DarkStar®

Command Reference

v5.1.0

We Make DWDM Easy

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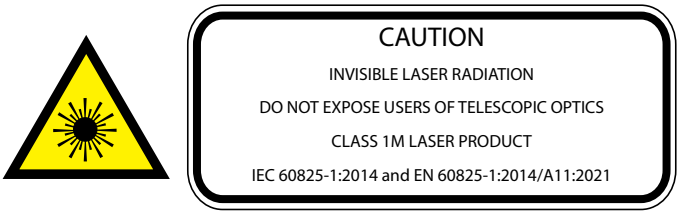

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1

Introduction

1.1 Operating System

DarkStar systems use the DXMOS command line interface (CLI). This chapter contains DXMOS syntax format conventions, keyboard shortcuts, and command summaries. Remaining chapters provide detailed information regarding the CLI commands used to configure and manage DarkStar products.

Reminder: The Systems Guide, found on the XKL website, also provides a wealth of information about our products and how to use them.

1.2 Syntax Format

Table 1-1 shows the conventions used in this guide to represent DXMOS command-line syntax.

TABLE 1-1. Conventions for DXMOS Syntax

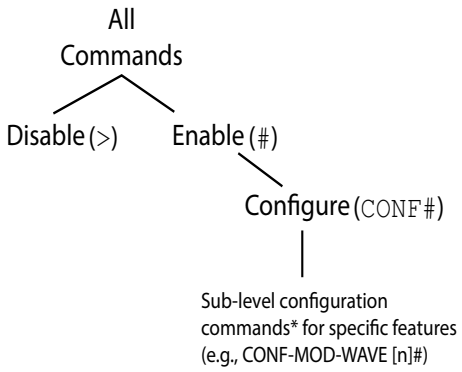
Format	Meaning
`Machine-generated text`	Command line prompt or other machine-generated command line interface (CLI) text. For example: `localhost>`
boldface font	Command line information including commands, command options, and keywords. For example: **show amplifier**
italic font	Arguments that a user supplies, such as free-form input text, passwords, numbers, etc. For example: **snmp-server community** *string*
{}	Curly braces denote required keywords and arguments. The vertical bar(s) between keywords and arguments denotes "or," and means one of multiple terms must be chosen as an option. For example: **{client|osc|trunk}**
[]	Square brackets denote optional keywords or arguments. For example: [no] **snmp-server enable traps**

1.3 Prompts, Modes, and Commands

Important: This guide covers the commands available for this version of the Command Reference. However, there may be some command-associated syntax presented here that is not available for your particular system. To see the exact command syntax available in the current context, either press the <Tab> key or enter a question mark (?). For details, see Command Line Help.

The DarkStar DXMOS essentially has three levels of permission as shown in Figure 1-1: disable mode, enable mode, and configure mode. Disable mode commands (`>` prompt) allow users to view the status of the system, but do not allow any changes to be made to its current state. Enable mode (`#` prompt) requires a password and also allows access to the configure (`CONF#` prompt) mode.

FIGURE 1-1. Permission Levels and Modes Tree



* For a list of sub-level configuration commands, see Table 1-2.

At any enable level, the `exit` command returns to the next level up, while `end` returns to the enable prompt. In configure mode, the `do` keyword executes a top-level command without leaving the current mode. This is very helpful when you are configuring something and want to double-check your work before writing it to memory.

For example, `#` **show ip routes** is an enable mode command, but you can execute it from configure mode by using "do": `CONF#` **do show ip routes**.

1.3.1 Sub-level Configuration Commands

In addition to the commands in the configure mode (indicated by the `CONF#` prompt), there are sub-level configuration commands to set up specific features, each identified by its own prompt. For example, if you are configuring a fan module, you will be entering commands at the `CONF-FAN[n]#` prompt. As you navigate through the system, the prompt provides a sort of sub-level "guide" that changes accordingly. While you are configuring a system, you may see `CONF-MGMT-ETH[n]#`, `CONF-LINE-VTY#`, `CONF-MOD-CLIENT[n]#`, and so on.

In addition to the three permission-level mode commands (`enable`, `configure`, and `disable`), Table 1-2 lists sub-level configuration commands used to set up specific components. **Note:** The table does not necessarily represent all possible sub-level configuration commands or prompts.

TABLE 1-2. Mode Commands Listed by Prompt

Mode/Command	Resulting Prompt
`>` **enable**	Prompt changes to `#`
`#` **configure**	Prompt changes to `CONF#`
`#` **disable**	Prompt changes to `>`
`CONF#` **amplifier**	`CONF-AMP[ampifier-label]#`
`CONF#` **fan**	`CONF-FAN[n]#`
`CONF#` **line vty** `CONF#` **line console**	`CONF-LINE-<VTY|CTY>#`
`CONF#` **management** `CONF#` **management ethernet 0** `CONF#` **management loopback 0** `CONF#` **management OSC 0**	The prompt changes depending on the management module you are configuring: - ethernet: `CONF-MGMT-ETH[n]#` - loopback: `CONF-MGMT-LOOP[n]#` - osc: `CONF-MGMT-OSC[n]#`
`CONF#` **module** `CONF#` **module client o** `CONF#` **module osc 0** `CONF#` **module wave 0** `CONF#` **module trunk 0**	The prompt changes depending on the transceiver you are configuring: -client: `CONF-MOD-CLIENT[n]#` -osc: `CONF-MOD-OSC[n]#` -wave: `CONF-MOD-WAVE[n]#` -trunk: `CONF-MOD-TRUNK[n]#`
`CONF#` **router rip**	`CONF-RIP#`
`CONF#` **switch**	`CONF-SWITCH#`

1.4 Keyboard Shortcuts

Table 1-3 lists the keyboard shortcuts that are available in DXMOS:

TABLE 1-3. DXMOS Keyboard Shortcuts

Shortcut	Action
CTRL+A	Go to the beginning of line.
CTRL+B or ←	Go back one character.
CTRL+C	Cancel the current command line input. Canceled commands will not be saved in the command history list.
CTRL+D	Delete the current character.
CTRL+E	Go to end of line.
CTRL+F or →	Go forward one character.
CTRL+K	Delete all characters from the current cursor position to the end of the command line.
CTRL+N or ↓	Scroll forward through the command history.
CTRL+P or ↑	Scroll backward through the command history.
CTRL+R	Redraw the current command input (useful for restoring what was typed if the system writes output to the console while you are entering a command).
CTRL+U	Clear the current command line contents.
CTRL+V	Disregard any special meaning of the character following. The CLI already disregards most special characters and this shortcut is rarely required.
CTRL+W	Delete previous word.
CTRL+Z	Discard the current command line and exit configure mode (equivalent to typing `end` at a configure mode prompt).
<Tab> key or question mark key (?)	Complete partially entered unique keyword. If more than one possible completion exists, it will display a list of choices.
; or !	Ignore rest of line. Use as an initial character to insert comments in the command line.

1.5 Command Abbreviations

Commands may be abbreviated if the command is unique in the current mode. For example, the `show switch` command can be shortened to `sh sw`, but cannot be shortened to `sh s` because there are multiple possible completions. In other words, entering `sh s` will result in additional context-sensitive help choices being shown, followed by `sh s` retained on the input line.

1.6 Command Line Help

Available from any command mode or command line, the tab key <Tab> or question mark key (?) enable you to determine the relevant context-specific commands, keywords and arguments, as well as to auto-fill partial command-line strings. Although the following examples use <Tab>, you can also use "?," as the results are the same.

Note: In these examples, an underscore "_" represents the command-line text cursor, and the spot where you press <Tab>.

One of the commands from Disable Mode (>) is the `show` command. Typing "s" and immediately pressing <Tab> will complete its string.

> **s_** **Result:** > **show _**

For auto-fill, there should be no space between the letter or partial command string and the text cursor when pressing <Tab>. If the letter or partial command string matches more than one command, those optional commands will be displayed. In this example, `show` is the only available command beginning with "s."

In the result above, auto-fill leaves a single space between the completed string and the text cursor. Depending on the initial command string, pressing <Tab> again may yield a list of added command options. For this example, we show the partial list that appears upon pressing <Tab>:

Result:
```
Information to be displayed, one of the following:
       arp
       bert
       calendar
       chassis
       clock
       connections
       debug
       edfa
       environment
```

From this list, we want `environment` to be the next string in the command line. However, there are two options beginning with an "e"— `environment` and `edfa`. Typing the first letter "e" and pressing <Tab> in this case only narrows the list down to string matches beginning with "e":

> **show e_** **Result:**
```
Information to be displayed, one of the following:
       edfa
       environment
```

For a quicker approach, simply type enough of the desired string to differentiate it from all others having the same beginning spelling. Here, we type the partial string "en" and press <Tab> to get `environment`.

> **show en_** **Result:** > **show environment _**

Additional tab strikes may provide more detail, keywords or arguments from which to choose. If not, the carriage return <cr> symbol will be the only option left. In this example, pressing <Tab> yields added details from which to choose.

Result:
```
specific environmental details one of the following:
 all
 fans
 logging
 power
 temperature
 <cr>
```

Typing "p" for `power` and pressing <Tab> auto-fills the chosen string. The desired command line, as shown below, is now complete.

Result: `>` **show environment power verbose** _

In this example, pressing <Tab> yet again will yield no further command-line options other than <cr>, which signals that you must press Enter to execute the command.

2

Basic Navigation

As explained in Chapter 1, commands fall into one of three modes: disable, enable, and configure. Enter the modes using the disable, enable, and configure commands, respectively. In addition, when you are configuring certain components, you enter a sub-level mode that contains the relevant commands for that component. For example, if you enter `CONF# router rip`, the prompt changes to `CONF-RIP#`, and you have access to the commands for router RIP configuration. Table 2-1 summarizes the commands used to move between the different modes.

TABLE 2-1. Moving Between Disable, Enable, and Configure Modes

Prompt/Command	Resulting Prompt	Resulting Mode
`>` **enable**	`#`	enable
`#` **configure**	`CONF#`	configure
`#` **disable**	`>`	disable
`#` **exit**	`>`	disable
`CONF#` **end**	`#`	enable
`CONF#` **exit**	`#`	enable
`CONF#` **router rip**	`CONF-RIP#`	router RIP configuration

This section covers the following commands:

- disable
- enable
- configure
- do
- end, exit, logout
- no
- delete
- no, more, version

2.1 disable

Exits enable mode # and returns to the disable mode command-prompt >.

Note: This is the default mode of DXMOS, and only limited commands are available. No commands in this mode can effect any change to system operation or configuration. To unlock the full command set, issue the enable command.

Syntax

 # disable

2.2 enable

From disable mode >, enters the enable mode command-prompt #.

Note: This command is used to unlock the full DXMOS command set. When done viewing or changing settings, issue the disable command to return to disable mode, which will relock the system and prevent accidental or unauthorized system changes.

If an enable mode password is set, the DXMOS prompts for the password before entering enable mode.

Syntax

> enable

2.3 configure

Covered in this section:

- line
- management
- module
- switch

From enable mode, places the DarkStar system into global configuration mode. The command prompt changes to CONF#. To move from CONF# (configure) → # (enable) mode, type end or exit.

Changes made in enable (#) mode immediately affect how the DarkStar is operating. Changes made in configure mode (CONF#) are saved to non-volatile storage using the write memory and write network commands. Any configuration command not saved to memory is lost on the next reboot, reload, or power cycle.

Note: Commands issued from the sub-level configuration mode (e.g., CONF-MGMT-ETH[n]# or CONF-MOD-CLIENT[n]#) do not take effect until the user issues the exit command to return to the next level up (i.e., configure or CONF# mode) or the end command to return to enable mode (#).

If more than one person is logged in and in configure mode (for example, from the console and a remote vty session), the system displays a warning, "Concurrent sessions in configuration mode."

	Commands not covered in this section are `Amplifiers`, `fan`, `ip Commands`, *and* `router rip`. *(Click a link to go to the applicable section.)*

Syntax

`#` **configure**

2.3.1 line

Places the DarkStar system in line (VTY or CTY) configuration mode. The command prompt changes to `CONF-LINE-<VTY|CTY>#`, depending on your selection. From here you set up many security-related functions, such as passwords, login privileges, and Telnet/SSH access.

Syntax

`CONF#` **line {console|vty}**

Parameters

console	Configures the console (CTY) line.
vty	Configures the virtual terminal (VTY) lines. DarkStar systems have four VTY lines, all configured identically.

Example

```
localhost# configure
localhost CONF# line console
localhost CONF-LINE-CTY# password new-password-string
localhost CONF-LINE-CTY# end
localhost# write memory
Are you sure? (yes/NO) yes
logout
```

2.3.2 management

From configure mode, places the DarkStar system in management configuration mode. After you specify which management interface you wish to configure, the command prompt changes accordingly, depending on what you specified. For example:

- `CONF-MGMT-ETH[n]#`
- `CONF-MGMT-LOOP[n]#`
- `CONF-MGMT-OSC[n]#`

Syntax

`CONF#` **management {ethernet|loopback|osc}** *n*

Parameters

ethernet *n*	The Ethernet interface you wish to configure, an integer. On CMD-based systems, this *n* integer is fixed at *0*. The `management ethernet 0` command corresponds to another port on the switch to which each of the E[*n*] ports are also connected. On non CMD-based systems, this *n* integer matches the E[*n*] numbers on the front panel Ethernet ports. **Note:** To determine whether your system is CMD-based, issue the `show hardware` command.
loopback *n*	The loopback interface you wish to configure, an integer.
osc *n*	The OSC interface you wish to configure, an integer.

Example

```
localhost CONF# management ethernet 0
localhost CONF-MGMT-ETH[0]# ip address 192.168.0.1/24
localhost CONF-MGMT-ETH[0]# exit
Interface Ethernet 0 address set to 192.168.0.1
localhost CONF# exit
localhost# write memory
Are you sure? [yes/NO] yes
```

2.3.3 module

From configure mode, places the DarkStar system in optical transceiver configuration mode. After you specify which module (i.e., transceiver) you wish to configure, the command prompt changes accordingly, depending on what you specified. For example:

- `CONF-MOD-CLIENT[n]#`
- `CONF-MOD-OSC[n]#`
- `CONF-MOD-TRUNK[n]#`
- `CONF-MOD-WAVE[n]#`

Syntax

`CONF#` **module {client|osc|trunk|wave}** *n*

client *n*	The client transceiver you wish to configure, an integer.
osc *n*	The OSC transceiver you wish to configure, an integer.
trunk *n*	The trunk transceiver you wish to configure, an integer.
wave *n*	The line transceiver you wish to configure, an integer.

Note: For modules with multiple optical lanes, the n/lane designation will enable a user to specify a lane. Depending on the system and transceivers used, there may be a number of configurations for lane counts.

Example: CONF# module client 0 / 1 (meaning lane 1 of client 0).

Example

```
localhost CONF# module osc 0
localhost CONF-MOD-OSC[0]# ip address 192.168.0.1/24
localhost CONF-MOD-OSC[0]# exit
Interface OSC 0 address set to 192.168.0.1
localhost CONF# exit
localhost# write memory
Are you sure? [yes/NO] yes
```

2.3.4 switch

Places the DarkStar system in switch configuration mode. Click `switch` to see the section describing this functionality.

2.4 do

Executes any enable mode command (most often the `show` command). From the `CONF#` prompt, precede the command with `do`. For example, `do show time`. See Table 5-1 for more information.

`CONF#` **do show environment**

2.5 end

Exits configuration mode and returns to the top level.

Syntax

`CONF#` **end**

2.6 exit

When issued from a CONF sub-mode (e.g., CONF-MOD-OSC[0]), `exit` moves the prompt to configure mode (CONF). When issued from configure mode (CONF), `exit` moves the prompt to enable mode (#).

When issued on the console (CTY) in enable mode (#), `exit` will log out the user. On CTY, the disable prompt (>) will be presented again. **Note:** If a console password has been set, you must enter a password to return to the disable mode (>) prompt. When issued from a Telnet or SSH connection, from either enable mode (#) or disable mode (>), `exit` will disconnect any Telnet or SSH session and release the VTY line for use by others.

logout *also disconnects Telnet or SSH sessions and releases the line.*

Syntax

`>` **exit**
`#` **exit**

`CONF#` **exit**

Example

```
localhost CONF-MOD-OSC[0]# exit
CONF# exit
localhost# exit
Logging out. Good bye.
localhost>
```

2.7 logout

When issued from a Telnet or SSH connection at the disable (`>`) or enable (`#`) mode, the `logout` command disconnects any Telnet or SSH session, and releases the VTY line for use by others. When performed on the console (CTY), `logout` resets the console line. If a console password has been set, you must enter a password to return to the disable mode prompt.

Typing exit at the enable or disable prompt does the same thing.

Syntax

`>` **logout**

`#` **logout**

2.8 no

Reverses the action of the specified command, in any mode. For example, `no terminal pager` or `no shutdown`.

Syntax

`>` **no** [terminal pager]

`#` **no** [command to be reversed]

`CONF#` **no** [command to be reversed]

2.9 delete

Deletes the specified file from the file system, if the file is not read only.

Do not attempt to delete any files under the following directories. They contain important system data required for proper system operation:

- **/dxmos**
- **/dxmos/sysdesc**
- **/boot**
- **/gateware**

Syntax

delete *filename*

Parameters

filename	The file to be deleted.

2.10 directory

Provides a directory listing for the specified file or directory. If no argument is present, it provides a listing of the root directory. **Note:** The `terminal pager` command sets the number of output lines per page.

Syntax

directory [*directory*|*filename*]

Parameters

directory	The desired directory.
filename	The filename must be a full path. For example, dxmos/dxmos.exe or /dxmos/dxmos.exe, but not dxmos.exe.

2.11 more

Displays the contents of the specified regular file, a page at a time. Use the `directory` command to list directories and files in the file system. The `more` command does not display the contents of executable files.

- *The terminal pager command enables the setting of lines per page for console output.*
- *The `more` command will paginate (i.e., wait for the user to press the space bar every n lines) if the terminal pager command is set to a non-zero value. By default, the terminal paginate value is zero, so no pagination occurs unless configured by the user. If pagination is ON (non-zero value), the output may also be halted by pressing control-C.*

Syntax

`#` **more** *file-path*

Parameters

file-path	The filename must be a full path. For example, dxmos/config.dat or /dxmos/config.dat, but not config.dat.

2.12 version

Displays the version of the currently loaded DXMOS software. See also show version.

Syntax

`>` **version** [verbose]

`#` **version** [verbose]

3

DarkStar System & Configuration Settings

System settings are those settings that affect the DarkStar itself, such as amplifiers, the location of the boot file, the system host name, message of the day, terminal display behavior, and others.

Amplifiers

- Amplifier-Label Keywords
- los-shutdown
- no shutdown

Controls for Individual Amplifiers

- show amplifier
- control manually-set
- show running-config amplifier
- los-shutdown
- no shutdown

SpectraPath Configuration Settings

- Waveplan Configuration Commands
- Custom Waveplans
- Wavelength Selective Switch
- Custom Waveplans

Optical Channel Monitor

- module

DUA Groups

- Group-Name Keywords
- show commands
- Controls for Individual WSSs
- group commands

DHCP and ZTP

- boot host dhcp
- ip dhcp
- show dhcp
- server configuration examples

General Settings

- app-code

- app switch
- banner motd
- boot
- connect
- copy
- curl
- description
- encapsulation
- fan
- hostname
- idle-mute
- lol-forward
- prompt-name
- protection
- sntp
- switch
- terminal pager
- tftp
- tune
- tune-for-dmd
- write

3.1 Amplifiers

This section includes the following:

- Amplifier-Label Keywords
- los-shutdown
- no shutdown

The `amplifier` *command set is only available on DarkStar systems with an amplifier installed.*

The `amplifier` *command set is accessed differently on DUA systems. Consult the* DUA Groups *section for more detail.*

3.1.1 Amplifier-Label Keywords

Amplifier commands use amplifier-label keywords to specify a particular amplifier. These amplifier-label keywords can be part of an amplifier-specific command prompt or issued from a particular mode (e.g., `>`), depending on the task.

Syntax

```
CONF-AMP[amplifier-label]#
```

`>` **show amplifier** [amplifier-label]

As the syntax lines above indicate, you can use an amplifier-label keyword to specify an amplifier within a command. Shown below is the `show amplifier` command, issued from the `>` mode, for the "east output edfa" system.

Example

`>` **show amplifier east output edfa**

For details on using the `show amplifier` command with amplifier-labels, see the beginning of the Controls for Individual Amplifiers section.

While the `show amplifier` and `show running-config amplifier` commands are available from multiple modes, the `CONF-AMP[amplifier-label]#` prompt is required for issuing the other amplifier commands, such as `shutdown` or `no shutdown`.

For instance, from the `CONF#` mode, when you specify a particular amplifier with the *amplifier-label*, the corresponding prompt will change, as shown in Table 3-1.

TABLE 3-1. Amplifier command prompts

amplifier-label	Prompt Changes To...
input raman	`CONF-AMP[input raman]#`
input edfa	`CONF-AMP[input edfa]#`
output edfa	`CONF-AMP[output edfa]#`
east input raman	`CONF-AMP[east input raman]#`
east input edfa	`CONF-AMP[east input edfa]#`
east output edfa	`CONF-AMP[east output edfa]#`
west input raman	`CONF-AMP[west input raman]#`
west input edfa	`CONF-AMP[west input edfa]#`
west output edfa	`CONF-AMP[west output edfa]#`

3.1.2 shutdown

Disables the amplifier by turning off the specified EDFA and Raman pump.

Be very careful when using this command. Shutting down an amplifier can disrupt customer traffic.

Syntax

`CONF-AMP[amplifier-label]#` **shutdown**

3.1.3 no shutdown

Enables the amplifier by turning on the specified EDFA and Raman pump.

Note: On the DMD-A or DLA, the EDFA and Raman pump will remain disabled (i.e., the XKL factory default) until an automatic channel count or a manually-set power/gain is configured. So before issuing the `no shutdown` command to enable the EDFA pump, issue either the `control automatic channel-count` command, as described in section 3.2.1 or a `control manually-set` command (for `gain` or `power`), as described in section 3.2.4.

Syntax

`CONF-AMP[amplifier-label]#` **no shutdown**

Parameters

no	Enable the amplifier. This is the default setting.

```
localhost# configure
localhost CONF# amplifier input edfa
localhost CONF-AMP[input edfa]# no shutdown
localhost CONF-AMP[input edfa]# exit
localhost CONF# amplifier output edfa
localhost CONF-AMP[output edfa]# no shutdown
localhost CONF-AMP[output edfa]# exit
localhost CONF# exit
localhost#
```

3.2 Controls for Individual Amplifiers

Available commands:

- show running-config amplifier
- show amplifier
- control manually-set
- los-shutdown
- no los-shutdown

3.2.1 show amplifier

Displays status of amplifiers, settings, and alarms.

	The `show amplifier` command is only available on DarkStar systems with an amplifier installed. *The contents of the `show amplifier` command are accessed differently on DUA systems. Consult the show group [n|name] amplifier section for more detail.*

Syntax

`>` **show amplifier** [amplifier-label|summary|all]
`#` **show amplifier** [amplifier-label|summary|all]
`CONF#` **do show amplifier** [amplifier-label|summary|all]

Parameters

amplifier-label	Specifies the amplifier for which to display information. If no parameter is specified, a summary, as described next, is provided. For more details, see Amplifier-Label Keywords.
summary	Displays a brief report of amplifier statistics.
all	Displays detailed information for all amplifiers in the system.

The output below is for a typically configured system. The "Control mode" in the output indicates how the EDFA was configured. Here, it appears as "Automatic (Gain Control)."

For an EDFA configured with the `control manually-set power` command, the "Control mode" would appear as "Manually-set (Power Control)." For an EDFA configured with the `control manually-set gain` command, the "Control mode" would appear as "Manually-set (Gain Control)."

Also in the output below, the "Applied Setpoint" displays the EDFA target output power, which is bounded by the amplifier's optical limits. In this example, the "Calculated Setpoint" is determined by the number of DWDM channels in the fiber, which is specified by the `control automatic channel count-12` command. The "Applied Setpoint" will reflect the "Calculated Setpoint" unless the "Calculated Setpoint" exceeds the EDFA's output power. If no calculation was performed by DXMOS, then the "Calculated Setpoint" will display a -.

When configured with the `control manually-set power` or the `control manually-set gain` commands, the "Applied Setpoint" displays the EDFA target optical output power. However, "Total output power" may not be the same as "Applied Setpoint." One reason for this possible discrepancy is that if there is no input optical power, then the EDFA will be automatically shutdown, and the Setpoint will not be reached.

Example

```
localhost> show amplifier all
Detailed information for Amplifier Input EDFA

Module is administratively up
  Module Status
    State ................... Up
    Control mode ............ Automatic (Gain Control)
    Channel-count ..........     12
    Calculated Setpoint ....   18.4 dB
    Applied Setpoint .......   18.4 dB
    Case temperature .......   34.3 C
  Pump Status
    Pump bias current ......   81.3 mA (Up)
    Pump EOL bias current ..  960.0 mA
    Pump temperature .......   25.0 C
  Signal Levels
    Input power ............  -12.7 dBm
    Total output power .....    5.7 dBm
    Signal output power ....    5.5 dBm
    Signal gain ............   18.2 dB
  Alarms
    None
  Module Identification
    Role ................... Pre-amplifier
    Path ................... Line input to Channel Outputs
    AGC Setpoint Min/Max ...   17.0/29.0 dB
    APC Setpoint Min/Max ...  -10.0/20.0 dBm

Detailed information for Amplifier Output EDFA (BKTel 20dBm)
  Module is administratively up
  Module Status
    State ................... Up
    Control mode ............ Automatic (Gain Control)
    Channel-count ..........     12
    Tx Power/Channel........    8.0 dBm
    Calculated Setpoint ....   17.2 dB
    Applied Setpoint .......   17.2 dB
    Case temperature .......   35.3 C
  Pump Status
    Pump bias current ......  733.5 mA (Up)
    Pump EOL bias current .. 1038.0 mA
    Pump temperature .......   25.0 C
  Signal Levels
    Input power ............    2.8 dBm (0.0 dBm Maximum Reached)
    Total output power .....   19.9 dBm
    Signal output power ....   20.0 dBm
    Signal gain ............   17.1 dB
  Alarms
    None
  Module Identification
    Role ................... Booster
```

```
    Path ................... Channel inputs to Line output
    AGC Setpoint Min/Max ...   17.0/29.0 dB
    APC Setpoint Min/Max ...  -10.0/20.0 dBm
```

Tip: As an alternative to the `show amplifier all` command, the `show amplifier summary` command summarizes amplifier information in an easy-to-read, column format, as shown in the example below.

Example

```
localhost> show amplifier summary

                                Admin  Ctrl   Control   RxPow   TxPow  Module
Amplifier               Role    State  Mode   Setpoint  (dBm)   (dBm)  State
----------------------  ------- -----  ----  ---------  ------  ------ ------
Input EDFA              Preamp   Up    AGC    18.4dB   -12.7    5.7    Up
Output EDFA             Booster  Up    AGC    17.2dB     2.8    20.0   Up
```

Note: The "Ctrl Mode" column indicates only the associated mode and not the full description— "Automatic (Gain Control)" or "Manually-set (Gain Control)" — as would the show amplifier all command.

3.2.2 show running-config amplifier

Displays the settings of amplifiers.

	The `show running-config amplifier` *command is only available on DarkStar systems with an amplifier installed.* *The contents of the* `show running-config amplifier` *command are accessed differently on DUA Systems. Consult the* Controls for Individual WSSs *section for more detail.*

Syntax

`#` **show running-config amplifier**
`CONF#` **do show running-config amplifier** [amplifier-label]

Parameters

amplifier-label	Specifies which amplifier to display information. If no parameter is specified, information is displayed for all amplifiers.

Example

```
localhost CONF-AMP[input edfa]# do show running-config amplifier
running-config:
amplifier input edfa
shutdown
control automatic channel-count 12 3.0 gain 18.4
exit
```

```
amplifier output edfa
description EDFA 20dBm
shutdown
control automatic channel-count 12 8.0 gain 17.2
exit
```

Note: In the output above, the amplifier-label `input edfa` was used. For more information on amplifier-labels, see Amplifier-Label Keywords. Also in the output above, the `control automatic channel-count` command was used. The additional parameters appended to the command include: the channel-count, power-per-channel in dBm, control mode, and the control setpoint. The control mode and control setpoint is the current amplifier settings which is used by DXMOS during initialization.

3.2.3 control automatic channel-count

Configures the EDFAs individually, based on the user-provided channel count. The user must set this channel-count in order for the EDFAs to be set correctly. In a DLA, input-to-output line amplification can be configured with the "east-to-west" and "west-to-east" `amplifier-label`. This command is for diagnostic purposes or advanced users, and not commonly used.

Caution: Setting the channel count to a value higher than the actual number of DWDM channels in the fiber will cause each channel to be at a higher power level than the desired target power per channel. This can result in degraded signal quality or even transceiver receiver damage.

Syntax

`CONF-AMP[amplifier-label]#` **control automatic channel-count {***n***} [***power-per-channel in dBm]*

Parameters

channel-count *n*	Channel-count integer values range depends on the System Configuration.
power-per-channel in dBm	Sets the optical power per channel in dBm as a decimal value (i.e., nn.n). If not supplied, the factory default power-per-channel will be used, +3.0dBm. For DUA systems, the default power per channel on input EDFAs is -10dBm.

Example

```
localhost> enable
localhost# configure
localhost CONF# amplifier east output edfa
localhost CONF-AMP[east output edfa]# control automatic channel-count 12 3.0
localhost CONF-AMP[east output edfa]# exit
localhost CONF#
```

3.2.4 control manually-set

These commands individually control each EDFA and Raman in a system. Included are the `control manually-set gain (only EDFA)` and `control manually-set power` commands.

	Only one amplifier control command is in effect at any time.

After running the `control manually-set` command(s), run the appropriate `show` command and verify that the new configuration value is displayed.

3.2.4.1 control manually-set gain

Sets the DarkStar EDFA to Automatic Gain Control mode. The user specifies the desired output gain (in dB) as a set point for controlling the amplifier. To maintain constant gain, the amplifier will do the following:

- If input power drops: drop output power and vary pump current as needed.
- If input power increases: increase output power and vary pump current as needed.

Syntax

`CONF-AMP[amplifier-label]#` **control manually-set gain** *gain-in-dB*

Parameters

gain-in-dB	Sets control point in dB as a decimal value (i.e., *nn.n*). Valid range of values is 17.0-29.0.

The example below comes from a system with an "east input edfa." Here, a gain value of 17.0 dB was entered using the `control manually-set gain` command.

The "Control mode" in the output indicates that the EDFA was configured as "Manually-set (Gain Control)." The "Applied Setpoint" displays the EDFA target optical gain, 17.0 dB. Note that "Total output power" may not be the same as "Applied Setpoint."

One reason for this possible discrepancy is that if there is no input optical power, then the EDFA will be automatically shutdown, and the Applied Setpoint will not be reached.

Example

`CONF-AMP[east input edfa]#` **do show amplifier east input edfa**

```
Detailed information for Amplifier East Input EDFA (20dBm East)
  Module is administratively down
  Module Status
    State ................... LOS
    Control mode ............ Manually-set (Gain Control)
    Channel-count ..........    N/A
    Calculated Setpoint ....    N/A
    Applied Setpoint .......   17.0 dB
    Case temperature .......   22.9 C
  Pump Status
    Pump bias current ......    0.3 mA (Disabled)
    Pump EOL bias current ..  898.7 mA
    Pump temperature .......   25.0 C
  Signal Levels
    Input power ............  -45.4 dBm
    Total output power .....  -40.0 dBm
    Signal output power ....  -40.0 dBm
    Signal gain ............    0.0 dB
  Alarms
    LOS/Loss of signal
  Module Identification
    Role ................... Pre-amplifier
```

```
Path ..................... East line input to East channel outputs
AGC Setpoint Min/Max ...   17.0/29.0 dB
APC Setpoint Min/Max ...  -10.0/20.0 dBm
```

Notes: From the amplifier-labeled command prompt (above), you can also issue the `do show amplifier all` and `do show amplifier summary` commands. See the Amplifier-Label Keywords section for more about amplifier-specific command prompts, and the Controls for Individual Amplifiers section for more about these related commands. Also, in the output above, the `East Input EDFA` was labeled `20dBm East` by using the description command.

3.2.4.2 control manually-set power

Sets the DarkStar EDFA and Raman to Automatic Power Control mode. The user specifies the desired output power (in dBm) as a set point for controlling the amplifier. To maintain constant power, the amplifier will do the following:

- If input power drops: increase pump power as needed.
- If input power increases: reduce pump power as needed.

Syntax

`CONF-AMP[amplifier-label]#` **control manually-set power** *power-in-dBm* | *power-in-mW*

Parameters

power-in-dBm	EDFA: Sets control point in dBm as a decimal value (i.e., *nn.n*)
power-in-mW	Raman: Valid range of values depends on system configuration

The example below comes from a system with an "east input edfa." Here, a power value of -10.0 dBm was entered for the `control manually-set power` command.

The "Control mode" in the output indicates that the EDFA was configured as "Manually-set (Power Control)." The "Applied Setpoint" displays the EDFA target optical power, -10.0 dBm. Note that "Total output power" may not be the same as "Applied Setpoint." One reason for this possible discrepancy is that if there is no input optical power, then the EDFA will automatically be shutdown, and the Applied Setpoint will not be reached.

Example

`CONF-AMP[east input edfa]#` **do show amplifier east input edfa**

```
Detailed information for Amplifier East Input EDFA (20dBm East)
  Module is administratively down
  Module Status
    State ................... LOS
    Control mode ............ Manually-set (Power Control)
    Channel-count ..........    N/A
    Calculated Setpoint ....    N/A
    Applied Setpoint .......  -10.0 dB
    Case temperature .......   23.2 C
  Pump Status
    Pump bias current ......    0.0 mA (Disabled)
    Pump EOL bias current ..  898.7 mA
    Pump temperature .......   25.0 C
  Signal Levels
    Input power ............  -45.1 dBm
```

```
    Total output power .....  -40.0 dBm
    Signal output power ....  -40.0 dBm
    Signal gain ............    0.0 dB
  Alarms
    LOS/Loss of signal
  Module Identification
    Role ................... Pre-amplifier
    Path ................... East line input to East channel outputs
    AGC Setpoint Min/Max ...   17.0/29.0 dB
    APC Setpoint Min/Max ...  -10.0/20.0 dBm
```

Example

```
CONF# amplifier input raman
CONF-AMP[input raman]# control manually-set power 650.0
CONF-AMP[input raman]# exit
CONF# exit

localhost# show amplifier input raman

Detailed information for Amplifier Input Raman (+650 mW RAMAN)
  Module is administratively up
  Module Status
    State .................. Up
    Control mode ........... Manually-set (Power Control)
    Channel-count ..........    N/A
    Setpoint ...............  650.0 mW
    Case temperature .......   44.3 C
    Shutdown due to LOS .... Disabled
  Pump Status
    Pump bias current ...... 1148.4 mA (Up)
    Pump EOL bias current .. 1500.0 mA
    Pump temperature .......   25.0 C
  Signal Levels
    Input power ............  -17.4 dBm
    Total output power .....  648.0 mW (28.1 dBm)
    Signal output power ....  -17.4 dBm
    Signal gain ............   0.71 dB
  Alarms
     None
  Module Identification
    Role ................... Pre-amplifier
    Path ................... Line input to Channel outputs
```

Notes: From the amplifier-labeled command prompt (above), you can also issue the `do show amplifier all` and `do show amplifier summary` commands. See the Amplifier-Label Keywords section for more about amplifier-specific command prompts, and the Controls for Individual Amplifiers section for more about these related commands. Also, in the output above, the `East Input EDFA` was labeled `20dBm East` by using the description command.

3.2.5 los-shutdown

Enables the Raman amplifier auto-shutdown feature when Loss of Signal occurs. This is the default setting.

Example

```
CONF-AMP[amplifier-label]# los-shutdown
localhost# configure
localhost CONF# amplifier west input raman
localhost CONF-AMP[west input raman]# los-shutdown

West Input Raman: Shutdown due to LOS is enabled.
localhost CONF-AMP[west input raman]# exit
localhost CONF# exit
localhost#
```

3.2.6 no los-shutdown

Disables the Raman amplifier auto-shutdown feature when Loss of Signal occurs.

Syntax

```
CONF-AMP[amplifier-label]# no los-shutdown
```

3.3 SpectraPath Configuration Settings

This section includes the following and is only applicable to SpectraPath systems:

- Waveplan Configuration Commands
- Custom Waveplans
- Wavelength Selective Switch
- Optical Channel Monitor

3.3.1 Waveplan Configuration Commands

A waveplan is a collection of unique non-overlapping bands that apportion the usable C-band spectrum. A band is a section of spectrum that contains a channel or multiple channels carrying customer traffic. Each band has a center frequency and a bandwidth. The following commands apply to Custom Waveplans, Wavelength Selective Switch, and the Optical Channel Monitor.

This section includes the following:

- band
- bandwidth
- plan

3.3.1.1 band

Define a center frequency and bandwidth for a channel or range of channels.

Syntax

[no] **band index** {*band-index*} **center-frequency** {*center-frequency*} **bandwidth** {*bandwidth*}

Parameters

band-index	A number to be used to identify a band.
center-frequency	The channel frequency in the middle of a bands, in GHz.
bandwidth	The range of frequencies to surround a bands, in GHz.

Example

```
SpectraPath-Provisioner# configure
SpectraPath-Provisioner CONF# waveplan 0
SpectraPath-Provisioner CONF-WP[0]# band index 0 center frequency 191600 bandwidth 100
```

3.3.1.2 bandwidth

Define a default bandwidth value to be used by the band command.

Syntax

bandwidth {*width*}

Parameters

width	The lower and upper frequencies to surround a band, in GHz. 0 to remove the define default bandwidth.

Example

```
SpectraPath-Provisioner CONF-WP[0]# bandwidth 200
```

3.3.1.3 plan

Set the waveplan to a match a channel frequency on the ITU grid or reset the stored waveplan.

Syntax

plan {50-itu | 75-itu | 100-itu | 150-itu | 200-itu | reset}

Parameters

50-itu	Define bands to match a channel frequency with 50 GHz spacing.
75-itu	Define bands to match a channel frequency with 75 GHz spacing.
100-itu	Define bands to match a channel frequency with 100 GHz spacing.
150-itu	Define bands to match a channel frequency with 150 GHz spacing.
200-itu	Define bands to match a channel frequency with 200 GHz spacing.
reset	Clear all defined bands.

3.3.2 Custom Waveplans

Custom Waveplans are template waveplans that can be defined and copied onto an active Wavelength Selective Switch or Optical Channel Monitor waveplan. These waveplans includes information about band definitions and does not include any information pertaining to WSS band characteristics (applied attenuation, switch port connection, etc.) or OCM band characteristics (threshold settings). Up to four custom waveplans can be defined and saved onto the DarkStar file system.

Syntax

```
CONF-WP[waveplan-index]#
```

As the syntax line above indicates, you can use a waveplan-index value to specify which custom waveplan to configure.

Available configuration commands for custom waveplans includes:

- band
- bandwidth
- commit
- display
- load
- plan

3.3.2.1 commit

Write a custom waveplan to memory and optionally commit the custom waveplan to a WSS waveplan.

Caution: Committing a custom waveplan to a WSS waveplan will erase settings and require that WSS to be reconfigured.

Syntax

`CONF-WP[waveplan-index]#` **commit [ocm] [wss]** [ocm-label] [wss-label]

Parameters

ocm-label	OCM waveplan to commit the custom waveplan to. Only available for the SpectraPath Illuminator.
wss-label	WSS waveplan to commit the custom waveplan to. Only available for the SpectraPath Provisioner.

Example

```
SpectraPath-Provisioner CONF-WP[0]# do show wss input waveplan
WSS Input:
Band  Center      Width    |Atten  RxPwr  Thresh/Hys    Status     Port  Name
      (GHz)       (GHz)    |(dB)   (dBm)  LowAlrm(dBm)
-------------------------|-------------------------------------------------
   1  192000.000   100.000|  0.4  -15.9          N/A  N/A           0  Seattle

SpectraPath-Provisioner CONF-WP[0]# commit wss input
```

```
Committing will save your changes to the waveplan.
Are you sure? [yes/NO]
Override the WSS waveplan.
Are you sure? [yes/NO] yes

Waveplan 0 committed to WSS Input waveplan
SpectraPath-Provisioner CONF-WP[0]# do show wss input waveplan

WSS Input:
Band  Center      Width    |Atten  RxPwr  Thresh/Hys    Status     Port  Name
      (GHz)       (GHz)    |(dB)   (dBm)  LowAlrm(dBm)
-------------------------|-------------------------------------------------
   0  191600.000   100.000| 99.9  -46.7           N/A  N/A        None  N/A
```

3.3.2.2 display

Displays either the current waveplan, draft waveplan, or a difference between the current and draft waveplans.

Syntax

`CONF-WP[waveplan-index]#` **display {changes | current | draft}**

Parameters

changes	Show the differences between the committed, saved waveplan and the uncommitted, modified waveplan.
current	Show the committed, saved waveplan.
draft	Show the uncommitted, modified waveplan.

Example

```
SpectraPath-Provisioner CONF-WP[0]# display changes

       Current Plan           Draft Plan
-------------------------------------------------
Band | Center      Width    | Center      Width
     | (GHz)       (GHz)    | (GHz)       (GHz)
-----|----------------------|----------------------
   0 | 193400.000  1000.000 | 194400.000  1000.000
  15 | 191400.000    50.000 | 191500.000     6.250
 255 |                      | 191800.000    50.000

SpectraPath-Provisioner CONF-WP[0]#
```

3.3.2.3 load

Upload another custom waveplan to the waveplan that is currently being configured.

Syntax

`CONF-WP[waveplan-index]#` **load waveplan** {waveplan-index}

Parameters

waveplan-index	The index of the waveplan to be uploaded.

Example

```
SpectraPath-Provisioner CONF-WP[1]# display changes

No changes have been made to the waveplan.

SpectraPath-Provisioner CONF-WP[1]# load waveplan 0


SpectraPath-Provisioner CONF-WP[1]# display changes

       Current Plan           Draft Plan
-------------------------------------------------
Band | Center      Width    | Center      Width
     | (GHz)       (GHz)    | (GHz)       (GHz)
-----|----------------------|----------------------
  15 |                      | 191600.000   100.000
  31 |                      | 193200.000   100.000
  55 |                      | 195500.000    50.000
  56 |                      | 195600.000    50.000
  57 |                      | 195700.000    50.000
  58 |                      | 195800.000    50.000
  59 |                      | 195900.000    50.000
  60 | 195900.000   100.000 |

SpectraPath-Provisioner CONF-WP[1]#
```

3.3.3 Wavelength Selective Switch

Wavelength Selective Switches (WSS) enables the SpectraPath Provisioner to dynamically control power levels and easily add/drop channels on a network. Each WSS has it's own waveplan. A WSS waveplan contains information about a defined band's characteristics, including the attenuation, band power, and current front panel switch port connection.

This section includes the following:

- WSS-Label Keywords
- show wss
- Controls for Individual WSSs

3.3.3.1 WSS-Label Keywords

WSS commands use WSS-label keywords to specify a particular WSS. These WSS-label keywords can be part of a WSS- specific command prompt or issued from a particular mode (e.g. `>`), depending on the task.

Syntax

`CONF-WSS[wss-label]#`

`>` **show wss** [wss-label]

As the syntax lines above indicate, you can use a wss-label keyword to specify an WSS within a command. Shown below is the waveplan command, issued from the > mode, to display the waveplan associated with the input WSS.

Example

`>` **show wss input waveplan**

See the waveplan command for more details on displaying the waveplan with WSS-labels.

While the `show wss` commands are available from multiple modes, the `CONF-WSS[wss-label]#` prompt is required for issuing the other wss commands such as `band`, `attenuate`, or `connect`.

For instance, from the `CONF#` mode, when you specify a particular WSS with the *wss-label*, the corresponding prompt will change, as shown in Table 3-2.

TABLE 3-2. WSS command prompts

WSS-label	Prompt Changes To...
input	`CONF-WSS[input]#`
output	`CONF-WSS[output]#`
east input	`CONF-WSS[east input]#`
east output	`CONF-WSS[east output]#`
west input	`CONF-WSS[west input]#`
west output	`CONF-WSS[west output]#`

3.3.3.2 show wss

This section includes show commands exclusive to Wavelength Selective Switches:

- module
- show running-config wss
- waveplan

3.3.3.2.1 module

Display information pertaining to the WSS module, including WSS device characteristics, alarms, and temperatures.

Syntax

`>` **show wss module**
`#` **show wss module**
`CONF#` **do show wss module**

Example

`SpectraPath-Provisioner#` **show wss module**

```
Wavelength Selective Switch

Module Operational Status: Ready
```

```
 WSS Module Features
-------------------------------------------------
 Total Number of Ports            44
 Total Number of Slices           772
 Slice Bandwidth                  6.250 GHz
 Minimum Frequency Bound          191325.000 GHz
 Maximum Frequency Bound          196150.000 GHz
 Start-Up State                   Start Factory Default


 WSS Alarm Statuses (Latched)
-------------------------------------------------
 Case Temp Exceeded               False (False)
 Internal Temp not Maintained     False (False)
 Temperature Control Shutdown     False (False)
 Thermal Shutdown                 False (False)
 Optical Control Failure          False (False)
 Power Supply Failure             False (False)
 Power Rail Issue                 False (False)
 Internal Failure                 False (False)
 Calibration Error                False (False)
 Single Event Upset Detected      False (False)


 WSS Module Env Monitors
-------------------------------------------------
 Case Temperature                 37.30 degC
 Internal Temperature             60.00 degC

SpectraPath-Provisioner#
```

3.3.3.2.2 show running-config wss

Displays the settings of wavelength selective switches.

	The `show running-config wss` *command is only available on SpectraPath systems with an WSS installed.*

Syntax

`#` **show running-config wss**
`CONF#` **do show running-config wss** [wss-label]

Example

`#` **show running-config wss**

```
running-config:
wss input
port 0 name Seattle
port 7 name Redmond
band index 0 center-frequency 192000.000 bandwidth 100
```

```
attenuate set 0.0 band 0
connect port 0 band 0
band index 1 center-frequency 192100.000 bandwidth 100
attenuate set 0.0 band 1
connect port 0 band 1
exit
wss output
band index 0 center-frequency 192000.000 bandwidth 100
attenuate set 5.0 band 0
connect port 0 band 0
band index 1 center-frequency 192100.000 bandwidth 100
attenuate set 5.0 band 1
connect port 0 band 1
band index 2 center-frequency 192200.000 bandwidth 100
attenuate set 5.0 band 2
connect port 1 band 2
exit
```

3.3.3.2.3 waveplan

Display the waveplan associated with a WSS.

Syntax

`>` **show wss** {wss-label} **waveplan**
`#` **show wss** {wss-label} **waveplan**
`CONF#` **do show wss** {wss-label} **waveplan**

Parameters

wss-label	Specifies the WSS for which to display the waveplan. For more details, see the WSS-Label Keywords.

This command contains information for all defined bands, which includes a band's frequency characteristics, applied attenuation, and assigned switch port connection. In the example below, you can see the waveplan associated with the input WSS on a SpectraPath Provisioner system.

Example

```
SpectraPath-Provisioner CONF-WSS[input]# do show wss input waveplan

WSS Input:

Band  Center      Width    |Atten  RxPwr  Thresh/Hys    Status     Port  Name
      (GHz)       (GHz)    |(dB)   (dBm)  LowAlrm(dBm)
--------------------------|-------------------------------------------------
   0  193750.000  1200.000|  0.0  -14.4           N/A  N/A           1  Seattle
   1  192000.000   100.000|  0.0  -17.2           N/A  N/A           0  Everett
   2  195450.000  1000.000|  5.0  -24.8           N/A  N/A           2  Tacoma

SpectraPath-Provisioner CONF-WSS[input]#
```

Note: The "OCM RxPwr" is the receive power that is pulled for the band from the optical channel monitor on the system. For more information, see Optical Channel Monitor.

3.3.3.3 Controls for Individual WSSs

Available configuration commands for individual wavelength selective switches includes:

- attenuate
- band
- bandwidth
- connect
- flatten
- plan
- port
- threshold

3.3.3.3.1 attenuate

Adjust the attenuation for a single band or range of bands.

Syntax

`CONF-WSS[wss-label]#` **attenuate** {add|set *attenuation-value*} **band** {first-band} [last-band]

add	Increase or reduce a band's attenuation relative to its current attenuation setting by the attenuation-value.
set	Sets the band's attenuation to the provided attenuation-value
attenuation-value	Adds or sets the band's gain attenuation as a decimal-value (i.e., nn.n).
first-band	The first equalizer band to attenuate.
last-band	The last equalizer band to attenuate. If this parameter is not provided, only the first-band is attenuated.

The example below comes from a Provisioner system with an "input" WSS. Here, an attenuation value of 2.0 dB was applied to bands 1-5 using the `attenuate` command..

The "Atten" in the output indicates the WSS was configured to apply an attenuation value of 2.0 dB.

For input WSSs, the "OCM RxPwr" does not account for the applied attenuation-value. However, for output WSSs, The "OCM RxPwr" does account for the applied attenuation-values.

Example

```
SpectraPath-Provisioner CONF-WSS[input]# attenuate set 2.0 band 1 5

SpectraPath-Provisioner CONF-WSS[input]# do show wss input waveplan

WSS Input:

Band   Center       Width    |Atten   RxPwr   Thresh/Hys     Status      Port   Name
       (GHz)        (GHz)    |(dB)    (dBm)   LowAlrm(dBm)
-------------------------------|-----------------------------------------------
0      191700.000    300.000|  99.9   -50.4            N/A   N/A         None   N/A
1      192100.000    100.000|   2.0    -8.5            N/A   N/A            0   Seattle
2      192200.000    100.000|   2.0    -8.6            N/A   N/A            0   Seattle
3      192300.000    100.000|   2.0    -8.3            N/A   N/A            1   Everett
4      192400.000    100.000|   2.0    -9.4            N/A   N/A            1   Everett
5      192500.000    100.000|   2.0    -9.1            N/A   N/A            2   Tacoma
```

Note: In the example output above, band 0 displays an attenuation of "99.9". This is the default attenuation value for a band that hasn't had its attenuation value set.

3.3.3.3.2 connect

Establish a connection between a front panel switch port and a band.

Syntax

`CONF-WSS[wss-label]#` [no] **connect port** {*port-index* | *port-name*} **band** {*first-band*} [*last-band*]

Parameters

port-index	The front-panel switch port index to be used for connecting to a band.
port-name	The name of a front-panel switch port index to be used for connecting a band. For more information on setting names for a front-panel switch port, see the port command.
first-band	The first band to be connected to the switch port.
last-band	The last band to be connected to the switch port.

SpectraPath systems offer 20 front-panel switching, add/drop ports for various band connections

The example below details a SpectraPath Provisioner system connecting bands 1 through 2 to front panel switch port 1, also known as Everett. Disconnections from a front panel switch port can be performed with the **no connect** command.

SpectraPath-Provisioner CONF-WSS[output]# **connect port** *1* **band** *1 2*

```
SpectraPath-Provisioner CONF-WSS[input]# do show wss input waveplan

WSS Input:
Band   Center       Width    |Atten   RxPwr   Thresh/Hys     Status      Port   Name
       (GHz)        (GHz)    |(dB)    (dBm)   LowAlrm(dBm)
--------------------------|-------------------------------------------------
0      191700.000    300.000| 99.9   -50.4            N/A   N/A         None   N/A
1      192100.000    100.000|  0.9   -11.5            N/A   N/A            1   Everett
2      192200.000    100.000|  0.8   -11.4            N/A   N/A            1   Everett
```

Note: In the example above, band 0 displays a connection to port "None". This is the default connection that is applied for a band that is disconnected, as light is transmitted to the WSS blocking port.

3.3.3.3.3 flatten

Increase the attenuation for a range of bands in a SpectraPath system by an amount that will produce equivalent optical channel output power for each band. The attenuation for each band can be increased to reach a desired user-supplied receive power setpoint value. If a desired receive power setpoint value isn't supplied, the SpectraPath system will attenuate the defined bands to the lowest receive power measured by a band.

Syntax

`CONF-WSS[wss-label]#` **flatten band** {*first-band*} {*last-band*} **setpoint** [*setpoint-value*]

Parameters

first-band	The first band to flatten.
last-band	The last band to flatten.
setpoint-value	An optional target receive power value to be reached by each band. If this parameter is not provided, all bands will be attenuated to the lowest measured receive power for a band.

If you wish to apply the flatten command, ensure that the range of bands that are being flattened have reasonable receive power values. Additionally, if you wish to reapply the flatten command after already applying it once, make sure to reset the attenuation that is already being applied to each band. This can be done with the Optical Channel Monitor command.

Example

```
SpectraPath-Provisioner CONF-WSS[output]# flatten band 1 5
SpectraPath-Provisioner CONF-WSS[output]# do show wss output waveplan

WSS Output:
Band  Center      Width    |Atten  TxPwr  Thresh/Hys    Status     Port  Name
      (GHz)       (GHz)    |(dB)   (dBm)  LowAlrm(dBm)
-------------------------|-----------------------------------------------------
0     191700.000   300.000| 99.9  -50.4           N/A  N/A        None  N/A
1     192100.000   100.000|  0.9  -11.5           N/A  N/A           0  Seattle
2     192200.000   100.000|  0.8  -11.4           N/A  N/A           0  Seattle
3     192300.000   100.000|  1.1  -11.4           N/A  N/A           1  Everett
4     192400.000   100.000|  0.0  -11.4           N/A  N/A           1  Everett
5     192500.000   100.000|  0.3  -11.5           N/A  N/A           2  Tacoma
```

3.3.3.3.4 port

Establish a name for a front-panel switch port. A port name is limited to 8 characters. The allowable characters are letters, numbers, hyphens, and underscores. If a name is not supplied, "Name" in the **show waveplan** command, will display as "N/A". Port names are shared between all WSS devices.

Syntax

`CONF-WSS[wss-label]#` [no] **port** {*port-index*} **name** *port-name*

Parameters

port-index	The front panel switch port index.
port-name	The name to identify a front-panel switch port index.

Example

```
SpectraPath-Provisioner CONF-WSS[input]# port 7 name Redmond
SpectraPath-Provisioner CONF-WSS[input]# do show wss input waveplan

WSS Input:
Band  Center      Width    |Atten  RxPwr  Thresh/Hys    Status     Port  Name
      (GHz)       (GHz)    |(dB)   (dBm)  LowAlrm(dBm)
-------------------------|-----------------------------------------------------
0     191500.000   100.000|  7.0   -5.4           N/A  N/A           7  Redmond
1     191600.000   100.000|  1.4  -10.5           N/A  N/A           8  N/A
```

3.3.4 Optical Channel Monitor

Optical Channel Monitors are used in SpectraPath systems to view power for defined bands in a waveplan. For Provisioner systems, OCMs are updated automatically as bands are updated with WSS waveplans using the band command. For Illuminator systems, OCM waveplans can be controlled individually.

The section includes the following:

- OCM-Label Keywords
- show ocm
- Controls for Individual OCMs

3.3.4.1 OCM-Label Keywords

OCM commands use OCM-Label keywords to specify a particular OCM. These OCM-Label keywords can be part of a OCM-specific command prompt or issued from a particular mode (e.g. `>`), depending on the task.

Syntax

```
CONF-OCM[ocm-label]#
> show ocm  [ocm-label]
```

As the syntax lines above indicate, you can use a ocm-label keyword to specify an OCM port within a command. Shown below is the waveplan command, issued from the `>` mode, to display the waveplan associated with the OCM port at the demux filter

Example

```
> show ocm demux waveplan
```

OCM-labels are associated with the location of the OCM port on an optical path. See the waveplan command for more details on displaying the waveplan with OCM-labels.

While the **show ocm** commands are available from multiple modes, the `CONF-OCM[ocm-label]#` prompt is required for issuing the other ocm commands such as `threshold`.

For instance, from the `CONF#` mode, when you specify a particular OCM with the *ocm-label*, the corresponding prompt with change, as shown in Table 3-3.

TABLE 3-3. OCM command prompts

OCM-label	Prompt Changes To...
demux	`CONF-OCM[demux]#`
line-out	`CONF-OCM[line-out]#`
line-in	`CONF-OCM[line-in]#`
mux	`CONF-OCM[mux]#`

3.3.4.2 show ocm

This section includes show commands pertaining to the Optical Channel Monitor.

- module

- show running-config ocm
- waveplan

3.3.4.2.1 module

Displays information about the OCM module, including device characteristics, alarms, and temperatures.

Syntax

`>` **show ocm module**
`#` **show ocm module**
`CONF#` **do show ocm module**

Example

```
SpectraPath-Provisioner> show ocm module

Optical Channel Monitor

Module Operational Status: Ready

 OCM Module Features
-------------------------------------------------
 Total Number of Ports            4
 Total Number of Slices           6465
 Slice Bandwidth                  1.5625 GHz
 Minimum Frequency Bound          186050.000 GHz
 Maximum Frequency Bound          196151.562 GHz
 Maximum Defined Channels         512
 Support Capability               0x33


 OCM Alarm Status (Latched)
-------------------------------------------------
 Junction Temp Exceeded           False (False)
 Internal Temp not Maintained     False (False)
 Power Rail Issue                 False (False)
 Internal Failure                 False (False)
 Optical Over Power               False (False)
 PD Temperature Failure           False (False)
 Wavelength Locker Failure        False (False)
 Laser Power Unacceptable Range   False (False)
 Single Event Upset Detected      False (False)


 OCM Module Env Monitors
-------------------------------------------------
 Case Temperature                 31.9 degC
 Internal Temperature             69.9 degC
```

3.3.4.2.2 show running-config ocm

Displays the settings of OCMs.

	The `show running-config ocm` *command is only available on SpectraPath Illuminator systems.*

Syntax

`#` **show running-config ocm**
`CONF#` **do show running-config ocm**

Example

 # show running-config ocm

```
running-config:
ocm demux
band index 0 center-frequency 192000 bandwidth 100
band index 1 center-frequency 192100 bandwidth 100
threshold low-alarm -30.0 band 1
exit
ocm line-out
band index 0 center-frequency 192000 bandwidth 100
band index 1 center-frequency 192100 bandwidth 100
threshold low-alarm -30.0 band 1
exit
ocm line-in
band index 0 center-frequency 192000 bandwidth 100
band index 1 center-frequency 192100 bandwidth 100
threshold low-alarm -30.0 band 1
exit
ocm mux
band index 0 center-frequency 192000 bandwidth 100
band index 1 center-frequency 192100 bandwidth 100
threshold low-alarm -30.0 band 1
exit
```

3.3.4.2.3 waveplan

Display the waveplan associated with an OCM.

Note: This command is specific to the SpectraPath Illuminator system. For viewing the waveplan on the SpectraPath Provisioner, see the waveplan command specific to the WSS.

Parameters

summary	Specifies the OCM for which to display the waveplan. For more details, see OCM-Label Keywords.

This command contains information for all defined bands, which includes a band's frequency characteristics, band power, and threshold alarms. In the example below, you can see the waveplan associated with the OCM located at the demux file on the SpectraPath Illuminator system.

Example

```
SpectraPath-Illuminator CONF-OCM[demux]# do show ocm demux waveplan

OCM Demux Waveplan:
  Default Waveplan.... 100-ITU
  Path................ Pre-amplifier output to Demux filter

Band  Center      Width    |Band Pwr  Thresh/Hys    Status
      (GHz)       (GHz)    |(dBm)     LowAlrm(dBm)
-------------------------|--------------------------------
   0  191400.000  100.000 |   -13.0     -20.5/2.0  OK
   1  191500.000  100.000 |   -13.0     -20.5/2.0  OK
   2  191600.000  100.000 |   -13.1     -20.5/2.0  OK
   3  191700.000  100.000 |   -13.2     -20.5/2.0  OK
   4  191800.000  100.000 |   -21.1     -20.5/2.0  Low Alarm
   5  191900.000  100.000 |   -20.8     -20.5/2.0  Low Alarm
   6  192000.000  100.000 |   -13.3     -20.5/2.0  OK
   7  192100.000  100.000 |   -13.0     -20.5/2.0  OK
   8  192200.000  100.000 |   -13.2     -20.5/2.0  OK
   9  192300.000  100.000 |   -13.1           N/A  N/A
```

3.3.4.3 Controls for Individual OCMs

Available configuration commands for individual optical channel monitors includes:

- band
- bandwidth
- plan
- threshold

3.3.4.3.1 threshold

Establish a setpoint value for generating threshold alert events. Events are generated when the band power exceeds the specified threshold setpoint value. Supported thresholds and their behavior are specified in Table 3-4.

TABLE 3-4. Threshold Alert Types and Behavior

Threshold Alert Type	Trigger	Resolution
Low Alarm	Band power falls below the threshold setpoint.	Band power exceeds the threshold setpoint plus the hysteresis.

Note: The hysteresis for each threshold is 2.0 dBm by default. This value can not be manipulated in DXMOS.

Syntax

`CONF-OCM[ocm-label]#` **threshold low-alarm** {*threshold-setpoint*} **band** {*first-band*} [*last-band*]

Parameters

threshold-setpoint	The threshold setpoint value, in dBm.
first-band	The first OCM band to apply the threshold.
last-band	The last OCM band to apply the threshold.

Example

```
SpectraPath-Illuminator CONF-OCM[demux]# threshold low-alarm -25.5 band 0 3
SpectraPath-Illuminator CONF-OCM[demux]# do show ocm demux waveplan

OCM Demux Waveplan:
  Default Waveplan.... 100-ITU
  Path................ Pre-amplifier output to Demux filter

Band  Center      Width    |Band Pwr  Thresh/Hys    Status
      (GHz)       (GHz)    |(dBm)     LowAlrm(dBm)
-------------------------|--------------------------------
   0  191400.000  100.000 |   -13.0     -25.5/2.0  OK
   1  191500.000  100.000 |   -13.0     -25.5/2.0  OK
   2  191600.000  100.000 |   -13.1     -25.5/2.0  OK
   3  191700.000  100.000 |   -13.2     -25.5/2.0  OK
   4  191800.000  100.000 |   -21.1     -20.5/2.0  Low Alarm
   5  191900.000  100.000 |   -20.8     -20.5/2.0  Low Alarm
   6  192000.000  100.000 |   -13.3     -20.5/2.0  OK
   7  192100.000  100.000 |   -13.0     -20.5/2.0  OK
   8  192200.000  100.000 |   -13.2     -20.5/2.0  OK
   9  192300.000  100.000 |   -13.1           N/A  N/A
```

3.4 DUA Groups

This section includes the following and is only applicable to the DarkStar Utility Amplifier (DUA):

- Group-Name Keywords
- show commands
- Controls for Individual WSSs
- group commands

3.4.1 Group-Name Keywords

A group is a collection of optical components that is contained within the Darkstar Utility Amplifier (DUA) system. Optical components can be comprised of amplifiers, OSCs, or OTDR transceivers. Show and group commands use group-name keywords to specify a group. These group-name keywords can be part of a group-specific command prompt or issued from a particular mode (e.g., >), depending on the task. If no group-name is supplied, the group number is used instead.

Syntax

```
CONF-GROUP[n|name]#
>show group [n|name]
```

As the syntax lines above indicate, you can use a group-number, denoted by *n*, or a group-name, denoted by *name*, to specify a group within a command. Shown below is the `show group` command, for the `seattle` group.

Example

```
DUA_System1> show group seattle
```

For details on using the `show group` command with group-names, see the beginning of the show group section. For details on configuring a group name, see the name section under group commands.

3.4.2 show commands

This section includes show commands exclusive to DUA groups:

- show group
- show group [n|name] amplifier
- show group [n|name] management
- show group [n|name] module
- show group [n|name] otdr

3.4.2.1 show group

Display the status of amplifiers, OSCs, and otdrs for a group.

Syntax

```
>show group [n|name|summary|all]
#show amplifier [n|name|summary|all]
CONF#do show group [n|name|summary|all]
```

Parameters

n	The group-number for which to display information. If no parameter is specified, a summary is provided.
name	The group-name for which to display information. If no parameter is specified, a summary is provided. For more details on group-names, see Group-Name Keywords.
summary	Displays a brief report of group statistics.

all	Displays detailed information for all optical components in the DUA system.

Example

```
DUA_System1> show group

Group 0 seattle:

                                 Admin  Ctrl   Control   RxPow   TxPow  Module
Amplifier                Role    State  Mode   Setpoint  (dBm)   (dBm)  State
-----------------------  ------- -----  ----  ---------  ------  ------ ------
Input EDFA               Preamp  Up     APC     0.5 dBm   -13.4     0.5 Up
Output EDFA              Booster Up     AGC    23.7 dB    -20.2     4.3 Up

Management Interface Admin  Line   Type      IP Address
-------------------- ------ ------ --------- ---------------------------------
OSC 0                Up     Up     LAN       192.168.1.249/29

Module       Admin Line    Rate     RxPow       Ch   Transceiver  Last Line Chg
------------ ----- ------- -------- ----------- ---- -----------  -------------
OSC 0        Up    Up      100Mb/s    -12.4 dBm N/A  N/A          00d 01:02:45*

OTDR OSC[0] (Group 0 [seattle])
  Automatic Mode: . Enabled
  Last Result: .... Not Measured

_____________________________________________________________________________

Group 1 everett:

                                 Admin  Ctrl   Control   RxPow   TxPow  Module
Amplifier                Role    State  Mode   Setpoint  (dBm)   (dBm)  State
-----------------------  ------- -----  ----  ---------  ------  ------ ------
Input EDFA               Preamp  Down   D           N/A   -38.5   -40.0 LOS
Output EDFA              Booster Down   APC     6.5 dBm    -9.7   -40.0 Down

Management Interface Admin  Line   Type      IP Address
-------------------- ------ ------ --------- ---------------------------------
OSC 1                Up     Down   LAN       192.168.2.213/16

Module       Admin Line    Rate     RxPow       Ch   Transceiver  Last Line Chg
------------ ----- ------- -------- ----------- ---- -----------  -------------
OSC 1        Up    Down   100Mb/s    -40.0 dBm N/A  N/A          00d 22:08:01*


_____________________________________________________________________________

Group 2 redmond:

                                 Admin  Ctrl   Control   RxPow   TxPow  Module
Amplifier                Role    State  Mode   Setpoint  (dBm)   (dBm)  State
-----------------------  ------- -----  ----  ---------  ------  ------ ------
```

```
Input EDFA               Preamp   Down   APC     6.5 dBm   -35.5   -40.0 LOS
Output EDFA              Booster  Down   APC     8.3 dBm   -50.4   -40.0 LOS

Management Interface Admin  Line   Type      IP Address
-------------------- ------ ------ --------- ---------------------------------
OSC 2                Up     Down   LAN       192.16.0.27/16

Module       Admin Line    Rate     RxPow       Ch   Transceiver  Last Line Chg
------------ ----- ------- -------- ----------- ---- -----------  -------------
OSC 2        Up    Down    100Mb/s    -40.0 dBm N/A  N/A          00d 22:08:15*

OTDR OSC[2] (Group 2 [redmond])
  Automatic Mode: . Enabled
  Last Result: .... Not Measured

_____________________________________________________________________________

Group 3 tacoma:

                                  Admin  Ctrl   Control   RxPow   TxPow  Module
Amplifier                Role     State  Mode   Setpoint  (dBm)   (dBm)  State
-----------------------  -------  -----  ----  ---------  ------  ------ ------
Input EDFA               Preamp   Down   D           N/A   -42.8   -40.0 LOS
Output EDFA              Booster  Down   APC     8.8 dBm   -47.7   -40.0 LOS

Management Interface Admin  Line   Type      IP Address
-------------------- ------ ------ --------- ---------------------------------
OSC 3                Up     Down   LAN       192.168.3.201/16

Module       Admin Line    Rate     RxPow       Ch   Transceiver  Last Line Chg
------------ ----- ------- -------- ----------- ---- -----------  -------------
OSC 3        Up    Down   100Mb/s    -40.0 dBm  N/A  N/A          00d 22:08:29*


DUA_System1>
```

3.4.2.2 show group [*n*|*name*] amplifier

Display a summary or detailed information for amplifiers in a specific DUA group.

Example

```
DUA_System1> show group seattle amplifier all

Detailed information for Amplifier Group 0 seattle Input EDFA
  Module is administratively up
  Module Status
    State ................. Up
    Control mode ........... Automatic (Power Control)
    Channel-count ..........      1
    Calculated Setpoint ....    0.5 dBm
    Applied Setpoint .......    0.5 dBm
    Case temperature .......   35.4 C
```

```
  Pump Status
    Pump bias current ......   69.5 mA (Up)
    Pump EOL bias current ..  192.0 mA
    Pump temperature .......   25.0 C
  Signal Levels
    Input power ............  -13.4 dBm
    Total output power .....    0.5 dBm
    Signal output power ....    0.5 dBm
    Signal gain ............   13.9 dB
 Alarms
    None
  Module Identification
    Role ................... Pre-amplifier
    Group Number ........... 0
    Group Name ............. seattle
    AGC Setpoint Min/Max ...   17.0/29.0 dB
    APC Setpoint Min/Max ...  -10.0/20.0 dBm



Detailed information for Amplifier Group 0 seattle Output EDFA
  Module is administratively up
  Module Status
    State .................. Up
    Control mode ........... Automatic (Gain Control)
    Channel-count ..........      1
    Tx Power/Channel .......    3.0 dBm
    Calculated Setpoint ....   23.7 dB
    Applied Setpoint .......   23.7 dB
    Case temperature .......   31.3 C
  Pump Status
    Pump bias current ......  108.2 mA (Up)
    Pump EOL bias current ..  636.3 mA
    Pump temperature .......   25.0 C
  Signal Levels
    Input power ............  -20.2 dBm
    Total output power .....    4.3 dBm
    Signal output power ....    3.4 dBm
    Signal gain ............   23.6 dB
  Alarms
    None
  Module Identification
    Role ................... Booster
    Group Number ........... 0
    Group Name ............. seattle
    AGC Setpoint Min/Max ...   17.0/29.0 dB
    APC Setpoint Min/Max ...  -10.0/20.0 dBm
```

The group name and number identifies which amplifier a group belongs to. For more details on the output, see the show amplifier command.

3.4.2.3 show group [*n*|*name*] management

Display a summary or detailed network management information for an OSC in a specific DUA Group.

Example

```
DUA_System1> show group seattle management osc

Group 0 seat OSC (Ethernet 4) is up, line protocol is up,
  Description is group-seattle-osc
  Internet address is 192.168.1.249/29
  Hardware is 10/100 Ethernet, MAC address is 00:A0:E3:00:0A:DF
  Full Duplex mode, link type is 100Mbps (Auto-Negotiated)
  Last State Change: 00d 01:24:42 ago
    2 packets input, 138 bytes
    0 no receive buffer, 0 CRC error, 0 overrun
    0 no transmit buffer
    2 packets output, 138 bytes
    0 collisions, 0 late collisions,
    0 deferred, 0 lost carrier, 0 no carrier
```

3.4.2.4 show group [*n*|*name*] module

Display a summary or detailed module information for an OSC in a specific DUA group.

Example

```
DUA_System1> show group 0 module osc

Group 0 The_First_group OSC    Up
  Description: .... group-seattle-osc
  Tx: ............. OK                        Rx: .......... OK
  State Changed: .. 00d 01:43:55              Channel: ..... N/A
  Tx Laser: ....... Enabled                   Frequency: ... 198406 GHz
  Tx Power: ....... 0.2 dBm                   Wavelength: .. 1511.00 nm
  Rx Power: ....... -12.4 dBm                 Module Type: . SFP
  Loopback: ....... Not Supported             Temperature: . 40 C
  Encapsulation: .. 100Base-FX                Vendor: ...... OPLINK
  Last Cleared: ... 01d 00:35:21              Part No.: ... TRPE03HL2C00030G
  Link Downtime: .. 00d 00:00:00              Serial No.: .. Z174501N0
  Maximum Reach: .. 80 km on SM               MFG Date: .... 180516
```

3.4.2.5 show group [*n*|*name*] otdr

Display a summary or detailed information for an OTDR in a specific DUA group.

Example

```
DUA_System1> show group seattle otdr

OTDR OSC[0] (Group 0 [seattle])
  Automatic Mode: . Enabled
  Last Result: .... Not Measured
```

3.4.3 show running-config group

Displays the settings for a DUA group

Syntax

`#` **show running-config group**
`CONF#` **do show running-config group** [*n*|*name*]

Parameters

n	Specifies which group-number to display information.
name	Specifies which group-name to display information.

Example

```
DUA_System1> show running-config group

running-config:
group 0
name seattle
amplifier input edfa
control automatic channel-count 1 -10.0 power -9.5
no shutdown
exit
amplifier output edfa
control automatic channel-count 1 3.0 gain 23.7
no shutdown
exit
amplifier input raman
control manually-set power 40.0
no los-shutdown
no shutdown
exit
group 1
name everett
amplifier input edfa
shutdown
exit
amplifier output edfa
control automatic channel-count 2 3.0 power 6.5
shutdown
exit
management osc 1
no laser shutdown
description group-everett-osc
ip address 192.168.2.213/16
exit
exit
group 2
name redmond
amplifier input edfa
```

```
control manually-set power 6.5
shutdown
exit
amplifier output edfa
control manually-set power 8.3
shutdown
exit
management osc 2
no laser shutdown
description group-redmond-osc
ip address 192.16.0.27/16
exit
exit
group 3
name tacoma
amplifier input edfa
shutdown
exit
amplifier output edfa
control manually-set power 8.8
shutdown
exit
management osc
no laser shutdown
description group-tacoma-osc
ip address 192.168.3.201/16
exit
exit
DUA_System1>
```

Note: In the output above, the group-name is preserved for each DUA group. For more information on DUA group-names, see the Group-Name Keywords section. Also in the output above, the `control automatic channel-count` command was used. The additional parameters appended to the command includes: the channel-count, power-per-channel in dBm, control mode, and the control setpoint. The control mode and control setpoint is the current amplifier settings which is used by DXMOS during initialization.

3.4.4 group commands

This section includes configuration commands for DUA groups.

- amplifier
- management
- module
- name
- no name
- otdr

The `group` keyword will place the Darkstar Utility Amplifier system in group configuration mode. For example, if you want to configure group `seattle`, the command prompt changes to `CONF-GROUP [seattle]#`.

3.4.4.1 amplifier

For the Darkstar Utility Amplifier system, amplifier configuration is only accessible through a DUA group. For more information on configuring an amplifier, see Controls for Individual Amplifiers.

Syntax

`CONF-GROUP [n|name]#` **amplifier** `[amplifier-label]`

Parameters

amplifier-label	Specifies which amplifier to configure in a DUA group.

Example

```
DUA_System1 CONF-GROUP[seattle]# amplifier input edfa

DUA_System1 CONF-GROUP[seattle input edfa]#

Command, one of the following:
 control
 description
 do
 end
 exit
 no
 show
 shutdown

DUA_System1 CONF-GROUP[seattle input edfa]#
```

3.4.4.2 management

The management OSC interface can be configured for a DUA group in the group configuration mode.

Syntax

`CONF-GROUP [n|name]#` **management osc** `[n]`

Parameters

n	Specifies which OSC to configure in a DUA group. There will only ever be one OSC for a DUA group. This option is offered so that Boot can understand the interface details assigned to the OSC.

Example

```
DUA_System1 CONF-GROUP[seattle]# management osc

DUA_System1 CONF-GROUP[seattle OSC]#

Command, one of the following:
  description
```

```
  do
  end
  exit
  ip
  ipv6
  laser
  no
  show
  shutdown
  snmp-traps

DUA_System1 CONF-GROUP[seattle OSC]#
```

3.4.4.3 module

The OSC module can be configured for a DUA group in the group configuration mode

Syntax

`CONF-GROUP [n|name]#` **module osc** `[n]`

Parameters

n	Specifies which OSC to configure in a DUA group. There will only ever be one OSC for a DUA group. This option is offered so that Boot can understand the interface details assigned to the OSC.

Example

```
DUA_System1 CONF-GROUP[seattle]# module osc

DUA_System1 CONF-GROUP[seattle OSC]#

Command, one of the following:
  description
  do
  end
  exit
  ip
  ipv6
  laser
  no
  show
  shutdown
  snmp-traps

DUA_System1 CONF-GROUP[seattle OSC]#
```

3.4.4.4 name

Adjust the name for a DUA group. A group name is limited to 31 characters. The allowable characters are letters, numbers, hyphens, and underscores.

Syntax

`CONF-GROUP[n]#` **name** `group-name`

Parameters

group-name	The name to identify a DUA group.

Example

```
DUA_System1> ena
DUA_System1# configure
DUA_System1 CONF# group 0
DUA_System1 CONF-GROUP[0]# name seattle
DUA_System1 CONF-GROUP[seattle]#
```

3.4.4.5 no name

Removes a group name for a DUA group. Removing a group name will display the index for the group-name while in configuration mode.

Syntax

`CONF-GROUP[n|name]#` **no name**

Parameters

no	Removes the name for a group. This is the default setting.

Example

```
DUA_System1 CONF-GROUP[seattle]# no name
DUA_System1 CONF-GROUP[0]#
```

3.4.4.6 otdr

Run an otdr test or configure an otdr for a DUA group. See otdr for more information on configuring/setting OTDR-capable OSCs.

Syntax

`CONF-GROUP[n|name]#` **otdr** `[n|disable-automatic|enable-automatic]`

Parameters

n	Number of fiber tests to run, an integer.
disable-automatic	Disable automatic OTDR when Loss of Signal occurs on a DUA Group's OSC.
enable-automatic	Enable automatic OTDR when Loss of Signal occurs on a DUA Group's OSC.

Example

```
DUA_System1 CONF-GROUP[seattle]# otdr
Number of tests, valid values are between 1 and 20.

Command, one of the following:
 disable-automatic
 enable-automatic
 <cr>
DUA_System1 CONF-GROUP[seattle]# otdr
```

3.5 DHCP and ZTP

The Dynamic Host Configuration Protocol (DHCP) enables a DarkStar system to dynamically acquire an IP address for an interface along with configuration data that enables Zero-Touch Provisioning (ZTP).

This sections includes the following:

- boot host dhcp
- ip dhcp
- show dhcp
- server configuration examples

3.5.1 boot host dhcp

Directs Boot to acquire a configuration file from a remote Dynamic Host Configuration Protocol (DHCP) server, via TFTP. This command is effective for Boot's auto-boot procedure and when Boot is commanded to reload.

When a DHCP server supplies a configuration file name and a TFTP server, Boot will acquire this file from the TFTP server and configure the system with this information. Then when DXMOS loads, it will use this configuration data rather than the configuration information stored on the flash file system, if it exists.

When DXMOS lacks a configuration file on the flash file system (dxmos/config.dat), as when a system is first deployed, Boot asks the DHCP server for configuration data. This use of DHCP, called "Zero Touch Provisioning" (ZTP), allows you to provide configuration information without using console commands. Thereafter, you may write a configuration file to record any further customization specific to the individual system.

When `boot host dhcp` is present in the configuration file, it takes precedence over any boot file or boot tftp commands

The remote configuration file must exist (on the designated TFTP server). A DHCPv4 server must be configured to provide a TFTP server host name, DNS server address, and boot file name (DHCPv4 options 6, 66, and 67) to the Darkstar system identified by its MAC address. A DHCPv6 server must supply similar data, i.e., Boot URL [RFC 5970] and DNS server addresses.

Note the following:

- If Boot receives no acceptable DHCP offer after a set duration, Boot loads DXMOS with the local configuration file (`dxmos/config.dat`). If no local configuration file is present, Boot loads DXMOS without a configuration and DXMOS handles ZTP.
- The duration of Boot's attempt to acquire a configuration file by DHCP is set by Boot's command define DHCP-Duration. The parameter is the duration in minutes, values 0 to 254. Zero disables DHCP. The value 255 means no limit: Boot will make DHCP requests until an acceptable response is made. By default, the duration is 2 minutes.
- Boot seeks DHCP responses through all of its active management interfaces (Ethernet and OSC). If enabled to do so, Boot uses both IPv4 and IPv6 when seeking a DHCP server.
- Boot sends a DHCP client identifier in its DHCP request.
- For DHCPv4, the DHCP client identifier is "01:" followed by an interface MAC address. For example, an active interface with the MAC address 00:A0:E3:00:01:A8 will present 01:00:A0:E3:00:01:A8 as its DHCPv4 client identifier. Unless directed otherwise, Boot uses the client identifier corresponding to the interface from which it is sending. However, by means of the optional `Ethernet n` or `OSC n` command parameter, Boot would use the MAC address of the specified interface as the client identifier regardless of the interface being used to make

the request: this allows a single MAC address to identify the system regardless of which interface is actually in contact with the DHCP server.

- For DHCPv6, the DHCP client identifier is a DUID-EN identifier (see RFC 3315) consisting of the EN prefix and XKL vendor identifier "00:02:00:00:52:9e:" followed by the system (Ethernet 0) MAC address. For example, a DarkStar system with the system MAC address 00:a0:e3:00:03:46 will have a DHCPv6 client identifier of 00:02:00:00:52:9e:00:a0:e3:00:03:46. For DHCPv6, both DUID-EN and the interface identifier (IAID) are sent in the request message.
- MAC addresses for Ethernet and OSC interfaces are assigned at the factory. You can determine the MAC address for an interface using the command show management. For Ethernet interfaces 0 through 3, n=0, 1, 2, or 3 or for OSC 0 through 3, n=4, 5, 6, or 7. However, a CMD system omits Ethernet interfaces 1, 2, and 3. To determine if the system is CMD-based, issue the show hardware command.

Syntax

`CONF#` [no] **boot host dhcp** [ethernet *n*|osc *n*]

Parameters

ethernet *n* or osc *n*	The MAC address of the specified interface will be used as the DHCPv4 client identifier, regardless of which actual interface is being used to contact the DHCP server. This allows the server to be configured to respond to only one identifier regardless of which interface is being used. (These parameters do not affect DHCPv6.)
no	append "in the running config."

3.5.2 ip dhcp

Enables a Dynamic Host Configuration Protocol (DHCP) client on a given interface within DXMOS.

When enabled, DXMOS will try and acquire a lease for the given interface. At a minimum, this lease will enable the interface to dynamically acquire an IPv4 address that it can use for communication.

If DXMOS boots without a configuration file on the flash system, all interfaces will enable their DHCP client's with the purpose of acquiring and applying a configuration file to enable Zero Touch Provisioning (ZTP) functionality.

If any changes are made to the configuration of the system between system startup and acquiring a remote configuration file, those changes will be lost once the acquired remote configuration file is applied. To save said changes and/or stop the automatic acquisition of a remote configuration file, execute the write memory command.

The remote configuration file must exist (on the designated TFTP server). A DHCPv4 server must be configured to provide a TFTP server IPv4 address and boot file name (DHCPv4 options 66 and 67) to the DarkStar system identified by its MAC address.

Note the following:

- If the DXMOS DHCP client is not able to acquire a lease after five re-transmissions at any stage in the lease acquisition process, the DHCP client will take a three minute break before trying again.

- The DXMOS DHCP client will use the interface's MAC address as the client hardware address and client identifier (with "01:" prepended to the client identifier).
- MAC addresses for Ethernet and OSC interfaces are assigned at the factory. You can determine the MAC address for an interface using the command show management. For Ethernet interfaces 0 through 3, n=0, 1, 2, or 3 or for OSC 0 through 3, n=4, 5, 6, or 7. However, a CMD system omits Ethernet interfaces 1, 2, and 3. To determine if the system is CMD-based, issue the show hardware command.
- A DXMOS DHCP client will not immediately detect a link down event, it will only detect the link is down upon failure to send out DHCP data. The client will also not immediately detect a link up event, it will detect the link is up within 30 seconds of the interface going up.
- The DXMOS DHCP client can make use of option 3 if offered to add a default route to the routing table.
- ZTP prefers to use the data provided in option 66 and option 67 but will use next-server parameter and the filename parameter if needed.
- Checking to see if there is a remote configuration file available to apply for ZTP only occurs upon any interface acquiring a lease or renewing/rebinding a lease.
- Upon successful acquisition of a remote configuration file, the DarkStar system will turn off lease-less DHCP clients before applying the configuration file.

Syntax

`CONF-MGMT-<ETH|OSC>[n]#` [no] **ip dhcp**

Parameters

ip dhcp	Enables the DHCP client for the specified interface.
no ip dhcp	Disables the DHCP client for the specified interface.

3.5.3 show dhcp

Displays the current DHCP client status for all interfaces using their DHCP client.

DHCP client events are silently logged, execute show logging *to see them.*

Syntax

`>` **show dhcp**

Syntax

```
localhost> show dchp

Ethernet 0 DHCP client info:
DHCP Status: Bound
Leased IPv4 Address: 10.10.0.250/24
Default Gateway IPv4 Address: 10.10.0.1
Lease time: 118 seconds
```

```
Lease start: 20:28:06 UTC Fri Jul 11 2025
Lease end: 20:30:04 UTC Fri Jul 11 2025

Ethernet 2 DHCP client info:
DHCP Status: Idle (link down)

localhost>
```

3.5.4 server configuration examples

The following are examples of Linux `isc-dhcpd-server` configurations for XKL systems:

In server file `/etc/dhcp/dhcpd6.conf`

```
# Server configuration file example for DHCPv6
host dxm-sea-01 {
    host-identifier option dhcp6.client-id
00:02:00:00:52:9e:00:A0:E3:00:01:A6;
    option dhcp6.bootfile-url "tftp://[fd123:123:1::99]/config-00.01.a6";
}
```

For DHCPv4 using DXMOS configuration `"boot host dhcp ethernet 2"`, in server file `/etc/dhcp/dhcpd.conf`:

```
host dxm-sea-01 {
    hardware ethernet 00:A0:E3:00:01:A8;
    option tftp-server-name "10.3.0.250";
    option bootfile-name "config-00.01.a8";
    next-server 10.3.0.250;
    filename "config-00.01.a8";
}
```

or DHCPv4 with DXMOS configuration "`boot host dhcp`" or "`ip dhcp`"
Alternate data in server file `/etc/dhcp/dhcpd.conf`:

```
host dxm-sea-01 {
    hardware ethernet 00:A0:E3:00:01:A6;
    option tftp-server-name "10.3.0.250";
    option bootfile-name "config-00.01.a6";
    next-server 10.3.0.250;
    filename "config-00.01.a6";
 }
```

3.6 General Settings

Available commands:

- app-code
- app switch
- banner motd
- boot
- connect
- copy
- curl
- description
- encapsulation
- fan
- hostname
- idle-mute
- prompt-name
- protection
- sntp
- switch
- terminal pager
- tftp
- tune
- tune-for-dmd
- write

3.6.1 app-code

Directly selects a CMIS compliant transceiver's application code instead of indirectly selecting through encapsulation.

	This is an advanced user command with less protections than encapsulation. **The system will not verify that the requested application code is supported by both transceivers in the client and wave pair.** **Changing the application code will result in customer traffic being temporarily dropped while the application is applied. Choosing an incompatible application code will result in customer traffic being dropped until the correct application code is selected and applied.**

	Not all application codes will have an associated encapsulation, in these instances, the encapsulation is set to unknown. The app-code cannot be set while BERT is running on the module. Trying to will be met with an error message.

Syntax

`CONF-MOD-CLIENT[n]#` **app-code** *app-code-number*
`CONF-MOD-WAVE[n]#` **app-code** *app-code-number*

Parameters

app-code-number	A supported application code number for the transceiver.

Example

```
CONF-MOD-CLIENT[1/*]# app-code 1

INNOLIGHT
T-DP4CNH-N00
Application Code 1:
 Host: ........ [0x11] 400GAUI-8 C2M (Annex 120E)
 Media: ....... [0x1C] 400GBASE-DR4 (Clause 124)
 Host Lanes: .. 8
 Media Lanes: . 4

Applying this Application Code may lead to the loss of data due to
incompatibility.
Are you sure? [yes/NO] yes
CONF-MOD-CLIENT[1/*]#
```

The following example snippet confirms the application code for a client 1.

```
CONF-MOD-CLIENT[0/*]# do show modules client 1 verbose
...

Supported Encapsulations:
  1: ................................................ 400GAUI-8
  2: ................................................ 4x100GAUI-2
Current Application Code: ............................. 1
Supported Application Codes:
 Application Code 1:
   Host: ............................................ [0x11] 400GAUI-8 C2M (Annex 120E)
   Media: ........................................... [0x1C] 400GBASE-DR4 (Clause 124)
   Host Lanes: ...................................... 8
   Media Lanes: ..................................... 4
 Application Code 2:
   Host: ............................................ [0x0D] 100GAUI-2 C2M (Annex 135G)
   Media: ........................................... [0x14] 100GBASE-DR (Clause 140)
   Host Lanes: ...................................... 2
   Media Lanes: ..................................... 1

...

CONF-MOD-CLIENT[1/*]#
```

3.6.2 app switch

Switches an automatic path protection (APP) group to a particular interface within the group. Applies to DSM10-5R systems only.

Syntax

`#` **app switch wave {east transport interface number 1|west transport interface number 2}** [force]

3.6.3 banner motd

Adds or removes a "motto of the day" message that displays on the console at login.

transport interface number 1	Specifies by interface the APP group to switch.
transport interface number 2	Specifies the target interface.
force	Overrides a locked APP group.

Syntax

`CONF#` [no] **banner motd** *delimiter message delimiter*

Parameters

delimiter	Delimits the displayed message. Delimiter value may be any ASCII character not used in the message, but the same delimiter value must be included at the beginning and end of the message.
message	The message text to display at login. Can be multiple lines of plain text.
no	Removes the display message.

Note: If the last character entered in the **banner motd** message does not match the "delimiter," then the first character in the string will be automatically appended; e.g., entering the config command "**banner motd** this banner has no ending delimiter" will cause a MOTD of "This banner has no ending delimiterT" to be displayed, with the last "T" on a separate line.

Note: The **banner motd** configuration command will not exit until a valid closing delimiter is entered, or <CTRL+C> is pressed to cancel the command.

3.6.4 boot

This command modifies the configuration setting for the location that Boot will load the DXMOS executable from. The Boot program loads an executable file from either a flash memory or a TFTP location. The Boot program reads the startup-config file to obtain specifications of what to load. (Absent a configuration setting, Boot defaults to "file /dxmos/dxmos.exe", loading an onboard DXMOS executable file.)

This command modifies the boot settings in the `running-config` by adding or removing entries from a list of file descriptions. To take effect during subsequent reloads, boot settings must be saved in the `startup-`

`config` file.

DXMOS initialization reads a config file from disk. The disk file's contents are called the startup-config.

At DXMOS initialization, the startup-config is copied to the running-config. The running-config resides in memory. If a user changes a configuration setting or option, the running-config will differ from the startup-config. When the user issues a "write memory" command, the running-config is saved to the startup-config file.

If a user does not issue the "write memory" command to save running-config changes, these changes will be lost, and the existing startup-config on the system disk will remain unchanged.

Note: write memory *writes to the* `startup-config` *location by default.*

If multiple boot locations are specified, the Boot program tries them in the order in which they are specified. Setting multiple boot locations provides a fallback in case the boot image in one location is missing or damaged.

Syntax

`CONF#` [no] **boot file** *`executable-file`*

`CONF#` [no] **boot tftp** *ip-address filename*

Parameters

file *`executable-file`*	The executable file must be a full path, such as dxmos/dxmos.exe or / dxmos/dxmos.exe.The system boots using the configuration from the dxmos/config.dat file in the system flash memory, also known as the startup config file.
tftp *ip-address filename*	The system boots from a file located at *`ip-address filename`*.
ip-address *filename*	IPv4 or IPv6 address or hostname. The filename must specify the host-specific path to the executable file.
no	Append from the running-config

3.6.5 clock

Depending on the mode, the clock command sets two different aspects of the system clock.

- Enable mode: Sets the system time and date.
- Configure mode: Sets the time zone and Daylight Saving Time behavior.

Note: Use `show clock` to display the currently set time and date.

3.6.5.1 clock (enable mode)

Sets the time and date of the DarkStar system clock.

The system time is in local time, as defined by the current `timezone` *and* `summer-time` *settings (which are set in* `configure` *mode). If your time zone observes DST, and you are setting the time close to the spring or fall transition, turn off* `summer-time` *(*`configure` *mode), set the clock (*`enable` *mode), then turn on* `summer-time` *(*`configure` *mode).*

Syntax

`#` **clock set** *hh:mm:ss day month year*

`#` **clock {read-calendar|update-calendar}**

Parameters

set *hh:mm:ss day month year*	Sets the time for the system clock to the specified time and date.
read-calendar	Copies the time from the calendar chip to the system clock.
update-calendar	Copies the time from the system clock to the calendar chip.

3.6.5.2 clock (configure mode)

Sets the timezone and Daylight Saving Time (DST) behavior of the DarkStar system clock relative to Coordinated Universal time, or UTC. This is not to be confused with the `clock` command in enable mode, which is used to set the time.

Time zones west of Greenwich time have a negative offset from Greenwich time.

Syntax

`CONF#` **clock timezone** *hrs-offset mins-offset*

`CONF#` **clock summer-time {on|off|usa|eu}**

Parameters

timezone *hrs-offset mins-offset*	Sets the time zone for the system clock to hour-offset and minutes-offset from UTC. For example, United States Pacific time has an hour-offset of -8 (UTC-8). Most time zones have a minutes-offset of 0.
summer-time on|off	`on` displays time with a forward offset of one hour from the system clock time; `off` displays with no adjustment.
summer-time usa|eu	`usa` applies DST rules for the United States; `eu` applies DST rules for the European Union.

3.6.6 connect

Creates a circuit between a client/wave interface and another client/wave interface of the same encapsulation type (e.g., 10gigabitethernet). An interface may be connected to itself, or looped back for testing purposes.

Syntax

`CONF#` [no] **connect** module *n* module *m* **encapsulation** encapsulation-type

Parameters

module *n*	**client** *n* or **wave** *n*
module *m*	**client** *m* or **wave** *m*

encapsulation encapsulation-type	Encapsulation type, which sets the appropriate clock rate.
	Options are:
	`gigabitethernet`
	`10gigabitethernet [fec]`
	`fibrechannel {1g|2g|4g|8g|10g}`
	`sonet {oc48|oc192|oc192 fec}`

no **connect** module *n* module *m*	Disconnect the two specified interfaces.

3.6.7 copy

Copies files ("containing" and "images to" with "images") to configuration data, software images, and gateware images to either a new or existing file. This command does not copy folders or directories.

- **If you attempt to overwrite an executable file with a data file, or vice versa, you will see a warning that the two files are of different modes. You will be prompted to confirm your decision before the file overwrite begins.**
- **Before using** copy **to install a new** `dxmos/config.dat` **file, be sure the enable password in the new file is known or empty. The system must be reloaded after installing a new dxmos/config.dat file to make the new configuration effective. Beware that a** write memory **command will overwrite the new file with the running configuration.**

Syntax

`#` **copy** *source-storage-location destination-storage-location*

Parameters

source-storage-location	Specifies the file to be copied, the original file. Must be a full absolute path. The filename should be a path: local paths are relative to the directory root and remote file paths are relative to the TFTP server root. Paths may include a leading forward slash (/). For example, */dxmos/dxmos.exe* and *dxmos/dxmos.exe* refer to the same file, but *dxmos.exe* does not.
destination-storage-location	Specifies the target location for the copied file. Must be a full absolute path. The path is interpreted relative to the file system root and may include a leading forward slash (/).

3.6.8 curl

Copy files between the DarkStar file system and a remote server using the management network. Use this command to transfer files using FTP or TFTP. Only passive FTP connections and the BINARY transfer mode are supported. The `anonymous` user name and a default password are used if not given in an FTP URL.

Note: Use of the **curl** command requires a functioning FTP or TFTP server. Configuring servers is beyond the scope of this documentation.

DNS must be configured with the `ip name-server` *command to resolve a hostname in a URL.*

- **It is possible to corrupt valid storage locations using the `curl` command. No checks are made to ensure the downloaded data files are legitimate DarkStar system data files. Use the `checksum` command on the retrieved file and manually verify its integrity.**
- **An attempt to overwrite an executable file with a data file, or vice versa, is not allowed. An executable file is identified by appending the `.exe` extension to the file name. You will receive an error when the source and destination files have different file types.**
- **It is possible to use `curl` to obtain a startup configuration file whose enable password is unknown. Be sure to write down each configuration's enable password in a safe place. Once the password is set and you leave enable mode, there is no way to configure the DarkStar system without entering the password to return to enable mode.**

Syntax

`#` **curl** *source-url-or-file-path destination-url-or-file-path*

Parameters

source-url-or-file-path	A file system path or an RFC 3986 formatted URL identifying the origin of the data to be copied. Supported URL schemes are **ftp**, **tftp**, and **file**. The source URL or file path is mandatory. A source file path is a path to a file that is located on the local DarkStar file system. For example, `/dxmos/dxmos.exe` or `dxmos/dxmos.exe`. Exactly one of the parameters must identify a file located on the DarkStar file system if both parameters are provided.

destination-url-or-file-path	TA file system path or an RFC 3986 formatted URL identifying the location of the copied data. Supported URL schemes are **ftp**, **tftp**, and **file**. The destination URL or file path is mandatory unless a directory listing for a remote FTP server is requested. A destination file path is a path to a file located on the local DarkStar file system. For example, `/dxmos/dxmos.exe` or `dxmos/dxmos.exe`. Exactly one of the parameters must identify a file located on the DarkStar file system if both *source* and *destination* parameters are provided. To locally display a remote FTP server's directory listing, omit this parameter and append a trailing `/` character to an FTP *source-url_* identifying a directory path.

Example

```
localhost# curl ftp://10.1.1.15/pub/config.dat /dxmos/config.dat
localhost# curl tftp://10.1.1.15/config.dat file:///dxmos/config.dat
localhost# curl /dxmos/config.dat ftp://10.1.1.15/pub/config.dat
localhost# curl ftp://user:passwd@10.1.1.15/pub/
```

3.6.9 description

Creates a site-configurable label to describe the use of amplifiers and transceivers.

On DQM and DQT systems, the `description` *command is only available for trunks and specific client lanes; the* `description` *command is not available as a configuration command for an entire QSFP+ client transceiver.*

Note: For modules with multiple optical lanes, the `n/lane` keyword will enable a user to specify a lane. Depending on the system and transceivers used, there may be a number of configurations for lane counts. Example: `CONF-MOD-CLIENT[0/1]# description`

Syntax

`CONF-MOD-CLIENT[n]#` **description** *string*
`CONF-MOD-WAVE[n]#` **description** *string*
`CONF-AMP[amplifier-label]#` **description** *string*

Syntax

`CONF-MOD-CLIENT[n]#` [no] **description**
`CONF-MOD-WAVE[n]#` [no] **description**
`CONF-AMP[amplifier-label]#` [no] **description**

Parameters

string	Label for the module. Omit if specifying no.
no	Removes the label from the module.

3.6.10 encapsulation

Configures the interface encapsulation type, which determines the data rate of an interface. Encapsulation options are system and transceiver dependent. Also see "Available Protocols, Data Rates and Corresponding Encapsulation" in the Systems Guide on the XKL website.

If an interface is carrying customer traffic, changing the encapsulation will interrupt that traffic.

Syntax

`CONF-MOD-CLIENT[n]#` **encapsulation** encapsulation-type [force]

`CONF-MOD-WAVE[n]#` **encapsulation** encapsulation-type [force]

encapsulation-type	System-dependent encapsulation types, which set the appropriate clock rate or data framing:
	`gigabitethernet`
	`10gigabitethernet [fec]`
	`fibrechannel {1g|2g|4g|8g|10g}`
	`sonet {oc48|oc192|oc192 fec}`
	`1xCAUI-4`
	`2xCAUI-4`
	`4x100GAUI-2`
	`4x100GAUI-2_ZR`
	`400GAUI-8`
	`400GAUI-8_ZR`

force	An optional third parameter accepted by the encapsulation command on DQ*400 systems. The system will not verify that the requested encapsulation is supported by both transceivers in the client and wave pair when force is indicated. The requested encapsulation is applied only to the selected client or wave. Omit this parameter to enable verification and apply the requested encapsulation to the client and wave pair.

If the client transceiver is a QSFP28 or does not support a 400G rate, the default encapsulation is 1xCAUI-4.

The preferred default 400G encapsulation will use a ZR+ format.

If the wave doesn't support a preferred 400G ZR+ format, then use a 400G ZR format if supported.

If neither client nor wave supports a preferred default, or if either are absent, then don't attempt to configure a default encapsulation.

Preferred default encapsulations are evaluated in the following order first to last:

- 4x100GAUI-2
- 4x100GAUI-2_ZR
- 400GAUI-8
- 400GAUI-8_ZR

- 1xCAUI-4

Note: For modules with multiple optical lanes, the `n/lane` keyword will enable a user to specify a lane. Depending on the system and transceivers used, there may be a number of configurations for lane counts.
Example: `CONF-MOD-CLIENT[0/1]# encapsulation`

The following example shows how to specify an encapsulation type for a client. **Note:** Available encapsulation types will depend on your system. For this particular product, a DQT400 series, setting an encapsulation type for a client will result in the same encapsulation type being set for the corresponding wave.

Example

```
CONF# module client 0
CONF-MOD-CLIENT[0/*]# encapsulation 1xCAUI-4
Client 0 encapsulation set to 1xCAUI-4
Wave 0 encapsulation set to 1xCAUI-4
CONF-MOD-CLIENT[0/*]#
```

The following example confirms the encapsulation type for a client 0.

```
CONF-MOD-CLIENT[0/*]# do show modules client 0

Client 0    Up
  Description: .... Seattle_to_Redmond
  Temperature: .... 30 C                        Vendor: ...... Eoptolink
  Part No.: ....... EOLQ-161HG-10-L             Serial No.: .. QM24130010
  Module Type: .... QSFP28                      MFG Date: .... 210205
  Connector: ...... LC                          Channel: ..... N/A
  Wavelength: ..... 1310.00 nm                  Frequency: ... 228849 GHz
  Encapsulation: .. 1xCAUI-4                    Last Cleared:  00d 00:02:36

Client 0/0    Down
  Description: .... N/A
  Tx: ............. OK                           Rx: .......... LOS,LOL
  State Changed: .. 00d 00:03:28*               Tx Laser: .... Enabled
  Tx Power: ....... 1.3 dBm                     Rx Power: .... -40.0 dBm
  Loopback: ....... Not Supported               Rate: ........ 25Gb/s
  Last Cleared: ... 00d 00:02:36                Link Downtime: 00d 00:03:28
  LOL Forwarding: . On


Client 0/1    Down
  Description: .... N/A
  Tx: ............. OK                           Rx: .......... LOS,LOL
  State Changed: .. 00d 00:03:28*               Tx Laser: .... Enabled
  Tx Power: ....... 1.3 dBm                     Rx Power: .... -40.0 dBm
  Loopback: ....... Not Supported               Rate: ........ 25Gb/s
  Last Cleared: ... 00d 00:02:36                Link Downtime: 00d 00:03:28
  LOL Forwarding: . On


Client 0/2    Down
  Description: .... N/A
```

```
  Tx: ............. OK                          Rx: .......... LOS,LOL
  State Changed: .. 00d 00:03:28*               Tx Laser: .... Enabled
  Tx Power: ....... 0.3 dBm                     Rx Power: .... -40.0 dBm
  Loopback: ....... Not Supported               Rate: ........ 25Gb/s
  Last Cleared: ... 00d 00:02:36                Link Downtime: 00d 00:03:28
  LOL Forwarding: . On


Client 0/3    Down
  Description: .... N/A
  Tx: ............. OK                          Rx: .......... LOS,LOL
  State Changed: .. 00d 00:03:28*               Tx Laser: .... Enabled
  Tx Power: ....... 2.1 dBm                     Rx Power: .... -40.0 dBm
  Loopback: ....... Not Supported               Rate: ........ 25Gb/s
  Last Cleared: ... 00d 00:02:37                Link Downtime: 00d 00:03:28
  LOL Forwarding: . On



* No state change since DXMOS started.
```

The following example shows how to use the `connect` command.

Example

```
# configure
CONF# connect client 0 / 0 wave 1 encapsulation 10gigabitethernet
Switch Connect: Connection successful (Client 0/0, Wave 1)
CONF# do show connections
10G Switch Complex connections:
Idx   If1          If2          Channel   If1 Line / Rate     If2 Line / Rate
---   ------------ ----------   -------   ---------------     ----------------
0     Client 0/0   Wave 1       21.0      Up      /10GE       Up      /10GE
```

3.6.11 equalizer

Places the Darkstar DLA Amplifier System in equalizer configuration mode with the dynamic gain equalizer and optical channel monitor device, or DGE-OCM. The command prompt changes to `CONF-EQ [east|west]#`.

Available commands are:

```
attenuate
band
bandwidth
flatten
plan
```

	`equalizer` commands are only available on DarkStar DLA amplification systems with a DGE-OCM.

Syntax

`CONF#` **equalizer** *equalizer-direction*

Parameters

equalizer direction	Opens a configuration mode for the equalizer device to be configured: east or west

Example

```
DLA_System# configure
DLA_System CONF# equalizer east
DLA_System CONF-EQ[east]# attenuate set 0.0 1
localhost CONF-EQ[east]# exit
DLA_System CONF# equalizer west
DLA_System CONF-EQ[west]# attenuate set 0.0 1
localhost CONF-EQ[west]# exit
```

3.6.11.1 attenuate

Adjust the attenuation for a single band or range of bands.

Syntax

`CONF-EQ[equalizer-direction#` **attenuate** {**add|set** *attenuation-value}* *first-band last-band*

Parameters

add	Increase or reduce a band's attenuation relative to its current attenuation setting by the attenuation-value.
set	Sets the band's attenuation to the provided attenuation-value
attenuation-value	Adds or sets the band's gain attenuation as a decimal value (i.e., nn.n). Valid range of values is 0.0-25.5.
first-band	The first equalizer band to attenuate. If this parameter is not provided, all bands will be attenuated.
last-band	The last equalizer band to attenuate. If this parameter is not provided, only the first-band is attenuated.

The attenuation-value parameter states a valid range of up to 25.5 dB attenuation; however, setting the attenuation-value to a value greater than 15 dB may not result in a greater attenuation.

The example below comes from a DLA system with an "east" DGE-OCM. Here, an attenuation value of 2.0 dB was applied to bands 1-5 using the `attenuate` command.

The "Atten" in the output indicates the DGE-OCM was configured to apply an attenuation value, 2.0 dB. Note that the "OCM RxPwr" is the channel power prior to being passed through the DGE-OCM and does not account for the applied attenuation value.

Example

```
DLA_System CONF-EQ[east]# do show equalizer east plan
```

Example

```
Band      Center           Width         Atten     OCM RxPwr
-----------------------------------------------------------
East   1  193000.000 GHz   100.000 GHz   2.0 dB   -30.8 dBm
East   2  193100.000 GHz   100.000 GHz   2.0 dB   -31.4 dBm
East   3  193200.000 GHz   100.000 GHz   2.0 dB   -32.8 dBm
East   4  193300.000 GHz   100.000 GHz   2.0 dB   -31.7 dBm
East   5  193400.000 GHz   100.000 GHz   2.0 dB   -31.6 dBm
East   6  193500.000 GHz   100.000 GHz   0.0 dB   -35.2 dBm
East   7  193600.000 GHz   100.000 GHz   0.0 dB   -31.4 dBm
East   8  193700.000 GHz   100.000 GHz   0.0 dB   -31.6 dBm
East   9  193800.000 GHz   100.000 GHz   0.0 dB   -31.6 dBm
East  10  193900.000 GHz   100.000 GHz   0.0 dB   -32.0 dBm
```

3.6.11.2 band

Define a center frequency and bandwidth for a channel to be attenuated by the DGE.

Example

`CONF-EQ[equalizer-direction]#` **band** *{band-index center-frequency bandwidth}*

Parameters

band-index	A number to be used to identify a band. Valid range of values is 0-255.
center-frequency	The channel frequency in the middle of the band, in GHz. Valid range of frequencies are 191325-196175 GHz. Must be a multiple of 3.125 GHz.
bandwidth	The lower and upper frequencies to surround a band, in GHz. Must be a multiple of 6.250 GHz.

Bands are not allowed to overlap each other in a plan.

Example

```
DLA_System# configure
DLA_System CONF# equalizer east
DLA_System CONF-EQ[east]# band 1 193000 100
DLA_System CONF-EQ[east]# band 2 193100 100
DLA_System CONF-EQ[east]# band 3 193200 100
DLA_System CONF-EQ[east]# band 4 193300 100
DLA_System CONF-EQ[east]# band 5 193400 100
DLA_System CONF-EQ[east]# band 6 193500 100
DLA_System CONF-EQ[east]# band 7 193600 100
DLA_System CONF-EQ[east]# band 8 193700 100
DLA_System CONF-EQ[east]# band 9 193800 100
DLA_System CONF-EQ[east]# band 10 193900 100
```

3.6.11.3 bandwidth

Define a default bandwidth value for the DarkStar DGE-OCM to be used by the `band` command.

Syntax

`CONF-EQ[equalizer-direction]#` **bandwidth** {width}

Parameters

width	The lower and upper frequencies to surround a band, in GHz. Must be a multiple of 6.250 GHz

Example

```
DLA_System# configure
DLA_System CONF# equalizer east
DLA_System CONF-EQ[east]# bandwidth 100
DLA_System CONF-EQ[east]# band 1 193000
DLA_System CONF-EQ[east]# do show equalizer east plan
```

Example

```
Band        Center                      Width             Atten     OCM RxPwr
-------------------------------------------------------------
West   1    193000.000 GHz              100.000 GHz        0.0 dB   -31.1 dBm
```

Example

```
DLA_System CONF-EQ[east]#
```

3.6.11.4 flatten

Increase the attenuation for a range of bands in the DarkStar DGE-OCM by an amount that will produce equivalent optical channel output power for each band. The attenuation for each band can be increased to reach a desired user-supplied receive power setpoint value. If a desired receive power setpoint value isn't supplied, the DarkStar system will attenuate the defined bands to the lowest measured receive power band.

Syntax

`CONF-EQ[equalizer direction]#` **flatten** *first-band last-band setpoint*

Parameters

first-band	The first equalizer band to flatten. If this parameter is not provided, all bands will be flattened.
last-band	The last equalizer band to flatten.
setpoint	An optional target receive power value to be reached by each band. If this parameter is not provided, all bands will be attenuated to the lowest measured receive power for a band.

The example below shows the flatten command with and without an optional receive power setpoint supplied. If you wish to reapply the flatten command after already applying it once, make sure to reset the attenuation that is already applied to each band. This can be done with the `attenuate` command.

Example

```
DLA_System CONF-EQ[east]# flatten
DLA_System CONF-EQ[east]# do show equalizer east plan
```

Example

```
Band      Center           Width         Atten     OCM RxPwr
-------------------------------------------------------------
East   1  193000.000 GHz   100.000 GHz   4.7 dB   -30.6 dBm
East   2  193100.000 GHz   100.000 GHz   4.0 dB   -31.3 dBm
East   3  193200.000 GHz   100.000 GHz   2.7 dB   -32.6 dBm
East   4  193300.000 GHz   100.000 GHz   3.7 dB   -31.5 dBm
East   5  193400.000 GHz   100.000 GHz   3.8 dB   -31.5 dBm
East   6  193500.000 GHz   100.000 GHz   0.0 dB   -35.4 dBm
East   7  193600.000 GHz   100.000 GHz   3.9 dB   -31.4 dBm
East   8  193700.000 GHz   100.000 GHz   3.6 dB   -31.7 dBm
East   9  193800.000 GHz   100.000 GHz   3.5 dB   -31.8 dBm
East  10  193900.000 GHz   100.000 GHz   3.1 dB   -32.2 dBm
```

Example

```
DLA_System CONF-EQ[east]#
DLA_System CONF-EQ[east]# attenuate set 0
DLA_System CONF-EQ[east]# flatten 1 5 -32.0
DLA_System CONF-EQ[east]# do show equalizer east plan
```

Example

```
Band      Center           Width         Atten     OCM RxPwr
-------------------------------------------------------------
East   1  193000.000 GHz   100.000 GHz   1.4 dB   -30.7 dBm
East   2  193100.000 GHz   100.000 GHz   0.7 dB   -31.3 dBm
East   3  193200.000 GHz   100.000 GHz   0.0 dB   -32.6 dBm
East   4  193300.000 GHz   100.000 GHz   0.4 dB   -31.6 dBm
East   5  193400.000 GHz   100.000 GHz   0.5 dB   -31.4 dBm
East   6  193500.000 GHz   100.000 GHz   0.0 dB   -35.4 dBm
East   7  193600.000 GHz   100.000 GHz   0.0 dB   -31.3 dBm
East   8  193700.000 GHz   100.000 GHz   0.0 dB   -31.7 dBm
East   9  193800.000 GHz   100.000 GHz   0.0 dB   -31.9 dBm
East  10  193900.000 GHz   100.000 GHz   0.0 dB   -32.2 dBm
```

Example

```
DLA_System CONF-EQ[east]#
```

3.6.11.5 plan

Define all bands to match a channel frequency on the ITU grid with a range from 191400 to 196100 GHz. This command can also be used to reset a defined plan or bands. Also called a waveplan.

Syntax

`CONF-EQ[equalizer-direction]#` **{100-itu|50-itu|reset}**

Parameters

100-itu	Define bands to match a channel frequency with 100 GHz spacing
50-itu	Define bands to match a channel frequency with 50 GHz spacing.

reset	Clear a defined plan or all defined bands.

The following example use the 100-itu parameter to evenly space west equalizer bands by 100 GHz. Note that the west OCM isn't receiving any optical power.

```
DLA_System CONF-EQ[west]# plan 100-itu
DLA_System CONF-EQ[west]# do show equalizer west plan

Band      Center           Width         Atten     OCM RxPwr
-------------------------------------------------------------
West   1  191400.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West   2  191500.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West   3  191600.000 GHz   100.000 GHz   0.0 dB   -80.9 dBm
West   4  191700.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West   5  191800.000 GHz   100.000 GHz   0.0 dB   -80.8 dBm
West   6  191900.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West   7  192000.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West   8  192100.000 GHz   100.000 GHz   0.0 dB   -80.9 dBm
West   9  192200.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  10  192300.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  11  192400.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  12  192500.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  13  192600.000 GHz   100.000 GHz   0.0 dB   -80.4 dBm
West  14  192700.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  15  192800.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  16  192900.000 GHz   100.000 GHz   0.0 dB   -77.3 dBm
West  17  193000.000 GHz   100.000 GHz   0.0 dB   -63.8 dBm
West  18  193100.000 GHz   100.000 GHz   0.0 dB   -61.0 dBm
West  19  193200.000 GHz   100.000 GHz   0.0 dB   -65.4 dBm
West  20  193300.000 GHz   100.000 GHz   0.0 dB   -74.9 dBm
West  21  193400.000 GHz   100.000 GHz   0.0 dB   -69.3 dBm
West  22  193500.000 GHz   100.000 GHz   0.0 dB   -68.1 dBm
West  23  193600.000 GHz   100.000 GHz   0.0 dB   -62.7 dBm
West  24  193700.000 GHz   100.000 GHz   0.0 dB   -70.4 dBm
West  25  193800.000 GHz   100.000 GHz   0.0 dB   -73.5 dBm
West  26  193900.000 GHz   100.000 GHz   0.0 dB   -68.2 dBm
West  27  194000.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  28  194100.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  29  194200.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  30  194300.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  31  194400.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  32  194500.000 GHz   100.000 GHz   0.0 dB   -80.9 dBm
West  33  194600.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  34  194700.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  35  194800.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  36  194900.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  37  195000.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  38  195100.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  39  195200.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
West  40  195300.000 GHz   100.000 GHz   0.0 dB   -80.8 dBm
West  41  195400.000 GHz   100.000 GHz   0.0 dB   -81.0 dBm
```

```
West   42   195500.000 GHz    100.000 GHz    0.0 dB    -81.0 dBm
West   43   195600.000 GHz    100.000 GHz    0.0 dB    -81.0 dBm
West   44   195700.000 GHz    100.000 GHz    0.0 dB    -81.0 dBm
West   45   195800.000 GHz    100.000 GHz    0.0 dB    -81.0 dBm
West   46   195900.000 GHz    100.000 GHz    0.0 dB    -81.0 dBm
West   47   196000.000 GHz    100.000 GHz    0.0 dB    -81.0 dBm
West   48   196100.000 GHz    100.000 GHz    0.0 dB    -81.0 dBm

DLA_System CONF-EQ[west]#
```

3.6.12 fan

Places the DarkStar system in fan configuration mode. As viewed from the rear, fan modules are numbered from left to right, 0-2. Some systems have 2 fans in positions 0 and 2. Other systems have 3 fans in positions 0, 1, and 2.

	For more information about viewing fan module information, see show dhcp.

The command prompt changes to `CONF-FAN[n]#`. Available command is speed.

Syntax

`CONF#` **fan** *fan-module-number*

Parameters

fan-module-number	Opens configuration mode for the fan module to be configured: 0, 1, or 2.

Example

```
# configure
CONF# fan 0
CONF-FAN[0]# speed med
CONF-FAN[0]# exit
CONF# fan 1
CONF-FAN[1]# speed med
CONF-FAN[1]# exit
CONF# fan 2
CONF-FAN[2]# speed med
CONF-FAN[2]# exit
```

3.6.12.1 speed

Sets fan speed. Changing the fan speed to anything other than `auto` disables the automatic fan control for that fan. It is strongly recommended to use the `auto` setting and let the system control the fan speed.

Setting a fixed fan speed will disable automatic fan control. This may result in the system running at abnormally high temperatures.

Syntax

`CONF-FAN[n]#` **speed {auto|high|low|med|***percent-value***}**

Parameters

auto	Sets the fans to automatically adjust their speed. This setting is the default.
high	Sets the fans to the highest possible speed.
low	Sets the fans to the lowest possible speed.
med	Sets the fans to medium speed.
percent-value	Sets the fans to a percentage of their operating speed range, from 1 to 100. 1 = low, 100 = high, 50 = med.

Example

```
localhost# configure

localhost CONF# fan 0
localhost CONF-FAN[0]# speed high
Warning! Operating the fan speeds in manual mode disables automatic fan
control and may result in irreversible damage to the system.

Are you sure? [yes/NO] yes
localhost CONF-FAN[0]# exit
localhost CONF# fan 2
localhost CONF-FAN[2]# speed high
Warning! Operating the fan speeds in manual mode disables automatic fan
control and may result in irreversible damage to the system.
localhost CONF-FAN[2]# exit
```

3.6.13 hostname

Sets the host name for the DarkStar system, as well as the CLI prompt (if prompt-name is not used). The default host name for the system is `localhost`.

Syntax

`CONF#` **hostname** *name*

Parameters

name	A string with restrictions; the DarkStar system hostname.

Example

```
localhost CONF# hostname newname
newname CONF# exit
newname#
```

Restrictions

- Can only be composed of Alphanumeric characters, periods, hyphens, and underscores ([a-zA-Z0-9._-]).
- Cannot be longer than 253 characters.
- Cannot begin or end with a hyphen or period.
- Cannot have two or more hyphens or periods in a row.
- Cannot have a label longer than 63 characters (a label is delimited by a period).

3.6.14 idle-mute

Enables and disables the transceiver's optical transmission of PRBS signals during signal error conditions.

When a client interface detects a signal error condition, and idle-mute is enabled, the transmitter of the interface is shut down. Conversely, when a client interface detects a signal error condition, and idle-mute is disabled, the transmitter is not shut down and the interface transmits a PRBS pattern.

The holdoff time is how long you want to wait to apply idle-mute, in hopes that the signal integrity will be restored. If there is no holdoff (or no holdoff time is specified), the transmitter is instantly disabled. If you specify a holdoff time other than 0, the interface will continue to transmit a PRBS pattern until either:

- Signal quality is restored before the holdoff time has expired. In this case, PRBS generation is stopped and the original signal is allowed to pass through again; or,
- The holdoff time expires, at which time the transmitter is disabled.

By default, idle-mute is enabled for client interfaces and disabled for DWDM wave interfaces. In addition, the default holdoff time is 0 milliseconds.

If you run the `show module` command on a client/wave lane, idle-mute status is also displayed. The status messages are listed in the following table.

TABLE 3-5. Idle-Mute Status Messages

Message	Status
`Off`	Part of a connection and the signal is good. Idle Tx and Idle Mute features are not active in this state.
`Idle Tx`	• Part of a connection that has bad signal data AND `idle-mute` is disabled; OR • Not part of a connection and `idle-mute` is disabled.

TABLE 3-5. Idle-Mute Status Messages

Message	Status
`Idle Mute`	• Part of a connection that has bad signal data AND `idle-mute` is enabled; OR • Not part of a connection and `idle-mute` is enabled.
`Idle Tx Pending Mute`	Only seen if `idle-mute` is enabled with a non-zero holdoff time configured and there is a connection with bad data. The transmitter will stay in this status until either the data restores integrity (at which time it transitions back to the `Off` status) or the holdoff time elapses (at which time the transmitter is disabled and the status changes to `Idle Mute`).

Syntax

`CONF-MOD-CLIENT[n]#` [no] **idle-mute** [holdoff *milliseconds*]
`CONF-MOD-WAVE[n]#` [no] **idle-mute** [holdoff *milliseconds*]

Parameters

`holdoff` *`milliseconds`*	The delay, in milliseconds, between the instant an interface detects a signal error condition and the instant the transmitter is shutdown. This delay helps alleviate situations where interfaces cycle frequently between up and down states. Values can be between 0 and 100000.
`no idle-mute`	Disables idle-mute.

Example

`CONF#` **do show running-config**

```
running-config:
;;;;;;;;
...
exit
module client 0
idle-mute holdoff 100
...
exit
module client 1
idle-mute holdoff 100
...
exit
module client 2
idle-mute holdoff 100
...
exit
...
```

3.6.15 lol-forward

Enables/Disables Loss-of-Lock Forwarding for an entire client module or specific lanes of the client module.

Disabling Loss-of-Lock Forwarding stops the local DarkStar system from receiving Loss-of-Lock events. A system no longer receiving Loss-of-Lock events will no longer be able to generate console messages, syslog messages, or SNMP traps for the event.

This command is only available on DQT400, DQM400, and DAT100 systems. The DAT100 forwards both Loss-of-Lock and Loss-of-Signal events.

Syntax

`CONF-MOD-CLIENT[n]#` [no] **lol-forward**

Note: For modules with multiple optical lanes, the n/lane keyword will enable a user to specify a lane. Depending on the system and transceivers used, there may be a number of configurations for lane counts.
Example: CONF-MOD-CLIENT [0/1]# lol-forward

The following example confirms that Loss-of-Lock forwarding is enabled for a client 0.

Example

```
# show modules client 0

Client 0    Up
  Description: .... N/A
  Tx: ............. OK                          Rx: .......... OK
  State Changed: .. 00d 00:18:55                Channel: ..... N/A
  Tx Laser: ....... Enabled                     Frequency: ... 228849 GHz
  Tx Power: ....... -4.6 dBm                    Wavelength: .. 1310.00 nm
  Rx Power: ....... -1.7 dBm                    Module Type: . SFP+
  Loopback: ....... Not Supported               Temperature: . 36 C
  Encapsulation: .. 10G Ethernet                Vendor: ...... FINISAR CORP.
  Last Cleared: ... 00d 00:27:07                Part No.: .... FTLX1471D3BCV
  Link Downtime: .. 00d 00:00:05                Serial No.: .. UKH04KP
  Maximum Reach: .. 10 km on SM                 MFG Date: .... 110423
  LOL Forwarding: . On
```

3.6.16 prompt-name

Sets the CLI prompt-name for the DarkStar system. If not set, the system hostname will be used for the CLI prompt-name.

Syntax

`CONF# [no]` **prompt-name** *name*

Parameters

name	A string (253 character maximum); the DarkStar CLI prompt name

Example

```
localhost CONF# prompt-name newname
newname CONF# no prompt-name
localhost CONF# exit
localhost
```

3.6.17 protection

Configures the Line Protection feature, also known as the Optical Protection Switch (OPS).

When enabled, the DarkStar system, by default, will switch from using the primary path to the backup path when a protection event occurs. After this switch, the Line Protection feature will be disabled. The backup path transports the data until a `protection enable` or `protection active-line primary` command is issued.

The DarkStar system can alternatively be configured to respond to protection events by switching from the primary path to the backup path and switching back after the protection event clears for a specified period of time. Restrictions apply, see the protection auto-revert section for more details.

The default protection event is the primary path's OSC module reporting a Loss of Signal alarm (LOS). Systems with an input EDFA can alternatively use the input EDFA's reporting of Loss of Signal (LOS) as the protection event. The DAT100 offers another alternative in the wave Loss of Signal (LOS) alarm. Restrictions apply, see the protection monitor-with section for more details.

Protection commands are available only on systems with redundant interfaces.

Protection consists of the following commands:

- protection enable
- protection disable
- protection active-line
- protection primary-line
- protection monitor-with
- protection auto-revert
- show protection

3.6.17.1 protection enable

Enables the Line Protection feature. Exact behavior is dependent on the DarkStar system state and other Line Protection configuration settings. See Table 3-6.

Enabling the Line Protection feature can disrupt customer traffic.

TABLE 3-6. Enable Protection Command Behavior

Command	Protection State	Active Line	Auto-Reversion	Result
protection enable	Disabled	Backup	Disabled	Enables the Line Protection feature and sets the Primary Line as the active line.
			To-primary	Enables the Line Protection feature and starts delay count-down to move to Primary Line. If the Primary Line is up and the Backup Line is down. It will immediately move to the Primary Line.
		Primary, with LOS de-asserted on primary	Either	Enables the Line Protection feature.
		Primary, with LOS asserted on primary	Disabled	Attempts to enable the Line Protection feature and then switches to the Backup Line and disables the protection feature.
			To-primary	Enables the Line Protection feature and switches to the Backup Line.
	Enabled	Primary	Either	Line Protection feature is already enabled, nothing occurs.
		Backup	To-primary	Line Protection feature is already enabled, nothing occurs.

Syntax

`CONF#` **protection enable**

3.6.17.2 protection disable

Turns off Line Protection feature. With the Line Protection feature disabled, the system will not move the Optical Protection Switch without manual intervention.

Syntax

`CONF#` **protection disable**

3.6.17.3 protection active-line

Sets which line is the active line if the Line Protection feature is disabled.

	Changing the active line can disrupt customer traffic.

Syntax

`CONF#` **protection active-line {primary|backup}**

Parameters

primary	The active line is set to the Primary Line.
backup	The active line is set to the Backup Line.

3.6.17.4 protection primary-line

Sets which physical line is considered the primary line for the Line Protection feature. By default, Line A is considered the primary line. Exact behavior is dependent on the DarkStar system state and other Line Protection configuration settings. See Table 3-7.

	Changing the primary line can disrupt customer traffic.

TABLE 3-7. Change Primary Line Command

Command	Protection State	Active Line	Auto-Reversion	Result
protection primary-line {A|B}	Disabled	Either	Either	Sets the Primary Line to the line specified without moving the optical switch.
protection primary-line B	Enabled	Primary (Line B)	Either	Nothing occurs since the Primary Line was already set to Line B.
		Primary (Line A)	Disabled	Sets the Primary Line to Line B and attempts to switch over to the new Primary Line.
			To-primary	Sets the Primary Line to Line B and starts delay countdown to move to the new Primary Line. If the new Primary Line is up and the new Backup Line is down, it will immediately move to the new Primary Line.
protection primary-line A	Enabled	Primary (Line A)	Either	Nothing occurs since the Primary Line was already set to Line A.
		Primary (Line B)	Disabled	Sets the Primary Line to Line A and attempts to switch over to the new Primary Line.
			To-primary	Sets the Primary Line to Line A and starts delay countdown to move to the new Primary Line. If the new Primary Line is up and the new Backup Line is down, it will immediately move to the new Primary Line.

Syntax

`CONF#` **protection primary-line {A|B}**

Parameters

A	The primary line is set to Line A.
B	The primary line is set to Line B.

3.6.17.5 protection monitor-with

Sets which device is used to monitor for protection events. Exact behavior is dependent on the DarkStar system state and other Line Protection configuration settings. See Table 3-8.

	Changing the primary line can disrupt customer traffic.

TABLE 3-8. Change Monitor Device Command Behavior

Command	Auto-Reversion	Result
protection monitor-with osc	Disabled	Sets the device to monitor for LOS to the system's OSCs.
	To-primary	Nothing happens since the to-primary auto-reversion scheme can only be used with OSCs monitoring for LOS.
protection monitor-with edfa	Disabled	Sets the device to monitor for LOS to the system's Input EDFA. Option not offered if the system does not have an Input EDFA.
	To-primary	Sets the device to monitor for LOS to the system's Input EDFA. Disables auto-reversion due to auto-reversion not being compatible with EDFA monitoring. Option not offered if the system does not have an Input EDFA.
protection monitor-with wave	Disabled	Sets the device to monitor for LOS to the system's wave module. Option only available on DAT100 systems.
	To-primary	Sets the device to monitor for LOS to the system's wave module. Disables auto-reversion due to auto-reversion not being compatible with wave monitoring. Option only available on DAT100 systems.

Syntax

`CONF#` **protection monitor-with {osc|edfa|wave}**

Parameters

osc	Uses the DarkStar system's OSCs to monitor for Loss of Signal protection events.
edfa	Uses the DarkStar system's input EDFA to monitor for Loss of Signal protection events.
wave	Uses the DarkStar system's wave module to monitor for Loss of Signal protection events.

3.6.17.6 protection auto-revert

Sets the Auto-Reversion scheme for the Line Protection feature.

The to-primary Auto-Reversion scheme will switch from the Primary Line to the Backup Line when a protection event occurs. When the protection event stays cleared for a specified amount of minutes, it will return to the Primary Line. Exact behavior is dependent on the DarkStar system state and other Line Protection configuration settings. See Table 3-9.

When Auto-Reversion is disabled, Line Protection will switch from the Primary Line to the Backup Line when a protection event occurs. Upon entering the Backup Line, the Line Protection feature will be disabled. Exact behavior is dependent on the DarkStar system state and other Line Protection configuration settings. See Table 3-9.

Changing the auto-reversion scheme can disrupt customer traffic.

TABLE 3-9. Change Auto-Reversion Scheme Command Behavior

Command	Protection State	Active Line	Auto-Reversion	Result
protection auto-revert disabled	Either	Either	Disabled	Nothing happens since auto-reversion is already disabled.
	Enabled	Primary	To-primary	Disables auto-reversion.
		Backup, with LOS de-asserted on primary		Disables auto-reversion and switches to the Primary Line.
		Backup, with LOS asserted on primary		Disables auto-reversion and attempts to switch to the Primary Line before switching to the Backup Line and disabling the Line Protection feature.

Command	Protection State	Active Line	Auto-Reversion	Result
protection auto-revert to-primary <mins>	Enabled	Primary	Disabled	Enables auto-reversion. Sets the time to wait before switching back to a healthy Primary Line to <mins> minutes.
			To-primary	Re-configures the time to wait before switching back to a healthy Primary Line to <mins> minutes.
		Backup, with LOS de-asserted on backup		Re-configures the delay to wait before switching back to a healthy Primary Line to <mins> minutes. **If the conditions for a timer to count-down are met, the new delay time will be applied to the already running count-down.**
		Backup, with LOS asserted on backup		Switches instantaneously to a healthy Primary Line instead of waiting for the count-down to elapse.
	Disabled	Backup	Disabled	Sets auto-reversion scheme to to-primary. Sets the time to wait before switching back to a healthy Primary Line to <mins> minutes. Line Protection feature needs to be enabled before the timer count-down will begin.

Syntax

`CONF#` **protection auto-revert {disabled|to-primary}**

Parameters

disabled	Disables auto-reversion.
to-primary	Sets auto-reversion to the to-primary scheme.

3.6.17.7 show protection

Displays the current states of Line Protection in the system. Line Protection is enabled by default.

This is not the same as `show running-config protection`, which displays the current configuration settings.

Syntax

`>` **show protection**

Example

```
localhost# show protection

Line Protection Feature: Enabled
Active Line: Primary (A)
LOS Monitoring: OSC A & OSC B
Auto-reversion scheme: Disabled
Protection event message: Protection Enabled, Line on Primary (A), OSC A: OK,
OSC B: OK
Protection event timestamp: Feb 19 10:04:29.885
```

3.6.18 sntp

Specifies one or more Simple Network Time Protocol (SNTP) servers for setting the system clock. Use this command to automatically synchronize the system clock with an external SNTP server.

Syntax

`CONF#` [no] **sntp server** *address*

Parameters

address	IP address or hostname of the SNTP server from which the DarkStar system should set its system clock.
no	Clears the specified SNTP server address.

3.6.19 switch

Note: Applies to DQT100 and DQM100 systems only.

Places a DarkStar system into switch mode (i.e., CONF-SWITCH#), where connection paths are configured, including assigning aliases and descriptions for local and remote systems or interfaces. You can also specify a class for a particular connection, for weighted round robin queuing priority.

Using statistical multiplexing, the internal muxponder handles all data coming to and from the optical transceivers. It combines lanes into virtual interfaces, formats data for transmission, interprets received data, labels outgoing frames, and interprets labels on incoming data to send frames to a particular transceiver.

Syntax

`CONF#` **switch**

A typical workflow might be:

1. Specify the alias of the local-vif, the remote-vif, and relevant systems. Aliases can be a more descriptive name that helps simplify output and thereby makes it easier to set up switching.
2. Specify a local-system and its next-hop path.
3. Specify the destinations for any local-vifs you wish to map, and a routing class for each (if desired). DXMOS has four RR (round robin) classes, 0-3. See destination for more information.
4. Validate and commit your changes. This writes them to the configuration file.

There are two categories of switch commands: configuration commands and action commands.

Switch configuration commands include:

- alias local-vif
- alias remote-vif
- alias system id
- local-system
- next-hop system
- destination

Action commands include:

- commit
- compare
- validate
- show switch
- revert-to
- end
- exit

DQT100 Switch Point-to-Point Configuration Example

Refer to Systems Guide 6.2.2.5 Configuring Optical Transport Service for DQM100 or 6.3.2.6 Configuring Optical Transport Service for DQT100.

Allocate system IDs

Seattle: id 1
Tacoma: id 2

Configure the system ID as an alias

```
Seattle_DQT100 CONF-SWITCH# alias system id 1 name Seattle
Seattle_DQT100 CONF-SWITCH# alias system id 2 name Tacoma

Tacoma_DQT100 CONF-SWITCH# alias system id 1 name Seattle
Tacoma_DQT100 CONF-SWITCH# alias system id 2 name Tacoma
```

Apply the local-system assignment

```
Seattle_DQT100 CONF-SWITCH# local-system Seattle
Tacoma_DQT100 CONF-SWITCH# local-system Tacoma
```

Alias the trunk ports

```
Seattle_DQT100 CONF-SWITCH# alias local-vif trunk 0 name Path_Tacoma
Tacoma_DQT100 CONF-SWITCH# alias local-vif trunk 0 name Path_Seattle
```

Set up next-hop pathways

```
Seattle_DQT100 CONF-SWITCH# next-hop system Tacoma via Path_Tacoma
Tacoma_DQT100 CONF-SWITCH# next-hop system Seattle via Path_Seattle
```

Add aliases for local-vifs

```
Seattle_DQT100 CONF-SWITCH# alias local-vif client 0 name Seattle.c0
Seattle_DQT100 CONF-SWITCH# alias local-vif client 1 name Seattle.c1
Seattle_DQT100 CONF-SWITCH# alias local-vif client 2 name Seattle.c2
Seattle_DQT100 CONF-SWITCH# alias local-vif client 3 name Seattle.c3
Seattle_DQT100 CONF-SWITCH# alias local-vif client 4 name Seattle.c4
Seattle_DQT100 CONF-SWITCH# alias local-vif client 5 name Seattle.c5
Seattle_DQT100 CONF-SWITCH# alias local-vif client 6 name Seattle.c6
Seattle_DQT100 CONF-SWITCH# alias local-vif client 7 name Seattle.c7
Seattle_DQT100 CONF-SWITCH# alias local-vif client 8 name Seattle.c8
Seattle_DQT100 CONF-SWITCH# alias local-vif client 9 name Seattle.c9
Seattle_DQT100 CONF-SWITCH# alias local-vif client 10 name Seattle.c10
Seattle_DQT100 CONF-SWITCH# alias local-vif client 11 name Seattle.c11
Seattle_DQT100 CONF-SWITCH# alias local-vif client 12 name Seattle.c12
Seattle_DQT100 CONF-SWITCH# alias local-vif client 13 name Seattle.c13
Seattle_DQT100 CONF-SWITCH# alias local-vif client 14 name Seattle.c14
Seattle_DQT100 CONF-SWITCH# alias local-vif client 15 name Seattle.c15
Seattle_DQT100 CONF-SWITCH# alias local-vif client 16 name Seattle.c16
Seattle_DQT100 CONF-SWITCH# alias local-vif client 17 name Seattle.c17
Seattle_DQT100 CONF-SWITCH# alias local-vif client 18 name Seattle.c18
Seattle_DQT100 CONF-SWITCH# alias local-vif client 19 name Seattle.c19
Seattle_DQT100 CONF-SWITCH# alias local-vif client 20 name Seattle.c20
Seattle_DQT100 CONF-SWITCH# alias local-vif client 21 name Seattle.c21
Seattle_DQT100 CONF-SWITCH# alias local-vif client 22 name Seattle.c22
Seattle_DQT100 CONF-SWITCH# alias local-vif client 23 name Seattle.c23
```

```
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 0 name Tacoma.c0
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 1 name Tacoma.c1
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 2 name Tacoma.c2
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 3 name Tacoma.c3
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 4 name Tacoma.c4
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 5 name Tacoma.c5
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 6 name Tacoma.c6
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 7 name Tacoma.c7
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 8 name Tacoma.c8
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 9 name Tacoma.c9
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 10 name Tacoma.c10
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 11 name Tacoma.c11
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 12 name Tacoma.c12
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 13 name Tacoma.c13
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 14 name Tacoma.c14
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 15 name Tacoma.c15
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 16 name Tacoma.c16
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 17 name Tacoma.c17
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 18 name Tacoma.c18
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 19 name Tacoma.c19
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 20 name Tacoma.c20
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 21 name Tacoma.c21
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 22 name Tacoma.c22
Tacoma_DQT100 CONF-SWITCH# alias local-vif client 23 name Tacoma.c23
```

Add aliases for remote-vifs

```
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 0 name Tacoma.c0
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 1 name Tacoma.c1
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 2 name Tacoma.c2
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 3 name Tacoma.c3
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 4 name Tacoma.c4
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 5 name Tacoma.c5
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 6 name Tacoma.c6
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 7 name Tacoma.c7
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 8 name Tacoma.c8
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 9 name Tacoma.c9
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 10 name Tacoma.c10
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 11 name Tacoma.c11
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 12 name Tacoma.c12
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 13 name Tacoma.c13
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 14 name Tacoma.c14
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 15 name Tacoma.c15
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 16 name Tacoma.c16
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 17 name Tacoma.c17
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 18 name Tacoma.c18
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 19 name Tacoma.c19
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 20 name Tacoma.c20
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 21 name Tacoma.c21
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 22 name Tacoma.c22
Seattle_DQT100 CONF-SWITCH# alias remote-vif Tacoma client 23 name Tacoma.c23
```

```
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 0 name Seattle.c0
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 1 name Seattle.c1
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 2 name Seattle.c2
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 3 name Seattle.c3
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 4 name Seattle.c4
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 5 name Seattle.c5
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 6 name Seattle.c6
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 7 name Seattle.c7
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 8 name Seattle.c8
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 9 name Seattle.c9
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 10 name Seattle.c10
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 11 name Seattle.c11
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 12 name Seattle.c12
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 13 name Seattle.c13
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 14 name Seattle.c14
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 15 name Seattle.c15
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 16 name Seattle.c16
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 17 name Seattle.c17
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 18 name Seattle.c18
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 19 name Seattle.c19
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 20 name Seattle.c20
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 21 name Seattle.c21
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 22 name Seattle.c22
Tacoma_DQT100 CONF-SWITCH# alias remote-vif Seattle client 23 name Seattle.c23
```

Route traffic with destination commands

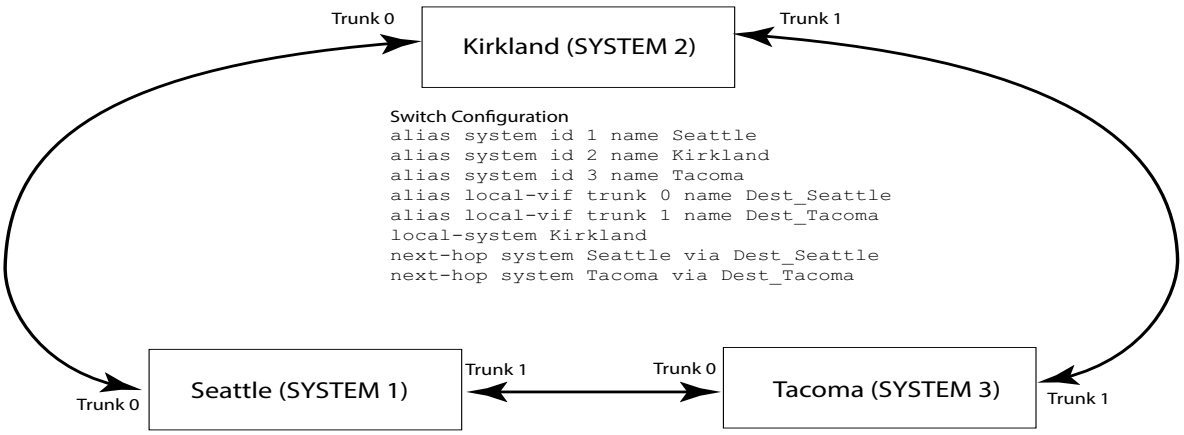
```
Seattle_DQT100 CONF-SWITCH# destination local-vif Seattle.c0 remote-vif Tacoma.c0
Seattle_DQT100 CONF-SWITCH# destination local-vif Seattle.c1 remote-vif Tacoma.c1 class 0
Seattle_DQT100 CONF-SWITCH# destination local-vif Seattle.c2 remote-vif Tacoma.c2 class 3

Tacoma_DQT100 CONF-SWITCH# destination local-vif Tacoma.c0 remote-vif Seattle.c0
Tacoma_DQT100 CONF-SWITCH# destination local-vif Tacoma.c1 remote-vif Seattle.c1 class 0
Tacoma_DQT100 CONF-SWITCH# destination local-vif Tacoma.c2 remote-vif Seattle.c2 class 3
```

Commit the configuration

```
Seattle_DQT100 CONF-SWITCH# commit
Tacoma_DQT100 CONF-SWITCH# commit
```

The following examples in Figure 3-1 and Figure 3-2 illustrate how switch commands might be used to specify routing for a ring topology.

FIGURE 3-1. Sample ring topology



Switch Configuration

```
alias system id 1 name Seattle
alias system id 2 name Kirkland
alias system id 3 name Tacoma
alias local-vif trunk 0 name Dest_Seattle
alias local-vif trunk 1 name Dest_Tacoma
local-system Kirkland
next-hop system Seattle via Dest_Seattle
next-hop system Tacoma via Dest_Tacoma
```

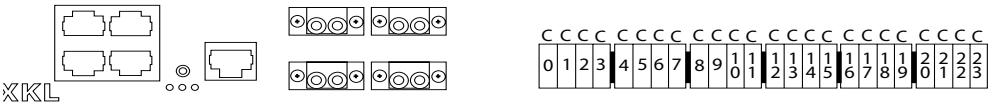
Switch Configuration

```
alias system id 1 name Seattle
alias system id 2 name Kirkland
alias system id 3 name Tacoma
alias local-vif trunk 0 name Dest_Kirkland
alias local-vif trunk 1 name Dest_Tacoma
local-system Seattle
next-hop system Kirkland via Dest_Kirkland
next-hop system Tacoma via Dest_Tacoma
```

Switch Configuration

```
alias system id 1 name Seattle
alias system id 2 name Kirkland
alias system id 3 name Tacoma
alias local-vif trunk 0 name Dest_Seattle
alias local-vif trunk 1 name Dest_Kirkland
local-system Tacoma
next-hop system Seattle via Dest_Seattle
next-hop system Kirkland via Dest_Kirkland
```

FIGURE 3-2. Switch commands used to specify sample ring topology



Switch Configuration Part 1

```
alias local-vif client 0 name Seattle.c0
alias local-vif client 1 name Seattle.c1
alias local-vif client 2 name Seattle.c2
alias local-vif client 3 name Seattle.c3
alias local-vif client 4 name Seattle.c4
alias local-vif client 5 name Seattle.c5
alias local-vif client 6 name Seattle.c6
alias local-vif client 7 name Seattle.c7
.
.
.
```

Switch Configuration Part 2

```
alias remote-vif Kirkland client 0 name Kirkland.c0
alias remote-vif Kirkland client 1 name Kirkland.c1
alias remote-vif Kirkland client 2 name Kirkland.c2
alias remote-vif Kirkland client 3 name Kirkland.c3
alias remote-vif Kirkland client 4 name Kirkland.c4
alias remote-vif Kirkland client 5 name Kirkland.c5
alias remote-vif Kirkland client 6 name Kirkland.c6
alias remote-vif Kirkland client 7 name Kirkland.c7
.
.
.
```

Switch Configuration Part 3

```
alias remote-vif Tacoma client 0 name Tacoma.c0
alias remote-vif Tacoma client 1 name Tacoma.c1
alias remote-vif Tacoma client 2 name Tacoma.c2
alias remote-vif Tacoma client 3 name Tacoma.c3
alias remote-vif Tacoma client 4 name Tacoma.c4
alias remote-vif Tacoma client 5 name Tacoma.c5
alias remote-vif Tacoma client 6 name Tacoma.c6
alias remote-vif Tacoma client 7 name Tacoma.c7
.
.
.
```

Switch Configuration Part 4

```
destination local-vif Seattle.c0 remote-vif Kirkland.c0
destination local-vif Seattle.c1 remote-vif Kirkland.c1
destination local-vif Seattle.c2 remote-vif Kirkland.c2
destination local-vif Seattle.c3 remote-vif Kirkland.c3
destination local-vif Seattle.c4 remote-vif Kirkland.c4
destination local-vif Seattle.c5 remote-vif Kirkland.c5
destination local-vif Seattle.c6 remote-vif Kirkland.c6
destination local-vif Seattle.c7 remote-vif Kirkland.c7
.
.
.
```

3.6.19.1 alias local-vif

Specifies an optional alias (alternate name) for a local virtual interface. The alias helps users more easily retain and configure interface names.

Syntax

`CONF-SWITCH#` **alias local-vif {client|trunk}** *vif-id* **name** vif-alias [**description** *vif-description*]

`CONF-SWITCH#` **no alias local-vif** [**client|trunk** *vif-id*]

Parameters

client *vif-id*	The `local-vif client` to which you are assigning an alias.
trunk *vif-id*	The `local-vif trunk` to which you are assigning an alias.
name *vif-alias*	The alias you are assigning to the selected `local-vif`.
description *vif-description*	An optional description for the alias you have specified. This can be helpful if the alias needs additional clarity.
no	Removes the alias for the specified local virtual interface from the draft configuration. Note that the `local-vif` is specified using its ID, not its name. The `no alias local-vif` command (without the `client` or `trunk` keyword) will clear all local-vif aliases.

3.6.19.2 alias remote-vif

Specifies an optional alias (alternate name) for a target remote virtual interface. The alias helps users more easily retain and configure interface names. A `remote-vif` alias has three parts: the remote system name, the client name (on the remote system), and the name (alias) being defined. The remote system may be specified by either name or id; the remote client must be specified by id.

Syntax

`CONF-SWITCH#` **alias remote-vif** **{***system-name***|system-id** *system-id***}** **client** *vif-id* **name** *vif-alias* [**description** *vif-description*]

`CONF-SWITCH#` **no alias remote-vif** [*system-name***|system-id** *system-id* **client** *vif-id*]

Parameters

remote-vif *system-name* **remote-vif system-id** *system-id*	The system containing the `remote-vif` to which you are assigning an alias. Can be a name, if you have assigned one using alias system id, or the system's number id in the range [0-63].
client *vif-id*	The `remote-vif client` to which you are assigning an alias.
name *vif-alias*	The alias you are assigning to the specified `remote-vif`.
description *vif-description*	An optional description for the alias you have specified. This can be helpful if the alias needs additional clarity.
no	Removes the alias for the specified remote virtual interface from the draft configuration. Note that the `remote-vif` is specified using the remote system client's ID, not its name. The `no alias remote-vif` command (without the *system name* or `system-id` keyword) will remove all remote-vif aliases.

3.6.19.3 alias system id

Specifies an optional alias (alternate name) for a system id. The alias helps users more easily remember and configure system names.

Syntax

`CONF-SWITCH#` **alias system id** *system-id* **name** *system-name* [**description** *system-description*]

`CONF-SWITCH#` **no alias system id** *system-id*

Parameters

id *system-id*	The ID number [0-63]of the system to which you want to assign an alias.
name *system-name*	The alias you are assigning to the specified system.
description *system-description*	An optional description for the alias you have specified. This can be helpful if the alias needs additional clarity.
no	Removes the alias for the specified system ID from the draft configuration. The `no alias system` command (without `id` keyword) will clear all system aliases.

3.6.19.4 local-system

Specifies the system to be considered the local system in the path you are configuring. The `local-system` name may be specified either by *system-id* or using the alias you created with the `alias system id` command (see alias system id).

A configuration isn't valid until all the system names used in a switch configuration are defined using the `alias system id` *command.*

Syntax

`CONF-SWITCH#` **local-system {***system-name***|id** *system-id***}**

`CONF-SWITCH#` **no local-system**

Parameters

system-id	The ID number of the local system, in the range [0-63].
system-name	The name of the local system, if you have assigned one using alias system id.
no	Removes the local system specification from the draft configuration.

3.6.19.5 next-hop system

Specifies which local trunk to use to reach a remote system. A valid configuration will contain exactly one next-hop specification for each system in the network. The `next-hop system` name must be the alias you created with the `alias system id` command (see alias system id).

A good switch configuration will have exactly one next-hop specification for every non-local system.

Syntax

`CONF-SWITCH#` **next-hop system {***system-name***|id** *system-id***} via {***trunk-name***| trunk** *vif-id***}** [**description** *next-hop-description*]

`CONF-SWITCH#` **no next-hop** [**system {***system-name***|id** *system-id***}**]

Parameters

system *system-name* **system id** *system-id*	The next system in the network topology. Can be a name, if you have assigned one using alias system id, or the system's number id in the range [0-63].
via *trunk-name* **via trunk** *vif-id*	The trunk to use for connecting to the next system. Can be a name assigned by `alias local-vif trunk` or the trunk id in the range that is system-configuration based.
description *next-hop-description*	An optional description for the next-hop system you have specified. This can detail certain characteristics of the system, for clarity.
no	Removes the specified next-hop from the draft configuration. (The system itself is still in the draft configuration.) The `no next-hop` command (without the `system` keyword) will remove all next-hops.

3.6.19.6 destination

Specifies the end-point of a transmission path, from the starting point (local client interface) to the remote system and client interface.

You can set a round robin (RR) class, if desired. In round-robin scheduling, each client (of a particular class) that seeks attention is dealt with in circular order. DXMOS has four RR classes, 0-3. All members of class 0 are dealt with first, in circular order, until no member is requesting attention. Next, class 1 is considered, then class 2, then class 3. When the output queue is ready for the next packet, class cycling repeats; pending work for class 0 being handled first, followed by class 1, and so on. If no class value is specified in the `destination` command, the default class of 3 (the lowest class) will be applied.

	When the remote-vif is specified by name (`remote-client-name`), don't specify `remote-system`, since the remote system is implicit in a remote-vif name.

Syntax

`CONF-SWITCH#` **destination local-vif {***client-name***|client** *vif-id***} remote-vif** *client-name* [**class** *class*] [**description** *destination-description*]

`CONF-SWITCH#` **destination local-vif {***client-name***|client** *vif-id***} remote-system{***system name***|id** *system-id***} remote-vif client** *vif-id* [**class** *class*] [**description** *destination-description*]

`CONF-SWITCH#` **no destination** [**local-vif {***client-name***|client** *vif-id***}**]

Parameters

local-vif *client-name* **local-vif client** *vif-id*	The local client interface (or "starting point") of the path you are specifying. Can be a name assigned by `alias local-vif` or the `client` id in the range that is system-configuration based.
remote-system *system-name* **remote-system id** *system-id*	The system at the end of a specified path (the destination). Can be a name, if you have assigned one using alias system id, or the system's number id in the range [0-63].
remote-vif *client-name* **remote-vif client** *vif-id*	The client interface on the system at the end of a specified path (i.e., the destination). Can be a name assigned by `alias remote-vif` or the `remote-vif client` id.
class *class*	Determines the priority of data frame processing. Can be 0-3. Destinations with a class of 0 will have their data frames processed first. If no class value is specified, the default class of 3 (the lowest class) will be applied.
description *destination-description*	An optional description for the destination system you have specified. This can detail certain characteristics of the system or path, for clarity.
no	Removes the specified local-vif from the draft configuration. The `no destination` command (without the `local-vif` keyword) removes all destinations.

3.6.19.7 commit

Validates and saves the draft switch configuration to the running configuration. If the configuration is not valid, the errors are reported and the configuration is NOT saved to the running configuration.

Syntax

`CONF-SWITCH#` **commit**

3.6.19.8 compare

Displays the differences between draft and running switch configurations.

Syntax

`CONF-SWITCH#` **compare**

3.6.19.9 revert-to

Discards current draft switch settings and reverts to the last-saved configuration.

Syntax

`CONF-SWITCH#` **revert-to {factory-config|running-config}**

factory-config	Resets the switch settings to the default factory settings (clears all settings).
running-config	Resets the switch settings to the last saved running configuration.

3.6.19.10 show switch

Displays the draft switch configuration.

This is very similar to `show running-config`*, except that the switch section is the draft configuration and NOT the running configuration.*

Syntax

`CONF-SWITCH#` **show switch**

3.6.19.11 validate

Verifies the syntax is correct and reports any errors. Validate does not check for completeness or save to the running configuration. Use the `commit` command to validate *and* save to the running configuration.

Syntax

`CONF-SWITCH#` **validate**

3.6.19.12 end

Exits switch configuration mode and returns to enable mode. If the draft configuration contains uncommitted changes, the system prompts you to confirm you really want to end. Whether or not the draft configuration is committed, it is retained for use the next time switch configuration mode is entered.

Syntax

`CONF-SWITCH#` **end**

3.6.19.13 exit

Exits switch configuration mode and returns to configuration mode. If the draft configuration contains uncommitted changes, the system prompts you to confirm you really want to exit. Whether or not the draft configuration is committed, it is retained for use the next time switch configuration mode is entered.

Syntax

`CONF-SWITCH#` **exit**

3.6.20 terminal pager

For commands that support text paging, sets the number of output lines per page and pauses after displaying the lines. When the console output pauses, the user presses the space bar to proceed to the next page.

The value for *n* in the command `terminal pager n` determines the output-line page length, or disables the terminal pager altogether if n=0. You can also disable it with the command `no terminal pager`.

- On first installation, the terminal pager is disabled (i.e., n=0).
- To enable the terminal pager, assign a value for *n* that sets the maximum number of output lines in the page. Even though you can change the command parameters in disable mode (`>`) and enable mode (`#`), you must be in configuration mode (`CONF#`) to make changes that can be saved to the config file.

The `terminal pager` command differences by mode:

- For configuration mode only, the `terminal pager` *n* command can be initiated in one of two ways:
  - Via the config file: During the next reboot or reload, the `terminal pager` command that was saved to the config file is processed (i.e., read and executed), and the console is set to the specified page length (or disabled if n=0 or the command `no terminal pager` was specified).
  - Via a terminal: Setting page length to *n*. **Note:** If the terminal is a VTY (i.e., virtual/remote), and no one is logged in to the console, the page length will also be set in the console.
- From configuration mode, any saved changes become the `default` parameter for disable and enable modes.
- For disable mode and enable mode, the `terminal pager default` command, available in these two modes only, acquires the particular `terminal pager` command specified and saved in configuration mode.

See also the more command.

Syntax

`>` [no] **terminal pager {0|1|***n***|default}**

`#` [no] **terminal pager {0|1|***n***|default}**

`CONF#` [no] **terminal pager {0|1|***n***}**

Parameters

0	The value for *n* that disables the terminal pager. Equivalent to the command `no terminal pager`.
1	Enables the terminal pager with 2 lines per page.
n	Sets the page size to *n* output lines for the terminal. **Note:** *n* can also take values of 0 and 1, as described above.
default	This parameter sets the page size in disable and/or enable mode to the *n* output lines specified (and saved) in configuration mode. **Note:** If no value for *n* `output` lines is specified and saved in configuration mode, the `terminal pager default` command will disable terminal paging in the mode from which it was issued (i.e., disable mode and/or enable mode). And because no *n* value was specified in configuration mode, that mode remains disabled, as well. In other words, not specifying a value for *n* means that *n*=0.
no	The command `no terminal pager` disables the terminal pager. Equivalent to specifying `terminal pager 0`. **Note:** If `no terminal pager` is specified and saved in configure mode, it becomes the `default` parameter for the disable and enable modes.

3.6.21 tftp

The tftp commands transfer files between the DarkStar system and a TFTP server using the management network.

Note: Use of the `tftp` command requires a functioning TFTP server. Configuring TFTP servers is beyond the scope of this documentation.

DNS must be configured with the `ip name-server` *command for* `tftp-server` *to work with a hostname instead of an IP address.*

- **It is possible to corrupt valid storage locations using the `tftp` command. No checks are made to ensure the downloaded data files are legitimate DarkStar system data files. Use the `checksum` command on the retrieved file and manually verify its integrity.**
- **If you attempt to overwrite an executable file with a data file, or vice versa, you will receive a warning that the two files are of different modes. You will be prompted to confirm your decision before the file overwrite begins.**
- **It is possible to use `tftp` to obtain a configuration whose enable password is unknown. Be sure to write down each configuration's enable password in a safe place. Once the password is set and you leave enable mode, there is no way to configure the DarkStar system without entering the password to return to enable mode.**

Syntax

`#` **tftp {get|put}** *tftp-server source-file-name destination-file-name*

Parameters

get	Retrieves a file from a remote TFTP server.
put	Places a file on a remote TFTP server, such as `/dxmos/dxmos.exe`. (Aways a good idea to make a backup of this file.)
`tftp-server`	The IP address or the hostname of the TFTP server.
`source-file-name`	File to be transferred. With a `tftp put` command, the *source-file-name* is a path to a file that is located on the local DarkStar file system. For example, `/dxmos/dxmos.exe` or `dxmos/dxmos.exe`. The *destination-file-name* is a path to a file located on the remote TFTP server.
`destination-file-name`	Target location for the file to be transferred. With a `tftp get` command, the *source-file-name* is a path to a file located on the remote TFTP server. The *destination-file-name* is a path to a file that is located on the local DarkStar file system. For example, `/dxmos/dxmos.exe` or `dxmos/dxmos.exe`.

Example

`localhost#` **tftp put 10.1.1.15** */dxmos/dxmos.exe copy-of-dxmos.exe*

3.6.22 tune

Used in module config mode, the `tune` command tunes a transceiver to a specific channel, frequency, or wavelength.

	Some DarkStar systems come equipped with line transceivers that must be "tuned," specifying the ITU channel of the DWDM wavelength. After tuning the line transceivers, save the system configuration file with the write memory command. See “Connecting a DarkStar System” in the Systems Guide on the XKL website for details on your specific model to see if tuning is required.

Syntax

`CONF-MOD-{CLIENT|WAVE}[n]` **tune** **{***`channel`***|***`frequency`***|***`wavelength`***}** *`n`*

Parameters

`channel n`	ITU grid channel/spacing indicator. A decimal number (xx.5), where ”xx” indicates the channel number and “.5” indicates 50GHz spacing. For DQ*400 systems, the channel value *`n`* number will be xx.yyyy to indicate 6.25 GHz spacing, where yyyy may be 1 to 4 decimal digits.
`frequency n`	ITU grid frequency in GHz (a decimal number). For DQ*400 systems, the frequency value *`n`* will be xxxxxx.yy to indicate 6.25 GHz spacing, where yy may be 1 or 2 decimal digits.
`wavelength n`	ITU grid wavelength in nm (xxxx.yy).

3.6.23 tune-for-dmd

Systems that do not have integrated mux/demux filters (i.e., transponders) are connected to external optical filters (such as the DarkStar DMD product line). The `tune-for-dmd command` enables you to tune a group of selected channels to match the external channel filter, or a remote DarkStar filterless system. While the `tune` command enables you to tune by channel, frequency or wavelength, `tune-for-dmd` is exclusively channel only.

The `tune-for-dmd` is not saved in the configuration file. The command calls individual tune commands on each wave, and that is what is saved in the system configuration file.

Some DarkStar systems come equipped with line transceivers that must be "tuned," specifying the ITU channel of the DWDM wavelength. After tuning the line transceivers, save the system configuration file with the write memory command. See “Connecting a DarkStar System” in the Systems Guide on the XKL website for details on your specific model to see if tuning is required.

Syntax

`CONF#` **tune-for-dmd wave** *n* **spacing {50GHz|100GHz} channel-group** *y*

`wave` *n*	The wave module group, *n, can be one of the following:* 00-03, 04-07, 08-11, 12-15, 16-19, 20-23, 24-27, 28-31, 32-35 (i.e., 4 waves) 00-05, 06-11, 12-17, 18-23, 24-29, 30-35 (i.e., 6 waves) 00-11, 12-23, 24-35 (i.e., 12 waves)
50GHz|100GHz	Sets the desired spacing for the channels.
channel-group *y* (50GHz, 4 waves)	Waves can be tuned from channels 14 through 61.5, with each wave in the group having their channels increment by 0.5. Groups are: • 14-15.5 • 16-17.5 • 18-19.5 • 20-21.5 • 22-23.5 • 24-25.5 • 26-27.5 • 28-29.5 • 30-31.5 • 32-33.5 • 34-35.5 • 36-37.5 • 38-39.5 • 40-41.5 • 42-43.5 • 44-45.5 • 46-47.5 • 48-49.5 • 50-51.5 • 52-53.5 • 54-55.5 • 56-57.5 • 58-59.5 • 60-61.5
channel-group *y* (100GHz, 4 waves)	Waves can be tuned from channel 14 through 61, with each wave in the group having their channels increment by one. Groups are: • 14-17 • 18-21 • 22-25 • 26-29 • 30-33 • 34-37 • 38-41 • 42-45 • 46-49 • 50-53 • 54-57 • 58-61

channel-group *y* (50GHz, 6 waves)	Waves can be tuned from channels 14 through 61.5, with each wave in the group having their channels increment by 0.5. Groups are:
	• 14-16.5 • 38-40.5 • 17-19.5 • 41-43.5 • 20-22.5 • 44-46.5 • 23-25.5 • 47-49.5 • 26-28.5 • 50-52.5 • 29-31.5 • 53-55.5 • 32-34.5 • 56-58.5 • 35-37.5 • 59-61.5
channel-group *y* (100GHz, 6 waves)	Waves can be tuned from channel 14 through 61, with each wave in the group having their channels increment by one. Groups are:
	• 14-19 • 38-43 • 20-25 • 44-49 • 26-31 • 50-55 • 32-37 • 56-61
channel-group *y* (50GHz, 12 waves)	Waves can be tuned from channels 14 through 61.5, with each wave in the group having their channels increment by 0.5. Groups are:
	• 14-19.5 • 38-43.5 • 20-25.5 • 44-49.5 • 26-31.5 • 50-55.5 • 32-37.5 • 56-61.5
channel-group *y* (100GHz, 12 waves)	Waves can be tuned from channel 14 through 61, with each wave in the group having their channels increment by one. Groups are:
	• 14-25 • 38-49 • 26-37 • 50-61

Example

CONF# **tune-for-dmd wave** *00-03* **spacing 50GHz channel-group** *14-15.5*

```
Tuning Wave 0 to channel 14.0...

Wave 0 tuned to channel 14.0.
Tuning Wave 1 to channel 14.5...

Wave 1 tuned to channel 14.5.
Tuning Wave 2 to channel 15.0...

Wave 2 tuned to channel 15.0.
Tuning Wave 3 to channel 15.5...

Wave 3 tuned to channel 15.5.

CONF#
```

3.6.24 write

Use write to view, store, or erase your configuration information. Available write commands include:

- write memory
- write network
- write terminal
- write erase config

3.6.24.1 write memory

Writes the current configuration information of the running-config to non-volatile storage (*location /dxmos/config.dat* in flash memory). **Note:** It's a good idea to use the `tftp put` command to make a backup of the startup-config (/dxmos/config.dat). For more information, refer to the tftp section.

Syntax

`#` **write memory**

3.6.24.2 write network

Writes current configuration information to a remote server using TFTP.

- *XKL strongly encourages a backup of the startup-config data on a remote TFTP server. In the event that backups of the configuration in the DarkStar system flash memory become corrupted, a TFTP backup of your settings allows you to restore your DarkStar system and customer traffic to normal conditions.*
- The tftp-server IP address must be of the same class as the system IP address (IPv4 vs IPv6)
- DNS must be configured with the ip name-server *command for* `tftp-server` *to work with a hostname instead of an IP address.*
- If the file already exists at the remote location, `write network` overwrites it.

Syntax

`#` **write network** *tftp-server filename*

Parameters

tftp-server	Specifies the IP address or hostname of a TFTP server to which the `write network` command saves the current `running-config`.
filename	Specifies the name of the file to which the `write network` command saves the current configuration.

3.6.24.3 write terminal

Writes the current configuration to the console. Identical to the show running-config command.

Syntax

`#` **write terminal**

3.6.24.4 write erase config

Erases configuration information from non-volatile storage (flash memory). The `write erase config` command must be followed with the `reload` command to reinitialize the system using factory default settings.

Caution: Only use these two commands if you want to revert all configuration settings back to factory defaults.

Syntax

```
# write erase config
# reload
```

4

Networking

There are several steps to connecting your DarkStar to a network. These include establishing connections via Telnet or SSH, specifying the router RIP configuration and setting up various IP parameters. The associated commands are as follows:

- telnet
- router rip
- ip Commands

4.1 telnet

Establishes a telnet connection to the specified host name or IP address. The host replies with a definition of the escape character (Control-Shift-6) and a login prompt. You can close the connection with a `logout` command or by using the Control-Shift-6 escape character. Also, you can close the connection on the remote target with the `exit` command (that is, if the connection is to a Unix like environment or another DarkStar system).

Syntax

`>` **telnet** **{***ip-address*|*name***}**

Parameters

name	The hostname of the server to which you are trying to connect.
ip-address	IPv4 or IPv6 address of the server to which you are trying to connect.

Example

```
localhost> telnet 10.14.1.99
Establishing connection to 10.14.1.99:23.
Connected.
The escape character is '^^' (Control-Shift-6) (octal 036).
password: ...
DarkStar> logout
Connection closed.
localhost>
```

Example

```
localhost> telnet 10.14.1.99
Port number (decimal number)
<cr>
```

4.2 router rip

Places the DarkStar system in Routing Information Protocol (RIP) configuration mode. Command prompt changes to `CONF-RIP#`.

RIP is a way to dynamically inform routers about networks that are not directly connected to them. It works by sharing information between routers: a router broadcasts all of its connected networks and their ports (a routing table), and updates its own routing table from other routers.

Other router rip mode commands include:

- default-information originate
- network
- distance
- passive-interface
- redistribute
- version
- clear rip
- show rip

See ip Commands *for more RIP-related commands.*

Syntax

`CONF#` [no] **router rip**
`CONF-RIP#`

Parameters

no	Removes all RIP configuration information from the running configuration and disables RIP.

4.2.1 default-information originate

Causes a system to both advertise and accept a default (0/0) route, if one is configured.

Syntax

`CONF-RIP#` [no] **default-information originate**

4.2.2 network

Turns on RIP for a given interface. When disabling RIP on an interface, the DarkStar system no longer shares network connectivity information about that interface.

If you are accessing your DarkStar system by way of Telnet or SSH to a VTY, be careful not to remove RIP routes that you are actively using to configure your system.

Syntax

`CONF-RIP#` [no] **network** *address*

Parameters

address	Turns on RIP for subnets, which contain the specified address.
no	Disables RIP for the specified address.

4.2.3 distance

Specify the preferred routing protocol by setting the administrative RIP distance. Values range from 1-255. If no distance is specified, it is set to 120. See Table 4-1.

Administrative distance is a measure of a protocol's reliability. Often there are multiple possible pathways and protocols that a router can use, and it uses the administrative distance to select a particular option. This is a relative measure of the various routing protocols, and the smaller the value, the more dependable the protocol. If you want to give preference to RIP over other protocols, set the administrative distance to a lower number.

TABLE 4-1. Routing Protocol Default Administrative Distances

Protocol	Distance
Connected interface	0
Static route	1
Enhanced Interior Gateway Routing Protocol (EIGRP) summary route	5
External Border Gateway Protocol (BGP)	20
Internal EIGRP	90
IGRP	100
OSPF	110
Intermediate System-to-Intermediate System (IS-IS)	115
Routing Information Protocol (RIP)	120
Exterior Gateway Protocol (EGP)	140
On Demand Routing (ODR)	160
External EIGRP	170
Internal BGP	200
Unknown*	255

Syntax

`CONF-RIP#` **distance**

`CONF-RIP#` **distance** *rip-distance*

`CONF-RIP#` **no distance**

Parameters

rip-distance	The RIP distance, between 1-255. Default is 120.
no	Removes RIP distance setting.

4.2.4 passive-interface

Disables sending of routing updates. The DarkStar continues to collect information, but doesn't send updated information.

Syntax

`CONF-RIP#` [no] **passive-interface {ethernet** *n*|**loopback** *n*|**osc** *n*}

Parameters

ethernet *n*, **loopback** *n*, **osc** *n*	Disables sending of routing updates on the specified interface.
no	Enables sending of routing updates on the specified interface.

4.2.5 redistribute

Redistributes routes from other routing protocols via RIP. Additionally, you can specify the number of hops a connection can make.

Syntax

`CONF-RIP#` [no] **redistribute static metric** [value]

Parameters

metric value	The routing metric to use. If you don't specify `metric` *`value`*, `redistribute static` defaults to a metric of 1. Valid values are 1-16 (infinity).
no	Disables redistribution of static routes.

4.2.6 version

Sets which version of RIP is used by the DarkStar system. The default is RIPv2, with RIPv1 compatibility. In general, this is not something that will need to be addressed. However, if RIP version 1 is the only RIP version in use in the local network, you must use this command to select RIP version 1.

This setting can be overridden by specific interfaces with `ip rip send version` and `ip rip receive version` commands.

The RIP version that is configured on an interface will override the RIP version set globally by the `router rip` command on that particular interface.

Syntax

`CONF-RIP#` [no] **version** *version-number*

Parameters

version-number	Sets the RIP version number. Valid values are 1 or 2.
no version	A version number is not accepted. Returns RIP version to its default value of 2/1 compatibility mode.

The RIP version that is configured on an interface will override the RIP version set globally by the `router rip` command on that particular interface.

4.2.7 clear rip

Deletes all routing information acquired by RIP. This information will be repopulated when the next RIP update occurs. This is a quick way to update the local network tables, and is useful when other connections on a network have changed, or some other system has failed or been brought online.

Use the `show` ip routes command to view the system-wide routing table.

Syntax

`#` **clear rip**

4.2.8 show rip

Displays current RIP routing settings, including distance and network addresses.

Syntax

`#` **show running-config rip**

`CONF#` **show rip**

4.3 ip Commands

Most IP-related commands are available in configure mode (`CONF#`). However, there are some that are only available while you are configuring an Ethernet device (`CONF-MGMT-<ETH|OSC|LOOP>[n]#`). Table 4-2 points to the prompt-associated commands.

TABLE 4-2. IP Commands Sorted by Prompt

Prompt	Available IP Commands
`CONF#`	ip domain-name ip host ip name-server ip route ipv6 route
`CONF-MGMT-<ETH|OSC|LOOP>[n]#`	ip **Note:** The `ip` command includes the following sub-commands: • ip address • ip helper address • ip poison-reverse • ip proxy-arp • ip rip receive version • ip rip send version • ip rip v2-broadcast • ip split-horizon
`CONF-MGMT-ETH[n]#`	ipv6 address

4.3.1 ip domain-name

Specifies an additional search domain on the DNS server that you have specified using ip name-server. When name resolution is performed on an unqualified hostname, lookups will be performed by appending these domain names in the order configured. These lookups apply only to queries that use the cache and DNS, not to statically configured hosts.

Note: The system supports 200 configured domain names.

Syntax

`CONF#` [no] **ip domain-name** *name*

Parameters

name	DNS domain name for the search path.
no	Disables an IP domain-name.

Example

```
localhost# configure
localhost CONF# ip domain-name mydomain.net
localhost CONF# exit
localhost#
```

4.3.2 ip host

Specifies a static mapping of host to address. These are searched in the order specified. They take priority over the DNS cache and name servers.

Syntax

`CONF#` [no] **ip host** *name address*

Parameters

name	Sets the name of the host to which an IP address is assigned.
address	Sets the IP address for the given hostname.
no	The static host name and address to remove.

localhost# **configure**
localhost CONF# **ip host** *myhost 11.2.2.4*
localhost CONF# **exit**
localhost#

Note: DXMOS only allows host names that comply with typical host name restrictions laid out in RFC822.

4.3.3 ip name-server

Specifies an additional name server. Servers are referenced in the order specified.

Syntax

`CONF#` [no] **ip name-server** *address*

Parameters

address	The IP address of the DNS server.
no	The name server IP address to remove.

Example

```
localhost# configure
localhost CONF# ip name-server 11.2.1.8
localhost CONF# exit
localhost#
```

4.3.4 ip route

Adds a static route to the routing table. You can combine this with RIP routing as a backup route. Just make sure to use a higher metric value so there is no conflict with the static route.

Syntax

`CONF#` [no] **ip route** *address/netmask gateway* [metric]

Parameters

address/netmask	Sets the IP address and netmask for the static route. **Note:** Static routes are deleted when the management interface is updated.
gateway	Sets a gateway IP address for the static route.
metric	Specifies the metric value for the static route. Valid range is 0 to 65535. The default metric is 1.
no	Disables a static route in the routing table.

4.3.5 ip

Configures IP settings for an Ethernet interface.

Note: The Ethernet interface can have both an IPv6 and an IPv4 address.

Syntax

`CONF-MGMT-<ETH|OSC|LOOP>[n]#` [no] **ip {address** *ip-address/netmask*|**helper-address** *ip-address***}**

`CONF-MGMT-<ETH|OSC|LOOP>[n]#` [no] **ip {dhcp|poison-reverse|split-horizon|proxy-arp}**

`CONF-MGMT-<ETH|OSC|LOOP>[n]#` [no] **ip {rip receive version** *rip-version*|**rip send version** *rip-version*|**rip v2-broadcast}**

Parameters

address *ip-address/netmask*	Sets the interface IP address to *ip-address* with a netmask of *netmask*. The *ip-address* is specified in IPv4 format, and *netmask* is specified in Classless Inter-Domain Routing (CIDR) notation. An interface can have multiple IP addresses.
helper-address *ip-address*	Any DHCP request received on this interface will be forwarded to the specified ip address (IPv4 address or host name), which should be the DHCP server providing addresses for the subnet connected to the interface.
no ip address *ip-address/netmask*	Removes the specified IP address. If no address is specified, removes all IP addresses from the interface.
dhcp	Enables the DHCP client for the given interface. See ip dhcp for more information.
poison-reverse	Enables the poisoning (advertisement with infinite metric 16) of routes that have become unreachable. When combined with split-horizon, routes received from a given subnet are advertised with infinite metric back to the subnet to help prevent routing loops. Enabled in RIP by default.
split-horizon	Prevents RIP from advertising a route out of the interface on which it learned the route to help prevent routing loops. Works in conjunction with poison-reverse. The `split-horizon` is enabled by default.
proxy-arp	Replies to ARP requests with a packet containing the DarkStar's MAC address. The DarkStar then forwards subsequent messages to the intended destination.
rip receive version *rip-version*	Configures the Routing Information Protocol (RIP) version that the interface will receive. Valid values for *rip-version* are `1` or `2` (default). This specifies an individual rip version and overrides the global rip setting in `router rip`.
rip send version *rip-version*	Configures the RIP version that the interface will send. Valid values for *rip-version* are `1` or `2` (default). This specifies an individual rip version and overrides the global rip setting in `router rip`.
rip v2-broadcast	Sends v2 updates as broadcast packets. Disabled by default.
no	Disables the settings specified on that command line.

4.3.6 ipv6 address

Configures IPv6 settings for an Ethernet interface.

An interface can have multiple IPv6 addresses . To remove one IPv6 address (e.g., `FD12:E32:DA22::1/64`), use the command `no ipv6 address FD12:E32:DA22::1/64` .

Notes:

- Only the unicast addressing mode is supported. There is no current support for multicast, anycast, or IPv6 routing protocols.
- The Ethernet interface can have both an IPv6 and an IPv4 address.

Syntax

`CONF-MGMT-ETH[n]#` [no] **ipv6 address** *ipv6-address/prefix-length*

Parameters

ipv6-address	An IPv6 address prefix in the form of eight segments, each a hexadecimal value from 0 to FFFF. Leading zeros can be suppressed. Each segment is separated by a colon; one consecutive run of all-zero segments can be abbreviated as "`::`". For instance, the abbreviated IPv6 address example used in this section is `FD12:E32:DA22::1/64`, where "`::`" represents "0000 0000 0000 0000." Also note that the last segment of "1" had its three leading zeros suppressed (i.e., it was originally "0001").
prefix-length	IPv6 prefix length, an integer from 1 to 128.
no ipv6	Removes all IPv6 addresses from the interface.
no ipv6 address *ipv6-address*	Removes the specified address from the interface.

4.3.7 ipv6 route

Adds a static IPv6 route to the routing table. Note that there is no current support for multicast, anycast, or IPv6 routing protocols.

Syntax

`CONF#` [no] **ipv6 route** *ipv6-prefix/prefix-length gateway*

Parameters

ipv6-prefix	The IPv6 network that is the destination of the static route.
prefix-length	IPv6 prefix length, an integer from 1 to 128.
gateway	The IPv6 address of the next hop that can be used to reach the specified network.
no	Disables a static IPv6 route in the routing table.

5

Show Commands

5.1 Overview

The `show` commands display information about how the DarkStar system is configured. Depending on the mode (disable, enable, or configure), `show` has different keywords and displays current active configuration settings or current status of the system and/or components. Most of the `show` keywords are available in disable mode, but there are a few that are only available in the enable and configure modes. Available commands and their equivalents in each mode are listed in Table 5-1. For "running-config" show commands, see Table 5-2.

There are a few things to note about the `show` command:

- In general, `# show run` commands are equivalent to `CONF# show` commands. Refer to the table below for specifics.
- To execute an enable mode `show` command from the `CONF#` prompt, precede it with "do." For example, `do show time`.
- To see the active configuration settings for an option, the complete enable mode command is `# show running-config`.

TABLE 5-1. SHOW Commands by Mode (Not Including "running-config" Commands)

Command in > Disable Mode	Command in # Enable Mode	Command in CONF# Configure Mode
show amplifier	show amplifier	do show amplifier
show arp, show ip arp	show arp show ip arp	do show arp do show ip arp
show bert	show bert	do show bert
show bert log	show bert log	do show bert log
show calendar, show clock, show time	show clock show time show calendar	do show clock do show time do show calendar
show connections	show connections	do show connections
show dhcp	show dhcp	do show dhcp
show debug	show debug	do show debug
show dhcp	show environment	do show environment
	show file	do show file
	show flash	do show flash
show hardware	show hardware	do show hardware
	show hostkey	do show hostkey
show hosts	show hosts	do show hosts
show ip routes	show ip routes	do show ip routes
show ip traffic	show ip traffic	do show ip traffic
show led	show led	do show led
show lines	show lines	do show lines
	show logging	do show logging
show management	show management	do show management
	show memory	do show memory
show modules	show modules	do show modules
show ocm	show ocm	do show ocm
show optical itu-grid (show optical wavelength-map)	show optical itu-grid show optical wavelength-map	do show optical itu-grid do show optical wavelength-map
	show otdr	do show otdr
show peers	show peers	do show peers
protection primary-line	show protection	do show protection
show sntp	show sntp	do show sntp
	show startup-config	do show startup-config
	show switch	do show switch
show sysinfo	show sysinfo	do show sysinfo
	show tech-support	do show tech-support
show support	show support	do show support
show version	show version	do show version

TABLE 5-1. SHOW Commands by Mode (Not Including "running-config" Commands)

Command in > Disable Mode	Command in # Enable Mode	Command in CONF# Configure Mode
show vifs	show vifs	show vifs do show vifs
waveplan	show waveplan	do show waveplan
show wss	show wss	do show wss

TABLE 5-2. Running-Config SHOW Commands

	Command in # Enable Mode	Command in CONF# Configure Mode
show running-config	show running-config	do show running-config
	show running-config access-list	show access-list do show running-config access-list
	show running-config amplifier	show amplifier do show running-config amplifier
	show running-config banner	show banner
	show running-config bert log	show bert log
	show running-config boot	show boot
	show running-config fan	show fan
	show running-config group	show group do show running-config group
	show running-config host	show host do show running-config host
	show running-config line	show line do show running-config line
	show running-config logging	show logging do show running-config logging
	show running-config management	show management do show running-config management
	show running-config module	show module do show running-config module
	show running-config ocm	show ocm do show running-config ocm
	show running-config prompt-name	show prompt-name show running-config prompt-name
	show running-config protection	show protection do show running-config protection
	show running-config rip	show rip do show running-config rip
	show running-config snmp	show snmp
	show running-config sntp	show sntp do show running-config sntp
	show running-config static-routes	show static-routes
	show running-config switch (crossbar switch)	show switch (crossbar switch)
	show running-config wss	show wss do show running-config wss

5.2 show running-config

Displays current active configuration settings for the specified option. There are several ways to call this command, depending on the permission level, either in enable (#)or configuration (CONF#) mode. See Table 5-2 for the list of command options.

There are many "show" commands that are very similar to "show run" commands. In general, "show" displays what is currently happening with a component (its status), and "show run" displays the configuration settings for a component.

- If you don't specify any options, `CONF# show` displays full configuration information, starting with a string of eight semicolons (;;;;;;;;). **Note:** This information can be captured in a text file, starting with the semicolons, and placed on a TFTP server for later download via the `tftp` command. The dxmos/config.dat file contains all of this information if `write memory` has been used to save configuration edits.
- Shortcuts include `show run` or `show run` <Tab key>.
- The `show running-config` command is identical to the `write terminal` command.

The running config may not yet have been preserved as a file. To preserve it, use the `write memory` command.

Syntax

`#` **show running-config** [See the following optional parameters.]

Parameters

no keyword	Displays complete currently running configuration information for the system.
access-list	Current access lists, if any are configured. For more information, see Access Control Lists.
amplifier	Current amplifier settings, including path, output gain and power, and pump current. For more information, see Amplifiers.
banner	Current banner message.
bert log	Current BERT log setting.
boot	Current boot target settings.
fan	Current configured fan speed for any fans not in auto mode. This is not the same as show dhcp fans, which displays the current environmental status of the fan modules.
group	Current configuration for a DUA group settings.
host	Current hostname and ip domain settings. This is not the same as show hosts.
line	Current line configurations, including passwords, TACACS+ and RADIUS server settings, and AAA-related settings. This is not the same as show lines.
logging	Current logging buffer configuration. For more information, see logging.
management	Current configuration settings for the Ethernet, OSC, and loopback interfaces in the system. This is not the same as show management.
module	Current configuration settings for the transceivers in the system. This is not the same as show modules.
ocm	Current configuration settings for the OCMs in the system, including band definitions and threshold setpoints. For more information see Optical Channel Monitor.
prompt-name	Currently configured CLI prompt-name.
protect	Current configuration of the system's optical path protection mechanism.
rip	Current RIP routing configuration, including distance and network addresses. For more information, see router rip.
snmp	Current SNMP settings, including trap locations. For more information, see snmp-traps.
sntp	Current SNTP configuration, including the IP address and last sync time of the currently selected SNTP server.
static-routes	Current static routes, if any.
switch	Current crossbar switch settings.
wss	Current configuration settings for the WSSs in the system, include band definitions, attenuation, and switch port connections. For more information, see Wavelength Selective Switch.

Example

```
localhost# show running-config

running-config:
;;;;;;;;
version 4.7.0
enable
```

```
configure
line console
break
exit
line vty
exit
clock summer-time off
hostname localhost
management ethernet 0
ip address 10.10.1.200/16
exit
management osc 0
no laser shutdown
exit
module client 0
no laser shutdown
exit
module client 1
no laser shutdown
exit
module client 2
no laser shutdown
exit
module client 3
no laser shutdown
exit
module client 4
no laser shutdown
exit
module client 5
no laser shutdown
exit
module client 6
no laser shutdown
exit
module client 7
no laser shutdown
exit
module wave 0/0
no laser shutdown
encapsulation 10gigabitethernet
exit
module wave 0/1
no laser shutdown
encapsulation 10gigabitethernet
exit
module wave 0/2
no laser shutdown
encapsulation 10gigabitethernet
exit
module wave 0/3
no laser shutdown
encapsulation 10gigabitethernet
exit
```

```
! banner motd should be last in the configuration file for safety.
! A malformed MOTD with a missing ending delimiter will result in
! undefined behavior of any configuration statements after the MOTD.
localhost#
```

5.3 show amplifier

Click Controls for Individual Amplifiers to see description in its proper context. Also see show running-config amplifier.

5.4 show arp, show ip arp

Click show arp, show ip arp to see descriptions in their proper context.

5.5 show calendar, show clock, show time

All of these commands display the current time and date; the difference is the source.

- `show calendar` displays the current time and date according to the DarkStar system calendar chip.
- `show clock` and `show time` display the current time and date according to the DarkStar system clock.

Syntax

`>` **show calendar** [verbose]

`>` **show clock** [verbose]

`>` **show time** [verbose]

Example

```
localhost> show time

High resolution clock (corrected): 21:52:30 UTC+1 Wed Jan 1 2025
localhost> show time verbose

Date and time from calendar:       21:53:06 UTC+1 Wed Jan 1 2025
High resolution clock (corrected): 21:52:33 UTC+1 Wed Jan 1 2025
High resolution clock (raw):       21:52:33 UTC+1 Wed Jan 1 2025
Clock most recently set at:        23:22:29 UTC+1 Wed Jan 1 2025
localhost>
```

5.6 show debug

Click show debug to see description in its proper context.

5.7 show bert

Click show bert to see description in its proper context.

5.8 show bert log

Click show bert log to see description in its proper context.

5.9 show connections

Displays information about the wave and client interface connections, line status, and line rates. Without a *transport-identifier*, show connections displays information about the connection between two transport interfaces.

Each line in the displayed table describes an active connection between interface 1 and interface 2. See the connect command for additional information.

Syntax

> **show connections** [*transport-identifier*] [verbose]

Parameters

transport-identifier	Display connections to the specified interface. On redundant systems: client *n*, *wave* east *n*, or *wave* west *n* On non-redundant systems: client *n* or *wave n*
verbose	Displays an additional table with details and descriptions of the connected interfaces.

The following uses the connect command for the crossbar switch.

Example

```
localhost# show connections

10G Switch Complex connections:
Idx   If1          If2           Channel   If1 Line / Rate     If2 Line / Rate
---   ----------- --------------  -------   -----------------   -------------
0     Client 0      Wave 0          30.0      Up      /10GE       Up      /10GE
1     Client 1      Wave 1          31.0      Up      /10GE       UP      /10GE

localhost# show connections verbose

10G Switch Complex connections:
Idx   If1          If2           Channel   If1 Line / Rate     If2 Line / Rate
---   ----------- --------------  -------   -----------------   -------------
0     Client 0       Wave 0          30.0      Up      /10GE       Up      /10GE
1     Client 1       Wave 1          31.0      Up      /10GE       Up      /10GE

Idx              Interface Description <==> Interface Description
--- ------------------------------------------------------------------------
```

```
0                Fairfax router port 3 <==> Chantilly Service Building
1                Fairfax router port 4 <==> Chantilly Parts Building
```

5.10 show datapath

Displays the current status for client and wave ports on the datapath. Without any arguments, the command displays summary information about the datapath for all transceivers. Datapath port status information for accepted frames, dropped frames and utilization is updated by DXMOS every 5 seconds .

Not to be confused with `show running-config module`*, which displays the current running-configuration settings for the specified* transceivers.

This command is only available on DAT100 systems.

- **Rebooting or reloading DXMOS will clear frame and byte counters in system memory.**

Syntax

`#` **show datapath** [client|wave|all|summary]

Parameters

client	Displays information for only the client transceiver(s). **Note:** The information shown is identical to the client information by the `show datapath` or `show datapath summary` commands.
wave	Displays information for only the wave transceiver(s) **Note:** The information shown is identical to the wave information displayed by the `show datapath` and `show datapath summary` commands.
summary	Displays a short summary of information about all the transceivers. **Note:** `show datapath summary` provides the same information as `show datapath`.
all (verbose)	Displays more information for all transceivers, including more detailed alarm information. Adding the keyword verbose provides the most detail, including information on Internal status and Module status.

Example

`XC8-DAT100#` **show datapath**

```
Mod  Description          Class  Status   | TxTotal  TxUtil%  RxTotal  RxUtil%
---  -------------------  -----  -------- | -------  -------  -------  -------
C0   Client0HasAVeryLong    N/A  Disabled |       0      0.0        0      0.0
C1                          N/A  Alarm    |       0      0.0        0      0.0
C2                          N/A  Down     |       0      0.0        0      0.0
C3                          N/A  Alarm    |       0      0.0        0      0.0
C4                          N/A  Down     |       0      0.0        0      0.0
C5                          N/A  Down     |       0      0.0        0      0.0
```

```
C6                          N/A  Alarm    |       0      0.0        0      0.0
C7                          N/A  Down     |       0      0.0        0      0.0
W0                          N/A  Down     |       0      0.0        0      0.0

XC8-DAT100#
```

5.11 show dhcp

Click show dhcp to see descriptions in their proper context.

5.12 show environment

Displays operating environment information, including temperature and status of power supply and fan modules.

Running `show environment` without any arguments is equivalent to `show environment all`.

Syntax

`>` **show environment** [all|fans|logging|power|temperature]

Parameters

all	Displays summary of fan and power system status, as well as the Command Loader log.
fans	Displays detailed fan module status and operational parameters.
logging	Displays items in the Command Loader log.
power	Displays detailed power supply module status and operational parameters.
temperature	Displays current temperature readings and temperature operating ranges for many DarkStar components.

Example

```
localhost# show environment all
Power Supply 0: Normal/On
Power Supply 1: Normal/On
Fan Module 0 is present, functioning normally
Fan Module 2 is present, functioning normally
Command Loader Log:
(0x01, time        0) Power up; reloaded per DIP
(0x29, time      257) Successful reload
(0xc5, time 10133150) Commanded reload
(0x29, time 10133407) Successful reload

localhost# show environment temperature
Temperature (C)               Curr  Low   Low   Fan   High  High  High
```

```
Sensor Id                      Temp  Alrm  Warn  Ctrl  Warn  Alrm  Crit
-----------                    ----  ----  ----  ----  ----  ----  ----
OSC 1                            28     0     5    50    65    70    80
OSC 0                            33     0     5    50    65    70    80
Fan 0 Outlet                     26     0     5  none    60    65    70
Fan 2 Outlet                     27     0     5  none    60    65    70
DAMP Board                       28     0     5  none    60    65    70
CMD Outlet                       36     0     5  none    60    65    70
CMD Board                        46     0     5  none    60    65    70
CMD FPGA                         60     0     5    80    95   100   115
C1UB Board                       29     0     5  none    60    65    70
East Input EDFA                  23    -5     0    50    65    70    80
West Input EDFA                  29    -5     0    50    65    70    80
```

localhost# **show environment** power

```
Power Supply 0 is present, with status: Normal/On
  Position:      Left (as viewed from rear)
  Type:          Common Redundant
  Manufacturer:  bel
  Serial Number: PEC0550NA200900057
  Part Number:   PEC550-12-074NA
  Revision:      V00
      Output Voltage:    12.277 V
      Output Current:     4.601 A
      Fan Speed:           6756 RPM
      Max Output Power: 550.000 W
  Status Word: 0x0000

Power Supply 1 is present, with status: Normal/On
  Position:      Right (as viewed from rear)
  Type:          Common Redundant
  Manufacturer:  bel
  Serial Number: PEC0550NA200900058
  Part Number:   PEC550-12-074NA
  Revision:      V00
      Output Voltage:    12.263 V
      Output Current:     5.406 A
      Fan Speed:           6820 RPM
      Max Output Power: 550.000 W
  Status Word: 0x0000

Power Regulators:
Board Name  RefD   Vnom (V)  Vout (V)  Iout (A)  Power Good  Alert Signal
----------  -----  --------  --------  --------  ----------  ------------
CMD         U2001     2.500     2.529     0.500         N/A           Off
CMD         U2100     0.950     0.954     0.812         N/A           Off
CB          U7301     1.200       N/A       N/A        True           Off
C1UB         U901     3.300     3.299     0.062        True           Off
PS0A         U200     3.600     3.578     0.062         N/A           Off
PS1A         U200     3.600     3.580     0.062         N/A           Off
```

```
CB          U7300     1.800     1.792    10.000        True          Off
CB          U7302     0.900     0.894    12.687        True          Off
CB          U7303     0.900     0.902    13.812        True          Off
CMD         U2000     3.300     3.315     0.062         N/A          Off
CMD         U2002     1.800     1.777     1.062         N/A          Off
C1UB         U900     5.000     5.023     0.062        True          Off
CMD         U2003     1.200     1.204     0.562         N/A          Off
CMD         U2101     0.900     0.919     2.625         N/A          Off
CB          U7203     2.500     2.563     1.187        True          Off
CB          U7200     3.300     3.328     1.937        True          Off
CB          U7201     3.300     3.333     9.937        True          Off
```

```
localhost# show environment fans
Fan 0, is present
  Position: Leftmost (as viewed from rear)
  Control Mode: Auto
 Blower 0, is present
  Position: Left (as viewed from rear)
  Minimum speed is 82 RPS, Maximum speed is 307 RPS
  Target speed is 1 percent, Last read 91 RPS
  No Alarms
 Blower 1, is present
  Position: Right (as viewed from rear)
  Minimum speed is 81 RPS, Maximum speed is 305 RPS
  Target speed is 1 percent, Last read 91 RPS
  No Alarms
Fan 2, is present
  Position: Rightmost (as viewed from rear)
  Control Mode: Auto
 Blower 0, is present
  Position: Left (as viewed from rear)
  Minimum speed is 83 RPS, Maximum speed is 305 RPS
  Target speed is 1 percent, Last read 92 RPS
  No Alarms
 Blower 1, is present
  Position: Right (as viewed from rear)
  Minimum speed is 81 RPS, Maximum speed is 303 RPS
  Target speed is 1 percent, Last read 92 RPS
  No Alarms
```

5.13 show equalizer

Displays DGE-OCM information for an east or west module in a DarkStar DLA.

Syntax

> show equalizer {east|west} [config|module|plan]

Parameters

config	Displays the current configuration settings.
module	Displays identification, feature, and environment measurements.
plan	Displays the defined bands in a waveplan.

Example

```
DLA_System# show equalizer east module

Molex OCM-DGE/WSS DC0.82:P201 @1:8.42

Module is Ready

Uptime 4 days, 21 hours, 59 minutes, 48 seconds

Vendor                Molex
Part Number           FFBB-C58L201-2NI
Serial Number         Z023A09529
Firmware Version      7.13.1
Hardware Version      11.2.0

Active Partition      1
Booted Partition      1
Partition1 Firmware   7.13.1-220803A
Partition2 Firmware   7.13.1-220803A
Bootloader            7.0.3


Module Features
-------------------------------------------------
Minimum Frequency Bound           191350.000 GHz
Maximum Frequency Bound           196175.000 GHz
Minimum Channel Bandwidth         6.250 GHz
Max WSS ID present                2
Max OCM ID present                2
Max Waveplan ID                   11
Supports Array Commands           True
Supports Multi Commands           True
Supports Broadcast                False
Supports Table and Row Commands   True
Supports Long Cmd Format          True

Cold-boot Switch Restore          True
Cold-boot Alarm Restore           True
Cold-boot Waveplan Restore        True
```

```
Module Env Monitors
-------------------------------------------------
Switch Temperature                25.30 degC
Board Temperature                 29.30 degC
Case Temperature                  25.40 degC
Lid Temperature                   25.00 degC

Sensor +1.2V                      0.99 V
Sensor +1.8V                      1.78 V
Sensor +3.3V                      1.32 V
Sensor +12V                       10.03 V

Barometric Pressure               102.08 kPa


DLA_System#
```

5.14 show file

Displays information pertaining to the file system.

Syntax

**show file info** *filename*

**show file {descriptors|systems}**

Parameters

descriptors	Lists which files are currently in use.
systems	Displays information about the file systems present, including size, type, and location.
info *filename*	Displays information about a specified file, including size, creation date, and last-modified date.

Example

```
localhost# show file descriptors
Scanning all open files...
  Directory '/.' is open.
  Directory '/dump' is open.
  Directory '/gateware' is open.
```

Example

```
localhost# show file systems
File Systems:

Flash card 0 has 61 stripes (about 8 GB).
 Device          Size             Free         Usage       Type      Flags  Mount
flash0:0      104856 KB           N/A          N/A       System      R/W    --
```

```
flash0:1      104856 KB          N/A         N/A      System     R/W    --
flash0:2      629136 KB       590576 KB      6.12%    DXMFS(P)   R/W   /
flash0:3     1048560 KB            0 KB    100.00%    DXMFS      R/W   /dump
flash0:4     2201976 KB      2091470 KB      5.01%    DXMFS      RO    /gateware
flash0:5     1048560 KB          N/A         N/A      DXMFS      R/W    --
flash0:6     1048560 KB          N/A         N/A      DXMFS      R/W    --

Flash card 1 has 61 stripes (about 8 GB).
 Device          Size            Free        Usage      Type     Flags  Mount
flash1:0      104856 KB          N/A         N/A      System     RO     --
flash1:1      104856 KB          N/A         N/A      System     RO     --
flash1:2      629136 KB          N/A         N/A      DXMFS(P)   RO     --
flash1:3     1048560 KB          N/A         N/A      DXMFS      RO     --
flash1:4     2201976 KB          N/A         N/A      DXMFS      RO     --
flash1:5     1048560 KB          N/A         N/A      DXMFS      RO     --
flash1:6     1048560 KB          N/A         N/A      DXMFS      RO     --
```

Example

localhost# **show file info** *last.cfg*

```
  File: 'last.cfg'
  Size: 1846 octets    Blocks: 3   regular file
FileNo: 56 Links: 1
Modify: 2014-03-21 11:50:23 -0700
Create: 2014-03-21 11:50:18 -0700
```

5.15 show flash

Lists system flash memory, flash interface status, and flash static files such as factory-boot.

Syntax

 # show flash

Example

localhost# **show flash**

```
Flash Card:
Status/Control Register 0: . o010140000023
Error Register 5: .......... o000000000000

System flash directory:
flash0:0  (Type: System)
Static File            Length   Address
  startup-gateware       32768  00000000
  startup-boot            4096  00500000
  backup1-boot            4096  00600000
flash0:1  (Type: System)
  Static File            Length   Address
flash0:2  (Type: DXMFS(P))
  No static flash files. Use 'dir' to list normal files.
```

```
flash0:3  (Type: DXMFS)
  No static flash files. Use 'dir' to list normal files.
flash0:4  (Type: DXMFS)
  No static flash files. Use 'dir' to list normal files.
flash0:5  (Type: DXMFS
  Static File            Length   Address
flash0:6  (Type: DXMFS)
  Static File            Length   Address
flash1:0  (Type: System)
 Static File            Length   Address
  factory-gateware       32768  00000000
  factory-boot            4096  005000000
flash1:1  (Type: System)
  Static File            Length   Address
flash1:2  (Type: DXMFS(P))
  Static File            Length   Address
flash1:3  (Type: DXMFS)
  Static File            Length   Address
flash1:4  (Type: DXMFS)
  Static File            Length   Address
flash1:5  (Type: DXMFS)
  Static File            Length   Address
flash1:6  (Type: DXMFS)
  Static File            Length   Address

localhost#
```

5.16 show hardware

Displays serial numbers, manufacturing dates, and hardware revision data for DarkStar system-hardware components. Displays the presence of various optical components, such as filters.

Syntax

`>` **show hardware**

Example

```
localhost# show hardware
Hardware:
 DarkStar Model: DLA
 System Part Number: 10002-12601-00
 System Serial Number: 99999988888Z99

  CMD:
     IDROM Standard Version: 2.8
     Board Serial Number: 1060219295T025
     Part Number: 30001-00106-02
     Board Interface Identifier: 1.3.2
     Manufacturing Date: 191022
     Last Write-Protect IDROM Update: 191113
     Last Read/Write IDROM Update: 200203
```

```
   Options:
     Base MAC Address: 00:A0:E3:00:0B:9E (8)

C1UB:
  IDROM Standard Version: 2.8
  Board Serial Number: 1070019275T009
  Part Number: 30001-00107-01
  Board Interface Identifier: 6.0.1
  Manufacturing Date: 191002
  Last Write-Protect IDROM Update: 210114
  Last Read/Write IDROM Update: 220909
  Options:
    System Configuration: 08 0E 60 E6 00 30 03 00 00 00 (10)
    Version 0; Mid-stage access is present.
    East input tilt filter 23.0 dBm.
    West input tilt filter 23.0 dBm.
    West Booster EDFA maximum output power +23 dBm
    East Booster EDFA maximum output power +23 dBm

Dual Amplifier (DAMP):
   IDROM Standard Version: 2.8
   Board Serial Number: 1000017075T013
   Part Number: 30001-00100-00
   Board Interface Identifier: 3.4.1
   Manufacturing Date: 170316
   Last Write-Protect IDROM Update: 170320
   Last Read/Write IDROM Update: 170320

Amplifier daughter (DOSA) 0:
   IDROM Standard Version: 2.8
   Board Serial Number: 1020220181T007
   Part Number: 30001-00102-03
   Board Interface Identifier: 3.5.3
   Manufacturing Date: 200629
   Last Write-Protect IDROM Update: 200720
   Last Read/Write IDROM Update: 200720

Fan 0:
   IDROM Standard Version: 2.7
   Board Serial Number: 0560408242X081
   Part Number: 30001-00056-04
   Board Interface Identifier: 4.1.2
   Manufacturing Date: 080829
   Last Write-Protect IDROM Update: 191204

Fan 2:
   IDROM Standard Version: 2.7
   Board Serial Number: 0560412086H004
   Part Number: 30001-00056-04
   Board Interface Identifier: 4.1.2
   Manufacturing Date: 120326
   Last Write-Protect IDROM Update: 191204
```

```
Power Supply 0:
   Manufacturer:  ASTEC
   Serial Number: E735TG0055ACP
   Part Number:   DS550HE-3

Power Supply 1:
   Manufacturer:  ASTEC
   Serial Number: E735TG003PACP
   Part Number:   DS550HE-3

Amplification Module East Output EDFA:
   Manufacturer ..... RED-C
   Model ............ 409470 EDFA
   Serial number ..... 17673
   Hardware version .. 000
   Firmware version .. 001.7
   Firmware date ..... JULY 07 2022
   RefD ............. DC0:P103

Amplification Module West Output EDFA:
   Manufacturer ..... RED-C
   Model ............ 409470 EDFA
   Serial number ..... 07014
   Hardware version .. 000
   Firmware version .. 001.7
   Firmware date ..... JULY 07 2022
   RefD ............. DC0:P102
```

5.17 show hostkey

Click show hostkey to see description in its proper context.

5.18 show hosts

Displays a table of local hostname ↔ IP address assignments. You can manually configure this table using the ip host command.

Not to be confused with `show run host`*, which displays the current configuration settings for the current hostname and IP domain.*

Syntax

`>` **show hosts**

5.19 show ip routes

Displays the current system routing table.

Syntax

> **show ip routes** [detailed]

Parameters

detailed	Displays more details, including link layer information. Returns the following display codes: C = Connected S = Static R = RIP

Example

```
localhost# show ip routes

Codes:  C - Connected, S - Static, R - RIP

Current Route Table:
Org Dest IP/CML         Cost Source           NextHop          Sending To
 C  10.11.0.0/16        0/0  10.15.1.222      10.15.1.222      Active R Active
 C  192.176.242.237/21  0/0  192.176.242.237  192.176.242.237  Active R Active

Routing tables
Internet:
Destination         Gateway            Flags  Refs  Use   Mtu  Prio  Iface
10.15/16            link#4             UC        0     0     -     4  eth3
127.0.0.1           127.0.0.1          UH        2   471  33196    4  lo0
192.172.242.237/21  link#1             UC        0     0     -     4  eth0

Internet6:
Destination         Gateway            Flags  Refs  Use    Mtu  Prio  Iface
::1                 ::1                UH        0    0  33196     4  lo0
fe80::%1/64         link#1             UC        0    0     -     4  eth0
fe80::2a0:e3ff:fe0  00:a0:e3:00:06:a6  UHL       0    0     -     4  lo0
.
.
.
```

5.20 show ip traffic

Displays current IP traffic statistics.

Syntax

`>` **show ip traffic**

Example

```
localhost# show ip traffic

ip:
        165526 total packets received
        0 bad header checksums
        0 with size smaller than minimum
        0 with data size < data length
        0 with header length < data size
        0 with data length < header length
        0 with bad options
        0 with incorrect version number
        0 fragments received
        0 fragments dropped (duplicates or out of space)
        0 malformed fragments dropped
        0 fragments dropped after timeout
        0 packets reassembled ok
        38532 packets for this host
        4159 packets for unknown/unsupported protocol
        0 packets forwarded
        22060 packets not forwardable
        0 redirects sent
        999 packets sent from this host
        0 packets sent with fabricated ip header
        0 output packets dropped due to no bufs, etc.
        299 output packets discarded due to no route
        0 output datagrams fragmented
        0 fragments created
        0 datagrams that can't be fragmented
        0 fragment floods
        0 packets with ip length > max ip packet size
        0 tunneling packets that can't find gif
        0 datagrams with bad address in header
        0 input datagrams checksum-processed by hardware
        0 output datagrams checksum-processed by hardware
        110098 multicast packets which we don't join
```

5.21 show led

Displays a readout of the front panel LEDs and a summary of system status. The output will vary, depending on the DarkStar configuration. Some examples follow.

Syntax

> **show led** [verbose]

Parameters

verbose	System-dependent parameter that provides additional details as applicable.

Examples

(Starting on next page.)

DarkStar DSM10-10

localhost# **show led** verbose

```
System Status:
    | PWR | WRN | ALM |
    |green|amber| red |
    |-----|-----|-----|
    | on  |     |     |

System Status Info:
   System fully operational

Ethernet Link:
    |   E0    |   E2    |
    |---------|---------|
    |on(green)|         |

    |   E1    |   E3    |
    |---------|---------|
    |         |         |

Line/Wave Ports:
  Wave Power (Wave 0 - Wave 9): on

Line/Wave Ports Info:
  Wave 0: on
  Wave 1: on
  Wave 2: on
  Wave 3: on
  Wave 4: on
  Wave 5: on
  Wave 6: on
  Wave 7: on
  Wave 8: on
  Wave 9: on

OSC Ports:
  OSC W Signal: on

Client Ports:
    |    C0     |    C1     |    C2     |    C3     |    C4     |
    | Ok  | Sig | Ok  | Sig | Ok  | Sig | Ok  | Sig | Ok  | Sig |
    |-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
    |     |     |     |     |     |     |     |     |     |     |

    |    C5     |    C6     |    C7     |    C8     |    C9     |
    | Ok  | Sig | Ok  | Sig | Ok  | Sig | Ok  | Sig | Ok  | Sig |
    |-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
    |     |     |     |     |     |     |     |     |     |     |
```

DarkStar DMD-A with OPS

```
localhost# show led

System Status:
    | PWR | WRN | ALM |
    |green|amber| red |
    |-----|-----|-----|
    | on  |     |     |

System Status Info:
   System fully operational

Ethernet Link:
    |   E0    |   E2    |
    |---------|---------|
    |         |on(green)|

    |   E1    |   E3    |
    |---------|---------|
    |         |         |

OSC Ports:
  OSC A: on
  OSC B: on

Protection/Amps:
                    Line
            Active        EDFA
       |   A     B   |  In    Out  |
  ================================
   OK  |       | on    | flash|      |
   WRN |       |       |      |      |
   ALM |       |       |      |      |
```

DarkStar DLA

```
localhost# show led

System Status:
    | PWR | WRN | ALM |
    |green|amber| red |
    |-----|-----|-----|
    | on  |     |     |

System Status Info:
   System fully operational

Ethernet Link:
    |   E0    |   E2    |
    |---------|---------|
    |         |         |

    |   E1    |   E3    |
    |---------|---------|
    |         |on(green)|

OSC Ports:
  OSC West: off
  OSC East: off

Amps:

                EDFA
           West          East
  EDFA |  In    Out  |  In    Out  |
  ================================
   OK  |      |      |      |      |
   WRN |      |on    |      |on    |
   ALM |      |      |      |      |
```

5.22 show lines

Shows the status of console and VTY lines. The current command session is indicated by an asterisk, as shown in the example below.

Not to be confused with `show run line`*, which displays the current SNTP running-config settings and the last sync time of the currently selected SNTP server.*

Syntax

`>` **show lines**

Example

`localhost>` **show lines**

```
Line Information
Line    Location        Idle            Status
0       CTY             0:00:00:00      Logged In*
1       VTY 0           NA              Free
2       VTY 1           NA              Free
3       VTY 2           NA              Free
4       VTY 3           NA              Free
```

5.23 show logging

Click show logging to see description in its proper context.

5.24 show management

Displays current status for management modules. Without any arguments, the `show management` command displays summary information for all configured Ethernet and loopback management modules. It is equivalent to the `show management summary` command.

If OSC transceivers are detected (i.e., are present), the applicable system-dependent OSC ports will display relevant information.

Not to be confused with `show run management`*, which displays the current configuration settings for the specified modules.*

Syntax

`>` **show management** [summary|all|ethernet *n*|loopback *n*|osc *n*|switch *n*|*group*|switch]

Important: The `switch` command parameter is not available on all systems. To determine whether the `switch` parameter is available on your system, issue the `show hardware` command. If the system is CMD based, the `switch` command parameter is available.

Parameters

ethernet *n*	When *n* is 0, the command displays the status of the internal Ethernet port 0. You can also use this command to display the status of an OSC transceiver. Depending on system configuration, *n* can be from 4–7, the values representing the internal ports of one or more installed OSC transceivers. **Note:** For systems with the `switch` parameter, values for `ethernet` *n* from 1–3 are invalid.
loopback *n*	*n* refers to a loopback interface, which is a virtual interface that echoes everything sent to it. **Notes:** • *n* can only be 0, as only one loopback address can be configured on any DarkStar system. • If loopback is not configured, it will not be listed in `show management summary` or `show management all`.
osc *n*	*n* refers to a single OSC port for which status will be displayed. Depending on system configuration, *n* can be from 0–3. **Note:** The `show management osc` *n* command is equivalent to the `show management ethernet` *n* command, where *n* is within the applicable OSC-value range for the respective commands. For example, the port for `osc` ***0*** is the same as the port for `ethernet` 4; the port for `osc` 1 is the same as the port for `ethernet` 5, and so on.
osc *group n*	DUA ONLY: Displays the status of the OSC port belonging to group *n*.
osc *group name*	DUA ONLY: Displays the status of the OSC port belonging to group *name*.
switch	For systems equipped with this feature, displays the status of the Ethernet switch's external ports (E0–E3). **Note:** The Ethernet switch acts as a Layer-2 switch, managing the DarkStar system's four front-panel Ethernet ports (E0–E3) to which copper LAN cables connect.
all	This command is a concatenation of all `show management ethernet` *n* commands, including loopback and switch information.
summary	Displays a short summary of information about all Ethernet and loopback management modules that are configured.

The following example shows output for a system with the `switch` parameter.

Example

```
localhost# show management ethernet 0
Ethernet 0 is up, line protocol is up,
 Description is Eth0
 Internet address is 10.15.1.148/16
 IPv6 address is ::ffff:a0f:194/64
 Hardware is Ethernet Switch. MAC address is 00:A0:E3:00:0B:0E
 Full Duplex mode, link type is 1Gbps (Auto-Negotiated)
 Last State Change: >00d 02:13:32 ago
```

```
   22655 packets input, 1793368 bytes
   0 no receive buffer, 0 CRC error, 0 overrun
   0 no transmit buffer
   3157 packets output, 495396 bytes
   0 collisions, 0 late collisions,
   0 deferred, 0 lost carrier, 0 no carrier
```

```
Note: '>' means knowledge of elapsed time doesn't extend into past beyond number
shown.
```

The following example shows the (Ethernet Layer-2) switch for the management interface.

Example

`localhost#` **show management** switch

```
    Port         Link           Type         Auto-negotiation    Link-status
-------------  ----------  ---------------  ------------------  --------------
e0             1000 Mbps   full-duplex      complete              up
e1             none        half-duplex      not complete        down
e2             none        half-duplex      not complete        down
e3             none        half-duplex      not complete        down
```

5.25 show memory

Click show memory to see description in its proper context.

5.26 show modules

Displays current status for transceivers. Without any arguments, the `show modules` command displays summary information for all included transceiver types (e.g., OSC, client, trunk, wave). Equivalent to `show modules summary`. For information on output fields associated with the `show modules` commands, see Glossary under Supplementary Information in Appendix A.

	Not to be confused with `show run module`*, which displays the current configuration settings for the specified* transceivers.

Syntax

`localhost>` **show modules** [summary | all | *module-identifier*][host-side [*host lane group*]|media-side|verbose|rx]

Parameters

summary	Displays summary information for all transceivers.
all	Displays detailed information for all transceivers, including detailed alarm, temperature, and component make/model information. **Note:** The secondary option, `verbose`, will provide additional module detail.
summary rx	Displays summary Rx power information for all transceivers.

module-identifier	Specific transceiver type for which to view information. You can also specify a transceiver `n` of a particular transceiver type, where `n` is an integer falling within the range of associated transceivers for that type (e.g., `OSC 0`, `wave 0`).
host-side [*host lane group*] |media-side verbose	`host-side`—This secondary option includes more details focused on the status of the transceiver module's electrical receiver and transmitter. This is the interface connecting a client module to a wave module inside the system. An optional integer is provided to isolate host lane groups. **Note:** Available only on select systems. `media-side`—This secondary option includes more details focused on the status of the transceiver module's optical receiver and transmitter. **Note:** Available only on select systems. `verbose`—This secondary option provides additional module detail.

Example

```
localhost# show modules osc 0
OSC West    Up
  Description: .... Seattle_to_Redmond
  Tx: ............. OK                          Rx: .......... OK
  State Changed: .. 00d 13:20:52                Channel: ..... N/A
  Tx Laser: ....... Enabled                     Frequency: ... 198406 GHz
  Tx Power: ....... 2.6 dBm                     Wavelength: .. 1511.00 nm
  Rx Power: ....... -19.5 dBm                   Module Type: . SFP
  Loopback: ....... Not Supported               Temperature: . 26 C
  Encapsulation: .. 100Base-FX                  Vendor: ...... SOURCEPHOTONICS
  Last Cleared: ... 00d 13:20:05                Part No.: .... SPC03XLR51CDA
  Link Downtime: .. 00d 00:00:00                Serial No.: .. A36T000517
  Maximum Reach: .. 150 km on SM                MFG Date: .... 10020588
```

Example

```
localhost# show modules
```

Interface	Admin	Line	Rate	RxPow	Ch	Transceiver	Last Line Chg
Client 0							
Lane 0	Up	Up	100Gb/s	1.7 dBm	N/A	OK	>00d 02:21:07
Lane 1	Up	Up	100Gb/s	2.5 dBm	N/A	OK	>00d 02:21:07
Lane 2	Up	Up	100Gb/s	1.3 dBm	N/A	OK	>00d 02:21:07
Lane 3	Up	Up	100Gb/s	1.6 dBm	N/A	OK	>00d 02:21:07
Client 1							
Lane 0	Up	Up	100Gb/s	3.4 dBm	N/A	OK	>00d 02:21:07
Lane 1	Up	Up	100Gb/s	4.1 dBm	N/A	OK	>00d 02:21:07
Lane 2	Up	Up	100Gb/s	3.2 dBm	N/A	OK	>00d 02:21:07
Lane 3	Up	Up	100Gb/s	3.5 dBm	N/A	OK	>00d 02:21:07
Client 2	Up	Absent	None	N/A	N/A	N/A	N/A
Client 3	Up	Absent	None	N/A	N/A	N/A	N/A
Wave 0							
Lane 0	Up	Up	400Gb/s	-6.3 dBm	20.0	OK	00d 02:18:10
Wave 1							
Lane 0	Up	Up	400Gb/s	-5.8 dBm	21.0	OK	00d 02:18:10
Wave 2	Up	Absent	None	N/A	N/A	N/A	N/A
Wave 3	Up	Absent	None	N/A	N/A	N/A	N/A

```
OSC A        Down  Up      100Mb/s    -24.4 dBm N/A  N/A          >00d 02:21:09
OSC B        Down  Up      100Mb/s    -20.2 dBm N/A  N/A          >00d 02:21:09
```

Example

```
Note: '>' means knowledge of elapsed time doesn't extend into past beyond
number shown.
localhost# show modules client 2
Client 2    Warning
  Description: .... Seattle_to_Redmond
  Tx: ............. Disabled                    Rx: .......... LOS,LOL
  State Changed: .. 00d 14:04:46               Channel: ..... N/A
  Tx Laser: ....... Disabled                    Frequency: ... 228849 GHz
  Tx Power: ....... -19.0 dBm                   Wavelength: .. 1310.00 nm
  Rx Power: ....... <-40.0 dBm                  Module Type: . SFP+
  Loopback: ....... Not Supported               Temperature: . 28 C
  Encapsulation: .. 10G Ethernet                Vendor: ...... FINISAR CORP.
  Last Cleared: ... 00d 14:03:57                Part No.: .... FTLX1471D3BCV
  Link Downtime: .. 00d 14:04:44                Serial No.: .. UGS0AP2
  Maximum Reach: .. 10 km on SM                 MFG Date: .... 101023
```

Example

```
localhost> show modules client 0 media-side
                        Client 0 Media-Side Receiver

Rx Loss Of Signal (LOS)
  Lane 0: ..............................................   False
  Lane 1: ..............................................   False
  Lane 2: ..............................................   False
  Lane 3: ..............................................   False

Rx Loss Of Lock (LOL)
  Lane 0: ..............................................   False
  Lane 1: ..............................................   False
  Lane 2: ..............................................   False
  Lane 3: ..............................................   False

Rx Power
  Lane 0: ..............................................    -3.9 dBm
  Lane 1: ..............................................    -3.5 dBm
  Lane 2: ..............................................    -3.4 dBm
  Lane 3: ..............................................    -2.8 dBm

  High Alarm: ..........................................     7.4 dBm (False)
  High Warning: ........................................     4.4 dBm (False)
  Low Warning: .........................................   -10.6 dBm (False)
  Low Alarm: ...........................................   -14.6 dBm (False)


                        Client 0 Media-Side Transmitter
Tx Power
```

```
  Lane 0: ..............................................     1.0 dBm
  Lane 1: ..............................................     1.5 dBm
  Lane 2: ..............................................     1.9 dBm
  Lane 3: ..............................................     2.1 dBm

Tx Laser Shutdown
  Lane 0: ..............................................   False
  Lane 1: ..............................................   False
  Lane 2: ..............................................   False
  Lane 3: ..............................................   False

Tx Fault
  Lane 0: ..............................................   False
  Lane 1: ..............................................   False
  Lane 2: ..............................................   False
  Lane 3: ..............................................   False

Tx Bias
  Lane 0: ..............................................    28.7 mA
  Lane 1: ..............................................    28.1 mA
  Lane 2: ..............................................    27.8 mA
  Lane 3: ..............................................    28.5 mA

  High Alarm: ..........................................    75.0 mA (False)
  High Warn: ...........................................    70.0 mA (False)
  Low Warn: ............................................    20.0 mA (False)
  Low Alarm: ...........................................    15.0 mA (False)

Wavelength: ........................................... 1302.35 nm
Frequency: ............................................  230193 GHz
Channel: ..............................................    N/A
```

Example

```
localhost> show module summary rx
```

```
Module       Rx Power     Rx Low Warn  Rx High Warn   Rx High Alarm   Rx Status
-----------  ---------    -----------  ------------   -------------   ----------
Client 0
Lane 0        1.7 dBm       -6.9 dBm       4.4 dBm         4.9 dBm           OK
Lane 1        2.5 dBm       -6.9 dBm       4.4 dBm         4.9 dBm           OK
Lane 2        1.3 dBm       -6.9 dBm       4.4 dBm         4.9 dBm           OK
Lane 3        1.6 dBm       -6.9 dBm       4.4 dBm         4.9 dBm           OK
Client 1
Lane 0        3.4 dBm       -6.9 dBm       4.4 dBm         4.9 dBm           OK
Lane 1        4.1 dBm       -6.9 dBm       4.4 dBm         4.9 dBm           OK
Lane 2        3.2 dBm       -6.9 dBm       4.4 dBm         4.9 dBm           OK
Lane 3        3.5 dBm       -6.9 dBm       4.4 dBm         4.9 dBm           OK
Client 2          N/A            N/A           N/A             N/A          N/A
Client 3           N/A            N/A           N/A             N/A          N/A
Wave 0
```

```
Lane 0       -6.3 dBm      -23.0 dBm       0.0 dBm         1.9 dBm          LOL
Wave 1
Lane 0       -5.8 dBm      -23.0 dBm       0.0 dBm         1.9 dBm          LOL
Wave 2            N/A           N/A           N/A             N/A          N/A
Wave 3            N/A           N/A           N/A             N/A          N/A
OSC A       -24.3 dBm      -24.9 dBm       0.9 dBm         1.9 dBm           OK
OSC B       -20.2 dBm      -24.9 dBm       0.9 dBm         1.9 dBm           OK
```

5.27 show optical itu-grid

Displays an ITU Grid reference table containing optical channels, their frequencies, and wavelengths.
Note: The `show optical wavelength-map` command yields the same results.

Syntax

`>` **show optical itu-grid**

`>` **show optical wavelength-map**

Example

```
localhost# show optical itu-grid

  ITU       Frequency      Wavelength
Channel       (GHz)           (nm)
-------     ----------     -----------
0.0         190000         1577.86
0.5         190050         1577.44
1.0         190100         1577.03
1.5         190150         1576.61
2.0         190200         1576.20
2.5         190250         1575.78
.
.
.
66.5        196650         1524.50
67.0        196700         1524.11
67.5        196750         1523.72
68.0        196800         1523.34
68.5        196850         1522.95
69.0        196900         1522.56
```

5.28 show otdr

Click `show otdr` to see description in its proper context.

5.29 show peers

Displays peer addresses and status.

Syntax

`>` **show peers**

Example

```
localhost# show peers

Codes:  C - Connected, S - Self, A - ARP, R - RIP, @ - Adjacent
        ~ - Deleted

Current Peer Information:
Proto  Peer Address     Int          Idle For        Adjacency        MAC
 C     10.15.1.218      Ethernet 3   00145h:02m:59s  10.15.1.218
 C     192.168.253.250  Ethernet 0   00145h:03m:00s  192.168.253.250
```

5.30 show protection

Click protection primary-line to see description in its proper context.

5.31 show rip

Click show rip to see description in its proper context.

5.32 show sntp

Shows SNTP status, including the IP address and last sync time of the currently selected SNTP server.

Not to be confused with `show run sntp`*, which displays the current SNTP running-config settings and the last sync time of the currently selected SNTP server.*

Syntax

`>` **show sntp**

Example

```
localhost# show sntp

SNTP is operating normally.
```

```
The next update will be in 34191 seconds (2016-10-17 23:07:24).
The current server is 10.15.1.99 (stratum 3).
The last update was 9009 seconds ago (2016-10-17 11:07:24).
The last adjustment was -5732 microseconds.
```

5.33 show startup-config

Displays DarkStar system startup and backup configurations from flash memory.

Syntax

`#` **show startup-config**

5.34 show support

Displays XKL customer support contact information and a minimal amount of system information needed to start the support inquiry.

Syntax

`>` **show support**

5.35 show tech-support

Click show tech-support to see description in its proper context.

5.36 show sysinfo

Reports the system configuration of the DarkStar system. These values are not user adjustable, and are intended for diagnostic purposes.

`#` **show sysinfo**

5.37 show switch

Reports the state of the system crossbar switch or a draft version of the stat mux switch configuration. This command is for diagnostic purposes or advanced users, and not intended for general operation.

Syntax

`>` **show switch** [verbose]

Syntax

`>` **show switch** {destination|next hop}

5.38 show version

Displays more detailed version information, including DXMOS, boot, and gateware version information, and the time and type of the last boot.

Syntax

`>` **show version** [verbose]

Parameters

`verbose`	Display additional version information and component revision numbers.

Example

```
localhost> show version

DXM Operating System (DXMOS), XKL LLC
4.7.0-d063af758fd5 Jan 1 2025  20:42:18 UTC
XKL Part Number: 00000-00204-60
Built from: ssh://git@gitlab.xkl.com/Software/dxmos-cmd.git
Boot String: file flash0:2:dxmos/dxmos.exe
MiniBoot version 2.2.2(140)
Booted via auto boot

Gateware: startup-gateware P/N: 01000-02423-01
Uptime: 0:02:46:26
Last booted up at: 11:45:21 UTC-7 Wed Jan 1 2025
localhost>
```

5.39 show vifs

Displays current status about virtual interfaces. Without any arguments, the command displays summary information for all transceivers, for all types. Equivalent to `show vifs summary`.

Not to be confused with `show running-config module`, which displays the current running-configuration settings for the specified transceivers.

Syntax

`#` **show vifs** [client|trunk|all|summary]

Parameters

client	Displays information for only the client transceivers. **Note:** The information shown is identical to the client information displayed by the `show vifs` or `show vifs summary` commands.
trunk	Displays information for only the trunk transceiver(s). **Note:** The information shown is identical to the trunk information displayed by the `show vifs` or `show vifs summary` commands.
summary	Displays a short summary of information about all transceivers. **Note:** `show vifs summary` provides the same information as `show vifs`.
all (verbose)	Displays more information for all transceivers, including more detailed alarm information. Adding the keyword verbose provides the most detail, including information on Internal Status Module Status, Lane Power Thresholds, and Lane Tunning Bounds.

Example

```
localhost# show vifs
 VID      Virtual Interface          Cls     Status    |  TxTotal     Drop%     RxTotal     Drop%
------  -------------------------  ------  ---------  | ---------  ---------  ---------  ---------
 C0      L1036.c0                      2    Alarm     |  0            0.0       0            0.0
 C1                                    3    Alarm     |  0            0.0       0            0.0
 C2                                    3    Alarm     |  0            0.0       0            0.0
 C3                                    3    Alarm     |  0            0.0       0            0.0
 C4                                    3    Alarm     |  0            0.0       0            0.0
 C5      L1036.c5                      1    Alarm     |  0            0.0       0            0.0
 C6                                    3    Alarm     |  0            0.0       0            0.0
 C7                                    3    Alarm     |  0            0.0       1.51e09     99.9
 C8                                    3    Alarm     |  0            0.0       0            0.0
 C9                                    3    Alarm     |  0            0.0       0            0.0
 C10                                   3    Alarm     |  0            0.0       0            0.0
 C11                                   3    Alarm     |  0            0.0       0            0.0
 T0      Destination-LXXX              -    Alarm     |  0            0.0       0            0.0
```

6

Configuring Security

The DXMOS includes commands to set up your security protocol. Which command you use will depend on your security approach. This chapter discusses the different types of security and the relevant commands to each.

6.1 Types of Security

Possible approaches include:

- Line passwords.
  - In `CONF-LINE-CTY#` (console) mode, you can use password *password* to configure the console with password protection. However, this is a sort of anonymous login, since no username is associated with the password. That is, each new console connection will request a password, but not a username. By default, the console is always enabled for access, unless you specify otherwise.
  - In `CONF-LINE-VTY#` (virtual terminal) mode, SSH and Telnet are disabled by default. Enter password *password* to enable SSH and Telnet access. You can restrict access to use either SSH or Telnet with transport input [ssh|telnet].
- Local users and passwords (also called "local database"). This approach requires a username and password, defined with user *username* password *password*, then login `local` (as opposed to simply `login`). This forces users to enter their username and password every time.
- Remote authentication & authorization using RADIUS. Specifies a RADIUS server to use with AAA services.
- Remote authentication & authorization using TACACS+. Specifies a TACACS+ server to use with AAA services.

To use AAA features, first set up the database, then configure how AAA security vets prospective DarkStar users. Something to keep in mind is that the "line passwords" and "local database" options do not require remote server support, but RADIUS and TACACS+ do.

It is possible to configure more than one security option into a method list, so that if one method doesn't work, users can still log in with another method; otherwise, no one can log in. For example, consider if RADIUS and local database are both specified. When the RADIUS server goes down, users can still log in with the local users and passwords

For more information on RADIUS and TACAS+, see Preparation for Remote Security. For AAA-related information, see AAA Security.

Table 6-1 shows examples of the different security approaches.

TABLE 6-1. Examples of Possible Security Approaches

Approach	Input Example	Result
Line login with no username	`CONF-LINE-<VTY|CTY>#` **login** `CONF-LINE-<VTY|CTY>#` **password** *xkl*	Anyone can log in, as long as they know the password; authentication is done locally.
Local user database	`CONF-LINE-<VTY|CTY>#` **login** local `CONF#` **user** *joe* **password** *test*	Users must correctly enter their username and password; authentication is done locally.
AAA with line login	`CONF#` **aaa new-model** `CONF#` **aaa authentication login default** line	Anyone can log in as long as they know the password.
AAA with local login	`CONF#` **aaa new-model** `CONF#` **aaa authentication login default** local	Users must correctly enter their username and password.
AAA overrides non-AAA setup	`CONF#` **aaa new-model** `CONF#` **aaa authentication login default** group radius	Overrides line and local methods (the first two entries in this table); authentication is handled by AAA services on a remote RADIUS server.
One method	`CONF#` **aaa new-model** `CONF#` **aaa authentication login default** group radius	Only the RADIUS server is specified. If it goes down, no one can log in.
Using a method list	`CONF#` **aaa new-model** `CONF#` **aaa authentication login default** group radius local	If the RADIUS server is down, the system will try to authenticate using the local database.

Whichever approach you choose, for setup you will be working in two configuration modes, (global) configure and line.

6.2 DXMOS Security Commands

The DarkStar DXMOS includes commands to specify who has access to what, privilege levels, passwords, and how you use AAA services or other authentication methods.

DXMOS security-related commands include:

Access Control Lists

- access-list
- access-class

Logins and Passwords

- user
- password
- enable secret
- login
- transport input
- session-timeout

Preparation for Remote Security

- radius-server host
- radius-server key
- tacacs-server host
- tacacs-server key

AAA Security

- aaa new-model
- aaa authentication login default
- aaa authentication enable default
- aaa authorization exec
- aaa authorization commands
- aaa accounting commands
- aaa accounting exec

Other useful DXMOS commands include:

- show hostkey – Displays the public and private DSA or RSA keys used by Secure Shell (SSH).
- show running-config line– Displays the current line settings. (See "line" in "running-config" parameter table.)
- show lines – Displays the status of the console and VTY lines.
- show running-config access-list – Displays the running configuration access list.

6.2.1 Access Control Lists

The process for setting up one or more Access Control Lists for your DarkStar system is straightforward: you first define the list(s), then apply to the VTY lines. Each list may have one or many entries.

1. Enter global configuration mode with configure.
2. Define the ACL(s) using access-list.
3. Enter line configuration mode with line `vty`.
4. Enable the ACL using access-class.

6.2.1.1 access-list

Defines an IP Access Control List (ACL) rule for filtering management network traffic (Telnet or SSH only). Incoming router traffic is compared to ACL entries in the order they were entered in the router, as the router searches for matches. The first match defines either deny or permit, and the router denies traffic if no match is found. There is an implied denial for traffic that is not permitted.

All IP ACL masks are saved in the config file in Classless Inter-Domain Routing (CIDR) notation (`/nn`), even if you have explicitly used the IPv4 dotted notation. In addition, the `access-list` command supports the CIDR format for both IPv4 and IPv6, for example:

```
access-list 1 permit 10.14.36.48/15
access-list 1 permit fd16:e32:da22:f02::/94
```

IPv6 supports only the classless CIDR format.

The `access-list` command also supports IP ACL wildcard masks (for IPv4 only) in the earlier "extended IP ACL" or "dotted" format. For example, the following ACL entries are equivalent, since /24 = 0.0.0.255.

```
access-list 10 permit 1.2.3.4/24
access-list 10 permit 1.2.3.4 0.0.0.255
```

Be careful not to confuse this with a subnet mask. The wildcard mask is an inverse of a subnet mask.

As you define an access list, remember that entries are compared in the same order as they are defined. This can result in some unintended permissions or denials. For example, access list 5 has the following entries:

```
access-list 5 deny 10.15.1.0 0.0.0.255
access-list 5 permit 10.15.2.0 0.0.0.255
access-list 5 deny 10.15.2.0 0.0.0.15
```

You then apply this list to connect to the DarkStar system with the command `access-class 5 in`. The following addresses would be permitted or denied as follows.

- `10.15.1.99` would match the first entry and be denied.
- `10.15.2.6` matches both the second and third entries. Since the first entry it matches grants permission, it would be allowed, even though the next entry would have denied it.
- `10.15.3.16` would be denied, since it does not match any entry.

The code example at the end of this section shows definitions for four sample ACLs.

Syntax

`CONF#` [no] **access-list** *list-number* **{deny|permit}** *ip-address mask*

Parameters

list-number	Assigns a number to identify the access list rule.
{deny|permit}	`permit` allows traffic from this address. `deny` prevents traffic from this address.
ip	Specify the beginning IP address in the access list.
mask	Define an IP wildcard mask to specify the end IP address in the access list.
no	Disables an access list.

Example

```
localhost CONF# access-list 1 permit fd16:e32:da22:f02::/64
localhost CONF# access-list 1 deny 2.2.2.2/0
localhost CONF# access-list 10 permit 192.168.254.250/29
localhost CONF# access-list 99 permit 10.14.1.0/24
```

6.2.1.2 access-class

Specifies an access class through which to filter network access.

Syntax

`CONF-LINE-<VTY|CTY>#` [no] **access-class** *list-number* **{in|out}**

Parameters

list-number	Assign the line to be accessible only to connections in the access list identified by *`list-number`*.
in|out	• **in** - filter Telnet/SSH connection requests to DXMOS, based on the source IP address. • **out** - filter ability to Telnet out of the box (from DXMOS), based on destination IP address.
no	Disables an access class.

6.2.1.3 show running-config access-list

Displays the `running configuration access list`. The command syntax changes slightly depending on the DarkStar mode.

Syntax

`#` **show running-config access-list**

Example

```
localhost# show running-config access-list
running-config:
access-list 1 deny 10.14.16.98/32
access-list 1 permit fd16:e31:da22:f01:2a0:e3ff:fe00:2e1/128
access-list 50 permit 172.30.255.210/32
```

6.2.2 Logins and Passwords

When you create user accounts, you need to specify usernames and passwords. You can also specify if a user has access to enable mode and how long a session can remain idle before timing out.

There are potentially three types of passwords you can specify:

- the password unique to each user for login,
- an anonymous password that everyone uses (no username required), or
- a password that everyone must use to access enable mode (in addition to their unique and/or anonymous password).

To assign an anonymous password, use the password command.

Anonymous passwords are not secure and can seriously compromise your system. XKL recommends creating a unique user account for each person who will be accessing the system.

The flow for setting up user accounts is typically:

1. Create accounts with user. Specify the username, password, and encryption type of the password.
2. Set a password to enter enable mode using enable secret.
3. Use **login [local]** to allow remote logins via the VTY lines and the console line. For more information, see login.
4. Enable Telnet, SSH, or both using transport input.
5. Set how long a session is idle before it times out with session-timeout.

If you choose to use AAA security features, passwords and logins can be overridden by aaa new-model.

6.2.2.1 user

Creates a user account for logging in to the DarkStar system. You can also specify a password that allows a user to login both remotely and from the console. When a privilege level is assigned, a qualified user with privilege level 15 is placed in enable mode immediately upon login.

To enable user accounts, use the `login local` *command or set up AAA services.*

Syntax

`CONF#` [no] **user** *username* **password** [0|5] *password* **privilege** *privilege-level*

Parameters

username	Sets the name for the new account to username, which may contain only letters, digits, and a hyphen (-).
[0|5]	Sets password input type. If the value is 0, *password* is treated as a plaintext string. If the value is 5, *password* is treated as an MD5-hashed password. The default is 0.
password	Specifies the password for the account.
privilege-level	Specifies the privilege-level of the account. **Note:** DXMOS currently supports only privilege level 15 for full administrative access, which automatically places a qualified user in enable mode upon login. Other privilege levels are regarded as user access and are placed in disable mode.
no user username	Removes *username* and its associated password from the local user database.

6.2.2.2 password

Enforces password-protected access to console or VTY lines. A user can have two different passwords: one for remote access, and a different one for console access. DXMOS will accept weak passwords, but prints a warning. Recommended password guidelines are:

1. Contain at least eight characters.
2. Contain at least three of the following:
   - One upper-case character (A, B, C, etc).
   - One lower-case character (a, b, c, etc).
   - One numeric character (0, 1, 2, etc).
   - One special character (!, @, #, etc).

overrides passwords set with this command.

Syntax

`CONF-LINE-<VTY|CTY>#` [no] **password** [0|5] *password*

Parameters

password	Sets the password for the line to *password*. DarkStar systems automatically encrypt a plaintext password as an MD5 hash before storing it.
password 5 *password*	Specifies password as an MD5 hash.
password 0 *password*	Specifies plaintext password. This syntax is equivalent to `password` *password*.
no	Removes password protection from the line. Removing the VTY password disables all VTY access.

6.2.2.3 enable secret

Sets a password to control access to the DarkStar enable mode.

The only way to clear the enable mode password (for example, if you lose the password), is to call XKL technical support at (U.S.) (866) 949-8340 or (outside U.S.) +1 (608) 807-0033.

Syntax

`CONF#` [no] **enable secret** [0|5] *password*

Parameters

password	Sets the password for enable mode. The DarkStar system automatically encrypts a plaintext password as an MD5 hash before storing it.
enable secret 5 *password*	Specifies a password as an MD5 hash.
enable secret 0 *password*	Specifies a password in plaintext. This command is equivalent to `enable secret` *password*.
no enable secret	Clears the password and allows user to enter enable mode without a password.

6.2.2.4 login

Enables or disables login from the username/password database. Table 6-2 describes how login behavior varies, depending on which mode you are in.

TABLE 6-2. Login Command Behavior

Prompt/Command	Behavior
`CONF-LINE-VTY#` **login** local	Subsequent new Telnet/SSH sessions will require a user and password from the local database. If there is no user/password set up in the local database, you will not be able to get to a prompt.
`CONF-LINE-VTY#` **login**	A "login" without "local" enables an anonymous login (no user name requested) using the password that was set with the password command. If no password was set, the Telnet/SSH session will end without any prompts.
`CONF-LINE-CTY#` **login** local	Subsequent new console sessions will require a user and password from a local database. If there is no user/password set up in a database, you will not be able to get to a prompt.
`CONF-LINE-CTY#` **login**	After setting a password (with the password command), "login" without "local" enables an anonymous login (no user name requested) using the password that was set. If no password is set, each new console session will start with a prompt without asking for a user name or a password.

VTY lines refuse Telnet connectivity attempts until VTY login is enabled or AAA new-model is set. Logins are always enabled for the console line.

If you use `login local`, then exit without defining any usernames or passwords, you can lock your self out of your system.

- Login settings are overridden by AAA rules when `aaa new-model` is used.
- VTY lines must have a password set before Telnet or SSH access is granted, unless or `login local` is set with a user database.
- To use stored usernames and passwords with the `local` option, users must first be created with the user command.

Syntax

`CONF-LINE-<VTY|CTY>#` [no] **login** [local]

Parameters

login [local]	Enables logins for VTY lines or CTY line, using stored usernames and passwords for authentication.
no login [local]	Disables logins for VTY lines or CTY line.

6.2.2.5 transport input

Enables or disables Secure Shell (SSH) and Telnet access to VTY lines. **Note:** A configuration change on any VTY line will be applied globally to all VTY lines.

To completely disable logins through VTY lines, use the `no login` *and commands.*

Syntax

`CONF-LINE-VTY#` [no] **transport input** [all|ssh|telnet]

Parameters

all	Allows VTY access via both Telnet and SSH.
ssh	Allows VTY access via SSH only.
telnet	Allows VTY access via Telnet only.
no transport input	Disables SSH and Telnet access. The default setting.

6.2.2.6 session-timeout

Specifies the number of minutes until an idle console session (CTY mode) or idle virtual session (VTY mode) times out. By default there is no timeout for CTY mode and a ten minute timeout for VTY mode.

Syntax

`CONF-LINE-CTY#` **session-timeout** *n*

`CONF-LINE-VTY#` **session-timeout** *n*

Parameters

n	Specifies number of minutes until idle session times out and logs you out of the session.

6.2.3 Preparation for Remote Security

If you want to use some form of remote security (for example, AAA), you need to specify the location and server key for the RADIUS or TACACS+ server.

Note: DXMOS does not support the Message-Authenticator attribute (Type 80) in RADIUS packets. Please ensure that the RADIUS server is configured to not require this attribute by setting the flag 'require_message_authenticator' or a similar option to false or no. If this is not done, the server may ignore or reject requests from DXMOS, which could result in unsuccessful authentication.

6.2.3.1 radius-server host

Adds or removes a RADIUS host server to be used with AAA.

- When adding a server, you can optionally specify an authorization port, an accounting port, or a RADIUS server key.
- When removing a server, specify only the server host name or IP address.

Syntax

`CONF#` [no] **radius-server host** [auth-port *port*]

`CONF#` [no] **radius-server host** [acct-port *port*]

`CONF#` [no] **radius-server host** [key *host-specific-key*]

Parameters

host	Specifies the hostname or IP address of a RADIUS server. If multiple RADIUS servers are specified, the DarkStar system will use that configuration order when attempting authentication and authorization.
auth-port port	Specifies a host-specific authorization port.
acct-port port	Specifies a host-specific accounting port.
key *host-specific-key*	Specifies a host-specific RADIUS server key. The key must be the last entry on the command line.
no radius-server host *host*	Removes a RADIUS server.

Example

```
localhost CONF# no radius-server host 10.15.1.99
localhost CONF# radius-server host 1.1.1.1 key somekey
localhost CONF# radius-server host 2.2.2.2 key anotherradiuskey
```

6.2.3.2 radius-server key

Specifies the encryption key on the RADIUS server.

- If you have several RADIUS servers and they all have the same encryption key, you can specify a global shared encryption key for all of them.
- If you specify a host-specific key, it will override the global-shared-key. Define a host-specific key using the `radius-server` host command.

Syntax

`CONF#` [no] **radius-server key** *global-shared-key*

Parameters

global-shared-key	A text string. The key must match the encryption key on the RADIUS server. Since spaces are allowed but the leading space is ignored, specify the key as the last item of the radius-server host configuration. Do not use quotes if you use spaces in your key, unless the quotation marks are part of the key.
no radius-server key	Clears the encryption key.

6.2.3.3 tacacs-server host

Adds or removes a TACACS+ host server to be used with AAA.

- When adding a server, you can optionally specify a TACACS+ server key.
- When removing a server, specify only the server host name or IP address.

Syntax

`CONF#` [no] **tacacs-server host** [`key` *host-specific-key*]

Parameters

host	Specifies the hostname or IP address of a TACACS+ server. If multiple TACACS+ servers are specified, the DarkStar system will contact them in the order specified.
`key` *host-specific-key*	Specifies the host-specific TACACS+ server key.
no tacacs-server host *host*	Removes the specified TACACS+ host server.

6.2.3.4 tacacs-server key

Specifies the encryption key on the TACACS+ server.

- If you have several TACACS+ servers and they all have the same encryption key, you can specify a global shared encryption key for all of them.
- If you specify a host-specific key, it will override the global-shared-key. Define a host-specific key using the `tacacs-server host` command.

Syntax

`CONF#` [no] **tacacs-server key** *global-shared-key*

Parameters

global-shared-key	A text string. The key must match the encryption key on the TACACS+ server.
no tacacs-server key	Clears the encryption key.

6.2.3.5 show hostkey

Displays the public and private DSA or RSA keys used by SSH.

Syntax

`#` **show hostkey {dsa|rsa} {private|public}**

Parameters

dsa private	Displays the private DSA hostkey for this system.
dsa public	Displays the public DSA hostkey for this system.
rsa private	Displays the private RSA hostkey for this system.
rsa public	Displays the public RSA hostkey for this system.

6.2.4 AAA Security

Use aaa commands to configure authentication, authorization, and accounting (AAA) by limiting a user's privileges. When AAA authorization is enabled, a user can access enable and configure mode only if the information in their profile allows it.

Flow of setting up AAA security:

3. Configure security protocol parameters (RADIUS, TACACS+) with Preparation for Remote Security.
4. Define the list of login authentication methods with aaa authentication login default.
5. Define the list of enable mode authentication methods with aaa authentication enable default.
6. Enable or disable the authorization of commands executed on VTY or CTY, if required.
7. Configure authorization with aaa authorization commands (TACACS+ only, since RADIUS combines this with authentication.)
8. Specify who will be logged in directly to enable mode (privilege-level 15 or administrative) with aaa authorization exec.
9. Configure accounting with aaa accounting commands (optional).
10. Enable AAA services with aaa new-model.

6.2.4.1 aaa authentication login default

Specifies a list (up to 5 entries) of databases to use for login (each database specifies which clients and users are authorized to request a login).

You can specify a hierarchy of up to five authentication methods. If the first method is not available (e.g., no RADIUS servers are up), the system will try the next method you specified, and so on. It will NOT try the next method if the previous method fails.

	Use of `none` is dangerous and should be used with extreme caution, even as a final item on a list of methods. For example, a missing username in a local database or an unreachable RADIUS server followed by `none` will give anyone access to the system.

	When SSH key-based or host-based authentication is enabled, DXMOS does not delegate authentication to an AAA system. Instead, it verifies SSH users by comparing their public keys against the authorized keys stored in the local directory on DXMOS. If an SSH user does not pass key-based or host-based authentication, password-based authentication will be employed, which will then delegate to a configured AAA system.

Syntax

`CONF#` [no] **aaa authentication login default** authentication methods

Parameters

authentication methods	Specify one to five of the following:	
	enable	Use the enable password as authentication.
	line	Use the line password as authentication.
	local	Use the local name database as authentication.
	`group` radius	Uses the list of RADIUS servers for authentication.
	group tacacs+	Uses the list of TACACS+ servers for authentication.
	none	Uses no authentication. Good for verifying the server is working properly, but should be used with extreme caution (see warning below).
no	Disables the AAA authentication methods used for login. **Caution: This will prevent the access to the system if the "aaa new-model" is enabled as no authentication method will be in effect.**	

6.2.4.2 aaa authentication enable default

You can specify a hierarchy of up to five authentication methods. If the first method is not available (e.g., no RADIUS servers are up), the system will try the next method you specified, and so on. It will NOT try the next method if the previous method fails.

Note: When this command is *not* configured and "**aaa new-model**" is configured, enable mode access on a VTY line is expected to fail; however, enable mode access on the console is still provided as a fail-safe.

Use of `none` is dangerous and should be used with extreme caution, even as a final item on a list of methods. For example, a missing username in a local database or an unreachable RADIUS server followed by `none` will give anyone access to the system.

There is an important distinction between "error" and "fail." An error means that no server could be found, there was some sort of transmission problem, or something similar. On the other hand, if the requested user/password is not found in the database, that is considered a "fail."

Syntax

`CONF#` [no] **aaa authentication enable default** {authentication methods}

Parameters

authentication methods	Specify one to five of the following:	
	enable	Logins will use the enable password for authentication.
	line	Logins through the console will use the line password. Logins through the virtual terminal will require authentication.
	group radius	Logins will require RADIUS authentication.
	group tacacs+	Logins will require TACACS+ authentication.
	none	No authentication is used. This would allow login even if all specified methods returned an error.
no	Disables access to enable mode.	

Example

`localhost CONF#` **aaa authentication enable default** group radius group tacacs+

6.2.4.3 aaa authorization commands

Enables or disables authorization of commands executed on a VTY session via the TACACS+ server. (By default, command authorization applies to VTY sessions only. Use aaa accounting commands to enable command authorization for the console session.)

- For a privilege-lowering command that does not terminate a session, such as `exit`, `end`, or `disable`, DXMOS will see TACACS+ authorization for the command and log the result, but always allow the operation to proceed. In this way, a user authorized to enter an elevated mode is not denied the ability to leave it.
- The top-level privilege-lowering commands `exit`and `logout` terminate a session. If TACACS+ denies an exit or logout command, DXMOS honors this denial. This prevents accidental logout from a session intended to be permanent. A permanent session may still be disconnected via a `clear line` command from a suitably authorized login, or externally by using the appropriate Telnet or SSH client escape sequence to break the session.

Syntax

`CONF#` [no] **aaa authorization commands privilege-level default** {authorization methods}

Parameters

privilege-level	Specifies enable mode access: 0 to authorize commands from a VTY in disable mode, 1 to authorize commands from a VTY in enable mode. (This is NOT the same as the privilege level for a TACACS+ or RADIUS Administrative group.)	
authorization methods	Specify one of the following:	
	group tacacs+	Set the privilege level for the user group that is configured in the Administrators group on your designated TACACS+ computer.
	none	Unconditionally authorize any command given.
no	Disables AAA authorization functionality.	

6.2.4.4 authorization commands default

Enables the authorization of AAA commands used in a console session.

After you have set up the configuration on the TACACS+ server, you need to enable access.

- By default, enabling AAA command authorization turns on authorization for VTY session commands, but not for the console.
- A user who has access to the console is considered to have access to the physical machine and, as such, already has privileges equivalent to root access. Use this command to turn off that access on the console.

This command forces the authorization of console commands in addition to VTY commands. Consider carefully the use of console authorization. An improperly configured system could deny access to essential management commands.

For example, you want the user Fred to have access to fan 0 only, and not have access to fan 2. The TACACS+ server configuration file might look like this:

```
user = fred {
     password = clear fred
     service = shell {
     cmd = enable {
```

```
      permit .* }
cmd = configure { permit .* }
cmd = fan { permit 0 }            <------ access to fan 0
set priv-lvl = 15
}
}
```

At the console, the running configuration file shows that `authorization commands default` has NOT been set (in line configuration mode). Because it is not enabled, the `aaa authorization commands` statement has no impact on a console session, and Fred can access fan 2.

```
localhost CONF# do show run line

running-config:
tacacs-server host 10.22.5.89
tacacs-server key secretkey
aaa authentication login default group tacacs+
aaa authorization commands 1 default group tacacs+
aaa authentication enable default group tacacs+
aaa new-model
line console
login
break
exit
line vty
login
exit

localhost# configure
localhost CONF# fan 2
localhost CONF-FAN[2]#
```

The next example shows a running-config file using authorization commands default (enabling it). Fred can no longer access fan 2 from the console.

```
localhost CONF-LINE-CTY# do show run line

running-config:
tacacs-server host 10.22.5.89
tacacs-server key secretkey
aaa authentication login default group tacacs+
aaa authorization commands 1 default group tacacs+
aaa authentication enable default group tacacs+
aaa new-model
line console
login
authorization commands default
break
exit
line vty
login
exit
```

```
localhost# configure
localhost CONF# fan 2

localhost CONF# Service not allowed.
```

The above examples are for a console session; for a VTY session, Fred cannot access fan 2 regardless of the `authorization commands default` setting. As a result, `aaa authorization commands 1 default group tacacs+` is always in effect during a VTY session.

Syntax

`CONF-LINE-CTY#` [no] **authorization commands default**

Parameters

no	Disables the authorization of AAA commands used in a console session.

6.2.4.5 aaa authorization exec

When set, a qualified user (which is administrative or holding privilege level 15) is immediately placed in enable mode upon login.

Syntax

`CONF#` [no] **aaa authorization exec default** {authorization methods}

Parameters

authorization methods	Specify up to three methods from the following options:	
	local	Use the local name database as authorization.
	group radius	Use the list of RADIUS servers for authorization.
	group tacacs+	Use the list of TACACS+ servers for authorization.
no aaa authorization exec	Disables AAA authorization functionality to direct the user to enable mode, if authorized.	

6.2.4.6 aaa accounting commands

Enables or disables AAA command accounting functionality for the specified user group and privilege level. A log file is generated that contains information about commands used by that user group/privilege level, including who issued what command, and when.

Syntax

`CONF#` [no] **aaa accounting commands** *privilege-level* **default start-stop group tacacs+**

Parameters

privilege-level	Specifies the enable mode access: `0` for commands from a disabled VTY session; `1` for commands from an enabled VTY session. (This is not to be confused with the privilege level setting in the TACACS+ configuration file.)
default start-stop group tacacs+	The user group that is configured in the Administrators group on your designated TACACS+ computer is to be used for command accounting.
no accounting commands	Disables AAA command accounting functionality.

6.2.4.7 aaa accounting exec

Enables or disables AAA accounting for session start/stops. A separate log is kept of the "start" and "stop" of each session, and another log tracks other session information (which includes user login name, date, and the IP address). The two records are linked with one unique session ID.

The extra processing required for this can impact performance and should NOT be used unless it is absolutely required.

Syntax

`CONF#` [no] **aaa accounting exec default start-stop group {radius|tacacs+}**

Parameters

group radius	Enables start-stop logging for the user group that is configured in the Administrators group on your designated RADIUS server.
group tacacs+	Enables start-stop logging for the user group that is configured in the Administrators group on your designated TACACS+ server.
no	Disables AAA accounting for session starts/stops.

6.2.4.8 aaa new-model

Globally enables or disables the AAA feature.

When AAA new-model is enabled, existing sessions, including the enabling session, do not possess the credentials necessary to authenticate any subsequent commands. They continue using the authentication model already in force, until logged out. If you make any changes to the AAA configuration, those changes won't take effect until you log out and log back in.

Enabling "aaa new-model" will override the existing login methods specified for the vty or console. Therefore, at least one active login method must be defined for "aaa authentication login default" beforehand; otherwise, users will be unable to access the system once "aaa new-model" is activated.

Syntax

`CONF#` [no] **aaa new-model**

Parameters

aaa new-model	Enables AAA functionality.
no aaa new-model	Disables AAA functionality.

7

Monitoring & Troubleshooting

DXMOS provides several ways to monitor your DarkStar system: 1) you can enable basic logging of system events, 2) test fiber with the OTDR, 3) set up SNMP traps, and 4) use `checksum` and `bert logging` to check for quality.

Monitoring commands:

- checksum
- logging
- OTDR Commands
- snmp-server and snmp-traps
- Time Stamp

Troubleshooting commands:

- BERT Commands
- clear
- Diagnostic Commands and show debug
- laser shutdown
- loopback
- ping, ping6
- reboot
- reload
- show memory
- show memory counters management
- show tech-support
- shutdown

In addition, the LED displays on the front panel can give a good indication of where to begin troubleshooting. There are a set of power-related LEDs, and a set of amplifier/protection (depending on your DarkStar configuration) LEDs.

Note: The following information about the LED displays can also be found in the Troubleshooting chapter of the Systems Guide on the XKL website.

7.1 checksum

For a given file, this command calculates and reports on checksums according to the MD5 hashing and the BSD cksum algorithms, based on the contents of a file. This value is used to verify the file, and can be used to detect corruption, mislabeling, and so on. This is most helpful when verifying that a file was transferred correctly over TFTP to or from the system, by comparing the `checksum` at both sides of the transfer.

The `checksum` reports both a 16-bit (2 byte) sum and a 128-bit (16 byte) MD5 sum.

Syntax

`#` **checksum** *filename*

Parameters

filename	The file to be checked.

7.2 logging

Configures the logging of DarkStar system events in the local circular logging buffer.

The contents of the local circular logging buffer are lost upon system reload.

Syntax

`CONF#` [no] **logging** **{buffer** *events*|**host** *address*|**mark** *syslog mark interval in minutes*|**rate-limit** *limit***}**

Parameters

buffer *events*	Sets the maximum number of events to store in the local circular logging buffer, and turns on logging. Values range from 1 to 10,000. Enabled by default to display 512 events. When the maximum number of specified events (i.e., log entries) is reached, older entries are removed to make room for the newer ones. For example, consider a log that is configured to hold 200 entries. If this log currently holds 100 entries, there will be room for another 100 entries before the log rolls over. If there are 105 events to be added to the log, the original list will discard the oldest (first) 5 entries to make room for the 105 new entries. Alternatively, if the user decreases the number of available entries to 50, only the most recent 50 entries are preserved.
no logging buffer, **logging buffer** *0*	Clears the contents of the local circular logging buffer.
host *address*	Sets `address` as the host to receive syslog messages, and turns on syslog message generation. Use multiple host logging commands to specify multiple hosts. **Note:** DXMOS implements an offline syslog message buffer that stores up to 200 syslog messages generated when syslog was not configured or the server was not reachable. Soon after the server comes online, the buffer will be emptied at the rate specified by the rate-limit command *if* specified. These stored messages retain the timestamp in which they were originally generated. The `no logging host` *address* command stops syslog logging to the specified host. **Note:** If a hostname is not configured, the syslogging name will use the system serial number for a name.
rate-limit	Sets the message rate limit in messages per second. Valid range for limit is 0-10000. The rate limit applies only to syslog logging.
syslog mark interval in minutes	Sets the mark interval. The DarkStar system sends a "mark" time-keeping message to syslog hosts at this interval. Valid range is 0-1440 minutes.
no logging mark, **logging mark** *0*	Turn off mark event generation. **Note:** Marks show up only at syslog hosts, not in the local logging buffer.

7.2.1 Viewing Buffer Setup and Contents

The commands for viewing the setup and contents of the system event buffer are very similar, and have several syntax formats, depending on the permission level. Table 7-1 lists the commands and their variations.

TABLE 7-1. Logging Display Commands

Displays	Mode Prompt	Command/Syntax
Contents of system event buffer	#	show logging
	CONF#	do show logging
Running configuration of system event buffer	#	show running-config logging
	CONF#	show logging
	CONF#	do show running-config logging

7.2.2 show logging

Displays the contents of the system event logging buffer. Syntax varies slightly depending on the permission level.

Syntax

`#` **show logging**

`CONF#` **do show logging**

Example

```
localhost# show logging

Sep 27 15:52:57:190: System Warm Reload
Sep 27 15:52:57:407: Power Supply 1 is absent (0xB4)
Oct  5 09:09:09:793: Link Down: Management interface OSC 0
Oct  5 09:09:10:757: Link Up: Management interface OSC 0
.
.
.
```

7.2.3 show running-config logging

Displays the running configuration of the system event buffer. Command syntax varies slightly depending on the permission level.

Syntax

`#` **show running-config logging**

`CONF#` **show logging**
`CONF#` **do show running-config logging**

Example

`CONF#` **logging buffer** *200*
`CONF#` **do show running-config logging**

```
running-config:
logging host 10.15.1.99
logging buffer 200
```

7.3 OTDR Commands

An OTDR (Optical Time Domain Reflectometer) device is able to measure the length of an optical fiber.
Note: These commands are available only in systems that include an OTDR-capable OSC transceiver.

There are two main reasons to use an OTDR integrated into a DarkStar product:

- A customer may experience a fiber break or cut somewhere in their network. If the fiber with the break is attached to a DarkStar system at its OTDR-capable transceiver, then DXMOS can report where the break has occurred.
- A customer can also perform an initial deployment OTDR to record the initial condition of their fiber, the information of which will be stored in the OTDR log.

Phantom Readings:

The OTDR may report multiple readings in the fiber, i.e., locations where a reflection exceeds a threshold. Connectors and poor splicing along the fiber can produce this. Typically, the furthest reading is of interest, as it will be the location of a break in the fiber or the end of the fiber.

The OTDR launches a high power pulse into the fiber in order to detect faults that are as far away as possible. The drawback of this is the difficulty in detecting nearby faults.

To assess the correct distance to the fiber break when the distance is less than 35km:

1. Compare the furthest OTDR reading to the 2nd furthest reading. If the furthest reading is twice the 2nd furthest reading, and the 2nd furthest reading is less than 35km, then the furthest reading is called a phantom reading. It is under such conditions that DXMOS may report the possibility of a phantom reading for fiber breaks within the first 35km of the link.

2. Discard the furthest reading, the phantom. The 2nd furthest reading is the true location of the fiber break or the end of the fiber.

Another way to verify the presence of a break is to issue the `otdr` command from the downstream DarkStar system. This command will report the readings on the return fiber, which is not the same fiber. Nevertheless, if there is a break in the fiber, there is a high probability that both fibers have been broken at the same location.

7.3.1 otdr

Used to test the fiber and return the measured fiber length and to enable or disable the automatic OTDR when Loss of Signal occurs on the OSC. The automatic OTDR is enabled by default.

	DUA systems access the OTDR feature differently. Consult the Group otdr **Command section for more detail.**

When used to test the fiber, the otdr command can be run n times, where n is an integer from 1 - 20. The default is n=1.

	Requesting a fiber length measurement via the OTDR feature will disrupt the management OSC.

Syntax

`CONF-MOD-OSC[n]#` **otdr** [*n*|`disable-automatic`|`enable-automatic`]

Parameters

n	Numbers of the fiber test
disable-automatic	Disable automatic OTDR when Loss of Signal occurs on the OSC n
enable-automatic	Enable automatic OTDR when Loss of Signal occurs on the OSC n

Example

```
localhost CONF-MOD-OSC[0]# otdr enable-automatic
Automatic OTDR is enabled on OSC[0]
localhost CONF-MOD-OSC[0]#
```

Example

```
localhost CONF-MOD-OSC[0]# otdr disable-automatic
Automatic OTDR is disabled on OSC[0]
localhost CONF-MOD-OSC[0]#
```

Example

```
localhost CONF-MOD-OSC[0]# otdr
 Warning! Operating the OTDR feature will temporarily disrupt the
 management OSC on this system and the connected DarkStar system.
 Are you sure? [yes/NO] yes

 OTDR OSC[0] Results: 55.00km
```

Notes:

- The otdr command will interrupt the DarkStar OSC management traffic if it has been configured. Expect to see error messages from the connected (downstream) DarkStar system as well as the system where the otdr

command is issued. Messages such as: `Management interface OSC 0 line is down` and `Management interface OSC 0 line up.`

- When the otdr command is run, the results are stored in '/log/otdr/OTDR_Log.dat' in the file system. Up to 512 closest events can be logged..
- The automatic otdr feature is enabled by default. This allows the otdr to run automatically in the event of a loss of signal, LOS, by the OSC transceiver. If the otdr command is run manually, the downstream DarkStar system sees this as an LOS event. Then the automatic otdr in the downstream system will run. Disabling the automatic otdr is recommended to avoid this confusion.

```
CONF-MOD-OSC[0]# otdr
Warning! Operating the OTDR feature will temporarily disrupt
the management OSC on this system and the connected DarkStar system.
Are you sure? [yes/NO] yes
***OTDR Run: 1/1Management interface OSC 0 line is down.
OTDR osc[0] Results: 5.61km 11.20km*
* 11.20km may be a phantom reading, see the Command Ref for details.
localhost CONF-MOD-OSC[0]# Management interface OSC 0 line up
Management interface OSC 0 line is down.
Management interface OSC 0 line up
```

7.3.2 show otdr

DUA systems access the OTDR feature differently. Consult the Group otdr Command section for more detail.

Reports the results of previously exercised OTDR measurements, as follows:

- If no measurement has been made since last power cycle, then `Not Measured` will be reported.
- If the report is `No Reflections Detected in Fiber`, then either no fiber was attached to the DarkStar system, the length of fiber was too long to measure, or there is a DarkStar system at the other end of the fiber which acts like a 15dB attenuator. This added attenuation will prevent the OTDR from accurately reporting the actual fiber length. To get an accurate OTDR report, the feature should be run before connecting a DarkStar system to both ends of the fiber.
- The `show otdr` or `show otdr osc` commands will report the automatic OTDR status and the results of previously exercised OTDR measurements of all OSCs.

Important: The `show otdr` command will neither run the OTDR nor will it interrupt the OSC connection to the adjacent DarkStar system.

Syntax

`#` **show otdr** [logging|osc *n*]

Parameters

logging	Reports the results of all exercised OTDR measurements of all OSCs.
osc *n*	Reports the automatic OTDR status and the results of previously exercised OTDR measurements of OSC *n*

Example

```
localhost# show otdr

Manual OTDR OSC[0]
  Automatic Mode: . Enabled
  Last Result:....101.19km

OTDR OSC[1]
  Automatic Mode: . Enabled
  Last Result:....Not Measured

localhost#
```

7.3.3 otdr {disable-automatic|enable-automatic}

	DUA systems access the OTDR feature differently. Consult the Group otdr **Command section for more detail.**

Disables/enables the automatic OTDR on all OTDR-capable OSCs when Loss of Signal occurs. The automatic OTDR is enabled by default on all OTDR-capable OSCs.

Syntax

`CONF#` **otdr** {disable-automatic|enable-automatic}

Parameters

disable-automatic	Disable automatic OTDR on all OTDR-capable OSCs when Loss of Signal occurs
enable-automatic	Enable automatic OTDR on all OTDR-capable OSCs when Loss of Signal occurs

Example

```
localhost CONF# otdr disable-automatic
Automatic OTDR is disabled on all OTDR-capable OSCs
localhost CONF#
```

Example

```
localhost CONF# otdr enable-automatic
Automatic OTDR is enabled on all OTDR-capable OSCs
localhost CONF#
```

7.3.4 show running-config module [osc n] (enable mode)

Displays the automatic OTDR status on the OTDR-capable OSCs.

Syntax

show running-config module [osc n]

Parameters

osc n	Display the automatic OTDR status on the OSC n

Example

```
localhost# show running-config module osc 0
running-config:
management osc 0
no laser shutdown
otdr disable-automatic
exit
localhost#
```

Example

```
localhost# show running-config module osc 0
running-config:
management osc 0
no laser shutdown
OTDR enable-automatic
exit
localhost#
```

7.4 snmp-server

Configures SNMP settings and specifies where to send the SNMP traps. For a trap to be sent to a host, either the global SNMP community must be set, or a host-specific community must be set.

DarkStar systems support both the SNMPv1 and SNMPv2c versions of SNMP. To monitor detailed DarkStar system status, use the XKL-proprietary SNMP management objects and traps defined in the current XKL MIB, which can be obtained from the XKL website.

To monitor a DarkStar system using SNMP, first configure your monitoring system to recognize XKL-specific traps and to access XKL management objects in the SNMP database. Then you can configure the DarkStar SNMP settings and enable asynchronous alarms and alerts ("traps").

Use the `snmp-server` command to configure SNMP settings and enable SNMP traps. The flow for setting up SNMP is shown next.

1) The `community` *`string`* argument is required to set up monitoring.

```
localhost# configure
localhost CONF# snmp-server community string
```

2) Then set up trap generation.

```
localhost CONF# snmp-server host address [Community Name]
localhost CONF# snmp-server enable traps [snmp|xkl|xkl-generic]
```

DXMOS currently only supports SNMP Get requests and does not allow the configuration of the community string permissions as Read-Only/Read-Write (i.e., RO/RW). A configured community string is, by default, Read-Only (RO), which permits management stations to query information but not modify the configuration.

Syntax

`CONF#` [no] **snmp-server {community** *string*|**contact** *string*|**location** *string*|**chassis-id** *string*}

`CONF#` [no] **snmp-server enable traps** [snmp|xkl|xkl-generic]

`CONF#` [no] **snmp-server disable-v2c**

`CONF#` [no] **snmp-server host** *address* [*Community Name*]

Parameters

chassis-id *string*	A name to help identify the SNMP server. Up to 254 characters.
community *string*	Start a read-only SNMP agent using the community string specified by `string`.
no snmp-server community	Turns off the SNMP agent.
contact *string*	Set SNMP-retrievable contact information to the value of `string`. This value may be accessed through the SNMP variable `SNMPv2-MIB:sysContact.0`.
no snmp-server contact	Sets `contact string` to an empty string.
enable traps [snmp|xkl|xkl-generic]	Turn on sending of SNMP traps. (A host address is also required.) If no traps are specified, they are all turned on. • `snmp` - Turn on only SNMP standard traps • `xkl` - XKL-specific traps (listed in Table 7-2) • `xkl-generic` - A set of cloned standard SNMP traps (listed in Table 7-3)
no snmp-server enable traps [snmp|xkl|xkl-generic]	Disable sending of SNMP traps. You can disable all traps, or only a specific category of traps.
disable-v2c	Disables the use of SNMP version 2c.
no snmp-server disable-v2c	Allows the use of SNMP version 2c.
host *address*	Send SNMP traps to a specific host, specified by `address`, which is either a hostname or an IP address. Multiple hosts may be specified, but only one per invocation of this command.
host address [Community Name]	Specify a `Community Name` to cause traps to use this community string rather than the global `community string` specified for SNMP read operations.
no snmp-server host	Remove an existing target host.
location *string*	Set SNMP-retrievable location information to the value of `string`. This value may be accessed through the SNMP variable `SNMPv2-MIB::sysLocation.0`.
no snmp-server location	Set `location string` to an empty string.

A list of XKL-specific trap types is found in Table 7-2.

TABLE 7-2. XKL-specific Trap Types

Trap Type	Event
xklFanFail	Fan module fault or failure.
xklPowerFail	Power supply module fault or failure.
xklFanUp	Fan module has come online.
xklPowerUp	Power supply module has come online.
xklProtectionPathSwitch	Protection path transition has occurred.
xklTempStatusChange	Temperature status has changed
xklEDFALineChange	EDFA line state has changed.
xklRamanLineChange	Raman line state has changed.
xklEDFAAlarmChange	EDFA alarm/warning state has changed.
xklRamanAlarmChange	Change in Raman alarms/warnings state.
xklPowerSupplyAdded	Power supply module added to the system.
xklPowerSupplyRemoved	Power supply module removed from the system.
xklTransceiverAdded	Transceiver added to the system.
xklTransceiverRemoved	Transceiver removed from the system.
xklRxPowerOK	Transceiver Rx power returned to normal.
xklRxPowerHiAlrm	Transceiver Rx power exceeds high alarm threshold.
xklRxPowerLoAlrm	Transceiver Rx power below low alarm threshold.
xklRxPowerHiWarn	Transceiver Rx power exceeds high warning threshold.
xklRxPowerLoWarn	Transceiver Rx power below low warning threshold.
xklAutomaticOTDRTriggered	Automatic OTDR triggered on the system.
xklLineProtectionSwitch	Line Protection switch changed positions.
xklRegulatorPowerGoodFalse	Regulator power good signal went to false.
xklRegulatorAlertTrue	Regulator alert signal went to true.
xklDatapathRemoteClientDown	Remote Datapath Client Port is down.
xklDatapathRemoteClientUp	Remote Datapath Client Port is up.
xklRegulatorPowerGoodFalse	Regulator's power good signal went to false.
xklRegulatorAlertTrue	Regulator's alert signal went to true.
xklOCMBandPowerOK	OCM Band Power is OK.
xklOCMBandPowerLowAlarm	OCM Band Power below low alarm threshold.
xklRxPCSAlarmCleared	Receiver no longer experiencing physical coding sublayer (PCS) alarm condition.
xklRxPCSAlarmRaised	Receiver experiencing physical coding sublayer (PCS) alarm condition.
xklTxPCSAlarmCleared	Transmitter no longer experiencing physical coding sublayer (PCS) alarm condition.

TABLE 7-2. XKL-specific Trap Types

Trap Type	Event
xklTxPCSAlarmRaised	Transmitter experiencing physical coding sublayer (PCS) alarm condition.
xklWSSBandProtectionSwitch	WSS Band Protection Switch was triggered.

A list of XKL-generic trap types is shown in Table 7-3.

TABLE 7-3. XKL-Generic Trap Types

Trap Type	Event
xklColdStart	System reload due to hard reset or power cycle.
xklWarmStart	System reload due to soft reset, system fault or operator command.
xklLinkDown	Interface entered down state.
xklLinkUp	Interface entered up state.
xklTransportLinkDown	Transport interface entered down state.
xklTransportLinkUp	Transport interface entered up state.

Table 7-4 shows the SNMP standard traps supported by XKL systems.

TABLE 7-4. SNMP Standard Traps

Trap Type	Event
coldStart	A coldStart trap signifies that the SNMP entity, supporting a notification originator application, is reinitializing itself and that its configuration may have been altered.
warmStart	A warmStart trap signifies that the SNMP entity, supporting a notification originator application, is reinitializing itself, such that its configuration is unaltered.
linkDown	A linkDown trap signifies that the SNMP entity, acting in an agent role, has detected that the ifOperStatus object for one of its communication links is about to enter the down state from some other state (but not from the notPresent state). This other state is indicated by the included value of ifOperStatus.
linkUp	A linkUp trap signifies that the SNMP entity, acting in an agent role, has detected that the ifOperStatus object for one of its communication links left the down state and transitioned into some other state (but not into the notPresent state). This other state is indicated by the included value of ifOperStatus.
authenticationFailure	An authenticationFailure trap signifies that the SNMP entity has received a protocol message that is not properly authenticated. While all implementations of SNMP entities MAY be capable of generating this trap, the snmpEnableAuthenTraps object indicates whether this trap will be generated.

7.5 snmp-traps

Enables /disables SNMP traps for an OSC, Ethernet, or transport interface. By default, traps are enabled. Only the disabling of SNMP traps (`no snmp-traps`) is written to the configuration file (see the example below).

SNMP traps are configured at the interface level (`eth`, `osc`, `loopback`, `client`, `wave`, etc.).

Syntax

`CONF-MOD-<CLIENT|OSC|WAVE>[n]#` [no] **snmp-traps**

`CONF-MGMT-<ETH|OSC|LOOP>[n]#` [no] **snmp-traps**

Parameters

no	Disables SNMP traps on the interface.
snmp-traps	Reinstates SNMP traps.

Note: For modules with multiple optical lanes, the `n/lane` keyword will enable a user to specify a lane. Depending on the system and transceivers used, there may be a number of configurations for lane counts.
Example: `CONF-MOD-CLIENT[0/1]# snmp-traps`

Example

```
localhost CONF# module client 0
localhost CONF-MOD-CLIENT[0/*]# no snmp-traps
localhost CONF-MOD-CLIENT[0/*]# do show run module client 0

running-config:
module client 0/0
no laser shutdown
no snmp-traps
exit
module client 0/1
no laser shutdown
no snmp-traps
exit
module client 0/2
no laser shutdown
no snmp-traps
exit
module client 0/3
no laser shutdown
no snmp-traps
exit
```

7.5.1 show running-config snmp

Displays current SNMP status, including the IP address and last sync time of the currently selected SNMP server.

Syntax

show running-config snmp

Example

```
localhost# show running-config snmp
running-config:
snmp-server community public
snmp-server contact John Doe
snmp-server location Seattle
snmp-server enable traps snmp
snmp-server enable traps xkl
snmp-server enable traps xkl-generic
snmp-server host 10.15.1.99
```

7.6 Time Stamp

Time stamps are optional. They are turned on or off by the configuration mode command Time-stamp [on|off]. The state of the time stamp can be saved in the configuration file. When turned on, the time stamp appears before each of the DXMOS prompts for a command.

Example

```
L1047_CMD_DQT400-4_c2_w2_lc3> enable
L1047_CMD_DQT400-4_c2_w2_lc3# configure
L1047_CMD_DQT400-4_c2_w2_lc3 CONF# time-stamp
One of the following:
off
on
L1047_CMD_DQT400-4_c2_w2_lc3 CONF# time-stamp on
240926 13:46:12
L1047_CMD_DQT400-4_c2_w2_lc3 CONF# time-stamp off
L1047_CMD_DQT400-4_c2_w2_lc3 CONF#
```

7.7 BERT Commands

The Bit Error Ratio Test or BERT is a method for testing a digital communication channel where a known PRBS (Pseudo Random Bit Stream) pattern emitted by a transmitter is checked by a receiver. Use BERT to test optical cables and/or connections between systems.

BERT PRBS patterns transmitted from one DarkStar system can be received by any other system that is using the same PRBS pattern, not just DarkStar systems. There are framed PRBS signals and unframed PRBS, so they must also match up. For example, a framed PRBS signal cannot be received by an unframed PRBS receiver.

Notes:

- The PRBS signal that is available in DarkStar systems is not configurable by the user. If the source provides framed PRBS, then it cannot be changed to support unframed PRBS. Similarly, the PRBS pattern is not configurable by the user (although a pattern is selected by DXMOS).
- BERT is available on select DarkStar systems, though system setup can differ. Refer to the Systems Guide on the XKL website for more information.

7.7.1 bert log

The BERT log mechanism records BERT activity to the file system (i.e., the `log/bert/` folder). Additionally, it periodically checks the lines targeted for BERT receive and records their condition to flash memory whenever the bit error count has changed.

Syntax

`CONF#` **bert log** *interval*

`CONF#` **no bert log**

Parameters

interval	Specifies the interval in minutes that the BERT logging mechanism will check for errors on the module targeted for BERT receive. **Note:** Messages are only added to the log file when the number of bit errors has changed since the last time BERT was running on the module.

7.7.2 bert transmit

Initiates transmission of BERT/PRBS on the module specified by `CONF# module {wave|client}`.

Notes:

- Supported data rates for BERT can vary by DarkStar system. From the appropriate CONF# module prompt (e.g., `CONF-MOD-WAVE[n]#`), type the `encapsulation` command followed by pressing the tab key to open help for your DarkStar system. After selecting a data rate, try the `bert transmit` command. DXMOS will inform you if that encapsulation is supported on your system.
- For details about BERT, see the Systems Guide on the XKL website.

Syntax

`CONF-MOD-WAVE[n]#` [no] **bert transmit** [host-side|media-side]

`CONF-MOD-CLIENT[n]#` [no] **bert transmit** [host-side|media-side]

Example

```
local host CONF-MOD-WAVE[3]# bert transmit

BERT transmission started on Wave 3.
```

Example

```
local host CONF-MOD-WAVE[3]# no bert transmit
```

```
BERT transmission stopped on Wave 3.
```

Parameters

no bert transmit	Cancels BERT/PRBS transmission on the selected module. **Note:** `no bert transmit` will fail if the module is not already running `bert transmit`.
bert transmit	Enables BERT/PRBS transmission on the selected module **Note:** On systems that support specifying the transmission source, `bert transmit` will use the default source. The default source for a module that supports both sides is the media-side, otherwise the default source is whatever side is supported.
bert transmit host-side	Enables BERT/PRBS transmission and specifies that it be sourced from the paired module's host-side. **Note:** Only available if the paired module supports host-side BERT/PRBS transmission.
bert transmit media-side	Enables BERT/PRBS transmission and specifies that it be sourced from the module's media-side. **Note:** Only available if the module supports media-side BERT/PRBS transmission.

Depending on the client mode you specify, **bert transmit** *and* **bert receive** *commands apply differently:*

- *In* `CONF-MOD-CLIENT[n]#` *mode, the* **bert transmit** *and* **bert receive** *commands apply to all four lanes of the module.*
- *In* `CONF-MOD-CLIENT[n/0-3]#` *mode, the* **bert transmit** *and* **bert receive** *commands apply only to the lane specified as 0, 1,2, or 3 in the prompt if BERT is not operating from the host-side.*

7.7.3 bert receive

Initiates reception of BERT/PRBS on the module specified by `CONF#` **module {wave|client}**.

Notes:

- Initiating reception on a module who is providing host-side BERT to its paired module may reset the paired module's counters
- For details about BERT, see the Systems Guide on the XKL website.

Syntax

`CONF-MOD-WAVE[n]#` [no] **bert receive** [host-side|media-side]

`CONF-MOD-CLIENT[n]#` [no] **bert receive** [host-side|media-side]

Parameters

no bert receive	Cancels BERT/PRBS reception on the selected module and generates final test results. **Note:** `no bert receive` will fail if the module is not already running `bert receive`.
bert receive	Enables BERT/PRBS reception on the selected module. **Note:** On systems that support specifying the reception source, `bert receive` will use the default source. The default source for a module that supports both sides is the media-side, otherwise the default source is whatever side is supported.
bert receive host-side	Enables BERT/PRBS reception and specifies that it be sourced from the paired module's host-side. **Note:** Only available on systems with a paired module that support host-side BERT/PRBS reception.
bert receive media-side	Enables BERT/PRBS reception and specifies that it be sourced from the module's media-side. **Note:** Only available on systems with a paired module that support media-side BERT/PRBS reception.

7.7.4 bert restart

Clears the BERT receive counters.

Notes:

- If a Loss of Lock (LOL), Loss of Signal (LOS), or Loss of Sync is asserted, all BERT receive counters will continue to accumulate, and may potentially overflow, so issue the `bert restart` command to clear these counters. There is no need to restart `bert receive` once the alarm condition is deasserted, however.
- Restarting reception on a module who is providing host-side BERT to its paired module may reset the paired module's counters.
- For details about BERT, see the Systems Guide on the XKL website.

Syntax

`CONF-MOD-WAVE[n]#` **bert restart**

`CONF-MOD-CLIENT[n]#` **bert restart**

7.7.5 show bert

Lists all modules running BERT. Can be used on any module to obtain results up to the time the command was issued. **Note:** For details about BERT, see the Systems Guide on the XKL website.

Syntax

`>` **show bert**

Example

`localhost>` **show bert**

```
   Module    BERT Rx/Tx   BERT Time   Status Bits Rec Errors   BER     Rate
------------ ---------- ------------ ------- -------- ------ ------- --------
Wave 0           Off/On 00d 00:00:00     N/A        0      0     N/A  400Gb/s
Wave 2            On/On 00d 00:01:35      OK   4.3e09 5.8e08 1.3e-01  400Gb/s
Wave 3            On/On 00d 00:01:55      OK   2.7e10      1 3.7e-11  400Gb/s
Wave 4            On/On 00d 00:02:10  LOS/LOL  4.0e15 4.0e15  1.0e00  400Gb/s
Wave 5            On/On 00d 00:01:50  SyncErr  1.0e10 1.0e04 1.0e-06  100Gb/s
```

7.7.6 show bert log

Displays, on the console, the current BERT log file. For each BERT log entry, the log file lists the timestamp, event message, module name, and the number of errors that have occurred over an interval, if reporting on a BERT receive. **Note:** For details about BERT, see the Systems Guide on the XKL website.

Syntax

> **show bert log** [all|recent <count>|status]

Parameters

all	Shows all the events in the log. Typically, this is the maximum of 4000 events, and it may take some time to print. **Note:** The "events" are the same as in **show bert log** recent <count>.
recent <count>	Shows the count of the most recent events in the log. The default is 20 events. The <count> must be greater than or equal to zero.
status	Shows the status of the BERT log. The output shows if logging is enabled, the interval at which the receivers are checked, and the number of events in the log.

Example

```
localhost> show bert log recent
Wed Jan 1 2025 08:41:53: System rebooted
Wed Jan 1 2025 09:45:15: System rebooted
Wed Jan 1 2025 17:07:21: Start BERT transmit on Wave 0
Wed Jan 1 2025 18:08:28: Start BERT receive on Wave 0
Wed Jan 1 2025 18:09:22: BERT report on Wave 0: 0 errors in 54 seconds
```

7.8 clear

There are several `clear` commands that reset or delete DXMOS operational data. For example, the `clear arp-cache` command deletes ARP table entries for all Ethernet interfaces. Clearing a system cache such as ARP, DNS, or RIP has the effect of refreshing the cache, since the cache will repopulate as the next host or IP address updates occur.

Clearing a client or wave transceiver resets the optical hardware and causes some loss of customer traffic. Clearing an OSC transceiver may cause the loss of some management traffic.

The `clear` commands include:

- clear arp-cache
- clear amplifier
- clear bert
- clear bert log
- clear group
- clear counters
- clear host
- clear line
- clear logging
- clear management
- clear module
- clear mxl
- clear ocm
- clear otdr logging
- clear rip
- clear wss

7.8.1 ARP (Address Resolution Protocol) Cache

The ARP cache is an internal table that is used to map IP addresses to the correct Ethernet MAC address. This table (cache) is built as connections are made and addresses are added. Over time, this cache can get quite large, and is periodically purged of addresses that have not been used recently.

If you are having issues with network connectivity, the ARP cache is one place to look. Occasionally, addresses get corrupted and prevent connections. You can look for incomplete or malformed addresses by using the `show arp` command. Sometimes it's necessary to clear the cache and effectively start over, but be aware that clearing the cache can cause some interruptions in data transmission.

7.8.1.1 clear arp-cache

Clears the DarkStar system ARP cache. Use the `show arp` command to view the ARP cache contents.

Syntax

`#` **clear arp-cache**

7.8.1.2 show arp, show ip arp

Displays the ARP cache for Ethernet modules. Without an identifier, displays the cache for all modules.

Syntax

`>` **show arp** [*ip-address*|*hostname*]

`>` **show ip arp** [*ip-address*|*hostname*]

Parameters

ip-address	The IPV4 address of the module for which you want to display the cache.
hostname	The host name for which you want to display ARP cache.

Example

```
localhost# show arp

? (10.16.1.89) at f0:2f:af:e0:de:52 on Ethernet 0     <----- ARP entry
localhost show ip arp

? (10.16.1.89) at f0:2f:af:e0:de:52 on Ethernet 0     <----- IP ARP entry
```

7.8.2 clear amplifier

Resets the specified amplifier.

Traffic on the specified amplifier(s) will be briefly disrupted by the clear amplifier command

Syntax

clear amplifier amplifier-label

7.8.3 clear bert

Turns `bert transmit` and `bert receive` off on all modules. A message is printed for each module and direction that is stopped.

Syntax

clear bert

7.8.4 clear bert log

Erases all the entries in the BERT log. It then adds a first message saying that the log has been cleared. The log indexes will start over from 1. This command will prompt for confirmation before running, It may take a while, however, and confirms by completing without error.

Syntax

clear bert log

7.8.5 clear group

Clear optical components on a DUA system. See clear amplifier, clear management, and clear module for more information on the optical component you want to clear.

On DUA systems, the clear amplifier command is absent. However, the clear management and clear module command are still supplied as an option you can use to clear a management interface or a module transceiver.

Syntax

clear group {*n*|*name*} {amplifier|management|module} [amplifier-label|all| osc]

Parameters

n|*name*	Group number or name to which the particular optical component you want to clear belongs.
amplifier|management|module	The optical component you would like to clear.
amplifier-label|all	The specified amplifier to reset in a DUA group.

all	Resets all the amplifiers in a DUA group.
osc	Specifies the osc transceiver to be reset.

7.8.6 clear counters

Resets packet and byte counters for the specified module. Example: `clear counters management ethernet 0`. Without arguments, `clear counters` clears all counters displayed by the `show (module|management|vif|datapath)` command.

Syntax

clear counters management {ethernet *n***|osc** *n***|switch}**
clear counters module [client *n*|osc *n*| trunk|wave|all]
clear counters vif [all]
clear counters datapath [all]

Note: For modules with multiple optical lanes, the `n/lane` keyword will enable a user to specify a lane. Depending on the system and transceivers used, there may be different configurations for lane counts. Example: # `clear counters module client 0 / 1`

Important: To determine whether the `switch` parameter is available on your system, issue the `show hardware` command. If the system is CMD based, the `switch` command parameter is available.

Parameters

management {ethernet *n*|**osc** *n*|**switch}**	The Ethernet interface on which to clear counters. The `clear counters management ethernet` *n* command: • You can use this command to clear the counters of an OSC transceiver. Depending on system configuration, *n* can be from 4–7, the values representing the internal ports of one or more installed OSC transceivers. **Note:** For systems with the `switch` parameter, values for `ethernet` *n* from 1–3 are invalid. The `clear counters management osc` *n* command: • Clears the counters of an OSC transceiver. Depending on system configuration, *n* can be from 0–3, the values representing the internal ports of one or more installed OSC transceivers. **Note:** The `clear counters management osc` *n* command is equivalent to the `clear counters management ethernet` *n* command, where *n* is within the applicable OSC-value range for the respective commands. For example, the port for `osc` ***0*** is the same as the port for `ethernet` ***4***; the port for `osc` ***1*** is the same as the port for `ethernet` ***5***, and so on. The `clear counters management switch` command: • For systems equipped with the switch feature, clears the counts of various kinds of packets sent and received on the Ethernet switch's external ports (E0 - E3) and the count of various kinds of packets sent and received by this DarkStar system. **Note:** The Ethernet switch acts as a Layer-2 switch, managing the DarkStar system's four front-panel Ethernet ports (E0–E3) to which copper LAN cables connect.
module [client *n*|osc *n* | trunk|wave *n*]	The transceiver on which to clear counters.
`vif`	Virtual interfaces
all	Clear counters on all of the specified type (management, module, or vif).

7.8.7 clear host

Clears the system DNS cache that maps network host names to IP addresses.

There are a number of reasons you might want to clear the cache. Among them:

- You've made security changes to running-config, and want to assure those changes are applied to all connections.
- An IP address has gone out of date or changed for some reason.
- An address has been entered incorrectly.

Syntax

`#` **clear host**

7.8.8 clear line

Immediately disconnects the terminal session on the designated console or VTY line.

- *The console session will reconnect immediately.*
- *Use the* show lines *command to see which lines are currently connected.*

Syntax

`#` **clear line** *line-number*

Parameters

line-number	The line session to terminate. Console session = `0`, VTY sessions are `1-4`.

7.8.9 clear logging

Clears the DarkStar system event log buffer. This can help prevent confusion when debugging an issue.

Syntax

`#` **clear logging**

7.8.10 clear management

Resets the specified management module or all modules of the given class if a particular module is not specified. This may be useful if a system becomes unresponsive. Example: `clear management osc 0`.

Traffic on a management interface will be briefly disrupted by the clear management command.

Syntax

`#` **clear management** [ethernet *n*|osc *n*|switch|all]

Important: The `switch` command parameter is available only on CMD based systems. To determine whether the `switch` parameter is available on your system, issue the `show hardware` command. If the system is CMD based, the `switch` command parameter is available.

Parameters

ethernet *n*|osc *n*|switch	Specifies the management module class to reset. The `clear management ethernet` *n* command: • When *n* equals 0, the command clears the counters on the internal Ethernet port 0. • You can also use this command to clear the counters of an OSC transceiver. Depending on system configuration, *n* can be from 4–7, the values representing the internal ports of one or more installed OSC transceivers. **Note:** For systems with the switch parameter, values for `ethernet` *n* from 1–3 are invalid. The `clear management osc` *n* command: • Clears the counters of an OSC transceiver. Depending on system configuration, *n* can be from 0–3. **Note:** The `clear management osc` *n* command is equivalent to the `clear management ethernet` *n* command, where *n* is within the applicable OSC-value range for the respective commands. For example, the port for `osc` ***0*** is the same as the port for `ethernet` ***4***; the port for `osc` ***1*** is the same as the port for `ethernet` ***5***, and so on. The `clear management switch` command: • For systems equipped with the switch feature, clears the counts of various kinds of packets sent and received on the Ethernet switch's external ports (E0 - E3) and the count of various kinds of packets sent and received by the DarkStar system (from which the command is issued). **Note:** The Ethernet switch acts as a Layer-2 switch, managing the DarkStar system's four front-panel Ethernet ports (E0–E3) to which copper LAN cables connect.
all	The `clear management all` command resets the Ethernet and OSC modules. It does not, however, reset the Ethernet switch (for those systems with this feature).

7.8.11 clear module

Resets the specified physical transceiver, or all transceivers of the given class if a particular transceiver is not specified. This may be useful if a transceiver becomes unresponsive. Example: `clear module client 0`

	Clearing a client transceiver resets the optical hardware and causes some loss of customer traffic. Clearing a line transceiver may result in loss of traffic for up to two minutes, while the transceiver initializes itself again.

Syntax

`#` **clear module** [client *n* |osc *n* |trunk |wave *n* |all]

Parameters

client|osc|trunk|wave	Specifies the transceiver class to reset.
n	Number of the particular transceiver you want to clear.
all	Resets all physical transceivers.

Note: For modules with multiple optical lanes, the `n/lane` keyword will enable a user to specify a lane. Depending on the system and transceivers used, there may be a number of configurations for lane counts.
Example: `# clear module client 0/1`

7.8.12 clear mxl

Resets the entire MXL component on DAT100 systems. **Note:** The clear counters datapath command can also be used to clear the frame and byte counters in system memory.

	Resetting the MXL will cause traffic to momentarily be dropped.

Syntax

`#` **clear mxl**

7.8.13 clear ocm

Perform a soft reset of the OCM device or clear any latched errors on the OCM.

Syntax

`#` **clear ocm {errors | module}**

Parameters

errors	Clear any latched errors on the OCM.
module	Perform a soft reset of the OCM device.

7.8.14 clear otdr logging

Clears the OTDR event log buffer. For more information on OTDR, see OTDR Commands.

Syntax

`#` **clear otdr logging**

7.8.15 clear rip

Delete all routing information acquired by RIP. This information will be repopulated when the next RIP update occurs. Use the show ip routes command to view the system-wide routing table.

Syntax

`#` **clear rip**

7.8.16 clear wss

Perform a non-traffic affecting reset of the WSS device or clear any latched errors on the WSS.

Syntax

`#` **clear wss {errors|module}**

Parameters

errors	Clear any latched errors on the WSS device.
module	Perform a non-traffic affecting reset of the WSS device.

7.9 Diagnostic Commands

This section explains the `debug` and associated `verbosity` commands, both of which help to diagnose system-wide problems. Also described in this section is the `undebug all` (or the identical `no debug`) command that turns off debugging output.

The `debug` and `verbosity` commands should only be used to diagnose specific problems. When debug/verbosity output is active, system performance may be degraded.

7.9.1 debug, undebug all

Turns on/off verbose debugging information for a specified subsystem. Neither `debug` nor `undebug` provide information that is useful during normal DarkStar system operation; debugging information is useful only for diagnosing system problems. In a production network, using `debug` can generate a high volume of trace information at the console and may degrade system performance, so XKL recommends the following:

- Use the `debug` command (and `verbosity` command when setting debug message levels) only when working with XKL technical support to diagnose a specific problem with your system.

- Avoid using the `debug` command (as well as the `verbosity` command) in a production network. The system gives high priority to bug reports, so using `debug` may impact business applications.
- To monitor system operations, use the `show` commands, the `logging` command, and SNMP traps to monitor system operations and events, rather than `debug`.

While debugging is enabled, use the `undebug all` command (or `no debug all`) followed by a <cr> to instantly quiet all debugging output. You can type these commands at the console even if the console seems overwhelmed with debug trace messages and fails to echo your keystrokes.

Note: If the amount of debugging information is significant enough to interfere with system operations, disable debugging by running `undebug all` (or `no debug all`).

Syntax

[no] **debug** *argument*

undebug all

Parameters

argument	The system modules for monitoring. Contact XKL Technical Support for guidance on using the appropriate argument.
no debug	Disables verbose debugging.

7.9.1.1 show debug

Displays a list of debug flags currently enabled. **Note:** This command is only for use by Technical Support.

Syntax

`>` **show debug**

7.9.2 verbosity debug

When the `debug` command is turned on, you can use the `verbosity debug` command to filter the "level" of displayed debug-output messages for modules system-wide.

Note: `debug` is one of optional message types that you can select for the `verbosity` command.

Syntax

`#` **verbosity** [debug|hal|msg|net-snmp|warn] *level*

Parameters

verbosity debug *level*	The *level* parameter is a value from *4–7,* or a value of *-1,* associated with the types of output messages to include for display. The user cannot specify the values 0-3. These levels will always display. For example, `verbosity debug 4`, displays debug messages associated with levels *0* to *4* inclusively. Similarly, each subsequent higher level includes all levels up to and including the specified level. The parameter *level* of *7* provides the most detail and encompasses all levels of debug output messages. With the level value of -1, the `verbosity debug` *-1* command sets the default `debug` level to 4. Description of each *level*: *0* = Emergency *1* = Alarm *2* = Critical *3* = Error *4* = Warning *5* = Message *6* = Informational *7* = All debug messages, most detail Besides the `debug` parameter, the `verbosity` command also supports the following message-type parameters: • **`hal`:** for hal-related debugging message (on/off). • **`msg`:** for error messages. the command `verbosity msg` *-1* sets the default message level to 1. • **`net-snmp`:** for net-snmp related debugging message (on/off). • **`warn`:** for warning/debugging messages. **Note:** The message types **`hal`** and **`net-snmp`** require a value, either *1 (display)* or 0 (not-display). Contact XKL Technical Support for guidance with these six additional message types.

7.10 laser shutdown

Powers down the laser transmitter portion of the transceiver.

	If write memory *is issued after* `laser shutdown`*, the* `laser shutdown` *command is stored in* `startup-config` *and will take effect during subsequent reloads. To power up* transceivers *following a reload, issue a* `no laser shutdown` *command. To avoid future* transceiver *shutdowns following a reload, issue a* `no laser shutdown` *command followed by* `write memory`.

Syntax

`CONF-MOD-<CLIENT[n]|OSC[n]|WAVE[n]>#` [no] **laser shutdown**

Note: For modules with multiple optical lanes, the `n/lane` keyword will enable a user to specify a lane. Depending on the system and transceivers used, there may be a number of configurations for lane counts.
Example: `CONF-MOD-CLIENT [0/1]# laser shutdown`

7.11 loopback

Enables the chosen loopback mode on the selected interface. Only one loopback mode can be enabled at a time. If you attempt to switch to a loopback that is not supported on the transceiver, the loopback mode will remain unchanged.

Notes:

- Command syntax will differ among systems featuring "loopback" functionality.
- For modules with multiple optical lanes, the `n/lane` keyword will enable a user to specify a lane. Depending on the system and transceivers used, there may be a number of configurations for lane counts.
  Example: `CONF-MOD-CLIENT[0/1]# loopback`

Syntax

`CONF-MOD-<CLIENT[n]|WAVE[n]>#` [no] **loopback {electrical|optical}**
`CONF-MOD-<CLIENT[n]|WAVE[n]>#` [no] **loopback {framed|unframed}**

Parameters

no	Turns loopback mode off.
electrical	Software-generated loopback within the system. As there is no physical connection between the transmitter and receiver ports, the ports themselves are not tested.
optical	Tests the ports and fibers by sending a signal through a physical loopback connection.
framed	Tests the fiber and transceiver ports in optical loopback mode to/from the system. At the loopback, traffic passes through the framing mechanism of the optical transceiver. Test data must be framed Ethernet traffic following the IEEE 802.3-2018 standard.
unframed	Tests the fiber and transceiver ports in optical loopback mode to/from the system. This is simply a connection from the optical receiver to the optical transmitter. Unframed traffic is allowed to pass through, as it does not utilize the transceiver re-framer. Removing the framer may reduce the link quality versus the `loopback framed` mode.

7.12 ping, ping6

Sends test packets to a specific IPv4 or IPv6 address. (Use the `ping6` command for IPv6 addresses.) The `ping` and `ping6` commands send five ICMP echo request packets and reports whether or not responses are received for each. An exclamation point (!) displays for each successful packet and a period (.) is displayed for each unsuccessful packet.

DNS must be configured with the ip name-server command for `remote-host` to work with a hostname instead of an IP address.

Syntax

`>` **ping** [*remote-host-name*|*ip-address*]

`>` **ping6** [*remote-host-name*|*ip-address*]

Parameters

remote-host-name	The destination hostname to which `ping` or `ping6` sends packets.
ip-address	The destination IPv4 or IPv6 address to which `ping` or `ping6` sends packets.

Example

```
localhost> ping6 fd16:e32:da22:f01:209:5bff:fee1:5a7e
(fd16:e32:da22:f01:209:5bff:fee1:5a7e)
!!!!!
Done pinging fd16:e32:da22:f01:209:5bff:fee1:5a7e - 5 of 5 packets received
localhost> ping 10.15.1.110
```

7.13 reboot

Reboots the program (i.e., usually DXMOS) from a manually designated file. The operator may designate the DXMOS from the DXMOS file system, or from a remote (TFTP) server. The `reboot` loads the selected program into the processor and starts it; the new program replaces the DXMOS program from which the command is issued. Often, the new program is a fresh copy of DXMOS. However, the new program does not necessarily have to be DXMOS.

This is different from the `reload` command that reloads processor gateware and DXMOS, but leaves the choice of the file up to the system boot loader or boot program.

The `reboot`, like the `reload` command, triggers a "warm boot" of DXMOS without power-cycling or updating system gateware. If the old and new DXMOS running configurations are the same, customer traffic is not disrupted by a warm boot.

Note:

- If any reboot command fails, Boot will run on the console. At that point, recovery is accomplished only by access to the console terminal.
- Rebooting from a remote (TFTP) server, an incorrect IP address or hostname, or unreachable TFTP server will cause the reboot to fail.
- RIP service will be disabled during system reboot. Therefore, RIP routes to the TFTP server will NOT work and will cause the TFTP server to be unreachable. RIP routes to reach the TFTP server should be replaced by Static routes.

Reboot may disrupt traffic if the startup configuration is not the same as the running configuration.

Syntax

`#` **reboot {file** *file_source*|**next|none|running|tftp** *tftp-server tftp_file_source***}**

Parameters

file *file_source*	Loads and starts the file from a DXMOS file system location.

next	Boots from the next location in the list of boot targets defined in the configuration file. For example, you might add these DXMOS executable files:
	• boot file—A DXMOS executable stored locally on the SD card (i.e., the flash memory) usually in the DXMOS directory (e.g., "boot_file_example.exe").
	• boot tftp—A DXMOS executable stored on a server in the tftpboot directory (e.g., "boot_tftp_example.exe").
	After adding the boot targets, issue the `show running-config boot` command to see the listed locations.
	`localhost#` **show running-config boot**
	`boot_file_example.exe`
	`boot_tftp_example.exe`

none	Returns control to the system boot loader or boot program.
running	Reloads and restarts the currently running DXMOS version by re-executing the previous command by which DXMOS was loaded.
tftp *tftp-server*	Boots from the designated TFTP server. Specify an IP address or hostname.
tftp_file_source	Designated file on the TFTP server.

Example
Console:

```
localhost# reboot tftp 10.10.1.1 dxmos.exe

Are you sure? [yes/NO] y

Initiating reboot using command 'boot tftp 10.10.1.1 dxmos.exe '...


*** NOTICE ****
DXMOS has been shut down
```

VTY:

```
localhost# reboot running


NOTICE:   Please have ready access to the system console terminal.
While shut down, the system may require commands that can be entered
```

```
only from the console.


This command will close your network connection.
You will need to re-connect when the system resumes.


Are you sure? [yes/NO] y


Initiating reboot of running source...



*** NOTICE ****
DXMOS has been shut down
```

7.14 reload

Reloads the processor gateware (or "firmware") and restarts the Boot program. The Boot program loads DXMOS (or another program) as specified by the configuration file.

The `reload` command is appropriate after new processor gateware has been installed in the file system. It causes the new gateware to be installed in the processor. Otherwise, while the processor functions normally, the `reboot` command is more usual.

Note: The `reload` command does not allow the operator to choose a specific file. The file that is booted is determined by the boot commands in the configuration file. Following a reload, the Boot program will load per the first boot entry in the config file. Absent any entries in the file, the Boot program uses “file /dxmos/dxmos.exe.”

When "boot host dhcp" is present in the config file, Boot will attempt to find a configuration file from a DHCP server. If successful, that config file dictates what file to boot.

The `reload` command causes a warm boot that does not affect the transport interfaces (client and line) unless there is a difference between the saved configuration (i.e., `file/dxmos/config.dat`) and the running configuration. To ensure that the transport interfaces are unaffected by `reload`, use the `write memory` command before the reload.

Reload may disrupt traffic if the saved configuration file is not the same as the running configuration.

Syntax

`#` **reload**

7.15 show memory

Displays the current system memory usage.

You may see more show memory commands listed in the CLI help. These are intended for use by XKL support, but are otherwise not likely to be useful to you.

Syntax

`#` **show memory**

Example

`localhost#` **show memory** [See the following optional parameters]

```
Current Memory Usage:
        process          blocks           words
     6764614000               0               0
     6763336000              40            8704
     6763126000               4            8704

    14374 pages of DXMOS fixed allocation.
    13408 pages of mapped system memory.
   496506 pages of system memory available.
   524288 total pages of system memory.

    10178 pages of dynamic memory (included in mapped memory).
```

Parameters

Optionally display memory usage for the following:	
cdr	idrom
cmd-loader	mdio
companion-monitor	mii
compchip-i2c	module
counters	monitor-pio
enviroload	mxp
epmonitor	power
fan	switch
i2c	tpi

Note: Available parameters are system dependent.

7.16 show memory counters management

Displays the memory counters for the internal Ethernet port, the OSC ports (depending on system configuration), and the Ethernet switch's external ports (E0–E3).

Syntax

`#` **show memory counters management** {`ethernet` *n*|`osc` *n*|`switch`}

Important: The `switch` command parameter is not available on all systems. To determine whether the `switch` parameter is available on your system, issue the `show hardware` command. If the system is CMD based, the `switch` command parameter is available.

Parameters

ethernet *n*	When *n* is 0, the command displays the memory counters of the internal Ethernet port 0. You can also use this command to display the memory counters of an OSC transceiver. Depending on system configuration, *n* can be from 4–7, the values representing the internal ports of one or more installed OSC transceivers. **Note:** For systems with the switch parameter, values for `ethernet` *n* from 1–3 are invalid.
osc *n*	*n* refers to a single OSC port for which the memory counters will be displayed. Depending on system configuration, *n* can be from 0–3. **Note:** The `show memory counters management osc` *n* command is equivalent to the `show memory counters management ethernet` *n* command, where *n* is within the applicable OSC-value range for the respective commands. For example, the port for `osc` ***0*** is the same as the port for `ethernet` ***4***; the port for `osc` ***1*** is the same as the port for `ethernet` ***5***, and so on.
switch	For systems equipped with this feature, displays the counts of various kinds of packets sent and received on the Ethernet switch's external ports (E0 - E3), as well as the count of various kinds of packets sent and received by the DarkStar system (from which the command is issued). **Note:** The Ethernet switch acts as a Layer-2 switch, managing the DarkStar system's four front-panel Ethernet ports (E0–E3) to which copper LAN cables connect.

Example

```
localhost# show memory counters management switch
```

Register (##):	E0	E1	E2	E3	DarkStar
RxHiPriorityByte (00):	0	0	0	0	0
RxUndersizePkt (01):	0	0	0	0	0
RxFragments (02):	0	0	0	0	0
RxOversize (03):	0	0	0	0	0
RxJabbers (04):	0	0	0	0	0
RxSymbolError (05):	0	0	0	0	0
RxCRCerror (06):	0	0	0	0	0
RxAlighmentError (07):	0	0	0	0	0
RxControl8808Pkts (10):	0	0	0	0	0
RxPausePkts (11):	0	0	0	0	0
RxBroadcast (12):	0	2	0	28	4
RXMulticast (13):	0	0	0	0	0
RxUnicast (14):	0	514854429	129719563	824526610	100846625
Rx64Octets (15):	0	730991710	152310060	40193	100770940
Rx65to127Octets (16):	0	455918547	1036803246	122331	75689
Rx128to255Octets (17):	0	926215953	141027766	0	0
Rx256to511Octets (20):	0	778690305	798379051	9	0
Rx512to2023Octets (21):	0	483638766	930910823	12378	0
Rx1024to1522Octets (22):	0	360624622	291514089	824351727	0
Rx1523to2000Octets (23):	0	0	0	0	0
Rx2001+Octets (24):	0	0	0	0	0
TxHiPriorityByte (25):	0	0	0	0	0
TxLateCollision (26):	0	0	0	0	0
TxPausePkts (27):	0	0	0	0	0
TxBroadcastPkts (30):	0	32	34	6	30
TxMulticastPkts (31):	0	0	0	0	0
TxUnicastPkts (32):	0	602611870	864793968	824713877	100835910
TxDeferred (33):	0	0	0	0	0
TxTotalCollision (34):	0	0	0	0	0
TxExcessiveCollision (35):	0	0	0	0	0
TxSingleCollision (36):	0	0	0	0	0
TxMultipleCollision (37):	0	0	0	0	0
RxByteCnt (40):	0	3453672691	2394750097	3639023838	2162471324
TxByteCnt (41):	0	3444601488	77995788	1294328297	370120840
RxDropPackets (42):	0	0	0	0	0
TXDropPackets (43):	0	1324605177	0	0	0

Note: Packets received on the external ports that are not destined for that system will not enter it and, therefore, not be counted in the `DarkStar` column (above).

7.17 show tech-support

Displays a large amount of information about DarkStar system operational status and configuration status. This command is intended for use by XKL customer support, and displays all system information in a format that is useful for diagnostics. Typically, an XKL support representative will request that you issue the `show tech-support` command, capture the output, and send it to XKL Support in an email message. Alternatively, a `show tech-support` report can also be written to the DarkStar file system. This is useful for transferring the file to a TFTP server, which may be easier to send to an XKL support representative (see tftp for more information).

Syntax

`#` **show tech-support** [*destination-file-name*]

Parameters

destination-file-name	Write the report to a file on the file system.

7.18 shutdown

Shuts down an Ethernet interface or brings it online.

If using SSH or Telnet, be careful not to shutdown the Ethernet interface through which you are connected. Use the `show line` command to help determine the Ethernet interface you are currently using.

Syntax

`CONF-MGMT-<ETH|OSC|LOOP>[n]#` [no] **shutdown**

Parameters

no	Brings the Ethernet module online.

8

SSH Commands

8.1 SSH Algorithms

SSH-algorithm commands allow and disallow the weak algorithms to be used in the negotiation between DXMOS SSH Server and SSH Clients.

Note: If a SSH Client tries to negotiate using only those weak algorithms that are not part of the allowed list, the request is rejected and the session is not established.

TABLE 8-1. Supported Default and Non-Default SSH Server Algorithms

Supported Algorithms	Default	Non-Default (Weak Algorithms)
Encryption	aes128-ctr aes192-ctr aes256-ctr	3des-cbc aes128-cbc aes192-cbc aes256-cbc
Hostkey	rsa-sha2-256 rsa-sha2-512 ssh-rsa	ssh-dss
KEX	diffie-hellman-group14-sha256	diffie-hellman-group1-sha1 diffie-hellman-group14-sha1
HMAC	hmac-sha2-256 hmac-sha2-512	hmac-sha1

8.1.1 ssh-algorithms encryption

Enable or disable weak encryption algorithms.

Syntax

`CONF#` *[no]* **ssh-algorithms encryption** *{ 3des-cbc | aes128-cbc | aes192-cbc | aes256-cbc }*

Parameters

3des-cbc	Enables *3des-cbc* in the negotiation allowed list
aes128-cbc	Enables *aes128-cbc* in the negotiation allowed list
aes192-cbc	Enables *aes192-cbc* in the negotiation allowed list
aes256-cbc	Enables *aes256-cbc* in the negotiation allowed list
no	Disable a weak algorithm in the negotiation allowed list

Example

```
localhost CONF# ssh-algorithms encryption 3des-cbc aes128-cbc aes256-cbc

Weak algorithm '3des-cbc' 'aes128-cbc' 'aes256-cbc' are enabled.
localhost CONF# no ssh-algorithms encryption 3des-cbc aes128-cbc

Weak algorithm '3des-cbc' 'aes128-cbc' are disabled.
localhost CONF#
```

8.1.2 ssh-algorithms hostkey

Enable or disable weak hostkey algorithms.

Syntax

`CONF#` *[no]* **ssh-algorithms hostkey** *{ ssh-dss }*

Parameters

ssh-dss	Enables *ssh-dss* in the negotiation allowed list
no	Disable a weak algorithm in the negotiation allowed list

Example

```
localhost CONF# ssh-algorithms hostkey ssh-dss

Weak algorithm 'ssh-dss' is enabled.
localhost CONF# no ssh-algorithms hostkey ssh-dss

Weak algorithm 'ssh-dss' is disabled.
localhost CONF#
```

8.1.3 ssh-algorithms kex

Enable or disable weak KEX algorithms.

Syntax

`CONF#` *[no]* **ssh-algorithms kex** { `diffie-hellman-group1-sha1` | `diffie-hellman-group14-sha1` }

Parameters

diffie-hellman-group1-sha1	Enables *diffie-hellman-group1-sha1* in the negotiation allowed list
diffie-hellman-group14-sha1	Enables *diffie-hellman-group14-sha1* in the negotiation allowed list
no	Disable a weak algorithm in the negotiation allowed list

Example

```
localhost CONF# ssh-algorithms kex diffie-hellman-group14-sha1

Weak algorithm 'diffie-hellman-group14-sha1' is enabled.
localhost CONF# no ssh-algorithms kex diffie-hellman-group14-sha1

Weak algorithm 'diffie-hellman-group14-sha1' is disabled.
localhost CONF#
```

8.1.4 ssh-algorithms mac

Enable or disable weak MAC algorithms.

Syntax

`CONF#` *[no]* **ssh-algorithms mac** { `hmac-sha1` }

Parameters

hmac-sha1	Enables *hmac-sha1* in the negotiation allowed list
no	Disable a weak algorithm in the negotiation allowed list

Example

```
localhost CONF# ssh-algorithms mac hmac-sha1

Weak algorithm 'hmac-sha1' is enabled.
localhost CONF# no ssh-algorithms mac hmac-sha1

Weak algorithm 'hmac-sha1' is disabled.
localhost CONF#
```

8.1.5 show ssh-algorithms (Enable mode)

Display the algorithms in the negotiation allowed lists.

Syntax

`#` **show ssh-algorithms**

Example

```
localhost# show ssh-algorithms

Enabled Algorithms:
 KEX       : diffie-hellman-group14-sha256
 Encryption: aes128-ctr,aes192-ctr,aes256-ctr
 MAC       : hmac-sha2-256,hmac-sha2-512
 HostKey   : ssh-rsa,rsa-sha2-256,rsa-sha2-512

Authentication Methods:
 Password Authentication: Enabled
 Public Key Authentication: Enabled
     Key algorithms : RSA,DSA
     Authorized keys: /dxmos/authorized_keys
 Host Authentication: Enabled
     Key algorithms : RSA,DSA
     Trusted hosts and users: /dxmos/authorized_keys

HostKey files:
  RSA hostkey-private: /dxmos/rsa-hostkey-private.dat
  RSA hostkey-public : /dxmos/rsa-hostkey-public.dat

localhost#

localhost# show ssh-algorithms

Enabled Algorithms:
 KEX       : diffie-hellman-group14-sha256
 Encryption: aes128-ctr,aes192-ctr,aes256-ctr
 MAC       : hmac-sha2-256,hmac-sha2-512
HostKey   : ssh-dss*,ssh-rsa,rsa-sha2-256,rsa-sha2-512

*Weak algorithm enabled by users.

Authentication Methods:
 Password Authentication: Enabled
 Public Key Authentication: Enabled
     Key algorithms : RSA,DSA
     Authorized keys: /dxmos/authorized_keys
 Host Authentication: Enabled
     Key algorithms : RSA,DSA
     Trusted hosts and users: /dxmos/authorized_keys

HostKey files:
```

```
 DSA hostkey-private: /dxmos/hostkey-private.dat
 DSA hostkey-public : /dxmos/hostkey-public.dat
 RSA hostkey-private: /dxmos/rsa-hostkey-private.dat
 RSA hostkey-public : /dxmos/rsa-hostkey-public.dat

localhost#
```

8.1.6 show running-config ssh (Enable mode)

Display the weak algorithms manually enabled by users. In the default state, the weak algorithms are disabled, and `Section not configured` will be displayed.

Syntax

`#` **show running-config ssh**

Example

```
localhost# show running-config ssh

running-config:
ssh-algorithms encryption 3des-cbc aes128-cbc
ssh-algorithms hostkey ssh-dss
ssh-algorithms kex diffie-hellman-group1-sha1 diffie-hellman-group14-sha1
ssh-algorithms mac hmac-sha1

localhost#

localhost# show running-config ssh

running-config:
Section not configured

localhost#
```

8.2 SSH Authentication Methods

Together with password-based authentication, DXMOS also supports passwordless authentication methods (i.e., host-based authentication, key-based authentication) that enhances security and allows users to log in without a password.

Notes:

- When multiple authentication methods are enabled, the order of the authentication will be decided by the SSH client.
- If AAA systems are utilized for Authentication, Authorization, and Accounting, please consult the section titled "Combination with AAA Systems" in Table 8-2 for further details.

TABLE 8-2. Supported Authentication Methods

	Password-based	Key-based	Host-based
Authentication	Based on user password, verifying the user	Based on a unique user key pair, verifying the user	Based on pre-shared host keys, verifying the host and user
Security	Less secure	Most secure	More secure
Use Cases	Suitable for low-risk environments, and ease of use is more priority than security.	General remote access, automating tasks, and any situation where secure and reliable authentication is needed.	Automated tasks, scripts, or environments where trust in a specific server is established and maintained.
Pros	Simple to set up and use.	The most secure due to the mathematical difficulty of cracking keys. Convenient, and suitable for environments with individual user access.	Simple to set up and maintain, especially for automated connections or environments where the same host keys are used consistently. Suitable for environments where all users on a specific host have the same level of access and trust.
Cons	Passwords can be easily compromised if intercepted or stored on a server. Vulnerable to brute-force attacks, phishing, and stolen passwords.	Requires more setup and management. Private keys must be stored securely. If a private key is compromised, it could lead to unauthorized access. Keys cannot be easily changed like passwords.	Less secure than public key authentication as it relies on the client's stored host key and can be vulnerable to man-in-the-middle attacks if the server's host key is compromised.

Client Setup	N/A	The client user generates a public/private key pair
		`~$ ssh-keygen -t rsa -b 2048 -m PEM -f ~/.ssh/id_rsa`
		`~$ ls -l ~/.ssh/`
		`total 169`
		`-rw------- 1 tle users 1675 Apr 29 14:42 id_rsa`
		`-rw-r--r-- 1 tle users 391 Apr 29 14:42 id_rsa.pub`
		Importance: Please ensure that the following settings are enabled in the Client's SSH:
		PubkeyAuthentication is enabled.
		PubkeyAcceptedKeyTypes must include either ssh-dss or ssh-rsa keys, as DXMOS currently supports these.
			A public/private key pair is generated for the client's host. (**Note:** The key pair must be at the host level, not the user level.)
			`~$ sudo ssh-keygen -t rsa -b 2048 -m PEM -f /etc/ssh/ssh_host_rsa_key`
			`~$ ls -l /etc/ssh/`
			`total 624`
			`-rw------- 1 root root 1679 Dec 15 2017 ssh_host_rsa_key`
			`-rw-r--r-- 1 root root 392 Dec 15 2017 ssh_host_rsa_key.pub`
			Importance: Please ensure that the following settings are enabled in the Client's SSH:
			HostbasedAuthentication is enabled.
			EnableSSHKeysign is enabled so that the client can sign its public key for host-based authentication.
			HostbasedKeyTypes must include either ssh-dss or ssh-rsa keys, as DXMOS currently supports these.

	Password-based	Key-based	Host-based
Server (DXMOS) Setup	Configure local users, remote users on AAA system (such as: Radius or Tacacs+), or line password Using line password: localhost# configure localhost CONF# line vty localhost CONF-LINE-VTY# login localhost CONF-LINE-VTY# password 0 <mypwd> localhost CONF-LINE-VTY# end Or, using local user: localhost# configure localhost CONF# line vty localhost CONF-LINE-VTY# login local localhost CONF-LINE-VTY# exit localhost CONF# user testusr password 0 testpwd localhost CONF# end Or, using remote user: **Note:** Please ensure that the users and passwords are set up on the AAA system (such as RADIUS or TACACS+), and that DXMOS can reach the AAA system. localhost# configure localhost CONF# radius-server host <rad-server> key <rad-key> localhost CONF# tacacs-server host <tac-server> key <tac-key> localhost CONF# aaa authentication login default group radius group tacacs+ localhost CONF# aaa new-model localhost CONF# end	The user's public keys are transferred via TFTP to the **/dxmos/authorized_keys/** directory, as shown in the following example: localhost# tftp get <tftp-server> <path_to_id_rsa.pub> /dxmos/authorized_keys/client1key And, using the command "**show ssh-authorized-keys [file filename | verbose]**" to verifying the authorized keys: localhost# show ssh-authorized-keys '/dxmos/authorized_keys/': floodkey file 788 bytes Apr 29 2025 14:46:26 authorized_keys_tle file 391 bytes Apr 29 2025 12:22:05 flood_key file 788 bytes Apr 29 2025 12:11:13 localhost# show ssh-authorized-keys file floodkey ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQ... localhost#	The trusted client hosts and allowed client users are transferred via TFTP to the **/dxmos/trusted_hosts/** directory; And, the client host's public keys are are transferred via TFTP to the **/dxmos/known_hosts/** directory, as shown in the following example: localhost# tftp get <tftp-server> <path_to_shosts.equiv> /dxmos/trusted_hosts/shosts.equiv localhost# localhost# tftp get <tftp-server> <path_to_ssh_known_hosts> /dxmos/known_hosts/ssh_known_hosts localhost# And, using the commands "**show ssh-trusted-hosts [file filename | verbose]**" and "**show ssh-known-hosts [file filename | verbose]**" to verifying the authorized keys: localhost# show ssh-trusted-hosts '/dxmos/trusted_hosts/': shosts.equiv_all file 31 bytes May 30 2025 13:01:04 localhost# localhost# show ssh-trusted-hosts file shosts.equiv_all 100.40.10.99 +root 100.40.10.99 +tle localhost# localhost# show ssh-known-hosts '/dxmos/known_hosts/': ssh_known_hosts_all file 990 bytes May 28 2025 15:25:19 localhost# show ssh-known-hosts file ssh_known_hosts_all 100.40.10.99 ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQ... 100.40.10.99 ssh-dss AAAAB3NzaC1kc3MAAACBAOMGM6ao5e... localhost#

	Password-based	Key-based	Host-based
Combination with AAA systems	**Authentication:** It is configurable to utilize remote users, allowing for authentication delegation to a AAA system (like RADIUS or TACACS+). This process verifies the client's identity by checking their password against those stored in the AAA systems. **Authorization:** AAA systems (like RADIUS or TACACS+) verify the credentials of the logged-in user and grant them access to specified resources and actions as defined in the AAA systems. **Accounting:** AAA systems (like RADIUS or TACACS+) will track and log the logged-in user activity, including resource usage, for auditing, billing, and reporting purposes.	**Authentication:** DXMOS does not support delegating key-based authentication to an AAA system. Instead, it will verify the client's identity by checking their public key against the authorized keys stored in the /dxmos/ authorized_keys/ directory. **Authorization:** AAA systems (like RADIUS or TACACS+) verify the credentials of the logged-in user and grant them access to specified resources and actions as defined in the AAA systems. **Note:** AAA Authorization Exec through RADIUS does not apply to SSH users authenticated by the key-based method. AAA Authorization Exec through LOCAL or TACACS+ will apply. **Accounting:** AAA systems (like RADIUS or TACACS+) will track and log the logged-in user activity, including resource usage, for auditing, billing, and reporting purposes.	**Authentication:** DXMOS does not support delegating key-based authentication to an AAA system. Instead, it will verify the client's identity by comparing their host's public key and username with the known host keys maintained in the /dxmos/known_hosts/ directory, as well as the trusted usernames associated with the host found in the /dxmos/ trusted_hosts/ directory. If the SSH user fails key-based authentication, password-based authentication will be used, with delegation to a configured AAA system. **Authorization:** AAA systems (like RADIUS or TACACS+) verify the credentials of the logged-in user and grant them access to specified resources and actions as defined in the AAA systems. **Note:** AAA Authorization Exec through RADIUS does not apply to SSH users authenticated by host-based method. AAA Authorization Exec through LOCAL or TACACS+ will apply. **Accounting:** AAA systems (like RADIUS or TACACS+) will track and log the logged-in user activity, including resource usage, for auditing, billing, and reporting purposes.

	Password-based	Key-based	Host-based
DXMOS Specification	When multiple authentication methods are enabled on DXMOS, the order of the authentication will be decided by the SSH client.	When multiple authentication methods are enabled on DXMOS, the order of the authentication will be decided by the SSH client. DXMOS does not support the key-based authentication delegation to an AAA system (such as: RADIUS or TACACS+). However, it still supports AAA authorization and accounting features for logged-in users. AAA Authorization Exec through RADIUS does not apply to SSH users authenticated by key-based method. AAA Authorization Exec through LOCAL or TACACS+ will apply. Currently, DXMOS supports DSA and RSA SHA1 keys. DXMOS recently does not support user-specific authorized keys. The authorized keys are system specific. As a result, the authorized keys added to DXMOS will apply to all logged-in users. When a client attempts to establish connection, DXMOS will check the public key of the client user on the respective client system.	When multiple authentication methods are enabled on DXMOS, the order of the authentication will be decided by the SSH client. DXMOS does not support the host-based authentication delegation to an AAA system (such as: RADIUS or TACACS+). However, it still supports AAA authorization and accounting features for logged-in users. AAA Authorization Exec through RADIUS does not apply to SSH users authenticated by the key-based method. AAA Authorization Exec through LOCAL or TACACS+ will apply. Currently, DXMOS supports DSA and RSA SHA1 keys. DXMOS recently does not support user-specific trusted hosts definition (i.e.: .rhosts). The trusted hosts are system specific (i.e.: hosts.equiv). Consequently, the trusted hosts added to DXMOS are system-specific and apply to all logged-in users. DXMOS does not support netgroup. When a client attempts to establish connection, DXMOS will check the host's public key and the client's username on the respective client system. **Note:** For security purposes, the trusted hosts should designate only authorized client users that are connecting to DXMOS from the client system. The trusted hosts should not be configured to include any users unless specifically intended.

8.2.1 ssh-authentication

Enable or disable an authentication method.

Syntax

`CONF#` *[no]* **ssh-authentication** *{ hostbased | password | publickey }*

Parameters

hostbased	Enables host-based authentication method
password	Enables password-based authentication method
publickey	Enables key-based authentication method
no	Disable an authentication method

Example

```
localhost CONF# ssh-authentication  publickey

Public key authentication is enabled.
localhost CONF#
localhost CONF# no ssh-authentication hostbased

Host authentication is disabled.
localhost CONF#
```

8.2.2 show ssh-authorized-keys (Enable mode)

Enable or disable an authentication method.

Syntax

`#` **show ssh-authorized-keys** [file filename | verbose]

Notes:

- DSA (ssh-dss) and RSA SHA1 (ssh-rsa) keys supported.
- To add an authorized key file to the system, use the `tftp get` command.
- To remove an authorized key file from the system, use the `delete` command.
- Authorized key files are located in the /dxmos/authorized_keys/ directory.
- The public-key authentication process will examine the authorized key files in the /dxmos/authorized_keys/ directory in chronological order.
- Limitation:
  - * A warning message will be reported if the number of authorized key files exceeds 30.
  - * Only the 50 most recent authorized key files under the directory '/dxmos/authorized_keys/' will be processed.

Parameters

file filename	Display public keys of allowed remote users in a specific file
verbose	Display public keys of allowed remote users in all files

Example

```
localhost# show ssh-authorized-keys
```

```
'/dxmos/authorized_keys/':

tle_keys                          file        381 bytes    Jun 13 2025 10:54:26
client_keys                       file        788 bytes    Jun 13 2025 10:49:10

localhost#
```

Example

```
localhost# show ssh-authorized-keys verbose

/dxmos/authorized_keys/tle_keys:
ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAABAQCvQhIR35SWmWELPVfg1MpQh4GMZSbejcbM9+...

/dxmos/authorized_keys/client_keys:
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQDV6bunLjQppEwYJ45reUXV2vHBC9Y+...
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQDBur812/tWNn6h+2r2OFBlvz3N4Dl0L...

To add an authorized key file:
localhost# tftp get 100.100.100.99 /authorized_keys/flood_key /dxmos/autho-
rized_keys/client_keys
Determining file type...

FILE__WriteConfirm: No such file or directory.
The destination file system is read-only.
Changes will be discarded upon reload.
Creating a new file.

Are you sure? [yes/NO] yesConnecting...

File transferred successfully.
...Completing flash write.
localhost#

To remove an authorized key file:
localhost# delete /dxmos/authorized_keys/client_keys

Removing file /dxmos/authorized_keys/client_keys:
Are you sure? [yes/NO] y

localhost#
```

8.2.3 show ssh-known-hosts (Enable mode)

Display the known host files that contain hostnames/IP addresses and public keys of remote hosts permitted to access the system.

Syntax

`#` **show ssh-known-hosts** [file filename | verbose]

Notes:

- DSA (ssh-dss) and RSA SHA1 (ssh-rsa) keys supported.
- To add a known host file to the system, use the `tftp get` command.
- To remove a known host file from the system, use the `delete` command.
- Known host files are located in the /dxmos/known_hosts/ directory.
- The host authentication process will examine the known host files in the /dxmos/known_hosts/ directory in chronological order.
- Limitation:
  - * A warning message will be reported if the number of known host files exceeds 30.
  - * Only the 50 most recent known host files under the directory '/dxmos/known_hosts/' will be processed.

Parameters

file filename	Display hostnames/IP addresses and public keys of permitted remote hosts in a specific file
verbose	Display hostnames/IP addresses and public keys of permitted remote hosts in all files

Example

```
localhost# show ssh-known-hosts

'/dxmos/known_hosts/':

all_hosts                        file        990 bytes    Jun 13 2025 11:48:32
client_hosts                    file        405 bytes    Jun 13 2025 11:47:53

localhost#
```

Example

```
localhost# show ssh-known-hosts file all_hosts

100.100.100.99 ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQC7...
100.100.100.99 ssh-dss AAAAB3NzaC1kc3MAAACBAOMGM6ao5eA...

localhost#
```

Example

```
localhost# show ssh-known-hosts verbose

/dxmos/known_hosts/all_hosts:
100.100.100.99 ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQC7...
100.100.100.99 ssh-dss AAAAB3NzaC1kc3MAAACBAOMGM6ao5eA...
/dxmos/known_hosts/client_hosts:
flood.xkl.com,100.100.100.99 ssh-rsa AAAAB3NzaC1yc2EAAAADAQ...

localhost#
```

```
To add a known host file :
localhost# tftp get 100.100.100.99 /known_hosts/ssh_known_hosts_all /dxmos/
known_hosts/all_hosts
Determining file type...

FILE__WriteConfirm: No such file or directory.
The destination file system is read-only.
Changes will be discarded upon reload.
Creating a new file.

Are you sure? [yes/NO] yesConnecting...

File transferred successfully.
...Completing flash write.
localhost#

To remove a known host file :
localhost# delete /dxmos/known_hosts/client_hosts

Removing file /dxmos/known_hosts/client_hosts:
Are you sure? [yes/NO] yes
localhost#
```

8.2.4 show ssh-trusted-hosts (Enable mode)

Display the trusted host files that contain hostnames/IP addresses and public keys of remote hosts permitted to access the system.

Syntax

`#` **show ssh-trusted-hosts** [file filename | verbose]

Notes:

- DSA (ssh-dss) and RSA SHA1 (ssh-rsa) keys supported.
- To add a trusted host file to the system, use the `tftp get` command.
- To remove a trusted host file from the system, use the `delete` command.
- Trusted host files are located in the /dxmos/trusted_hosts/ directory.
- The host authentication process will examine the trusted host files in the /dxmos/trusted_hosts/ directory in chronological order.
- Limitation:
  - * A warning message will be reported if the number of known host files exceeds 30.
  - * Only the 50 most recent known host files under the directory '/dxmos/known_hosts/' will be processed.

Parameters

file filename	Display hostnames/IP addresses and public keys of permitted remote hosts in a specific file

verbose	Display hostnames/IP addresses and public keys of permitted remote hosts in all files

Example

```
localhost# show ssh-trusted-hosts

'/dxmos/trusted_hosts/':
shosts.equiv                    file         11 bytes    Jun 13 2025 12:34:07
shosts.equiv_all                file         31 bytes    Jun 13 2025 12:32:54
100.100.100.99 ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQC7...
100.100.100.99 ssh-dss AAAAB3NzaC1kc3MAAACBAOMGM6ao5eA...

localhost# ssh-trusted-hosts file shosts.equiv_all

100.100.100.99 -denied_user
100.100.100.99 +permitted_user

localhost# ssh-trusted-hosts verbose

/dxmos/trusted_hosts/shosts.equiv:
100.100.100.99

/dxmos/trusted_hosts/shosts.equiv_all:
100.100.100.99 -denied_user
100.100.100.99 +permitted_user

localhost#

To add a trusted host file :
localhost# tftp get 100.100.100.99 /trusted_hosts/shosts.equiv_hostonly /dxmos/trust-
ed_hosts/shosts.equiv
Determining file type...

FILE__WriteConfirm: No such file or directory.
The destination file system is read-only.
Changes will be discarded upon reload.
Creating a new file.

Are you sure? [yes/NO] yConnecting...

File transferred successfully.

...Completing flash write.

localhost#

To remove a trusted host file :
localhost# delete /dxmos/trusted_hosts/shosts.equiv

Removing file /dxmos/trusted_hosts/shosts.equiv:
Are you sure? [yes/NO] y

localhost#
```

A

Supplementary Information

A.1 Glossary

The following states are reported by DXMOS.

Admin
Administrative State
Admin status is defined differently for an OSC transceiver vs all other types of transceivers. Admin status for an OSC evaluates the Ethernet network status as well as the optical transmission status.

Admin status is the overall status of the transceiver.

Admin Status

Admin Status	Description	
Up	Transceiver Type	Conditions
	OSC	Ethernet network is configured and the module is not shut down by the user.
	Client	The module is not shut down by the user.
	Wave	
Down	Transceiver Type	Conditions
	OSC	Either the Ethernet network is not configured or module is shut down by the user.
	Client	The module is shut down by the user.
	Wave	

AGC – Automatic Gain Control
An amplifier mode that maintains a constant signal gain. A change in the input power leads to a corresponding change in the output power. Gain is calculated with the following equation: Signal Gain = Signal Output Power - Input Power.

APC – Automatic Power Control
An amplifier mode that maintains a constant signal output power despite a change in the number of optical channels.

BERT Enabled

BERT Enabled Description

BERT Enabled	Description
Transmit, Receive	BERT transmit and receive are in progress.
Transmit	Only BERT transmit in progress.
Receive	Only BERT receive in progress.
No	BERT transmit and receive are inactive.
N/A	Could not determine if BERT is active.

BERT Error Count

The total number of errors detected by the BERT. **Display format:** `n.ddeyy`

BERT Status

BERT Status

BERT Status	Description
Sync Failure	DXMOS BERT reads transceiver if the transceiver detects sync loss.
LOS/LOL	Either Loss of Signal or Loss of Lock has occurred.
OK	BERT test is in process.
N/A	The module is absent. It may also be if a module is absent and can still support loopback and not a CFP type transceiver.

BERT Time

The total time that BERT has been in progress (Receive only). **Display format:** `dd hh:mm:ss`

Channel

The ITU-grid channel for the optical transmitter, as reported by the transceiver (or table lookup) by DXMOS. This value is associated with the frequency or wavelength of a DWDM transmitter. Only DWDM transceivers have a channel, others will report N/A. Note that one of these fields must be supplied by the transceiver: Channel, Wavelength, Frequency.
Display format: `nn.m`

Connector

Type of connector based on module type that is used to connect the fiber optics to the transceiver. This data is located in the on-chip memory of the transceiver.

CDR Mode

Reports the operating mode of the CDR in BERT. Based on CDR Types, (which are currently GN2012 or GN2412).

CDR Mode

CDR Mode	Description
Bypass	Depending upon the rate, this defines that the BERT bypasses the CDR. For lower data rates, 1GE and 1GFC, this mode is set.
Normal	Normal BERT operations. Used for higher data rates.

CDR Temperature

DSM10 only. Temperature of the clock and data recovery (CDR) chip(s). **Display format:** `NN C`

CDR +3.3V Supply Voltage

DSM10 only. The supply voltage to the CDR. **Display format:** `n.mmV`

Description

A user provided description of transceiver. Default is empty string.

EDFA Alarm States and LEDs (DLA, DMD-A, DUA systems only) †

OK (green)	WRN (amber)	ALM (red)	Logic Condition	CLI/SNMP	Priority (highest =1)*
○	○	○	(Amplifier Reset) or (Amplifier Booting)	Reset	1
○	○	●	((AOP) and (Administratively enabled) and (HCT or LCT or APT or HPB or HBR)) OR ((Administratively enabled) and (pump current == 0) and (not LOS))	Alarm	2
○	●	○	((AOP) and (Administratively enabled)) xor (HCT or LCT or APT or HPB or HBR)	Warning	3
○	●	○	LOS	LOS	4
◐	○	○	(No alarms) and (Administratively disabled)	Down	5
●	○	○	(No alarms) and (Administratively enabled) and (pump current (pump, NOT pump ild)) > 0)	Up	6

†For versions prior to v4.6, please see the Archived CCC Based DLA/DMD-A page.

*Priorities are evaluated from highest to lowest. The first matching priority determines the device status.

The acronyms for these alarms, as referenced in the EDFA manufacturer user guide, are different than the XKL acronyms. See the Glossary in the Systems Guide for details on this.

These are XKL acronyms:

- LOS = Loss of Signal

- AOP = Abnormal Output Power (this is referred to as LOP in the EDFA, Loss of Output Power)
- HCT = High Case Temperature
- LCT = Low Case Temperature
- APT = Abnormal Pump Temperature
- HPB = High Pump Bias current
- HBR = High Back Reflections

Encapsulation

Reports the user-configured encapsulation of the module. Refer to Table : Rate (Encapsulation) Description.

Frequency

The frequency of the optical transmitter, as reported by the transceiver (or table lookup by DXMOS). See Channel. Note that one of these fields must be supplied by the transceiver: Channel, Wavelength, Frequency. **Display format:** `nn GHz`

General Status

Depending on the system, this section can contain the following fields:

--Module State
--Admin OR Administrative State
--Transmitter
--Receiver
--IdleTx/Mute
--Total Down/Total Down/Error Time
--Time Since Last State Change
--Last Cleared Time Stamp
--I2C Transaction Error Count
--Status Register Contents

High Alarm

Occurs when a value exceeds the manufacturer's highest threshold value.

High Warning

Occurs when a value is about to exceed the manufacturer's highest threshold value.

I2C Address

The I2C address in the DarkStar system that is used to communicate with the module.

I2C Transaction Error Count

Reports the number of I2C communication errors between DXMOS and the transceiver.

IdleTx/Mute

The information that lets the user know if FEC is supported and how the Tx handles that extra data. Possible output follows:

Idle Tx/Mute Description

CDR Mode	Description
Idle Tx pending Mute	Forward state is Virtual Light hold off.
Idle Mute	Forward state is Virtual Light out.
Off	Forward state is NONE.
Idle Tx with BERT	Forward state is Error Forwarding only if BERT is in progress and system is a DQ*10.
Idle Tx	Forward state is Error Forwarding.
Off	Used for BERT diagnostics.
Transaction Pending	Default Error Forwarding State.

Interface

Interface Description

CDR Mode	Description
OSC	Optical Service Channel is a connection between two adjacent DarkStar systems.
Client	The local connection in (and out) of a system. These ports are used to connect the DarkStar system to local customer equipment, such as switches, routers, and other network services.
Wave Trunk	At XKL, "wave" can have multiple meanings: 1) An optical carrier of data. 2) The line transceiver generating this optical carrier, and also called a "wave transceiver," "wave port," or "wave interface." 3) The line counterpart of a particular client. For example, in some DarkStar products, a wave is associated with a client by creating a "connection" in the crossbar switch. The wave can then retransmit a signal received by the client, or conversely, receive a signal that the client can retransmit. The term “trunk” is equivalent to '”wave” and is used exclusively in DQ*100 systems.

Laser Temperature

Reports the temperature of the module case. Also see Temperature.
Display format: +/- nn C

Last Cleared
Last Cleared Time Stamp

The time since the error counters were last cleared or when the system gets reloaded. **Display format:** `dd:hh:mm:ss` (day hour:minute:second).

Last Line Chng

Displays how long the transceiver or lane has been in the reported state. For OSC modules, this field is N/A.
Display format: `n.mmey sec` (exponential)

Link DownTime

The total time that a module is administratively up, yet the line is down in an error state or the system is reloading. **Note:** The module is in error state when the Tx is Disabled, Tx is in Fault, Rx in Loss of Lock (LOL), or Rx in Loss of Signal (LOS).
Display format: `dd:hh:mm:ss` (day hour:minute:second).

Line

Lane Status

Line Status	Description	
Absent	The module is not present.	
Up	No optical line alarms and the module is not shut down by the user.	
Alarm	**Condition**	**Description**
	Rx LOS	Optical receiver has LOS.
	Rx LOL	Optical receiver has LOL.
	Tx LOL	Optical transmitter has LOL.
	Tx Fault	Transmission error.
	Sensor	Temperature, Tx Power, Rx Power. Bias Current and Supply Voltage sensors read the alarm bytes from the module.
Warning	Sensor	Temperature, Tx Power, Rx Power. Bias Current and Supply Voltage sensors read the warning bytes from the module.
IO Error	I2C read error	I2C bus is busy.
Down	The module reports Tx is disabled. For example, the user may have shut down the laser, or the module itself fails and cannot transmit data due to an electrical failure.	

Loopback

Reports the loopback capabilities of the module. If loopback is supported, reports the loopback mode currently enabled by the user.

Loopback

Loopback	Description
Not Supported	Loopback is not supported by module.
Electrical	Host-side loopback is enabled.
Optical	Media-side loopback is enabled.
Off	Loopback is disabled.
N/A	The module is absent. It may also be if a module is absent and can still support loopback and not a CFP type transceiver.

Low Alarm

Occurs when a value drops below the manufacturer's lowest threshold value.

Low Warn
Low Warning

Occurs when a value is about to drop below the manufacturer's lowest threshold value.

Manufacturing Date
MFG Date

The manufacture date of the transceiver, as reported by the transceiver. The information is stored in the on-chip memory of the transceiver. **Display format:** `YYMMDD`

Maximum Reach

The maximum supported link length, as reported by the transceiver.

Module <n / lane> Lane-Status

The module-identifier, Module <n / lane>, and the Lane-Status are reported first. The Lane-Status values are shown in Table : Module Status.

Module <n> Module-Status

The module-identifier, Module <n>, and the Module-Status are reported first. The Module-Status values are shown in Table : Lane Status.

Module State

See Line.

Module Type

The transceiver type, as reported by the transceiver.

Module Type Description

Module	Description
SFP	Small Form-factor Pluggable - supports up to 2.5Gbps.
SFP+	Small Form-factor Pluggable plus - supports up to 11Gbps.
CFP	Centum(100) G Form-factor Pluggable - supports up to 100Gbps.
QSFP+	Quad SFP+ - 4 x 10 Gbps (up to 40Gbps).
QSFP28	Quad SFP - up to 100Gbps.
QSFP-DD	Quad SFP Double Density - supports up to 400Gbps.
OSFP	Octal SFP - supports up to 400Gbps.

OSC - optical service channel

An optical channel that connects adjacent DarkStar systems. The OSC provides network connectivity between the management planes in DarkStar systems. The OSC is an out-of-band communication channel.

Part No.
Part Number

The part number is data provided by the vendor and is read from the transceiver.

PRBS Generate

Reports if the PRBS (Pseudo Random Bit Stream) generator is on/off for the specified module. See also Transmit.

PRBS Pattern-Check

Reports if the PRBS (Pseudo Random Bit Stream) pattern checker is on/off for the specified module. See also Receive.

Rate

Rate is an alias for encapsulation, which is user configured.

Rate (Encapsulation) Description

Rate		
Summary	Verbose	Description
GE	1G Ethernet	1G Ethernet
10GE	10G Ethernet	10G Ethernet
10GEFEC	10G Ethernet FEC	10G Ethernet with FEC (Forward Error Correction)
OC48	OC48	Sonet OC-48
OC192	OC192	Sonet OC-192
OC192FEC	OC192 FEC	Sonet OC-192 with FEC (Forward Error Correction)
1xFC	1x Fiber Channel	1x Fiber Channel - 1Gbps FC
2xFC	2x Fiber Channel	2x Fiber Channel - 2Gbps FC
4xFC	4x Fiber Channel	4x Fiber Channel - 4Gbps FC
8xFC	8x Fiber Channel	8x Fiber Channel - 8Gbps FC
10xFC	10x Fiber Channel	10x Fiber Channel - 10Gbps FC
1x100GE	1xCAUI-4	1 x 100Gbps CAUI-4 (OpenZR+ mode)
2x100GE	2xCAUI-4	2 x 100Gbps CAUI-4 (OpenZR+ mode)
3x100GE	3x100GAUI-2	3 x 100Gbps GAUI-2 (OpenZR+ mode)
4x100GE	4x100GAUI-2	4 x 100Gbps GAUI-2 (OpenZR+ mode)
4x100GE ZR	4x100GAUI-2 ZR	4 x 100Gbps GAUI-2 (ZR Compliant)
400GE	400GAUI-8	400Gbps GAUI-8 (OpenZR+ mode)
400GE ZR	400GAUI-8 ZR	400Gbps GAUI-8 (ZR Compliant)
N/A	N/A	Value for OSC transceivers only

Receive

Reports if BERT Receive is in progress.

BERT Receive Status

Receive	Description
On	BERT receive is in progress.
Off	BERT receive is not in progress.

Reported Wavelength

For DSM10/DQ*10. Reports the wavelength of the light of the optical transmitter. See Channel. **Display format:** `DDDD.D nm`

Receiver

Rx

The status of the lane receiver.

Rx Status

Rx Status	Description
IO Error	I2C data transaction error.
LOS	Receiver has Loss of Signal (LOS).
LOL	Receiver has Loss of Lock (LOL).
LOS,LOL	Receiver has both LOS and LOL conditions.
OK	Receiver is operational without errors, alarms, or warnings.
N/A	Module not present.

Rx CDR Firmware

Reports the firmware version for the specified module's Rx CDR (Clock and Data Recovery). Display format: n-n-n-c

Rx Cdr (name, lane)

Reports the Rx CDR (Clock and Data Recovery) module's user interface name and associated CDR lane.

Rx CDR Version

Reports the version of the CDR (Clock and Data Recovery) chip for the specified module.

Rx Laser Input Power

Reports the optical input power to the receiver. If a multi-lane module, then the Rx Laser Input Power is reported as "Reported By Lane (below)." The value of the Input Power is reported in the Lane section. Also see Rx Power.
Display Format: `+/- nn.m dBm`

Rx Power
RxPow

The optical power received, as reported by the transceiver. If a multi-lane transceiver, Rx power is reported for each lane.
Display Format: `+/- nn.m dBm` OR `N/A`

Rx Power

Rx Power	Explanation
<value>	The receive optical power.
<-40dBm	If the transceiver reports the receive optical power is less than -40dBm, and as this is below the accuracy of the module capabilities, DXMOS reports < -40 instead of the actual value reported by the transceiver.
N/A	Will be result for CFP transceivers if number of optical lanes is greater than 1 or a flag is set and LOW_DBM setting is reached.

Sensor Reading and Thresholds

Readings from each of the module sensors. Each sensor in the module has up to 4 thresholds.

Readings and Thresholds

Threshold	Threshold Definition
high alarm	Factory set. Indicates the need for immediate attention because the reading has exceeded the high condition.
high warn	Factory Set. Indicates that the condition is a heading towards a high alarm condition.
low warn	Factory Set. Indicates that the condition is a heading towards a low alarm condition.
low alarm	Factory set. Indicates the need for immediate attention because the reading has exceeded the low condition.

Sensor Status

Detailed sensor status of the lane of a transceiver. Each of these fields will have a value shown in the following table.

- Laser Temperature
- Supply Voltage
- Rx Laser Input Power
- Tx Laser Output Power
- Tx Laser Bias Current

Sensor Status Description

Sensor Status	Description
Unsupported	DXMOS does not support this sensor.
High Alarm	Value has exceeded the threshold set in module.
Low Alarm	
OK	No alarm.
N/A	Module is not present.

Serial Number
Serial No.

The serial number provided by the manufacturer. This information is reported by the transceiver.

Signal Type

Reports the user configured encapsulation of the module. See Rate**.**

State Changed

Reports how long after the last change to the lane Rx or Tx status. **Display format:** `nd hh:mm:ss`

Status Register Contents

Reports the contents of the transceiver status register.

Supply Voltage
+3.3V Supply Voltage

The supply voltage to the transceiver, as reported by the transceiver. +3.3V supply voltage in single-lane modules.
Display format: `s.ddd V`

Supported Distance

If the module reports this value, it represent the maximum supported distance for error-free operation. See Maximum Reach.

Temperature

The case temperature of the transceiver, as reported by the transceiver. The value is read from the module temperature sensor.
Display format: +/- nn C

Temperature DSP

The DSP temperature as reported by the transceiver. The value is read from the DSP temperature sensor in some supported transceivers.
Display format: +/- nn C

Temperature Laser

The laser temperature as reported by the transceiver. The value is read from the laser temperature sensor in some supported transceivers.
Display format: +/- nn C

Temperature PCB

The PCB temperature as reported by the transceiver. The value is read from the PCB temperature sensor in some supported transceivers.
Display format: +/- nn C

Temperature PIC

The PIC temperature as reported by the transceiver. The value is read from the PIC temperature sensor in some supported transceivers.
Display format: +/- nn C

Time Since Last State Change

See Last Line Chng.

Total Down
Total Down/Error Time

The total time that a module is administratively up, yet the line is down in an error state. **Note:** The module is in error state when the Tx is Disabled, Tx is in Fault, Rx is in Loss of Lock (LOL), or Rx is in Loss of Signal (LOS).

Transceiver

Displays the overall status of the transceiver or lane.

Module Status

Transceiver Status	Description
Absent	Module not present.
OK	Module has no sensor alarms or warnings.
Fault	Could not read module memory or Tx is in Fault state. This state is only available on DQ*100 and DQ*400 systems.
Low Power	Module set to Low Power mode. This mode is set in order to protect the module if host cannot cool in high powered mode. This message is only available on DQ*400 systems.
Not Ready	The module reports it is not ready. This message is only available on DQ*100 and DQ*400 systems.
Alarm	A module alarm threshold has been exceeded. Possible alarms and thresholds are defined by the transceiver and may include: temperature, voltage, Tx/Rx power, bias current, etc. Thresholds are set by the vendor.
Warning	Only displayed for SFP+ transceivers. A module warning threshold has been exceeded. Possible warnings and thresholds are defined by the transceiver and may include: temperature, voltage, Tx/Rx power, bias current, etc. Thresholds are set by the vendor.

Transmit

Reports if BERT is in progress.

Bert Transmit Status

Transmit	Description
On	BERT transmit is in progress.
Off	BERT transmit is not in progress.

Transmitter

Tx

The status of the lane transmitter.

Tx Status

Tx Status	Description
Disabled	Lane is shut down by the user.
LOL	Transmitter has Loss of Lock (LOL) transmission error.
Fault	Transmission error.
Fault, LOL	Both Fault and LOL conditions.
OK	Tx optics is functional.
N/A	Module not present.

Tx CDR Firmware

Reports the firmware version for the specified module's Tx CDR (Clock and Data Recovery). Display format: `n-n-n-`.

Tx Cdr (name, lane)

Reports the Tx CDR (Clock and Data Recovery) module's user interface name and associated CDR lane.

Tx CDR Version

Reports the version of the CDR (Clock and Data Recovery) chip for the specified module.

Tx Laser

Reports the state of the optical transmitter.

Tx Laser Status

Tx Laser	Explanation
Enabled	Module is not shut down by the user.
Disabled	Module is shut down by the user.

Tx Laser Bias Current

The Tx laser bias current, as reported by the transceiver. If a multi-lane module, then the Tx Laser Bias Current is reported as "Reported By Lane (below)." The value of the Bias Current is reported in the Lane section. **Display format:** `± nn.mmA`

In addition to each sensor report, a sensor has up to 4 warning and alarm thresholds that are also reported. These thresholds are set by the transceiver manufacturer.

Sensor Thresholds Description

Threshold	Description
high alarm	Set by the transceiver. Indicates the need for immediate attention because the reading has exceeded the high alarm threshold.
high warn	Set by the transceiver. Indicates a warning condition that should be looked into.

Sensor Thresholds Description

Threshold	Description
low warn	Set by the transceiver. Indicates a warning condition that should be looked into.
low alarm	Set by the transceiver. Indicates the need for immediate attention because the reading has exceeded the low alarm threshold.

Tx Laser Output Power

Reports the optical output power of transmitter. If a multi-lane module, then the Tx Laser Output Power is reported as "Reported By Lane (below)." The value of the Output Power is reported in the Lane section. Also see Tx Power.

Display format: ± `nn.m dBm`

Tx Power

The optical power of the transmitter, as reported by the transceiver. **Display Format:** `+/- nn.m dBm` or `N/A`

Tx Power

Tx Power	Explanation
<value>	The transmit optical power as reported by the transceiver.
<-40 dBm	If the transceiver reports the transmit optical power is less than -40dBm, and as this is below the accuracy of the module capabilities, DXMOS reports < -40 instead of the actual value reported by the transceiver.
N/A	Will be result for CFP transceivers if number of optical lanes is greater than 1 or a flag is set and LOW_DBM setting is reached.

Vendor

The vendor field data is retrieved from the transceiver. It provides information about who manufactured the transceiver.

Wavelength

The wavelength of the optical transmitter, as reported by the transceiver (or table lookup by DXMOS). See Channel. Note that one of these fields must be supplied by the transceiver: Channel, Wavelength, Frequency. **Display format:** `DDDD.D nm`.

Zero Touch Provisioning (ZTP)

ZTP is a mechanism that allows an unconfigured device to automatically load configuration files upon power-on. See section DHCP and ZTP .

Support

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