Connecting Cisco EHWIC-3G-EVDO-*x* to the Network

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This guide describes how to connect the EVDO versions of the 3G wireless Enhanced High-Speed WAN Interface Cards (EHWICs) to your network.

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3G Wireless WAN EHWIC Overview

The EHWIC-3G-EVDO-*x* card is a multiband, multiservice WAN card. Its primary application is WAN connectivity as a backup datalink for critical data applications and as a primary WAN connection.

The EHWIC-3G-EVDO-*x* card supports the ISR G2 platforms (the Cisco 1900 series, the Cisco 2900 series and the Cisco 3900 series).

The EHWIC-3G-EVDO-*x* card houses one cellular modem for connection to a wireless WAN.

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EHWIC-3G-EVDO

The EHWIC-3G-EVDO cards support multiple bands and services:

- 800/1900 MHz for 1xRTT
- 800/1900 MHz for 1xEVDO Revision 0 and Revision A
- Standalone GPS
- Short Message Service (SMS)

EHWIC-3G-EVDO-*x* is the Cisco part number for which the interface card is configured and *x* is a variable representing carrier-specific versions.

The EHWIC-3G-EVDO versions currently available are:

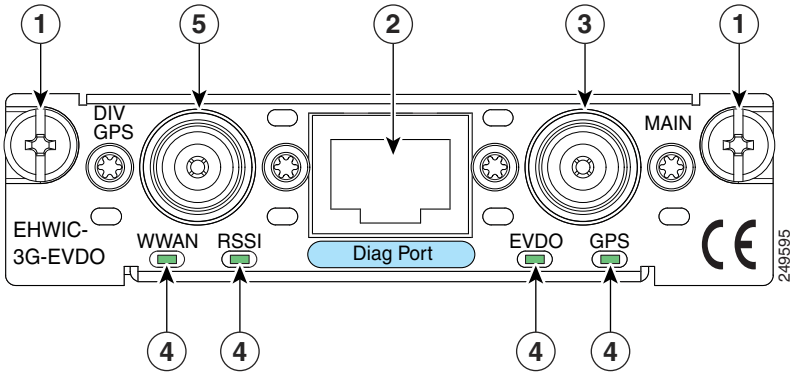
- EHWIC-3G-EVDO-B (BSNL)
- EHWIC-3G-EVDO-S (Sprint)
- EHWIC-3G-EVDO-V (Verizon)

Additional carrier-specific versions may also be available. See the onboard Product ID (PID) sticker to differentiate between released versions.

The EHWIC-3G-EVDO cards support diversity mode (dual antenna mode) in the antennas. Types of antennas include swivel-mounted dipole with extended base and ceiling-mounted antennas. The diversity mode requires two antennas located together and spaced a minimum of 7.5 inches (19 cm) for better RF reception.

Figure 1 shows the front panel view of EHWIC-3G-EVDO.

Figure 1 EHWIC-3G-EVDO Front Panel



1	Mounting Screws	**4**	LEDs
2	Diagnostic Port	**5**	Diversity/GPS Antenna Connector
3	Main Antenna Connector		

Note To use the GPS feature, connect a GPS antenna to the Diversity/GPS Antenna Connector. To use the Diversity feature, connect a Diversity antenna to the Diversity/GPS Antenna Connector. You cannot use the same antenna for both features.

Table 1 describes the LED functions of the EHWIC-3G-EVDO cards.

Table 1 EHWIC-3G-EVDO LED Description

LED	Description
WWAN LED Modem status and data transmission	**Off**: EHWIC in reset mode or not powered.
	Slow Green Blink: Searching for service.
	Solid Green: Active service; no traffic detected.
	Fast Green Blink: Active service. Detected traffic is proportional to blink rate.
RSSI LED Received Signal Strength Indicator	**Off**: Low RSSI (under -100 dBm).
	Slow Green Blink: Low or medium RSSI (-99 to -90 dBm).
	Fast Green Blink: Medium RSSI (-89 to -70 dBm).
	Solid Green: High RSSI (-69 dBm or higher).
	Solid Yellow: No service or no RSSI detected.
EVDO LED 3G-EVDO Service Indicator	**Off**: 1xRTT Service
	Green Blink: 1xEVDO Rev 0 Service
	Solid Green: 1xEVDO Rev A Service
GPS LED GPS Acquisition	**Off**: Disabled or searching for satellite signal.
	Solid Green: GPS location obtained.

Figure 2 shows the top view of EHWIC-3G-EVDO.

Figure 2 Top View of EHWIC-3G-EVDO

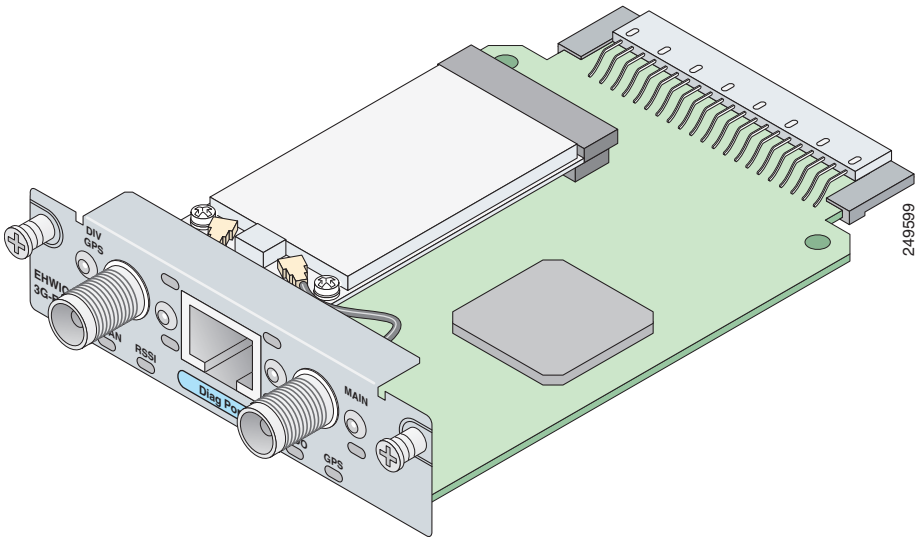
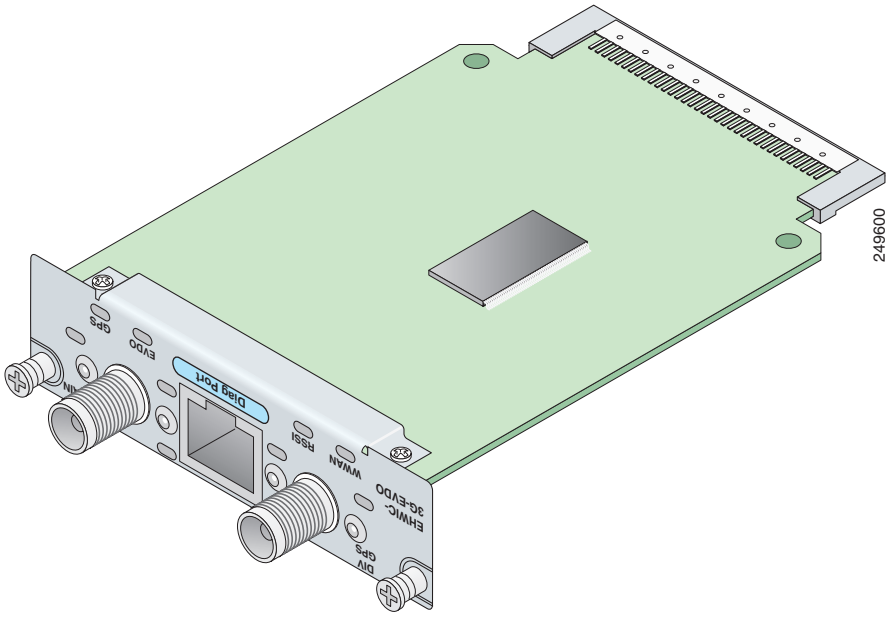


Figure 3 shows the bottom view of EHWIC-3G-EVDO.

Figure 3 Bottom View of EHWIC-3G-EVDO



Default Antenna and Antenna Extension

EHWIC-3G-EVDO cards ship with the default antenna (3G-ANTM1919D) and the default antenna extension, a base with a 10-foot cable (3G-AE010-R):

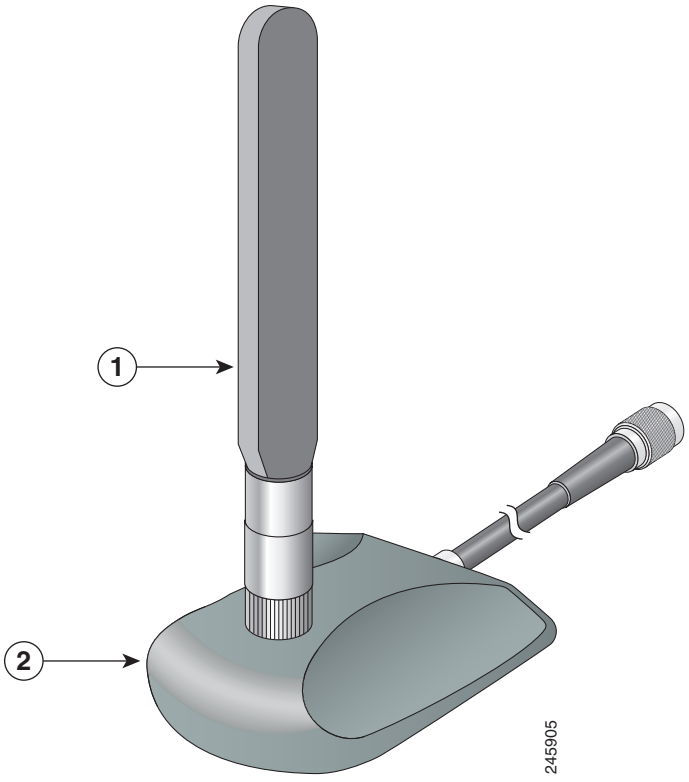
- *Cisco Multiband Swivel Mount Dipole Antenna (3G-ANTM1919D)* antenna
- *Cisco Single-Port Antenna Stand for Multiband TNC Male-Terminated Portable Antenna (3G-AE010-R)* antenna extension

Note The 3G-AE010-R antenna extension is the same as 3G-AE015-R except for the length of the antenna cable. The 3G-AE015-R antenna extension comes with a 15-foot cable.

Connect the default antenna to the main antenna connector on the EHWIC card. If you need to move the antenna to a better location, connect the antenna to the extension and then connect the extension's cable to the main antenna connector on the card.

Figure 2 shows the Cisco 3G-ANTM-1919D multiband swivel-mount dipole antenna connected to the Cisco 3G-AE010-R antenna extension.

Figure 4 Cisco 3G-ANTM1919D Antenna Connected to the 3G-AE010-R Antenna Extension



1	Cisco 3G-ANTM-1919D antenna.	2	Cisco 3G-AE010-R antenna extension base

Prerequisites

Before you connect, make sure you have done the following:

- Make sure you have subscribed to an appropriate CDMA service plan with your wireless service provider.
- Choose an antenna that best suits your needs. See the "Connecting an Antenna to EHWIC-3G-EVDO" section on page 6.
- Although not required, you can use two antennas to take advantage of the diversity antenna mode for the best RF performance.

Note To use the GPS feature, connect a GPS antenna to the Diversity/GPS Antenna Connector. To use the Diversity feature, connect a Diversity antenna to the Diversity/GPS Antenna Connector. You cannot use the same antenna for both features.

- To connect a diversity GPS antenna to the diversity antenna connector on the card, you need to make a separate order for the antenna from Cisco.
- Contact your carrier for information on network coverage, signal strength, choosing a suitable antenna, and antenna placement.

Note The diagnostics port is to be used as an advanced diagnostics tool. Do not use this port for normal operations.

Restrictions

Limitations of 3G wireless EHWIC cards include the following:

- The 3G wireless EHWIC card must be installed in an EHWIC slot. To determine which slots on your platform support HWICs, see the *Cisco Interface Cards for Cisco Access Routers* guide:

  http://www.cisco.com/en/US/docs/routers/access/interfaces/ic/hardware/installation/guide/oview_ic.html
- The 3G wireless EHWIC cards are only supported on ISR G2 platform

Connecting an Antenna to EHWIC-3G-EVDO

This section contains the following sub-sections:

- Wireless Access Devices Safety Guidelines and Warnings, page 7
- Prerequisites for Connecting Antennas, page 8
- Supported Cisco Antennas and Cables, page 9
- Connecting Swivel-Mount Dipole Antennas, page 12
- Faceplate-Mounted and Ceiling-Mounted Antennas and Cabling, page 12

Wireless Access Devices Safety Guidelines and Warnings

The following are guidelines for wireless access devices:

- Do not touch or move antenna(s) while the unit is transmitting or receiving.
- Do not hold any component containing a radio so that the antenna is very close to or touching any exposed parts of the body, especially the face or eyes, while transmitting.
- The use of wireless devices in hazardous locations is limited to the constraints posed by the local codes, the national codes, and the safety directors of such environments.

Warning **Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units.** Statement 12

Warning **When handling the EHWICs and antennas, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself.** Statement 94

Warning **Do not operate your wireless network device near unshielded blasting caps or in an explosive environment unless the device has been modified to be especially qualified for such use.** Statement 245B

Warning **In order to comply with FCC radio frequency (RF) exposure limits, antennas should be located at a minimum of 7.9 inches (20 cm) or more from the body of all persons.** Statement 332

Warning **This equipment must be connected to an indoor antenna only.** Statement 373

Warning **Do not work on the system or connect or disconnect cables during periods of lightning activity.** Statement 1001

Warning **Read the installation instructions before connecting the system to the power source.** Statement 1004

Warning **Ultimate disposal of this product should be handled according to all national laws and regulations.** Statement 1040

Prerequisites for Connecting Antennas

This section contains information about connecting the antennas.

Note Before you connect the antennas, install the 3G wireless EHWIC in the router. For more information, see the *Installing Cisco Interface Cards in Cisco Access Routers* guide:

http://www.cisco.com/en/US/docs/routers/access/interfaces/ic/hardware/installation/guide/inst_ic.html

In addition to antenna orientation, installation location with respect to other wireless equipment and other RF noise sources, such as telecom and datacom equipment, plays a significant role in determining overall network performance.

Because antennas transmit and receive radio signals, their performance can be adversely affected by the surrounding environment, including distance between the EHWIC antenna and cellular base station, physical obstructions, or radio frequency (RF) interference.

Follow these guidelines to ensure the best possible performance:

- Wherever possible, mount the 3G wireless EHWIC antenna away from physical obstructions. Barriers along the line of sight between the EHWIC antenna and cellular base station will degrade the wireless radio signals. The 3G wireless HWICs and antennas can be installed above floor level in office environments or near the ceiling for better performance because most obstructions tend to be near floor level.
- The density of the materials used in a building's construction determines the number of walls the signal must pass through and still maintain adequate coverage. Consider the following before choosing the location to install your antenna:
  - Paper and vinyl walls have very little effect on signal penetration.
  - Solid and precast concrete walls limit signal penetration to one or two walls without signal degradation.
  - Concrete and wood block walls limit signal penetration to three or four walls.
  - A signal can penetrate five or six walls constructed of drywall or wood.
  - A thick metal wall or a wire-mesh stucco wall causes signals to reflect back and causes poor penetration.
- Avoid mounting the antenna next to a column or vertical support that could create a shadow zone and reduce the coverage area.
- Keep the antenna away from reflective metal objects such as heating and air-conditioning ducts, large ceiling trusses, building superstructures, and major power cabling runs. If necessary, use an extension cable to relocate the antenna away from these obstructions.

Caution Install the EHWIC card and any antennas away from appliances that share the same frequency bands. Microwave ovens, cordless telephones, and security monitors can temporarily interfere with wireless performance.

Caution We recommend you avoid installing wireless antennas in or near rack-mounted installations that include networking equipment and computer servers whose radiated noise emissions can severely degrade radio performance.

Note If the desired installation site has a marginally acceptable level of radiated noise emissions, consider using a remotely-mounted antenna, such as a wall-mounted or ceiling-mounted antenna, for better radio performance and coverage.

Supported Cisco Antennas and Cables

Table 2 lists the Cisco antennas that are supported for use on 3G wireless WAN EHWIC cards.

Table 2 Cisco Antennas Supported on the 3G Wireless EHWIC Cards

Cisco Part Number	Antenna Type	Maximum Gain and Frequency Range	Description
3G-ANTM1916-CM	High-gain ceiling-mount omnidirectional	1.5 dBi (806–960 MHz) 2.5 dBi (1710–2170 MHz)	Multiband ceiling-mounted omnidirectional antenna. For more information, see *Cisco Multiband In-Building Omnidirectional Ceiling-Mount Antenna (3G-ANTM1916-CM)*.
3G-ANTM1919D	Dipole omnidirectional	0 dBi (806–960 MHz) 0 dBi (1710–2170 MHz)	This is the default antenna. Multiband dipole antenna. For more information, see *Cisco Multiband Swivel-Mount Dipole Antenna (3G-ANTM1919D)*.
3G-AE015-R (Antenna Extension)	Extension base	0.8–6.0 GHz	This antenna extension is a base with a 15-foot cable included for use with a dipole omnidirectional antenna. For more information, see *Cisco Single-Port Antenna Stand for Multiband TNC Male-Terminated Portable Antenna (Cisco 3G-AE015-R)*.
3G-AE010-R (Antenna Extension)	Extension Base	0.8–6.0 GHz	This is the default antenna extension. This antenna extension is a base with a 10-foot cable included for use with dipole omnidirectional antennas. For more information, see *Cisco Single-Port Antenna Stand for Multiband TNC Male-Terminated Portable Antenna (Cisco 3G-AE015-R)*. This document applies to both 3G-AE015-R and 3G-AE010-R. The only difference between these two products is the length of the cable.
3G-ANTM-OUT-OM	Outdoor Omnidirectional	+2 dBi 800/900 MHz +4 dBi 1800/1900/2100 MHz	This is an outdoor low profile omnidirectional mast antenna. For more information, see *Cisco 3G Omnidirectional Outdoor Antenna (3G-ANTM-OUT-OM)*.
3G-ANTM-OUT-LP	Low Profile Stick Antenna	- 1.5 dBi 850, 900 MHz - 2.5 dBi 1800, 1900, 2100 MHz	This is an omnidirectional stick antenna. For more information, see *Cisco Multiband Omnidirectional Panel-Mount Antenna (3G-ANTM-OUT-LP)*

Table 2 Cisco Antennas Supported on the 3G Wireless EHWIC Cards (continued)

Cisco Part Number	Antenna Type	Maximum Gain and Frequency Range	Description
3G-ACC-OUT-LA (Lightning Arrestor)	Lightning Arrestor	800 MHz to 2200 MHz	This is a quarter-wave lightning protector with integrated high-pass filter. For more information, see *Cisco 3G Lightning Arrestor (3G-ACC-OUT-LA)*
3G-ACC-OUT-COMBO	Lightning Arrestor and antenna	N/A	Multi-Band Outdoor Omnidirectional Antenna Mast/Wall Mount (3G-ACC-OUT-OM) and 3G Outdoor Antenna Lightning Arrestor (3G-ACC-OUT-LA)
4G-ANTM-OM-CM	Low Profile Surface Mount Omnidirectonal	698 MHz–2690 MHz	This is a ceiling mount omnidirectional antenna that can be used in any of the 3G or 4G bands (that is, any of the 700/800/900/1700/1800/1900/2100/2600 MHz bands). For more information, see *Cisco 4G Indoor Ceiling-Mount Omnidirectional Antenna (4G-ANTM-OM-CM)*.

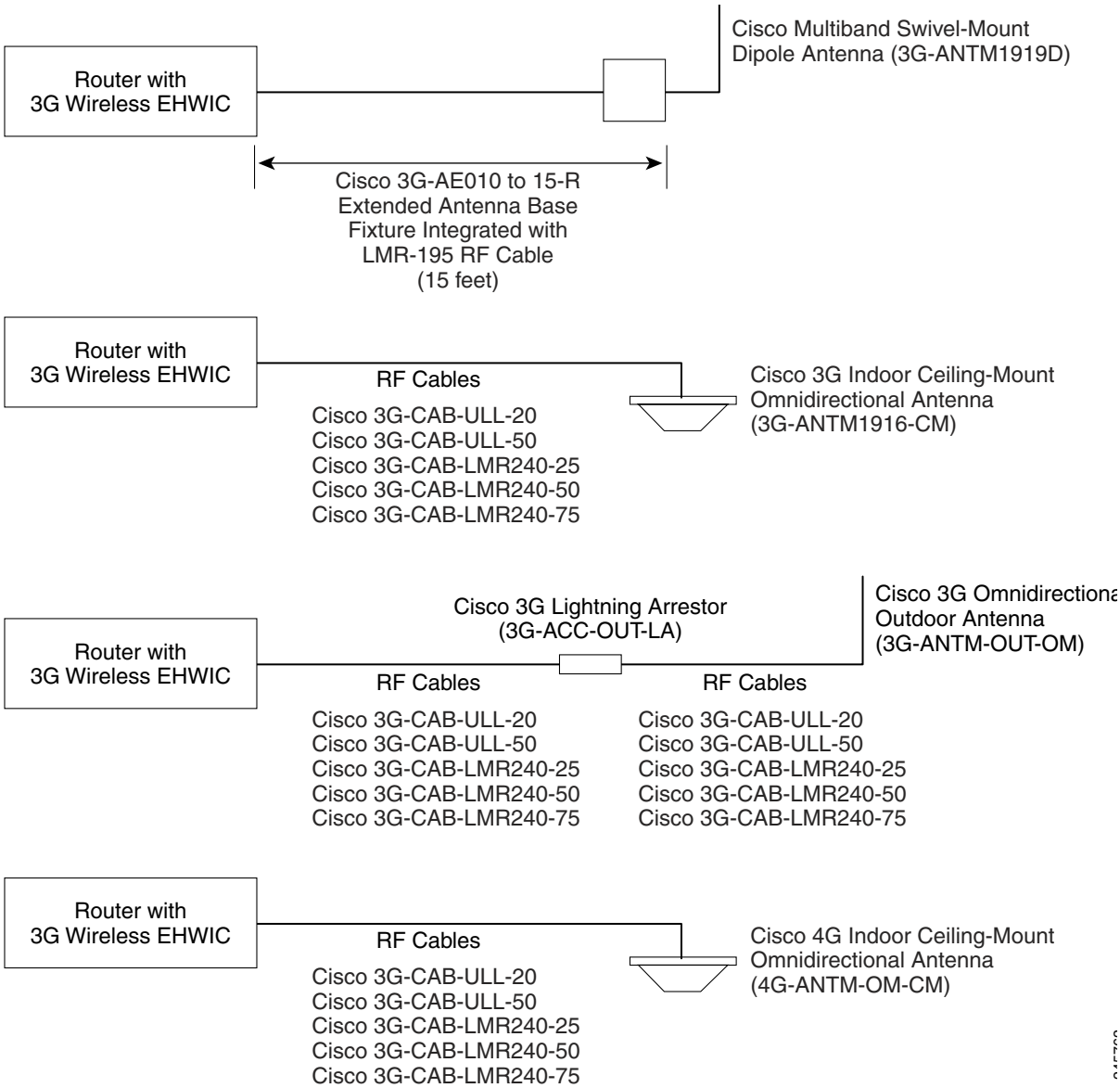
Table 3 lists insertion loss information for the ultra-low-loss (ULL) LMR 400 extension cables available from Cisco for use with 3G EHWIC antennas.

Table 3 Cisco Extension Cables for Use with Antennas

Cisco Product Number	Cable Length	Insertion Loss	Frequency (MHz)
3G-CAB-ULL-20	20 ft (6 m)	1.50 dB max.	2100
3G-CAB-ULL-50	50 ft (15 m)	3.50 dB max.	2100
3G-CAB-LMR240-25	25 ft (7.5 m)	3.50 dB max.	2200
3G-CAB-LMR240-50	50 ft (15 m)	6.90 dB max.	2200
3G-CAB-LMR240-75	75 ft (23 m)	10.5 dB max.	2200

Figure 5 shows the various antenna options for 3G wireless WAN EHWIC cards.

Figure 5 Antenna Options



Connecting Swivel-Mount Dipole Antennas

If you are using Cisco swivel-mounted dipole antennas, follow these steps:

Step 1 Attach an antenna to each TNC antenna connector on the front of the EHWIC card and tighten it hand-tight.

Step 2 Orient the antennas, depending on how you intend to mount the router in which the card is installed.

- If the router is on a table or desk, orient the antennas to the left and right sides so that they are at a 90-degree angle to each other. (See Figure 5.)
- If the router is on a vertical surface, such as a wall, orient the antennas up and at a 90-degree angle to each other.
- If the router is on a ceiling, orient the antennas down and at a 90-degree angle to each other.

Note Although it is not absolutely necessary, for best RF performance, do not attach the dipole antenna directly to the face-plate of the card. Use the antenna extension cable and antenna base recommended for the product.

Faceplate-Mounted and Ceiling-Mounted Antennas and Cabling

Depending on the wireless environment, wall-mounted or ceiling-mounted antennas may be preferred for optimum radio coverage. If the length of the coaxial antenna cable is insufficient to cover the distance between the EHWIC card and the location of the installed antenna, you can use ultra-low-loss TNC extension cables between the EHWIC card and the antenna cable.

RF energy is carried between the antennas and the radio equipment through a coaxial cable. An antenna cable introduces signal loss in the antenna system for both the transmitter and the receiver.

Although the cable run can be 100 feet (30 m) or more from the EHWIC card to antenna locations, the longer the cable run, the greater the signal loss. To reduce signal loss, minimize the cable length and use only ultra-low-loss antenna cables to connect radio devices to antennas.

To connect faceplate-mounted or ceiling-mounted antennas, follow the installation instructions for your antenna:

- For more information about connecting the 3G-ANTM1919D antenna to EHWIC cards, see the *Cisco Multiband Swivel Mount Dipole Antenna (3G-ANTM1919D)* document.
- For more information about connecting the 3G-ANT1916-CM antenna to EHWIC cards, see the *Cisco Multiband Omnidirectional Ceiling Mount Antenna (3G-ANTM1916-CM)* document.
- For more information about connecting the 3G-AE015-R antenna extension to EHWIC cards, see the *Cisco Extended Antenna Base (3G-AE015-R)* document.

Related Documents

For additional information, see the following documents and resources.

Related Topic	Document Title
Regulatory compliance and safety information	*Cisco Network Modules and Interface Cards Regulatory Compliance and Safety Information* http://www.cisco.com/en/US/docs/routers/access/interfaces/rcsi/IOHrcsi.html
Cisco IOS software website and reference documentation	*Cisco IOS Software* http://www.cisco.com/en/US/docs/ios/preface/aboutios.html
Information about Cisco's 3G wireless connectivity solutions	Cisco 3G Wireless Connectivity Solutions http://www.cisco.com/en/US/prod/routers/ps380/3g_solns.html

Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, obtaining support, providing documentation feedback, security guidelines, and also recommended aliases and general Cisco documents, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html