
config>port# tdm
config>port>tdm# ds1 1.1.1
config>port>tdm>ds1# channel-group 1
config>port>tdm>ds1>channel-group# mode network
config>port>tdm>ds1>channel-group# encap-type ppp-auto
config>port>tdm>ds1>channel-group# no shutdown
config>port>tdm>ds1>channel-group# exit
config>port>tdm>ds1# no shutdown
config>port>tdm>ds1# exit
config>port>tdm# ds1 1.1.2
config>port>tdm>ds1# channel-group 1
config>port>tdm>ds1>channel-group# mode network
config>port>tdm>ds1>channel-group# encap-type ppp-auto
config>port>tdm>ds1>channel-group# no shutdown
config>port>tdm>ds1>channel-group# exit
config>port>tdm>ds1# no shutdown
config>port>tdm>ds1# exit
config>port>tdm# ds1 1.1.3
config>port>tdm>ds1# channel-group 1
config>port>tdm>ds1>channel-group# mode network
config>port>tdm>ds1>channel-group# encap-type ppp-auto
config>port>tdm>ds1>channel-group# no shutdown
config>port>tdm>ds1>channel-group# exit
config>port>tdm>ds1# no shutdown
config>port>tdm>ds1# exit
config>port>tdm# exit
config>port# exit

```

Step 2. Create an MLPPP bundle using the three DS1s.

CLI Syntax:

```

configure port bundle-ppp-1/2.1
config>port# multilink-bundle
config>port>ml-bundle# member 1/2/2.1.1.1
config>port>ml-bundle# member 1/2/2.1.1.2.1
config>port>ml-bundle# member 1/2/2.1.1.3.1
config>port>ml-bundle# exit
config>port# no shutdown
config>port# exit

```

Step 3. Repeat the same configurations on 7705 SAR_119 port 1/2/2.

Verifying the Configured Network Ports

```
*A:SAR118# show port 1/2
=====
Ports on Slot 1
=====
Port          Admin Link Port   Cfg  Oper LAG/  Port Port Port   SFP/XFP/
Id            State  State State MTU  MTU  Bndl Mode Encp Type  MDIMDX
-----
1/2/1         Down  No   Down
1/2/2         Up    Yes  Link Up
1/2/2.1.1.1.1
1/2/2.1.1.1.1  Up    Yes  Up      1572 1572   1 netw pppa tdm
1/2/2.1.1.2.1
1/2/2.1.1.2.1  Up    Yes  Up      1572 1572   1 netw pppa tdm
1/2/2.1.1.3.1
1/2/2.1.1.3.1  Up    Yes  Up      1572 1572   1 netw pppa tdm
=====
*A:SAR118#
```

Verifying the Available Channelization

Use the **port-tree** command to confirm the current channelization of the OC3 channel.

Until port 1/2/1 is configured, the default STS3 is subdivided into three STS1s, each having a payload type of DS3.

```
*A:SAR119# show port-tree 1/2/1
  ifIndex  type, sonet-sdh-index (* = provisioned)
=====
  37781504 Port, N/A *
  574652417 STS3, none
  574652478 STS1, sts1-1
  574652481 DS3, 1
  574652484 STS1, sts1-2
  574652487 DS3, 2
  574652488 STS1, sts1-3
  574653222 DS3, 3
```

When port 1/2/1 path **sts1-1** has been provisioned (indicated in the following output by an "*" in line 574652478), all the available VT1.5 paths under **sts1-1** on port 1/2/1 are created and listed. In this case, all seven VT groups (VTGs) are listed, each containing four VT1.5 paths. The remaining two STS1s (**sts1-2** and **sts1-3**) still have DS3 payloads.



Note: The same **show>port-tree** display is used for both SONET and SDH. The SONET nomenclature is used to show both SONET and SDH hierarchies.

The following **configure** command provisions **sts1-1** with VT1.5 paths, which appear in the **port-tree** command that follows.

```
*A:SAR119# configure port 1/2/1 sonet-sdh path sts1-1 payload vt15
```

```
*A:SAR119# show port-tree 1/2/1
  ifIndex  type, sonet-sdh-index (* = provisioned)
=====  =====
  37781504  Port, N/A *
574652417      STS3, none
574652478      STS1, sts1-1 *
N/A           VTG, 1.1
574653223      VT15, vt15-1.1.1
574653224      DS1, 1.1.1
574653249      VT15, vt15-1.1.2
574653250      DS1, 1.1.2
574653275      VT15, vt15-1.1.3
574653276      DS1, 1.1.3
574653301      VT15, vt15-1.1.4
574653302      DS1, 1.1.4
N/A           VTG, 1.2
574653328      VT15, vt15-1.2.1
574653329      DS1, 1.2.1
574653354      VT15, vt15-1.2.2
574653355      DS1, 1.2.2
574653380      VT15, vt15-1.2.3
574653381      DS1, 1.2.3
574653406      VT15, vt15-1.2.4
574653407      DS1, 1.2.4
N/A           VTG, 1.3
574653433      VT15, vt15-1.3.1
574653434      DS1, 1.3.1
574653459      VT15, vt15-1.3.2
574653460      DS1, 1.3.2
574653485      VT15, vt15-1.3.3
574653486      DS1, 1.3.3
574653511      VT15, vt15-1.3.4
574653512      DS1, 1.3.4
N/A           VTG, 1.4
574653538      VT15, vt15-1.4.1
574653539      DS1, 1.4.1
574653564      VT15, vt15-1.4.2
574653565      DS1, 1.4.2
574653590      VT15, vt15-1.4.3
574653591      DS1, 1.4.3
574653616      VT15, vt15-1.4.4
574653617      DS1, 1.4.4
N/A           VTG, 1.5
574653643      VT15, vt15-1.5.1
574653644      DS1, 1.5.1
574653669      VT15, vt15-1.5.2
574653670      DS1, 1.5.2
574653695      VT15, vt15-1.5.3
574653696      DS1, 1.5.3
574653721      VT15, vt15-1.5.4
574653722      DS1, 1.5.4
N/A           VTG, 1.6
574653748      VT15, vt15-1.6.1
```

```

574653749          DS1, 1.6.1
574653774          VT15, vt15-1.6.2
574653775          DS1, 1.6.2
574653800          VT15, vt15-1.6.3
574653801          DS1, 1.6.3
574653826          VT15, vt15-1.6.4
574653827          DS1, 1.6.4
N/A               VTG, 1.7
574653853          VT15, vt15-1.7.1
574653854          DS1, 1.7.1
574653879          VT15, vt15-1.7.2
574653880          DS1, 1.7.2
574653905          VT15, vt15-1.7.3
574653906          DS1, 1.7.3
574653931          VT15, vt15-1.7.4
574653932          DS1, 1.7.4
574652484          STS1, sts1-2
574652487          DS3, 2
574652488          STS1, sts1-3
574653222          DS3, 3
*A:SAR119#

```

3.11.2.7 Configuring Voice Ports

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

```

CLI Syntax:  port port-id
                 voice
                 audio-wires {four-wires | two-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#

```

Use the following CLI syntax to configure an analog voice port on an 8-port Voice & Teleprotection card.

CLI Syntax:

```

port port-id
  voice
    fxo
      channel-group channel-group-id
        description description-string
        encap-type {cem}
        mode access
        no shutdown
      fault-signaling {idle | seized}
      loopback {internal-digital}
      no shutdown
    fxs
      channel-group channel-group-id
        description description-string
        encap-type cem
        mode access
        no shutdown
      fault-signaling {idle | seized}
      loopback {internal-digital}
      ring-generation {16 | 20 | 25}
      no shutdown

```

```

line-balance {nominal | 800 | short | long}
signaling-type {3600plar | 1511plar | 3600ls |
  1511profile1 | 3600re | 1511sn137}
tlp-rx decibels {-7.0 | -6.9 | ... | -0.1 | 0.0}
tlp-tx decibels {-4.0 | -3.9 | ... | 2.9 | 3.0}

```

The following CLI syntax shows an example of configuring an analog voice port on an 8-port Voice & Teleprotection card. The default values are used for the commands that are not shown in the example.

Example:

```

config# port 1/1/6
config>port# voice
config>port>voice# fxo
config>port>voice>fxo# channel-group 1
config>port>voice>fxo>channel-group# mode access
config>port>voice>fxo>channel-group# encap-type cem
config>port>voice>fxo>channel-group# no shutdown
config>port>voice>fxo>channel-group# exit
config>port>voice>fxo# no shutdown
config>port>voice>fxo# exit
config>port>voice# exit
config>port# no shutdown
config>port# exit
config#

```

Use the following CLI syntax to configure an analog voice port on an 8-port FXO Adapter card.

CLI Syntax:

```

port port-id
  voice
    fxo
      channel-group channel-group-id
        description description-string
        encap-type cem
        mode access
        no shutdown
        fault-signaling {idle | seized}
        loopback internal-digital
        no shutdown
      line-balance {nominal | 800}
      signaling-type {3600ls | 1511profile1 | 3600re |
        1511sn137}
      tlp-rx decibels {-7.0 | -6.9 | ... | -0.1 | 0.0}
      tlp-tx decibels {-4.0 | -3.9 | ... | 2.9 | 3.0}

```

The following CLI syntax shows an example of configuring an analog voice port on an 8-port FXO Adapter card. The default values are used for the commands that are not shown in the example.

Example:

```

config# port 1/1/6
config>port# voice
config>port>voice# fxo
config>port>voice>fxo# channel-group 1
config>port>voice>fxo>channel-group# mode access
config>port>voice>fxo>channel-group# encap-type cem
config>port>voice>fxo>channel-group# no shutdown
config>port>voice>fxo>channel-group# exit
config>port>voice>fxo# no shutdown
config>port>voice>fxo# exit
config>port>voice# exit
config>port# no shutdown
config>port# exit
config#

```

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

CLI Syntax:

```

port port-id
  voice
    fxs
      channel-group channel-group-id
        description description-string
        encap-type cem
        mode access
        no shutdown
        fault-signaling {idle | seized}
        loopback internal-digital
        no shutdown
        line-balance {nominal | 800}
        ring-generation {16 | 20 | 25}
        signaling-type {3600plar | 1511plar | 3600ls
          | 1511profile1 | 3600re | 1511sn137}
        tlp-rx {-7.0 | -6.9 | ... | -0.1 | 0.0}
        tlp-tx {-4.0 | -3.9 | ... | 2.9 | 3.0}

```

The following CLI syntax shows an example of configuring an analog voice port on a 6-port FXS Adapter card.

Example:

```

config# port 1/6/1
config>port# voice
config>port>voice# fxs
config>port>voice>fxs# channel-group 1
config>port>voice>fxs>channel-group# mode access
config>port>voice>fxs>channel-group# encap-type cem
config>port>voice>fxs>channel-group# no shutdown
config>port>voice>fxs>channel-group# exit
config>port>voice>fxs# no shutdown

```

```

config>port>voice>fxs# exit
config>port>voice# line-balance nominal
config>port>voice# ring-generation 16
config>port>voice# signaling-type 3600ls
config>port>voice# tlp-rx -7.0
config>port>voice# tlp-tx -4.0
config>port>voice# exit
config>port# exit

```

3.11.2.8 Configuring Codirectional G.703 Ports

Use the following CLI syntax to configure a codirectional G.703 port on an 8-port Voice & Teleprotection card.

CLI Syntax:

```

port port-id
  tdm
    codir
      channel-group channel-group-id
        description description-string
        encap-type cem
        mode access
        no shutdown
      loopback {internal | line}
      report-alarm {ais | los}
      no shutdown

```

The following CLI syntax shows an example of configuring a codirectional G.703 port on an 8-port Voice & Teleprotection card.

Example:

```

config# port 1/1/2
config>port# tdm
config>port>tdm>codir
config>port>tdm>codir# channel-group 1
config>port>tdm>codir>channel-group# description "CG 1"
config>port>tdm>codir>channel-group# encap-type cem
config>port>tdm>codir>channel-group# mode access
config>port>tdm>codir>channel-group# no shutdown
config>port>tdm>codir>channel-group# exit
config>port>tdm>codir# loopback line
config>port>tdm>codir# report-alarm ais
config>port>tdm>codir# no shutdown
config>port>tdm>codir# exit
config>port>tdm# exit

```


3.11.2.9 Configuring Teleprotection Ports

Use the following CLI syntax to configure a teleprotection port on an 8-port Voice & Teleprotection card or 8-port C37.94 Teleprotection card.

CLI Syntax:

```
port port-id
  tdm
    tpif
      channel-group channel-group-id
        description description-string
        encap-type cem
        mode access
        no shutdown
        timeslots timeslots
      framing {framed | unframed}
      loopback {internal | line}
      report-alarm {los | rai}
      no shutdown
```

The following CLI syntax shows an example of configuring a teleprotection port on an 8-port Voice & Teleprotection card or an 8-port C37.94 Teleprotection card.

Example:

```
config# port 1/1/3
config>port# tdm
config>port>tdm>tpif
config>port>tdm>tpif# channel-group 1
config>port>tdm>tpif>channel-group# description "TPIF 1"
config>port>tdm>tpif>channel-group# encap-type cem
config>port>tdm>tpif>channel-group# mode access
config>port>tdm>tpif>channel-group# timeslots 1
config>port>tdm>tpif>channel-group# no shutdown
config>port>tdm>tpif>channel-group# exit
config>port>tdm>tpif# framing framed
config>port>tdm>tpif# loopback internal
config>port>tdm>tpif# report-alarm los
config>port>tdm>tpif# no shutdown
config>port>tdm>tpif# exit
config>port>tdm# exit
```

3.11.2.10 Configuring TDM PPP

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

```

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

```

3.11.2.11 Configuring Channelized Ports

Channelized ports are supported on the following cards and modules:

- 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
- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
- 4-port DS3/E3 Adapter card
- 8-port Voice & Teleprotection card
- 8-port C37.94 Teleprotection card
- 4-port T1/E1 and RS-232 Combination module
- 8-port FXO Adapter card
- 6-port FXS Adapter card



Note: Ethernet ports cannot be channelized.

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

- $N \times DS0$ in DS1 port.*channel-group*, where *channel-group* is 1 to 24
- $N \times DS0$ in E1 port.*channel-group*, where *channel-group* is 1 to 32
- $N \times DS1$ in DS3 port.*channel-group*, where *channel-group* is 1 to 24
- $N \times E1$ in E3 port.*channel-group*, where *channel-group* is 1 to 32
- $1 \times DS0$ in V.35, RS-232, or X.21 port.*channel-group*, where *channel-group* is 1
- $1 \times DS0$ in E&M, FXO, or FXS port.*channel-group*, where *channel-group* is 1
- $1 \times DS0$ in codirectional port.*channel-group*, where *channel-group* is 1
- $N \times DS0$ in TPIF port.*channel-group*, where *channel-group* is 1

3.11.2.11.1 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, mda 4, and mda 6 show channelized adapter cards on the 7705 SAR-8 Shelf V2.

```
*A:NOK-1# show mda
=====
MDA Summary
=====
Slot  Mda  Provisioned Type           Admin   Operational
      Mda  Equipped Type (if different) State    State
-----
1     1     a12-sdiv2                  up      up
      2     a4-oc3                     up      up
      3     a16-chds1v2                up      up
      4     a4-chds3v2                 up      up
      5     a8-ethv2                   up      up
      6     a2-choc3                   up      up
=====
*A:NOK-1
```

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

```
*A:NOK-1# show mda 1/1 detail
=====
MDA 1/1 detail
=====
Slot  Mda  Provisioned Type           Admin   Operational
      Mda  Equipped Type (if different) State    State
-----
1     1     a12-sdiv2                  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:NOK-1#

*A:NOK-1# show mda 1/3 detail
=====
MDA 1/3 detail
=====
Slot  Mda   Provisioned Type                Admin   Operational
      Mda   Equipped Type (if different)   State   State
-----
1     3     a16-chds1v2                      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:NOK-1#

*A:NOK-1# show mda 1/5 detail
=====
MDA 1/5 detail
=====
Slot  Mda  Provisioned Type           Admin   Operational
      Mda  Equipped Type (if different) State   State
-----
1     5    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
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        : a4:58:01:03:00:01
=====
*A:NOK-1#

```

On the 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, 2-port OC3/STM1 Channelized Adapter card, 4-port DS3/E3 Adapter card, and T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module, 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. The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card supports channelization at the DS1/E1 level only.

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 and RS-232 ports of the 4-port T1/E1 and RS-232 Combination module, DS0 channel groups and their parameters are configured in the V.35, RS-232, RS-530, 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.

On the 8-port Voice & Teleprotection card, a single DS0 channel group and its parameters are configured in the codirectional, FXO, FXS, or TPIF context and up to 12 timeslots can be assigned in the TPIF context.

On the 8-port C37.94 Teleprotection card, a single DS0 channel group and its parameters are configured in the TPIF context and up to 12 timeslots can be assigned in the TPIF context.

**Note:**

- Encapsulation type is configured at the DS1 or E1 level on the following:
 - 16-port T1/E1 ASAP Adapter card
 - 32-port T1/E1 ASAP Adapter card
 - 2-port OC3/STM1 Channelized Adapter card
 - 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
 - 4-port DS3/E3 Adapter card
 - T1/E1 ports of the 4-port T1/E1 and RS-232 Combination module
- The encapsulation type is configured at the RS-232, RS-530, V.35, or X.21 level for the following:
 - 12-port Serial Data Interface card
 - RS-232 ports of the 4-port T1/E1 and RS-232 Combination module
- A port can support only one encapsulation type. When the first channel group is configured for an encapsulation type, all other channel groups on the port are automatically configured with that encapsulation type. To change an encapsulation type, the channel group must be deleted, then recreated with the new encapsulation type.

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

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

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

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

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

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

The following is an example of an FXO channel group configuration:

```
NOK-A>config# port 1/1/6
NOK-A>config>port# voice
NOK-A>config>port>voice# fxo
NOK-A>config>port>voice>fxo# channel-group 1
NOK-A>config>port>voice>fxo>channel-group# mode access
NOK-A>config>port>voice>fxo>channel-group# encap-type cem
NOK-A>config>port>voice>fxo>channel-group# no shutdown
config>port>voice>fxo>channel-group# exit
config>port>voice>fxo# no shutdown
config>port>voice>fxo# exit
config>port>voice# exit
config>port# no shutdown
config>port# exit
config#
```

The following is an example of an FXS channel group configuration:

```
NOK-A>config# port 1/6/1
NOK-A>config>port# voice
NOK-A>config>port>voice# fxs
NOK-A>config>port>voice>fxs>channel-group 1
NOK-A>config>port>voice>fxs>channel-group# mode access
NOK-A>config>port>voice>fxs>channel-group# encap-type cem
NOK-A>config>port>voice>fxs>channel-group# no shutdown
config>port>voice>fxs>channel-group# exit
config>port>voice>fxs# no shutdown
config>port>voice>fxs# exit
config>port>voice# exit
config>port# no shutdown
config>port# exit
config#
```

Services can now be applied to the configured channelized ports.

3.11.2.12 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.

The following cards and platforms support fractional T1/E1 on a PPP channel group (encapsulation type `ppp-auto`), or all timeslots on T1/E1 ports, in network mode:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)
- T1/E1 ports on the 7705 SAR-A
- T1/E1 ports on the 7705 SAR-M
- T1/E1 ports on the 7705 SAR-X

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
ssm
  shutdown
  ssm-bit 8
  no tx-dus
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

```

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

```

```

    ssm
      shutdown
      ssm-bit 8
      no tx-dus
    channel-group 1
      shutdown
      description "DS0GRP"
      mode network
      encaps-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#

```

3.11.2.13 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 ft over the full range of cable lengths up to 655 ft (200 m).

Use the following CLI syntax to configure LBO functions for T1 (DS1) 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. This command applies to T1 ports only.

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 ft on a T1 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
#-----
```

3.11.2.14 Configuring TDM E1 SSM

Use the following CLI syntax to configure Synchronization Status Messaging (SSM) for E1 TDM ports.



Note: Only **g704** framing mode should be used with E1 SSM. The **no-crc-g704** and **e1-unframed** framing modes are not compatible with E1 SSM.

CLI Syntax:

```
port port-id
  tdm
    e1
      ssm
        [no] shutdown
        [no] ssm-bit sa-bit
        [no] tx-dus
```

The following CLI syntax shows an example of configuring SSM on an E1 port.

Example:

```
config# port 1/3/1
config>port# tdm
config>port>tdm# e1
config>port>tdm>e1# ssm
config>port>tdm>e1>ssm# ssm-bit 4
config>port>tdm>e1>ssm# tx-dus
```

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

```
ALU-A>config>port# info
#-----
    tdm
      e1
        ssm
          ssm-bit 4
          tx-dus
          no shutdown
        exit
      no shutdown
    exit
  exit
#-----
```

3.11.2.15 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-8 Shelf V2 and 7705 SAR-18 support configuration of the following ATM interface parameters:

- **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
- **mapping** — allows the user to configure ATM cell mapping for DS3 clear channels. Since E3 ports only support G.751 framing with direct cell mapping, ATM mapping is hard-coded for direct mapping for an E3 port (you will get an error message if you try to change the value).

3.11.2.15.1 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/E3 ports.

```
CLI Syntax:  port port-id
                tdm
                  ds3
                    atm
                      cell-format cell-format
                      mapping direct
                      min-vp-vpi value
                  e3
                    atm
                      cell-format cell-format
                      min-vp-vpi value
```

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
```

3.11.2.16 Configuring Multilink PPP Bundles

The following cards, modules, and platforms support multilink bundles:

- T1/E1 ports on the 7705 SAR-A
- T1/E1 ports on the 7705 SAR-M
- T1/E1 ports on the 7705 SAR-X

The following must have all member links of an MLPPP bundle configured on the same card or module:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)

The following must have all member links of an MLPPP bundle configured on the same card or module, and on the same port:

- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card

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 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.

3.11.2.17 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 fragments 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 port info** command to display port configuration information.

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

3.11.2.18 Configuring LAG Parameters

Observe the following general rules and conditions when configuring LAGs.

- All ports (links) in a LAG must share the same characteristics (speed, duplex, hold-timer, and so on). The port characteristics are inherited from the primary port.
- Autonegotiation must be disabled or set to limited mode for ports in a LAG, in order to guarantee a specific port speed.
- Ports in a LAG must be configured as full duplex.
- Ports in a LAG must be configured with the same encapsulation value.
- LAG is supported on Ethernet access, network, and hybrid ports.
- On access ports, the links must be distributed over two different adapter cards or different MDAs on the 7705 SAR-X, in order to minimize the effect of an adapter card failure on the LAG.
- On network ports, the links can be on the same platform or adapter card/module or distributed over multiple components.
- A LAG can be in active/active mode or in active/standby mode for access, network, or hybrid mode. Active/standby mode is a subset of active/active mode if subgroups are enabled.
- By default, LACP is disabled. LACP operates in two modes: passive and active. If the mode on the CE end is passive, the LACP mode on the 7705 SAR end must be active.



Note: LACP cannot be configured for static LAG. For more information on static LAG, see [Static LAG \(Active/Standby LAG Operation without LACP\)](#).

- Each link in a LAG must be a member of a subgroup. On access, network or hybrid ports, a LAG can have a maximum of four subgroups and a subgroup can have links up to the maximum number supported on the LAG. LAG is active/active if there is only one sub-group. LAG is active/standby if there is more than one subgroup.
- The port with the highest priority is the primary port. If multiple ports have the same priority, the port with the lowest port ID becomes the primary port.
- A port on standby can be replaced while the active port in the LAG is operational.
- When one port is on a first- or second-generation Ethernet adapter card and the other port is on a third-generation Ethernet adapter card, mix-and-match traffic management occurs. The LAG SAP uses a generic QoS configuration where **scheduler-mode**, *agg-rate*, and *cir-rate* are configured for the SAP, but only those applicable parameters needed by the active adapter card are used to set the QoS values of the active port. See [LAG Support on Mixed-Generation Hardware](#) for details. See [Table 2](#) for a list of adapter card generations.
- The primary port configuration settings are applied to both the primary and secondary LAG ports. Thus in order to support unshaped SAPs when the primary port is a Gen-3-based port and the secondary port is a Gen-2-based port, configuring the **unshaped-sap-cir** on the Gen-3-based port is allowed, even though it does not apply to the Gen-3-based port. This is because **unshaped-sap-cir** is needed by the (secondary) Gen-2-based port when it becomes the active port. The full command is **config>port>ethernet>access>egress>unshaped-sap-cir** *cir-rate*.
- When a LAG contains a port on a first-generation Ethernet adapter card, the scheduler mode can only be 4-priority.

Additional general rules for LAG configuration are as follows.

- Most port features (port commands) can only be configured on the primary member port. The configuration, or any change to the configuration, is automatically propagated to any remaining ports within the same LAG. Operators cannot modify the configurations on non-primary ports.
- When adding the first port member to a LAG group, its port configuration becomes the configuration of the LAG group.
- Once a LAG group has been created, new ports can be added to the LAG group only if their port configurations match with the LAG group configurations inherited from the group's existing primary port. A newly added port may become the primary port or a non-primary port, depending on the setting of the LAG selection criteria, priorities, and so on.
- Not all configurations follow the conventions above. Some exceptions include the commands **loopback** (internal or line), **cfm-loopback**, **mac**, **lldp**, **dot1x**, and **efm-oam**.

- At boot-up, port configuration is applied before LAG configuration is applied. Therefore, configuration values are allowed or prohibited for both a standalone port and a port attached to a LAG group; otherwise, a database **restore** or **exec** command will fail. For example, if the scheduler mode **profile** command option is supported on a Gen-2 port that is the primary member of a LAG, operators are allowed to change **scheduler-mode** on other member links, including Gen-1 and Gen-3 ports. If the scheduler mode **profile** command option is blocked for a standalone Gen-2 port, then after issuing an **admin>save** command followed by a **reboot** command, the node will fail to reload the database file.

The following CLI syntax shows an example of configuring LAG parameters:

```

Example:   config# lag 2
               config>lag# description LAG2
               config>lag# port 1/4/3 priority 200 sub-group 1
               config>lag# port 1/5/3 priority 100 sub-group 2
               config>lag# lacp active administrative-key 32768
  
```

The following example displays a LAG configuration:

```

NOK-B>config>lag# info detail
-----
      shutdown
      description "LAG2"
      port 1/4/3 priority 200 sub-group 1
      port 1/5/3 priority 100 sub-group 2
      lacp active administrative-key 32768
      no mac
      mode access
      encap-type null
      port-threshold 0
      lacp-xmit-interval fast
      lacp-xmit-stdby
      no selection-criteria
      no hold-time
      standby-signaling lacp
-----
NOK-B>config>lag#
  
```

3.11.2.19 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, 2-port OC3/STM1 Channelized Adapter cards, and T1/E1 ports on the 7705 SAR-M. The groups aggregate E1 or DS1 ATM channels into a single logical ATM interface.

3.11.2.19.1 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]
```

3.11.2.19.2 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 the ifindexes 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

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:

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

3.11.2.19.3 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.

3.11.2.20 Configuring SDI Ports for IPCP Encapsulation

V.35 and X.21 ports on the 12-port Serial Data Interface card can be configured for IPCP encapsulation to support PPP SAPs for Ipipes. See the 7705 SAR Services Guide for more information about IP interworking VLL (Ipipe) services.

Use the following CLI syntax to configure IPCP parameters for V.35 serial ports. X.21 ports that are configured for super-rate speeds are also supported. The **encap-type** must be set to **ipcp**.

CLI Syntax:

```
port port-id
  serial
    v35
```

```

channel-group channel-group-id
  encap-type {cem | frame-relay | ipcp | hdlc |
             cisco-hdlc}
  mode access
  ppp
    keepalive time-interval [dropcount drop
                             count]
  exit
  exit
  no shutdown
  exit
  no shutdown
  exit
exit
no shutdown

```

Use the **config port info detail** command to display port configuration information:

```

*A:NOK-A>config>port# info detail
-----
description "RS-232/V.35/X.21/RS-530"
serial
  v35
  shutdown
  no loopback
  control-lead
  input
    dtr-dsr high
    rts-dcd high
    alb-cts high
  exit
  output
    dsr-dtr high
    dcd-rts high
    cts-alb high
  exit
exit
speed 64k
device-mode synchronous
device-gender dce
clock-source slave
duplex full
no report-alarm hcmOof hcmRai
channel-group 1
  shutdown
  description "DS0GRP"
  mode access
  encap-type ipcp
  mtu 2000
  crc 32
  idle-cycle-flag ones
  ppp
    keepalive 20 dropcount 100
  exit
exit

```

```

        exit
    exit
-----
*A:NOK-A>config>port#

```

3.11.2.21 Configuring TDM and SDI Ports for Frame Relay Encapsulation

Frame relay service can be configured on the following ports:

- 16-port T1/E1 ASAP Adapter card on DS1 or E1 ports
- 32-port T1/E1 ASAP Adapter card on DS1 or E1 ports
- 4-port DS3/E3 Adapter card on clear channel DS3 or E3 ports, or on DS3 ports channelized to DS1 or E1 down to DS0
- 12-port Serial Data Interface card on V.35 or X.21 serial ports

Frame relay ports can be configured in access mode to support:

- Fpipes on:
 - 16-port T1/E1 ASAP Adapter card on DS1 or E1 ports
 - 32-port T1/E1 ASAP Adapter card on DS1 or E1 ports
 - 4-port DS3/E3 Adapter card on clear channel DS3 or E3 ports, or on DS3 ports channelized to DS1 or E1 down to DS0
 - 12-port Serial Data Interface card on V.35 or X.21 serial ports
- Ipipes on:
 - 16-port T1/E1 ASAP Adapter card on DS1 or E1 ports
 - 32-port T1/E1 ASAP Adapter card on DS1 or E1 ports
 - 4-port DS3/E3 Adapter card on clear channel DS3 or E3 ports only
 - 12-port Serial Data Interface card on V.35 or X.21 serial ports

The **encap-type** must be set to **frame-relay**. The settings for the frame relay port can be modified by using the parameters under the **frame-relay** command hierarchy as shown in the following examples. The settings apply to frame relay ports used for Fpipe SAPs and interworking Ipipe SAPs. See the 7705 SAR Services Guide for more information about frame relay VLL (Fpipe) services and IP interworking VLL (Ipipe) services.

Use the following CLI syntax to configure a frame relay access port on a 16-port T1/E1 ASAP Adapter card or a 32-port T1/E1 ASAP Adapter card.

CLI Syntax:

```

port port-id
  tdm
  e1
    channel-group channel-group-id
    encaps-type {atm|bcp-null|bcp-dot1q|ipcp|
      ppp-auto|frame-relay|wan-mirror|cisco-hdlc|
      cem|hdlc}
    frame-relay
      lmi-type {ansi | itu | none | rev1}
      mode {dce | dte | bidir}
      n393dce count
      n393dte count
      n391dte intervals
      n392dce threshold
      n392dte threshold
      t391dte keepalive
      t392dce keepalive
      mode access
      no shutdown
    exit
  no shutdown
exit
no shutdown

```

Use the **config port info detail** command to display port configuration information:

```

*A:NOK-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
    ssm
      shutdown
      ssm-bit 8
      no tx-dus
    channel-group 1
      shutdown
      description "E1"
      mode access
      encaps-type frame-relay
      no mtu
      network
        queue-policy "default"
      exit

```

```

        timeslots 2-32
        crc 16
        frame-relay
            lmi-type ansi
            mode dte
            n393dce 4
            n393dte 4
            n391dte 6
            n392dce 3
            n392dte 3
            t391dte 10
            t392dce 15
        exit
    exit
exit
line-impedance 120
exit
no shutdown
-----
*A:NOK-A>config>port#

```

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

CLI Syntax:

```

port port-id
    tdm
        ds3
            encap-type {atm | bcp-null | bcp-dot1q | ipcp |
                ppp-auto | frame-relay | wan-mirror | cem}
            mode {access | network}
            frame-relay
                lmi-type {ansi | itu | none | rev1}
                mode {dce | dte | bidir}
                n393dce count
                n393dte count
                n391dte intervals
                n392dce threshold
                n392dte threshold
                t391dte keepalive
                t392dce keepalive
            no shutdown
        exit
    no shutdown
exit
no shutdown
    e3
        encap-type {atm | bcp-null | bcp-dot1q | ipcp |
            ppp-auto | frame-relay | wan-mirror | cem}
        mode {access | network}
        frame-relay
            lmi-type {ansi | itu | none | rev1}

```

```

        mode {dce | dte | bidir}
        n393dce count
        n393dte count
        n391dte intervals
        n392dce threshold
        n392dte threshold
        t391dte keepalive
        t392dce keepalive
    no shutdown
  exit
  no shutdown
exit
no shutdown

```

Use the following CLI syntax to configure frame relay parameters for V.35 serial ports. X.21 ports at super-rate speeds are also supported.

CLI Syntax:

```

port port-id
  serial
    v35
      channel-group channel-group-id
      encap-type {cem | frame-relay | ipcp | hdlc |
        cisco-hdlc}
      mode access
      frame-relay
        lmi-type {ansi | itu | none | rev1}
        mode {dce | dte | bidir}
        n393dce count
        n393dte count
        n391dte intervals
        n392dce threshold
        n392dte threshold
        t391dte keepalive
        t392dce keepalive
      no shutdown
    exit
  no shutdown
exit
no shutdown

```

3.11.2.22 Configuring TDM and SDI Ports for HDLC Encapsulation

HDLC service can be configured on the following ports:

- 16-port T1/E1 ASAP Adapter card on clear channel or fractional DS1 or E1 ports
- 32-port T1/E1 ASAP Adapter card on clear channel or fractional DS1 or E1 ports
- 12-port Serial Data Interface card on V.35 or X.21 serial ports (at super-rate speeds only)

HDLC ports can be configured in access mode to support Hpipes on the above cards. The **encap-type** must be set to **hdlc**.



Note: HDLC encapsulation can be used on a port to transmit cHDLC frames into an Hpipe.

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

HDLC ports cannot be configured if the mode is set to network.

CLI Syntax:

```

port port-id
  tdm
    e1
      channel-group channel-group-id
        encap-type {atm | cem | ipcp | ppp-auto |
          frame-relay | hdlc | cisco-hdlc}
        timeslots timeslots
        mode {access}
        no shutdown
      exit
    no shutdown
  exit
exit
no shutdown

```

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

```

*A:NOK-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
ssm
  shutdown
  ssm-bit 8
  no tx-dus
channel-group 1
  description "DSOGRP"
  mode access
  encaps-type hdlc
  no mtu
  timeslots 2-32
  crc 16
  idle-cycle-flag flags
  no scramble
  no shutdown
exit
no shutdown
exit
line-impedance 120
exit
no shutdown

```

*A:NOK-A>config>port#

Use the following CLI syntax to configure an X.21 serial port (super-rate speed) on a 12-port Serial Data Interface card for HDLC. The syntax for a V.35 serial port is similar.

CLI Syntax:

```

port port-id
  serial
    x21
      channel-group channel-group-id
        encaps-type {cem | ipcp | frame-relay | hdlc |
          cisco-hdlc}
        mode access
        no shutdown
        speed
          {1200|2400|4800|9600|19200|38400|56000|64k|12
            8k|256k|384k|512k|640k|768k|89k|1024k|1152k|1
            280k|1408k|1536k|1664k |1792k|1920k|2048k}
        exit
        no shutdown
      exit
    exit
  exit
  no shutdown

```

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

```

*A:NOK-A>config>port# info
-----
description "RS-232/V.35/X.21/RS-530"
serial
  x21
    speed 1024k
    channel-group 1
    shutdown
    encap-type hdlc
    mode access
  exit
  no shutdown
exit
exit
no shutdown
-----
*A:NOK-A>config>port#

```

3.11.2.23 Configuring TDM and SDI Ports for Cisco HDLC Encapsulation

Cisco HDLC (cHDLC) service can be configured on the following ports:

- 16-port T1/E1 ASAP Adapter card on clear channel or fractional DS1 or E1 ports
- 32-port T1/E1 ASAP Adapter card on clear channel or fractional DS1 or E1 ports
- 12-port Serial Data Interface card on V.35 or X.21 serial ports (at super-rate speeds)

Cisco HDLC ports can be configured in access mode to support lpipes on the above cards. The **encap-type** must be set to **cisco-hdlc**.



Note: Cisco HDLC encapsulation cannot be used to transmit HDLC frames into an lpipe.

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

Cisco HDLC ports cannot be configured if the mode is set to network.

CLI Syntax:

```

port port-id
  tdm
  e1
    channel-group channel-group-id
    encap-type {atm | cem | ipcp | ppp-auto |
      frame-relay | hdlc | cisco-hdlc}
    cisco-hdlc
    down-count down-count

```

```

        keep-alive time-interval
        up-count up-count
        timeslots timeslots
        mode {access | network}
        no shutdown
    exit
    no shutdown
exit
exit
no shutdown

```

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

```

*A:NOK-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
        ssm
            shutdown
            ssm-bit 8
            no tx-dus
        channel-group 1
            description "DS0GRP"
            mode access
            encaps-type cisco-hdlc
            no mtu
            timeslots 2-32
            crc 16
            idle-cycle-flag flags
            no scramble
            cisco-hdlc
                keepalive 0
                upcount 1
                downcount 3
            exit
            no shutdown
        exit
        no shutdown
    exit
    line-impedance 120
exit
no shutdown
-----
*A:NOK-A>config>port#

```

Use the following CLI syntax to configure an X.21 serial port (at super-rate speeds) on a 12-port Serial Data Interface card for cHDLC. The syntax for a V.35 serial port is similar.

```

CLI Syntax:  port port-id
                 serial
                 x21
                 channel-group channel-group-id
                 encap-type {cem | ipcp | frame-relay | hdlc |
                 cisco-hdlc}
                 mode access
                 no shutdown
                 speed
                 {1200|2400|4800|9600|19200|38400|56000|64k|12
                 8k|256k|384k|512k|640k|768k|89k|1024k|1152k|1
                 280k|1408k|1536k|1664k |1792k|1920k}
                 no shutdown
                 exit
                 no shutdown
                 exit
                 exit
                 no shutdown

```

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

```

*A:NOK-A>config>port# info
-----
description "RS-232/V.35/X.21"
serial
  x21
    speed 1024k
    channel-group 1
      shutdown
      description "DSOGRP"
      mode access
      encap-type cisco-hdlc
      cisco-hdlc
        keepalive 10
        up-count 1
        down-count 3
      exit
    exit
  no shutdown
exit
exit
no shutdown
-----
*A:NOK-A>config>port#

```


3.11.2.24 Configuring GNSS Receiver Port Parameters

Use the following CLI syntax to configure GNSS receiver port parameters.

CLI Syntax:

```
config# port port-id
      gnss
        antenna-cable-delay 0..32767
        no antenna-cable-delay
        elevation-mask-angle 0..89
        no elevation-mask-angle
        [no] type [gps] [glonass]
```

3.11.2.25 Configuring Serial Ports for Raw Socket Transport

Use the following CLI syntax to configure raw socket parameters on an RS-232 serial port.

Note: Raw sockets are only supported on RS-232 serial ports.



CLI Syntax:

```
port port-id
  serial
    rs232
      socket socket-id
      description description-string
      encaps-type raw
      rx
        eop
          idle-timeout milliseconds
          length bytes
          special-char value
          exit
        unquench-delay seconds
        squelch-reset
        exit
      tx
        inter-session-delay milliseconds
        exit
    no shutdown
  exit
exit
exit
```

3.11.3 Configuring SCADA Bridge Parameters

Use the following CLI commands to configure SCADA bridge parameters on an Integrated Services card.

CLI Syntax:

```

scada bridge-id
  branch branch-id
    description description-string
    gain
      input decibels
      output decibels
    squelch
    exit
  description description-string
  exit
mddb
  force-active master branch-id
  redundant-mode redundant-mode
  report-alarm [hcmOof] [hcmRai]
  speed {600 | 1200 | 2400 | 4800 | 9600 | 19200 |
        38400 | 56000}
  squelch timeout timeout
  squelch reset
  squelch-recovery [mode] [time time]
  exit
pcm
  force-active master branch-id
  redundant-mode redundant-mode
  squelch reset
  squelch timeout timeout
  squelch-recovery [mode] [time time]
  exit
vcb
  idle-code abcd-code
  seized-code abcd-code
  exit
exit

```

The following CLI syntax shows an example of configuring SCADA bridge parameters on an Integrated Services card.

CLI Syntax:

```

scada 1/8/1 type mddb
  description "scada bridge1"
  no shutdown
  branch 1
    no shutdown
    exit
  branch 2

```

```
        no shutdown
        exit
    branch 3
        no shutdown
        exit
    branch 4
        no shutdown
        exit
    branch 5
        no shutdown
        exit
    branch 6
        no shutdown
        exit
    branch 7
        no shutdown
        exit
    branch 8
        no shutdown
        exit
    branch 9
        no shutdown
        exit
    branch 10
        no shutdown
        exit
    branch 11
        no shutdown
        exit
    branch 12
        no shutdown
        exit
    exit
    mddb
        report-alarm hcmOof hcmRai
        squelch timeout 60
    exit
    exit
exit
```

Use the **config scada info** command to display the new SCADA bridge configuration information:

```
NOK-1>config>scada# info
#-----
echo "Mddb Configuration"
#-----
.....
  scada 1/8/1
    description "scada bridge1"
    mddb
      squelch timeout 60
    exit
    branch 1
      no shutdown
    exit
    branch 2
      no shutdown
    exit
    branch 3
      no shutdown
    exit
    branch 4
      no shutdown
    exit
    branch 5
      no shutdown
    exit
    branch 6
      no shutdown
    exit
    branch 7
      no shutdown
    exit
    branch 8
      no shutdown
    exit
    branch 9
      no shutdown
    exit
    branch 10
      no shutdown
    exit
    branch 11
      no shutdown
    exit
    branch 12
      no shutdown
    exit
  exit
.....
```

3.12 Service Management Tasks

This section describes the following service management tasks:

- [Changing a Provisioned Adapter Card Type](#)
- [Deleting an Adapter Card](#)

3.12.1 Changing a Provisioned Adapter Card Type

To change an adapter card type already provisioned for a specific slot, you must shut down any existing port configurations on the card, delete the adapter card configuration, and provision the new adapter card.

Use the following CLI syntax to change an adapter card type:

CLI Syntax:

```
port port-id
shutdown
exit
```

CLI Syntax:

```
card slot-number //always 1
mda mda-number
shutdown
exit
no mda mda-number //deletes the adapter card
mda mda-number
mda-type mda-type //provisions new adapter card
no 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# mda-type a16-chds1v2
config>card>mda# no shutdown
```

3.12.2 Deleting an Adapter Card

To delete an adapter card provisioned for a specific slot, you must shut down any existing port configurations on the card and delete the adapter card configuration.

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

CLI Syntax: `port port-id`
`shutdown`
`exit`

CLI Syntax: `card slot-number //always 1`
`mda mda-number`
`shutdown`
`exit`
`no mda mda-number //deletes the adapter card`
`exit`

The following CLI syntax shows an example of deleting 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# exit`

3.13 Configuration Command Reference

3.13.1 Command Hierarchies

- [Card Commands](#)
- [Adapter Card Commands](#)
- [External Alarm Commands](#)
- [APS Port Commands](#)
- [T1/E1 LCR Commands](#)
- [Microwave Link Commands](#)
- [Port Configuration Commands](#)
- [Ethernet Commands](#)
- [GNSS Commands](#)
- [IEEE 802.1x Ethernet Port Commands](#)
- [LLDP Ethernet Port Commands](#)
- [Ring Virtual Port Ethernet Commands](#)
- [Ring MAC Operations Commands](#)
- [Multilink Bundle and IMA Group Commands](#)
- [Serial Commands](#)
- [SONET/SDH Commands](#)
- [TDM Commands](#)
- [DS1 Commands](#)
- [DS3 Commands](#)
- [E1 Commands](#)
- [E3 Commands](#)
- [Voice Commands](#)
- [LAG Commands](#)
- [SCADA Commands](#)

3.13.1.1 Card Commands

- ```

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

```

### 3.13.1.2 Adapter Card Commands

- ```

config
  — [no] card slot-number
  — [no] mda mda-slot
  — access
  — ingress
  — fabric-policy fabric-policy-id
  — no fabric-policy
  — security-queue-policy policy-id
  — no security-queue-policy
  — shaper-policy policy-name
  — no shaper-policy policy-name
  — ais-propagation {enable | disable}
  — clock-mode adaptive
  — clock-mode {dcr-acr | differential} [timestamp-freq {19440 | 25000 | 77760 |
    103680}]
  — [no] fabric-stats-enabled
  — mda-mode mda-mode
  — no mda-mode
  — mda-type mda-type
  — no mda-type
  — network
  — ingress
  — fabric-policy fabric-policy-id
  — no fabric-policy
  — queue-policy name
  — no queue-policy
  — security-queue-policy policy-id
  — no security-queue-policy
  — ring
  — add-drop-port-queue-policy name
  — no add-drop-port-queue-policy
  — qos-policy network-policy-id
  — no qos-policy
  — poe-power-source {internal | external | none}
  — no poe-power-source
  — ring (see Ring MAC Operations Commands)
  — [no] shutdown
  — spt
  — security-aggregate-rate agg-rate
  — no security-aggregate-rate

```


- **vcb**
 - **application** {broadcast | teleprotection | vcb | vcb-branch-initiate}
- **voice**
 - **companding-law** {a-law | mu-law}
 - **signaling-type** {type-i | type-ii | type-v}

3.13.1.3 External Alarm Commands

- ```

config
— external-alarms
— [no] alarm alarm-id
— [no] chassis-alarms
— 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
— normally {open | closed}
— [no] shutdown
— output alarm-output
— description description-string
— no description
— name name-string
— no name
— [no] shutdown

```

### 3.13.1.4 APS Port Commands

```

config
 — [no] port {aps-id}
 — aps
 — advertise-interval advertise-interval
 — no advertise-interval
 — hold-time hold-time
 — no hold-time
 — hold-time-aps ([!signal-fail sf-time] [!signal-degrade sd-time])
 — no hold-time-aps
 — neighbor ip-address
 — no neighbor
 — 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.

### 3.13.1.5 T1/E1 LCR Commands

```

config
 — [no] lcr lcr-id
 — advertise-interval advertise-interval
 — no advertise-interval
 — description description
 — no description
 — hold-time hold-time
 — no hold-time
 — neighbor ip-address
 — no neighbor
 — protect-mds mda-id
 — no protect-mds
 — revert-time minutes
 — no revert-time
 — working-mds mda-id
 — no working-mds

```

### 3.13.1.6 Microwave Link Commands

```

config
— [no] port mw-link-id
— [no] shutdown
— mw
— [no] hold-time {[up hold-time-up] [down hold-time-down]}
— [no] peer-discovery
— [no] protection
— radio port-id [create] [main | spare]
— no radio port-id
— database filename
— no database
— name name-string
— no name
— perfmon [g826] [power] [acm]
— no perfmon
— rsl-history file-url
— no rsl-history
— [no] standalone
— suppress-faults [hber] [rsl-threshold] [rdi] [all]
— [no] suppress-faults
— [no] tx-mute
— [no] revert [eps] [rps]

```

### 3.13.1.7 Port Configuration Commands

```

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

```

### 3.13.1.8 Ethernet Commands

```

config
 — [no] port port-id
 — ethernet
 — access
 — egress
 — shaper-policy name
 — no shaper-policy
 — unshaped-sap-cir cir-rate
 — no unshaped-sap-cir
 — autonegotiate [limited]
 — no autonegotiate
 — cfm-loopback priority {low | high | dot1p} [match-vlan {vlan-range | none}]
 — no cfm-loopback
 — crc-monitor
 — sd-threshold threshold [multiplier multiplier]
 — no sd-threshold
 — sf-threshold threshold [multiplier multiplier]
 — no sf-threshold
 — window-size seconds
 — no window-size
 — dot1q-etype 0x0600 to 0xffff
 — no dot1q-etype
 — dot1x
 — down-when-looped
 — keep-alive timer
 — no keep-alive
 — retry-timeout timer
 — no retry-timeout
 — [no] shutdown
 — [no] use-broadcast-address
 — duplex {full | half}
 — efm-oam
 — [no] accept-remote-loopback
 — hold-time time-value
 — no hold-time
 — [no] ignore-efm-state
 — mode {active | passive}
 — [no] shutdown
 — [no] transmit-interval interval [multiplier multiplier]
 — [no] tunneling
 — egress-rate sub-rate [include-fcs] [allow-eth-bn-rate-changes] [hold-time hold-time]
 — no egress-rate
 — encap-type {dot1q | null | qinq}
 — no encap-type
 — [no] group-encryption
 — encryption-keygroup keygroup-id direction {inbound | outbound}
 — no encryption-keygroup direction {inbound | outbound}
 — hold-time {[up hold-time-up] [down hold-time-down]}
 — no hold-time
 — ingress-rate ingress-rate cbs {size [bytes | kilobytes] | default}

```

- **no ingress-rate**
  - **src-pause**
  - **no src-pause**
- **lACP-tunnel**
- **no lACP-tunnel**
- **lldp**
- **loopback** {line | internal} {timer {0 | 30 .. 86400} | persistent} [swap-src-dst-mac]
- **no loopback**
- **mac** *ieee-address*
- **no mac**
- **mode** {access | network | hybrid}
- **no mode**
- **mtu** *mtu-bytes*
- **no mtu**
- **network**
  - **accounting-policy** *policy-id*
  - [no] **accounting-policy**
  - [no] **collect-stats**
  - **egress**
    - **shaper-policy** *name*
    - **no shaper-policy**
    - **unshaped-if-cir** *cir-rate*
    - **no unshaped-if-cir**
  - **queue-policy** *name*
  - **no queue-policy**
  - **scheduler-mode** {profile | 4-priority | 16-priority} (See Note below)
- **phy-tx-clock** {auto-pref-master | auto-pref-slave | slave | master}
- **no phy-tx-clock**
- **poE** [plus]
- **no poE**
- **ptp-asymmetry** *ptp-asymmetry*
- **no ptp-asymmetry**
- **qinq-etype** *0x0600 to 0xffff*
- **report-alarm** [signal-fail] [remote] [local] [no-frame-lock] [high-ber]
- **no report-alarm**
- **speed** {10 | 100 | 1000 | 10000}
- **SSM**
  - **code-type** {sonet | sdh}
  - [no] **shutdown**
  - [no] **tx-dus**
- [no] **vlan-filter** *filter-id*
- **xgig** {lan | wan}
- **xor-mode** {rj45 | rj45 | sfp}



**Note:** For more information about how to configure the scheduler mode on Ethernet ports, refer to the 7705 SAR Quality of Service Guide.

### 3.13.1.9 GNSS Commands

```

config
 — port port-id
 — gnss
 — antenna-cable-delay 0 .. 32767
 — no antenna-cable-delay
 — elevation-mask-angle 0 .. 89
 — no elevation-mask-angle
 — [no] type [gps] [glonass]

```

### 3.13.1.10 IEEE 802.1x Ethernet Port Commands

```

config
 — port port-id
 — ethernet
 — dot1x
 — [no] mac-auth
 — mac-auth-wait seconds
 — no mac-auth-wait
 — 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
 — [no] tunneling

```

### 3.13.1.11 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
 — port-id-subtype {tx-if-alias | tx-if-name | tx-local}
 — tx-mgmt-address [system]
 — no tx-mgmt-address
 — tx-tlvs [port-desc] [sys-name] [sys-desc] [sys-cap]
 — no tx-tlvs

```

### 3.13.1.12 Ring Virtual Port Ethernet Commands

```

config
 — [no] port port-id
 — ethernet
 — cfm-loopback priority {low | high | dot1p} [match-vlan {vlan-range | none}]
 — no cfm-loopback
 — dot1q-etype 0x0600 to 0xffff
 — no dot1q-etype
 — down-when-looped
 — keep-alive timer
 — no keep-alive
 — retry-timeout timer
 — no retry-timeout
 — [no] shutdown
 — [no] use-broadcast-address
 — duplex full
 — egress-rate sub-rate
 — no egress-rate
 — encap-type {dot1q | null}
 — no encap-type
 — mac ieee-address
 — no mac
 — mode network
 — no mode
 — mtu mtu-bytes
 — no mtu
 — network
 — queue-policy name
 — no queue-policy
 — scheduler-mode 16-priority
 — speed 2500

```

### 3.13.1.13 Ring MAC Operations Commands

```

config
 — card
 — mda mda-id
 — ring
 — [no] disable-aging
 — [no] disable-learning
 — [no] discard-unknown-source
 — fdb-table-high-wmark high-water-mark
 — no fdb-table-high-wmark
 — fdb-table-size table-size
 — no fdb-table-size
 — [no] mac-pinning [port port-id]
 — remote-age aging-timer
 — no remote-age
 — [no] static-mac mac ieee-address port port-id [create]

```

### 3.13.1.14 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**

### 3.13.1.15 Serial Commands

- ```
config
  — [no] port {port-id}
  — serial
    — [no] rs232
      — [no] channel-group channel-group-id
        — crc {16 | 32}
        — description description-string
        — no description
        — encap-type cem
        — no encap-type
        — idle-payload-fill all-ones
        — no idle-payload-fill
        — mode access
        — [no] shutdown
      — character-length {6 | 7 | 8}
      — clock-source {external | slave | dcr-serial}
      — control-lead {input | monitor | output}
        — input
          — alb-cts {high | low | end-to-end}
          — dtr-dsr {high | low}
          — rdl-ri {high | low}
          — rts-dcd {high | low | end-to-end}
        — monitor
          — alb-cts {on | off | high | low}
          — dtr-dsr {on | off | high | low}
          — rdl-ri {on | off | high | low}
          — rts-dcd {on | off | high | low}
        — output
          — cts-rl {high | low | end-to-end}
          — dcd-rts {high | low | end-to-end}
          — dsr-dtr {high | low}
          — ri-rdl {high | low}
      — data-position {F0-B5 | F0-B6}
      — device-gender {dte | dce}
      — device-mode {synchronous | asynchronous}
      — duplex {half | full}
      — hold-time {[up hold-time-up] [down hold-time-down]}
      — no hold-time
      — [no] invert-clock
      — no invert-clock
      — loopback {bidir-b | bidir-e}
      — no loopback
```

- **mon-clock-deviation** {[raise *debounce-time-r*] [clear *debounce-time-c*]}
- **no mon-clock-deviation**
- **mon-data-inactivity** {[raise *debounce-time-r*] [clear *debounce-time-c*]}
- **no mon-data-inactivity**
- **multi-drop** {disabled | slave | master}
- **parity** {odd | even | mark | space}
- **no parity**
- [no] **report-alarm** [hcmOof | hcmRai] [ctrlLeadMon] [monClockDev] [monDataInac]
- **s-bit-signaling** {on | off}
- [no] **shutdown**
- **socket** *socket-id*
 - **description** *description-string*
 - **no description**
 - **encap-type** *encap-type*
 - **rx**
 - **eop**
 - **idle-timeout** *milliseconds*
 - **length** *bytes*
 - **special-char** *value*
 - **no special-char**
 - **sqelch-delay** *seconds*
 - **no sqelch-delay**
 - **sqelch-reset**
 - **unsquelch-delay** *seconds*
 - **no unsquelch-delay**
- [no] **shutdown**
- **tx**
 - **inter-session-delay** *milliseconds*
- **speed** {600 | 1200 | 2400 | 4800 | 8000 | 9600 | 14400 | 16000 | 19200 | 24000 | 32000 | 38400 | 56000 | 57600 | 64k | 115200}
- **stop-bits** {1 | 2}
- [no] **rs530**
 - [no] **channel-group** *channel-group-id*
 - **description** *description-string*
 - **no description**
 - **encap-type** cem
 - **no encap-type**
 - **idle-payload-fill** {all-ones | pattern}
 - **no idle-payload-fill**
 - **mode** {access | network}
 - [no] **shutdown**
 - **character-length** {6 | 7 | 8}
 - **clock-source** {external | slave | dcr-serial}
 - **control-lead** {input | monitor | output}
 - **input**
 - **dtr-dsr** {high | low}
 - **ll-tm** {high | low}
 - **rl-cts** {high | low | end-to-end}
 - **rts-dcd** {high | low | end-to-end}
 - **monitor**
 - **dtr-dsr** {on | off | high | low}
 - **ll-tm** {on | off | high | low}
 - **rl-cts** {on | off | high | low}

- **rts-dcd** {on | off | high | low}
- **output**
 - **cts-rl** {high | low | end-to-end}
 - **dcd-rts** {high | low | end-to-end}
 - **dsr-dtr** {high | low}
 - **tm-ll** {high | low}
- **data-position** {F0-B5 | F0-B6}
- **device-gender** {dte | dce}
- **device-mode** {synchronous | asynchronous}
- **duplex** {half | full}
- **hold-time** {[up *hold-time-up*] [down *hold-time-down*]}
- **no hold-time**
- [no] **invert-clock**
- **loopback** *bidir-e*
- **no loopback**
- **mon-clock-deviation** {[raise *debounce-time-r*] [clear *debounce-time-c*]}
- **no mon-clock-deviation**
- **mon-data-inactivity** {[raise *debounce-time-r*] [clear *debounce-time-c*]}
- **no mon-data-inactivity**
- **multi-drop** {disabled | slave | master}
- **parity** {odd | even | mark | space}
- **no parity**
- [no] **report-alarm** [hcmOof | hcmRai] [ctrlLeadMon] [monClockDev] [monDataInac]
- **s-bit-signaling** {on | off}
- [no] **shutdown**
- **speed** {600 | 1200 | 2400 | 4800 | 8000 | 9600 | 14400 | 16000 | 19200 | 32000 | 38400 | 56000 | 64k | 128k | 192k | 256k | 288k | 336k | 384k | 512k | 640k | 704k | 768k | 896k | 1024k | 1152k | 1280k | 1344k | 1408k | 1536k | 1664k | 1792k | 1920k | 2048k | 3072k | 4096k | 5120k | 6144k | 7168k | 8192k | 9216k | 10240k | 11264k | 12288k | 13312k | 14336k | 15360k | 16384k}
- **stop-bits** {1 | 2}
- [no] **v35**
 - [no] **channel-group** *channel-group-id*
 - **cisco-hdlc**
 - **down-count** *down-count*
 - **no down-count**
 - **keepalive** *time-interval*
 - **no keepalive**
 - **up-count** *up-count*
 - **no up-count**
 - **crc** {16 | 32}
 - **description** *description-string*
 - **no description**
 - **encap-type** {cem | ipcp | frame-relay | hdlc | cisco-hdlc}
 - **no encap-type**
 - **frame-relay**
 - **lmi-type** {ansi | itu | none | rev1}
 - **mode** {dce | dte | bidir}
 - **n391dte** *intervals*
 - **no n391dte**
 - **n392dce** *threshold*
 - **no n392dce**
 - **n392dte** *threshold*

- **no n392dte**
- **n393dce** *count*
- **no n393dce**
- **n393dte** *count*
- **no n393dte**
- **t391dte** *keepalive*
- **no t391dte**
- **t392dce** *keepalive*
- **no t392dce**
- **idle-cycle-flag** {*flags* | *ones*}
- **no idle-cycle-flag**
- **idle-payload-fill** *all-ones*
- **no idle-payload-fill**
- **mode** *access*
- **mtu** *mtu-bytes*
- **no mtu**
- [no] **ppp**
 - **keepalive** *time-interval* [*dropcount* *drop-count*]
- [no] **shutdown**
- **clock-source** *slave*
- **control-lead** {*input* | *output*}
 - **input**
 - **alb-cts** {*high* | *low* | *end-to-end*}
 - **dtr-dsr** {*high* | *low*}
 - **rts-dcd** {*high* | *low* | *end-to-end*}
 - **monitor**
 - **alb-cts** {*on* | *off* | *high* | *low*}
 - **dtr-dsr** {*on* | *off* | *high* | *low*}
 - **rts-dcd** {*on* | *off* | *high* | *low*}
 - **output**
 - **cts-alb** {*high* | *low* | *end-to-end*}
 - **dcd-rts** {*high* | *low* | *end-to-end*}
 - **dsr-dtr** {*high* | *low*}
- **device-gender** {*dte* | *dce*}
- **device-mode** {*synchronous*}
- **duplex** {*half* | *full*}
- **hold-time** {[*up* *hold-time-up*] [*down* *hold-time-down*]}
- **no hold-time**
- [no] **invert-clock**
- **loopback** {*bidir-b* | *bidir-e*}
- **no loopback**
- **multi-drop** {*disabled* | *slave* | *master*}
- **mon-clock-deviation** {[*raise* *debounce-time-r*] [*clear* *debounce-time-c*]}
- **no mon-clock-deviation**
- **mon-data-inactivity** {[*raise* *debounce-time-r*] [*clear* *debounce-time-c*]}
- **no mon-data-inactivity**
- [no] **report-alarm** [*hcmOof* | *hcmRai*] [*ctrlLeadMon*] [*monClockDev*] [*monDataInac*]
- [no] **shutdown**
- **speed** {*56k* | *64k* | *128k* | *192k* | *256k* | *384k* | *512k* | *640k* | *768k* | *896k* | *1024k* | *1152k* | *1280k* | *1344k* | *1408k* | *1536k* | *1664k* | *1792k* | *1920k* | *2048k* | *4096k* | *5120k* | *7168k*}
- [no] **x21**
 - [no] **channel-group** *channel-group-id*

- **cisco-hdlc**
 - **down-count** *down-count*
 - **no down-count**
 - **keepalive** *time-interval*
 - **no keepalive**
 - **up-count** *up-count*
 - **no up-count**
- **crc** {16 | 32}
- **description** *description-string*
- **no description**
- **encap-type** {cem | ipcp | frame-relay | hdlc | cisco-hdlc}
- **no encap-type**
- **frame-relay**
 - **lmi-type** {ansi | itu | none | rev1}
 - **mode** {dce | dte | bidir}
 - **n391dte** *intervals*
 - **no n391dte**
 - **n392dce** *threshold*
 - **no n392dce**
 - **n392dte** *threshold*
 - **no n392dte**
 - **n393dce** *count*
 - **no n393dce**
 - **n393dte** *count*
 - **no n393dte**
 - **t391dte** *keepalive*
 - **no t391dte**
 - **t392dce** *keepalive*
 - **no t392dce**
- **idle-cycle-flag** {flags | ones}
- **no idle-cycle-flag**
- **idle-payload-fill** all-ones
- **no idle-payload-fill**
- **invert-clock**
- **no invert-clock**
- **mode** access
- **mtu** *mtu-bytes*
- **no mtu**
- [no] **ppp**
 - **keepalive** *time-interval* [**dropcount** *drop-count*]
- [no] **shutdown**
- **character-length** {6 | 7 | 8}
- **clock-source** slave
- **control-lead** {input | output}
 - **input**
 - **c-i** {high | low | end-to-end}
 - **monitor**
 - **c-i** {on | off | high | low}
 - **output**
 - **i-c** {high | low | end-to-end}
- **data-position** {F0-B5 | F0-B6}
- **device-gender** {dte | dce}
- **device-mode** {synchronous | asynchronous}
- **duplex** {half | full}

- **hold-time** {[up *hold-time-up*] [down *hold-time-down*]}
- **no hold-time**
- **invert-clock**
- **no invert-clock**
- **loopback** {*bidir-b* | *bidir-e*}
- **no loopback**
- **mon-clock-deviation** {[raise *debounce-time-r*] [clear *debounce-time-c*]}
- **no mon-clock-deviation**
- **mon-data-inactivity** {[raise *debounce-time-r*] [clear *debounce-time-c*]}
- **no mon-data-inactivity**
- **parity** {*odd* | *even* | *mark* | *space*}
- **no parity**
- [no] **report-alarm** [*hcmOof* | *hcmRai*] [*ctrlLeadMon*] [*monClockDev*] [*monDataInac*]
- **s-bit-signaling** {*on* | *off*}
- [no] **shutdown**
- **speed** {*1200* | *2400* | *4800* | *9600* | *19200* | *38400* | *56000* | *64k* | *128k* | *256k* | *384k* | *512k* | *640k* | *768k* | *896k* | *1024k* | *1152k* | *1280k* | *1408k* | *1536k* | *1664k* | *1792k* | *1920k* | *2048k*}

3.13.1.16 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
— accounting-policy policy-id
— [no] accounting-policy
— [no] collect-stats
— queue-policy name
— no queue-policy
— payload {sts12 | sts3 | tug3 | ds3 | e3 | vt2 | vt15 | ds1 | e1}

```

- **ppp**
  - **keepalive** *time-interval* [**dropcount** *drop-count*]
  - **no keepalive**
- [no] **report-alarm** [**pais**] [**plop**] [**prdi**] [**pplm**] [**prei**] [**puneq**] [**plcd**]
- [no] **scramble**
- [no] **shutdown**
- **signal-label** *value*
- **no signal-label**
- **trace-string** [*trace-string*]
- **no trace-string**
- [no] **report-alarm** [**loc**] [**lais**] [**lrldi**] [**ss1f**] [**lb2er-sd**] [**lb2er-sf**] [**slof**] [**slos**] [**lrei**]
- **section-trace** {**increment-z0** | **byte** *value* | **string** *string*}
- **speed** {**oc3** | **oc12**}
- **threshold** {**ber-sd** | **ber-sf**} **rate** *threshold-rate*
- **no threshold** {**ber-sd** | **ber-sf**}
- [no] **tx-dus**

### 3.13.1.17 TDM Commands

- ```
config
  — [no] port port-id
  — tdm
    — buildout {long | short}
- [no] codir
  - [no] channel-group channel-group-id
    - description description-string
    - no description
    - encap-type cem
    - mode access
    - [no] shutdown
  - loopback {internal | line}
  - no loopback
  - report-alarm {ais | los}
  - no report-alarm
  - [no] shutdown
  - [no] timing-8k
- [no] ds1 ds1-id
- [no] ds3 [sonet-sdh-index]
- [no] e1 e1-id
- [no] e3 [sonet-sdh-index]
- encoding {b8zs | ami}
- length {133 | 266 | 399 | 533 | 655}
- line-impedance {75 | 100 | 120}
- [no] tpif
  - [no] channel-group channel-group-id
    - description description-string
    - no description
    - encap-type cem
    - mode access
    - [no] shutdown
    - timeslots timeslots

```

- **framing** {framed | unframed}
- **no framing**
- **loopback** {internal | line}
- **no loopback**
- **report-alarm** {los | rai}
- **no report-alarm**
- [no] **shutdown**

3.13.1.18 DS1 Commands

- ```

config
— [no] port {port-id | aps-id | lcr-port-id}
— tdm
— [no] ds1 ds1-id
— [no] channel-group channel-group-id
— atm
— cell-format cell-format
— min-vp-vpi value
— cisco-hdlc
— down-count down-count
— no down-count
— keepalive time-interval
— no keepalive
— up-count up-count
— no up-count
— crc {16 | 32}
— description description-string
— no description
— encap-type {atm | cem | ipcp | ppp-auto | frame-relay | hdlc | cisco-hdlc}
— no encap-type
— frame-relay
— lmi-type {ansi | itu | none | rev1}
— mode {dce | dte | bidir}
— n391dte intervals
— no n391dte
— n392dce threshold
— no n392dce
— n392dte threshold
— no n392dte
— n393dce count
— no n393dce
— n393dte count
— no n393dte
— t391dte keepalive
— no t391dte
— t392dce keepalive
— no t392dce
— 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**
  - **loopback** {line | internal}
  - **no loopback**
  - **mac** *ieee-address*
  - **no mac**
  - **mode** {access | network}
  - **no mode**
  - **mtu** *mtu-bytes*
  - **no mtu**
  - **network**
    - **accounting-policy** *policy-id*
    - [no] **accounting-policy**
    - [no] **collect-stats**
    - **queue-policy** *name*
    - **no queue-policy**
  - [no] **ppp**
    - **ber-sf-link-down**
    - **no ber-sf-link-down**
    - **keepalive** *time-interval* [**dropcount** *drop-count*]
    - **no keepalive**
  - [no] **scramble**
  - [no] **shutdown**
  - **signal-mode** *cas*
  - **no signal-mode**
  - **timeslots** *timeslots*
  - **no timeslots**
  - **clock-source** {loop-timed | node-timed | adaptive | differential}
  - **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] **shutdown**
  - **signal-mode** *cas*
  - **no signal-mode**
  - **threshold** {ber-sd | ber-sf} rate *threshold-rate*
  - **no threshold** {ber-sd | ber-sf}

### 3.13.1.19 DS3 Commands

```

config
 — [no] port {port-id | aps-id}
 — tdm
 — [no] ds3 [sonet-sdh-index]
 — atm
 — cell-format cell-format
 — no cell-format
 — mapping direct
 — no mapping
 — min-vp-vpi value
 — no min-vp-vpi
 — channelized {ds1 | e1}
 — no channelized
 — clock-source {loop-timed | node-timed | differential | free-run}
 — crc {16 | 32}
 — description description-string
 — no description
 — encap-type {atm | ppp-auto | frame-relay}
 — no encap-type
 — [no] feac-loop-respond
 — frame-relay
 — lmi-type {ansi | itu | none | rev1}
 — mode {dce | dte | bidir}
 — n391dte intervals
 — no n391dte
 — n392dce threshold
 — no n392dce
 — n392dte threshold
 — no n392dte
 — n393dce count
 — no n393dce
 — n393dte count
 — no n393dte
 — t391dte keepalive
 — no t391dte
 — t392dce keepalive
 — no t392dce
 — framing (DS3) {c-bit | m23}
 — idle-cycle-flag {flags | ones}
 — no idle-cycle-flag
 — loopback {line | internal | remote}
 — no loopback
 — mac ieee-address
 — no mac
 — 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
 — network

```

- **accounting-policy** *policy-id*
- **[no] accounting-policy**
- **[no] collect-stats**
- **queue-policy** *name*
- **no queue-policy**
- **ppp**
  - **keepalive** *time-interval* [**dropcount** *drop-count*]
  - **no keepalive**
- **[no] report-alarm** {**ais** | **los** | **oof** | **rai** | **looped**}
- **[no] shutdown**

### 3.13.1.20 E1 Commands

- ```
config
— [no] port {port-id | aps-id | lcr-port-id}
— tdm
  — [no] e1 e1-id
    — [no] channel-group channel-group-id
      — atm
        — cell-format cell-format
        — min-vp-vpi value
      — cisco-hdlc
        — down-count down-count
        — no down-count
        — keepalive time-interval
        — no keepalive
        — up-count up-count
        — no up-count
      — crc {16 | 32}
      — description description-string
      — no description
      — encap-type {atm | cem | ipcp | ppp-auto | frame-relay | hdlc | cisco-hdlc}
      — no encap-type
      — frame-relay
        — lmi-type {ansi | itu | none | rev1}
        — mode {dce | dte | bidir}
        — n391dte intervals
        — no n391dte
        — n392dce threshold
        — no n392dce
        — n392dte threshold
        — no n392dte
        — n393dce count
        — no n393dce
        — n393dte count
        — no n393dte
        — t391dte keepalive
        — no t391dte
        — t392dce keepalive
        — no t392dce
      — 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**
- **loopback** {line | internal}
- **no loopback**
- **mac** *ieee-address*
- **no mac**
- **mode** {access | network}
- **no mode**
- **mtu** *mtu-bytes*
- **no mtu**
- **network**
 - **accounting-policy** *policy-id*
 - [no] **accounting-policy**
 - [no] **collect-stats**
 - **queue-policy** *name*
 - **no queue-policy**
- [no] **ppp**
 - **ber-sf-link-down**
 - **no ber-sf-link-down**
 - **keepalive** *time-interval* [**dropcount** *drop-count*]
 - **no keepalive**
- [no] **scramble**
- [no] **shutdown**
- **signal-mode** *cas*
- **no signal-mode**
- **timeslots** *timeslots*
- **no timeslots**
- **clock-source** {loop-timed | node-timed | adaptive | differential}
- **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] **shutdown**
- **signal-mode** *cas*
- **no signal-mode**
- **ssm**
 - [no] **shutdown**
 - **ssm-bit** *sa-bit*
 - **no ssm-bit**
 - [no] **tx-dus**
- **threshold** {ber-sd | ber-sf} *rate* *threshold-rate*
- **no threshold** {ber-sd | ber-sf}

3.13.1.21 E3 Commands

```

config
  — [no] port {port-id}
  — tdm
    — [no] e3 [sonet-sdh-index]
      — atm
        — cell-format cell-format
        — no cell-format
        — min-vp-vpi value
        — no min-vp-vpi
      — clock-source {loop-timed | node-timed | differential | free-run}
      — crc {16 | 32}
      — description description-string
      — no description
      — encap-type {atm | cem | ppp-auto | frame-relay}
      — no encap-type
      — [no] feac-loop-respond
      — frame-relay
        — lmi-type {ansi | itu | none | rev1}
        — mode {dce | dte | bidir}
        — n391dte intervals
        — no n391dte
        — n392dce threshold
        — no n392dce
        — n392dte threshold
        — no n392dte
        — n393dce count
        — no n393dce
        — n393dte count
        — no n393dte
        — t391dte keepalive
        — no t391dte
        — t392dce keepalive
        — no t392dce
      — 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
      — network
        — accounting-policy policy-id
        — [no] accounting-policy
        — [no] collect-stats
        — queue-policy name
        — no queue-policy
      — ppp
        — keepalive time-interval [dropcount drop-count]
        — no keepalive
      — [no] report-alarm {ais | los | oof | rai | looped}

```

- [no] **shutdown**

3.13.1.22 Voice Commands

```

config
  — [no] port port-id
    — voice
      — audio-wires {two-wires | four-wires}
      — [no] em
        — [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
        — signaling-lead
          — e {high | low | end-to-end}
          — m {high | low | end-to-end}
        — signaling-mode {em | transmission-only}
        — [no] shutdown
      — [no] fxo
        — [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}
        — loopback internal-digital
        — no loopback
        — [no] shutdown
      — [no] fxs
        — [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}
        — loopback internal-digital
        — no loopback
        — [no] shutdown

```

- **line-balance** {nominal | 800}
- **ring-generation** {16 | 20 | 25}
- **no ring-generation**
- **signaling-type** {3600plar | 1511plar | 3600ls | 1511profile1 | 3600re | 1511sn137}
- **t1p-rx** *decibels*
- **t1p-tx** *decibels*

3.13.1.23 LAG Commands

- config
- [no] **lag** [*lag-id*]
 - **access**
 - **adapt-qos** {link | distribute}
 - **description** *description-string*
 - **no description**
 - [no] **dynamic-cost**
 - **encap-type** {dot1q | null | qinq}
 - **no encap-type**
 - **hold-time down** *hold-down-time*
 - **no hold-time**
 - **lACP** [*mode*] [**administrative-key** *admin-key*] [**system-id** *system-id*] [**system-priority** *priority*]
 - **no lACP**
 - **lACP-xmit-interval** {slow | fast}
 - **no lACP-xmit-interval**
 - [no] **lACP-xmit-stdby**
 - **mac** *ieee-address*
 - **no mac**
 - **mode** {access | network | hybrid}
 - **no mode**
 - **port** *port-id* [*port-id*] [**priority** *priority*] [**sub-group** *sub-group-id*]
 - **no port** *port-id*
 - **port-threshold** *value* [**action** {dynamic-cost | down}]
 - **no port-threshold**
 - **selection-criteria** [best-port | highest-count | highest-weight] [**slave-to-partner** [**subgroup-hold-time** *hold-time*]]
 - **no selection-criteria**
 - [no] **shutdown**
 - **standby-signaling** [lACP | power-off]
 - **no standby-signaling**

3.13.1.24 SCADA Commands

```

config
— scada bridge-id
— [no] branch branch-id
— description description-string
— no description
— gain
— input decibels
— output decibels
— [no] sidetone (see Note:)
— [no] shutdown
— [no] squelch
— description description-string
— no description
— mddb
— force-active master branch-id
— redundant-mode redundant-mode
— [no] report-alarm [hcmOof] [hcmRai]
— speed {600 | 1200 | 2400 | 4800 | 9600 | 19200 | 38400 | 56000}
— squelch timeout timeout
— squelch reset
— no squelch
— squelch-recovery [mode] [time time]
— pcm
— force-active master branch-id
— redundant-mode redundant-mode
— squelch timeout timeout
— squelch reset
— no squelch
— squelch-recovery [mode] [time time]
— [no] shutdown
— vcb
— idle-code abcd-code
— no idle-code
— seized-code abcd-code
— no seized-code

```



Note: The **sidetone** command is not supported in this release.

3.13.2 Command Descriptions

- [Generic Commands](#)
- [Card Commands](#)
- [Adapter Card Commands](#)
- [Interface QoS Commands](#)
- [External Alarm Commands](#)
- [APS Port Commands](#)
- [T1/E1 LCR Commands](#)
- [Microwave Link Commands](#)
- [General Port Commands](#)
- [Ethernet Commands](#)
- [GNSS Commands](#)
- [IEEE 802.1x Ethernet Port Commands](#)
- [LLDP Ethernet Port Commands](#)
- [Ring MAC Operations Commands](#)
- [Serial Commands](#)
- [RS-232, RS-530, V.35, and X.21 Channel Group Commands](#)
- [SONET/SDH Port Commands](#)
- [SONET/SDH Path Commands](#)
- [Network Port Commands](#)
- [Multilink Bundle and IMA Group Commands](#)
- [ATM Interface Commands](#)
- [TDM Commands](#)
- [DS1 and E1 Commands](#)
- [DS1 and E1 Channel Group Commands](#)
- [DS3 and E3 Commands](#)
- [Voice Commands](#)
- [Voice Channel Group Commands](#)
- [LAG Commands](#)
- [Frame Relay Commands](#)
- [Cisco HDLC Commands](#)
- [SCADA Commands](#)

3.13.2.1 Generic Commands

description

Syntax	description <i>description-string</i> no description
Context	config>external-alarms>alarm config>external-alarms>input config>external-alarms>output config>lcr config>port config>port>tdm>ds1>channel-group config>port>tdm>ds3 config>port>tdm>e1>channel-group config>port>tdm>e3 config>port>tdm>codir>channel-group config>port>tdm>tpif>channel-group config>port>voice>fxo>channel-group config>port>voice>fxs>channel-group config>port>sonet-sdh>path config>port>serial>rs232>channel-group config>port>serial>rs232>socket config>port>serial>rs530>channel-group config>port>serial>v35>channel-group config>port>serial>x21>channel-group config>port>voice>em>channel-group config>lag config>scada config>scada>branch
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	“DS0GRP” (for the serial context and the voice context) “Discrete Digital Input” for digital input (for Auxiliary Alarm card or chassis alarm inputs), “Analog Input” for analog input, and “Digital Output Relay” for output (for Auxiliary Alarm card) n/a for others
Parameters	<i>description-string</i> — description character string. Allowed values are any string up to 80 or 160 characters long (depending on the command) 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>down-when-looped
 config>port>ethernet>efm-oam
 config>port>ethernet>ssm
 config>port>mw-link
 config>port>serial>rs232
 config>port>serial>v35
 config>port>serial>x21
 config>port>serial>rs232>channel-group
 config>port>serial>rs232>socket
 config>port>serial>rs530>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>ssm
 config>port>tdm>e1>channel-group
 config>port>tdm>e3
 config>port>tdm>codir
 config>port>tdm>codir>channel-group
 config>port>tdm>tpif
 config>port>tdm>tpif>channel-group
 config>port>voice>fxo
 config>port>voice>fxs
 config>port>voice>fxo>channel-group
 config>port>voice>fxs>channel-group
 config>port>voice>em
 config>port>voice>em>channel-group
 config>lag
 config>scada
 config>scada>branch

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.



Note: The **config>port>shutdown** command does not remove power on ports that are Power over Ethernet (PoE/PoE+) capable. You must use the **config>port>ethernet>no poe** command to turn the power off; see [poe](#) for more information.

Default	card – no shutdown
	mda – no shutdown
	port – shutdown
	scada – shutdown
	scada>branch – no shutdown
	input – no shutdown (for Auxiliary Alarm card and chassis alarm inputs)
	alarm – shutdown (for Auxiliary Alarm card)
	output – shutdown (for Auxiliary Alarm card)
	lag – shutdown

3.13.2.2 Card Commands

card

Syntax	[no] card <i>slot-number</i>
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	<i>slot-number</i> — the slot number of the card in the chassis
	Values 1

card-type

Syntax	card-type <i>card-type</i> no card-type
Context	config>card
Description	<p>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.</p> <p>A card must be provisioned (configured) before an adapter card or port can be configured.</p> <p>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.</p> <p>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.</p> <p>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.</p>
Default	n/a

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

Values iom-sar

3.13.2.3 Adapter Card Commands

mda

Syntax	[no] mda <i>mda-slot</i>	
Context	config>card	
Description	This mandatory command enables access to a card's MDA CLI context to configure adapter cards.	
Default	n/a	
Parameters	<i>mda-slot</i> — the adapter card or module slot number to be configured	
	Values	
	1 to 6	on the 7705 SAR-8 Shelf V2
	1 to 12 and X1 to X4 for XMDA cards	on the 7705 SAR-18
	1 (for Ethernet), 2 (for T1/E1), and 3 (for module)	on the 7705 SAR-M
	1 (for Ethernet) and 2 (for T1/E1)	on the 7705 SAR-A
	1 (for Ethernet) and 2 (for GNSS RF)	on the 7705 SAR-Ax
	1 (for Ethernet)	on the 7705 SAR-W
	1 (for Ethernet) and 3 (for GPS)	on the 7705 SAR-Wx
	1 (for Ethernet), 2 (for module position 1), and 3 (for module position 2)	on the 7705 SAR-H
	1 (for Ethernet) and 2 (for RS-232)	on the 7705 SAR-Hc
	1 (for T1/E1); 2 (for Ethernet XOR RJ-45 ports 2/1A and 2/2A, Ethernet XOR SFP ports 2/1B and 2/2B, Ethernet ports 2/3 to 2/6, and 10GigE SFP+ port 2/7); 3 (for Ethernet XOR RJ-45 ports 3/1A and 3/2A, Ethernet XOR SFP ports 3/1B and 3/2B, Ethernet ports 3/3 to 3/6, and 10GigE SFP+ port 3/7)	on the 7705 SAR-X

ais-propagation

Syntax	ais-propagation { enable disable }
Context	config>card>mda
Description	<p>This command enables the 7705 SAR to interoperate with SDH networks that use subnetwork connection protection (SNCP). When ais-propagation is enabled, the 7705 SAR can use SDH signaling to make pseudowire switching decisions on Cpipes configured for redundancy.</p> <p>For more information about 7705 SAR interoperability with SDH SNCP, refer to the 7705 SAR Services Guide, "AIS Fault Propagation".</p>
Default	n/a

clock-mode

Syntax	clock-mode adaptive clock-mode { dcr-acr differential } [timestamp-freq { 19440 25000 77760 103680 }]
Context	config>card>mda
Description	<p>This command defines the clocking mode and the associated timestamp frequency (if differential or dcr-acr clocking mode is configured).</p> <p>All clock modes are supported on the following:</p> <ul style="list-style-type: none"> • 16-port T1/E1 ASAP Adapter card • 32-port T1/E1 ASAP Adapter card • 7705 SAR-A (variant with T1/E1 ports) • 7705 SAR-M (variants with T1/E1 ports) • 7705 SAR-X • T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (the clock frequency value configured for dcr-acr clock mode or differential clock mode on one module will take effect on both modules installed in the 7705 SAR-H) <p>Only differential mode is supported on the following cards:</p> <ul style="list-style-type: none"> • 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card (DS1/E1 channels) • 4-port DS3/E3 Adapter card (clear channel DS3/E3 ports and DS1/E1 channels on channelized DS3 ports (E3 ports cannot be channelized)); differential mode on DS1/E1 channels is supported only on the first three ports of the card
Default	adaptive (if no clocking mode is configured) differential (for 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card and 4-port DS3/E3 Adapter card)

If **differential** or **dcr-acr** clocking mode is configured on the 7705 SAR-M, 7705 SAR-A, 7705 SAR-X, or 4-port T1/E1 and RS-232 Combination module, the default timestamp frequency is **103680**.

If **differential** or **dcr-acr** clocking mode is configured on the 16-port T1/E1 ASAP Adapter card or the 32-port T1/E1 ASAP Adapter card, the default timestamp frequency is **77760**.

For the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card and the 4-port DS3/E3 Adapter card, the default timestamp frequency is **77760**.

- Parameters**
- adaptive** — enables adaptive clock recovery
 - dcr-acr** — enables DCR and ACR on different ports of the same card
 - differential** — enables differential clock recovery
 - timestamp-freq** — sets the optional timestamp frequency
 - 19440** — sets the timestamp frequency to 19440 Hz (19.44 MHz) for Y.1413 compliance
 - 25000** — sets the timestamp frequency to 25000 Hz (25 MHz) for Ethernet-based systems
 - 77760** — sets the timestamp frequency to 77760 Hz (77.76 MHz) for interoperation with SONET/SDN-based systems such as TSS-5
 - 103680** — sets the timestamp frequency to 103680 Hz (103.68 MHz), recommended for any operation over 100 MHz



Note: The 25000 and 103680 options are not supported on the 16-port T1/E1 ASAP Adapter card or the 32-port T1/E1 ASAP Adapter card. The 19440, 25000, and 103680 options are not supported on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card or the 4-port DS3/E3 Adapter card.

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-mode

Syntax	mda-mode <i>mda-mode</i> no mda-mode
Context	config>card>mda
Description	<p>This command configures the set of software services that are enabled for a specific adapter card.</p> <p>The cem-atm-ppp and cem-fr-hdlc-ppp parameter values are used to configure the appropriate encapsulation methods that are required to support pseudowire services. These values apply to the following adapter cards:</p> <ul style="list-style-type: none"> • 16-port T1/E1 ASAP Adapter card • 32-port T1/E1 ASAP Adapter card • 4-port DS3/E3 Adapter card <p>The card-level encapsulation capabilities must be configured before the encap-type parameter is configured at the port level.</p> <p>The x10-1gb-sfp and x1-10gb-sf+ parameter values are used for the 10-port 1GigE/1-port 10GigE X-Adapter card to define whether the card operates in 10-port 1GigE mode or 1-port 10GigE mode.</p> <p>The p4-oc3 and p1-oc12 parameter values are used for the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card to define whether the card operates in 4-port OC3/STM1 mode or 1-port OC12/STM4 mode.</p> <p>The mddb, pcm, and vcb parameter values are used for the Integrated Services card to define which SCADA application is active on the card.</p> <p>The no form of this command sets the mda-mode back to the card's default mode. All service and port/channel configurations associated with the adapter card must be removed before the mda-mode can be changed. On the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, changing the mode causes the adapter card to reset.</p>
Default	<p>x1-10gb-sf+ (for the 10-port 1GigE/1-port 10GigE X-Adapter card)</p> <p>cem-atm-ppp (for the T1/E1 ASAP adapter cards and 4-port DS3/E3 Adapter card)</p> <p>p4-oc3 (for the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card)</p> <p>mddb (for the Integrated Services card)</p>
Parameters	<p><i>mda-mode</i> — the encapsulation mode for the adapter card to be provisioned</p> <p>Values cem-atm-ppp, cem-fr-hdlc-ppp, x10-1gb-sfp, x1-10gb-sf+, p4-oc3, p1-oc12, mddb, pcm, vcb</p>

mda-type

Syntax	mda-type <i>mda-type</i> no mda-type
Context	config>card>mda
Description	<p>This mandatory command provisions a specific adapter card or module type to the device configuration for the slot. The adapter card or module can be preprovisioned, but it must be provisioned before ports can be configured. Ports can be configured once the adapter card or module is properly provisioned.</p> <p>A maximum of 6 adapter cards can be installed in a 7705 SAR-8 Shelf V2 chassis, and a maximum of 12 adapter cards and 4 XMDA adapter cards can be installed in a 7705 SAR-18 chassis. One module can be installed in a 7705 SAR-M chassis. A maximum of two modules can be installed in a 7705 SAR-H chassis. Only one adapter card or module can be provisioned per MDA or module slot. To modify an MDA or module slot, shut down all port associations.</p> <p>A medium severity alarm is generated if an adapter card or module is inserted that does not match the adapter card or module type configured for the slot. This alarm is cleared when the correct adapter card or module is inserted or the configuration is modified. A high severity alarm is raised if an administratively enabled adapter card or module is removed from the chassis. This alarm is cleared if either the correct adapter card or module type is inserted or the configuration is modified. A low severity trap is issued if an administratively disabled adapter card or module is removed.</p> <p>An alarm is raised if partial or complete adapter card or module failure is detected. The alarm is cleared when the error condition ceases.</p> <p>The no form of this command deletes the adapter card or module from the configuration. The adapter card or module must be administratively shut down before it can be deleted from the configuration. Before an adapter card or module can be shut down, all port associations with this adapter card or module, for example SAPs and IP interfaces, must be shut down first.</p>
Default	n/a
Parameters	<i>mda-type</i> — the type of adapter card to be provisioned

Values

For the 7705 SAR-8 Shelf V2

a16-chds1v2	16-port T1/E1 ASAP Adapter card
a32-chds1v2	32-port T1/E1 ASAP Adapter card
a12-sdi	12-port Serial Data Interface card, version 1
a12-sdiv2	12-port Serial Data Interface card, version 2
a12-sdiv3	12-port Serial Data Interface card, version 3
a6-eth-10G	6-port Ethernet 10Gbps Adapter card
a6-eth-10G-e	6-port Ethernet 10Gbps Adapter card-E

a8-ethv2	8-port Ethernet Adapter card
a8-1gb-sfp	8-port Gigabit Ethernet Adapter card, version 1
a8-1gb-v2-sfp	8-port Gigabit Ethernet Adapter card, version 2
a8-1gb-v3-sfp	8-port Gigabit Ethernet Adapter card, version 3
a6-em	6-port E&M Adapter card
a4-oc3	4-port OC3/STM1 Clear Channel Adapter card
a4-chds3	4-port DS3/E3 Adapter card, version 1
a4-chds3v2	4-port DS3/E3 Adapter card, version 2
a2-choc3	2-port OC3/STM1 Channelized Adapter card
a4-choc3/12	4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
a2-10gb-xfp	2-port 10GigE (Ethernet) Adapter card
aux-alarm	Auxiliary Alarm card
mw-pic-2	Power Injector card
a8-pmc	Packet Microwave Adapter card
a8-vt	8-port Voice & Teleprotection card
a8-c3794	8-port C37.94 Teleprotection card
a8-fxo	8-port FXO Adapter card
a6-fxs	6-port FXS Adapter card
oadm-cwdm-1ch	CWDM OADM Adapter card (1-channel)
oadm-cwdm-2ch	CWDM OADM Adapter card (2-channel)
oadm-cwdm-4ch	CWDM OADM Adapter card (4-channel)
oadm-cwdm-8ch	CWDM OADM Adapter card (8-channel)
isc	Integrated Services card
a1-gnss	GNSS Receiver card

For the 7705 SAR-18

a16-chds1v2	16-port T1/E1 ASAP Adapter card
a32-chds1v2	32-port T1/E1 ASAP Adapter card
a12-sdi	12-port Serial Data Interface card, version 1
a12-sdiv2	12-port Serial Data Interface card, version 2
a12-sdiv3	12-port Serial Data Interface card, version 3
a6-eth-10G	6-port Ethernet 10Gbps Adapter card
a6-eth-10G-e	6-port Ethernet 10Gbps Adapter card-E
a8-ethv2	8-port Ethernet Adapter card
a8-1gb-sfp	8-port Gigabit Ethernet Adapter card, version 1
a8-1gb-v2-sfp	8-port Gigabit Ethernet Adapter card, version 2
a8-1gb-v3-sfp	8-port Gigabit Ethernet Adapter card, version 3
x-10GigE	10-port 1GigE/1-port 10GigE X-Adapter card, version 1

x-10GigE-v2	10-port 1GigE/1-port 10GigE X-Adapter card, version 2
a6-em	6-port E&M Adapter card
a4-chds3	4-port DS3/E3 Adapter card, version 1
a4-chds3v2	4-port DS3/E3 Adapter card, version 2
a4-oc3	4-port OC3/STM1 Clear Channel Adapter card
a2-choc3	2-port OC3/STM1 Channelized Adapter card
a4-choc3/12	4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
a2-10gb-xfp	2-port 10GigE (Ethernet) Adapter card
aux-alarm	Auxiliary Alarm card
mw-pic-2	Power Injector card
a8-pmc	Packet Microwave Adapter card
a8-vt	8-port Voice & Teleprotection card
a8-c3794	8-port C37.94 Teleprotection card
a8-fxo	8-port FXO Adapter card
a6-fxs	6-port FXS Adapter card
oadm-cwdm-1ch	CWDM OADM Adapter card (1-channel)
oadm-cwdm-2ch	CWDM OADM Adapter card (2-channel)
oadm-cwdm-4ch	CWDM OADM Adapter card (4-channel)
oadm-cwdm-8ch	CWDM OADM Adapter card (8-channel)
isc	Integrated Services card
a1-gnss	GNSS Receiver card

For the 7705 SAR-M

oadm-cwdm-1ch	CWDM OADM module (1-channel)
p2-10gb-xfp	2-port 10GigE (Ethernet) module
p6-eth	6-port SAR-M Ethernet module

For the 7705 SAR-H

p4-combo	4-port T1/E1 and RS-232 Combination module
p1-gps	GPS Receiver module
p4-eth	4-port SAR-H Fast Ethernet module

poe-power-source

Syntax `poe-power-source {internal | external | none}`
`no poe-power-source`

Context `config>card>mda`

Description This command specifies whether the internal system-level PoE power supply or an external PoE power supply is used to power the PoE-capable ports on a 7705 SAR chassis.

When the 7705 SAR-H is configured for the internal power supply, standard 15 W PoE can be enabled only on ports 5 and 6. Port 5 can also support 34 W PoE+, but in that case, port 6 cannot support PoE. When configured for the external PoE power supply, all four PoE-capable ports support a combination of standard 15 W PoE and 34 W PoE+, with a maximum power delivery of 83 W among all PoE-enabled ports. Refer to the 7705 SAR-H Chassis Installation Guide, “Ethernet Ports”, for information about supported combinations and restrictions.

The following chassis types only support the internal system-level PoE power supply:

- 7705 SAR-Hc
- 7705 SAR-W
- 7705 SAR-Wx

The **no** form of this command disables the PoE power supply on the node.

Default internal

Parameters **internal** — specifies that the internal PoE power source be used for the PoE-capable ports

external — specifies that an external PoE power source be used for the PoE-capable ports

none — specifies that no internal or external PoE power source is used

vcb

Syntax **vcb**

Context config>card>mda

Description This command enables the context to configure voice conference bridge (VCB) parameters on the Integrated Services card.

Default n/a

application

Syntax **application {broadcast | teleprotection | vcb | vcb-branch-initiate}**

Context config>card>mda>vcb

Description This command specifies the operating mode for the VCB application. The mode is set at the card level and applies to all bridges configured on the card.

Default	vcb
Parameters	<p>broadcast — only one branch on the bridge (fixed as branch 1) has control of the bridge to transmit, and all other branches are in listen-only mode</p> <p>teleprotection — each teleprotection relay transmits state information on discrete frequencies so that each relay can both hear what the other relays are transmitting as well as transmit its own information to the other relays</p> <p>vcb — one branch talks and all other branches on the bridge can hear</p> <p>vcb-branch-initiate — branches on the bridge are only enabled (unmuted) when the attached base station signals its presence by grounding the M-lead on the interface connected to the bridge. Upon receiving the grounded M-lead via T1/E1 ABCD bits or TDM PW signaling, the bridge unmutes the associated branch. When the ground is removed, the branch is muted again.</p>

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, 8-port Voice & Teleprotection card, 8-port FXO Adapter card, 6-port FXS Adapter card, and Integrated Services card (when it is configured for VCB with the mda-mode command).
Default	n/a

companding-law

Syntax	companding-law {a-law mu-law}
Context	config>card>mda>voice
Description	<p>This command specifies the companding law to be used on the 6-port E&M Adapter card, 8-port Voice & Teleprotection card, 8-port FXO Adapter card, 6-port FXS Adapter card, and Integrated Services card (for VCB).</p> <p>To change this parameter, all ports associated with the 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. The signaling-type applies only to the 6-port E&M Adapter card.</p>
Default	mu-law
Parameters	<p>a-law — A-Law companding</p> <p>mu-law — Mu-Law companding</p>

signaling-type

Syntax	signaling-type { type-i type-ii type-v }
Context	config>card>mda>voice
Description	<p>This command specifies the signaling type to be used on the 6-port E&M Adapter card.</p> <p>To change the signaling type, 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.</p> <p>The signaling type is selectable on a per-card basis. When either A-Law or Mu-Law companding is configured, Type I, Type II, or Type V signaling can be selected. However, the only supported configurations are both ends of the connection operating in the same mode (for example, Type I to Type I) or one end operating in Type I mode and the other in Type V mode.</p>
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

3.13.2.4 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 <i>fabric-policy-id</i> no fabric-policy
Context	config>card>mda>access>ingress config>card>mda>network>ingress
Description	This command configures (applies) the ingress fabric policy, in either an access or network context, for the specified adapter card.

Fabric profiles do not apply to the Auxiliary Alarm card.

The **no** form of this command resets the *fabric-policy-id* to the default value.

Default	1
Parameters	<i>fabric-policy-id</i> — an existing fabric policy ID
Values	1 to 256

queue-policy

Syntax	queue-policy <i>name</i> 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 Quality of Service Guide, “Network Queue QoS Policies”, for more information. The no form of this command reverts to the default.
Default	“default”
Parameters	<i>name</i> — specifies an existing network queue policy name

security-queue-policy

Syntax	security-queue-policy <i>policy-id</i> no security-queue-policy
Context	config>card>mda>access>ingress config>card>mda>network>ingress
Description	This command applies an existing security queue policy, in either an access or network context, to the specified adapter card. The no form of this command sets the <i>policy-id</i> back to the default.
Default	1
Parameters	<i>policy-id</i> — specifies an existing security queue policy ID
Values	1 to 65535

shaper-policy

Syntax **shaper-policy** *policy-name*
no shaper-policy *policy-name*

Context config>card>mda>access>ingress

Description This command enables the context to assign a shaper policy to an Ethernet MDA.

For access ingress per-customer aggregate shaping, the shaper policy is assigned to an Ethernet MDA and SAPs on that Ethernet MDA must be bound to a shaper group within the shaper policy bound to that Ethernet MDA.

The default shaper policy cannot be deleted. [Table 23](#) displays the default shaper policy parameters.

Table 23 Shaper Policy Defaults

Field	Default
description	"Default Shaper QoS policy."
shaper-group	"default"
description	"Default Shaper Group."
pir-rate	max
cir-rate	0

The **no** form of this command removes the configured **shaper-policy**.

Default shaper-policy "default"

Parameters *policy-name* — the name of the shaper policy. To access the default shaper policy, enter "default".

Values Valid names consist of any string up to 32 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.

create — keyword used to create a shaper policy

ring

Syntax	ring
Context	config>card>mda>network
Description	This command specifies the QoS policy parameters for ring traffic in a network, for the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module.

add-drop-port-queue-policy

Syntax	add-drop-port-queue-policy <i>name</i> no add-drop-port-queue-policy
Context	config>card>mda>network>ring
Description	This command specifies the network queue policy to be applied to the add/drop port on the bridging domain side of a ring adapter card. The network queue policy is defined in the config>qos>network-queue context. Refer to the 7705 SAR Quality of Service Guide, “Network Queue QoS Policies”, for more information. The ring ports and the add/drop port cannot use the same non-default network queue policy that is being used by the v-port and any other port on other cards.
Default	no add-drop-port-queue-policy
Parameters	<i>name</i> — specifies an existing network queue policy

qos-policy

Syntax	qos-policy <i>network-policy-id</i> no qos-policy
Context	config>card>mda>network>ring
Description	This command specifies the network QoS policy for the ring. Only a ring type network QoS policy can be assigned to a port on the bridging domain side of a ring adapter card.
Default	no qos-policy
Parameters	<i>network-policy-id</i> — specifies the network QoS policy for the ring ports and the add/drop port on a ring adapter card

spt

Syntax	spt
Context	config>card>mda config>system
Description	This command enables the context for configuring SPT (self-processed traffic) parameters. The config>card>mda context is used for the 7705 SAR-8 Shelf V2, 7705 SAR-18, and 7705 SAR-X. The config>system context is used for the 7705 SAR-Hc, 7705 SAR-H, and 7705 SAR-Wx.
Default	n/a

security-aggregate-rate

Syntax	security-aggregate-rate <i>agg-rate</i> no security-aggregate-rate				
Context	config>card>mda>spt config>system>spt				
Description	This command configures the fabric aggregate rate for security queues on the datapath. The command is configured in the config>card>mda>spt context for the 7705 SAR-8 Shelf V2, 7705 SAR-18, and 7705 SAR-X, and in the config>system>spt context for the 7705 SAR-Hc, 7705 SAR-H, and 7705 SAR-Wx.				
Parameters	<i>agg-rate</i> — specifies the aggregate rate for security queues, in kilobits per second <table> <tr> <td>Values</td> <td>1 to 10000000 maximum</td> </tr> <tr> <td>Default</td> <td>50000</td> </tr> </table>	Values	1 to 10000000 maximum	Default	50000
Values	1 to 10000000 maximum				
Default	50000				

3.13.2.5 External Alarm Commands

external-alarms

Syntax	external-alarms
Context	config
Description	This command enables access to the context to configure external alarm attributes on 7705 SAR Ethernet ports (supported on all platforms with Ethernet ports), on the Auxiliary Alarm card, and on the four alarm inputs on the fan module (for the 7705 SAR-8 Shelf V2), alarm connector (for the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-Wx, and 7705 SAR-X), and alarm module (for the 7705 SAR-18). When configuring custom alarms for an Ethernet port, the port must be configured for 100Base-Tx operation with autonegotiation disabled.

alarm

Syntax	[no] alarm <i>alarm-id</i>
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	<i>alarm-id</i> — specifies the alarm identifier Values 1 to 2147483647

chassis-alarms

Syntax	[no] chassis-alarms
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-alarms

log

Syntax	[no] log
Context	config>external-alarms>alarm
Description	<p>This command generates raise/clear log events for the specified alarm and controls SNMP trap generation for the raise/clear log events.</p> <p>The no form of this command disables the generation of raise/clear log events.</p>
Default	log

severity

Syntax	severity {critical major minor warning}
Context	config>external-alarms>alarm
Description	<p>This command configures the severity level for the specified alarm.</p> <p>The alarm must be disabled before the severity level can be modified.</p> <p>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.</p> <p>If the alarm generates output to chassis alarm relays and LEDs (enabled by the chassis-alarms 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.)</p>
Default	major
Parameters	<p>critical — specifies a critical alarm</p> <p>major — specifies a major alarm</p> <p>minor — specifies a minor alarm</p> <p>warning — specifies a warning (not applicable for chassis relay alarms)</p>

thresholds

Syntax	thresholds
Context	config>external-alarms>alarm
Description	This command enables 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 enables 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	<p>This command configures the analog voltage level thresholds for the specified alarm.</p> <p>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.</p> <p>The no form of this command removes the analog voltage level threshold.</p>
Default	no level
Parameters	<p>lt — specifies a less-than value</p> <p>gt — specifies a greater-than value</p> <p><i>millivolts</i> — specifies the voltage level in millivolts</p> <p>Values 0 to 75000</p>

trigger

Syntax	trigger [any all] { <i>alarm-input1</i> <i>alarm-input2...</i> <i>alarm-input8</i> } no trigger
Context	config>external-alarms>alarm
Description	<p>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.</p> <p>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.</p> <p>The no form of this command removes the trigger.</p>
Default	no trigger
Parameters	<p>any — specifies that any configured input trigger will raise an alarm</p> <p>all — specifies that all configured input triggers that are enabled are required to raise an alarm</p> <p><i>alarm-input</i> — identifies the input trigger, up to a maximum of eight</p> <p>for Ethernet ports, the format is: port-slot/mda/port [<i>name</i>]</p> <p>for the Auxiliary Alarm card, the format is: alarm-slot/mda.{d a}-alarm-num [<i>name</i>]</p> <p>for the four alarm inputs on the fan module (for the 7705 SAR-8 Shelf V2), alarm connector (for the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-Wx, and 7705 SAR-X), and alarm module (for the 7705 SAR-18), the format is: alarm.d-alarm-num [<i>name</i>]</p> <p>where:</p> <ul style="list-style-type: none"> <i>slot</i> = card slot number for IOM (always 1 on the 7705 SAR) <i>mda</i> = Ethernet adapter card or Auxiliary Alarm card slot number (for Ethernet modules or ports on platforms with no card slots, the mda slot number is preconfigured) <i>port</i> = port number for Ethernet ports d = digital input a = analog input <i>alarm-num</i> = alarm port number (1 to 24 for digital on the Auxiliary Alarm card, 1 to 4 for digital on the four chassis alarm inputs, 1 or 2 for analog) <i>name</i> = optional name assigned to the input <p>for example: alarm-1/3.d-3 windowOpen3 alarm.d-1</p>

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 <i>alarm-input</i>
Context	config>external-alarms
Description	<p>This command enables the context to configure the external alarm inputs on 7705 SAR Ethernet ports, on the Auxiliary Alarm card, and on the four alarm inputs on the fan module (for the 7705 SAR-8 Shelf V2), alarm connector (for the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-Wx, and 7705 SAR-X), and alarm module (for the 7705 SAR-18).</p> <p>An alarm input must be associated with an alarm in order for the input to be triggered. See the trigger command. An input can be associated with up to four alarms.</p>
Default	n/a
Parameters	<p><i>alarm-input</i> — identifies the alarm input</p> <p>for Ethernet ports, the format is:</p> <p>port-slot/mda/port [<i>name</i>]</p> <p>for the Auxiliary Alarm card, the format is:</p> <p>alarm-slot/mda.{d a}-alarm-num [<i>name</i>]</p> <p>for the four alarm inputs on the fan module (for the 7705 SAR-8 Shelf V2), alarm connector (for the 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-Wx, and 7705 SAR-X), and alarm module (for the 7705 SAR-18), the format is:</p> <p>alarm.d-alarm-num [<i>name</i>]</p> <p>where:</p> <ul style="list-style-type: none"> <i>slot</i> = card slot number for IOM (always 1 on the 7705 SAR) <i>mda</i> = Ethernet adapter card or Auxiliary Alarm card slot number (for Ethernet modules or ports on platforms with no card slots, the mda slot number is preconfigured) <i>port</i> = port number for Ethernet ports d = digital input a = analog input <i>alarm-num</i> = alarm port number (1 to 24 for digital on the Auxiliary Alarm card, 1 to 4 for digital on the four chassis alarm inputs, 1 or 2 for analog) <i>name</i> = optional name assigned to the input <p>for example:</p> <pre>alarm-1/3.d-3 windowOpen3 alarm.d-1</pre>

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 for the [trigger](#) command, or when performing a **show>external-alarms>input** or **show>external-alarms>output** command.

debounce

Syntax	debounce <i>seconds</i> debounce detect <i>detect-seconds</i> clear <i>clear-seconds</i> no debounce
Context	config>external-alarms>input
Description	This command configures the debounce time associated with detecting and clearing an alarm input. Debounce time is not supported on alarm inputs on Ethernet ports. 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	<i>seconds</i> — 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 <i>detect-seconds</i> — specifies the amount of time that the input must be on before it is accepted as on by the system Values 0 to 60 <i>clear-seconds</i> — 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 <i>alarm-output</i>
Context	config>external-alarms
Description	This command enables 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 (1 to 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 <i>name-string</i> 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 <i>alarm-input</i> name configured for the trigger or input command, or an <i>alarm-output</i> 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	<i>name-string</i> — specifies a unique name for the alarm input or output relay (maximum of 15 characters)

normally

Syntax	normally {open closed}
Context	config>external-alarms>input
Description	This command configures the normal condition of the digital input – either normally open or normally closed. You cannot configure the normal condition on alarm inputs on Ethernet ports.
Default	normally open

3.13.2.6 APS Port Commands

port

Syntax	[no] port {aps-id}
Context	config
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 with the same APS group ID on either the same 7705 SAR node (SC-APS) or on two 7705 SAR nodes (MC-APS).
Parameters	aps — keyword <i>id</i> — 1 to 8

aps

Syntax	aps
Context	config>port
Description	This command configures APS on SONET/SDH ports. An APS group contains a working and protection circuit with the same APS group ID on either a single 7705 SAR node (SC-APS) or on two 7705 SAR nodes (MC-APS). 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.

advertise-interval

Syntax	advertise-interval <i>advertise-interval</i> no advertise-interval
Context	config>port>aps
Description	This command specifies the time interval, in 100s of milliseconds, between “I am operational” messages sent by the protection and working circuits to their neighbor in an MC-APS group. The advertise-interval value is valid only for an MC-APS.
Default	10

Parameters *advertise-interval* — the time interval, in 100s of milliseconds, between transmitted operational messages

Values 10 to 650

hold-time

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

Context config>port>aps

Description This command specifies how much time can pass without the node receiving an advertise packet from its neighbor before the MC-APS signaling link is considered operationally down.

The hold time is in 100s of milliseconds and is usually the [advertise-interval](#) value multiplied by 3.

Parameters *hold-time* — specifies, in 100s of milliseconds, how long to wait for an APS advertise packet before the neighbor in an MC-APS group is considered operationally down.

Values 10 to 650

hold-time-aps

Syntax **hold-time-aps** {[**signal-fail** *sf-time*] [**signal-degrade** *sd-time*]}

no hold-time-aps

Context config>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 SC-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

neighbor

Syntax	neighbor <i>ip-address</i> no neighbor															
Context	config>port>aps															
Description	<p>This command specifies the neighbor's IP address in an MC-APS group. When the value of the neighbor IP address is set to 0.0.0.0, or not set, this implies that the APS group is configured as an SC-APS group.</p> <p>The route to the neighbor must not traverse the MC-APS member (working or protection) circuits. It is recommended that the neighbor IP address configured be on a shared network between the routers that own the working and protection circuits. The node should be connected with a direct interface to ensure optimum failover time.</p> <p>By default, no neighbor address is configured and both the working and protection circuits should be configured on the same router as an SC-APS group.</p>															
Default	0.0.0.0															
Parameters	<p><i>ip-address</i> — specifies the neighbor's IP address for MC-APS.</p> <table border="0" style="margin-left: 2em;"> <tr> <td style="vertical-align: top;">Values</td> <td><i>ipv4-address:</i></td> <td>a.b.c.d</td> </tr> <tr> <td></td> <td><i>ipv6-address:</i></td> <td>x:x:x:x:x:x:x (eight 16-bit pieces)</td> </tr> <tr> <td></td> <td></td> <td>x:x:x:x:x:d.d.d.d</td> </tr> <tr> <td></td> <td></td> <td>x: [0 to FFFF]H</td> </tr> <tr> <td></td> <td></td> <td>d: [0 to 255]D</td> </tr> </table>	Values	<i>ipv4-address:</i>	a.b.c.d		<i>ipv6-address:</i>	x:x:x:x:x:x:x (eight 16-bit pieces)			x:x:x:x:x:d.d.d.d			x: [0 to FFFF]H			d: [0 to 255]D
Values	<i>ipv4-address:</i>	a.b.c.d														
	<i>ipv6-address:</i>	x:x:x:x:x:x:x (eight 16-bit pieces)														
		x:x:x:x:x:d.d.d.d														
		x: [0 to FFFF]H														
		d: [0 to 255]D														

protect-circuit

Syntax	protect-circuit <i>port-id</i> no protect-circuit
Context	config>port>aps
Description	<p>This command configures a physical port that will act as the protection circuit for this APS group.</p> <p>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.</p> <p>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.</p> <p>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:</p>

- 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 config>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 SC-APS mode. When you configure RDI alarms on a port on the 2-port OC3/STM1 Channelized Adapter card, the second port is automatically configured with a matching RDI alarms setting. As a consequence, both ports will then support only 1+1 unidirectional SC-APS 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 <i>minutes</i> no revert-time
Context	config>port>aps
Description	<p>This command configures how long the 7705 SAR waits before switching back to the working circuit after it has been restored to service.</p> <p>If the minutes value is changed, it takes effect at the next initiation of the wait-to-restore (WTR) timer.</p> <p>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.</p> <p>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.</p>
Parameters	<p><i>minutes</i> — the time to wait, in minutes, before reverting to the working circuit after it has been restored to service</p> <p>Values 0 to 60</p> <p>Default 5</p>

switching-mode

Syntax	switching mode { bi-directional uni-1plus1 }
Context	config>port>aps
Description	This command configures the switching mode for the APS port. SC-APS supports both bi-directional and uni-1plus1 ; MC-APS supports only bi-directional switching mode.
Default	bi-directional
Parameters	<p>bi-directional — provides protection in both directions</p> <p>uni-1plus1 — provides protection in one direction</p>

working-circuit

Syntax	working-circuit <i>port-id</i> no working-circuit
Context	config>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*

3.13.2.7 T1/E1 LCR Commands

lcr

Syntax	[no] lcr lcr-id
Context	config
Description	This command enables access to the context to configure Line Card Redundancy (LCR) parameters on T1/E1 ports or links. When the lcr-id is specified, this command assigns an LCR group ID. Both working and protection adapter cards must be configured with the same LCR group ID and on the same card type. For SC-LCR, both working and protection adapter cards must be on the same 7705 SAR node. For MC-LCR, the working and protection adapter cards must be on different 7705 SAR nodes.
Parameters	lcr — keyword id — the LCR group ID, from 1 to 6

advertise-interval

Syntax	advertise-interval advertise-interval no advertise-interval
Context	config>lcr
Description	This command specifies the time interval between “I am operational” messages sent by the protection and working adapter cards to their neighbors in an MC-LCR group. The advertise-interval value is valid only for MC-LCR.
Default	10
Parameters	advertise-interval — the time interval, in tenths of a second, between transmitted operational messages Values 10 to 650

hold-time

Syntax	hold-time hold-time no hold-time
Context	config>lcr
Description	This command specifies how much time can pass without the node receiving an advertise packet from its neighbor in an MC-LCR group before the neighbor is considered operationally down.

The hold time is usually the [advertise-interval](#) value multiplied by 3.

Parameters	<i>hold-time</i> — specifies, in 100s of milliseconds, how long to wait for an LCR advertise packet before the neighbor in an MC-LCR group is considered operationally down
Values	10 to 650

neighbor

Syntax	neighbor <i>ip-address</i> no neighbor										
Context	config>lcr										
Description	<p>This command specifies the neighbor IP address in an MC-LCR group. When the value of the neighbor IP address is set to 0.0.0.0, or not set, this implies that the LCR group is configured as an SC-LCR group.</p> <p>The route to the neighbor must not traverse the MC-LCR member (working or protection) adapter cards. It is recommended that the neighbor be on a shared network between the nodes that are configured with the working and protection cards. The node should be connected with a direct interface to ensure optimum failover time.</p> <p>By default, no neighbor address is configured and both the working and protection adapter cards should be configured as an SC-LCR group on the same node.</p>										
Default	0.0.0.0										
Parameters	<i>ip-address</i> — specifies the neighbor IP address for MC-LCR										
Values	<table> <tr> <td><i>ipv4-address:</i></td> <td>a.b.c.d</td> </tr> <tr> <td><i>ipv6-address:</i></td> <td>x:x:x:x:x:x:x (eight 16-bit pieces)</td> </tr> <tr> <td></td> <td>x:x:x:x:x:d.d.d.d</td> </tr> <tr> <td></td> <td>x: [0 to FFFF]H</td> </tr> <tr> <td></td> <td>d: [0 to 255]D</td> </tr> </table>	<i>ipv4-address:</i>	a.b.c.d	<i>ipv6-address:</i>	x:x:x:x:x:x:x (eight 16-bit pieces)		x:x:x:x:x:d.d.d.d		x: [0 to FFFF]H		d: [0 to 255]D
<i>ipv4-address:</i>	a.b.c.d										
<i>ipv6-address:</i>	x:x:x:x:x:x:x (eight 16-bit pieces)										
	x:x:x:x:x:d.d.d.d										
	x: [0 to FFFF]H										
	d: [0 to 255]D										

protect-md

Syntax	protect-md <i>mda-id</i> no protect-md
Context	config>lcr
Description	This command configures an adapter card that will act as the protection card for this LCR group.

The protection adapter card must contain only the default configuration and cannot belong to another LCR group. The protection card must be of the same type as the working adapter card for the LCR group; if it is not, the command will return an error.

A protection card can only be added if the working card already exists in the LCR group. The protection card must be removed from the configuration before the working card can be removed.

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

The **no** form of this command removes the protection card from the LCR group.

Default no protect-md

Parameters *mda-id* — the adapter card that will act as the protection card for this LCR group in the format *slot/mda*, where *slot* is the slot number of the IOM and *mda* is the slot number of the adapter card

Values *slot* is 1
mda is from 1 to 16

revert-time

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

Context config>lcr

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

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

This command does not modify the duration 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 adapter card fails or activity is manually switched by the operator.

Default no revert-time

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

Values 0 to 60

Default 5

working-mda

Syntax	working-mda <i>mda-id</i> no working-mda
Context	config>lcr
Description	<p>This command configures an adapter card that will act as the working card for this LCR group.</p> <p>The working card must contain only the default configuration and cannot be part of another LCR group. The working card must be created before the protection card.</p> <p>The working card must be shut down before it can be removed from an LCR group. The inherited configuration for the card and configured LCR operational commands for that card are not preserved when it is removed from the LCR group.</p> <p>The no form of this command removes the working card from the LCR group. The working card can only be removed from the configuration after the protection card has been removed.</p>
Default	no working-mda
Parameters	<p><i>mda-id</i> — the adapter card that will act as the working card for this LCR group in the format <i>slot/mda</i>, where <i>slot</i> is the slot number of the IOM and <i>mda</i> is the slot number of the adapter card</p> <p>Values <i>slot</i> is 1 <i>mda</i> is from 1 to 16</p>

3.13.2.8 Microwave Link Commands

port

Syntax	[no] port <i>mw-link-id</i>
Context	config
Description	This command configure a microwave link on a 7705 SAR-8 Shelf V2 or 7705 SAR-18. The no form of this command removes the microwave link configuration.
Parameters	<i>mw-link-id</i> — specifies the microwave link ID number, using the form mw-link-id
Values	<i>id</i> = 1 to 24

mw

Syntax	mw
Context	config>port
Description	This command enables the context to configure microwave link parameters.

hold-time

Syntax	[no] hold-time {[up <i>hold-time-up</i>] [down <i>hold-time-down</i>]}
Context	config>port>mw
Description	This command configures dampening timers on a microwave link. Dampening timers guard against excessive link transitions reported to upper layer protocols. The no form of this command removes the dampening timers configuration.
Default	down 0 or up 0 — no microwave link dampening is enabled; link transitions are immediately reported to upper layer protocols
Parameters	<i>hold-time-up</i> — the number of seconds before an up-state to down-state transition is reported to upper layer protocols
Values	0 to 900 s
	<i>hold-time-down</i> — the number of seconds before a down-state to up-state transition is reported to upper layer protocols
Values	0 to 900 s


peer-discovery

- Syntax** `[no] peer-discovery`
- Context** `config>port>mw`
- Description** This command enables or disables peer discovery on the microwave link.
- Peer discovery is used to discover the IP addresses of remote routers over the microwave link, as well as the physical ports of the remote routers corresponding to the primary radios for the microwave link.
- Ports with peer discovery disabled do not send peer discovery packets and ignore any received peer discovery packets. The CLI does not display the IP address of peers when peer discovery is disabled.

protection

- Syntax** `[no] protection`
- Context** `config>port>mw`
- Description** This command enables protection switching on a microwave link.
- The **no** form of this command removes the protection switching on a microwave link.

radio

- Syntax** `radio port-id create [main | spare]`
`no radio port-id`
- Context** `config>port>mw`
- Description** This command configures an MPR-e radio for a microwave link.
- The **no** form of this command removes an MPR-e spare radio from the specified port
-  **Note:** You cannot remove an MPR-e main radio that is associated with a microwave link. The microwave link must be deleted and then re-configured with the desired MPR-e radio.
- Parameters** *port-id* — specifies a port on a Packet Microwave Adapter card on which an MPR-e radio is configured, in the format *slot/mda/port* (*port* = 1 through 4)

**Note:**

- The port must have an **encap-type** of dot1q and it cannot be used by any service or interface.
- Only a main radio can be configured on an odd-numbered port, that is, port 1 or 3.

create — creates the MPR-e radio (mandatory)

main — sets the MPR-e radio as the main (active) radio

spare — sets the MPR-e radio as the spare (standby) radio

database

Syntax	database <i>filename</i> no database
Context	config>port>mw>radio
Description	This command configures the filename of the MPR-e radio database. The no form of this command removes the MPR-e radio database configuration.
Default	n/a
Parameters	<i>filename</i> — specifies the name of the MPR-e radio database Values up to 32 characters

name

Syntax	name <i>name-string</i> no name
Context	config>port>mw>radio
Description	This command specifies a name to be associated with an MPR-e radio. The no form of this command removes the name configured for the MPR-e radio.
Default	n/a
Parameters	<i>name-string</i> — specifies the MPR-e radio name Values up to 32 characters

perfmon

Syntax	perfmon [g826] [power] [acm]
Context	config>port>mw>radio
Description	This command enables MWA performance monitoring on microwave links in order to collect G.826, radio power, and Adaptive Coding and Modulation (ACM) level performance statistics. The no form of this command disables MWA performance monitoring on microwave links.
Default	no perfmon
Parameters	g826 — enables performance monitoring for G.826 statistics (BBE, ES, SES, and UAS) power — enables performance monitoring for radio power statistics acm — enables performance monitoring for ACM level statistics

rsl-history

Syntax	rsl-history <i>file-url</i> no rsl-history
Context	config>port>mw>radio
Description	This command enables the RSL history file for an MPR-e radio to be uploaded to the 7705 SAR. The no form of this command removes the configuration.
Default	no rsl-history
Parameters	<i>file-url</i> — specifies the URL of the RSL history file for the specified radio Values <i>local-urt:</i> [<i>cflash-id</i>][<i>file-path</i>]; 99 characters maximum

standalone

Syntax	[no] standalone
Context	config>port>mw>radio
Description	This command configures the MPR-e radio to operate in standalone mode. The no form of this command removes the standalone designation and sets the MPR-e radio in MWA mode.
Default	no standalone

suppress-faults

Syntax	suppress-faults [hber] [rsl-threshold] [rdi] [all] [no] suppress-faults
Context	config>port>mw>radio
Description	This command suppresses detected faults on microwave links. If microwave link faults are detected, an event is logged and the link is disabled. When faults are suppressed, the event is still logged, but the microwave link is not disabled. By default, the system does not suppress faults for FFD. The no form of this command removes fault suppression.
Default	no suppress-faults
Parameters	hber — suppresses High Bit Error Rate faults rsl-threshold — suppresses RSL threshold crossing faults rdi — suppresses RDI faults all — suppresses all faults

tx-mute

Syntax	[no] tx-mute
Context	config>port>mw>radio
Description	This command mutes the transmitter on the radio MPR-e radio. The no form of this command disables the mute configuration.

revert

Syntax	[no] revert [eps] [rps]
Context	config>port>mw
Description	This command configures the type of revertive switching on the microwave link. Revertive switching occurs when the MPR-e radio operation switches from the spare radio back to the main radio after a fault condition is cleared. The no form of this command removes the revertive switching configuration.
Default	n/a

Parameters **eps** — sets Equipment Protection Switching as the revertive switching type



Note: If EPS is configured as the revertive switching type, Transmission Protection Switching (TPS) is automatically applied as well; TPS cannot be enabled independently.

rps — sets Radio Protection Switching as the revertive switching type

3.13.2.9 General Port Commands

port

Syntax	port { <i>port-id</i> <i>bundle-id</i> } no port { <i>port-id</i> <i>bundle-id</i> }
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	<i>port-id</i> — specifies the physical port ID in the <i>slot/mda/port</i> format, or a virtual port (v-port) on the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module (where <i>port-id</i> for the virtual port is either “v-port” or 3) <i>bundle-id</i> — specifies the multilink bundle identifier The command syntax must be configured as follows: Syntax <i>bundle-type-slot/mda.bundle-num</i> bundle[-ppp]-slot/mda.bundle-num (Creates a multilink PPP bundle) bundle-ima-slot/mda.bundle-num (Creates an IMA group) bundle: keyword <i>slot:</i> card/adapter card slot numbers <i>bundle-num:</i> 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, OC3 SONET SFP ports, and v-ports.
Default	no ddm-events

dwdm

Syntax	dwdm
Context	config>port
Description	This command configures the Dense Wavelength Division Multiplexing (DWDM) parameters.

channel

Syntax	channel <i>channel</i>
Context	config>port>dwdm
Description	This command configures the DWDM ITU channel for a tunable adapter card optical interface. The channel is expressed in a form that is derived from the laser's operational frequency. For example, 193.40 THz corresponds to DWDM ITU channel 34 in the 100 GHz grid and 193.45 THz corresponds to DWDM ITU channel 345 in the 50 GHz grid. The provisioned adapter card must support DWDM tunable optics. For a complete list of supported optics and associated adapter cards, contact your Nokia representative.

The DWDM channel must be set to a non-zero value before the port is set to **no shutdown**.

The port must be shut down before changing the DWDM channel, and the port must be a physical port to set the DWDM channel.

Parameters	<i>channel</i> — specifies the channel
Values	0: valid on disabled ports 17 to 61 inclusive: 100 GHz channels 175, 185 to 605: 50 GHz channels

3.13.2.10 Ethernet Commands

ethernet

Syntax	ethernet
Context	config>port
Description	This command enables access to the context to configure Ethernet port attributes on all cards, modules, and chassis that support Ethernet. For the Packet Microwave Adapter card, this command does not apply to ports that support microwave awareness.

access

Syntax	access
Context	config>port>ethernet
Description	This command enables access to the context to configure access mode parameters.

egress

Syntax	egress
Context	config>port>ethernet>access
Description	This command enables access to the context to configure the CIR rate for the aggregate of all the unshaped 4-priority SAPs on the port and to configure the shaper policy.

shaper-policy

Syntax	shaper-policy <i>name</i> no shaper-policy
Context	config>port>ethernet>access>egress
Description	This command assigns a shaper policy to the specified hybrid port. For hybrid ports, the shaper policy is independently assigned to access or network egress traffic. When the Ethernet port mode is changed to hybrid mode, the default policy is assigned to access and network traffic. To change an access or network policy, use the commands config>port>ethernet> access>egress>shaper-policy and config>port>ethernet> network>egress>shaper-policy .

For access egress per-customer aggregate shaping, the shaper policy is assigned to a port and SAPs on that port must be bound to a shaper group within the shaper policy bound to that port.

The shaper policy defines shaper parameters such as shaper group, and PIR and CIR rates. The shaper policy is defined in the **config>qos>shaper-policy** context. Refer to the 7705 SAR Quality of Service Guide, “QoS for Hybrid Ports” and “Per-Customer Aggregate shapers (Multiservice Site)”, for more information.



Note:

- The port shaper rate applies to the bulk of access and network traffic. Thus, once the configured egress shaper rate is reached, both the access and network traffic scheduling pauses.
- For hybrid ports, there can be a single shaper policy on access egress and a single shaper policy on network egress. Therefore, all the SAP traffic and all the network traffic is each bound to its own shaper group in the shaper policy (access and network shaper policy, respectively). In other words, shaped SAPs and the bulk/aggregate of unshaped SAPs are shaped together as per the shaper policy assigned to the access egress. A similar behavior applies to network traffic, where the shaped interfaces and the bulk/aggregate of unshaped interfaces are shaped together as per the shaper policy assigned to the network egress.

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

Default “default”

Parameters *name* — specifies an existing shaper policy name

unshaped-sap-cir

Syntax **unshaped-sap-cir** *cir-rate*
no unshaped-sap-cir

Context config>port>ethernet>access>egress

Description This command sets the CIR rate for the aggregate of all the unshaped 4-priority SAPs on the port. The default *cir-rate* is 0 kb/s. When the *cir-rate* is set to **max**, the CIR rate adopts the maximum rate of the port, which is set using the [egress-rate sub-rate](#) command.

If the *cir-rate* is higher than the *sub-rate*, the *cir-rate* is stored in the configuration database but the *sub-rate* limit is used.

On a Gen-3-based port, this command can be set for mix-and-match LAG SAP purposes, but is not applied to the Gen-3-based port. See [LAG Support on Mixed-Generation Hardware](#) for more information.

The **no** form of the command sets the **unshaped-sap-cir** CIR rate to 0 kb/s.

Default	no unshaped-sap-cir
Parameters	<i>cir-rate</i> — the CIR rate for the aggregate of all the unshaped 4-priority SAPs on the port
Values	0 to 100000000 kb/s, or max
Default	0 kb/s

autonegotiate

Syntax	autonegotiate [limited] no autonegotiate
Context	config>port>ethernet
Description	<p>For the 8-port Ethernet Adapter card, 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 on optical Gigabit Ethernet SFPs; the mode is always full duplex.</p> <p>The 8-port Gigabit Ethernet Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card in x10-1gb-sfp mode, and Packet Microwave Adapter card support speed autonegotiation and duplex autonegotiation on all SFP ports. Each port can run in full-duplex mode or in half-duplex mode at 10 or 100 Mb/s.</p> <p>The 6-port Ethernet 10Gbps Adapter card and the 7705 SAR-X support speed autonegotiation and duplex autonegotiation on all SFP ports; SFP+ ports do not support autonegotiation. Each SFP port can run in full-duplex mode or half-duplex mode at 10 Mb/s or 100 Mb/s, and in full-duplex mode at 1 Gb/s. Each SFP+ port can run in full-duplex mode at 10 Gb/s.</p> <p>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.</p> <p>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. Also, when autonegotiation is disabled, the tx and rx pauses are enabled automatically (the tx and rx pauses are negotiated with the far end if autonegotiation is enabled).</p> <p>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.</p>

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



Caution:

- Autonegotiation must not be disabled on an Ethernet port if the port is connected to an MPR-e radio.
- For fiber SFP-based Gigabit Ethernet ports, it is recommended that autonegotiation be enabled. If autonegotiation is disabled and the configured speed does not correctly match the capability of the SFP, then the operational state of the link will remain down. Attempting to configure a speed and duplex mode to 1000 Mb/s, half-duplex, is an invalid combination and will be blocked from CLI.
- For RJ-45 interfaces, autonegotiation is mandatory for 1000Base-T operation (if disabled, the behavior is undefined).



Note:

- 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](#).
- Ports belonging to a microwave link must have limited autonegotiation enabled before the link can be added to a LAG.

Default autonegotiate

cfm-loopback

Syntax **cfm-loopback priority** {**low** | **high** | **dot1p**} [**match-vlan** {*vlan-range* | **none**}]
no cfm-loopback

Context config>port>ethernet

Description This command enables the port to respond to Loopback Messages (LBMs) 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 the 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.

The **priority dot1p** and **match-vlan** keywords apply only to physical ring ports on the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module.

The 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
- for the 8-port Gigabit Ethernet Adapter card, the 10-port 1GigE/1-port 10GigE X-Adapter card, and for the v-port on the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module, for network egress, where 16-priority scheduling is enabled:
 - **high-priority**: has higher priority than any user frames
 - **low-priority**: has lower priority than any user frames
- for the physical ring ports on the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module, which can only operate as network egress, the priority of the LBR frame is derived from the `dot1p` setting of the received LBM frame. Based on the assigned ring-type network queue policy, `dot1p-to-queue` mapping is handled using the same mapping rule that applies to all other user frames.

CFM loopback support on a physical ring port on the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module differs from other Ethernet ports. For these ports, **cfm-loopback** is configured using **dot1p** and an optional list of up to 16 VLANs. The null VLAN is always applied. The CFM Loopback Message will be processed if it does not contain a VLAN header, or if it contains a VLAN header with a VLAN ID that matches one in the configured **match-vlan** list.

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

Default	no cfm-loopback
Parameters	<p>low — sets the queue parameters and scheduler mappings, as described above</p> <p>high — sets the queue parameters and scheduler mappings, as described above</p> <p>dot1p — sets the queue parameters and scheduler mappings on a physical ring port, as described above</p> <p>match-vlan — sets the matching VLAN IDs that will allow a CFM loopback on a physical ring port when priority is set to dot1p, as described above</p>
Values	<p><i>vlan-range</i>: 1 to 4094 (for example, 1-10,33,2123)</p> <p>none: only untagged CFM LBMs are accepted</p>
Default	none

crc-monitor

Syntax	crc-monitor
Context	config>port>ethernet
Description	This command enables the context to configure Ethernet CRC monitoring parameters.

sd-threshold

Syntax	sd-threshold <i>threshold</i> [multiplier <i>multiplier</i>] no sd-threshold
Context	config>port>ethernet>crc-monitor
Description	<p>This command configures the error rate threshold at which the signal degrade condition is declared on an Ethernet interface. The error rate threshold value is the ratio of errored frames over total frames received, which is calculated as an average over the time set by the sliding window. The value is calculated as $M \times 10E-N$, where M is the optional multiplier used to increase the error ratio, and N is the rate of errored frames allowed (threshold). For example, $3 \times 10E-3$ sets the error rate threshold at 3 errored frames per 1000 total frames received. If no window-size is configured, a default of 10-s is used. The CRC errors on the interface are sampled once per second.</p> <p>The multiplier keyword is optional. If the multiplier keyword is omitted, the default value of 1 is used.</p> <p>The no form of the command disables sd-threshold monitoring.</p>
Default	no sd-threshold
Parameters	<p><i>threshold</i> — specifies the threshold value</p> <p>Values 1 to 9</p> <p><i>multiplier</i> — specifies the multiplier value</p> <p>Values 1 to 9</p> <p>Default 1</p>

sf-threshold

Syntax	sf-threshold <i>threshold</i> [multiplier <i>multiplier</i>] no sf-threshold
Context	config>port>ethernet>crc-monitor

Description	<p>This command configures the error rate threshold at which the signal fail condition is declared on an Ethernet interface. The error rate threshold value is the ratio of errored frames over total frames received, which is calculated as an average over the time set by the sliding window. The value is calculated as $M \times 10E-N$, where M is the optional multiplier used to increase the error ratio, and N is the rate of errored frames allowed (threshold). For example, $3 \times 10E-3$ sets the error rate threshold at 3 errored frames per 1000 total frames received. If no window-size is configured, a default of 10-s is used. The CRC errors on the interface are sampled once per second.</p> <p>The multiplier keyword is optional. If the multiplier keyword is omitted, the default value of 1 is used.</p> <p>The no form of the command disables sf-threshold monitoring.</p>
Default	no sf-threshold
Parameters	<p><i>threshold</i> — specifies the threshold value</p> <p style="padding-left: 2em;">Values 1 to 9</p> <p><i>multiplier</i> — specifies the multiplier value</p> <p style="padding-left: 2em;">Values 1 to 9</p>

window-size

Syntax	<p>window-size <i>seconds</i></p> <p>no window-size</p>
Context	config>port>ethernet>crc-monitor
Description	<p>This command configures the sliding window size over which the Ethernet frames are sampled to detect signal fail or signal degrade conditions. The command is used jointly with the sd-threshold and the sf-threshold commands.</p> <p>A sliding window (window-size) is used to calculate a statistical average of CRC error statistics collected every second. Each second, the oldest statistics are dropped from the calculation. For example, if the default 10-s sliding window is configured, at the 11th second the oldest second of statistical data is dropped and the 11th second is included. This sliding average is compared against the configured SD and SF thresholds to determine if the error rate over the window exceeds one or both of the thresholds, which will generate an alarm and log event.</p> <p>The no form of the command disables window-size monitoring.</p>
Default	10
Parameters	<p><i>seconds</i> — specifies the size of the sliding window over which the errors are measured</p> <p style="padding-left: 2em;">Values 5 to 60</p>

dot1q-etype

Syntax	dot1q-etype <i>0x0600 to 0xffff</i> no dot1q-etype
Context	config>port>ethernet
Description	<p>This command specifies the Ethertype expected when the port's encapsulation type is dot1q.</p> <p>IEEE 802.1q (also known as VLAN tagging) defines a process to channelize a single Ethernet port or v-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 Services Guide.</p> <p>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.</p> <p>For Ethernet ports, when the port encap-type is qinq, the dot1q-etype value sets the Ethertype for the inner VLAN tag. The qinq encapsulation type is not supported by v-ports.</p> <p>Network ports do not allow dot1q-etype settings.</p> <p>The no form of this command resets the dot1q-etype value to the default.</p>
Default	0x8100
Parameters	<i>0x0600 to 0xffff</i> — specifies the Ethertype to expect

down-when-looped

Syntax	down-when-looped
Context	config>port>ethernet
Description	<p>This command enables the down-when-looped feature on Ethernet ports or v-ports. When the down-when-looped feature is activated, a keepalive loop PDU is transmitted periodically toward the network. The port listens for returning keepalive loop PDUs. A loop is detected if any of the received PDUs have an Ethertype value of 9000 and the source and destination MAC addresses are identical to the MAC address of the port. When a loop is detected, the port is immediately brought down.</p> <p>Ethernet port-layer line loopbacks and Ethernet port-layer internal loopbacks can be enabled on the same port with the down-when-looped feature. EFM OAM cannot be enabled on the same port with the down-when-looped feature.</p>

keep-alive

Syntax	keep-alive <i>timer</i> no keep-alive
Context	config>port>ethernet>down-when-looped
Description	This command configures the time interval between the keepalive PDUs transmitted toward the network during loop detection by the down-when-looped feature.
Default	10 s
Parameters	<i>timer</i> — the interval between keepalive PDUs Values 1 to 120 s

retry-timeout

Syntax	retry-timeout <i>timer</i> no retry-timeout
Context	config>port>ethernet>down-when-looped
Description	This command configures the minimum wait time before re-enabling the Ethernet port or v-port after it is brought down due to a loop detection.
Default	120
Parameters	<i>timer</i> — the minimum wait time before re-enabling the Ethernet port or v-port Values 0 s or 10 to 160 s

use-broadcast-address

Syntax	[no] use-broadcast-address
Context	config>port>ethernet>down-when-looped
Description	This command configures the down-when-looped feature to declare a loop when the destination MAC address matches the broadcast MAC address instead of the MAC address of the Ethernet port or v-port.

duplex

Syntax	duplex {full half}
Context	config>port>ethernet

Description	<p>This command configures the duplex mode of an Ethernet or Fast Ethernet port when autonegotiation is disabled.</p> <p>The 10-port 1GigE/1-port 10GigE X-Adapter card must be in x10-1gb-sfp mode to support this command.</p> <p>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 optical GigE SFPs only support full-duplex mode; duplex autonegotiation is not supported.</p> <p>On 10 Gb/s ports, the mode is always full duplex and cannot be changed. This includes the ring Ethernet XFP ports and the v-port on the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module.</p>
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	<p>This command enables reactions to loopback control OAMPDUs from peers.</p> <p>The no form of this command disables reactions to loopback control OAMPDUs.</p>
Default	no accept-remote-loopback

hold-time

Syntax	hold-time <i>time-value</i> 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.

Default no hold-time

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

ignore-efm-state

Syntax `[no] ignore-efm-state`

Context `config>port>ethernet>efm-oam`

Description This command decouples the EFM OAM protocol from the port state and operational state.

When this command is configured on the port, any failure in the EFM protocol state (discovery, configuration, time-out, loops, and so on) does not affect the port. Only a protocol warning message is raised to indicate issues with the protocol.

When the command is not configured on a port, the port state is affected by any EFM OAM protocol fault or clear condition.

If the port is a member of a microwave link, the **ignore-efm-state** command must be enabled before the EFM OAM protocol can be activated. This restriction is required because EFM OAM is not compatible with microwave links.

Default no ignore-efm-state

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 <i>interval</i> [multiplier <i>multiplier</i>]
Context	config>port>ethernet>efm-oam
Description	This command configures the transmit interval of OAMPDUs.
Default	interval 10, multiplier 5
Parameters	<i>interval</i> — specifies the transmit interval Values 1 to 600 (in 100 ms) <i>multiplier</i> — 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.
Default	no tunneling

egress-rate

Syntax	egress-rate <i>sub-rate</i> [include-fcs] [allow-eth-bn-rate-changes] [hold-time <i>hold-time</i>] no egress-rate
Context	config>port>ethernet
Description	<p>This command configures the rate of traffic leaving the network.</p> <p>With the include-fcs option, the egress rate limit is applied to the traffic rate egressing the port with the 4-byte Ethernet FCS field included. If this option is not configured, the egress rate limit is applied to the traffic rate egressing the port without the 4-byte Ethernet FCS field included, and the actual rate of packets leaving the port is slightly higher than the configured egress rate value.</p> <p>The include-fcs option is not supported on the 8-port Ethernet Adapter card, 7705 SAR-A Fast Ethernet ports (ports 9 to 12), or 4-port SAR-H Fast Ethernet module. On the 6-port SAR-M Ethernet module, the include-fcs option is always on and cannot be disabled to compensate for the 4-byte FCS.</p> <p>The allow-eth-bn-rate-changes option enables the Y.1731 ETH-BN client MEP option on the port. In applications such as a point-to-point microwave link, where degradation on the line can result in reduced link bandwidth, the egress rate can be dynamically changed based on the available bandwidth on the link as indicated by the ETH-BN server. When enabled, the received rate overrides the configured sub-rate for the port. For information on ETH-BN, including which Ethernet ports support this functionality, refer to the 7705 SAR OAM and Diagnostics Guide, "ITU-T Y.1731 Ethernet Bandwidth Notification (ETH-BN)".</p> <p>The bandwidth indicated by the ETH-BN server includes the FCS; therefore, the include-fcs option must be selected if the allow-eth-bn-rate-changes option is selected or the dynamically changed bandwidth will not match the intended rate.</p> <p>The <i>hold-time</i> is used to limit the number of bandwidth changes as requested by the ETH-BN server. After a rate change occurs based on a Bandwidth Notification Message (BNM), any BNM received before the hold timer expires will be ignored.</p> <p>The no form of this command returns the value to the default.</p>
Default	no egress-rate
Parameters	<p><i>sub-rate</i> — the egress rate in kb/s</p> <p>Values 1 to 10000000</p> <p>include-fcs — the egress rate limit is applied to the traffic rate egressing the port with the 4-byte Ethernet FCS field included. This option must be selected if the allow-eth-bn-rate-changes option is selected; otherwise, the dynamically changed bandwidth will not match the intended rate.</p>

allow-eth-bn-rate-changes — enables the Y.1731 ETH-BN client MEP option on the port. The egress rate will be dynamically changed to the bandwidth indicated in messages received from an ETH-BN server MEP. When enabled, the received rate overrides the configured sub-rate for the port.

hold-time — configures the hold time for egress rate bandwidth changes based on a received BNM, in seconds

Values 1 to 600

Default 5

encap-type

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

Context config>port>ethernet

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

Before an MPR-e radio can be configured on an MWA port (see [radio](#)), the port must have an encapsulation type of **dot1q**.

The **qinq** encapsulation type is not supported by v-ports.

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

See also [dot1q-etype](#) and [qinq-etype](#) for information on 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.

qinq — ingress frames carry two stacked tags, where the outer tag is the service provider tag and the inner tag is the customer service tag as defined in 802.1ad

group-encryption

Syntax [**no**] **group-encryption**

Context config>port>ethernet

Description This command enables network group encryption (NGE) on the Ethernet port. When NGE is enabled on the port, all received Layer 2 IS-IS and LLDP packets are considered to be NGE packets and must be encrypted using a valid set of keys from any preconfigured key group on the system.

The **no** form of the command disables NGE on the Ethernet port. NGE cannot be disabled unless all key groups and IP exception filters are removed.

Default no group-encryption

encryption-keygroup

Syntax **encryption-keygroup** *keygroup-id* **direction** {**inbound** | **outbound**}
no encryption-keygroup **direction** {**inbound** | **outbound**}

Context config>port>ethernet>group-encryption

Description This command is used to bind a key group to an Ethernet port for inbound or outbound packet processing. When configured in the outbound direction, packets egressing the router use the **active-outbound-sa** associated with the configured key group. When configured in the inbound direction, received packets must be encrypted using one of the valid security associations configured for the key group.

The **no** form of the command removes the key group from the Ethernet port in the specified direction.

Default no encryption-keygroup direction inbound
no encryption-keygroup direction outbound

Parameters *keygroup-id* — the ID number of the key group being configured
Values 1 to 127 | *keygroup-name* (64 characters maximum)
inbound — binds the key group in the inbound direction
outbound — binds the key group in the outbound direction

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, interface down transitions are not advertised to upper layers until the *hold-time-down* interval has expired. When an interface transitions from a down state to an up state, interface up transitions are not advertised until the *hold-time-up* interval has expired.

If the *hold-time-down* or *hold-time-up* value is 0, interface down and interface up transitions are immediately reported to upper layer protocols.

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	<i>hold-time-up</i> — the interval, in seconds, before an interface transition from a down state to an up state is reported to upper layer protocols Values 0 to 900 <i>hold-time-down</i> — the interval, in seconds, before an interface transition from an up state to a down state is reported to upper layer protocols Values 0 to 900

ingress-rate

Syntax	ingress-rate <i>ingress-rate</i> cbs <i>size</i> [bytes kilobytes] no ingress-rate
Context	config>port>ethernet
Description	This command configures a policing action to rate-limit the ingress traffic. Ingress-rate enforcement uses dedicated hardware for rate limiting, however software configuration is required at the port level (ingress-rate limiter) to ensure that the network processor or adapter card or port never receives more traffic than they are optimized for. The configured ingress rate ensures that the network processor does not receive traffic greater than this configured value on a per-port basis. Once the ingress-rate value is reached, all subsequent frames are dropped. The ingress-rate limiter drops excess traffic without classifying whether the traffic has a higher or lower priority. Similar to the egress-rate configuration, the ingress-rate configuration survives port mode changes. If a port mode is changed (for example, from access to network mode), the ingress rate and configured CBS still remain when the port comes back up. The no form of this command returns the value to the default.
Default	no ingress-rate
Parameters	<i>ingress-rate</i> — the ingress rate in Mb/s Values 1 to 10000 cbs — specifies the committed burst size that the hard policer can accept while complying with the configured ingress rate. Set the cbs value to at least two times the ingress packet size so that the datapath can make a proper policing and forwarding decision.



Note: CBS is integrated with the **ingress-rate** command and you must always specify the CBS size every time you configure the ingress rate. If you use the default CBS size, then explicitly indicate that it is the CBS default.

size — specifies the committed burst size in bytes or kilobytes. If configured in bytes, the committed burst size must be a multiple of 256 bytes and must include the **bytes** parameter. If configured in kilobytes, the maximum value is 127 and must include the **kilobytes** parameter. If configured as default, the value is set to 130816 bytes.

Values	256 to 130816 bytes 1 to 127 kilobytes default
Default	130816

src-pause

Syntax	src-pause no src-pause
Context	config>port>ethernet>ingress-rate
Description	<p>This command sends a notification to slow down the transmission rate when it exceeds the bandwidth limit.</p> <p>If incoming traffic exceeds the configured ingress rate, an src-pause frame is sent to the far end to hold transmission (src-pause delay timer). When the src-pause delay timer expires, the far end resumes transmission. The src-pause delay timer varies based on the difference between the incoming traffic rate and the configured ingress rate on the port. If the difference is large, then the far end must wait for a longer period before resuming transmission. The src-pause frame helps to prioritize far-end traffic so that the ingress-rate limiter does not drop high-priority traffic.</p> <p>The ingress-rate limiter can be configured with or without src-pause; however, src-pause is disabled whenever the ingress-rate limiter is disabled.</p> <p>The no form of this command disables the src-pause feature.</p> <p>This command is blocked for the 6-port SAR-M Ethernet module.</p>
Default	no src-pause

lACP-tunnel

Syntax	lACP-tunnel no lACP-tunnel
Context	config>port>ethernet
Description	<p>This command enables LACP packet tunneling for the Ethernet port. When tunneling is enabled, the port does not process any LACP packets, but tunnels them instead. A port with LACP packet tunneling enabled cannot be added as a member of a Link Aggregation Group (LAG).</p> <p>The no form of this command disables LACP packet tunneling for the Ethernet port.</p>
Default	no lACP-tunnel

loopback

Syntax	loopback {line internal} {timer {0 30 .. 86400} persistent} [swap-src-dst-mac] no loopback
Context	config>port>ethernet
Description	<p>This command configures timed line loopbacks on Ethernet network and access ports, timed line loopbacks on ring Ethernet network ports, untimed line loopbacks on Ethernet access ports, and timed and untimed internal loopbacks on Ethernet ports.</p> <p>For Ethernet ports, a line loopback loops frames received on the corresponding port back towards the transmit (egress) direction inside the network processor. Line loopbacks are supported on ports configured in network or access mode.</p> <p>You can swap the source and destination MAC addresses of the received frames using the swap-src-dst-mac keyword. The swap-src-dst-mac keyword is not supported on ring Ethernet ports.</p> <p>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.</p> <p>Loopback timers can be configured for 30 s to 86400 s. All non-zero timed loopbacks are turned off under the following conditions: an adapter card reset, an activity switch, or timer expiry. Line or internal loopbacks can also be configured as a latched loopback by setting the timer to 0 s, or as a persistent loopback with the persistent keyword.</p>

Latched and persistent loopbacks are enabled indefinitely until turned off by the user. Latched loopbacks survive adapter card resets and activity switches, but are lost if there is a system restart. Persistent loopbacks survive adapter card resets and activity switches and can survive a system restart if the **admin-save** or **admin-save-detail** command was executed prior to the restart. Latched (untimed) persistent loopbacks can be enabled only on Ethernet access ports.

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.

Persistent loopbacks are the only Ethernet loopbacks saved to the database by the **admin-save** and **admin-save-detail** commands.

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

Parameters	<p>line — places the associated Ethernet port or ring Ethernet port into line loopback mode</p> <p>internal — places the associated Ethernet access port into internal loopback mode; not supported on ring Ethernet ports</p> <p>persistent — places the associated Ethernet access port or ring Ethernet port into persistent loopback mode</p> <p>swap-src-dst-mac — swaps source and destination MAC addresses for Ethernet line loopbacks; not supported on ring Ethernet ports</p> <p>timer — the timer set for Ethernet loopbacks, in seconds</p> <p>Values 0 30 to 86400</p>
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mac

Syntax	<p>mac <i>ieee-address</i></p> <p>no mac</p>
Context	config>port>ethernet
Description	<p>This command assigns a specific MAC address to an Ethernet port, ring Ethernet port, or v-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.</p> <p>The no form of this command returns the MAC address to the default value.</p>
Default	a default MAC address is assigned by the system
Parameters	<p><i>ieee-address</i> — 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.</p>

mode

Syntax	mode { access network hybrid } no mode
Context	config>port>ethernet
Description	<p>This command configures an Ethernet port for access, network, or hybrid mode operation, or configures a ring Ethernet port or v-port for network mode. On ring Ethernet ports and the v-port, the mode is always network and cannot be changed.</p> <p>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 it.</p> <p>A network port participates in the service provider transport or infrastructure network when network mode is selected.</p> <p>A hybrid Ethernet port allows the combination of network and access modes of operation on a per-VLAN basis and must be configured for either dot1q or qinq encapsulation.</p> <p>A hybrid port must use dot1q encapsulation to be configured as a network IP interface. Binding a network IP interface to a qinq encapsulation is blocked. In hybrid mode, qinq encapsulation is for access mode use only.</p> <p>If the hybrid port is configured for dot1q encapsulation, the user configures a SAP inside a service or a network IP interface as follows:</p> <ul style="list-style-type: none"> • configure a SAP under config>service by providing the SAP ID, which must include the <i>port-id</i> value of the hybrid port and an unused VLAN tag value. The format is <i>port-id:qtag1</i>. A SAP of format <i>port-id:*</i> is also supported. • configure a network IP interface under config>router>if>port by providing the <i>port-name</i>, which consists of the <i>port-id</i> of the hybrid port and an unused VLAN tag value. The format is <i>port-id:qtag1</i>. The user must explicitly enter a valid value for <i>qtag1</i>. The <i>port-id:*</i> value is not supported on a network IP interface. The VLAN tag space on the port (range of 0 to 4094) is shared among VLAN SAPs and VLAN network IP interfaces. <p>If the hybrid port is configured for qinq encapsulation, the user configures a SAP inside a service as follows:</p> <ul style="list-style-type: none"> • configure a SAP under config>service by providing the SAP ID, which must include the <i>port-id</i> value of the hybrid port and the outer and inner VLAN tag values. The format is <i>port-id:qtag1.qtag2</i>. A SAP of format <i>port-id: qtag1.*</i> is also supported. The outer VLAN tag value must not have been used to create an IP network interface on this port. In addition, the <i>qtag1.qtag2</i> value combination must not have been used by another SAP on this port. <p>The no form of this command restores the default.</p>
Default	access (except as listed below)

network

- 10-port 1GigE/1-port 10GigE X-Adapter card (in 1-port 10GigE mode, the port operates in network mode only)
- 2-port 10GigE (Ethernet) Adapter card
- 2-port 10GigE (Ethernet) module

Parameters **access** — configures the port as service access
network — configures the port for transport network use
hybrid — configures the port for hybrid use (transport network and service access per VLAN)

mtu

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

Context config>port>ethernet

Description This command configures the maximum payload MTU size for an Ethernet port or a v-port on an Ethernet Ring adapter card (for ring Ethernet ports, the MTU value is fixed at 9728 bytes).

The 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 24](#).

Parameters *mtu-bytes* — sets the maximum allowable size of the MTU, expressed as an integer (see [Table 24](#))

Values 128 to 9732 bytes (Ethernet ports)

Table 24 Port MTU Default and Maximum Values

Port Type	Mode	Encap Type	Default (bytes)	Max MTU (bytes)
10/100 Ethernet ¹	Access/ Network	null	1514	9724 ²
		dot1q	1518	9728 ²
		qinq ³	1522 (access only)	9732 (access only) ²
GigE SFP ¹ and 10-GigE SFP+	Access/ Network	null	1514 (access) 1572 (network)	9724 (access and network)
		dot1q	1518 (access) 1572 (network)	9728 (access and network)
		qinq ³	1522 (access only)	9732 (access only)
Ring port	Network	null	9728 (fixed)	9728 (fixed)
v-port (on Ring adapter card)	Network	null	1572	9724
		dot1q	1572	9728

Notes:

1. The maximum MTU value is supported only on cards that have buffer chaining enabled.
2. On the Packet Microwave Adapter card, MWA ports support 4 bytes less than Ethernet ports. MWA ports therefore support a maximum MTU of 9720 bytes (null) or 9724 bytes (dot1q). MWA ports do not support qinq.
3. QinQ is supported only on access ports.

phy-tx-clock

Syntax [no] **phy-tx-clock** {**auto-pref-master** | **auto-pref-slave** | **slave** | **master**}

Context config>port>ethernet

Description This command configures the 1000Base-T physical layer transmit clock. The mode affects the establishment of the master-slave relationship between two ports sharing a link segment during auto-negotiation. The master port uses a local clock to determine the timing of transmitter operations. The slave port recovers the clock from the signal it receives and uses the signal to determine the timing of transmitter operations. For ports that do not support 1000Base-T, the value defaults to N/A and cannot be changed.

The phy-tx-clock configuration is supported on SFP ports whether or not the SFP is inserted. The **phy-tx-clock** command applies only to copper-based RJ-45 synchronous Ethernet ports. The command can be used on an SFP port that supports fiber and copper, but the command has no effect if a fiber SFP is installed.

The proper value must be set to ensure that the synchronous Ethernet clock relay is correctly configured. See the 7705 SAR Basic System Configuration Guide for more information about synchronous Ethernet.

Default The default value for the MWA 1000Base-T Ethernet ports on the Packet Microwave Adapter card is master. On other adapter cards, the default value is auto-pref-slave for ports that support 1000Base-T Ethernet connections. The default value is n/a for ports that do not support 1000Base-T Ethernet connections.

Parameters

- auto-pref-master** — prefers to be master during autonegotiation
- auto-pref-slave** — prefers to be slave during autonegotiation
- slave** — forces the port to be the slave clocking source
- master** — forces the port to be the master clocking source

poe

Syntax **poe [plus]**
no poe

Context config>port>ethernet

Description The **poe** command enables an RJ-45 or RJ point five port that is Power over Ethernet (PoE) capable to deliver power to a “Powered Device” at levels compatible with the IEEE 802.3af standard.

The **poe plus** command enables an RJ-45 or RJ point five port that is PoE+ capable to deliver power to a “Powered Device” at levels compatible with the IEEE 802.3at standard.

On the 7705 SAR-H, 7705 SAR-Hc, and 6-port SAR-M Ethernet module, a PoE-capable port can be configured for PoE and PoE+. On the 7705 SAR-W and 7705 SAR-Wx, a PoE-capable port only supports PoE+ and can only be enabled using the **poe plus** command.

On the 7705 SAR-H, before a port can be configured for either PoE or PoE+, the PoE power source option must first be configured as either internal or external using the **config>system>poe-power-source** command; refer to the 7705 SAR Basic System Configuration Guide, “System Command Reference”, for information.

When the 7705 SAR-H is configured for the internal power source option, PoE capability is allowed on ports 5 and 6 only. Port 5 can be configured for PoE+ but in that case, port 6 cannot support PoE. When the system is configured for the external power source option, a mix of PoE and PoE+ is allowed on ports 5, 6, 7, and 8. PoE+ is supported only on ports 5 and 7. [Table 25](#) describes the allowed mix of PoE and PoE+ ports on the 7705 SAR-H.

Table 25 Supported PoE/PoE+ Combinations on the 7705 SAR-H

PoE Power Supply Source	Port 5	Port 6	Port 7	Port 8	Supported PoE/PoE+ Combinations
Internal	PoE	PoE	No PoE	No PoE	Two PoE ports
Internal	PoE+	No PoE	No PoE	No PoE	One PoE+ port
External	PoE	PoE	PoE	PoE	Four PoE ports
External	PoE	PoE	PoE+	PoE	Three PoE ports and one PoE+ port
External	PoE+	No PoE	PoE+	PoE	One PoE port and two PoE+ ports

On the 6-port SAR-M Ethernet module, ports 5 and 6 on the module can each support PoE. Port 5 can also support PoE+, but if it is configured for PoE+, then port 6 cannot support PoE power.

On the 7705 SAR-Hc, ports 5 and 6 each support PoE and PoE+. If configured for PoE, both ports can be used for PoE simultaneously. Both ports are also capable of supporting PoE+ but not simultaneously; if one port is configured for PoE+, the other port can only be configured for PoE. Ports 5 and 6 can also operate in non-PoE mode.

On the 7705 SAR-W, ports 4 and 5 support PoE+. Both ports can operate in non-PoE+ mode. On the 7705 SAR-Wx, port 5 (the RJ-45 port labeled PoE) supports PoE+. The port can also operate in non-PoE+ mode.

To disable PoE/PoE+ on a port and prevent it from delivering power, use the **no** form of the command. Performing a **shutdown** command on the port does not disable PoE/PoE+ on the port.

Default n/a

Parameters **plus** — enables PoE+ on the 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, 7705 SAR-Wx, and 6-port SAR-M Ethernet module

ptp-asymmetry

Syntax **ptp-asymmetry** *ptp-asymmetry*
no ptp-asymmetry

Context config>port>ethernet

Description This command configures the PTP asymmetry delay delta on an Ethernet port. The command corrects for known asymmetry for time of day/phase recovery of PTP packets on both local and downstream PTP slave clocks as well as on end-to-end transparent clocks.

Parameters *ptp-asymmetry* — the value in nanoseconds that the forward path delay varies from the mean path delay; the value can be a negative number

qinq-etype

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

Context config>port>ethernet

Description This command specifies the Ethertype expected when the port's encapsulation type is qinq. The **qinq-etype** value sets the Ethertype for the outer VLAN tag when qinq encapsulation is used.

IEEE 802.1ad (also known as VLAN stacking) defines a process to channelize a single Ethernet port or v-port into double-tagged VLANs. Each VLAN can represent a customer or an application. Each tag allows for up to 4096 VLANs to be configured on a port (4096 × 4096 total). For more information on VLANs and VLAN tagging, refer to “VLL Services” in the 7705 SAR 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 IEEE 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 for each tag (4 bytes total). Together, the TPID and TCI make up a VLAN tag.

The **qinq-etype** command is not supported by v-ports.

Network ports do not allow **qinq-etype** settings.

The **no** form of this command resets the qinq-etype value to the default.

Default 0x8100

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

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.

The command applies only to the physical 10GigE ports on the 7705 SAR-X, 6-port Ethernet 10Gbps Adapter card, 2-port 10GigE (Ethernet) Adapter card, and 2-port 10GigE (Ethernet) module, and on the 10-port 1GigE/1-port 10GigE X-Adapter card in 1-port 10GigE mode (select x1-10GigE-sf+ with the [mda-mode](#) command).

- 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 | 2500 | 10000}**
- Context** config>port>ethernet
- Description** This command configures the port speed of an Ethernet port, ring Ethernet port, or v-port when autonegotiation is disabled.
- Default**
- 100 (for Fast Ethernet ports on the 8-port Ethernet Adapter card, 7705 SAR-A (ports 9 to 12), 7705 SAR-Hc (ports 3 and 4), 4-port SAR-H Fast Ethernet module, and 6-port SAR-M Ethernet module (ports 1 and 2))
 - 1000 (for Gigabit Ethernet ports on all adapter cards, modules, and fixed platforms)
 - 2500 on a v-port (this default cannot be changed)
 - 10000 (for the 10-port 1GigE/1-port 10GigE X-Adapter card in 1-port 10GigE mode, 2-port 10GigE (Ethernet) Adapter card, 2-port 10GigE (Ethernet) module, 6-port Ethernet 10Gbps Adapter card (ports 5 and 6), 7705 SAR-X (ports 1/2/7 and 1/3/7))
- Parameters**
- 10** — sets the link speed to 10 Mb/s
 - 100** — sets the Ethernet port speed to 100 Mb/s
 - 1000** — sets the Ethernet port speed to 1000 Mb/s (only supported on GigE SFPs)
 - 2500** — sets the v-port speed to 2500 Mb/s (only supported on a v-port)
 - 10000** — sets the ring Ethernet port speed (only supported on GigE XFPs) and the SFP+ ports speed on the 6-port Ethernet 10Gbps Adapter card and a 7705 SAR-X to 10 000 Mb/s

ssm

Syntax	ssm
Context	config>port>ethernet
Description	<p>This command enables the Ethernet Synchronization Message Channel (ESMC) capability on a synchronous Ethernet port on the following:</p> <ul style="list-style-type: none"> • 2-port 10GigE (Ethernet) Adapter card • 2-port 10GigE (Ethernet) module • 6-port Ethernet 10Gbps Adapter card • 8-port Ethernet Adapter card • 8-port Gigabit Ethernet Adapter card • 10-port 1GigE/1-port 10GigE X-Adapter card • Packet Microwave Adapter card • 4-port SAR-H Fast Ethernet module • 7705 SAR-A • 7705 SAR-Ax • 7705 SAR-H • 7705 SAR-Hc • 7705 SAR-M • 7705 SAR-W • 7705 SAR-Wx • 7705 SAR-X

The **ssm** command is enabled and disabled using the **no shutdown** and **shutdown** commands.

On the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module, SSM frames received on the ring Ethernet ports are extracted for processing through the v-port. Therefore, the v-port must be active (that is, in **no shutdown** mode) in order for SSM to function. The v-port must also be active in order for the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module to transmit SSM frames. No additional interface or IP configuration is required on the v-port for SSM.

Default	shutdown
----------------	----------

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: <ul style="list-style-type: none"> • synchronous ring Ethernet port on the 2-port 10GigE (Ethernet) Adapter card • synchronous ring Ethernet port on the 2-port 10GigE (Ethernet) module • synchronous Ethernet port on the 6-port Ethernet 10Gbps Adapter card • synchronous Ethernet port on the 8-port Ethernet Adapter card • synchronous Ethernet port on the 8-port Gigabit Ethernet Adapter card • synchronous Ethernet port on the 10-port 1GigE/1-port 10GigE X-Adapter card • synchronous Ethernet port on the Packet Microwave Adapter card • synchronous Ethernet port on the 4-port SAR-H Fast Ethernet module • synchronous Ethernet port on the 7705 SAR-A • synchronous Ethernet port on the 7705 SAR-Ax • synchronous Ethernet port on the 7705 SAR-H • synchronous Ethernet port on the 7705 SAR-Hc • synchronous Ethernet port on the 7705 SAR-M • synchronous Ethernet port on the 7705 SAR-W • synchronous Ethernet port on the 7705 SAR-Wx • synchronous Ethernet port on the 7705 SAR-X
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>ssm config>port>ethernet>ssm
Description	This command sets the quality level value transmitted from the Synchronization Status Messaging (SSM) channel of the following ports to QL-DUS/QL-DNU (do not use for synchronization for timing purposes): <ul style="list-style-type: none"> • synchronous Ethernet port on the 2-port 10GigE (Ethernet) Adapter card • synchronous Ethernet port on the 2-port 10GigE (Ethernet) module • synchronous Ethernet port on the 6-port Ethernet 10Gbps Adapter card • synchronous Ethernet port on the 8-port Ethernet Adapter card • synchronous Ethernet port on the 8-port Gigabit Ethernet Adapter card • synchronous Ethernet port on the 10-port 1GigE/1-port 10GigE X-Adapter card • synchronous Ethernet port on the Packet Microwave Adapter card

- synchronous Ethernet port on the 4-port SAR-H Fast Ethernet module
- synchronous Ethernet port on the 7705 SAR-A
- synchronous Ethernet port on the 7705 SAR-Ax
- synchronous Ethernet port on the 7705 SAR-H
- synchronous Ethernet port on the 7705 SAR-Hc
- synchronous Ethernet port on the 7705 SAR-M
- synchronous Ethernet port on the 7705 SAR-W
- synchronous Ethernet port on the 7705 SAR-Wx
- synchronous Ethernet port on the 7705 SAR-X

Default enabled for fiber ports
disabled (no tx-dus) for copper ports

vlan-filter

Syntax `[no] vlan-filter filter-id`

Context config>port>ethernet

Description This command associates a VLAN filter policy with an ingress ring port on the 2-port 10GigE (Ethernet) Adapter card or 2-port 10GigE (Ethernet) module.

Filter policies control the forwarding and dropping of packets based on matching criteria. Only one filter policy can be applied to a ring port at a time. The same filter policy can be applied to both ring ports.

The *filter-id* must already be defined before the **vlan-filter** command is executed. If the filter policy does not exist, the operation will fail and an error message will be displayed.

The **no** form of the command removes any configured *filter-id* association with the ring port. The filter policy cannot be deleted until it is removed from all ring ports where it is applied.

Default n/a

Parameters *filter-id* — the VLAN filter policy ID number or filter name

Values 1 to 65535 or *filter-name* (up to 64 characters)

xgig

Syntax	xgig {lan wan}
Context	config>port>ethernet
Description	<p>This command configures the specified 10-Gb/s interface in LAN or WAN mode. When configuring the port for WAN mode, you can change some SONET/SDH parameters to reflect the SONET/SDH requirements for this port. When you configure a port for LAN mode, all SONET/SDH parameters are predetermined and not configurable. The command is supported on the 7705 SAR-X, 6-port Ethernet 10Gbps Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card, 2-port 10GigE (Ethernet) Adapter card, and 2-port 10GigE (Ethernet) module.</p> <p>On the 6-port Ethernet 10Gbps Adapter card, both 10-Gb/s interfaces (ports 5 and 6) operate in the same xgig mode, either LAN mode or WAN mode. Setting the xgig mode for either port sets the mode for both ports.</p>
Default	lan
Parameters	<p>lan — specifies that the port operates in LAN mode</p> <p>wan — specifies that the port operates in WAN mode</p>

xor-mode

Syntax	xor-mode {rj45 rjp5 sfp}
Context	config>port>ethernet
Description	<p>This command configures the operational mode of Ethernet XOR combination ports. Ethernet XOR ports on the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-H, and 7705 SAR-X can be configured to operate as either RJ-45 ports or SFP ports. Ethernet XOR ports on the 6-port SAR-M Ethernet module can be configured to operate as either RJ point five ports or SFP ports. The mode can be configured on each port independently. Refer to the individual hardware installation guides for more information.</p>
Default	rj45 (for applicable 7705 SAR chassis); rjp5 (for 6-port SAR-M Ethernet module)
Parameters	<p>rj45 — specifies that the port operate as a 10/100/1000Base-T electrical RJ-45 port (applicable 7705 SAR chassis only)</p> <p>rjp5 — specifies that the port operate as a 10/100/1000Base-T electrical RJ point five port (6-port SAR-M Ethernet module only)</p> <p>sfp — specifies that the port operate as an SFP port</p>

3.13.2.11 GNSS Commands

gnss

Syntax	gnss
Context	config>port
Description	This command enters the context to perform GNSS receiver port configuration.
Default	n/a

antenna-cable-delay

Syntax	antenna-cable-delay 0 .. 32767 no antenna-cable-delay
Context	config>port>gnss
Description	This command configures the expected signal delay resulting from the length of the antenna cable. The no form of this command returns the value to the default.
Default	0
Parameters	0 .. 32767 — the signal delay, in nanoseconds

elevation-mask-angle

Syntax	elevation-mask-angle 0 .. 89 no elevation-mask-angle
Context	config>port>gnss
Description	This command configures the elevation mask angle. It provides a method of filtering satellites to be used by the system. Configuring an elevation mask angle below 10° is not recommended. The no form of this command returns the value to the default.
Default	10
Parameters	0 .. 89 — the elevation mask angle, in degrees.

type

Syntax	[no] type [gps] [glonass]
Context	config>port>gnss
Description	<p>This command configures which GNSS system or systems will be used by the GNSS receiver.</p> <p>The no form of this command removes the specified GNSS system or systems.</p> <p>By default, gps is configured. Configuring glonass does not remove gps; the GNSS receiver will use both GPS and GLONASS systems.</p>
Default	gps
Parameters	<p>gps — configures the GNSS receiver to use the American GPS GNSS system</p> <p>glonass — configures the GNSS receiver to use the Russian GLONASS GNSS system</p>

3.13.2.12 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.

mac-auth

Syntax	[no] mac-auth
Context	config>port>ethernet>dot1x
Description	<p>This command enables MAC-based authentication. To use MAC-based authentication, 802.1x authentication must first be enabled using the port-control auto command.</p> <p>When MAC-based authentication is enabled, and the mac-auth-wait timer expires, the 7705 SAR begins listening on the port for valid Ethernet frames. The source address of a received frame is used for MAC-based authentication.</p> <p>The no form of this command disables MAC-based authentication.</p>
Default	no mac-auth

mac-auth-wait

Syntax	mac-auth-wait <i>seconds</i> no mac-auth-wait
Context	config>port>ethernet>dot1x
Description	<p>This command configures the delay period before MAC authentication is activated and the 7705 SAR searches for a valid client MAC address.</p> <p>The no form of this command disables the delay and allows MAC authentication to be used immediately.</p>
Default	no mac-auth-wait
Parameters	<i>seconds</i> — specifies the MAC authentication delay period in seconds
Values	1 to 3600

max-auth-req

Syntax	max-auth-req <i>max-auth-request</i> no max-auth-req
Context	config>port>ethernet>dot1x
Description	<p>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.</p> <p>The no form of this command returns the value to the default.</p>
Default	2
Parameters	<i>max-auth-req</i> — 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	<p>This command configures the 802.1x authentication mode.</p> <p>The no form of this command returns the value to the default.</p>
Default	force-auth
Parameters	<p>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.</p> <p>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.</p> <p>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.</p>

quiet-period

Syntax	quiet-period <i>seconds</i> 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 timer is started after sending an EAP-Failure message or after expiry of the supplicant timeout timer. The no form of this command returns the value to the default.
Default	60
Parameters	<i>seconds</i> — specifies the quiet period in seconds Values 1 to 3600

radius-plcy

Syntax	radius-plcy <i>name</i> 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	<i>name</i> — specifies an existing 802.1x RADIUS policy name

re-auth-period

Syntax	re-auth-period <i>seconds</i> 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	<i>seconds</i> — specifies the reauthentication delay period in seconds
Values	1 to 9000

re-authentication

Syntax	[no] re-authentication
Context	config>port>ethernet>dot1x
Description	<p>This command enables or disables periodic 802.1x reauthentication.</p> <p>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.</p> <p>The no form of this command disables 802.1x reauthentication.</p>
Default	no re-authentication

server-timeout

Syntax	server-timeout <i>seconds</i> no server-timeout
Context	config>port>ethernet>dot1x
Description	<p>This command configures the time during which the 7705 SAR waits for the RADIUS server to respond 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.</p> <p>The no form of this command returns the value to the default.</p>
Default	30
Parameters	<i>seconds</i> — specifies the server timeout period in seconds
Values	1 to 300

supplicant-timeout

Syntax	supplicant-timeout <i>seconds</i> 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	<i>seconds</i> — specifies the supplicant timeout period in seconds Values 1 to 300

transmit-period

Syntax	transmit-period <i>seconds</i> 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	<i>seconds</i> — specifies the server transmit period in seconds Values 1 to 3600

tunneling

Syntax	[no] tunneling
Context	config>port>ethernet>dot1x
Description	This command enables the tunneling of untagged 802.1x frames received on a port for both Epipe and VPLS services using a null SAP or a default SAP on a dot1q or qinq port. When configured, untagged 802.1x frames are switched into the service with the corresponding supported SAP. 802.1x tunneling is supported only when the port-control command is set to force-auth . The no form of this command disables tunneling of untagged 802.1x frames.
Default	no tunneling

3.13.2.13 LLDP Ethernet Port Commands

Refer to the 7705 SAR 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.



Note: In order for LLDP to be operational on the Ethernet ports on the 2-port 10GigE (Ethernet) Adapter card/module, the v-port must be active (that is, in **no shutdown** mode).

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	<p>nearest-bridge — configures the LLDP to use the nearest bridge</p> <p>nearest-non-tpmr — configures the LLDP to use the nearest non-two-port MAC relay (TPMR) bridge</p> <p>nearest-customer — configures the LLDP to use the nearest customer bridge</p>

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	<p>rx — specifies that the LLDP agent will receive, but will not transmit, LLDP frames on this port</p> <p>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</p>

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
Description	This command enables LLDP notifications. The no form of the command disables LLDP notifications.
Default	no notification

port-id-subtype

Syntax	port-id-subtype {tx-if-alias tx-if-name tx-local}
Context	config>port>ethernet>lldp>destmac
Description	This command specifies how to encode the port ID TLV transmit to the peer. The default setting tx-local (ifindex value) is required by some versions of the NSP NFM-P to properly build the Layer 2 topology map using LLDP. Changing this value to transmit the ifName (tx-if-name) or ifAlias (tx-if-alias) in place of the ifindex (tx-local) may affect the ability of the NSP NFM-P to build the Layer 2 topology map using LLDP.
Default	tx-local
Parameters	<p>tx-if-alias — transmits the ifAlias string (subtype 1) that describes the port as stored in the IF-MIB, either user-configured or the default entry (that is, 10/100/Gig Ethernet SFP)</p> <p>tx-if-name — transmits the ifName string (subtype 5) that describes the port as stored in the IF-MIB ifName info</p> <p>tx-local — the interface ifindex value (subtype 7) as the port ID</p>

tx-mgmt-address

Syntax	tx-mgmt-address [system] [system-ipv6] no tx-mgmt-address
Context	config>port>ethernet>lldp>dest-mac
Description	<p>This command specifies which management address to transmit. The 7705 SAR can only be configured to send or not send the system address.</p> <p>If the no form of the command is used, the port will not include the system management address TLV in any LLDPDUs it transmits.</p>
Default	no tx-mgmt-address
Parameters	<p>system — specifies to use the system IPv4 address. The system address is only transmitted after it has been configured.</p> <p>system-ipv6 — specifies to use the system IPv6 address. The system address is only transmitted after it has been configured.</p>

tx-tlvs

Syntax	tx-tlvs [port-desc] [sys-name] [sys-desc] [sys-cap] no tx-tlvs
Context	config>port>ethernet>lldp>dest-mac
Description	<p>This command specifies which LLDP optional TLVs to transmit.</p> <p>If the no form of the command is used, the port will not include any optional TLVs in any LLDPDUs it transmits.</p>
Default	no tx-tlvs
Parameters	<p>port-desc — indicates that the LLDP agent should transmit port description TLVs</p> <p>sys-name — indicates that the LLDP agent should transmit system name TLVs</p> <p>sys-desc — indicates that the LLDP agent should transmit system description TLVs</p> <p>sys-cap — indicates that the LLDP agent should transmit system capabilities TLVs</p>

3.13.2.14 Ring MAC Operations Commands

disable-aging

Syntax	[no] disable-aging
Context	config>card>mda>ring
Description	<p>This command disables MAC address aging across an Ethernet ring.</p> <p>As is the case for a Layer 2 switch, learned MACs can be aged out if no packets are sourced from the MAC address for a period of time (the aging time). In each ring, there are independent aging timers for local learned MAC and remote learned MAC entries in the FDB. The disable-aging command turns off aging for local and remote learned MAC addresses.</p> <p>The no form of this command enables aging on the ring.</p>
Default	no disable-aging

disable-learning

Syntax	[no] disable-learning
Context	config>card>mda>ring
Description	<p>This command disables learning of new MAC addresses in the ring FDB.</p> <p>When disable-learning is enabled, new source MAC addresses will not be entered in the ring FDB. This is true for both local and remote MAC addresses.</p> <p>When disable-learning is disabled, new source MAC addresses will be learned and entered into the ring FDB.</p> <p>This parameter is mainly used in conjunction with the discard-unknown-source command.</p> <p>The no form of this command enables learning of MAC addresses.</p>
Default	no disable-learning

discard-unknown-source

Syntax	[no] discard-unknown-source
Context	config>card>mda>ring
Description	<p>This command specifies that packets with an unknown source MAC address received on a ring port will be dropped if the source MAC is not already in the FDB (that is, the source MAC was not learned before the discard-unknown-source command was enabled or is not a static entry already created for the packet MAC).</p> <p>When disabled, the packets are flooded to the other ring port or forwarded to the v-port (if the packets are addressed to the v-port).</p> <p>The no form of this command disables discard-unknown-source.</p>
Default	no discard-unknown-source

fdb-table-high-wmark

Syntax	fdb-table-high-wmark <i>high-water-mark</i> no fdb-table-high-wmark
Context	config>card>mda>ring
Description	<p>This command specifies the upper threshold value for learned FDB entries. The high-water-mark is configured as a percentage of the FDB. When the number of FDB entries exceeds the <i>high-water-mark</i>, the system raises a log event.</p> <p>The no form of this command returns the maximum FDB table high-water-mark to the default (95%).</p>
Default	no fdb-table-high-wmark
Parameters	<i>high-water-mark</i> — specifies the upper threshold for FDB entries as a percentage of FDB table size, which when exceeded, causes the system to raise a log event
Values	0 to 100

fdb-table-size

Syntax	fdb-table-size <i>table-size</i> no fdb-table-size
Context	config>card>mda>ring
Description	This command specifies the maximum number of MAC entries in the dynamic FDB for the ring.

The **no** form of this command returns the maximum FDB table size to the default (512).

Default no fdb-table-size

Parameters *table-size* — the maximum number of learned MAC entries in the FDB for the ring

Values 4 to 512

mac-pinning

Syntax [**no**] **mac-pinning** port *port-id*

Context config>card>mda>ring

Description This command keeps MAC address information that has been learned from a source frame in the FDB until the expiry of the mac-aging timer, which is specified using the [remote-age](#) command). If a MAC address is pinned and a frame with an existing source MAC address is received from the other ring port, the FDB entry is not altered—the address that was learned from the first source frame is preserved until the expiry of the aging timer. If the aging timer is disabled, then the MAC address remains pinned until the timer is enabled again.

The **no** form of this command disables mac-pinning.

Default no mac-pinning

Parameters *port-id* — specifies the physical ring port

remote-age

Syntax **remote-age** *aging-timer*
no remote-age

Context config>card>mda>ring

Description This command specifies the aging time for remotely learned MAC addresses in the FDB.

As is the case for a Layer 2 switch, learned MAC addresses can be aged out if no packets are sourced from the MAC address for a period of time (the aging time). The **remote-age** timer specifies the aging time for remotely learned MAC addresses.

The **no** form of this command returns the remote aging timer to the default value (900 s).

Default no remote-age

Parameters *aging-timer* — the aging time for remote MAC addresses, expressed in seconds

Values 60 to 86400

static-mac

- Syntax** `[no] static-mac mac ieee-address port port-id [create]`
- Context** `config>card>mda>ring`
- Description** This command creates a local static MAC entry in the FDB for the specified port. The maximum number of static MAC addresses per ring adapter card is 256.
- Static MAC definitions on one edge device are not propagated to other edge devices; that is, each edge device has an independent FDB.
- Only one static MAC entry (local or remote) can be defined per MAC address per instance.
- By default, no static MAC address entries are defined.
- The **no** form of this command deletes the static MAC entry with the specified MAC address associated with the port from the FDB.
- Parameters** *ieee-address* — specifies the 48-bit MAC address for the static ARP 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 (cannot be all zeros). Allowed values are any non-broadcast, non-multicast MAC, and non-IEEE reserved MAC addresses.
- port-id* — specifies the port that is associated with the specified MAC address
- create** — this keyword is mandatory when specifying a static MAC address

3.13.2.15 Serial Commands

serial

Syntax	serial
Context	config>port
Description	<p>This command enables the context to configure RS-232, V.35, X.21, or RS-530 parameters for a port on a channelized 12-port Serial Data Interface card, or to configure RS-232 parameters for an RS-232 port on the 7705 SAR-Hc or on the 4-port T1/E1 and RS-232 Combination module. This context cannot be accessed by any other adapter card, module, or platform.</p> <p>On the 12-port Serial Data Interface card (version 1 or version 2), if the port has been enabled for an RS-530 interface through the use of an adapter cable, X.21 configuration applies to the RS-530 interface. There is no configuration specifically for RS-530 operation on this card version. For the 12-port Serial Data Interface card, version 3, there is a separate rs530 command to configure RS-530 channel parameters.</p> <p>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.</p> <p>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 on RS-232, X.21, and RS-530 ports.</p>
Default	n/a

rs232

Syntax	[no] rs232
Context	config>port>serial
Description	<p>This command enables the context to configure RS-232 parameters for a channel. When one of the ports on a connector has been configured for an RS-232 channel, the other ports on the connector can only be configured for RS-232.</p> <p>The no form of this command deletes the RS-232 channel.</p>
Default	n/a

rs530

Syntax	[no] rs530
Context	config>port>serial
Description	<p>This command enables the context to configure RS-530 parameters for a channel on a 12-port Serial Data Interface card, version 3. When one of the ports on a connector has been configured for an RS-530 channel, the other port on the connector can only be configured for RS-530.</p> <p>The no form of this command deletes the RS-530 channel.</p>
Default	n/a

v35

Syntax	[no] v35
Context	config>port>serial
Description	<p>This command enables the context to configure V.35 parameters for a channel. When one of the ports on a connector has been configured for a V.35 channel, the other ports on the connector can only be configured for V.35. The no form of this command deletes the V.35 channel.</p> <p>The no form of this command deletes the V.35 channel.</p>
Default	n/a

x21

Syntax	[no] x21
Context	config>port>serial
Description	<p>This command enables the context to configure X.21 parameters for a channel. When one of the ports on a connector has been configured for an X.21 channel, the other ports on the connector can only be configured for X.21.</p> <p>On a 12-port Serial Data Interface card (version 1 or version 2), if the port has been enabled for an RS-530 interface through the use of an adapter cable, X.21 configuration applies to the RS-530 interface. There is no configuration specifically for RS-530 operation. All X.21 functionality is available on the RS-530 interface, except that only DCE operation is supported for RS-530. However, because X.21 does not support all the control leads available for RS-530, only a subset of the RS-530 control leads are supported.</p> <p>The no form of this command deletes the X.21 channel.</p>

Default n/a

character-length

Syntax	character-length {6 7 8}
Context	config>port>serial>rs232 config>port>serial>rs530 config>port>serial>x21
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 {external slave dcr-serial}
Context	config>port>serial>rs232 config>port>serial>rs530 config>port>serial>v35 config>port>serial>x21
Description	This command configures the source of the transmit clock. The command is valid only if device-mode is synchronous. The 12-port Serial Data Interface card (version 1 or version 2), the 4-port T1/E1 and RS-232 Combination module, and the 7705 SAR-Hc support slave clocking only. The 12-port Serial Data Interface card, version 3, supports all clocking options. Table 26 describes the clocking options. See the device-gender command for information on setting DTE or DCE on serial data interface ports.

Table 26 Synchronization Clocking Options

Attached Device Gender		7705 SAR Port Gender		Tx Clock Option	Description
DTE	DCE	DTE	DCE		
✓			✓	Slave	DCE slave: the transmit and receive clocks are derived from the Baud Rate Generator (BRG) locked to the system timing
	✓	✓		Slave	DTE slave: the transmit and receive clocks are derived are supplied by the attached DCE device
✓			✓	DCR serial	DCR DCE: the transmit and receive clocks are derived from the far-end clock transported via DCR serial (12-port Serial Data Interface card, version 3, only)
	✓	✓		DCR serial	DCR DTE: the transmit and receive clocks are supplied by the attached DCE device (12-port Serial Data Interface card, version 3, only)
✓			✓	External ¹	DCE Ext: the transmit clock is provided by the attached DTE device. The received clock is derived from the internal BRG. (12-port Serial Data Interface card, version 3, only)
	✓	✓		External ¹	DTE Ext: the transmit clock is provided by the attached DCE device. The received clock is derived from the internal BRG. (12-port Serial Data Interface card, version 3, only)

Note:

1. External is commonly referred to as Terminal Timing.

Default slave

Parameters **external** — terminal timing mode

slave — slave mode

dcr-serial — the Rx Clk signal from the DTE port is used as the source of the clock, which is also transported to the DCE port across the network; only supported for SAToP serial Cpipes for synchronous RS-232 and RS-530 ports on the 12-port Serial Data Interface card, version 3

control-lead

Syntax `control-lead {input | monitor | output}`

Context
`config>port>serial>rs232`
`config>port>serial>rs530`
`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, teardown, and synchronization.

[Table 27](#) summarizes the supported control leads for each protocol.

Table 27 Control Leads

Protocol		DCE	DTE
RS-232	Input	DTR, RTS, ALB, RDL	DSR, DCD, CTS, RI
	Output	DSR, DCD, CTS, RI	DTR, RTS, ALB, RDL
V.35	Input	DTR, RTS, ALB	DSR, DCD, CTS
	Output	DSR, DCD, CTS	DTR, RTS, ALB
X.21	Input	C	I
	Output	I	C
RS-530	Input	DTR, RTS, RL, LL	DSR, DCD, CTS, TM
	Output	DSR, DCD, CTS, TM	DTR, RTS, RL, LL

Default n/a

input

Syntax `input`

Context
`config>port>serial>rs232>control-lead`
`config>port>serial>rs530>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

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. This command is valid only for RS-232 and V.35 interfaces.
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.

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 X.21 interfaces.
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

dtr-dsr

Syntax	dtr-dsr { high low }
Context	config>port>serial>rs232>control-lead>input config>port>serial>rs530>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.

This command is valid only for RS-232, RS-530, and V.35 interfaces.

Default high

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

ll-tm

Syntax ll-tm {high | low}

Context config>port>serial>rs530>control-lead>input

Description This command configures the Local Loopback (LL) or Test Mode (TM) input control lead. The input signal that is sent depends on the [device-gender](#) setting. For a DCE device, the input signal is LL. For a DTE device, the input signal is TM.

This command is valid only for RS-530 interfaces.

Default on

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

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 RS-232 interfaces.

Default high

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

rl-cts

Syntax	rl-cts { high low end-to-end }
Context	config>port>serial>rs530>control-lead>input
Description	<p>This command configures the Remote Loopback (RL) 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 RL. For a DTE device, the input signal is CTS.</p> <p>This command is valid only for RS-530 interfaces.</p>
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

rts-dcd

Syntax	rts-dcd { high low end-to-end }
Context	config>port>serial>rs232>control-lead>input config>port>serial>rs530>control-lead>input config>port>serial>v35>control-lead>input
Description	<p>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.</p> <p>This command is valid only for RS-232, RS-530, and V.35 interfaces.</p>
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 on RS-232 and V.35 interfaces.

monitor

Syntax	monitor
Context	config>port>serial>rs232>control-lead config>port>serial>rs530>control-lead config>port>serial>v35>control-lead config>port>serial>x21>control-lead
Description	<p>This command enables access to the context to monitor the input control leads. When monitoring is enabled on a control lead, the 7705 SAR polls the status of the control lead every second. Any change in state of the control lead causes an alarm to be raised. This functionality provides an indication to the operator of a problem in the DTE-to-DCE path; for example, it can indicate that the far-end device is disconnected.</p> <p>Monitoring is enabled on a per-lead basis. The monitoring functionality is supported on ports configured for either DTE or DCE.</p>
Default	n/a

alb-cts

Syntax	alb-cts {on off high low}
Context	config>port>serial>rs232>control-lead>monitor config>port>serial>v35>control-lead>monitor
Description	<p>This command enables monitoring on the Analog Loopback (ALB) or Clear To Send (CTS) input control lead. For a DCE device, the input control lead is ALB. For a DTE device, the input control lead is CTS.</p> <p>This command is valid only for RS-232 and V.35 interfaces.</p>
Default	off
Parameters	<p>on — monitoring is enabled on the lead</p> <p>off — monitoring is disabled on the lead</p> <p>high — enable monitoring and force link down when lead is high (only supported on 12-port Serial Data Interface card, version 3)</p> <p>low — enable monitoring and force link down when lead is low (only supported on 12-port Serial Data Interface card, version 3)</p>

c-i

Syntax	c-i {on off high low}
Context	config>port>serial>x21>control-lead>monitor
Description	<p>This command enables monitoring on the Control (C) or Indication (I) input control lead. For a DCE device, the input control lead is C. For a DTE device, the input control lead is I.</p> <p>This command is valid only for an X.21 interface.</p>
Default	off
Parameters	<p>on — monitoring is enabled on the lead</p> <p>off — monitoring is disabled on the lead</p> <p>high — enable monitoring and force link down when lead is high (only supported on 12-port Serial Data Interface card, version 3)</p> <p>low — enable monitoring and force link down when lead is low (only supported on 12-port Serial Data Interface card, version 3)</p>

dtr-dsr

Syntax	dtr-dsr {on off high low}
Context	config>port>serial>rs232>control-lead>monitor config>port>serial>rs530>control-lead>monitor config>port>serial>v35>control-lead>monitor
Description	<p>This command enables monitoring on the Data Terminal Ready (DTR) or Data Set Ready (DSR) input control lead. For a DCE device, the input control lead is DTR. For a DTE device, the input control lead is DSR.</p> <p>This command is valid only for RS-232, RS-530, and V.35 interfaces.</p>
Default	off
Parameters	<p>on — monitoring is enabled on the lead</p> <p>off — monitoring is disabled on the lead</p> <p>high — enable monitoring and force link down when lead is high (only supported on 12-port Serial Data Interface card, version 3)</p> <p>low — enable monitoring and force link down when lead is low (only supported on 12-port Serial Data Interface card, version 3)</p>

ll-tm

Syntax	ll-tm { on off high low }
Context	config>port>serial>rs530>control-lead>monitor
Description	This command enables monitoring on the Local Loopback (LL) or Test Mode (TM) input control lead. For a DCE device, the input signal is LL. For a DTE device, the input signal is TM. This command is valid only for RS-530 interfaces.
Default	on
Parameters	on — monitoring is enabled on the lead off — monitoring is disabled on the lead high — enable monitoring and force link down when lead is high low — enable monitoring and force link down when lead is low

rl-cts

Syntax	rl-cts { on off high low }
Context	config>port>serial>rs530>control-lead>monitor
Description	This command enables monitoring on the Remote Loopback (RL) or Clear To Send (CTS) input control lead. For a DCE device, the input signal is RL. For a DTE device, the input signal is CTS. This command is valid only for RS-530 interfaces.
Default	high
Parameters	on — monitoring is enabled on the lead off — monitoring is disabled on the lead high — enable monitoring and force link down when lead is high low — enable monitoring and force link down when lead is low

rdl-ri

Syntax	rdl-ri {on off high low}
Context	config>port>serial>rs232>control-lead>monitor
Description	<p>This command enables monitoring on the Remote Digital Loopback (RDL) or Ring Indicator (RI) input control lead. For a DCE device, the input control lead is RDL. For a DTE device, the input control lead is RI.</p> <p>This command is valid only for RS-232 interfaces.</p>
Default	off
Parameters	<p>on — monitoring is enabled on the lead</p> <p>off — monitoring is disabled on the lead</p> <p>high — enable monitoring and force link down when lead is high (only supported on 12-port Serial Data Interface card, version 3)</p> <p>low — enable monitoring and force link down when lead is low (only supported on 12-port Serial Data Interface card, version 3)</p>

rts-dcd

Syntax	rts-dcd {on off high low}
Context	config>port>serial>rs232>control-lead>monitor config>port>serial>rs530>control-lead>monitor config>port>serial>v35>control-lead>monitor
Description	<p>This command enables monitoring on the Request To Send (RTS) or Data Carrier Detect (DCD) input control lead. For a DCE device, the input control lead is RTS. For a DTE device, the input control lead is DCD.</p> <p>This command is valid only for RS-232, RS-530, and V.35 interfaces.</p>
Default	off
Parameters	<p>on — monitoring is enabled on the lead</p> <p>off — monitoring is disabled on the lead</p> <p>high — enable monitoring and force link down when lead is high (only supported on 12-port Serial Data Interface card, version 3)</p> <p>low — enable monitoring and force link down when lead is low (only supported on 12-port Serial Data Interface card, version 3)</p>

output

Syntax	output
Context	config>port>serial>rs232>control-lead config>port>serial>rs530>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

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. This command is valid only for RS-232 and V.35 interfaces.
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, except when the output control lead is carrying a CTS signal on an RS-232 port operating at subrate speeds. In this case, the control lead follows the HCM status: <ul style="list-style-type: none"> • if the HCM status is Up, the CTS output control lead is 1 • if the HCM status is Down, the CTS output control lead is 0

cts-rl

Syntax	cts-rl {high low end-to-end}
Context	config>port>serial>rs530>control-lead>output
Description	This command configures the Clear To Send (CTS) or Remote Loopback (RL) 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 RL. This command is valid only for RS-530 interfaces.

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

dcd-rts

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

Context config>port>serial>rs232>control-lead>output
config>port>serial>rs530>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.

This command is valid only for RS-232, RS-530, and V.35 interfaces.

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

dsr-dtr

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

Context config>port>serial>rs232>control-lead>output
config>port>serial>rs530>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 output signal is DSR. For a DTE device, the output signal is DTR.

This command is valid only for RS-232, RS-530, and V.35 interfaces.

Default high

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

tm-ll

Syntax	dsr-dtr { high low }
Context	config>port>serial>rs530>control-lead>output
Description	This command configures the Test Mode (TM) or Local Loopback (LL) output control lead. The output signal that is sent depends on the device-gender setting. For a DCE device, the output signal is TM. For a DTE device, the output signal is LL. This command is valid only for RS-530 interfaces.
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 X.21 interfaces.
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 RS-232 interfaces.

Default high

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

data-position

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

Context config>port>serial>rs232
 config>port>serial>rs530
 config>port>serial>x21

Description This command configures the HCM data start position for an RS-232, RS-530, or X.21 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.

This command is only valid for ports configured for substrate speeds.



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>rs530
 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.

On ports on the 12-port Serial Data Interface card (version 1 or version 2), the data and control signals are electrically wired as DCE. Regardless of the gender configured, the Tx pin on the port is always an input pin and the Rx pin on the port is always an output pin. Changing a port from DCE to DTE does not change the pin orientation. Therefore, when a port is configured as DTE, a crossover cable is required in order to interconnect with some serial devices. If the port has been enabled for an RS-530 interface through the use of an adapter cable, only DCE operation is supported.



Note: On the 12-port Serial Data Interface card, version 3, **device-gender** must match the cable type being used (either DCE or DTE).

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>rs530
 config>port>serial>v35
 config>port>serial>x21

Description This command configures the mode of operation for the device. An RS-232, RS-530, or X.21 channel can be configured for either synchronous or asynchronous mode. Asynchronous mode is not supported on a V.35 channel; V.35 can only be configured for synchronous mode.

Asynchronous mode is supported only on channels with substrate speeds of 38 400 b/s or less with the exception of RS-232 interfaces configured as raw sockets. See the [socket](#) and [speed](#) commands for more information.

On the 12-port Serial Data Interface card, version 3, a V.35, X.21, or RS-530 channel operating at a super-rate speed can 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>rs530 config>port>serial>v35 config>port>serial>x21
Description	<p>This command configures the duplex mode.</p> <p>Half-duplex mode uses a single transmission path.</p> <p>Full-duplex mode uses two independent transmission paths, one in each direction, allowing two connected devices to transmit and receive data simultaneously.</p> <p>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 (multi-drop) is configured in slave mode (applies to RS-232 only).</p>
Default	full
Parameters	half — uses a single transmission path full — uses two independent transmission paths, one in each direction

hold-time

Syntax	hold-time {[up <i>hold-time-up</i>] [down <i>hold-time-down</i>]} no hold-time
Context	config>port>serial>rs232 config>port>serial>rs530 config>port>serial>v35 config>port>serial>x21
Description	<p>This command configures the serial link dampening timers in 100s of milliseconds, which guards against reporting excessive interface transitions. Once implemented, subsequent transitions of the interface from one state to another are not advertised to upper layer protocols until the configured timer has expired.</p>
Default	no hold-time
Parameters	<p><i>hold-time-up</i> — the hold-timer for link-up event dampening. A value of zero (0) indicates that an up transition is reported immediately.</p> <p>Values 0 to 100 (in 100s of milliseconds)</p> <p><i>hold-time-down</i> — the hold-timer for link-down event dampening. A value of zero (0) indicates that a down transition is reported immediately.</p> <p>Values 0 to 100 (in 100s of milliseconds)</p>

invert-clock

Syntax	[no] invert-clock
Context	config>port>serial>rs232 config>port>serial>rs530 config>port>serial>v35 config>port>serial>x21
Description	<p>This command enables the inverting of the receive clock used to sample data in order to improve performance under noisy conditions.</p> <p>The no form of this command disables loopback on the inverting of the clock used to sample data.</p> <p>This command is only supported on the 12-port Serial Data Interface card, version 3.</p>
Default	n/a

loopback

Syntax	loopback {bidir-b bidir-e} no loopback
Context	config>port>serial>rs232 config>port>serial>rs530 config>port>serial>v35 config>port>serial>x21
Description	<p>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.</p> <p>In the serial context, a bidirectional loopback B or E can 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.</p> <p>This command is not saved in the system configuration between boots.</p> <p>The no form of this command disables loopback on the interface.</p>
Default	no loopback
Parameters	<p>bidir-b — specifies that the loopback is bidirectional loopback B (not supported on the 12-port Serial Data Interface card, version 3)</p> <p>bidir-e — specifies that the loopback is bidirectional loopback E; this is the only option supported on RS-530 interfaces</p>

mon-clock-deviation

Syntax	mon-clock-deviation {[raise <i>debounce-time-r</i>] [clear <i>debounce-time-c</i>]} no mon-clock-deviation
Context	config>port>serial>rs232 config>port>serial>rs530 config>port>serial>v35 config>port>serial>x21
Description	This command raises or clears the debounce time for monitoring clock deviation. The no form of this command removes the monitoring clock deviation configuration. This command is only supported on the 12-port Serial Data Interface card, version 3.
Default	no mon-clock-deviation
Parameters	raise — raises the debounce time <i>debounce-time-r</i> — specifies how much debounce time to raise Values 10 to 100 s, increments of 10 s clear — clears the debounce time <i>debounce-time-c</i> — specifies how much debounce time to clear Values 10 to 100 s, increments of 10 s

mon-data-inactivity

Syntax	mon-data-inactivity {[raise <i>debounce-time-r</i>] [clear <i>debounce-time-c</i>]} no mon-data-inactivity
Context	config>port>serial>rs232 config>port>serial>rs530 config>port>serial>v35 config>port>serial>x21
Description	This command raises or clears the debounce time for monitoring data inactivity. The no form of this command removes the monitoring data inactivity configuration. This command is only supported on the 12-port Serial Data Interface card, version 3.
Default	no mon-data-inactivity
Parameters	raise — raises the debounce time <i>debounce-time-r</i> — specifies how much debounce time to raise Values 10 to 100 s, increments of 10 s

clear — clears the debounce time

debounce-time-c — specifies how much debounce time to clear

Values 10 to 100 s, increments of 10 s

multi-drop

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

Context
 config>port>serial>rs232
 config>port>serial>rs530
 config>port>serial>x21

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, RS-530, or X.21 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.

In a SCADA network, the 7705 SAR provides the communications infrastructure to connect the central masters to multiple RTUs at remote locations, where the masters and RTUs communicate over serial RS-232 and X.21 synchronous or asynchronous links, or serial RS-530 asynchronous links (RS-530 links are only supported on the 12-port Serial Data Interface card, version 3). The 7705 SAR-8 Shelf V2 or 7705 SAR-18 located at the master site contains the Integrated Services card, which provides the MDDB bridge functionality and acts as the MDDB master. Remote 7705 SAR nodes connected to RTUs are referred to as MDDB slaves.

For both master and slave applications, the 7705 SAR must be physically connected to the SCADA device by one of the following:

- a 7705 SAR-8 Shelf V2 or 7705 SAR-18 using the 12-port Serial Data Interface card
- a 7705 SAR-H using the 4-port T1/E1 and RS-232 Combination module (supports RS-232 links only)
- a 7705 SAR-Hc using an on-board RS-232 serial port (supports RS-232 links only)



Note: The 12-port Serial Data Interface card (version 1 and version 2), supports the RS-530/RS-422 interface with the use of an adapter cable that connects to a DB15 connector on the front of the X.21 distribution panel. There is no configuration specifically for the RS-530/RS-422 interface on this card; configuration is done in X.21 mode and applies to the RS-530/RS-422 interface when it is physically enabled through hardware. For information about 12-port Serial Data Interface card adapter cables, see the 7705 SAR Serial Data Interface Card Installation Guide. The 12-port Serial Data Interface card, version 3, supports the RS-530 interface without the need for an adapter cable.

Multidrop data bridge is supported only at subrate speeds (less than 64 kb/s) on X.21 interfaces.

When an RS-232 interface is configured as an MDDB 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).



Note: An X.21 interface configured as an MDDB slave does not change duplex mode; half-duplex is not supported on X.21.

When either an RS-232, RS-530, or X.21 interface is configured as an MDDB master, the duplex mode is automatically set to full-duplex and S-bit signaling is forced off.

Default disabled

Parameters **disabled** — MDDB mode is off
slave — the port is operating as an MDDB slave device
master — the port is operating as an MDDB master device

parity

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

Context config>port>serial>rs232
 config>port>serial>rs530
 config>port>serial>x21

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 is set to 0 or 1 to make the total number of 1s in the set of bits odd
even — the parity bit is 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 is always set to 1
space — the parity bit is present but not used and is always set to 0

report-alarm

Syntax **[no] report-alarm [hcmOof | hcmRai] [ctrlLeadMon] [monClockDev] [monDataInac]**

Context config>port>serial>rs232
 config>port>serial>rs530
 config>port>serial>v35
 config>port>serial>x21

Description This command enables logging of alarms.

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

ctrlLeadMon — reports input control lead monitoring alarm indications (only supported on the 12-port Serial Data Interface card, version 3)

Default input control lead monitoring alarm indications are issued

monClockDev — reports clock deviation monitoring alarm indications (only supported on the 12-port Serial Data Interface card, version 3)

Default clock deviation monitoring alarm indications are issued

monDataInac — reports data inactivity monitoring alarm indications (only supported on the 12-port Serial Data Interface card, version 3)

Default data inactivity monitoring alarm indications are issued

s-bit-signaling

Syntax	s-bit-signaling { on off }
Context	config>port>serial>rs232 config>port>serial>rs530 config>port>serial>x21
Description	<p>This command configures the S-bit signaling option on an RS-232, RS-530, or X.21 interface.</p> <p>For RS-232 interfaces only, if multi-drop is configured as slave or master, the system automatically turns S-bit signaling off. The signaling mode cannot then be changed. If multi-drop is configured as 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.</p> <p>This command is only valid for ports configured for subrate speeds.</p>
Default	on
Parameters	<p>on — enables S-bit signaling</p> <p>off — disables S-bit signaling</p>

socket

Syntax	[no] socket <i>socket-id</i>
Context	config>port>serial>rs232
Description	<p>This command creates a socket on an RS-232 port. When a socket is configured, the RS-232 channel-group command is blocked. If the port is already configured as a channel group before the socket is configured, this command is blocked.</p> <p>The RS-232 port must be in asynchronous mode.</p> <p>The no form of the command deletes the socket from the serial port.</p>
Default	n/a
Parameters	<i>socket-id</i> — specifies the raw socket ID number
Values	1

encap-type

Syntax	encap-type <i>encap-type</i>
Context	config>port>serial>rs232>socket
Description	This command specifies the encapsulation type for a socket. When the encapsulation type is set, then the socket is considered operational and the port can be further configured as an IP transport subservice under an IES or VPRN service. If the serial port has already been configured as an IES or VPRN IP transport subservice, then this command is blocked until the IP transport subservice is deconfigured.
Default	raw
Parameters	<i>encap-type</i> — specifies the encapsulation type to be used with the socket
	Values raw

rx

Syntax	rx
Context	config>port>serial>rs232>socket
Description	This command enables the context to configure parameters for data packets received over a serial port's raw socket.
Default	n/a

eop

Syntax	eop
Context	config>port>serial>rs232>socket>rx
Description	This command enables the context to configure end-of-packet (EOP) parameters for data packets received over the socket.



Note: An end of packet will be declared by whichever EOP condition is encountered first.

Default	n/a
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idle-timeout

Syntax	idle-timeout <i>milliseconds</i>
Context	config>port>serial>rs232>socket>rx>eop
Description	This command specifies how long a serial port can remain idle before an EOP is declared and the packet is sent over the socket.
Default	50 ms
Parameters	<i>milliseconds</i> — specifies the length of time, in milliseconds, that a serial port can remain idle before an EOP is declared
	Values 10 to 5000

length

Syntax	length <i>bytes</i>
Context	config>port>serial>rs232>socket>rx>eop
Description	This command specifies the number of characters (converted to bytes) received on the serial port that triggers the node to encapsulate the characters in an IP transport packet and send it over an IES or VPRN service.
Default	1500
Parameters	<i>bytes</i> — the number of characters (in bytes) to trigger sending an IP transport packet
	Values 1 to 1500

special-char

Syntax	special-char <i>value</i> no special-char
Context	config>port>serial>rs232>socket>rx>eop
Description	This command specifies a special character that, if received on the serial port, declares an EOP and triggers the node to encapsulate previously received queued characters in an IP transport packet and send it over an IES or VPRN service.



Note: Other than declaring the EOP, the special character is otherwise treated as regular data; that is, it is added to the packet.

The **no** form of the command disables checking for a special character.

Default	no special-char
Parameters	<i>value</i> — specifies the special character, in a decimal or hexadecimal format, that triggers end of packet
Values	0 to 255, or 0x00 to 0xFF

squelch-delay

Syntax	squelch-delay <i>seconds</i> no squelch-delay
Context	config>port>serial>rs232>socket>rx
Description	This command specifies how long a serial port can receive a continuous data stream before an alarm is raised indicating that the serial port has locked up and triggering the squelching function. The no form of the command disables the squelching function on the serial port.
Default	no squelch-delay
Parameters	<i>seconds</i> — the number of seconds that a serial port can receive data before the squelching function is triggered
Values	1 to 120

squelch-reset

Syntax	squelch-reset
Context	config>port>serial>rs232>socket>rx
Description	This command allows an operator to manually clear squelching on a serial port's raw socket without having to configure a time limit on the squelching function. Squelching can also be set to clear automatically after a time limit has been reached with the unsquelch-delay command.
Default	n/a

unsquelch-delay

Syntax	unsquelch-delay <i>seconds</i> no unsquelch-delay
Context	config>port>serial>rs232>socket>rx
Description	This command clears squelching on a raw socket by setting a limit on the amount of time that squelching can remain active on the port. When the time limit is reached, the auto-clear function is enabled and the serial port's raw socket is put back into a normal state. Squelching can also be cleared manually with the squelch-reset command. The no form of the command disables the auto-clear function on a serial port.
Default	no unsquelch-delay
Parameters	<i>seconds</i> — the number of seconds before the auto-clear function is activated
	Values 1 to 120

tx

Syntax	tx
Context	config>port>serial>rs232>socket
Description	This command enables the context to configure parameters for data packets transmitted over a serial port's raw socket.

inter-session-delay

Syntax	inter-session-delay <i>milliseconds</i>
Context	config>port>serial>rs232>socket>tx
Description	This command specifies a time delay that the node inserts between a session's data that is being transmitted over a serial port and the next queued session's data. The next session's data is not sent until the current session's data is sent and the inter-session-delay is reached.
Default	10 ms
Parameters	<i>milliseconds</i> — the time delay, in milliseconds, between a session's data that is being transmitted over a serial port and the next queued session's data
	Values 0 to 5000

speed

Syntax	speed { 600 1200 2400 4800 8000 9600 14400 16000 19200 24000 32000 38400 56000 57600 64k 115200 }
Context	config>port>serial>rs232
Description	<p>This command configures the speed of the interface. The speed also determines the DS0 timeslots assigned to the channel group.</p> <p>RS-232 interfaces that are functioning as raw sockets support speeds up to 115 200 b/s but do not support 56 000 b/s.</p> <p>RS-232 interfaces that are not functioning as raw sockets support speeds up to 56 000 b/s.</p> <p>Speeds of 56 000 b/s and greater are only supported if the device-mode is synchronous (with the exception of raw sockets).</p> <p>The following speeds are supported only on RS-232 interfaces on the 12-port Serial Data Interface card, version 3; 8000, 14400, 16000, 24000, 32000, and 64k.</p>
Default	9600
Parameters	<p>600 — sets the link speed to 600 b/s</p> <p>1200 — sets the link speed to 1200 b/s</p> <p>2400 — sets the link speed to 2400 b/s</p> <p>4800 — sets the link speed to 4800 b/s</p> <p>8000 — sets the link speed to 8000 b/s (only on RS-232 interfaces on the 12-port Serial Data Interface card, version 3)</p> <p>9600 — sets the link speed to 9600 b/s</p> <p>14400 — sets the link speed to 14 400 b/s (only on RS-232 interfaces on the 12-port Serial Data Interface card, version 3)</p> <p>16000 — sets the link speed to 16 000 b/s (only on RS-232 interfaces on the 12-port Serial Data Interface card, version 3)</p> <p>19200 — sets the link speed to 19 200 b/s</p> <p>24000 — sets the link speed to 24 000 b/s (only on RS-232 interfaces on the 12-port Serial Data Interface card, version 3)</p> <p>32000 — sets the link speed to 32 000 b/s (only on RS-232 interfaces on the 12-port Serial Data Interface card, version 3)</p> <p>38400 — sets the link speed to 38 400 b/s</p> <p>56000 — sets the link speed to 56 000 b/s (not supported on RS-232 raw sockets)</p> <p>57600 — sets the link speed to 57 600 b/s (supported on RS-232 raw sockets only)</p> <p>64k — sets the link speed to 64 kb/s (only on RS-232 interfaces on the 12-port Serial Data Interface card, version 3)</p>

115200 — sets the link speed to 115 200 b/s (supported on RS-232 raw sockets only)

speed

Syntax	speed { 600 1200 2400 4800 8000 9600 14400 16000 19200 32000 38400 56000 64k 128k 192k 256k 288k 336k 384k 512k 640k 704k 768k 896k 1024k 1152k 1280k 1344k 1408k 1536k 1664k 1792k 1920k 2048k 3072k 4096k 5120k 6144k 7168k 8192k 9216k 10240k 11264k 12288k 13312k 14336k 15360k 16384k }
Context	config>port>serial>rs530
Description	This command configures the speed of the interface. The speed also determines the DS0 timeslots assigned to the channel group. Speeds of 56 000 b/s and greater are only supported if the device-mode is synchronous.
Default	64k
Parameters	<p>600 — sets the link speed to 600 b/s</p> <p>1200 — sets the link speed to 1200 b/s</p> <p>2400 — sets the link speed to 2400 b/s</p> <p>4800 — sets the link speed to 4800 b/s</p> <p>8000 — sets the link speed to 8000 b/s</p> <p>9600 — sets the link speed to 9600 b/s</p> <p>14400 — sets the link speed to 14 400 b/s</p> <p>16000 — sets the link speed to 16 000 b/s</p> <p>19200 — sets the link speed to 19 200 b/s</p> <p>32000 — sets the link speed to 32 000 b/s</p> <p>38400 — sets the link speed to 38 400 b/s</p> <p>56000 — sets the link speed to 56 000 b/s</p> <p>64k — sets the link speed to 64 kb/s</p> <p>128k — sets the link speed to 128 kb/s</p> <p>192k — sets the link speed to 192 kb/s</p> <p>256k — sets the link speed to 256 kb/s</p> <p>288k — sets the link speed to 288 kb/s</p> <p>336k — sets the link speed to 336 kb/s</p> <p>384k — sets the link speed to 384 kb/s</p> <p>512k — sets the link speed to 512 kb/s</p>

640k — sets the link speed to 640 kb/s
704k — sets the link speed to 704 kb/s
768k — sets the link speed to 768 kb/s
896k — sets the link speed to 896 kb/s
1024k — sets the link speed to 1024 kb/s
1152k — sets the link speed to 1152 kb/s
1280k — sets the link speed to 1280 kb/s
1344k — sets the link speed to 1344 kb/s
1408k — sets the link speed to 1408 kb/s
1536k — sets the link speed to 1536 kb/s
1664k — sets the link speed to 1664 kb/s
1792k — sets the link speed to 1792 kb/s
1920k — sets the link speed to 1920 kb/s
2048k — sets the link speed to 2048 kb/s
3072k — sets the link speed to 3072 kb/s
4096k — sets the link speed to 4096 kb/s
5120k — sets the link speed to 5120 kb/s
6144k — sets the link speed to 6144 kb/s
7168k — sets the link speed to 7168 kb/s
8192k — sets the link speed to 8192 kb/s
9216k — sets the link speed to 9216 kb/s
10240k — sets the link speed to 10 240 kb/s
11264k — sets the link speed to 11 264 kb/s
12288k — sets the link speed to 12 288 kb/s
13312k — sets the link speed to 13 312 kb/s
14336k — sets the link speed to 14 336 kb/s
15360k — sets the link speed to 15 360 kb/s
16384k — sets the link speed to 16 384 kb/s

speed

Syntax	speed { 56k 64k 128k 192k 256k 384k 512k 640k 768k 896k 1024k 1152k 1280k 1334k 1408k 1536k 1664k 1792k 1920k 2048k 4096k 5120k 7168k }
Context	config>port>serial>v35
Description	This command configures the speed of the interface. The speed also determines the DS0 timeslots assigned to the channel group. The following speeds are supported only on V.35 interfaces on the 12-port Serial Data Interface card, version 3; 56k , 192k , 1334k , 2048k , 4096k , 5120k , and 7168k .
Default	64k
Parameters	<p>56k — sets the link speed to 56 kb/s (only on V.35 interfaces on the 12-port Serial Data Interface card, version 3)</p> <p>64k — sets the link speed to 64 kb/s</p> <p>128k — sets the link speed to 128 kb/s</p> <p>192k — sets the link speed to 192 kb/s (only on V.35 interfaces on the 12-port Serial Data Interface card, version 3)</p> <p>256k — sets the link speed to 256 kb/s</p> <p>384k — sets the link speed to 384 kb/s</p> <p>512k — sets the link speed to 512 kb/s</p> <p>640k — sets the link speed to 640 kb/s</p> <p>768k — sets the link speed to 768 kb/s</p> <p>896k — sets the link speed to 896 kb/s</p> <p>1024k — sets the link speed to 1024 kb/s</p> <p>1152k — sets the link speed to 1152 kb/s</p> <p>1280k — sets the link speed to 1280 kb/s</p> <p>1334k — sets the link speed to 1334 kb/s (only on V.35 interfaces on the 12-port Serial Data Interface card, version 3)</p> <p>1408k — sets the link speed to 1408 kb/s</p> <p>1536k — sets the link speed to 1536 kb/s</p> <p>1664k — sets the link speed to 1664 kb/s</p> <p>1792k — sets the link speed to 1792 kb/s</p> <p>1920k — sets the link speed to 1920 kb/s</p> <p>2048 — sets the link speed to 2048 kb/s (only on V.35 interfaces on the 12-port Serial Data Interface card, version 3)</p>

4096k — sets the link speed to 4096 kb/s (only on V.35 interfaces on the 12-port Serial Data Interface card, version 3)

5120k — sets the link speed to 5120 kb/s (only on V.35 interfaces on the 12-port Serial Data Interface card, version 3)

7168k — sets the link speed to 7168 kb/s (only on V.35 interfaces on the 12-port Serial Data Interface card, version 3)

speed

Syntax	speed { 1200 2400 4800 9600 19200 38400 56000 64k 128k 256k 384k 512k 640k 768k 896k 1024k 1152k 1280k 1408k 1536k 1664k 1792k 1920k 2048k }
Context	config>port>serial>x21
Description	<p>This command configures the speed of the interface. The speed also determines the DS0 timeslots assigned to the channel group.</p> <p>Speeds of 56 000 b/s and greater are only supported if the device-mode is synchronous.</p> <p>The 2048 kb/s value is supported only on X.21 interfaces on the 12-port Serial Data Interface card, version 3.</p>
Default	64k
Parameters	<p>1200 — sets the link speed to 1200 b/s</p> <p>2400 — sets the link speed to 2400 b/s</p> <p>4800 — sets the link speed to 4800 b/s</p> <p>9600 — sets the link speed to 9600 b/s</p> <p>19200 — sets the link speed to 19 200 b/s</p> <p>38400 — sets the link speed to 38 400 b/s</p> <p>56000 — sets the link speed to 56 000 b/s</p> <p>64k — sets the link speed to 64 kb/s</p> <p>128k — sets the link speed to 128 kb/s</p> <p>256k — sets the link speed to 256 kb/s</p> <p>384k — sets the link speed to 384 kb/s</p> <p>512k — sets the link speed to 512 kb/s</p> <p>640k — sets the link speed to 640 kb/s</p> <p>768k — sets the link speed to 768 kb/s</p> <p>896k — sets the link speed to 896 kb/s</p>


- 1024k** — sets the link speed to 1024 kb/s
- 1152k** — sets the link speed to 1152 kb/s
- 1280k** — sets the link speed to 1280 kb/s
- 1408k** — sets the link speed to 1408 kb/s
- 1536k** — sets the link speed to 1536 kb/s
- 1664k** — sets the link speed to 1664 kb/s
- 1792k** — sets the link speed to 1792 kb/s
- 1920k** — sets the link speed to 1920 kb/s
- 2048k** — sets the link speed to 2048 kb/s (only supported on X.21 interfaces on the 12-port Serial Data Interface card, version 3)

stop-bits

Syntax	stop-bits {1 2}
Context	config>port>serial>rs232 config>port>serial>rs530 config>port>serial>x21
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

3.13.2.16 RS-232, RS-530, V.35, and X.21 Channel Group Commands

channel-group

Syntax	[no] channel-group <i>channel-group-id</i>
Context	config>port>serial>rs232>channel-group config>port>serial>rs530>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, RS-530, V.35, or X.21 circuit. RS-530 channel groups are only supported on the 12-port Serial Data Interface card, version 3.
	Note: When a socket is configured using the socket command, the RS-232 channel-group command is blocked.
	Channel groups cannot be further subdivided. The no form of this command deletes the specified channel group.
Default	n/a
Parameters	<i>channel-group-id</i> — specifies the channel group ID number
	Values RS-232: 1 RS-530: 1 V.35: 1 X.21: 1

crc

Syntax	crc {16 32}
Context	config>port>serial>rs232>channel-group config>port>serial>v35>channel-group config>port>serial>x21>channel-group
Description	This command configures the precision of the cyclic redundancy check. The command is valid only if the encap-type is frame-relay or ipcp .
Default	16

- Parameters** **16** — a 16-bit checksum is used for the channel group
32 — a 32-bit checksum is used for the channel group

encap-type

- Syntax** **encap-type {cem | ipcp | frame-relay | hdlc | cisco-hdlc}**
no encap-type
- Context** config>port>serial>rs232>channel-group
config>port>serial>rs530>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.
- When **encap-type** is specified, the channel group must be deleted before **encap-type** can be changed.
- The **frame-relay**, **ipcp**, **hdlc**, and **cisco-hdlc** encapsulation types are not supported on RS-232 or RS-530 interfaces or on ports with substrate speeds (below 64 kb/s). For RS-232 and RS-530 interfaces, only **cem** is supported.
- The **no** form of this command restores the default value.
- Default** no encap-type
- Parameters** **cem** — specifies the encapsulation type as circuit emulation mode
frame-relay — specifies the encapsulation type as frame relay mode
ipcp — specifies the encapsulation type as ipcp mode for a PPP channel group in access mode
hdlc — specifies the encapsulation type as hdlc mode
cisco-hdlc — specifies the encapsulation type as cisco-hdlc mode

idle-cycle-flag

- Syntax** **idle-cycle-flag {flags | ones}**
no idle-cycle-flag
- Context** config>port>serial>v35>channel-group
config>port>serial>x21>channel-group
- Description** This command defines the value to be transmitted by the channel group during its idle cycle. The command is valid only if the **encap-type** is **frame-relay** or **ipcp**.
- Default** flags

- Parameters** **flags** — defines the 8-bit value to be transmitted as 01111110
ones — defines the 8-bit value to be transmitted as 11111111

idle-payload-fill

- Syntax** **idle-payload-fill** {**all-ones** | **pattern**}
no idle-payload-fill
- Context** config>port>serial>rs232>channel-group
config>port>serial>rs530>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 accepted in decimal, hex or binary format, from 0 to 255

mode

- Syntax** **mode** {**access** | **network**}
- Context** config>port>serial>rs232>channel-group
config>port>serial>rs530>channel-group
config>port>serial>v35>channel-group
config>port>serial>x21>channel-group
- Description** This command configures a channel group for access mode or network operation. Only access mode is supported on serial channels; 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.
- Default** access
- Parameters** **access** — configures the serial channel as service access
network — configures the serial channel for transport network use

mtu

Syntax	mtu { <i>mtu-bytes</i> } no mtu
Context	config>port>serial>v35>channel-group config>port>serial>x21>channel-group
Description	This command defines the maximum MTU size that the channel group can support. The command is valid only if the encap-type is frame-relay or ipcp .
Default	1514 for frame relay 1502 for ipcp
Parameters	<i>mtu-bytes</i> — 578 to 2090

ppp

Syntax	[no] ppp
Context	config>port>serial>v35>channel-group config>port>serial>x21>channel-group
Description	This command enables access to the context to configure the LCP operational parameters for a V.35 or X.21 channel group. This command is available only if the encap-type is set to ipcp and therefore does not apply to RS-232 ports or to X.21 ports configured for subrate speeds. The no form of the command removes the LCP operational parameters.
Default	no ppp

keepalive

Syntax	keepalive <i>time-interval</i> [dropcount <i>drop-count</i>] no keepalive
Context	config>port>serial>v35>channel-group>ppp config>port>serial>x21>channel-group>ppp
Description	This command enables the sending of keepalive messages and configures the time between messages and how many messages can be missed before the link is brought down. The no form of this command disables the sending of keepalive messages.
Default	keepalive 10 dropcount 3

Parameters *time-interval* — the time, in seconds, between keepalive messages

Values 1 to 60

drop-count — the number of consecutive failed keepalive request attempts or remote replies that can be missed before the link is operationally brought down

Values 1 to 255

3.13.2.17 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/OC12 or STM1/STM4 port on an appropriate adapter card. SONET/SDH ports can be configured on the following adapter cards: <ul style="list-style-type: none"> • 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card • 4-port OC3/STM1 Clear Channel Adapter Card • 2-port OC3/STM1 Channelized 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. The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card does not support loop timing. 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. Changing the framing mode on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card causes the adapter card to reset.
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 or a 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.
- Default** n/a
- Parameters**
- sonet-sdh-index* — specifies the group index for the port on the 2-port OC3/STM1 Channelized Adapter card or 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card configured for OC3. When configured for OC12, the *sonet-sdh-index* specifies the **tug3-index**, where *index* is from 1 to 3.
 - tu3** — specifies the tributary unit group (TUG3) on a path and configures the port or channel for transport network use (supported only on the 2-port OC3/STM1 Channelized Adapter card)
 - vt2** — configures the path as a VT2 type virtual tributary group
 - vt15** — configures the path as a VT1.5 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. Once implemented, subsequent transitions of the interface from one state to another are not advertised to upper layer protocols until the configured timer has expired.
- Default** no hold-time
- Parameters**
- hold-time-up* — 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* — 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	<p>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.</p> <p>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.</p>

report-alarm

Syntax	[no] report-alarm [loc] [lais] [lrdi] [ss1f] [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. When configured, logging is enabled for the raising and clearing of the specified alarms. The no form of this command disables logging of the specified alarms.
Parameters	<p>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</p> <p>lais — reports line alarm indication signal errors Default line alarm indication signal alarms are not issued</p> <p>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. Default line remote defect indication alarms are issued</p>

ss1f — reports section synchronization failure, which is detected when the S1 byte is not consistent for eight consecutive frames. When configured, ss1f alarms are raised and cleared. Although this option is shown on the CLI, it is not available for use on the 7705 SAR.

Default section synchronization failure alarms are not issued

lb2er-sd — reports line signal degradation BER (bit interleaved parity) errors

Default line signal degradation BER alarms are not issued

lb2er-sf — reports line signal failure BER errors

Default line signal failure BER alarms are issued

slof — reports section loss of frame errors

Default section loss of frame alarms are issued

slos — reports a section loss of signal error on the transmit side

Default section loss of signal alarms are issued

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

Default line error alarms 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.

The **increment-z0** parameter is not supported on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.

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 oc12 }
Context	config>port>sonet-sdh
Description	<p>This command configures the speed of a SONET/SDH port.</p> <p>Although the oc3 option is shown in the CLI, it is not configurable. And, although the oc12 option is shown in the CLI, it is not available for use on the 7705 SAR. Users can change between oc3 and oc12 on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card by using the mda-mode keyword in the config>card>mda context and selecting either the p4-oc3 or p1-oc12 option. The adapter card automatically reboots to make the change.</p> <p>The no form of this command reverts to the default value.</p>
Default	oc3
Parameters	<p>oc3 — sets the speed of the port to OC3</p> <p>oc12 — sets the speed of the port to OC12 (not available on the 7705 SAR)</p>

threshold

Syntax	threshold { ber-sd ber-sf } rate <i>threshold-rate</i> no threshold { ber-sd ber-sf }
Context	config>port>sonet-sdh
Description	<p>This command configures the line signal (b2) degradation bit error rate (BER) and line signal failure thresholds.</p> <p>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.</p> <p>The no form of this command reverts to the default value.</p>
Default	<p>threshold ber-sd 6 - signal degrade BER threshold of 10⁻⁶</p> <p>threshold ber-sf 3 - signal failure BER threshold of 10⁻³</p>
Parameters	<p>ber-sd — specifies the BER for signal degradation</p> <p>ber-sf — specifies the BER for signal failure</p> <p><i>threshold-rate</i> — specifies the BER negative exponent (n in 10⁻ⁿ), expressed as a decimal integer</p> <p>Values 3 to 9 (10⁻³ to 10⁻⁹)</p>

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

3.13.2.18 SONET/SDH Path Commands

path

Syntax	<code>[no] path [sonet-sdh-index]</code>
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 is specified
Parameters	<p><i>sonet-sdh-index</i> — specifies the components making up the SONET/SDH path. Depending on the SONET/SDH adapter card and the type of SONET/SDH port, the <i>sonet-sdh-index</i> must specify one or more path indexes to identify the payload location of the path. The CLI uses the same <i>sonet-sdh-index</i> syntax nomenclature to configure SONET and SDH paths.</p> <p>In addition, the support of virtual tributary circuits adds another level of complexity and several levels of indexes, which means that one or more path commands may be needed to set up the container in the path.</p> <p>On the 4-port OC3/STM1 Clear Channel Adapter card, <i>sonet-sdh-index</i> is optional; if used, the value must be sts3.</p> <p>Values sts12, sts3, sts1, tu3, vt2, vt15 <i>sonet-sdh-index</i></p> <p>See SONET/SDH Channelized Port ID, Configuring SONET/SDH Port Parameters and SONET/SDH Channelized Port Configuration Examples for more information and examples.</p>

crc

Syntax	<code>crc {16 32}</code>
Context	config>port>sonet-sdh>path
Description	This command specifies a cyclic redundancy check on a SONET/SDH path on a SONET/SDH port.
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	<p>16 — specifies that a 16-bit checksum be used for the associated port/channel</p> <p>32 — specifies that a 32-bit checksum be used for the associated port/channel</p>

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 SONET/SDH port.

The **encap-type** of **atm** is used for access mode (4-port OC3/STM1 Clear Channel Adapter card and 2-port OC3/STM1 Channelized Adapter card), and the **encap-type** of **ppp-auto** is used for network mode (4-port OC3/STM1 / 1-port OC12/STM4 Adapter card).

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

When **encap-type** is **atm**, ATM sublayer verification specified in GR-1248-CORE, *Generic Requirements for Operations of ATM Network Elements*, 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	<p>atm — specifies that the encapsulation on the port is ATM</p> <p>ppp-auto — enables PPP on the associated port or channel. The activation of IPCP and MPLSCP is automatic depending on the protocol configuration.</p>

mode

Syntax	mode { access network }
Context	config>port>sonet-sdh>path
Description	<p>This command configures the mode of operation for a SONET/SDH port or channel on a 4-port OC3/STM1 Clear Channel Adapter card or 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.</p> <p>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 on the 4-port OC3/STM1 Clear Channel Adapter card is configured for access mode, the encap-type must be set to atm. The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card does not support ATM when configured for access mode.</p> <p>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.</p> <p>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:</p> <pre>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#</pre>
Default	access
Parameters	<p>access — configures the port or channel for access mode</p> <p>network — configures the port or channel for network mode</p>

mtu

Syntax	mtu <i>mtu</i> no mtu
Context	config>port>sonet-sdh>path
Description	<p>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 Services Guide, “Global Service Command Reference”, for information on configuring the path MTU.</p> <p>The no form of this command restores the default value.</p>

Default	1524 (for access mode) 1572 (for network mode)
Parameters	<i>mtu</i> — sets the maximum allowable size of the MTU, expressed as an integer
Values	578 to 2090 (in bytes)

payload

Syntax	payload { sts12 sts3 tug3 ds3 e3 vt2 vt15 ds1 e1 }
Context	config>port>sonet-sdh>path
Description	This command configures the SONET/SDH path on a channelized adapter card (2-port OC3/STM1 Channelized Adapter card or 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card) as an asynchronous circuit or a virtual tributary group.
Default	n/a
Parameters	<p>sts12 — configures the STS12/STM4 (OC12/OC3) payload as clear channel</p> <p>sts3 — configures the STS3/STM1 payload as clear channel</p> <p>tug3 — configures the STS3/STM1 payload as tributary unit group 3 (TUG3)</p> <p>ds3 — configures the port or channel as D3 STS1/VC3</p> <p>e3 — configures the VC3 payload as E3</p> <p>vt2 — configures the STS1 payload as virtual tributary group 2</p> <p>vt15 — configures the path as virtual tributary group 1.5</p> <p>ds1 — configures the port or channel VT1.5 or VT2 payload as DS1</p> <p>e1 — configures the VT2 payload as E1</p>

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 <i>time-interval</i> [dropcount <i>drop-count</i>] 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	<i>time-interval</i> — the time interval, in seconds, that echo requests are issued Values 1 to 60 Default 10 <i>drop-count</i> — 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] [plcd]
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 alarms are raised but not cleared. Default path loss of pointer alarms 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 alarms are raised but not cleared.

Default path payload mismatch alarms 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 alarms are raised but not cleared. (This parameter is not supported on the 4-port OC3/STM1 card.)

Default path error alarms are not issued

puneq — reports path unequipped errors

Default path unequipped alarms are issued

plcd — reports path loss of code group delineation errors. It is applicable only when the value of **xgig** is set to WAN. Although this option is shown on the CLI, it is not available for use on the 7705 SAR.

Default path loss of code traps are not 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 x^43+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 <i>value</i> 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	<i>value</i> — 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 [<i>trace-string</i>] no trace-string
Context	config>port>sonet-sdh>path
Description	This command specifies the path trace identifier for the circuit that is continuously inserted at source. This identifier corresponds to J1 or J2 in the SONET/SDH overhead, depending on the associated path. 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 path trace value is ALU 7705 SAR. The value does not change when the encap-type changes. The path trace string contains all zeros for a non-provisioned path.
Parameters	<i>trace-string</i> — 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

3.13.2.19 Network Port Commands

network

Syntax	network
Context	config>port>ethernet config>port>sonet-sdh>path config>port>tdm>ds1>channel-group config>port>tdm>ds3 config>port>tdm>e1>channel-group config>port>tdm>e3
Description	This command enables access to the context to configure network port parameters.
Default	n/a

accounting-policy

Syntax	accounting-policy <i>policy-id</i> no accounting-policy
Context	config>port>ethernet>network config>port>sonet-sdh>path>network config>port>tdm>ds1>channel-group>network config>port>tdm>ds3>network config>port>tdm>e1>channel-group>network config>port>tdm>e3>network
Description	<p>This command configures an accounting policy that can apply to an interface.</p> <p>An accounting policy must be configured before it can be associated to an interface. If the accounting <i>policy-id</i> does not exist, an error is returned.</p> <p>Accounting policies associated with service billing can only be applied to SAPs. Accounting policies associated with network ports can only be associated with interfaces. Only one accounting policy can be associated with an interface at a time.</p> <p>No accounting policies are specified by default. You must explicitly specify a policy. If configured, the accounting policy configured as the default under the config>log>accounting-policy>default command is used.</p> <p>The no form of this command removes the accounting policy association from the network interface, and the accounting policy reverts to the default.</p>
Default	n/a

Parameters	<i>policy-id</i> — specifies the accounting <i>policy-id</i> of an existing policy. Accounting policies record either service (access) or network information. A network accounting policy can only be associated with the network port configurations. Accounting policies are configured in the config>log>accounting-policy context.
Values	1 to 99

collect-stats

Syntax	[no] collect-stats
Context	config>port>ethernet>network config>port>sonet-sdh>path>network config>port>tdm>ds1>channel-group>network config>port>tdm>ds3>network config>port>tdm>e1>channel-group>network config>port>tdm>e3>network
Description	This command enables the collection of accounting and statistical data for the network interface. When applying accounting policies, the data, by default, is collected in the appropriate records and written to the designated billing file. When the no collect-stats command is issued, the statistics are still accumulated by the adapter cards. However, the CPU does not obtain the results and write them to the billing file. If the collect-stats command is issued again (enabled), then the counters written to the billing file will include the traffic collected while the no collect-stats command was in effect.
Default	no collect-stats

egress

Syntax	egress
Context	config>port>ethernet>network
Description	This command enables access to the context to assign network egress parameters.
Default	n/a

shaper-policy

Syntax	shaper-policy <i>name</i> no shaper-policy
Context	config>port>ethernet>network>egress
Description	This command assigns a shaper policy to the specified port.

The shaper policy defines shaper parameters such as shaper group, and PIR and CIR rates. The shaper policy is defined in the **config>qos>shaper-policy** context. Refer to the 7705 SAR Quality of Service Guide, “QoS for Hybrid Ports”, for more information.



Note:

- The port shaper rate applies to the bulk of access and network traffic. Thus, once the configured egress shaper rate is reached, both the access and network traffic scheduling pauses.
- For hybrid ports, there can be a single shaper policy on access egress and a single shaper policy on network egress. Therefore, all the SAP traffic and all the network traffic is each bound to its own shaper group in the shaper policy (access and network shaper policy, respectively). In other words, shaped SAPs and the bulk/aggregate of unshaped SAPs are shaped together as per the shaper policy assigned to the access egress. A similar behavior applies to network traffic, where the shaped interfaces and the bulk/aggregate of unshaped interfaces are shaped together as per the shaper policy assigned to the network egress.

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

Default “default”

Parameters *name* — specifies an existing shaper policy name

unshaped-if-cir

Syntax **unshaped-if-cir** *cir-rate*
no unshaped-if-cir

Context config>port>ethernet>network>egress

Description This command sets the CIR rate for the aggregate of all the unshaped VLANs (that is, network interfaces) on the port. The default *cir-rate* is 0 kb/s. When the *cir-rate* is set to **max**, the CIR rate adopts the maximum rate of the port. The actual rate of the port is dictated by the physical port speed, which can be overwritten by the [egress-rate sub-rate](#) command.

If the *cir-rate* is higher than the *sub-rate*, the *cir-rate* is stored in the configuration database but the *sub-rate* limit is used.

On Gen-3 hardware, the *cir-rate* for this command can be configured and is applied but has no effect on the network port, except for network traffic in hybrid mode, where the *cir-rate* value has an effect.

On the 8-port Ethernet Adapter card, shaped and unshaped VLANs are arbitrated towards the port but the [egress-rate](#) cannot be enabled.

The **no** form of the command sets the **unshaped-if-cir** CIR rate to 0 kb/s.

Default	no unshaped-if-cir
Parameters	<i>cir-rate</i> — the CIR rate for the aggregate of all the unshaped VLANs on the port
Values	0 to 10000000 kb/s, or max
Default	0 kb/s

queue-policy

Syntax	queue-policy <i>name</i> no queue-policy
Context	config>port>ethernet>network config>port>sonet-sdh>path>network config>port>tdm>ds1>channel-group>network config>port>tdm>ds3>network config>port>tdm>e1>channel-group>network config>port>tdm>e3>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 FC-to-queue mappings. The network queue policy is defined in the config>qos>network-queue context. Refer to the 7705 SAR Quality of Service Guide, “Network Queue QoS Policies”, for more information. The no form of this command reverts to the default.
Default	“default”
Parameters	<i>name</i> — specifies an existing network queue policy name

scheduler-mode

Syntax	scheduler-mode { profile 4-priority 16-priority }
Context	config>port>ethernet>network
Description	This command selects the network-side scheduling option for the following: <ul style="list-style-type: none"> • 8-port Ethernet Adapter card • 8-port Gigabit Ethernet Adapter card • Packet Microwave Adapter card • 10-port 1GigE/1-port 10GigE X-Adapter card • 2-port 10GigE (Ethernet) Adapter card • 2-port 10GigE (Ethernet) module • Ethernet ports on the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-M, 7705 SAR-W, and 7705 SAR-Wx

On the 6-port Ethernet 10Gbps Adapter card and the 7705 SAR-X, **scheduler-mode** is permanently set to support 4-priority and is not user-configurable.

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



Note: 16-priority is the default scheduling option on the 8-port Gigabit Ethernet Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card, 2-port 10GigE (Ethernet) Adapter card, 2-port 10GigE (Ethernet) module, Packet Microwave Adapter card, 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, and 7705 SAR-Wx Ethernet ports. These cards, modules, and ports support 16-priority scheduling, but not profiled or 4-priority scheduling. In addition, 16-priority scheduling is not supported on the 8-port Ethernet card. For information on 16-priority scheduling, refer to the 7705 SAR Quality of Service Guide, “QoS Policies”.

Default profile —8-port Ethernet Adapter card

16-priority —8-port Gigabit Ethernet Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card, 2-port 10GigE (Ethernet) Adapter card, 2-port 10GigE (Ethernet) module, Packet Microwave Adapter card, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-M, 7705 SAR-W, and 7705 SAR-Wx Ethernet ports (cannot be changed)

Parameters **profile** — sets the profiled scheduling option for the 8-port Ethernet Adapter card

4-priority — sets the 4-priority scheduling option for the 8-port Ethernet Adapter card

16-priority — sets the 16-priority scheduling option for the 8-port Gigabit Ethernet Adapter card, 10-port 1GigE/1-port 10GigE X-Adapter card, 2-port 10GigE (Ethernet) Adapter card, 2-port 10GigE (Ethernet) module, Packet Microwave Adapter card, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-M, 7705 SAR-W, and 7705 SAR-Wx Ethernet ports

3.13.2.20 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 enables the context to configure bundle properties for this bundle port.
Default	n/a

fragment-threshold

Syntax	fragment-threshold <i>fragment-threshold</i> 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	<i>fragment-threshold</i> — 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 bytes (IMA)

member

Syntax	[no] member <i>port-id</i>
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.

The following lists the cards, modules, and platforms that support multilink bundles and the number of channel groups on the network and/or access side that can be bound to an MLPPP bundle:

- T1/E1 ports on the 7705 SAR-A
Network: 8 Access: 8
- T1/E1 ports on the 7705 SAR-M
Network: 16 Access: 8
- T1/E1 ports on the 7705 SAR-X
Network: 8 Access: 8

The following must have all member links of an MLPPP bundle configured on the same card or module:

- 16-port T1/E1 ASAP Adapter card
Network: 16 Access: 8
- 32-port T1/E1 ASAP Adapter card
Network: 16 Access: 8
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)
Network: 2 Access: 2

The following must have all member links of an MLPPP bundle configured on the same card or module, and on the same port:

- 2-port OC3/STM1 Channelized Adapter card
Network: 8 Access: 8
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
Network: 8 Access: 8

The following lists the cards, modules, and platforms that support IMA groups and the number of channel groups on the network and/or access side that can be bound to an IMA group:

- T1/E1 ports on the 7705 SAR-M

IMA: 16

The following must have all member links of an IMA bundle configured on the same card or module:

- 16-port T1/E1 ASAP Adapter card

IMA: 16

- 32-port T1/E1 ASAP Adapter card

IMA: 16

The following must have all member links of an IMA bundle configured on the same card or module, and on the same port:

- 2-port OC3/STM1 Channelized Adapter card

IMA: 8

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 [Table 28](#) lists the minimum link limit values.

Table 28 Minimum Link Limit Values

Port	MLPP Bundles		IMA Bundles
	Access	Network	Access
T1/E1 ports on the 7705 SAR-A	1 to 8	1 to 8	—
T1/E1 ports on the 7705 SAR-M	1 to 8	1 to 16	1 to 16
T1/E1 ports on the 7705 SAR-X	1 to 8	1 to 8	—
T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module (on 7705 SAR-H)	1 to 2	1 to 2	—
DS1/E1 channels on the 2-port OC3/STM1 Channelized Adapter card	1 to 8	1 to 8	1 to 8
4-port OC3/STM1 / 1-port OC12/STM4 Adapter card	—	1 to 8	—
16-port T1/E1 ASAP Adapter card	1 to 8	1 to 16	1 to 16
32-port T1/E1 ASAP Adapter card	1 to 8	1 to 16	1 to 16

mlppp

Syntax mlppp

Context config>port>multilink-bundle

Description This command enables the context to configure MLPPP bundle attributes.

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.

If the **null** option is configured, the 7705 SAR will advertise an endpoint-discriminator class value of NULL in link membership negotiations. If the far-end node rejects the NULL object, the 7705 SAR will remove the object from future requests. The **null** option should only be used if the far-end node cannot support the **ip-address** or **global-mac-address** endpoint-discriminator class options, as these options provide more protection from incorrectly adding a link to an MLPPP bundle.

The **no** form of this command removes the configured parameters.

Parameters	<p>class — specifies the link control protocol endpoint-discriminator class field</p> <p>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)</p> <p><i>discriminator-id</i> — specifies the endpoint-discriminator identifier value within the specified endpoint-discriminator class</p> <p>Values any valid IP address</p>
-------------------	--

magic-number

Syntax	[no] magic-number
Context	config>port>multilink-bundle>mlppp
Description	<p>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.</p> <p>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.</p> <p>The no form of the command disables the loopback detection.</p> <p>Default no magic-number</p>

multiclass

Syntax	multiclass <i>count</i> 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 (for MLPPP)
1500 to 2090 bytes (for PPP)

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	<i>red-diff-delay</i> — the maximum red differential delay value, in milliseconds
Values	0 to 25 ms for MLPPP bundles 2 to 75 ms for IMA bundles on the 16-port T1/E1 ASAP Adapter card or 32-port T1/E1 ASAP Adapter card 2 to 75 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). To transition the circuit back to the up state, the user should shutdown, then no shutdown the channel group.

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 <i>yellow-diff-delay</i> 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. This command and its sub-commands are not saved in the router configuration between reboots.

test-link

Syntax	test-link <i>port-id</i> 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	<i>port-id</i> — the port ID to be used to verify link connectivity within an IMA group

test-pattern

Syntax	test-pattern <i>pattern</i> 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	<i>pattern</i> — 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

3.13.2.21 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>tdm>e3 config>port>sonet-sdh>path
Description	This command enables the context to configure ATM interface properties.

cell-format

Syntax	cell-format <i>cell-format</i> no 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>tdm>e3>atm config>port>sonet-sdh>path>atm
Description	This command configures the ATM cell format. The no form of this command restores the default value.
Default	uni
Parameters	<i>cell-format</i> — 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 no mapping
Context	config>port>tdm>ds3>atm
Description	This command specifies the ATM cell mapping to be used on this DS3 ATM interface. The no form of this command restores the default value.



Note: For an E3 interface, the **mapping** command does not appear in the CLI; the interface is hard-coded for direct mapping.

Default	direct
Parameters	direct — specifies direct cell mapping

min-vp-vpi

Syntax	min-vp-vpi value no min-vp-vpi
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>tdm>e3>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). The no form of this command restores the default value.
Default	0
Parameters	<i>value</i> — 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)

3.13.2.22 TDM Commands

tdm

Syntax	tdm
Context	config>port
Description	<p>This command enables the context to configure:</p> <ul style="list-style-type: none"> • DS1/E1 parameters for a port on a channelized 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, 2-port OC3/STM1 Channelized Adapter card, 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, or 4-port DS3/E3 Adapter card (DS3 ports only) • DS3 parameters for a port on a channelized 2-port OC3/STM1 Channelized Adapter card • DS3/E3 parameters for a port on a 4-port DS3/E3 Adapter card • codirectional and teleprotection interfaces (TPIF) parameters for a port on an 8-port Voice & Teleprotection card • teleprotection interfaces (TPIF) parameters for a port on an 8-port C37.94 Teleprotection card <p>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.</p>
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 or 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)

codir

Syntax	[no] codir
Context	config>port>tdm
Description	This command creates a 64 kb/s codirectional G.703 channel on a port on the 8-port Voice & Teleprotection card. The no form of this command deletes the port's codirectional channel.
Default	n/a

channel-group

Syntax	[no] channel-group <i>channel-group-id</i>
Context	config>port>tdm>codir config>port>tdm>tpif
Description	This command creates a DS0 channel group on a TDM interface on the 8-port Voice & Teleprotection card or 8-port C37.94 Teleprotection card. The no form of this command deletes the port's codirectional or TPIF channel group.
Default	n/a
Parameters	<i>channel-group-id</i> — specifies the channel group ID number
Values	1

encap-type

Syntax	encap-type cem
Context	config>port>tdm>codir>channel-group config>port>tdm>tpif>channel-group
Description	This command specifies the encapsulation type. The channel group must be deleted before changing the encapsulation type.
Default	no encap-type
Parameters	cem — circuit emulation (TDM)

mode

Syntax	mode access
Context	config>port>tdm>codir>channel-group config>port>tdm>tpif>channel-group
Description	This command configures the interface for access mode. An access port or channel is used for customer-facing traffic. A Service Access Point (SAP) can only be configured on an access port or channel. When an interface is configured for access mode, the appropriate encapsulation type must be specified.
Default	access
Parameters	access — configures the port as service access

framing

Syntax	framing {framed unframed} no framing
Context	config>port>tdm>tpif
Description	This command configures framing on a C37.94 port in a TPIF VC. If the VC is configured for unstructured circuit emulation (satop-tpif) (only supported on the 8-port C37.94 Teleprotection card), the framing mode must be set to unframed . The no form of this command removes the configuration.
Default	no framing
Parameters	framed — configures the port for framing unframed — configures the port for unframed mode

loopback

Syntax	loopback {internal line} no loopback
Context	config>port>tdm>codir config>port>tdm>tpif
Description	This command puts the specified interface into a loopback mode. The port must be shut down before loopback mode is enabled. This command is not saved in the system configuration between boots.

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

Default no loopback

Parameters **internal** — places the port or channel into an internal loopback mode. An internal loopback loops the frames from the local router back to the framer.

line — places the port or channel into a line loopback mode. A line loopback loops data received on the port or channel back to the remote end.

report-alarm

Syntax **report-alarm {ais | los | rai}**
no report-alarm

Context config>port>tdm>codir
 config>port>tdm>tpif

Description This command enables logging of codirectional and TPIF alarms for the specified interface or channel.

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

Default ais for codir
 rai for tpif

Parameters **ais** — reports alarm indication signal errors (configurable for codir only)
los — reports loss of signal errors
rai — reports remote alarm indication signal errors (configurable for tpif only)

timing-8k

Syntax [**no**] **timing-8k**

Context config>port>tdm>codir

Description This command enables generation of an 8-kHz signal on a codirectional interface.

Default disabled

ds1

Syntax	[no] ds1 <i>ds1-id</i>
Context	config>port>tdm
Description	<p>This command enables the context to configure DS1 frame parameters on a channelized 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, 2-port OC3/STM1 Channelized Adapter card, 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, or 4-port DS3/E3 Adapter card (DS3 ports only).</p> <p>T1 transmits DS1-formatted data at 1.544 Mb/s through the network.</p> <p>Once a channel has been configured for DS1, 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.</p> <p>The no form of this command deletes the specified DS1 channel.</p>
Default	n/a
Parameters	<p><i>ds1-id</i> — the identifier of the DS1 channel</p> <p>Values DS1 number (1 to 28) <i>ds1-sonet-sdh-index</i></p>

ds3

Syntax	[no] ds3 [<i>sonet-sdh-index</i>]
Context	config>port>tdm
Description	<p>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.</p> <p>DS3 lines carry 28 DS1 signals and a 44.736 Mb/s data rate.</p> <p>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).</p> <p>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.</p>
Default	n/a
Parameters	<p><i>sonet-sdh-index</i> — specifies the components making up the specified SONET/SDH path on the 2-port OC3/STM1 Channelized Adapter card</p>

e1

Syntax	[no] e1 <i>e1-id</i>
Context	config>port>tdm
Description	<p>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, 2-port OC3/STM1 Channelized Adapter card, 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, or 4-port DS3/E3 Adapter card (DS3 ports only). E1 is a standard WAN digital communication format designed to operate over copper facilities at a rate of 2.048 Mb/s.</p> <p>Once a channel has been configured for E1, 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.</p> <p>The no form of this command deletes the specified E1 channel.</p>
Default	n/a
Parameters	<i>e1-id</i> — the identifier of the E1 channel
Values	E1 number (1 to 21) <i>e1-sonet-sdh-index</i>

e3

Syntax	[no] e3 [<i>sonet-sdh-index</i>]
Context	config>port>tdm
Description	<p>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.</p>
Default	n/a
Parameters	<i>sonet-sdh-index</i> — specifies the components making up the specified SONET/SDH path on the 2-port OC3/STM1 Channelized Adapter card

encoding

Syntax	encoding { b8zs ami }
Context	config>port>tdm
Description	<p>This command configures the encoding for the physical DS1 (T1) port. DS1 ports can be configured for either B8ZS (bipolar with eight-zero substitution) zero code suppression or AMI (alternate mark inversion). B8ZS and AMI are line coding techniques.</p>

This command is supported on the following cards and platforms:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 7705 SAR-A (on the variant with T1/E1 ports)
- 7705 SAR-M (on the variants with T1/E1 ports)

Default b8zs

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 **75** — 75 Ω

100 — 100 Ω

120 — 120 Ω

tpif

Syntax	[no] tpif
Context	config>port>tdm
Description	This command creates an IEEE C37.94 teleprotection interface (TPIF) channel. The no form of this command deletes the port's TPIF channel.
Default	n/a

timeslots

Syntax	timeslots <i>timeslots</i>
Context	config>port>tdm>tpif>channel-group
Description	This command defines the list of DS0 timeslots to be used in the TPIF channel group.
Default	1
Parameters	<i>timeslots</i> — specifies the number of consecutive timeslots to be associated with the channel group. The value must start from the first timeslot. It represents line bandwidth of $n \times 64$ kb/s, where n is the number of timeslots. Values 1 to 12

3.13.2.23 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 { loop-timed node-timed adaptive differential }
Context	config>port>tdm>ds1 config>port>tdm>e1
Description	This command specifies the clock source to be used for the link transmit timing. The following can be configured for loop timing and node timing: <ul style="list-style-type: none"> • T1/E1 CES circuits on the 16-port T1/E1 ASAP Adapter card • T1/E1 CES circuits on the 32-port T1/E1 ASAP Adapter card • T1/E1 CES circuits on the 2-port OC3/STM1 Channelized Adapter card • T1/E1 CES circuits on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card • T1/E1 CES circuits on the 4-port DS3/E3 Adapter card The following can be configured for adaptive timing: <ul style="list-style-type: none"> • 16-port T1/E1 ASAP Adapter card • 32-port T1/E1 ASAP Adapter card • T1/E1 ports on the 7705 SAR-M on T1/E1 CES circuits used for TDM pseudowires • T1/E1 ports on the 7705 SAR-X on T1/E1 CES circuits used for TDM pseudowires • T1/E1 ports on the 7705 SAR-A on T1/E1 CES circuits used for TDM pseudowires • T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module

The following can be configured for differential timing:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- T1/E1 channels on the 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
- T1/E1 channels on the DS3 ports on the 4-port DS3/E3 Adapter card (E3 ports cannot be channelized)
- T1/E1 ports on the 7705 SAR-M
- T1/E1 ports on the 7705 SAR-X
- T1/E1 ports on the 7705 SAR-A
- T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module

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 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

- loop-timed** — the link recovers the clock from the received data stream
- node-timed** — the link uses the internal clock when transmitting data
- adaptive** — clocking is derived from the incoming pseudowire packets from the MPLS network
- differential** — clocking is derived from a common clock compared to differential clock recovery (DCR) data in the RTP header in the TDM PW overhead. DCR must also be enabled on the relevant card, module, or chassis with the [clock-mode](#) command.

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 the following:

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

- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
- 4-port DS3/E3 Adapter card (DS3 ports only)
- 4-port T1/E1 and RS-232 Combination module (T1/E1 ports only)

When an unframed DS1 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 the following:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 2-port OC3/STM1 Channelized Adapter card
- 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card
- 4-port DS3/E3 Adapter card (DS3 ports only)
- 4-port T1/E1 and RS-232 Combination module (T1/E1 ports only)

When an unframed E1 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 `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 <i>hold-time-up</i>] [down <i>hold-time-down</i>]} 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. Once implemented, subsequent transitions of the interface from one state to another are not advertised to upper layer protocols until the configured timer has expired.
Default	no hold-time
Parameters	<i>hold-time-up</i> — 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) <i>hold-time-down</i> — 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.
- The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card cannot initiate **fdl-ansi**, **fdl-bellcore**, or **payload-ansi** loopbacks.
- The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card supports up to 16 line loopbacks and 16 internal loopbacks at a time.

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	<p>This command puts the specified port or channel in a loopback mode.</p> <p>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.</p> <p>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.</p> <p>The no form of this command disables the specified type of loopback.</p>
Default	no loopback
Parameters	<p>line — places the associated port or channel into line loopback mode</p> <p>internal — places the associated port or channel into internal loopback mode</p>

remote-loop-respond

Syntax	[no] remote-loop-respond
Context	config>port>tdm>ds1
Description	<p>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.</p> <p> Note: The 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card cannot respond to fdl-ansi, fdl-bellcore, or payload-ansi loopbacks.</p>
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. When configured, logging is enabled for the raising and clearing of the specified alarms. The no form of this command disables logging of the specified alarms.
Parameters	<p>ais — reports alarm indication signal errors Default ais alarms are issued</p> <p>los — reports loss of signal errors Default los alarms are issued</p> <p>oof — reports out-of-frame errors Default oof alarms are not issued</p> <p>rai — reports remote alarm indication signal errors Default rai alarms are not issued</p> <p>looped — reports looped packets errors Default looped alarms are not issued</p> <p>ber-sd — reports BER line signal degradation errors on:</p> <ul style="list-style-type: none"> • the 16-port T1/E1 ASAP Adapter card • the 32-port T1/E1 ASAP Adapter card • T1/E1 ports on the 7705 SAR-M • T1/E1 ports on the 7705 SAR-X • T1/E1 ports on the 7705 SAR-A • T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module <p>Default line signal degradation alarms are not issued</p> <p>ber-sf — reports BER line signal failure errors on:</p> <ul style="list-style-type: none"> • the 16-port T1/E1 ASAP Adapter card • the 32-port T1/E1 ASAP Adapter card • T1/E1 ports on the 7705 SAR-M • T1/E1 ports on the 7705 SAR-X • T1/E1 ports on the 7705 SAR-A • T1/E1 ports on the 4-port T1/E1 and RS-232 Combination module <p>Default line signal failure alarms are not issued</p>

signal-mode

Syntax	signal-mode cas no signal-mode
Context	config>port>tdm>ds1 config>port>tdm>e1
Description	<p>This command enables or disables Channel Associated Signaling (CAS) at the port and circuit levels. When enabled, control signals (such as those for synchronizing and bounding frames) are carried in the same channels as voice and data signals.</p> <p>If the signal mode for a DS1/E1 port or channel is configured for no signal-mode, all DS0/64 kb/s channels within the DS1 or E1 port will not be enabled for CAS. Individual channel groups within that DS1 or E1 port inherit this state and cannot be changed.</p> <p>If the signal mode for a DS1/E1 port or channel is configured for signal-mode cas, any new channel groups default to signal-mode cas.</p> <p>The signal mode must be configured for CAS before creating a Cpipe service that supports T1 or E1 with CAS. Refer to the 7705 SAR Services Guide, "Creating a Cpipe Service", for information on configuring a Cpipe service.</p> <p>This command is valid only on the following cards and platforms when DS1 framing is set to esf or sf, or E1 framing is set to g704 or no-crc-g704:</p> <ul style="list-style-type: none"> • 16-port T1/E1 ASAP Adapter card • 32-port T1/E1 ASAP Adapter card • 2-port OC3/STM1 Channelized Adapter card • 4-port DS3/E3 Adapter card • 4-port T1/E1 and RS-232 Combination module • 7705 SAR-A • 7705 SAR-M • 7705 SAR-X
Parameters	cas — specifies channel associated signaling

SSM

Syntax	ssm
Context	config>port>tdm>e1
Description	This command accesses the context to configure E1 Synchronization Status Messaging (SSM) parameters.



Note: Only **g704** framing mode should be used with E1 SSM. The **no-crc-g704** and **e1-unframed** framing modes are not compatible with E1 SSM. See the [framing \(E1\)](#) command for information on E1 framing.

ssm-bit

Syntax	ssm-bit <i>sa-bit</i> no ssm-bit
Context	config>port>tdm>e1>ssm
Description	This command configures which Sa bit in the E1 frame to use for conveying the quality level SSM information.
Default	8
Parameters	<i>sa-bit</i> — identifies which Sa bit to use for SSM information Values 4 to 8

tx-dus

Syntax	[no] tx-dus
Context	config>port>tdm>e1>ssm
Description	This command enables or disables the transmission of 0xF (DUS) (do not use for synchronization) in the SSM channel. The code 0xF is transmitted but it is translated to DNU (do not use) for E1 or SDH and to DUS for SONET or T1.
Default	no tx-dus

threshold

Syntax	threshold {ber-sd ber-sf} rate <i>threshold-rate</i> no threshold {ber-sd ber-sf}
Context	config>port>tdm>ds1 config>port>tdm>e1
Description	This command configures the line signal degradation (SD) bit error rate (BER) and line signal failure (SF) thresholds. PCV error rates are measured and when they cross either the degradation or failure threshold, alarms are raised.

The **no** form of this command disables the BER-SD or BER-SF feature.

Default ber-sd - disabled

ber-sf - disabled

Parameters **threshold ber-sd** — specifies the BER that specifies signal degradation

threshold ber-sf — specifies the BER that specifies signal failure

threshold-rate — specifies the number of errors, in millions

Values 1, 5, 10, 50, 100

3.13.2.24 DS1 and E1 Channel Group Commands

channel-group

Syntax	[no] channel-group <i>channel-group-id</i>
Context	config>port>tdm>ds1 config>port>tdm>e1
Description	This command creates $n \times$ DS0 (64 kb/s) 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 group.
Default	n/a
Parameters	<i>channel-group-id</i> — 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 | frame-relay | cisco-hdlc | hdlc}`
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, 2-port OC3/STM1 Channelized Adapter card, 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card, 4-port DS3/E3 Adapter card (DS3 ports only), or 4-port T1/E1 and RS-232 Combination module (T1/E1 ports only). This parameter can be set on both access and network ports.

For access mode, the supported encapsulation types are **atm**, **cem**, **frame-relay**, **cisco-hdlc**, **hdlc**, and **ipcp**. [Table 29](#) lists the adapter cards and the corresponding encapsulation types.

Table 29 Adapter Cards and Encapsulation Types in Access Mode

Adapter Card	Encapsulation Type					
	atm	cem	frame-relay	cisco-hdlc	hdlc	ipcp
16-port T1/E1 ASAP Adapter card	✓	✓	✓	✓	✓	✓
32-port T1/E1 ASAP Adapter card	✓	✓	✓	✓	✓	✓
2-port OC3/STM1 Channelized Adapter card	✓	✓				✓
4-port OC3/STM1 / 1-port OC12/STM4 Adapter card		✓				
4-port DS3/E3 Adapter card (DS3 ports only)		✓	✓			
4-port T1/E1 and RS-232 Combination module		✓				✓

For network mode, only **ppp-auto** encapsulation is supported.

To change the **encap-type**, the channel group must first be deleted, 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 (CEM) for TDM pseudowires
- frame-relay** — specifies the encapsulation type as frame relay
- cisco-hdlc** — specifies the encapsulation type as Cisco HDLC
- hdlc** — specifies the encapsulation type as HDLC
- ipcp** — specifies the encapsulation type as IPCP for a PPP/MLPPP channel group in access mode on the 2-port OC3/STM1 Channelized Adapter card, 16-port T1/E1 ASAP Adapter card, 32-port T1/E1 ASAP Adapter card, or 4-port T1/E1 and RS-232 Combination module. IPCP is not supported on fractional T1/E1 channels on a 2-port OC3/STM1 Channelized 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, 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 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 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)

loopback

Syntax	loopback { line internal } no loopback
Context	config>port>tdm>ds1>channel-group config>port>tdm>e1>channel-group
Description	<p>This command puts the specified $n \times$ DS0 (64 kb/s) channel group in a loopback mode. For T1 ports, the channel group can have 1 to 24 channels. For E1 ports, the channel group can have 1 to 31 channels.</p> <p>When a line loopback is enabled on the channel group:</p> <ul style="list-style-type: none"> • frames received on the channel group on the Rx port are looped back toward the Tx (egress) port before reaching the framer. However, if CAS is enabled on the interface, the Tx signaling bits will continue to be sourced from the far end of the Cpipe (not looped back). • an all-ones pattern is inserted by the framer in the direction of the switch fabric and to the far end of the Cpipe <p>When an internal loopback (usually referred to as an equipment loopback) is enabled on the channel group:</p> <ul style="list-style-type: none"> • frames received on the channel group from the switch fabric toward the framer are looped back to the switch fabric and to the far end of the Cpipe. However, if CAS is enabled on the interface, the Rx signaling bits will continue to be sourced from the local access port (not looped back). • traffic received on the channel group will continue to be sent out the Tx (egress) port as if no internal loopback was there <p>$N \times$ DS0 (64 kb/s) channel group loopbacks are only supported on the 16-port T1/E1 ASAP Adapter card and the 32-port T1/E1 ASAP Adapter card.</p>
Default	no loopback
Parameters	<p>line — puts the specified channel group in line loopback mode</p> <p>internal — puts the specified channel group in internal loopback mode</p>

mac

Syntax	mac <i>ieee-address</i> no mac
Context	config>port>tdm>ds1>channel-group config>port>tdm>e1>channel-group config>port>tdm>ds3

Description	<p>This command assigns a specific MAC address to an APS 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. Configuring a MAC address using the mac command is only supported for APS channel groups. Physical channel groups do not support the mac command.</p> <p>The no form of this command removes the configured MAC address. The physical port MAC address will be used instead.</p> <p>For TDM ports, configuring the MAC address allows the same MAC address to be assigned to ports across two routers in an MC-APS pair for MEF 8.</p> <p>The mac command is only supported on the 2-port OC3/STM1 Channelized Adapter card and 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card.</p>
Default	no mac
Parameters	<p><i>ieee-address</i> — 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.</p>

mode

Syntax	<p>mode {access network}</p> <p>no mode</p>
Context	<pre>config>port>tdm>ds1>channel-group config>port>tdm>e1>channel-group</pre>
Description	<p>This command configures a TDM channel for access or network mode operation.</p> <p>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.</p> <p>When a port is configured for access mode, the appropriate encap-type 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.</p> <p>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.</p> <p>The no form of this command restores the default.</p>
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 30](#))

Table 30 **Default and Maximum Port MTU**

Port Type	Mode	Encap Type	Default (Bytes)	Max MTU (Bytes)
TDM (PW)	Access	cem	1514	1514
TDM (ATM PW)	Access	atm	1524	1524
TDM (FR PW)	Access	frame-relay	1514	2090
TDM (HDLC PW)	Access	hdlc	1514	2090
TDM (IW PW)	Access	cisco-hdlc	1514	2090
TDM (PPP/MLPPP)	Access	ipcp	1502	2090
TDM (PPP/MLPPP)	Network	ppp-auto	1572	2090
Serial V35 or X21 (FR PW)	Access	frame-relay	1514	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

ber-sf-link-down

Syntax	ber-sf-link-down no ber-sf-link-down
Context	config>port>tdm>ds1>channel-group>ppp config>port>tdm>e1>channel-group>ppp
Description	This command enables the channel-group down on BER-SF alarm. When enabled, the channel-group will be placed out of service once BER-SF is detected. The no form of this command disables the feature.
Default	no ber-sf-link-down

keepalive

Syntax	keepalive <i>time-interval</i> [dropcount <i>drop-count</i>] 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	<i>time-interval</i> — 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**.

signal-mode

Syntax **signal-mode cas**
no signal-mode

Context config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

Description This command enables or disables Channel Associated Signaling (CAS) at the channel group level. When enabled, control signals (such as those for synchronizing and bounding frames) are carried in the same channels as voice and data signals.

If the signal mode at the DS1/E1 port level is configured for **signal-mode cas**, any new channel groups default to **signal-mode cas**. Any existing channel groups can be individually changed from **cas** to **no signal-mode**.

The signal mode must be configured for CAS before creating a Cpipe with CAS. Refer to the 7705 SAR Services Guide, "Creating a Cpipe Service", for information on configuring a Cpipe service.

This command is valid only on the following cards and platforms when DS1 framing is set to **esf** or **sf**, or E1 framing is set to **g704** or **no-crc-g704**:

- 16-port T1/E1 ASAP Adapter card
- 32-port T1/E1 ASAP Adapter card
- 2-port OC3/STM1 Channelized Adapter card
- 4-port DS3/E3 Adapter card
- 7705 SAR-A
- 7705 SAR-M
- 7705 SAR-X

Parameters **cas** — specifies channel associated signaling

timeslots

Syntax	timeslots <i>timeslots</i> no timeslots
Context	config>port>tdm>ds1>channel-group config>port>tdm>e1>channel-group
Description	<p>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.</p> <p>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.</p> <p>The no form of this command removes DS0 timeslots from a channel group.</p>
Default	<p>no timeslots — non-ATM channel groups</p> <p>1 to 24 — channel groups configured under DS1 with atm encapsulation</p> <p>2 to 16, 18 to 32 — channel groups configured under E1 with atm encapsulation</p> <p>2 to 32 — channel groups configured under E1 (ppp-auto)</p>
Parameters	<p><i>timeslots</i> — 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.</p> <p>Values</p> <p>1 to 24 for DS1 interfaces. The full range is automatically configured for ATM channel groups and cannot be changed.</p> <p>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.</p>

3.13.2.25 DS3 and E3 Commands

clock-source

Syntax	clock-source { loop-timed node-timed differential free-run }
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 Basic System Configuration Guide, “Node Timing”, for more information.
Default	node-timed (for the 4-port DS3/E3 Adapter card) loop-timed (for all other applicable adapter cards)
Parameters	loop-timed — the link recovers the clock from the received data stream node-timed — the link uses the internal clock when transmitting data (this parameter does not apply to the 2-port OC3/STM1 Channelized Adapter card) differential — clocking is derived from a common clock compared to differential clock recovery (DCR) data in the RTP header in the TDM PW overhead. DCR must also be enabled on the relevant card, module, or chassis with the clock-mode command. This parameter applies only to DS3/E3 ports on the 4-port DS3/E3 Adapter card. free-run — timing source is from its own clock, not an external timing source (this parameter does not apply to the 4-port DS3/E3 Adapter card)

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. CRC applies to PPP applications only on the 2-port OC3/STM1 Channelized Adapter card and 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 | cem | ppp-auto | frame-relay}**
 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, then reconfigured with the new **encap-type**.
- Default** no encap-type
- Parameters** **atm** — specifies the encapsulation type as ATM
- cem** — specifies the encapsulation type as circuit emulation mode (CEM) for TDM pseudowires
- ppp-auto** — specifies the encapsulation type as PPP. 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 or DS3 channels in network mode.
- frame-relay** — specifies the encapsulation type as frame relay

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 resets 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	<p>This command puts the specified DS3/E3 port into a loopback mode.</p> <p>A line loopback loops frames received on the corresponding port or channel back towards the transmit (egress) direction before reaching the framer.</p> <p>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.</p> <p>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.</p> <p>The loopback command is not saved to the system configuration.</p> <p>The no form of this command disables loopback on the DS3/E3 port.</p>
Default	no loopback
Parameters	<p>line — places the associated DS3/E3 port into line loopback mode</p> <p>internal — places the associated DS3/E3 port into internal loopback mode</p> <p>remote — places the associated DS3/E3 port into remote loopback mode</p>

mdl

Syntax	mdl { eic lic fic unit pfi port gen } <i>mdl-string</i> no mdl
Context	config>port>tdm>ds3
Description	<p>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.</p> <p>The no form of this command removes the mdl-string association and stops the transmission of MDL messages.</p>
Default	no mdl

Parameters	<p><i>mdl-string</i> — specifies an MDL message up to 38 characters long</p> <p>eic — specifies the equipment ID code up to 10 characters long</p> <p>lic — specifies the line ID code up to 11 characters long</p> <p>fic — specifies the frame ID code up to 10 characters long</p> <p>unit — specifies the unit ID code up to 6 characters long</p> <p>pfi — specifies the facility ID code up to 38 characters long</p> <p>port — specifies the port ID code up to 38 characters long</p> <p>gen — specifies the generator number to send in the MDL test signal message, up to 38 characters long</p>
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mdl-transmit

Syntax	[no] mdl-transmit {path idle-signal test-signal}
Context	config>port>tdm>ds3
Description	<p>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.</p> <p>The no form of this command prevents the transmission of an MDL message on the DS3 port or channel.</p>
Default	no mdl-transmit
Parameters	<p>path — specifies the MDL path message</p> <p>idle-signal — specifies the MDL idle signal message</p> <p>test-signal — specifies the MDL test signal message</p>

mode

Syntax	<p>mode {access network}</p> <p>no mode</p>
Context	<p>config>port>tdm>ds3</p> <p>config>port>tdm>e3</p>
Description	<p>This command configures a DS3/E3 port for access or network mode of operation.</p> <p>SAPs can only be configured on access ports. When a DS3/E3 port is configured for access mode, the encap-type can be set to atm, cem, or frame-relay.</p>

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 **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 <i>time-interval</i> [dropcount <i>drop-count</i>] 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	<i>time-interval</i> — the time in seconds between keepalive messages, expressed as a decimal integer Values 1 to 60 <i>drop-count</i> — 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. When configured, logging is enabled for the raising and clearing of the specified alarms. The no form of this command disables logging of the specified alarms.
Parameters	ais — reports alarm indication signal errors Default ais alarms are issued los — reports loss of signal errors Default los alarms are issued oof — reports out-of-frame errors Default oof alarms are not issued rai — reports remote alarm indication signal errors Default rai alarms are not issued looped — reports looped packets errors Default looped alarms are not issued

3.13.2.26 Voice Commands

voice

Syntax	voice
Context	config>port
Description	This command enables the context to configure voice port parameters. This context can only be accessed on the 6-port E&M Adapter card, 8-port Voice & Teleprotection card, 8-port FXO Adapter card, and 6-port FXS Adapter card.
Default	n/a

audio-wires

Syntax	audio-wires { four-wires two-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 t1p-rx and t1p-tx values.
Default	four-wires
Parameters	four-wires — four-wire operation two-wires — two-wire operation. This parameter is not valid if the corresponding port or channel's signaling type is 4W transmission.

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`
`config>port>voice>fxo`
`config>port>voice>fxs`

Description This command configures a voice channel for idle or seized fault signaling.

On the 6-port E&M Adapter card, this command is valid only if [signaling-mode](#) is configured for E&M signaling. The 6-port E&M Adapter card also supports configuration of the idle and seized codes.

Configuration of the idle and seized codes is not supported on the FXO and FXS channels on the 8-port Voice & Teleprotection card, or on the 8-port FXO Adapter card or 6-port FXS Adapter card. The code transmitted depends on signaling type and companding law as shown in [Table 31](#).

Table 31 Idle and Seized Codes for FXO and FXS Signaling Types

Signaling Type	Companding Law		ABCD code	
	A-Law	Mu-Law	Idle	Seized
3600plar (FXS only)	✓		1101	0101
3600plar (FXS only)		✓	11	00
1511plar (FXS only)	✓		1101	0101
1511profile1 (FXO, FXS)	✓		1101	0101
3600ls (FXO, FXS)		✓	01	11
3600re (FXO, FXS)	✓		1101	0101
1511sn137 (FXO, FXS)	✓		1111	0111

Default idle

Parameters
idle — specifies idle fault signaling
seized — specifies seized fault signaling

fxo

Syntax	[no] fxo
Context	config>port>voice
Description	This command creates a Foreign Exchange Office (FXO) channel on a channelized voice interface. This command applies to the 8-port FXO Adapter card and the 8-port Voice & Teleprotection Card. The no form of this command deletes the port's FXO channel.
Default	n/a

fxs

Syntax	[no] fxs
Context	config>port>voice
Description	This command creates a Foreign Exchange Subscriber (FXS) channel on a channelized voice interface. This command applies to the 8-port Voice & Teleprotection card and 6-port FXS Adapter card. The no form of this command deletes the port's FXS channel.
Default	n/a

idle-code

Syntax	idle-code <i>abcd-code</i> no idle-code
Context	config>port>voice>em
Description	This command defines the ABCD signaling code to be transmitted when the 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 on the 6-port E&M Adapter card and 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	<i>abcd-code</i> — the 4-bit ABCD value to be transmitted
Values	0 to 15 (can be entered in decimal, binary, or hexadecimal format)

line-balance

Syntax	line-balance { nominal 800 }
Context	config>port>voice
Description	This command configures the line balance for the FXO or FXS voice interface on the 8-port Voice & Teleprotection card, for the FXO voice interface on the 8-port FXO Adapter card, and for the FXS voice interface on the 6-port FXS Adapter card.
Default	nominal (for both FXS and FXO)
Parameters	nominal — 600 Ω 800 — 800 Ω/(100 Ω+50 nF)

loopback

Syntax	loopback { internal-analog internal-digital } no loopback
Context	config>port>voice>em config>port>voice>fxo config>port>voice>fxs
Description	This command puts the specified port or channel in loopback mode. The internal-digital parameter is the only valid option for FXO and FXS. The loopback command is not saved to the system configuration between boots. The no form of this command disables the 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. For E&M ports, the loopback analog signal may be looped back at a different signal level due to gain/loss circuits outside of the CODEC being bypassed. 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.

ring-generation

Syntax	ring-generation { 16 20 25 } no ring-generation
Context	config>port>voice
Description	This command configures the frequency of the generated ring signal for the specified FXS voice port. This command does not apply to FXO or E&M ports. The no form of this command reverts to the default value.
Default	16
Parameters	16 — 16 Hz ring signal 20 — 20 Hz ring signal 25 — 25 Hz ring signal

seized-code

Syntax	seized-code <i>abcd-code</i> no seized-code
Context	config>port>voice>em
Description	This command defines the ABCD signaling code to be transmitted when the 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 on the 6-port E&M Adapter card and 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	<i>abcd-code</i> — the 4-bit ABCD value to be transmitted

signaling-type

Syntax	signaling-type { 3600plar 1511plar 3600ls 1511profile1 3600re 1511sn137 }
Context	config>port>voice
Description	<p>This command configures how the signaling leads operate to establish a call. To change this parameter, the voice channel must be shut down first.</p> <p>For FXO, 3600ls, 1511profile1, 3600re, and 1511sn137 are the only valid options; 1511profile1, 3600re, and 1511sn137 support A-Law companding, and 3600ls supports Mu-Law companding.</p> <p>For FXS, all signaling types are supported; 3600plar supports both A-Law and Mu-Law companding, 1511plar, 1511profile1, 3600re, and 1511sn137 support A-Law companding, and 3600ls supports Mu-Law companding.</p>
Default	<p>3600ls (for Mu-Law companding)</p> <p>3600re (for A-Law companding)</p>
Parameters	<p>3600plar — private line automatic ringdown</p> <p>1511plar — private line automatic ringdown</p> <p>3600ls — loop start</p> <p>1511profile1 — 1511 loop start</p> <p>3600re — remote extension</p> <p>1511sn137 — 1511 profile 137</p>

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	<p>em — specifies E&M signaling mode</p> <p>transmission-only — specifies transmission-only mode. This parameter is not valid if audio-wires is configured for two-wire operation.</p>

t1p-rx

Syntax	t1p-rx <i>decibels</i>
Context	config>port>voice
Description	This command configures the analog-to-digital receive transmission level point (TLP) for the specified port.
Parameters	<p><i>decibels</i> — specifies the transmission level point expressed as an integer (in tenths)</p> <p>Values –16.0 to +7.0 (for E&M four-wires) –10.0 to +6.0 (for E&M two-wires) –7.0 to 0.0 (for FXO and FXS)</p> <p>Default 0.0 (for E&M) –3.0 (for FXO and FXS)</p>

t1p-tx

Syntax	t1p-tx <i>decibels</i>
Context	config>port>voice
Description	This command configures the analog-to-digital transmit transmission level point (TLP) for the specified port.
Parameters	<p><i>decibels</i> — specifies the transmission level point expressed as an integer (in tenths)</p> <p>Values –16.0 to +7.0 (for E&M four-wires) –10.0 to +6.0 (for E&M two-wires) –4.0 to +3.0 (for FXO and FXS)</p> <p>Default 0.0 (for E&M) 0.0 (for FXO and FXS)</p>

3.13.2.27 Voice Channel Group Commands

channel-group

Syntax	[no] channel-group <i>channel-group-id</i>
Context	config>port>voice>em config>port>voice>fxo config>port>voice>fxs
Description	This command creates a DS0 channel group for a channelized E&M, FXO, or FXS voice interface. Channel groups cannot be further subdivided. The no form of this command deletes the specified channel group.
Default	n/a
Parameters	<i>channel-group-id</i> — 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
Context	config>port>voice>em>channel-group config>port>voice>fxo>channel-group config>port>voice>fxs>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 config>port>voice>fxo>channel-group config>port>voice>fxs>channel-group
Description	This command configures a channelized voice interface 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, FXO, or FXS voice port as service access

3.13.2.28 LAG Commands

lag

Syntax	<code>[no] lag lag-id</code>
Context	config
Description	<p>This command enables the context in which Link Aggregation Group (LAG) attributes are defined.</p> <p>A LAG groups two or more Ethernet links (ports) into one logical link. The aggregation of multiple physical links adds redundancy and improves resiliency between two network devices, and allows for load sharing.</p> <p>On access ports, a LAG can have a maximum of two links and can support active/standby operation. If an active link in a LAG fails, traffic gets redistributed to the standby link.</p> <p>On network ports, a LAG can have a maximum of eight links (depending on the platform or adapter card/module and the Ethernet port type) and can support active/active and active/standby operation. In active/active mode, the links are used for load sharing.</p> <p>The no form of this command deletes the LAG from the configuration. A LAG can only be deleted while it is administratively shut down. Any dependencies, such as IP interface configurations, must be removed from the LAG before it can be shut down.</p>
Default	no lag
Parameters	<i>lag-id</i> — the LAG identifier, expressed as a decimal integer
	Values 1 to 32

access

Syntax	<code>access</code>
Context	config>lag
Description	This command enables the context to configure access parameters.
Default	n/a

adapt-qos

Syntax	adapt-qos {link distribute}
Context	config>lag>access
Description	This command specifies how active/active LAG SAP queue scheduler, SAP scheduler (H-QoS), and SAP MSS scheduler QoS rates (as specified by the SLA) are distributed to each of the active LAG ports. This command applies only to access LAGs.
Default	link
Parameters	link — specifies that the full QoS rates are configured on each of the active LAG links for SAP queue schedulers, SAP schedulers (H-QoS), and SAP MSS schedulers distribute — specifies that the QoS rates are divided equally among the active LAG links for SAP queue schedulers, SAP schedulers (H-QoS), and egress MSS schedulers. For ingress MSS shaper schedulers, the distribute parameter specifies that the QoS rates are divided proportionally among the active link MDAs based on the number of active links on each MDA.

dynamic-cost

Syntax	[no] dynamic-cost
Context	config>lag
Description	<p>This command enables OSPF or IS-IS costing of a LAG based on the available aggregated, operational bandwidth.</p> <p>The path cost is dynamically calculated based on the interface bandwidth. OSPF path cost can be changed through the interface metric or the reference bandwidth.</p> <p>If dynamic cost is configured, costing is applied based on the total number of links configured and the cost advertised is inversely proportional to the number of links available at the time. This requires that the number of links that are up exceeds the configured LAG threshold value; if the number of links that are up falls below the threshold, the configured threshold action determines whether, and at what cost, this LAG will be advertised (see port-threshold).</p> <p>For example, a physical link in OSPF has a cost associated with it of 100, and the LAG consists of four physical links. The cost associated with the logical link is 25. If one link fails, the cost is automatically adjusted to 33.</p> <p>If dynamic cost is not configured and OSPF auto-cost is configured, costing is applied based on the total number of links configured. This cost will remain static provided that the number of links that are up exceeds the configured LAG threshold value; if the number of links that are up falls below the threshold, the configured threshold action determines whether, and at what cost, this LAG will be advertised.</p>

If dynamic cost is configured and OSPF auto-cost is not configured, the cost is determined by the cost configured on the OSPF metric, provided that the number of links that are up exceeds the configured LAG threshold value; if the number of links that are up falls below the threshold, the configured threshold action determines whether this LAG will be advertised.

If neither dynamic cost nor OSPF auto-cost is configured, the cost advertised is determined by the cost configured on the OSPF metric, provided that the number of links that are up exceeds the configured LAG threshold value; if the number of links that are up falls below the threshold, the configured threshold action determines whether this LAG will be advertised.

The **no** form of this command removes dynamic costing from the LAG.

Default no dynamic-cost

encap-type

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

Context config>lag

Description This command configures the encapsulation method used to distinguish customer traffic on a LAG.

The encapsulation type of a LAG must match that of its member links. If the encapsulation type of the LAG is changed, the encapsulation type of all its member links also changes.

The encapsulation type can be changed on the LAG only if there is no interface or service associated with it. If the MTU is set to a non-default value, it will be reset to the default value when the encapsulation type is changed.

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

Default null — all traffic on the link belongs to a single service or VLAN

Parameters **dot1q** — ingress Ethernet frames carry IEEE 802.1Q tags, each tag signifying a different service

null — ingress Ethernet frames do not use any tags to indicate a service. As a result, only one service can be configured on a link with null encapsulation.

qinq — ingress frames carry two tags, where the outer tag is the service provider tag and the inner tag is the customer service tag as defined in 802.1ad

hold-time

Syntax	hold-time down <i>hold-down-time</i> no hold-time
Context	config>lag
Description	<p>This command specifies the delay between detecting that a LAG is down (all active ports are down) and reporting it to the upper layer protocols.</p> <p>When a failure in a LAG is detected, it is immediately advertised to the rest of the system, but subsequent failures are not advertised to upper layers until the hold-time down interval has expired.</p> <p>Specifying a hold time is especially useful in a 1:1 active/standby configuration because the time between detecting that the active link in the LAG is down and the time needed to activate the standby link is very short. The hold time prevents the LAG from being operationally down when switching between the active and standby link.</p> <p>The no form of this command removes any hold time configured.</p>
Default	no hold-time
Parameters	<i>hold-down-time</i> — specifies, in tenths of seconds, the hold time before a failure is reported
Values	0 to 2000

lacp

Syntax	lacp [<i>mode</i>] [administrative-key <i>admin-key</i>] [system-id <i>system-id</i>] [system-priority <i>priority</i>] no lacp
Context	config>lag
Description	<p>This command specifies the LACP mode of the LAG. By default, the LACP mode is not set.</p> <p>Per the IEEE 802.1AX-2008 (IEEE 802.3ad) standard, the Link Aggregation Control Protocol (LACP) provides a standardized means for exchanging information between network devices using LAGs. LACP operates in two modes: passive and active. At least one partner must operate in active mode. For example, if the mode on the CE end is passive, the LACP mode on the 7705 SAR end must be active.</p> <p>The no form of this command disables LACP.</p>
Default	no lacp

Parameters	<i>mode</i> — specifies the mode in which LACP operates
	<p>Values <i>passive</i> — starts transmitting LACP packets only after receiving packets</p> <p> <i>active</i> — initiates the transmission of LACP packets</p>
	<i>admin-key</i> — specifies an administrative key value to identify the aggregation group on each port configured to use LACP. This value should be configured only in exceptional cases. If it is not specified, a random key is assigned.
	Values 1 to 65535
	Default 32768
	<i>system-id</i> — the 6-byte system identifier in hexadecimal format
	Values xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx
	<i>priority</i> — the system priority
	Values 0 to 65535

lacp-xmit-interval

Syntax	lacp-xmit-interval {slow fast} no lacp-xmit-interval
Context	config>lag
Description	This command specifies the interval signaled to the peer and tells the peer at which rate it should transmit. The no form of this command returns the value to the default.
Default	fast
Parameters	slow — transmits packets every 30 seconds fast — transmits packets every second

lacp-xmit-stdby

Syntax	[no] lacp-xmit-stdby
Context	config>lag
Description	This command enables LACP message transmission on the standby link. The no form of this command disables LACP message transmission on the standby link. Disable LACP message transmission on the standby link if the peer does not properly follow the IEEE 802.3ax standard regarding the LACP sync bit.

Default lacp-xmit-stdby

mac

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

Context config>lag

Description This command assigns a specific MAC address to the LAG.

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** | **hybrid**}
no mode

Context config>lag

Description This command configures the LAG for access, network, or hybrid mode operation.

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

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


A **hybrid** port allows a single port to operate in both access and network modes.

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

Default network

Parameters **access** — configures the LAG for access mode operation
network — configures the LAG for network mode operation
hybrid — configures the LAG for hybrid mode operation

port

Syntax	port <i>port-id</i> [<i>port-id</i>] [priority <i>priority</i>] [sub-group <i>sub-group-id</i>] no port <i>port-id</i>
Context	config>lag
Description	<p>This command adds ports (links) to a LAG. Multiple ports can be added in one command as long as the maximum is not exceeded. A LAG can have up to eight links, depending on the platform or adapter card/module and the Ethernet port type.</p> <p>The port configuration of the first port added to the LAG is used to compare to subsequently added ports. All ports must share the same characteristics (MTU, speed, duplex, and so on) as those of the first port; otherwise, they will not be added to the LAG.</p> <p>The priority parameter sets the priority of the port, which is used by LACP. The port with the highest priority is the primary port. If two or more ports share the same priority value, the port with the lowest port ID becomes the primary port.</p> <p>Any configuration changes made to the primary port apply to all member ports of a LAG. For example, port hold-time and MTU settings can be modified directly on the primary port and will be applied to all member ports. Any configuration changes made to non-primary ports are rejected.</p>
	<p>Note: All ports in a LAG must have autonegotiation disabled or set to limited mode (recommended setting is limited). Autonegotiation can be disabled or set to limited mode using the autonegotiate command under the config>port>ethernet context.</p>
	<p>The no form of this command removes ports from the LAG.</p>
Default	n/a
Parameters	<p><i>port-id</i> — specifies the physical port ID in the <i>slot/mda/port</i> format</p> <p><i>priority</i> — specifies the priority of a port</p> <p>Values 1 to 65535</p> <p><i>sub-group-id</i> — identifies a LAG subgroup. Each port in a LAG must be a member of a subgroup. If no subgroup is specified for an access port, the configuration will fail. If no subgroup is specified for a network port, the port is assigned to subgroup 1.</p> <p>Subgroups should only be configured on one side of a LAG, not both. If you configure the 7705 SAR with subgroups to handle active/standby operation, the partner system should not be configured with subgroups. Only having one side perform active/standby selection guarantees a consistent selection and fast convergence. Active/standby selection is signaled through LACP from one side of the LAG to the other.</p> <p>Values 1 or 2 (for LAGs on access ports) 1 to 8 (for LAGs on network ports; system-dependent)</p>

port-threshold

Syntax	port-threshold <i>value</i> [action { dynamic-cost down }] no port-threshold
Context	config>lag
Description	This command sets a threshold value and controls the behavior of the LAG if the number of operational links is equal to or below the threshold value. The no form of this command returns the value to the default.
Default	0 action down
Parameters	<i>value</i> — the number of operational links at or below which the configured action will be invoked for the LAG. When the number of operational links exceeds the port threshold value, any action taken for being below the threshold value will cease. Values 0 to 7 action dynamic-cost — specifies that dynamic costing will be activated if the number of operational links is equal to or below the configured threshold value. The LAG will remain operationally up with a cost relative to the number of operational links. The link will only be regarded as operationally down when all links in the LAG are down. action down — specifies that the LAG will be brought operationally down if the number of operational links is equal to or below the configured threshold value. The LAG will only be regarded as up when the number of operational links exceeds the configured threshold value.

selection-criteria

Syntax	selection-criteria [best-port highest-count highest-weight] [slave-to-partner] [subgroup-hold-time <i>hold-time</i>] no selection-criteria
Context	config>lag
Description	This command specifies which criteria is used to select the active subgroup (link) of a LAG. Every time the configuration of a link changes, the selection algorithm is applied. The no form of this command returns the value to the default.
Default	highest-count
Parameters	best-port — specifies that all standby ports will have their corresponding transmitters disabled. This parameter is used in static LAG configurations. highest-count — specifies the subgroup with the highest number of eligible member links. An eligible member link of a LAG is a member that can potentially become active.

A subgroup can have a maximum of one eligible member link.

highest-weight — specifies the subgroup with the highest aggregate weight

slave-to-partner — selects, together with the selection criteria, the active subgroup. An eligible member link of a LAG is a member that can potentially become active. This means it is operationally up (not disabled) for use by the remote side. The **slave-to-partner** parameter can be used to control whether this latter condition is taken into account. The **slave-to-partner** parameter does not apply to static LAG configurations.

It is recommended that this parameter be set.

hold-time — specifies the delay time, in tenths of a second, before switching to a newly selected active subgroup from the existing active subgroup. The timer delay applies only if the existing subgroup remains operationally up. If a value of 0 or no value is specified, the switchover occurs immediately. If a value of **infinite** is specified, no switchover will occur as long as the subgroup remains up; this setting can be overridden with the **tools>perform>force>lag-id** command. LACP must be enabled on the LAG.

Values 0 to 2000 | infinite

standby-signaling

Syntax	standby-signaling [lACP power-off] no standby-signaling
Context	config>lag
Description	This command specifies how the state of a member port is signaled to the remote side when the status corresponding to this member port has a standby value. The no form of this command turns off standby signaling.
Parameters	lACP — specifies that lACP is active power-off — specifies that the standby port transmitter is disabled

3.13.2.29 Frame Relay Commands

frame-relay

Syntax	frame-relay
Context	<pre>config>port>tdm>ds1>channel-group config>port>tdm>ds3 config>port>tdm>e1>channel-group config>port>tdm>e3 config>port>serial>v35>channel-group config>port>serial>x21>channel-group</pre>
Description	<p>This command allows access to the context to configure the frame relay LMI operational parameters for a DS1/E1 channel group, a V.35 or X.21 SDI channel group, a DS-3/E-3 clear channel port, or a channelized DS3.</p> <p>The no form of this command removes the frame relay LMI operational parameters.</p>

lmi-type

Syntax	lmi-type {ansi itu none rev1} no lmi-type
Context	<pre>config>port>tdm>ds1>channel-group>frame-relay config>port>tdm>ds3>frame-relay config>port>tdm>e1>channel-group>frame-relay config>port>tdm>e3>frame-relay config>port>serial>v35>channel-group>frame-relay config>port>serial>x21>channel-group>frame-relay</pre>
Description	<p>This command configures the LMI type for frame relay interfaces. LMIs are sets of enhancements to the basic frame relay specification.</p>
Default	itu
Parameters	<p>ansi — specifies ANSI T1.617 Annex D</p> <p>itu — specifies ITU-T Q933 Annex A</p> <p>none — disable frame relay LMI on the port/channel</p> <p>rev1 — specifies Rev 1 version of ANSI T1.617 Annex D</p>

mode

Syntax	mode { dce dte bidir } no lmi-type
Context	config>port>tdm>ds1>channel-group>frame-relay config>port>tdm>ds3>frame-relay config>port>tdm>e1>channel-group>frame-relay config>port>tdm>e3>frame-relay config>port>serial>v35>channel-group>frame-relay config>port>serial>x21>channel-group>frame-relay
Description	This command sets the frame relay interface to the DCE, DTE, or bidirectional mode of LMI operation. The DTE mode causes the router to send status enquiries over the interface. The DCE mode causes the router to respond to status enquiries. In bidirectional mode, the router performs both DTE and DCE operation over the FR interface. The bidirectional mode applies to the ANSI and ITU LMI types only. This feature is used when two routers are connected back-to-back, running frame relay encapsulation.
Default	dce
Parameters	dce — specifies the DCE mode dte — specifies the DTE mode bidir — the bidirectional mode for LMI types ANSI and ITU

n391dte

Syntax	n391dte <i>intervals</i> no n391dte
Context	config>port>tdm>ds1>channel-group>frame-relay config>port>tdm>ds3>frame-relay config>port>tdm>e1>channel-group>frame-relay config>port>tdm>e3>frame-relay config>port>serial>v35>channel-group>frame-relay config>port>serial>x21>channel-group>frame-relay
Description	This command configures the DTE full status polling interval for the frame relay LMI. The number specifies the frequency at which inquiries expect a full status report. The no form of this command returns the n391dte counter to the default value.
Default	6

Parameters *intervals* — sets the number of exchanges to be done before requesting a full-status report. A value of 1 specifies to receive full-status messages only.

Values 1 to 255

n392dce

Syntax **n392dce** *threshold*
no n392dce

Context config>port>tdm>ds1>channel-group>frame-relay
config>port>tdm>ds3>frame-relay
config>port>tdm>e1>channel-group>frame-relay
config>port>tdm>e3>frame-relay
config>port>serial>v35>channel-group>frame-relay
config>port>serial>x21>channel-group>frame-relay

Description This command configures the DCE error threshold for the frame relay LMI. The threshold specifies the number of errors needed to bring down a link.

The **no** form of this command returns the n392dce counter to the default value.

Default 3

Parameters *threshold* — sets the number of errors that will put the channel in an operationally down state

Values 1 to 10

n392dte

Syntax **n392dte** *threshold*
no n392dte

Context config>port>tdm>ds1>channel-group>frame-relay
config>port>tdm>ds3>frame-relay
config>port>tdm>e1>channel-group>frame-relay
config>port>tdm>e3>frame-relay
config>port>serial>v35>channel-group>frame-relay
config>port>serial>x21>channel-group>frame-relay

Description This command configures the DTE error threshold for the frame relay LMI. The threshold specifies the number of errors needed to bring down a link.

The **no** form of this command returns the n392dte counter to the default value.

Default 3

Parameters *threshold* — sets the number of errors that will put the channel in an operationally down state

Values 1 to 10

n393dce

Syntax **n393dce** *count*
no n393dce

Context config>port>tdm>ds1>channel-group>frame-relay
 config>port>tdm>ds3>frame-relay
 config>port>tdm>e1>channel-group>frame-relay
 config>port>tdm>e3>frame-relay
 config>port>serial>v35>channel-group>frame-relay
 config>port>serial>x21>channel-group>frame-relay

Description This command configures the DCE monitored event count for the frame relay LMI. The **no** form of this command returns the n393dce counter to the default value.

Default 4

Parameters *count* — sets the diagnostic window used to verify link integrity on the DCE interface

Values 1 to 10

n393dte

Syntax **n393dte** *count*
no n393dte

Context config>port>tdm>ds1>channel-group>frame-relay
 config>port>tdm>ds3>frame-relay
 config>port>tdm>e1>channel-group>frame-relay
 config>port>tdm>e3>frame-relay
 config>port>serial>v35>channel-group>frame-relay
 config>port>serial>x21>channel-group>frame-relay

Description This command configures the DTE monitored event count for the frame relay LMI. The **no** form of this command returns the n393dte counter to the default value.

Default 4

Parameters *count* — sets the diagnostic window used to verify link integrity on the DTE interface

Values 1 to 10

t391dte

Syntax	t391dte <i>keepalive</i> no t391dte
Context	config>port>tdm>ds1>channel-group>frame-relay config>port>tdm>ds3>frame-relay config>port>tdm>e1>channel-group>frame-relay config>port>tdm>e3>frame-relay config>port>serial>v35>channel-group>frame-relay config>port>serial>x21>channel-group>frame-relay
Description	This command configures the DTE keepalive timer for the frame relay LMI. This number specifies the interval at which the DTE sends out a keepalive response request to the DCE. The no form of this command returns the t391dte keepalive timer to the default value.
Default	10
Parameters	<i>keepalive</i> — sets the interval, in seconds, between status inquiries issued by the DTE Values 5 to 30

t392dce

Syntax	t392dce <i>keepalive</i> no t392dce
Context	config>port>tdm>ds1>channel-group>frame-relay config>port>tdm>ds3>frame-relay config>port>tdm>e1>channel-group>frame-relay config>port>tdm>e3>frame-relay config>port>serial>v35>channel-group>frame-relay config>port>serial>x21>channel-group>frame-relay
Description	This command configures the DCE keepalive timer for the frame relay LMI. This number specifies the interval at which the DCE checks for keepalive responses from the DTE. The no form of this command returns the t392dce keepalive timer to the default value.
Default	15
Parameters	<i>keepalive</i> — sets the expected interval, in seconds, between status inquiries issued by the DTE Values 5 to 30

3.13.2.30 Cisco HDLC Commands

cisco-hdlc

Syntax	cisco-hdlc
Context	config>port>tdm>ds1>channel-group config>port>tdm>e1>channel-group config>port>serial>v35>channel-group config>port>serial>x21>channel-group
Description	This command enables the context to configure Cisco HDLC parameters. Cisco HDLC is an encapsulation protocol that governs information transfer. The protocol specifies a data encapsulation method on synchronous serial links using frame characters and checksums.

down-count

Syntax	down-count <i>down-count</i> no down-count
Context	config>port>tdm>ds1>channel-group>cisco-hdlc config>port>tdm>e1>channel-group>cisco-hdlc config>port>serial>v35>channel-group>cisco-hdlc config>port>serial>x21>channel-group>cisco-hdlc
Description	This command configures the number of keepalive intervals that must pass without receiving a keepalive packet before the link is declared down. The nodes at the two endpoints of the cHDLC link must be provisioned with the same values. The no form of this command returns the down-count to the default value.
Default	3
Parameters	<i>down-count</i> — sets the number of keepalive intervals that must pass without receiving a keepalive packet before the link is declared down Values 3 to 16

keepalive

Syntax	keepalive <i>time-interval</i> no keepalive
Context	config>port>tdm>ds1>channel-group>cisco-hdlc config>port>tdm>e1>channel-group>cisco-hdlc config>port>serial>v35>channel-group>cisco-hdlc config>port>serial>x21>channel-group>cisco-hdlc
Description	This command configures the interval, in seconds, used to send periodic keepalive packets. The receiver process expects to receive a keepalive packet every keepalive interval. The link is declared down if the receiver process does not receive a keepalive within the time-out interval. The link is declared up when the number of continual keepalive packets received equals the up-count. The nodes at the two endpoints of the cHDLC link must be provisioned with the same values. The no form of this command returns the keepalive interval to the default value.
Default	10
Parameters	<i>time-interval</i> — sets the interval, in seconds, used to send periodic keepalive packets Values 0 to 300. A value of 0 means no keepalive packets are sent.

up-count

Syntax	up-count <i>up-count</i> no up-count
Context	config>port>tdm>ds1>channel-group>cisco-hdlc config>port>tdm>e1>channel-group>cisco-hdlc config>port>serial>v35>channel-group>cisco-hdlc config>port>serial>x21>channel-group>cisco-hdlc
Description	This command configures the number of continual keepalive packets that have to be received in order to declare the link up. The nodes at the two endpoints of the cHDLC link must be provisioned with the same values. The no form of this command returns the up-count to the default value.
Default	1
Parameters	<i>up-count</i> — sets the number of continual keepalive packets that must be received in order to declare the link up Values 1 to 3

3.13.2.31 SCADA Commands

scada

Syntax	scada <i>bridge-id</i>
Context	config
Description	This command configures a SCADA bridge on the Integrated Services card.
Parameters	<i>bridge-id</i> — specifies a SCADA bridge, in the format <i>slot/mda/bridge-id</i> where <i>bridge-id</i> is 1 to 16

branch

Syntax	[no] branch <i>branch-id</i>
Context	config>scada
Description	This command configures a branch that is used by the configured bridge. The no form of the command deletes the specified branch.
Parameters	<i>branch-id</i> — the branch identifier Values 1 to 32; branches 1 and 2 are dedicated as master branches, and branches 3 to 32 are slave branches (MDDB) 1 to 30; branches 1 and 2 are dedicated as master branches, and branches 3 to 30 are slave branches (PCM with A-Law encoding) 1 to 22; branches 1 and 2 are dedicated as master branches, and branches 3 to 22 are slave branches (PCM with Mu-Law encoding) 1 to 32; in broadcast mode, branch 1 is dedicated as the master branch (VCB with A-Law encoding) 1 to 24; in broadcast mode, branch 1 is dedicated as the master branch (VCB with Mu-Law encoding)

gain

Syntax	gain
Context	config>scada>branch
Description	This command enables the context to set gain levels for a branch.

input

Syntax	input <i>decibels</i>
Context	config>scada>branch>gain
Description	This command sets the input gain for the branch. The input gain defines the magnitude of the increase or decrease of the signal transmitted into the bridge.
Default	0
Parameters	<i>decibels</i> — number of decibels by which the transmitted signal is increased or decreased Values -16 to +9 dB (in 1-dB increments)

output

Syntax	output <i>decibels</i>
Context	config>scada>branch>gain
Description	This command sets the output gain for the branch. The output gain defines the magnitude of the increase or decrease of the signal received from the bridge.
Default	0
Parameters	<i>decibels</i> — number of decibels by which the received signal is increased or decreased Values -16 to +9 dB (in 1-dB increments)

sqelch

Syntax	[no] sqelch
Context	config>scada>branch
Description	This command administratively enables the squelching function for the branch. The squelching function can only be enabled on a branch if it is enabled at the bridge level (config>scada>mddb>sqelch or config>scada>pcm>sqelch). The no form of this command administratively disables the squelching function on the branch. The command does not apply to the VCB application.
Default	sqelch (slave branches) no sqelch (master branches)

mddb

Syntax	mddb
Context	config>scada
Description	This command enables the context to configure MDDB parameters for a SCADA bridge.

pcm

Syntax	pcm
Context	config>scada
Description	This command enables the context to configure PCM multidrop bridge parameters for a SCADA bridge.

force-active

Syntax	force-active master <i>branch-id</i>
Context	config>scada>mddb config>scada>pcm
Description	This command forces a master branch to become active. The command applies only if redundant-mode is set to manual mode.
Default	1
Parameters	<i>branch-id</i> — the master branch that is forced to become active
	Values 1 or 2

redundant-mode

Syntax	redundant-mode <i>redundant-mode</i>
Context	config>scada>mddb config>scada>pcm
Description	This command configures the redundancy mode for the master inputs of the SCADA bridge. In manual mode, the branch must be made active manually using the force-active command in order to receive data from the master input. The bridge always broadcasts to both master branches.

In auto mode, both the master branch inputs are received simultaneously. This requires the master input behavior to be similar to an RTU, which transmits data when active and transmits either all 1s (MDDB) or no data (PCM) when inactive.

Default	manual
Parameters	<i>redundant-mode</i> — specifies the redundancy mode for the master inputs of the SCADA bridge
Values	manual auto

report-alarm

Syntax	[no] report-alarm [hcmOof] [hcmRai]
Context	config>scada>mddb
Description	This command enables the logging of alarms. The no form of the command disables the logging of alarms.
Default	no report-alarm
Parameters	hcmOof — specifies HCM out-of-frame errors hcmRai — specifies HCM remote alarm indications

speed

Syntax	speed {600 1200 2400 4800 9600 19200 38400 56000}
Context	config>scada>mddb
Description	This command configures the SCADA MDDB speed for RS-232 and X.21 interfaces. SCADA MDDB is supported only at subrate speeds (less than 64 kb/s) on X.21 interfaces.
Default	2400
Parameters	600 — sets the SCADA MDDB speed at 600 (supported on RS-232 interfaces only) 1200 — sets the SCADA MDDB speed at 1200 2400 — sets the SCADA MDDB speed at 2400 4800 — sets the SCADA MDDB speed at 4800 9600 — sets the SCADA MDDB speed at 9600 19200 — sets the SCADA MDDB speed at 19200 38400 — sets the SCADA MDDB speed at 38400 56000 — sets the SCADA MDDB speed at 56000

sqelch

Syntax	sqelch timeout <i>timeout</i> sqelch reset no sqelch
Context	config>scada>mddb config>scada>pcm
Description	This command enables the squelching function for all branches configured on a bridge. This setting takes priority over the setting at the branch level; that is, if squelch is disabled with this command, it cannot be enabled for individual branches. The no form of this command disables the squelching function on a bridge.
Default	no sqelch
Parameters	<i>timeout</i> — the interval between when an alarm is raised indicating that a branch has locked up and is continuing to send data to the master, and squelching is triggered Values 1 to 120 s reset — puts the bridge back into the normal state

sqelch-recovery

Syntax	sqelch-recovery [<i>mode</i>] [time <i>time</i>]
Context	config>scada>mddb config>scada>pcm
Description	This command configures squelch recovery attributes. When the sqelch-recovery mode is configured as auto, the branch will automatically be put back into the normal state after the configured time. If the branch remains locked up, the branch will automatically be squelched again. Configuring the sqelch-recovery mode as manual disables automatic squelch recovery. To put the bridge back into the normal state, use the sqelch reset command.
Default	sqelch-recovery manual
Parameters	<i>mode</i> — specifies the squelch recovery mode Values manual auto <i>time</i> — the interval after which the branch will automatically be put back into the normal state Values 1 to 120 s

vcb

Syntax	vcb
Context	config>scada
Description	This command enables the context to configure voice conference bridge parameters for a SCADA bridge.

idle-code

Syntax	idle-code <i>abcd-code</i> no idle-code
Context	config>scada>vcb
Description	This command defines the ABCD signaling code to be transmitted when the E&M interface is configured to transmit idle fault signaling (see fault-signaling). The no form of the command reverts to the default value. This command is supported only when VCB is operating in vcb-branch-initiate mode.
Default	0 (for Mu-Law companding) 13 (for A-Law companding)
Parameters	<i>abcd-code</i> — the 4-bit ABCD value to be transmitted Values 0 to 15 (can be entered in decimal, binary, or hexadecimal format)

seized-code

Syntax	seized-code <i>abcd-code</i> no seized-code
Context	config>scada>vcb
Description	This command defines the ABCD signaling code to be transmitted when the E&M interface is configured to transmit seized fault signaling (see fault-signaling). The no form of the command reverts to the default value. This command is supported only when VCB is operating in vcb-branch-initiate mode.
Default	0 (for Mu-Law companding) 13 (for A-Law companding)

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

Values 0 to 15 (can be entered in decimal, binary, or hexadecimal format)

3.14 Show, Monitor, Clear, and Debug Command Reference

3.14.1 Command Hierarchies

- [Show Commands](#)
- [Monitor Commands](#)
- [Clear Commands](#)
- [Debug Commands](#)

3.14.1.1 Show Commands

show

- **aps** [*aps-id*] [detail]
- **card** [*slot-number*] [detail]
- **card state**
- **mda** [*slot* [*mda*]] [detail]
- **mda** [*slot*/*mda*] **statistics** [source-mds | dest-mds | ip-transport | cflowd | mirror | security [encryption | firewall]]
- **mda aggregate-statistics**
- **mda with-fabric-stats**
- **mda** [*slot* [*mda*]] **ring mda**
 - **fdb** [mac *ieee-address*] [port *port-id*] [all]
- **external-alarms alarm** [*alarm-id*]
- **external-alarms input** [*alarm-input*] [detail]
- **external-alarms name** [*name-string*] [detail]
- **external-alarms output** [*alarm-output*] [detail]
- **lcr** [*lcr-id*] [detail]
- **mw link** [*mw-link-id*] [detail]
- **mw radio** *port-id* [detail] [power]
- **mw radio** *port-id* **perfmon** [all | g826 | acm | power]
- **mw radio software**
- **lag** [*lag-id*] [detail] [statistics]
- **lag** *lag-id* **associations**
- **lag** [*lag-id*] **description**
- **lag** *lag-id* [detail] **lcp-partner**
- **lag** [*lag-id*] **port**
- **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** [*vpj*] [detail]
- **port** [*port-id*] [statistics] [detail]
- **port** *port-id* **acr** [detail]
- **port** *port-id* **cisco-hdlc**
- **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* **frame-relay** [detail | dlci *dlci*]
- **port** *port-id* **ima-link**
- **port** *port-id* **atm**
- **port** *port-id* **atm connections**
- **port** *port-id* **atm pvc** [*vpi/vci*] [detail]
- **port** *port-id* **atm pvp** [*vpj*] [detail]
- **port** **aps** [-group-id] [.channel]
- **port** **lcr** [-group-id] [port] [.channel]
- **port-tree** *port-id*

- **scada** *[bridge-id]* **[detail]**
- **scada** *[bridge-id]* **description**
- **scada** *[bridge-id]* **[detail] statistics**

3.14.1.2 Monitor Commands

monitor

- **port** *port-id* [*port-id...*(up to 5 total)] [**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-md** | **source-md**} [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
- **scada** *scada-id* [*scada-id...*(up to 5 total)] [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]

3.14.1.3 Clear Commands

clear

- **external-alarms** **alarm** [**all** | *alarm-id*]
- **lag** *lag-id* **statistics**
- **mda** *mda-id*
- **mda** *mda-id* **statistics** {**source-md** | **destination-md** | **fabric-port** | **fabric-global** | **all**}
- **mda** *mda-id* **statistics** **ip-transport**
- **mda** *mda-id* **statistics** **security** [**encryption** | **firewall**]
- **mda** *mda-id* **statistics** **mirror**
- **mda** *mda-id* **statistics** **cflowd**
- **mda** *mda-id* **ring** {**all** | **mac** *ieee-address* | **port** *port-id*}
- **mda** **all**
- **mw**
 - **link** *mw-link-id* **statistics**
 - **radio** *port-id*
 - **radio** *radio* **perfmon** [**all** | **g826** | **acm** | **power**]
 - **rsl-history** *port-id*
- **port** *port-id* **statistics**
- **port** *port-id* **atm** **pvc** [*vpi* / *vc*] **statistics**
- **port** *port-id* **atm** **pvp** [*vpi*] **statistics**
- **port** *port-id* **frame-relay** **dlci** *dlci*
- **scada** *bridge-id* **statistics**

3.14.1.4 Debug Commands

debug

- **lag** [**lag-id** *lag-id* [**port** *port-id*] [**all**]
- **lag** [**lag-id** *lag-id* [**port** *port-id*] [**sm**] [**pkt**] [**cfg**] [**red**] [**iom-upd**] [**port-state**] [**timers**] [**sel-logic**] [**mc**] [**mc-pkt**]
- **no lag** [**lag-id** *lag-id*]

3.14.2 Command Descriptions

- [Show Commands](#)
- [Monitor Commands](#)
- [Clear Commands](#)
- [Debug Commands](#)

3.14.2.1 Show Commands

- [Show APS Commands](#)
- [Show Card Commands](#)
- [Show External Alarms Commands](#)
- [Show T1/E1 LCR Commands](#)
- [Show Microwave Link Commands](#)
- [Show Port Commands](#)
- [Show ATM Port Commands](#)
- [Show Port-tree Commands](#)
- [Show LAG Commands](#)
- [Show Multilink Bundle and IMA Group Commands](#)
- [Show ATM IMA Group Commands](#)
- [Show SCADA Commands](#)



Note: The following command outputs are examples only; actual displays may differ depending on supported functionality and user configuration.

3.14.2.1.1 Show APS Commands

aps

- Syntax** `aps [aps-id] [detail]`
- Context** show
- Description** This command displays Automatic Protection Switching (APS) information.
- Parameters** *aps-id*— displays information for the specified APS group ID
- Values** 1 to 128
- detail** — displays detailed APS information
- Output** The following outputs are examples of APS information, and [Table 32](#) describes the fields.

Output Example

```
*A:7705:Dut-A>config>port# show aps
=====
APS Group Info
=====
Interface Admin Oper MC-Ctl Work Prot Active Tx/Rx
          State State State Circuit Circuit Circuit K1 Byte
-----
aps-1 Up Up N/A 1/5/1 1/6/1 1/5/1 PC-Tx: No-Req
=====

*A:7705:Dut-A>config>port# show aps detail
=====
APS Group: aps-1
=====
Description : APS Group
Group Id : 1 Active Circuit : 1/5/1
Admin Status : Up Oper Status : Up
Working Circuit : 1/5/1 Protection Circuit : 1/6/1
Switching-mode : Bi-directional Switching-arch : 1+1(sig,data)
Revertive-mode : Non-revertive Revert-time (min) :
Rx K1/K2 byte : 0x00/0x05 (No-Req on Protect)
Tx K1/K2 byte : 0x00/0x05 (No-Req on Protect)
Current APS Status : OK
Multi-Chassis APS : No
Neighbor : 0.0.0.0
Control link state : N/A
Mode mismatch Cnt : 0 Channel mismatch Cnt : 0
PSB failure Cnt : 1 FEPL failure Cnt : 1
-----
APS Working Circuit - 1/5/1
-----
Admin Status : Up Oper Status : Up
Current APS Status : OK No. of Switchovers : 0
Last Switchover : None Switchover seconds : 0
```

```
Signal Degrade Cnt : 1           Signal Failure Cnt   : 0
Last Switch Cmd   : No Cmd      Last Exercise Result : Unknown
Tx L-AIS          : None
```

 APS Protection Circuit - 1/6/1

```
Admin Status      : Up           Oper Status          : Up
Current APS Status : OK          No. of Switchovers   : 0
Last Switchover   : None         Switchover seconds   : 0
Signal Degrade Cnt : 1           Signal Failure Cnt   : 0
Last Switch Cmd   : No Cmd      Last Exercise Result : Unknown
Tx L-AIS          : None
```

=====

Table 32 APS Field Descriptions

Label	Description
Interface	Specifies the APS interface name (the APS group port)
Admin State	Specifies whether the APS interface is administratively up or down
Oper State	Specifies whether the APS interface is operationally up or down
MC-Ctl state	Specifies the multi-chassis state
Work Circuit	Specifies the physical port that is acting as the working circuit for this APS group
Prot Circuit	Specifies the physical port that is acting as the protection circuit for this APS group
Active Circuit	Specifies the active circuit
Tx/Rx K1 Byte	Displays the value of the SONET/SDH K1 byte received or transmitted on the protection circuit
APS Group	Displays the APS group name
Description	Displays the APS group description
Group ID	Displays the APS group ID number
Active Circuit	Specifies the physical port that is acting as the active circuit for this APS group
Admin Status	Specifies whether the APS circuit is administratively up or down
Oper Status	Specifies whether the APS circuit is operationally up or down

Table 32 APS Field Descriptions (Continued)

Label	Description
Working Circuit	Displays the physical port that is acting as the working circuit for this APS group
Protection Circuit	Displays the physical port that is acting as the protection circuit for this APS group
Switching-mode	Displays the switching mode of the APS group
Switching-arch	Displays the architecture of the APS group
Revertive-mode	Displays the revertive mode of the APS group: non-revertive — traffic remains on the protection line until another switch request is received revertive — when the condition that caused a switch to the protection line has been cleared, the signal is switched back to the working line
Revert-time	Displays the configured time, in minutes, to wait after the working circuit has become functional again before making the working circuit active again. If the revertive mode is non-revertive, then this field is empty.
Rx K1/K2 byte	Displays the value of the SONET/SDH K1/K2 byte received on the interface
Tx K1/K2 byte	Displays the value of the SONET/SDH K1/K2 byte transmitted on the interface
Current APS Status	Displays the current APS status
Multi-Chassis APS	Indicates whether MC-APS is configured
Neighbor	Displays the neighbor IP address. All zeros indicates the APS group is an SC-APS.
Control link state	Displays the current control link status
Mode mismatch Cnt	Indicates the number of times a conflict occurs between the current local mode and the received K2 mode information
Channel mismatch Cnt	Indicates the number of mismatches between the transmitted K1 channel and the received K2 channel that have been detected

Table 32 APS Field Descriptions (Continued)

Label	Description
PSB failure Cnt	Displays a count of Protection Switch Byte (PSB) failure conditions. This condition occurs when either an inconsistent APS byte or an invalid code is detected.
FEPL failure Cnt	Displays a count of far-end protection-line (FEPL) failure conditions. This condition is declared based on receiving SF on the protection line in the K1 byte.
No. of Switchovers	Displays the number of times a switchover has occurred
Last Switchover	Displays the timestamp of the last switchover
Switchover seconds	<p>Displays the cumulative Protection Switching Duration (PSD) time in seconds</p> <p>For a working channel, this is the cumulative number of seconds that service was carried on the protection line</p> <p>For the protection line, this is the cumulative number of seconds that the protection line has been used to carry any working channel traffic. This information is only valid if revertive switching is enabled.</p>
Signal Degrade Cnt	Displays the number of times the signal was degraded
Signal Failure Cnt	Displays the number of times the signal failed
Last Switch Cmd	Reports the last switch command that was performed on a circuit
Last Exercise Result	Displays the result of the last exercise request on a circuit
Advertise Interval	Displays the advertise interval
Hold time	Displays the hold time

3.14.2.1.2 Show Card Commands

card

Syntax	card [<i>slot-number</i>] [detail] card state
Context	show
Description	This command displays IOM and CSM information for the chassis.
Default	displays summary information only
Parameters	<i>slot-number</i> — displays information for the specified card slot (always 1)
	Values 1
	state — displays provisioned and equipped card, adapter card, and module information
	detail — displays detailed IOM information if used with the card <i>slot-number</i> option and displays detailed IOM and CSM card information if used without the <i>slot-number</i> option
Output	The following outputs are examples of card information: <ul style="list-style-type: none"> • Card (Output Example, Table 33) • Card State (Output Example, Table 34) • Card Detailed (Output Example, Table 35) • CSM Card (Output Example, Table 36)

Output Example

```

ALU-1# show card
=====
Card Summary
=====
Slot   Provisioned Type           Admin Operational  Comments
      Equipped Type (if different) State State
-----
1      iom-sar                    up    up
A      csmv2-10g                  up    up/active
B      csmv2-10g                  up    down/standby
=====

```

Table 33 Card Field Descriptions

Label	Description
Slot	The slot number of the card in the chassis
Provisioned Type	The card type that is configured for the slot
Equipped Type (if different)	The card type that is actually populated in the slot if different from the provisioned type
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 active: the CSM is in active mode (for redundancy) standby: the CSM is in standby mode (for redundancy)
Comments	Provides other information about the card

Output Example

The following examples display the card states for a 7705 SAR-8 Shelf V2, 7705 SAR-18, 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, and 7705 SAR-X.

**Note:**

- The **show card state** command output for the 7705 SAR-Hc, 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, and 7705 SAR-X will always appear as shown because these platforms have a fixed physical configuration.
- The **show card state** command output for the 7705 SAR-M will always appear as shown, with the exception of slot 1/3 where the provisioned type depends on the module installed in the slot.
- The **show card state** command output for the 7705 SAR-H will always appear as shown, with the exception of slots 1/2 and 1/3 where the provisioned type depends on the module installed in those slots.

For the 7705 SAR-8 Shelf V2:

```
*A:NOK-1># show card state
=====
Card State
=====
```

Slot/ Id	Provisioned Type Equipped Type (if different)	Admin State	Operational State	Num Ports	Num MDA	Comments
1	iom-sar	up	up		6	
1/1	a12-sdiv2	up	provisioned	12		
1/2	a4-oc3	up	provisioned	4		
1/3	a16-chds1v2	up	provisioned	16		
1/4	a4-chds3v2	up	provisioned	4		
1/5	a8-ethv2	up	provisioned	8		
1/6	a2-choc3	up	provisioned	2		
A	csmv2-10g	up	up			Active
B	csmv2-10g	up	down			Standby

```
=====
```

For the 7705 SAR-18:

```
*A:NOK-1># show card state
=====
Card State
=====
```

Slot/ Id	Provisioned Type Equipped Type (if different)	Admin State	Operational State	Num Ports	Num MDA	Comments
1	iom-sar	up	up		12	
1/1	aux-alarm	up	up			
1/2	a8-ethv2	up	up			
1/3	a8-ethv2	up	up	8		
1/4	a8-ethv2	up	provisioned	8		
1/5	a8-ethv2	up	provisioned	8		
1/6	a32-chds1v2	up	up	32		
1/7	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-chds3v2	up	provisioned	4		
1/12	a2-choc3	up	provisioned	2		
1/X1	x-10GigE-v2	up	provisioned	1		
1/X2	x-10GigE-v2	up	provisioned	10		
1/X3	x-10GigE-v2	up	provisioned	1		
1/X4	x-10GigE-v2	up	provisioned	10		
A	csm-10g	up	up			Active
B	csm-10g	up	down			Standby

```
=====
*A:NOK-1>#
```

For the 7705 SAR-M:

```
*A:ALU-1># show card state
=====
Card State
=====
Slot/ Provisioned Type           Admin Operational  Num  Num Comments
Id      Equipped Type (if different) State State           Ports MDA
-----
1       iom-sar                       up    up                3
1/1    i7-1gb                         up    up                7
1/2    i16-chds1                      up    up               16
1/3    p6-eth                         up    up                6
A       csm-2.5g                       up    up                Active
=====
*A:ALU-1>#
```

For the 7705 SAR-H:

```
*A:ALU-1># show card state
=====
Card State
=====
Slot/ Provisioned Type           Admin Operational  Num  Num Comments
Id      Equipped Type (if different) State State           Ports MDA
-----
1       iom-sar                       up    up                3
1/1    i8-1gb                         up    up                8
1/2    p4-combo                      up    up                4
1/3    p4-combo          p4-combo         up    up                4
A       csm-2.5g          csm-2.5g         up    up                Active
=====
*A:ALU-1>#
```

For the 7705 SAR-Hc:

```
*A:ALU-1># show card state
=====
Card State
=====
Slot/ Provisioned Type           Admin Operational  Num  Num Comments
Id      Equipped Type (if different) State State           Ports MDA
-----
1       iom-sar                       up    up                2
1/1    i6-1gb                         up    up                6
1/2    i2-sdi                         up    up                2
A       csm-2.5g                       up    up                Active
=====
*A:ALU-1>#
```

For the 7705 SAR-A:

```
*A:ALU-1># show card state
=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num  Num Comments
Id     Equipped Type (if different) State State           Ports MDA
-----
1      iom-sar                    up   up                2
1/1    i12-eth-xor                up   up                12
1/2    i8-chds1                   up   up                8
A      csm-2.5g                   up   up                Active
=====
*A:ALU-1>#
```

For the 7705 SAR-Ax:

```
*A:sar-Ax# show card state
=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num  Num Comments
Id     Equipped Type (if different) State State           Ports MDA
-----
1      iom-sar                    up   up                2
1/1    i12-1gb-xor                up   up                12
1/2    i1-gnss                     up   up                1
A      csm-2.5g                   up   up                Active
=====
```

For the 7705 SAR-W:

```
*A:ALU-1># show card state
=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num  Num Comments
Id     Equipped Type (if different) State State           Ports MDA
-----
1      iom-sar                    up   up                1
1/1    i5-1gb                      up   up                6
A      csm-2.5g                   up   up                Active
=====
*A:ALU-1>#
```

For the 7705 SAR-Wx:

```
*A:ALU-1># show card state
=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num  Num Comments
Id     Equipped Type (if different) State State           Ports MDA
-----
1      iom-sar                    up   up                1
1/1    i5-1gb-b                   up   up                5
A      csm-2.5g                   up   up                Active
=====
```

For the 7705 SAR-X:

```
*A:ALU-1># show card state
=====
Card State
=====
Slot/  Provisioned Type          Admin Operational  Num   Num  Comments
Id     Equipped Type (if different) State State           Ports MDA
-----
1      iom-sar                    up    up                3
1/1    i8-chdsl-x                 up    up                8
1/2    i7-mix-eth                 up    up                7
1/3    i7-mix-eth                 up    up                7
A      csm-2.5g                   up    up                Active
=====
*A:ALU-1>#
```

Table 34 Card State Field Descriptions

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 (if different)	The card type that is actually populated in the slot if different from the provisioned type
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)

Output Example

The following example displays detailed card (IOM) information for the 7705 SAR-8 Shelf V2.

```
*A:ALU-1># show card 1 detail
=====
Card 1
=====
Slot   Provisioned Type           Admin Operational   Comments
      Equipped Type (if different) State State
-----
1      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-8.0.I1070 both/i386 NOKIA SAR 7705 *
  Time of last boot           : 2016/08/05 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 35 Card (IOM) Detailed Field Descriptions

Label	Description
Slot	The slot number of the IOM (always 1)
Provisioned Type	The card type that is configured for the slot (iom-sar)
Equipped Type (if different)	The card type that is actually populated in the slot if different from the provisioned type
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
Comments	Provides other information about the card

Table 35 Card (IOM) Detailed Field Descriptions (Continued)

Label	Description
Clock source	The system's clock source
Available MDA slots	The number of card slots available
Installed MDAs	The number of cards installed
Part number	The chassis part number
CLEI code	The Common Language Equipment Identifier (CLEI) code string for the router
Serial number	The chassis serial number
Manufacture date	The chassis manufacture date
Manufacturing string	A factory-inputted manufacturing text string
Manufacturing deviations	A record of changes done to the hardware or software that is outside the normal revision control process
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

Output Example

The following example displays detailed CSMv2 information for the 7705 SAR-8 Shelf V2.

```
*A:ALU-1># show card "a" detail
=====
Card A
=====
Slot   Provisioned Type           Admin Operational   Comments
      Equipped Type (if different) State State
-----
A      csmv2-10g                 up    up/active

BOF last modified           : N/A
Config file version         : WED SEP 01 15:49:15 2015 UTC
Config file last modified   : 2016/01/12 21:08:27
Config file last saved     : 2016/07/14 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             : SMART CF
  Size                     : 1,953 MB
  Free space               : 1,948 MB
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              : 35C
  Temperature threshold    : 75C
  Software boot (rom) version : simulated
  Software version         : TiMOS-B-8.0.I536 both/i386 NOKIA SAR 7705 *
  Time of last boot        : 2016/08/05 20:57:10
  Current alarm state      : alarm cleared
  Base MAC address         : a4:58:02:00:00:00
  Memory capacity          : 2,048 MB
=====
```

Table 36 CSM Card Field Descriptions

Label	Description
Slot	The slot number of the card in the chassis
Provisioned Type	The card type that is configured for the slot
Equipped Type (if different)	The card type that is actually populated in the slot if different from the provisioned type

Table 36 CSM Card Field Descriptions (Continued)

Label	Description
Admin 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 active: the CSM is in active mode (for redundancy) standby: the CSM is in standby mode (for redundancy)
Comments	Provides other information about the card
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
Free space	The amount of free space on the compact flash
Part number	The CSM part number
CLEI code	The code used to identify the router
Serial number	The CSM serial number
Manufacture date	The chassis manufacture date
Manufacturing string	A factory-inputted manufacturing text string

Table 36 CSM Card Field Descriptions (Continued)

Label	Description
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

mda

Syntax **mda** [*slot* [*/mda*]] [**detail**]
mda *slot/mda* **statistics** [**source-mda** | **dest-mda** | **ip-transport** | **cflowd** | **mirror** | **security**
[encryption | **firewall**]]
mda aggregate-statistics
mda with-fabric-stats
mda [*slot* [*/mda*]] **ring**

Context show

Description This command displays adapter card information and statistics collected from a specified adapter card and associated fabric ports.

The **mda slot/mda statistics** command applies only to the 7705 SAR-8 Shelf V2, 7705 SAR-18, and 7705 SAR-X. For the 7705 SAR-X, only the **cflowd** and **mirror** parameters apply.

The **mda aggregate-statistics** command applies only to the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, and 7705 SAR-Wx. Additionally, on the 7705 SAR-Ax, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, and 7705 SAR-Wx, the displays include IPsec security statistics. On the 7705 SAR-Ax, 7705 SAR-H, 7705 SAR-Hc, and 7705 SAR-Wx, the displays also include firewall queue statistics. On the 7705 SAR-H and 7705 SAR-Hc, the displays also include IP transport statistics.

The **mda with-fabric-stats** command applies only to 7705 SAR-8 Shelf V2 and 7705 SAR-18.

The **mda slot/mda ring** command applies only to the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module

If no command line options are specified, a summary output of all adapter cards is displayed.

Parameters

slot — the slot number of the IOM

Values 1

mda — the slot number of the adapter card or the fixed platform MDA. If this parameter is omitted, information on all MDAs is 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.

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. The following are also collected: global fabric statistics, fabric firewall statistics, and 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.

ip-transport — displays IP transport queue forward and drop statistics

cflowd — displays Cflowd queue statistics

security encryption — displays IPsec encryption statistics for the 7705 SAR-8 Shelf V2 and 7705 SAR-18 only

security firewall — displays firewall security statistics for the 7705 SAR-8 Shelf V2 and 7705 SAR-18 only

aggregate-statistics — displays all applicable statistics aggregated over all MDAs in the system. This command applies only to the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, and 7705 SAR-Wx.

with-fabric-stats — displays all adapter cards that have been configured to collect fabric port statistics. For the 7705 SAR-8 Shelf V2, only one adapter card can have fabric statistics enabled. For the 7705 SAR-18, multiple adapter cards can have fabric statistics enabled.

ring — accesses the commands to show the FDB and statistics on a ring adapter card. See the [fdb](#) command for more information.

Output The following outputs are examples of MDA information:

- MDA ([Output Example, Table 37](#))
- MDA Detailed ([Output Example, Table 38](#))
- MDA Fabric Statistics ([Output Example \(source-mda and dest-mda\), Table 39](#))
- MDA Fabric Statistics ([Output Example \(ip-transport statistics\), Table 40](#))
- MDA Fabric Statistics ([Output Example \(Cflowd Statistics\), Table 41](#))
- MDA Fabric Statistics ([Output Example \(mirror statistics\), Table 42](#))
- MDA Fabric Security Encryption Statistics ([Output Example \(security encryption\), Table 43](#))
- MDA Fabric Security Firewall Statistics ([Output Example \(security firewall\), Table 44](#))
- MDA With Fabric Statistics ([Output Example, Table 45](#))
- MDA Aggregate-Statistics ([Output Example, Table 46](#))

Output Example

```
*A:ALU-1># show mda 1/1
=====
MDA 1/1
=====
Slot  Mda  Provisioned Type                Admin  Operational
      Mda  Equipped Type (if different)      State  State
-----
1     1     a6-em                               up     provisioned
=====
*A:ALU-1>
```

```
*A:ALU-1># show mda 1/2
=====
MDA 1/2
=====
Slot  Mda  Provisioned Type                Admin  Operational
      Mda  Equipped Type (if different)      State  State
-----
1     2     a4-oc3                               up     provisioned
=====
*A:ALU-1>#
```

```
*A:ALU-1># show mda 1/3
=====
MDA 1/3
=====
Slot  Mda  Provisioned Type                Admin  Operational
      Mda  Equipped Type (if different)      State  State
-----
1     3     a16-chds1v2                          up     provisioned
=====
*A:ALU-1>#
```

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

```

=====
Slot  Mda  Provisioned Type                               Admin  Operational
          Equipped Type (if different)             State  State
-----
1      4      a4-chds3v2                                     up      provisioned
=====
*A:NOK-1>#

*A:NOK-1># show mda 1/6
=====
MDA 1/6
=====
Slot  Mda  Provisioned Type                               Admin  Operational
          Equipped Type (if different)             State  State
-----
1      6      a2-choc3                Unknown    up      failed
=====
*A:NOK-1>#
    
```

Table 37 MDA Field Descriptions

Label	Description
Slot	The card slot number (always 1)
Mda	The adapter card slot number
Provisioned Type	The provisioned adapter card type
Equipped Type (if different)	The adapter card type actually installed in the slot if different from the provisioned type
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

Output Example

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 Type                               Admin   Operational
          Equipped Type (if different)          State   State
-----
 1     1     a12-sdiv2                                     up      provisioned

MDA Specific Data
  Maximum port count           : 12
  Number of ports equipped     : 12
  Transmit timing selected     : CPM Card A
  Sync interface timing status : Qualified
  Network ingress queue policy : default
  Network ingress fabric policy : 1
  Access ingress fabric policy : 1
  Fabric Stats Enabled         : FALSE
  Capabilities                  : Serial, PPP, FR, HDLC, cHDLC, 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.

```
*A:ALU-1># show mda 1/1 detail
=====
MDA 1/1 detail
=====
Slot  Mda   Provisioned Type                               Admin   Operational
          Equipped Type (if different)           State   State
-----
1      1     a6-em                                           up      provisioned

MDA Specific Data
  Maximum port count           : 6
  Number of ports equipped     : 6
  Network ingress queue policy : default
  Transmit timing selected     : CPM Card A
  Sync interface timing status : Qualified
  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 Type                               Admin   Operational
          Equipped Type (if different)             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
  Transmit timing selected     : CPM Card A
  Sync interface timing status : Qualified
  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 6.

```
*A:NOK-1># show mda 1/6 detail
=====
MDA 1/6 detail
=====
Slot  Mda   Provisioned Type                               Admin   Operational
          Equipped Type (if different)           State   State
-----
      6    a16-chds1v2                               up      provisioned
          (not equipped)
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
  Fabric Port Speed-Hardware   : 1000000 kbps
  Fabric Port Speed-In-Use     : 1000000 kbps
  Network security queue policy : 1
  Access security queue policy : 1
  Security aggregate rate      : 50000
  Access ingress shaper policy : N/A
  Capabilities                  : TDM, PPP, ATM, CEM
  Min channel size              : PDH DS0 Group
  Max channel size              : PDH DS1
  Max number of channels        : 256
  Channels in use               : 0
  Capability mode               : cem-atm-ppp
CEM MDA Specific Data
  Clock Mode                    : dcr-acr
  Timestamp Frequency           : 77760
ATM MDA Specific Data
  ATM Mode                      : max8k-vc
Hardware Data
  Part number                   :
  CLEI code                     :
  Serial number                 :
  Manufacture date              :
  Administrative state          : up
  Operational state             : provisioned
  Software version              : (Not Specified)
  Time of last boot             : N/A
  Current alarm state           : alarm cleared
  Base MAC address              :
=====
A:NOK-1>#
```


The following example shows the details of a 4-port DS3/E3 Adapter card in slot 4.

```
*A:NOK-1># show mda 1/4 detail
=====
MDA 1/4 detail
=====
Slot  Mda   Provisioned Type                               Admin   Operational
          Equipped Type (if different)           State   State
-----
1      4      a4-chds3v2                                     up      up

MDA Specific Data
  Maximum port count           : 4
  Number of ports equipped     : 4
  Network ingress queue policy : default
  Transmit timing selected     : CPM Card A
  Sync interface timing status : Qualified
  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
=====
```

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 Type                               Admin   Operational
          Equipped Type (if different)             State   State
-----
1      6     a2-choc3                                       up      failed

MDA Specific Data
  Maximum port count           : 2
  Number of ports equipped     : 2
  Network ingress queue policy : default
  Transmit timing selected     : CPM Card A
  Sync interface timing status : Qualified
  Network ingress fabric policy : 1
  Access ingress fabric policy : 1
  Fabric Stats Enabled         : FALSE
  Capabilities                  : Sonet, TDM, PPP, ATM, 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>#
```

The following example shows the details of an 8-port Voice & Teleprotection card in slot 6.

```
*A:ALU-1> show mda 1/6 detail
=====
MDA 1/6 detail
=====
Slot  Mda   Provisioned Type                               Admin   Operational
          Equipped Type (if different)           State   State
-----
1      6     a8-vt                                           up      up

MDA Specific Data
  Maximum port count           : 8
  Number of ports equipped     : 8
  Network ingress queue policy : default
  Transmit timing selected     : CPM Card A
  Sync interface timing status : Qualified
  Network ingress fabric policy : 1
  Access ingress fabric policy : 1
  Fabric Stats Enabled         : FALSE
  Capabilities                  : TDM, Voice, CEM
  Min channel size              : PDH DS0 Group
  Max channel size              : Voice FXO
  Max number of channels        : 8
  Channels in use                : 2

CEM MDA Specific Data
  Clock Mode                    : n/a

Voice MDA Specific Data
  Companding Law                 : mu-law
  Signaling Type                 : n/a

Hardware Data
  Part number                    : Sim Part#
  CLEI code                      : Sim CLEI
  Serial number                  : mda-6
  Manufacture date               : 01012003
  Manufacturing variant          : ch1: 1471 ch2: 1491
  Manufacturing string           : Sim MfgString mda-6
  Manufacturing deviations       : Sim MfgDeviation mda-6
  Administrative state          : down
  Operational state              : down
  Temperature                    : 36C
  Temperature threshold         : 75C
  Software version               : N/A
  Time of last boot              : 2011/07/18 14:39:12
  Current alarm state            : alarm cleared
  Base MAC address               : a4:8d:01:06:00:01
=====
*A:ALU-1>#
```

The following example shows the details of an 8-port C37.94 Teleprotection card in slot 12 on a 7705 SAR-18.

```
*A: Sar18> show mda 1/12 detail
=====
MDA 1/12 detail
=====
Slot  Mda   Provisioned Type                               Admin   Operational
      Mda   Equipped Type (if different)                 State   State
-----
1     12    a8-c3794                                     up      provisioned
      (not equipped)
MDA Specific Data
  Maximum port count           : 8
  Number of ports equipped     : 8
  Network ingress queue policy : default
  Network ingress fabric policy : 1
  Access ingress fabric policy : 1
  Fabric Stats Enabled         : FALSE
  Fabric Port Speed-Hardware   : 1000000 kbps
  Fabric Port Speed-In-Use     : 1000000 kbps
  Network security queue policy : 1
  Access security queue policy : 1
  Security aggregate rate      : 50000
  Access ingress shaper policy : N/A
  Capabilities                 : TDM, CEM
  Min channel size             : PDH DS0 Group
  Max channel size             : Data TPIF
  Max number of channels       : 8
  Channels in use              : 0
CEM MDA Specific Data
  Clock Mode                   : n/a
Hardware Data
  Part number                  :
  CLEI code                   :
  Serial number                :
  Manufacture date             :
  Administrative state         : up
  Operational state            : provisioned
  Software version              : (Not Specified)
  Time of last boot            : N/A
  Current alarm state          : alarm cleared
  Base MAC address             :
=====
A: Sar18 Dut-B#
```

The following example shows the details of an 8-port FXO Adapter card in slot 6.

```
*A:ALU-1> show mda 1/6 detail
=====
MDA 1/6 detail
=====
Slot  Mda   Provisioned Type                               Admin   Operational
          Equipped Type (if different)           State   State
-----
1      6     a8-fxo                                         up      up

MDA Specific Data
  Maximum port count           : 8
  Number of ports equipped     : 8
  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 FXO
  Max number of channels        : 8
  Channels in use               : 1

CEM MDA Specific Data
  Clock Mode                   : n/a

Voice MDA Specific Data
  Companding Law                : mu-law
  Signaling Type               : n/a

Hardware Data
  Part number                   : Sim Part#
  CLEI code                    : Sim CLEI
  Serial number                 : mda-6
  Manufacture date              : 01012003
  Manufacturing variant         : ch1: 1471 ch2: 1491
  Manufacturing string          : Sim MfgString mda-6
  Manufacturing deviations      : Sim MfgDeviation mda-6
  Administrative state         : down
  Operational state            : down
  Temperature                   : 36C
  Temperature threshold        : 75C
  Software version              : N/A
  Time of last boot             : 2011/07/18 14:39:12
  Current alarm state           : alarm cleared
  Base MAC address              : a4:8d:01:06:00:01
=====
*A:ALU-1>#
```

The following example shows the details of a 10-port 1GigE/1-port 10GigE X-Adapter card in x10-1gb-sfp mode in slot X1 on a 7705 SAR-18.

```
*A:ALU-1> show mda 1/X1 detail
=====
MDA 1/X1 detail
=====
Slot  Mda    Provisioned Type                               Admin   Operational
      Mda    Equipped Type (if different)                 State   State
-----
1     X1      x-10GigE-v2                                  up      up

MDA Specific Data
  Maximum port count           : 10
  Number of ports equipped     : 10
  Network ingress queue policy : default
  Network ingress fabric policy : 1
  Access ingress fabric policy : 1
  Fabric Stats Enabled         : FALSE
  Capabilities                  : Ethernet
  Min channel size              : Sonet STS-192
  Max channel size              : Sonet STS-192
  Max number of channels        : 10
  Channels in use               : 2
  Capability mode               : x10-1gb-sfp

Hardware Data
  Part number                   : Sim Part#
  CLEI code                     : Sim CLEI
  Serial number                 : mda-X1
  Manufacture date              : 01012011
  Manufacturing variant         : ch1: 1471 ch2: 1491
  Manufacturing string          : Sim MfgString mda-X1
  Manufacturing deviations      : Sim MfgDeviation mda-X1
  Administrative state         : down
  Operational state            : down
  Software version              : N/A
  Time of last boot            : 2011/07/18 14:39:12
  Current alarm state          : alarm cleared
  Base MAC address             : a4:8d:01:06:00:01
=====
*A:ALU-1>#
```

The following example shows the details of a 2-port 10GigE (Ethernet) Adapter card in slot 11 on a 7705 SAR-18.

```
*A:ALU-1> show mda 1/11 detail
=====
MDA 1/11 detail
=====
Slot  Mda   Provisioned Type                               Admin   Operational
          Equipped Type (if different)           State   State
-----
1      11    a2-10gb-xfp                                   up      failed

MDA Specific Data
  Maximum port count           : 3
  Number of ports equipped     : 3
  Sync-E Capable               : TRUE
  Network ingress queue policy : r.nw.q3
  Network Ring queue policy    : r.nw.q2
  Network Ring qos policy      : 1
  Network ingress fabric policy : 1
  Access ingress fabric policy : 1
  Fabric Stats Enabled         : FALSE
  Capabilities                  : Ethernet
  Min channel size              : Sonet STS-192
  Max channel size              : Sonet STS-192
  Max number of channels        : 3
  Channels in use               : 0

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              :

-----
QOS Settings
-----
=====
*A:ALU-1>#
```

Table 38 MDA Detail Field Descriptions

Label	Description
Slot	The card slot number (always 1)
Mda	The adapter card slot number
Provisioned Type	The provisioned adapter card type
Equipped Type (if different)	The adapter card type actually installed in the slot if different from the provisioned type
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
Transmit timing selected	The CSM clock used for the transmit clock. It should be the active CSM except during a system or MDA initialization or during an activity switch.
Sync-E Capable	TRUE: the adapter card supports synchronous Ethernet timing
	FALSE: the adapter card does not support synchronous Ethernet timing
Sync interface timing status	The status of synchronization interface timing; it should be qualified except during a system or MDA initialization or during an activity switch
Network Ring queue policy	The network queue policy applied to the ring port on the adapter card to define the queuing structure for this object
Network Ring qos policy	The network QoS policy applied to the ring port on this adapter card

Table 38 MDA Detail Field Descriptions (Continued)

Label	Description
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
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
Capability mode	The adapter card mode (mda-mode) for cards that support mda-mode
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
Signaling Type	The signaling type used on the adapter card
Hardware Data	
Part number	The hardware part number
CLEI code	The code used to identify the adapter card
Serial number	The adapter card part number
Manufacture date	The adapter card manufacture date
Manufacturing variant	The adapter card manufacture variant
Manufacturing string	A factory-inputted manufacturing text string

Table 38 MDA Detail Field Descriptions (Continued)

Label	Description
Manufacturing deviations	A record of changes done to the hardware or software that is outside the normal revision control process
Administrative state	up: the adapter card is administratively up
	down: the adapter card is administratively down
Operational state	up: the adapter card is operationally up
	down: the adapter card is operationally down
	provisioned: there is no adapter card in the slot but it has been preconfigured
	failed: the provisioned adapter card has operationally failed
Temperature	The internal chassis temperature
Temperature threshold	The value above which the internal temperature must rise in order to indicate that the temperature is critical
Software version	The software version number
Time of last boot	The date and time the most recent boot occurred
Current alarm state	The alarm conditions for the specific adapter card
Base MAC address	The base MAC address of the hardware component

Output Example (source-mds and dest-mds)

The following example shows an MDA fabric statistics display if the **source-mds** keyword is used.

```
*A:ALU-1># show mda 1/5 statistics source-mds
=====
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

The following example shows an MDA fabric statistics display if the **dest-md** keyword is used.

```
*A:ALU-1># show mda 1/5 statistics dest-md
=====
Statistic of Destination MDA 1/5
=====
-----
Drop Events: 0
-----
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 Firewall Stats          Packets      Octets
Unicast Forwarded :          1929191      N/A
Multicast Forwarded :        1046297      N/A
Total Forwarded   :          2975488           0
Total Dropped     :              0           0

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 39 MDA Fabric Statistics Field Descriptions

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.

Table 39 MDA Fabric Statistics Field Descriptions (Continued)

Label	Description
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
	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 39 MDA Fabric Statistics Field Descriptions (Continued)

Label	Description
Multipoint (for source-md)	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 ¹
	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

Table 39 MDA Fabric Statistics Field Descriptions (Continued)

Label	Description
Total Network dropped Packets/ Octets	The number of network in-profile and out-of-profile packets/octets dropped
Total Access forwarded Packets/ Octets	The number of access in-profile and out-of-profile packets/octets forwarded
Total Access dropped Packets/ Octets	The number of access in-profile and out-of-profile packets/octets dropped
Statistic of Destination MDA	If the dest-mda keyword is specified in the show statistics command, displays the network and access ingress statistics from all source adapter cards going towards the fabric and destined for the specified adapter card. Global fabric statistics are also displayed, as well as the fabric port statistics if the destination adapter card has the collection of fabric statistics enabled. The sum of traffic forwarded or dropped is also displayed.
Drop Events	The number of packets that are dropped from the buffer at the 7705 SAR-8 Shelf V2 or 7705 SAR-18 adapter card port instead of being transferred to the fabric. Drop events only occur if an excessive amount of traffic is flowing through the ports, which causes the buffers to fill up; under normal circumstances, this statistic should always be 0.

Table 39 MDA Fabric Statistics Field Descriptions (Continued)

Label	Description
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
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

Table 39 MDA Fabric Statistics Field Descriptions (Continued)

Label	Description
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-mds 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 Shelf V2 and 1 to 12 and X1 to X4 on the 7705 SAR-18.
2. Source MDA 1/x in the output field, where x = 1 to 6 on the 7705 SAR-8 Shelf V2 and 1 to 12 and X1 to X4 on the 7705 SAR-18.
3. Fabric Global Stats octet counts are supported only on the 7705 SAR-18. For other 7705 SAR products, "N/A" is displayed in these fields.

Output Example (ip-transport statistics)

The following example shows an MDA fabric statistics display when the **ip-transport** keyword is used. The keyword applies only to the 7705 SAR-8 Shelf V2 and 7705 SAR-18.

```
*A:ALU-1># show mda 1/1 statistics ip-transport
=====
IP Transport Statistics
=====
-----
IP Transport Queue Statistics
-----
Network Ingress Queue          Packets      Bytes
  Forwarded                    :          99      34238
  Dropped                      :           0           0
Access Ingress Queue           Packets      Bytes
  Forwarded                    :           50      29250
  Dropped                      :           0           0
```

```

-----
Serial Socket Queue Statistics
-----
Access Ingress Queue          Packets          Bytes
  Forwarded                   :          0          0
  Dropped                      :          0          0
=====
    
```

Table 40 MDA Fabric IP-Transport Statistics Field Descriptions

Label	Description
IP Transport Statistics	
IP Transport Queue Statistics	
Network Ingress Queue Forwarded Dropped	The number of IP-Transport subservice network ingress queued packets and bytes that were forwarded and dropped
Access Ingress Queue Forwarded Dropped	The number of IP-Transport subservice access ingress queued packets and bytes that were forwarded and dropped
Serial Socket Queue Statistics	
Access Ingress Queue Forwarded Dropped	The number of serial raw socket access ingress queued packets and bytes that were forwarded and dropped

Output Example (Cflowd Statistics)

The following example shows an MDA fabric statistics display when the **cflowd** keyword is used.

```

*A:ALU-1# show mda 1/1 statistics cflowd
-----
Cflowd Queue Statistics
-----
Cflowd Queue          Packets          Bytes
  forwarded           :          0          0
  dropped              :          0          0
=====
    
```

Table 41 MDA Fabric Cflowd Statistics Field Descriptions

Label	Description
Cflowd Queue Statistics	
Cflowd Queue Forwarded	The number of forwarded and dropped Cflowd packets and bytes
Cflowd Queue Dropped	

Output Example (mirror statistics)

The following example shows an MDA fabric statistics display when the **mirror** keyword is used. The **statistics mirror** keywords apply only to the 7705 SAR-8 Shelf V2, 7705 SAR-18, and 7705 SAR-X. The **aggregate-statistics mirror** keywords apply only to the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, and 7705 SAR-Wx. Refer to the “Mirroring” chapter in the 7705 SAR OAM and Diagnostics Guide for more information on mirroring.

```
*A:ALU-1# show mda 1/1 statistics mirror
=====
mirror Statistics
=====
-----
mirror Queue Statistics
-----
Mirror Queue 1 Best-effort      Packets      Bytes
  In Profile forwarded   :          0          0
  In Profile dropped     :          0          0
  Out Profile forwarded  :          0          0
  Out Profile dropped    :          0          0
Mirror Queue 2 Best-effort      Packets      Bytes
  In Profile forwarded   :          0          0
  In Profile dropped     :          0          0
  Out Profile forwarded  :          0          0
  Out Profile dropped    :          0          0
Mirror Queue 3 Best-effort      Packets      Bytes
  In Profile forwarded   :          0          0
  In Profile dropped     :          0          0
  Out Profile forwarded  :          0          0
  Out Profile dropped    :          0          0
Mirror Queue 4 Best-effort      Packets      Bytes
  In Profile forwarded   :          0          0
  In Profile dropped     :          0          0
  Out Profile forwarded  :          0          0
  Out Profile dropped    :          0          0
Mirror Queue 5 Expedited        Packets      Bytes
  In Profile forwarded   :          0          0
  In Profile dropped     :          0          0
  Out Profile forwarded  :          0          0
  Out Profile dropped    :          0          0
Mirror Queue 6 Expedited        Packets      Bytes
  In Profile forwarded   :          0          0
  In Profile dropped     :          0          0
```

```

Out Profile forwarded :      0          0
Out Profile dropped   :      0          0
Mirror Queue 7 Expedited      Packets      Bytes
In Profile forwarded  :      0          0
In Profile dropped    :      0          0
Out Profile forwarded :      0          0
Out Profile dropped   :      0          0
Mirror Queue 8 Expedited      Packets      Bytes
In Profile forwarded  :      0          0
In Profile dropped    :      0          0
Out Profile forwarded :      0          0
Out Profile dropped   :      0          0
=====
    
```

Table 42 MDA Fabric Mirror Statistics Field Descriptions

Label	Description
Mirror Queue Statistics for Mirror Queue 1 to 4	
In Profile forwarded	The number of packets and octets forwarded by the mirror queue for in-profile and best-effort traffic
In Profile dropped	The number of packets and octets dropped by the mirror queue for in-profile and best-effort traffic
Out Profile forwarded	The number of packets and octets forwarded by the mirror queue for out-of-profile and best-effort traffic
Out Profile dropped	The number of packets and octets dropped by the mirror queue for out-of-profile and best-effort traffic
Mirror Queue Statistics for Mirror Queue 5 to 8	
In Profile forwarded	The number of packets and octets forwarded by the mirror queue for in-profile and expedited traffic
In Profile dropped	The number of packets and octets dropped by the mirror queue for in-profile and expedited traffic
Out Profile forwarded	The number of packets and octets forwarded by the mirror queue for out-of-profile and expedited traffic
Out Profile dropped	The number of packets and octets dropped by the mirror queue for out-of-profile and expedited traffic

Output Example (security encryption)

The following example shows an MDA fabric statistics display when the **security encryption** keywords are used. The **security encryption** keywords apply only to the 7705 SAR-8 Shelf V2 and the 7705 SAR-18. Refer to the “IPSec” section in the 7705 SAR Services Guide for more information on IPSec security.

```
*A:ALU-1# show mda 1/1 statistics security encryption
=====
MDA 1/1 Security Statistics
=====
-----
IPsec Datapath Statistics
-----
Encrypted packets           : 382893273
Encrypted bytes            : 187617703770
Outbound dropped packets   : 130532
Outbound SA misses        : 130532
Outbound policy entry misses : 0
Decrypted packets         : 382878423
Decrypted bytes           : 187610427270
Inbound dropped packets   : 0
Inbound SA misses        : 0
Inbound IP dst/src mismatches : 0
Transmit packet errors    : 0
Drop Too Big/Df-set Pkts  : 0
-----
IPsec Control Statistics (System Wide)
-----
Static IPsec Tunnels       : 1
Dynamic IPsec Tunnels     : 0
-----
IPsec Queue Statistics
-----
Decryption Queue Best-effort   Packets      Bytes
Hi Priority forwarded :      0           0
Hi Priority dropped   :      0           0
Low Priority forwarded : 383236465    2018336468
Low Priority dropped   :      0           0
Decryption Queue Expedited    Packets      Bytes
Hi Priority forwarded :      0           0
Hi Priority dropped   :      0           0
Low Priority forwarded :      0           0
Low Priority dropped   :      0           0
Encryption Queue Best-effort   Packets      Bytes
In Profile forwarded  :      0           0
In Profile dropped    :      0           0
Out Profile forwarded : 383494130    3228529972
Out Profile dropped   :      0           0
Encryption Queue Expedited    Packets      Bytes
In Profile forwarded  :      0           0
In Profile dropped    :      0           0
Out Profile forwarded :      0           0
Out Profile dropped   :      0           0
Encryption Queue CTL          Packets      Bytes
Forwarded             :      0           0
Dropped               :      0           0
=====
```

Table 43 MDA Fabric Security Encryption Statistics Field Descriptions

Label	Description
IPsec Datapath Statistics	
Encrypted packets	The total number of packets encrypted by the adapter card to be sent out IPsec tunnels
Encrypted bytes	The total number of bytes encrypted by the adapter card to be sent out IPsec tunnels
Outbound dropped packets	The total number of outbound packets dropped instead of encrypted and sent out IPsec tunnels
Outbound SA misses	The number of Security Association-related mismatches in the outbound direction
Outbound policy entry misses	The number of security policy entry mismatches in the outbound direction
Decrypted packets	The total number of decrypted packets
Decrypted bytes	The total number of decrypted bytes
Inbound dropped packets	The total number packets dropped instead of forwarded
Inbound SA misses	The number of inbound Security Association-related misses (that is, having mismatched security parameter index (SPI) on manual keyed tunnel)
Inbound IP dst/src mismatches	The number of security policy entry mismatches in the inbound direction due to IP destination or source address mismatches
Transmit packet errors	The number of generic packet transmit errors
Drop Too Big/Df-set Pkts	The number of packets dropped because the packet is too big and the do-not-fragment flag is set
IPsec Control Statistics (System Wide)	
Static IPsec Tunnels	The number of static IPsec tunnels configured on the 7705 SAR
Dynamic IPsec Tunnels	Not applicable (always 0)
Encryption/Decryption Queue Statistics	
Decryption Queue Best-effort	
Hi Priority forwarded	The number of packets and octets forwarded by the decryption queue for high priority and best effort traffic

Table 43 MDA Fabric Security Encryption Statistics Field Descriptions

Label	Description
Hi Priority dropped	The number of packets and octets dropped by the decryption queue for high priority and best effort traffic
Low Priority forwarded	The number of packets and octets forwarded by the decryption queue for low priority and best effort traffic
Low Priority dropped	The number of packets and octets dropped by the decryption queue for low priority and best effort traffic
Decryption Queue Expedited	
Hi Priority forwarded	The number of packets and octets forwarded by the decryption queue for high priority and expedited traffic
Hi Priority dropped	The number of packets and octets dropped by the decryption queue for high priority and expedited traffic
Low Priority forwarded	The number of packets and octets forwarded by the decryption queue for low priority and expedited traffic
Low Priority dropped	The number of packets and octets dropped by the decryption queue for low priority and expedited traffic
Encryption Queue Best-effort	
In Profile forwarded	The number of packets and octets forwarded by the encryption queue for in-profile and best effort traffic
In Profile dropped	The number of packets and octets dropped by the encryption queue for in-profile and best effort traffic
Out Profile forwarded	The number of packets and octets forwarded by the encryption queue for out-of-profile and best effort traffic
Out Profile dropped	The number of packets and octets dropped by the encryption queue for out-of-profile and best effort traffic
Encryption Queue Expedited	
In Profile forwarded	The number of packets and octets forwarded by the encryption queue for in-profile and expedited traffic
In Profile dropped	The number of packets and octets dropped by the encryption queue for in-profile and expedited traffic
Out Profile forwarded	The number of packets and octets forwarded by the encryption queue for out-of-profile and expedited traffic
Out Profile dropped	The number of packets and octets dropped by the encryption queue for out-of-profile and expedited traffic

Table 43 MDA Fabric Security Encryption Statistics Field Descriptions

Label	Description
Encryption Queue CTL	
Forwarded	The number of packets and octets forwarded by the encryption queue for control path traffic
Dropped	The number of packets and octets dropped by the encryption queue for control path traffic

Output Example (security firewall)

The following example shows an MDA fabric statistics display when the **security firewall** keywords are used. The **security firewall** keywords apply only to the 7705 SAR-8 Shelf V2 and 7705 SAR-18. Refer to the “Security Parameters” section in the 7705 SAR Router Configuration Guide for more information on firewall security.

```
*A:ALU-1# show mda 1/6 statistics security firewall
=====
Firewall Statistics
=====
-----
Firewall Queue Statistics
-----
Network Queue 1 Best-effort          Packets          Bytes
  In Profile forwarded   :          0          0
  In Profile dropped     :          0          0
  Out Profile forwarded  :          0          0
  Out Profile dropped    :          0          0
Network Queue 2 Expedited           Packets          Bytes
  In Profile forwarded   :          0          0
  In Profile dropped     :          0          0
  Out Profile forwarded  :          0          0
  Out Profile dropped    :          0          0
Access Queue 1 Best-effort          Packets          Bytes
  In Profile forwarded   :          0          0
  In Profile dropped     :          0          0
  Out Profile forwarded  :          0          0
  Out Profile dropped    :          0          0
Access Queue 2 Expedited           Packets          Bytes
  In Profile forwarded   :          0          0
  In Profile dropped     :          0          0
  Out Profile forwarded  :          0          0
  Out Profile dropped    :          0          0
=====
```

Table 44 MDA Fabric Security Firewall Statistics Field Descriptions

Label	Description
Network Queue 1 Best-effort	The statistics for the best-effort network queue; queue 1 is always for best-effort traffic
Network Queue 2 Expedited	The statistics for the expedited network queue; queue 2 is always for expedited traffic
Access Queue 1 Best-effort	The statistics for the best-effort access queue; queue 1 is always for best-effort traffic
Access Queue 2 Best-effort	The statistics for the expedited access queue; queue 2 is always for expedited traffic
In Profile forwarded	The number of packets and bytes forwarded by the security queue for in-profile best-effort or expedited traffic
In Profile dropped	The number of packets and bytes dropped by the security queue for in-profile best-effort or expedited traffic
Out Profile forwarded	The number of packets and bytes forwarded by the security queue for out-of-profile best-effort or expedited traffic
Out Profile dropped	The number of packets and bytes dropped by the security queue for out-of-profile best-effort or expedited traffic

Output Example

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 Type                               Admin   Operational
      Mda   Equipped Type (if different)                 State   State
-----
1     1     a12-sdiv2                                   down    provisioned
=====
*A:ALU-1>#
```

Table 45 MDA With Fabric Statistics Field Descriptions

Label	Description
Slot	The card slot number (always 1)
Mda	The adapter card slot number

Table 45 MDA With Fabric Statistics Field Descriptions (Continued)

Label	Description
Provisioned Type	The provisioned adapter card type
Equipped Type (if different)	The adapter card type actually installed in the slot if different from the provisioned type
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

Output Example

The following example shows aggregate statistics for access and network ingress fabric traffic on the 7705 SAR-M when the **aggregate-statistics** keyword is used. The displays on the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, 7705 SAR-H, and 7705 SAR-Hc look similar. Additionally, on the 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, 7705 SAR-H, and 7705 SAR-Hc, the displays include IPsec security statistics. Refer to the "IPsec" section in the 7705 SAR Services Guide for more information on IPsec security. On the 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-Ax and 7705 SAR-Wx, the displays include the aggregated firewall security statistics. On the 7705 SAR-H and 7705 SAR-Hc, the displays include IP transport statistics.

```
*A:ALU-1># show mda aggregate-statistics
```

```
=====
Drop Events: 0
=====

-----
Unicast from All MDA's to MDA 1/1 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  : 0              0
  Access Out Profile forwarded : 6592860     6724717200
  Access dropped                : 1070278      1093824116
Unicast from All MDA's to MDA 1/2 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  : 0              0
  Access Out Profile forwarded : 0              0
```

```

Access dropped : 0 0
-----
Unicast from All MDA's to MDA 1/3 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 : 0 0
Access Out Profile forwarded : 0 0
Access dropped : 0 0
-----
Multicast from All MDA's 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 : 0 0
Access Out Profile forwarded : 0 0
Access dropped : 0 0
-----
Total Network forwarded : 0 0
Total Network dropped : 0 0
Total Access forwarded : 6592860 6724717200
Total Access dropped : 1070278 1093824116
=====

```

=====
Aggregated Cflowd Queue Statistics
=====

```

Cflowd Queue Packets Bytes
forwarded : 0 0
dropped : 0 0
=====

```

*A:ALU-1>#

The following example shows the inclusion of IPSec security statistics on 7705 SAR-Ax, 7705 SAR-W, 7705 SAR-Wx, 7705 SAR-H, and 7705 SAR-Hc displays.

*A:ALU-1# show mda aggregate-statistics

=====
Aggregated Statistics
=====

```

Drop Events : 0
-----
Unicast from All MDA's to MDA 1/1 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 : 0 0
Access Out Profile forwarded : 0 0
Access dropped : 0 0
Multicast from All MDA's 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  : 0          0
Access Out Profile forwarded : 0          0
Access dropped                : 0          0
-----
Total Network forwarded  :      0          0
Total Network dropped   :      0          0
Total Access forwarded  :      0          0
Total Access dropped    :      0          0
=====
Aggregated Security Statistics
=====
-----
IPsec Datapath Statistics
-----
Encrypted packets          : 2114116
Encrypted bytes            : 2997816488
Outbound dropped packets  : 1928
Outbound SA misses        : 1928
Outbound policy entry misses : 0
Decrypted packets         : 2104241
Decrypted bytes           : 2983813738
Inbound dropped packets   : 207
Inbound SA misses        : 207
Inbound IP dst/src mismatches : 0
Inbound IP fragmented packets : 0
Transmit packet errors    : 0
Drop Too Big/Df-set Pkts  : 0
-----
IPsec Control Statistics (System Wide)
-----
Static IPsec Tunnels      : 4
Dynamic IPsec Tunnels    : 0
-----
IPsec Queue Statistics
-----
Decryption Queue Best-effort      Packets      Bytes
Hi Priority forwarded  :      0          0
Hi Priority dropped    :      0          0
Low Priority forwarded :    2105076    3056570352
Low Priority dropped   :      0          0

Decryption Queue Expedited        Packets      Bytes
Hi Priority forwarded  :      0          0
Hi Priority dropped    :      0          0
Low Priority forwarded :      0          0
Low Priority dropped   :      0          0

Encryption Queue Best-effort      Packets      Bytes
In Profile forwarded  :    893166    1266509388
In Profile dropped    :      0          0
Out Profile forwarded :    1221786    1732492548
Out Profile dropped   :      0          0

Encryption Queue Expedited        Packets      Bytes
In Profile forwarded  :      0          0
In Profile dropped    :      0          0

```

```

Out Profile forwarded :      0          0
Out Profile dropped   :      0          0

Encryption Queue CTL      Packets      Bytes
  Forwarded :              0          0
  Dropped   :              0          0

```

```
=====
*A:ALU-1#
```

The following example shows the inclusion of aggregated firewall security statistics on the 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-Ax and 7705 SAR-Wx displays.

```

*A:ALU-1# show mda aggregate-statistics
=====
Aggregated Statistics
=====
-----
Drop Events :                      0
-----
-----
Unicast from All MDA's to MDA 1/1  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  :    0          0
  Access Out Profile forwarded  :    0          0
  Access dropped                :    0          0
Multicast from All MDA's            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  :    0          0
  Access Out Profile forwarded  :    0          0
  Access dropped                :    0          0
-----
Total Network forwarded :      0          0
Total Network dropped   :      0          0
Total Access forwarded  :      0          0
Total Access dropped    :      0          0
=====
=====
Aggregated Security Statistics
=====
-----
Group Encryption Datapath Statistics
-----
  Encrypted packets      : 0
  Encrypted bytes        : 0
  Outbound dropped packets : 0
  Outbound unsupported uplink : 0
  Outbound enqueue error : 0
  Decrypted packets      : 0
  Decrypted bytes        : 0
  Inbound dropped packets : 0
  Inbound invalid spi    : 0
  Inbound authentication failure: 0
  Inbound padding error   : 0

```

```

Inbound control word mismatch : 0
Inbound enqueue error         : 0
-----
Encryption/Decryption Queue Statistics
-----
Decryption Queue Best-effort      Packets      Bytes
Hi Priority forwarded :         0          0
Hi Priority dropped   :         0          0
Low Priority forwarded :         0          0
Low Priority dropped   :         0          0
Decryption Queue Expedited      Packets      Bytes
Hi Priority forwarded :         0          0
Hi Priority dropped   :         0          0
Low Priority forwarded :         0          0
Low Priority dropped   :         0          0
Encryption Queue Best-effort     Packets      Bytes
In Profile forwarded  :         0          0
In Profile dropped    :         0          0
Out Profile forwarded :         0          0
Out Profile dropped   :         0          0
Encryption Queue Expedited      Packets      Bytes
In Profile forwarded  :         0          0
In Profile dropped    :         0          0
Out Profile forwarded :         0          0
Out Profile dropped   :         0          0
Encryption Queue CTL            Packets      Bytes
Forwarded :              0          0
Dropped   :              0          0
=====
Aggregated Firewall Statistics
=====
-----
Firewall Queue Statistics
-----
Network Queue 1 Best-effort      Packets      Bytes
In Profile forwarded  :         0          0
In Profile dropped    :         0          0
Out Profile forwarded :         0          0
Out Profile dropped   :         0          0
Network Queue 2 Expedited      Packets      Bytes
In Profile forwarded  :         0          0
In Profile dropped    :         0          0
Out Profile forwarded :         0          0
Out Profile dropped   :         0          0
Access Queue 1 Best-effort     Packets      Bytes
Hi Priority forwarded :         0          0
Hi Priority dropped   :         0          0
Low Priority forwarded :         0          0
Low Priority dropped   :         0          0
Access Queue 2 Expedited      Packets      Bytes
Hi Priority forwarded :         0          0
Hi Priority dropped   :         0          0
Low Priority forwarded :         0          0
Low Priority dropped   :         0          0
=====
Aggregated Mirror Queue Statistics
=====

```

```

Mirror Queue 1                Packets      Bytes
  In Profile forwarded   :      0          0
  In Profile dropped    :      0          0
  Out Profile forwarded  :    5600      4481226
  Out Profile dropped   :      0          0
Mirror Queue 2                Packets      Bytes
  In Profile forwarded   :      0          0
  In Profile dropped    :      0          0
  Out Profile forwarded  :      0          0
  Out Profile dropped   :      0          0
Mirror Queue 3                Packets      Bytes
  In Profile forwarded   :      0          0
  In Profile dropped    :      0          0
  Out Profile forwarded  :      0          0
  Out Profile dropped   :      0          0
Mirror Queue 4                Packets      Bytes
  In Profile forwarded   :      0          0
  In Profile dropped    :      0          0
  Out Profile forwarded  :      0          0
  Out Profile dropped   :      0          0
Mirror Queue 5                Packets      Bytes
  In Profile forwarded   :      0          0
  In Profile dropped    :      0          0
  Out Profile forwarded  :      0          0
  Out Profile dropped   :      0          0
Mirror Queue 6                Packets      Bytes
  In Profile forwarded   :      0          0
  In Profile dropped    :      0          0
  Out Profile forwarded  :      0          0
  Out Profile dropped   :      0          0
Mirror Queue 7                Packets      Bytes
  In Profile forwarded   :      0          0
  In Profile dropped    :      0          0
  Out Profile forwarded  :      0          0
  Out Profile dropped   :      0          0
Mirror Queue 8                Packets      Bytes
  In Profile forwarded   :      0          0
  In Profile dropped    :      0          0
  Out Profile forwarded  :      0          0
  Out Profile dropped   :      0          0

```

=====

The following example shows the inclusion of IP transport statistics on the 7705 SAR-H and 7705 SAR-Hc displays.

```

=====
Aggregated IP Transport Statistics
=====
-----
IP Transport Queue Statistics
-----
Network Ingress Queue          Packets      Bytes
  Forwarded                    :    101      35450
  Dropped                      :      0          0
Access Ingress Queue           Packets      Bytes
  Forwarded                    :      48      28080
  Dropped                      :      0          0
-----
Serial Socket Queue Statistics

```



```

-----
Access Ingress Queue          Packets          Bytes
  Forwarded                   :          98          54586
  Dropped                      :           0           0
=====
    
```

Table 46 MDA Aggregate Statistics Field Descriptions

Label	Description
Drop Events	The number of packets that are dropped from the buffer at the port instead of being transferred to the fabric. Drop events only occur if an excessive amount of traffic is flowing through the ports, which causes the buffers to fill up; under normal circumstances, this statistic should always be 0.
Unicast from all MDA's to Destination MDA Packets/Octets	Network In Profile forwarded: 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
	Network In Profile dropped: 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
	Network Out Profile forwarded: 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
	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
	Access In Profile forwarded: 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
	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
	Access dropped: the number of access packets/octets dropped from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command

Table 46 MDA Aggregate Statistics Field Descriptions (Continued)

Label	Description
Multicast from All MDA's Packets/Octets	Network In Profile forwarded: number of multicast 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
	Network In Profile dropped: number of multicast 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
	Network Out Profile forwarded: number of multicast 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
	Network Out Profile dropped: the number of multicast 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
	Access In Profile forwarded: number of multicast 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
	Access Out Profile forwarded: the number of multicast 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
	Access dropped: the number of multicast access packets/octets dropped from any source adapter card toward the fabric, then to the destination adapter card specified in the show mda command
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

Table 46 MDA Aggregate Statistics Field Descriptions (Continued)

Label	Description
Total Access dropped Packets/ Octets	The number of access in-profile and out-of-profile packets/octets dropped
Aggregated Cflowd Queue Statistics	
Cflowd Queue Forwarded Dropped	The number of forwarded and dropped Cflowd packets and bytes
Aggregated Security Statistics See Table 42 and Table 43	
Aggregated IP Transport Statistics	
IP Transport Queue Statistics	
Network Ingress Queue Forwarded Dropped	The number of IP-Transport subservice network ingress queued packets and bytes that were forwarded and dropped
Access Ingress Queue Forwarded Dropped	The number of IP-Transport subservice access ingress queued packets and bytes that were forwarded and dropped
Serial Socket Queue Statistics	
Access Ingress Queue Forwarded Dropped	The number of serial raw socket access ingress queued packets and bytes that were forwarded and dropped

fdb

Syntax `fdb [mac ieee-address] [port port-id] [all]`

Context `show>mda>ring`

Description This command displays the forwarding database (FDB) for the specified MAC address or ring port, or all FDBs associated with the specified ring adapter card.

Parameters *ieee-address* — displays the FDB associated with the specified MAC address
port-id — displays the FDB associated with the specified port, where the port is a ring port or the v-port
all — displays all FDBs associated with the ring adapter card

Output The following output is an example of FDB information, and [Table 47](#) describes the fields.

Output Example

```

*A:7705:Dut-A# show mda 1/2 ring fdb port 1/11/1
=====
Ring MDA Forwarding Database for 1/11/1
=====
MAC                Port          Type
-----
38:52:1a:f4:1f:cd  1/11/1       Host
-----
No. of Entries: 1
-----
Learning Enabled.
-----
Ageing Enabled.
-----
Remote age time = 900
-----
Discard unknown source Disabled.
-----
Table Size = 512
-----
High water Mark = 95
-----
1/2/1, Mac pinning Disabled.
1/2/2, Mac pinning Disabled.
=====

*A:7705:Dut-A# show mda 1/2 ring fdb port 1/11/v-port
=====
Ring MDA Forwarding Database for 1/11/v-port
=====
MAC                Port          Type
-----
38:52:1a:f4:1f:cf  1/11/v-port  Host
-----
No. of Entries: 1
-----
Learning Enabled.
-----
Ageing Enabled.
-----
Remote age time = 900
-----
Discard unknown source Disabled.
-----
Table Size = 512
-----
High water Mark = 95
-----
1/2/1, Mac pinning Disabled.
1/2/2, Mac pinning Disabled.
=====

*A:7705:Dut-A# show mda 1/11 ring fdb all
=====
Ring MDA Forwarding Database
=====

```

```

MAC                Port      Type
-----
38:52:1a:f4:1f:cd  1/11/1   Host
38:52:1a:f4:1f:ce  1/11/2   Host
38:52:1a:f4:1f:cf  1/11/v-port Host
38:52:1a:f4:20:e9  1/11/2   Dynamic
-----
No. of Entries: 4
-----
Learning Enabled.
-----
Ageing Enabled.
-----
Remote age time = 900
-----
Discard unknown source Disabled.
-----
Table Size = 512
-----
High water Mark = 95
-----
1/2/1, Mac pinning Disabled.
1/2/2, Mac pinning Disabled.
=====

```

Table 47 MDA Ring FDB Field Descriptions

Label	Description
Ring MDA Forwarding Database	
MAC	The MAC address of any matching entry
Port	The port identifier of any matching entry
Type	The type of matching entry
No. of Entries:	The total number of MAC addresses currently in all FDBs on the adapter card, which includes host, static, and dynamic addresses
Learning	The configured state of the learning capabilities: Enabled or Disabled
Ageing	The configured state of the aging capabilities: Enabled or Disabled
Remote age time	The age time setting of the remote device, in seconds
Discard unknown source	The configured state of the discard capability for packets arriving from an unknown source: Enabled or Disabled
Table Size	The table size of the dynamic FDB table
High water Mark	The high-water mark setting for the FDB table, in percentage of table-size

Table 47 MDA Ring FDB Field Descriptions (Continued)

Label	Description
1/mda/port, Mac pinning	The configured state of the MAC pinning capability: Enabled or Disabled

3.14.2.1.3 Show External Alarms Commands

external-alarms

Syntax	external-alarms alarm [<i>alarm-id</i>] external-alarms input [<i>alarm-input</i>] [detail] external-alarms name [<i>name-string</i>] [detail] external-alarms output [<i>alarm-output</i>] [detail]
Context	show
Description	This command displays external alarm information for 7705 SAR Ethernet ports, for the Auxiliary Alarm card, or the External Alarms connector on the Fan module of the 7705 SAR-8 Shelf V2, the Alarm module of the 7705 SAR-18, or the faceplate of the 7705 SAR-M, 7705 SAR-X, 7705 SAR-H, or 7705 SAR-Hc chassis.
Parameters	<i>alarm-id</i> — the alarm identifier Values 1 to 2147483647 <i>alarm-input</i> — identifies the alarm input <ul style="list-style-type: none"> for Ethernet ports, the format is: port-slot/mda/port [<i>name</i>] for the Auxiliary Alarm card, the format is: alarm-slot/mda.{d a}-alarm-num [<i>name</i>] for the four alarm inputs on an External Alarms connector, the format is: alarm.d-alarm-num [<i>name</i>] where: <ul style="list-style-type: none"> <i>slot</i> = card slot number for IOM (always 1 on the 7705 SAR) <i>mda</i> = Ethernet adapter card or Auxiliary Alarm card slot number (for Ethernet modules or ports on platforms with no card slots, the mda slot number is preconfigured) <i>port</i> = port number for Ethernet ports d = digital input a = analog input <i>alarm-num</i> = alarm port number (1 to 24 for digital on the Auxiliary Alarm card, 1 to 4 for digital on the four chassis alarm inputs, 1 or 2 for analog) <i>name</i> = optional name assigned to the input



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 ([Output Example, Table 48](#))
- External Alarm Input ([Output Example, Table 49](#))
- External Alarm Input Detail ([Output Example, Table 50](#))
- External Alarm Output ([Output Example, Table 51](#))
- External Alarm Output Detail ([Output Example, Table 52](#))
- External Alarm Name ([Output Example, Table 53](#))

Output Example

```
*A:ALU-1># show>external-alarms# alarm 1
=====
Alarm 1 Detail
=====
Admin Status      : up                State           : ok
Severity         : critical
Description      : N/A

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 48 Specific Alarm Field Descriptions

Label	Description
Admin Status	The administrative 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
Description	An optional description of the alarm
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	Indicates whether raise/clear log events and SNMP traps are generated for the specified alarm
Chassis Alarming	Indicates whether output to chassis alarm relays and LEDs are generated for the specified alarm
Trigger	The inputs that will trigger the alarm
Type	The type of trigger (a digital input or analog input, or, for Ethernet ports, the operational state)
Admin	The administrative state of the trigger

Table 48 Specific Alarm Field Descriptions (Continued)

Label	Description
Value	<p>The current value of the alarm input:</p> <ul style="list-style-type: none"> • for a digital input — the state of the digital circuit associated with the trigger (open or closed). A value 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 a digital input on an Auxiliary Alarm card faceplate or External Alarm connector, all digital input ports read open. A value 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 or External Alarm connector, both analog inputs show no applied voltage (0.0V). • for an Ethernet port — a value of down indicates an alarm event; a value of up indicates no alarm
Threshold State	<p>The threshold state: ghost: no threshold is present</p>
	<p>not monitored: the threshold is administratively disabled</p>
	<p>ok: the threshold is enabled</p>
	<p>detected: the threshold has been crossed</p>
Triggers Req'd	<p>The trigger condition that is required to raise an alarm: any: any configured input trigger is required to raise an alarm</p>
	<p>all: all configured input triggers are required to raise an alarm</p>

Output Example

```
*A:ALU-1># show external-alarms input
=====
External Alarm Input Summary
=====
Input Id          Name          Type          Admin  Value  Alarm State
-----
alarm.d-1                digital-in    up        open   ok
alarm.d-2                digital-in    up        open   ok
alarm.d-3                digital-in    up        open   ok
alarm.d-4                digital-in    up        open   ok
port-1/2/1              oper-state    up        down   alarm-detected
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 49 External Alarm Input Field Descriptions

Label	Description
External Alarm Input Summary	
Input Id	The alarm input identifier
Name	The name of the alarm input
Type	The type of input: digital, analog, or oper-state (for Ethernet ports)
Admin	The administrative state of the alarm input
Value	<p>The current value of the alarm input:</p> <ul style="list-style-type: none"> for a digital input — the state of the digital circuit associated with the trigger (open or closed). A value 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 a digital input on an Auxiliary Alarm card faceplate or External Alarm connector, all digital input ports read open. A value 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 or External Alarm connector, both analog inputs show no applied voltage (0.0V). for an Ethernet port — a value of down indicates an alarm event; a value of up indicates no alarm
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

Output Example

```

*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
-----

```

Table 50 External Alarm Input Detail Field Descriptions

Label	Description
Input <i>alarm input</i> Detail	
Name	The name of the alarm input
Admin Status	The administrative 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 (not applicable to Ethernet ports)
Clear Debounce	The debounce time associated with the clearance of the specified alarm input (not applicable to Ethernet ports)
Port State	The value of the alarm input for Ethernet ports, either up or down

Table 50 External Alarm Input Detail Field Descriptions (Continued)

Label	Description
Value	<p>The current value of the alarm input:</p> <ul style="list-style-type: none"> for a digital input — the state of the digital circuit associated with the trigger (open or closed). A value 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 a digital input on an Auxiliary Alarm card faceplate or External Alarm connector, all digital input ports read open. A value 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 or External Alarm 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	<p>The threshold value:</p> <ul style="list-style-type: none"> 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 for Ethernet ports — the operational state threshold
Severity	The severity level for the specified alarm input: critical, major, minor, or warning
Alarm Id	The alarm identifier (1 to 2147483647)
Threshold State	<p>The threshold state indicates whether the input state contributes to the alarm:</p> <p>detected: this input triggers the alarm into an alarm-detected state</p>
	ok: this input does not trigger the alarm into an alarm-detected state

Output Example

```
*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>#
```

Table 51 External Alarm Field Descriptions

Label	Description
Output Relay Summary	
Output Id	The output relay identification
Name	The name of the output relay
Type	The output type is digital
Admin	The administrative 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)

Output Example

```
*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 52 External Alarm Output Detail Field Descriptions

Label	Description
Output relay-x/x.d-x Detail	
Name	The name of the output relay
Admin	<p>The administrative state of the alarm output relay</p> <p>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).</p> <p>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).</p>
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)
Description	The description for the output relay

Output Example

```

*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>#

```

Table 53 External Alarm Name Field Descriptions

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 (digital input, analog input, or oper-state) or output relay type (digital output)
Admin	The administrative state of the alarm input or output relay

Table 53 External Alarm Name Field Descriptions (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 or External Alarm connector is wired to the external equipment): <ul style="list-style-type: none"> • for a digital input — the state of the digital circuit associated with the trigger (open or closed). A value 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 a digital input on an Auxiliary Alarm card faceplate or External Alarm connector, all digital input ports read open. A value 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 or External Alarm connector, both analog inputs show no applied voltage (0.0V).

3.14.2.1.4 Show T1/E1 LCR Commands

lcr

- Syntax** `lcr [lcr-id] [detail]`
- Context** show
- Description** This command displays T1/E1 Line Card Redundancy (LCR) information.
- Parameters** *lcr-id* — displays information for the specified LCR group ID
- Values** 1 to 6
- detail** — displays detailed LCR information
- Output** The following outputs are examples of LCR information:
- LCR ([Output Example, Table 54](#))
 - LCR Detailed ([Output Example, Table 55](#))

Output Example

```
*A: Sar8 Dut-A# show lcr
=====
LCR Group Info
=====
ID                MC-Ctrl Work      Prot      Active      Request
                  State  MDA          MDA        MDA         Byte
-----
lcr-1             Down   N/A          N/A        N/A         N/A
lcr-2             Down   N/A          N/A        N/A         N/A
lcr-3             N/A    N/A          N/A        N/A         N/A
lcr-5             N/A    1/5          1/6        1/5         Prot: SF-Low
-----
No. of LCR Groups: 4
=====

*A: Sar8 Dut-A# show lcr "lcr-5"
=====
LCR Group Info
=====
ID                MC-Ctrl Work      Prot      Active      Request
                  State  MDA          MDA        MDA         Byte
-----
lcr-5             N/A    1/5          1/6        1/5         Prot: SF-Low
=====
*A: Sar8 Dut-A# show lcr "lcr-5"

*A: Sar8 Dut-A# show lcr "lcr-5" detail
=====
LCR Group: lcr-5
=====
```

```

Description          : (Not Specified)
Group Id             : 5
Working MDA          : 1/5
Revertive-mode       : non-revertive
Request byte         : 0xc0 (SF-Low on Protect)
Multi-Chassis LCR   : No
Neighbor             : 0.0.0.0
Control link state   : N/A
Advertise Interval   : 1000 msec
Hold Time            : 3000 msec
-----
LCR Working MDA - 1/5
-----
Admin State          : up
Current LCR Status   : sf
Last Switchover      : None
Last Switch Cmd      : noCmd
Operational State    : provisioned
No. of Switchovers   : 0
Switchover seconds   : 0
-----
LCR Protection MDA - 1/6
-----
Admin State          : down
Current LCR Status   : sf
Last Switchover      : None
Last Switch Cmd      : noCmd
Operational State    : provisioned
No. of Switchovers   : 0
Switchover seconds   : 0
=====
*A: Sar8 Dut-A#
    
```

Table 54 LCR Field Descriptions

Label	Description
ID	The LCR group name
MC-Ctl State	Specifies the multi-chassis state
Work MDA	Specifies the physical MDA that is acting as the working MDA for this LCR group
Prot MDA	Specifies the physical MDA that is acting as the protection MDA for this LCR group
Active MDA	Specifies the active MDA
Request Byte	Specifies the value of the request byte received or transmitted on the protection MDA

Table 55 LCR Detail Field Descriptions

Label	Description
LCR Group	Specifies an LCR group
Description	A description of the LCR group
Group ID	The LCR group identifier
Active MDA	Displays the active MDA
Working MDA	Displays the physical MDA that is acting as the working MDA for this LCR group
Protection MDA	Displays the physical MDA that is acting as the protection MDA for this LCR group
Revertive-mode	The revertive mode of the LCR group: non-revertive — traffic remains on the protection MDA until another switch request is received revertive — when the condition that caused a switch to the protection MDA has been cleared, the traffic is switched back to the working MDA
Revert-time (min)	The configured time, in minutes, to wait after the working MDA has become functional again before making the working MDA active again. If the revertive mode is non-revertive, then this field is empty.
Request byte	Specifies the value of the request byte received or transmitted on the protection MDA
Multi-Chassis LCR	Indicates whether MC-LCR is configured
Neighbor	Displays the neighbor IP address. A 0.0.0.0 address indicates that the LCR group is an SC-LCR.
Control link state	Displays the current control link status
Advertise Interval	Displays the advertise interval
Hold time	Displays the hold time
LCR Working MDA	Specifies the working MDA
Admin State	Specifies whether the working MDA is administratively up or down

Table 55 LCR Detail Field Descriptions (Continued)

Label	Description
Operational State	Specifies the operational state of the working MDA
Current LCR Status	Specifies the current status of the LCR
No. of Switchovers	The number of switchovers that have occurred on this MDA
Last Switchover	Displays the timestamp of the last switchover
Switchover Seconds	Displays the cumulative Protection Switching Duration (PSD) time in seconds For a working MDA, this is the cumulative number of seconds that service was carried on the protection MDA
Last Switch Cmd	Displays the last switch command that was performed on the working MDA
LCR Protection MDA	Specifies the protection MDA
Admin State	Specifies whether the protection MDA is administratively up or down
Operational State	Specifies the operational state of the protection MDA
Current LCR Status	Specifies the current status of the LCR
No. of Switchovers	The number of switchovers that have occurred on this MDA
Last Switchover	Displays the timestamp of the last switchover
Switchover Seconds	Displays the cumulative Protection Switching Duration (PSD) time in seconds For the protection MDA, this is the cumulative number of seconds that the protection MDA has been used to carry any working MDA traffic. This information is only valid if revertive switching is enabled.
Last Switch Cmd	Displays the last switch command that was performed on the protection MDA

3.14.2.1.5 Show Microwave Link Commands

mw

Syntax **mw link** [*mw-link-id*] [**detail**]
mw radio *port-id* [**detail**] [**power**]
mw radio *port-id* **perfmon** [**all** | **g826** | **acm** | **power**]
mw radio software

Context show

Description This command displays information pertaining to a microwave link or an MPR-e radio.

Parameters **acm** — displays MWA performance monitoring Adaptive Coding and Modulation level information
all — displays all MWA performance monitoring information
g826 — displays G.826 (BBE, ES, SES, and UAS) performance monitoring information
link — displays microwave link summary information
mw-link-id — identifies a specific microwave link
 Values *id* = 1 to 24
power — displays MWA performance monitoring radio power information
radio — displays MPR-e radio summary information
port-id — identifies a specific port on a Packet Microwave Adapter card associated with the MPR-e radio, in the format *slot/mda/port*
detail — displays detailed microwave link or MPR-e radio information
perfmon — displays MWA performance monitoring information
power — displays MPR-e radio power measurement information
software — displays the state of the MPR-e radio software

Output The following outputs are examples of microwave link and MPR-e radio information:

- microwave link detail ([Output Example, Table 56](#))
- MPR-e radio detail ([Output Example, Table 57](#))
- MPR-e radio power measurement ([Output Example, Table 58](#))
- MPR-e radio software state ([Output Example, Table 59](#))
- MWA performance monitoring ([Output Example, Table 60](#))

Output Example

```
*A:ALU-1># show>mw# link mw-link-1 detail
=====
Microwave Link
=====
Description      : Packet Microwave Link
Interface        : mw-link-11                IfIndex      : 1610973184
Admin State     : up                       Mode         : network
Oper State      : up
Oper Flag       :
Last State Change : 08/15/2016 19:08:46
Transmit Diversity : enabled
  Position      : main
  Force         : diversity
Configured Address : 48:f7:f1:b6:1d:33
Hardware Address  : 48:f7:f1:b6:1d:33
Link Alarm Synthesis
-----
      0   0   0   0   0   0   0
  CRI MAJ MIN WAR IND | COM  EQT
Protection      : 1+1HSB
-----
                    Main      Spare      Abnormal
Type Activity   Revert Command  Command  Condition
-----
EPS Spare      Yes   Forced   Automatic N/A
TPS Main       Yes   Automatic Automatic N/A
RPS Main       Yes   Automatic Automatic N/A
-----
-----
Port      Name                Type      Link Role      Tx   Oper   Alarm
                State State
-----
1/5/1     MPT-3-A                    MPT-HC  11   Main   On    Up    Ok
1/6/1     MPT-3-B                    MPT-HC  11   Spare Auto  Up    Ok
-----
Discovered Peer Radio
-----
NE Ip Address   : 10.10.10.3
Slot/Port      : 3/1
=====
Traffic Statistics
=====
                                     Input                                     Output
-----
Octets                                                0                                     0
Packets                                               0                                     0
Discards                                              0                                     0

Queue 1
  Octets                                                0                                     0
  Packets                                               0                                     0
  Discards                                              0                                     0

Queue 2
  Octets                                                0                                     0
  Packets                                               0                                     0
```


Discards	0	0
Queue 3		
Octets	0	0
Packets	0	0
Discards	0	0
Queue 4		
Octets	0	0
Packets	0	0
Discards	0	0
Queue 5		
Octets	0	0
Packets	0	0
Discards	0	0
=====		

Table 56 Microwave Link Detail Field Descriptions

Label	Description
Microwave Link	
Description	The microwave link description
Interface	The microwave link interface
IfIndex	The microwave link interface index number, which reflects its initialization sequence
Admin State	The microwave link interface administrative state
Mode	The microwave link interface mode
Oper State	The microwave link interface operational state
Oper Flag	The microwave link interface operational flag:
	noRadioCfg: the link has no radios configured
	linkAdminDown: the link is admin down
	noRadiosPresent: no radios detected
	noRadiosReady: no radios are ready
	incompatibleConfig: radio configuration is incompatible
	radioFailure: radio equipment has failure
	receptionFailure: radio reception failure
	di: defect Indication
txMuted: no radios transmitting	

Table 56 Microwave Link Detail Field Descriptions (Continued)

Label	Description
Last State Change	The last time that the operational status of the microwave link interface changed state
Transmit Diversity	The configured state of Transmit Diversity Antenna: enabled or disabled
Position	The configured antenna position: main or diversity
Force	The configured antenna switching: not forced or diversity
Configured Address	The configured microwave link interface address
Hardware Address	The configured microwave link interface hardware or system-assigned MAC address
Link Alarm Synthesis	The microwave link alarm synthesis
Protection	The configured microwave link protection
Type	The type of protection scheme
Activity	The type of MPR-e radio activity, either main or spare
Revert	Indicates whether revertive switching has been configured on the microwave link
Main Command	The type of command configured on the main MPR-e radio, either forced or automatic
Spare Command	The type of command configured on the spare MPR-e radio, either forced or automatic
Abnormal Condition	Indicates whether an abnormal condition has been detected
Port	The 7705 SAR-8 Shelf V2 or 7705 SAR-18 port configured for an MPR-e radio.
Name	The name configured for the MPR-e radio
Type	The type of MPR-e radio
Link	The microwave link ID associated with the MPR-e radio
Role	The role of the MPR-e radio, either main or spare
Tx State	The transmit state of the MPR-e radio
Oper State	The operational state of the MPR-e radio
Alarm State	The alarm state of the MPR-e radio

Table 56 Microwave Link Detail Field Descriptions (Continued)

Label	Description
Discovered Peer radio	
NE Ip Address	The network element IP address of a peer radio
Slot/Port	The slot and port of the peer radio
Traffic Statistics	
Octets Input/Output	The total number of input/output octets
Packets Input/Output	The total number of input/output packets
Discards Input/Output	The total number of input/output discards
Queue Octets Input/Output	The number of input/output octets per queue
Queue Packets Input/Output	The number of input/output packets per queue
Queue Discards Input/Output	The number of input/output discards per queue

Output Example

```

*A:ALU-1># show mw radio 1/5/1 detail
=====
Microwave Radio
=====
Name           : MPT-3-A
Interface      : 1/5/1                      Mode           : Single NE
Link          : mw-link-20                 Role           : Main
Tx State      : On                         Oper State     : up
Oper Flag     :
Suppressed Faults : HighBer RSL
Database Filename : mpt_3_a.tar
Last State Change : 11/15/2012 19:56:02       IfIndex        : 44072960
Mgmt Last Up   : 11/15/2012 19:56:01
Mgmt Last Lost : Never
Radio Alarm Synthesis
-----
      0      0      0      0      0      0      0
      CRI  MAJ  MIN  WAR  IND | COM  EQT
Radio Information
-----
Type           : MPT-HC
Frequency Band : 15 GHz
Modules        : XPIC
Software       : Ok
CompanyId     : ALU                          Mnemonic       : MPT-MSX
Hardware Part Num : 3DB20423BAAB04             CLEI Code      : -----
Software Part Num : 3DB20502AAAA03           Factory Id     : CIT
Date Identifier : 00                          Date           : 110919
Serial Number  : SH1136X00ZJ
Customer Field :
=====

```

Table 57 MPR-e Radio Detail Field Descriptions

Label	Description
Microwave Radio	
Name	The name configured for the MPR-e radio
Interface	The port configured for the MPR-e radio
Mode	The MPR-e radio mode, either standalone or Single NE
Link	The microwave link ID associated with the MPR-e radio
Role	The role configured for MPR-e radio, either main or spare
Tx State	The transmit state of the MPR-e radio
Oper State	The operational state of the MPR-e radio
Oper Flag	The MPR-e radio operational flag:
	portNotPresent: IDU port is not present
	portOperDown: IDU port is operationally down
	radioNotPresent: radio is not present
	radioCommError: radio communication error
	radioInIt: IDU is initializing radio
	softwareDownload: radio is downloading software
	txMuted: radio is not transmitting
	radioNotReady: radio not ready
	radioEqFailure: radio equipment failure
	incompatibleShifter: radio incompatible with shifter configuration
	incompatibleFreq: radio incompatible with frequency configuration
incompatiblePower: radio incompatible with power configuration	

Table 57 MPR-e Radio Detail Field Descriptions (Continued)

Label	Description
	incompatibleModParms: radio incompatible with modulation parameters
	di: radio defect indication
	radioLinkDown: radio link down
	rslThresholdFail: RSL threshold crossed
	lof: loss of radio frame
	protectionFail: protection failure
	proxyActive: MCT proxy session is active to the radio
	noDbFile: radio database file is missing
	dbSynclnProgress: radio database synchronization in progress
	noDbConfig: radio database configuration is missing
	tpsTxMuted: radio is muted due to TPS activity
	noSoftware: IDU did not detect any software
	softwareMismatch: radio does not contain correct software
	issu: radio is in in-service software upgrade
	highBer: high bit error rate
Suppressed Faults	The microwave link faults that are suppressed, if any: <ul style="list-style-type: none"> • High Bit Error Rate (HighBer) • RSL threshold crossing (RSL) • RDI • All
Database Filename	The MPR-e radio database filename
Last State Change	The date and time of last operational state change of the MPR-e radio.
IfIndex	The MPR-e radio interface index number, which reflects its initialization sequence
Mgmt Last Up	The alarm state of the MPR-e radio
Mgmt Last Lost	The alarm state of the MPR-e radio

Table 57 MPR-e Radio Detail Field Descriptions (Continued)

Label	Description
Radio Alarm Synthesis	The alarm state of the MPR-e radio
Radio Information	The MPR-e radio information: Type Frequency Band Modules Software Company Id Mnemonic Hardware Part Number Common Language Equipment Identifier (CLEI) Code Software Part Number Factory Id Date Identifier Date Serial Number Customer Field

Output Example

```
*A:ALU-1># show>mw# radio 1/5/2 power
=====
Power Measurements
=====
                                TxPower (dBm)      RSL (dBm)
-----
Local Radio (Near End)          25.0          -60.1
Peer Radio (Far End)           40.0          -34.5
=====
```

Table 58 MPR-e Radio Power Measurement Field Descriptions

Label	Description
Power Measurements	
Local Radio (Near End) TxPower (dBm)	The transmit power measurement of the near-end radio
Local Radio (Near End) RSL (dBm)	The received power from the near-end radio
Peer Radio (Far End) TxPower (dBm)	The transmit power measurement from the far-end radio

Table 58 MPR-e Radio Power Measurement Field Descriptions

Label	Description
Peer Radio (Far End) RSL (dBm)	The received power from the far-end radio

Output Example

```
*A:NOK-1># show>mw# radio software
=====
Microwave Radio Software Summary
=====
Port      Name                Type   Link Role  Software State   Progress
-----
1/5/1     MPT-3-A             MPT-HC 20   Main    Ok
1/6/1     MPT-3-B             MPT-HC 20   Spare   Ok
=====
```

Table 59 MPR-e Radio Software State Field Descriptions

Label	Description
Microwave Radio Software Summary	
Port	The port configured for the MPR-e radio
Name	The name configured for the MPR-e radio
Type	The type of MPR-e radio
Link	The microwave link ID
Role	The role of the MPR-e radio, either main or spare
Software State	The state of the MPR-e radio software; the software states are: <ul style="list-style-type: none"> • Ok - the software that is running is correct • Ready - the software is downloaded and ready for upgrade • Requested - a software download has been requested; waiting for the download to begin • Forced - a software download has been forced; waiting for the download to begin • Downloading - a software download is in progress • Failed - a software download to this MPR-e radio has failed

Table 59 MPR-e Radio Software State Field Descriptions (Continued)

Label	Description
Progress	The progress of the MPR-e radio software download

Output Example

```

*A:7CSA:Dut-A# show mw radio 1/5/1 perfmon all
=====
Microwave Radio Performance Monitoring
=====
Family      : Normalized G.826
Admin State: Up                               Oper State: Up
=====

Section: Radio Hop  Period: 15 minutes  Data: Current
=====
Date          Duration EPS      Suspect ES    SES  BBE  UAS
-----
10/16/2019 09:30:00  652    Active        0    0    0    0
=====

Section: Radio Hop  Period: 15 minutes  Data: Historic
=====
Date          Duration EPS      Suspect ES    SES  BBE  UAS
-----
10/16/2019 09:15:00  900    Active        0    0    0    0
10/16/2019 09:00:00  900    Active        0    0    0    0
10/16/2019 08:45:00  900    Active        0    0    0    0
10/16/2019 08:30:00  900    Active        0    0    0    0
10/16/2019 08:15:00  900    Active        0    0    0    0
10/16/2019 08:00:00  900    Active        0    0    0    0
=====

Section: Radio Hop  Period: 24 hours  Data: Current
=====
Date          Duration EPS      Suspect ES    SES  BBE  UAS
-----
10/15/2019 19:00:00  52857  Active        0    0    0    0
=====

Section: Radio Hop  Period: 24 hours  Data: Historic
=====
Date          Duration EPS      Suspect ES    SES  BBE  UAS
-----
10/14/2019 19:00:00  86399  Active        0    0    0    0
10/13/2019 19:00:00  86399  Active        0    0    0    0
10/12/2019 19:00:00  86399  Active        0    0    0    0
10/11/2019 19:00:00  86399  Active        0    0    0    0
10/10/2019 19:00:00  86399  Active        0    0    0    0
10/09/2019 19:00:00  86399  Active        0    0    0    0
10/08/2019 19:00:00  86399  Active        0    0    0    0
10/08/2019 12:45:42  22457  Active    X    0    0    0    0
=====

```



```

Section: Radio Link Period: 15 minutes Data: Current
=====
Date                Duration EPS      Suspect ES    SES    BBE    UAS
-----
10/16/2019 09:30:00 658      Active        0      0      0      0
=====

```

```

Section: Radio Link Period: 15 minutes Data: Historic
=====
Date                Duration EPS      Suspect ES    SES    BBE    UAS
-----
10/16/2019 09:15:00 900      Active        0      0      0      0
10/16/2019 09:00:00 900      Active        0      0      0      0
10/16/2019 08:45:00 900      Active        0      0      0      0
10/16/2019 08:30:00 900      Active        0      0      0      0
10/16/2019 08:15:00 900      Active        0      0      0      0
10/16/2019 08:00:00 900      Active        0      0      0      0
10/16/2019 07:45:00 900      Active        0      0      0      0
10/16/2019 07:30:00 900      Active        0      0      0      0
10/16/2019 07:15:00 900      Active        0      0      0      0
=====

```

```

Section: Radio Link Period: 24 hours Data: Current
=====
Date                Duration EPS      Suspect ES    SES    BBE    UAS
-----
10/15/2019 19:00:00 52861   Active        0      0      0      0
=====

```

```

Section: Radio Link Period: 24 hours Data: Historic
=====
Date                Duration EPS      Suspect ES    SES    BBE    UAS
-----
10/14/2019 19:00:00 86399   Active        0      0      0      0
10/13/2019 19:00:00 86399   Active        0      0      0      0
10/12/2019 19:00:00 86399   Active        0      0      0      0
10/11/2019 19:00:00 86399   Active        0      0      0      0
10/10/2019 19:00:00 86399   Active        0      0      0      0
10/09/2019 19:00:00 86399   Active        0      0      0      0
10/08/2019 19:00:00 86399   Active        0      0      0      0
10/08/2019 12:45:43 22456   Active    X      0      0      0      0
=====

```

```

Family      : Adaptive Coding and Modulation
Admin State: Up                               Oper State: Up
=====

```

```

Milliseconds at each modulation Period: 15 minutes Data: Current
=====
Date                Duration Suspect QPSK      8 PSK      16 QAM      32 QAM
                        64 QAM      128 QAM      256 QAM
-----
10/16/2019 09:30:00 661          0          0          0          0
                        0          0          661009
=====

```

```

Milliseconds at each modulation Period: 15 minutes Data: Historic
=====

```

```

=====
Date                Duration Suspect QPSK      8 PSK      16 QAM      32 QAM
                   64 QAM     128 QAM    256 QAM
-----
10/16/2019 09:15:00  900          0          0          0          0
                   0          0          900009
10/16/2019 09:00:00  900          0          0          0          0
                   0          0          900009
10/16/2019 08:45:00  900          0          0          0          0
                   0          0          900013
10/16/2019 08:30:00  900          0          0          0          0
                   0          0          900008
10/16/2019 08:15:00  900          0          0          0          0
                   0          0          900009
10/16/2019 08:00:00  900          0          0          0          0
                   0          0          900008
10/16/2019 07:45:00  900          0          0          0          0
                   0          0          900008
=====
    
```

=====
 Milliseconds at each modulation Period: 24 hours Data: Current
 =====

```

Date                Duration Suspect QPSK      8 PSK      16 QAM      32 QAM
                   64 QAM     128 QAM    256 QAM
-----
10/15/2019 19:00:00  52866        0          0          0          0
                   0          0          52866596
=====
    
```

=====
 Milliseconds at each modulation Period: 24 hours Data: Historic
 =====

```

Date                Duration Suspect QPSK      8 PSK      16 QAM      32 QAM
                   64 QAM     128 QAM    256 QAM
-----
10/14/2019 19:00:00  86399        0          0          0          0
                   0          0          86399968
10/13/2019 19:00:00  86399        0          0          0          0
                   0          0          86399974
10/12/2019 19:00:00  86399        0          0          0          0
                   0          0          86399969
10/11/2019 19:00:00  86399        0          0          0          0
                   0          0          86399972
10/10/2019 19:00:00  86399        0          0          0          0
                   0          0          86399972
10/09/2019 19:00:00  86399        0          0          0          0
                   0          0          86399967
10/08/2019 12:45:44  22455    X    0          0          0          0
                   0          0          22455248
=====
    
```

=====
 Family : Power
 Admin State: Up Oper State: Up
 =====

=====
 RX Power Section: Radio Hop Period: 15 minutes Data: Current
 =====

```

Date                Duration EPS      Suspect Min Power Max Power Mean Power
-----
10/16/2019 09:30:00  667      Active          65144    65147    65145
    
```

```

=====
RX Power Section: Radio Hop Period: 15 minutes Data: Historic
=====
Date                Duration EPS      Suspect Min Power Max Power Mean Power
-----
10/16/2019 09:15:00  900    Active          65144   65147   65145
10/16/2019 09:00:00  900    Active          65144   65147   65145
10/16/2019 08:45:00  900    Active          65144   65147   65145
10/16/2019 08:30:00  900    Active          65144   65147   65145
10/16/2019 08:15:00  900    Active          65144   65147   65145
10/16/2019 08:00:00  900    Active          65144   65147   65145
10/16/2019 07:45:00  900    Active          65144   65147   65145
10/16/2019 07:30:00  900    Active          65144   65147   65145
=====
RX Power Section: Radio Hop Period: 24 hours Data: Current
=====
Date                Duration EPS      Suspect Min Power Max Power Mean Power
-----
10/15/2019 19:00:00  52870  Active          65144   65148   65146
=====
RX Power Section: Radio Hop Period: 24 hours Data: Historic
=====
Date                Duration EPS      Suspect Min Power Max Power Mean Power
-----
10/14/2019 19:00:00  86399  Active          65144   65148   65146
10/13/2019 19:00:00  86399  Active          65144   65148   65146
10/12/2019 19:00:00  86399  Active          65144   65148   65146
10/11/2019 19:00:00  86399  Active          65143   65148   65145
10/10/2019 19:00:00  86399  Active          65143   65148   65146
10/09/2019 19:00:00  86399  Active          65143   65148   65146
10/08/2019 19:00:00  86399  Active          65143   65148   65146
10/08/2019 12:45:45  22454  Active    X          65143   65148   65145
=====
RX Power Section: Radio Link Period: 15 minutes Data: Current
=====
Date                Duration EPS      Suspect Min Power Max Power Mean Power
-----
10/16/2019 09:30:00  671    Active          65144   65147   65145
=====
RX Power Section: Radio Link Period: 15 minutes Data: Historic
=====
Date                Duration EPS      Suspect Min Power Max Power Mean Power
-----
10/16/2019 09:15:00  900    Active          65144   65147   65145
10/16/2019 09:00:00  900    Active          65144   65147   65145
10/16/2019 08:45:00  900    Active          65144   65147   65145
10/16/2019 08:30:00  900    Active          65144   65147   65145
10/16/2019 08:15:00  900    Active          65144   65147   65145
10/16/2019 08:00:00  900    Active          65144   65147   65145
10/16/2019 07:45:00  900    Active          65144   65147   65145
10/16/2019 07:30:00  900    Active          65144   65147   65145
10/16/2019 07:15:00  900    Active          65144   65147   65145
=====
=====

```

```

RX Power Section: Radio Link Period: 24 hours Data: Current
=====
Date                Duration EPS      Suspect Min Power Max Power Mean Power
-----
10/15/2019 19:00:00 52873   Active           65144   65148   65146
=====
    
```

```

RX Power Section: Radio Link Period: 24 hours Data: Historic
=====
Date                Duration EPS      Suspect Min Power Max Power Mean Power
-----
10/14/2019 19:00:00 86399   Active           65144   65148   65146
10/13/2019 19:00:00 86399   Active           65144   65148   65146
10/12/2019 19:00:00 86399   Active           65144   65148   65146
10/11/2019 19:00:00 86399   Active           65143   65148   65145
10/10/2019 19:00:00 86399   Active           65143   65148   65146
10/09/2019 19:00:00 86399   Active           65143   65148   65146
10/08/2019 19:00:00 86399   Active           65143   65148   65146
10/08/2019 12:45:46 22453   Active    X           65143   65148   65145
=====
    
```

```

TX Power Section: Radio Hop Period: 15 minutes Data: Current
=====
Date                Duration EPS      Suspect Min Power Max Power Mean Power
-----
10/16/2019 09:30:00 674     N/A              70      70      70
=====
    
```

```

TX Power Section: Radio Hop Period: 15 minutes Data: Historic
=====
Date                Duration EPS      Suspect Min Power Max Power Mean Power
-----
10/16/2019 09:15:00 900     N/A              70      70      70
10/16/2019 09:00:00 900     N/A              70      70      70
10/16/2019 08:45:00 900     N/A              70      70      70
10/16/2019 08:30:00 900     N/A              70      70      70
10/16/2019 08:15:00 900     N/A              70      70      70
10/16/2019 08:00:00 900     N/A              70      70      70
10/16/2019 07:45:00 900     N/A              70      70      70
10/16/2019 07:30:00 900     N/A              70      70      70
10/16/2019 07:15:00 900     N/A              70      70      70
10/16/2019 07:00:00 900     N/A              70      70      70
=====
    
```

```

TX Power Section: Radio Hop Period: 24 hours Data: Current
=====
Date                Duration EPS      Suspect Min Power Max Power Mean Power
-----
10/15/2019 19:00:00 52876   N/A              70      70      70
=====
    
```

```

TX Power Section: Radio Hop Period: 24 hours Data: Historic
=====
Date                Duration EPS      Suspect Min Power Max Power Mean Power
-----
10/14/2019 19:00:00 86399   N/A              70      70      70
10/13/2019 19:00:00 86399   N/A              70      70      70
10/12/2019 19:00:00 86399   N/A              70      70      70
10/11/2019 19:00:00 86399   N/A              70      70      70
    
```

10/10/2019 19:00:00	86399	N/A		70	70	70
10/09/2019 19:00:00	86399	N/A		70	70	70
10/08/2019 19:00:00	86399	N/A		70	70	70
10/08/2019 12:45:47	22452	N/A	X	70	70	70

=====
 *A:7CSA:Dut-A#

Table 60 MWA Performance Monitoring Field Descriptions

Label	Description
Microwave Radio Performance Monitoring	
Family	The category of monitoring statistics, either Normalized G.826, Adaptive Coding and Modulation, or Power
Admin State	The administrative state of the microwave link, either Up or Down
Oper State	The operational state of the microwave link, either Up or Down
Section	The section being monitored, either Radio Hop or Radio Link
Period	The reporting period, either 15 minutes or 24 hours
Data	The type of data being collected, either current or historic
Date	The date and time of the monitoring period
Duration	The duration of the monitoring period in seconds
EPS	The EPS state at the time of recording this period
Suspect	Suspected faults (marked with an x)
ES	Errored Seconds statistics
SES	Severely Errored Seconds statistics
BBE	Background Block Errors statistics
UAS	Unavailable Seconds statistics
QPSK	Quadrature Phase Shift Keying modulation statistics
8 PSK	Eight Phase Shift Keying modulation statistics
16 QAM	16-state Quadrature Amplitude Modulation statistics

Table 60 MWA Performance Monitoring Field Descriptions (Continued)

Label	Description
32 QAM	32-state Quadrature Amplitude Modulation statistics
64 QAM	64-state Quadrature Amplitude Modulation statistics
128 QAM	128-state Quadrature Amplitude Modulation statistics
256 QAM	256-state Quadrature Amplitude Modulation statistics
Min Power	Minimum power statistics
Max Power	Maximum power statistics
Mean Power	Mean power statistics

3.14.2.1.6 Show Port Commands

port

Syntax **port** [*port-id*] [**statistics**] [**detail**]
port *port-id* **acr** [**detail**]
port *port-id* **associations**
port *port-id* **cisco-hdlc**
port *port-id* **description**
port *port-id* **dot1x** [**detail**]
port *port-id* **ethernet** [**efm-oam** | **detail**]
port *port-id* **frame-relay** [**detail** | **dlci** *dlci*]
port *port-id* **ima-link**
port *port-id* **ppp** [**detail**]
port **aps**[-*group-id*][*.channel*]
port **lcr**[-*group-id*]*port*][*.channel*]

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, fixed platforms, and modules.

If the **detail** keyword is specified without any *port-id*, a detailed output of every port in the system is displayed whether the ports are configured or not. This is useful for gathering full reports or as an input into the “| match” filtering command to display a customized summary of fields.

If the *port-id* parameter only specifies a portion of a port identifier, a summary of all ports that start with that portion is displayed. For example, specifying a slot number and an MDA number displays a summary of all ports on that MDA. If no *port-id* is specified, a summary of all ports in the system is displayed.

If the port identifier specifies a unique port, information about that port is displayed. The specific information displayed depends on the type of port. Additional information is displayed if the **detail** keyword is included. In addition, information subsets can be displayed by using various keywords. For example, the **dot1x** keyword displays only the dot1x information for the port.

Parameters *port-id* — specifies the physical port ID

Syntax

port-id *slot*[/*mda*[/*port*]] or
slot/*mda*/*port*[.*channel*]

where:

<i>slot</i>	1	
<i>mda</i>	1 to 6	7705 SAR-8 Shelf V2
	1 to 12 and X1 to X4	7705 SAR-18
	1 (Ethernet), 2 (T1/E1), or 3 (module)	7705 SAR-M
	1 (Ethernet), 2 (module position 1), or 3 (module position 2)	7705 SAR-H
	1 (Ethernet), 2 (RS-232)	7705 SAR-Hc
	1 (Ethernet) or 2 (T1/E1)	7705 SAR-A
	1 (Ethernet) or 2 (GNSS RF)	7705 SAR-Ax
	1	7705 SAR-W
	1 (Ethernet)	7705 SAR-Wx (Ethernet-only variants and Ethernet and PoE+ variants)
	3 (GPS)	7705 SAR-Wx (variants with GPS)
	1 (for T1/E1 ports)	7705 SAR-X
	2 (for Ethernet XOR RJ-45 ports 2/1A and 2/2A, Ethernet XOR SFP ports 2/1B and 2/2B, Ethernet ports 2/3 to 2/6, and 10GigE SFP+ port 2/7)	
	3 (for Ethernet XOR RJ-45 ports 3/1A and 3/2A, Ethernet XOR SFP ports 3/1B and 3/2B, Ethernet ports 3/3 to 3/6, and 10GigE SFP+ port 3/7)	
<i>port</i>	1 to 2	2-port OC3/STM1 Channelized Adapter card
	1 to 2 physical ports, 1 virtual port (designated as “v-port” or port 3)	2-port 10GigE (Ethernet) Adapter card 2-port 10GigE (Ethernet) module
	1 to 4	4-port OC3/STM1 Clear Channel Adapter card 4-port OC3/STM1 / 1-port OC12/STM4 Adapter card 4-port DS3/E3 Adapter card 4-port SAR-H Fast Ethernet module

1 to 6	6-port E&M Adapter card 6-port FXS Adapter card 6-port Ethernet 10Gbps Adapter card 6-port SAR-M Ethernet module
1 to 8	8-port Ethernet Adapter card 8-port Gigabit Ethernet Adapter card 8-port Voice & Teleprotection card 8-port C37.94 Teleprotection card 8-port FXO Adapter card Packet Microwave Adapter card
1 to 10	10-port 1GigE/1-port 10GigE X-Adapter card (10-port 1GigE mode)
1	10-port 1GigE/1-port 10GigE X-Adapter card (1-port 10GigE mode)
1	GPS Receiver module (GPS RF port) GNSS Receiver card (GNSS RF port)
1 to 12	12-port Serial Data Interface card
1 to 16	16-port T1/E1 ASAP Adapter card
1 to 32	32-port T1/E1 ASAP Adapter card
1 to 7 (Ethernet), 1 to 16 (T1/E1), or 1 (module)	7705 SAR-M
1 to 8 (Ethernet)	7705 SAR-H
1 to 6 (Ethernet), 1 to 2 (RS-232)	7705 SAR-Hc
1 to 2 (RS-232 ports)	4-port T1/E1 and RS-232 Combination module
3 to 4 (T1/E1 ports)	4-port T1/E1 and RS-232 Combination module
1 to 12 (Ethernet) or 1 to 8 (T1/E1)	7705 SAR-A
1 to 12 (Ethernet) or 1 (GNSS RF)	7705 SAR-Ax
1 to 5 (Ethernet) and vrtl-mgmt (in-band management)	7705 SAR-W
1 to 5 (Ethernet) (on the Ethernet-only variants and Ethernet and PoE+ variants) or 1 (for GPS)	7705 SAR-Wx
1 to 8 (T1/E1 ports), 1 or 2 (Ethernet XOR RJ-45/SFP ports), 3 to 6 (Ethernet ports), 7 (Ethernet SFP+ ports)	7705 SAR-X
<i>channel</i> ds1, e1, codir, or tpif	for config>port>tdm information

em, fxo, or fxs	for config>port>voice information
rs232, rs530, v35, or x21	for config>port>serial information
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
1 (DS0)	for config>port>tdm>codir>channel-group , config>port>tdm>tpif>channel-group , config>port>voice>fxo>channel-group , and config>port>voice>fxs>channel-group information
1 (RS-232, RS-530, V.35, or X.21)	for config>port>serial>channel-group information

statistics — displays only port counter summary information

statistics detail — displays only port counter detail information

acr — displays ACR-capable port information

acr detail — displays ACR-capable port detail information

cisco-hdlc — displays cHDLC port information

description — displays port description strings

dot1x — displays statistics and status information about 802.1x ports

dot1x detail — displays statistics and status detail information about 802.1x ports

associations — displays a list of current router interfaces to which the port is associated

ppp — displays PPP protocol information for the port

ppp detail — displays PPP protocol detail information for the port

ethernet — displays Ethernet port information

ethernet efm-oam — displays EFM OAM information

ethernet detail — displays Ethernet port detail information

frame-relay — displays port-level frame relay statistics

frame-relay detail — displays frame relay port information

frame-relay dlci — displays circuit-level frame relay statistics

ima-link — displays port-level IMA link information

aps[-group-id][.channel] — specifying only the keyword displays all the ports in APS groups. Specifying the group ID displays information about the specified APS group.

lcr[-group-id/port][.channel] — specifying only the keyword displays all the ports in LCR groups. Specifying the group ID and port displays information about the port in the specified LCR group.

Output The following outputs are examples of port information:

- General ([Output Example, Table 61](#))
- Port Statistics ([Output Example, Table 62](#))
- Specific, Ethernet ([Output Example, Table 63](#))
- Specific, PoE Enabled ([Output Example, Table 64](#))
- Specific, Serial ([Output Example, Table 65](#))
- Specific, SONET/SDH ([Output Example, Table 66](#))
- Specific, Voice E&M ([Output Example, Table 67](#))
- Specific, Voice FXO ([Output Example, Table 68](#))
- Specific, Voice FXS ([Output Example, Table 69](#))
- Specific, DS0 Voice Channel Group ([Output Example, Table 70](#))
- Detail, SONET/SDH ([Output Example, Table 71](#))
- Detail, Ethernet ([Ethernet Output Example \(access mode\), Table 72](#))
- Detail, Ethernet ([Ethernet Output Example \(network mode\), Table 73](#))
- Detail, 10G Ring Ethernet ([Output Example, Table 74](#))
- Detail, 2.5G Virtual Ethernet ([Output Example, Table 75](#))
- Detail, TDM/DS1 ([Output Example, Table 76](#))
- Serial Channel ([Output Example, Table 77](#))
- Voice Channel, E&M ([Output Example, Table 78](#))
- Channel Group ([Output Example, Table 79](#))
- Channelized DS3 ([Output Example, Table 80](#))
- Clear Channel DS3 ([Output Example, Table 81](#))
- ACR Detail ([Output Example, Table 82](#))
- dot1x ([Output Example, Table 83](#))
- Descriptions ([Output Example, Table 84](#))
- Associations ([Output Example, Table 85](#))
- IMA Link ([Output Example, Table 86](#))
- PPP ([Output Example, Table 87](#))
- CEM ([Output Example, Table 88](#))
- Frame Relay ([Output Example, Table 89](#))
- Frame Relay DLCI ([Output Example, Table 90](#))
- HDLC and cHDLC ([Output Example, Table 90](#))
- TDM Codir or TPIF ([Output Example, Table 91](#))
- GNSS ([Output Example, Table 92](#))
- APS ([Output Example, Table 93](#))
- Specific APS Port ID ([Output Example, Table 94](#))

- LCR ([Output Example, Table 95](#))
- Specific LCR Port ID ([Output Example, Table 96](#))

Output Example

```
*A:NOK-1># show port 1/1
=====
Ports on Slot 1
=====
```

Port Id	Admin State	Link State	Port State	Cfg MTU	Oper MTU	LAG/ Bndl	Port Mode	Port Encp	Port Type	SFP/XFP/ 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:NOK-1># show port 1/2
=====
Ports on Slot 1
=====
```

Port Id	Admin State	Link State	Port State	Cfg MTU	Oper MTU	LAG/ Bndl	Port Mode	Port Encp	Port Type	SFP/XFP/ 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:NOK-1>#
```

```
A:NOK-1># show port 1/3
=====
Ports on Slot 1
=====
```

Port Id	Admin State	Link State	Port State	Cfg MTU	Oper MTU	LAG/ Bndl	Port Mode	Port Encp	Port Type	SFP/XFP/ 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
=====
    
```

Table 61 General Port Field Descriptions

Label	Description
Port ID	The port ID configured or displayed in the <i>slot/mda/port</i> format
Admin State	Up: the administrative state is up
	Down: the administrative state is down
Link	Yes: a physical link is present
	No: a physical link is not present
Port State	Up: the port is physically present and has a physical link
	Down: the port is physically present but does not have a link
	Ghost: the port is not physically present
	None: the port is in its initial creation state or about to be deleted
	Link Up: the port is physically present and has a physical link. When Link Up appears at the lowest level of a TDM tributary, it means the physical connection is active but the port is waiting before data traffic can flow. It is a waiting state and indicates that data traffic will not flow until it transitions to the Up state.
	Link Down: the port is physically present but does not have a link
Cfg MTU	The configured MTU
Oper MTU	The negotiated size of the largest packet that can be sent on the port or channel specified in octets

Table 61 General Port Field Descriptions (Continued)

Label	Description
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
	hybrid: the port is configured for hybrid use (transport network and service access per VLAN)
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)

Output Example

```

*A:NOK-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:NOK-1>#

*A:NOK-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:NOK-1>#

*A:NOK-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:NOK-1>#

```

Table 62 Port Statistics Field Descriptions

Label	Description
Port ID	The port ID configured or displayed in the <i>slot/mda/port</i> 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

Output Example

```

*A:ALU-1># show port 1/5/8
=====
Ethernet Interface
=====
Description      : 10/100/Gig Ethernet SFP
Interface        : 1/5/8                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
Single Fiber Mode : No
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
Phys State Chng Cnt: 0

Configured Mode   : hybrid                    Encap Type      : 802.1q
Dot1Q Ethertype  : 0x8100                    QinQ Ethertype  : 0x8100
Ing. Pool % Rate  : 100                       Egr. Pool % Rate : 100
Ing. Acc. Wt.     : 50                         Egr. Acc. Wt.   : 50
Ing. Net. Wt.     : 50                         Egr. Net. Wt.   : 50
Net. Egr. Queue Pol: default
Auto-negotiate    : true                      MDI/MDX         : unknown
Net. Egr. ShaperPol: 2
Acc. Egr. ShaperPol: 5
Net. Scheduler Mode: 16-priority
Config Phy-tx-clock: auto-pref-slave          Oper Phy-tx-clock: N/A
SapEgr.Unshaped-Cir: 0 Kbps
SapEgr.Shaper Pol : default
NetEgr.Unshaped-Cir: 0 Kbps
Allow Eth-BN      : True                      Eth-BN hold time : 6
BN Egr.Rate in use : 765000                   Ingress Rate     : n/a
Egress Rate       : Default
Egr.Rate Incl.FCS : Disabled
Ingress CBS(bytes) : 130816                   Src-pause        : Disabled
                                                LACP Tunnel      : Disabled
Down-when-looped  : Disabled                  Keep-alive       : 10
Loop Detected     : False                     Retry            : 120
Use Broadcast Addr : False

Loopback          : none                      Swap Mac Addr    : Disabled
Loopback Time Left : unspecified
Cfm Loopback      : Disabled

Sync. Status Msg. : Enabled                   Rx Quality Level : 0xf(dus)
PTP Asymmetry     : 0                         Edge Timestamp    : Disable
Timestamp Capable : True

CRC Mon SD Thresh : Disabled                  CRC Mon Window   : 10 seconds
CRC Mon SF Thresh : Disabled

Configured Address : 00:1a:f0:d4:09:de
Hardware Address   : 00:1a:f0:d4:09:de
Cfg Alarm          :
Alarm Status       :

Transceiver Data

Transceiver Status : operational
Transceiver Type   : SFP
Model Number       : 3HE00027AAAA02 ALU 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             0
=====

Port Discard Statistics
=====
                                Input          Output
-----
Inv L2 Packets   :                   0
Inv IP Packets   :                   0
CSM Ingress Queues
  Hi              :                   0   CSM Egress Queues
  Low             :                   0   Common          :                   0
  Ftp             :                   0
=====

Ethernet CFM Statistics
=====
Cfm LbmRx       :                   0
Cfm LbReplyTx   :                   0   Cfm LbmDropped   :                   0

Num Bn Rate Chng :                   1   Last BnRateChng : 04/12/2017 21:20:53
Valid BnmRx      :                   2   Last Valid BnmRx : 04/12/2017 21:21:10
Invalid BnmRx    :                   0
BnmOutOfRangeBW :                   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 63 Specific Port Field Descriptions (GigE Port with Optical SFP)

Label	Description
Ethernet Interface	
Description	A text description of the port
Interface	The port ID displayed in the <i>slot/mda/port</i> 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
Single Fiber Mode	Yes: single fiber mode
	No: not single fiber mode
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

Table 63 Specific Port Field Descriptions (GigE Port with Optical SFP)

Label	Description
Phys State Chng Cnt	<p>The physical state change counter. This counter increments when a fully qualified (debounced) transition occurs at the physical layer of an Ethernet port, including the following transitions of the port state as displayed in the show port slot/mda/port output:</p> <ul style="list-style-type: none"> • from Down to Link Up or Up • from Link Up or Up to Down <p>This counter does not increment for changes only in the link protocol states. That is, if the physical link is up, any transitions of the port state due to link protocols (for example, 802.3ah EFM OAM, LACP, 802.1ag) do not cause the counter to increment. The following port state transitions are examples of transitions that are not counted:</p> <ul style="list-style-type: none"> • from Link Up to Up • from Up to Link Up
Configured Mode	network: the port is configured for transport network use
	access: the port is configured for service access
	hybrid: the port is configured for hybrid use (transport network and service access per VLAN)
Dot1Q Ethertype	The Ethertype expected when the port's encapsulation type is dot1q
QinQ Ethertype	The Ethertype expected when the port's encapsulation type is qinq
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
Net. Egr. ShaperPol	The network egress shaper policy ID
Acc. Egr. ShaperPol	The access egress shaper policy ID
Net. Scheduler Mode	The network scheduler mode
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 63 Specific Port Field Descriptions (GigE Port with Optical SFP)

Label	Description
Config Phy-tx-clock	The mode used to establish timing control of a 1000Base-T port. The options are: <ul style="list-style-type: none"> • N/A— the port does not support 1000Base-T • auto-pref-master—prefers to be master during autonegotiation • auto-pref-slave—prefers to be slave during autonegotiation • slave—the port is forced to be slave • master—the port is forced to be master
Oper Phy-tx-clock	The operational value of the MASTER-SLAVE relationship of the 1000Base-T physical layer transmit clock. The options are: <ul style="list-style-type: none"> • N/A— the port or the inserted SFP does not support 1000Base-T, the port is down, or negotiation failed • slave—the port is slave • master—the port is master
SapEgr.Shaper Pol	The SAP egress shaper policy for the port
SapEgr.Unshaped-Cir	The CIR rate for the aggregate of all the unshaped 4-priority SAPs on the port
NetEgr.Unshaped-Cir	The CIR rate for the aggregate of all the unshaped VLANs on the port
Allow Eth-BN	Indicates whether Ethernet Bandwidth Notification (ETH-BN) is allowed on the port: True or False
BN Egr.Rate in use	The egress rate in use based on the request from the ETH-BN server MEP
Eth-BN hold time	The configured hold time (in seconds) between an egress rate change based on a received Bandwidth Notification Message (BNM) and the next change request that will be accepted
Egress Rate	The maximum amount of egress bandwidth (in kilobits per second) that this Ethernet interface can generate
Egr.Rate Incl.FCS	The configured state of egress rate FCS inclusion: enabled or disabled
Ingress CBS (bytes)	Indicates the ingress committed buffer space
Src-pause	A notification to slow down the transmission rate when it exceeds the bandwidth limit

Table 63 Specific Port Field Descriptions (GigE Port with Optical SFP)

Label	Description
LACP Tunnel	Indicates whether LACP packet tunneling is enabled
Down-when-looped	Enabled: The down-when-looped feature is enabled on the port
	Disabled: The down-when-looped feature is disabled on the port
Keep-alive	The time interval between keepalive PDUs transmitted toward the network during loop detection by the down-when-looped feature
Loop Detected	Indicates whether a loop is detected on the port
Retry	The minimum wait time before the port is re-enabled after it is brought down due to a loop detection
Use Broadcast Addr	Indicates whether the down-when-looped feature has been configured to compare the destination MAC address of received PDUs to the broadcast MAC address instead of the MAC address of the port
Loopback	The type of loopback configured on the port, either line, internal, or none
Swap Mac Addr	Indicates whether 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 If configured loopback is persistent, the value persistent.
Cfm Loopback	Indicates whether the CFM loopback is enabled
Sync. Status Msg.	Indicates whether Synchronization Status Messaging is enabled on the port
PTP Asymmetry	Indicates whether PTP asymmetry is enabled
Edge Timestamp	Indicates whether the edge timestamp is enabled
Timestamp Capable	Indicates whether the port is timestamp-capable
CRC Mon SD Thresh	Indicates the CRC signal degrade threshold value (1 to 9), if enabled
CRC Mon SF Thresh	Indicates the CRC signal fail threshold value (1 to 9), if enabled
CRC Mon Window	Indicates the CRC window sampling size value (5 to 60)

Table 63 Specific Port Field Descriptions (GigE Port with Optical SFP)

Label	Description
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 sublayer
Cfg Alarm	The type of alarms to be logged and reported for the Ethernet port
Alarm Status	The current alarm state
Oper Speed	The operating speed of the interface
Config Speed	The configured speed of the interface
Oper Duplex	full: the link is operating at full-duplex mode half: the link is operating at half-duplex mode
Config Duplex	full: the link is set at full-duplex mode half: the link is set at half-duplex mode
MTU	The size of the largest packet that can be sent/received on the Ethernet physical interface, specified in octets
Hold time up	The link-up dampening time in seconds
Hold time down	The link-down dampening time in seconds
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
	qinq: ingress frames carry two 802.1Q tags, where the outer tag is the service provider tag and the inner tag is the customer service tag

Table 63 Specific Port Field Descriptions (GigE Port with Optical SFP)

Label	Description
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 Data	<p>The following information is provided for a configured transceiver (SFP):</p> <ul style="list-style-type: none"> • transceiver status • transceiver type • 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 63 Specific Port Field Descriptions (GigE Port with Optical SFP)

Label	Description
Transceiver Digital Diagnostic Monitoring (DDM), Internally Calibrated	
	<p>SFP manufacturers specifications guidelines contained in specification SFF-8472, for the following:</p> <ul style="list-style-type: none"> • temperature (C) • supply voltage (V) • Tx bias current (mA) • Tx output power (dBm) • Rx optical power (avg dBm) <p>For the above categories, the following values are shown:</p> <ul style="list-style-type: none"> • 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 <p>If alarms/warnings are raised, there will be an "!" in the output</p>
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 sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.

Table 63 Specific Port Field Descriptions (GigE Port with Optical SFP)

Label	Description
Errors Input/Output	<p>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.</p> <p>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.</p>
Port Statistics	
Unicast packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Multicast packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Broadcast packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space

Table 63 Specific Port Field Descriptions (GigE Port with Optical SFP)

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	
Inv L2 Packets Input	The number of invalid packets discarded due to an unknown Layer 2 ID
Inv IP Packets Input	The number of invalid IP packets discarded
CSM Ingress Queues Input	The number of incoming control packets discarded
CSM Egress Queues Output	The number of outgoing control packets discarded
Ethernet CFM Statistics	
Cfm LbmRx	The number of LBMs received
Cfm LbReplyTx	The number of LBRs transmitted
Cfm LbmDropped	The number of LBMs dropped
Num Bn Rate Chng	The number of times that the port egress rate is dynamically changed based on Bandwidth Notification (BN) messages Note: not every bandwidth change indicated by a BNM triggers a port egress rate change
Last BnRateChng	The time that the port egress rate was last changed based on a BNM
Valid BnmRx	The number of valid BN messages received
Last Valid BnmRx	The time that the last valid BNM was received
Invalid BnmRx	The number of invalid BN messages received
BnmOutOfRangeBW	The number of BN messages received with a requested bandwidth that was out of range

Table 63 Specific Port Field Descriptions (GigE Port with Optical SFP)

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

Output Example

```

*A:ALU-1># show port 1/1/7 detail
=====
Ethernet Interface
=====
Description      : 10/100/Gig Ethernet TX
Interface        : 1/1/7
Link-level       : Ethernet
Admin State      : down
Oper State       : down
Physical Link    : No
Single Fiber Mode : No
IfIndex          : 44302336
Last State Change : 04/14/2014 14:05:25
Last Cleared Time : N/A

Oper Speed       : N/A
Config Speed    : 1 Gbps
Oper Duplex     : N/A
Config Duplex   : full
MTU             : 1514

Hold time up    : 0 seconds
Hold time down  : 0 seconds

Configured Mode : access
Dot1Q Ethertype : 0x8100
Ing. Pool % Rate : 100
Net. Egr. Queue Pol: default
Auto-negotiate  : true
Config Phy-tx-clock: auto-pref-slave
Allow Eth-BN    : True
BN Egr.Rate in use : 765000
Egress Rate     : Default
Down-when-looped : Disabled
Loop Detected   : False
Use Broadcast Addr : False

Encap Type      : Null
Egr. Pool % Rate : 100
MDI/MDX         : unknown
Oper Phy-tx-clock: N/A
Eth-BN hold time : 6
Ingress Rate    : n/a
Keep-alive      : 10
Retry           : 120

Loopback        : none
Loopback Time Left : unspecified
Cfm Loopback    : Disabled

Swap Mac Addr   : Disabled

PoE Mode        : None
Poe Class       : Class 0
PoE Maximum Power : None
PoE Detection   : Searching
PoE Fault Reason : none
PoE Power In Use : 0.0 watts

Sync. Status Msg. : Disabled
Rx Quality Level : N/A

PTP Asymmetry   : 0
Timestamp Capable : False
Edge Timestamp   : Disable

CRC Mon SD Thresh : Disabled
CRC Mon SF Thresh : Disabled
CRC Mon Window   : 10 seconds

Configured Address : 6c:be:e9:b1:af:1b
Hardware Address   : 6c:be:e9:b1:af:1b
Cfg Alarm          :
Alarm Status       :

Transceiver Data
Transceiver Status : not-equipped
=====
Traffic Statistics
=====
Input              Output
-----

```

```

Octets                10728                14236
Packets               102                  156
Errors                 0                    0
    
```

```

=====
Port Statistics
=====
-----
                                Input                Output
-----
Unicast Packets              102                101
Multicast Packets              0                   52
Broadcast Packets              0                   3
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
Medium :                        0
Low :                            0
=====
    
```

```

=====
Port Control Statistics
=====
-----
Ingress Queue CTL              Packets              Octets
Forwarded :                    0                      0
Dropped :                      0                      N/A

Egress Queue CTL               Packets              Octets
Forwarded :                    0                      0
Dropped :                      0                      N/A
=====
    
```

```

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

```

=====
Ethernet CFM Statistics
=====
    
```

```

Cfm LbmRx      : 0
Cfm LbReplyTx : 0 Cfm LbmDropped : 0

Num Bn Rate Chng : 1 Last BnRateChng : 04/12/2017 21:20:53
Valid BnmRx     : 2 Last Valid BnmRx  : 04/12/2017 21:21:10
Invalid BnmRx   : 0
BnmOutOfRangeBW : 0
=====
*A:ALU-1>#
    
```

Table 64 PoE Port Field Descriptions (Ethernet)

Label	Description
Ethernet Interface	
Description	A text description of the port
Interface	The port ID displayed in the <i>slot/mda/port</i> 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
Single Fiber Mode	Yes: single fiber mode
	No: not single fiber mode
IfIndex	The interface's index number, which reflects its initialization sequence

Table 64 PoE Port Field Descriptions (Ethernet) (Continued)

Label	Description
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.
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
	hybrid: the port is configured for hybrid use (transport network and service access per VLAN)
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
	qinq: ingress frames carry two 802.1Q tags, where the outer tag is the service provider tag and the inner tag is the customer service tag
Dot1Q Ethertype	The protocol carried in a dot1q Ethernet frame
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
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
MDI/MDX	Indicates the Ethernet interface type

Table 64 PoE Port Field Descriptions (Ethernet) (Continued)

Label	Description
Config Phy-tx-clock	The mode used to establish timing control of a 1000Base-T port. The options are: <ul style="list-style-type: none"> • N/A—the port does not support 1000Base-T • auto-pref-master—prefers to be master during autonegotiation • auto-pref-slave—prefers to be slave during autonegotiation • slave—the port is forced to be slave • master—the port is forced to be master
Oper Phy-tx-clock	The operational value of the master-slave relationship of the 1000Base-T physical layer transmit clock. The options are: <ul style="list-style-type: none"> • N/A—the port or the inserted SFP does not support 1000Base-T, the port is down, or negotiation failed • slave—the port is slave • master—the port is master
Allow Eth-BN	Indicates whether Ethernet Bandwidth Notification (ETH-BN) is allowed on the port: True or False
BN Egr.Rate in use	The egress rate in use based on the request from the ETH-BN server MEP
Eth-BN hold time	The configured hold time (in seconds) between an egress rate change based on a received Bandwidth Notification Message (BNM) and the next change request that will be accepted
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
Down-when-looped	Enabled: The down-when-looped feature is enabled on the port
	Disabled: The down-when-looped feature is disabled on the port
Keep-alive	The time interval between keepalive PDUs transmitted toward the network during loop detection by the down-when-looped feature
Loop Detected	Indicates whether a loop is detected on the port

Table 64 PoE Port Field Descriptions (Ethernet) (Continued)

Label	Description
Retry	The minimum wait time before the port is re-enabled after it is brought down due to a loop detection
Use Broadcast Addr	Indicates whether the down-when-looped feature has been configured to compare the destination MAC address of received PDUs to the broadcast MAC address instead of the MAC address of the port
Loopback	The type of loopback configured on the port, either line, internal, or none
Swap Mac Addr.	Indicates whether 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. If configured loopback is persistent, the value persistent
Cfm Loopback	Indicates whether the CFM loopback is enabled
PoE Mode	Indicates whether the port is using Poe, PoE+, or if the PoE function is turned off (disabled)
PoE Detection	Indicates the detection state of the PoE port
PoE Class	Displays the class of the PoE device connected to the port, as defined in IEEE 802.3af
PoE Fault Reason	Displays the reason the PoE port is down if a fault is detected
PoE Maximum Power	Indicates the maximum amount of PoE power configured and available on the port
PoE Power in Use	Indicates the amount of PoE power being used by the port
Sync. Status Msg.	Indicates whether Synchronization Status Messaging is enabled on the port
Rx Quality Level	The Synchronization Status Messaging quality level value received on the port
PTP Asymmetry	Indicates whether PTP asymmetry is enabled
Edge Timestamp	Indicates whether the edge timestamp is enabled
Timestamp Capable	Indicates whether the port is timestamp-capable

Table 64 PoE Port Field Descriptions (Ethernet) (Continued)

Label	Description
CRC Mon SD Thresh	Indicates the CRC signal degrade threshold value (1 to 9), if enabled
CRC Mon SF Thresh	Indicates the CRC signal fail threshold value (1 to 9), if enabled
CRC Mon Window	Indicates the CRC window sampling size value (1 to 10)
Configured Address	The base chassis Ethernet MAC address
Hardware Address	The interface hardware- or system-assigned MAC address at its protocol sublayer
Cfg Alarm	The type of alarms to be logged and reported for the port
Alarm Status	The current alarm state
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 sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Errors Input/Output	<p>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.</p> <p>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.</p>

Table 64 PoE Port Field Descriptions (Ethernet) (Continued)

Label	Description
Port Statistics	
Unicast Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Multicast Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent
Broadcast Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound 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	
Inv L2 Packets Input	The number of invalid packets that are discarded due to an unknown Layer 2 ID
Inv IP Packets Input	The number of invalid IP packets that are discarded
CSM Ingress Queues Input	The number of incoming control packets discarded

Table 64 PoE Port Field Descriptions (Ethernet) (Continued)

Label	Description
CSM Egress Queues Output	The number of outgoing control packets discarded
Port Control Statistics	
Ingress Queue CTL	The number of forwarded packets and octets, and the number of dropped packets, for the ingress control queue. For access ports, this statistic applies only to Ethernet cards. For network ports, this statistic applies to all adapter cards.
Egress Queue CTL	The number of forwarded packets and octets, and the number of dropped packets, for the egress control queue. For access ports, this statistic applies only to Ethernet cards. For network ports, this statistic applies to all adapter cards.
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

Table 64 PoE Port Field Descriptions (Ethernet) (Continued)

Label	Description
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
Ethernet CFM Statistics	
Cfm LbmRx	The number of LBMs received
Cfm LbReplyTx	The number of LBRs transmitted
Cfm LbmDropped	The number of LBMs dropped
Num Bn Rate Chng	The number of times that the port egress rate is dynamically changed based on Bandwidth Notification (BN) messages Note: not every bandwidth change indicated by a BNM triggers a port egress rate change
Last BnRateChng	The time that the port egress rate was last changed based on a BNM
Valid BnmRx	The number of valid BN messages received
Last Valid BnmRx	The time that the last valid BNM was received
Invalid BnmRx	The number of invalid BN messages received
BnmOutOfRangeBW	The number of BN messages received with a requested bandwidth that was out of range

Output Example

```
*A:ALU-1># show port 1/1/1
=====
Serial RS-232 Physical Interface
=====
Description      : RS-232/V.35/X.21
Interface        : 1/1/1
Admin Status     : down
Physical Link    : No
Port IfIndex     : 35684352
Oper Status     : down
```

```

Type                : rs232
=====
Port Statistics
=====
-----
                                Input          Output
-----
Packets                0                0
Discards                0                0
Unknown Proto Discards 0
=====
*A:ALU-1>#
    
```

Table 65 Specific Port Field Descriptions (Serial Port)

Label	Description
Serial RS-232 Physical Interface	
Description	A text description of the port
Interface	The port ID displayed in the <i>slot/mda/port</i> 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 sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards input/output	The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space

Table 65 Specific Port Field Descriptions (Serial Port) (Continued)

Label	Description
Unknown proto discards input/output	For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0.

Output Example

```
*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 slo
Alarm Status     :
BER SD Threshold : 6                   BER SF Threshold : 3
Hold time up     : 500 milliseconds
Hold time down   : 0 milliseconds

Transceiver Data

Transceiver Status : operational
Transceiver Type   : SFP
Model Number       : 3HE00034AAAA02 ALU 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 66 Specific Port Field Descriptions (SONET/SDH Port)

Label	Description
SONET/SDH interface	
Description	A text description of the port
Interface	The port ID displayed in the <i>slot/mda/port</i> 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

Table 66 Specific Port Field Descriptions (SONET/SDH Port) (Continued)

Label	Description
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
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

Table 66 Specific Port Field Descriptions (SONET/SDH Port) (Continued)

Label	Description
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
Transceiver Data	<p>The following information is provided for a configured transceiver (SFP):</p> <ul style="list-style-type: none"> • transceiver status • transceiver type • 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 66 Specific Port Field Descriptions (SONET/SDH Port) (Continued)

Label	Description
Transceiver Digital Diagnostic Monitoring (DDM), Externally Calibrated	
	<p>SFP manufacturers specifications guidelines contained in specification SFF-8472, for the following:</p> <ul style="list-style-type: none"> • temperature (C) • supply voltage (V) • Tx bias current (mA) • Tx output power (dBm) • Rx optical power (avg dBm) <p>For the above categories, the following values are shown:</p> <ul style="list-style-type: none"> • 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 <p>If alarms/warnings are raised, an "!" is included in the output</p>
Port Statistics	
Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space

Table 66 Specific Port Field Descriptions (SONET/SDH Port) (Continued)

Label	Description
Unknown proto discards Input/Output	For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0.

Output Example

```
*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 67 Specific Port Field Descriptions (E&M Voice Port)

Label	Description
Voice Physical Interface	
Description	A text description of the port
Interface	The port ID displayed in the <i>slot/mda/port</i> format
Port IfIndex	The interface's index number, which reflects its initialization sequence

Table 67 Specific Port Field Descriptions (E&M Voice Port) (Continued)

Label	Description
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
Audio Wires	Four-wire or two-wire (for E & M only)
TLP Tx	The transmit transmission level point value for the port
Port Statistics	
Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound 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.

Output Example

```
*A:ALU-1># show port 1/1/5
=====
Voice Physical Interface
=====
Description      : FXO
Interface        : 1/1/5          Port IfIndex      : 39878656
Admin Status     : down          Oper Status       : down
Physical Link    : no
Type             : fxo           Signaling Type    : 3600ls
TLP Rx           : 0.0           Line Balance      : nominal
TLP Tx           : 0.0
=====
Port Statistics
=====
-----
                                Input          Output
-----
Packets                0                0
Discards                0                0
Unknown Proto Discards 0
=====
*A:ALU-1>#
```

Table 68 Specific Port Field Descriptions (FXO Voice Port)

Label	Description
Voice Physical Interface	
Description	A text description of the port
Interface	The port ID displayed in the <i>slot/mda/port</i> 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 (fxo)

Table 68 Specific Port Field Descriptions (FXO Voice Port) (Continued)

Label	Description
Signaling Type	The signaling type: Mu-law: 3600ls —loop start A-law: 1511profile1 —1511 loop start 3600re —remote extension 1511sn137 —1511 profile 137
TLP Rx	The receive transmission level point value for the port
Line Balance	nominal or 800
TLP Tx	The transmit transmission level point value for the port
Port Statistics	
Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound 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.

Output Example

```
*A:ALU-1># show port 1/6/1
=====
Voice Physical Interface
=====
Description      : FXO
Interface        : 1/1/5          Port IfIndex      : 39878656
Admin Status     : down          Oper Status       : down
Physical Link    : no
Type             : fxs           Signaling Type    : 3600ls
TLP Rx           : -3.0          Line Balance      : nominal
TLP Tx           : 0.0          Ring Generation   : 16
=====
Port Statistics
=====
-----
                                Input          Output
-----
Packets                0                0
Discards                0                0
Unknown Proto Discards 0
=====
*A:ALU-1>#
```

Table 69 Specific Port Field Descriptions (FXS Voice Port)

Label	Description
Voice Physical Interface	
Description	A text description of the port
Interface	The port ID displayed in the <i>slot/mda/port</i> 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 (fxs)

Table 69 Specific Port Field Descriptions (FXS Voice Port) (Continued)

Label	Description
Signaling Type	The signaling type: Mu-law: 3600ls —loop start 3600plar —private line automatic ringdown A-law: 1511plar —1511 private line automatic ringdown 3600plar —private line automatic ringdown 1511profile1 —1511 loop start 3600re —remote extension 1511sn137 —1511 profile 137
TLP Rx	The receive transmission level point value for the port
Line Balance	nominal or 800
TLP Tx	The transmit transmission level point value for the port
Ring Generation	The frequency of the generated ring signal
Port Statistics	
Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound 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.

Output Example

```

*A:ALU-1># show port 1/6/1.1
=====
Voice DS0 Chan Group
=====
Description      : DS0GRP
Interface        : 1/6/1.1
Admin Status     : down                Oper Status      : down
Last State Change : 01/31/2011 16:06:07  Chan-Grp IfIndex : 57255325
Configured Mode  : access              Encap Type       : cem
Admin MTU        : 1514                Oper MTU         : 1514
Physical Link    : No
=====
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 70 Specific Port Field Descriptions (DS0 Voice Channel Group)

Label	Description
Voice	
Description	A text description of the port
Interface	The port ID displayed in the <i>slot/mda/port</i> format
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
Chan-grp IfIndex	The channel group's index number, which reflects its initialization sequence
Last State Change	Date and time of last state change
Configured Mode	short, long, nominal or 800

Table 70 Specific Port Field Descriptions (DS0 Voice Channel Group)

Label	Description
Admin MTU	The configured MTU
Physical Link	Yes: a physical link is present
	No: a physical link is not present
Encap Type	The transmit transmission level point value for the port
Oper MTU	The negotiated size of the largest packet that can be sent on the port or channel specified in octets
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 sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, 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 sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space

Table 70 Specific Port Field Descriptions (DS0 Voice Channel Group)

Label	Description
Unknown proto discards Input/Output	For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0.

Output Example

```
*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 Data

Transceiver Status : operational
Transceiver Type   : SFP
Model Number       : 3HE00034AAAA02 ALU 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  0
=====
*A:ALU-1>#
    
```

Table 71 Port Detail Field Descriptions (SONET/SDH Port)

Label	Description
SONET/SDH interface	
Description	A text description of the port
Interface	The port ID displayed in the <i>slot/mda/port</i> 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

Table 71 Port Detail Field Descriptions (SONET/SDH Port) (Continued)

Label	Description
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
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

Table 71 Port Detail Field Descriptions (SONET/SDH Port) (Continued)

Label	Description
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
Transceiver Data	The following information is provided for a configured SFP: <ul style="list-style-type: none"> • transceiver status • transceiver type • 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 71 Port Detail Field Descriptions (SONET/SDH Port) (Continued)

Label	Description
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
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

Table 71 Port Detail Field Descriptions (SONET/SDH Port) (Continued)

Label	Description
Port Statistics	
Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound 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.

Ethernet Output Example (access mode)

```
*A:ALU-1># show port 1/5/8 detail
=====
Ethernet Interface
=====
Description      : 10/100/Gig Ethernet SFP
Interface        : 1/5/8                      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             : 1518
Single Fiber Mode : No
IfIndex          : 44302336                  Hold time up    : 0 seconds
Last State Change : 10/04/2011 14:05:25      Hold time down  : 0 seconds
Last Cleared Time : 10/04/2011 14:04:37            DDM Events     : Enabled
Phys State Chng Cnt: 3

Configured Mode   : access                    Encap Type      : 802.1q
Dot1Q Ethertype  : 0x8100                    QinQ Ethertype  : 0x8100
Ing. Pool % Rate : 100                       Egr. Pool % Rate : 100
Net. Egr. Queue Pol: default
Auto-negotiate   : true                      MDI/MDX        : MDX
Net. Scheduler Mode: 16-priority
Config Phy-tx-clock: auto-pref-slave        Oper Phy-tx-clock: slave
SapEgr.Unshaped-Cir: 0 Kbps
SapEgr.Shaper-Pol : EgrShprPolicy
NetEgr.Unshaped-Cir: 0 Kbps
Allow Eth-BN     : True
```

```

BN Egr.Rate in use : 765000          Eth-BN hold time : 6
Egress Rate       : 1111            Ingress Rate      : n/a
Egr.Rate Incl.FCS : Disabled
Ingress CBS(bytes): 130816         Src-pause        : Disabled
                                           LACP Tunnel      : Disabled

Down-when-looped  : Disabled        Keep-alive       : 10
Loop Detected     : False           Retry            : 120
Use Broadcast Addr: False

Loopback          : none            Swap Mac Addr    : Disabled
Loopback Time Left: unspecified
Cfm Loopback     : Disabled

Sync. Status Msg. : Disabled        Rx Quality Level : N/A

PTP Asymmetry    : 0                Edge Timestamp   : Disable
Timestamp Capable: False

Configured Address: 2001:db8::
Hardware Address : 2001:db8::
Cfg Alarm        :
Alarm Status     :
    
```

Transceiver Data

```

Transceiver Status : operational
Transceiver Type   : SFP
Model Number       : 3HE00062AAAA01 ALA IPUIAEHDA
TX Laser Wavelength: 0 nm           Diag Capable     : no
Connector Code     : Unknown         Vendor OUI       : 00:90:65
Manufacture date   : 2010/01/15     Media            : Ethernet
Serial Number      : PH23PQS
Part Number        : FCMJ-8521-3-A5
Optical Compliance: GIGE-T
Link Length support: 100m for copper
SFP Sync-E Capable: no
    
```

=====
Traffic Statistics
=====

	Input	Output
Octets	10728	14236
Packets	102	156
Errors	0	0

=====
Ethernet Statistics
=====

```

Broadcast Pckts : 3 Drop Events : 0
Multicast Pckts : 52 CRC/Align Errors : 0
Undersize Pckts : 0 Fragments : 0
Oversize Pckts : 0 Jabbers : 0
Collisions : 0

Octets : 24964
Packets : 258
    
```

```

Packets of 64 Octets      :          54
Packets of 65 to 127 Octets :        204
Packets of 128 to 255 Octets :          0
Packets of 256 to 511 Octets :          0
Packets of 512 to 1023 Octets :          0
Packets of 1024 to 1518 Octets :          0
Packets of 1519 or more Octets :          0
=====

```

=====
Port Statistics
=====

	Input	Output
Unicast Packets	102	101
Multicast Packets	0	52
Broadcast Packets	0	3
Discards	0	0
Unknown Proto Discards	0	

=====

=====
Port Discard Statistics
=====

	Input	Output
Inv L2 Packets :	0	0
Inv MPLS Labels :	0	0
Inv IP Packets :	0	0

CSM Ingress Queues		CSM Egress Queues	
Hi :	0	Common :	0
Medium :	0		
Low :	0		

=====

=====
Port Control Statistics
=====

Ingress Queue CTL	Packets	Octets
Forwarded :	102	13482
Dropped :	0	N/A

Egress Queue CTL	Packets	Octets
Forwarded :	56	3184
Dropped :	0	N/A

=====

=====
Ethernet CFM Statistics
=====

```

Cfm LbmRx      :          0
Cfm LbReplyTx  :          0  Cfm LbmDropped   :          0

Num Bn Rate Chng :          1  Last BnRateChng : 04/12/2017 21:20:53
Valid BnmRx      :          2  Last Valid BnmRx : 04/12/2017 21:21:10
Invalid BnmRx    :          0

```

```

BnmOutOfRangeBW : 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
=====
    
```

Table 72 Port Detail Field Descriptions (Ethernet, Access Mode)

Label	Description
Ethernet Interface	
Description	A text description of the port
Interface	The port ID displayed in the <i>slot/mda/port</i> 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

Table 72 Port Detail Field Descriptions (Ethernet, Access Mode)

Label	Description
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.
Phys State Chng Cnt	<p>The physical state change counter. This counter increments when a fully qualified (debounced) transition occurs at the physical layer of an Ethernet port, including the following transitions of the port state as displayed in the show port slot/mda/port output:</p> <ul style="list-style-type: none"> • from Down to Link Up or Up • from Link Up or Up to Down <p>This counter does not increment for changes only in the link protocol states. That is, if the physical link is up, any transitions of the port state due to link protocols (for example, 802.3ah EFM OAM, LACP, 802.1ag) do not cause the counter to increment. The following port state transitions are examples of transitions that are not counted:</p> <ul style="list-style-type: none"> • from Link Up to Up • from Up to Link Up
Configured Mode	network: the port is configured for transport network use
	access: the port is configured for service access
	hybrid: the port is configured for hybrid use (transport network and service access per VLAN)
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
	qinq: ingress frames carry two 802.1Q tags, where the outer tag is the service provider tag and the inner tag is the customer service tag
Dot1Q Ethertype	The protocol carried in a dot1q Ethernet frame
QinQ Ethertype	The protocol carried in a qinq Ethernet frame

Table 72 Port Detail Field Descriptions (Ethernet, Access Mode)

Label	Description
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
Net. Scheduler Mode	The network scheduler mode
SapEgr.Unshaped-Cir	The CIR rate for the aggregate of all the unshaped 4-priority SAPs on the port
SapEgr.Shaper-Pol	The access egress shaper policy ID
NetEgr.Unshaped-Cir	The CIR rate for the aggregate of all the unshaped VLANs on the port
NetEgr. Shaper-Pol	The network egress shaper policy ID
Allow Eth-BN	Indicates whether Ethernet Bandwidth Notification (ETH-BN) is allowed on the port: True or False
BN Egr.Rate in use	The egress rate in use based on the request from the ETH-BN server MEP
Eth-BN hold time	The configured hold time (in seconds) between an egress rate change based on a received Bandwidth Notification Message (BNM) and the next change request that will be accepted
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
Egr.Rate Incl.FCS	The configured state of egress rate FCS inclusion: enabled or disabled
LACP Tunnel	Indicates whether LACP packet tunneling is enabled
Down-when-looped	Enabled: The down-when-looped feature is enabled on the port
	Disabled: The down-when-looped feature is disabled on the port
Keep-alive	The time interval between keepalive PDUs transmitted toward the network during loop detection by the down-when-looped feature

Table 72 Port Detail Field Descriptions (Ethernet, Access Mode)

Label	Description
Loop Detected	Indicates whether a loop is detected on the port
Retry	The minimum wait time before the port is re-enabled after it is brought down due to a loop detection
Use Broadcast Addr	Indicates whether the down-when-looped feature has been configured to compare the destination MAC address of received PDUs to the broadcast MAC address instead of the MAC address of the port
Loopback	The type of loopback configured on the port, either line, internal, or none
Swap Mac Addr.	Indicates whether 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. If configured loopback is persistent, the value persistent
Cfm Loopback	Indicates whether the CFM loopback is enabled
Sync. Status Msg.	Indicates whether 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 sublayer
Cfg Alarm	The type of alarms to be logged and reported for the port
Alarm Status	The current alarm state

Table 72 Port Detail Field Descriptions (Ethernet, Access Mode)

Label	Description
Transceiver Data	<p>The following information is provided for a configured transceiver (SFP):</p> <ul style="list-style-type: none"> • transceiver status • transceiver type • 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	
	<p>SFP manufacturers specifications guidelines contained in specification SFF-8472, for the following:</p> <ul style="list-style-type: none"> • temperature (C) • supply voltage (V) • Tx bias current (mA) • Tx output power (dBm) • Rx optical power (avg dBm) <p>For the above categories, the following values are shown:</p> <ul style="list-style-type: none"> • 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 <p>If alarms/warnings are raised, there will be an "!" in the output</p>

Table 72 Port Detail Field Descriptions (Ethernet, Access Mode)

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 sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Errors Input/Output	<p>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.</p> <p>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.</p>
Ethernet Statistics	
Broadcast Pckts	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Multicast Pckts	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. 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 sublayer, 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 72 Port Detail Field Descriptions (Ethernet, Access Mode)

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 sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.

Table 72 Port Detail Field Descriptions (Ethernet, Access Mode)

Label	Description
Multicast Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent
Broadcast Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound 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	
Inv L2 Packets Input	The number of invalid packets that are discarded due to an unknown Layer 2 ID
Port MTU Exceeded	Indicates that the port MTU has been exceeded
Inv MPLS Labels	The number of MPLS labels discarded
Inv IP Packets Input	The number of invalid IP packets that are discarded
H. Policed Packets	The number of packets that are discarded due to hard policing
CSM Ingress Queues Input	The number of incoming control packets discarded
CSM Egress Queues Output	The number of outgoing control packets discarded

Table 72 Port Detail Field Descriptions (Ethernet, Access Mode)

Label	Description
Port Control Statistics	
Ingress Queue CTL	The number of forwarded packets and octets, and the number of dropped packets, for the ingress control queue. For access ports, this statistic applies only to Ethernet cards. For network ports, this statistic applies to all adapter cards.
Egress Queue CTL	The number of forwarded packets and octets, and the number of dropped packets, for the egress control queue. For access ports, this statistic applies only to Ethernet cards. For network ports, this statistic applies to all adapter cards.
Ethernet CFM Statistics	
Cfm LbmRx	The number of LBMs received
Cfm LbReplyTx	The number of LBRs transmitted
Cfm LbmDropped	The number of LBMs dropped
Num Bn Rate Chng	The number of times that the port egress rate is dynamically changed based on Bandwidth Notification (BN) messages Note: not every bandwidth change indicated by a BNM triggers a port egress rate change
Last BnRateChng	The time that the port egress rate was last changed based on a BNM
Valid BnmRx	The number of valid BN messages received
Last Valid BnmRx	The time that the last valid BNM was received
Invalid BnmRx	The number of invalid BN messages received
BnmOutOfRangeBW	The number of BN messages received with a requested bandwidth that was out of range
Ethernet-like Medium Statistics	
Alignment Errors	The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets

Table 72 Port Detail Field Descriptions (Ethernet, Access Mode)

Label	Description
FCS Errors	The number of frames received that are an integral number of octets in length but do not pass the FCS check
SQE Errors	The number of times that the SQE TEST ERROR is received
CSE	The number of times that the carrier sense condition was lost or never asserted when attempting to transmit a frame
Too long Frames	The number of frames received that exceed the maximum permitted frame size
Symbol Errors	For an interface operating at 100 Mb/s, the number of times there was an invalid data symbol when a valid carrier was present
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



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.

Ethernet Output Example (network mode)

The **show>port** output for an Ethernet port in network mode is similar to the access mode output (see [Ethernet Output Example \(access mode\)](#)) with the addition of a section for queue statistics. The output example below shows only the queue statistics fields.

```
*A:ALU-1># show port 1/1/1 detail
=====
Ethernet Interface
=====

.....

=====
Queue Statistics
=====

-----
Ingress Queue 1          Packets          Octets
  In Profile forwarded :    0                0
  In Profile dropped   :  4626            6939000
  Out Profile forwarded :  2425            3637500
  Out Profile dropped   :    0                0
Ingress Queue 2          Packets          Octets
  In Profile forwarded :   2022           3033000
  In Profile dropped   :    0                0
  Out Profile forwarded :    0                0
  Out Profile dropped   :    0                0
Ingress Queue 3          Packets          Octets
  In Profile forwarded :   2024           3036000
  In Profile dropped   :    0                0
  Out Profile forwarded :    0                0
  Out Profile dropped   :    0                0
Ingress Queue 4          Packets          Octets
  In Profile forwarded :   2404           3606000
  In Profile dropped   :    0                0
  Out Profile forwarded :    0                0
  Out Profile dropped   :    0                0
Ingress Queue 5          Packets          Octets
  In Profile forwarded :   2396           3594000
  In Profile dropped   :    0                0
  Out Profile forwarded :    0                0
  Out Profile dropped   :    0                0
Ingress Queue 6          Packets          Octets
  In Profile forwarded :   2342           3513000
  In Profile dropped   :    0                0
  Out Profile forwarded :    0                0
  Out Profile dropped   :    0                0
Ingress Queue 7          Packets          Octets
  In Profile forwarded :   2306           3459000
  In Profile dropped   :    0                0
  Out Profile forwarded :    0                0
  Out Profile dropped   :    0                0
Ingress Queue 8          Packets          Octets
  In Profile forwarded :   2301           3451500
  In Profile dropped   :    0                0
  Out Profile forwarded :    0                0
  Out Profile dropped   :    0                0
```

Ingress Queue 9	Packets	Octets
In Profile forwarded :	0	0
In Profile dropped :	0	0
Out Profile forwarded :	0	0
Out Profile dropped :	0	0
Ingress Queue 10	Packets	Octets
In Profile forwarded :	0	0
In Profile dropped :	0	0
Out Profile forwarded :	0	0
Out Profile dropped :	0	0
Ingress Queue 11	Packets	Octets
In Profile forwarded :	0	0
In Profile dropped :	0	0
Out Profile forwarded :	0	0
Out Profile dropped :	0	0
Ingress Queue 12	Packets	Octets
In Profile forwarded :	0	0
In Profile dropped :	0	0
Out Profile forwarded :	0	0
Out Profile dropped :	0	0
Ingress Queue 13	Packets	Octets
In Profile forwarded :	0	0
In Profile dropped :	0	0
Out Profile forwarded :	0	0
Out Profile dropped :	0	0
Ingress Queue 14	Packets	Octets
In Profile forwarded :	0	0
In Profile dropped :	0	0
Out Profile forwarded :	0	0
Out Profile dropped :	0	0
Ingress Queue 15	Packets	Octets
In Profile forwarded :	0	0
In Profile dropped :	0	0
Out Profile forwarded :	0	0
Out Profile dropped :	0	0
Ingress Queue 16	Packets	Octets
In Profile forwarded :	0	0
In Profile dropped :	0	0
Out Profile forwarded :	0	0
Out Profile dropped :	0	0
Ingress Queue CTL	Packets	Octets
Forwarded :	0	0
Dropped :	0	N/A
Unshaped Egress Queue 1	Packets	Octets
In Profile forwarded :	0	0
In Profile dropped :	0	0
Out Profile forwarded :	129084	193109664
Out Profile dropped :	0	0
Unshaped Egress Queue 2	Packets	Octets
In Profile forwarded :	128674	192496304
In Profile dropped :	0	0
Out Profile forwarded :	0	0
Out Profile dropped :	0	0
Unshaped Egress Queue 3	Packets	Octets
In Profile forwarded :	128685	192512760
In Profile dropped :	0	0
Out Profile forwarded :	0	0
Out Profile dropped :	0	0

```

Unshaped Egress Queue 4      Packets      Octets
  In Profile forwarded :    154389      230965944
  In Profile dropped   :         0         0
  Out Profile forwarded :         0         0
  Out Profile dropped   :         0         0
Unshaped Egress Queue 5      Packets      Octets
  In Profile forwarded :    154372      230940512
  In Profile dropped   :         0         0
  Out Profile forwarded :         0         0
  Out Profile dropped   :         0         0
Unshaped Egress Queue 6      Packets      Octets
  In Profile forwarded :    154306      230841776
  In Profile dropped   :         0         0
  Out Profile forwarded :         0         0
  Out Profile dropped   :         0         0
Unshaped Egress Queue 7      Packets      Octets
  In Profile forwarded :    154265      230780440
  In Profile dropped   :         0         0
  Out Profile forwarded :         0         0
  Out Profile dropped   :         0         0
Unshaped Egress Queue 8      Packets      Octets
  In Profile forwarded :    154261      230774456
  In Profile dropped   :         0         0
  Out Profile forwarded :         0         0
  Out Profile dropped   :         0         0

Total Egress from all Shaped and Unshaped Queues
                                Packets      Octets
  In Profile forwarded :    1028952      1539312192
  In Profile dropped   :         0         0
  Out Profile forwarded :    129084      193109664
  Out Profile dropped   :         0         0

Egress Queue CTL              Packets      Octets
  Forwarded :                16         1024
  Dropped   :                 0         N/A
=====
    
```

See [Table 72](#) for field descriptions common to both access and network mode outputs.

Table 73 Port Detail Field Descriptions (Ethernet, Network Mode)

Label	Description
Queue Statistics	
Ingress Queue	For the specified ingress queue, the number of packets and octets that are: <ul style="list-style-type: none"> • In Profile forwarded/dropped • Out Profile forwarded/dropped

Table 73 Port Detail Field Descriptions (Ethernet, Network Mode)

Label	Description
Unshaped Egress Queue	For the specified unshaped egress queue, the of number packets and octets that are: <ul style="list-style-type: none"> • In Profile forwarded/dropped • Out Profile forwarded/dropped
Total Egress from all Shaped and Unshaped Queues	For all shaped and unshaped queues, the total number of egress packets and octets that are: <ul style="list-style-type: none"> • In Profile forwarded/dropped • Out Profile forwarded/dropped
Egress Queue CTL	The number of forwarded packets and octets, and the number of dropped packets, for the egress control queue.

Output Example

```
sar18# show port 1/11/1 detail
=====
Ethernet Interface
=====
Description          : 10-Gig Bridged Ethernet
Interface            : 1/11/1                      Oper Speed       : 10 Gbps
Link-level           : Ethernet                  Config Speed     : N/A
Admin State          : up                       Oper Duplex      : full
Oper State           : up                       Config Duplex    : N/A
Physical Link        : Yes                      MTU              : 9728
Single Fiber Mode    : No
IfIndex              : 39878656
Last State Change    : 11/03/2012 21:30:51      Hold time up     : 0 seconds
Last Cleared Time    : N/A                      Hold time down   : 0 seconds
                                          DDM Events      : Enabled

Configured Mode      : network
Dot1Q Ethertype      : 0x8100                      Encap Type       : Null&dot1q
Ing. Pool % Rate     : 100                       VLAN Filter      : 2
Net. Egr. Queue Pol : default                    Egr. Pool % Rate : 100
Net. Scheduler Mode  : 16-priority
Auto-negotiate       : N/A                      MDI/MDX         : N/A
Config Phy-tx-clock : not-applicable           Oper Phy-tx-clock : N/A
Egress Rate          : Default                    Ingress Rate     : Default
Ingress CBS(bytes)   : 130816                   Src-pause        : N/A
                                          LACP Tunnel      : N/A

Down-when-looped    : N/A                      Keep-alive       : N/A
Loop Detected        : N/A                      Retry            : N/A
Use Broadcast Addr   : N/A

Loopback             : none                      Swap Mac Addr    : Disabled
Loopback Time Left   : unspecified
Cfm Loopback         : dot1p
Cfm Loopback Vlan    : 10-15,20,47

Sync. Status Msg.   : Disabled                    Rx Quality Level : N/A
```

PTP Asymmetry : N/A Edge Timestamp : Disable
 Timestamp Capable : False

Configured Address :
 Hardware Address :
 Cfg Alarm : remote local
 Alarm Status :

=====
 Traffic Statistics
 =====

	Input	Output
Octets	0	0
Packets	0	0
Errors	0	0

=====
 Ethernet Statistics
 =====

Broadcast Pkts :	0	Drop Events :	0
Multicast Pkts :	0	CRC/Align Errors :	0
Undersize Pkts :	0	Fragments :	0
Oversize Pkts :	0	Jabbers :	0
Collisions :	0		

Octets :	0
Packets :	0
Packets of 64 Octets :	0
Packets of 65 to 127 Octets :	0
Packets of 128 to 255 Octets :	0
Packets of 256 to 511 Octets :	0
Packets of 512 to 1023 Octets :	0
Packets of 1024 to 1518 Octets :	0
Packets of 1519 or more Octets :	0

=====
 Port Statistics
 =====

	Input	Output
Unicast Packets	0	0
Multicast Packets	0	0
Broadcast Packets	0	0
Discards	0	0
Unknown Proto Discards	0	

=====
 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

```

=====
Ethernet CFM Loopback Statistics   N/A
=====
Queue Statistics
-----
Egress Queue 1
  In Profile forwarded : 0          Octets
  In Profile dropped   : 0          0
  Out Profile forwarded: 0          0
  Out Profile dropped  : 0          0
=====
*A:7705custDoc: Sar18#
    
```

Table 74 Port Detail Field Descriptions (Ring Ethernet)

Label	Description
Ethernet Interface	
Description	A text description of the port
Interface	The port ID displayed in the <i>slot/mda/port</i> 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
Single Fiber Mode	Yes: single fiber mode
	No: not single fiber mode

Table 74 Port Detail Field Descriptions (Ring Ethernet) (Continued)

Label	Description
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.
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
Configured Mode	network: the port is configured for transport network use
	access: the port is configured for service access
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
	null&dot1q: applies only to port 1 and port 2 on the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module. The encapsulation type for these ports is not user-configurable.
Dot1Q Ethertype	The protocol carried in a dot1q Ethernet frame
VLAN Filter	The filter ID of the VLAN filter
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

Table 74 Port Detail Field Descriptions (Ring Ethernet) (Continued)

Label	Description
Net. Egr. Queue Pol.	The number of the associated network egress queue QoS policy, or default if the default policy is used
Net. Scheduler Mode	The mode for servicing CoS queues; 16-priority scheduling is the only supported value
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
MDI/MDX	Ethernet type
Config Phy-tx-clock	The mode used to establish timing control of a 1000Base-T port. The options are: <ul style="list-style-type: none"> • N/A—the port does not support 1000Base-T • auto-pref-master—prefers to be master during autonegotiation • auto-pref-slave—prefers to be slave during autonegotiation • slave—the port is forced to be slave • master—the port is forced to be master
Oper Phy-tx-clock	The operational value of the master-slave relationship of the 1000Base-T physical layer transmit clock. The options are: <ul style="list-style-type: none"> • N/A—the port or the inserted SFP does not support 1000Base-T, the port is down, or negotiation failed • slave—the port is slave • master—the port is master
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
Ingress CBS (bytes)	Indicates the ingress committed buffer space
Src-pause	A notification to slow down the transmission rate when it exceeds the bandwidth limit
LACP Tunnel	Indicates whether LACP packet tunneling is enabled

Table 74 Port Detail Field Descriptions (Ring Ethernet) (Continued)

Label	Description
Down-when-looped	Enabled: The down-when-looped feature is enabled on the port
	Disabled: The down-when-looped feature is disabled on the port
Keep-alive	The time interval between keepalive PDUs transmitted toward the network during loop detection by the down-when-looped feature
Loop Detected	Indicates whether a loop is detected on the port
Retry	The minimum wait time before the port is re-enabled after it is brought down due to a loop detection
Use Broadcast Addr	Indicates whether the down-when-looped feature has been configured to compare the destination MAC address of received PDUs to the broadcast MAC address instead of the MAC address of the port
Loopback	The type of loopback configured on the port, either line, internal, or none
Swap Mac Addr.	Indicates whether 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. If configured loopback is persistent, the value persistent
Cfm Loopback	Indicates whether the CFM loopback is high priority, low priority, dot1p, or disabled
Cfm Loopback Vlan	Indicates the VLAN IDs for VLANs that have a CFM loopback enabled
Sync. Status Msg.	Indicates whether Synchronization Status Messaging is enabled on the port
Rx Quality Level	The Synchronization Status Messaging quality level value received on the port
PTP Asymmetry	Indicates whether PTP asymmetry is enabled
Edge Timestamp	Indicates whether the edge timestamp is enabled
Timestamp Capable	Indicates whether the port is timestamp-capable
Code-Type	The Synchronization Status Messaging quality level code type, either SONET or SDH

Table 74 Port Detail Field Descriptions (Ring Ethernet) (Continued)

Label	Description
Configured Address	The base chassis Ethernet MAC address
Hardware Address	The interface hardware- or system-assigned MAC address at its protocol sublayer
Cfg Alarm	The type of alarms to be logged and reported for the port
Alarm Status	The current alarm state
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 sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Errors Input/Output	<p>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.</p> <p>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.</p>
Ethernet Statistics	
Broadcast Pckts	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. 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 sublayer, including those that were discarded or not sent.

Table 74 Port Detail Field Descriptions (Ring Ethernet) (Continued)

Label	Description
Multicast Pckts	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Undersize Pckts	The total number of packets received that were shorter than 64 octets (excluding framing bits, but including FCS octets) but were otherwise well formed
Oversize Pckts	The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) but were otherwise well formed
Collisions	The best estimate of the total number of collisions on this Ethernet segment
Drop Events	The total number of times that packets were detected as being dropped due to a lack of resources (not necessarily the total number of packets dropped)
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

Table 74 Port Detail Field Descriptions (Ring Ethernet) (Continued)

Label	Description
Port Statistics	
Unicast Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Multicast Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent
Broadcast Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound 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
Ethernet-like Medium Statistics	
Alignment Errors	The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets

Table 74 Port Detail Field Descriptions (Ring Ethernet) (Continued)

Label	Description
FCS Errors	The number of frames received that are an integral number of octets in length but do not pass the FCS check
SQE Errors	The number of times that the SQE TEST ERROR is received
CSE	The number of times that the carrier sense condition was lost or never asserted when attempting to transmit a frame
Too long Frames	The number of frames received that exceed the maximum permitted frame size
Symbol Errors	For an interface operating at 100 Mb/s, the number of times there was an invalid data symbol when a valid carrier was present
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
Ethernet CFM Loopback Statistics N/A	
Queue Statistics	
Egress Queue	In Profile forwarded/dropped
	Out Profile forwarded/dropped

Output Example

```

sar18# show port 1/11/v-port detail
=====
Ethernet Interface
=====
Description      : 2.5G Virtual Ethernet Port
Interface        : 1/11/v-port          Oper Speed      : 2.50 Gbps
Link-level       : Ethernet             Config Speed    : N/A
Admin State      : up                   Oper Duplex     : N/A
Oper State       : up                   Config Duplex   : N/A
Physical Link    : Yes                  MTU             : 1572
Single Fiber Mode : No
IfIndex          : 39944192             Hold time up    : N/A
Last State Change : 11/03/2012 21:30:51 Hold time down  : N/A
Last Cleared Time : N/A

Configured Mode  : network              Encap Type      : null
Dot1Q Ethertype  : 0x8100              QinQ Ethertype  : 0x8100
Ing. Pool % Rate : 100                  Egr. Pool % Rate : 100
Net. Egr. Queue Pol: r.nw.q4
Net. Scheduler Mode: 16-priority
Auto-negotiate   : N/A                 MDI/MDX         : N/A
Config Phy-tx-clock: not-applicable    Oper Phy-tx-clock: N/A
Allow Eth-BN     : True
BN Egr.Rate in use : 765000              Eth-BN hold time : 6
Egress Rate      : Default              Ingress Rate     : Default
Ingress CBS(bytes) : 130816             Src-pause       : Disabled
LACP Tunnel      : N/A

Down-when-looped : Disabled              Keep-alive       : 10
Loop Detected    : False                 Retry            : 120
Use Broadcast Addr : False

Loopback         : none                  Swap Mac Addr    : Disabled
Loopback Time Left : unspecified
Cfm Loopback     : Disabled

Sync. Status Msg. : Disabled              Rx Quality Level : N/A

PTP Asymmetry    : N/A                  Edge Timestamp   : Disable
Timestamp Capable : False

CRC Mon SD Thresh : Disabled              CRC Mon Window   : 10 seconds
CRC Mon SF Thresh : Disabled

Configured Address :
Hardware Address  :
Cfg Alarm         : N/A
Alarm Status      : N/A

=====
Traffic Statistics
=====
-----
Input              Output
-----
Octets             0              0
Packets            0              0
Errors             0              0

```

```

=====
Ethernet Statistics
=====
Broadcast Pkts   :           0 Drop Events       :           0
Multicast Pkts  :           0 CRC/Align Errors :           0
Undersize Pkts  :           0 Fragments      :           0
Oversize Pkts   :           0 Jabbers          :           0
Collisions      :           0
Octets          :           0
Packets         :           0
Packets of 64 Octets :           0
Packets of 65 to 127 Octets :           0
Packets of 128 to 255 Octets :           0
Packets of 256 to 511 Octets :           0
Packets of 512 to 1023 Octets :           0
Packets of 1024 to 1518 Octets :           0
Packets of 1519 or more Octets :           0
=====
Port Statistics
=====
                                     Input           Output
-----
Unicast Packets           0             0
Multicast Packets         0             0
Broadcast Packets         0             0
Discards                   0             0
Unknown Proto Discards    0
=====
Port Discard Statistics
=====
                                     Input           Output
-----
Inv L2 Packets           :           0 Port MTU Exceeded:           0
Inv MPLS Labels          :           0
Inv IP Packets           :           0
H.Policed Packets       :           0
CSM Ingress Queues
  Hi                      :           0 CSM Egress Queues
  Medium                  :           0 Common           :           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
In Pause Frames  :           0 Out Pause Frames :           0
=====
Ethernet CFM Statistics
=====
Cfm LbmRx          :           0
Cfm LbReplyTx      :           0 Cfm LbmDropped   :           0

```

```

Num Bn Rate Chng :          1  Last BnRateChng : 04/12/2017 21:20:53
Valid BnmRx       :          2  Last Valid BnmRx : 04/12/2017 21:21:10
Invalid BnmRx     :          0
BnmOutOfRangeBW  :          0
=====
Queue Statistics
=====
-----
Add-drop Port Queue 1      Packets      Octets
  In Profile forwarded :    8700493441110376715    8700493580567332216
  In Profile dropped   :    243616594368814244    2209638931652
  Out Profile forwarded :    12884901891    8700494542739924144
  Out Profile dropped   :    143944465151581384    284544364229582056
Ingress Queue 1          Packets      Octets
  In Profile forwarded :          0          0
  In Profile dropped   :          0          0
  Out Profile forwarded :          0          0
  Out Profile dropped   :          0          0
Ingress Queue 9          Packets      Octets
  In Profile forwarded :          0          0
  In Profile dropped   :          0          0
  Out Profile forwarded :          0          0
  Out Profile dropped   :          0          0
Ingress Queue CTL        Packets      Octets
  Forwarded :          0          0
  Dropped   :          0          N/A
Egress Queue 1          Packets      Octets
  In Profile forwarded :          0          0
  In Profile dropped   :          0          0
  Out Profile forwarded :          0          0
  Out Profile dropped   :          0          0
Egress Queue CTL        Packets      Octets
  Forwarded :          0          0
  Dropped   :          0          N/A
=====

```

Table 75 Port Detail Field Descriptions (v-port)

Label	Description
Ethernet Interface	
Description	A text description of the port
Interface	The port ID displayed in the <i>slot/mda/port</i> 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

Table 75 Port Detail Field Descriptions (v-port) (Continued)

Label	Description
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
Single Fiber Mode	Yes: single fiber mode
	No: not single fiber mode
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
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
	null&dot1q: applies only to port 1 and port 2 on the 2-port 10GigE (Ethernet) Adapter card and 2-port 10GigE (Ethernet) module. The encapsulation type for these ports is not user-configurable.

Table 75 Port Detail Field Descriptions (v-port) (Continued)

Label	Description
Dot1Q Ethertype	The protocol carried in a dot1q Ethernet frame
QinQ Ethertype	The protocol carried in a QinQ Ethernet frame
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
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
Net. Scheduler Mode	The mode for servicing CoS queues; 16-priority scheduling is the only supported value
MDI/MDX	Ethernet type
Config Phy-tx-clock	The mode used to establish timing control of a 1000Base-T port. The options are: <ul style="list-style-type: none"> • N/A—the port does not support 1000Base-T • auto-pref-master—prefers to be master during autonegotiation • auto-pref-slave—prefers to be slave during autonegotiation • slave—the port is forced to be slave • master—the port is forced to be master
Oper Phy-tx-clock	The operational value of the master-slave relationship of the 1000Base-T physical layer transmit clock. The options are: <ul style="list-style-type: none"> • N/A—the port or the inserted SFP does not support 1000Base-T, the port is down, or negotiation failed • slave—the port is slave • master—the port is master
Allow Eth-BN	Indicates whether Ethernet Bandwidth Notification (ETH-BN) is allowed on the port: True or False

Table 75 Port Detail Field Descriptions (v-port) (Continued)

Label	Description
BN Egr.Rate in use	The egress rate in use based on the request from the ETH-BN server MEP
Eth-BN hold time	The configured hold time (in seconds) between an egress rate change based on a received Bandwidth Notification Message (BNM) and the next change request that will be accepted
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
Ingress CBS (bytes)	Indicates the ingress committed buffer space
Src-pause	A notification to slow down the transmission rate when it exceeds the bandwidth limit
LACP Tunnel	Indicates whether LACP packet tunneling is enabled
Down-when-looped	Enabled: The down-when-looped feature is enabled on the port
	Disabled: The down-when-looped feature is disabled on the port
Keep-alive	The time interval between keepalive PDUs transmitted toward the network during loop detection by the down-when-looped feature
Loop Detected	Indicates whether a loop is detected on the port
Retry	The minimum wait time before the port is re-enabled after it is brought down due to a loop detection
Use Broadcast Addr	Indicates whether the down-when-looped feature has been configured to compare the destination MAC address of received PDUs to the broadcast MAC address instead of the MAC address of the port
Loopback	The type of loopback configured on the port, either line, internal, or none
Swap Mac Addr.	Indicates whether 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. If configured loopback is persistent, the value persistent

Table 75 Port Detail Field Descriptions (v-port) (Continued)

Label	Description
Cfm Loopback	Indicates whether the CFM loopback is high priority, low priority, dot1p, or disabled
Sync. Status Msg.	Indicates whether Synchronization Status Messaging is enabled on the port
Rx Quality Level	The Synchronization Status Messaging quality level value received on the port
PTP Asymmetry	Indicates whether PTP asymmetry is enabled
Edge Timestamp	Indicates whether the edge timestamp is enabled
Timestamp Capable	Indicates whether the port is timestamp-capable
CRC Mon SD Thresh	Indicates the CRC signal degrade threshold value (1 to 9), if enabled
CRC Mon SF Thresh	Indicates the CRC signal fail threshold value (1 to 9), if enabled
CRC Mon Window	Indicates the CRC window sampling size value (5 to 60)
Configured Address	The base chassis Ethernet MAC address
Hardware Address	The interface hardware- or system-assigned MAC address at its protocol sublayer
Cfg Alarm	The type of alarms to be logged and reported for the port
Alarm Status	The current alarm state
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 sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.

Table 75 Port Detail Field Descriptions (v-port) (Continued)

Label	Description
Errors Input/Output	<p>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.</p> <p>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.</p>
Ethernet Statistics	
Broadcast Pckts	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Multicast Pckts	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Undersize Pckts	The total number of packets received that were shorter than 64 octets (excluding framing bits, but including FCS octets) but were otherwise well formed
Oversize Pckts	The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) but were otherwise well formed
Collisions	The best estimate of the total number of collisions on this Ethernet segment
Drop Events	The total number of times that packets were detected as being dropped due to a lack of resources (not necessarily the total number of packets dropped)

Table 75 Port Detail Field Descriptions (v-port) (Continued)

Label	Description
CRC/Align Errors	The total number of packets received that were between 64 and 1518 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)
Fragments	The total number of packets received that were shorter than 64 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)
Jabbers	The total number of packets received that were longer than 1518 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error)
Octets	Total number of octets received
Packets	Number of packets received
Packets of n Octets	Number of packets received, broken down by size
Port Statistics	
Unicast Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Multicast Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent

Table 75 Port Detail Field Descriptions (v-port) (Continued)

Label	Description
Broadcast Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound 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	
Inv L2 Packets Input	The number of invalid packets that are discarded due to an unknown Layer 2 ID
Port MTU Exceeded Output	Indicates that the port MTU has been exceeded
Inv MPLS Labels Input	The number of MPLS labels discarded
Inv IP Packets Input	The number of invalid IP packets that are discarded
H. Policed Packets Input	The number of packets that are discarded due to hard policing
CSM Ingress Queues Input	The number of incoming control packets discarded
CSM Egress Queues Output	The number of outgoing control packets discarded

Table 75 Port Detail Field Descriptions (v-port) (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 75 Port Detail Field Descriptions (v-port) (Continued)

Label	Description
Ethernet CFM Statistics	
Cfm LbmRx	The number of LBMs received
Cfm LbReplyTx	The number of LBRs transmitted
Cfm LbmDropped	The number of LBMs dropped
Num Bn Rate Chng	The number of times that the port egress rate is dynamically changed based on Bandwidth Notification (BN) messages Note: not every bandwidth change indicated by a BNM triggers a port egress rate change
Last BnRateChng	The time that the port egress rate was last changed based on a BNM
Valid BnmRx	The number of valid BN messages received
Last Valid BnmRx	The time that the last valid BNM was received
Invalid BnmRx	The number of invalid BN messages received
BnmOutOfRangeBW	The number of BN messages received with a requested bandwidth that was out of range
Queue Statistics	
Add-drop Port Queue	In Profile forwarded/dropped
	Out Profile forwarded/dropped
Ingress Queue	In Profile forwarded/dropped
	Out Profile forwarded/dropped
Ingress Queue CTL	The number of forwarded packets and octets, and the number of dropped packets, for the ingress control queue. For access ports, this statistic applies only to Ethernet cards. For network ports, this statistic applies to all adapter cards.
Egress Queue	In Profile forwarded/dropped
	Out Profile forwarded/dropped
Egress Queue CTL	The number of forwarded packets and octets, and the number of dropped packets, for the egress control queue. For access ports, this statistic applies only to Ethernet cards. For network ports, this statistic applies to all adapter cards.

Output Example

```

*A:ALU-1>config# show port 1/3/1.e1 detail
=====
TDM DS1 Interface
=====
Description          : E1
Interface            : 1/3/1.e1
Type                 : e1
Admin Status         : down
Physical Link        : no
Clock Sync State     : normal
Signal Mode          : cas
Last State Change    : 10/30/2008 14:40:26
Loopback             : none
Remote Loop respond  : N/A
Load-balance-algo    : default
Cfg Alarm            : ais los ber-sd ber sf
Alarm Status         :
BER SD Threshold     : 10
Hold time up         : 0 milliseconds
Hold time down       : 0 milliseconds
Sync. Status Msg.    : Enabled
Ssm-bit              : 6
Rx Quality Level     : 0x02(prc)
Framing              : g704
Oper Status          : down
Clock Source         : node-timed
Channel IfIndex      : 576749569
In Remote Loop       : N/A
Egr. Sched. Pol      : N/A
Tx DUS/DNU           : Disabled
Tx Quality Level     : 0x02(prc)
=====
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
Timeslot ABCD ABCD
-----
1       n/a  n/a
2       n/a  n/a
3       n/a  n/a
4       n/a  n/a
5       n/a  n/a
6       n/a  n/a
7       n/a  n/a
8       n/a  n/a
9       n/a  n/a
10      n/a  n/a
11      n/a  n/a
12      n/a  n/a

13      n/a  n/a
14      n/a  n/a
15      n/a  n/a
16      n/a  n/a
17      n/a  n/a
18      n/a  n/a
19      n/a  n/a
20      n/a  n/a
21      n/a  n/a
22      n/a  n/a
23      n/a  n/a
24      n/a  n/a
=====

Port Statistics
=====
Input          Output
-----
Packets                0                0
Discards               0                0
Unknown Proto Discards 0
=====

```

Table 76 Port Detail Field Descriptions (TDM DS1 Interface)

Label	Description
TDM DS1 Interface	
Description	A text description of the port
Interface	The port ID displayed in the <i>slot/mda/port</i> 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

Table 76 Port Detail Field Descriptions (TDM DS1 Interface) (Continued)

Label	Description
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
Sync. Status Msg.	The setting of SSM: enabled or disabled
Tx DUS/DNU	The setting of tx-dus : enabled or disabled
Ssm-bit	The Sa bit that carries the quality level value: Sa4 to Sa8
Rx Quality Level	The SSM QL value received on the interface
Tx Quality Level	The SSM QL value transmitted on the interface
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	<p>loop-timed: the link recovers the clock from the received data stream</p> <p>node-timed: the link uses the internal clock when transmitting data</p> <p>adaptive: clocking is derived from the incoming pseudowire packets</p> <p>differential: clocking is derived from a common clock compared to differential clock recovery data in the RTP header in the TDM PW overhead</p>
Clock Sync State	The current state of the clock recovery function
Channel IfIndex	The channel interface index number
In Remote Loop	Indicates whether incoming remote loopback is enabled
Egr. Sched. Pol	The egress scheduling policy
BER SD Threshold	The configured value of the BER SD threshold
BER SF Threshold	The configured value of the BER SF threshold
Traffic Statistics	
Octets Input/Output	The total number of octets received and transmitted on the port

Table 76 Port Detail Field Descriptions (TDM DS1 Interface) (Continued)

Label	Description
Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, 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 76 Port Detail Field Descriptions (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 sublayer to a higher (sub) layer, which were not addressed to a unicast, multicast, or broadcast address at this sublayer
Discards Input/Output	The number of inbound/outbound 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.

Output Example

```

*A:ALU-1># show port 1/2/1.v35
=====
Serial RS-232 Interface
=====
Description      : V35
Interface        : 1/2/1.v35
Type             : v35
Admin Status     : up                Oper Status      : up
Physical Link    : yes                Clock Source     : slave
Device Mode      : synchronous        Speed            : 64k
Character Length : N/A                Parity           : N/A
Stop Bits        : N/A
Device Gender    : dte                Duplex           : full
Last State Change : 02/13/2015 21:03:47 Channel IfIndex  : 574652417
Loopback         : none
Hold time up     : 0 milliseconds
Hold time down   : 0 milliseconds
Cfg Alarm        :
Alarm Status     :
=====

=====
Serial Control Leads
=====
Inputs          Cfg      Netw  Line  Mon
-----
dtr-dsr [DSR]  : high      1     1    off
rts-dcd [DCD]  : high      1     0    off
alb-cts [CTS]  : high      1     1    off

Outputs         Cfg      Netw  Line
-----
dsr-dtr [DTR]  : high      1     1
dcd-rts [RTS]  : high      1     1
cts-alb [ALB]  : high      1     1

=====
Traffic Statistics
=====
-----
Input          Output
-----
Octets         39022208    39022016
Packets        609722     609719
Errors          0           0

=====
Port Statistics
=====
-----
Input          Output
-----
Packets        609722     609719
Discards        0           0
Unknown Proto Discards  0

=====
*A:ALU-1># show port 1/2/7.x21
=====

```

```

Serial RS-232 Interface
=====
Description      : X21
Interface        : 1/2/7.x21
Type             : x21
Admin Status     : up
Physical Link    : yes
Device Mode      : synchronous
Character Length : N/A
Stop Bits        : N/A
Device Gender    : dte
Data Position    : N/A
Last State Change : 02/13/2015 21:03:50
Loopback         : none
Hold time up     : 0 milliseconds
Hold time down   : 0 milliseconds
Cfg Alarm        :
Alarm Status     :
=====

```

```

=====
Serial Control Leads
=====
Inputs      Cfg      Netw Line Mon
-----
c-i [I]      : high      1     1  off

Outputs     Cfg      Netw Line
-----
i-c [C]      : high      1     1

```

```

=====
Traffic Statistics
=====
                                Input      Output
-----
Octets                                39403456    39403264
Packets                               615679     615676
Errors                                 0          0

```

```

=====
Port Statistics
=====
                                Input      Output
-----
Packets                               615679     615676
Discards                               0          0
Unknown Proto Discards                 0

```

```
*A:ALU-1># show port 1/2/4.rs232
```

```

=====
Serial RS-232 Interface
=====
Description      : RS232
Interface        : 1/2/4.rs232
Type             : rs232
Admin Status     : up
Physical Link    : yes
Oper Status      : up
Clock Source     : slave

```

```

Device Mode       : synchronous           Speed           : 9600
Character Length  : N/A                  Parity          : N/A
Stop Bits        : N/A                  Multi-Drop     : disabled
Device Gender    : dce                   Duplex         : full
Data Position    : F0-B5                 S-Bit Signaling : on
Last State Change : 02/13/2015 21:04:16 Channel IfIndex : 574750724
Loopback        : none
Hold time up     : 0 milliseconds
Hold time down   : 0 milliseconds
Cfg Alarm       : hcmOof hcmRai
Alarm Status     :

```

```
=====
```

```

Serial Control Leads
=====

```

Inputs	Cfg	Netw	Line	Mon
dtr-dsr [DTR]	: high	1	1	off
rts-dcd [RTS]	: high	1	1	off
alb-cts [ALB]	: high	1	0	off
rdl-ri [RDL]	: high	1	0	off

Outputs	Cfg	Netw	Line
dsr-dtr [DSR]	: high	1	1
dcd-rts [DCD]	: high	1	1
cts-alb [CTS]	: high	1	1
ri-rdl [RI]	: high	1	1

```

Traffic Statistics
=====

```

	Input	Output
Octets	17935808	17932416
Packets	280247	280194
Errors	0	0

```

Port Statistics
=====

```

	Input	Output
Packets	280247	280194
Discards	0	0
Unknown Proto Discards	0	

The following output is an example of raw socket statistics.

```
*A:ALU-1># show port 1/12/6.1
```

```

Serial Socket
=====

```

```

Description       : SOCKET
Interface        : 1/12/6.1
Admin Status     : up
Last State Change : 01/24/2017 15:21:05
Oper Status      : up
Socket IfIndex   : 595787809

```

```

Configured mode      : access          Encap Type          : raw
Physical Link       : yes
EOP Length          : 511              Squelch Delay       : Disabled
EOP Idle Timeout    : 5000            Unsquelch Delay     : Disabled
EOP Special Char    : Disabled         Inter-Session Delay : 10
Squelch Status      : off
=====

Socket Statistics
=====
Count
-----
Characters received      4088
Characters transmitted   4088
End of packet idle timeout 0
End of packet length    8
End of packet special character 0
Ingress forwarded packets 8
Egress forwarded packets 8
Ingress dropped packets 0
Egress dropped packets 0
Squelch activated       0
=====

Traffic Statistics
=====
Input          Output
-----
Octets         4088         4088
Packets        8           8
Errors         0           0
=====

Port Statistics
=====
Input          Output
-----
Packets        8           8
Discards       0           0
Unknown Proto Discards 0
=====

```

Table 77 Port Serial Channel Field Descriptions

Label	Description
Serial RS-232 Interface	
Description	The description of the port
Interface	The port ID displayed in the <i>slot/mda/port.channel</i> format
Type	The type of serial interface
Admin Status	up: the administrative state is up down: the administrative state is down

Table 77 Port Serial Channel Field Descriptions (Continued)

Label	Description
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: On the 12-port Serial Data Interface card (version 1 and version 2): slave On the 12-port Serial Data Interface card, version 3: <ul style="list-style-type: none"> • for RS-232 and RS-530 interfaces: external, slave, dcr-serial • for V.35 and X.21 interfaces: external, slave
Device Mode	The operational mode of the device, either synchronous (the device transmits data continuously based on timing) or asynchronous (the device transmits data one character at a time) Asynchronous mode is supported only on channels with substrate speeds of 38 400 b/s or less RS-232, RS-530, and X.21 channels support synchronous and asynchronous modes (RS-530 channels are only supported on the 12-port Serial Data Interface card, version 3) V.35 channels support synchronous mode only
Speed	The speed of the interface
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
Multi-Drop	The MDDB mode; supported on RS-232 and X.21 synchronous or asynchronous links, and on RS-530 asynchronous links (RS-530 links are only supported on the 12-port Serial Data Interface card, version 3): disabled: MDDB mode is off slave: device operates as an MDDB slave device master: device operates as an MDDB master device

Table 77 Port Serial Channel Field Descriptions (Continued)

Label	Description
Device Gender	The gender of the device: dce: the device is performing the role of the data communications equipment dte: the device is performing the role of the data terminal equipment
Duplex	The duplex mode: half: single transmission path (supported only if multidrop data bridge is enabled in slave mode) full: two independent transmission paths, one in each direction
Data Position	The HCM data start position; applies to RS-232, RS-530, and X.21 interfaces only (RS-530 interfaces are only supported on the 12-port Serial Data Interface card, version 3)
S-Bit-Signaling	Indicates whether S-bit signaling is turned on or off; applies to RS-232, RS-530, and X.21 interfaces only (RS-530 interfaces are only supported on the 12-port Serial Data Interface card, version 3)
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 (not supported on the 12-port Serial Data Interface card, version 3) 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
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 77 Port Serial Channel Field Descriptions (Continued)

Label	Description
Cfg Alarm	The HCM alarms to be reported for RS-232, RS-530, or X.21 interfaces (RS-530 interfaces are only supported on the 12-port Serial Data Interface card, version 3): hcmOof: local HCM out-of-frame errors are raised and cleared hcmRai: HCM remote alarm indication events are raised and cleared
Alarm Status	The current alarm status
Serial Control Leads (The input and output leads, which carry control signals)	
Inputs	The input control leads
dtr-dsr	The Data Terminal Ready/Data Set Ready input control lead (applicable only for RS-232, RS-530, and V.35 interfaces; RS-530 interfaces are only supported on the 12-port Serial Data Interface card, version 3)
rts-dcd	The Request To Send/Data Carrier Detect input control lead (applicable only for RS-232, RS-530, and V.35 interfaces; RS-530 interfaces are only supported on the 12-port Serial Data Interface card, version 3)
ll-tm	The Local Loopback/Test Mode input control lead (only supported on RS-530 interfaces on the 12-port Serial Data Interface card, version 3)
rl-cts	The Remote Loopback/Clear To Send input control lead (only supported on RS-530 interfaces on the 12-port Serial Data Interface card, version 3)
alb-cts	The Analog Loopback/Clear To Send input control lead (applicable only for RS-232 and V.35 interfaces) Not supported on the 4-port T1/E1 and RS-232 Combination module
rdl-ri	The Remote Digital Loopback/Ring Indicator input control lead (applicable only for RS-232 interfaces) Not supported on the 4-port T1/E1 and RS-232 Combination module
c-i	The Control/Indication input control lead (applicable only for X.21 interfaces)

Table 77 Port Serial Channel Field Descriptions (Continued)

Label	Description
Cfg	The configuration of the input signaling leads: <ul style="list-style-type: none"> • 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. It can only be configured when the interface speed is <64 kb/s and is only applicable on the following control leads: <ul style="list-style-type: none"> - rts-dcd - alb-cts - rl-cts - c-i
Outputs	The output control leads
dsr-dtr	The Data Set Ready/Data Terminal Ready output control lead (applicable only for RS-232, RS-530, and V.35 interfaces; RS-530 interfaces are only supported on the 12-port Serial Data Interface card, version 3) Not supported on the 4-port T1/E1 and RS-232 Combination module
dcd-rts	The Data Carrier Detect/Request To Send output control lead (applicable only for RS-232, RS-530, and V.35 interfaces; RS-530 interfaces are only supported on the 12-port Serial Data Interface card, version 3)
cts-alb	The Clear To Send/Analog Loopback output control lead (applicable only for RS-232 and V.35 interfaces)
ri-rdl	The Ring Indicator/Remote Digital Loopback output control lead (applicable only for RS-232 interfaces)
cts-rl	The Clear To Send/Remote Loopback output control lead (only supported on RS-530 interfaces on the 12-port Serial Data Interface card, version 3)
tm-ll	The Test Mode/Local Loopback output control lead (only supported on RS-530 interfaces on the 12-port Serial Data Interface card, version 3)
i-c	The Indication/Control output control lead (applicable only for X.21 interfaces)

Table 77 Port Serial Channel Field Descriptions (Continued)

Label	Description
Cfg	<p>The configuration of the output signaling leads:</p> <ul style="list-style-type: none"> • high: the output control lead is forced on • low: the output control lead is forced off • end-to-end: the input control lead follows that of the remote end. It can only be configured when the interface speed is <64 kb/s and is only applicable on the following control leads: <ul style="list-style-type: none"> – dcd-rts – cts-alb – follows that of the remote end except when the output control lead is carrying a CTS signal on an RS-232 port operating at subrate speeds. In this case, the control lead follows the HCM status: <ul style="list-style-type: none"> • if the HCM status is Up, the CTS output control lead is 1 • if the HCM status is Down, the CTS output control lead is 0 – cts-rl – i-c
Netw	<p>The value that indicates the current states of the input and output control leads. These values are transported over the network; therefore, are referred to as network-side values:</p> <ul style="list-style-type: none"> • 0 indicates low • 1 indicates high • blank indicates unknown (for example, due to a shutdown)
Line	<p>The value that indicates the current signal levels of the input and output control leads connected to the attached CPE. These values are signaled over the (physical) line; therefore, are referred to as line-side values:</p> <ul style="list-style-type: none"> • 0 indicates low • 1 indicates high • blank indicates unknown (for example, due to a shutdown)
Mon	<p>Indicates whether monitoring is enabled (on) or disabled (off) for the control lead; applies to input control leads only</p>

Table 77 Port Serial Channel Field Descriptions (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 sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Errors Input/Output	<p>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.</p> <p>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.</p>
Port Statistics	
Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound 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.

Table 77 Port Serial Channel Field Descriptions (Continued)

Label	Description
Serial Socket	
Description	The configured port type
Interface	The interface ID displayed in the format <i>slot/mda/port.channel</i>
Admin Status	The administrative status of the port, either up or down
Oper status	The operational status of the port, either up or down
Last State Change	The last time the operational status of the channel changed state
Socket IfIndex	The socket index number
Configured mode	The port mode (serial raw sockets support access mode only)
Encap Type	The encapsulation type of the port (serial raw sockets support encapsulation type raw only)
Physical Link	Indicates whether a physical link is present
EOP Length	The number of characters (in bytes) that trigger sending an IP transport packet when end of packet is declared
Squelch Delay	Indicates whether squelch delay is enabled or disabled
EOP Idle Timeout	The limit, in milliseconds, that a queued packet can remain idle before an end of packet is declare
Unsquelch Delay	Indicates whether unsquelch delay is enabled or disabled
EOP Special Char	Indicates whether the sending of a special character that declares end of packet is enabled or disabled
Inter-Session Delay	The time delay, in milliseconds, between transmission of a session's data over a serial port and the transmission of the next queued session's data
Squelch Status	Indicates whether squelch is enabled (on) or disabled (off)
Socket Statistics	
Characters received	The number of data characters received
Characters transmitted	The number of data characters sent
End of packet idle timeout	The number of times that end of packet has been declared due to an EOP idle timeout

Table 77 Port Serial Channel Field Descriptions (Continued)

Label	Description
End of packet length	The number of times that an IP transport packet was sent due to the EOP packet length being exceeded
End of packet special character	The number of times that end of packet has been declared due to an EOP special character being sent
Ingress forwarded packets	The number of ingress forwarded packets
Egress forwarded packets	The number of egress forwarded packets
Ingress dropped packets	The number of ingress dropped packets
Egress dropped packets	The number of egress dropped packets
Squelch activated	The number of times that squelch was activated

Output Example

```

*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 78 Port Voice Channel Field Descriptions

Label	Description
Voice Interface	
Description	The description of the port
Interface	The port ID displayed in the <i>slot/mda/port.channel</i> 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

Table 78 Port Voice Channel Field Descriptions (Continued)

Label	Description
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
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 configuration of the input signaling lead:
	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 configuration of the output signaling lead:
	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)

Table 78 Port Voice Channel Field Descriptions (Continued)

Label	Description
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
Voice Call Usage Statistics	
State	The state of the channel (non-forwarding, out-of-service, idle, incoming, or outgoing), and voice call usage statistics. 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, Ans	The total duration (in seconds) of all incoming calls that were answered
O/G Call Count	The number of outgoing calls
O/G Call Count, Ans	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, Ans	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. The only valid statistics for transmission-only mode are Out-Of-Service Time and Idle Time.

Table 78 Port Voice Channel Field Descriptions (Continued)

Label	Description
Idle Time	The total duration the circuit was in an idle state (that is, on-hook). The only valid statistics for transmission-only mode are Out-Of-Service Time and Idle 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.
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
Traffic Statistics	
Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, 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 sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space

Table 78 Port Voice Channel Field Descriptions (Continued)

Label	Description
Unknown Proto Discards Input/Output	For packet-oriented interfaces, the number of packets received at the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received at the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0.

Output Example

```

*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
BER SF Link Down : disabled
Last State Change : 06/22/2009 12:29:42  Chan-Grp IfIndex   : 578846785
Loopback        : line
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 79 Port Channel Group Field Descriptions

Label	Description
Description	A text description of the port
Interface	The port ID displayed in the format <i>slot/mda/port.channel-group-id</i>
Timeslots	The number of timeslots that are part of this channel group
Speed	The speed of the interface

Table 79 Port Channel Group Field Descriptions (Continued)

Label	Description
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
BER SF Link Down	Indicates whether BER SF Link Down is enabled
Oper Status	Up: the port is operationally up
	Down: the port is operationally down
Remote Loop respond	Indicates whether the channel will respond to requests for remote loopbacks
Cfg Alarm	Indicates the alarms configured
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
Loopback	The type of loopback configured on the channel group: line, internal, or none
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, ppp-auto, hdlc, or cisco-hdlc)
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)
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 79 Port Channel Group Field Descriptions (Continued)

Label	Description
Idle Cycle Flags	The value transmitted by the DS0, DS1, or E1 interface during idle cycles
Clock Source	loop-timed: the link recovers the clock from the received data stream node-timed: the link uses the internal clock when transmitting data adaptive: clocking is derived from the incoming pseudowire packets
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 sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.

Table 79 Port Channel Group Field Descriptions (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 sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound 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.

Output Example

```
A:ALU-1# show port 1/4/1.ds3
```

```
=====
TDM Interface
=====
Description      : DS3
Interface        : 1/4/1.ds3
Type             : ds3
Admin Status     : up
Framing          : m23
Oper Status      : up
```

```

Physical Link      : No
Last State Change : 10/02/2009 19:21:59
Configured mode   : access
Admin MTU         : 1524
Scramble          : true
Ing. Pool % Rate  : 100
Egr. Sched. Pol   : N/A
CRC               : 32
Idle Cycle Flags  : n/a
FEAC Loop Respond : Disabled
BERT Duration     : N/A
BERT Synched     : 00h00m00s
BERT Errors       : 0
BERT Total Bits   : N/A
Cfg Alarm         : ais los
Alarm Status      :
Subrate CSU Mode  : none
MDL Transmit     : none

Clock Source      : node-timed
Port IfIndex     : 578846721
Encap Type       : atm
Oper MTU         : 1524
Egr. Pool % Rate : 100
Channelized      : DS1
Loopback         : line
In FEAC Loop     : No
BERT Pattern     : none
Err Insertion Rate : 0
BERT Status      : idle

Subrate Step     : 0
    
```

Local MDL Information

```

EIC      :
FIC      :
PFI      :
Idle Signal Port :
Test Signal Gen :
LIC      :
Unit     :
    
```

Far End MDL Information

```

EIC      :
FIC      :
PFI      :
Idle Signal Port :
Test Signal Gen :
LIC      :
Unit     :
    
```

=====
=====
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	0

Table 80 Port Channelized DS3 Field Descriptions

Label	Description
Description	A text description of the port
Interface	The port ID displayed in the format <i>slot/mda/port.channel-group-id</i>
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, ppp-auto)
Admin MTU	The configured MTU
Oper MTU	The negotiated size of the largest packet that can be sent on the port or channel specified in octets
Scramble	Indicates whether payload scrambling is enabled on channel groups (only applicable if encap type is atm)
CRC	Indicates the precision of the cyclic redundancy check: 16 — a 16-bit CRC calculation 32 — a 32-bit CRC calculation; 32-bit CRC increases the error detection ability, but it also adds some performance overhead
Physical Link	Yes: a physical link is present
	No: a physical link is not present

Table 80 Port Channelized DS3 Field Descriptions (Continued)

Label	Description
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	loop-timed: the link recovers the clock from the received data stream node-timed: the link uses the internal clock when transmitting data adaptive: clocking is derived from the incoming pseudowire packets
Port IfIndex	The interface's index number, which reflects its initialization sequence
oper MTU	The negotiated size of the largest packet that can be sent on the port or channel specified in octets
Channelized	The level of channelization on the port
Loopback	The port loopback mode
In FEAC Loop	The remote loopback state
Local MDL Information	The MDL strings sent by the near end
Far End MDL Information	The MDL strings received from the far end
Traffic Statistics	
Octets Input/Output	The total number of octets received and transmitted on the port
Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.

Table 80 Port Channelized DS3 Field Descriptions (Continued)

Label	Description
Errors Input/Output	<p>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.</p> <p>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.</p>
Port Statistics	
Packets Input/Output	<p>The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.</p>
Discards Input/Output	<p>The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space</p>
Unknown proto discards Input/Output	<p>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.</p>

Output Example

```

A:ALU-1# show port 1/4/1
=====
TDM DS3 Physical Interface
=====
Description      : DS3/E3
Interface        : 1/4/1
Admin Status     : down
Physical Link    : No
Port IfIndex     : 41975808
Oper Status      : down
    
```

```

Type           : ds3           Buildout           : short
Hardware Address : 2001:db8::
=====
Port Statistics
=====
                                     Input           Output
-----
Packets                0                0
Discards                0                0
Unknown Proto Discards 0
=====
    
```

Table 81 Port Clear Channel DS3 Field Descriptions

Label	Description
Description	A text description of the port
Interface	The port ID displayed in the format <i>slot/mda/port</i>
Port IfIndex	The interface's index number, which reflects its initialization sequence
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
Hardware Address	The port's hardware address
Port Statistics	
Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space

Table 81 Port Clear Channel DS3 Field Descriptions (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.

Output Example

```

*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
Overrun        : 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
=====
time              frequency offset  frequency offset  phase error  phase error
                  mean      stddev  mean      stddev  mean      stddev
                  (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 82 Port ACR Detail Field Descriptions

Label	Description
Adaptive Clock Recovery (ACR) Configuration	
Clock Master PW	The SAP being used by the port for recovering the clock

Table 82 Port ACR Detail Field Descriptions (Continued)

Label	Description
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	Indicates whether RTP headers are used in CES packets (Yes or No)
CAS Framing	The type of CAS framing
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

Table 82 Port ACR Detail Field Descriptions (Continued)

Label	Description
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
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

Output Example

```
*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 83 Port dot1x Field Descriptions

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

Table 83 Port dot1x Field Descriptions (Continued)

Label	Description
Port status	authorized: the 802.1 port is authorized
	unauthorized: the 802.1 port is unauthorized
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

Table 83 Port dot1x Field Descriptions (Continued)

Label	Description
Transmit period	The time, in seconds, that the 7705 SAR waits before sending a new EAPOL message
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

Table 83 Port dot1x Field Descriptions (Continued)

Label	Description
user rx frames	The number of user data frames received on this port during the session
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

Table 83 Port dot1x Field Descriptions (Continued)

Label	Description
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
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)

Table 83 Port dot1x Field Descriptions (Continued)

Label	Description
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
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

Table 83 Port dot1x Field Descriptions (Continued)

Label	Description
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

Output Example

```
*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 84 Port Description Field Descriptions

Label	Description
Port Id	The port identifier
Description	A text description of the port

Output Example

```
*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 85 Port Associations Field Descriptions

Label	Description
Router/ServiceId	The service identifier

Table 85 Port Associations Field Descriptions (Continued)

Label	Description
Name	The name of the IP interface
Encap Val	The dot1q, null, or qinq encapsulation value on the port for this IP interface

Output Example

```
*A:ALU-1># show port 1/2/1.1 ima-link
=====
State Information
=====
Transmit Link Identifier: 0
Receive Link Identifier : 0
Near Rx Failure State   : IMA Link Failure
Far End Rx Failure State: IMA Link Failure
Near End Tx State       : Unusable - No given reason
Near End Rx State       : Unusable - No given reason
Far End Tx State        : Unusable - No given reason
Far End Rx State        : Unusable - No given reason
Link Test State         : Disabled
Rx Test Pattern         : 0
=====
TC Sublayer Information
=====
TC Alarm State          : LCD Failure      Number OCD Events      : 0
HEC Errors (Dropped)   : 0                HEC Errors (Fixed)     : 0
=====
Statistical Information
=====
Num Violations         : 0                Num OIF Anomalies      : 0
NE Severely Err. Seconds: 0                FE Severely Err. Seconds: 0
NE Unavail. Seconds   : 0                FE Unavail. Seconds    : 0
NE Tx Unused Seconds  : 0                FE Tx Unused Seconds   : 0
NE Rx Unused Seconds  : 0                FE Rx Unused Seconds   : 0
NE Tx Num Failures    : 0                NE Rx Num Failures     : 0
FE Tx Num Failures    : 0                FE Rx Num Failures     : 0
Tx ICP Cell count     : 0                Rx ICP Cell count      : 0
Error ICP Cells Total : 0                Rx Lost ICP Cells Total : 0
Relative Link Delay    : 0
=====
*A:ALU-1#
```

Table 86 Port IMA Link Field Descriptions

Label	Description
State Information	
Transmit Link Identifier	The identifier of the IMA link used to transmit data
Receive Link Identifier	The identifier of the IMA link used to receive data

Table 86 Port IMA Link Field Descriptions (Continued)

Label	Description
Near Rx Failure State	The failure state of the near-end receive link
Far End Rx Failure State	The failure state of the far-end receive link
Near End Tx State	The state of the near-end transmit link
Near End Rx State	The state of the near-end receive link
Far End Tx State	The state of the far-end transmit link
Far End Rx State	The state of the far-end receive link
Link Test State	The state of the link test procedure: Enabled or Disabled
Rx Test Pattern	The received test pattern in an IMA link loopback operation (0 to 255)
TC Sublayer Information	
TC Alarm State	The alarm state for the traffic class of the IMA link
HEC Errors (Dropped)	The number of HEC errors resulting in dropped packets
Number OCD Events	The number of OCD events
HEC Errors (Fixed)	The number of HEC errors fixed
Statistical Information	
Num Violations	The number of violations (path, line, code, and length)
NE Severely Err. Seconds	The number of near-end severely errored seconds
NE Unavail. Seconds	The number of seconds that the near end has been unavailable
NE Tx Unused Seconds	The number of seconds that the near-end transmit link has been unused
NE Rx Unused Seconds	The number of seconds that the near-end receive link has been unused
NE Tx Num Failures	The number of near-end transmit link failures
FE Tx Num Failures	The number of far-end transmit link failures
Tx ICP Cell count	The number of ICP cells transmitted on the IMA link
Error ICP Cells Total	The total number of errored ICP cells on the IMA link
Relative Link Delay	The time delay, in seconds, between detection of a link activation/deactivation condition and acting upon it (going in/out of the Rx failure state on a link)

Table 86 Port IMA Link Field Descriptions (Continued)

Label	Description
Num OIF Anomalies	The number of OIF anomalies for the IMA link
FE Severely Err. Seconds	The number of far-end severely errored seconds
FE Unavail. Seconds	The number of seconds that the far end has been unavailable
FE Tx Unused Seconds	The number of seconds that the far-end transmit link has been unused
FE Rx Unused Seconds	The number of seconds that the far end receive link has been unused
NE Rx Num Failures	The number of near-end receive link failures
FE Rx Num Failures	The number of far-end receive link failures
Rx ICP Cell count	The number of ICP cells received on the IMA link
Rx Lost ICP Cells Total	The total number of lost ICP cells received on the IMA link

Output Example

```

*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
ipsv6cp   initial          10/12/2007 20:15:54      0             10/12/2007 20:15:54
=====
PPP Statistics
=====
Local Mac address  : 2001:db8::          Remote Mac address :
Local Magic Number : 0x0                 Remote Magic Number: 0x0
Local address      : 10.0.0.0           Remote address      : 10.0.0.0
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 87 Port PPP Field Descriptions

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
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

Table 87 Port PPP Field Descriptions (Continued)

Label	Description
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

Output Example

```
*A:ALU-1># show port cem
=====
Ports on Slot 1
=====
Port      Admin  Link  Port  Clock      Master      Clock
Id        State  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 88 Port CEM Field Descriptions

Label	Description
Port Id	The port ID, in the <i>slot/mda/port</i> 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

Output Example

```
*A:ALU-1# show port 1/2/32.1 frame-relay
=====
Frame Relay Info for 1/2/32.1
=====
Mode           : dce           LMI Type           : itu
FR Interface Status : fault
N391 DTE       : 6           N392 DCE           : 3
```

```

N392 DTE          : 3          N393 DCE          : 4
N393 DTE          : 4          T392 DCE          : 15
T391 DTE          : 10
FRF-12           : Disabled
Link Identifier   : N/A

Tx Status Enquiry : 1097      Rx Status Enquiry : 0
Rx Status Messages : 0        Tx Status Messages : 0
Status Message Timeouts : 1096  Status Enquiry Timeouts : 0
Discarded Messages : 0        Inv. RxSeqNum Messages : 0
=====
frame-relay statistics for port "1/2/32.1"
=====

```

	Received	Transmitted
Frames	0	0
Octets	0	0
DEFrames	0	0
DEOctets	0	0
FECNFrames	0	0
BECNFrames	0	0
Invalid Dlci	0	-
Last Invalid Dlci	-	-
Crc Errors	0	-
Alignment Errors	0	-
Length Violations	0	-
Illegal Header	0	-
Underruns Errors	-	0
Other Errors	0	0

Table 89 Port Frame Relay Field Descriptions

Label	Description
Frame Relay Info for port identifier	
Mode	The frame relay mode: <ul style="list-style-type: none"> dce—specifies the DCE mode dte—specifies the DTE mode bidir—the bidirectional mode for LMI types ANSI and ITU
LMI Type	The LMI type: <ul style="list-style-type: none"> ansi—specifies ANSI T1.617 Annex D itu—specifies ITU-T Q933 Annex A none—frame relay LMI is disabled on the port/channel rev1—specifies Rev 1 version of ANSI T1.617 Annex D

Table 89 Port Frame Relay Field Descriptions (Continued)

Label	Description
FR Interface Status	The status of the frame relay interface as determined by the performance of the DLCMI. If no DLCMI is running, the frame relay interface will stay in the running state indefinitely.
N391 DTE	The DTE full status polling interval for the frame relay LMI. The number specifies the frequency at which inquiries expect a full status report.
N392 DCE	The DCE error threshold for the frame relay LMI. The threshold specifies the number of errors needed to bring down a link.
N392 DTE	The DTE error threshold for the frame relay LMI. The threshold specifies the number of errors needed to bring down a link.
N393 DCE	The DCE monitored event count for the frame relay LMI
N393 DTE	The DTE monitored event count for the frame relay LMI
T392 DCE	The DCE keepalive timer for the frame relay LMI. The number specifies the interval at which the DCE checks for keepalive responses from the DTE.
T391 DTE	The DTE keepalive timer for the frame relay LMI. The number specifies the interval at which the DTE sends a keepalive response request to the DCE.
FRF-12	Not supported
Link Identifier	The link associated with the frame relay port
Tx Status Enquiry	The number of status enquiries sent
Rx Status Enquiry	The number of status enquiries received
Rx Status Messages	The number of status messages received
Tx Status Messages	The number of status messages sent
Status Message Timeouts	The number of status message timeouts
Status Enquiry Timeouts	The number of status enquiry timeouts
Discard Messages	The number of status enquiry messages discarded due to errors
Inv. RxSeqNum Messages	The number of LMI messages received with an invalid sequence number

Table 89 Port Frame Relay Field Descriptions (Continued)

Label	Description
frame-relay statistics for port <i>port-identifier</i> (input and output values)	
Frames	The number of frames received or transmitted
Octets	The number of octets received or transmitted
DEFrames	The number of packets received or transmitted with the DE bit set
DEOctets	The number of octets received or transmitted with the discard eligibility (DE) bit set
FECNFrames	The number of frames received or transmitted with the forward explicit congestion notification bit set
BECNFrames	The number of frames received or transmitted with the backward explicit congestion notification bit set
Invalid DlcI	The number of invalid DLCIs
Last Invalid DlcI	The last time when an invalid DLCI was detected
Crc Errors	The number of cyclical redundancy check errors
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 with an integral number of octets (FCS error) or a bad FCS with a non-integral number of octets
Length Violations	The number of packet length violations
Illegal Header	The number of header configuration errors
Underruns Errors	The number of frames that were unsuccessfully transmitted because transmission was not fast enough to maintain synchronization
Other Errors	The number of other unspecified errors

Output Example

```
*A:ALU-1# show port 1/2/32.1 frame-relay dlci 16
=====
Frame Relay Info for 1/2/32.1
=====
Mode                : dte                LMI Type            : ansi
FR Interface Status : fault
N391 DTE             : 6                 N392 DCE             : 3
N392 DTE             : 3                 N393 DCE             : 4
```

```

N393 DTE           : 4           T392 DCE           : 15
T391 DTE           : 10
FRF-12            : Disabled
Link Identifier    : N/A
Tx Status Enquiry : 0           Rx Status Enquiry  : 0
Rx Status Messages : 0           Tx Status Messages : 0
Status Message Timeouts : 0       Status Enquiry Timeouts : 0
Discarded Messages : 0           Inv. RxSeqNum Messages : 0
=====
Frame Relay PVCs
=====
Dlci      State   Type      Creation Time
-----
16        Inactive Static    07/11/2011 15:27:27
-----
PVCs: 1
=====
frame-relay statistics for port "1/2/32.1" dlci "16"
=====
                Input                Output
-----
Frames           1077                2920112
Octets            0                4294967295
FECNs             32                3247074
BECNs            4294967295        1837088656
DE Frames         3621691           68756528
DE Octets         1990621688        1
Discards          1893384560        2920112
Crc Discard       2                  -
Aborts            56295902          -
Other Discard     1837088656        -
=====
*A:ALU-1#

```

Table 90 Port Frame Relay DLCI Field Descriptions

Label	Description
Frame Relay Info for <i>port-identifier</i>	
See Table 89	—
Frame Relay PVCs	
Dlci	The specified DLCI
State	The port state
Type	The port type
Creation Time	The time at which the port was created
PVCs	The number of PVCs

Table 90 Port Frame Relay DLCI Field Descriptions (Continued)

Label	Description
frame-relay statistics for port <i>port-identifier</i> (input and output values)	
Frames	The number of frames received or transmitted
Octets	The number of octets received or transmitted
DE Frames	The number of packets received or transmitted with the DE bit set
DE Octets	The number of octets received or transmitted with the discard eligibility bit set
Crc Discard	The number of cyclical redundancy check discards
Aborts	The number of aborts
Other Discard	The number of other discards

Output Example

```
*A:7705:Dut-C#show port 1/10/9.1 detail
=====
TDM DS0 Chan Group
=====
Description      : DS0GRP
Interface        : 1/10/9.1
TimeSlots       : 2-32
Speed           : 64
Admin Status    : up
Last State Change : 07/12/2011 08:17:15
CRC              : 16
Oper Status     : up
Chan-Grp IfIndex : 591691837

Configured mode : access
Admin MTU       : 1514
Scramble        : false
Physical Link   : yes
Idle Cycle Flags : flags
Payload Fill Type : n/a
Signal Fill Type : n/a
Ing. Pool % Rate : 100
Egr. Sched. Pol : N/A
Encap Type      : hdlc
Oper MTU       : 1514
Bundle Number   : none
Load-balance-algo : n/a
Payload Pattern : N/A
Signal Pattern  : N/A
Egr. Pool % Rate : 100
=====

Traffic Statistics
=====
                                Input          Output
-----
Octets                        304520          301852
Packets                        3310            3281
Errors                          0                0
=====
Port Statistics
=====
```

```

-----
                                     Input                                     Output
-----
Packets                               3310                               3281
Discards                               0                                   0
Unknown Proto Discards                 0
=====
*A:7705:Dut-C# configure port 1/10/9

*A:7705:Dut-C# show port detail 1/5/1.1
=====
TDM DS0 Chan Group
=====
Description       : DS0GRP
Interface         : 1/5/1.1
TimeSlots        : 2-32
Speed            : 64
Admin Status     : up
Last State Change : 07/12/2011 08:17:18
CRC              : 16
Oper Status      : up
Chan-Grp IfIndex : 580943933

Configured mode  : access
Admin MTU        : 1514
Scramble         : false
Physical Link    : yes
Idle Cycle Flags : flags
Payload Fill Type : n/a
Signal Fill Type : n/a
Ing. Pool % Rate : 100
Egr. Sched. Pol : N/A
Encap Type       : cisco-hdlc
Oper MTU         : 1514
Bundle Number    : none
Load-balance-algo : n/a
Payload Pattern  : N/A
Signal Pattern    : N/A
Egr. Pool % Rate : 100
=====

=====
Traffic Statistics
=====
                                     Input                                     Output
-----
Octets            301852                               304520
Packets           3281                                 3310
Errors            0                                   0
=====
Port Statistics
=====
                                     Input                                     Output
-----
Packets           3281                                 3310
Discards          0                                   0
Unknown Proto Discards 0
=====
*A:7705:Dut-C# configure port 1/10/9

*A:7705:Dut-C# config>port>serial>x21>channel-group# show port 1/3/1.1
=====
Serial DS0 Chan Group
=====
Description       : DS0GRP
Interface         : 1/3/1.1
CRC              : 16
Admin Status     : down
Last State Change : 01/27/2012 14:32:01
Oper Status      : down
Chan-Grp IfIndex : 576749629

```

```

Configured Mode      : access                      Encap Type           : cisco-hdlc
Admin MTU            : 1514                       Oper MTU             : 1514
Physical Link       : No                          Bundle Number       : none
Idle Cycle Flags    : flags
Payload Fill Type   : n/a                        Payload Pattern      : n/a
=====
Traffic Statistics
=====
                                     Input           Output
-----
Octets                118222             30008
Packets              1640                1364
Errors                 0                   0
=====
Port Statistics
=====
                                     Input           Output
-----
Packets                1640             1364
Discards                0                 0
Unknown Proto Discards 0
=====

*A:7705:Dut-C# config>port>serial>x21>channel-group# show port 1/3/8
=====
Serial RS-232 Physical Interface
=====
Description           : ozgur
Interface             : 1/3/8                Port IfIndex         : 40108032
Admin Status          : up                    Oper Status           : up
Physical Link         : Yes
Type                  : v35
=====
Port Statistics
=====
                                     Input           Output
-----
Packets                0                 0
Discards                0                 0
Unknown Proto Discards 0
=====

*A:7705:Dut-C# config>port>serial>x21>channel-group#

*A:7705:Dut-C# config>port>serial>x21>channel-group# show port 1/3/8.1 detail
=====
Serial DS0 Chan Group
=====
Description           : DS0GRP
Interface             : 1/3/8.1
CRC                   : 32
Admin Status          : up                    Oper Status           : up
Last State Change    : 01/27/2012 10:37:44  Chan-Grp IfIndex     : 576979019
Configured Mode      : access                      Encap Type           : hdlc
Admin MTU            : 1514                       Oper MTU             : 1514
Physical Link       : Yes                          Bundle Number       : none
Idle Cycle Flags    : flags
Payload Fill Type   : n/a                        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:7705:Dut-C# config>port>serial>x21>channel-group#

```

Output Example

```

*A:ALU-1># show port 1/1/3
=====
TDM Data Physical Interface
=====
Description       : G.703 64kbps Codirectional
Interface         : 1/1/3                      Port IfIndex      : 39878656
Admin Status     : down                      Oper Status       : down
Physical Link    : No
Type             : codir
=====
Port Statistics
=====
                                     Input           Output
-----
Packets          0             0
Discards         0             0
Unknown Proto Discards 0
=====
*A:ALU-1># show port 1/2/3.codir detail
=====
TDM Data Interface
=====
Description       : CODIR
Interface         : 1/2/3.codir
Type             : codir
Admin Status     : down                      Oper Status       : down
Physical Link    : no                       Clock Source      : node-timed
Timing 8khz     : Disabled
Last State Change : 05/27/2013 12:42:10      Channel IfIndex   : 574717955
Loopback        : none
Cfg Alarm        : ais los
Alarm Status     : los
=====

```

```

Traffic Statistics
=====
-----
Input                               Output
-----
Octets                               0                               0
Packets                              0                               0
Errors                               0                               0
=====
Codir Line
=====
Receive:
Data-slip :                0
=====
Port Statistics
=====
-----
Input                               Output
-----
Packets                             0                               0
Discards                             0                               0
Unknown Proto Discards               0
=====
*A:ALU-1>#
    
```

Table 91 Port Field Descriptions (TDM Codirectional or TPIF)

Label	Description
TDM Data Physical Interface	
TDM Data Interface	
Description	A text description of the port
Interface	The port ID displayed in the <i>slot/mda/port</i> format
Port IfIndex	The port 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: there is no alarm condition for the link
	no: there is an outstanding alarm condition for the link
Type	The type of interface: codirectional or TPIF

Table 91 Port Field Descriptions (TDM Codirectional or TPIF) (Continued)

Label	Description
Clock Source	loop-timed: the link recovers the clock from the received data stream node-timed: the link uses the internal clock when transmitting data adaptive: clocking is derived from the incoming pseudowire packets differential: clocking is derived from a common clock compared to differential clock recovery data in the RTP header in the TDM PW overhead
Timing 8khz	Indicates whether 8-kb/s timing on a codirectional interface is enabled or disabled
Last State Change	The last time the operational status of the port changed state
Channel IfIndex	The channel interface index number
Loopback	The loopback mode for the channel: internal-analog, internal-digital, or none
Cfg Alarm	The type of alarms to be logged and reported for the port
Alarm Status	The current alarm state
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 sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.

Table 91 Port Field Descriptions (TDM Codirectional or TPIF) (Continued)

Label	Description
Errors Input/Output	<p>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.</p> <p>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.</p>
Codir Line	
Data-slip:	In a plesiochronous timing system, the number of data slips that have occurred in the receive direction
Port Statistics	
Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound 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.

Output Example

```
*A:ALU-1># show port 1/3/1
```

```
=====
GNSS Physical Interface
=====
Description      : GNSS Rx
Interface        : 1/3/1          Port IfIndex      : 39878656
Admin Status    : up             Oper Status       : up
Physical Link    : Yes
Type            : gps
Ant. Cable Delay : 0             Elev. Mask Angle  : 10
Antenna Status  : ok             Visible Satellites : 9
Sync Status     : locked         Used Satellites   : 7
Receiver Status : Position Hold
Time            : 2014/04/23 18:47:38 Latitude          : +45.34811
UTC Offset      : 17             Longitude         : -75.92142
                                           Altitude (m MSL) : 90
=====
```

Table 92 Port Field Descriptions (GNSS)

Label	Description
Description	Specifies the GNSS RF port description
Interface	Specifies the card, MDA, and port number of the GNSS RF port
Admin Status	up: the port is administratively up down: the port is administratively down
Physical Link	yes: an operational GNSS antenna is detected no: an operational GNSS antenna is not detected
Type	Specifies the type of satellite navigation system used
Ant. Cable Delay	Specifies the amount of time, in nanoseconds, compensated for signal delay due to cable length
Antenna Status	ok: valid antenna connection under-current: open condition. Previously, an under-current status caused the port operational status to be down. Currently, the port remains operationally up in the event that any GNSS splitters used do not provide a load. over-current: short circuit, or maximum power limits for the receiver have been exceeded no-bias voltage: antenna power disabled
Sync Status	locked: GNSS time is within alarm limits (1 μ s) not locked: GNSS time is outside of the alarm limits and/or there is an insufficient number of tracked satellites

Table 92 Port Field Descriptions (GNSS) (Continued)

Label	Description
Receiver Status	<p>Acquiring Satellites: GNSS receiver is attempting to track satellite</p> <p>Position Hold: GNSS receiver position is determined and GNSS receiver is no longer solving for position</p> <p>2D Fix: GNSS receiver is attempting to get a 2D fix on a satellite</p> <p>3D Fix: GNSS receiver is attempting to get a 3D fix on a satellite</p> <p>Unknown: default state on power-up</p> <p>Communication Lost: occurs after 30 s of no Channel/Data/Status messages from the GNSS receiver</p> <p>Communication Established: occurs after a successful re-establishment of communication following a Communication Lost status</p> <p>Self-Test Failed: occurs after a GNSS receiver startup failure</p>
Time	Specifies the GNSS system date and time
UTC Offset	<p>Specifies the difference between GNSS time and UTC time</p> <p><i>UTC time = GNSS time – UTC offset</i></p>
Port IfIndex	Specifies the GNSS interface index number, which reflects its initialization sequence
Oper Status	<p>up: the port is operationally up (communication with the GNSS receiver is established, the self-test has passed, and the antenna status is OK)</p> <p>down: the port is operationally down (any of the up conditions have not been met)</p>
Elev. Mask Angle	Specifies the configured elevation angle below which satellites are ignored. The default elevation mask angle is 10°.
Visible Satellites	<p>Specifies the number of satellites that the GNSS receiver should see at the current time. This number can be 0 if the GNSS receiver has not yet downloaded an almanac, even if Used Satellites is more than 0.</p> <p>Five or more satellites must be in view of the GNSS receiver antenna at all times when the receiver is in the process of obtaining a position fix, and these satellites must be above the configured elevation mask angle.</p>

Table 92 Port Field Descriptions (GNSS) (Continued)

Label	Description
Used Satellites	Specifies the number of tracked satellites
Latitude	Specifies the latitude of the GNSS antenna
Longitude	Specifies the longitude of the GNSS antenna
Altitude (m MSL)	Specifies the altitude of the GNSS antenna above mean sea level, in meters

Output Example

```
*A: Sar8 Dut-A>show# port aps
=====
Ports on APS Groups
=====
Port          Admin Link Port   Cfg  Oper LAG/ Port Port Port   C/QS/S/XFP/
Id            State  State  MTU  MTU  Bndl Mode Encp Type  MDIMDX
-----
aps-1         Down  No   Ghost
=====
*A: Sar8 Dut-A>show#
```

Table 93 Port Field Descriptions (APS)

Label	Description
Port Id	The port ID configured or displayed in the aps-id 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 93 Port Field Descriptions (APS) (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
	hybrid: the port is configured for hybrid use (transport network and service access per VLAN)
Port Encp	The encapsulation type on the port
Port Type	The type of port or optics installed
C/QS/S/XFP/MDIMDX	The SFP type on the port

Output Example

```
*A: Sar8 Dut-A>show# port aps-1
=====
SONET/SDH Interface
=====
Description      : APS Group
Interface        : aps-1
Admin Status     : down
Speed            : oc3
Oper Status      : down
```

```

Physical Link      : No                Loopback Mode      : none
Single Fiber Mode : No
Clock Source      : node              Framing            : sonet
Last State Change : 01/09/2019 20:50:16  Port IfIndex       : 1358987264
Configured Address : d6:64:ff:00:02:49
Hardware Address  : d6:64:ff:00:02:49
Last Cleared Time : 01/24/2019 21:33:06
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) : 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Cfg Alarm         : loc lrldi lb2er-sf slof slo
Alarm Status      :
BER SD Threshold  : 6                 BER SF Threshold   : 3
Hold time up     : 500 milliseconds   Reset On Path Down : Disabled
Hold time down   : 200 milliseconds

Transceiver Data
Transceiver Status : not-equipped
Hardware Address   : d6:64:ff:00:02:49
=====
Port Statistics
=====
                                     Input           Output
-----
Packets                          0             0
Discards                          0             0
Unknown Proto Discards            0
=====
    
```

Table 94 Port Field Descriptions (With APS ID)

Label	Description
SONET/SDH Interface	
Description	A description of the port
Interface	The APS interface name (the APS group port)
Speed	The speed of the SONET/SDH port
Admin Status	Specifies whether the APS circuit is administratively up or down
Oper Status	Specifies whether the APS circuit is operationally up or down
Physical Link	Specifies whether or not a physical link is present
Loopback Mode	The loopback mode of the port
Single Fiber Mode	Specifies whether the port is operating in single-fiber mode

Table 94 Port Field Descriptions (With APS ID) (Continued)

Label	Description
Clock Source	node: the link uses the internal clock when transmitting data loop: the link recovers the clock from the received data stream
Framing	sonet: the port is configured for SONET framing sdh: the port is configured for SDH framing
Last State Change	The last time that the operational status of the port changed state
Port IfIndex	The interface index number, which reflects its initialization sequence
Configured Address	The base chassis SONET/SDH MAC address
Hardware Address	The interface hardware- or system-assigned MAC address at its protocol sublayer
Last Cleared Time	The time since the last clear
J0 String	The section trace value that is sent to the far-end port
Section Trace Mode	byte: the section trace in the SONET section header is set in bytes string: a text string is used to identify the SONET section header increment-z0: an incremental STM ID is configured instead of a static value
Rx S1 Byte	The value of the SONET/SDH S1 byte received on the interface
Rx K1/K2 Byte	The value of the SONET/SDH K1/K2 byte received on the interface
Tx S1 Byte	The value of the SONET/SDH S1 byte transmitted on the interface
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 hexadecimal value of the received J0

Table 94 Port Field Descriptions (With APS ID) (Continued)

Label	Description
Cfg Alarm	The types 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 link-up dampening time in seconds
Reset On Path Down	Specifies whether or not the port will be reset when the path transitions to the operationally down state
Hold time down	The link-down dampening time in seconds
Transceiver Data	The following information is provided for a configured SFP: <ul style="list-style-type: none"> • transceiver status • transceiver type • 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 Status	The status of the transceiver
Hardware Address	The port hardware address

Table 94 Port Field Descriptions (With APS ID) (Continued)

Label	Description
Port Statistics	
Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast, multicast, or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound 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.

Output Example

```
*A: Sar8 Dut-A>show# port lcr
=====
Ports on LCR Groups
=====
Port      Admin Link Port  Cfg  Oper LAG/ Port Port Port  C/QS/S/XFP/
Id        State  Type State MTU  MTU  Bndl Mode Encp Type MDIMDX
-----
lcr-1/1   Down  No   Ghost
lcr-1/2   Down  No   Ghost
lcr-1/3   Down  No   Ghost
lcr-1/4   Down  No   Ghost
lcr-1/5   Down  No   Ghost
lcr-1/6   Down  No   Ghost
lcr-1/7   Down  No   Ghost
lcr-1/8   Down  No   Ghost
lcr-1/9   Down  No   Ghost
lcr-1/10  Down  No   Ghost
lcr-1/11  Down  No   Ghost
```

```
lcr-1/12      Down No  Ghost
lcr-1/13      Down No  Ghost
lcr-1/14      Down No  Ghost
lcr-1/15      Down No  Ghost
lcr-1/16      Down No  Ghost
lcr-5/1       Down No  Ghost
lcr-5/2       Down No  Ghost
lcr-5/3       Down No  Ghost
=====
```

Table 95 Port Field Descriptions (LCR)

Label	Description
Port Id	The port ID configured or displayed in the <i>slot/mda/port</i> format
Admin State	Up: the administrative state is up
	Down: the administrative state is down
Link	Yes: a physical link is present
	No: a physical link is not present
Port State	Up: the port is physically present and has a physical link
	Down: the port is physically present but does not have a link
	Ghost: the port is not physically present
	None: the port is in its initial creation state or about to be deleted
	Link Up: the port is physically present and has a physical link When Link Up appears at the lowest level of a TDM tributary, it means the physical connection is active but the port is waiting before data traffic can flow. It is a waiting state and indicates that data traffic will not flow until it transitions to the Up state.
	Link Down: the port is physically present but does not have a link
Cfg MTU	The configured MTU
Oper MTU	The negotiated size of the largest packet that can be sent on the port or channel specified in octets
LAG/Bndl	The Link Aggregation Group (LAG) or multilink bundle to which a TDM port is assigned

Table 95 Port Field Descriptions (LCR) (Continued)

Label	Description
Port Mode	network: the port is configured for transport network use
	access: the port is configured for service access
	hybrid: the port is configured for hybrid use (transport network and service access per VLAN)
Port Encp	The encapsulation type on the port
Port Type	The type of port or optics installed
C/QS/S/XFP/MDIMDX	The SFP type on the port

Output Example

```
*A: Sar8 Dut-A>show# port lcr-1/1
=====
TDM DS1 Physical Interface
=====
Description          : APS Group
Interface            : lcr-1/1          Port IfIndex       : 1367343104
Admin Status        : down             Oper Status        : down
Physical Link       : No
Line Impedance      : 100
Line Encoding       : b8zs
Type                : ds1              Buildout           : short
Length              : 133
Hardware Address    :
=====
Port Statistics
=====
                                     Input           Output
-----
Packets              0                 0
Discards              0                 0
Unknown Proto Discards 0
=====
```

Table 96 Port Field Descriptions (With LCR Port ID)

Label	Description
TDM DS1 Physical Interface	
Description	A text description of the LCR port
Interface	The LCR port ID displayed in the <i>lcr-group-id/ port[.channel]</i> format

Table 96 Port Field Descriptions (With LCR Port ID) (Continued)

Label	Description
Port Ifindex	The interface index number, which reflects its initialization sequence
Admin Status	up: the LCR port is administratively up
	down: the LCR port is administratively down
Oper Status	up: the LCR port is operationally up
	down: the LCR port is operationally down
Physical Link	yes: a physical link is present
	no: a physical link is not present
Line Impedance	The line impedance configured for the port
Line Encoding	The line encoding configured for the physical DS1 (T1) port
Type	The type of interface
Buildout	The line buildout (cable length) configured for physical DS1 ports on the 16-port T1/E1 ASAP Adapter card or 32-port T1/E1 ASAP Adapter card
Length	The line length configured for the physical DS1 port on the 16-port T1/E1 ASAP Adapter card or 32-port T1/E1 ASAP Adapter card
Hardware Address	The port hardware address
Port Statistics	
Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast, multicast, or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space

Table 96 Port Field Descriptions (With LCR Port ID) (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.

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 ([Output Example, Table 97](#))
- LLDP Detail ([Output Example, Table 98](#))

Output Example

```

*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
Tunnel Nearest Bridge : Disabled
Transmit TLVs        : portDesc sysCap
PortID TLV Subtype   : tx-local

Management Address Transmit Configuration:
Index 1 (system)      : Enabled           Address             : 10.20.30.40
Index 2 (IPv6 system) : Disabled          Address             : ::

Port 1/2/2 Bridge nearest-non-tpmr
-----
Admin State           : disabled        Notifications       : Disabled
Transmit TLVs        : None
PortID TLV Subtype   : tx-local

Management Address Transmit Configuration:
Index 1 (system)      : Disabled          Address             : 10.20.30.40
Index 2 (IPv6 system) : Disabled          Address             : ::

Port 1/2/2 Bridge nearest-customer
-----
Admin State           : disabled        Notifications       : Disabled
Transmit TLVs        : None
PortID TLV Subtype   : tx-local

Management Address Transmit Configuration:
Index 1 (system)      : Disabled          Address             : 10.20.30.40
Index 2 (IPv6 system) : Disabled          Address             : ::

=====
*A:ALU-1>#

```

Table 97 Port LLDP Field Descriptions

Label	Description
Admin State	The LLDP transmission/reception frame handling
Notifications	Indicates whether LLDP notifications are enabled
Tunnel Nearest Bridge	n/a
Transmit TLVs	The optional TLVs that are transmitted by this port
PortID TLV Subtype	Indicates the setting for the port ID subtype: tx-if-alias, tx-fi-name, or tx-local

Table 97 Port LLDP Field Descriptions (Continued)

Label	Description
Management Address Transmit Configuration	
Index 1 (system) Index 2 (IPv6 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

Output Example

```
*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 12/02/2014 16:08:14:

Supported Caps       : bridge router
Enabled Caps         : bridge router
Chassis Id Subtype   : 4 (macAddress)
Chassis Id           : ac:fa:ff:00:00:00
PortId Subtype       : 1 (interfaceAlias)
Port Id              : 37814272
Port Description     : 2/1/2, 10/100 Gig Eth SFP, "rempo1" (from ifDesc RFC2863)
```

System Name : n/a
 System Description : n/a

Remote Peer Index 2 management addresses at time 12/02/2014 16:08:14:
 No remote management addresses found

=====

*A:ALU-1>#

Table 98 Port LLDP Detail Field Descriptions

Label	Description
Admin State	The LLDP transmission/reception frame handling
Notifications	Indicates whether LLDP notifications are enabled
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
Enabled Address	The address transmitted by the port when the management address TLV is included in LLDPDUs sent by the port
Port LLDP Stats	
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
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.

Table 98 Port LLDP Detail Field Descriptions (Continued)

Label	Description
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
Port Id	The port identifier of the Ethernet port that sent the LLDPDU
Port Description	Describes the port that sent the LLDPDU and indicates that the description is the ifDescr object text string from RFC 2863 - IF MIB
System Name	The name of the system that sent the LLDPDU
System Description	Describes the system that sent the LLDPDU

3.14.2.1.7 Show ATM Port Commands

port

Syntax	port <i>port-id</i> atm port <i>port-id</i> atm connections port <i>port-id</i> atm pvc [<i>vpi/vci</i>] [detail] port <i>port-id</i> atm pvp [<i>vpi</i>] [detail]										
Context	show										
Description	<p>This command displays ATM port information.</p> <p>If no command line options are specified, the command port displays summary information for all ports on provisioned adapter cards.</p>										
Parameters	<p><i>port-id</i> — specifies the physical port ID</p> <p>Syntax</p> <table border="0"> <tr> <td style="padding-right: 10px;"><i>port-id</i></td> <td><i>slot[/mda[/port]]</i> or <i>slot/mda/port[.channel]</i>, where:</td> </tr> <tr> <td><i>slot</i></td> <td>1</td> </tr> <tr> <td><i>mda</i></td> <td>1 to 6 (7705 SAR-8 Shelf V2) 1 to 12 (7705 SAR-18)</td> </tr> <tr> <td><i>port</i></td> <td>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 16 (16-port T1/E1 ASAP Adapter card ports) 1 to 32 (32-port T1/E1 ASAP Adapter card ports)</td> </tr> <tr> <td><i>channel</i></td> <td>1 to 24 (DS1) or 1 to 32 (E1)</td> </tr> </table> <p>atm — displays ATM information</p> <p>connections — displays ATM connection information</p> <p>pvc — displays ATM port PVC information</p> <p>pvp — displays ATM port PVP information</p> <p><i>vpi/vci</i> — vpi: 0 to 4095 (NNI; not supported on SONET/SDH ports), 0 to 255 (UNI) vci: 1, 2, 5 to 65534</p> <p>detail — provides detailed information</p>	<i>port-id</i>	<i>slot[/mda[/port]]</i> or <i>slot/mda/port[.channel]</i> , where:	<i>slot</i>	1	<i>mda</i>	1 to 6 (7705 SAR-8 Shelf V2) 1 to 12 (7705 SAR-18)	<i>port</i>	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 16 (16-port T1/E1 ASAP Adapter card ports) 1 to 32 (32-port T1/E1 ASAP Adapter card ports)	<i>channel</i>	1 to 24 (DS1) or 1 to 32 (E1)
<i>port-id</i>	<i>slot[/mda[/port]]</i> or <i>slot/mda/port[.channel]</i> , where:										
<i>slot</i>	1										
<i>mda</i>	1 to 6 (7705 SAR-8 Shelf V2) 1 to 12 (7705 SAR-18)										
<i>port</i>	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 16 (16-port T1/E1 ASAP Adapter card ports) 1 to 32 (32-port T1/E1 ASAP Adapter card ports)										
<i>channel</i>	1 to 24 (DS1) or 1 to 32 (E1)										

Output The following outputs are examples of ATM information:

- ATM ([Output Example, Table 99](#))
- ATM Connections ([Output Example, Table 100](#))
- ATM PVC ([Output Example, Table 101](#))
- ATM PVC VPI/VCI ([Output Example, Table 102](#))
- ATM PVC VPI/VCI Detail ([Output Example, Table 103](#))
- ATM PVP ([Output Example, Table 104](#))
- ATM PVP Detail ([Output Example, Table 105](#))

Output Example

```
*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 99 Port ATM Field Descriptions

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

Table 99 Port ATM Field Descriptions (Continued)

Label	Description
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
Configured VPs	The number of configured VPs
Configured IFCs	The number of configured IFCs
TC Alarm State	The ATM interface notifications indicating that the TC sublayer is currently in the Loss of Cell Delineation (LCD) defect maintenance state or that the TC sublayer is currently not in the Loss of Cell Delineation (LCD) defect maintenance state
HEC Errors (Dropped)	The number of cells with uncorrectable HEC errors on this interface
Number OCD Events	The number of times the Out of Cell Delineation (OCD) events occurred
HEC Errors (Fixed)	The number of cells with correctable HEC errors on this interface
Ingress CBR	The total CBR bandwidth consumed on this interface in the ingress direction
Ingress RT-VBR	The total real-time variable bit rate (rt-VBR) bandwidth consumed on this interface in the ingress direction
Ingress NRT-VBR	The total non-real-time variable bit rate (nrt-VBR) bandwidth consumed on this interface in the ingress direction
Ingress UBR	The total unspecified bit rate (UBR) bandwidth consumed on this interface in the ingress direction
Egress CBR	The total CBR bandwidth consumed on this interface in the egress direction
Egress RT-VBR	The total real-time variable bit rate (rt-VBR) bandwidth consumed on this interface in the egress direction
Egress NRT-VBR	The total non-real-time variable bit rate (nrt-VBR) bandwidth consumed on this interface in the egress direction

Table 99 Port ATM Field Descriptions (Continued)

Label	Description
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

Output Example

```
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 100 Port ATM Connections Field Descriptions

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

Table 100 Port ATM Connections Field Descriptions (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

Output Example

```
*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 101 Port ATM PVC Field Descriptions

Label	Description
VPI/VCI	The VPI/VCI values
Owner	The system entity that owns a specific ATM connection
Type	The connection type
Ing. TD	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr. TD	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Adm	The administrative state of the interface connection
OAM	The OAM operational status of ATM connections: Up: the interface is operationally up ETE-AIS: the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Opr	The status of the ATM interface

Output Example

```
*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 102 Port ATM PVC VPI/VCI Field Descriptions

Label	Description
Port Id	The port ID configured or displayed in the <i>slot/mda/port</i> format
VPI/VCI	The VPI/VCI values
Admin State	The administrative state of the interface connection
Oper State	The status of the ATM interface
OAM State	The OAM operational status of ATM connections: Up: the interface is operationally up ETE-AIS: the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Encap Type	The encapsulation type
Owner	The system entity that owns a specific ATM connection
Endpoint Type	The endpoint type
Cast Type	The connection topology type
Ing. TD Idx	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr. TD Idx	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection

Output Example

```

*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              0
Tagged Cells          0              0
=====
ATM OAM Statistics
=====
                                     Input          Output
-----
Loopback              0              0
OAM Cells (generated) 0              0
=====

```

Table 103 Port ATM PVC VPI/VCI Detail Field Descriptions

Label	Description
Port Id	The port ID configured or displayed in the <i>slot/mda/port</i> 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 103 Port ATM PVC VPI/VCI Detail Field Descriptions (Continued)

Label	Description
Owner	Identifies the system entity that owns a specific ATM connection
AAL Type	The ATM Adaptation Layer 5 (AAL5) information
Endpoint Type	The endpoint type
Cast Type	The connection topology type
Ing. Td Idx	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr. Td Idx	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Last Changed	The date and time that the interface connection entered its current operational state
Octets	The number of input and output octets HEC discarded cells are not included in the input octet numbers
Cells	The number of input and output cells HEC discarded cells are not included in the input cell numbers
CLP=0 Cells	The number of CLP=0 cells
Dropped CLP=0 Cells	The number of dropped CLP=0 cells
Dropped Cells (CLP=0+1)	The number of dropped CLP=0+1 cells
Tagged Cells	The number of tagged cells
Loopback	The number of loopback requests and responses transmitted and received on this connection for both end-to-end and segment
OAM Cells (generated)	The number of OAM cells generated at the endpoint and sent towards the network

Output Example

```
*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
=====
```

Table 104 Port ATM PVP Field Descriptions

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

Output Example

```
*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                0
Tagged Cells          0
=====
```

```

=====
ATM OAM Statistics
=====
                                     Input          Output
-----
Loopback                               0              0
OAM Cells
(generated)                             0
=====
*A:ALU-1>#

```

Table 105 Port ATM PVP Detail Field Descriptions

Label	Description
Port Id	The port ID configured or displayed in the <i>slot/mda/port</i> 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
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

Table 105 Port ATM PVP Detail Field Descriptions (Continued)

Label	Description
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

3.14.2.1.8 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.



Note: The same **show>port-tree** display is used for both SONET and SDH. The SONET nomenclature is used to show both SONET and SDH hierarchies.

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 106](#) describes the fields.

Output Example

```
*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 106 Port-tree Field Descriptions

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

3.14.2.1.9 Show LAG Commands

lag

Syntax **lag** [*lag-id*] [**detail**] [**statistics**]
lag *lag-id* **associations**
lag [*lag-id*] **description**
lag *lag-id* [**detail**] **lACP-partner**
lag [*lag-id*] **port**

Context show

Description This command displays Link Aggregation Group (LAG) information.
 If no command line options are specified, a summary listing of all LAGs is displayed.

Parameters *lag-id* — displays information only on the specified LAG

Values 1 to 32

detail — displays detailed LAG information

Default displays summary LAG information

statistics — displays LAG statistics information

associations — displays a list of current router interfaces to which the LAG is associated

description — displays a list of all LAGs and LAG ports and their descriptions

lACP-partner — displays information about the LACP partner (**detail** keyword provides detailed information)

port — displays information about the specified LAG port or all LAG ports

Output The following outputs are examples of LAG information:

- Summary ([Output Example, Table 107](#))
- Detail ([Output Example, Table 108](#))
- Statistics ([Output Example, Table 109](#))
- Associations ([Output Example, Table 110](#))
- Description ([Output Example, Table 111](#))
- LACP partner ([Output Example, Table 112](#))
- LACP partner (detail) ([Output Example, Table 113](#))
- Port ([Output Example, Table 114](#))

Output Example

```
*A:ALU-1># show lag
=====
Lag Data
=====
Lag-id      Adm    Opr    Port-Threshold  Up-Link-Count  MC Act/Stdby
-----
1           up    down   0                0               N/A
2           up    down   1                0               N/A
3           up    up     0                1               N/A
-----
Total Lag-ids: 3      Single Chassis: 3      MC Act: 0      MC Stdbby: 0
=====
*A:ALU-1>#
```

Table 107 LAG Summary Field Descriptions

Label	Description
Lag-id	The LAG identifier
Adm	Up: the LAG is administratively up
	Down: the LAG is administratively down
Opr	Up: the LAG is operationally up
	Down: the LAG is operationally down
Port-Threshold	The number of operational links at or below which the LAG is considered to be operationally down
Up-Link-Count	The number of ports that are physically present and have physical links present
MC Act/Stdby	N/A

Output Example

```
*A:ALU-1># show lag 2 detail
=====
LAG Details
=====
Description      : LAG2
-----
Details
-----
Lag-id           : 2                Mode                : access
Adm              : up                Opr                 : down
Thres. Exceeded Cnt : 0                Port Threshold      : 1
Thres. Last Cleared : 08/19/2011 14:35:28  Threshold Action    : down
Dynamic Cost     : false              Encap Type          : null
Configured Address : 2001:db8::                Lag-IfIndex         : 1342177282
Hardware Address  : 2001:db8::52:0:1    Adapt Qos           : N/A
Hold-time Down   : 0.0 sec          Port Type           : standard
```



```

LACP : enabled Mode : active
LACP Transmit Intvl : fast LACP xmit stdby : enabled
Selection Criteria : highest-count Slave-to-partner : disabled
Number of sub-groups: 2 Forced : -
System Id : a4:58:ff:00:00:00 System Priority : 32768
Admin Key : 32769 Oper Key : 32769
Prtr System Id : Prtr System Priority : 0
Prtr Oper Key : 0

```

```

-----
Port-id      Adm      Act/Stdbby Opr      Primary  Sub-group  Forced  Prio
-----
1/4/3       up       active   down   yes       1          -       1
1/5/3       up       standby  down           2          -       2

```

```

-----
Port-id      Role      Exp  Def  Dist  Col  Syn  Aggr  Timeout  Activity
-----
1/4/3       actor    Yes  Yes  No    No   No   Yes   Yes      Yes
1/4/3       partner  Yes  Yes  No    No   No   No    Yes      No
1/5/3       actor    Yes  Yes  No    No   No   Yes   Yes      Yes
1/5/3       partner  Yes  Yes  No    No   No   No    Yes      No

```

```

=====
*A:ALU-1>#

```

The following example displays LAG details with MC-LAG Output

```
*A:ALU-1># show lag 2 detail
```

```
=====
LAG Details
=====
```

```
Description : LAG2
-----
```

```
Details
-----
```

```

Lag-id      : 2 Mode : access
Adm         : up Opr : down
Thres. Exceeded Cnt : 0 Port Threshold : 1
Thres. Last Cleared : 08/19/2011 14:35:28 Threshold Action : down
Dynamic Cost : false Encap Type : null
Configured Address : 2001:db8:: Lag-IfIndex : 1342177282
Hardware Address : 2001:db8::52:0:1 Adapt Qos : N/A
Hold-time Down : 0.0 sec Port Type : standard
LACP : enabled Mode : active
LACP Transmit Intvl : fast LACP xmit stdby : enabled
Selection Criteria : highest-count Slave-to-partner : disabled
Number of sub-groups: 2 Forced : -
System Id : a4:58:ff:00:00:00 System Priority : 32768
Admin Key : 32769 Oper Key : 32769
Prtr System Id : Prtr System Priority : 0
Prtr Oper Key : 0

```

```

MC Peer Address : 10.10.10.4 MC Peer Lag-id : 1
MC System ID : 11.11.11.11:11:11 MC System Priority : 3
MC Admin Key : 12 MC Active/Standby : active
MC Lacp ID in use : true MC extended timeout : false
MC Selection Logic : peer timed out, selected local subgroup
MC Config Mismatch : no mismatch

```

```

-----
Port-id      Adm      Act/Stdbby Opr      Primary  Sub-group  Forced  Prio
-----

```

```

1/4/3      up      active  down   yes     1       -       1
1/5/3      up      standby down   down    2       -       2
-----
Port-id    Role     Exp    Def   Dist  Col   Syn  Aggr  Timeout  Activity
-----
1/4/3      actor   Yes    Yes   No    No    No   Yes   Yes     Yes
1/4/3      partner Yes    Yes   No    No    No   No    Yes     No
1/5/3      actor   Yes    Yes   No    No    No   Yes   Yes     Yes
1/5/3      partner Yes    Yes   No    No    No   No    Yes     No
=====
*A:ALU-1>#
    
```

Table 108 LAG Detailed Field Descriptions

Label	Description
Lag-id	The LAG identifier
Mode	The mode of the LAG: access or network
Adm	Up: the LAG is administratively up
	Down: the LAG is administratively down
Opr	Up: the LAG is operationally up
	Down: the LAG is operationally down
Thres. Exceeded Cnt	The number of times that the drop count was reached
Port Threshold	The number of operational links at or below which the LAG is regarded as operationally down
Thres. Last Cleared	The last time that keepalive statistics were cleared
Threshold Action	Action to take when the number of operational links is equal to or below the port threshold
Dynamic Cost	n/a
Encap Type	The encapsulation method used to distinguish customer traffic on a LAG
Configured Address	The base chassis Ethernet MAC address
Lag-IfIndex	A unique number assigned to this interface
Hardware Address	The hardware address
Adapt Qos	The configured QoS mode
Hold-time Down	The hold-time, in tenths of seconds, before a failure is reported to higher levels
Port Type	Standard: standard Ethernet port types are supported

Table 108 LAG Detailed Field Descriptions (Continued)

Label	Description
LACP	Enabled: LACP is enabled
	Disabled: LACP is disabled
Mode	Active: LACP operates in active mode
	Passive: LACP operates in passive mode
Role	Actor: local device (7705 SAR) participating in LACP negotiation
	Partner: remote device participating in LACP negotiation
LACP Transmit Intvl	LACP timeout signaled to peer
LACP xmit stdby	LACP transmit on standby links enabled or disabled
Selection Criteria	Configured subgroup selection criteria
Slave-to-partner	Slave-to-partner flag enabled or disabled
Number of sub-groups	Total subgroups in LAG
Forced	n/a
System Id	System ID used by actor in LACP messages
System Priority	System priority used by actor in LACP messages
Admin Key	Configured LAG key
Oper Key	Key used by actor in LACP messages
Prtr System Id	System ID used by partner in LACP messages
Prtr System Priority	System priority used by partner in LACP messages
Prtr Oper Key	Key used by partner in LACP messages
MC Peer Address	IP address of the MC-LAG peer
MC Peer Lag-id	The LAG identifier of the MC-LAG peer
MC System Id	System ID used by the MC-LAG actor in LACP messages
MC System Priority	System priority used by the MC-LAG actor in LACP messages
MC Admin Key	Configured MC-LAG key
MC Active/Standby	Indicates whether the port is in active or standby mode

Table 108 LAG Detailed Field Descriptions (Continued)

Label	Description
MC Lacp ID in use	Indicates whether MC-LAG values such as system-id, system priority, and lacp-key are advertised to the LACP peer
MC extended timeout	Indicates whether the system is using a larger value than the value configured as the MC-LAG hold-on-neighbor-failure value
MC Selection Logic	The current state of the MC-LAG protocol, indicating which of the two MC-LAG redundancy systems is the master
MC Config Mismatch	Indicates whether there is a LAG configuration mismatch between redundancy systems, and what is mismatched
Port-id	The member physical port ID expressed in <i>slot/mda/port</i> format
Adm	Up: the member port is administratively up
	Down: the member port is administratively down
Act/Stdby	Active: the member port is active
	Standby: the member port is on standby
Opr	Up: the member port is operationally up
	Down: the member port is operationally down
Primary	Indicates whether the member port is the primary port
Sub-group	The member port subgroup
Prio	The member port priority

Output Example

```
*A:ALU-1># show lag 2 statistics
=====
LAG Statistics
=====
Description          : LAG2
Port-id   Input      Input      Output      Output      Input      Output
          Bytes      Packets    Bytes      Packets     Errors     Errors
-----
1/4/3     0           9968       0           9833        0           0
1/5/3     0            435       0            401         0           0
-----
Totals    0           10403      0           10234       0           0
=====
*A:ALU-1>#
```

Table 109 LAG Statistics Field Descriptions

Label	Description
Port-id	The member physical port ID expressed in <i>slot/mda/port</i> format
Input Bytes	The number of inbound bytes for the LAG on a per-port basis
Input Packets	The number of inbound packets for the LAG on a per-port basis
Output Bytes	The number of outbound bytes for the LAG on a per-port basis
Output Packets	The number of outbound packets for the LAG on a per-port basis
Input Errors	The number of inbound packets (for packet-oriented interfaces) or inbound transmission units (for character-oriented or fixed-length interfaces) that contained errors preventing them from being delivered to higher layers
Output Errors	The number of outbound packets (for packet-oriented interfaces) or outbound transmission units (for character-oriented or fixed-length interfaces) that could not be transmitted because of errors

Output Example

```
*A:ALU-1># show lag 1 associations
=====
Interface Table
=====
Router/ServiceId          Name                               Encap Val
-----
Router: Base              ies-337-30.30.30.1                104
-----
Interfaces
=====
*A:ALU-1>#
```

Table 110 LAG Associations Field Descriptions

Label	Description
Router/ServiceId	The service associated with the LAG
Name	The name of the IP interface
Encap Val	The dot1q or qinq values of the port for the IP interface

Output Example

```
*A:ALU-1># show lag description
=====
Lag Port States
LACP Status: e - Enabled, d - Disabled
=====
Lag-id Port-id  Adm  Act/Stdby Opr  Description
-----
1 (e)
   1/1/7      up   standby  down  10/100/Gig Ethernet SFP
   1/6/1      up   active   down  10/100/Gig Ethernet SFP
2 (e)
   1/6/3      up   active   down  10/100/Gig Ethernet SFP
   1/7/3      up   standby  down  10/100/Gig Ethernet SFP
=====
*A:ALU-1>#
```

Table 111 LAG Description Field Descriptions

Label	Description
Lag Port States	
LACP Status	Indicates whether LACP is enabled or disabled
Lag-id	The LAG identifier and LACP status code
Port-id	The member physical port ID
Adm	Indicates the administrative state of the member port: up or down
Act/Stdby	Indicates whether the port is in active or standby mode
Opr	Indicates the operational state of the member port: up or down
Description	The description strings configured for the LAG and member ports

Output Example

```
*A:ALU-1># show lag 1 lacp-partner
=====
LAG Partner information
=====
Partner system ID       : ea:3e:ff:00:00:00
Partner system priority : 32768
Partner operational key  : 2
=====

LAG 1 Ports Partner operational information
=====
Port                    Actor Port  Prio  Key
                        port
-----
1/1/7                   33863 33864 5     2
1/6/1                   34177 34178 7     2
=====

LAG 1 Ports Partner operational state information
=====
Port                    Exp  Def  Dist Col  Syn  Aggr Time Act
                        out
-----
1/1/7                   No   No   Yes  Yes  Yes  Yes  Yes  Yes
1/6/1                   No   No   Yes  Yes  Yes  Yes  Yes  Yes
=====
*A:ALU-1>#
```

Table 112 LAG LACP Partner Field Descriptions

Label	Description
LAG Partner information	
Partner system ID	The system ID of the partner (remote device)
Partner system priority	The system priority used by the partner in LACP messages
Partner operational key	The key used by the partner in LACP messages
LAG 1 Ports Partner operational information	
Port	The member physical port ID
Actor port	The actor (local device) port associated with the member port
Port	The partner port associated with the member port
Prio	The partner port priority associated with the member port
Key	The partner operational key associated with the member port

Table 112 LAG LACP Partner Field Descriptions (Continued)

Label	Description
LAG 1 Ports Partner operational state information	
Port	The member physical port ID
Exp	(Expired) – indicates whether the partner is in the Expired state; if Yes, the LAG is not operational
Def	(Default) – indicates whether the partner information (system priority, key, port priority, and state of the partner) is the default information that is configured administratively or is information received through LACPDU. Default partner information is used if LACPDUs were not received on time.
Dist	(Distributing) – indicates whether the distribution of outgoing frames is enabled or disabled on the link
Col	(Collecting) – indicates whether the collection of incoming frames is enabled or disabled on the link
Syn	(Synchronization) – indicates whether the link is allocated to the correct LAG
Aggr	(Aggregation) – indicates whether link aggregation is enabled or disabled on the port
Time out	Indicates whether a timeout value is set for the port
Act	(Activity) – indicates whether the link is active (port can send and receive LACPDU messages) or passive (port does not initiate LACP messages but will respond to LACP messages)

Output Example

```
*A:ALU-1># show lag 1 detail lacp-partner
=====
LAG Partner information
=====
Partner system ID       : de:41:ff:00:00:00
Partner system priority : 32768
Partner operational key  : 32768
=====
LAG port 1/1/7 partner information
-----
Actor port              : 33863
Partner admin system prio : 32768
Partner oper system prio  : 32768
Partner admin system ID   : 00:00:00:00:00:00
Partner oper system ID    : de:41:ff:00:00:00
```



```

Partner admin key      : 0
Partner oper key      : 32768
Partner admin port    : (Not Specified)
Partner oper port     : 33864
Partner admin port prio : 32768
Partner oper port prio : 32768
Partner admin state   : (Not Specified)
Partner oper state    : lacp-timeout, aggregation synchronization
                       collecting distributing
-----

```

LAG port 1/6/1 partner information

```

Actor port            : 34177
Partner admin system prio : 32768
Partner oper system prio : 32768
Partner admin system ID : 00:00:00:00:00:00
Partner oper system ID  : de:41:ff:00:00:00
Partner admin key     : 0
Partner oper key      : 32768
Partner admin port    : (Not Specified)
Partner oper port     : 34178
Partner admin port prio : 32768
Partner oper port prio : 32768
Partner admin state   : (Not Specified)
Partner oper state    : lacp-timeout, aggregation synchronization
                       collecting distributing
-----

```

*A:ALU-1>#

Table 113 LAG Detailed LACP Partner Field Descriptions

Label	Description
LAG Partner information	
Partner system ID	The system ID of the partner (remote device)
Partner system priority	The system priority used by the partner in LACP messages
Partner operational key	The key used by the partner in LACP messages
LAG port <i>port-id</i> partner information	
Actor port	The actor (local device) port associated with the member port
Partner admin system prio	The partner administrative system priority associated with the member port
Partner oper system prio	The partner operational system priority associated with the member port
Partner admin system ID	The partner administrative system ID associated with the member port

Table 113 LAG Detailed LACP Partner Field Descriptions (Continued)

Label	Description
Partner oper system ID	The partner operational system ID associated with the member port
Partner admin key	The partner administrative key associated with the member port
Partner oper key	The partner operational key associated with the member port
Partner admin port	The partner administrative port associated with the member port
Partner oper port	The partner operational port associated with the member port
Partner admin port prio	The partner administrative port priority associated with the member port
Partner oper port prio	The partner operational port priority associated with the member port
Partner admin state	The administrative state of the partner
Partner oper state	The operational state of the partner

Output Example

```
*A:ALU-1># show lag 1 port
=====
Lag Port States
LACP Status: e - Enabled, d - Disabled
=====
Lag-id Port-id Adm Act/Stdby Opr Primary Sub-group Forced Priority
-----
1(e) 1/1/7 up standby down yes 2 - 32768
      1/6/1 up active down 1 - 32768
=====
*A:ALU-1>#
```

Table 114 LAG Port Field Descriptions

Label	Description
Lag Port States	
LACP status	Indicates whether LACP is enabled or disabled
Lag-id	The LAG identifier and LACP status code
Port-id	The member physical port ID

Table 114 LAG Port Field Descriptions (Continued)

Label	Description
Adm	Indicates the administrative state of the member port: up or down
Act/Stdby	Indicates whether the member port is in active or standby mode
Opr	Indicates the operational state of the member port: up or down
Primary	Indicates whether the member port is the primary port
Sub-group	The member port sub-group
Forced	n/a
Priority	The member port priority

3.14.2.1.10 Show Multilink Bundle and IMA Group Commands

multilink-bundle

Syntax	multilink-bundle [<i>bundle-id</i> <i>slot/mda</i> type { mlppp ima-grp }] [detail] multilink-bundle [{ <i>bundle-id</i> <i>slot/mda</i> } [ppp [multiclass] ima]]
Context	show
Description	This command displays multilink bundle information. An operator can display: <ul style="list-style-type: none"> • all bundles on the system/adaptor 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	<i>bundle-id</i> — the multilink (PPP or IMA) bundle identifier. The command syntax must be used as follows: <p>Syntax: <i>bundle-type-slot/mda.bundle-num</i> <i>bundle-ppp-slot/mda.bundle-num</i> (a multilink PPP bundle) <i>bundle-ima-slot/mda.bundle-num</i> (an IMA group bundle) <i>bundle:</i> keyword <i>slot:</i> MDA slot numbers <i>bundle-num:</i> 1 to 32</p> <p>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</p>
Output	The following outputs are examples of multilink bundle information: <ul style="list-style-type: none"> • Multilink Bundle (Output Example, Table 115) • Multilink Bundle IMA Group (Output Example, Table 116) • Multilink Bundle IMA Group Detailed (Output Example, Table 117) • Multilink Bundle MLPPP (Output Example, Table 118) • Multilink Bundle Multi-class (Output Example, Table 118) • Multilink Bundle MLPPP Detail (Output Example, Table 119)

Output Example

```

*A:ALU-1># show multilink-bundle
=====
Bundle Summary
=====
Bundle          Type    Admin   Oper   Port   Min   Total/
Id              State  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 115 Multilink Bundle Field Descriptions

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

Table 115 Multilink Bundle Field Descriptions (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 “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

Output Example

```
*A:ALU-1># show multilink-bundle type ima-grp
=====
Bundle Summary
=====
Bundle          Type      Admin   Oper   Port   Min   Total/
Id              State    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 116 **Multilink Bundle IMA Group Field Descriptions**

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)

Table 116 Multilink Bundle IMA Group Field Descriptions (Continued)

Label	Description
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

Output Example

```

*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 117 Multilink Bundle IMA Group Detailed Field Descriptions

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.

Table 117 Multilink Bundle IMA Group Detailed Field Descriptions

Label	Description
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
Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.

Table 117 Multilink Bundle IMA Group Detailed Field Descriptions

Label	Description
Errors Input/Output	<p>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.</p> <p>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.</p>
Port Statistics	
Unicast packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Multicast packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Broadcast packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound packets chosen to be discarded to possibly free up buffer space

Table 117 Multilink Bundle IMA Group Detailed Field Descriptions

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.

Output Example

```
*A:ALU-1># show multilink-bundle type mlppp
=====
Bundle Summary
=====
Bundle          Type      Admin   Oper    Port    Min   Total/
Id              State    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   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 118 Multilink Bundle MLPPP Field Descriptions

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
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)

Table 118 Multilink Bundle MLPPP Field Descriptions (Continued)

Label	Description
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

Output Example

```
*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 119 Multilink Bundle MLPPP Detail Field Descriptions

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
Oper MRRU	The operating maximum frame size that can be reconstructed from multilink fragments

Table 119 Multilink Bundle MLPPP Detail Field Descriptions (Continued)

Label	Description
Bandwidth	The bandwidth configured for this MLPPP bundle in kb/s
Traffic and Port statistics	The traffic and port statistics information displayed for bundles when the detail option is selected is the same as information displayed for physical ports
Traffic Statistics	
Octets Input/Output	The total number of octets received and transmitted on the port
Packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, 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 sublayer to a higher (sub) layer, which were not addressed to a multicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Multicast packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or broadcast address at this sublayer. 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 sublayer, including those that were discarded or not sent.

Table 119 Multilink Bundle MLPPP Detail Field Descriptions (Continued)

Label	Description
Broadcast packets Input/Output	The number of packets, delivered by this sublayer to a higher (sub) layer, which were not addressed to a unicast or multicast address at this sublayer. 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 sublayer, including those that were discarded or not sent.
Discards Input/Output	The number of inbound/outbound 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.

3.14.2.1.11 Show ATM IMA Group Commands

multilink-bundle

Syntax	multilink-bundle <i>bundle-id</i> ima atm [detail] multilink-bundle <i>bundle-id</i> ima atm connections multilink-bundle <i>bundle-id</i> ima atm pvc [<i>vpi/vci</i>] [detail] multilink-bundle <i>bundle-id</i> ima atm pvp [<i>vpi</i>] [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	<i>bundle-id</i> — 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 <i>vpi/vci</i> — 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: <ul style="list-style-type: none"> • Multilink Bundle IMA ATM (Output Example, Table 120) • Multilink Bundle IMA ATM Connections (Output Example, Table 121) • Multilink Bundle IMA ATM PVC (Output Example, Table 122) • Multilink Bundle IMA ATM PVP (Output Example, Table 123)

Output Example

```
*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
=====
```

Table 120 Multilink Bundle IMA ATM Field Descriptions

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

Output Example

```
*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 121 Multilink Bundle IMA ATM Connections Field Descriptions

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

Table 121 Multilink Bundle IMA ATM Connections Field Descriptions

Label	Description
Opr	Up: the bundle is operationally up
	Down: the bundle is operationally down

Output Example

```

*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
(generator)               0
=====
*A:ALU-1>#
    
```

Table 122 Multilink Bundle IMA ATM PVC Field Descriptions

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

Output Example

```
*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 123 Multilink-bundle IMA ATM PVP Field Descriptions

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

3.14.2.1.12 Show SCADA Commands

scada

Syntax **scada** [*bridge_id*] [**detail**]
scada [*bridge_id*] **description**
scada [*bridge_id*] [**detail**] **statistics**

Context show

Description This command displays SCADA bridge information.

Parameters **detail** — displays detailed information

bridge-id — specifies the bridge ID, in the format *slot/mda/bridge-id*, where *bridge-id* is 1 to 16

description — displays the descriptions that have been configured for each bridge

statistics — displays statistics information pertaining to bridges and branches

Output The following outputs are examples of SCADA information:

- SCADA bridge detail ([Output Example, Table 124](#))
- specific SCADA bridge detail ([Output Example, Table 125](#))

Output Example

```
A:ALU-1># show scada detail
=====
Scada Bridges on Slot 1
=====
Bridge      Admin Link Bridge  Port Port Bridge Branch
Id          State  State  State Mode Encp Type  Type
-----
1/8/1       Up     Yes   Up     accs cem  mddb  master
1/8/1.1     Up     Yes   Up     accs cem  mddb  master
1/8/1.2     Up     Yes   Up     accs cem  mddb  slave
1/8/1.3     Up     Yes   Up     accs cem  mddb  slave
1/8/1.4     Up     Yes   Up     accs cem  mddb  slave
1/8/1.5     Up     Yes   Up     accs cem  mddb  slave
1/8/2       Down  No    Down
1/8/3       Down  No    Down
1/8/4       Down  No    Down
1/8/5       Down  No    Down
1/8/6       Down  No    Down
1/8/6.5     Down  No    Down  accs cem  mddb  slave
1/8/7       Down  No    Down
1/8/8       Down  No    Down
1/8/8.4     Down  No    Down  accs cem  mddb  slave
1/8/8.5     Down  No    Down  accs cem  mddb  slave
1/8/8.6     Down  No    Down  accs cem  mddb  slave
1/8/9       Down  No    Down
1/8/10      Down  No    Down
```



```

1/8/10.10 Down No Down accs cem mddb slave
1/8/11 Down No Down
1/8/11.11 Down No Down accs cem mddb slave
1/8/11.22 Down No Down accs cem mddb slave
1/8/12 Down No Down
1/8/13 Down No Down
1/8/14 Down No Down
1/8/14.14 Down No Down accs cem mddb slave
1/8/15 Down No Down
1/8/16 Down No Down
1/8/16.32 Down No Down accs cem mddb slave
=====
    
```

Table 124 SCADA Bridge Detail Field Descriptions

Label	Description
Scada Bridges on Slot 1	
Bridge Id	The bridge/branch ID (the bridge ID is in the format <i>slot/mda/bridge-id</i> , where <i>bridge-id</i> is 1 to 16; the branch ID is in the format <i>slot/mda/bridge-id.branch-id</i> , where <i>branch-id</i> is 1 to 32)
Admin State	The administrative state of the bridge, either Up or Down
Link	Indicates whether there is an active link on the bridge, either Yes or No
Bridge State	The operational state of the bridge, either Up or Down
Port Mode	The operational mode of the bridge (always accs – access)
Port Encp	The encapsulation type of the bridge (always cem – circuit emulation)
Bridge Type	The bridge type: mddb, pcm, or vcb
Branch Type	The type of device connected to the bridge, either master or slave (for MDDB and PCM applications) or N/A (for the VCB application)

Output Example

```
A:ALU-1># show scada 1/8/14 detail
=====
Scada Info
=====
Description      : SCADA bridge 14
Bridge Id        : 1/8/14                Type           : Mddb
Admin Status     : down                  Oper Status    : down
Squelch          : enabled               Squelch Timeout : 120 (s)
Squelch Recovery : manual                Recovery Timeout : N/A
Squelch Status   : 0x0                  Force-active    : 1
Redundant Mode   : manual
Report Alarms    : hcmOof hcmRai        Speed           : 2400
=====
Bridge Members
-----
Identifier      Multidrop  AdminState  OperState  AlarmStatus  Squelched
-----
1/8/14.14      slave     up          down       N
=====
Scada Bridge Statistics
=====
                                     Input           Output
-----
Packets                    0                0
Discards                   0                0
Unknown Proto Discards     0
=====
```

Table 125 Specific SCADA Bridge Detail Field Descriptions

Label	Description
Scada Info	
Description	The description configured for the bridge
Bridge Id	The bridge ID in the format <i>slot/mda/bridge-id</i> , where <i>bridge-id</i> is 1 to 16
Type	The bridge type: Mddb, pcm, or vcb
Admin Status	The administrative state of the bridge, either up or down
Oper Status	The operational state of the bridge, either up or down
Squelch	Indicates whether the squelch function has been enabled (applies only to MDDB and PCM)
Squelch Timeout	The configured squelch timeout (applies only to MDDB and PCM)
Squelch Recovery	The squelch recovery mode: manual or auto (applies only to MDDB and PCM)

Table 125 Specific SCADA Bridge Detail Field Descriptions (Continued)

Label	Description
Recovery Timeout	The configured time after which the branch will automatically be put back in the normal state (applies only to MDDB and PCM) Applicable only if recovery mode is auto; if recovery mode is manual, the field displays N/A
Squelch Status	The bitmap (32 bits) of the branches that are squelched (applies only to MDDB and PCM). A value of 0x0 means that no branch is squelched.
Force-active	The master branch (1 or 2) to which the force-active command has been applied (applies only to MDDB and PCM)
Redundant Mode	The redundancy mode for the master inputs: manual or auto (applies only to MDDB and PCM)
Report Alarms	The configured type of alarms to be reported to the bridge (applies only to MDDB)
Speed	The configured speed of the bridge (applies only to MDDB)
Bridge Members	
Identifier	The branch ID in the format <i>bridge-id.branch-id</i> , where <i>bridge-id</i> is 1 to 16 and <i>branch-id</i> is 1 to 32
Multidrop	The type of device connected to the bridge, either master or slave (applies only to MDDB and PCM)
AdminState	The administrative state of the branch, either up or down
OperState	The operational state of the branch, either up or down
AlarmStatus	The current alarm state of the branch
Squelched	Indicates whether the squelch function has been enabled
Scada Bridge Statistics	
Packets Input/Output	The total number of packets that were delivered by this sublayer to a higher (sub) layer and that were not addressed to a multicast or broadcast address at this sublayer The total number of packets that higher-level protocols requested to be transmitted and that were not addressed to a multicast or broadcast address at this sublayer, including those that were discarded or not sent

Table 125 Specific SCADA Bridge Detail Field Descriptions (Continued)

Label	Description
Discards Input/Output	The number of inbound/outbound 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.

3.14.2.2 Monitor Commands

- [Port Monitor Commands](#)
- [Fabric Profile Statistics Monitor Commands](#)
- [SCADA Monitor Commands](#)

3.14.2.2.1 Port Monitor Commands

port

Syntax	port <i>port-id</i> [<i>port-id...</i> (up to 5 total)] [interval <i>seconds</i>] [repeat <i>repeat</i>] [absolute rate] [multiclass]
Context	monitor
Description	<p>This command enables port traffic monitoring. The specified ports' statistical information is shown at the configured interval until the configured count is reached.</p> <p>The first screen displays the current statistics related to the specified ports. The subsequent statistical information listed for each interval is displayed as a delta to the previous screen.</p> <p>When the keyword rate is specified, the "rate per second" for each statistic is displayed instead of the delta.</p> <p>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.</p>
Parameters	<p><i>port-id</i> — specifies up to 5 port IDs</p> <p style="padding-left: 40px;">Syntax <i>port-id</i> <i>slot[/mda[/port]]</i> or <i>slot/mda/port[.channel]</i> <i>bundle-id</i>: <i>bundle-type-slot/mda.bundle-num</i> bundle keyword <i>bundle-num</i>: 1 to 32 <i>type</i> ima, ppp</p> <p><i>seconds</i> — configures the interval for each display in seconds</p> <p style="padding-left: 40px;">Values 3 to 60 Default 10</p> <p><i>repeat</i> — configures how many times the command is repeated</p> <p style="padding-left: 40px;">Values 1 to 999 Default 10</p> <p>absolute — when the absolute keyword is specified, the raw statistics are displayed without processing. No calculations are performed on the delta or rate statistics.</p> <p>rate — when the rate keyword is specified, the rate per second for each statistic is displayed instead of the delta</p> <p>multiclass — displays statistics for multi-class MLPPP bundles</p>
Output	The following outputs are examples of port monitoring information.

Output Example

```

*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]]* or *slot/mda/port[.channel]*
bundle-id: *bundle-type-slot/mda.bundle-num*
bundle keyword
bundle-num: 1 to 32
type ima, ppp

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 — 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.

Output Example

```
*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#
```

3.14.2.2.2 Fabric Profile Statistics Monitor Commands

fabric-profile

Syntax	fabric-profile mda { <i>mda-id</i> with-stats-enabled } { dest-mda source-mda } [interval <i>seconds</i>] [repeat <i>repeat</i>] [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	<p><i>mda-id</i> — the slot number of the adapter card</p> <p>with-stats-enabled — if used, this keyword replaces the <i>mda-id</i> 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.</p> <p>dest-mda — displays network and access ingress statistics for all adapter cards going towards the fabric and destined for the specific destination adapter card. The following are also displayed: global fabric statistics, fabric firewall statistics, and 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.</p> <p>source-mda — displays network and access ingress traffic statistics from the specified adapter card going towards the fabric and towards a destination adapter card. Fabric firewall statistics and the sum of traffic forwarded or dropped are also displayed.</p> <p><i>seconds</i> — configures the interval for each display in seconds</p> <p>Values 3 to 60</p> <p>Default 10</p> <p><i>repeat</i> — configures how many times the command is repeated</p> <p>Values 1 to 999</p> <p>Default 10</p> <p>absolute — displays the raw statistics without processing. No calculations are performed on the delta or rate statistics.</p> <p>rate — displays the rate per second for each statistic instead of the delta</p>

3.14.2.2.3 SCADA Monitor Commands

scada

Syntax	scada <i>scada-id</i> [<i>scada-id</i> ...(up to 5 total)] [interval <i>seconds</i>] [repeat <i>repeat</i>] [absolute rate]
Context	monitor
Description	<p>This command enables traffic monitoring for a SCADA bridge or branch. The statistical information for the specified bridge or branch is shown at the configured interval until the configured count is reached.</p> <p>The first screen displays the current statistics related to the specified bridge or branch. The subsequent statistical information listed for each interval is displayed as a delta to the previous screen.</p> <p>When the keyword rate is specified, the “rate per second” for each statistic is displayed instead of the delta.</p> <p>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.</p>
Parameters	<p><i>scada-id</i> — specifies a <i>bridge-id</i> or a <i>branch-id</i>. For a <i>bridge-id</i>, the format is <i>slot/mda/bridge-id</i>, where <i>bridge-id</i> is 1 to 16. For a <i>branch-id</i>, the format is <i>slot/mda/bridge-id.branch-id</i>, where <i>bridge-id</i> is 1 to 16 and <i>branch-id</i> is 1 to 32. Up to five <i>scada-ids</i> can be specified.</p> <p><i>seconds</i> — configures the interval for each display in seconds</p> <p>Values 3 to 60</p> <p>Default 10</p> <p><i>repeat</i> — configures how many times the command is repeated</p> <p>Values 1 to 999</p> <p>Default 10</p> <p>absolute — when the absolute keyword is specified, the raw statistics are displayed without processing. No calculations are performed on the delta or rate statistics.</p> <p>rate — when the rate keyword is specified, the rate per second for each statistic is displayed instead of the delta; the default mode is delta</p>

3.14.2.3 Clear Commands

external-alarms

Syntax	external-alarms alarm [all <i>alarm-id</i>]
Context	clear
Description	This command clears remote site external alarm information.
Parameters	all — clears the status for all alarms <i>alarm-id</i> — clears the status for a specific alarm
Values	1 to 2147483647

lag

Syntax	lag <i>lag-id</i> statistics
Context	clear
Description	This command clears statistics for the specified LAG.
Parameters	<i>lag-id</i> — the LAG identifier, expressed as a decimal integer
Values	1 to 32
	statistics — specifies that statistics are cleared for the specified LAG

mda

Syntax	mda <i>mda-id</i> mda <i>mda-id</i> statistics { source-mda destination-mda fabric-port fabric-global fabric-firewall all } mda <i>mda-id</i> ring { all mac <i>ieee-address</i> port <i>port-id</i> } mda <i>mda-id</i> statistics ip-transport mda <i>mda-id</i> statistics security [encryption firewall] mda <i>mda-id</i> statistics mirror mda <i>mda-id</i> statistics cflowd mda 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 card. The **clear mda statistics** form of this command clears all the collected fabric statistics related to the specified adapter card. The **clear mda ring** form of this command clears the dynamic FDB entries related to the specified ring adapter card.
- The **clear mda all** form of this command applies only to the 7705 SAR-A, 7705 SAR-Ax, 7705 SAR-M, 7705 SAR-H, 7705 SAR-Hc, 7705 SAR-W, and 7705 SAR-Wx and is equivalent to clearing all adapter cards using all keywords above (**source-mda**, **destination-mda**, **fabric-port**, and **fabric-global**)
- 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
 - fabric-firewall** — clears fabric firewall statistics collected for all egress traffic from the fabric
 - security** — clears only security statistics for the specified adapter card
 - encryption** — specifies that encryption statistics will be cleared for the specified adapter card
 - firewall** — specifies that firewall statistics will be cleared for the specified adapter card
 - ip-transport** — specifies that IP transport statistics will be cleared for the specified adapter card
 - mirror** — specifies that mirror statistics will be cleared for the specified adapter card
 - cflowd** — clears Cflowd queue statistics on the 7705 SAR-8 Shelf V2, 7705 SAR-18, or 7705 SAR-X
 - mda-id 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**).
 - ring all** — clears the entire dynamic FDB
 - ieee-address* — clears the dynamic FDB entry for the specified MAC address
 - port-id* — clears the dynamic FDB entries for the specified port
 - all** — clears all the collected fabric statistics across all adapter cards or modules

mw

Syntax	mw
Context	clear
Description	This command enables the context to clear microwave link parameters.

link

Syntax	link <i>mw-link-id</i> statistics
Context	clear mw
Description	This command clears microwave link statistics.
Parameters	<i>mw-link-id</i> — specifies the microwave link ID number, using the form mw-link-id
Values	<i>id</i> = 1 to 24

radio

Syntax	radio <i>port-id</i> radio <i>radio</i> perfmon [all g826 acm power]
Context	clear mw
Description	This command reboots managed microwave devices or resets their performance monitoring statistics.



Note: This command will bring down the microwave link; traffic will not pass over it while the radio is rebooting.

Parameters	<i>port-id</i> — specifies the physical port ID associated with the MPR-e radio, in the format <i>slot/mda/port</i> (where <i>port</i> = 1 through 4)
	<i>radio</i> — specifies the MWA performance monitoring radio
	acm — resets the Adaptive Coding and Modulation level MWA performance monitoring statistics to 0
	all — resets all MWA performance monitoring statistics to 0
	g826 — resets the G.286 MWA performance monitoring statistics to 0
	power — resets the radio power MWA performance monitoring statistics to 0

rsl-history

Syntax	rsl-history <i>port-id</i>
Context	clear mw
Description	This command clears the RSL history for the specified MPR-e radio.
Parameters	<i>port-id</i> — specifies the physical port ID associated with the MPR-e radio, in the format <i>slot/mda/port</i> (where <i>port</i> = 1 through 4)

port

Syntax	port <i>port-id</i> statistics port <i>port-id</i> atm pvc [<i>vpi</i> [<i>vci</i>]] statistics port <i>port-id</i> atm pvp [<i>vpi</i>] statistics port <i>port-id</i> frame-relay dlci <i>dlci</i>
Context	clear
Description	This command clears the statistics for the specified port or channel group.
Parameters	<i>port-id</i> — specifies the physical port ID

Syntax *port-id* *slot* [*mda* [*port*]] or *slot* *mda* *port* [*channel*]
bundle-id *bundle-type* *slot* *mda* *bundle-num*
bundle keyword
bundle-num: 1 to 32
type ima, ppp

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

frame-relay dlci — clears circuit-level frame relay statistics

dlci — specifies the frame relay virtual circuit identifier

The **clear port** *port-id* **statistics frame-relay dlci** *dlci* command differs from the **clear port** *port-id* **statistics** command in the sense that the former clears the circuit-level SAP statistics whereas the latter clears the frame-relay port statistics.

scada

Syntax	scada <i>bridge-id</i> statistics
Context	clear
Description	This command clears the statistics for all or specified bridges or branches.
Parameters	<i>bridge-id</i> — specifies the bridge ID or branch ID (the bridge ID is in the format <i>slot/mda/bridge-id</i> , where <i>bridge-id</i> is 1 to 16; the branch ID is in the format <i>slot/mda/bridge-id.branch-id</i> , where <i>branch-id</i> is 1 to 32) statistics — specifies that bridge or branch statistics will be cleared

3.14.2.4 Debug Commands

lag

Syntax	<pre>lag [lag-id lag-id [port port-id]] [all] lag [lag-id lag-id [port port-id]] [sm] [pkt] [cfg] [red] [iom-upd] [port-state] [timers] [sel-logic] [mc] [mc-pkt] no lag [lag-id lag-id]</pre>
Context	debug
Description	<p>This command enables debugging for a LAG.</p> <p>The no form of the command disables debugging for a LAG.</p>
Parameters	<p><i>lag-id</i> — specifies the LAG identifier, expressed as a decimal integer</p> <p style="padding-left: 2em;">Values 1 to 32</p> <p><i>port-id</i> — specifies the physical port ID in the <i>slot/mda/port</i> format</p> <p>all — traces all LAG and LACP parameters</p> <p>sm — traces the LACP state machine</p> <p>pkt — traces LACP packets</p> <p>cfg — traces the LAG configuration</p> <p>red — traces LAG high availability</p> <p>iom-upd — traces LAG IOM updates</p> <p>port-state — traces LAG port state transitions</p> <p>timers — traces LAG timers</p> <p>sel-logic — traces LACP selection logic</p> <p>mc — traces multi-chassis parameters</p> <p>mc-pkt — traces received MC-LAG control packets with valid authentication</p>

4 List of Acronyms

Table 126 Acronyms

Acronym	Expansion
2G	second-generation wireless telephone technology
3DES	triple DES (data encryption standard)
3G	third-generation mobile telephone technology
6VPE	IPv6 on Virtual Private Edge Router
7705 SAR	7705 Service Aggregation Router
7750 SR	7750 Service Router
8 PSK	eight phase shift keying
16 QAM	16-state quadrature amplitude modulation
32 QAM	32-state quadrature amplitude modulation
64 QAM	64-state quadrature amplitude modulation
128 QAM	128-state quadrature amplitude modulation
256 QAM	256-state quadrature amplitude modulation
ABR	area border router available bit rate
AC	alternating current attachment circuit
ACK	acknowledge
ACL	access control list
ACR	adaptive clock recovery
AD	auto-discovery
ADM	add/drop multiplexer
ADP	automatic discovery protocol
AES	advanced encryption standard
AFI	authority and format identifier
AIGP	accumulated IGP
AIS	alarm indication signal

Table 126 Acronyms (Continued)

Acronym	Expansion
ALG	application level gateway
ANSI	American National Standards Institute
Apipe	ATM VLL
APS	automatic protection switching
ARP	address resolution protocol
A/S	active/standby
AS	autonomous system
ASAP	any service, any port
ASBR	autonomous system boundary router
ASM	any-source multicast autonomous system message
ASN	autonomous system number
ATM	asynchronous transfer mode
ATM PVC	ATM permanent virtual circuit
AU	administrative unit
AUG	administrative unit group
B3ZS	bipolar with three-zero substitution
Batt A	battery A
B-bit	beginning bit (first packet of a fragment)
BBE	background block errors
Bc	committed burst size
Be	excess burst size
BECN	backward explicit congestion notification
Bellcore	Bell Communications Research
BFD	bidirectional forwarding detection
BGP	border gateway protocol
BGP-LS	border gateway protocol link state
BGP-LU	border gateway protocol labeled unicast

Table 126 Acronyms (Continued)

Acronym	Expansion
BITS	building integrated timing supply
BMCA	best master clock algorithm
BMU	<p>broadcast, multicast, and unknown traffic</p> <p>Traffic that is not unicast. Any nature of multipoint traffic:</p> <ul style="list-style-type: none"> • 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)
BNM	bandwidth notification message
BOF	boot options file
BoS	bottom of stack
BPDU	bridge protocol data unit
BRAS	Broadband Remote Access Server
BSC	Base Station Controller
BSM	bootstrap message
BSR	bootstrap router
BSTA	Broadband Service Termination Architecture
BTS	base transceiver station
CA	certificate authority
CAS	channel associated signaling
CBN	common bonding networks
CBS	committed buffer space
CC	<p>continuity check</p> <p>control channel</p>
CCM	continuity check message
CCTV	closed-circuit television

Table 126 Acronyms (Continued)

Acronym	Expansion
CE	circuit emulation customer edge
CEM	circuit emulation
CES	circuit emulation services
CESoPSN	circuit emulation services over packet switched network
CFM	connectivity fault management
cHDLC	Cisco high-level data link control protocol
CIDR	classless inter-domain routing
CIR	committed information rate
CLI	command line interface
CLP	cell loss priority
CMP	certificate management protocol
C-multicast	customer multicast
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.
CPROTO	C prototype
CPU	central processing unit
C/R	command/response
CRC	cyclic redundancy check
CRC-32	32-bit cyclic redundancy check
CRL	certificate revocation list
CRON	a time-based scheduling service (from chronos = time)
CRP	candidate RP
CSM	Control and Switching Module

Table 126 Acronyms (Continued)

Acronym	Expansion
CSNP	complete sequence number PDU
CSPF	constrained shortest path first
C-TAG	customer VLAN tag
CV	connection verification customer VLAN (tag)
CW	control word
CWDM	coarse wavelength-division multiplexing
DA/FAN	distribution automation and field area network
DC	direct current
DC-C	DC return - common
DCE	data communications equipment
DC-I	DC return - isolated
DCO	digitally controlled oscillator
DCR	differential clock recovery
DDoS	distributed DoS
DE	discard eligibility
DER	distinguished encoding rules
DES	data encryption standard
DF	do not fragment designated forwarder
DH	Diffie-Hellman
DHB	decimal, hexadecimal, or binary
DHCP	dynamic host configuration protocol
DHCPv6	dynamic host configuration protocol for IPv6
DIS	designated intermediate system
DLCI	data link connection identifier
DLCMI	data link connection management interface
DM	delay measurement

Table 126 Acronyms (Continued)

Acronym	Expansion
DNS	domain name server
DNU	do not use
DoS	denial of service
dot1p	IEEE 802.1p bits, in Ethernet or VLAN ingress packet headers, used to map traffic to up to eight forwarding classes
dot1q	IEEE 802.1q encapsulation for Ethernet interfaces
DPD	dead peer detection
DPI	deep packet inspection
DPLL	digital phase locked loop
DR	designated router
DSA	digital signal algorithm
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
DUS	do not use for synchronization
DV	delay variation
DVMRP	distance vector multicast routing protocol
e911	enhanced 911 service
EAP	Extensible Authentication Protocol
EAPOL	EAP over LAN
E-bit	ending bit (last packet of a fragment)
E-BSR	elected BSR
ECMP	equal cost multipath
EE	end entity
EFM	Ethernet in the first mile

Table 126 Acronyms (Continued)

Acronym	Expansion
EGP	exterior gateway protocol
EIA/TIA-232	Electronic Industries Alliance/Telecommunications Industry Association Standard 232 (also known as RS-232)
EIR	excess information rate
EJBCA	Enterprise Java Bean Certificate Authority
E-LAN	Ethernet local area network
E-Line	Ethernet virtual private line
EL	entropy label
eLER	egress label edge router
ELI	entropy label indicator
E&M	ear and mouth earth and magneto exchange and multiplexer
eMBMS	evolved MBMS
EOP	end of packet
EPC	evolved packet core
EPD	early packet discard
Epipes	Ethernet VLL
EPL	Ethernet private line
EPON	Ethernet Passive Optical Network
EPS	equipment protection switching
ERO	explicit route object
ES	Ethernet segment errored seconds
ESD	electrostatic discharge
ESI	Ethernet segment identifier
ESMC	Ethernet synchronization message channel
ESN	extended sequence number
ESP	encapsulating security payload

Table 126 Acronyms (Continued)

Acronym	Expansion
ESPI	encapsulating security payload identifier
ETE	end-to-end
ETH-BN	Ethernet bandwidth notification
ETH-CFM	Ethernet connectivity fault management (IEEE 802.1ag)
EVC	Ethernet virtual connection
EVDO	evolution - data optimized
EVI	EVPN instance
EVPL	Ethernet virtual private link
EVPN	Ethernet virtual private network
EXP bits	experimental bits (currently known as TC)
FC	forwarding class
FCS	frame check sequence
FD	frequency diversity
FDB	forwarding database
FDL	facilities data link
FEAC	far-end alarm and control
FEC	forwarding equivalence class
FECN	forward explicit congestion notification
FeGW	far-end gateway
FEP	front-end processor
FF	fixed filter
FFD	fast fault detection
FIB	forwarding information base
FIFO	first in, first out
FIPS-140-2	Federal Information Processing Standard publication 140-2
FNG	fault notification generator
FOM	figure of merit

Table 126 Acronyms (Continued)

Acronym	Expansion
Fpipe	frame relay VLL
FQDN	fully qualified domain name
FR	frame relay
FRG bit	fragmentation bit
FRR	fast reroute
FTN	FEC-to-NHLFE
FTP	file transfer protocol
FXO	foreign exchange office
FXS	foreign exchange subscriber
GFP	generic framing procedure
GigE	Gigabit Ethernet
GLONASS	Global Navigation Satellite System (Russia)
GNSS	global navigation satellite system (generic)
GPON	Gigabit Passive Optical Network
GPRS	general packet radio service
GPS	Global Positioning System
GRE	generic routing encapsulation
GRT	global routing table
GSM	Global System for Mobile Communications (2G)
GTP-U	GPRS tunneling protocol user plane
GW	gateway
HA	high availability
HCM	high capacity multiplexing
HDB3	high density bipolar of order 3
HDLC	high-level data link control protocol
HEC	header error control
HMAC	hash message authentication code

Table 126 Acronyms (Continued)

Acronym	Expansion
Hpipe	HDLC VLL
H-QoS	hierarchical quality of service
HSB	hot standby
HSDPA	high-speed downlink packet access
HSPA	high-speed packet access
H-VPLS	hierarchical virtual private line service
IANA	internet assigned numbers authority
IBN	isolated bonding networks
ICB	inter-chassis backup
ICMP	Internet control message protocol
ICMPv6	Internet control message protocol for IPv6
ICP	IMA control protocol cells
IDS	intrusion detection system
IDU	indoor unit
IED	intelligent end device
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
IGMP	Internet group management protocol
IGP	interior gateway protocol
IID	instance ID
IKE	Internet key exchange
iLER	ingress label edge router
ILM	incoming label map
IMA	inverse multiplexing over ATM
IMET-IR	inclusive multicast Ethernet tag—ingress replication

Table 126 Acronyms (Continued)

Acronym	Expansion
INVARP	inverse address resolution protocol
IOM	input/output module
IP	Internet Protocol
IPCP	Internet Protocol Control Protocol
IPIP	IP in IP
Ipipe	IP interworking VLL
I-PMSI	inclusive PMSI
IPoATM	IP over ATM
IPS	intrusion prevention system
IPSec	Internet Protocol security
IR	ingress replication
IRB	integrated routing and bridging
ISA	integrated services adapter
ISAKMP	Internet security association and key management protocol
IS-IS	Intermediate System-to-Intermediate System
IS-IS-TE	IS-IS-traffic engineering (extensions)
ISO	International Organization for Standardization
IW	interworking
JP	join prune
KG	key group
LB	loopback
lbf-in	pound force inch
LBM	loopback message
LBO	line buildout
LBR	loopback reply
LCP	link control protocol
LDP	label distribution protocol

Table 126 Acronyms (Continued)

Acronym	Expansion
LER	label edge router
LFA	loop-free alternate
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
LMI	local management interface
LOS	line-of-sight loss of signal
LSA	link-state advertisement
LSDB	link-state database
LSP	label switched path link-state PDU (for IS-IS)
LSPA	LSP attributes
LSR	label switch router link-state request
LSU	link-state update
LT	linktrace
LTE	long term evolution line termination equipment
LTM	linktrace message
LTN	LSP ID to NHLFE
LTR	link trace reply
MA	maintenance association
MAC	media access control
MA-ID	maintenance association identifier

Table 126 Acronyms (Continued)

Acronym	Expansion
MBB	make-before-break
MBGP	multicast BGP multiprotocol BGP multiprotocol extensions for BGP
MBMS	multimedia broadcast multicast service
MBS	maximum buffer space maximum burst size media buffer space
MBSP	mobile backhaul service provider
MCAC	multicast connection admission control
MC-APS	multi-chassis automatic protection switching
MC-MLPPP	multi-class multilink point-to-point protocol
MCS	multicast server multi-chassis synchronization
MCT	MPT craft terminal
MD	maintenance domain
MD5	message digest version 5 (algorithm)
MDA	media dependent adapter
MDDDB	multidrop data bridge
MDL	maintenance data link
MDT	multicast distribution tree
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

Table 126 Acronyms (Continued)

Acronym	Expansion
MHD	multi-homed device
MHF	MIP half function
MHN	multi-homed network
MIB	management information base
MI-IS-IS	multi-instance IS-IS
MIR	minimum information rate
MLD	multicast listener discovery
mLDP	multicast LDP
MLPPP	multilink point-to-point protocol
mLSP	multicast LSP
MoFRR	multicast-only fast reroute
MP	merge point multilink protocol multipoint
MP-BGP	multiprotocol border gateway protocol
MPLS	multiprotocol label switching
MPLSCP	multiprotocol label switching control protocol
MPP	MPT protection protocol
MPR	see Wavence
MPR-e	Microwave Packet Radio (standalone mode)
MPT-HC V2/9558HC	Microwave Packet Transport, High Capacity version 2
MPT-HLC	Microwave Packet Transport, High-Capacity Long-Haul Cubic (ANSI)
MPT-HQAM	Microwave Packet Transport, High Capacity (MPT-HC-QAM) or Extended Power (MPT-XP-QAM) with 512/1024 QAM
MPT-MC	Microwave Packet Transport, Medium Capacity
MPT-XP	Microwave Packet Transport, High Capacity (very high power version of MPT-HC V2/9558HC)
MRAI	minimum route advertisement interval

Table 126 Acronyms (Continued)

Acronym	Expansion
MRRU	maximum received reconstructed unit
MRU	maximum receive unit
MSDP	Multicast Source Discovery Protocol
MSDU	MAC Service Data Unit
MSO	multi-system operator
MS-PW	multi-segment pseudowire
MSS	maximum segment size Microwave Service Switch
MTIE	maximum time interval error
MTSO	mobile trunk switching office
MTU	maximum transmission unit multi-tenant unit
M-VPLS	management virtual private line service
MVPN	multicast VPN
MVR	multicast VPLS registration
MW	microwave
MWA	microwave awareness
N·m	newton meter
NAT	network address translation
NAT-T	network address translation traversal
NBMA	non-broadcast multiple access (network)
ND	neighbor discovery
NE	network element
NET	network entity title
NFM-P	Network Functions Manager - Packet (formerly 5620 SAM)
NGE	network group encryption
NG-MVPN	next generation MVPN
NH	next hop

Table 126 Acronyms (Continued)

Acronym	Expansion
NHLFE	next hop label forwarding entry
NHOP	next-hop
NLOS	non-line-of-sight
NLPID	network level protocol identifier
NLRI	network layer reachability information
NNHOP	next next-hop
NNI	network-to-network interface
Node B	similar to BTS but used in 3G networks — term is used in UMTS (3G systems) while BTS is used in GSM (2G systems)
NOC	network operations center
NPAT	network port address translation
NRC-F	Network Resource Controller - Flow
NRC-P	Network Resource Controller - Packet
NRC-T	Network Resource Controller - Transport
NRC-X	Network Resource Controller - Cross Domain
NSAP	network service access point
NSD	Network Services Director
NSP	native service processing Network Services Platform
NSSA	not-so-stubby area
NTP	network time protocol
NTR	network timing reference
OADM	optical add/drop multiplexer
OAM	operations, administration, and maintenance
OAMPDU	OAM protocol data units
OC3	optical carrier level 3
OCSP	online certificate status protocol
ODU	outdoor unit

Table 126 Acronyms (Continued)

Acronym	Expansion
OIF	outgoing interface
OLT	optical line termination
OMC	optical management console
ONT	optical network terminal
OOB	out-of-band
OPX	off premises extension
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
OWAMP	one-way active measurement protocol
P2MP	point to multipoint
PADI	PPPoE active discovery initiation
PADR	PPPoE active discovery request
PAE	port authentication entities
PSB	path state block
PBO	packet byte offset
PBR	policy-based routing
PBX	private branch exchange
PCAP	packet capture
PCC	Path Computation Element Client
PCE	Path Computation Element

Table 126 Acronyms (Continued)

Acronym	Expansion
PCEP	Path Computation Element Protocol
PCM	pulse code modulation
PCP	priority code point
PCR	proprietary clock recovery
PDU	power distribution unit protocol data units
PDV	packet delay variation
PDVT	packet delay variation tolerance
PE	provider edge router
PEAPv0	protected extensible authentication protocol version 0
PEM	privacy enhanced mail
PFoE	power feed over Ethernet
PFS	perfect forward secrecy
PHB	per-hop behavior
PHP	penultimate hop popping
PHY	physical layer
PIC	prefix independent convergence
PID	protocol ID
PIM SSM	protocol independent multicast—source-specific multicast
PIR	peak information rate
PKCS	public key cryptography standards
PKI	public key infrastructure
PLAR	private line automatic ringdown
PLCP	Physical Layer Convergence Protocol
PLR	point of local repair
PLSP	path LSP
PMSI	P-multicast service interface
P-multicast	provider multicast

Table 126 Acronyms (Continued)

Acronym	Expansion
PoE	power over Ethernet
PoE+	power over Ethernet plus
POH	path overhead
POI	purge originator identification
PoP	point of presence
POS	packet over SONET
PPP	point-to-point protocol
PPPoE	point-to-point protocol over Ethernet
PPS	pulses per second
PRC	primary reference clock
PRS	primary reference source
PRTC	primary reference time clock
PSE	power sourcing equipment
PSK	pre-shared key
PSN	packet switched network
PSNP	partial sequence number PDU
PTA	PMSI tunnel attribute
PTM	packet transfer mode
PTP	performance transparency protocol precision time protocol
PuTTY	an open-source terminal emulator, serial console, and network file transfer application
PVC	permanent virtual circuit
PVCC	permanent virtual channel connection
PW	pseudowire
PWE	pseudowire emulation
PWE3	pseudowire emulation edge-to-edge
Q.922	ITU-T Q-series Specification 922

Table 126 Acronyms (Continued)

Acronym	Expansion
QL	quality level
QoS	quality of service
QPSK	quadrature phase shift keying
RADIUS	Remote Authentication Dial In User Service
RAN	Radio Access Network
RBS	robbed bit signaling
RD	route distinguisher
RDI	remote defect indication
RED	random early discard
RESV	reservation
RIB	routing information base
RIP	routing information protocol
RJ-45	registered jack 45
RMON	remote network monitoring
RNC	Radio Network Controller
RP	rendezvous point
RPF RTM	reverse path forwarding RTM
RPS	radio protection switching
RPT	rendezvous-point tree
RR	route reflector
RRO	record route object
RS-232	Recommended Standard 232 (also known as EIA/TIA-232)
RSA	Rivest, Shamir, and Adleman (authors of the RSA encryption algorithm)
RSHG	residential split horizon group
RSTP	rapid spanning tree protocol
RSVP-TE	resource reservation protocol - traffic engineering
RT	receive/transmit

Table 126 Acronyms (Continued)

Acronym	Expansion
RTC	route target constraint
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
r-VPLS	routed virtual private LAN service
SA	security association source-active
SAA	service assurance agent
SAFI	subsequent address family identifier
SAP	service access point
SAToP	structure-agnostic TDM over packet
SCADA	surveillance, control and data acquisition
SC-APS	single-chassis automatic protection switching
SCP	secure copy
SCTP	Stream Control Transmission Protocol
SD	signal degrade space diversity
SDH	synchronous digital hierarchy
SDI	serial data interface
SDN	software defined network
SDP	service destination point
SE	shared explicit
SeGW	secure gateway
SES	severely errored seconds
SETS	synchronous equipment timing source

Table 126 Acronyms (Continued)

Acronym	Expansion
SF	signal fail
SFP	small form-factor pluggable (transceiver)
SFTP	SSH file transfer protocol
(S,G)	(source, group)
SGT	self-generated traffic
SHA-1	secure hash algorithm
SHG	split horizon group
SIR	sustained information rate
SLA	Service Level Agreement
SLARP	serial line address resolution protocol
SLID	subscriber location identifier of a GPON module
SLM	synthetic loss measurement
SNMP	Simple Network Management Protocol
SNPA	subnetwork point of attachment
SNR	signal to noise ratio
SNTP	simple network time protocol
SONET	synchronous optical networking
S-PE	switching provider edge router
SPF	shortest path first
SPI	security parameter index
S-PMSI	selective PMSI
SPT	shortest path tree
SR	service router (7750 SR) segment routing
SRLG	shared risk link group
SRP	stateful request parameter
SRRP	subscriber routed redundancy protocol
SR-ISIS	segment routing IS-IS

Table 126 Acronyms (Continued)

Acronym	Expansion
SR-OSPF	segment routing OSPF
SR-TE	segment routing traffic engineering
SSH	secure shell
SSM	source-specific multicast synchronization status messaging
SSU	system synchronization unit
S-TAG	service VLAN tag
STM	synchronous transport module
STM1	synchronous transport module, level 1
STP	spanning tree protocol
STS	synchronous transport signal
SVC	switched virtual circuit
SVEC	synchronization vector
SYN	synchronize
TACACS+	Terminal Access Controller Access-Control System Plus
TC	traffic class (formerly known as EXP bits)
TCP	transmission control protocol
TDA	transmit diversity antenna
TDEV	time deviation
TDM	time division multiplexing
TE	traffic engineering
TEDB	traffic engineering database
TEID	tunnel endpoint identifier
TEP	tunnel endpoint
TFTP	trivial file transfer protocol
T-LDP	targeted LDP
TLS	transport layer security
TLV	type length value

Table 126 Acronyms (Continued)

Acronym	Expansion
TM	traffic management
ToD	time of day
ToS	type of service
T-PE	terminating provider edge router
TPID	tag protocol identifier
TPIF	IEEE C37.94 teleprotection interface
TPMR	two-port MAC relay
TPS	transmission protection switching
TSoP	Transparent SDH/SONET over Packet
TTL	time to live
TTLS	tunneled transport layer security
TTM	tunnel table manager
TU	tributary unit
TUG	tributary unit group
TWAMP	two-way active measurement protocol
U-APS	unidirectional automatic protection switching
UAS	unavailable seconds
UBR	unspecified bit rate
UDP	user datagram protocol
UFD	unidirectional forwarding detection
UMH	upstream multicast hop
UMTS	Universal Mobile Telecommunications System (3G)
UNI	user-to-network interface
uRPF	unicast reverse path forwarding
V.11	ITU-T V-series Recommendation 11
V.24	ITU-T V-series Recommendation 24
V.35	ITU-T V-series Recommendation 35

Table 126 Acronyms (Continued)

Acronym	Expansion
VC	virtual circuit
VCB	voice conference bridge
VCC	virtual channel connection
VCCV	virtual circuit connectivity verification
VCI	virtual circuit identifier
VID	VLAN ID
VLAN	virtual LAN
VLL	virtual leased line
VM	virtual machine
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
VRRP	virtual router redundancy protocol
VSE	vendor-specific extension
VSI	virtual switch instance
VSO	vendor-specific option
VT	virtual trunk virtual tributary
VTG	virtual tributary group
Wavence	formerly 9500 MPR (Microwave Packet Radio)
WCDMA	wideband code division multiple access (transmission protocol used in UMTS networks)

Table 126 Acronyms (Continued)

Acronym	Expansion
WRED	weighted random early discard
WTR	wait to restore
X.21	ITU-T X-series Recommendation 21
XOR	exclusive-OR
XRO	exclude route object

5 Standards and Protocol Support

This chapter lists the 7705 SAR compliance with EMC, environmental, and safety standards, telecom standards, and supported protocols:

- [EMC Industrial Standards Compliance](#)
- [EMC Regulatory and Customer Standards Compliance](#)
- [Environmental Standards Compliance](#)
- [Safety Standards Compliance](#)
- [Telecom Interface Compliance](#)
- [Directives, Regional Approvals and Certifications Compliance](#)
- [Security Standards](#)
- [Telecom Standards](#)
- [Protocol Support](#)
- [Proprietary MIBs](#)

Table 127 EMC Industrial Standards Compliance

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
IEEE 1613:2009 + A1:2011	IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Electric Power Substations	✓ ¹		✓ ³		✓ ²	✓ ¹	✓ ³	✓ ³		
IEEE 1613.1-2013	IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Transmission and Distribution Facilities	✓ ⁴		✓ ⁷		✓ ⁵	✓ ⁶	✓ ⁷	✓ ⁷		
IEEE Std C37.90	IEEE Standard for relays and relay systems associated with Electric Power Apparatus	✓		✓		✓	✓	✓	✓		
IEEE Std C37.90.1	Surge Withstand Capability (SWC) Tests	✓		✓		✓	✓	✓	✓		
IEEE Std C37.90.2	Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers	✓		✓		✓	✓	✓	✓		
IEEE Std C37.90.3	IEEE Standard Electrostatic Discharge Tests for Protective Relays	✓		✓		✓	✓	✓	✓		
EN 50121-4	Electromagnetic Compatibility – Part 4: Emission and Immunity of the Signalling and Telecommunications Apparatus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 62236-4	Electromagnetic Compatibility – Part 4: Emission and Immunity of the Signalling and Telecommunications Apparatus	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-6-2	Generic standards – Immunity for industrial environments	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-6-4	Generic standards – Emissions standard for industrial environments	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-6-5	Generic standards – immunity for equipment used in power station and substation environment	✓		✓		✓	✓	✓	✓		
IEC 61850-3	Communication networks and systems for power utility automation - Part 3: General requirements	✓		✓		✓	✓ ⁸	✓	✓		
IEC/AS 60870.2.1	Telecontrol equipment and systems. Operating conditions. Power supply and electromagnetic compatibility	✓		✓		✓	✓	✓	✓		

Notes:

1. Performance Class 1
2. Performance Class 1 (Class 2 with Optics interfaces only)
3. Performance Class 2
4. Zone A; Performance Class 1
5. Zone A; Performance Class 1 (Class 2 with Optics interfaces only)
6. Zone B; Performance Class 1
7. Zone A; Performance Class 2
8. With the exception of DC surges

Table 128 EMC Regulatory and Customer Standards Compliance

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
IEC 61000-4-2	Electrostatic discharge immunity test	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-4-3	Radiated electromagnetic field immunity test	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-4-4	Electrical fast transient/burst immunity test	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-4-5	Surge immunity test	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-4-6	Immunity to conducted disturbances	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-4-8	Power frequency magnetic field immunity test	✓		✓		✓	✓	✓	✓		
IEC 61000-4-9	Pulse Magnetic field immunity test	✓		✓		✓	✓	✓	✓		
IEC 61000-4-10	Damped Oscillatory Magnetic Field	✓		✓		✓	✓	✓	✓		
IEC 61000-4-11	Voltage dips, short interruptions and voltage variations immunity tests	✓	✓ ¹	✓ ¹	✓ ¹	✓ ¹	✓ ¹	✓	✓ ¹	✓	✓
IEC 61000-4-12	Oscillatory wave immunity test	✓		✓		✓	✓	✓	✓		
IEC 61000-4-16	Conducted immunity 0 Hz - 150 kHz	✓		✓		✓	✓	✓	✓		
IEC 61000-4-17	Ripple on d.c. input power port immunity test	✓		✓		✓	✓	✓	✓		
IEC 61000-4-18	Damped oscillatory wave immunity test	✓		✓		✓	✓	✓	✓		
IEC 61000-4-29	Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests	✓		✓		✓	✓	✓	✓		
IEC 61000-3-2	Limits for harmonic current emissions (equipment input current <16A per phase)	✓	✓ ¹	✓ ¹	✓ ¹	✓ ¹	✓ ¹	✓	✓ ¹	✓	✓

Table 128 EMC Regulatory and Customer Standards Compliance (Continued)

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
IEC 61000-3-3	Limits for voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current <16A	✓	✓ ¹	✓ ¹	✓ ¹	✓ ¹	✓ ¹	✓	✓ ¹	✓	✓
ITU-T K.20 (DC Ports)	Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents	✓	✓	✓	✓	✓	✓	✓	✓		
ITU-T K.44	Resistibility tests for telecommunication equipment exposed to overvoltages and overcurrents - Basic Recommendation									✓	✓
ETSI 300 132-2	Power supply interface at the input to telecommunications and datacom (ICT) equipment; Part 2: Operated by -48 V direct current (dc)	✓	✓	✓	✓	✓	✓	✓	✓	✓	
ETSI 300 132-3	Power supply interface at the input to telecommunications equipment; Part 3: Operated by rectified current source, alternating current source or direct current source up to 400V	✓	✓ ¹	✓ ¹	✓ ¹			✓	✓ ¹	✓	✓
EN 300 386	Telecommunication network equipment; ElectroMagnetic Compatibility (EMC)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ES 201 468	Electromagnetic compatibility and Radio spectrum Matters (ERM); Additional ElectroMagnetic Compatibility (EMC) requirements and resistibility requirements for telecommunications equipment for enhanced availability of service in specific applications	✓		✓	✓	✓	✓				✓
EN 55024	Information technology equipment - Immunity characteristics - Limits and methods of measurements	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Telcordia GR-1089-CORE	EMC and Electrical Safety - Generic Criteria for Network Telecommunications Equipment	✓	✓	✓	✓	✓	✓	✓	✓		
AS/NZS CISPR 32	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ³	✓ ³
FCC Part 15, Subpart B	Radio Frequency devices- Unintentional Radiators (Radiated & Conducted Emissions)	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ³	✓ ³

Table 128 EMC Regulatory and Customer Standards Compliance (Continued)

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
ICES-003	Information Technology Equipment (ITE) — Limits and methods of measurement	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ³	✓ ³
EN 55032	Electromagnetic compatibility of multimedia equipment – Emission requirements	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²
CISPR 32	Electromagnetic compatibility of multimedia equipment – Emission requirements	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²	✓ ²
GS7 EMC	Electromagnetic Standard Compatibility (BT standard)	✓		✓	✓	✓	✓	✓			✓
KC Notice Emission (KN32) and Immunity (KN35) (South Korea)	EMS standard: NRRRA notice	✓	✓	✓	✓	✓	✓	✓	✓		

Notes:

1. With external AC/DC power supply
2. Class A
3. Class B

Table 129 Environmental Standards Compliance

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
IEEE 1613:2009 + A1:2011	Environmental and Testing Requirements for Communications Networking Devices	✓ ¹		✓		✓ ¹	✓ ¹	✓	✓		
IEC 61850-3	Communication networks and systems for power utility automation - Part 3: General requirements	✓ ²		✓ ²		✓ ²	✓ ²	✓ ²	✓ ²		
IEC 60068-2-1	Environmental testing – Part 2-1: Tests – Test A: Cold	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 60068-2-2	Environmental testing - Part 2-2: Tests - Test B: Dry heat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 60068-2-30	Environmental testing - Part 2: Tests. Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 129 Environmental Standards Compliance (Continued)

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
IEC 60255-21-2	Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section Two: Shock and bump tests	✓		✓		✓	✓	✓	✓		
ETSI 300 753 Class 3.2	Acoustic noise emitted by telecommunications equipment	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Telcordia GR-63-CORE	NEBS Requirements: Physical Protection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ETSI EN 300 019-2-1 Class 1.2	Specification of environmental tests; Storage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ETSI EN 300 019-2-2 Class 2.3	Specification of environmental tests; Transportation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ETSI EN 300 019-2-3 Class 3.2	Specification of environmental tests; Stationary use at weatherprotected locations	✓	✓	✓	✓	✓	✓	✓	✓		
ETSI EN 300 019-2-4 Class T4.1	Specification of environmental tests; Stationary use at non-weatherprotected locations									✓	✓
Telcordia GR-3108-CORE	Generic Requirements for Network Equipment in the Outside Plant (OSP)	✓ ³	✓ ³	✓ ³	✓ ³	✓ ³		✓ ³	✓ ³	✓ ⁴	✓ ⁴
Telcordia GR-950-CORE	Generic Requirements for ONU Closures and ONU Systems									✓	✓
"GR-3108 Class 3 Section 6.2 IEC 60068-2-52 - Severity 3 MIL-STD-810G Method 509.5 EN 60721-3-3 Class 3C4 EN 60068-2-11: Salt Mist EN 50155 Class ST4"	Conformal Coating ⁵	✓			✓	✓		✓	✓		

Notes:

1. Forced air system; uses fans
2. Normal environmental conditions as per IEC 61850-3 ed.2
3. Class 2
4. Class 4
5. Conformal coating is available as an orderable option

Table 130 Safety Standards Compliance

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
UL/CSA 60950-1	Information technology equipment - Safety - Part 1: General requirements	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC/EN 60950-1	Information technology equipment - Safety - Part 1: General requirements	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UL/CSA 62368-1	Audio/video, information and communication technology equipment - Part 1: Safety requirements		✓	✓	✓	✓	✓				✓
IEC/EN 62368-1	Audio/video, information and communication technology equipment - Part 1: Safety requirements	✓	✓	✓	✓	✓	✓				✓
AS/NZS 60950-1	Information technology equipment - Safety - Part 1: General requirements	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AS/NZS 62368-1	Audio/video, information and communication technology equipment, Part 1: Safety requirements		✓		✓	✓	✓				✓
IEC/EN 60825-1 and 2	Safety of laser products - Part 1: Equipment classification and requirements Part 2: Safety of optical fibre communication systems (OFCS)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UL/CSA 60950-22	Information Technology Equipment - Safety - Part 22: Equipment to be Installed Outdoors									✓	✓
CSA–C22.2 No.94	Special Purpose Enclosures									✓	✓
UL50	Enclosures for Electrical Equipment, Non-Environmental Consideration									✓	✓
IEC/EN 60950-22	Information technology equipment. Equipment to be installed Outdoors.									✓	✓
IEC 60529	Degrees of Protection Provided by Enclosures (IP Code)	✓ ¹	✓ ²	✓ ²	✓ ¹	✓ ¹	✓ ¹	✓ ²	✓ ²	✓ ³	✓ ³

Notes:

1. IP20
2. IP40
3. IP65

Table 131 Telecom Interface Compliance

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
IC CS-03 Issue 9	Compliance Specification for Terminal Equipment, Terminal Systems, Network Protection Devices, Connection Arrangements and Hearing Aids Compatibility	✓	✓		✓	✓	✓	✓			
ACTA TIA-968-B	Telecommunications - Telephone Terminal Equipment - Technical Requirements for Connection of Terminal Equipment to the Telephone Network	✓	✓		✓	✓	✓	✓			
AS/ACIF S016 (Australia)	Requirements for Customer Equipment for connection to hierarchical digital interfaces	✓	✓		✓	✓	✓	✓			
ATIS-06000403	Network and Customer Installation Interfaces- DS1 Electrical Interfaces	✓	✓		✓	✓	✓	✓			
ANSI/TIA/EIA-422-B (RS422)	Electrical Characteristics for balanced voltage digital interfaces circuits					✓	✓				
ITU-T G.825	The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)					✓	✓				
ITU-T G.703	Physical/electrical characteristics of hierarchical digital interfaces	✓	✓		✓	✓	✓	✓			
ITU-T G.712 (E&M)	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 (RS232)	List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)					✓	✓	✓	✓		
ITU-T V.28 (V35)	Electrical characteristics for unbalanced double-current interchange circuits					✓	✓				
ITU-T V.36 (V35)	Modems for synchronous data transmission using 60-108 kHz group band circuits					✓	✓				

Table 131 Telecom Interface Compliance (Continued)

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
ITU-T V.11 / X.27 (RS-422)	Electrical characteristics for balanced double current interchange circuits operating at data signalling rates up to 10 Mbit/s					✓	✓				
ITU-T X.21 (RS-422)	Interface between Data Terminal Equipment and Data Circuit-terminating Equipment for synchronous operation on public data networks					✓	✓				
IEEE 802.3at (POE)	Data Terminal Equipment Power via the Media Dependent Interfaces Enhancements				✓			✓	✓	✓	✓

Table 132 Directives, Regional Approvals and Certifications Compliance

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
EU Directive 2014/30/ EU (EMC)	Electromagnetic Compatibility (EMC)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EU Directive 2014/35/ EU (LVD)	Low Voltage Directive (LVD)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EU Directive 2012/19/ EU (WEEE)	Waste Electrical and Electronic Equipment (WEEE)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EU Directive 2011/65/ EU (RoHS)	EU Directive 2011/65/EU Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment (Recast) Directive (including Commission Delegated Directive (EU) 2015/863)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CE Mark		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UKCA Mark		✓	✓	✓	✓	✓	✓	✓	✓		✓
CRoHS Logo; Ministry of Information Industry order No.39		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
China (MII NAL) Network Access License			✓		✓	✓	✓	✓		✓	

Table 132 Directives, Regional Approvals and Certifications Compliance (Continued)

Standard	Title	Platform									
		SAR-X	SAR-A	SAR-AX	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
South Korea (KC Mark)		✓	✓	✓	✓	✓	✓	✓	✓		
Australia (RCM Mark)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Japan (VCCI Mark)		✓	✓	✓	✓	✓	✓	✓			
NEBS Level 3		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TL9000 certified		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ISO 14001 certified		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ISO 9001 certified		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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IEEE 802.1p/q—VLAN Tagging

IEEE 802.3—10BaseT

IEEE 802.3ab—1000BaseT

IEEE 802.3ah—Ethernet OAM

IEEE 802.3u—100BaseTX

IEEE 802.3x —Flow Control

IEEE 802.3z—1000BaseSX/LX

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IEEE 802.1AX-2008—Link Aggregation Task Force (transferred from IEEE 802.3ad)

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ITU-T G.704—Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels

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- RFC 2385—Protection of BGP Sessions via the TCP MD5 Signature Option
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- RFC 3392—Capabilities Advertisement with BGP-4
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- 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)

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