Configuring the Eight-Port FXS RJ-21 Module

The Eight-port RJ-21 FXS Module is a high-density analog phone and fax relay interface. By providing service to analog phones and fax machines, the eight Foreign Exchange Station (FXS) ports emulate a Public Switched Telephone Network (PSTN) central office (CO) or private branch exchange (PBX).

This section describes how to configure the eight-port FXS module on the Catalyst 4224. This section contains the following topics:

Eight-Port RJ-21 FXS Module User Interface Conventions

The eight-port Foreign Exchange Station (FXS) module is similar to the two-port FXS analog interface card (VIC-2FXS). Because the eight-port FXS module is located in slot 4, the eight ports are numbered 4/0 to 4/7. The front panel of this module has two rows of four LEDs each. The LEDs numbered 0 through 3 on the left side represent ports 4/0 through 4/3, and the LEDs numbered 4 through 7 on the right side represent ports 4/4 through 4/7.

Configuring FXS Voice Ports

The default values for FXS voice ports are usually adequate but this section includes information on changing the defaults if necessary. This section describes the following procedures:

- Changing Default Configurations, page 7-2
- Validating the Configuration, page 7-4
- Troubleshooting the Configuration, page 7-5

Changing Default Configurations

To configure FXS voice ports, use the following commands in privileged EXEC mode:

Command	Purpose
`configure terminal`	Enters global configuration mode.
`voice-port` *`slot-number/port`*	Identifies the voice slot and port number you want to configure, and entesr voice port configuration mode.
`signal` {**`loop-start`** | **`ground-start`**}	Selects the appropriate signal type for this interface.

Command	Purpose
cptone *country*	Selects the appropriate voice call progress tone for this interface. The default for this command is **us**. For a list of supported countries, refer to the *Voice, Video, and Home Applications Command Reference*.
ring frequency {**25** | **50**}	Selects the appropriate ring frequency (in Hertz) specific to the equipment attached to this voice port.
connection plar *string*	(Optional) Specifies the PLAR[1] connection if this voice port is used for a PLAR connection. The *string* value is any series of digits that specifies the destination E.164 telephone number.
music-threshold *number*	(Optional) Specifies the threshold (in decibels) for music on hold. Valid entries are from –70 to –30.
description *string*	(Optional) Attaches descriptive text about this voice port connection.
comfort-noise	(Optional) Specifies that background noise will be generated.

1. Private line automatic ringdown

For complete information about configuration commands and about configuring LAN and WAN interfaces on your switch, refer to the Cisco IOS configuration guides and command references.

The following example shows how to use the FXS configuration commands:

```
Gateway# conf t

Enter configuration commands, one per line.  End with CNTL/Z.

Gateway(config)# voice-port 4/0
Gateway(config-voiceport)# signal loopStart
Gateway(config-voiceport)# cptone IN
Gateway(config-voiceport)# ring frequency 50
Gateway(config-voiceport)# connection plar 5265761
Gateway(config-voiceport)# music-threshold -50
Gateway(config-voiceport)# description "Connection to PBX"
Gateway(config-voiceport)# comfort-noise
```

To display the values configured, use the **show running-config** command.

Validating the Configuration

To validate your voice port configuration, perform one or both of the following tasks:

- Pick up the handset of a telephony device attached to your IP network and check for a dial tone. The corresponding LED turns green to indicate "off-hook" and "call-in-progress" conditions. If the dial tone stops when you dial a digit, then the voice port is probably configured properly.
- To confirm that the data is configured correctly, use the **show voice port** command as follows:

```
Gateway# sh voice port 4/0

Foreign Exchange Station 4/0 Slot is 4, Port is 0
 Type of VoicePort is FXS
 Operation State is DORMANT
 Administrative State is UP
 No Interface Down Failure
 Description is "Connection to PBX"
 Noise Regeneration is enabled
 Non Linear Processing is enabled
 Music On Hold Threshold is Set to -50 dBm
 In Gain is Set to 0 dB
 Out Attenuation is Set to 0 dB
 Echo Cancellation is enabled
 Echo Cancel Coverage is set to 8 ms
 Playout-delay Mode is set to default
 Playout-delay Nominal is set to 60 ms
 Playout-delay Maximum is set to 200 ms
 Connection Mode is plar
 Connection Number is 5265761
 Initial Time Out is set to 10 s
 Interdigit Time Out is set to 10 s
 Ringing Time Out is set to 180 s
 Companding Type is u-law
 Region Tone is set for IN
Analog Info Follows:
 Currently processing none
 Maintenance Mode Set to None (not in mtc mode)
 Number of signaling protocol errors are 0
 Impedance is set to 600r Ohm
 Wait Release Time Out is 30 s
 Station name None, Station number None
Voice card specific Info Follows:
 Signal Type is loopStart
```

```
Ring Frequency is 50 Hz
Hook Status is On Hook
Ring Active Status is inactive
Ring Ground Status is inactive
Tip Ground Status is inactive
Digit Duration Timing is set to 100 ms
InterDigit Duration Timing is set to 100 ms
Ring Cadence is defined by CPTone Selection
Ring Cadence are [4 2] [4 20] * 100 msec
```

Troubleshooting the Configuration

If you are having trouble placing a call and you suspect the problem is associated with the voice port configuration, you might be able to resolve the problem by performing one or more of the following tasks:

- Ping the associated IP address to confirm connectivity, as follows:

```
Gateway# ping 172.20.59.93

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.20.59.93, timeout is 2
seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4
ms
```

  If you cannot successfully ping your destination, refer to the *Network Protocols Configuration Guide, Part 1*.

- Use the **show voice port** command to ensure that the port is enabled (administrative state is UP), as follows:

```
Gateway# sh voice port 4/0

Operation State is DORMANT
Administrative State is UP
```

  If the port state is DOWN, as in the following display, use the **no shutdown** command to enable the port. (See the "Activating the Voice Port" section on page 7-8.)

```
Operation State is DOWN
Administrative State is DOWN
```

Fine-Tuning FXS Voice Ports

Depending on the specifics of your particular network, you might need to fine-tune the FXS voice port settings. Under most circumstances, the default values will suffice; however, if you need to change them, use the following commands in privileged EXEC mode.

Command	Purpose
configure terminal	Enters global configuration mode.
voice-port *slot_number/port*	Identifies the voice slot and port number you want to configure, and enters voice port configuration mode.
input gain *value*	Specifies (in decibels) the amount of gain to be inserted at the receiver side of the interface. Acceptable values are from –6 to 14.
output attenuation *value*	Specifies (in decibels) the amount of attenuation at the transmit side of the interface. Acceptable values are from 0 to 14.
echo-cancel enable	Enables echo-cancellation of voice that is sent out through the interface and received back on the same interface.
echo-cancel coverage *value*	Adjusts the size (in milliseconds) of the echo-cancel. Acceptable value is 8.
impedance *value*	Specifies the impedance of the port. The functional values are 600r (the default) and complex2 (an 820 ohm in series with (220 ohm | 120 nF)).
non-linear	Enables nonlinear processing, which shuts off any signal if no near-end speech is detected. (Nonlinear processing is used with echo-cancellation.)
timeouts initial *seconds*	Specifies the number of seconds that the system will wait for the caller to enter the first digit of the digits to be dialed. Valid entries are from 0 to 120.
timeouts interdigit *seconds*	Specifies the number of seconds the system will wait (after the caller has entered the initial digit) for the caller to enter a subsequent digit. Valid entries are from 0 to 120.

Command	Purpose
timing digit *milliseconds*	If the voice port dial type is dual tone multifrequency (DTMF), configures the duration (in milliseconds) of the DTMF digit signal. The range of the duration is from 50 to 100; the default is 100.
timing inter-digit *milliseconds*	If the voice port dial type is DTMF, configures the duration (in milliseconds) of the DTMF interdigit signal. The range of the duration is from 50 to 500; the default is 100.

For complete information about configuration commands and about configuring LAN and WAN interfaces on your switch, refer to the Cisco IOS configuration guides and command references.

The following example shows how to use the fine-tune FXS commands:

```
Gateway# conf t

Enter configuration commands, one per line.  End with CNTL/Z.

Gateway(config)# voice-port 4/0
Gateway(config-voiceport)# input gain 10
Gateway(config-voiceport)# output attenuation 10
Gateway(config-voiceport)# echo-cancel enable
Gateway(config-voiceport)# echo-cancel coverage 8
Gateway(config-voiceport)# non-linear
Gateway(config-voiceport)# timeouts initial 10
Gateway(config-voiceport)# timeouts interdigit 10
Gateway(config-voiceport)# timing digit 60
Gateway(config-voiceport)# timing inter-digit 60
```

To display the values configured, use the **show running-config** command, as follows:

```
Gateway# sh running-config
!
voice-port 4/0
input gain 10
output attenuation 10
echo-cancel coverage 8
timeouts initial 10
timeouts interdigits 10
timing digit 60
timing inter-digit 60
!
```

Activating the Voice Port

By default, configured voice ports are active. However, if you need to activate a port because it has been shut down explicitly, use the **no shutdown** command, as follows:

```
Gateway# conf t

Enter configuration commands, one per line.  End with CNTL/Z.

Gateway(config)# voice-port 4/0
Gateway(config-voiceport)# no shutdown
Gateway(config-voiceport)#
00:55:53:%LINK-3-UPDOWN:Interface Foreign Exchange Station 4/0,
changed state to up
```

To deactivate a port, use the **shutdown** command, as follows:

```
Gateway# conf t

Enter configuration commands, one per line.  End with CNTL/Z.

Gateway(config)# voice-port 4/0
Gateway(config-voiceport)# shutdown
Gateway(config-voiceport)#
00:55:23:%LINK-3-UPDOWN:Interface Foreign Exchange Station 4/0,
changed state to Administrative Shutdown
```

Sample Configuration

This section provides a sample configuration for sending a fax or a call from the Cisco 2610 (a voice-enabled router) to the eight-port FXS module on a Catalyst 4224, and vice versa.

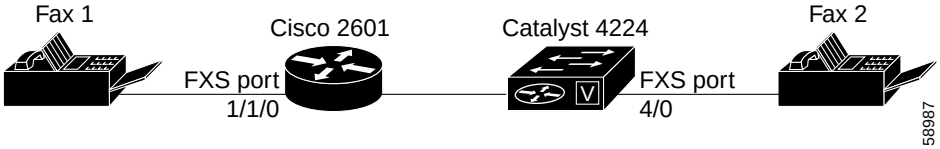
Note You can substitute any voice-enabled router for the Cisco 2610 and any Fast Ethernet interface connected to an IP network.

In the sample configuration illustrated in Figure 7-1, Fax1 is connected through an FXS port to the Cisco 2610 router. The router is connected through Fast Ethernet to the eight-port FXS module, which is connected through an FXS port to Fax2.

This section includes the following configuration-related samples:

- Cisco 2600 Sample Configuration, page 7-10
- FXS Module Sample Configuration, page 7-10
- Displaying Cisco 2600 Configuration Values, page 7-11
- Displaying FXS Module Configuration Values, page 7-12

Figure 7-1 Configuration for Connecting Faxs through Catalyst 4224



The following template can be used to implement this configuration:

Dial-Peer Tag[1]	Destination Pattern[2]	Type	Voice Port	Session Target[3]	codec
For Cisco 2610					
1	10	POTS	1/1/0	—	G.711 (default)
2	20	VoIP	—	172.20.59.93	G.729 (default)
For Eight-Port RJ-21 FXS Module					
1	20	POTS	4/0	—	G.711 (default)
2	10	VoIP	—	172.20.59.61	G.729 (default)

1. Assigns a unique number (1, 2,...) to a dial peer. Has only local significance.
2. Assigns phone numbers to dial peers. The router directs voice calls based on these patterns.

3. Identifies the remote end of the VoIP call, which can be specified using an IP address (as shown in the configuration) or a DNS name.

Cisco 2600 Sample Configuration

Using the configuration template shown, you could configure the Cisco 2600 as follows:

```
>[Configure the fast ethernet interface]
>2600# conf t

>Enter configuration commands, one per line.  End with CNTL/Z.

>2600(config)# interface FastEthernet0/0
>2600(config-if)# ip address 172.20.59.61 255.255.255.0
>
>[Configure the POTS call leg, as shown in the template above]
>2600(config-if)# dial-peer voice 1 pots
>2600(config-dial-peer)# destination-pattern 10
>2600(config-dial-peer)# port 1/1/0
>
>[Configure the VOIP call leg, as shown in the template above]
>2600(config-dial-peer)# dial-peer voice 2 voip
>2600(config-dial-peer)# destination-pattern 20
>2600(config-dial-peer)# session target ipv4:172.20.59.93
```

FXS Module Sample Configuration

Similarly, the eight-Port RJ-21 FXS module could be configured as follows:

```
>[Configure the fast ethernet interface]
>Gateway# conf t
>
>Enter configuration commands, one per line.  End with CNTL/Z.
>
>Gateway(config)# interface FastEthernet5/0
>Gateway(config-if)# ip address 172.20.59.93 255.255.0.0
>
>[Configure the POTS call leg as shown in the template above]
>Gateway(config-if)# dial-peer voice 1 pots
>Gateway(config-dial-peer)# destination-pattern 20
>Gateway(config-dial-peer)# port 4/0
>
>[Configure the VOIP call leg, as shown in the template above]
```

```
>Gateway(config-dial-peer)# dial-peer voice 2 voip
>Gateway(config-dial-peer)# destination-pattern 10
>Gateway(config-dial-peer)# session target ipv4:172.20.59.61
```

At this point, you should be able to send a fax or phone call from the Cisco 2600 to the FXS module, and vice versa.

Displaying Cisco 2600 Configuration Values

To display the values configured on the Cisco 2600, use the **show running-config** command, as follows:

```
>2600# sh running-config
>Building configuration...
>
>Current configuration :951 bytes
>!
>version 12.1
>no service single-slot-reload-enable
>service timestamps debug uptime
>service timestamps log uptime
>no service password-encryption
>!
>hostname 2600
>!
>no logging buffered
>no logging buffered
>logging rate-limit console 10 except errors
>!
>ip subnet-zero
>no ip finger
>!
>frame-relay switching
>no mgcp timer receive-rtcp
>!
>interface FastEthernet0/0
> ip address 172.20.59.61 255.255.255.0
> duplex auto
> speed auto
>!
>interface FastEthernet0/1
> ip address 192.100.1.156 255.255.255.0
> shutdown
> duplex auto
> speed auto
>!
```

```
>ip classless
>ip route 8.1.1.0 255.255.255.0 30.1.1.1
>no ip http server
>!
>snmp-server packetsize 4096
>call rsvp-sync
>!
>voice-port 1/1/0
>!
>voice-port 1/1/1
>!
>dial-peer cor custom
>!
>dial-peer voice 1 pots
> destination-pattern 10
> port 1/1/0
>!
>dial-peer voice 2 voip
> destination-pattern 20
> session target ipv4:172.20.59.93
>!
>line con 0
> transport input none
>line aux 0
>line vty 0 4
> login
>!
>end
```

Displaying FXS Module Configuration Values

To display the values configured on the eight-Port RJ-21 FXS module, use the **show running-config** command, as follows:

```
>--------------------
>Gateway# sh running-config
>Building configuration...
>
>Current configuration :1062 bytes
>!
>version 12.1
>no service single-slot-reload-enable
>no service pad
>service timestamps debug uptime
>service timestamps log uptime
```

```
>no service password-encryption
>!
>hostname Gateway
>!
>no logging buffered
>no logging buffered
>logging rate-limit console 10 except errors
>!
>ip subnet-zero
>no ip finger
>!
>ip audit notify log
>ip audit po max-events 100
>!
>voicecard mode toll-by-pass
>!
>interface FastEthernet0/0
> ip address 172.20.59.93 255.255.0.0
> duplex auto
> speed auto
>!
>interface GigabitEthernet0/0
> ip address 1.1.1.1 255.255.255.0
> no negotiation auto
>!
>ip default-gateway 172.20.59.1
>ip classless
>no ip http server
>!
>call rsvp-sync
>!
>voice-port 3/0
>!
>voice-port 3/1
>!
>voice-port 4/0
>!
>voice-port 4/1
>!
>voice-port 4/2
>!
>voice-port 4/3
>!
>voice-port 4/4
>!
>voice-port 4/5
>!
>voice-port 4/6
```

```
>!
>voice-port 4/7
>!
>dial-peer voice 1 pots
> destination-pattern 20
> port 4/0
>!
>dial-peer voice 2 voip
> destination-pattern 10
> session target ipv4:172.20.59.61
>!
>gatekeeper
> shutdown
>!
>line con 0
> exec-timeout 0 0
> transport input none
>line vty 0 4
> login
>!
>end
```