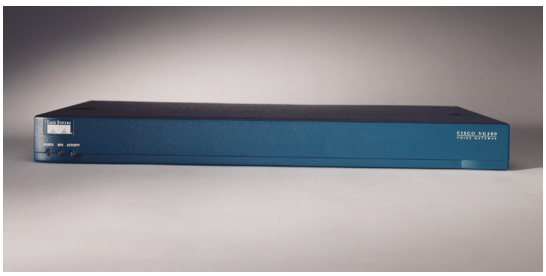
Cisco VG200:
Cisco IP Telephony Voice Gateway

NOTE: The VG200 is designed and validated strictly for Cisco AVVID CallManager environments only. It is not intended, tested or supported for applications such as H.323 toll bypass or as a SIP GW.

The Cisco VG200 Voice-over-IP (VoIP) Gateway is a next-generation voice-conversion device that provides powerful interoperability and advanced features in an affordable package— taking advantage of Cisco AVVID (Architecture for Voice, Video and Integrated Data). It is used to connect a Cisco IP Telephony Solutions network to traditional telephone trunks or analog devices. These telephone trunks may be connected to the Public Switched Telephone Network (PSTN) or existing private branch exchange (PBX) systems. Analog devices include legacy telephones, fax machines, and voice conference units. On the user side, the Cisco VG200 provides an auto-sensing 10/100 Ethernet port. Internally, the Cisco VG200 is equipped with digital signal processors (DSPs) that convert analog and digital voice into IP packets for transport through the IP network using standard coders/decoders (codecs), including G.711, G.723.1, G.729(a), and others.



Cisco VG200 VoIP gateways provide a cost-effective solution to meet new-generation telephony needs for:

- PBX and PSTN connectivity
- Analog and digital voice services
- Voice-mail connectivity to legacy voice-mail systems
- Transcoding services between different codecs
- Conferencing services

The Cisco VG200 VoIP Gateway modular architecture based on Cisco AVVID enables administrators to upgrade interfaces to accommodate expansion or changes in technology as new services and applications are deployed. The Cisco VG200 Gateway is managed, controlled, and administered using the Cisco CallManager, but can also be accessed directly using the same command-line interface (CLI) as other Cisco IOS® Software-based products.

Key Features and Benefits

The Cisco VG200 hardened chassis contains open slots for installation of various combinations of analog or digital voice interface cards (VICs). This gateway allows businesses to extend cost-effective, seamless network infrastructures to branch offices or small and midsized offices.

The Cisco VG200 Voice Gateway provides the following benefits:

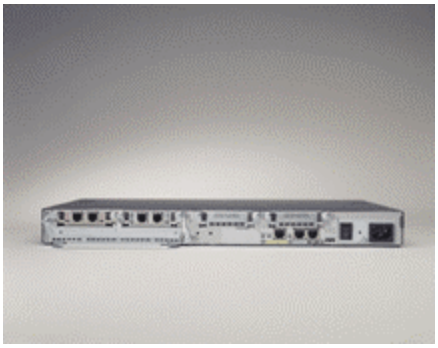
- *Investment protection*—An integrated component of Cisco AVVID, the Cisco VG200 offers a modular design with support for the same range of interfaces in voice-enabled Cisco 2600, 3600, and 3700 routers and gateways. Customers can easily replace these field-upgradable modules.
- L*ower cost of ownership*—The Cisco VG200 communicates with the Cisco CallManager using the Media Gateway Control Protocol (MGCP) or H.323 Version 2. It allows connectivity between a Cisco CallManager-based IP telephony system and legacy telephony equipment such as the PSTN, private branch exchanges (PBXs), and voice-mail systems. The Cisco VG200 provides a space-saving solution that can be managed remotely using network management applications such as CiscoWorks.
- *Reliable*—The Cisco VG200 uses proven hardware and Cisco IOS Software and can be managed with Simple Network Management Protocol (SNMP) and Telnet access.

Cisco VG200 Product Description

The Cisco VG200 allows customers to connect Cisco IP telephony solution products such as IP phones to the PSTN or to a PBX. Analog telephones or fax machines can also be connected. The compact unit consists of the Cisco VG200 chassis, a network module (NM) that provides processing and digital signal processor (DSP) resources, and VICs and/or VWICs, which provide the physical voice interfaces.

A typical configuration includes a NM-2V network module and two VICs. These VICs can be any combination of foreign exchange station (FXS), foreign exchange office (FXO), ear and mouth (E&M), or Basic Rate Interface (BRI) (both user and network sides) for a total of four channels.

In another common configuration of the Cisco VG200, the digital T1/E1 packet voice trunk network module is used. The module can support up to 60 voice channels (two E1 interfaces in a single network module). This packet voice trunk module supports both on- and off-premise connections to PBXs and PSTNs.

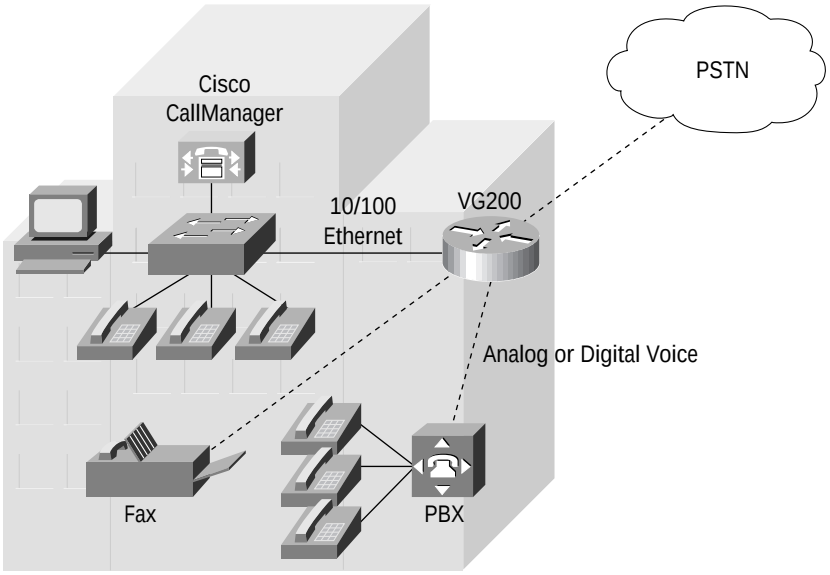


Cisco VG200 Application Description

The Cisco telephony solution is part of Cisco AVVID and provides a full-featured telephony system running on an IP network. Various IP telephony devices, including IP phones and IP telephony clients and gateways, communicate seamlessly over IP infrastructures under the control of one or more Cisco CallManagers. This solution rewards users with greatly reduced cost of ownership and new IP-based feature capabilities.

The Cisco VG200 gateways allow users to make and receive calls outside the IP network by providing the interfaces to the PSTN and PBX systems via traditional telephony interfaces (see Figure 1). The Cisco VG200 VoIP gateway differs from competitor’s products because of the modular design, which supports the industry's broadest combinations of FXS, FXO, E&M, BRI, T1, and E1 interfaces.

Figure 1 Cisco VG200 Application



The Cisco VG200 can be equipped with either analog ports such as FXS, FXO, or E&M, or digital interfaces such as BRI, T1, or E1 interfaces. Analog interfaces support loop start and ground start. For E&M signaling, the Cisco VG200 supports Types I, II, III, and V interfaces. Digital interfaces support both the user and network sides. In addition, the Cisco VG200 supports T1 channel-associated signaling (CAS), T1 CAS Feature Group D (FGD), and E1 CAS R2.

In typical applications, the Cisco VG200 operates as an H.323 Version 2 VoIP gateway and communicates as an intelligent gateway device with the Cisco CallManager. The following features are supported in H.323 mode:

- ISDN Primary Rate Interface (PRI) (T1/E1): Both user and network sides
- ISDN BRI: Both user and network sides
- T1 CAS FGD
- E1 CAS R2
- Interface Type E&M
- Caller ID for FXO/FXS
- Analog direct inward dial (DID)

The Cisco VG200 can also operate as an MGCP gateway under control of the Cisco CallManager. The following interface types are supported in MGCP mode:

- VIC FXS
- VIC FXO
- T1/E1 PRI
- T1 CAS
- T1/E1 QSIG (CCM 3.3 required)
- Caller ID for FXS
- Analog direct inward dial (DID)

When operating in this mode, the Cisco VG200 becomes a stateless client to the Cisco CallManager, giving it full control for enhanced management and calling features. In either case (H.323 Version 2 or MGCP), the Cisco VG200 communicates directly with the Cisco CallManager, allowing for the implementation of supplementary services such as hold, transfer, and forward.

Transcoding Services

In any IP telephony environment, different IP telephony devices support different codecs, depending on bandwidth availability. Transcoding is required to enable communications between these disparate devices. The DSP farm module provides hardware-based transcoding for the branch office or small office. Transcoding services are provided as described in Table 1.

Table 1 Transcoding Services

From Codec	To Codec
G.729a (Annex B)	G.711 mu-law
G.729a (Annex B)	G.711 a-law
G.711 mu-law	**G.729a (Annex B)**
G.711 a-law	**G.729a (Annex B)**

Note: 10,20,and 30 msec packetizations are supported

Audio Conferencing Services

Unlike traditional PBXs, IP phones send their voice data directly between phones, and, therefore, a network-based conference bridge is required to facilitate multiparty conferences. The DSP farm module provides hardware-based meet-me and ad-hoc audio conferencing for the branch or small office.

Transcoding/Conferencing Capacities

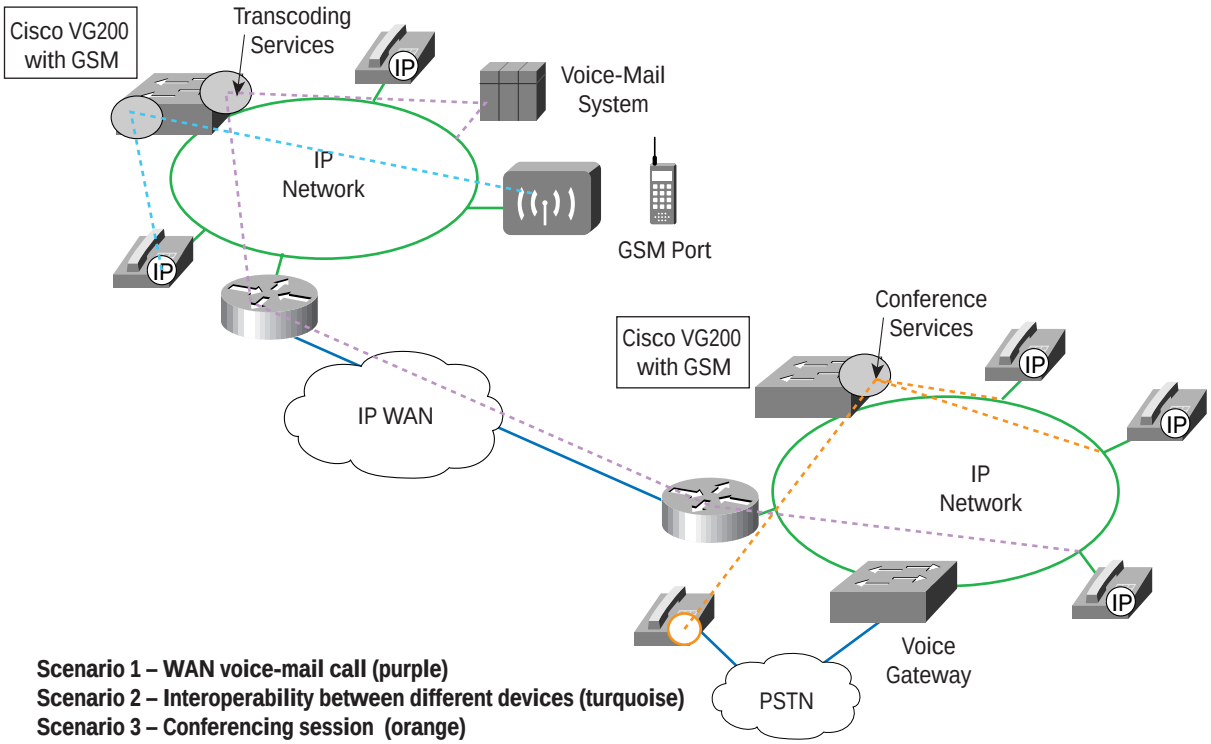
The Cisco VG200 can provide transcoding and conferencing services for branch offices by adding a DSP farm module. The DSP farm module is equipped with one to five DSP single in-line memory modules (SIMMs). Each SIMM contains three DSPs. Each DSP can support either 4 transcoding sessions or 1 conference call containing up to six parties. The maximum number of transcoding sessions supported by a five-SIMM configuration is 60 transcoding sessions. The maximum number of conference calls supported by a five-SIMM configuration is 15 conference calls.

Note: When the Cisco VG200 is configured to act as a DSP transcoding/conferencing farm, it cannot provide analog or digital trunk services.

Figure 2 shows the applications for the Cisco VG200 DSP Farm Module. In Scenario 1, the caller is directed over a WAN connection to a remotely hosted voice-mail system. The Virtual Switch Manager (VSM) provides the transcoding services to convert the G.729 connection from the WAN into a G.711 connection required by the voice-mail system. In Scenario 2, a Global System for Mobile Communications (GSM) caller calls a G.711-connected Cisco IP Phone and the Cisco VG200 VSM provides transcoding from GSMFR to G.711. In Scenario 3, a Cisco IP Phone allows an outside caller with another Cisco IP Phone to call in for a conference call.

Note: As of 12.2(13)T, the NM-HDV cards will be able to concurrently support both voice gateway functionality (termination) as well as transcoding/conferencing capacities.

Figure 2 Applications for the Cisco VG200 DSP Farm Module



Survivability of Transcoding/Conferencing Services

The Cisco VG200 DSP Farm uses Skinny Gateway Protocol with extensions for survivability and is designed to switch over to a secondary Cisco CallManager if the primary Cisco CallManager fails. This switchover occurs without the loss of any existing conferences or transcoding sessions. When the primary Cisco CallManager is restored to service, it resumes control of the Cisco VG200 DSP Farm after a predetermined guard time has been achieved. This feature requires Cisco CallManager 3.1.

When deployed in a network, the Cisco VG200 VoIP Gateway can be placed in a standard equipment rack used for routers and other network equipment. When multiple Cisco VG200 gateways are needed, they can be treated as separate gateways or aggregated together as a common channel pool.

Simple Installation, Configuration, and Management

- Installs in any standard equipment rack—only 1.69 inches high, less than one rack unit (RU).

Modular Design

- Supports mix-and-match analog interface types

- Supports the same voice interfaces as the Cisco 2600, 3600, and 3700 series router families
- Offers field upgradability from analog to digital voice interfaces as system size grows

Broad Interface Support

- FXO and FXS supports both loop-start and ground-start trunk types
- Supports E&M Types I, II, III, and V
- Supports ISDN BRI on both network and user sides
- Supports ISDN PRI on both network and user sides
- Supports digital T1 CAS
- Supports E1 CAS
- Supports T1/E1 MGCP QSIG backhaul
- Supports auto-sensing 10/100-Mbps Ethernet interface
- Offers high reliability with its hardened, proven, router-based hardware

Advanced Management Capability

- Features standard setup and configuration using familiar Cisco IOS commands
- Provides direct serial connection or remote Telnet access to the CLI
- Configuration is stored in nonvolatile memory
- Offers direct SNMP support

Standards-Based Software

- Supports dual voice signaling modes MGCP or H.323 (provisionable)

T1/E1 PRI Backhaul for MGCP and MGCP T1-CAS

IOS Release 12.2(11)T provides T1/E1 PRI backhaul as well as Switchover support for MGCP T1-CAS when used with Cisco CallManager Release 3.1.

T1/E1 QSIG Backhaul for MGCP

T1/E1 QSIG backhaul with MGCP is also supported with 12.2(11)T when used with CCM release 3.3.

Centralized Configuration

The Cisco VG200 supports centralized configuration via Cisco CallManager 3.1 software. This setup allows the Cisco CallManager administrator to configure the settings for the VG200 locally and download the configuration to a remote VG200 using Extended Markup Language (XML), thereby eliminating the need to locally connect each Cisco VG200 in the CallManager network.

Remote Survivability

When the Cisco VG200 is located in a remote site behind an SRST-enabled (Survivable Remote Site Telephony) WAN router, and configured to operate as an MGCP gateway, it will revert to operating as an H.323 gateway when the WAN connection fails between the VG200 and the Cisco CallManager. This scenario allows the SRST-enabled WAN router to go into SRST mode and use the Cisco VG200 as a gateway for the duration of the failure. In addition, it allows IP phones at the remote location to make outgoing calls using the Cisco VG200 during the duration of the WAN connection failure.

Note: SRST is not supported on the VG200 natively. It can only assist an SRST-enabled gatewayas described above.

Multicast Music-on-Hold Support

The Cisco VG200 supports MCS server-based multicast music-on-hold to allow a single music source to be applied to calls held either on-net or off-net on the VG200. This applies for calls on the H.323 or MGCP signalling plane.

Enterprise-Wide Common Architecture

The Cisco VG200 can be part of an enterprise-wide strategy for standard components in a VoIP network:

- Homologated for use in most countries around the world
- Interchangeable NM and VIC with Cisco 2600, 3600 and 3700 routers
- Common CLI with Cisco IOS routers

Note: NM-HDAis not supported)

Technical Specifications

The Cisco VG200 Voice Gateway conforms to numerous safety, EMI, immunity, and network homologation standards. Details of the regulatory specifications can be found on the Web at www.cisco.com/univercd/cc/td/doc/product/voice/c_access/vg_200/vg2rcsi.htm

Memory for 12.2(13)T and beyond

- System memory (DRAM): 64MB
- Flash memory: One SIMM slot supporting 16MB

Software

- Cisco IOS Software standard

Codecs Supported

- G.711 PCM (64 K)
- G.726 ADPCM (32K, 24K, 16K)
- G.728 LD-CELP (16 K)
- G.729 CS-ACELP (8 K)
- G.729 (A, B, AB) CS-ACELP (8 K)
- G.723.1 (A) MP-MLQ (6.3 K), ACELP (5.3 K)

Dimensions and Weight

- H x W x D: 1.69 x 17.5 x 11.8 in. (4.3 x 44.5 x 30 cm)
- Average shipping: Minimum 8.85 lb (4.02 kg); maximum 10.25 lb (4.66 kg)

Power and Temperature

- Power dissipation: 72W (maximum)
- AC input voltage: 100 to 240 VAC
- AC input current: 1.5A
- Frequency: 47 to 64 Hz
- Operating temperature range: 32 to 104 F (0 to 40 C)
- Nonoperating temperature range: –13 to 158 F (–25 to 70 C)
- Operating humidity 5% to 95% noncondensing
- Noise level (min./max.): 38/42 dbA
- Regulatory compliance FCC Part 15 Class B; for additional compliance information, refer to Cisco VG200 Series Public Network Certification document

Options

- Power cable

- LAN cable
- Auxiliary and console cables
- 19-inch rack-mount brackets
- Configuration documentation
- Reference documentation (CD-ROM)

Ordering Information

Table 2 shows part numbers, descriptions and Cisco IOS Software Release versions for the Cisco VG200 and modules.

Table 2 Part Numbers and Cisco IOS Software Releases for the Cisco VG200 VoIP Gateway Products—Chassis

VoIP Voice Gateway	Cisco VG200
Voice/Fax NMs (shared with the Cisco 2600 and 3600 Series [order one per Cisco VG200 chassis])	
One-Slot Voice/Fax NM	NM-1V
Two-Slot Voice/Fax NM	NM-2V
Voice/Fax Interface Cards (shared with the Cisco 2600 and 3600 Series [order one per available NM slot])	
Two-Port FXS Voice/Fax Interface Card	VIC-2FXS
Two-Port DID Voice/Fax Interface Card	VIC-2DID
Two-Port E&M Voice/Fax Interface Card	VIC-2E/M
Two-Port FXO Voice/Fax Interface Card (also see VIC-2FXO-M1)	VIC-2FXO
Two-Port FXO Voice/Fax Interface Card (for Europe) (also see VIC-2FXO-M2)	VIC-2FXO-EU
Two-Port FXO Voice/Fax Interface Card with Battery Reversal Detection and Caller ID Support (for U.S., Canada, and others) (enhanced version of the VIC-2FXO)	VIC-2FXO-M1
Two-Port FXO Voice/Fax Interface with Battery Reversal Detection and Caller ID Support (for Europe) (enhanced version of the VIC-2FXO-EU)	VIC-2FXO-M2

VoIP Voice Gateway	Cisco VG200
Two-Port FXO Voice/Fax Interface Card (for Australia)	VIC-2FXO-M3
Two-Port BRI Voice/Fax Interface Card (terminal side)	VIC-2BRI-S/T-TE
Two-Port BRI Voice/Fax Interface Card (network and terminal sides)	VIC-2BRI-NT/TE
T1/E1 Modules (shared with the Cisco 2600 and 3600 Series [order one per Cisco VG200 chassis])	
Single-Port 24-Channel T1 Voice/Fax Network Module	NM-HDV-1T1-24
Single-Port Enhanced 24-Channel T1 Voice/Fax Network Module	NM-HDV-1T1-24E
Dual-Port 48-Channel T1 Voice/Fax Network Module	NM-HDV-2T1-48
Single-Port 30-Channel E1 Voice/Fax Network Module	NM-HDV-1E1-30
Single-Port Enhanced 30-Channel E1 Voice/Fax Network Module	NM-HDV-1E1-30E
Dual-Port 60-Channel E1 Voice/Fax Network Module	NM-HDV-2E1-60
HDV Voice Service DSP Farm (maximum one per Cisco VG200 chassis)	
HDV Transcoding/Conferencing DSP Farm Equipped with Two DSP SIMMs	NM-HDV-FARM-C36
HDV Transcoding/Conferencing DSP Farm Equipped with Three DSP SIMMs	NM-HDV-FARM-C54
HDV Transcoding/Conferencing DSP Farm Equipped with Five DSP SIMMs	NM-HDV-FARM-C90
Cisco IOS VG200 Releases	
Cisco IOS VG200 Release to Support Analog and Digital Trunking Only	12105XM
Cisco IOS VG200 Release to Support Analog Trunking, Digital, Trunking, PRI backhaul, MGCP T1-CAS, Centralized Configuration, Remote Survivability, and Multicast Music-on-Hold.	12202XN Requires CallManager Release 3.1.
Cisco IOS VG200 Release to Support Transcoding/Conferencing DSP Farm Only	12105YH

Voice Card Specifications

Network Modules

NM-1V	One-slot voice/fax NM
Cisco IOS Requirement	12.1(3)T
Cisco Part Number	NM-1V
FCC Specifications	FCC Class B device
Spare	NM-1V
Mean Time between Failures (MTBF)	946,423 hours

Requires One VIC	VIC-2FXS VIC-2E/M VIC-2FXO VIC-2FXO-EU VIC-2FXO-M1 VIC-2FXO-M2 VIC-2FXO-M3 VIC-2BRI-S/T-TE VIC-2BRI-NT/TE

NM-2V	Two-slot voice/fax NM

Cisco IOS Requirement	12.1(3)T
Cisco Part Number	NM-2V
FCC Specifications	FCC Class B device
Spare	NM-2V
Mean Time between Failures (MTBF)	755,717 hours
Requires at least one VIC (maximum of two)	VIC-2FXS VIC-2E/M VIC-2FXO VIC-2FXO-EU VIC-2FXO-M1 VIC-2FXO-M2 VIC-2FXO-M3 VIC-2BRI-S/T-TE VIC-2BRI-NT/TE

NM-HDV-1T1-24	One-port, 24-channel T1 voice/fax Network Module
Interface Type	Channelized T1
Cisco IOS Requirement	12.1(3)T
Voice Ports	24 channels of low-complexity codecs and 12 channels of high-complexity codecs
Cisco Part Number	NM-HDV-1T1-24
FCC Specifications	FCC Part 68, FCC Part 15 Class B, T1, CS-03, T1, CSA C108.8 Class A, T1, VCCI Class 2, VCCI:V-3/97.04, T1, JATE green book
Safety Conformance	UL 1950, CSA 950, IEC950
Spare	NM-HDV-1T1-24
Telco Standards	AT &T Accunet (62411), ATT 54016
Line Bit Rate	T1, 1.544 Mbps
Line code	AMI, B8ZS (T1)
Framing Format	D4 (SF) and ESF
Output Level (LBO)	0, -7.5, or –15dB
Input Level	+1dB0 down to –24dB0
Line Frequency	1.544 Mbps +/= 75bps/32PPM
DTE/DCE Interface (VIC Mode)	G.704/structured
Diagnostic Loopback Support	ANSI T1.403 Annex B/V.54 loopup/down code recognition, network loopback, and user-initiated loopbacks, network payload loopback, local DTE loopback, remote line (codes: V.541, loop up, and loop down)

Alarm detection	Alarm indication signal (AIS), remote alarm, far-end block error (FEBE), out of frame (OOF), cyclic redundancy check (CRC) multiframe OOF, signaling multiframe OOF, frame errors, CRC errors, loss of network signal (red alarm), loss of network frame, receive (blue alarm) (AIS) from network, receive (yellow) from network Performance Reports / Error Counters CRC, errored seconds, burst-errored seconds, severely errored seconds, Ft and Fs framing errors for SF framing, FPS framing errors for ESF framing, 24-hour history stored in 15-minute increments
LED Indicators	Data carrier detect (CD), Loopback (LP), Alarm (AL), Voice DSP processing status
Physical Interface Standards	T1 ANSI, ATT T1.1, ANSI T1.403
Physical Connector	RJ-48
Number of Connectors/Ports	One
Environmental	Operating Temperature: 32 to 104 F (0 to 40º C) Storage Temperature: -13 to 158 F (-25 to +70º C) Relative Humidity: 5 to 85% non-condensing operating, 5 to 95% non-condensing, non-operating
MTBF:	81,087 to 467,253 hours

NM-HDV-1T1-24E	One-port, enhanced 24-channel T1 voice/fax Network Module
Interface Type	Channelized T1
Cisco IOS Requirement	12.1(3)T
Voice Ports	24 channels of both high- and medium-complexity codecs
Cisco Part Number	NM-HDV-1T1-24E
FCC Specifications	FCC Part 68, FCC Part 15 Class B, T1, CS-03, T1, CSA C108.8 Class A, T1, VCCI Class 2, VCCI:V-3/97.04, T1, JATE green book
Safety Conformance	UL 1950, CSA 950, IEC950
Spare	NM-HDV-1T1-24E
Telco Standards	AT &T Accunet (62411), ATT 54016
Line Bit Rate	T1, 1.544Mbps
Line code	AMI, B8ZS (T1)
Framing Format	D4 (SF) and ESF
Output Level (LBO)	0, –7.5, or –15dB
Input Level	+1dB0 down to –24dB0
Line Frequency	1.544 Mbps +/= 75bps/32PPM
DTE/DCE Interface (VIC Mode)	G.704/structured
Diagnostic Loopback	Same as NM-HDV-1T1-24
Alarm detection	Same as NM-HDV-1T1-24

LED Indicators	Data carrier detect (CD), Loopback (LP), Alarm (AL), Voice DSP processing status
Physical Interface Standards	T1 ANSI, ATT T1.1, ANSI T1.403
Physical Connector	RJ-48
Number of Connectors/ Ports	One
Environmental	Operating Temperature: 32 to 104 F (0 to 40º C) Storage Temperature: –13 to 158 F (–25 to +70º C) Relative Humidity: 5 to 85% non-condensing operating, 5 to 95% non-condensing, non-operating
MTBF	381,087 to 467,253 hour

NM-HDV-2T1-48	Two-port, 48-channel T1 voice/fax Network Module
Interface Type	Channelized T1
Cisco IOS Requirement	12.1(3)T
Voice Ports	48 channels of medium complexity and 24 channels of high complexity codecs
Cisco Part Number	NM-HDV-2T1-48
FCC Specifications	FCC Part 68, FCC Part 15 Class B, T1, CS-03, T1, CSA C108.8 Class A, T1, VCCI Class 2, VCCI:V-3/97.04, T1, JATE green book
Safety Conformance	UL 1950, CSA 950, IEC950

Spare	NM-HDV-2T1-48
Telco Standards	AT &T Accunet (62411), ATT 54016
Line Bit Rate	T1, 1.544 Mbps
Line code	AMI, B8ZS (T1)
Framing Format	D4 (SF) and ESF
Output Level (LBO)	0, -7.5, or –15dB
Input Level	+1dB0 down to –24dB0
Line Frequency	1.544 Mbps +/= 75bps/32PPM
DTE/DCE Int. (VIC)	G.704/structured
Diagnostic Loopback	Same as NM-HDV-1T1-24
Alarm detection	Same as NM-HDV-1T1-24
LED Indicators	Data carrier detect (CD), Loopback (LP), Alarm (AL), Voice DSP processing status
Physical Interface Standards	T1 ANSI, ATT T1.1, ANSI T1.403
Physical Connector	RJ-48
Number of Connectors/ Ports	Two
Environmental	Operating Temperature: 32 to 104 F (0 to 40º C) Storage Temperature: 13 to 158 F (-25 to +70º C) (-) Relative Humidity: 5 to 85% non-condensing operating, 5 to 95% non-condensing, non-operating
MTBF	366,394 to 445,354 hours

NM-HDV-1E1-30	One-port, 30-channel E1 voice/fax Network Module
Interface Type	Channelized E1
Cisco IOS Requirement	12.1(5)XM1
Voice Ports	30 channels of low complexity codecs and 18 channels of high complexity codecs
Cisco Part Number	NM-HDV-1E1-30

FCC Specifications	EMC: EN55022, EN50082, EN61000, AS/NZS 3548, CISPR22 Telecom: CTR13/CTR12, TS016, DLCN1/DLCN2, TNA 117
Safety Conformance	EN60950, AS/NZS 3260
Spare	NM-HDV-1E1-30
Telco Standards	AT &T Accunet (62411), ATT 54016
Line Bit Rate	E1, 2.048 Mbps
Line code	HDB3
Framing Format	D4 (SF) and ESF
Output Level (LBO)	0, –7.5, or –15dB
Input Level	+1dB0 down to –24dB0
Line Frequency	2.048 Mbps +/= 75bps/32PPM
DTE/DCE Interface (VIC Mode)	G.704/structured
Diagnostic Loopback	Same as NM-HDV-1T1-24
Alarm detection	Same as NM-HDV-1T1-24
LED Indicators	Data carrier detect (CD), Loopback (LP), Alarm (AL), Voice DSP processing status
Physical Interface Standards	
Physical Connector	RJ-48
Number of Connectors/ Ports	One
Environmental	Operating Temperature: 32 to 104 F (0 to 40º C) Storage Temperature: –13 to 158 F (–25 to +70º C) Relative Humidity: 5 to 85% non-condensing operating, 5 to 95% non-condensing, non-operating
MTBF	381,087 to 467,253 hours

NM-HDV-1E1-30E	One-port enhanced 30-channel E1 voice/ fax Network Module
Interface Type	Channelized E1
Cisco IOS Requirement	12.1(5)XM1

Voice Ports	30 channels medium and high complexity codecs
Cisco Part Number	NM-HDV-1E1-30E
FCC Specifications	EMC: EN55022, EN50082, EN61000, AS/NZS 3548, CISPR22 Telecom: CTR13/CTR12, TS016, DLCN1/DLCN2, TNA 117
Safety Conformance	EN60950, AS/NZS 3260
Spare	NM-HDV-1E1-30E
Telco Standards	AT &T Accunet (62411), ATT 54016
Line Bit Rate	E1, 2.048Mbps
Line code	HDB3
Framing Format	D4 (SF) and ESF
Output Level (LBO)	0, –7.5, or –15dB
Input Level	+1dB0 down to –24dB0
Line Frequency	2.048 Mbps +/= 75bps/32PPM
DTE/DCE Interface (VIC Mode)	G.704/structured
Diagnostic Loopback	Same as NM-HDV-1T1-24
Alarm detection	Same as NM-HDV-1T1-24
LED Indicators	Data carrier detect (CD), Loopback (LP), Alarm (AL), Voice DSP processing status
Physical Interface Standards	
Physical Connector	RJ-48
Number of Connectors/ Ports	One
Environmental	Operating Temperature: 32 to 104 F (0 to 40º C) Storage Temperature: –13 to 158 F (–25 to +70º C) Relative Humidity: 5to 85% non-condensing operating, 5 to 95% non-condensing, non-operating
MTBF	381,087 to 467,253 hours

NM-HDV-2E1-60	Two-port 60 channel E1 voice/fax Network Module
Interface Type	Channelized E1
Cisco IOS Requirement	12.1(5)XM1
Voice Ports	60 channels of medium complexity and 30 channels of high complexity codecs
Cisco Part Number	NM-HDV-2E1-60
FCC Specifications	EMC: EN55022, EN50082, EN61000, AS/NZS 3548, CISPR22 Telecom: CTR13/CTR12, TS016, DLCN1/DLCN2, TNA 117
Safety Conformance	EN60950, AS/NZS 3260
Spare	NM-HDV-2E1-60
Telco Standards	AT &T Accunet (62411), ATT 54016
Line Bit Rate	E1, 2.048Mbps
Line code	HDB3
Framing Format	D4 (SF) and ESF

Output Level (LBO)	0, –7.5, or –15dB
Input Level	+1dB0 down to –24dB0
Line Frequency	2.048 Mbps +/= 75bps/32PPM
DTE/DCE Int. (VIC)	G.704/structured
Diagnostic Loopback	Same as NM-HDV-1T1-24
Alarm detection	Same as NM-HDV-1T1-24
LED Indicators	Data carrier detect (CD), Loopback (LP), Alarm (AL), Voice DSP processing status
Physical Interface Standards	T1 ANSI, ATT T1.1, ANSI T1.403
Physical Connector	RJ-48
Number of Connectors/ Ports	Two
Environmental	Operating Temperature: 0 to 40º C (32 to 104 F) Storage Temperature: –25 to +70º C (–13 to 158 F) Relative Humidity: 5 to 85% non-condensing operating, 5 to 95% non-condensing, non-operating
MTBF	366,394 to 445,354 hours

Analog Voice Interface Cards (VIC)

VIC-2FXS	Two-port FXS voice/fax interface card
Interface Type	Foreign exchange station
Cisco IOS Requirement	12.1(3)T
Cisco Part Number	VIC-2FXS
FCC Specifications	FCC Class B device, CE
Safety Conformance	UL 1950
Spare	NM-2FXS
Address Signaling Formats	In-band DTMF Out-of-band pulse (10/20 pps)
Signaling Formats	Loop-start, ground-start
Ringing Tone	Configurable for different country requirements
Ringing Voltage	< 45 Vrms at 5 REN at 25 Hz (configurable frequency)
Ringing Frequencies	20 Hz, 50Hz
Physical Connector	RJ-11
Number of Connectors/ Ports	Two
MTBF	2,248,909 hours

VIC-2E/M	Two-port E&M voice/fax interface card
Interface Type	PBX Trunking
Cisco IOS Requirement	12.1(5)XM1
Cisco Part Number	VIC-2E/M
FCC Specifications	FCC Class B device, CE
Safety Conformance	UL 1950
Spare	NM-2E/M
Address Signaling Formats	In-band DTMF Out-of-band pulse (10/20 pps)
Signaling Formats	Immediate, delay dial, wink start
Signaling Types	I, II, III, and V
E-Lead Current Limit	100mA
M-Lead Sensitivity	> 3 mA
Pulse Distortion	< 2%
Physical Connector	RJ-11 (4/2 wire)
Number of Connectors/ Ports	Two
MTBF	1,943,521 hours

VIC-2FXO	Two-port FXO voice/fax interface card
Interface Type	Foreign exchange Office
Cisco IOS Requirement	12.1(3)T
Cisco Part Number	VIC-2FXO
FCC Specifications	FCC Class B device, CE
Safety Conformance	UL 1950
Spare	NM-2FXO
Address Signaling Formats	In-band DTMF Out-of-band pulse (10/20 pps)
Signaling Formats	Loop-start, ground-start
Tone Disconnect Supervision	Call disconnect on progress tone of less than 600 Hz
Power Interrupt Disconnect	Call disconnect on power interrupt of > 600 msec
Physical Connector	RJ-11
Number of Connectors/ Ports	Two
Mean Time between Failures (MTBF)	2,302,609 hours

VIC-2FXO-EU	Two-port FXO voice/fax interface card (for Europe)
Interface Type	Foreign exchange Office
Cisco IOS Requirement	12.1(3)T
Cisco Part Number	VIC-2FXO-EU
Compliance	CE, CTR-21
Safety Conformance	UL 1950
Spare	NM-2FXO-EU
Address Signaling Formats	In-band DTMF Out-of-band pulse (10/20 pps)

Signaling Formats	Loop-start, ground-start
Tone Disconnect Supervision	Call disconnect on progress tone of less than 600 Hz
Power Interrupt Disconnect	Call disconnect on power interrupt of > 600 msec
Physical Connector	RJ-11
Number of Connectors/ Ports	Two
Mean Time between Failures (MTBF)	1,010,264 hours

VIC-2FXO-M1	Two-port FXO voice/fax interface card w/ battery reversal detection and call ID (for US, Canada, Japan and other countries)
Interface Type	Foreign exchange Office
Cisco IOS Requirement	12.1(3)T
Cisco Part Number	VIC-2FXO-M1
Compliance	FCC Class B device, CE
Safety Conformance	UL 1950
Spare	NM-2FXO-M1=

Address Signaling Formats	In-band DTMF Out-of-band pulse (10/20 pps)
Signaling Formats	Loop-start, ground-start
Tone Disconnect Supervision	Call disconnect on progress tone of less than 600 Hz
Power Interrupt Disconnect	Call disconnect on power interrupt of > 600 msec
Battery Polarity Reversal Detection	Detection of disconnect supervision and far-end answer supervision via battery polarity reversal
Physical Connector	RJ-11
Number of Connectors/ Ports	Two
Mean Time between Failures (MTBF)	546,560 hours

VIC-2FXO-M2	Two-port FXO voice/fax interface card w/ battery reversal detection and call ID (for Europe)
Interface Type	Foreign exchange Office
Cisco IOS Requirement	12.1(3)T
Cisco Part Number	VIC-2FXO-M1
Compliance	CE, CTR-21

Safety Conformance	UL 1950
Spare	NM-2FXO-M2
Address Signaling Formats	In-band DTMF Out-of-band pulse (10/20 pps)
Signaling Formats	Loop-start, ground-start
Tone Disconnect Supervision	Call disconnect on progress tone of less than 600 Hz
Power Interrupt Disconnect	Call disconnect on power interrupt of > 600 msec
Battery Polarity Reversal Detection	Detection of disconnect supervision and far-end answer supervision via battery polarity reversal
Physical Connector	RJ-11
Number of Connectors/ Ports	Two
Mean Time between Failures (MTBF)	656,116 hours

VIC-2FXO-M3	Two-port FXO voice/fax interface card (for Australia)

Interface Type	Foreign exchange Office
Cisco IOS Requirement	12.1(5)XM1
Cisco Part Number	VIC-2FXO-M3
Compliance	AUA TS.002, AUA TS.003
Safety Conformance	UL 1950
Spare	NM-2FXO-M3
Address Signaling Formats	In-band DTMF Out-of-band pulse (10/20 pps)
Signaling Formats	Loop-start, ground-start
Tone Disconnect Supervision	Call disconnect on progress tone of less than 600 Hz
Power Interrupt Disconnect	Call disconnect on power interrupt of > 600 msec
Physical Connector	RJ-11
Number of Connectors/ Ports	Two
Mean Time between Failures (MTBF)	1,010,264 hours

VIC-2DID	Two port analog DID interface card

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