Cisco Systems

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Cisco 3200 Series Mobile Access Router Hardware Reference

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Cisco 3200 Series Mobile Access Router Hardware Reference

CONTENTS

Introduction to the Cisco 3200 Series Mobile Access Router Cards

The Cisco 3200 Series Mobile Access Routers include a combination of mobile interface cards. The following cards are available from Cisco:

- Mobile Access Router Card (MARC)
- Fast Ethernet Switch Mobile Interface Cards (FESMICs)
- Serial Mobile Interface Cards (SMICs)
- Wireless Mobile Interface Cards (WMICs)

A completed router includes a third-party power source, cables, and an enclosure, that are assembled and installed by your system integrator. This document describes the cards provided by Cisco Systems, Inc. used to assemble Cisco 3200 Series Mobile Access Routers. For information regarding the specific hardware configuration of your router, contact your vendor.

The following chapters provide the information that you need to understand the physical components of a completed Cisco 3200 Series Mobile Access Router. It is not intended as assembly or repair instructions.

Chapter 1, "Mobile Access Router Card (MARC)," describes the Mobile Access Router Card (MARC) layout, ports, and buses.

Chapter 2, "Fast Ethernet Switch Mobile Interface Card (FESMIC)," describes the Fast Ethernet Switch Mobile Interface Cards (FESMICs) layout, ports, and buses.

Chapter 3, "Serial Mobile Interface Card (SMIC)," describes the Serial Mobile Interface Cards (SMICs) layout, ports, and buses.

Chapter 4, "Wireless Mobile Interface Card (WMIC)," describes the Wireless Mobile Interface Cards (WMICs) layout, ports, and buses.

Audience and Scope

The audience for this document is the system administrator (SA), system integrator (SI), and system engineer (SE). They are experts, with networking industry training and experience. We assume that users are familiar with the terminology and concepts of the PC-104, IOS, and Mobile IP networking.

The SA, SI, or SE uses this document to understand how the router hardware is connected to peripheral devices and to perform minor troubleshooting on the cards. Although they might not be specifically identified as SAs, SIs, or SEs, all users of this documentation are assumed to have comparable skills and knowledge.

Related Documentation

You can access these documents on the Documentation page on Cisco Connection Online (CCO) at www.cisco.com. The following documentation is available at the http://www.cisco.com/en/US/products/hw/routers/ps272/tsd_products_support_series_home.html
URL:

- *Release Notes for the Cisco 3200 Series Mobile Access Routers* (78-13975)—Provides information on accessing documentation and technical assistance for the Cisco 3200 Series Mobile Access Router.
- *Cisco 3200 Series Wireless MIC Software Configuration Guide*[1] (OL-7734)—This document. It provides example procedures for using the IOS commands to configure Wireless Mobile Interface Cards (WMICs).
- *Configuration Guide for the Cisco 3200 Series Mobile Access Router*[1]—Example procedures for using the IOS commands to configure the Mobile Access Router Card (MARC) in Cisco 3200 Series routers.

- *Cisco 3200 Series Mobile Access Router Hardware Reference*[1] (OL-5816)—descriptions of the Cisco MIC I/O cards found in Cisco 3200 Series routers.
- *Cisco 3200 Series Mobile Access Router Reference Sell Document*[1] (OL-3880)—An overview of the reference sell program and components for the Cisco 3200 Series router.
- *Regulatory Compliance and Safety Information for the Cisco 3200 Mobile Access Router* (78-16930)—Regulatory compliance and safety information.

1. `Also available on the platform-specific CD-ROM.`

The Release Notes for the Cisco 3250 Mobile Router lists the enhancements to and caveats for Cisco IOS releases as they relate to the Cisco 3200 Series router can be found at:

http://www.cisco.com/en/US/products/sw/iosswrel/products_ios_cisco_ios_software_releases.html or

http://www.cisco.com/en/US/products/sw/iosswrel/ps5012/ps4629/index.html

For information about using Cisco IOS software to configure SNMP, refer to the following documents:

- The "Configuring SNMP Support" chapter of the *Cisco IOS Configuration Fundamentals Configuration Guide,* Release 12.2
- The "SNMP Commands" chapter of the *Cisco IOS Configuration Fundamentals Command Reference,* Release 12.2

For information about using Cisco IOS software to configure SNMP MIB features, refer to the appropriate documentation for your network management system.

For information on configuring Mobile IP using Cisco IOS software, refer to the following documents:

- The "Configuring Mobile IP" chapter of the *Cisco IOS IP Configuration Guide,* Release 12.2
- The "Mobile IP Commands" chapter of the *Cisco IOS IP Command Reference, Volume 1 of 3: Addressing and Services,* Release 12.2

Related documents from the Cisco TAC Web pages include:

- Antenna Cabling

  http://www.cisco.com/warp/public/102/wlan/antcable.html

Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

You can access the Cisco website at this URL:

http://www.cisco.com

You can access international Cisco websites at this URL:

http://www.cisco.com/public/countries_languages.shtml

Ordering Documentation

You can order Cisco documentation in these ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Ordering tool:

  http://www.cisco.com/en/US/partner/ordering/index.shtml

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 1 800 553-NETS (6387).

Documentation Feedback

You can send comments about technical documentation to bug-doc@cisco.com.

You can submit comments by using the response card (if present) behind the front cover of your document or by writing to the following address:

Cisco Systems
Attn: Customer Document Ordering
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Tools and Web Sites

If you are registered Cisco Direct Customer, you can access the following web sites:

IOS Command Lookup—A search engine dedicated to finding information on Cisco IOS commands in the Cisco IOS Command Reference, Cisco IOS Configuration Guide, Catalyst Command Reference, and PIX Firewall Command Reference.

http://www.cisco.com/cgi-bin/Support/Cmdlookup/home.pl

Bug Toolkit—Searches for known bugs based on software version, feature set and keywords. The resulting matrix shows when each bug was integrated, or fixed if applicable.

http://www.cisco.com/cgi-bin/Support/Bugtool/launch_bugtool.pl

Feature Navigator—Locates the Cisco IOS Software release based on the features you want to run on your network.

http://tools.cisco.com/ITDIT/CFN/jsp/index.jsp

Obtain information on compatibility between hardware products and software releases at the following public URL:

http://tools.cisco.com/Support/Fusion/FusionHome.do

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- Cisco Marketplace provides a variety of Cisco books, reference guides, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:

  http://www.cisco.com/go/marketplace/

- The Cisco *Product Catalog* describes the networking products offered by Cisco Systems, as well as ordering and customer support services. Access the Cisco Product Catalog at this URL:

  http://cisco.com/univercd/cc/td/doc/pcat/

- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:

  http://www.ciscopress.com

- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and troubleshooting tips, configuration examples, customer case studies, certification and training information, and links to scores of in-depth online resources. You can access Packet magazine at this URL:

  http://www.cisco.com/packet

- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

  http://www.cisco.com/go/iqmagazine

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

  http://www.cisco.com/ipj

- World-class networking training is available from Cisco. You can view current offerings at this URL:

  http://www.cisco.com/en/US/learning/index.html

Cisco 3200 Documentation CD

The *Cisco 3200 Series Router Documentation CD* contains the technical publications for the Cisco 3200 Series Mobile Access Router. To view the documentation requires Acrobat Reader 4.0 or higher.

After the CD is inserted in the CD ROM drive and recognized by your PC, do the following:

Step 1 Access the root directory CD drive.

Step 2 Double click the StartHere.htm file.

System Requirements for the CD

Processor	Pentium 150 MHz or faster recommended
PC Operating System	Microsoft Windows 95 Microsoft Windows 98 Microsoft Windows ME Microsoft Windows XP Microsoft Windows NT 4.0 Microsoft Windows 2000
Memory	64-MB DRAM

Processor	Pentium 150 MHz or faster recommended
Drives	4x CD-ROM drive
Monitor	Color monitor capable of 800 x 600 pixel resolution
Software	Adobe Acrobat Reader 4.0 or later

Printing Documents from the CD

To print a document:

Step 1 Display the document in Acrobat.

Step 2 Click the **Printer** icon on the Acrobat toolbar.

The Windows Print Dialog box appears.

Step 3 Select your default printer, and click **OK**.

Conventions

This publication uses these conventions to convey instructions and information:

Command descriptions use these conventions:

- Commands and keywords are in boldface text.
- Arguments for which you supply values are in italic.
- Square brackets ([ ]) mean optional elements.
- Braces ({ }) group required choices, and vertical bars (|) separate the alternative elements.
- Braces and vertical bars within square brackets ([{ | }]) mean a required choice within an optional element.

Interactive examples use these conventions:

- Terminal sessions and system displays are in `screen` font.
- Information you enter is in **`boldface screen`** font.
- Nonprinting characters, such as passwords or tabs, are in angle brackets (< >).

Notes, cautions, and timesavers use these conventions and symbols:

Tip Means the following will help you solve a problem. The tips information might not be troubleshooting or even an action, but could be useful information.

Note Means reader take note. Notes contain helpful suggestions or references to materials not contained in this manual.

Caution Means reader be careful. In this situation, you might do something that could result equipment damage or loss of data.

Warning **This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. (To see translations of the warnings that appear in this publication, refer to the appendix "Translated Safety Warnings.")**

Waarschuwing **Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen. (Voor vertalingen van de waarschuwingen die in deze publicatie verschijnen, kunt u het aanhangsel "Translated Safety Warnings" (Vertalingen van veiligheidsvoorschriften) raadplegen.)**

Varoitus **Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista. (Tässä julkaisussa esiintyvien varoitusten käännökset löydät liitteestä "Translated Safety Warnings" (käännetyt turvallisuutta koskevat varoitukset).)**

Attention **Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures. Avant d'accéder à cet équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures courantes de prévention des accidents. Pour obtenir les traductions des mises en garde figurant dans cette publication, veuillez consulter l'annexe intitulée « Translated Safety Warnings » (Traduction des avis de sécurité).**

Warnung **Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt. (Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise finden Sie im Anhang mit dem Titel "Translated Safety Warnings" (Übersetzung der Warnhinweise).)**

Avvertenza **Questo simbolo di avvertenza indica un pericolo. Si è in una situazione che può causare infortuni. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti. La traduzione delle avvertenze riportate in questa pubblicazione si trova nell'appendice, "Translated Safety Warnings" (Traduzione delle avvertenze di sicurezza).**

Advarsel **Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du være oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. (Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i vedlegget "Translated Safety Warnings" [Oversatte sikkerhetsadvarsler].)**

Aviso **Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos fisicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes. (Para ver as traduções dos avisos que constam desta publicação, consulte o apêndice "Translated Safety Warnings" - "Traduções dos Avisos de Segurança").**

¡Advertencia! **Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes. (Para ver traducciones de las advertencias que aparecen en esta publicación, consultar el apéndice titulado "Translated Safety Warnings.")**

Varning! **Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador. (Se förklaringar av de varningar som förekommer i denna publikation i appendix "Translated Safety Warnings" [Översatta säkerhetsvarningar].)**

Obtaining Technical Assistance

For all customers, partners, resellers, and distributors who hold valid Cisco service contracts, Cisco Technical Support provides 24-hour-a-day, award-winning technical assistance.

The Cisco Technical Support Website on Cisco.com features extensive online support resources. In addition, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not hold a valid Cisco service contract, contact your reseller.

Cisco Technical Support Website

The Cisco Technical Support Website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day, 365 days a year, at this URL:

http://www.cisco.com/techsupport

Access to all tools on the Cisco Technical Support Website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

http://tools.cisco.com/RPF/register/register.do

Note Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support Website by clicking the **Tools & Resources** link under Documentation & Tools. Choose **Cisco Product Identification Tool** from the Alphabetical Index drop-down list, or click the **Cisco Product Identification Tool** link under Alerts & RMAs. The CPI tool offers three search options: by product ID or model name; by tree view; or for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco TAC engineer. The TAC Service Request Tool is located at this URL:

http://www.cisco.com/techsupport/servicerequest

For S1 or S2 service requests or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco TAC engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)
EMEA: +32 2 704 55 55
USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

http://www.cisco.com/techsupport/contacts

Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—Your network is “down,” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3)—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Mobile Access Router Card (MARC)

The Mobile Access Router Card (MARC) is one component of the Cisco 3200 Series Mobile Access Router. It includes the host processor, memory, and headers for the 10/100 Fast Ethernet, console, and auxiliary signals for the router. Additional components provide power and link interfaces to the MARC. For example, the 4-port Serial Mobile Interface Card provides up to 4 smart serial interfaces. The exact configuration of your router will vary, depending on how it was configured by your vendor.

Note This section provides basic information regarding the MARC hardware for the purpose of performing simple troubleshooting, such as reconnecting a loose cable. To solve more difficult problems, please contact your vendor.

The key features of the MARC include the following:

- MPC8250 processor running 210-MHz at the CPU core, 150-MHz at the CPM core, and 60-MHz on the Motorola 60x bus
- 32 MB of Flash memory
- 128 MB synchronous DRAM
- 10/100 Fast Ethernet, full-duplex connection with auto negotiation
- Console connection with hardware/software flow control
- Asynchronous, RS-232 serial connection with a 5 V auxiliary power supply for Global Positioning System (GPS) and auxiliary (AUX) devices
- A 32-bit PCI bus, version 2.1 running at 25-MHz
- Supports zeroization when this featured is configured on the router.

Caution Zeroization is a feature that erases all potentially sensitive information from the router. Zeroization is configured through the CLI and activated through an actuator that must be attached to the AUX port, such as a push button. Zeroization is disabled by default on the Cisco 3200 Series router.

When Zeroization is not configured on the router, the AUX port functions as a modem port or a terminal port. When declassification is enabled through the CLI, we recommend that you do not use the AUX port for any other function than declassification. This is because there is no way for the router to reliably determine if a device attached to the AUX port is an actuator; therefore, any device attached to the AUX port could potentially trigger declassification.

MARC Component Systems

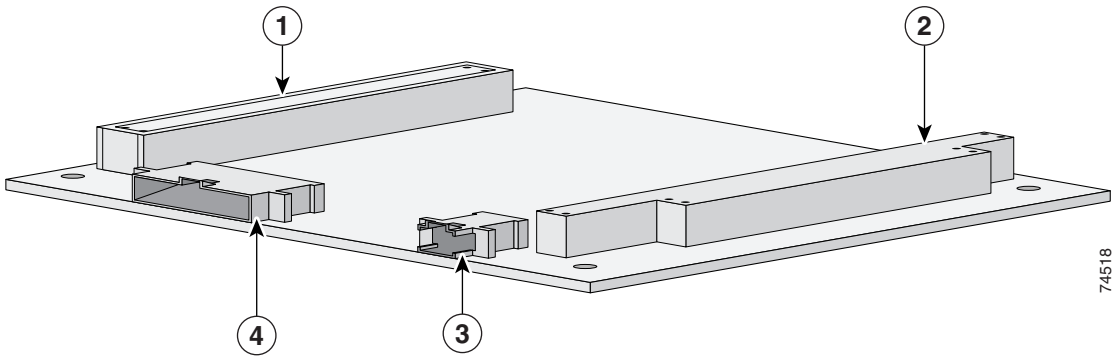
The industry-standard architecture (ISA) buses and peripheral component interconnect (PCI) buses on the Cisco 3200 Series Mobile Access Router cards provide power to the components on the cards. Both buses comply with the PC/104-*Plus* standard. The ISA bus allows PC/104-*Plus* ISA signals to pass through the card bus, but the Cisco cards do not use any of the signals.

The PCI bus signals allow the Cisco cards to communicate. Non-Cisco cards cannot communicate with the Cisco 3200 Series Mobile Access Router cards over the PCI bus.

Caution If you add non-Cisco cards that generates signals on the PCI bus, the router might shut down. Please do not add non-Cisco cards that generate signals on the PCI bus.

Figure 1-1 shows the MARC header and bus locations.

Figure 1-1 MARC Header and Bus Locations



1	PCI Bus	**2**	ISA Bus
3	Ethernet Header	**4**	Multifunction Header

Note The PC/104-Plus standard requires that the PCI Bus and the ISA bus utilize keying features in the standard stacking headers to guarantee proper module installation. On the PCI bus, pin D30 is removed and the D30 opening plugged. On the ISA bus, pin C19 and B10 are removed, and the C19 and B10 openings are plugged.

MARC Router Signals

Cisco 3200 Series router cards do not support any ISA bus signals. The PCI bus connector supports communication between Cisco 3200 Series Mobile Access Router cards.

Note Non-Cisco MIC cards cannot use PCI signals. The use of PCI signals by non-Cisco cards causes unpredictable results. You cannot add 3rd-party devices that might attempt to communicate with the SMIC through the ISA or PCI bus.

The signals are delivered through the shared, 34-pin multifunction header and the 10-pin Ethernet header. LED signals and 5 V of power are also provided through the shared, 34-pin multifunction header.

10/100 Fast Ethernet Signals on the MARC

There is one fixed 10/100 Fast Ethernet port on the MARC. A Cisco router identifies a 10/100 Fast Ethernet interface address by its slot number and port number, in the format slot/port. The slot/port address of a Fast Ethernet interface on the MARC is 0/0.

The 10/100 Fast Ethernet port signals are in compliance with IEEE 802.3. They are provided through the 10-pin Ethernet header, which supports the following:

- Auto-negotiation and parallel detection MII interface with extended register capability for 10/100BASE-TX connection
- Full-duplex and half-duplex modes
- 3.3V operation low power consumption (300 mW typical)
- Low-power sleep mode
- 10BASE-T and 100BASE-TX using a single Ethernet connection
- Robust baseline wander correction performance
- 100BASE-FX fiber optic capabilities
- Standard carrier signal multiple access collision detect (CSMA/CD) or full-duplex operation
- Integrated, programmable LED drivers

Figure 1-2 shows the 10-pin 10/100 Fast Ethernet header pin locations.

Figure 1-2 MARC Ethernet Header Pin Locations

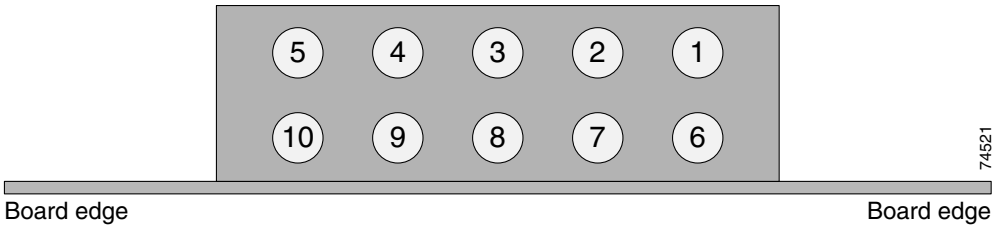


Table 1-1 describes the pin assignments shown in Figure 1-2.

Table 1-1 MARC Ethernet Header Pin Assignments

Pin	Signal	Description
1	TX+	Transmit Positive
6	TX-	Transmit Negative
2	RX+	Receiving Positive
7	Unused	Terminated
3	Unused	Terminated
8	RX-	Receiving Negative

Table 1-1 MARC Ethernet Header Pin Assignments (continued)

Pin	Signal	Description
4	Unused	Terminated
9	Unused	Terminated
5	Reserved	Do not use
10	Reserved	Do not use

The FastEthernet 0/0 port on the MARC is a 10/100 Fast Ethernet *router* port. The FastEthernet ports on the 4-port FESMIC and the 2-port FESMIC are 10/100 Fast Ethernet *switch* ports. The routing features supported on the MARC cannot be configured on the FESMIC ports.

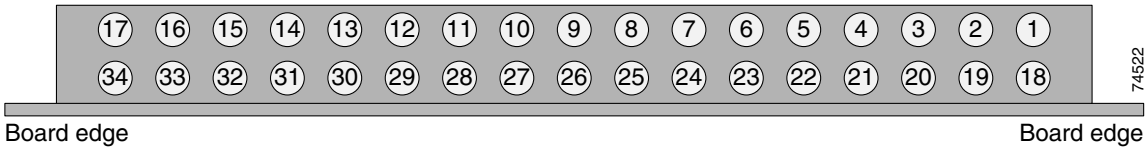
Console, Auxiliary, LED Signals, and Power

Figure 1-3 shows the 34-pin multifunction header that provides console, AUX and GPS connectivity.

A small footprint +3.3V/+12V dual RS-232 transceiver drives the RS-232 lines. It supports full modem control signals DTR, CD, RTS, and CTS. The transceiver is connected directly to SMC-1 on the MPC8250. The serial baud rates can be between 9,600 to 115,000bps.

The same +3.3V/+12V dual RS232 transceiver—Maxim's MAX3209E—drives the RS-232 lines. It supports full modem control signals DTR, CD, RTS, and CTS. The transceiver is connected directly to SCC-1 on the MPC8250. The serial baud rates can be between 9,600 and 115,000bps.

Figure 1-3 MARC Multifunction Header Pin Locations



Console Connections

You can configure the console interface by using IOS command line interface (CLI) commands. The console interface and the AUX port can be accessed simultaneously. For example, you can connect a terminal to the console interface and an external modem or a GPS to the AUX port.

The console port signals are provided through the multifunction header:

- Asynchronous serial DCE
- 1.2 Kbps, 2.4 Kbps, 4.8 Kbps, 9.6 Kbps, 19.2 Kbps, 38.4 Kbps, 57.6 Kbps, and 115.2 Kbps baud rates
- Support full modem control DTR, DSR, RTS, and CTS signals

Table 1-2 MARC Multifunction Header Console Interface Pin Assignments

Pin	Signal	Description
1	CON_RTS_OUT	Request To Send
18	CON_DTR_OUT	Data Terminal Ready

Table 1-2 MARC Multifunction Header Console Interface Pin Assignments (continued)

Pin	Signal	Description
2	CON_TXD_OUT	Transmit Data
19	GND	Ground
3	GND	Ground
20	CON_RXD_IN	Receive Data
4	CON_DSR_IN	Data Set Ready
21	CON_CTS_IN	Clear To Send

AUX Connections

The AUX port is a serial asynchronous port that works at speeds of 1.2 Kbps, 2.4 Kbps, 4.8 Kbps, 9.6 Kbps, 19.2 Kbps, 38.4 Kbps, 57.6 Kbps, and 115.2 Kbps. The console port and AUX port can be accessed simultaneously. For example, you can connect a terminal to the console interface and an external modem or a GPS modem to the AUX port.

The AUX port supports the following:

- Asynchronous serial DTE
- Baud rates range from 1,200 to 115,000
- 5 to 8 data bits
- 1, 1.5, or 2 stop bits
- Odd, even, or no parity
- Flow control by using RTS, CTS, DTR, and CDC signals

Table 1-3 MARC Multifunction Header AUX Pin Assignments

Pin	Signal	Description
5	AUX_RTS_OUT	Request To Send
22	AUX_DTR_OUT	Data Terminal Ready
6	AUX_TXD_OUT	Transmit Data
23	GND	Ground
7	AUX_DSR_IN	Data Set Ready
24	AUX_RXD_IN	Receive Data
8	AUX_CD_IN	Carrier Detect
25	AUX_CTS_IN	Clear To Send

LED Connections

Table 1-4 shows the MARC LEDs supported through the multifunction header that indicate system and LAN status.

Table 1-4 MARC LEDs Multifunction Header Pin Assignments

Pin	Signal	Description	Function	Indicates
10	LED_PWR	Power–up status	LED - (1)	Indicates the router operating status. The LED blinks during IOS bootup and is continuously on after the router completes its self-test and begins operating. If the ROMMON self–tests fail, this LED will be off.
27	+3.3V	LED power supply	LED + (1)	
11	LED_LAN_ACT	LAN activity status	LED - (2)	Blinks when a packet is either transmitted or received on 10/100 Fast Ethernet port.
28	+3.3V	LED power supply	LED + (2)	
12	LED_LAN_LINK	LAN link indicator	LED - (3)	Indicates the status of the 10/100 Fast Ethernet port. The LED is on while the Ethernet link is up and connected to another device.
29	+3.3V	LED power supply	LED + (3)	

Power Connections (AUX)

A +5V power supply is provided for device connected to AUX port. A GPS modem is used as an example in this section. Typically the +5V power supply current to GPS modems should be limited to less than 200 mA.

Table 1-5 shows the pin assignments for power.

Table 1-5 MARC Multifunction Header Pin Assignments for Power

Pin	Signal	Description	Function
9	GND	Ground	GND
26	+5V	+5V DC Power Supply	Power

MARC Power Requirements

The MARC uses +3.3 V, +5 V, and +12 V power sources. Internal on-board DC-to-DC conversion circuitry generates 1.8 V/1.5 amps from the +3.3V power source.

Table 1-6 MARC Voltages

Voltage	Current	Power
+5.0 V	0.3 amps	1.5 W
+12.0 V	0.1 amps	1.2 W
+3.3 V	2.0 amps	6.6 W

Fast Ethernet Switch Mobile Interface Card (FESMIC)

The Fast Ethernet Switch Mobile Interface Card (FESMIC) is a mobile interface card (MIC) in a standard PC/104-*Plus* form factor. FESMICs are components of the Cisco 3200 Series Mobile Access Router. The 4-port FESMIC provides 4 sets of switched 10/100 Fast Ethernet signals. The 2-port FESMIC provides 2 sets of switched 10/100 Fast Ethernet signals.

The key features of the FESMIC include the following:

- Auto-sensing switched 10/100 Fast Ethernet interfaces.
- Auto-MDIX (medium-dependent interface crossover). Auto-MDIX automatically detects and corrects crossed Ethernet cabling.
- Support for 802.1D standard bridging, 802.1Q trunking, and 802.1P class of service (CoS).
- Layer 3 routing support between VLANs.

Additional cards and components provide power and link interfaces to the FESMIC. The exact configuration of your router will vary, depending on how it was configured by your vendor.

Note This section provides basic information about the FESMIC hardware for the purpose of performing simple troubleshooting, such as reconnecting a loose cable. To solve more difficult problems, please contact your vendor.

The FESMIC draws power from the PCI and the ISA connectors. Table 2-1 shows the estimated power consumption. Note that these are theoretical maximum wattages.

Table 2-1 FESMIC Estimated Power Consumption

Voltage	Current Draw	Power	Source
+5.0 V	0.2 amps	1.0 W	ISA and PCI connectors
+3.3 V	2.3 amps	7.7 W	PCI connectors

Auto-Negotiation and Auto-MDI/MDIX

All of the 10/100 Fast Ethernet interfaces support Ethernet auto-negotiation for the line transmission speed. Both sides of the connection are automatically set to either 10BASE-TX or 100BASE-TX. Auto-negotiation is widely used on most Ethernet interfaces, and it is the default mode.

When a 10/100 Fast Ethernet interface is enabled, one end of the link must perform media dependent interface (MDI) crossover (MDIX), so that the transmitter on one end of the data link is connected to the receiver on the other end of the data link (a crossover cable is typically used). The Auto-MDIX feature eliminates the need for crossover cabling by performing an internal crossover when a straight cable is detected during the auto-negotiation phase.

If auto-negotiation is disabled, Auto-MDI/MDIX cannot work because there is no signal transmission at initialization to sample the cabling with. Therefore, as in all systems not supporting the HP Auto-MDIX feature, cabling must be correct for the devices being connected. The Auto-MDIX feature is disabled if you explicitly set the line speed rather than leaving the default mode of auto-negotiation. Although it is possible to disable HP Auto-MDIX with auto-negotiation enabled, the current software does not implement an explicit CLI command to allow you to disable Auto-MDIX during auto-negotiation.

Auto-negotiation Enable

To enable auto-negotiation, do the following:

```
Router#(config) FastEthernet m/n
Router#(config-if) speed auto
```

where *m* is the slot and *n* is the port number.

Auto-negotiation Disable

To disable auto-negotiation and auto-MDIX by forcing the line speed through a manual setting, do the following:

```
Router#(config) FastEthernet m/n
Router#(config-if) speed 10
```

or

```
Router#(config) FastEthernet m/n
Router#(config-if) speed 100
```

MAC Address Allocation

The 4-port FESMIC stores 4 unique MAC addresses for the 10/100 Ethernet interfaces. The 2-port FESMIC stores 2 unique MAC addresses for the 10/100 Ethernet interfaces. In addition, 33 unique MAC addresses are burned into the Mobile Access Router Card (MARC) to support the FESMIC per-VLAN spanning tree (PVST) and inter-VLAN routing features.

To provide support for up to 32 VLANs, and the 32 Spanning Tree Protocol (STP) sessions that might be running, 32 unique MAC addresses required for the bridge packet data unit (BPDU) IDs. In addition, one MAC address is needed by the FESMIC for VLAN routing., bringing the total of number of MAC addresses on the wired router to 34. The MAC addresses are burned in the MARC, instead of the FESMIC to support future development.

FESMIC Component Systems

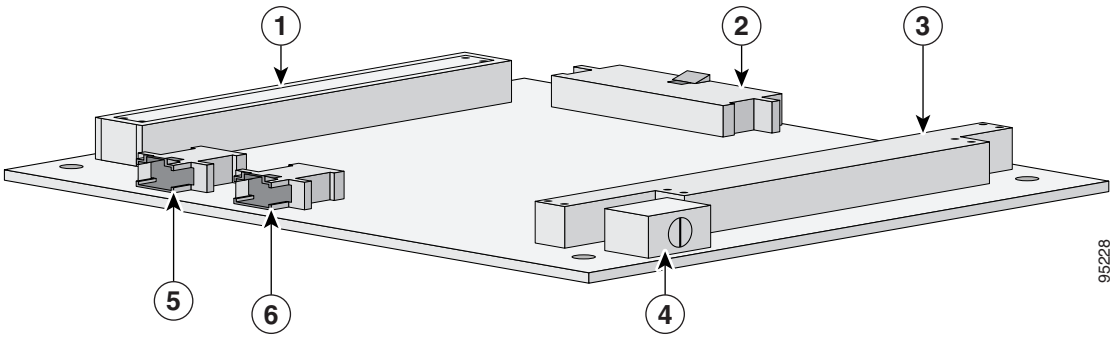
The ISA buses and PCI buses on the Cisco 3200 Series Mobile Access Router cards provide power to the components on the cards. Both buses comply with the PC/104-*Plus* standard. The ISA bus allows PC/104-*Plus* ISA signals to pass through the card bus, but the Cisco cards do not use any of the signals.

The PCI bus signals allow the Cisco cards to communicate. Non-Cisco cards cannot communicate with the Cisco 3200 Series Mobile Access Router cards over the PCI bus.

Caution If you add non-Cisco cards that generates signals on the PCI bus, the router might shut down. Please do not add non-Cisco cards that generate signals on the PCI bus.

Figure 2-1 shows the 2-port FESMIC header and bus locations.

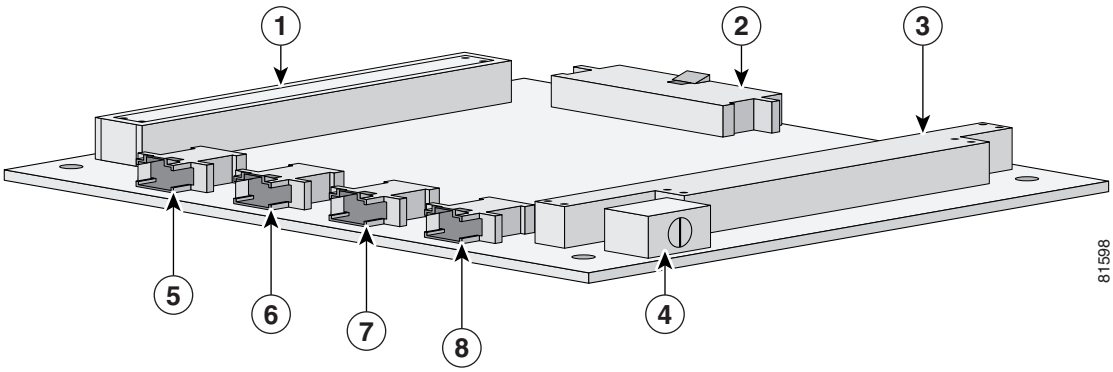
Figure 2-1 2-port FESMIC Header and Bus Locations



1	PCI bus	**2**	20-pin LED header
3	ISA bus	**4**	Rotary switch
5	FE0 10/100 Fast Ethernet header	**6**	FE1 10/100 Fast Ethernet header

Figure 2-2 shows the 4-port FESMIC header and bus locations.

Figure 2-2 4-port FESMIC Header and Bus Locations



1	PCI bus	**2**	20-pin LED header
3	ISA bus	**4**	Rotary switch
5-8	E0–E3 10/100 Fast Ethernet headers		

Note The PC/104-Plus standard requires that the PCI bus and the ISA bus utilize keying features in the standard stacking headers to guarantee proper module installation. On the PCI bus, pin D30 is removed and the D30 opening is plugged. On the ISA bus, pin C19 and pin B10 are removed, and the C19 and B10 openings are plugged.

Signals for the FESMIC

Cisco 3200 Series router cards do not support any ISA bus signals. The PCI bus connector supports communication between Cisco 3200 Series Mobile Access Router cards.

Note Non-Cisco MIC cards cannot use PCI signals. The use of PCI signals by non-Cisco cards causes unpredictable results. You cannot add third-party devices that might attempt to communicate with the router through the ISA or PCI bus.

The signals are delivered through 10-pin headers, one set of 10/100 Fast Ethernet signals per header. LED signals and 5 V of power are provided through the 20-pin LED header.

10/100 Fast Ethernet Signals on the FESMIC

There are 4 fixed 10/100 Fast Ethernet signals on the FESMIC. A Cisco router identifies a 10/100 Fast Ethernet interface address by its slot number and port number, in the form of *slot/port*. The slot/port addresses of the 10/100 Fast Ethernet interfaces on the FESMIC depend on the position of the rotary switch.

For example, if the rotary switch on the 4-port FESMIC is in position 0, the ports are identified as 1/0, 1/1, 1/2, and 1/3. If the rotary switch on the 2-port FESMIC is in position 0, the ports are identified as 1/0 and 1/1.

The 10/100 Fast Ethernet port signals are in compliance with IEEE 802.3. They are provided through the Ethernet headers, which support the following:

- Auto-negotiation for 10/100BASE-TX connection
- Full-duplex and half-duplex modes
- Low-power sleep mode
- 10BASE-T and 100BASE-TX using a single Ethernet connection
- Robust baseline wander correction performance
- Standard carrier signal multiple access collision detect (CSMA/CD) or full-duplex operation
- Integrated LED drivers

The FastEthernet ports on the 4-port FESMIC and the 2-port FESMIC are 10/100 Fast Ethernet *switch* ports. The switch ports support all layer 2 features. The FastEthernet 0/0 port on the MARC is a 10/100 Fast Ethernet *router* port. The routing features supported on the MARC cannot be configured on the FESMIC ports.

Figure 2-3 shows the 10-pin 10/100 Fast Ethernet header pin locations.

Figure 2-3 FESMIC Ethernet Header Pin Locations

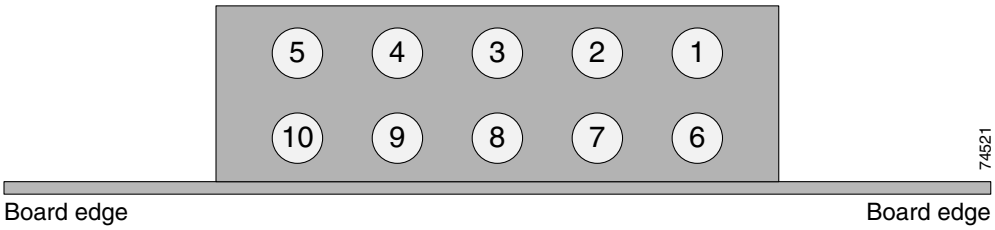


Table 2-2 describes the pin assignments shown in Figure 2-3.

Table 2-2 FESMIC Ethernet Header Pin Assignments

Pin	Signal	Description
1	RX+	Receive positive
6	RX-	Receive negative
2	TX+	Transmit positive
7	Unused	Terminated
3	Unused	Terminated
8	TX-	Transmit negative
4	Unused	Terminated
9	Unused	Terminated
5	Reserved	Do not use
10	Reserved	Do not use

FESMIC LED Signals

Figure 2-4 shows the 20-pin LED header that provides connections for the LEDs.

Figure 2-4 FESMIC LED Header Pin Locations

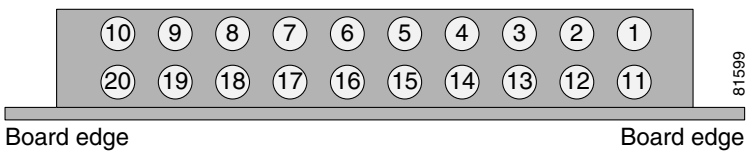


Table 2-3 lists the pin assignments on the FESMIC 20-pin LED header.

Table 2-3 FESMIC LED Header Pin Assignments

Pin	Signal	Description	
1	Port0 LINK+	Link Positive LED terminal Port 0 (power supply)	The LED is on while the 10/100 Fast Ethernet link is up and connected to another device.
11	Port0 LINK-	Link Negative LED terminal Port 0	
2	Port0 ACT+	Active Positive LED terminal Port 0 (power supply)	Blinks when a packet is either transmitted or received.
12	Port0 ACT-	Active Negative LED terminal Port 0	
3	Port1 LINK+	Link Positive LED terminal Port 1 (power supply)	The LED is on while the 10/100 Fast Ethernet link is up and connected to another device.
13	Port1 LINK-	Link Negative LED terminal Port 1	
4	Port1 ACT+	Active Positive LED terminal Port 1 (power supply)	Blinks when a packet is either transmitted or received.
14	Port1 ACT-	Active Negative LED terminal Port 1	
5	Port2 LINK+	Link Positive LED terminal Port 2 (power supply)	The LED is on while the 10/100 Fast Ethernet link is up and connected to another device (4-port FESMIC only).
15	Port2 LINK-	Link Negative LED terminal Port 2	
6	Port2 ACT+	Active Positive LED terminal Port 2 (power supply)	Blinks when a packet is either transmitted or received (4-port FESMIC only).
16	Port2 ACT-	Active Negative LED terminal Port 2	
7	Port3 LINK+	Link Positive LED terminal Port 3 (power supply)	The LED is on while the 10/100 Fast Ethernet link is up and connected to another device (4-port FESMIC only).
17	Port3 LINK-	Link Negative LED terminal Port 3	
8	Port3 ACT+	Active Positive LED terminal Port 3 (power supply)	Blinks when a packet is either transmitted or received (4-port FESMIC only).
18	Port3 ACT-	Active Negative LED terminal Port 3	
9	Open	Do not use	
19	Open	Do not use	
10	Open	Do not use	
20	Open	Do not use	

FESMIC Rotary Switch Positions

The rotary switch position determines the IOS port number for the MIC. Table 2-4 shows the mapping of the switch positions to the IOS slot numbers.

Table 2-4 FESMIC Rotary Switch Positions

Switch Position	IOS Slot Number
0	1
1	2
2	3
3–7	Not supported

Caution The rotary switch positions must be unique and should not be assigned to more than one MIC.

If a MIC rotary switch is set to 3 or higher, the message is:

"MIC-3-SLOTNOTSUPPORTED: The MIC cannot operate when the rotary switch is in position 3. Change the switch position to one of the supported, unused positions 0-2."

If two or more MICs have the rotary switches set to the same position, or if one or more MICs are in rotary switch position 4 through 7, the router might crash after displaying the following error message:

"Non-recoverable error occurred. Please check the rotary switch positions on the MIC cards for the possible misconfiguration of the switch position."

Table 2-5 shows the FESMIC 10/100 Fast Ethernet signal assignments. The position of the rotary switch determines the port assignments. Although the rotary switch has eight positions, only one of three positions can be selected. The rotary switch position should be unique for each MIC.

Table 2-5 FESMIC Rotary Switch Positions and Signal Assignments

Rotary Switch Position	MIC Slot	Fast Ethernet Signal Assignments			
0	1	FE 1/0	FE 1/1	FE 1/2[1]	FE 1/3[1]
1	2	FE 2/0	FE 2/1	FE 2/2[1]	FE 2/3[1]
2	3	FE 3/0	FE 3/1	FE 3/2[1]	FE 3/3[1]

1. 4-port FESMIC only

Serial Mobile Interface Card (SMIC)

The Serial Mobile Interface Card (SMIC) is one component of the Cisco 3200 Series Mobile Access Router. It provides the router up to 4 high–speed sets of serial signals in both data terminal equipment (DTE) and data circuit equipment (DCE) modes. Additional components provide power and link interfaces to the SMIC. For example, the Mobile Access Router Card (MARC) provides the host processor, memory, and headers for the 10/100 Fast Ethernet, console, and auxiliary signals for the router. The exact configuration of your router will vary, depending on how it was configured by your vendor.

Note This section provides basic information about the SMIC hardware for the purpose of performing simple troubleshooting, such as reconnecting a loose cable. To solve more difficult problems, please contact your vendor.

Each SMIC provides the following:

- Support for 2 to 4 sets of serial signals with protocol support for HDLC, asynchronous, synchronous and octet-oriented PPP modes. The signals can be configured to any serial standard (EIA/TIA-232, EIA/TIA-449, EIA/TIA-530, EIA/TIA-530A, EIA/TIA-X.21, or CCITT V.35).
- DCE and DTE mode support on each set of serial signals.
- Speeds of 2 Mbps for synchronous data transfer and 115 Kbps for asynchronous data transfer on each serial interface. All serial standards reach 2 Mbps (for synchronous) except for the EIA/TIA-232 standard which supports up to 192K.

Note The PCI bus and ISA bus utilize keying features in the standard stacking headers to guarantee proper module installation. On the PCI bus, pin D30 is removed and the D30 opening plugged. On the ISA Bus, pin C19 and pin B10 are removed, and the pin C19 and pin B10 openings are plugged.

The SMIC draws power from the PCI and the ISA connectors. Table 3-1 shows the estimated power consumption. Note that these are theoretical maximum wattages.

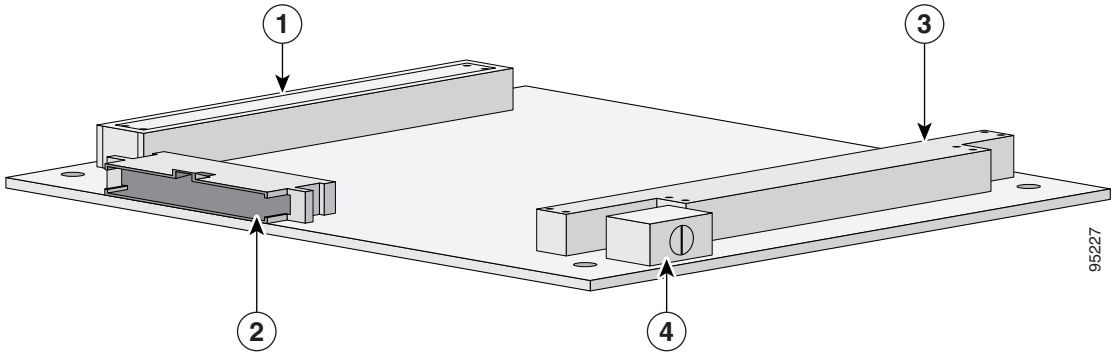
Table 3-1 SMIC Estimated Power Consumption

Voltage	Current Draw	Power	Source
+5.0 V	1.0 amps	5.0 W	ISA and PCI connectors
+3.3 V	0.5 amps	1.7 W	PCI connectors

SMIC Component Systems

Figure 3-1 shows the 2-port SMIC header and bus locations.

Figure 3-1 2-port SMIC Header and Bus Locations

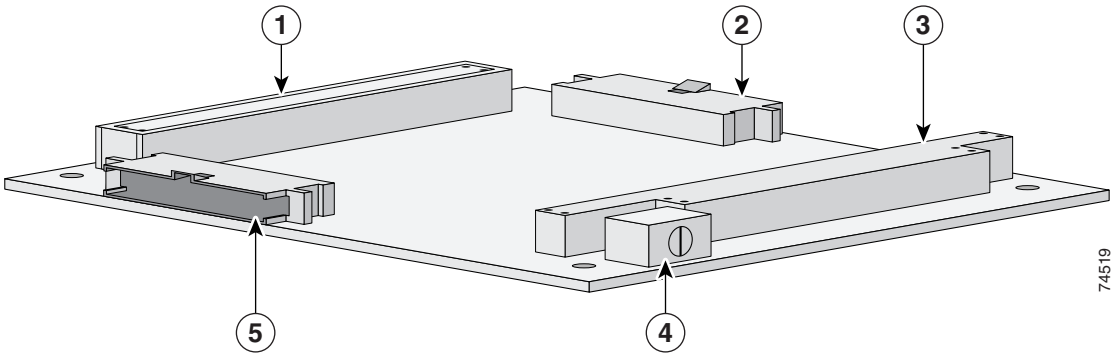


1	PCI bus	**2**	60-pin multifunction header for Serial 0 and Serial 1 signals
3	ISA bus	**4**	Rotary switch

Figure 3-2 shows the 4-port SMIC header and bus locations.

Caution If you add non-Cisco cards that generates signals on the PCI bus, the router might shut down. Please do not add non-Cisco cards that generate signals on the PCI bus.

Figure 3-2 4-port SMIC Header and Bus Locations



1	PCI bus	**2**	60-pin multifunction header for Serial 2 and Serial 3 signals
3	ISA bus	**4**	Rotary switch
5	60-pin multifunction header for Serial 0 and Serial 1 signals		

Signals for the SMIC

The Cisco SSB Serial standard supports the following:

- EIA/TIA-232, EIA/TIA-449, EIA-530, EIA-530A, X.21, and V.35 standards in both DTE or DCE modes.
- Signals (SSB and LED) are provided through the 60-pin multifunction header(s).

The position of the rotary switch determines the port assignments. Although the rotary switch has eight positions, only position 0, 1, and 2 are supported on the 4-port SMIC and only position 0 and 1 are supported on the 2-port SMIC.

Table 3-2 provides 4-port SMIC port assignments.

Table 3-2 4-port SMIC Rotary Switch Settings and Port Assignments

Position	MIC Slot	Port Assignments			
0	1	Serial 1/0	Serial 1/1	Serial 1/2	Serial 1/3
1	2	Serial 2/0	Serial 2/1	Serial 2/2	Serial 2/3
2	3	Serial 3/0	Serial 3/1	Serial 3/2	Serial 3/3

Table 3-3 provides the 2-port SMIC port assignments.

Table 3-3 2-port SMIC Rotary Switch Settings and Port Assignments

Position	MIC Slot	Port Assignments	
0	1	Serial 1/0	Serial 1/1
1	2	Serial 2/0	Serial 2/1

Serial Cable Length

Maximum Cable length depends on a number of factors, including how well the sender and receiver are implemented regarding rise times, and cable capacitance, inductance and screening. These are all difficult to quantify, but the primary factor is the data rate. Typically, doubling the data rate halves the recommended maximum cable length.

The RS-232 specification limits cable length to 15.25 metres (50 feet) at a maximum data rate of 20,000 bps. The Cisco 3200 Series router RS-232 serial interfaces data rate is 115,200 bps and are limited to a maximum cable length of 2.8 meters (8 feet).

SMIC LED Signals

Table 3-4 shows the LED signals that are supported on the SMIC, along with the corresponding functions. Serial 2 and Serial 3 apply to the 4-port SMIC only.

Table 3-4 SMIC LED Functions

LED	Function
SERIAL0 ACTIVITY	Blinks once when a packet is either transmitted or received on Serial 0, and originates from Header 5.
SERIAL0 LINK	Indicates the status of Serial 0 and originates from Header 5. The LED is on when a serial port is in DTE mode, and when the data set ready (DSR), data carrier detect (DCD), and clear to send (CTS) signals are detected. The LED is on when a serial port is in DCE mode, and when the data terminal ready (DTR) and request to send (RTS) signals have been detected.
SERIAL1 ACTIVITY	Blinks once when a packet is either transmitted or received on Serial 1. Originates from Header 5.
SERIAL1 LINK	Indicates the status of Serial 1, and originates from Header 5. The LED is on when the serial port is in DTE mode, and when the data set ready (DSR), data carrier detect (DCD), and clear to send (CTS) signals are detected. The LED is on when the serial port is in DCE mode, and when the data terminal ready (DTR) and request to send (RTS) signals have been detected.
SERIAL2 ACTIVITY	Blinks once when a packet is either transmitted or received on Serial 2. Originates from Header 2.
SERIAL2 LINK	Indicates the status of Serial 2, and originates from Header 2. The LED is on when the serial port is in DTE mode, and when the data set ready (DSR), data carrier detect (DCD), and clear to send (CTS) signals are detected. The LED is on when the serial port is in DCE mode, and when the data terminal ready (DTR) and request to send (RTS) signals have been detected.
SERIAL3 ACTIVITY	Blinks once when a packet is either transmitted or received on Serial 3. Originates from Header 2.
SERIAL3 LINK	Indicates the status of Serial 3, and originates from Header 2. The LED is on when the serial port is in DTE mode, and when the data set ready (DSR), data carrier detect (DCD), and clear to send (CTS) signals are detected. The LED is on when the serial port is in DCE mode, and when the data terminal ready (DTR) and request to send (RTS) signals have been detected.

4-Port SMIC Rotary Switch Positions

Table 3-5 shows the 4-port SMIC serial signal assignments. The position of the rotary switch determines the port assignments. Although the rotary switch has 8 positions, only 1 of 3 positions can be selected. The rotary switch position should be unique for each mobile interface card (MIC) card.

Table 3-5 4-port SMIC Rotary Switch Positions and Serial Set Signal Assignments

Rotary Switch Position	MIC Slot	Signal Assignments			
0	1	Serial 1/0	Serial 1/1	Serial 1/2	Serial 1/3
1	2	Serial 2/0	Serial 2/1	Serial 2/2	Serial 2/3

Table 3-5 4-port SMIC Rotary Switch Positions and Serial Set Signal Assignments

Rotary Switch Position	MIC Slot	Signal Assignments			
2	3	Serial 3/0	Serial 3/1	Serial 3/2	Serial 3/3
3	4	Serial 4/0	Serial 4/1	Serial 4/2	Serial 4/3

Wireless Mobile Interface Card (WMIC)

The Wireless Mobile Interface Card (WMIC) is a mobile interface card (MIC) in a standard PC/104-*Plus* form factor. It is one component of the Cisco 3200 Series Mobile Access Routers and provides a 2.4-GHz (802.11b/g) or 4.9-GHz (US Only, Public Safety) wireless interface.

The WMIC can be configured as a:

- Wireless Access Point
- Wireless Root Bridge
- Wireless Non-root Bridge
- Wireless Work Group Bridge.

The WMIC communicates with the router through its 10/100 Fast Ethernet interface.

Note This chapter provides basic information about the WMIC hardware for the purpose of performing simple troubleshooting, such as reconnecting a loose cable. To solve more difficult problems, please contact your vendor.

Caution The 4.9-GHz (US Only, Public Safety) radio requires an operators license and can only be operated by US Public Safety operators who meet the requirements specified under FCC Part 90.20.

WMIC Component Systems

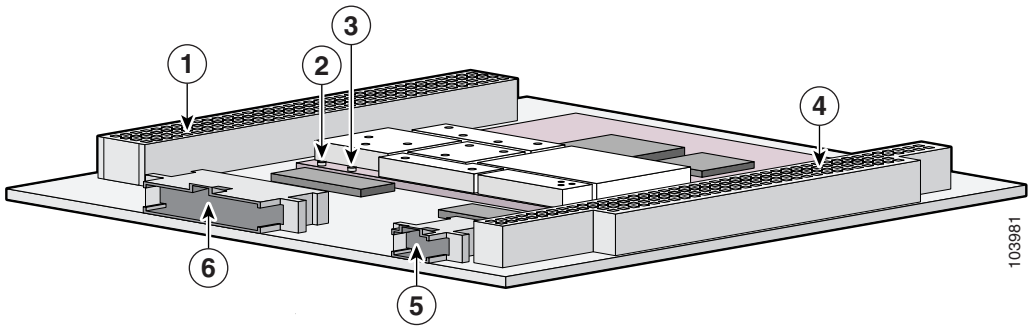
The ISA buses and PCI buses on the Cisco 3200 Series Mobile Access Router cards provide power to the components on the cards. The WMIC does not receive or transmit communications signals on the buses, but it will pass signals through to a card above or below the WMIC. Both buses comply with the PC/104-*Plus* standard.

The PCI bus signals allow the Cisco cards to communicate. Non-Cisco cards cannot communicate with the Cisco 3200 Series Mobile Access Router cards over the PCI bus.

Caution If you add non-Cisco cards that generates signals on the PCI bus, the router might shut down. Please do not add non-Cisco cards that generate signals on the PCI bus.

Figure 4-1 shows the WMIC header and bus locations.

Figure 4-1 WMIC Header and Bus Locations



1	PCI bus	**2**	Left antenna connector (J2)
3	Right antenna connector (J1)	**4**	ISA bus
5	10-pin 10/100 Fast Ethernet header	**6**	24-pin multifunction header

Note The PC/104-Plus standard requires that the PCI bus and the ISA bus utilize keying features in the standard stacking headers to guarantee proper module installation. On the PCI bus, pin D30 is removed and the D30 opening is plugged. On the ISA bus, pin C19 and pin B10 are removed, and the C19 and B10 openings are plugged.

Signals for the WMIC

Cisco 3200 Series router cards do not support any ISA bus signals. The PCI bus connector supports communication between Cisco 3200 Series Mobile Access Router cards.

Note Non-Cisco MIC cards cannot use PCI signals. The use of PCI signals by non-Cisco cards causes unpredictable results. You cannot add third-party devices that might attempt to communicate with the router through the ISA or PCI bus.

The 10/100 Fast Ethernet signals are delivered through a 10-pin header. LED signals and RS-232 console signals are provided through the 24-pin multifunction header.

10/100 Fast Ethernet Signals on the WMIC

There is one set of fixed 10/100 Fast Ethernet signals on the WMIC. The 10/100 Fast Ethernet port signals are in compliance with IEEE 802.3. They are provided through the Ethernet headers, which support the following:

- Auto-negotiation for 10/100BASE-TX connection
- Full-duplex and half-duplex modes
- Low-power sleep mode
- 10BASE-T and 100BASE-TX using a single Ethernet connection
- Robust baseline wander correction performance
- Standard carrier signal multiple access collision detect (CSMA/CD) or full-duplex operation
- Integrated LED drivers

Figure 4-2 shows the 10-pin 10/100 Fast Ethernet header pin locations.

Figure 4-2 WMIC Ethernet Header Pin Locations

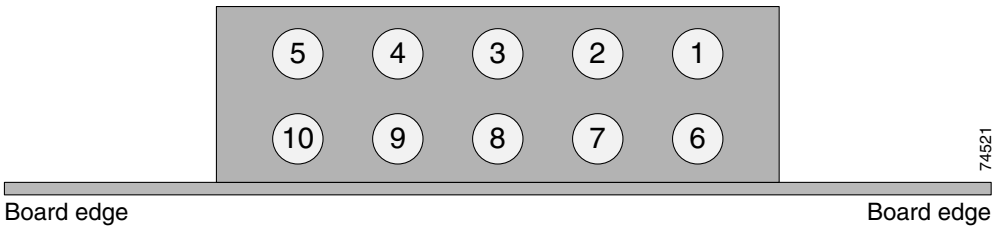


Table 4-1 describes the pin assignments shown in Figure 4-2.

Table 4-1 WMIC Ethernet Header Pin Assignments

Pin	Signal	Description
1	TX+	Transmit positive
6	TX-	Transmit negative
2	RX+	Receive positive
7	Unused	Terminated
3	Unused	Terminated
8	RX-	Receive negative
4	Unused	Terminated
9	Unused	Terminated
5	Reserved	Do not use
10	Reserved	Do not use

Note If Auto-MDIX is disabled, when connecting to Ethernet switches or repeaters a straight-through cable can be used. When connecting to compatible workstations, servers, and routers, a crossover cable should be used. If Auto-MDIX is enabled, either a straight-through or crossover cable can be used can be used to make the connection, as the router automatically changes the signals on the pins to compensate.

WMIC Multifunction Header Signals

The multifunction header contains RS-232 console signals and three-color status LED signals. Figure 4-3 shows the 24-pin multifunction header that provides connections for the LEDs.

Figure 4-3 WMIC Multifunction Header Pin Locations

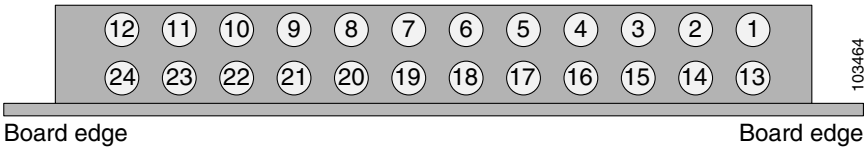


Table 4-2 lists the pin assignments on the WMIC 20-pin LED header.

Table 4-2 WMIC Multifunction Header Pin Assignments

Pin	Signal
1	Negative Ethernet RED LED terminal
13	Shared Positive Ethernet LED terminal
2	Negative Ethernet GREEN LED terminal
14	Negative Radio/RF RED LED terminal
3	Shared Positive Radio/RF LED terminal
15	Negative Radio/RF GREEN LED terminal
4	Negative Wireless Status RED LED terminal
16	Shared Positive Wireless Status LED terminal
5	Negative Wireless Status GREEN LED terminal
17	Negative Installation RED LED terminal
6	Shared Positive Installation/Operation LED terminal
18	Negative Operation GREEN LED terminal
7	Not Used (No Connection)
19	Console TX - Transmit Data
8	Console RX - Receive Data
20	Console GND - Signal Ground
9	Reserved
21	Reserved
10	Reserved
22	Reserved
11	Reserved
23	Reserved
12	Reserved
24	Reserved

LED Behavior

During normal operations, the indicator signals on the wireless device have the following meanings.

- The status indicator signals operational status. Steady green indicates that the wireless device is associated with at least one wireless client. Blinking green indicates that the wireless device is operating normally but is not associated with any wireless devices.
- The radio indicator blinks green to indicate radio traffic activity. The light is normally off, but it blinks whenever a packet is received or transmitted over the radio.
- The Ethernet indicator signals traffic on the wired LAN. This indicator is normally green when an Ethernet cable is connected, and blinks green when a packet is received or transmitted over the Ethernet infrastructure. The indicator is off when the Ethernet cable is not connected.

Table 4-3 shows the details of LED behavior.

Table 4-3 Indicator Signals

Message type	Ethernet indicator	Status indicator	Radio indicator	Meaning
Boot loader status	Green	–	Green	DRAM memory test.
	–	Amber	Red	Board initialization test.
	–	Blinking green	Blinking green	Flash memory test.
	Amber	Green	–	Ethernet initialization test.
	Green	Green	Green	Starting Cisco IOS software.
Association status	–	Green	–	At least one wireless client device is associated with the unit.
	–	Blinking green	–	No client devices are associated; check the wireless device SSID and WEP settings.
Operating status	–	Green	Blinking green	Transmitting/receiving radio packets.
	Green	–	–	Ethernet link is operational.
	Blinking green	–	–	Transmitting/receiving Ethernet packets.
Boot Loader Errors	Red	–	Red	DRAM memory test failure.
	–	Red	Red	File system failure.
	Red	Red	–	Ethernet failure during image recovery.
	Amber	Green	Amber	Boot environment error.
	Red	Green	Red	No Cisco IOS image file.
	Amber	Amber	Amber	Boot failure.
Operation Errors	–	Green	Blinking amber	Maximum retries or buffer full occurred on the radio.
	Blinking amber	–	–	Transmit/receive Ethernet errors.
	–	Blinking amber	–	General warning.

Table 4-3 Indicator Signals (continued)

Message type	Ethernet indicator	Status indicator	Radio indicator	Meaning
Configuration Reset	–	Amber	–	Resetting the configuration options to factory defaults.
Failures	Red	Red	Red	Firmware failure; try disconnecting and reconnecting unit power.
	Blinking red	–	–	Hardware failure. The wireless device must be replaced.
Firmware Upgrade	–	Red	–	Loading new firmware image.

Antenna Connector

On the radio card, there are two ultra-miniature coaxial connectors (U.FL connector) that are used to connect the coax cables between the WMIC and the external antenna connectors. This low profile connector offers frequency performance up to 6-GHz. Two connectors are used to support antenna diversity.

The cable should be as short as possible to minimize the loss in strength of the radio frequency (RF) signal. The cable carries the RF signal from the antenna to the low noise amplifier (LNA) on the receiver and transmits the RF signal from power amplifier (PA) to the antenna that radiates the RF signal.

There are many antenna connector families. The Cisco RP-TNC antenna connector can be used to support standard antennas.

Key Features

This section lists the key features of the radios.

2.4-GHz (802.11b/g) WMIC and the 4.9-GHz (US Only, Public Safety) Features

The key features of the 2.4-GHz (802.11b/g) WMIC and the 4.9-GHz (US Only, Public Safety) WMIC are listed below.

Table 4-4 WMIC Key Features

Wireless Medium	Direct Sequence Spread Spectrum (DSSS) Orthogonal Frequency Division Multiplexing (OFDM)
Media Access Protocol	Carrier sense multiple access with collision avoidance (CSMA/CA)
SNMP Compliance	MIB I and MIB II
Encryption Key Length	128-bit
Virtual LAN (VLAN) Support	The segmentation of up to 16 user groups is allowed.
Quality of Service (QoS) Support	Prioritization of traffic for different requirements, such as voice and video.

Table 4-4 WMIC Key Features

Security	Cisco Wireless Security Suite including: **Authentication:** • 802.1X support including LEAP, PEAP, EAP-TLS, EAP-TTLS, and EAP-SIM to yield mutual authentication and dynamic, per-user, per-session WEP keys • MAC address and by standard 802.11 authentication mechanisms **Encryption:** • Support for static and dynamic IEEE 802.11 WEP keys of 40 bits and 128 bits • Pre-standard TKIP WEP enhancements: key hashing (per-packet keying), message integrity check (MIC), and broadcast key rotation
Status Indicators	LEDs provide information concerning association status, operation, error/warning, firmware upgrade, and configuration, network/modem, and radio status
Memory	8 MB Flash 32 MB DRAM
Automatic Configuration Support	BOOTP and DHCP
Remote Configuration Support	Telnet, HTTP, FTP, TFTP, and SNMP
Uplink	Auto-sensing 10/100BaseT Ethernet
Local Configuration	Console port

Note If no FESMIC is installed, the Cisco 3200 Series routers support a maximum of one WMIC on each router. The routers support a maximum of three WMICs on each router when a FESMIC is installed.

MAC Address Allocation

The WMIC stores one unique MAC address for the BVI interface.

Differences Between 2.4-GHz (802.11b/g) and 4.9-GHz (US Only, Public Safety) Radios

Table 4-5 Differences between 2.4-GHz WMIC and 4.9-GHz WMIC

	2.4-GHz (802.11b/g)	4.9-GHz (US Only, Public Safety)	Comment
Power	Maximum OFDM power level is 15dbm (30mw), but the power level might vary by country.	Maximum OFDM power level is 17dbm (50mw).	
power client Command	Supported	Not supported.	Use the **power** command.
Concatenation	Supported.	Not supported.	
Fragmentation	Maximum threshold is 4000 bytes.	Maximum threshold is 2346 bytes.	Fragment counter is in units of fragmented packets.
distance Command (to minimize delay propagation)	Supported up to 99 kilometers.	Supported up to 3 kilometers (1.8 miles).	
World Mode	Supported.	Not supported.	
HTML-Based User Interface	Supported	Not supported	
VLANs	16 unencrypted VLANs, 16 static key VLANs, or 16 dynamic key VLANs,	16 unencrypted VLANs, 1 static key VLAN, or 4 dynamic key VLANs.	
Wireless encryption/cipher suites	WEP-40, WEP-128, TKIP, CKIP, CMIC and CKIP-CMIC	WEP-40, WEP-128, TKIP and AES-CCM	
Max Number of Stations with WEP	255	116	
Max Number of Stations with TKIP	256	26	
Max Number of Stations with AES-CCM	256	116	
WDS server	Not supported.	The 4.9-GHz WMIC can be configured to act as WDS server.	
WDS client	The 2.4-GHz WMIC acting as root device can auto discover and work with a subnet WDS server.	The 4.9-GHz WMIC acting as root device can auto discover and work within a subnet WDS server. If IP address of a WDS server is statically configured on a 4.9-GHz WMIC acting as root device, the WMIC can also work with a central WDS server located anywhere on the network.	
EAP-TLS, EAP-TTLS	Supported	Not Supported	
WDS Server related MIBS	N/A	Supported	

2.4-GHz (802.11b/g) Features

The key features of the 2.4-GHz (802.11b/g) WMIC are listed below.

Data Rates Supported	1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, and 54 Mbps
Network Standard	IEEE 802.11b and IEEE 802.11g
Frequency Band	2.400-GHz to 2.497-GHz
Modulation	BPSK 1 Mbps and 6 Mbps QPSK 2 Mbps and 12 Mbps CCK 5.5 Mbps BPSK 9.6 Mbps CCK2 11 Mbps QPSK 18 Mbps 16 QAM 24 Mbps and 36 Mbps 64 QAM 48 Mbps and 54 Mbps
Operating Channels	North America: 11; ETSI: 13; Japan: 14
Receive Sensitivity	1 Mbps: -94 dBm 2 Mbps: -91 dBm 5.5 Mbps: -89 dBm 11 Mbps: -85 dBm
Available Transmit Power Settings	100 mW (20 dBm) 50 mW (17 dBm) 30 mW (15 dBm) 20 mW (13 dBm) 5 mW (7 dBm) 1 mW (0 dBm) Maximum power setting will vary according to individual country regulations.
Range (typical @ 1000-mW transmit power setting with 6 dBi diversity dipole antenna)	Outdoor: 0.5 mile (804 m) @ 45 Mbps 1 mile (1609 m) @ 11 Mbps 3 miles (4,827 m) @ 1 Mbps
Compliance	2.4-GHz (802.11b/g) operates license free under FCC Part 15 and complies as a Class B device; complies with DOC regulations; complies with ETS 300.328, FTZ 2100, and MPT 1349 standards; rugged version complies with UL 2043

4.9-GHz (US Only, Public Safety) Features

The key features of the 4.9-GHz (US Only, Public Safety) WMIC are listed below.

Data Rates Supported

5-MHz channelization: 1.5, 2.25, 3, 4.5, 6, 9, 12, and 13.5 Mbps

10-MHz channelization: 3, 4.5, 6, 9, 12, 18, 24, and 27 Mbps

20-MHz channelization: 6, 9, 12, 18, 24, 36, 48, and 54 Mbps

Network Standard

Currently there is no IEEE 4.9-GHz (US Only, Public Safety) standard; however, it is similar to the IEEE 802.11a standard.

Frequency Band

4.940-GHz to 4.990-GHz

Operating Channels

North America: 11

Available Transmit Power Settings

40 mW (16 dBm)
30 mW (15 dBm)
20 mW (13 dBm)
10 mW (10 dBm)
5 mW (7 dBm)

Compliance

4.9-GHz (US Only, Public Safety):

- Operation restricted to operators meeting requirements of CFR47 Part 90.20 of the technical rules for qualification as a Public Safety operator.
- Requires a FCC license to operate under this part of the Part 90 Regulation

4.9 -GHz Channels

Table 4-6 shows the channel options for the 4.94-GHz to 4.99-GHz band for the United States regulatory domain.

Table 4-6 FCC 4.9 Operational Channels as per TIA TR-8 specification

Operating Channel Numbers	Channel Center 5-MHz Channel Spacing	Channel Center 10-MHz Channel Spacing	Channel Center 20-MHz Channel Spacing
1			
3			
5	4942.5		
7			
9			
10		4945.0	
15	4947.5		
20		4950.0	4950.0
25	4952.5		

Table 4-6 FCC 4.9 Operational Channels as per TIA TR-8 specification (continued)

Operating Channel Numbers	Channel Center 5-MHz Channel Spacing	Channel Center 10-MHz Channel Spacing	Channel Center 20-MHz Channel Spacing
30		4955.0	4955.0
35	4957.5		
40		4960.0	4960.0
45	4962.5		
50		4965.0	4965.0
55	4967.5		
60		4970.0	4970.0
65	4972.5		
70		4975.0	4975.0
75	4977.5		
80		4980.0	4980.0
85	4982.5		
90		4985.0	
91			
93			
95	4987.5		
97			
99			

Note Channel Center Frequencies (MHz) 1-MHz Channel Spacing is documented in the TIA TR-8 specification, but it is not supported by the 4.9-GHz (US Only, Public Safety) WMIC.

Throughput

The throughput is a minimum of:

- 4 Mbps half-duplex at one mile line-of-sight for a 5-MHz-wide channel
- 8 Mbps half-duplex at one mile line-of-sight range for a 10-MHz-wide channel.
- 16 Mbps half-duplex at one mile line-of-sight range for a 20-MHz-wide channel.

Modulation

Table 4-7 shows the modulation.

Table 4-7 Modulation

Modulation	5 Mbps	10 Mbps	20 Mbps
BPSK	1.5 Mbps and 2.25 Mbps	3 Mbps and 4.5 Mbps	6 Mbps and 9 Mbps
QPSK	3 Mbps and 4.5 Mbps	6 Mbps and 9 Mbps	12 Mbps and 18 Mbps
16 QAM	6 Mbps and 9 Mbps	12 Mbps and 18 Mbps	24 Mbps and 27 Mbps
64 QAM	12 Mbps and 13.5 Mbps	24 Mbps and 27 Mbps	48 Mbps and 54 Mbps

Receive Sensitivity

Table 4-8 shows the receive sensitivity.

Table 4-8 Receive Sensitivity

5-MHz		10-MHz		20-MHz	
1.5 Mbps	-89 dBm	3 Mbps	-87 dBm	6 Mbps	-85 dBm
2.25 Mbps	-89 dBm	4.5 Mbps	-87 dBm	9 Mbps	-85 dBm
3 Mbps	-89 dBm	6 Mbps	-87 dBm	12 Mbps	-85 dBm
4.5 Mbps	-85 dBm	9 Mbps	-87 dBm	18 Mbps	-82 dBm
6 Mbps	-82 dBm	12 Mbps	-85 dBm	24 Mbps	-79 dBm
9 Mbps	-79 dBm	18 Mbps	-79 dBm	36 Mbps	-76 dBm
12 Mbps	-74 dBm	24 Mbps	-74 dBm	48 Mbps	-71 dBm
13.5 Mbps	-72 dBm	27 Mbps	-72 dBm	54 Mbps	-69 dBm

Power Requirements

Additional cards and components provide power and link interfaces to the WMIC. The exact configuration of your router will vary, depending on how it was configured by the vendor.

The WMIC draws power from the PCI and the ISA connectors. Table 4-9 shows the estimated power consumption. Note that these are theoretical maximum wattages.

Table 4-9 WMIC Power Requirement

Voltage	Current Draw	Power	Source
+5.0 V	0.4 amps	2.0 W	ISA and PCI connectors
+3.3 V	1.7 amps	5.6 W	PCI connectors

Related Documentation

These documents provide detailed information regarding the configuration of the wireless card:

- *Cisco IOS Switching Services Configuration Guide.* Click this link to browse to this document: http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122cgcr/fswtch_c/index.htm
- *Cisco Internetwork Design Guide.* Click this link to browse to this document: http://www.cisco.com/univercd/cc/td/doc/cisintwk/idg4/index.htm
- *Cisco Internetworking Technology Handbook.* Click this link to browse to this document: http://www.cisco.com/univercd/cc/td/doc/cisintwk/ito_doc/index.htm
- *Cisco Internetworking Troubleshooting Guide.* Click this link to browse to this document: http://www.cisco.com/univercd/cc/td/doc/cisintwk/itg_v1/index.htm

Numerics

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