



# Configuring Fibre Channel Interfaces

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This chapter provides information about Fibre Channel interfaces, its features, and how to configure the Fibre Channel interfaces.

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## Finding Feature Information

Your software release might not support all the features documented in this module. For the latest caveats and feature information, see the Bug Search Tool at <https://tools.cisco.com/bugsearch/> and the release notes for your software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the New and Changed chapter or the Feature History table below.

# Information About Fibre Channel Interfaces

## Forward Error Correction

Forward Error Correction (FEC) allows you to send frames in a way that the receiver can detect and correct errors without the need of retransmitting the frames if there are any errors in the frames. Using FEC, you can transfer frames over impaired links because of an increased tolerance on the receiver side; in fact, in case of bit errors, FEC allows the receiver to correct them.

Transmitter Training Signal (TTS) provides the capability for FC ports to negotiate the following two capabilities:

1. Enables a receiver to send feedback to a transmitter to assist the transmitter in adapting to the characteristics of the link that connects them.
2. Allows to use FEC.

For more information on configuring FEC and TTS, see the [Configuring FEC, on page 8](#) section.



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**Note** Modifying the FEC configuration briefly disrupts traffic on the port.

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## Out-of-Service Interfaces

On supported modules and fabric switches, you might need to allocate all the shared resources for one or more interfaces to another interface in the port group or module. When an interface is taken out of service, all shared resources are released and made available to the other interface in the port group or module. These shared resources include BB\_credits and extended BB\_credits. All shared resource configurations are returned to their default values when the interface is brought back into service. Corresponding resources must be made available in order for the port to be successfully returned to service.



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**Caution** If you need to bring an interface back into service, you might disrupt traffic if you need to release shared resources from other interfaces in the same port group.

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# Guidelines and Limitations

## Port Channel Limitations

Port channels have the following restrictions:

### Port Speed Information

- Cisco MDS 9700 48-Port 32-Gbps Fibre Channel Switching Module (DS-X9648-1536K9) supports 32 Gbps, 16 Gbps, 8 Gbps, and 4 Gbps speed. However, a single 32-Gbps SFP supports only 32 Gbps, 16 Gbps, and 8 Gbps speed and a single 16 Gbps SFP supports only 16 Gbps, 8 Gbps, and 4 Gbps speed. You must not configure speed values other than the values recommended for these SFPs.
- Cisco MDS 9700 48-Port 16-Gbps Fibre Channel Switching Module (DS-X9648-768K9) and the Cisco MDS 9000 24/10-Port SAN Extension Module (DS-X9334-K9) (Fibre Channel ports) supports 16 Gbps, 10 Gbps, 8 Gbps, 4 Gbps, and 2 Gbps speeds. However, a single 16 Gbps SFP supports only 16 Gbps, 8 Gbps, and 4 Gbps speed and a single 8-Gbps SFP supports only 8 Gbps, 4 Gbps, and 2 Gbps speed. For 10 Gbps speeds, the 10 Gbps SFP supports only 10 Gbps. You must not configure speed values other than the values recommended for these SFPs.

The following table describes the results of adding a member to a port channel for various configurations.

**Table 1: Port Channel Configuration and Addition Results**

Port Channel Members	Configured Speed		New Member Type	Addition Type	Result
	Port Channel	New Member			
DS-X9448-768K9 and DS-X9334-K9	Auto	Auto max 4000	DS-X9448-768K9 and DS-X9334-K9	Normal	Fail
				Force	Pass
	Auto max 4000	Auto max 4000	DS-X9448-768K9 and DS-X9334-K9	Normal or Force	Pass
				Force	Pass
	Auto max 4000	Auto max 8000 or auto max 16000	DS-X9448-768K9 and DS-X9334-K9	Normal	Fail
				Force	Pass
	Auto max 8000 or auto max 16000	Auto max 4000	DS-X9448-768K9 and DS-X9334-K9	Normal	Fail
				Force	Pass

Port Channel Members	Configured Speed		New Member Type	Addition Type	Result
	Port Channel	New Member			
DS-X9448-768K9, DS-X9334-K9, and DS-X9648-1536K9	Auto	Auto	DS-X9448-768K9, DS-X9334-K9, and DS-X9648-1536K9	Normal or Force	Pass
	Auto	Auto max 8000 or auto max 16000	DS-X9448-768K9, DS-X9334-K9, and DS-X9648-1536K9	Normal	Fail
				Force	Pass
	Auto	Auto max 32000	DS-X9648-1536K9	Normal	Fail
				Force	Pass
	Auto max 8000	Auto max 8000	DS-X9448-768K9, DS-X9334-K9, and DS-X9648-1536K9	Normal or Force	Pass
	Auto max 8000	Auto max 16000	DS-X9448-768K9, DS-X9334-K9, and DS-X9648-1536K9	Normal	Fail
				Force	Pass
	Auto max 8000	Auto max 32000	DS-X9648-1536K9	Normal	Fail
				Force	Pass
	Auto max 16000	Auto max 16000	DS-X9448-768K9, DS-X9334-K9, and DS-X9648-1536K9	Normal or Force	Pass
	Auto max 16000	Auto max 8000	DS-X9448-768K9, DS-X9334-K9, and DS-X9648-1536K9	Normal	Fail
				Force	Pass
	Auto max 16000	Auto max 32000	DS-X9648-1536K9	Normal	Fail
Force				Pass	
DS-X9648-1536K9	Auto max 32000	Auto max 32000	DS-X9648-1536K9	Normal or force	Pass
	Auto max 32000	Auto max 4000, auto max 8000, or auto max 16000	DS-X9448-768K9, DS-X9334-K9, and DS-X9648-1536K9	Normal	Fail
				Force	Pass

Use the **show port-channel compatibility parameters** command to obtain information about port channel addition errors.

# Configuring Fibre Channel Interfaces

## Configuring Port Speed



**Note** Changing port speed and rate mode disrupts traffic on the port. Traffic on other ports in the port group is not affected.

To configure the port speed on an interface, perform these steps:

**Step 1** switch# **configure terminal**

Enters configuration mode.

**Step 2** switch(config)# **interface fc 1/1**

Selects the interface and enters interface configuration submode.

**Step 3** switch(config-if)# **switchport speed {1000 | 2000 | 4000 | 8000 | 10000 | 16000 | 32000}**

Configures the port speed in megabits per second. The auto parameter enables autosensing on the interface.

**Step 4** switch(config-if)# **switchport speed auto**

Configures autosensing for an interface.

**Note** The auto speed configurations are available only for the specific modules.

**Step 5** switch(config-if)# **no switchport speed**

Reverts to the default speed for the interface (auto).

Use the **show interface** command to verify the port speed configuration for an interface.

```
switch# show interface fc 9/1
fc9/1 is up
  Hardware is Fibre Channel, SFP is short wave laser w/o OFC (SN)
  Port WWN is 22:01:00:05:30:01:9f:02
  Admin port mode is F
  snmp traps are enabled
  Port mode is F, FCID is 0xeb0002
  Port vsan is 1
  Speed is 2 Gbps
  Rate mode is shared
  Transmit B2B Credit is 64
  Receive B2B Credit is 16
  Receive data field Size is 2112
  Beacon is turned off
  5 minutes input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
  5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    226 frames input, 18276 bytes
      0 discards, 0 errors
      0 CRC, 0 unknown class
      0 too long, 0 too short
```

```

326 frames output, 21364 bytes
 0 discards, 0 errors
0 input OLS, 0 LRR, 1 NOS, 0 loop inits
3 output OLS, 2 LRR, 0 NOS, 0 loop inits
16 receive B2B credit remaining
64 transmit B2B credit remaining

```

## Configuring FEC

FEC has the following restrictions:

- FEC is supported on the DS-X9748-3072K9, DS-X9648-1536K9, DS-X9334-K9, and DS-X9448-768K9 modules in the Cisco MDS 9700 Series switch. FEC is also supported on the Cisco MDS 9132T, MDS 9220i, MDS 9396S, MDS 9148T, and MDS 9396T switches.
- FEC fallback<sup>1</sup> is not supported on the Cisco MDS 48-Port 64-Gbps Fibre Channel Switching Module (DS-X9748-3072K9) and Cisco MDS 9700 48-Port 32-Gbps Fibre Channel Switching Module (DS-X9648-1536K9) when their interfaces are configured at 16-Gbps Fibre Channel fixed speed. However, FEC fallback is supported on the Cisco MDS 9700 48-Port 16-Gbps Fibre Channel Switching Module (DS-X9448-768K9) when its interfaces are configured at 16-Gbps Fibre Channel fixed speed.
- Modifying the FEC configuration briefly disrupts traffic on the port.
- FEC cannot be configured when auto speed is selected for operating speeds 2000/4000/8000/16000. However, FEC is always enabled on ports running at 32-Gbps and higher speeds but no configuration is required.
- Ports operating at 32 Gbps or higher speeds automatically negotiate FEC because FEC is required at those speeds. No FEC configuration is necessary as the **switchport fec** and **switchport fec tts** commands are meant only for 16-Gbps speeds where FEC is optional.
- From Cisco MDS NX-OS Release 6.2(11c), FEC with Transmitter Training Signal (TTS) is supported on the Cisco MDS 9396S 16-Gbps Multilayer Fabric Switch and Cisco MDS 9700 48-Port 16-Gbps Fibre Channel Switching Module (DS-X9448-768K9), except in Cisco MDS NX-OS Release 6.2(13).
- From Cisco MDS NX-OS Release 8.2(1), FEC with TTS feature is supported in Simple Network Management Protocol (SNMP) and Device Manager (DM). This feature is not supported in Cisco MDS NX-OS Release 8.1(1) or earlier.
- From Cisco MDS NX-OS Release 8.4(1), FEC admin state has changed from up or down to on or off respectively.

To configure FEC on an interface operating at 16-Gbps fixed speed, perform these steps:

**Step 1** switch# **configure terminal**

Enters configuration mode.

**Step 2** switch(config)# **interface fc 1/1**

Selects the interface and enters interface configuration submode.

<sup>1</sup> When the admin speed is auto and FEC is configured on either side of a link, but the link does not come up in FEC mode.



**Step 3** switch(config-if)# **switchport speed 16000**

Sets the port speed.

**Step 4** switch(config-if)# **switchport fec**

**Note** The **switchport fec** command works only on interfaces that support fixed 16 Gbps and higher speeds and a message stating the same appears when you execute this command.

Enables FEC for the interface.

- FEC is active if it is configured on both local and peer switches.
- FEC is not active if it is configured only on the local switch, but not on the peer switch.

**Step 5** switch(config-if)# **switchport fec tts**

(Optional) Enables TTS, that allows negotiation of FEC. This command is only accepted on interfaces with fixed 16-Gbps speeds and FEC enabled.

**Note** The **switchport fec tts** command can be used only after configuring FEC using the **switchport fec** command.

Use the **show interface** command to verify the port speed configuration for an interface:

This example displays the FEC state when FEC is enabled:

```
switch# show interface fc3/15 | i fec
admin fec state is on
oper fec state is down
```

This example displays the FEC state when FEC is disabled:

```
switch# show interface fc3/15 | i fec
admin fec state is off
oper fec state is down
```

## Configuring Rate Mode

**Note**

- Changing port speed and rate mode disrupts traffic on the port.
- Dedicated and shared rate modes are not supported on interfaces that support 16 Gbps or higher speeds.
- Interfaces that are on modules and switches that support 16 Gbps and higher speeds operate in dedicated mode.

To configure the rate mode (dedicated or shared) on an interface on a Fibre Channel switching module, perform these steps:

**Step 1** switch# **configure terminal**

Enters configuration mode.

**Step 2** switch(config)# **interface fc 1/1**

Selects the interface and enters interface configuration submode.

**Step 3** switch(config-if)# **switchport rate-mode dedicated**

Reserves dedicated bandwidth for the interface.

**Note** If you cannot reserve dedicated bandwidth on an interface, you might have exceeded the port group maximum bandwidth. Use the **show port-resources** command to determine what resources are already allocated.

**Step 4** switch(config-if)# **switchport rate-mode shared**

Reserves shared (default) bandwidth for the interface.

**Step 5** switch(config-if)# **no switchport rate-mode**

Reverts to the default state (shared).

## Taking Interfaces out of Service



### Note

- The interface must be disabled using a **shutdown** command before it can be taken out of service.
- The interface cannot be a member of a port channel.
- Taking interfaces out of service releases all the shared resources to ensure that they are available to other interfaces. This causes the configuration in the shared resources to revert to default when the interface is brought back into service. Also, an interface cannot come back into service unless the default shared resources for the port are available. The operation to free up shared resources from another port is disruptive.

To take an interface out of service, perform these steps:

**Step 1** switch# **configure terminal**

Enters configuration mode.

**Step 2** switch(config)# **interface fc 1/1**

Selects the interface and enters interface configuration submode.

**Step 3** switch(config-if)# **no channel-group**

Removes the interface from a port channel.

**Step 4** switch(config-if)# **shutdown**

Disables the interface.

**Step 5** switch(config-if)# **out-of-service**

Takes the interface out of service.

This example shows a 24-port 4-Gbps module:

```
switch# show port-resources module 1
Module 1
  Available dedicated buffers for global buffer #0 [port-group 1] are 2618
  Available dedicated buffers for global buffer #1 [port-group 2] are 2149
  Available dedicated buffers for global buffer #2 [port-group 3] are 2150
  Available dedicated buffers for global buffer #3 [port-group 4] are 1102
  Available dedicated buffers for global buffer #4 [port-group 5] are 2150
  Available dedicated buffers for global buffer #5 [port-group 6] are 2150
  Available dedicated buffers for global buffer #6 [port-group 7] are 2150
  Available dedicated buffers for global buffer #7 [port-group 8] are 2150
  Available dedicated buffers for global buffer #8 [port-group 9] are 2150
  Available dedicated buffers for global buffer #9 [port-group 10] are 2150
  Available dedicated buffers for global buffer #10 [port-group 11] are 2150
  Available dedicated buffers for global buffer #11 [port-group 12] are 2150

Port-Group 1
Total bandwidth is 64.0 Gbps
Allocated dedicated bandwidth is 64.0 Gbps
-----
Interfaces in the Port-Group      B2B Credit  Bandwidth  Rate Mode
                               Buffers      (Gbps)
-----
fc1/1                             500         16.0    dedicated
fc1/2                             32          16.0    dedicated
fc1/3                             500         16.0    dedicated
fc1/4                             500         16.0    dedicated

Port-Group 2
Total bandwidth is 64.0 Gbps
Allocated dedicated bandwidth is 52.0 Gbps
-----
Interfaces in the Port-Group      B2B Credit  Bandwidth  Rate Mode
                               Buffers      (Gbps)
-----
fc1/5                             500         16.0    dedicated
fc1/6                             500         16.0    dedicated
fc1/7                             500          4.0    dedicated
fc1/8                             500         16.0    dedicated

.
.
.

Port-Group 12
Total bandwidth is 64.0 Gbps
Allocated dedicated bandwidth is 64.0 Gbps
-----
Interfaces in the Port-Group      B2B Credit  Bandwidth  Rate Mode
                               Buffers      (Gbps)
-----
fc1/45                             500         16.0    dedicated
fc1/46                             500         16.0    dedicated
fc1/47                             500         16.0    dedicated
fc1/48                             500         16.0    dedicated
```

## Verifying Fibre Channel Interfaces Configuration

To display Fibre Channel interface configuration information, perform one of the following tasks:

Command	Purpose
<code>show module</code>	Displays the module.
<code>show module slot recovery-steps</code>	Displays the slot for the module.
<code>show port-resources module slot</code>	Displays the port resources for the slot.
<code>show interface fc slot/port</code>	Displays the slot or port information. FEC admin and operational states are displayed.
<code>show interface brief</code>	Displays the interface.
<code>show port index-allocation</code>	Displays the port in the index allocation.
<code>show port index-allocation startup</code>	Displays the startup port in the index allocation.
<code>show port-channel compatibility parameters</code>	Displays the port channel compatibility parameters.
<code>show module slot bandwidth-fairness</code>	Displays the module slot bandwidth fairness information.

For detailed information about the fields in the output from these commands, refer to the [Cisco MDS 9000 Series Command Reference](#).

## Displaying FEC Module Interfaces

This example shows a 32-Gbps Fibre Channel interface status:



**Note** 32-Gbps Fibre Channel ports comes up automatically in FEC and need not be configured.

```
switch# show interface fc 10/21 brief
-----
Interface  Vsan   Admin  Admin  Status      SFP   Oper  Oper  Port   Logical
          Mode   Trunk                                     Mode  Speed  Channel  Type
          Mode                                     (Gbps)
-----
fc10/21    1      auto   on     trunking    swl   TE    32    --     core
```

```
switch# show interface fc10/21
fc10/21 is trunking
  Hardware is Fibre Channel, SFP is short wave laser w/o OFC (SN)
  Port WWN is 22:55:54:7f:ee:ea:1f:00
  Peer port WWN is 22:24:54:7f:ee:ea:1d:00
  Admin port mode is auto, trunk mode is on
  snmp link state traps are enabled
```

```

Port mode is TE
Port vsan is 1
Admin Speed is auto max 32 Gbps
Operating Speed is 32 Gbps
Rate mode is dedicated
Port flow-control is R_RDY

Transmit B2B Credit is 500
Receive B2B Credit is 500
B2B State Change Number is 14
Receive data field Size is 2112
Beacon is turned off
fec is enabled by default
Logical type is core
Trunk vsans (admin allowed and active) (1)
Trunk vsans (up) (1)
Trunk vsans (isolated) (0)

```

## Displaying SFP Diagnostic Information

You can use the **show interface *interface-range* transceiver details** command to display small form-factor pluggable (SFP) diagnostic information.

```

switch# show interface fc1/5 transceiver details
fc1/5 sfp is present
  Name is CISCO-AVAGO
  Manufacturer's part number is SFBR-5780APZ-CS2
  Revision is G2.3
  Serial number is AGD151785V6
  Cisco part number is 10-2418-01
  Cisco pid is DS-SFP-FC8G-SW
  FC Transmitter type is short wave laser w/o OFC (SN)
  FC Transmitter supports short distance link length
  Transmission medium is multimode laser with 62.5 um aperture (M6)
  Supported speeds are - Min speed: 2000 Mb/s, Max speed: 8000 Mb/s
  Nominal bit rate is 8500 Mb/s
  Link length supported for 50/125um OM2 fiber is 50 m
  Link length supported for 62.5/125um fiber is 21 m
  Link length supported for 50/125um OM3 fiber is 150 m
  Cisco extended id is unknown (0x0)

  No tx fault, no rx loss, in sync state, diagnostic monitoring type is 0x68
  SFP Diagnostics Information:
-----

```

		Alarms		Warnings	
		High	Low	High	Low
Temperature	50.26 C	75.00 C	-5.00 C	70.00 C	0.00 C
Voltage	3.35 V	3.63 V	2.97 V	3.46 V	3.13 V
Current	8.33 mA	8.50 mA	2.00 mA	8.50 mA	2.00 mA
Tx Power	-2.45 dBm	1.70 dBm	-14.00 dBm	-1.30 dBm	-10.00 dBm
Rx Power	-4.81 dBm	3.00 dBm	-17.30 dBm	0.00 dBm	-13.30 dBm
Transmit Fault Count = 0					

```

-----
Note: ++ high-alarm; + high-warning; -- low-alarm; - low-warning

```

# Configuration Examples for Fibre Channel Interfaces

## Configuration Example for FEC Module Interfaces

These steps describe how to configure FEC module interfaces:

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**Step 1** Select the interfaces fc 4/1 through fc 4/2.

**Example:**

```
switch# configure terminal
switch(config)# interface fc 4/1 - 2
```

**Step 2** Configure the FEC on the interfaces.

**Example:**

```
switch(config-if)# switchport speed 16000
switch(config-if)# switchport fec
```

**Step 3** Enable the interfaces and return to configuration mode.

**Example:**

```
switch(config-if)# no shutdown
switch(config-if)# exit
```

**Step 4** Select the interfaces fc 4/3 through fc 4/4.

**Example:**

```
switch# configure terminal
switch(config)# interface fc 4/3 - 4
```

**Step 5** Configure the port speed, rate mode, and port mode on the interfaces.

**Example:**

```
switch(config-if)# switchport speed 16000
switch(config-if)# switchport fec
```

**Note** For port that is connected to DWDM devices, when the port speed is set to the default speed of **switchport speed auto**, the port may take some time to switch to the new port speed. Hence, set the port speed explicitly using the **switchport speed {1000 | 2000 | 4000 | 8000 | 10000 | 16000 | 32000}** command for such ports to use the new port speed much faster.

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