Cisco MWR 2941-DC Mobile Wireless Edge Router Hardware Installation Guide

October 2009

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You can determine whether your equipment is causing interference by turning it off. If the interference stops, it was probably caused by the Cisco equipment or one of its peripheral devices. If the equipment causes interference to radio or television reception, try to correct the interference by using one or more of the following measures:

• Turn the television or radio antenna until the interference stops.

• Move the equipment to one side or the other of the television or radio.

• Move the equipment farther away from the television or radio.

• Plug the equipment into an outlet that is on a different circuit from the television or radio. (That is, make certain the equipment and the television or radio are on circuits controlled by different circuit breakers or fuses.)

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About This Guide

This section describes the objectives, audience, organization, and conventions of this hardware installation guide.

Note Use this document with the documents listed in the "Related Documentation" section on page xvii.

This section contains the following:

Document Revision History

The Document Revision History table below records technical changes to this guide. The table shows the document revision number for the change, the date of the change, and a brief summary of the change. Not all Cisco documents use a Document Revision History table.

OL-16867-02	October 2009	• Added support for the following interface cards: – HWIC-4T1/E1 – HWIC-4SHDSL – HWIC-1GE-SFP – HWIC-D-9ESW
OL-16867-02	October 2009	• Added support for the following SFP modules: – CWDM-SFP-1470 – CWDM-SFP-1490 – CWDM-SFP-1510 – CWDM-SFP-1530 – CWDM-SFP-1550 – CWDM-SFP-1570 – CWDM-SFP-1590 – CWDM-SFP-1610 – DWDM-SFP-4612 – DWDM-SFP-4692 – DWDM-SFP-4772 – DWDM-SFP-4851 – DWDM-SFP-5012 – DWDM-SFP-5092 – DWDM-SFP-5172 – DWDM-SFP-5252 – DWDM-SFP-5413 – DWDM-SFP-5494 – DWDM-SFP-5575 – DWDM-SFP-5655 – DWDM-SFP-5817 – DWDM-SFP-5898 – DWDM-SFP-5979 – DWDM-SFP-6061 – GLC-ZX-SM-RGD – GLC-LX-SM-RGD – GLC-SX-MM-RGD – SFP-GE-L – SFP-GE-S – SFP-GE-Z
OL-16867-01	March 2009	Initial release.

Objectives

This guide explains how to install, maintain, and troubleshoot your router hardware.

This guide provides minimum software configuration information, not comprehensive information. For detailed software configuration information, see the Cisco IOS configuration guide and command reference publications (see the "Obtaining Documentation, Obtaining Support, and Security Guidelines" section on page xvii for more information.)

Warranty, service, and support information is in the *Cisco Information Packet* that shipped with your router.

Audience

This guide is designed for personnel who install, configure, and maintain the router. These persons should be familiar with electronic circuitry and wiring practices and be experienced electronic or electromechanical technicians. This guide identifies certain procedures that should be performed only by trained and qualified personnel.

Organization

This hardware installation guide contains:

Chapter	Title	Description
Chapter 1	Product Overview	Describes the hardware features and specifications of the routers.
Chapter 2	Preparing to Install the Router	Describes safety recommendations, site requirements, network connection considerations, required tools and equipment, and provides the installation checklist.
Chapter 3	Installing the Cisco MWR 2941-DC Router	Includes router installation information, and shows how to connect the router console/auxiliary port.
Appendix A	Troubleshooting	Describes how to isolate problems, read LEDs, interpret error and status messages, and recover software images.
Appendix B	Cable Specifications	Provides cable specifications to use if you plan to build your own cables.
Appendix C	Site Log	Provides example site log.
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Conventions

This document uses the following conventions:

Convention	Indication
bold font	Commands and keywords and user-entered text appear in **bold** font.

italic font	Document titles, new or emphasized terms, and arguments for which you supply values are in *italic* font.
[ ]	Elements in square brackets are optional.
{x | y | z }	Required alternative keywords are grouped in braces and separated by vertical bars.
[x | y | z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.
`courier` font	Terminal sessions and information the system displays appear in `courier` font.
< >	Nonprinting characters such as passwords are in angle brackets.
[ ]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

Note Means *reader take note*.

Tip Means *the following information will help you solve a problem*.

Caution Means *reader be careful*. In this situation, you might perform an action that could result in equipment damage or loss of data.

Timesaver Means *the described action saves time*. You can save time by performing the action described in the paragraph.

Warning **Means *reader be warned*. In this situation, you might perform an action that could result in bodily injury.**

Safety Warnings

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, might harm you. A warning symbol precedes each warning statement. The safety warnings provide safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring. Warnings are translated into several languages. (For information about compliance guidelines and translated safety warnings, refer to the *Cisco Regulatory Compliance and Safety Information for the Cisco MWR 2941-DC Mobile Wireless Edge Router.*)

Warning **IMPORTANT SAFETY INSTRUCTIONS**

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. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071

SAVE THESE INSTRUCTIONS

Waarschuwing **BELANGRIJKE VEILIGHEIDSINSTRUCTIES**

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 de standaard praktijken om ongelukken te voorkomen. Gebruik het nummer van de verklaring onderaan de waarschuwing als u een vertaling van de waarschuwing die bij het apparaat wordt geleverd, wilt raadplegen.

BEWAAR DEZE INSTRUCTIES

Varoitus **TÄRKEITÄ TURVALLISUUSOHJEITA**

Tämä varoitusmerkki merkitsee vaaraa. Tilanne voi aiheuttaa ruumiillisia vammoja. Ennen kuin käsittelet laitteistoa, huomioi sähköpiirien käsittelemiseen liittyvät riskit ja tutustu onnettomuuksien yleisiin ehkäisytapoihin. Turvallisuusvaroitusten käännökset löytyvät laitteen mukana toimitettujen käännettyjen turvallisuusvaroitusten joukosta varoitusten lopussa näkyvien lausuntonumeroiden avulla.

SÄILYTÄ NÄMÄ OHJEET

Attention **IMPORTANTES INFORMATIONS DE SÉCURITÉ**

Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers liés aux circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions des avertissements figurant dans les consignes de sécurité traduites qui accompagnent cet appareil, référez-vous au numéro de l'instruction situé à la fin de chaque avertissement.

CONSERVEZ CES INFORMATIONS

Warnung **WICHTIGE SICHERHEITSHINWEISE**

Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu Verletzungen führen kann. Machen Sie sich vor der Arbeit mit Geräten mit den Gefahren elektrischer Schaltungen und den üblichen Verfahren zur Vorbeugung vor Unfällen vertraut. Suchen Sie mit der am Ende jeder Warnung angegebenen Anweisungsnummer nach der jeweiligen Übersetzung in den übersetzten Sicherheitshinweisen, die zusammen mit diesem Gerät ausgeliefert wurden.

BEWAHREN SIE DIESE HINWEISE GUT AUF.

Avvertenza **IMPORTANTI ISTRUZIONI SULLA SICUREZZA**

Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di intervenire su qualsiasi apparecchiatura, occorre essere al corrente dei pericoli relativi ai circuiti elettrici e conoscere le procedure standard per la prevenzione di incidenti. Utilizzare il numero di istruzione presente alla fine di ciascuna avvertenza per individuare le traduzioni delle avvertenze riportate in questo documento.

CONSERVARE QUESTE ISTRUZIONI

Advarsel **VIKTIGE SIKKERHETSINSTRUKSJONER**

Dette advarselssymbolet betyr fare. Du er i en situasjon som kan føre til skade på person. Før du begynner å arbeide med noe av utstyret, må du være oppmerksom på farene forbundet med elektriske kretser, og kjenne til standardprosedyrer for å forhindre ulykker. Bruk nummeret i slutten av hver advarsel for å finne oversettelsen i de oversatte sikkerhetsadvarslene som fulgte med denne enheten.

TA VARE PÅ DISSE INSTRUKSJONENE

Aviso **INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

Este símbolo de aviso significa perigo. Você está em uma situação que poderá ser causadora de lesões corporais. Antes de iniciar a utilização de qualquer equipamento, tenha conhecimento dos perigos envolvidos no manuseio de circuitos elétricos e familiarize-se com as práticas habituais de prevenção de acidentes. Utilize o número da instrução fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham este dispositivo.

GUARDE ESTAS INSTRUÇÕES

¡Advertencia! **INSTRUCCIONES IMPORTANTES DE SEGURIDAD**

Este símbolo de aviso indica peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considere los riesgos de la corriente eléctrica y familiarícese con los procedimientos estándar de prevención de accidentes. Al final de cada advertencia encontrará el número que le ayudará a encontrar el texto traducido en el apartado de traducciones que acompaña a este dispositivo.

GUARDE ESTAS INSTRUCCIONES

Varning! **VIKTIGA SÄKERHETSANVISNINGAR**

Denna varningssignal 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 vanliga förfaranden för att förebygga olyckor. Använd det nummer som finns i slutet av varje varning för att hitta dess översättning i de översatta säkerhetsvarningar som medföljer denna anordning.

SPARA DESSA ANVISNINGAR

Figyelem

FONTOS BIZTONSÁGI ELOÍRÁSOK

Ez a figyelmezeto jel veszélyre utal. Sérülésveszélyt rejto helyzetben van. Mielott bármely berendezésen munkát végezte, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplo figyelmeztetések fordítása a készülékhez mellékelt biztonsági figyelmeztetések között található; a fordítás az egyes figyelmeztetések végén látható szám alapján keresheto meg.

ORIZZE MEG EZEKET AZ UTASÍTÁSOKAT!

Предупреждение

ВАЖНЫЕ ИНСТРУКЦИИ ПО СОБЛЮДЕНИЮ ТЕХНИКИ БЕЗОПАСНОСТИ

Этот символ предупреждения обозначает опасность. То есть имеет место ситуация, в которой следует опасаться телесных повреждений. Перед эксплуатацией оборудования выясните, каким опасностям может подвергаться пользователь при использовании электрических цепей, и ознакомьтесь с правилами техники безопасности для предотвращения возможных несчастных случаев. Воспользуйтесь номером заявления, приведенным в конце каждого предупреждения, чтобы найти его переведенный вариант в переводе предупреждений по безопасности, прилагаемом к данному устройству.

СОХРАНИТЕ ЭТИ ИНСТРУКЦИИ

警告 重要的安全性说明

此警告符号代表危险。您正处于可能受到严重伤害的工作环境中。在您使用设备开始工作之前，必须充分意识到触电的危险，并熟练掌握防止事故发生的标准工作程序。请根据每项警告结尾提供的声明号码来找到此设备的安全性警告说明的翻译文本。

请保存这些安全性说明

警告 安全上の重要な注意事項

「危険」の意味です。人身事故を予防するための注意事項が記述されています。装置の取り扱い作業を行うときは、電気回路の危険性に注意し、一般的な事故防止策に留意してください。警告の各国語版は、各注意事項の番号を基に、装置に付属の「Translated Safety Warnings」を参照してください。

これらの注意事項を保管しておいてください。

주의 중요 안전 지침

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이 지시 사항을 보관하십시오.

Aviso **INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

Este símbolo de aviso significa perigo. Você se encontra em uma situação em que há risco de lesões corporais. Antes de trabalhar com qualquer equipamento, esteja ciente dos riscos que envolvem os circuitos elétricos e familiarize-se com as práticas padrão de prevenção de acidentes. Use o número da declaração fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham o dispositivo.

GUARDE ESTAS INSTRUÇÕES

Advarsel **VIGTIGE SIKKERHEDSANVISNINGER**

Dette advarselssymbol betyder fare. Du befinder dig i en situation med risiko for legemesbeskadigelse. Før du begynder arbejde på udstyr, skal du være opmærksom på de involverede risici, der er ved elektriske kredsløb, og du skal sætte dig ind i standardprocedurer til undgåelse af ulykker. Brug erklæringsnummeret efter hver advarsel for at finde oversættelsen i de oversatte advarsler, der fulgte med denne enhed.

GEM DISSE ANVISNINGER

تحذير **إرشادات الأمان الهامة**

يوضح رمز التحذير هذا وجود خطر. وهذا يعني أنك متواجد في مكان قد ينتج عنه التعرض لإصابات. قبل بدء العمل، احذر مخاطر التعرض للصدمات الكهربائية وكن على علم بالإجراءات القياسية للحيلولة دون وقوع أي حوادث. استخدم رقم البيان الموجود في أخر كل تحذير لتحديد مكان ترجمته داخل تحذيرات الأمان المترجمة التي تأتي مع الجهاز.

قم بحفظ هذه الإرشادات

Upozorenje **VAŽNE SIGURNOSNE NAPOMENE**

Ovaj simbol upozorenja predstavlja opasnost. Nalazite se u situaciji koja može prouzročiti tjelesne ozljede. Prije rada s bilo kojim uređajem, morate razumjeti opasnosti vezane uz električne sklopove, te biti upoznati sa standardnim načinima izbjegavanja nesreća. U prevedenim sigurnosnim upozorenjima, priloženima uz uređaj, možete prema broju koji se nalazi uz pojedino upozorenje pronaći i njegov prijevod.

SAČUVAJTE OVE UPUTE

Upozornění **DŮLEŽITÉ BEZPEČNOSTNÍ POKYNY**

Tento upozorňující symbol označuje nebezpečí. Jste v situaci, která by mohla způsobit nebezpečí úrazu. Před prací na jakémkoliv vybavení si uvědomte nebezpečí související s elektrickými obvody a seznamte se se standardními opatřeními pro předcházení úrazům. Podle čísla na konci každého upozornění vyhledejte jeho překlad v přeložených bezpečnostních upozorněních, která jsou přiložena k zařízení.

USCHOVEJTE TYTO POKYNY

Προειδοποίηση ΣΗΜΑΝΤΙΚΕΣ ΟΔΗΓΙΕΣ ΑΣΦΑΛΕΙΑΣ

Αυτό το προειδοποιητικό σύμβολο σημαίνει κίνδυνο. Βρίσκεστε σε κατάσταση που μπορεί να προκαλέσει τραυματισμό. Πριν εργαστείτε σε οποιοδήποτε εξοπλισμό, να έχετε υπόψη σας τους κινδύνους που σχετίζονται με τα ηλεκτρικά κυκλώματα και να έχετε εξοικειωθεί με τις συνήθεις πρακτικές για την αποφυγή ατυχημάτων. Χρησιμοποιήστε τον αριθμό δήλωσης που παρέχεται στο τέλος κάθε προειδοποίησης, για να εντοπίσετε τη μετάφρασή της στις μεταφρασμένες προειδοποιήσεις ασφαλείας που συνοδεύουν τη συσκευή.

ΦΥΛΑΞΤΕ ΑΥΤΕΣ ΤΙΣ ΟΔΗΓΙΕΣ

אזהרה **הוראות בטיחות חשובות**

סימן אזהרה זה מסמל סכנה. אתה נמצא במצב העלול לגרום לפציעה. לפני שתעבוד עם ציוד כלשהו, עליך להיות מודע לסכנות הכרוכות במעגלים חשמליים ולהכיר את הנהלים המקובלים למניעת תאונות. השתמש במספר ההוראה המסופק בסופה של כל אזהרה כדי לאתר את התרגום באזהרות הבטיחות המתורגמות שמצורפות להתקן.

שמור הוראות אלה

Opomena ВАЖНИ БЕЗБЕДНОСНИ НАПАТСТВИЈА

Симболот за предупредување значи опасност. Се наоѓате во ситуација што може да предизвика телесни повреди. Пред да работите со опремата, бидете свесни за ризикот што постои кај електричните кола и треба да ги познавате стандардните постапки за спречување на несреќни случаи. Искористете го бројот на изјавата што се наоѓа на крајот на секое предупредување за да го најдете неговиот период во преведените безбедносни предупредувања што се испорачани со уредот.

ЧУВАЈТЕ ГИ ОВИЕ НАПАТСТВИЈА

Ostrzeżenie **WAŻNE INSTRUKCJE DOTYCZĄCE BEZPIECZEŃSTWA**

Ten symbol ostrzeżenia oznacza niebezpieczeństwo. Zachodzi sytuacja, która może powodować obrażenia ciała. Przed przystąpieniem do prac przy urządzeniach należy zapoznać się z zagrożeniami związanymi z układami elektrycznymi oraz ze standardowymi środkami zapobiegania wypadkom. Na końcu każdego ostrzeżenia podano numer, na podstawie którego można odszukać tłumaczenie tego ostrzeżenia w dołączonym do urządzenia dokumencie z tłumaczeniami ostrzeżeń.

NINIEJSZE INSTRUKCJE NALEŻY ZACHOWAĆ

Upozornenie **DÔLEŽITÉ BEZPEČNOSTNÉ POKYNY**

Tento varovný symbol označuje nebezpečenstvo. Nachádzate sa v situácii s nebezpečenstvom úrazu. Pred prácou na akomkoľvek vybavení si uvedomte nebezpečenstvo súvisiace s elektrickými obvodmi a oboznámte sa so štandardnými opatreniami na predchádzanie úrazom. Podľa čísla na konci každého upozornenia vyhľadajte jeho preklad v preložených bezpečnostných upozorneniach, ktoré sú priložené k zariadeniu.

USCHOVAJTE SI TENTO NÁVOD

Related Documentation

For additional information about the Cisco MWR 2941-DC router, refer to the following documents:

- *Cisco Regulatory Compliance and Safety Information for the Cisco MWR 2941-DC Mobile Wireless Edge Router*
- *Cisco MWR 2941-DC Mobile Wireless Edge Router Software Configuration Guide*
- *Release Notes for Cisco MWR 2941-DC Mobile Wireless Edge Router for Cisco IOS Release 12.4(20)MR*

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

CHAPTER 1

Product Overview

The Cisco MWR 2941-DC Mobile Wireless Edge Router is a general purpose router platform specializing in 2/2.5G Global System for Mobile Communication (GSM) Radio Access Network (RAN) backhaul transport and optimization.

This chapter includes the following sections:

Introduction

A typical RAN is composed of:

- Thousands of Base Transceiver Stations (BTSs)/Node Bs
- Hundreds of Base Station Controllers/Radio Network Controllers (BSCs/RNCs)
- Several Mobile Switching Centers (MSCs)

The BTSs/Node Bs and BSCs/RNCs are often separated by large geographic distances, with the BTSs/Node Bs located in cell sites uniformly distributed throughout a region, and the BSCs, RNCs, and MSCs located at a Central Office (CO) or Mobile Telephone Switching Offices (MTSOs).

Traffic generated by a BTS/Node B is transported to the corresponding BSC/RNC across a network, (referred to as the *backhaul network*), which is often a hub-and-spoke topology with hundreds of BTSs/Node Bs connected to a BSC/RNC by point-to-point TDM trunks. TDM trunks may be leased-line T1/E1s or their logical equivalents, such as microwave links or satellite channels.

The interface between the BTS and BSC in GSM and CDMA systems is the Abis interface.

Hardware Description

Contained in a standard shelf-rack enclosure, the Cisco MWR 2941-DC router weighs approximately 12 pounds (5.44 kg). It measures 1.72 inches high x 17.5 inches wide x 12.5 inches deep (4.37 cm or 1 RU x 44.45 cm x 31.75 cm). These dimensions do not include the rack-mount brackets (installed at the factory).

The Cisco MWR 2941-DC router is mounted in a standard (EIA-310D) 19-inch (48.3 cm) equipment rack (using the rack-mount brackets provided).

The Cisco MWR 2941-DC router includes the following features:

- 16 fixed ports of T1/E1

Note A mix of T1s and E1s is not supported. All ports must be configured as either T1s or E1s.

- Per port T1/E1 configuration options:
  - GSM shorthaul (Abis)
  - Backhaul: IP over TDM
  - ATM SAR (AAL2 & AAL5)
  - ATM IMA bundling
- DS0 Time Slot Interchange available to all T1/E1 ports including HWIC slots (24 ports maximum)
- Support for structured and unstructured T1/E1s
- 4 ports of 100/1000 Copper Ethernet (RJ45 connectors)
- 2 ports of 1000 Ethernet with pluggable SFP slots (SFP Transceivers)
- 2 HWIC interface card slots
- 1 Console/Auxiliary port (RJ45)
- 1 BITS clock input port (RJ45
- Support for Timing over Packet (ToP) features, including Active Clock Recovery, Precision Time Protocol (PTP) using the IEEE 1588v2 standard, and synchronous Ethernet
- Distributed Processing: Dedicated communications processor to provide feature processing such as: GSM Mux Functions; IP packet generation and L2 encapsulation; ATM, IMP, MLPPP, etc.
- Line protection; T1 ports compliant to IEC60950-1; design to meet GR-1089 and GR-63 core requirements
- Chassis: 1RU, 12.5 inch depth
- Dual feed supply with additional redundant DC inputs plus redundant power supply (RPS) input
- Operating temperature range is -4 to 60°F (-20°C to 60°C). If HWICs are installed, the operating temperature range is 14 to 131°F (-10C to 55C). If you install the HWIC-D-9ESW card, the operating temperature range is 32 to 104°F (0C to 40C).
- Front to back airflow
- Two LEDs for each T1/E1 port
  - C—indicates out of service or not configured, carrier condition, and loop condition
  - AL—no alarm, or alarm condition

- Two LEDs for each Ethernet port
  - L—indicates activity, lack of activity, or no link
  - S—indicates speed (100 or 1000) or off
- One compact flash LED—indicates activity or lack of activity
- One link activity LED for each SFP port—indicates whether link is active or not enabled
- Four chassis LEDs (see the "Cisco MWR 2941-DC Router Front View" section on page 1-3):
  - Power—indicates whether power supply is operational
  - Status—indicates whether software is up and running
  - Activity—indicates whether interrupts or packet transfers are running
  - BITS Activity—indicates whether BITS is in service and working properly
- The Cisco MWR 2941-DC router is normally shipped with mounting rack-mount brackets already installed

Hardware Configuration Options

The Cisco MWR 2941-DC router has the following hardware configuration options:

- Two HWIC slots allow the end user to configure the chassis with any two approved HWIC interface cards. The supported HWICs are listed in HWIC Numbering section.
- Two SFP ports allows the end user to configure the Ethernet ports with the appropriate transceiver for the end user's application. Multiple transceiver options will be made available. These ports support the Synchronous Ethernet feature.
- The timing over packet is enabled by adding an internal daughter card (RTM) to the base board and enabling the feature in software. The RTM module is sold with the base board.
- The host processor has a removable DDR2 SDRAM memory module that allows the end user to choose from a number of different memory size options.

All other platform configuration options and features are available by way of software settings.

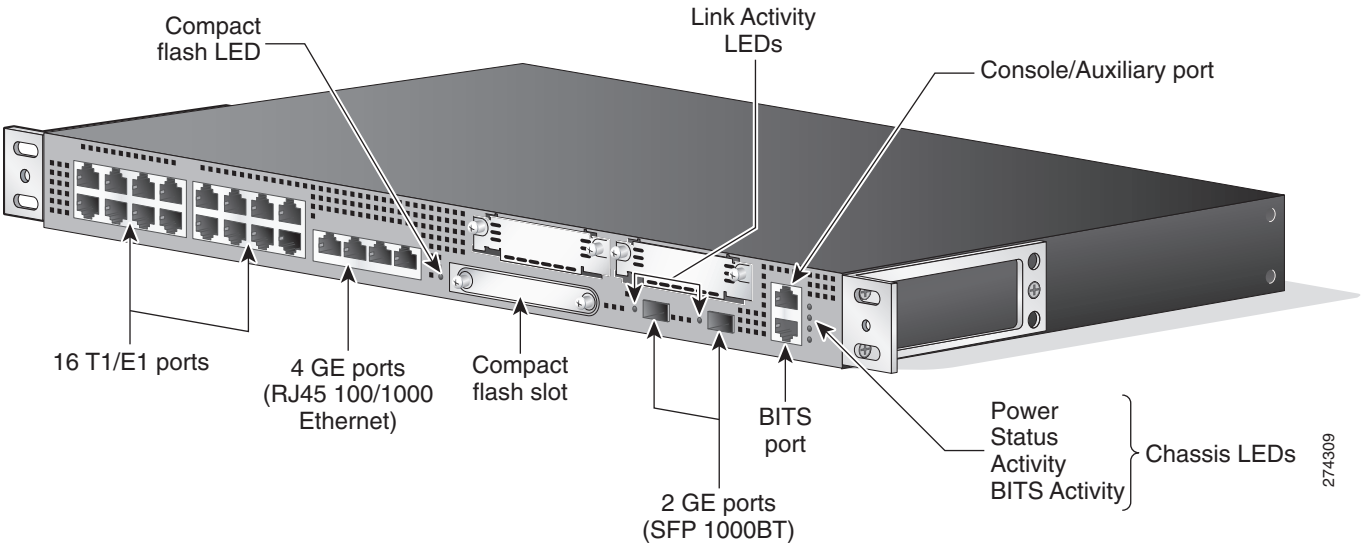
Cisco MWR 2941-DC Router Front View

On the front panel, the Cisco MWR 2941-DC router (Figure 1-1) shows the orientation of the following components:

- 16 T1/E1 ports, labeled "T1/E1" (positions 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15)
- 4 RJ-45 jacks for copper Ethernet ports, labeled "100/1000" Ethernet (positions 2, 3, 4, and 5)
- 2 HWIC slots, labeled "HWIC0" and "HWIC1"
- 1 compact FLASH Type-II connector, labeled "Compact Flash"
- 2 SFP connectors for optical GE ports, labeled "GE0" and "GE1"
- 1 RJ-45 connector for Console/Auxiliary, labeled "CON/AUX"
- 1 RJ-45 jack for BITS interface, labeled "BITS"
- Various LEDs. For a description of all LEDs, see the "Router Chassis LEDs" section on page 1-4.

Note The location of the rack-mounting brackets is also shown facing front on the left and right sides of the router. The rack-mounting brackets are installed when the unit is shipped.

Figure 1-1 Cisco MWR 2941-DC Router—Front View



Note There are also 2 LEDs associated with each of the T1/E1 and Ethernet ports.

Router Chassis LEDs

The front panel of the Cisco MWR 2941-DC router provides access to LEDs associated with:

- T1/E1 ports
- Ethernet ports
- Compact flash
- SFP ports
- Chassis
  - Power
  - Operating status
  - Activity
  - BITS activity

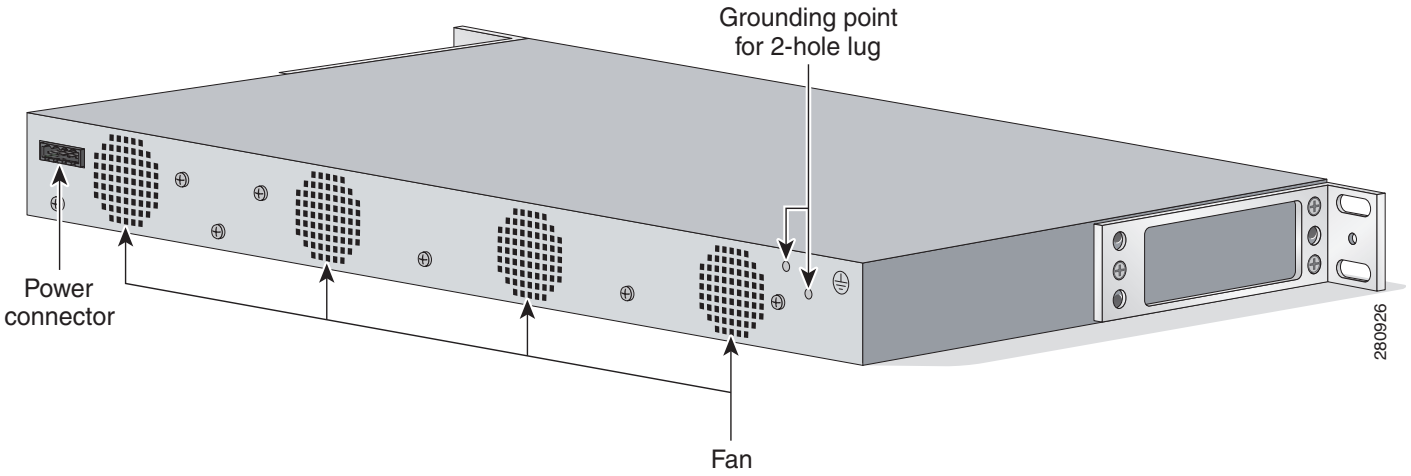
For a more detailed description of the LEDs, see the "Reading the LEDs" section on page A-5.

Cisco MWR 2941-DC Rear View

On the rear panel, the Cisco MWR 2941-DC router (Figure 1-2) shows the orientation of the following components:

- Four exhaust fans
- Mounting point for 2-hole lug (see the "Connecting the Chassis Ground and Power" section on page 3-6)
- Cisco MWR 2941-DC router power connector (see the "Wiring the DC-Input Power Source" section on page 3-9)

Figure 1-2 Cisco MWR 2941-DC Router Rear View



Fixed Interfaces

There are 16 fixed T1/E1 ports available on the front panel of the Cisco MWR 2941-DC router. Each port has a dedicated RJ45 connector belonging to one of two 2x4 (8 ports each) connectors. Each T1/E1 link has 2 dedicated LEDs—one LED to monitor link activity and a second LED to monitor alarms.

The Cisco MWR 2941-DC router also has 6 fixed ports of Ethernet available for an application requiring Ethernet connectivity. There are 4 copper RJ45 ports of 100/1000 Ethernet. In addition, there are 2 ports of 1000 Ethernet available through SFP connectors, allowing the end user the flexibility to connect to copper or fiber networks through SFP transceiver selection. The ports are fully compliant with the IEEE 802.3 and 802.3U standards. The ports integrate the MAC functions and a dual-speed media-dependent interface (MDI). The ports can operate in half- or full-duplex mode and can run independently of one another.

Each Ethernet link has a dedicated LED to monitor link activity. The 4 copper RJ45 ports of 100/1000 Ethernet have a second dedicated LED to monitor speed. (For LED information, see the "Reading the LEDs" section on page A-5.

Interface Cards

The Cisco MWR 2941-DC router provides for two high-speed WIC (HWIC) slots for any two approved HWIC interface cards. The Cisco MWR 2941-DC supports the following interface cards:

- HWIC-4T1/E1
- HWIC-4SHDSL
- HWIC-1GE-SFP
- HWIC-D-9ESW

The Cisco MWR 2941-DC router supports the following SFP modules:

- CWDM-SFP-1470
- CWDM-SFP-1490
- CWDM-SFP-1510
- CWDM-SFP-1530
- CWDM-SFP-1550
- CWDM-SFP-1570
- CWDM-SFP-1590
- CWDM-SFP-1610
- DWDM-SFP-4612
- DWDM-SFP-4692
- DWDM-SFP-4772
- DWDM-SFP-4851
- DWDM-SFP-5012
- DWDM-SFP-5092
- DWDM-SFP-5172
- DWDM-SFP-5252
- DWDM-SFP-5413
- DWDM-SFP-5494
- DWDM-SFP-5575
- DWDM-SFP-5655
- DWDM-SFP-5817
- DWDM-SFP-5898
- DWDM-SFP-5979
- DWDM-SFP-6061
- GLC-ZX-SM-RGD
- GLC-LX-SM-RGD
- GLC-SX-MM-RGD
- SFP-GE-L
- SFP-GE-S

- SFP-GE-Z

Other hardware interfaces are not supported.

Note The Cisco MWR 2941-DC does not support online insertion and removal (OIR) of HWIC interface cards. Attempts to perform OIR on a card in a powered-on router might cause damage to the card.

HWIC Numbering

The HWIC slots are labeled *HWIC0* and *HWIC1* on the faceplate of the Cisco MWR 2941-DC router.

The HWIC slots can accommodate 2 quad T1/E1 HWICs, expanding the number of T1/E1 ports from 16 to 24 ports. Like the 16 T1/E1 fixed ports, the additional 8 T1/E1 ports available through the HWIC slots can be individually configured for use as a GSM short-haul connection or an IP RAN backhaul connection.

The HWIC-D-9ESW card is a double-wide HWIC; its interfaces use HWIC slot 0 such that interfaces are numbered FE 1/0–1/8. Port 1/8 is reserved for stacking. For information about how to connect cables for switchport stacking, see Connecting Cables for Switchport Stacking, page 3-14.

Compact Flash Memory

The Cisco MWR 2941-DC router supports one compact flash slot on the front panel. The slot is intended to house a memory card using the compact flash standard file system. The most common usage is for storage of the system image or core dumps for diagnostic purposes. The Cisco IOS image and troubleshooting logs reside on the flash memory.

This compact flash device is not field upgradeable, it is only installed at the factory.

The front panel connector supports both Type I and Type II 3.3V Compact Flash devices. The compact flash controller has the following features:

- Operating mode: PCMCIA-compatible PC card in memory mode
- Auto power removal on removal of compact flash from the slot
- Write protection
- Support Cisco qualified 128MB compact flash devices

Note The interface supports any size compact flash device. The size limit is a statement on test coverage and qualification time limits.

Please refer to the industry standard for compact flash for details on internal registers. All compact flash follow the ATA standard for internal register access.

Power Supply

The Cisco MWR -DC router is equipped with an Internal +27/-48 volts Direct Current (VDC) (±20 to 60 VDC supply tolerance).

Safety Precautions

Observe the following general safety precautions and recommendations in planning the source power requirements for the Cisco MWR 2941-DC router (for additional safety information, see the "Safety Guidelines" section on page 2-1):

- Check the power at your site before router installation (and periodically after installation) to ensure clean power (free of spikes and noise) is being received.
- Always disconnect the power source and unplug the power cable before working on the router.
- Install proper grounding for the site to avoid damage from lightning and power surges.

Warning **To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits, and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. Use caution when connecting cables.** Statement 1021

Table 1-1 lists DC power supply specifications for the Cisco MWR 2941-DC router.

Table 1-1 Cisco MWR 2941-DC Router Power Supply Specifications

Specification	+27/-48 VDC
Input voltage, DC power supply	±20 to 60 VDC
Maximum input current **Note** If the input voltage drops below 18.5 VDC, the router goes into shut down mode.	3.5 A (current rating = 4 A)
Wire gauge for DC input power connections	18-AWG
Power dissipation	65 W (maximum), 45 W (typical)

The Cisco MWR 2941-DC router uses a 4-pin terminal block (part number 27-2030-01) for input to the power supply. The terminal block is part of the accessory kit (part number 53-3085-01), which ships with the Cisco MWR 2941-DC router.

Note that the ground wire connects to a 2-hole lug, which connects to the corresponding mounting point.

With the connector installed in the chassis, the pins are for two separate input power sources named A and B. From left to right, the pins are for rail A+, rail A-, rail B-, and rail B+.

Table 1-2 and Table 1-3 list the pinout configurations for the connector, based on the power source.

Table 1-2 Power Supply Connector Pinouts (+27 VDC Application)

Pin	+27 VDC Power Source
1	+27 VDC A
2	RTN A

Table 1-2 Power Supply Connector Pinouts (+27 VDC Application)

Pin	+27 VDC Power Source
3	RTN B
4	+27 VDC B

Table 1-3 Power Supply Connector Pinouts (-48 VDC Application)

Pin	-48 VDC Power Source
1	RTN A
2	-48 VDC A
3	-48 VDC B
4	RTN B

Environmental Monitoring Temperature Sensor

The Cisco MWR 2941-DC router has a temperature sensor to detect overtemperature conditions inside the chassis. The overtemperature detection trips at 70°C +/- 5%. This condition is reported to the processor as an interrupt, where software takes action to generate the appropriate alarms.

System Specifications

Table 1-4 lists the system specifications for Cisco MWR 2941-DC- router.

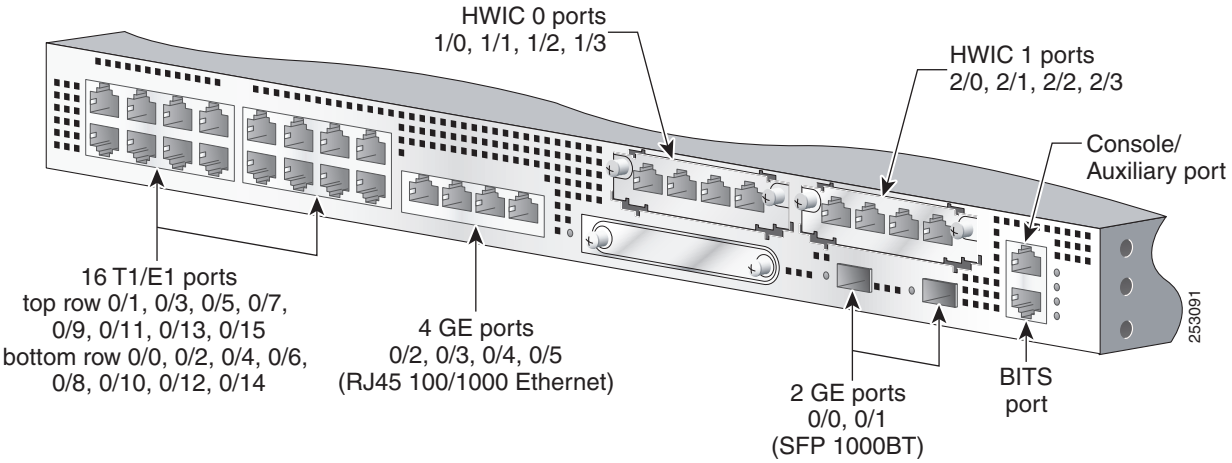
Table 1-4 Cisco MWR 2941-DC Router System Specifications

Description	Specification
Dimensions (H x W x D)	1.72 x 17.5 x 12.5 in. (4.37 x 44.45 x 31.75 cm) 1 RU (rack unit) in a 19-inch (48.3 cm) rack
Weight	12 lb (5.44 kg)
Console and Auxiliary ports	RJ-45 connector
Operating Temperature	Operating temperature range is -4 to 60°F (-20°C to 60°C). If HWICs are installed, the operating temperature range is 14 to 131°F (-10C to 55C).
Non-Operational Temperature	-40 to 185°F (-40 to 85°C)
Operating Humidity	5 to 90% RH (non-condensing)
Operating Altitude	9,842.5 ft. (3000 m) at 113°F (45°C)
Operating Vibration	0.41 Grms, 3 to 500 Hz/2 hr. per axis GR-63-CORE earthquake resistance, Zone 4, shelf-level
Non-Operational Vibration	1.12 Grms, 3 to 500 Hz/30 min. per axis
Operating Acoustics	<60 dBa

Cisco MWR 2941-DC Router Interface Numbering

Each network interface on a Cisco MWR 2941-DC router is identified by a slot number and a port number. Figure 1-3 shows the interface numbering for a Cisco MWR 2941-DC router.

Figure 1-3 Cisco MWR 2941-DC Router Port Numbers



Note HWIC interface cards are not included with the Cisco MWR 2941-DC router; you must order them separately. Supported interface cards are listed in the "Interface Cards" section.

Slot and Port Numbering

The Cisco MWR 2941-DC router chassis contains the following interface types:

- 16 T1/E1 ports, labeled "T1/E1"
- 4 RJ-45 jacks for copper Ethernet ports, labeled "100/1000" Ethernet
- 2 HWIC slots, labeled "HWIC0" and "HWIC1"
- 1 compact FLASH Type-II connector, labeled "Compact Flash"
- 2 SFP connectors for optical GE ports, labeled "GE0" and "GE1"
- 1 RJ-45 connector for Console/Auxiliary, labeled "CON/AUX"
- 1 RJ-45 jack for BITS interface, labeled "BITS"

The logical slot numbers are 0 for all built-in interfaces.

The numbering format is:

```
Interface type Slot number/Interface number
```

Interface (port) numbers begin at logical 0 for each interface type.

Following is an explanation of the slot/port numbering:

- Logical interface numbering for the built-in T1/E1 ports runs from 0/0 through 0/15. Interfaces are hardwired; therefore, port 0 is always logical interface 0/0, port 1 is always logical interface 0/1, and so on. Built-in T1/E1 ports are numbered bottom to top, left to right (bottom row numbered 0-2-4-6-8-10-12-14, top row numbered 1-3-5-7-9-11-13-15).

- When the 2 HWIC slots are used to expand the T1/E1 port density to 20 or 24 ports, logical interface numbering continues from 1/0 through 1/3 and 2/0 through 2/3. Logical interfaces for HWIC0 are always 1/0 through 1/3 and logical interfaces for HWIC1 are always 2/0 through 2/3. Because the interfaces are hardwired, HWIC0 port 0 is always logical interface 1/0, HWIC0 port 1 is always logical interface 1/1, HWIC1 port 0 is always logical interface 2/0, HWIC1 port 1 is always logical interface 2/1, and so on. Ports are numbered left to right for each HWIC.
- Logical interface numbering for the built-in Ethernet ports runs from 0/0 through 0/5. Because the interfaces are hardwired, port 0 is always logical interface 0/0, port 1 is always logical interface 0/1, and so on. SFP ports are numbered left to right, 0 and 1; 100/1000 Ethernet ports are numbered left to right, 2 through 5.

Regulatory Compliance

For regulatory compliance and safety information, see the Cisco *Regulatory Compliance and Safety Information for the Cisco MWR 2941-DC Mobile Wireless Edge Router* document. This document is available online at Cisco.com (see the "Obtaining Documentation, Obtaining Support, and Security Guidelines" section on page xvii for more information).

CHAPTER 2

Preparing to Install the Router

This chapter describes site requirements and equipment used to install your Cisco MWR 2941-DC router. It includes the following sections:

Safety Guidelines

Before you begin the installation of the Cisco MWR 2941-DC router, review the safety guidelines in this chapter, the "Safety Precautions" section on page 1-7, and the "Rack-Mounting Configuration Guidelines" section on page 3-2 to avoid injuring yourself or damaging the equipment.

In addition, before replacing, configuring, or maintaining the Cisco MWR 2941-DC router, review the safety warnings listed in the document Cisco *Regulatory Compliance and Safety Information for the Cisco MWR 2941-DC Mobile Wireless Edge Router.*

Safety with Equipment

The following guidelines help ensure your safety and protect the equipment. This list is not all- inclusive of all potentially hazardous situations, so be *alert*.

Warning **Before connecting the system to the power source, read the installation instructions.** Statement 1004

- Before moving the system, always disconnect all power cords and interface cables.
- Never assume that power is disconnected from a circuit; *always* check.
- Before and after installation, keep the chassis area clear and dust-free.
- Keep tools and assembly components away from walk areas where you or others could fall over them.
- Do not work alone if potentially hazardous conditions exist.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- Do not wear loose clothing that may get caught in the chassis.

- When working under conditions that may be hazardous to your eyes, wear safety glasses.

Safety with Electricity

Warning **Before performing any of the following procedures, ensure that power is removed from the DC circuit.** Statement 1003

Warning **This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security.** Statement 1017

Warning **To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits, and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors.** Statement 1021

Warning **Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals.** Statement 43

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 **During periods of lightning activity, do not work on the system or connect or disconnect cables.** Statement 1001

When working on equipment powered by electricity, follow these guidelines:

- Locate the room's emergency power-off switch. Then, if an electrical accident occurs, you can quickly turn off the power.
- Before working on the system, turn off the DC main circuit breaker and disconnect the power terminal block cable.
- Before doing the following, disconnect all power:
  - Working on or near power supplies
  - Installing or removing a router chassis or network processor module
  - Performing most hardware upgrades
- Never install equipment that appears damaged.
- Carefully examine your work area for possible hazards, such as moist floors, ungrounded power extension cables, and missing safety grounds.
- Never assume that power is disconnected from a circuit; *always* check.
- Never perform any action that creates a potential hazard to people or makes the equipment unsafe.

- If an electrical accident occurs, proceed as follows:
  - Use caution, and do not become a victim yourself.
  - Turn off power to the router.
  - If possible, send another person to get medical aid. Otherwise, determine the condition of the victim, and then call for help.
  - Determine whether the person needs rescue breathing or external cardiac compressions; then take appropriate action.

In addition, use the following guidelines when working with any equipment that is disconnected from a power source, but still connected to telephone wiring or network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for it.
- Never touch un-insulated telephone wires or terminals unless the telephone line is disconnected at the network interface.
- When installing or modifying telephone lines, use caution.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. ESD can occur when electronic printed circuit cards are improperly handled and can cause complete or intermittent failures. When removing and replacing modules, always follow ESD prevention procedures:

- Ensure that the router chassis is electrically connected to earth ground.
- Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. To channel unwanted ESD voltages safely to ground, connect the clip to an unpainted surface of the chassis frame. To guard against ESD damage and shocks, the wrist strap and cord must operate effectively.
- If no wrist strap is available, ground yourself by touching a metal part of the chassis.

Caution For the safety of your equipment, periodically check the resistance value of the antistatic wrist strap. It should be between 1 and 10 Mohm.

Prerequisites

Before installing the Cisco MWR 2941-DC router, it is important to prepare for installation by:

- Preparing the site (site planning) and reviewing the installation plans or method of procedures (MOPs)
- Unpacking and inspecting the Cisco MWR 2941-DC router
- Gathering tools and test equipment required to properly install the Cisco MWR 2941-DC router

Site Planning

Typically, you should have prepared the installation site beforehand. As part of your preparation, obtain a floor plan of the site and the equipment rack where the Cisco MWR 2941-DC router will be housed. Determine the location of any existing routers and their interconnections, including communications and power. Following the air flow guidelines (see the "Air Flow Guidelines" section on page 2-4) ensures that adequate cooling air is provided to the Cisco MWR 2941-DC router.

All personnel involved in the installation of the Cisco MWR 2941-DC router including installers, engineers, and supervisors should participate in the preparation of a MOP for approval by the customer.

Power Supply Considerations

Check the power at your site to ensure that you are receiving clean power (free of spikes and noise). Install a power conditioner if necessary (see the "Power Supply" section on page 1-7 for power requirements).

Warning **This equipment is designed for connection to TN and IT power systems.** Statement 16

Site Environment

Install the Cisco MWR 2941-DC router in an equipment rack. The location of your router and the layout of your equipment rack or wiring room are extremely important considerations for proper operation. Cramped equipment, inadequate ventilation, and inaccessible panels can cause malfunctions and shutdowns, and can make maintenance difficult. Plan for access to front and rear panels of the router.

The following precautions will help you plan an acceptable operating environment for your router and will help you avoid environmentally caused equipment failures:

- Ensure that the room where your router operates has adequate circulation. Electrical equipment generates heat. Without adequate circulation, ambient air temperature may not cool equipment to acceptable operating temperatures (see the next section, "Air Flow Guidelines").
- Always follow ESD-prevention procedures described in the "Preventing Electrostatic Discharge Damage" section on page 2-3 to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.

Air Flow Guidelines

To ensure adequate air flow through the equipment rack, it is recommended that you maintain a clearance of at least 6 inches (15.24 cm) in the front and the rear of the rack at all times.

If airflow through the equipment rack and the routers that occupy it is blocked or restricted, or if the ambient air being drawn into the rack is too warm, an overtemperature condition within the rack and the routers that occupy it can occur.

The site should also be as dust-free as possible. Dust tends to clog the router fans, reducing the flow of cooling air through the equipment rack and the routers that occupy it. Thus, increasing the risk of an overtemperature condition.

Additionally, the following guidelines will help you plan your equipment rack configuration:

- Mount the Cisco MWR 2941-DC router in a 19-inch rack (with a 17.5- or 17.75-inch opening).
- Beside air flow, you must allow clearance around the rack for maintenance.
- Enclosed racks must have adequate ventilation. Ensure that the rack is not congested, because each router generates heat. An enclosed rack should have louvered sides and a fan to provide cooling air. Heat that is generated by equipment near the bottom of the rack can be drawn upward into the intake ports of the equipment above.
- When mounting a chassis in an open rack, ensure that the rack frame does not block the front intakes or the rear exhaust fans.
- When rack-installed equipment fails, especially equipment in an enclosed rack, try operating the equipment by itself, if possible. Power off other equipment in the rack (and in adjacent racks) to give the router a maximum of cooling air and clean power.

Method of Procedure

Part of site preparation includes reviewing installation plans or MOPs. An example of a MOP (pre-installation checklist of tasks and considerations to address and agree upon before proceeding with the installation) is as follows:

1. Assign personnel.
2. Determine protection requirements for personnel, equipment, and tools.
3. Evaluate potential hazards that may affect service.
4. Schedule time for installation.
5. Determine space requirements.
6. Determine power requirements.
7. Identify required procedures or tests.
8. On an equipment plan, make a preliminary decision that locates each Cisco MWR 2941-DC router that you plan to install.
9. Read this hardware installation guide.
10. Verify the list of replaceable parts for installation (screws, bolts, washers, and so on) so that the parts are identified.
11. Check the required tools list to make sure the necessary tools and test equipment are available (see the "Required Tools and Equipment" section on page 2-6).
12. Perform the installation.

Unpacking and Checking the Contents of your Shipment

The shipping package for the Cisco MWR 2941-DC router is designed to reduce the possibility of product damage associated with routine handling experienced during shipment. To reduce the potential damage to the product, transport the Cisco MWR 2941-DC router in its Cisco specified packaging. Failure to do so may result in damage to the Cisco MWR 2941-DC router. Also do not remove the Cisco MWR 2941-DC router from its shipping container until you are ready to install it.

Note Do not discard the packaging materials used in shipping your Cisco MWR 2941-DC router. You will need the packaging materials in the future if you move or ship your Cisco MWR 2941-DC router.

The Cisco MWR 2941-DC router, cables, and any optional equipment you ordered may be shipped in more than one container. When you unpack the containers, check the packing list to ensure that you receive all of the following items:

- Router
- Accessory kit (part number 53-3085-01), containing
  - Terminal block (part number 27-2030-01)
  - 2-hole lug, 6-AWG ground wire, #10 blue stud (part number 32-0629-01)
  - 2 pan-head Phillips screws used to attach the lug to the router, M5.0x10mm (part number 48-0426-01)
  - 2 rack-mounting brackets for recessed mounting (part number 700-24513-01)
  - 2 cable guides (part number 700-01663-01)
  - 2 pan-head Phillips screws used to attach the cable guides, M4,0x20mm (part number 48-0654-01)

Note There is no AC power option.

- *Cisco Information Packet* publication

Inspect all items for shipping damage. If an item appears to be damaged, or if you encounter problems installing or configuring your router, contact customer service. The *Cisco Information Packet* provides warranty, service, and support information.

Required Tools and Equipment

You need the following tools and equipment to install and upgrade the router and its components:

Warning **Only trained and qualified personnel should be allowed to install or replace this equipment.** Statement 49

- ESD-preventive cord and wrist strap.
- Number 2 Phillips screwdriver.
- Flat-blade screwdrivers: small, 3/16-inch (0.476 cm) and medium, 1/4-inch (0.625 cm).
  - To install or remove modules
  - To remove the cover, if you are upgrading memory or other components
- #12-24 pan-head screws to secure the router to the equipment rack.
- Cables for connection to the WAN and LAN ports (depending on the configuration).

Note For more information on cable specifications, see Appendix B, “Cable Specifications.”

- Ethernet hub or PC with a network interface card for connection to the Ethernet (LAN) ports.
- Console terminal (an ASCII terminal or a PC running terminal emulation software) that is configured for 9600 baud, 8 data bits, no parity, and 2 stop bits.
- Console cable for connection to the console port.

- Modem for connection to the auxiliary port for remote administrative access (optional).
- Auxiliary cable for connection to the auxiliary port. You can supply this cable or order one from Cisco Systems, Inc.
- Ratcheting torque screwdriver with a Phillips head that exerts up to 15 pound-force inches (lbf-in) of pressure.
- Crimping tool as specified by the ground lug manufacturer.
- 18-AWG copper wire for the power cord.
- Wire-stripping tools for stripping both 6- and 18-AWG wire.
- Serial interfaces may require a data service unit (DSU) or channel service unit/data service unit (CSU/DSU).

Installation Checklist

To assist you with your installation and to provide a historical record of completed tasks and users, use the following Installation Checklist. Make a copy of this checklist and mark the entries as you complete each task. When the checklist is completed, include a copy of the checklist for each router in your Site Log along with other records for your new router. See Appendix C, "Site Log" for information on the Site Log, including a sample Site Log.

Installation Checklist for Site:

Router Name:

Task	Verified by	Date
Installation Checklist copied		
Background information placed in Site Log		
Site power voltages verified		
Installation site power check completed		
Required tools available		
Additional equipment available		
Router received		
Documentation DVD received (if ordered)		
Cisco Information Packet publication received		
Chassis components verified		
Initial electrical connections established		
ASCII terminal (for local configuration) or modem (for remote configuration)		
Signal distance limits verified		
Startup sequence steps completed		
Initial operation verified		
Software image verified		

Creating a Site Log

The Site Log provides a record of all actions related to installing and maintaining the router. Keep it in an accessible place near the chassis so that anyone who performs tasks has access to it.

Create the Site Log prior to installation. (See Appendix C, "Site Log" for more detailed information on the Site Log as well as a sample Site Log that can be used to make copies.)

Console/Auxiliary Port Considerations

The Cisco MWR 2941-DC router provides a single console/auxiliary port (labeled CON/AUX). A single RJ-45 cable is used for either a console or auxiliary connection.

This section describes important cabling information to consider before connecting a console terminal—either an ASCII terminal or a PC running terminal emulation software—or a modem to the console/auxiliary port. The console/auxiliary port provides access to the router either locally (using a console terminal), or remotely (using a modem).

The main difference between a console connection and an auxiliary connection is that the auxiliary connection supports hardware flow control and the console connection does not. Flow control paces the transmission of data between a sending device and a receiving device. Flow control ensures that the receiving device can process all the data sent to it before the sending device sends more data. When the buffers on the receiving device are full, a message is sent to the sending device to suspend transmission until the data in the buffers has been processed. Because the auxiliary connection supports flow control, it is suited for use with the high-speed transmissions of a modem. Console connections transmit at slower speeds than modems; therefore, the console connection is suited for use with console terminals.

Note Console and rollover cables are not included with the Cisco MWR 2941-DC router. You can order the console cable from Cisco Systems, Inc. (part number ACS-1900ASYN=). You must supply your own rollover cable.

To change the console port into an auxiliary port, use the **modem enable [autodetect]** command in line configuration mode. To return the auxiliary port to a console port, use the **no** form of this command (**no modem enable**).

This command is not configured by default and is applicable only on the console line. The console port must be changed to act as a virtual auxiliary port using the **modem enable [autodetect]** command before the dial backup and remote management capabilities can be enabled.

Use the **show line autodetect** EXEC command to determine when a modem or a console has been detected. The command displays messages to indicate the type or state of connection on the console line.

Console Port Connections

The router provides an EIA/TIA-232 asynchronous serial console port (RJ-45). Depending on the cable and the adapter used, this port appears as a data terminal equipment (DTE) or data communications equipment (DCE) device at the end of the cable.

To connect an ASCII terminal to the console/auxiliary port, use the RJ-45 rollover cable with the female RJ-45-to-DB-25 adapter (labeled TERMINAL). To connect a PC running terminal emulation software to the console/auxiliary port, use the RJ-45 rollover cable with the female RJ-45-to-DB-9 adapter

(labeled TERMINAL). The default parameters for the port are 9600 baud, 8 data bits, no parity, and 2 stop bits. As a console port, hardware flow control is not supported. For instructions on installing a console terminal, see the "Connecting the Console/Auxiliary Port" section on page 3-10.

For cable and port pinouts, see the online document *Cisco Modular Access Router Cable Specifications.* This document is available online at Cisco.com.

Auxiliary Port Connections

The router includes an EIA/TIA-232 asynchronous serial auxiliary port (RJ-45) that supports flow control. Depending on the cable and the adapter used, this port appears as either a DTE or DCE device at the end of the cable.

To connect a modem to the console/auxiliary port, use an RJ-45 rollover cable with the male RJ-45-to-DB-25 adapter (labeled MODEM). For instructions on connecting devices to the console/auxiliary port, see the "Connecting the Console/Auxiliary Port" section on page 3-10.

For cable and port pinouts, see the online document *Cisco Modular Access Router Cable Specifications.* This document is available online at Cisco.com.

CHAPTER 3

Installing the Cisco MWR 2941-DC Router

This chapter describes how to install your Cisco MWR 2941-DC router and how to connect it to networks and external devices. This chapter contains the following sections:

Warning **Only trained and qualified personnel should be allowed to install, replace, or service this equipment.** Statement 1030

Warning **This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security.** Statement 1017

Interface Cards

The HWIC interface cards are a configurable option. If ordered, they are shipped already installed. If you need to remove or install the card, refer to the applicable documents online.

Note If the HWIC interface card must be removed or installed, we recommend that you perform the installation or removal before you install the chassis.

Caution The Cisco MWR 2941-DC has a caveat that causes the native VLAN interface on the motherboard to drop packets on the native VLAN if you install the HWIC-D-9ESW card without configuring the **stacking-partner** command. We recommend that you install the HWIC-D-9ESW card and immediately apply this configuration command. For more information, see the *Cisco MWR 2941-DC Mobile Wireless Edge Router Software Configuration Guide*.

If the HWIC interface cards are already installed, proceed to the next section "Mounting the Cisco MWR 2941-DC Router."

Mounting the Cisco MWR 2941-DC Router

Each Cisco MWR 2941-DC router has rack-mounting brackets installed at the factory. If the router is shipped without the rack-mounting brackets installed, the rack-mounting bracket kit may have been separately packaged with your router.

Using the rack-mounting brackets installed at the factory, you can front-mount or center-mount the Cisco MWR 2941-DC router in a 19-inch (48.3-cm) equipment rack that conforms to the EIA-310-D specification (the inside width of the rack should be 17.72 to 17.80 inches [45 to 45.21 cm]).

Using the two rack-mounting brackets (part number 700-24513-01) in the accessory kit (part number 53-3085-01), you can recess Cisco MWR 2941-DC router in the equipment rack. This arrangement provides extra space in front of the router for the cables and allows you to close the doors of racks equipped with front-close doors.

If you need to reposition or replace the factory-installed rack-mounting brackets, see the "Attaching the Rack-Mounting Brackets" section on page 3-3.

The rack-mounting brackets are slotted to allow the router to be mounted in racks with EIA 1.25-inch (3.81-cm) or WECO 1.0-inch (2.54-cm) hole spacing. When installed in the rack, the Cisco MWR 2941-DC router requires one EIA 1.75-inch (4.4-cm) vertical mounting space (or 1 rack unit [RU]) for mounting (see the "Mounting the Cisco MWR 2941-DC Router in a Rack" section on page 3-5).

Caution Allow clearance in the front and rear of the Cisco MWR 2941-DC router for cooling air to be drawn in through the front and circulated through the chassis and out the four fan exhaust ports mounted on the rear of the chassis.

Rack-Mounting Configuration Guidelines

Use the following information to help you plan your equipment rack configuration:

- When mounting the router to an equipment rack, ensure that the rack is bolted to the floor.
- Because you may install more than one router into the rack, ensure that the weight of all of the routers installed does not make the rack unstable.

Caution Some equipment racks are also secured to ceiling brackets, if necessary, due to the weight of the equipment in the rack. Make sure that the rack you are using to install the routers is secured to the building structure.

- As mentioned in the "Air Flow Guidelines" section on page 2-4, maintain a 6-inch (15.2-cm) clearance at the front and rear of the router to ensure adequate air intake and exhaust.
- Avoid installing the routers in an overly congested rack. Air flowing to or from other routers in the rack might interfere with the normal flow of cooling air through the routers, increasing the potential for overtemperature conditions within the routers.

- Allow at least 19 inches (48.7 cm) of clearance at the front and rear of the rack for router maintenance.
- Follow your local practices for cable management. Ensure that cables to and from the routers do not impede access to perform equipment maintenance or upgrades.

Attaching the Rack-Mounting Brackets

Rack-mount a Cisco MWR 2941-DC router with the front of the chassis facing forward.

The rack-mounting brackets for the Cisco MWR 2941-DC router should be installed at the factory. If the router is shipped without the rack-mounting brackets installed, the rack-mounting bracket kit is packaged with your router.

Perform the following procedure to install, replace, or rearrange the rack-mounting brackets so you can then mount the Cisco MWR 2941-DC router in a 19-inch (48.3-cm) equipment rack. There are three options for mounting the router in the equipment rack:

- Front-mount
- Center-mount
- Recess-mount

Note You can use the same factory-installed rack-mounting brackets to front-mount or center-mount the Cisco MWR 2941-DC router in the equipment rack.

If you want to recess Cisco MWR 2941-DC router in the equipment rack, locate the two rack-mounting brackets (part number 700-24513-01) in the accessory kit (part number 53-3085-01). Replace the factory-installed rack-mounting brackets with the rack-mounting brackets in the accessory kit. Be sure that the flange for attaching the router to the rack extends beyond the front of the router. If you have front doors on your equipment rack, recessing the router allows you to close the doors even with the cables protruding from the front of the router.

Step 1 Locate the mounting holes of the Cisco MWR 2941-DC router for the mounting.

Step 2 Align the rack-mounting bracket with the Cisco MWR 2941-DC router and position with the three #8-32 x 0.37-inch screws (provided) (see Figure 3-1 for front-mounting, Figure 3-2 for center-mounting or Figure 3-3 for recess-mounting).

Step 3 Insert the screws (3 places) and tighten using a Number 2 Phillips screwdriver.

Step 4 Repeat Steps 2 and 3 for the other rack-mounting bracket.

Figure 3-1 Attaching the Bracket for Front-Mounting

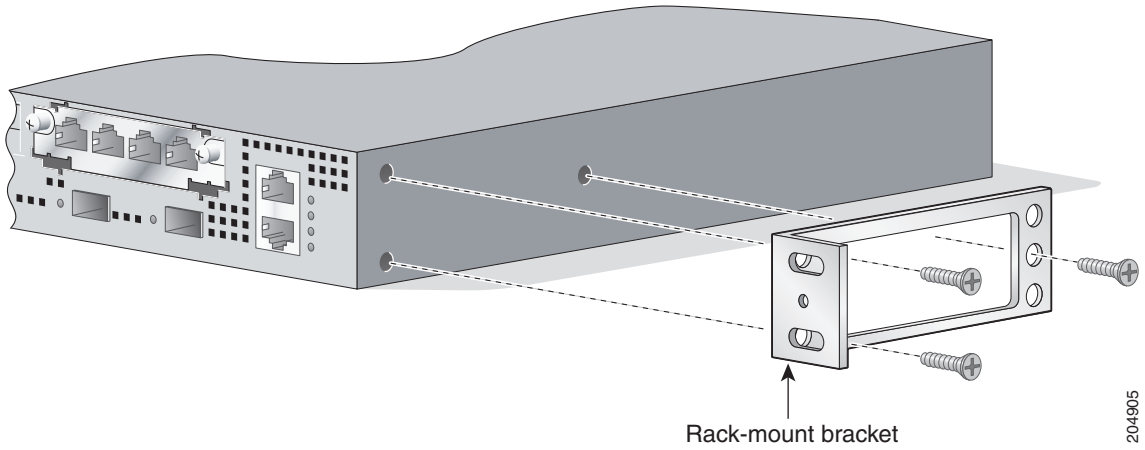


Figure 3-2 Attaching the Bracket for Center-Mounting

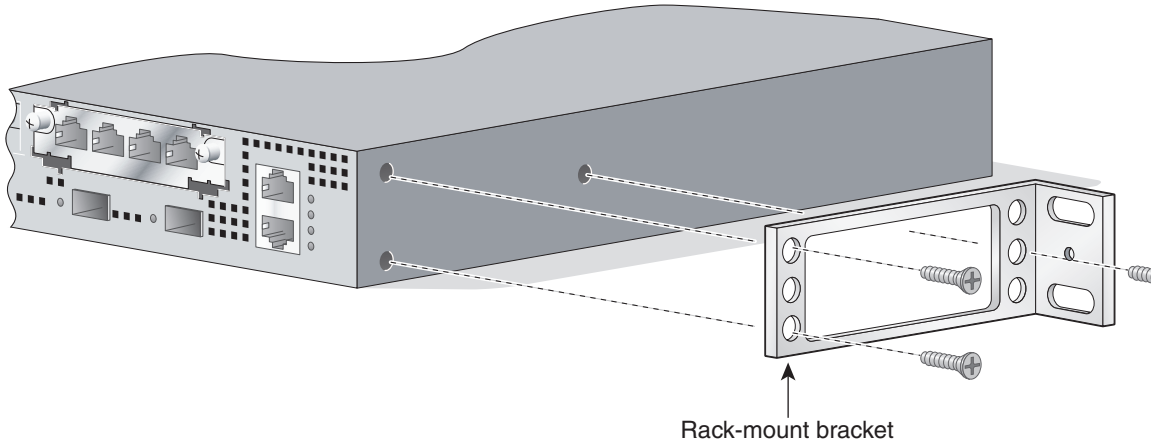
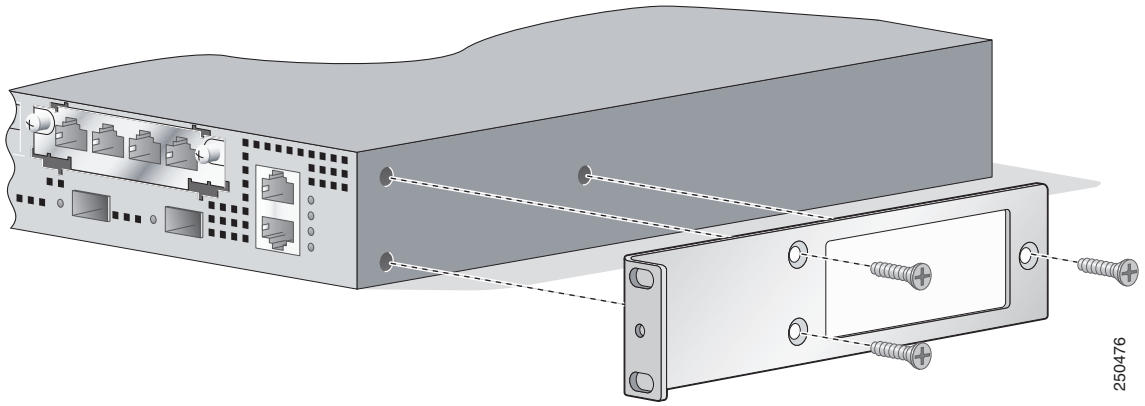


Figure 3-3 Attaching the Bracket for Recess-Mounting



Proceed to the next section, "Mounting the Cisco MWR 2941-DC Router in a Rack" to continue the installation.

Mounting the Cisco MWR 2941-DC Router in a Rack

Typically, the Cisco MWR 2941-DC router mounts to a 19-inch (48.3-cm) 2-post equipment rack with rack-mounting brackets that attach toward the front of the router sides. The inside width between the two posts or mounting strips (left and right) must be at least 17.5 inches (44.45 cm). For information about the equipment rack, see "Hardware Description" section on page 1-2.

No vertical clearance is necessary above or below the router when it is mounted in the rack.

To secure the Cisco MWR 2941-DC router to the equipment rack, you must use the three mounting screws (provided) for each side or follow your local practices for installing the router into your equipment rack. Ensure that the rack-mount brackets are securely fastened. For more information, see the "Attaching the Rack-Mounting Brackets" section on page 3-3.

To mount the Cisco MWR 2941-DC router into the equipment rack, perform the following procedure.

Caution To prevent injury, review the "Safety Guidelines" section on page 2-1 and the "Rack-Mounting Configuration Guidelines" section on page 3-2 before installing the Cisco MWR 2941-DC router in the equipment rack.

Step 1 Locate the equipment rack position where you plan to install the Cisco MWR 2941-DC router.

Step 2 Verify that there are no obstructions and ensure that the equipment rack is stabilized.

Step 3 Position the Cisco MWR 2941-DC router in the equipment rack lining up the bracket holes on the router with the holes on the rack and secure with four #12-24 x 0.37-inch mounting screws (two on each side).

Note The vertical spacing for EIA equipment racks is 1.75 inches (4.44 cm), with mounting holes spaced 1.5 inches (3.81 cm) apart. Vertical spacing for WECO racks is 2.0 inches (5.08 cm), with mounting holes spaced 1.0 inch (2.54 cm) apart.

Step 4 Tighten the screws using a 1/4-inch flat-blade screwdriver (each side).

If your router is front-mounted, proceed to the section "Attaching the Cable Guides." If your router is center-mounted or recess-mounted, proceed to section, "Connecting the Chassis Ground and Power."

Attaching the Cable Guides

Perform the following procedure to attach the two cable guides to the front of the mounting brackets. This procedure is optional.

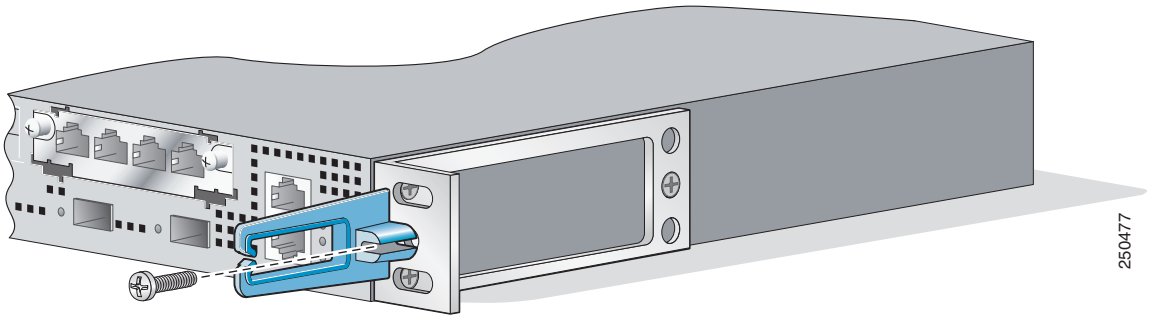
Note The cable guides are practical only if your router is front-mounted. Do not attach the cable guides if your router is center-mounted or recess-mounted.

Use the cable guides to dress the cables that you will attach to the front of the Cisco MWR 2941-DC router. The cable guides allow you to gather the cables and direct them to the left and right sides of the router. This helps to keep the cables from obscuring the fronts of lower routers in the same rack.

Step 1 In the accessory kit, locate the two cable guides (part number 700-01663-01) and two M4.0x20mm Phillips screws used to attach the cable guides (part number 48-0654-01).

Step 2 Position the cable guide over the threaded hole in the front flange of either the left or right mounting bracket. The threaded hole is located midway between the two slotted holes used to mount the unit to the rack (Figure 3-4).

Figure 3-4 Attaching the Cable Guide



Step 3 Use a M4.0x20mm Phillips screw to fix the cable guide to the mounting bracket. Do not over-tighten the screw.

Step 4 Repeat Steps 2 and 3 to attach the other cable guide.

Note If you find it awkward to insert the screw while holding the cable guide in place, you can first insert the screw only far enough so that it does not fall out. Then, using the slot in the mounting pillar of the cable guide, slide the cable guide into place around the screw. Finally, tighten the screw to fix the cable guide to the mounting bracket.

Proceed to the next section, "Connecting the Chassis Ground and Power" to continue the installation.

Connecting the Chassis Ground and Power

Before you connect power or turn on power to the Cisco MWR 2941-DC router, you must provide an adequate chassis ground (earth) connection to your router.

Grounding the Cisco MWR 2941-DC Router

The Cisco MWR 2941-DC router provides a grounding point on the rear of the unit for a 2-hole lug.

The grounding point is marked on the rear panel of the Cisco MWR 2941-DC router for ease of installation (Figure 3-5).

To ensure the chassis ground connection that you provide is adequate, you need the following parts and tools:

- Ratcheting torque screwdriver with Phillips head that exerts up to 15 pound-force inches (lbf-in) of pressure for attaching the ground wire to the router.
- Crimping tool as specified by the ground lug manufacturer
- 18-AWG copper wire for the power cord
- Wire-stripping tools appropriate to the wire you are using

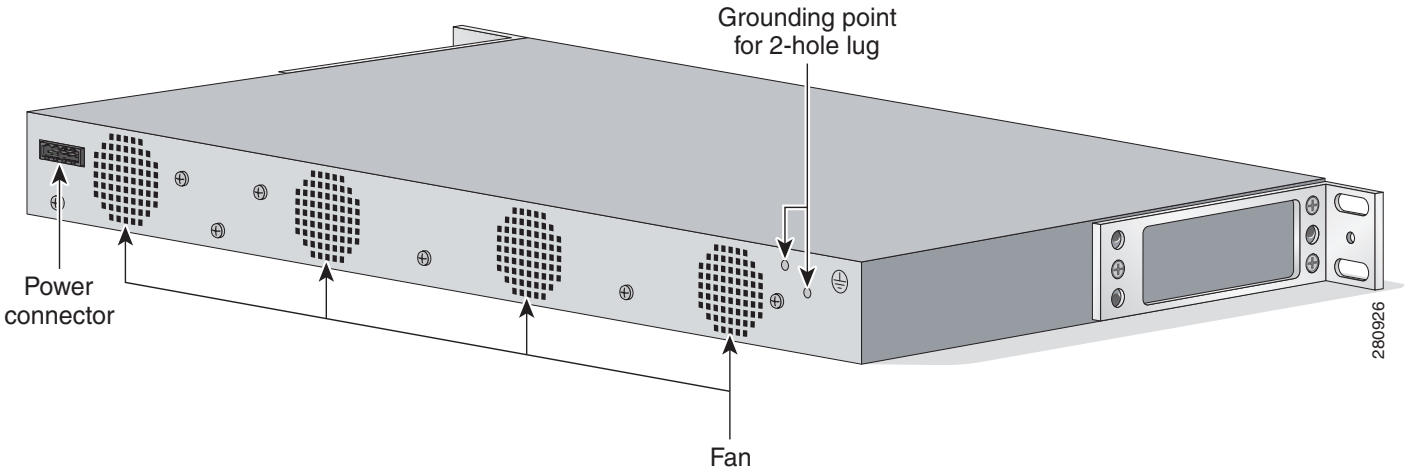
Caution Before making connections to the Cisco MWR 2941-DC router, ensure that you disconnect the power at the circuit breaker. Otherwise severe injury or damage to the router may result.

Warning **This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.** Statement 1024

Warning **Use copper conductors only.** Statement 1025

Warning **When installing the unit, the ground connection must always be made first and disconnected last.** Statement 42

Figure 3-5 Cisco MWR 2941-DC Router Rear View



This unit is to be installed in a restrictive access location and must be permanently grounded to minimum 6-AWG copper ground wire.

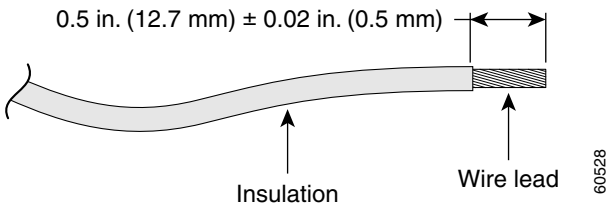
Perform the following procedure to ground the Cisco MWR 2941-DC router using a 2-hole lug and the corresponding mounting point. Most carriers require a 6-AWG ground connection. Verify your carrier's requirements for the ground connection.

Step 1 In the accessory kit (part number 53-3085-01), locate the 2-hole lug, 2 pan-head Phillips head screws used to attach the lug to the router, and 6-AWG ground wire. (Lug, screws, and wire are part number 32-0629-01.)

Step 2 Set the parts aside.

Step 3 If your ground wire is insulated, use a wire-stripping tool to strip the ground wire to 0.5 inch ± 0.02 inch (12.7 mm ±0.5 mm) for the ring terminal (Figure 3-6).

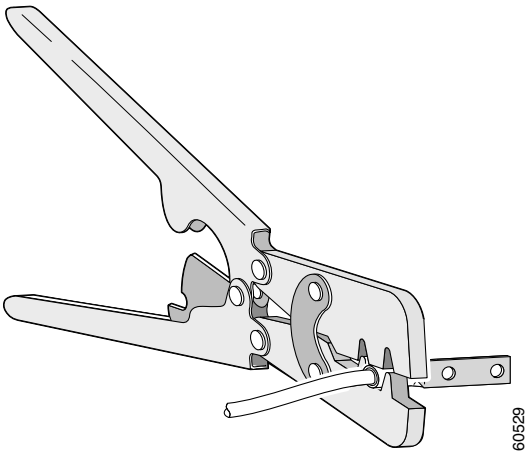
Figure 3-6 Stripping a Ground Wire



Step 4 Slide the open end of your ground lug over the exposed area of the ground wire.

Step 5 Using a crimping tool (as specified by the ground lug manufacturer), crimp the ground lug to the ground wire (Figure 3-7).

Figure 3-7 Crimping a Ground Lug onto the Ground Wire



Step 6 Use a Phillips head screwdriver to attach the ground lug and wire assembly to the rear of the router with the 2 screws from the accessory kit.

Step 7 Connect the other end of the ground wire to a suitable grounding point at your site.

To continue the installation, go to the next section, "Power Connection Compliance."

Power Connection Compliance

Warning **Before performing any of the following procedures, ensure that power is removed from the DC circuit.** Statement 1003

Warning **Use copper conductors only.** Statement 1025

Note The installation must comply with the 2002 National Electric Code (NEC) and other applicable codes.

Wiring the DC-Input Power Source

Warning **This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than 10 A minimum, 60 VDC.** Statement 1005

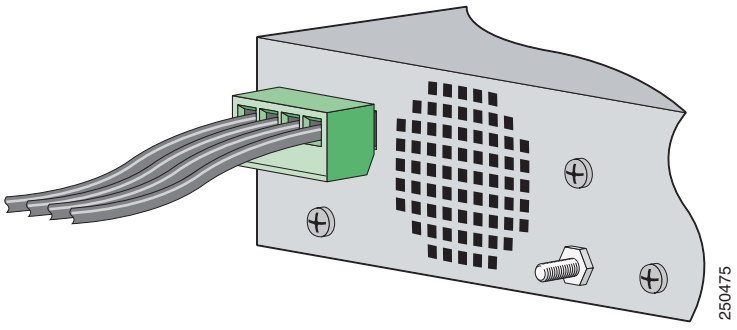
Note With the connector installed in the chassis, the pins are for two separate input power sources named A and B. From left to right, the pins are for rail A+, rail A-, rail B-, and rail B+.

To connect the DC power supply to the Cisco MWR 2941-DC router, do the following:

Step 1 Turn off the DC power source at the circuit breaker, and tape the circuit breaker in the Off position.

Step 2 Locate the 4-pin terminal block (part number 27-2030-01) (Figure 3-8). The terminal block is located in the accessory kit (part number 53-3085-01), which is shipped with the router.

Figure 3-8 4-Pin Terminal Block



Step 3 Plug the 4-pin terminal block into the power connector located on the rear left-hand side of the router (looking at the router from the rear) (Figure 3-5 on page 3-7).

Step 4 Connect one end of the customer-supplied power cord (18-AWG copper wire) to the site DC power source.

Step 5 Plug the connector on the power supply cord into the 4-pin terminal block that you plugged into the rear of the router in Step 3.

Warning **An exposed wire lead from a DC-input power source can conduct harmful levels of electricity. Be sure that no exposed portion of the DC-input power source wire extends from the terminal block plug.** Statement 122

Warning **When installing this unit, secure all power cabling to avoid disturbing field-wiring connections.** Statement 38

Caution *DO NOT* power on the unit yet.

To continue the installation, proceed to the next section, "Connecting Cables."

Connecting Cables

This section describes how to connect your Cisco MWR 2941-DC router to external devices and networks. It includes the following sections:

Connecting the Console/Auxiliary Port

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

Your Cisco MWR 2941-DC router has a single console/auxiliary port that can function in either DTE or DCE mode:

- DTE-mode console (terminal) port for connecting a console terminal
- DCE-mode auxiliary (modem) port for connecting a modem or other DCE device (such as, a CSU/DSU or other router) to your router

Note Both the console and auxiliary port functions are asynchronous serial ports; any devices connected to the console/auxiliary port must be cabled for asynchronous transmission. (Asynchronous is the most common type of serial device; for example, most modems are asynchronous devices.)

The Cisco MWR 2941-DC router uses RJ-45 ports for both the auxiliary port and console port function.

Cisco provides the following cables and adapters for connecting your Cisco MWR 2941-DC router to a console terminal, PC, or modem:

- One console adapter cable (RJ-45-to-DB-9, blue)
- One modem adapter cable (RJ-45-to-DB-25, black)

Types of RJ-45 Cables

Cisco products use the following three types of RJ-45 cables:

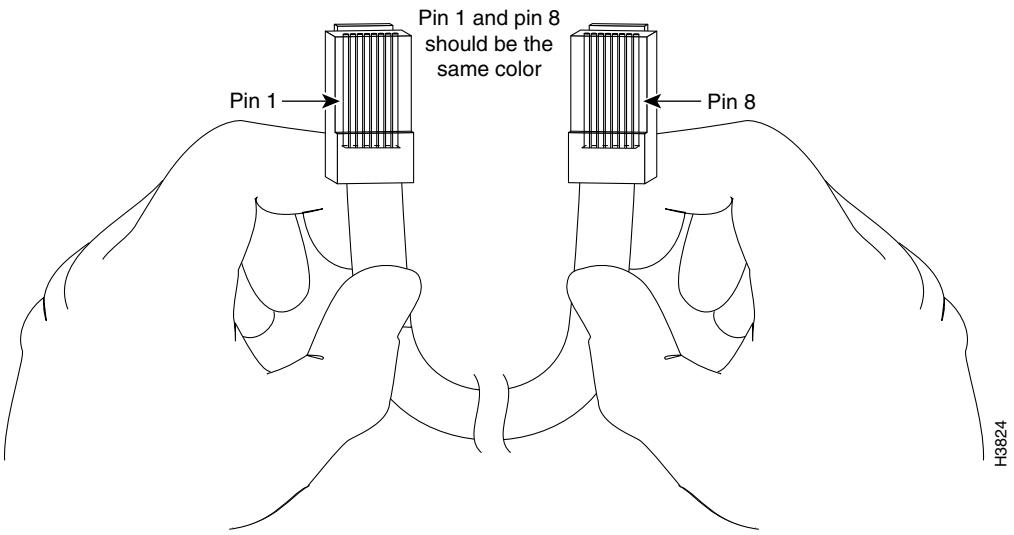
- Straight-through
- Crossover
- Rolled (or Rollover)

Your Cisco MWR 2941-DC router ships with and uses the rollover cable (see the next section, "Identifying a Rollover Cable").

Identifying a Rollover Cable

Use a rollover cable to connect to the asynchronous serial console/auxiliary ports. You can identify a rollover cable by comparing the two modular ends of the cable. Holding the cables side-by-side, with the tab at the rear, the wire connected to the pin on the outside of the left plug should be the same color as the wire connected to the pin on the outside of the right plug (Figure 3-9).

Figure 3-9 Identifying a Rollover Cable



If your cable was supplied by Cisco, pin 1 is white on one connector and pin 8 is white on the other (a rollover cable reverses pins 1 and 8, 2 and 7, 3 and 6, and 4 and 5).

Console Port

To connect a terminal or a PC running terminal emulation software to the console/auxiliary port on the router:

Step 1 Connect the terminal using an RJ-45 rollover cable and an RJ-45-to-DB-25 or RJ-45-to-DB-9 adapter (labeled TERMINAL) to the console/auxiliary port. For cable pinouts, see the "Console Port Signals and Pinouts" section on page B-1.

Note The RJ-45-to-DB-25 adapter (Cisco part number 29-0810-01) can be purchased from Cisco Systems.

Step 2 Configure your terminal or terminal emulation software for 9600 baud, 8 data bits, no parity, and 2 stop bits.

Note Because hardware flow control is not possible on the console port, we recommend changing the console/auxiliary port from console port to auxiliary port before connecting modems to the console/auxiliary port.

Auxiliary Port

To connect a modem to the console/auxiliary port on the router, follow these steps:

Step 1 If necessary, change the console port to an auxiliary port using the **modem enable [autodetect]** command.

Step 2 Connect a modem to the console/auxiliary port using an RJ-45 rollover cable with an RJ-45-to-DB-25 adapter. The provided adapter is labeled MODEM. For cable pinouts, see the "Auxiliary Port Signals and Pinouts" section on page B-3 of this guide or the online publication *Cisco Modular Access Router Cable Specifications* available on the documentation DVD and online at Cisco.com.

Step 3 Make sure that your modem and the router auxiliary port are configured for the same transmission speed (a speed of up to 115200 bps is supported) and hardware flow control with Data Carrier Detect (DCD) and Data Terminal Ready (DTR) operation.

Connecting the Network Cables

This section describes how to connect the following router interfaces:

Connecting the Fixed Gigabit Ethernet Interface Cable

The RJ-45 port supports standard straight-through and crossover Category 5 unshielded twisted-pair (UTP) cables. Cisco Systems does not supply Category 5 UTP cables; these cables are available commercially.

Follow these steps to connect the cable to the router Gigabit Ethernet port:

Step 1 Confirm that the router is powered off.

Step 2 Connect one end of the cable to the GE port on the router.

Step 3 Connect the other end to the BTS patch or demarcation panel at your site.

Figure 3-10 shows the RJ-45 connector and port.

Figure 3-10 RJ-45 Connector and Port

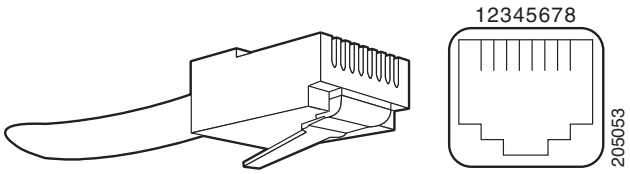


Table 3-1 lists the pinouts and signals for the RJ-45 connector.

Table 3-1 RJ-45 Connector Pinouts

Pin	FE Signal	GE Signal
1	TX data+	TX A+
2	TX data–	TX A–
3	RX data+	RX B+
4	Not used	TX C+
5	Not used	TX C–
6	RX data–	RX B–
7	Not used	RX D+
8	Not used	RX D–

Connecting the Cisco T1 and E1 Interface Cables

Use a straight-through, shielded RJ-48C-to-RJ-48C cable.

Note You must close the relays on the card using the **standalone** subcommand. For more information, see the *Cisco MWR 2941-DC Mobile Wireless Edge Router Software Configuration Guide*.

Step 1 Confirm that the router is powered off.

Step 2 Connect one end of the cable to the T1 or E1 (RJ-48C) port on the T1/E1 HWIC card.

Step 3 Connect the other end to the BTS patch or demarcation panel at your site.

Step 4 Turn on power to the router (see "Powering On the Router" section on page 3-15 for more details).

The T1/E1 ports use an RJ-48C connection, as shown in Figure 3-11.

Figure 3-11 RJ-48C Connection

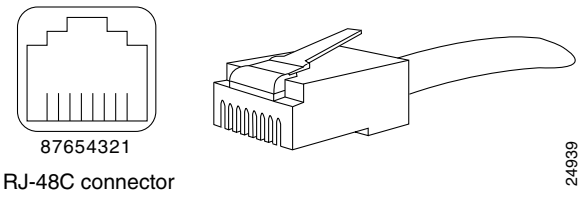


Table 3-2 shows the pinout configuration for the RJ-48C connectors for both shielded and unshielded cables for either T1 or E1.

Note We recommends using a shielded cable for your RJ-48C connectors.

Table 3-2 RJ-48C Pinout for Shielded and Unshielded Cables

Shielded		Unshielded	
Pin	**Description**	**Pin**	**Description**
1	RX ring	1	Receive ring
2	RX tip	2	Receive tip
3	RX shield	3	—
4	TX ring	4	Transmit ring
5	TX tip	5	Transmit tip
6	TX shield	6	—
7	Not used	7	—
8	Not used	8	—

Connecting Cables for Switchport Stacking

The HWIC-D-9ESW card supports stacking, which allows two switch modules to behave as a single switch. Follow these steps to connect cables for switchport stacking.

Caution The Cisco MWR 2941-DC has a caveat that causes the native VLAN interface on the motherboard to drop packets on the native VLAN if you install the HWIC-D-9ESW card without configuring the **stacking-partner** command. We recommend that you install the HWIC-D-9ESW card and immediately apply this configuration command. For more information, see the *Cisco MWR 2941-DC Mobile Wireless Edge Router Software Configuration Guide*.

Step 1 Connect a crossover cable to port 8 of the HWIC-9ESW card.

Step 2 Connect the other end of the crossover cable to the GigabitEthernet switch port that you want to use as a stacking partner.

For information about how to install the HWIC-D-9ESW Card, see 10/100BASE-T Ethernet Switch High-Speed WAN Interface Cards. For information about how to configure the HWIC-9ESW card, see the *Cisco MWR 2941-DC Mobile Wireless Edge Router Software Configuration Guide.*

Dressing Router Cables

Ensure all Cisco router cables are properly dressed so as not to interfere with each other or other pieces of equipment. Use local practices to ensure that the cables attached to your router are properly dressed.

Note If your Cisco MWR 2941-DC router is front-mounted, you can use the cable guide (found in the accessory kit) to dress the cables.

To continue the installation, proceed to the next section, "Powering On the Router."

Powering On the Router

Warning **Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is off and the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected.** Statement 4

Warning **This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use.** Statement 39

Checklist for Power Up

You are ready to power on the Cisco MWR 2941-DC router if the following steps are complete:

- Router is securely mounted.
- Power, network, and interface cables are properly connected.

Interpreting Front-Panel LEDs

The Cisco MWR 2941-DC router provides a number of LEDs on the front panel to monitor conditions and to aid in troubleshooting problems.

T1/E1 Port LEDs

The following LEDs provide activity and alarm information pertaining to T1/E1 ports. This includes the 16 fixed T1/E1 connections as well as up to 8 additional T1/E1 connections that can be added through two HWICs. Each connection has 2 dedicated LEDs embedded in it, one tracking carrier activity and the other tracking alarms.

- Active
  - Green: Carrier operating without problem
  - Amber: Existing loop condition
  - Off: Out of service or not configured
- Alarm

  - Amber: Existing alarm condition
  - Off: No alarm

100/1000 Ethernet Port LEDs

The following LEDs provide information pertaining to the 4 100/1000 Ethernet port connections. Each connection has 2 dedicated LEDs associated with it, one tracking link activity and the other tracking RJ-45 speed.

- RJ-45 link
  - Solid green: Link with no activity
  - Flash green: Link with activity
  - Off: No link activity
- RJ-45 speed
  - Green: Speed 1000
  - Amber: Speed 100
  - Off: Off

Compact Flash LED

The compact flash slot has a single dedicated LED associated with it to track activity.

- Compact flash
  - Flash green: Indicates activity
  - Off: No activity

SFP LEDs

The following LEDs provide information pertaining to the 2 SFP links. Each SFP link has a single dedicated LED associated with it to indicate whether or not the link is active.

- SFP0 link
  - Green: Link is present and active
  - Off: Link not enabled
- SFP1 link
  - Green: Link is present and active
  - Off: Link not enabled

Chassis LEDs

The following LEDs provide information pertaining to the chassis.

- Power
  - Green: All power rails are within spec
  - Red: Internal power module failure; Reserve Power Supply (RPS) is providing power.
  - Off: No power, reset
- Status
  - Green: System is operational
  - Yellow: Over or under temperature condition

  - Off: Router has not booted
- Activity
  - Green: IOS has booted and packets are being transferred
  - Yellow: BootRom successfully loaded
  - Off: No activity occurring
- BITS Activity
  - Green: In frame and working properly
  - Amber: Fault or loop condition
  - Off: Port is out of service or not configured

For a more detailed description of the LEDs, see the "Reading the LEDs" section on page A-5.

Power-On Procedure

To power on the Cisco MWR 2941-DC router and verify its initialization and self-test, follow this procedure. When the procedure is finished, the Cisco MWR 2941-DC router is ready to configure.

Step 1 Remove the tape from the circuit breaker switch handle.

Step 2 Reinstate power by moving the handle of the circuit breaker to the On position.

The LED (labeled POWER) on the front panel should go on and the fans operate.

Depending on your installation, other front-panel LEDs should also come on.

Note If you encounter problems when you power on the router, see Appendix A, "Troubleshooting."

Formatting Procedures for Flash Memory Cards

For the Cisco MWR 2941-DC router, we recommend that you format/erase the flash memory card to initialize them with a Class C flash file system. This ensures proper formatting and enables the ROM monitor to recognize and boot the flash.

The Class C flash file system is similar to the standard DOS file system; however, a flash memory card formatted with the standard DOS file system does not support booting from the ROM monitor.

Formatting Flash Memory Card as a DOS File System

To format a built-in flash memory card, or to remove the files from a flash memory card, enter the **format flash:** command.

The following example shows output for formatting a flash memory card formatted with a Class C flash file system:

```
Router# format flash:

Format operation may take a while. Continue? [confirm]
```

```
Format operation will destroy all data in "flash:".  Continue? [confirm]
Enter volume ID (up to 64 chars)[default flash]:
Current Low End File System flash card in flash will be formatted into DOS
File System flash card!  Continue? [confirm]
Format:Drive communication & 1st Sector Write OK...
Writing Monlib sectors ...................................................................
Monlib write complete
..
Format:All system sectors written. OK...

Format:Total sectors in formatted partition:250592
Format:Total bytes in formatted partition:128303104
Format:Operation completed successfully.

Format of flash complete
```

File and Directory Procedures

The following sections describe file and directory procedures for flash memory cards formatted with a Class C flash file system.

Copying Files

To copy the files to another location, use the **copy flash:** *source-filename* {**flash:** | **tftp:** | **lex**: | **null:** | **nvram**: | **pram:** | **rcp:** | **system:** | **tftp:** | **xmodem:** | **ymodem:** | **running-config** | **startup-config**} *destination-filename* command.

The following example shows output for copying a Cisco IOS file from an external flash memory card to a TFTP server:

```
Router# copy flash:mwr2941-ipran-mz.tmp tftp:

Destination filename [mwr2941-ipran-mz.tmp]?
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
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CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
6458584 bytes copied in 202.940 secs (31973 bytes/sec)
```

Displaying the Contents of a Flash Card

To display the contents (directories and files) of a flash memory card formatted with a Class C flash file system, use the **dir flash:** command.

The following example shows output for displaying the contents of a flash memory card with a Class C flash file system:

```
Router# dir flash:

Directory of flash:/

   3  -rw-     6455048   Mar 01 2001 00:04:06  mwr2941-ipran-mz
1579  -rw-     6458584   Mar 01 2001 00:24:38  mwr2941-ipran-mz.new

15912960 bytes total (2998272 bytes free)
```

Displaying Geometry and Format Information

To display the geometry and format information of a flash memory card formatted with a Class C flash file system, use the **show flash:** command.

The following example shows output for displaying the geometry and format information of a flash memory card formatted with a Class C flash file system:

```
Router# show flash:

******** ATA Flash Card Geometry/Format Info ********

ATA CARD GEOMETRY
  Number of Heads:      2
  Number of Cylinders    490
  Sectors per Cylinder   32
  Sector Size            512
Total Sectors          31360

ATA CARD FORMAT
  Number of FAT Sectors  12
  Sectors Per Cluster    8
  Number of Clusters     3885
  Number of Data Sectors 31264
  Base Root Sector       152
  Base FAT Sector        128
  Base Data Sector       184

Please use "dir" command to display the contents of the card.
```

Deleting Files from a Flash Memory Card

To delete a file from a flash memory card, use the **delete flash:** *filename* command.

The following example shows output for deleting a Cisco IOS software file from a flash card:

```
Router# delete flash:mwr2941-ipran-mz.tmp

Delete filename [mwr2941-ipran-mz.tmp]?
Delete flash:mwr2941-ipran-mz.tmp? [confirm]
Router# dir flash:
Directory of flash:/

No files in directory

128094208 bytes total (128094208 bytes free)
```

Renaming a File in a Flash Memory Card

To rename a file in a flash memory card, use the **rename flash:** *original-filename* **flash:** *new-filename* command.

The following example shows output for renaming a Cisco IOS software file in a flash card:

```
Router# rename flash:mwr2941-ipran-mz.tmp flash:mwr2941-ipran-mz

Destination filename [mwr2941-ipran-mz]?
Router# dir flash:

Directory of flash:/

 1580  -rw-     6462268   Mar 06 1993 06:14:02  mwr2941-ipran-mz.2941ata
    3  -rw-     6458388   Mar 01 1993 00:01:24  mwr2941-ipran-mz

63930368 bytes total (51007488 bytes free)
```

Displaying File Content

To display the content of a file in a flash memory card, use the **more flash:** *filename* command.

The following example shows output from the **more flash** command on a flash card:

```
Router# more flash:mwr2941-ipran-mz.tmp

00000000: 7F454C46 01020100 00000000 00000000    .ELF .... .... ....
00000010: 00020061 00000001 80008000 00000034    ...a .... .... ...4
00000020: 00000054 20000001 00340020 00010028    ...T  ... .4.  ...(
00000030: 00050008 00000001 0000011C 80008000    .... .... .... ....
00000040: 80008000 00628A44 00650EEC 00000007    .... .b.D .e.l ....
00000050: 0000011C 0000001B 00000001 00000006    .... .... .... ....
00000060: 80008000 0000011C 00004000 00000000    .... .... ..@. ....
00000070: 00000000 00000008 00000000 00000021    .... .... .... ...!
00000080: 00000001 00000002 8000C000 0000411C    .... .... ..@. ..A.
00000090: 00000700 00000000 00000000 00000004    .... .... .... ....
000000A0: 00000000 00000029 00000001 00000003    .... ...) .... ....
000000B0: 8000C700 0000481C 00000380 00000000    ..G. ..H. .... ....
000000C0: 00000000 00000004 00000000 0000002F    .... .... .... .../
000000D0: 00000001 10000003 8000CA80 00004B9C    .... .... ..J. ..K.
000000E0: 00000020 00000000 00000000 00000008    ...  .... .... ....
000000F0: 00000000 0000002F 00000001 10000003    .... .../ .... ....
00000100: 8000CAA0 00004BBC 00623FA4 00000000    ..J  ..K< .b?$ ....
00000110: 00000000 00000008 00000000 3C1C8001    .... .... .... <...
00000120: 679C4A80 3C018001 AC3DC70C 3C018001    g.J. <... ,=G. <...
00000130: AC3FC710 3C018001 AC24C714 3C018001    ,?G. <... ,$G. <...
00000140: AC25C718 3C018001 AC26C71C 3C018001    ,%G. <... ,&G. <...
00000150: AC27C720 3C018001 AC30C724 3C018001    ,'G  <... ,0G$ <...
00000160: AC31C728 3C018001 AC32C72C 3C018001    ,1G( <... ,2G, <...
--More-- q
```

Creating a New Directory

To create a directory in flash memory, use the **mkdir flash:** *directory-name* command.

The following example shows output for displaying the contents of a flash card, and then creating a **config** directory, followed by a **test-config** subdirectory:

```
Router# dir flash:

Directory of flash:/
```

```
  3  -rw-     6458208   Mar 01 1993 00:04:08  mwr2941-ipran-mz.tmp

128094208 bytes total (121634816 bytes free)
Router# mkdir flash:/config

Create directory filename [config]?
Created dir flash:/config
Router# mkdir flash:/config/test-config

Create directory filename [/config/test-config]?
Created dir flash:/config/test-config
Router# dir flash:

Directory of flash:/

  3  -rw-     6458208   Mar 01 1993 00:04:08  mwr2941-ipran-mz.tmp
 1580  drw-           0   Mar 01 1993 23:48:36  config

128094208 bytes total (121626624 bytes free)
Router# cd flash:/config

Router# dir flash:

Directory of flash:/config/

 1581  drw-           0   Mar 01 1993 23:50:08  test-config

128094208 bytes total (121626624 bytes free)
```

Removing a Directory

To remove a directory from flash memory, use the **rmdir flash:**/*directory-name* command.

Before removing a directory, remove all files and subdirectories from the directory.

The following example shows output for displaying the contents of a flash card, and then removing the **test-config** directory:

```
Router# dir flash:

Directory of flash:/config/

  1581  drw-           0   Mar 01 1993 23:50:08  test-config

128094208 bytes total (121626624 bytes free)
Router# rmdir flash:/config/test-config

Remove directory filename [/config/test-config]?
Delete flash:/config/test-config? [confirm]
Removed dir flash:/config/test-config
Router# dir flash:

Directory of flash:/config/

No files in directory

128094208 bytes total (121630720 bytes free)
```

Enter a Directory and Determine the Current Directory

To enter a directory in flash memory, use the **cd flash:**/*directory-name* command. To determine which directory you are in, use the **pwd** command.

The following example shows output for the following actions:

- Entering the home directory of a flash memory card in an external slot (flash:/)
- Verifying that you are in the flash:/ directory

```
Router# cd flash:

Router# pwd

flash:/
```

What to Do After Installing the Hardware

After you have installed the router hardware, refer to the *Cisco MWR 2941-DC Mobile Wireless Edge Software Configuration Guide* for initial software configuration information.

APPENDIX A

Troubleshooting

The Cisco MWR 2941-DC router undergoes extensive testing before it leaves the factory. If you encounter problems, use the information in this appendix to help isolate problems or to eliminate the router as the source of the problem.

This appendix contains the following sections:

If you cannot locate the source of the problem, contact a customer service representative for information on how to proceed. For technical support information, see the *Cisco Information Packet* publication that shipped with your router. Before you call, have the following information ready:

- Chassis type and serial number
- Maintenance agreement or warranty information
- Type of software and version number
- Date you received the new chassis
- Brief description of the problem
- Brief explanation of the steps you have taken to isolate the problem

Note Ensure you provide the customer service representative with any upgrade or maintenance information that was performed on the Cisco MWR 2941-DC router after your initial installation (see Appendix C, "Site Log" for Site Log information.)

Problem Solving

To problem solve, isolate the problem to a specific subsystem by comparing current router activity to expected router activity.

The LEDs on the front panel of the router enable you to determine router performance and operation. For a description of these LEDs, see "Reading the LEDs" section on page A-5.

When problem solving, check the following router subsystems:

- Power and cooling systems—External power source, power cable, router power supply and circuit breaker, and router fans. Also check for inadequate ventilation or air circulation.
- Modules—Checking the LEDs on the modules can help you to identify a failure.

- Cables—Ensure that the external cables connecting the router to the network are all secure.

Troubleshooting the Power and Cooling Systems

Both the power LED and the fans can help you troubleshoot a power problem. See Table A-1 for information to help you isolate the problem.

Table A-1 Troubleshooting the Power and Cooling Systems

Symptom	Possible Cause	Corrective Action
The power (labeled POWER) LED on the front panel is not on.	The power source is not connected properly.	Check the DC input. Check the DC source.
The router shut down after being on for only a short time.	The cause is environmental.	Check for an environmentally induced shutdown. (See "Environmental Reporting Features" section on page A-2).
	The fans are not working; the router overheats and shuts down.	Check the fans.
	The chassis intake and exhaust vents are obstructed.	Check the chassis intake and exhaust vents for obstructions. Clear any obstructions.
	Installation does not meet environmental site requirements.	Check the environmental site requirements in the "System Specifications" section on page 1-9.
The router partially boots, but the LEDs do not light.	There is a possible power supply failure.	Check the power LED on the front panel of the router. If the LED is on, the power supply is functional. If the LED is off, refer to the *Cisco Information Packet* for warranty information or contact customer service.

Environmental Reporting Features

The Cisco MWR 2941-DC router has a temperature sensor to detect over-temperature conditions inside the chassis. The over-temperature detection trips at 70°C +/- 5%. This condition is reported to the processor as an interrupt; software acts on this interrupt, generating the appropriate alarm. If the router reaches a temperature of 90°C, the power supply will cycle to prevent the router from exceeding that temperature in a powered-up state. See Table A-2 for help in interpreting environmental reporting features.

Table A-2 Interpreting Environmental Reporting Features

Symptom	Possible Cause	Corrective Action
The router is operating at an abnormally high temperature. The following message appears on the console screen: `%SYS-1-OVERTEMP: System detected OVERTEMPERATURE condition. Please resolve cooling problem immediately!`	There is a fan failure. There is an air conditioner failure in the room. The air flow to cooling vents is blocked.	Take steps to correct the problem. For information about environmental operating conditions, see the "System Specifications" section on page 1-9).

Troubleshooting Modules, Cables, and Connections

Network problems can be caused by a module, cable or cable connection, or external device such as a modem, transceiver, hub, wall jack, WAN interface, or terminal. See Table A-3 for information to help you isolate the problem.

Table A-3 Troubleshooting Modules, Cables, and Connections

Symptom	Possible Cause	Corrective Action
The router is experiencing network problems.	The router does not recognize the module.	Make sure that the module is firmly seated in its slot.
		Check the LEDs on the module. Each module has its own set of LEDs. For information on these LEDs (see the "Reading the LEDs" section on page A-5).
		Make sure you have a version of Cisco IOS software that supports the module.
	The router recognizes the module but the interface ports do not initialize.	Make sure that the module is firmly seated in its slot.
		Check external cable connections.
		Make sure you have a version of Cisco IOS software that supports the module.

Table A-3 Troubleshooting Modules, Cables, and Connections

Symptom	Possible Cause	Corrective Action
	The router does not boot properly.	Make sure the module is firmly seated in its slot.
	The router constantly or intermittently reboots.	Check the router chassis or software. For warranty information, refer to the *Cisco Information Packet* publication that shipped with your router or contact customer service.
	The router boots, but the console screen is frozen.	Check the external console connection.
		Verify that the parameters for your terminal are set as follows: (a) The terminal should have the same data rate as the router (9600 bps is the default). (b) 8 data bits. (c) No parity generated or checked. (d) 2 stop bits.
	The router powers on and boots only when a particular module is removed.	Check the module. For warranty information, refer to the *Cisco Information Packet* publication that shipped with your order or contact customer service.
	The router powers on and boots only when a particular cable is disconnected.	There may be a problem with the module or cable. For warranty information, refer to the *Cisco Information Packet* publication that shipped with your order or contact customer service.

Reading the LEDs

Tables A-4, A-5, A-6, A-7, and A-8 describe the Cisco MWR 2941-DC LEDs located on the front panel.

Table A-4 T1/E1 Port LEDs

LED	Color/State	Description (two LEDs for eachT1/E1 port)
Active (labeled C)	Green	Carrier condition—without problem
	Yellow	Loop condition
	Off	Out of service or not configured
Alarm (labeled AL)	Yellow	Alarm condition
	Off	No alarm

Note The LED descriptions in Table A-4apply to the 16 fixed E1/T1 connections as well as the additional 8 T1/E1 connections that can be added by way of 2 HWICs (RJ45 connectors).

Table A-5 100/1000 Ethernet Port LEDs

LED	Color/State	Description (two LEDs for each 100/1000 Ethernet port)
100/1000 RJ-45 link (labeled L)	Solid Green	Link with no activity
	Flash Green	Link with activity
	Off	No link detected
100/1000 RJ-45 speed (labeled S)	Green	Speed 1000
	Yellow	Speed 100
	Off	Off

Table A-6 Compact Flash LED

LED	Color/State	Description
Compact flash (labeled ACT FLASH MEMORY)	Flash Green	Indicates activity
	Off	No activity

Table A-7 SFP LEDs

LED	Color/State	Description
SFP0 Link/Active (labeled LINK ACT)	Green	Link and active indicator
	Off	Link not enabled
SFP1 Link/Active (labeled LINK ACT)	Green	Link and active indicator
	Off	Link not enabled

Table A-8 Chassis LEDs

LED	Color/State	Description
Power (labeled POWER)	Green	All power rails are within spec
	Red	Internal power module failure The reserve power supply (RPS) is providing power.
Operating status (labeled STATUS)	Green	All OK System is operational
	Yellow	An over or under temperature condition
	Off	Default state is at Power On Reset (POR) The router is not yet booted, or an error condition is detected in the boot process.
Activity (labeled ACTIVITY)	Green	IOS has booted and packets are being transferred
	Yellow	BootRom has successfully loaded
	Off	Default state is at POR No activity occurring
BITS I/F (labeled BITS ACT)	Green	In frame and working properly
	Yellow	Fault or loop condition
	Off	Port is out of service or not configured

APPENDIX B

Cable Specifications

If you prefer to build your own cables, this appendix provides cable specifications for the Cisco MWR 2941-DC router.

This appendix includes the following sections:

Note Pins not listed in the tables in this appendix are not connected.

Console/Auxiliary Port Signals and Pinouts

Your router ships with a console cable kit, which contains the cable and adapters to connect a console terminal (an ASCII terminal or PC running terminal emulation software). The console cable kit includes the following items:

- RJ-45-to-RJ-45 rollover cable
- RJ-45-to-DB-9 female DTE adapter (labeled TERMINAL)
- RJ-45-to-DB-25 female DTE adapter (labeled TERMINAL)

To connect a modem, you need to order an auxiliary cable.

For console connections, see the "Console Port Signals and Pinouts" section on page B-1; for modem connections, see the "Auxiliary Port Signals and Pinouts" section on page B-3.

Console Port Signals and Pinouts

Use the thin, flat, RJ-45-to-RJ-45 rollover cable and the RJ-45-to-DB-9 female DTE adapter (labeled TERMINAL) to connect the console port to a PC running terminal emulation software. Figure B-1 shows how to connect the console port to a PC. Table B-1 lists the pinouts for the asynchronous serial console port, the RJ-45-to-RJ-45 rollover cable, and the RJ-45-to-DB-9 female DTE adapter (labeled TERMINAL).

Figure B-1 Connecting the Console Port to a PC

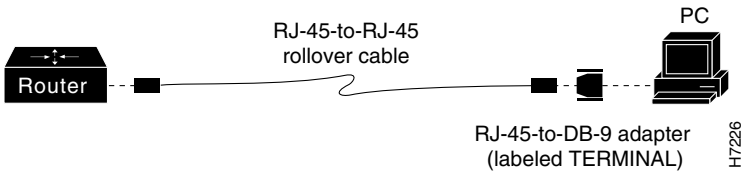


Table B-1 Console Port Signaling and Cabling Using a DB-9 Adapter

Console Port (DTE)	RJ-45-to-RJ-45 Rollover Cable		RJ-45-to-DB-9 Terminal Adapter (Connected to Rollover Cable)	Console Device
Signal	**RJ-45 Pin**	**RJ-45 Pin**	**DB-9 Pin**	**Signal**
RTS	1[1]	8	8	CTS
DTR	2	7	6	DSR/DCD
TxD	3	6	2	RxD
GND/RI	4	5	5	GND
GND	5	4	5	GND/RI
RxD	6	3	3	TxD
DSR/DCD	7	2	4	DTR
CTS	8[1]	1	7	RTS

1. Pin 1 is connected internally to pin 8.

Table B-2 lists the pinouts for the asynchronous serial console port, the RJ-45-to-RJ-45 rollover cable, and the RJ-45-to-DB-25 female DTE adapter (labeled TERMINAL).

Table B-2 Console Port Signaling and Cabling Using a DB-25 Adapter

Console Port (DTE)[1]	RJ-45-to-RJ-45 Rollover Cable		RJ-45-to-DB-25 Terminal Adapter	Console Device
Signal	**RJ-45 Pin**	**RJ-45 Pin**	**DB-25 Pin**	**Signal**
RTS	1[2]	8	5	CTS
DTR	2	7	6	DSR/DCD
TxD	3	6	3	RxD
GND/RI	4	5	7	GND
GND	5	4	7	GND/RI
RxD	6	3	2	TxD
DSR/DCD	7	2	20	DTR
CTS	8[2]	1	4	RTS

1. You can use the same cabling to connect a console to the auxiliary port.
2. Pin 1 is connected internally to pin 8.

Auxiliary Port Signals and Pinouts

Table B-3 lists the pinouts for the asynchronous serial auxiliary port, the RJ-45-to-RJ-45 rollover cable, and the RJ-45-to-DB-25 male DCE adapter (labeled MODEM).

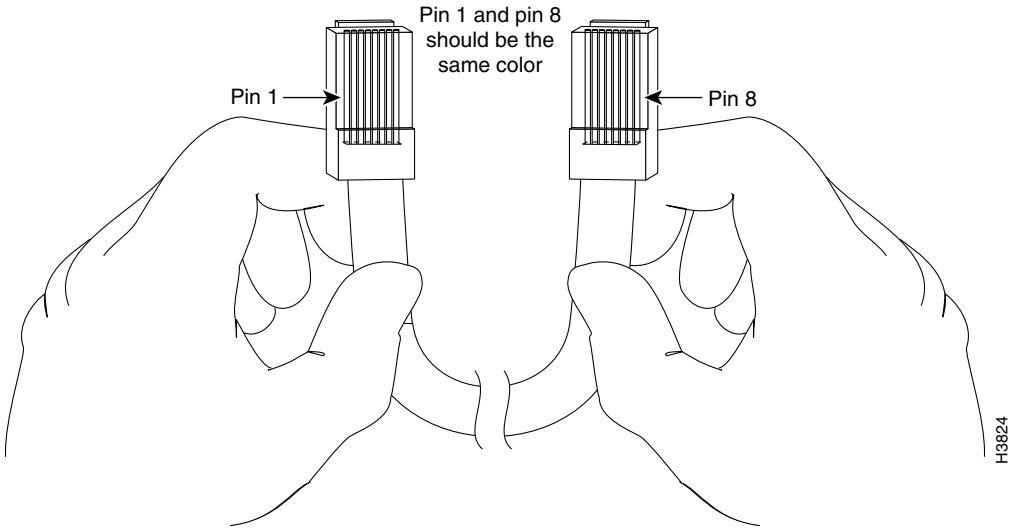
Table B-3 Auxiliary Port Signaling and Cabling Using a DB-25 Adapter

Auxiliary Port (DTE)	RJ-45-to-RJ-45 Rollover Cable		RJ-45-to-DB-25 Modem Adapter	Modem
Signal	**RJ-45 Pin**	**RJ-45 Pin**	**DB-25 Pin**	**Signal**
RTS	1[1]	8	4	RTS
DTR	2	7	20	DTR
TxD	3	6	3	TxD
GND/RI	4	5	7	GND/RI
GND	5	4	7	GND
RxD	6	3	2	RxD
DSR/DCD	7	2	8	DCD/DSR
CTS	8[1]	1	5	CTS

1. Pin 1 is connected internally to pin 8.

To identify a rollover cable, compare the modular plugs at the two ends of the cable. When you hold the plugs side by side, with the tab at the back, the wire connected to the pin on the outside of the left plug should be the same color as the wire connected to the pin on the outside of the right plug (Figure B-2.) If you purchased your cable from Cisco Systems, pin 1 is white on one connector, and pin 8 is white on the other (a rollover cable connects pins 1 and 8, 2 and 7, 3 and 6, and 4 and 5).

Figure B-2 Identifying a Rollover Cable



BITS Pinouts

Table B-4 lists the pinouts for the BITS interface RJ-48 port.

Table B-4 RJ-48 Port Pinouts

Pin	Signal Name	Direction	Description
1	RX ring	Input	Receive ring
2	RX tip	Input	Receive tip (T1/E1)
3, 4	Not used		—
5	TX ring	Not used	—
6	TX tip	Not used	—
7, 8	Not used		—

SFP Modules and Cable Specifications

Table B-5 provides information on optical GigabitEthernet 1000BASE-SX, 1000BASE-LX/LH, and 1000BASE-ZX SFPs.

Table B-5 GE SFP Module Products, Descriptions, and Operating Distances

SFP Module	Wavelength Type	Description	Operating Distance
GLC-SX-MM-RGD SFP-GE-S	Short wavelength (1000BASE-SX)	Contains a Class 1 laser of 850 nm for 1000BASE-SX (short-wavelength) applications.	Operates on standard multimode fiber-optic link spans of up to 1804 feet (550 m).

Table B-5 GE SFP Module Products, Descriptions, and Operating Distances

SFP Module	Wavelength Type	Description	Operating Distance
GLC-LX-SM-RGD SFP-GE-L	Long wavelength/long haul (1000BASE-LX/LH)	Contains a Class 1 laser of 1300 nm for 1000BASE-LX/LH (long-wavelength) applications.	Operates on single-mode fiber-optic link spans of up to 6.2 miles (10 km) or multimode spans up to 1804 feet (550 m) with mode-conditioning patch cord.
GLC-ZX-SM-RGD	Extended distance wavelength (1000BASE-ZX)	Contains a Class 1 laser of 1550 nm for 1000BASE-ZX (extended wavelength) applications.	Operates on ordinary single-mode fiber-optic link spans of up to 43.5 miles (70 km). Link spans of up to 62.1 miles (100 km) are possible using premium single-mode fiber or dispersion-shifted single-mode fiber (premium single-mode fiber has a lower attenuation per unit length than ordinary single-mode fiber; dispersion-shifted single-mode fiber has both lower attenuation and less dispersion).

Table B-6 provides cabling specifications for the SFP modules that you install in the Cisco MWR 2941-DC SFP ports. Note that all SFP ports have LC-type connectors. Also, the minimum cable distance for the SFP GLC-SX-MM multimode fiber (MMF) and SFP GLC-LH-SM single-mode fiber (SMF) is 6.5 feet (2 m).

Table B-6 SFP Port Cabling Specifications

SFP Module	Wavelength (mm)	Fiber Type	Core Size (micron)	Model Bandwidth (MHz/km)	Minimum Cable Distance
GLC-SX-MM-RGD SFP-GE-S	850	MMF[1]	62.5	160	722 ft (220 m)
			62.5	200	902 ft (275 m)
			50.0	400	1640 ft (500 m)
			50.0	500	1804 ft (550 m)
GLC-LX-SM-RGD SFP-GE-L	1300	MMF[2] and SMF	62.5	500	1804 ft (550 m)
			50.0	400	1804 ft (550 m)
			50.0	500	1804 ft (550 m)
			9/10	—	6.2 miles (10 km)
GLC-ZX-SM-RGD	1550	SMF and SMF[3]	9/10	—	43.5 miles (70 km)
			8	—	62.1 miles (100 km)

1. Multimode fiber (MMF) only.
2. A mode-conditioning patch cord is required. When using the SFP GLC-LH-SM with 62.5-micron diameter MMF, you must install a mode-conditioning patch cord between the SFP module and the MMF cable on both the transmit and the receive ends of the link when link distances are greater than 984 ft (300 m). We do not recommend using the SFP GLC-LH-SM and MMF with no patch cord for very short link distances (tens of meters). The result could be an elevated bit error rate (BER).
3. Dispersion-shifted single-mode fiber-optic cable.

Gigabit Ethernet Connector Pinouts

This section illustrates the Gigabit Ethernet RJ-45 connector and lists its pinout and signal descriptions. Note that the RJ-45 ports are capable of operating in both 100BaseT and 1000BaseT modes.

Figure B-3 shows the RJ-45 connector and port, and Table B-7 lists the connector pinouts and signals.

Figure B-3 RJ-45 Connector and Port

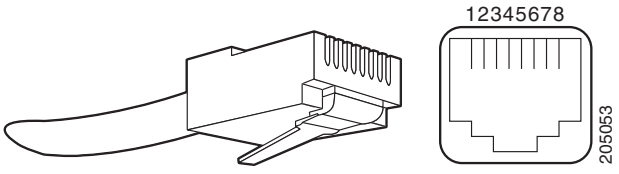


Table B-7 RJ-45 Connector Pinouts

Pin	FE Signal	GE Signal
1	TX data+	TX A+
2	TX data–	TX A–

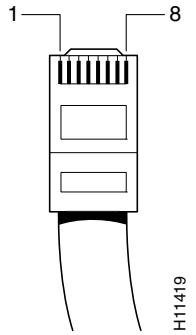
Table B-7 RJ-45 Connector Pinouts

Pin	FE Signal	GE Signal
3	RX data+	RX B+
4	Not used	TX C+
5	Not used	TX C–
6	RX data–	RX B–
7	Not used	RX D+
8	Not used	RX D–

T1/E1 Port Pinouts

Figure B-4 shows the RJ-48C connector wiring for the T1/E1 cable for the Cisco MWR 2941-DC. Table B-8 shows the pinout configuration for the RJ-48C connectors on the the Cisco MWR 2941-DC for both the shielded and unsaddled cables for either T1 or E1.

Figure B-4 RJ-48-to-RJ-48 T1/E1 Cable Wiring



Note We recommend using a shielded cable for your RJ-48C connectors.

Table B-8 RJ-48C Pinout for Shielded and Unshielded Cables

Shielded		Unshielded	
Pin	**Description**	**Pin**	**Description**
1	RX ring	1	Receive ring
2	RX tip	2	Receive tip
3	RX shield	3	—
4	TX ring	4	Transmit ring
5	TX tip	5	Transmit tip
6	TX shield	6	—
7	Not used	7	—
8	Not used	8	—

APPENDIX C

Site Log

Use the Site Log to provide a record of actions related to installing and maintaining the router. Keep it in an accessible place near the chassis so that those who performs tasks have access to it. Use the Installation Checklist (see the "Installation Checklist" section on page 2-7) to verify the steps in the installation and maintenance of your router. Site Log entries might include the following:

- Installation progress—Make a copy of the Cisco MWR 2941-DC router Installation Checklist, and insert it into the Site Log. Make entries as you complete each task.
- Upgrade, removal, and maintenance procedures—Use the Site Log as a record of ongoing router maintenance and expansion history. Each time a task is performed on the Cisco MWR 2941-DC router, update the Site Log to reflect the following:
  - Removal or replacement of HWIC interface cards
  - Configuration changes
  - Maintenance schedules and requirements
  - Maintenance procedures performed
  - Intermittent problems
  - Comments and notes

Table C-1 on page C-2 shows a sample site log. Make copies of the sample or design your own site log to meet the needs of your site and equipment.

Table C-1 Site Log

Date	Description of Action Performed or Symptom Observed	Initials

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