CISCO SYSTEMS

DATA SHEET

CISCO SECOND-GENERATION 1- AND 2-PORT T1/E1 MULTIFLEX TRUNK VOICE/WAN INTERFACE CARDS

This flexible, multiservice solution supports multiple data, voice, and integrated data and voice applications, facilitating the migration from data only or channelized data and voice to packet voice solutions and simplifying deployment, management, and sparing.

INTRODUCTION

The Cisco® Second-generation 1- and 2-port T1/E1 Multiflex Trunk Voice/WAN Interface (MFT VWIC2s) support data and voice applications on the Cisco 1721 (data only), 1751 and 1760 Modular Access Routers, the Cisco 2600XM Multiservice Router, the Cisco 2691 Multiservice Platform, the Cisco 3662 Telco Versatile DCN Access Platform, the Cisco 3725 and 3745 Multiservice Routers, and the Cisco 1841 (data only), 2801, 2811, 2821, 2851, 3825, and 3845 Integrated Services Routers. The Cisco MFT VWIC2 combines WAN-interface-card (WIC) and voice-interface-card (VIC) functions to provide unparalleled flexibility, versatility, and investment protection through its many uses. Customers who choose to integrate data and voice in multiple steps preserve their investment in a T1/E1 WAN interface because the Cisco MFT VWIC2 cards can be reused in packet voice applications. The 2 port T1/E1 MFT VWIC2 is shown below.

Figure 1. Cisco 2-Port T1/E1 MFT VWIC2 (part number VWIC2-1MFT-T1/E1)

The Cisco MFT VWIC2 interface cards add numerous improvements over the Cisco 1- and 2-port T1/E1 Multiflex Voice/WAN Interface Cards (MFT VWICs). The MFT VWIC2 cards have an onboard slot for a Cisco MFT Dedicated Echo Cancellation (ECAN) Module (part number EC-MFT-32 or EC-MFT-64), offering an enhanced echo-cancellation capability for demanding network conditions. The T1/E1 MFT VWIC2 cards support both T1 and E1, providing additional flexibility in configuring the Cisco MFT VWIC2s for supporting T1, fractional T1, E1, and fractional E1 for both voice and WAN applications. All MFT VWIC2 modules now include the drop-and-insert multiplexing capability, which eliminates costly external third-party channel service units/data service units (CSUs/DSUs) and drop-and-insert multiplexers. The Cisco 2-port MFT VWIC2s also can enable each port to be clocked from independent clock sources for data applications. This independent clocking capability is not supported for voice applications or with the Cisco ATM/Voice Advanced Integration Modules (part number AIM-ATM, AIM-VOICE-30, AIM-ATM-VOICE-30).

The Cisco MFT VWIC2 cards can either be inserted into the WIC, VWIC and high-speed WIC (HWIC) slots on the supported Cisco 1721, 1751, 1760, 1841, 2600XM, 2691, 2801, 2811, 2821, 2851, 3662, 3725, 3745, 3825, and 3845 access routers, or they can be used in the VWIC slot(s) on the Digital T1/E1 Packet Voice Trunk Network Module (NM-HDV), IP Communications High-Density Digital Voice/Fax Network Modules (NM-HDV2), IP Communications High-Density Digital Voice NM with 1 T1/E1 (part number NM-HDV2-1T1/E1), IP Communications High-Density Digital Voice NM with 2 T1/E1 (part number NM-HDV2-2T1/E1), 2 slot IP Communications Enhanced Voice/Fax Network Modules (NM-HD-2VE), 2 WAN Card Slot Network Module (NM-2W), 1 10/100 Ethernet 1 4/16 Token Ring 2 WAN Card Slot NM (NM-1FE1R2W), 1 10/100 Ethernet 2 WAN Card Slot Network Module (NM-1FE2W-V2), and 2 10/100 Ethernet 2 WAN Card Slot Network Module (NM-2FE2W-V2) when used with a supported access router.

The Cisco MFT VWIC2 cards are offered in single- and dual-port versions, which can be used and then redeployed as network requirements change, thereby addressing several applications:

- **T1/E1 data**---The Cisco 1- and 2- port T1/E1 MFT VWIC2 versions act as a WIC, supporting T1, fractional T1, E1, (including structured G.703 with G.704 framing), fractional E1, and E1structured G.703 applications. To simplify remote management, these MFT VWIC2 cards integrate a fully managed DSU/CSU for T1 deployments and a fully managed DSU for E1 deployments.
- **E1/G.703 data**---The Cisco 1- and 2- port G.703 MFT VWIC2 versions act as a WIC, supporting T1, fractional T1, E1 (including structured G.703 with G.704 framing), fractional E1, and unstructured E1 (G.703) applications. To simplify remote management, the G.703 version includes a fully managed DSU. The G.703 versions also support all the capabilities on the T1/E1 versions.
- **T1/E1 packet voice**---The Cisco 1- and 2- port T1/E1 MFT VWIC2 (voice and WAN) versions act as a VIC, supporting packet voice applications by providing T1, fractional T1, E1, and fractional E1 connections to private branch exchanges (PBXs) and central offices, thereby enabling new services and reducing voice and fax toll charges.
- **Mixed data and packet voice**---The Cisco MFT VWIC2 interface cards can simultaneously support both data and voice, reducing the complexity and number of network components and facilitating a graceful migration to bandwidth-efficient packet voice.
- **Mixed data and packet voice with drop and insert**---The Cisco MFT VWIC2 cards can be deployed as a T1/E1 drop-and-insert multiplexer with integrated DSUs/CSUs, reducing the complexity of the network and the cost of the central-office ports by efficiently combining time-division multiplexing (TDM) voice (PBX), IP voice, and data on the same trunks. Note the Cisco 1721, 1751 and 1760 support drop and insert between two ports over a single VWIC2 card while Cisco 2800 and 3800 ISR routers supports drop and insert between two ports over a single VWIC2 card and two ports over two different VWICs.

KEY BENEFITS

Reduces Networking Lifecycle Costs
- Enables graceful migration from data-only to multiplexed data and voice to packetized voice applications
- Reduces training, deployment, management, and sparing inventory over single-purpose interfaces
- Maximizes investment protection
- Simplifies network configuration and sparing through the support of both T1 and E1 on the same card
- Offers multifunction support for LAN-to-LAN routing, multiplexed data and voice, and packetized voice
- Offers ability to share modules between Cisco 1700, 1800, 2800 and 3700 series and Cisco 3800 routers, select Cisco 2600 and 3600 series routers, and select network modules (refer to Table 1 for details)
- Increases configuration flexibility and reduces cost for data applications by allowing individual ports to be clocked from independent clock sources (not supported for voice and not supported with ATM/Voice Advanced Integration Module (part number AIM-ATM-VOICE-30) with ATM/Voice Advanced Integration Module (part number AIM-ATM, AIM-VOICE-30, AIM-ATM-VOICE-30)
- Supports E1 configurations for both balanced and unbalanced modes
- Supports (G.703 models) unstructured E1 (G.703) for using the full 2.048 Mbps
- Eliminates costly external third-party CSUs/DSUs and drop-and-insert multiplexers
- Provides optional support of a Cisco MFT Dedicated ECAN Module for demanding network conditions
- Simplifies remote network management by allowing a single management tool such as CiscoView or CiscoWorks to support router, CSU/DSU, or drop-and-insert multiplexer

Maximizes System Resources
- Increases T1/E1 port density on the supported Cisco 1700, 1800, 2600, 2800, 3600, 3700, and 3800 access routers---up to four T1/E1 connections with an integrated CSU/DSU in a single network-module slot or up to two T1/E1 connections in a single WIC slot
- Offers easy migration to bandwidth-efficient packet voice, enabling new services

Customers who choose to integrate data and voice in stages to preserve their investment in WAN interfaces. For example, the Cisco MFT VWIC2 can support data-only applications as a WAN interface, and then be reused to integrate data and voice with the drop-and-insert multiplexer function or configured to support packetized voice (voice over IP [VoIP] or voice over Frame Relay [VoFR]) when installed in the Digital T1/E1 Packet

Voice Trunk Network Module (NM-HDV), 2 slot IP Communications Enhanced Voice/Fax Network Module (NM-HD-2VE), or IP Communications High-Density Digital Voice/Fax Network Module (NM-HDV2), IP Communications High-Density Digital Voice NM with 1 T1/E1 (part number NM-HDV2-1T1/E1), IP Communications High-Density Digital Voice NM with 2 T1/E1 (part number NM-HDV2-2T1/E1).

APPLICATIONS

Packet Voice Solutions: PBX and Central-Office Connectivity

The Cisco MFT VWIC2 interface cards, through its digital T1/E1 ports, supply PBX and public-switched-telephone-network (PSTN) connectivity for the Digital T1/E1 Packet Voice Trunk Network Module (NM-HDV), 2 slot IP Communications Enhanced Voice/Fax Network Modules (NM-HD-2VE), IP Communications High-Density Digital Voice/Fax Network Modules (NM-HDV2), IP Communications High-Density Digital Voice NM with 1 T1/E1 (part number NM-HDV2-1T1/E1), IP Communications High-Density Digital Voice NM with 2 T1/E1 (part number NM-HDV2-2T1/E1), and access routers with on-board VIC/WIC/HWIC slots. The NM-HDV, NM-HD-2VE, NM-HDV2, NM-HDV2-1T1/E1, NM-HDV2-2T1/E1, and access routers support H.323-, Session Initiation Protocol (SIP)-, Media Gateway Control Protocol (MGCP)-, and Skinny Client Control Protocol (SCCP)-based VoIP-, FRF.11-, and FRF.12-based VoFR, and ATM Adaption Layer 5 (AAL5)-based voice-over-ATM (VoATM) industry standards.

Note: For each of these packet voice applications (VoIP, VoFR, or VoATM), an appropriate WIC also is required.

Packet Voice Solutions: Echo Cancellation for Demanding Network Conditions

The Cisco MFT VWIC2 interface cards have an onboard slot for a 32- or 64-channel Cisco MFT Dedicated ECAN Module (part number EC-MFT-32 or EC-MFT-64) (see Figure 2). These optional daughter cards provide a dedicated hardware resource that runs the Cisco Enhanced ITU-T G.168 ECAN feature. The processing and memory resources of the dedicated ECAN module help enable configuration of the echo canceller with predefined settings and an extended 128-ms echo tail buffer, providing a robust echo-cancellation performance for demanding network environments. The 32- and 64-channel configurations of the dedicated ECAN modules match the requirements of the Cisco 1- and 2-port MFT VWIC2 cards, respectively.

Figure 2.   Cisco 2-Port T1/E1 MFT VWIC2 (part number VWIC2-2MFT-T1/E1) with an Optional 64-Channel MFT Dedicated ECAN Module (part number EC-MFT-64)

Data Solutions: 1- and 2-Port T1/E1 WIC with Integrated DSU/CSU

The Cisco MFT VWIC2 interface cards simplify branch-office connectivity by integrating the functions of a router, T1/E1, and fractional T1/E1 serial interface with a fully managed DSU/CSU.

When used for "data-only" WAN connectivity, the Cisco MFT VWIC2 cards support numerous functions, including Cisco IOS® Software Command-Line Interface (CLI)-initiated loopback control, similar to the popular 1 Port T1/Fractional T1 DSU/CSU WAN Interface Card (part number WIC-1DSU-T1). Additionally, the MFT VWIC2 also is offered in dual-port versions, including dual T1/E1 configurations, enabling increased WAN port density in Cisco 1800, 2800 and 3700 series and Cisco 3800 routers and supported Cisco 1700, 2600 and 3600 series access routers. The T1/E1 MFT VWIC2 versions include integrated DSU functions for E1 deployments and integrated CSU and DSU functions for T1 deployments, simplifying remote network management.

The Cisco 2-port MFT VWIC2 interface cards increase configuration flexibility on Cisco Systems® multiservice access routers, eliminating the need for two single-port T1/E1 WICs. Increasing the T1/E1 port density in a single WIC or HWIC slot helps enable applications such as local serial aggregation with the 2-port high-speed serial WAN Interface Card or 2-port asynchronous/synchronous serial WAN Interface Card (part number WIC-2T or WIC-2A/S), or ISDN backup with the 1 Port ISDN BRI S/T WAN Interface Card (part number WIC-1B-S/T-V3) or the 1 port ISDN with NT-1 WAN Interface Card (part number WIC-1B-U-V2).

The Cisco MFT VWIC2 cards also support a channelized capability where the T1 or E1 service can be flexibly split into two or more fractional channel groups. Thus a single physical port can provide connection to multiple sites. (**Note:** If this mode is chosen, only a single port can be supported in each WIC slot.)

The Second-generation 1- and 2-port G.703 Multiflex Trunk voice/WAN Interface Cards (product numbers VWIC2-1MFT-G703 and VWIC2-2MFT-G703) support not only unstructured E1 (G.703) but also all the features of the other Cisco MFT VWIC2 cards, including drop and insert. Additional flexibility is provided on the 2 port G.703 Multiflex Trunk voice/WAN Interface Cards with the capability to configure one port for unstructured E1 (G.703) while configuring the other for standard framed E1.

Multiplexed Data and Voice Solutions: 2-Port T1/E1 Drop-and-Insert Multiplexer with Integrated DSU/CSU

The Cisco 1- and 2-port MFT VWIC2 interface cards simplify branch-office connectivity by helping enable a Cisco 2800, 3700, or 3800 and select Cisco 2600 and 3600 routers to consolidate the functions of a router, a fully managed drop-and-insert multiplexer, and a fully managed DSU/CSU into a single box. (It is possible to use two Cisco 1-port MFT VWIC2 interface cards for supporting the drop-and-insert feature. Generally a Cisco 2-port MFT VWIC2 is more appropriate because 2 ports are required.) Typically a drop-and-insert multiplexer is used for channelized (that is, TDM) integration of data and voice onto a single T1, fractional T1, E1, or fractional E1 connection to the central office. Sharing a line can significantly reduce costs over those of two separate physical lines to the central office. Although the normal use is for data and voice sharing of a T1 or E1 service, the drop-and-insert capability also can be used for video and data, or data and data sharing of the service.

Moreover, the integrated drop-and-insert capability enhances system availability by allowing the Cisco IOS Software to be reloaded while maintaining TDM switching.

Figure 3.   Drop and Insert to Share a T1/FT1 or E1/FE1 Service between Data and TDM Voice
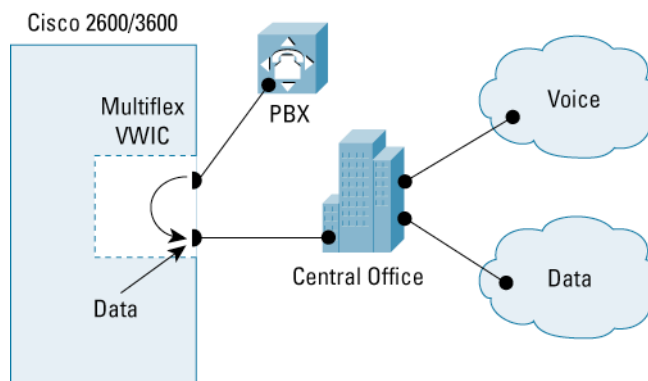
To illustrate, consider the example of a PBX with a T1 interface that needs to support a maximum of 10 simultaneous calls. With 24 DS-0 channels in a T1 service (1.544 Mbps), this leaves 14 DS-0 channels or 896 kbps of bandwidth for data from the router (14 x 64 kbps). The number of DS-0 channels assigned for PBX calls and the remainder that are available for use with router data are fully configurable (statically, not dynamically). In the case of an E1 service, 30 DS-0 channels are available for division between voice and router data.

In this example one port of the Cisco 2-port T1/E1 MFT VWIC2 is connected to the PBX and the other port is connected to the central office. The 10 DS-0 channels from the PBX are TDM switched to the "central-office port," and this switching is done on the MFT VWIC2 itself. The

configuration of this TDM switching is flexible so that DS-0 channels on the "PBX port" do not have to be mapped to DS-0 channels with the same time slots on the central-office port. The remaining 14 DS-0 channels on the MFT VWIC2 central-office port terminate through the backplane connector of the VWIC2 on the router as a single aggregate channel group. The 14 DS-0 channels are not individually addressable by the router as a channelized service, but can be split into two or more channel groups.

The drop-and-insert function is included in all the Cisco MFT VWIC2 interface cards. The term "drop and insert" is normally used when router data (or data from another data device) is multiplexed with voice calls. A more generic term for "drop and insert" is "digital cross-connect." On Cisco 2600/3700 access routers, Digital cross-connecting of voice channels is only supported by the Cisco MFT VWIC2 when inserted into the Digital T1/E1 Packet Voice Trunk Network Module (NM-HDV), 2 slot IP Communications Enhanced Voice/Fax Network Modules (NM-HD-2VE) or IP Communications High-Density Digital Voice/Fax Network Modules (NM-HDV2), IP Communications High-Density Digital Voice NM with 1 T1/E1 (part number NM-HDV2-1T1/E1), and IP Communications High-Density Digital Voice NM with 2 T1/E1 (part number NM-HDV2-2T1/E1). For example, a single T1 connection from a PBX to the PBX port on the MFT VWIC2 can be divided between DS-0 channels that go to the Digital T1/E1 Packet Voice Trunk Network Module (NM-HDV) for packetized voice (for example, VoIP) and DS-0 channels that are TDM switched to the central-office port of the MFT VWIC2 for standard circuit-switched voice connectivity. On Cisco 2800/3800 integrated services routers, digital cross-connecting of channels is supported by the Cisco MFT VWIC2 when inserted into an HWIC slot or any of the network modules listed above.

Analog Cross Connect Solution

The time-division multiplexing (TDM) DS0 channels can be cross-connected with analog voice ports to create an analog cross connect solution. This capability is supported on the 1760, 2800 and 3800 series routers. It can also be supported the supported 26, 37 and 3700 access routers when both ports are on the same network module (NM-HD-2VE, NM-HDV2, NM-HDV2-1T1/E1, NM-HDV2-2T1/E1).

Table 1.   Cisco MFT VWIC2 Platform Support and Minimum Cisco IOS Software Release Requirements

	VWIC2-1MFT-T1/E1)	VWIC2-2MFT-T1/E1)	VWIC2-1MFT-G703)	VWIC2-2MFT-G703)
Cisco 1721,1751 and 1760 WIC/VWIC Slots	12.3(14)T	12.3(14)T	12.3(14)T	12.3(14)T
Cisco 1751 and 1760 VIC Slot****	12.3(14)T	12.3(14)T	12.3(14)T	12.3(14)T
Cisco 2600 Chassis WIC Slots	No	No	No	No
Cisco 2600 with Voice-Capable or Data-Only Network Modules	No	No	No	No
Cisco 2600XM Chassis WIC Slots	12.3(14)T***	12.3(14)T***	12.3(14)T***	12.3(14)T***
Cisco 2600XM with Voice-Capable or Data-Only Network Modules	12.3(14)T	12.3(14)T	12.3(14)T*	12.3(14)T**
Cisco 2691 Chassis WIC Slots	12.3(14)T***	12.3(14)T***	12.3(14)T***	12.3(14)T***
Cisco 2691 with Voice-Capable or Data-Only Network Modules	12.3(14)T	12.3(14)T	12.3(14)T*	12.3(14)T**
Cisco 3620, 3640A, and 3660 Chassis WIC Slots	No	No	No	No
Cisco 3620, 3640A, and 3660 with Voice-Capable or Data-Only Network Modules	No	No	No	No

	VWIC2-1MFT-T1/E1)	VWIC2-2MFT-T1/E1)	VWIC2-1MFT-G703)	VWIC2-2MFT-G703)
Cisco 3662 Telco Versatile DCN Access Platform with Voice-Capable or Data-Only Network Modules	12.3(14)T***	12.3(14)T***	12.3(14)T*, ***	12.3(14)T**, ***
Cisco 3700 Chassis WIC Slots	12.3(14)T***	12.3(14)T***	12.3(14)T***	12.3(14)T***
Cisco 3700 with Voice-Capable or Data-Only Network Modules	12.3(14)T	12.3(14)T	12.3(14)T*	12.3(14)T**
Cisco 2800 Chassis HWIC Slots	12.3(14)T	12.3(14)T	12.3(14)T	12.3(14)T
Cisco 2800 with Voice-Capable or Data-Only Network Modules	12.3(14)T	12.3(14)T	12.3(14)T*	12.3(14)T**
Cisco 3800 Chassis HWIC Slots	12.3(14)T	12.3(14)T	12.3(14)T	12.3(14)T
Cisco 3800 with Voice-Capable or Data-Only Network Modules	12.3(14)T	12.3(14)T	12.3(14)T*	12.3(14)T**

*   VWIC2-1MFT-G703 is not supported on NM-HDV and NM-HD-2VE.

**   VWIC2-2MFT-G703 is not supported on NM-HD-2VE.

***   AIM-VOICE-30 or AIM-ATM-VOICE-30 module is required for voice.

****   Support for voice applications only in VIC slot of Cisco 1751 and 1760.

Network-Module Summary

Voice-capable network modules: Digital T1/E1 Packet Voice Trunk Network Module (NM-HDV), 2 slot IP Communications Enhanced Voice/Fax Network Modules (NM-HD-2VE), and IP Communications High-Density Digital Voice/Fax Network Modules (NM-HDV2), IP Communications High-Density Digital Voice NM with 1 T1/E1 (part number NM-HDV2-1T1/E1), and IP Communications High-Density Digital Voice NM with 2 T1/E1 (part number NM-HDV2-2T1/E1), Data-only network modules: 2 WAN Card Slot Network Module (NM-2W), 1 10/100 Ethernet 1 4/16 Token Ring 2 WAN Card Slot NM (NM-1FE1R2W), 1 10/100 Ethernet 2 WAN Card Slot Network Module (NM-1FE2W-V2), and 2 10/100 Ethernet 2 WAN Card Slot Network Module (NM-2FE2W-V2)

Table 2.   Cisco MFT VWIC2 Card Feature Comparison

Part Number	Number of Ports	T1 Support	E1 Support	Unstructured E1 (G.703) Support	Data Support WIC Mode	Voice Support VIC Mode	Drop-and-Insert Multiplexing
VWIC2-1MFT-T1/E1	1	Yes	Yes	No	Yes	Yes	Yes*
VWIC2-2MFT-T1/E1	2	Yes	Yes	No	Yes	Yes	Yes
VWIC2-1MFT-G703	1	Yes	Yes	Yes	Yes	Yes	Yes*
VWIC2-2MFT-G703	2	Yes	Yes	Yes	Yes	Yes	Yes

*   For supported platforms with >1 HWIC slots, at least 2 MFT VWICs are required to support drop and insert. The 1-port MFT VWIC2 card doesn't support Drop and Insert on Cisco 1721, 1751 and 1760.

SPECIFICATIONS

Table 3. Part Number and Descriptions of Cisco MFT VWIC2 Cards

Product Number	Description
VWIC2-1MFT-T1/E1	1-Port T1/E1 Multiflex Trunk Voice/WAN Interface Card
VWIC2-2MFT-T1/E1	2-Port T1/E1 Multiflex Trunk Voice/WAN Interface Card
VWIC2-1MFT-G703	1-Port G.703 Multiflex Trunk Voice/WAN Interface Card
VWIC2-2MFT-G703	2-Port G.703 Multiflex Trunk Voice/WAN Interface Card

Cisco IOS Software Release and Cisco IOS Software Feature Set License Requirements

Refer to Table 1 for platform support. The Cisco MFT VWIC2 cards are first supported in Cisco IOS Software Release 12.3(14)T and will be first available in the 12.4(1) mainline release. Data applications require at a minimum the IP Base feature set license and voice applications require at a minimum the IP Voice feature set license.

Data Features

- T1/E1 or fractional T1/E1 network interface
- n x 64 kbps or n x 56 kbps, nonchannelized data rates (T1: n = 1 to 24, E1: n = 1 to 31)
- Standards based, including ANSI T1.403 and AT&T Publication 62411

Network Interfaces Specifications

Table 4. T1 Network Interface Specifications

T1 Network Interface	
Transmit Bit Rate	1.544 Mbps ± 50 bps/32 ppm
Receive Bit Rate	1.544 Mbps ± 50 bps/32 ppm
Line Code	Alternate-mark-inversion (AMI), binary 8-zero substitution (B8ZS)
AMI Ones Density	Enforced for n x 56-kbps channels
Framing Format	D4 (Super Frame [SF]) and Extended Super Frame (ESF)
Output Level (line build-out [LBO])	0, –7.5, or –15 dB
Input Level	+1 dB0 down to –24 dB0
Data-Terminal-Equipment (DTE) Interface (WIC mode)	Fractional service
DTE Interface (VIC mode)	G.704 or structured
Data-Communications-Equipment (DCE) Interface	G.704 or structured

Table 5.   E1 Network Interface Specifications

E1 Network Interface	
Transmit Bit Rate	2.048 Mbps ± 100 bps/50 ppm
Receive Bit Rate	2.048 Mbps ± 100 bps/50 ppm
Data Rate	1.984 Mbps (framed mode) per E1 port
Clocking	Internal and loop (recovered from network)
E1 National Bits	Fixed (nonconfigurable)
Encoding	High-density bipolar three (HDB3)
DTE Interface (WIC mode)	Fractional service
DTE Interface (VIC mode)	G.704 or structured
DCE Interface	G.704 or structured

Dimensions (H x W x D)

MFT VWIC2: 0.8 x 3.1 x 4.8 in. (2.1 x 7.9 x 12.2 cm)

Weight

- 1 port VWIC2-1MFT-T1/E: 0.125 lb (57 g)
- 2 port VWIC2-2MFT-T1/E1: 0.137 lb (62 g)

Diagnostics

- ANSI T1.403 Annex B/V.54 loopup/down code recognition, network loopback, and user-initiated loopbacks, network payload loopback, local DTE loopback, and remote line (codes: V.54, loop up, and loop down)
- Bit-error-rate-testing (BERT) patterns: All 0's, all 1's, 1:2, 1:8, 3:24, QRW, QRSS, 63, 511, 2047, and V.54/T1.403 annex B bit patterns, and two user-programmable 24-bit patterns
- Alarm detection: Alarm indication signal (AIS), time-slot 16 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 or 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, and 24-hour history stored in 15-minute increments
- Onboard processor for real-time facility-data-link (FDL) messaging, in-band code detection and insertion, alarm integration, and performance monitoring
- Full FDL support and FDL performance monitoring, according to configurable standard: ANSI T1.403 or AT&T TR 54016

DSU/CSU

- Selectable DSX-1 cable length in increments from 0 to 655 feet in DSU mode
- Selectable DS-1 CSU line build-out: 0, –7.5, and –15 dB

LEDs

- **CD (data carrier detect)**---Indicates a received error on the telco link
- **LP (loopback)**---Indicates that the interface is in loopback mode
- **AL (alarm)**---Indicates an alarm condition

Table 6. Network Management Features

Management Feature	
Telnet or Console	Remote and local configuration, monitoring, and troubleshooting from Cisco IOS Software CLI
Simple Network Management Protocol (SNMP)	- Router and DSU/CSU managed by single SNMP agent; router, DSU, and CSU appear as a single network entity to user - Standard MIB (MIB II) - Cisco Integrated DSU/CSU MIB - RFC 1406 T1 MIB, Including Alarm Detection and Reporting
SNMP Traps	Generated in response to alarms

Environmental

- Operating temperature: 0 to 40ºC (32 to 104°F)
- Storage temperature: –25 to +70ºC (–13 to 158°F)
- Relative humidity: 5 to 85% noncondensing operating; 5 to 95% noncondensing, nonoperating

Regulatory Compliance

Table 7 gives regulatory compliance information for the Cisco MFT VWIC2 cards.

Table 7. Regulatory Compliance for Cisco MFT VWIC2 Cards

Safety	EMC Immunity	EMC Emissions	Network Equipment Building Standards (NEBS)
- UL 60950 - CAN/CSA C22.2 No. 60950 - IEC 60950-1 - EN 60950-1 - AS/NZS 60950	- EN55024 (CISPR24) - EN61000-4-2 - EN61000-4-3 - EN41000-4-4 - EN41000-4-5 - EN41000-4-6 - EN41000-4-8 - EN41000-4-11 - EN50082-1 - EN61000-6-2 - ITU-T K.21	- CFR 47 Part 15, Class B - ICES-003 Class B - EN55022 Class B - CISPR22 Class B - AS/NZS 3548 Class B - VCCI Class B - EN 300386 - EN61000-3-2 - EN61000-3-3	- GR-63 - GR-1089 Type 1, 3

Telecom Homologation

Homologation requirements vary by country and interface type. For specific country information, refer to the online approvals data base at
http://tools.cisco.com/cse/prdapp/jsp/externalsearch.do?action=externalsearch&page=EXTERNAL_SEARCH&module=EXTERNAL_SEARCH.

T1 Compliance (partial list)

- TIA-968-A
- CS-03
- Jate
- ANSI T1.403

E1 Compliance (partial list)

- TBR4 , TBR12, TBR13
- ITU-T G.703, G.704, G.823, I.431
- S016 (Australia)

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