Cisco Catalyst IR8140 Heavy Duty Series Router Hardware Installation Guide

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Preface

This preface describes the objectives, audience, organization, and conventions of this guide and describes related documents that have additional information.

Note The documentation set for this product strives to use bias-free language. For purposes of this documentation set, bias-free is defined as language that does not imply discrimination based on age, disability, gender, racial identity, ethnic identity, sexual orientation, socioeconomic status, and intersectionality. Exceptions may be present in the documentation due to language that is hardcoded in the user interfaces of the product software, language used based on RFP documentation, or language that is used by a referenced third-party product.

The sections are:

Objective

This guide provides an overview and explains how to install and connect your Cisco device.

Audience

This guide is intended for people who have a high level of technical ability, although they may not have experience with Cisco software.

Conventions

This section describes the conventions used in this guide.

Note Means reader take note. Notes contain helpful suggestions or references to additional information and material.

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

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

Warning 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.

Safety Warnings

Caution If this product will be installed in a hazardous location, read the Getting Started/Product Document of Compliance included in the package.

Warning	This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. 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**
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 이 경고 기호는 위험을 나타냅니다. 작업자가 신체 부상을 일으킬 수 있는 위험한 환경에 있습니다. 장비에 작업을 수행하기 전에 전기 회로와 관련된 위험을 숙지하고 표준 작업 관례를 숙지하여 사고를 방지하십시오. 각 경고의 마지막 부분에 있는 경고문 번호를 참조하여 이 장치와 함께 제공되는 번역된 안전 경고문에서 해당 번역문을 찾으십시오. 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 آخر 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**
Opozorilo	**Ta naprava mora biti ozemljena. Nikoli ne odklapljajte ozemljitve oz. upravljajte naprave, ki ni primerno ozemljena. V primeru, da niste sigurni, ali imate primerno ozemljitev, nemudoma pokličite pooblaščeni električni servis ali električarja.**
警告	重要安全性指示 此警告符號代表危險，表示可能造成人身傷害。使用任何設備前，請留心電路相關危險，並熟悉避免意外的標準作法。您可以使用每項警告後的聲明編號，查詢本裝置隨附之安全性警告譯文中的翻譯。 請妥善保留此指示

Warning When installing the product, please use the provided or designated connection cables/power cables/AC adapters. Using any other cables/adapters could cause a malfunction or a fire. Electrical Appliance and Material Safety Law prohibits the use of UL-certified cables (that have the "UL" shown on the code) for any other electrical devices than products designated by CISCO. The use of cables that are certified by Electrical Appliance and Material Safety Law (that have "PSE" shown on the code) is not limited to CISCO-designated products. **Statement 371**

Warning Read the wall-mounting instructions carefully before beginning installation. Failure to use the correct hardware or to follow the correct procedures could result in a hazardous situation to people and damage to the system. **Statement 378**

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

Warning Class 1 laser product. **Statement 1008**

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**

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 When installing or replacing the unit, the ground connection must always be made first and disconnected last. **Statement 1046**

Warning Do not locate the antenna near overhead power lines or other electric light or power circuits, or where it can come into contact with such circuits. When installing the antenna, take extreme care not to come into contact with such circuits, because they may cause serious injury or death. For proper installation and grounding of the antenna, please refer to national and local codes (for example, U.S.:NFPA 70, National Electrical Code, Article 810, Canada: Canadian Electrical Code, Section 54). **Statement 1052**

Warning No user-serviceable parts inside. Do not open. **Statement 1073**

Warning Installation of the equipment must comply with local and national electrical codes. **Statement 1074**

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

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

Warning The covers are an integral part of the safety design of the product. Do not operate the unit without the covers installed. **Statement 1077**

Warning Hot surface. **Statement 1079**

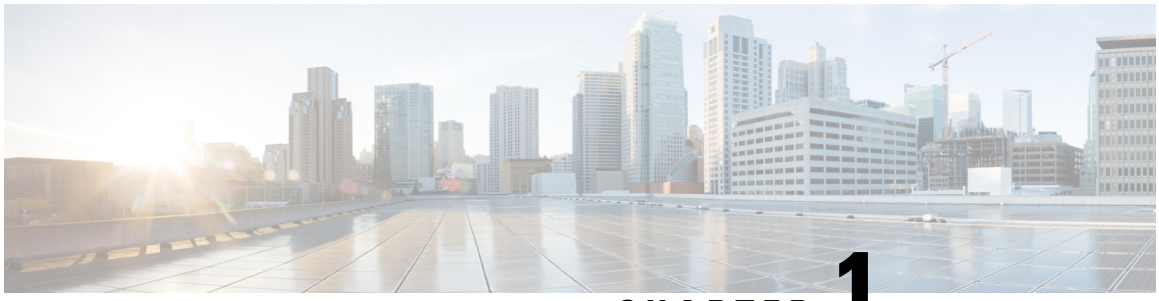
Related Documentation

All of the IR8140H documentation can be found online here: https://www.cisco.com/c/en/us/support/routers/catalyst-ir8100-heavy-duty-series-routers/series.html

Searching Cisco Documents

To search an HTML document using a web browser, press **Ctrl-F** (Windows) or **Cmd-F** (Apple). In most browsers, the option to search whole words only, invoke case sensitivity, or search forward and backward is also available.

To search a PDF document in Adobe Reader, use the basic Find toolbar (**Ctrl-F**) or the Full Reader Search window (**Shift-Ctrl-F**). Use the Find toolbar to find words or phrases within a specific document. Use the Full Reader Search window to search multiple PDF files simultaneously and to change case sensitivity and other options. Adobe Reader's online help has more information about how to search PDF documents.



CHAPTER 1

Router Hardware Description and Specifications

This section describes the major hardware features of the Cisco Catalyst Industrial Router 8140 Heavy Duty Series Router (also identified as Cisco Catalyst IR8140H), including the chassis, internal and external connectors and ports, and hardware specifications.

These topics are discussed:

Router Overview

Router Applications Overview

The Cisco Catalyst IR8140H is a ruggedized communication platform, designed for use in Field Area Network (FAN) power distribution grids that require outdoor, pole-mounted routers. The FAN is a distribution system in which power generation and transmission are linked to the power consumers.

The router provides an end-to-end communication network that enables increased power grid efficiency and reliability, reduced energy consumption, and reduced greenhouse gas emissions. The router can be leveraged across applications including:

- Smart transportation and roadways
- Advanced Metering Infrastructure (AMI)
- Distribution Automation (DA)
- Integration of Distributed Energy Resources (DER)
- Remote Workforce Automation
- Smart Lighting

The router provides reliable and secure real-time communication between the FAN systems and the numerous devices that exist on the FAN, including meters, sensors, protection relays, Intelligent Electronic Devices (IEDs), plug-in electric vehicle (PEV) charging stations, and distributed solar farms. Network data is forwarded and processed over secure communication links between devices within the distribution grid for local decision processing.

Router Hardware Overview: Exterior

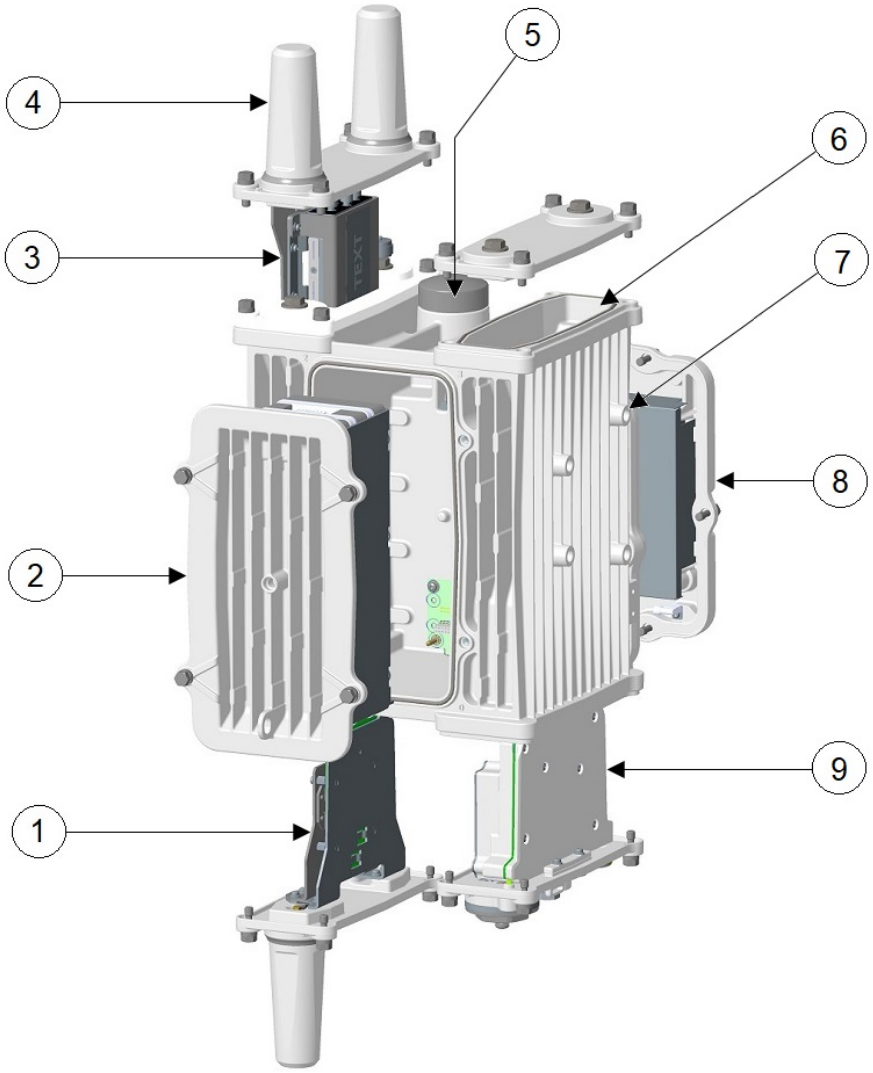
The Cisco Catalyst IR8140H router is a modular chassis with four external module slots.

Note Do not leave module slots unsealed as it can damage the router when exposed to the elements outdoors. You can use a slot cover when the module is not populated. See Accessories, on page 11.

Slot 0 faces downward and is referred to as a super slot as it is the largest slot of the four module slots within the IR8140H.

The super slot is reserved for the CPU module and is found at the bottom right of the IR8140H. The other three slots support Universal Interface Modules (UIMs).

Figure 1: IR8140H with Component Labeling

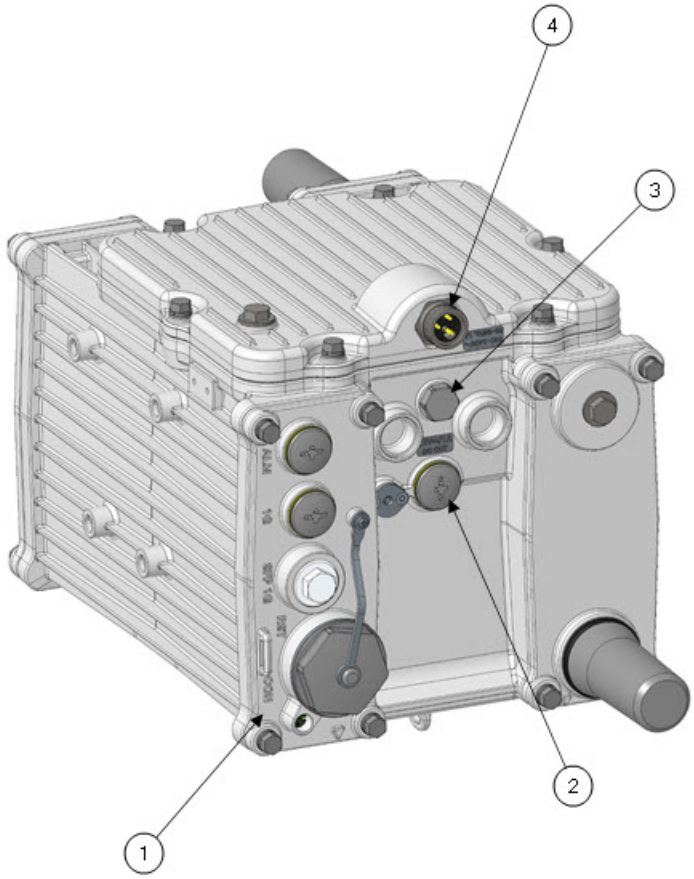


The following table provides a summary of all of the modules and power supplies supported on the Cisco Catalyst IR8140H shown in above figure.

Table 1: Cisco Catalyst IR8140H Components

Item No	Description
1	Industrial Router Module Heavy Duty with one antenna, for example, a IRMH-WPAN module.
2	Battery Backup Unit (BBU) Module. Up to 3 BBUs can be stacked in the enclosure.
3 and 4	Universal Interface Module (UIM) with two antennas (item 3). The antenna (4) is part of the module. This is one of three UIM slots that are available for Industrial Router modules that provide connectivity to Neighborhood Area Networks (NAN) endpoints and to the Wide-Area Networks (WAN) for connectivity to the utility control center. IR8140H supports the following Universal Interface Modules (UIMs): • IRMH-WPAN module (WPAN Module. Normally installed in the downward facing slot: slot 1) • IRMH-LTE module (LTE Module. Normally installed in one of the upward facing slots: slot 2 or slot 3) • IRMH-LTEA module (LTE Advanced Module. Normally installed in one of the upward facing slots: slot 2 or slot 3)
5	GNSS/GPS antenna. Identifies the router location after it is installed and is in use. The GNSS/GPS antenna provides accurate time and location information to the system.
6	Empty Universal Interface Module (UIM) slot with cover elevated. By default, the cover is attached unless a module is installed in the IR8140H chassis.
7	4 x Mounting Posts (M8)
8	Power Supply
9	CPU module. Provides processing power for the IR8140H modules and provides two Gigabit Ethernet connections to the backhaul network and other IP network devices. The CPU module is installed in slot 0 and it is the largest module slot. It is found at the bottom of the IR8140H.

Figure 2: Bottom View of the IR8140H with Cable Port Seals



Item No	Description
1	CPU module. The CPU module provides processing power for the IR8140H modules and provides two Gigabit Ethernet connections to the backhaul network and other IP network devices. The CPU module is installed in slot 0 and it is the largest module slot. It is found at the bottom of the IR8140H. The CPU module includes the following items: • Console Port - CON • Reset Button - RST • SSD Module - SSD • Alarm Port - ALM • SFP Gigabit Ethernet- SFP 1G • SYS LED • 10/100/1000 RJ45 Ethernet - 1G You must remove the plugs on the bottom of the CPU module to access the items listed above. See Figure 1: IR8140H with Component Labeling, on page 2 and Figure 2: Bottom View of the IR8140H with Cable Port Seals, on page 4 to view location of the CPU module in the IR8140H chassis.
2	12VDC_OUT/1A port covered by cable port seal, to power an external device. Only available when Power-over-Ethernet (PoE) is **not in use**.
3	Pressure vent. The vent relieves pressure build up inside the router chassis that can be caused by changing temperatures in the router installation environment. the vent also protects the router interior from dust, dirt, water and other environmental elements.
4	AC power input with a 7/8” 3-Pin circular AC power connector.

Note For an illustration of cable port seals, see Figure 8: PG13 Plug: Cable Port Seal, on page 12.

The following figure shows the CPU module with covers off all components.

Figure 3: CPU Module with Covers Off All Components (Front Faceplate View of CPU Module)

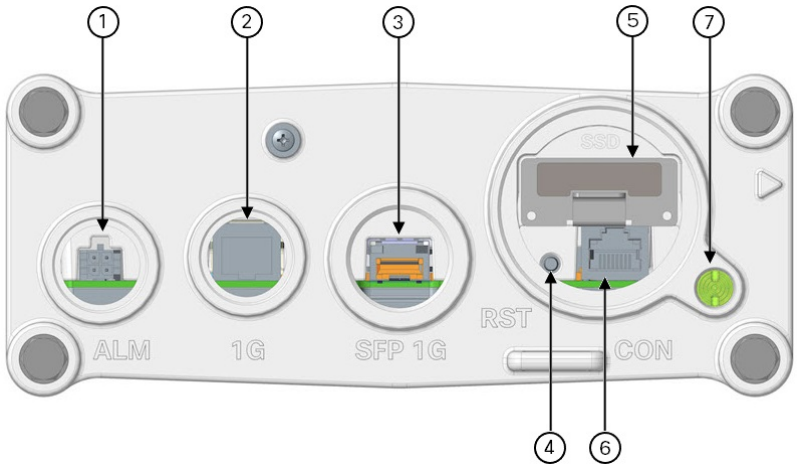
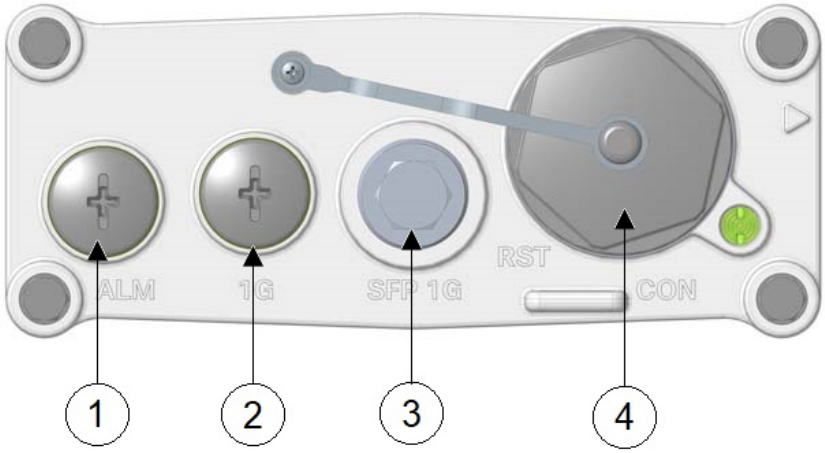


Table 2: Description of CPU Module Components (left-to-right)

Item no	Item	Description
1	ALM	Alarm port with Micro-fit 4P connector
2	1G	10/100/1000 Mbps Ethernet port
3	SFP 1G	SFP One Gigabit Ethernet
4	RST	Reset Button
5	SSD	SSD module (optional)
6	CON	Console port (accessible when plug is removed)
7	LED	SYS LED

The following figure shows the CPU module with covers over all components.

Figure 4: CPU Module with Covers Over All Components



Item no	Item
1	Alarm port covered by PG13 plug **Note** To remove alarm port plug, use #3 Phillips bit.
2	Ethernet port covered by PG13 plug **Note** To remove Ethernet port plug, use #3 Phillips bit.
3	SFP port covered by 3/4 NPT plug **Note** To remove SFP port plug, use 5/8" 6 Pt socket driver.
4	Reset button and Console port covered by M42 plug **Note** To remove M42 plug, use adjustable wrench that spans to 1 3/8".

The following figure shows the bottom view of the router.

Figure 5: Bottom View of IR8140H without Cable Seals

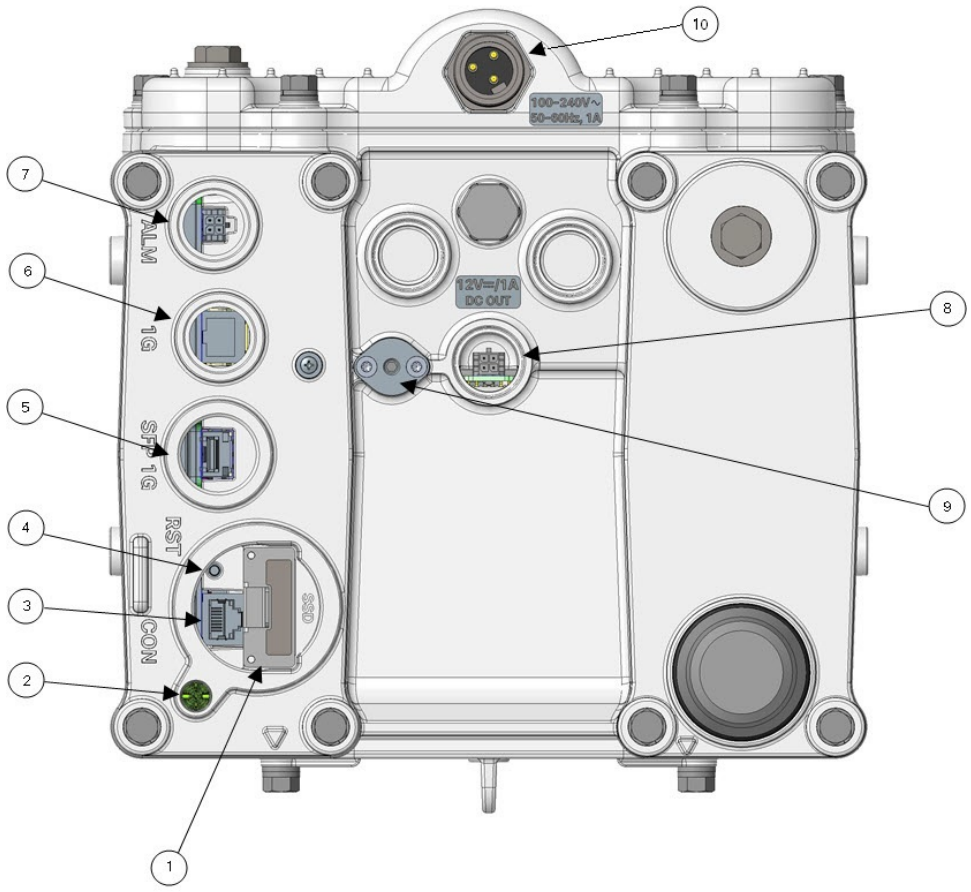


Table 3: Components on the Bottom of IR8140H Without Cable Port Seals

Item No	Hardware Feature	Item No	Hardware Feature
1	SSD module	6	One Gigabit Ethernet (1G) with PG13 port
2	LED	7	Alarm port with PG13 port
3	Console port (accessible when plug is removed)	8	12VDC/1A DC output
4	Reset button	9	BBU locking screw
5	Small form-Factor Pluggable (SFP) 1G SFP 1G module can be installed or removed while the router is on and operating normally. See instructions on how to install and remove a SFP module from the CPU module.	10	AC power input—Hexagonal 7/8” 3-Pin circular connector

The following table provides the IR8140H hardware features.

Table 4: IR8140H Hardware Features

Hardware Feature	Description
CPU Module: Quantity of one (1)	The CPU module provides processing power for the IR8140H modules and provides two Gigabit Ethernet connections to the backhaul network and other IP network devices. The CPU module is installed in slot 0 and it is the largest module slot. It is found at the bottom of the IR8140H. You can access the following ports and connectors when you remove the plugs found on the bottom of the CPU module as seen in Figure 5: Bottom of IR8140H without Cable Seals. • ALM: Alarm port for use with PG13 cable gland (Figure 7: Cable Gland, on page 11). • 1G: 10/100/1000 Mbps Ethernet port for use with PG13 cable gland. This port provides up to 15W of PoE PSE output power (only available with IR8140H-P-K9 SKU). • SFP 1G: One Gigabit Ethernet SFP socket. **Note** Requires an SFP adapter kit, if you want to cable it. • RST: Reset button covered by M42 plug • CON: Console Port (RJ45): Accessible when M42 plug is removed. The front panel of the CPU module provides visual status of the following items: See Figure 1: IR8140H with Component Labeling, on page 2 and Figure 2: Bottom View of the IR8140H with Cable Port Seals, on page 4 to view location of the CPU module in the IR8140H chassis.
Universal Interface Module (UIM) slots, Quantity of three (3) slots	The three UIM slots are available for ruggedized Industrial Router modules that provide connectivity to Neighborhood Area Networks (NAN) endpoints and to the Wide-Area Networks (WAN) for connectivity to the utility control center. IR8140H supports the following Universal Interface Modules (UIMs): • IRMH-WPAN module • IRMH-LTE module • IRMH-LTEA module
Management interface	An RJ-45 console port on the CPU module provides local access to the router for management and administration tasks. Accessible when plug is removed.
N-type female connectors	Allows direct connection of an antenna or cable to the IR8140H.

Hardware Feature	Description
60W Power Supply Unit (PSU) Board	Found on the back of the IR8140H. **Note** The power supply can be replaced in the field; however if installed on a pole, the IR8140H must first be removed from the pole to swap the power supply. Also, BBU must be disabled before swapping the power supply. The PoE-enabled PID (IR8140H-P-K9) allows up to 15W PoE output power.
Battery Backup Unit (BBU)	Up to three BBUs can be installed in an IR8140H. The BBUs are stacked upon one another in a module assembly in which they reside. When you install 3 BBUs, up to 8 hours of battery backup power is available on a fully-loaded system in the event of an AC power failure. BBUs can be replaced in the field. BBUs are found in the center-front of the IR8140H.
12VDC_Out	Provides 12VDC/1A to power an external device. Power option is only available when Power over Ethernet (PoE) is not in use.
Small form-Factor Pluggable (SFP)	SFP modules can be installed or removed while the router is on and operating normally. See instructions on how to install and remove a SFP module from the CPU module.
GNSS/GPS	An integrated GNSS/GPS receiver provides accurate time and location information to the system.
Mounting Bracket Kit	Includes mounting hardware for the IR8140H.
Optional Items (Ordered Separately)	
Pole mount kit	Includes the following equipment to support installation of the IR8140H on a pole: • Mounting plate • Two clamp brackets • Required hardware
Band strap kit	Two steel straps and band strip kit
Strap tool kit	BAND-IT strap tool
Antenna plug	IR-ANT-PLUG
Cable gland	IR-IP67GLAND
Fiber Kit	Cable Extender and Cable Gland (AIR-ACC15-SFP-GLD=)
Module slot cover	IRMH-BLANK

Operating Range

IR8140H can operate in a temperature range of -40°C to +70°C.

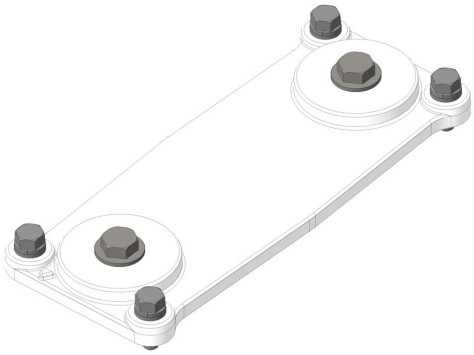
Accessories

Module Slot Cover

The following figure shows an illustration of the slot cover you can use to cover empty IR8140H module slots. You should always cover an empty module slot to prevent damage to a system exposed to the elements.

Note Slot covers are ordered separately.

Figure 6: Module Slot Cover



Cisco Product ID
IRMH-BLANK

Cable Glands

A cable gland (also known as a cable connector) is required to install cables in the CPU Alarm and Ethernet ports and the Chassis 12VDC_OUT port. Use a compatible cable gland to attach and secure the end of a cable to the router. The cable gland provides cable strain relief and seals the cable entry into the router chassis to prevent damage to the router interior.

Note Cable Glands are ordered separately. This picture may not exactly resemble the latest version.

Figure 7: Cable Gland

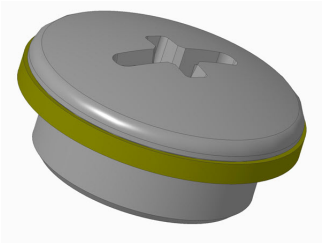
Table 5: Supported Cisco Cable Port Seal

Cisco Product ID
IR-IP67GLAND

Cable Port Seals

Unused CPU (Alarm and Ethernet) and Chassis 12VDC_OUT ports must be sealed with a liquid-tight cover (PG13) cable port seal to protect the router interior from environmental elements.

Figure 8: PG13 Plug: Cable Port Seal



Note The cable port seals come with the chassis and are not orderable separately.

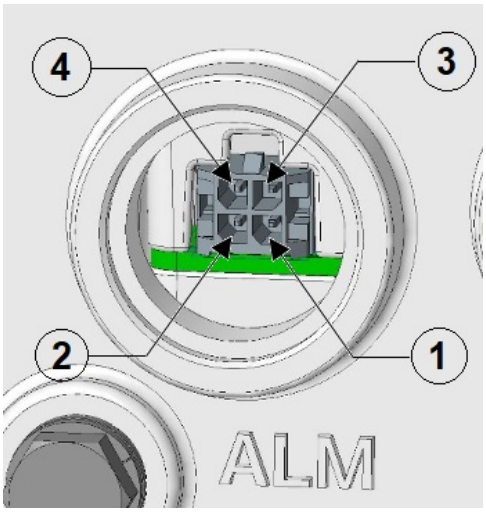
Caution Do not install the router unless all unused chassis cable ports are sealed. Leaving chassis ports unsealed can damage the router.

Specifications

Alarm Port

The following figure shows the alarm port and pinouts.

Figure 9: Alarm Port

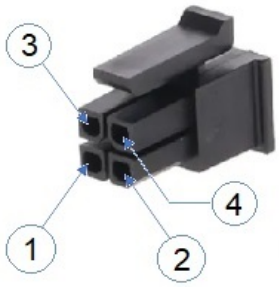


Pin	Description
pin 1	Alarm Input/Output #1
pin 2	Alarm Input/Output #2
pin 3	Alarm Common #1
pin 4	Alarm Common #2

Note Pins 3 and 4 are tied together at the router, but are isolated from Ground.

The following figure shows the Micro-Fit 3.0™ Receptacle Housing.

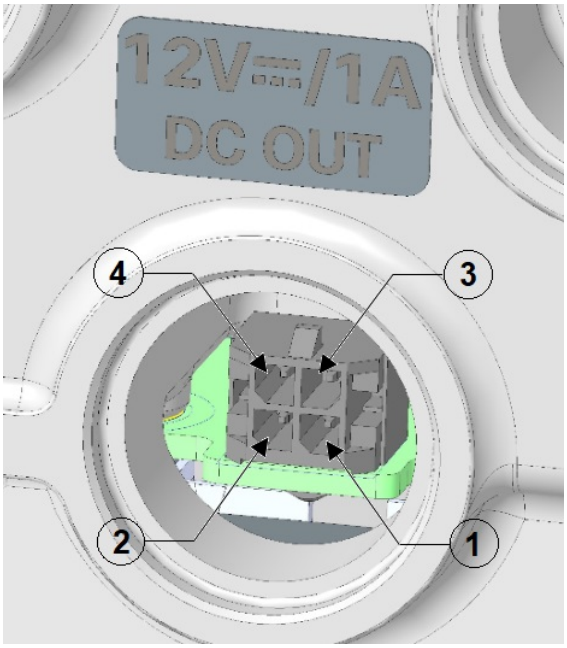
Figure 10: Mating Connector



12V/1A DC Out Port

The following figure shows the 12V/1A DC Out port and pinouts.

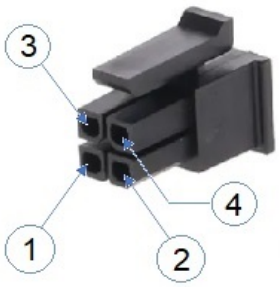
Figure 11: 12V/1A DC Out Port

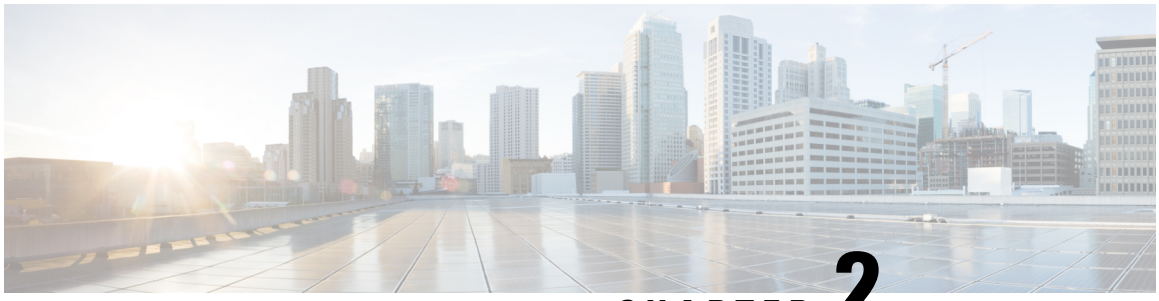


Pin	Description
pin 1	+12V Output pin
pin 2	Ground pin
pin 3	Cable_Present_L Input pin) **Note** External 12V DC Out Cable should ground this pin 3 to pin 4 directly so that the router detects that the cable is inserted (present).
pin 4	Ground pin

The power connector housing is installed on the router power harness for connection to an external, non-Cisco module. The following figure shows the Micro-Fit 3.0™ Receptacle Housing.

Figure 12: Mating Connector





CHAPTER 2

Unpacking the Router

This chapter contains these sections:

Overview

The IR8140H is an IP67 industrial router for outdoor use. It is comprised of a base modular platform with four module slots. One of the four IR8140H modules is larger than the other three and is identified as the super slot and is identified as Slot 0. This super slot 0 is reserved for the CPU module and it faces downward in the IR8140H as labeled.

The other three slots support Universal Interface Modules (UIMs).

This chapter includes instructions about how to unpack the IR8140H and describes the items that ship with the router.

Important When you unpack the router, do not remove the foam blocks attached to the antennas and antenna connectors until you install the router. The foam protects the antennas and connectors during installation.

To unpack the router:

Step 1 Open the shipping container and carefully remove the contents.

Step 2 Return all packing material to the shipping container, and save it.

Step 3 Ensure that all items listed in the Package Contents, on page 15 section are included in the shipment. If any item is damaged or missing, notify your authorized Cisco sales representative.

Package Contents

The following table lists those items that can ship with your router.

Table 6: IR8140H Package Contents

Qty	Item	Description

1	Cisco IR8140H	Router enclosure with the following components installed:
		• Power supply (100-240 VAC, 60W output) attached to the back of the IR8140H. Power supply converts AC input voltage to 12V DC output voltage for the router (+/- 10%) and input frequency 60Hz and 50Hz (+/- 5%)
		• Up to three plug-in Universal Interface Modules (UIMs) installed with the two supported module types (slots 1, 2, and 3):
		  • IRMH-WPAN module
		  • IRMH-LTE module
		• CPU module (reserved super slot 0, bottom of the unit)
		• On-board GNSS/GPS receiver with antenna port
		• N-type connector for direct mount of outdoor antennas
		• Battery Backup Units (BBUs), 0 to 3 depending on configuration ordered

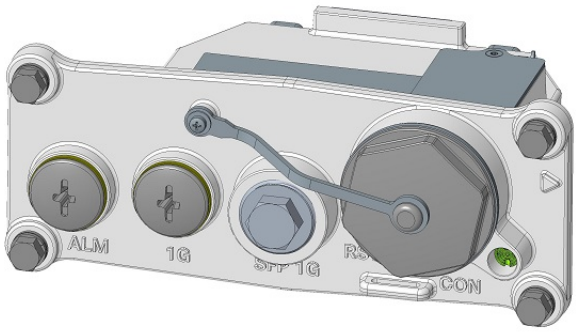
1	Console cable	RJ-45 to DB-9
1	Grounding kit	Grounding lug and two screws.
1	Mounting Bracket Kit	Includes: • Mounting bracket • Required hardware
Optional Items (Ordered Separately)		
1	Pole mount kit	Includes: • Mounting plate • Two clamp brackets • Required hardware
1	Band strap kit	Two steel straps
1	Strap tool kit	BAND-IT strap tool
1	Antenna plug	IR-ANT-PLUG

Qty	Item	Description
1	Cable glands kit	Includes: • One cable gland (more can be ordered) • One tube of anti-seize compound
1	Fiber Adapter Kit	Includes: • Cable Extender • Cable Gland
3	Module slot cover	IRMH-BLANK

Supported Modules and Interfaces

The Supervisor module serves as the CPU for the industrial router and is installed in the bottom of the router in the super slot.

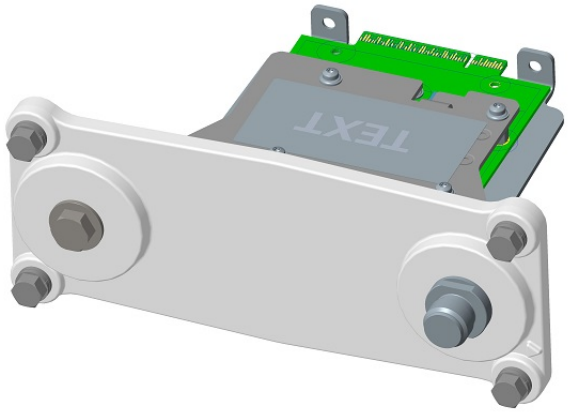
Figure 13: IRMH-SUP-SP Supervisor Module



IR8140H supports the following two interface modules:

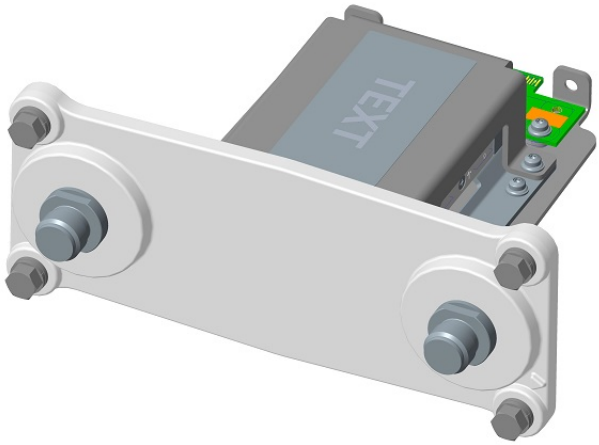
- An example of IRMH-WPAN module is shown in the following figure:

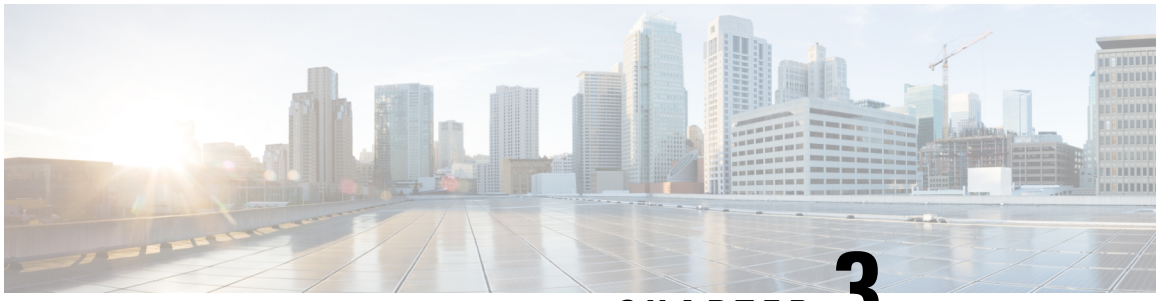
Figure 14: IRMH-WPAN Module



- An exmple of IRMH-LTE module is shown in the following figure:

Figure 15: IRMH-LTE Module





CHAPTER 3

Installation Safety and Site Preparation

This section contains safety and site preparation information.

Note Read this entire section before installing the IR8140H router.

These topics are discussed:

Safety Recommendations

To ensure general safety, follow these guidelines:

- Keep the chassis area clear and dust-free during and after installation.
- Keep tools and chassis components away from walk areas.
- Do not wear loose clothing that could get caught in the chassis. Fasten your tie or scarf and roll up your sleeves.
- Wear safety glasses when working under conditions that might be hazardous to your eyes.
- Do not perform any action that creates a hazard to people or makes the equipment unsafe.

Safety with Electricity

Follow these guidelines when working on equipment powered by electricity:

- Read all warnings in Safety Warnings, on page 20.

- Locate the emergency power-off switch for your installation location. If an electrical accident occurs, you can quickly turn off the power.
- Disconnect all power before doing the following:
  - Installing or removing a chassis
  - Working near power supplies
- Look carefully for possible hazards in your work area, such as moist floors, ungrounded power extension cables, frayed power cords, and missing safety grounds.
- Do not work alone if hazardous conditions exist.
- Never assume that power is disconnected from a circuit. Always check.
- Never open the enclosure of the router internal power supply.
- If an electrical accident occurs, proceed as follows:
  - Use caution; do not become a victim yourself.
  - Turn off power to the device.
  - If possible, send another person to get medical aid. Otherwise, assess the victim's condition and then call for help.
  - Determine if the person needs rescue breathing or external cardiac compressions; then take appropriate action.

Preventing Electrostatic Discharge Damage

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

- Ensure that the router chassis is electrically connected to earth ground.
- Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the clip to an unpainted surface of the chassis frame to channel unwanted ESD voltages safely to ground. 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 strap. It should be between 1 and 10 megohms (Mohm).

Safety Warnings

This section contains important safety warnings for the installation and use of the router.

Translated versions of all safety warnings are available in the safety warnings document that shipped with your router, and which is available on Cisco.com.

Warning **IMPORTANT SAFETY INSTRUCTIONSThis 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

Warning **Do not operate the unit near unshielded blasting caps or in an explosive environment unless the device has been modified to be especially qualified for such use.** Statement 364

Warning **This equipment must be externally grounded using a customer-supplied ground wire before power is applied. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.** Statement 366

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

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

Warning **This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than 20 A.** Statement 1005

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

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

Warning **Installation of the equipment must comply with local and national electric codes.** Statement 1074

Site Requirements

This section describes the requirements your site must meet for safe installation and operation of your router. Ensure that the site is properly prepared before beginning installation. If you are experiencing shutdowns or unusually high errors with your existing equipment, this section can also help you isolate the cause of failures and prevent future problems.

Pole-Top Installation Requirements

These installation steps (see Mounting the Router, on page 25) require that the router mounting and installation locations, usually at the top of a power or other utility pole, have the following connections available for basic router installation:

- AC power connection, as described in Power Guidelines and Requirements, on page 24.
- Ethernet connection, as described in Ethernet Connections, on page 24.

Environmental Requirements

The location of your router is an important consideration for proper operation. Equipment placed too close together, inadequate ventilation, and inaccessible panels can cause malfunctions and shutdowns, and can make maintenance difficult. Plan for access to both power supply side and cable side panels of the router.

If you are currently experiencing shutdowns or an unusually high number of errors with your existing equipment, these precautions and recommendations may help you isolate the cause of failure and prevent future problems.

- Always follow ESD-prevention procedures described in Preventing Electrostatic Discharge Damage, on page 20 to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.
- Ensure that all empty module slots have blank panels installed and that all ports are sealed.
- When other equipment is installed on or connected to the router, try operating the router by itself, if possible. Power off other equipment (such as USB devices and installed third-party modules) to allow the router under test a maximum of cooling air and clean power.

FCC Safety Compliance Statements

Class A Notice for FCC

Modifying the equipment without Cisco's authorization may result in the equipment no longer complying with FCC requirements for Class A digital devices. In that event, your right to use the equipment may be limited by FCC regulations, and you may be required to correct any interference to radio or television communications at your own expense.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

The FCC, with its action in ET Docket 9608, has adopted a safety standard for human exposure to RF electromagnetic energy emitted by FCC-certified equipment. When used with approved Cisco antennas, Cisco products meet the uncontrolled environmental limits found in OET 65 Subpart C and ANSI C95.1 2019. Proper operation of this radio device according to the instructions in this publication results in user exposure substantially below the FCC recommended limits.

The antenna(s) used for this device may be located with or operating in conjunction with the following devices only:

1. Two or more modular transmitters with FCC ID: N7NEM7455, only one (1) of which may transmit simultaneously with other transmitters types.
2. Two or more modular transmitters with FCC ID: N7NWP7610, only one (1) of which may transmit simultaneously with all other transmitters types.
3. Two or more modular transmitters with FCC ID: RI7LM960, only one (1) of which may transmit simultaneously with other transmitters types.
4. Two or more modular transmitters with FCC ID: LDK-CGMOFDM, only one (1) of which may transmit simultaneously with other transmitters types.

To ensure RF exposure compliance, installers must be provided with antenna installation and transmitter operating conditions described in this document and in the antenna installation documentation.

FCC Class A warnings

The following information is for FCC compliance of Class A devices:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to correct the interference at their own expense.

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS(s). Operation is subject to the following two conditions:

1. 1. This device may not cause interference.
2. 2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. 1. L'appareil ne doit pas produire de brouillage;
2. 2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Important ISED Radiation Exposure Statement:

This equipment complies with ISED RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 30cm between the radiator & your body.

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 30cm de distance entre la source de rayonnement et votre corps

Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

CAN ICES-3 (A)/NMB-3(A)

The Country Code Selection feature is disabled for products marketed in the US/Canada.

Power Guidelines and Requirements

- Check the power at your site to ensure that you are receiving power that is free of spikes and noise.
- Install a power conditioner if necessary.
- Confirm that the AC input power supply has a 110 VAC nominal, 1.0 A rms or 220 VAC nominal 0.5 A rms output sourcing capability.

Preparing for Network Connections

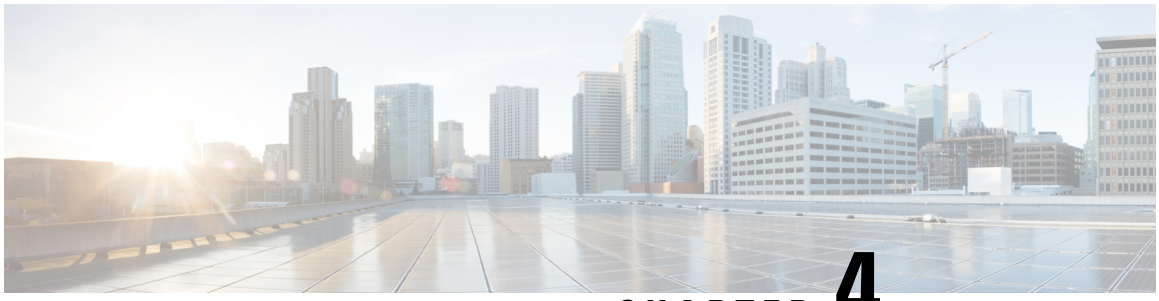
When setting up your router, consider distance limitations and potential electromagnetic interference (EMI) as defined by the applicable local and international regulations.

Network connection considerations are provided for several types of network interfaces and are described in the following sections.

Ethernet Connections

The IEEE has established Ethernet as standard IEEE 802.3. The router supports the following Ethernet implementations:

- 1000BASE-X—1000 Mb/s full-duplex transmission over a fiber optics cable.
- 100BASE-X—100 Mb/s full-duplex transmission over a fiber optics cable.
- 10/100/1000Base-T—10/100/1000 Mb/s Copper Port.



CHAPTER 4

Mounting the Router

This section describes the safety information, equipment, and procedures required to mount the IR8140 on a vertical pole or streetlight.

These topics are discussed:

Mounting Kits Overview

You will need some or all of the kits described in this section to install the router on a pole. Your installation environment and requirements determine the kits you need.

For a detailed description of each kit, see Contents of the Mounting Kits, on page 26.

Cisco Product ID (PID)	Name	Description
—	Mounting Bracket Kit, on page 28	Use this kit if your installation requires a Cisco mounting bracket to mount the router. This kit is included with in the router accessory kit, and is used with the pole kit and includes the hardware required to attach the mounting bracket to the mounting plate.
IR-PMK1000	Pole Mount Kit, on page 26	This kit is required for all pole or streetlight installations and includes a mounting plate and the hardware required to attach the mounting plate to a pole. This kit includes two PMK bands as well.
IR-PMK-BAND	Band Strap Kit, on page 29	This kit includes two steel straps for mounting the router on poles larger than 4.5 inches (11.4 cm) in diameter. This kit is used together with the Pole Mount Kit, on page 26. A BAND-IT Tool is required to install the steel straps on a pole.

Cisco Product ID (PID)	Name	Description
AIR-BAND-INST-TL=	Strap Tool Kit, on page 29	This kit includes a BAND-IT tool that is required when using steel straps to install the router on poles larger than 4.5 inches (11.4 cm) in diameter.

General Safety Information for Mounting

Read the safety warnings in this section.

One person is required to properly and safely mount the router.

Caution All mounting methods at any location are subject to the acceptance of local jurisdiction.

Caution The mounting surface, attaching screws, and optional wall anchors must be able to support a 50 pound (22.7 kg) static weight.

Caution Personnel mounting the router must understand grounding methods.

Warning **Do not locate the antenna near overhead power lines or other electric light or power circuits, or where it can come into contact with such circuits. When installing the antenna, take extreme care not to come into contact with such circuits, as they may cause serious injury or death. For proper installation and grounding of the antenna, please refer to national and local codes (for example, U.S.:NFPA 70, National Electrical Code, Article 810, Canada: Canadian Electrical Code, Section 54).** Statement 1052

Contents of the Mounting Kits

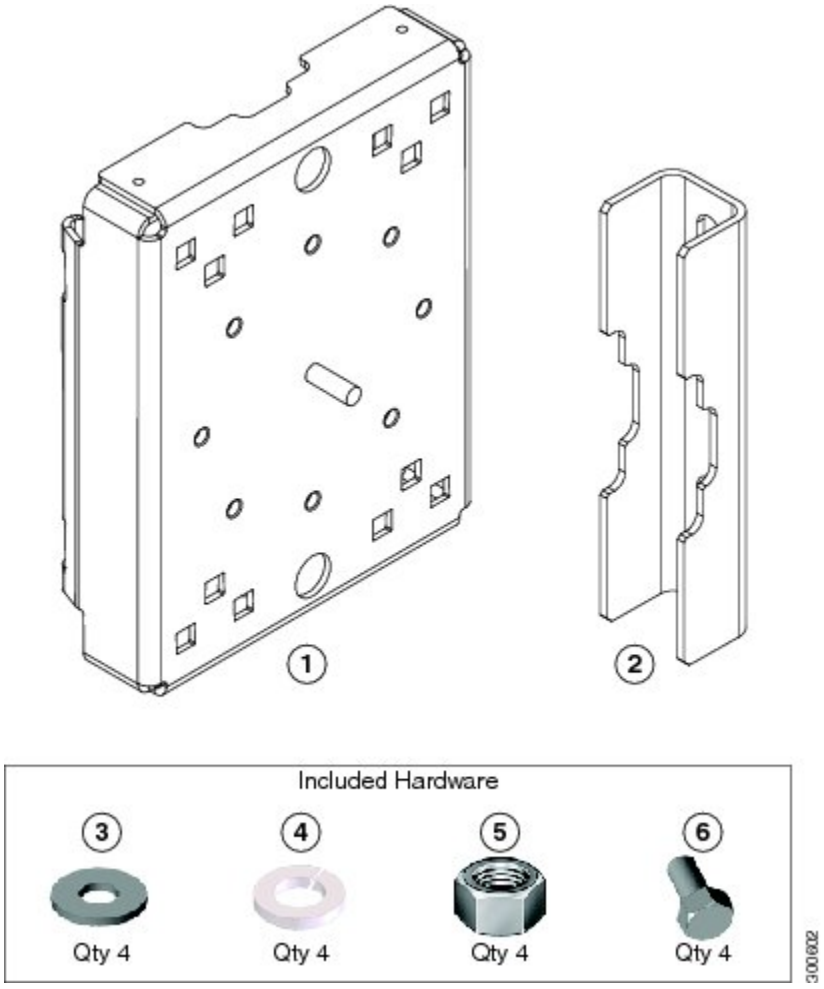
This section describes the contents of the mounting kits available for the router and when you should use each kit.

Pole Mount Kit

Use the Cisco pole mount kit to install the mounting plate on any pole or streetlight. The kit supports poles that meet the following criteria:

- **Size**—2 to 16 inch diameter poles
- **Material**—Metal, wood, or fiberglass poles

Figure 16: Pole Mount Kit Contents



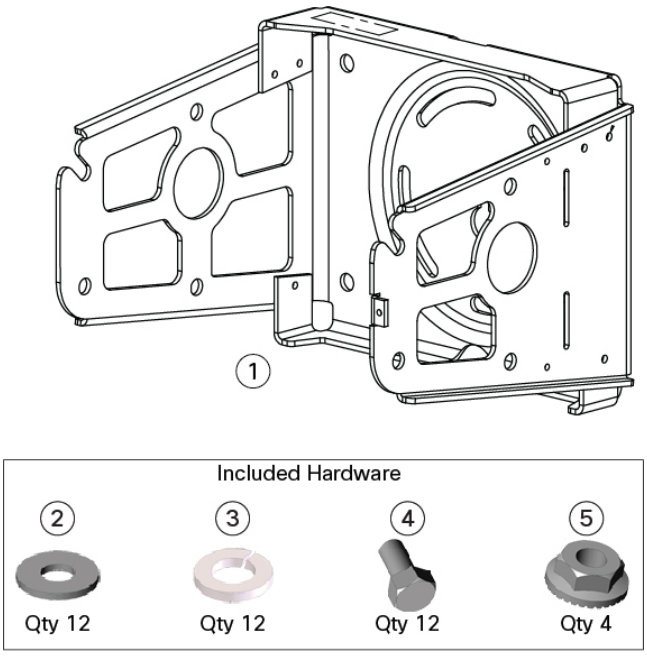
Item	Name	Qty.	Description
1	Mounting plate	1	Install mounting plate on pole. Mounting bracket attaches to the mounting plate.
2	Clamp brackets	2	Use the clamp brackets to install the mounting plate on a pole of up to 4.5 inches in diameter.
Included Hardware			
3	Washer (3/8 inch)	4	Use the included hardware to attach the mounting plate to the pole, as described in Install the Mounting Plate onto a Pole, on page 30.
4	Split lock washer (3/8 inch)	4	
5	Nut (3/8-16)	4	
6	Carriage bolt (3/8-16 x 7 inches)	4	

Mounting Bracket Kit

Use the mounting bracket kit if you require a Cisco mounting bracket. The mounting bracket attaches to the mounting plate, and then the router is installed on the mounting bracket.

Note You can optionally use any compatible mounting bracket with the Cisco pole mount kit. Check with your authorized Cisco reseller for compatible mounting brackets. See Pole Mount Kit, on page 26.

Figure 17: Mounting Bracket Kit Contents—Required Parts



Item	Name	Qty.	Description
1	Mounting bracket	1	Mounts router to mounting plate or wall.
Included Hardware			
2	Washer (M8)	12	Use the hardware noted in above figure (items 2 thru 5) to attach the mounting bracket to the mounting plate, and the router to the mounting bracket. Assemble the washer, split lock washer, and bolt as described in Assemble Bracket Hardware, on page 36.
3	Split lock washer (M8)	12	
4	Bolt (M8 x 1.25)	12	
5	Serrated nut (M8 x 1.25)	1	Use nut to align mounting bracket to pole bracket when pole bracket is being used.

Band Strap Kit

Use the straps in the Band Strap Kit when you mount the router on a pole larger than 4.5 inches (11.4 cm) in diameter. This installation also requires the pole mount kit and strap tool kit. See Pole Mount Kit, on page 26 and Strap Tool Kit, on page 29.

Figure 18: Band Strap Kit Contents

Item	Description
1	Steel straps (2)

Strap Tool Kit

Use the tool in the Strap Tool Kit to attach the steel straps included in the band strap kit. Steel straps are required to install the mounting plate on poles larger than 4.5 inches (11.4 cm) in diameter. See Band Strap Kit, on page 29.

Note The tool in the Strap Tool Kit is manufactured and supported by BAND-IT. For more information about the tool, see www.band-it-idex.com.

Figure 19: Strap Tool Kit Contents

Item	Description
1	Strap tool
2	Strap tool documentation (not shown)

Materials and Tools You Supply

- 1/2-inch (13-mm) socket wrench
- #2 Phillips head screwdriver

Mounting Instructions

This section includes all the procedures required to mount the router on any supported pole type.

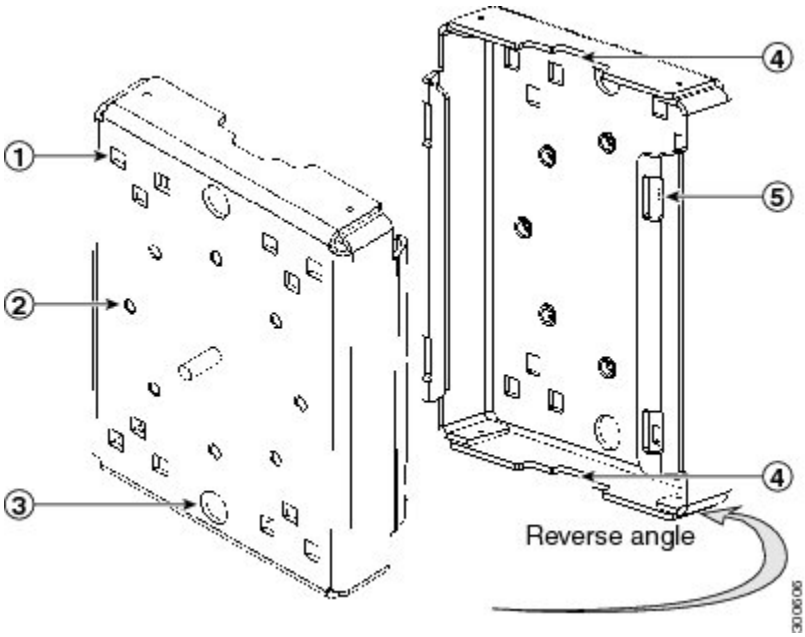
This section covers the following procedures.

Install the Mounting Plate onto a Pole

This section describes three different procedures for installing the mounting plate on a pole. Follow the instructions for the pole type used in your installation.

The instructions in these section refer to the mounting plate features shown in the following table.

Figure 20: Mounting Plate Details



Item	Description	Qty.
1	Carriage bolt holes	4
2	Bracket mount holes	8
3	Clearance holes, 3/4 in.	2
4	Pole clamp notches	2
5	Steel band strap slots	4

Install the Mounting Plate—Poles Up to 4.5 Inches in Diameter

Required Materials

- Mounting plate, carriage bolts, and clamp brackets included in Pole Mount Kit, on page 26.
- 13-mm box-end socket wrench

To install the mounting plate on a vertical pole up to 4.5 inches (11.4 cm) in diameter:

Step 1 Select a mounting location on the pole and place the top and bottom pole clamp bracket (1) notches against the pole.

Step 2 Place one of the clamp brackets on the opposite side of the pole, aligning the clamp bracket holes with the top two carriage bolt holes on the mounting plate.

Step 3 Insert a carriage bolt (5) through each of the top two carriage bolt holes on the mounting plate and through the holes in the clamp brackets.

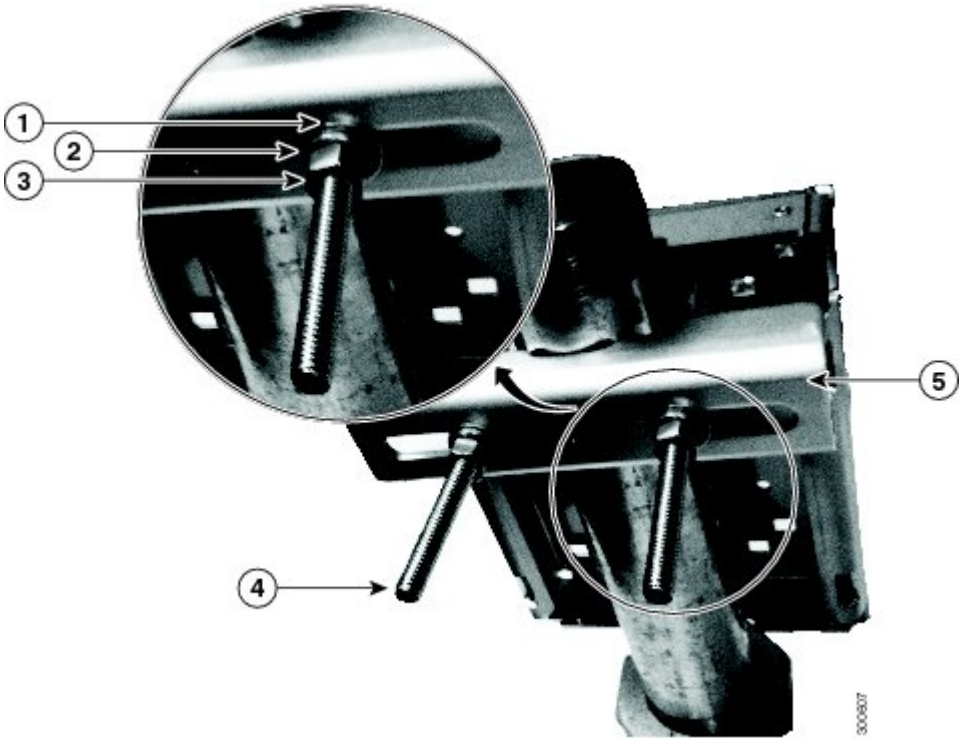
Step 4 Position each bolt in the clamp so that the bolt is next to the pole, as shown in the following figure.

Step 5 To place the bracket hardware on each carriage bolt (see the following figure):

a) Place the washer (2) and then the split lock washer (3) on the back of each carriage bolt (5).

b) Thread the hex nut (4) on each carriage bolt. Ensure that the split-lock washer is between the washer and the nut.

Figure 21: Carriage Bolt Hardware Assembly Details



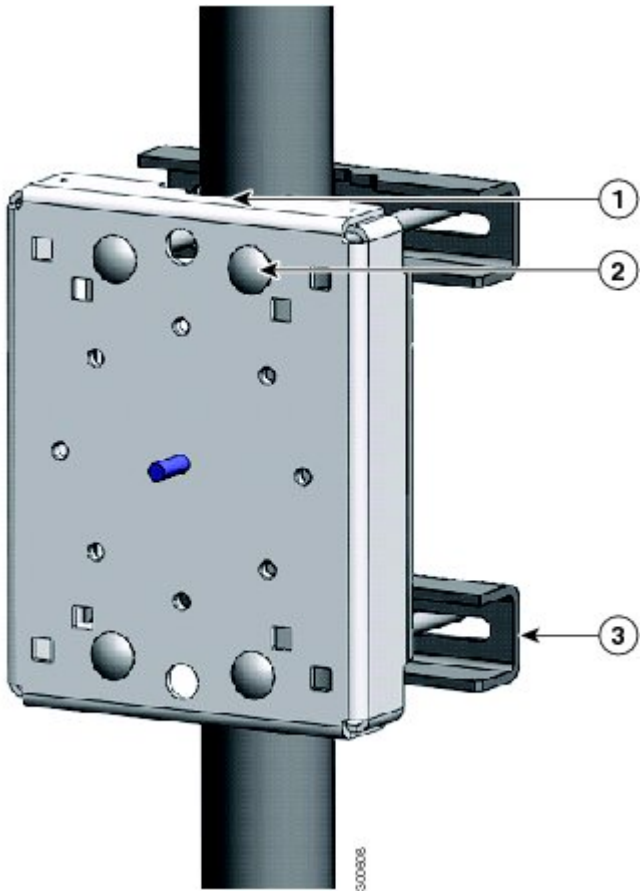
Step 6 Hand tighten the hex nuts (do not over tighten).

Step 7 Repeat Step 3 through Step 6, installing the two bottom carriage bolts and the second clamp bracket at the bottom of the mounting plate.

Step 8 Position the mounting plate and clamp brackets on the pole as needed before further tightening the carriage bolts.

Step 9 Use a socket wrench to evenly tighten all four carriage bolts to finish installing the mounting plate on the pole.

Figure 22: Mounting Plate Installed on Pole with Clamp Brackets



Item	Description
1	Pole clamp notch
2	Carriage bolts (4)
3	Pole clamps (2)

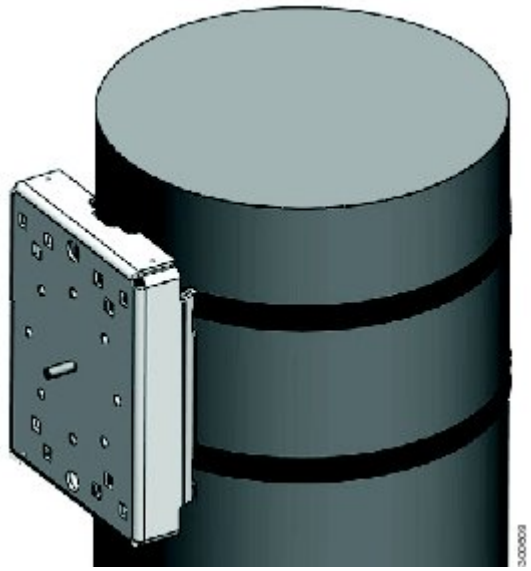
Install the Mounting Plate—Poles Larger than 4.5 Inches in Diameter

Required Materials

- Mounting plate and steel straps included in Pole Mount Kit, on page 26
- BAND-IT tool included in Strap Tool Kit, on page 29
- Torque wrench

To install the mounting plate on a vertical pole that is larger than 4.5 inches (11.4 cm) in diameter (refer to the following figure):

Figure 23: Mounting Plate Installed on Pole with Steel Straps for a Pole with Greater than 4.5 Inch Diameter



Step 1 Assemble the straps and the mounting plate by threading the two steel straps through the band strap slots on the mounting plate.

Step 2 Select a mounting location on the pole.

Step 3 Position the mounting plate on the pole as needed and tighten the straps around the pole.

Step 4 Use the BAND-IT strap tool to tighten the metal bands around the pole, following the instructions in the box with the tool. Ensure the metal bands are as tight as possible (approximately 7 ft-lbs).

Note When the metal bands are tightened to the full tension, the mounting plate cannot be adjusted unless the metal bands are disassembled or cut.

Install the Mounting Plate—Through-Pole Mounting on Wood Pole (Optional)

If the pole used in your installation is made of wood, you can optionally install the mounting plate using the procedure described in this section. This is an alternate mounting method to the following two mounting methods, which can also be used when mounting the router on a wood pole:

- Install the Mounting Plate—Poles Up to 4.5 Inches in Diameter, on page 31
- Install the Mounting Plate—Poles Larger than 4.5 Inches in Diameter, on page 33

Required Materials

- Mounting plate included in Pole Mount Kit, on page 26.
- Hardware that you supply: 5/8-in. carriage bolt (length depends on the pole size in your installation), standard washer, fender washer and nut (2 sets)
- Tools that you supply: Drill, drill bit (for 5/8-in. through bolts), and 13-mm box-end socket wrench

To mount the router on a wood pole:

Step 1 Place the mounting plate on the selected mounting location on the pole.

Step 2 Mark the drilling locations on the pole through the clearance holes and remove the mounting plate.

Step 3 Drill holes completely through the pole at the points you marked in Step 2.

Step 4 Position the mounting plate over the drilled holes. Align the clearance holes on the mounting plate with the drilled holes.

Step 5 Place a standard washer against one of the clearance holes on the mounting plate, then feed the bolt through the washer, clearance hole, and drilled hole. Push the bolt all the way through the pole. See Figure 20: Mounting Plate Details, on page 31.

Step 6 Follow these steps on the opposite side of the pole:

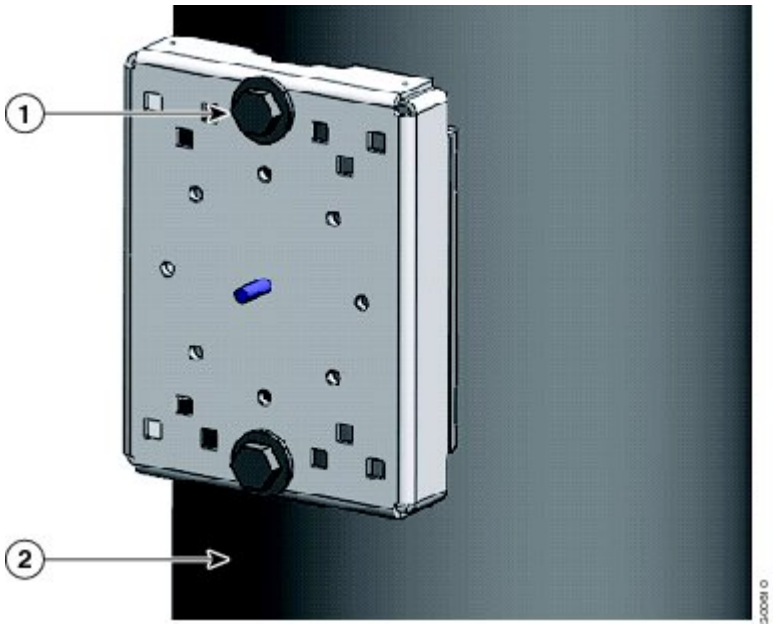
a) Place a fender washer on the end of the bolt, and then a nut.

b) Hand tighten the nut.

Step 7 Repeat Step 5 and Step 6 for the second bolt.

Step 8 Use a socket wrench to evenly tighten both bolts to finish installing the mounting plate on the wooden pole (see the following figure).

Figure 24: Mounting Plate Installed on Wooden Pole with Through Bolts



Item	Description
1	5/8-in. through bolts (2)
2	Wood pole

Attach the Mounting Bracket to the Mounting Plate

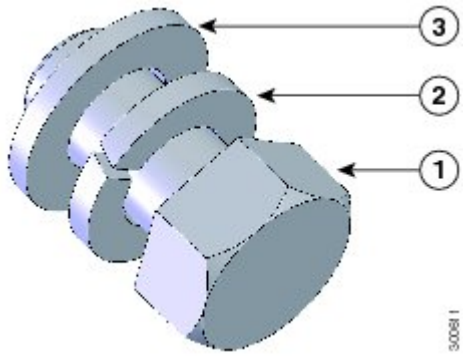
This section describes how to attach the mounting bracket to the mounting plate.

Assemble Bracket Hardware

Several of the procedures in this section require you to assemble the bracket hardware before installing the bracket. A bracket hardware set consists of one bolt, one washer, one split lock washer, and one nut.

To assemble the bracket hardware set (see the following figure):

Figure 25: Assemble Bracket Hardware Set



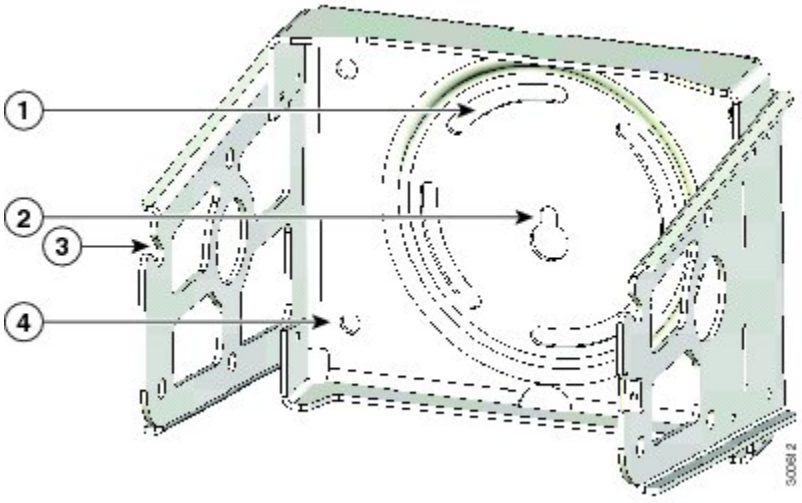
Step 1 Slide the split lock washer (2) on the bolt (1).

Step 2 Slide the regular washer (3) on the bolt (1).

Ensure that the split-lock washer is between the regular washer and the bolt as shown.

The instructions for the procedures in this section refer to the mounting plate features shown in the following figure.

Figure 26: Mounting Bracket Details



Item	Description
1	Pivot grooves (4)
2	Quick hang notch

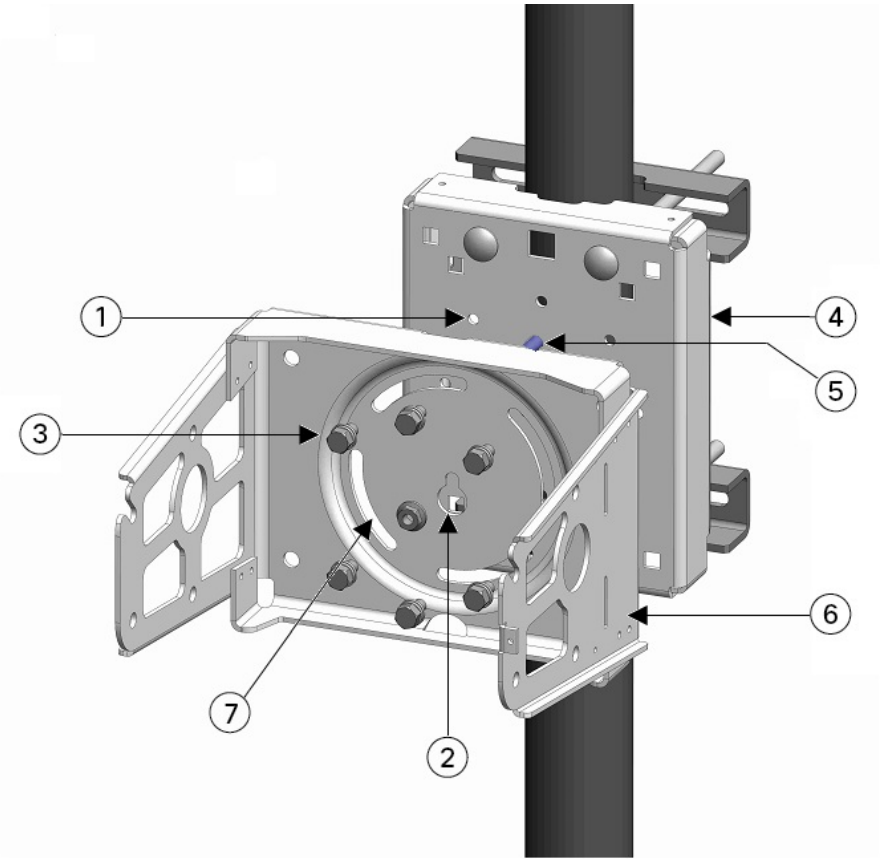
Item	Description
3	Quick hang slots (2)
4	Optional wall-mount holes (4)

Note The mounting plate must be installed as described in the section, Install the Mounting Plate onto a Pole, on page 30.

Attach the Mounting Bracket

To attach the mounting bracket to the mounting plate, refer to the following figure.

Figure 27: Mounting Bracket Attached to Mounting Plate



Required Materials

- Mounting bracket and hardware included in the Mounting Bracket Kit, on page 28
- 13-mm box-end socket wrench

Step 1 Assemble 6 sets of bracket hardware (washer, split lock washer, and bolt) as detailed in Assemble Bracket Hardware, on page 36.

Step 2 Place the mounting bracket (6) against the mounting plate by inserting the bracket quick hang notch (2) over the mounting plate quick hang stud (5).

Step 3 Thread the serrated nut onto the quick mount stud (4) and hand tighten (do not over tighten).

Step 4 Align the pivot grooves (7) on the bracket with four of the bracket mount holes (1) on the mounting plate. Follow these guidelines:

- Each of the four pivot grooves on the bracket must be attached to at least one bracket mount hole on the mounting plate.
- The final desired orientation of the mounting plate and router determine which bracket mount holes are used.
- Mount the router as described in Install the Mounting Plate onto a Pole, on page 30.

Step 5 Insert one bolt assembly (3) through one of the pivot grooves (7) on the bracket and then through the corresponding bracket mount hole on the mounting plate.

Step 6 Repeat Step 5 for the remaining bolt assemblies.

Step 7 Position the mounting bracket onto the mounting plate as needed before further tightening the bolts.

Step 8 Use a socket wrench to evenly tighten all four bolts and the serrated nut to finish installing the bracket on the plate. Use a torque of 6-7 foot-pounds when tightening the bolts and nut.

Attach the Router onto the Mounting Bracket

This section describes how to attach the IR8140H to the mounting bracket.

Required Materials

- 13-mm box-end socket wrench
- 2 sets of bracket hardware (split lock washer, regular washer, and bolt). You will attach 1 set of bracket hardware to opposite sides of the IR8140H to support to allow it to rest on the attach to each side of the router (See Figure 25: Assemble Bracket Hardware Set, on page 36) to support installation in the Mounting Bracket.

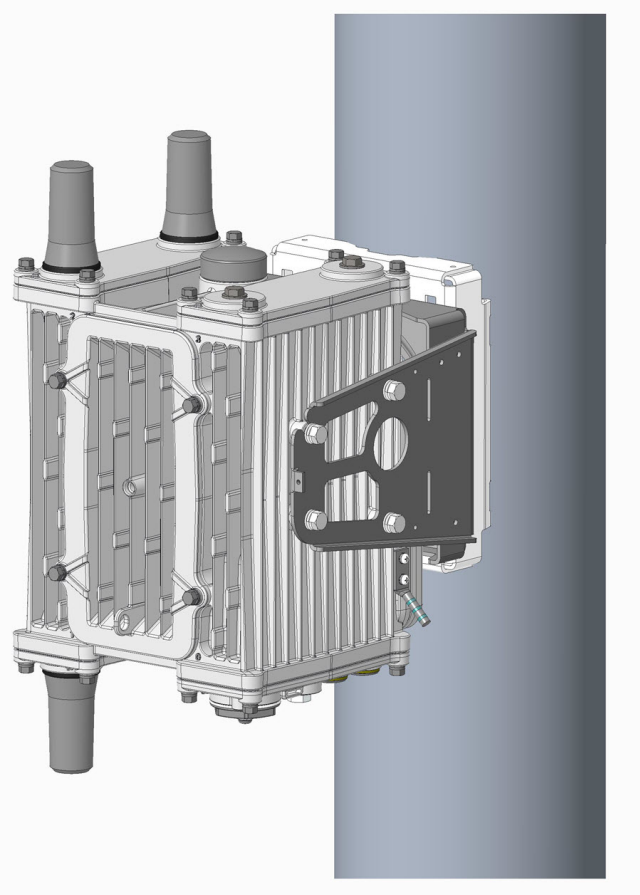
Step 1 Attach two sets of bracket hardware, one on either side, of the IR8140H router.

Step 2 Slide the router onto the bracket and rest it on the two quick hang slots (see Figure 26: Mounting Bracket Details, on page 36).

Step 3 Use a socket wrench to evenly tighten the 2 sets of bracket hardware to secure the router in the mounting bracket.

Step 4 You are now ready to ground the router. See Grounding the Router, on page 40.

Figure 28: IR8140H Attached to the Mounting Bracket



Grounding Instructions

In all installations, after the router is mounted, you must properly ground the unit according to the instructions in this section before connecting network and power cables.

Warning **This equipment must be externally grounded using a customer-supplied ground wire before power is applied. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.** Statement 366

Warning **Installation of the equipment must comply with local and national electrical codes.** Statement 1074

Grounding Hardware

The router is shipped with a grounding kit, shown in the following figure.

Figure 29: Router Grounding Kit Contents

Item	Description	Qty.
1	Grounding lug	1
2	Screws	2

Materials You Supply

You must provide the tools listed in the "Materials and Tools You Supply" section.

Grounding the Router

Note You can perform these steps when the IR8140H is attached onto the mounting bracket as seen in Figure 28: IR8140H Attached to the Mounting Bracket, on page 39.

To ground the router:

Step 1 Use the appropriate crimping tool or pliers to crimp the 6-gauge ground wire (included in the grounding kit) to the grounding lug.

Step 2 Connect the grounding lug to the router chassis ground connection point shown in Figure 30: Grounding Lug Connectors (Chassis Ground Connection Point) , on page 41, using the supplied grounding screws.

Note Tighten the grounding screws to 10 to 12 foot-pounds of torque. Do not overtightened!

Step 3 If necessary, strip the other end of the ground wire and connect it to a reliable earth ground, such as a grounding rod or an appropriate grounding point on a pole that is grounded.

Figure 30: Grounding Lug Connectors (Chassis Ground Connection Point)

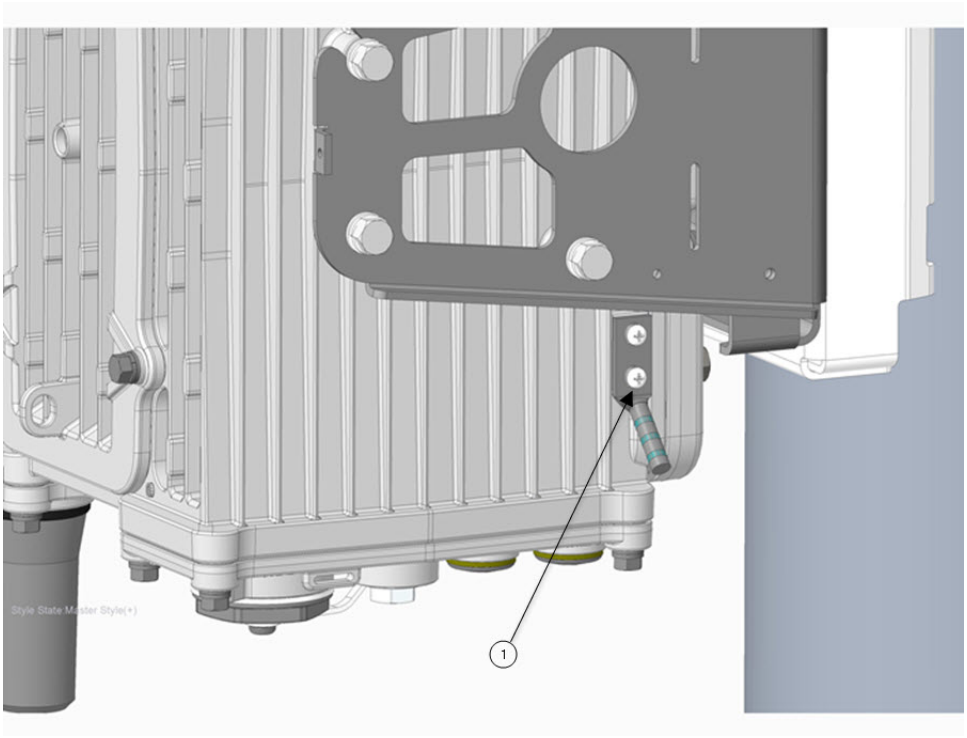
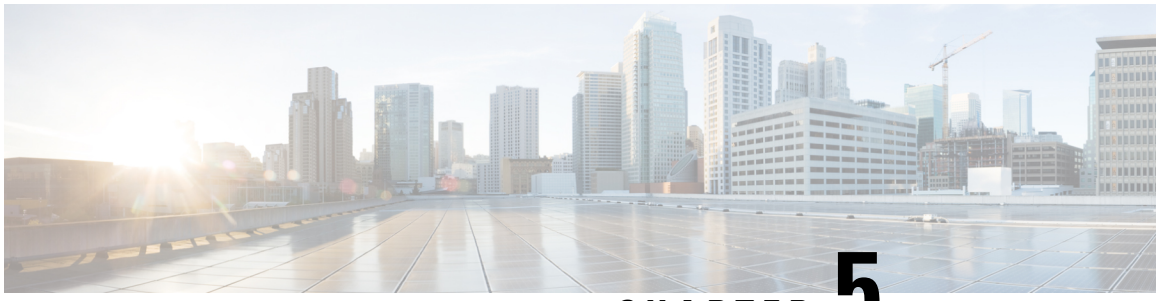


Table 7: Ground Lug and Screws

Item Number	Description
1	Ground lug and screws (qty of 2) and 6-gauge ground wire



CHAPTER 5

Installing Universal Interface Modules (UIMs)

This section discusses how the Cisco Catalyst Industrial Router 8140 Heavy Duty Series Router (IR8140H router) supports up to three Universal Interface Modules (UIMs) that enable Neighborhood Area Network (NAN) connections from the router to field devices such as meters and Intelligent Electronic Devices (IEDs), and from the router to the central utility station or data management center.

These topics are discussed:

Installing or Replacing Modules

The router supports up to three Universal Interface Modules (UIMs). Depending on the configuration, your router could arrive in the shipping container with all required modules already installed. However, you might need to install a module when you:

- Add modules to your current installation.
- Replace a faulty module.

Installing Modules in the Router

This section provides general instructions for installing modules in the router.

Preparing to Install Modules

Before installing modules in the router, ensure that the following guidelines have been met:

- Verify that there is adequate airflow around the router. See Installation Safety and Site Preparation, on page 19.
- Make sure the router is powered off.
- When modules are installed in a closed assembly (such as inside the router), the temperature around it might be higher than normal room temperature.
- The installation environment humidity must not exceed 95% (non-condensing).

- The installation site altitude must be no higher than 10,000 feet.

Installation Warning Statements

This section includes the installation warning statements. Translations of these warning statements appear in the Regulatory Compliance and Safety Information for Cisco Catalyst Industrial Router 8140 Heavy Duty Series Router documents on Cisco.com, at:

https://www.cisco.com/c/en/us/support/routers/catalyst-ir8100-heavy-duty-series-routers/series.html

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

Warning To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 158°F (70°C). Statement 1047

Warning To prevent airflow restriction, allow clearance around the router of 6" on vertical sides and 12" above and below.

Installing and Removing Modules

This section provides general module installation steps (for the offline case), and refers to additional documentation for detailed information.

Tools and Materials You Supply

You must provide the following tool to install and remove modules:

- 10mm socket driver

Supported Modules

The following table shows the Universal Interface Modules (UIMs) supported on IR8140H. For supported antennas of each module, see Antenna Selection and Installation, on page 51.

Module Type	Module PID	Description
Cellular modules (LTE/5G)	IRMH-LTE-MNA	Multi-carrier band-14 CAT4 LTE Module for North America
	IRMH-LTE-MNA-900	Multi-carrier band-14 CAT4 LTE Module for North America with 900MHz WPAN co-existence filter
	IRMH-LTEA-EA	CAT6 LTE Advanced Module for Europe and North America
	IRMH-LTEA-EA-900	CAT6 LTE Advanced Module for Europe and North America with 900MHz WPAN co-existence filter
	IRMH-LTEA-LA	CAT6 LTE Advanced Module for APAC, LATAM and ANZ
	IRMH-LTEAP18-GL	CAT18 LTE Advanced PRO Module for ALL Global Regions
WPAN modules	IRMH-WPAN-NA	IEEE 802.15.4e/g 900MHz WPAN Module for North America
	IRMH-WPAN-BRZ	IEEE 802.15.4e/g 900MHz WPAN Module for Brazil

Module Installation Locations

To ensure support for all module types and allow convenient cabling, Cisco recommends the following installation location guidelines:

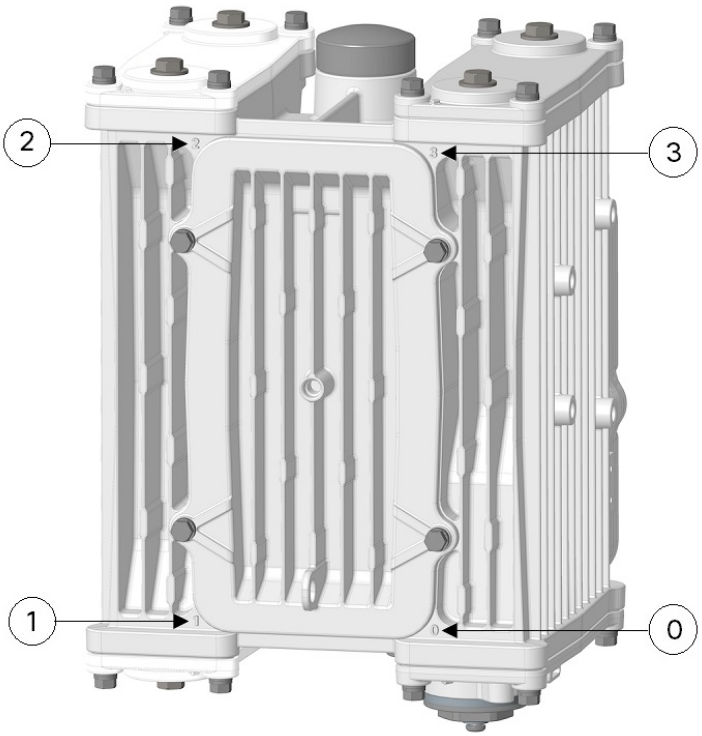
- Universal Interface Modules (UIMs) and module slot compatibility are listed in Table 8: UIM Locations in the IR8140H Router, on page 45 and illustrated in Figure 31: Module Slot Identifiers, on page 46.
- Module antenna installation procedures are illustrated in Attaching an Antenna to IR8140H, on page 53.

Table 8: UIM Locations in the IR8140H Router

UIM Type	Installation Slot
WPAN module	Slot 1
Cellular modules (LTE/5G)	Slot 2 or 3

The following figure shows the slot identifier on the router chassis.

Figure 31: Module Slot Identifiers



0	Slot identifier 0 (CPU/Supervisor module slot)	2	Slot identifier 2 (UIM slot)
1	Slot identifier 1 (UIM slot)	3	Slot identifier 3 (UIM slot)

Note For a deployment with both WPAN module and LTE/5G module, you must choose IRMH-LTEA-EA-900 or IRMH-LTE-MNA-900 (with 900MHz WPAN co-existence filter) as the LTE/5G module. It is recommended that you install the LTE/5G module in UIM slot 3 when the WPAN module is installed in slot 1. This is applicable when using the antenna ANT-5G-MP-OUT-N on both WPAN and LTE modules.

For increased isolation and better WPAN/LTE performance, you can choose 10ft cables and either ANT-5G-OMNI-OUT-N or any of the available multi-element antenna solutions (for example, ANT-4-5G4-O). For more information, see Antenna Selection and Installation, on page 51.

Installing a Module in the Router

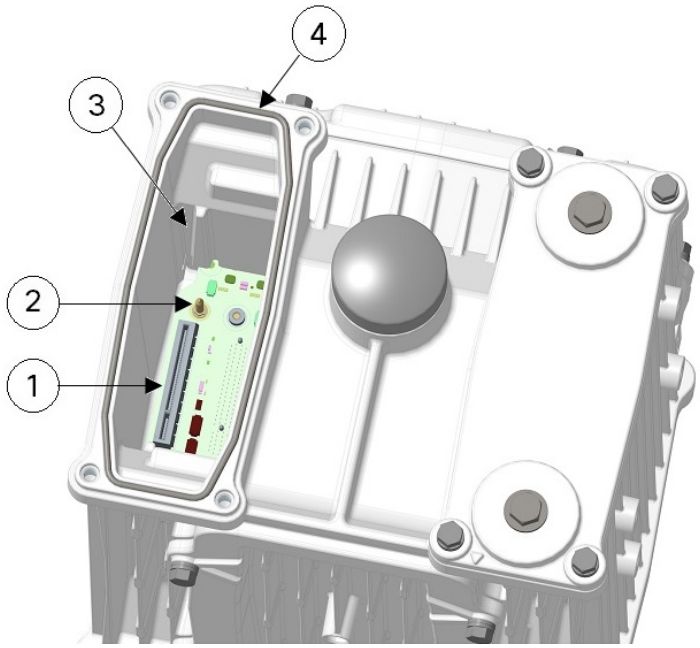
Note This is a general installation procedure for installing modules in the chassis of the router. For hardware installation and software configuration steps that are specific to your module, see the installation and configuration guide for the module.

To install a module in an available slot of the router:

Step 1 Disable any installed battery backup units, and disconnect the router from AC power.

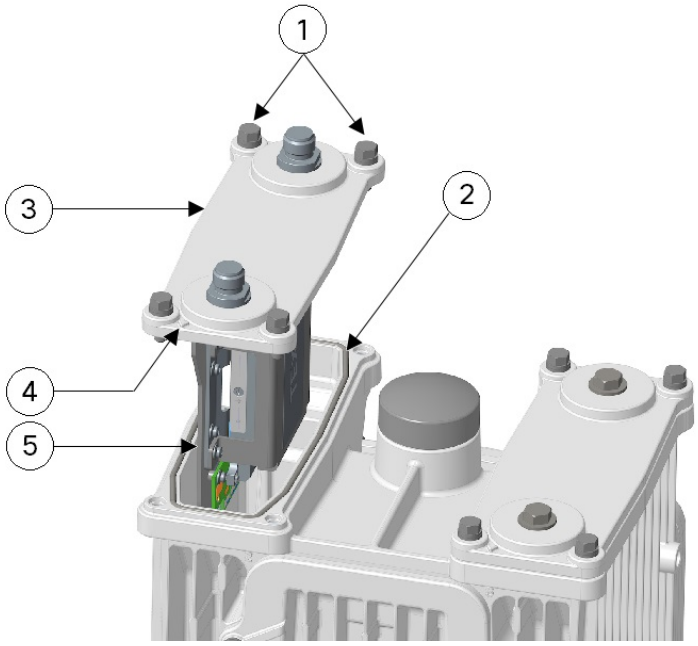
Step 2 If there is a blank or module in applicable slot, go to Removing a Module or a Blank from the Router, on page 49.

Step 3 Ensure that gasket is fully contained in groove and all debris is removed from gasket surface.



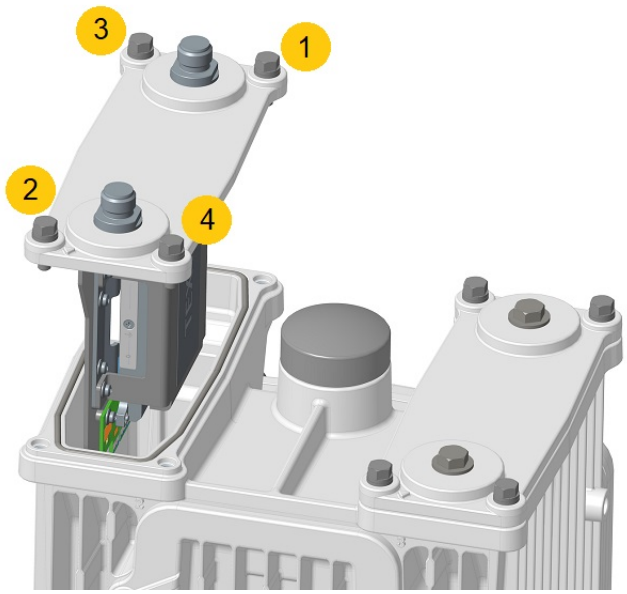
1	UIM interface connector	3	Chassis guide slot
2	Guide pin	4	Gasket

Step 4 Align the module orientation indicator with the front of chassis. Align carrier edge with chassis guides and fully insert module into the slot.



1	M6 bolts	2	Gasket
3	Module	4	Module orientation indicator
5	Align carrier edge with chassis guides		

Step 5 Use 10mm socket driver and tighten four bolts to 15-20 in-lbs in sequence as shown in the following figure.



Step 6 Attach any RF cables or antennas to N-connectors on UIM if applicable.

Step 7 Connect the router to the AC power and to the network.

Step 8 Re-enable the BBU using the CLIs as described in the Cisco Catalyst IR8140 Heavy Duty Series Router Software Configuration Guide.

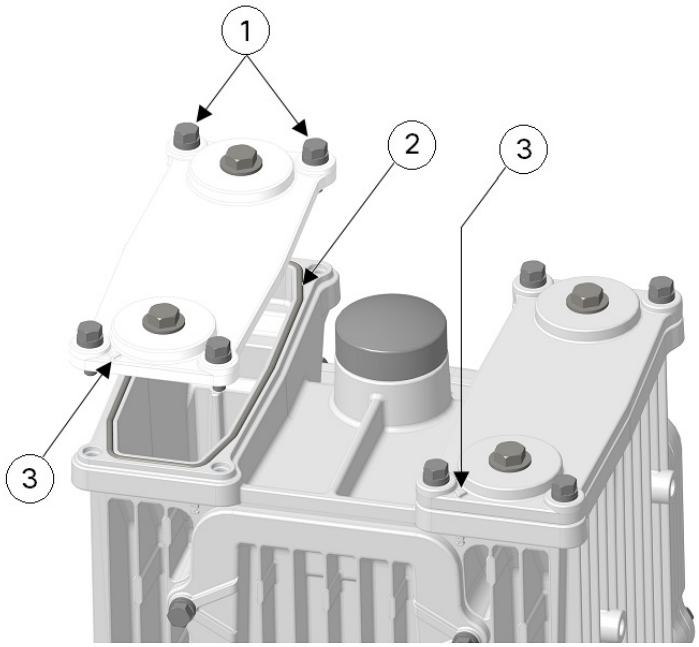
Removing a Module or a Blank from the Router

To remove a module from the router:

Step 1 Disable any installed battery backup units, and disconnect the router from AC power.

Step 2 Remove any cables attached to the UIM.

Step 3 Fully loosen four M6 bolts on UIM or UIM blank with 10mm socket driver (do not remove bolts from the faceplate).



1	M6 bolts
2	Gasket
3	Module orientation indicator

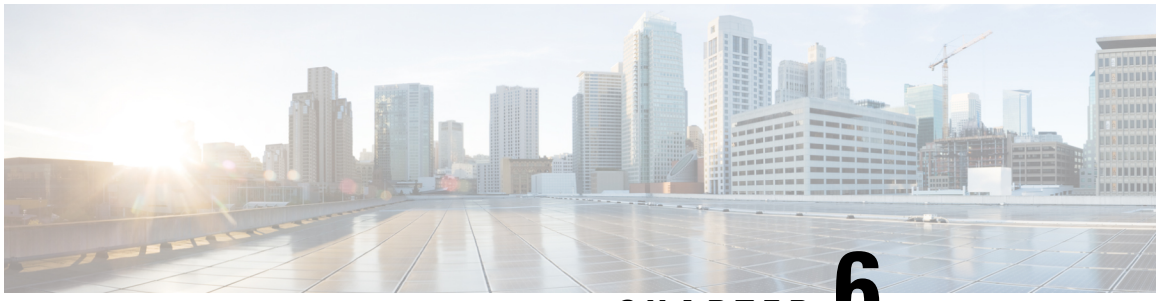
Step 4 Use your hands to gently pull the module or blank from the router.

Step 5 Ensure that gasket is fully contained in groove and all debris is removed from gasket surface.

Step 6 Do not leave slot open and unattended. Install a new module or a blank as prescribed in Installing a Module in the Router, on page 46.

Step 7 Connect the router to AC power and to the network.

Step 8 Re-enable the BBU using the CLIs as described in the Cisco Catalyst IR8140 Heavy Duty Series Router Software Configuration Guide.



CHAPTER 6

Antenna Selection and Installation

These topics are discussed:

Overview

Note Before you install the Cisco Catalyst IR8140 Heavy Duty Series Router on a vertical pole or streetlight, install the antennas on the UIM module. It is difficult to install the antennas after the router is installed.

The following section contains information for selecting antennas on the IR8140H router.

The IRMH-LTE or IRMH-LTEA cellular modules have two RF N-type (f) connectors on the UIM module, Main and Div (diversity), which are used to connect to the 5G/LTE modem. The Diversity port may also be referred to as an Aux connector.

The IRMH-LTEAP18-GL module has four RF N-type (f) connectors. There are two pairs of main and diversity connectors used to connect to such modems.

Antenna Installation Best Practices

The optimal site location for antennas in 4G/5G routers and cellular modules plays a significant role in determining overall cellular link performance. Routers located at the farthest coverage points might have 10 to 50 percent of the bandwidth available compared to routers located closer to the cellular base station tower, away from obstructions, and with an unobstructed view of the cellular tower.

Because antennas transmit and receive radio signals over the air, the signal propagation and antenna performance may be adversely affected by the surrounding environment, including physical obstructions. Radio frequency (RF) interference may also occur between wireless systems located close to each other, especially if the antennas of these systems are likewise in close proximity. Interference may also occur when the antenna is in close proximity to cable clutter or other sources of radio interference.

Follow these guidelines to ensure the best possible performance:

- Keep antennas away from electrical and signal cable clutter. Metal conductors inside cables may block antenna view of the base station. Additionally, unshielded (and even shielded cables in some cases) may radiate signals that interfere with RF signal reception.
- It is recommended that all cellular antennas for the IR8140H are oriented vertically to ensure polarization match. While polarization of the signal may change as it is reflected from obstructions, when the view is unobstructed - vertical polarization is optimal.
- For a deployment with both WPAN module and LTE/5G module, you must choose IRMH-LTEA-EA-900 or IRMH-LTE-MNA-900 (with 900MHz WPAN co-existence filter) as the LTE/5G module. It is recommended that you install the LTE/5G module in UIM slot 3 when the WPAN module is installed in slot 1. For module slot locations, see Module Installation Locations, on page 45. This is applicable when using the antenna ANT-5G-MP-OUT-N on both WPAN and LTE modules.

  For increased isolation and better WPAN/LTE performance, you can choose 10ft cables and either ANT-5G-OMNI-OUT-N or any of the available multi-element antenna solutions (for example, ANT-4-5G4-O).
- For optimal MIMO performance, space cellular Main and Aux antennas apart by at least 17 inches (43 cm). At the lowest LTE frequency of 700 MHz, 17 inches represents 1 wavelength. Spacing of half (or 0.5) wavelength or 8.5 inch (22.5cm) results in good MIMO performance.
- Spacing Main and Aux LTE antennas less than 8.5 inches may result in significantly reduced MIMO performance.
- Spacing antennas too close to each other (e.g. 3 inches) results in antennas significantly detuning from their original designed performance due to increased antenna coupling.
- Wherever possible, mount the IR8140H router with the UIM module and antenna where the cellular base station or tower are within sight and without physical obstructions. Barriers along the line of sight between the router and the local base station will degrade the wireless radio signals. Install the IR8140H, UIM modules and antennas above floor level in office environments or near the ceiling for better performance because most obstructions tend to be near the floor level.
- The density of the materials used in a building's construction determines the number of walls the signal must pass through while still maintaining adequate coverage. Consider the following before choosing the location for installing the antenna:
  - Paper and vinyl walls have very little effect on signal penetration.
  - Solid and precast concrete walls limit signal penetration to one or two walls without degradation of coverage.
  - Concrete and wood block walls limit signal penetration to three or four walls.
  - A signal can penetrate five or six walls constructed of drywall or wood.
  - A thick metal wall or wire-mesh stucco wall causes signals to reflect back and causes poor penetration.
- Avoid mounting the antenna next to a column or vertical support that could create a shadow zone and reduce the coverage area.

- Keep the antenna away from reflective metal objects such as heating and air-conditioning ducts, large ceiling trusses, building superstructures, and major power cabling runs. If necessary, use an extension cable to relocate the antenna away from these obstructions.

This radio transmitter [IC : 2461N-CGMOFDM] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

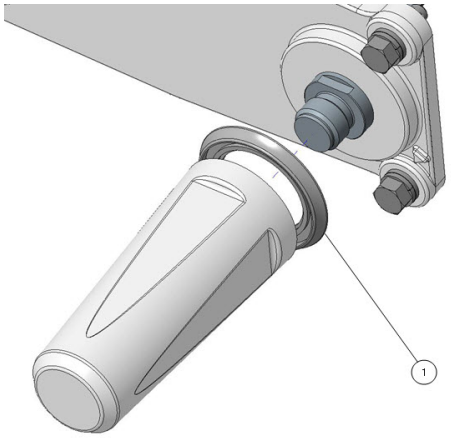
Le présent émetteur radio [IC: 2461N-CGMOFDM] a été approuvé par Innovation, Sciences et Développemen économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

Attaching an Antenna to IR8140H

The following figure illustrates how to attach the antenna ANT-5G-MP-OUT-N to IR8140H.

Be sure to attach the black gasket labeled (1) in the following figure to the antenna before attaching the antenna to the router. Use a torque of 4-4.5 ft-lbs to attach the antenna to the IR8140H.

Figure 32: Attaching Gasket to Antenna



Supported Antennas for the IR8140H

Refer to the following tables for supported antennas.

Supported Antennas for Universal Interface Modules (UIMs)

UIM	Module PIDs	Antenna Selection Single Port PID
LTE Advanced (3GPP Category 4) modules	IRMH-LTE-MNA IRMH-LTE-MNA-900[1]	2 x LTE (5G) antennas ANT-5G-OMNI-OUT-N[2] ANT-5G-MP-OUT-N
LTE Advanced (3GPP Category 6)	IRMH-LTEA-EA IRMH-LTEA-EA-900[1] IRMH-LTEA-LA	2 x LTE (5G) antennas ANT-5G-OMNI-OUT-N[2] ANT-5G-MP-OUT-N
LTE CAT18	IRMH-LTEAP18-GL	4 x LTE (4G/5G) antennas: [3] ANT-5G-OMNI-OUT-N ANT-5G-MP-OUT-N Or 1x 4-in-1 multi-element antenna: ANT-4-5G4-O

1 IRMH-LTE-MNA-900 and IRMH-LTEA-EA-900 modules are deployed only when using WPAN and LTE.
2 ANT-5G-OMNI-OUT-N needs an extension cable.
3 Use two of each of these antennas to maintain proper spatial separation and proper MIMO operation.

Supported Antennas for WPAN Modules

WPAN Module	Module PIDs	Antenna Selection Single Port PID
IEEE 802.15.4g WPAN (OFDM/FSK)	IRMH-WPAN-NA IRMH-WPAN-BRZ	ANT-5G-OMNI-OUT-N[4] ANT-WPAN-OD-OUT-N[5] ANT-5G-MP-OUT-N ANT-LPWA-DB-O-N-5[6]

4 ANT-5G-OMNI-OUT-N needs an extension cable.
5 For use with WPAN Australia and New Zealand
6 ANT-LPWA-DB-O-N-5 needs an extension cable.

Outdoor Antennas

Antenna	PIDs	Antenna Specifications
Mast-Mounted/Outdoor 4G/5G-FR1	ANT-5G-OMNI-OUT-N	Antenna Type: Dipole Frequency Band: 617-960 MHz 1448-1511 MHz 1695-2690 MHz 3300-4200 MHz 5150-7125 MHz Connector: N-type (f)
Integrated/Multipurpose 4G/5G-FR1	ANT-5G-MP-OUT-N	Antenna Type: Monopole Frequency Band: 617-960 MHz 1710-5925 MHz Connector: N-type (m)
Outdoor/Vertical	ANT-WPAN-OD-OUT-N	Antenna Type: Dipole Frequency Band: 863-928 MHz Connector: N-type (f)
Outdoor/Vertical	ANT-LPWA-DB-O-N-5	Antenna Type: Dipole Frequency Band: 863-928 MHz Connector: N-type (f)
4-in-1 (LTE) Outdoor/Vertical	ANT-4-5G4-O	Antenna Type: Multi-Element Frequency Band: 617-960 MHz 1710-5925 MHz Connector: 4xN-type (m) with 10ft low-loss cables

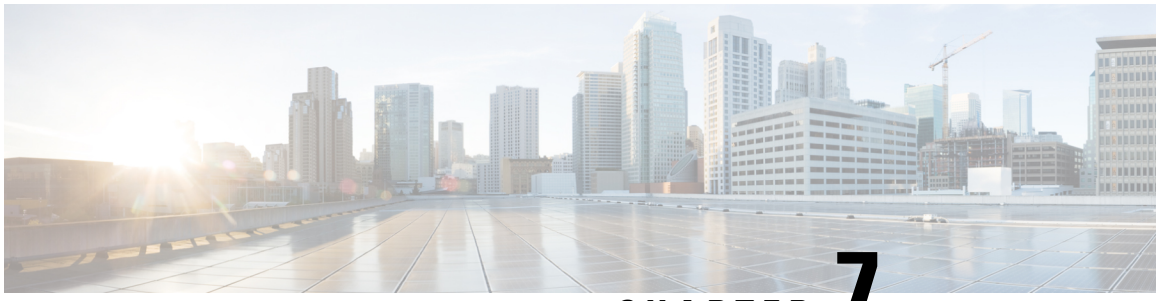
Supported Antenna Cables and Lightning Arrestors for IR8140H

You can choose the N(m) to N(m) RF cables from the following table to use with the antennas which require extension cables. For more supported cables, refer to Cisco Industrial Routers and Industrial Wireless Access Points Antenna Guide.

Antenna PIDs	Extension Cable(s) PID	Cable Description	RF Loss
ANT-5G-OMNI-OUT-N ANT-LPWA-DB-O-N-5	CAB-L400-5-N-NS	N(m)-STR to N(m)-STR LMR-400, 5 foot RF cable Type: outdoor DB (direct burial)	0.2dB @ 0.7 GHz 0.3dB @ 1.0 GHz 0.4dB @ 1.7 GHz 0.5dB @ 2.4 GHz 0.8dB @ 5.8 GHz
	AIR-CAB010LL-N	N(m)-STR to N(m)-RA LMR-400, 10 foot RF cable Type: outdoor DB (direct burial)	0.4dB @ 0.7 GHz 0.5dB @ 1.0 GHz 0.7dB @ 1.7 GHz 0.9dB @ 2.4 GHz 1.5dB @ 5.8 GHz
	CAB-L400-20-N-N	N(m)-STR to N(m)-RA LMR-400, 20 foot RF cable Type: outdoor DB (direct burial)	0.8dB @ 0.7 GHz 1.0dB @ 1.0 GHz 1.3dB @ 1.7 GHz 1.6dB @ 2.4 GHz 2.5dB @ 5.8 GHz

The following table shows the supported lightning arrestor for IR8140H:

Lightning Arrestor PID	Connectors Type	Arrestor Type and Frequency Range (MHz)
IOT-LA-NM-NF	N(m)-STR to N(f)-STR	DC to 6000 MHz GDT type



CHAPTER 7

Connecting the Router

This section presents installation instructions for the Cisco Catalyst Industrial Router 8140 Heavy Duty Series Router (IR8140H or router). The procedures you follow depend on your network environment and requirements.

These topics are discussed:

Before Installing

Read the safety warnings in this section and Installation Safety and Site Preparation before beginning the installation procedures.

Prepare the Installation Site

These procedures assume that the installation site is prepared according to the information in Installation Safety and Site Preparation, on page 19.

Preventing Electrostatic Discharge Damage

Many of the these components are sensitive to electrostatic discharge (ESD) damage, which can occur when electronic cards or components are handled improperly, results in complete or intermittent failures.

To prevent ESD damage, follow these guidelines:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.

- Place any removed memory card on an antistatic surface or in a static shielding bag. If the card will be returned to the factory, immediately place it in a static shielding bag.
- Avoid contact between the card and clothing. The wrist strap protects the card from ESD voltages on the body only; ESD voltages on clothing can still cause damage.
- Do not remove the wrist strap until the installation is complete.

Cabling Guidelines

Follow these guidelines for using cables with the router:

- Position cables so that they do not place strain on the router connectors.
- Organize cables into bundles when necessary to avoid intertwining.

  Inspect cables to ensure adequate routing and bend radius.
- Install cable ties that comply with your site requirements.

Connecting to AC Power

When connecting the router to AC power, you must ensure that the following conditions are met:

- AC power can be readily and conveniently removed from the router. The power should not be removed by disconnecting the AC power connector on the unit. It should be removed by disabling AC power at the power circuit.

Warning The plug-socket combination must be accessible at all times, because it serves as the main disconnecting device. Statement 1019

Caution Before connecting or disconnecting the power cord, remove AC power from the power cord using a suitable service disconnect.

- Protect AC power plugs and AC receptacles from water and other outdoor elements. You can use a UL-listed waterproofing enclosure suitable for covering the AC receptacle and AC power plug that supplies power to the unit, as described in Article 406 of the National Electric Code (NEC).
- When you install the unit outdoors, or in a wet or damp location, the AC branch circuit that powers the unit should have ground fault protection (GFCI), as required by Article 210 of the NEC.
- If the power cord goes through a metal cover, a bushing should be installed to prevent fraying of the cord. When using a strain relief bushing, you should follow these recommendations:
  - Use properly sized parts
  - Use bushings that are safety certified
  - Use parts that are suitable for outdoor installation

- Ensure that the user-supplied AC power plug is certified for outdoor use and has a minimum IP67 rating.

The topics in this section include:

AC Power Cable

The router supports the Cisco AC power cable that is shipped with the unit. One end of the cable has the router AC power connector; the other end is unfinished and you must provide and attach an AC power plug, or terminate the cable at your installation site. The AC power plug or termination method you use depends on the power source, such as a junction box, at your site.

If you attach an AC power plug:

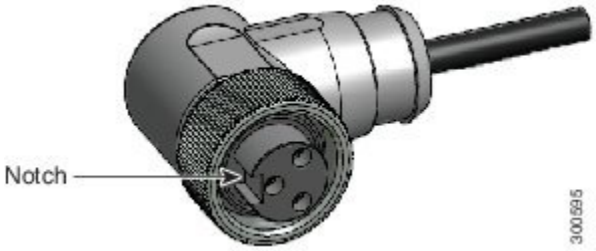
- Use a plug that complies with local and national electrical codes.
- Verify the connection between the cable and plug is weatherproof.

You might have to cut the cable if a specific cable length is needed for your installation.

Caution Ensure that the power source is OFF before connecting or disconnecting the power cord wires from the power source.

Caution To attach the appropriate connector the AC power cable, follow the manual or other instructions provided by the electrical equipment vendor, ensuring that you comply with the electrical codes for your installation location.

Figure 33: Router AC Power Cable (Router Connector End)



Connecting to AC Power

To connect the router AC connector to an AC power source:

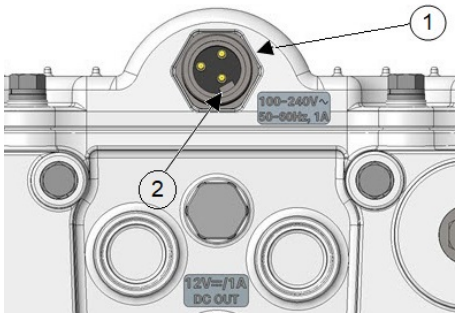
Note When connecting the router AC power connector, always connect the router end of the cable first. When removing the AC power connector, always disconnect the router end of the cable last.

Step 1 Verify that the unit is grounded as described in Grounding Instructions.

Step 2 Turn off power to the AC power source at the designated circuits.

Step 3 Align the notch in the AC power cable connector with the key in the router AC power connector, then push the cable connector into the router connector. When the cable connector is fully seated, rotate the cable connector ring clockwise until hand-tight.

Figure 34: Router AC Connector and AC Connector Key



1	AC power connector	2	AC connector key

Step 4 Confirm the router antennas are connected to the router before you apply power to the router.

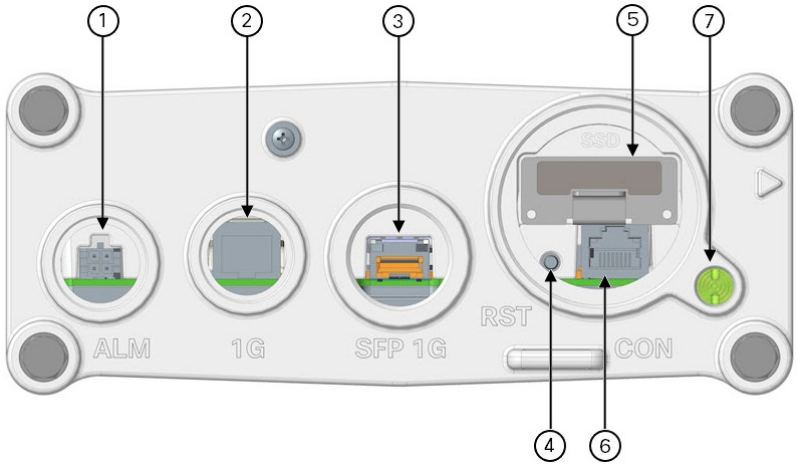
Step 5 Connect the other end of the AC power cable to the power source, using the instructions that came with the connecting device.

Step 6 Turn on AC power at the designated circuits. The router powers on and boots the software image.

Reset Button

There is a reset button on the CPU module. See the following figure for reset button location.

Figure 35: CPU Module Components



Item no	Item	Description
1	ALM	Alarm port with Micro-fit 4P connector with cable port seal.
2	1G	10/100/1000 Mbps Ethernet port
3	SFP 1G	SFP One Gigabit Ethernet
4	RST	Reset Button
5	SSD	SSD module (optional)
6	CON	Console port (accessible when plug is removed)
7	LED	SYS LED

Caution When you use the Reset button to restore the router to the factory default software configuration, the current software configuration is permanently deleted from the router.

The Reset button is used to reset the software configuration to factory default. It is not used to power the router on and off; the router powers on immediately when it is connected to an AC power source.

The Reset button must be pressed and held for at least 5 seconds to return the router to factory default. If the router is equipped with BBU, you must either disable BBU charge-discharge or enable BBU transportation mode prior to removing AC power in order to fully power down the router, then you can press and hold the Factory Reset button, and power it up with AC power.

Accessing the Button

You must provide a non-metallic pin or other thin metal tool no larger than 3/16 inches in diameter to access and press the reset button.

Checking the System (SYS) LED

To verify that the router has been successfully installed, check the System (SYS) LED on the router base. As the router starts up, the SYS LED will show these states:

Table 9: System (SYS) LED

State	Description
Off	System is not powered on.
Blinking green	System is in boot up phase or in Rommon.
Solid green	System is operating normally.

State	Description
Solid yellow	System receiving power but there is an internal error. For example, interface is administratively unshut but is down due to cable disconnection.

Additional Router Connections

This section provides information about making other, additional router cable connections. Follow the procedures in this section based on your network configuration and requirements. This section contains these procedures:

External Connections and Chassis Cable Ports

When connecting the router internal ports to external cables or exterior devices, you must thread the router cables through the chassis cable ports designated for this purpose. Some chassis ports are reserved for specific cables and remaining ports can be used based on your network configuration and cabling requirements.

Caution When you make router cable connections through the ports, you must use cable glands as described in Using Cable Glands, to protect the router interior from environmental elements, including moisture, heat, cold, and dust. Failure to use cable glands with the chassis cable ports can result in damage to the router.

Note We recommend that you cover the ports mentioned in this section with a PG 13.5 plug when they are not in use. Ensure that you torque the PG 13.5 plug to 10-12 in-lbs.

Using Cable Glands

This section describes how to use cable glands with router cables that are threaded through the chassis cable ports described in External Connections and Chassis Cable Ports.

Caution The cable glands must be used for all cables that are threaded through the router chassis cable ports to prevent exposing the router interior to environmental elements.

Ordering Cisco Cable Glands

You can order a cable gland kit from Cisco using the model number IR-IP67GLAND. Each kit contains one cable gland.

Tools You Supply

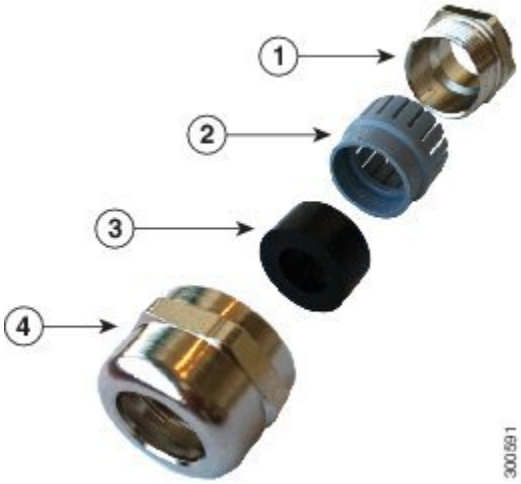
You must supply:

- #3 Phillips screwdriver to remove port seals from the router
- Adjustable wrench that spans to 1 3/8" (for SFP Extender and M42 Plug)
- 5/8" 6 Pt socket driver (for SFP Plug)
- 15/16-inch (24 mm) open-end wrench

Cable Glands Description

Figure 36: Cable Glands, Assembled

Figure 37: Cable Gland Components



Item	Name	Description
1	adapter	Connects directly to the chassis cable port on the router.
2	Grommet	Secures the split gasket over the cable.
3	Split gasket	Fits over the cable and creates an liquid-tight seal inside the glands.
4	Cap	Fits over gasket-and-cable assembly and connects it to the chassis cable port.

Cable Requirements

Cables used with the cable glands should meet the following criteria:

- Outdoor-rated

- UV-stabilized
- Diameter of 0.20-0.35 inches (5.08-8.89 mm)

Caution Cables must be a minimum of 0.20 in. in diameter to create an adequate seal within the cable glands. Using smaller cables could result in an inadequate seal and therefore expose the router interior to environmental elements.

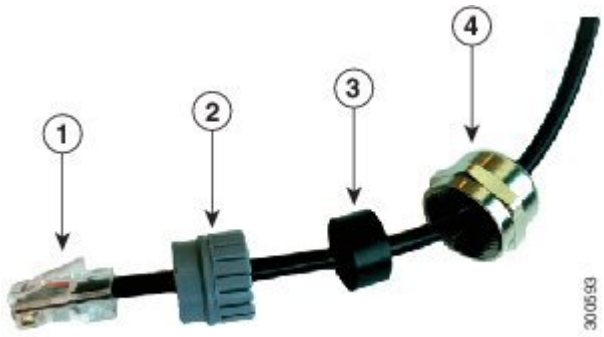
Cable Glands Installation Steps

Follow these steps for every cable that you will connect through the chassis cable ports on the router. Step 4 and Step 5 can be done ahead of time and the prepared cable gland assembly can be transported to the router installation site.

The cable glands components referred to in this section are shown in Figure 37: Cable Gland Components, on page 63.

Note The following figure shows an Ethernet cable but the steps are the same for all cable types.

Figure 38: Cable Glands Components Threaded on Cable



1	Cable connector (to router)	3	Split gasket
2	Grommet	4	Cap

Step 1 Verify the cable you are using meets the requirements described in Cable Requirements, on page 63.

Step 2 Remove the port plug from the port on the router. Use the #3 Phillips screwdriver if needed.

The router is shipped with ports plugs in unused ports.

Step 3 Use your hands to attach the cable glands adapter (item 1 in Figure 37: Cable Gland Components, on page 63) into the chassis cable port on the router.

Step 4 Thread the following cable glands components over the cable in this order (Figure 38: Cable Glands Components Threaded on Cable, on page 64).

- Cap
- Split gasket
- Grommet

Step 5 Slide the split gasket along the cable and into the grommet, pressing firmly to ensure the gasket is completely seated in the grommet.

Step 6 Thread the connector-end of the cable through the router port and insert it into the corresponding router connector.

Step 7 Align and press the grommet-gasket assembly into the adapter.

Step 8 Slide the cap along the cable, over the grommet, and then onto the adapter.

Step 9 Hand-tighten the cap, and then use the open-end wrench to tighten it until the split gasket seals around the cable (6 to 7 foot-pounds of torque). There should be 5-10 pounds of cable pull support.

Connecting the Console Port

See Figure 35: CPU Module Components, on page 60 for the console port location.

To configure the router through the Cisco IOS command-line interface (CLI), you must establish a connection between the router console port and either a terminal or a PC with a terminal emulation program such as PuTTY or TeraTerm.. The console port is located on the router exterior and is labeled CON.

Use this port to connect a PC terminal, enabling you to log directly into the router system software to perform configuration or other commands.

⚠

Caution The console port does not support cable glands. When a cable is connected to this port, the router interior is exposed to environmental elements, which can damage the port and the router interior. This port should be exposed only during terminal sessions, when a cable is connected to the port. This port should never be left unattended when in use. When not in use, cover the console port with a M42 plug that is attached to the CPU module. Ensure that you torque the M42 plug to 13-15 in-lbs.

Connecting

This section describes how to connect a PC terminal to the console port.

Your router kit includes a console cable with an RJ-45 connector on one end, and a DB-9 connector on the other end.

- When a terminal is connected to the console port, you can connect directly to the router and configure it. You can connect a PC terminal to this port while the router is operating normally.
- To connect a PC terminal to the router, you must provide one of the following adapters, depending on the device port: RJ-45-to-DB-25 female DTE adapter, RJ-45-to-DB-9 female DTE adapter (labeled TERMINAL), or USB-to-DB-9 adapter.
- To remove the RJ-45 cable from the console port, compress the retention latch on the RJ-45 connector while removing the cable from the port. Use any small, flat, non-metallic tool to press the latch while pulling the cable from the port.

To connect a PC or PC terminal to the console port:

Step 1 Connect the RJ-45 connector on the console cable to the console port on the router.

Step 2 If your device requires a DB-9 adapter, connect the adapter you provide to the DB-9 connector on the cable.

Step 3 Connect the adapter-end or DB-9 connector-end of the console cable to your terminal or PC.

Note A typical connection to a PC is through the PC's USB port. A DB-9 to USB adapter is required for that case if you use the included Cisco console cable. Alternately, RJ45-to-USB Cisco Router Console cables do exist, that would not require an additional adapter.

Connecting the SFP Port

See Figure 35: CPU Module Components, on page 60 for the SFP port locations.

Small Form-Factor Pluggable (SFP) modules are transceiver devices that plug into the router SFP port. The transceiver connects the electrical circuitry of the module with the optical network.

The SFP module used on each port must match the wavelength specifications on the other end of the cable, and the cable must not exceed the stipulated cable length for reliable communications.

Use only Cisco SFP transceiver modules with the router. Each SFP transceiver module supports the Cisco Quality Identification (ID) feature which allows a Cisco switch or router to identify and validate that the transceiver module is certified and tested by Cisco.

Warning Class 1 laser product. Statement 1008

Caution Do not remove the dust plugs from the fiber-optic SFP module port or the rubber caps from the fiber-optic cable until you are ready to connect the cable. The plugs and caps protect the SFP module ports and cables from contamination and ambient light.

Caution We recommend that you not install or remove the SFP module while the fiber-optic cable is attached to it because of the potential damage to the cables, to the cable connector, or to the optical interfaces in the SFP module. Disconnect the cable before you remove or install an SFP module.

Materials and Tools You Supply

You must provide these tools and materials to install the SFP transceiver module:

- Tools listed in Tools You Supply, on page 62.
- Wrist strap or other personal grounding device to prevent ESD occurrences.

- Antistatic mat or antistatic foam to set the transceiver on.
- Fiber-optic end-face cleaning tools and inspection equipment. For complete information on inspecting and cleaning fiber-optic connections, see the white-paper document at this URL:

  http://www.cisco.com/en/US/tech/tk482/tk876/technologies_white_paper09186a0080254eba.shtml

Connecting a Fiber-optic Cable to the Router

The Cisco Fiber Kit is required to support fiber-optic network connections.

Your require the following materials for connecting the fiber-optic cable to the router:

- Small form-factor pluggable (SFP) transceiver module
- SFP module adapter
- Duplex LC fiber-optic cables. The outer diameter of the fiber optic cable should be 0.24-0.47 inches (6-12 mm).
- Adjustable wrench that adjusts to 1 1/8" minimum

You can connect the fiber-optic networking cable to the SFP port. The small form-factor pluggable (SFP) transceiver module is used to connect the cable to the SFP port. To install the SFP transceiver module and the cable, follow this procedure:

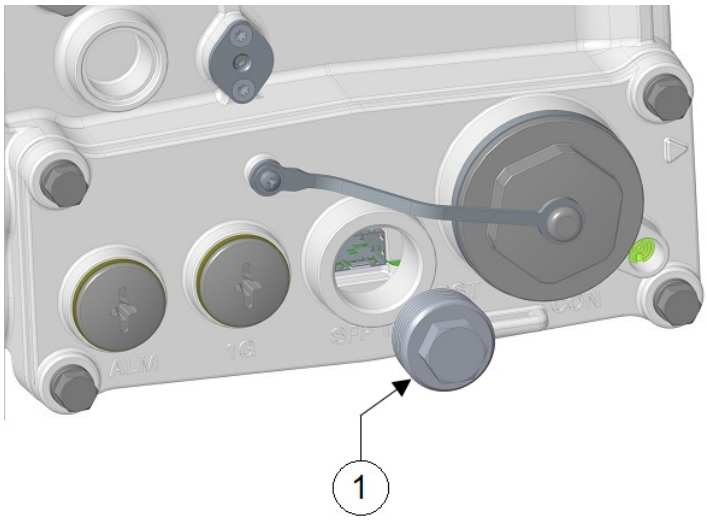
Step 1 Ensure that all power sources have been disconnected from the router.

Step 2 Remove the ¾ NPT covering plug (see **1** of the following figure) from the SFP port by following the guidelines given in this step.

The SFP port covering plug is designed to be removed only once, and then be replaced with the SFP adapter. The plug does not have a rubber O-ring, but is fixed in place using a thread seal tape on the threads during manufacturing. While removing the plug, you need to ensure that its hex bolt-head does not get stripped.

Use a 5/8” (16 mm) 6-point socket wrench to loosen the hex bolt-head SFP port plug. Firmly and carefully, turn the socket wrench counter-clockwise to loosen the plug. This requires a torque of 25 ft-lb (34 Nm).

Though not ideal, a 5/8” (16 mm) 12-point socket wrench can be used too. A crescent wrench is to be used only if the socket wrenches are not available. Do not use a pipe or monkey wrench for this task, as it will strip the hex bolt-head.



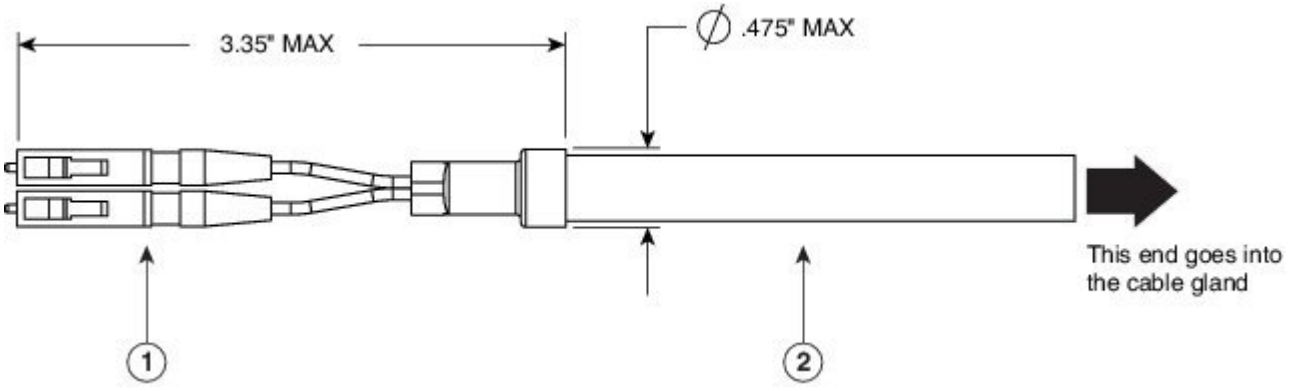
Step 3 Insert the SFP module into the SFP port, and ensure that it latches properly. See Figure 40: Exploded View of Connecting Fiber-Optic Cable to the Router, on page 69 for assembly detail.

Step 4 Loosen the cable gland's nut (round end of the cable gland) by turning counterclockwise, but do not remove.

Step 5 Feed terminated fiber cable through gland and adapter as shown in the following figures.

Note The optic fiber connectors are too big to pass through the cable gland. That is the reason why you need to thread the cable through the gland from the unterminated end (even if the cable is quite long).

Figure 39: Duplex LC Fiber Optic Cable



1	Duplex LC optic fiber connector	2	Optic fiber cable

Step 6 Insert the LC optic fiber connector-end of the cable, into the SFP module adapter. Do not attach the cable gland to the adapter yet. See the following figure.

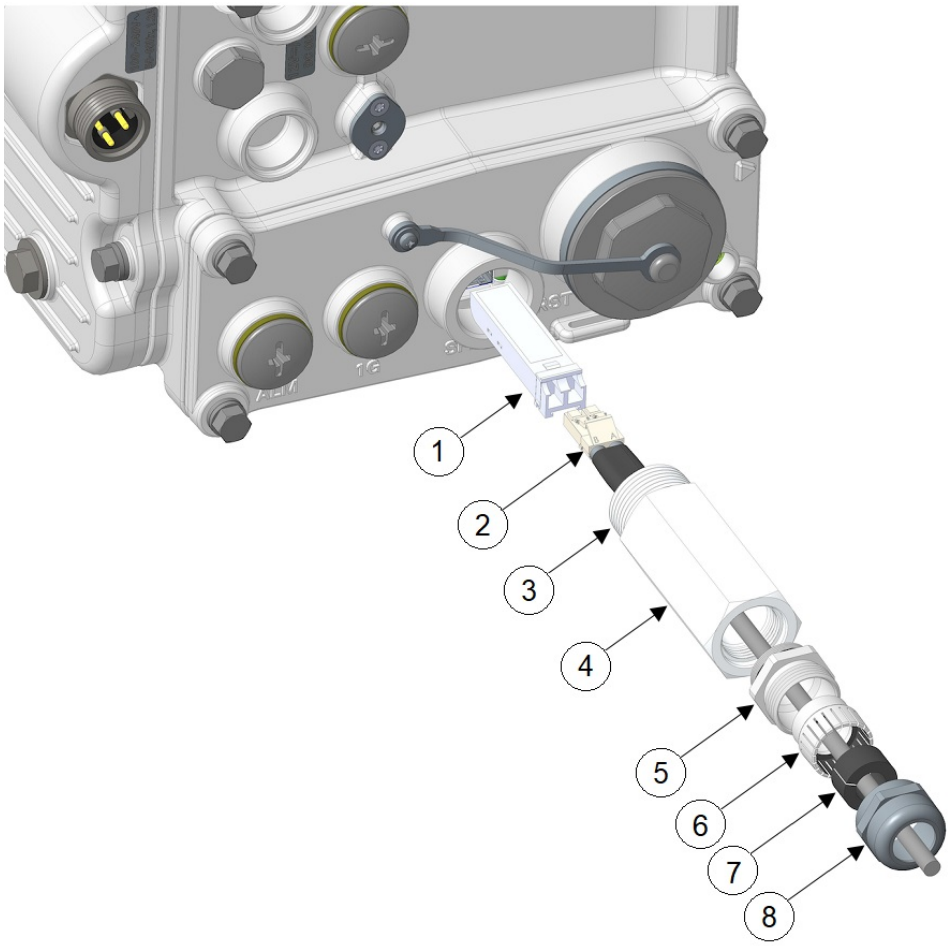
Step 7 Insert the LC optic fiber connector into the SFP module and ensure that it latches into place.

Step 8 Apply sealing tape or sealant to threads of the extender, and then thread the extender into the SFP port of the router chassis. Use an adjustable wrench to tighten the threaded end of the cable gland to 6-7 lb.ft (8.1 to 9.5 Nm).

Step 9 Thread the adapter base into the extender with 3-4 ft-lbs of torque.

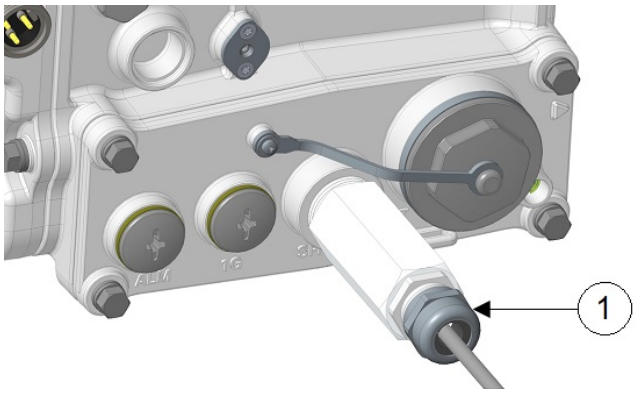
Step 10 Insert "keyed" grommet into the adapter base, and insert the gasket into the grommet.

Figure 40: Exploded View of Connecting Fiber-Optic Cable to the Router



1	SFP module	5	Adapter base
2	SFP cable	6	Grommet
3	Extender threads	7	Gasket
4	Extender	8	Compression cap

Step 11 Tighten the compression cap (**1**) until the grommet and gasket compress on to the cable and provides seal and cable stress relief. Use an adjustable or open-end wrench to tighten to 2.7 to 3.2 lb.ft (3.66 to 4.34 Nm).



Caution When removing this SFP assembly it is absolutely imperative that you proceed in the reverse order of this installation. Start by loosening the cable gland's nut.

Connecting the Ethernet Port

See Figure 35: CPU Module Components, on page 60 for the Ethernet port location.

The router features a Gigabit Ethernet (GE) port for connecting the router to an Ethernet network through a hub or switch.

- One or two Ethernet cables are typically provided with the router. Additional cables and transceivers can be ordered from Cisco. For ordering information, contact customer service.
- When connecting cable to the Ethernet port, you must use cable gland and thread cable through the chassis cable port on the router. See External Connections and Chassis Cable Ports.

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

Connecting an Ethernet Cable to the Router

The following tools and materials are required:

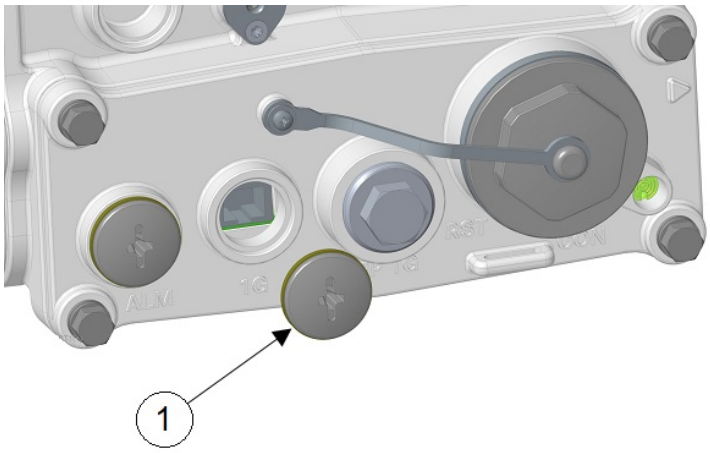
- Shielded outdoor-rated Ethernet (CAT5e or better) cable
- RJ-45 connector and installation tool
- #3 Phillips Screwdriver

To connect the shielded Ethernet cable to the router, follow these steps:

Step 1 Ensure all power sources to the router are turned off.

Step 2 Verify that the router is grounded as described in Grounding Instructions, on page 39.

Step 3 Remove PG13.5 plug and seal ring (**1**) from the router chassis with #3 Phillips screwdriver.

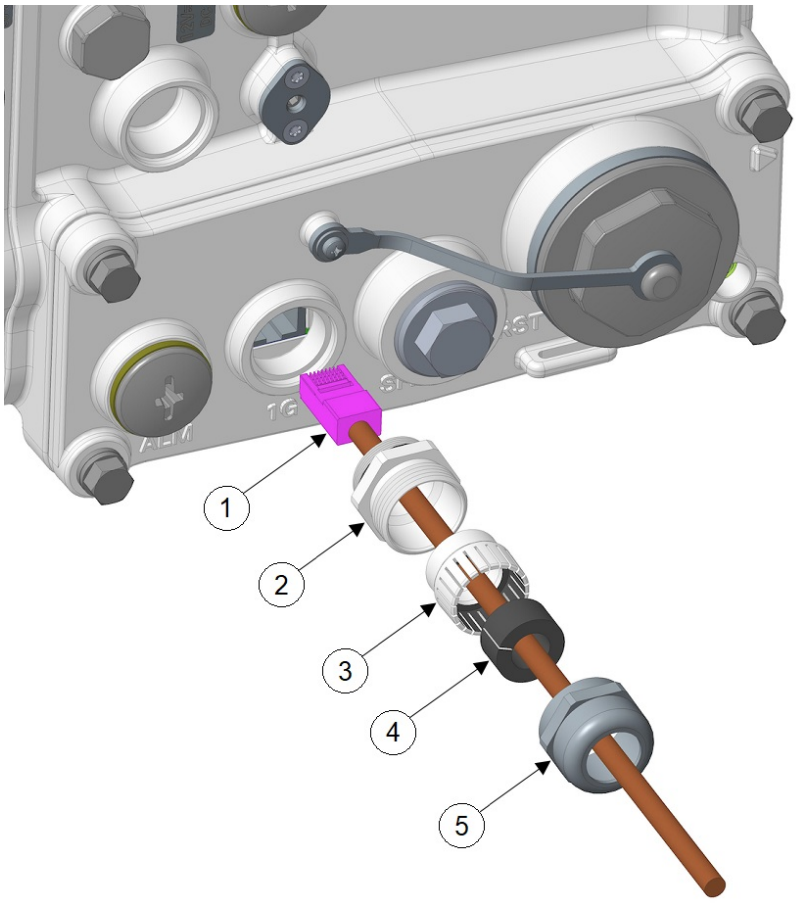


Step 4 Loosen the cable gland's nut (round end of the cable gland) by turning counterclockwise, but do not remove.

Step 5 Insert the unterminated end of the Ethernet cable through the sealing nut end of the cable gland, and pull several inches of cable through the adapter.

Step 6 Install an RJ-45 connector on the unterminated end of the Ethernet cable using your Ethernet cable installation tool.

Step 7 Carefully insert the RJ-45 cable connector into the Ethernet port opening on the router chassis, and connect to the internal Ethernet connector. See the following figure.



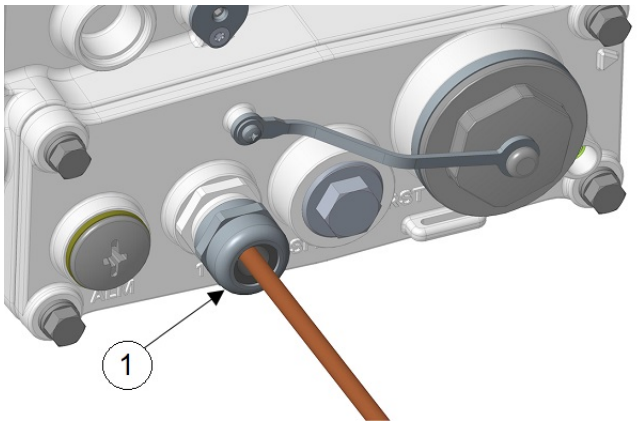
1	RJ-45 cable connector	4	Split gasket
2	Adapter base	5	Compression cap
3	Grommet		

Step 8 Thread the adapter base into the Ethernet port and tighten with 3-4 ft-lbs of torque.

Step 9 Insert “keyed” grommet into the adapter base.

Step 10 Install the split gasket around the cable, and then insert the gasket into the compression ring.

Step 11 Tighten the compression cap (**1** in the following figure) until the grommet and gasket compress on to the cable and provides seal and cable stress relief. Use an adjustable or open-end wrench to tighten to 2.7 to 3.2 lb.ft (3.66 to 4.34 Nm).



Step 12 Route your Ethernet cable.

Connecting the Alarm Port

See Figure 35: CPU Module Components, on page 60 for the alarm port location.

Attach the alarm port to an alarm system to monitor software events and errors. The alarm port supports two bi-directional channels that can be configured as inputs or outputs independently.

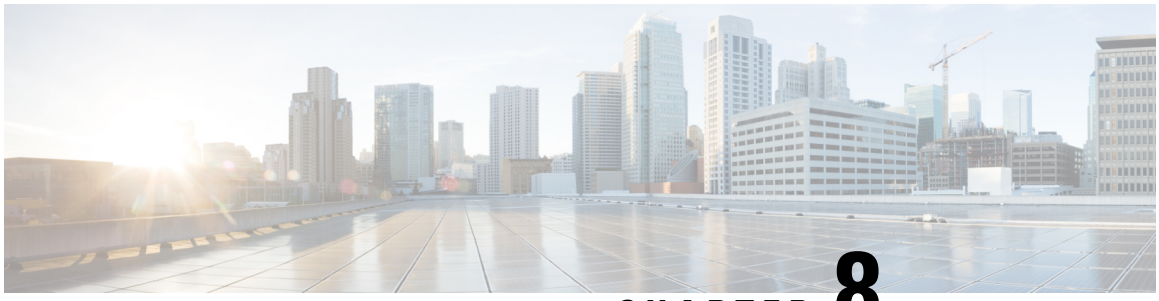
The alarm-trigger setting determines when an alarm is sent to the attached alarm system.

- You can connect this port while the router is operating normally.
- If you use an alarm system on your network, connect the alarm port to an alarm system, using an alarm cable that you provide.
- When connecting this port to an external alarm system, you must use cable glands and thread cables through the chassis cable ports on the router. See External Connections and Chassis Cable Ports, on page 62.
- When configuring alarm channel as an input, the alarm input will detect an open or closed external circuit, such as a relay.
- When configuring alarm as an output, the alarm output requires the user to provide their own external relay and external pullup resistor in the range of 3V to 60V. The resistor value needs to be strong enough to energize the relay but weak enough to stay under 100mA when the pullup is forced to 0V.

Procedure to connecting to the alarm port is identical as described in Connecting an Ethernet Cable to the Router, on page 70, with the exception that the connector is not RJ45, but 4 pin Micro-Fit. See Alarm Port, on page 12 for details.

Installing Modules and Antennas

The router supports up to three Universal Interface Modules (UIMs). Each module requires one or two antennas, which are installed on or near the router. See Installing Universal Interface Modules (UIMs), on page 43 and Attaching an Antenna to IR8140H, on page 53.



CHAPTER 8

Installing Battery Backup Units

The Cisco Catalyst Industrial Router 8140 Heavy Duty Series Router (IR8140H or router) supports up to three battery backup units (BBUs), which provide power to the router if the router AC power supply fails or is not available. This section describes the BBU features and installation procedures.

These topics are discussed:

Battery Backup Operations

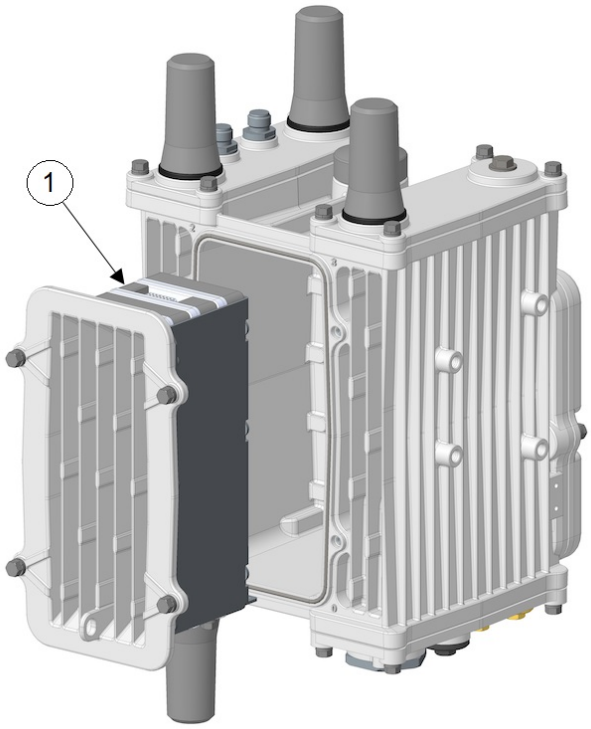
The battery backup unit (BBU) provides the router with an emergency power source if the AC power source is unavailable.

The router supports up to three BBU units installed at one time. The units are mounted in the center-front of the IR8140H. When you install 3 BBUs, up to 8 hours of battery backup power is available on a fully-loaded system in the event of an AC power failure. BBUs can be replaced in the field.

The BBU can be installed in the router while the router is powered on and operating normally.

The BBU internal components include battery cells, a primary protection circuit, a fuel gauge, and a charger. For detailed, illustrated descriptions of the BBU, see BBU Components, on page 80.

Figure 41: Battery Backup Units Mounted on Router



Item	Cisco Product ID (PID)	Description
1	IRMH-BATT-4AH	Battery backup units. The router supports up to three BBUs.

BBU Status

The BBU must first be enabled before it can begin supplying power to the router. The BBU continues to supply power to the router until at least one of the following conditions is met:

- All BBUs are completely discharged.
- AC power to the router is restored.
- The BBU is disabled with software commands (see *Cisco Catalyst IR8140 Heavy Duty Series Router Software Configuration*).

Note For information on technical details about the router power path selection and the conditions that trigger the BBU to begin operating, see BBU Technical Specifications, on page 90.

Battery Backup Mode

This section describes the impact on the router configuration and operating capabilities when the router switches from AC power to BBU power.

BBU Capacity

The router supports up to three BBUs at one time. You should install as many BBUs as needed, up to three, to meet your emergency power requirements.

If all installed batteries fully discharge while providing backup power to the router, the router will send a dying gasp message and then shut down.

Router Configuration

The router software configuration is not impacted when the router switches from AC power to BBU power.

Universal Interface Module (UIM) Operation

By default, the Universal Interface Modules (UIMs) installed in slots continue to operate normally when the router switches from AC power to BBU power.

You can configure the router to automatically power off specific modules when the router switches to BBU power.

BBU Lifecycle Handling and Storage Guidelines

This section contains information about the BBU status and condition during the BBU lifecycle and how to approach and manage it.

BBU Storage Related Definitions

- Shelf life—Shelf life is the length of time before a BBU needs to be recharged in order to avoid BBU over-discharge.
- State of charge—State of charge (SOC) is the amount of charge on a battery and it is expressed as a percentage value. For example, an SOC of 100% represents a battery that is fully charged, and an SOC of 0% represents a battery that is fully discharged.

BBU Shipping and Receiving Guidelines

The BBU shipping and receiving guidelines define the BBU SOC status and how it can be managed at this stage of the BBU life cycle:

- Cisco ships BBUs with a minimum of 60% SOC from the Cisco contract manufacturer (CM).
- Each BBU should have a minimum SOC of 50% upon receipt from the Cisco CM.

- A minimum SOC of 50% allows for approximately 10 weeks between shipment from Cisco's CM and a customer checking the SOC.
- SOC decreases approximately 1% per week (due to self-discharge).
- BBU SOC status can be checked using the command line interface (CLI).
- BBUs with less than 50% SOC should be recharged by the system integrator or customer to >50% SOC.

BBU Storage and Handling Guidelines

The BBU storage and handling guidelines define the BBU shelf life status and how it can be managed at this stage of the BBU lifecycle:

- The shelf life of a BBU installed in a router with discharge disabled and BBU disabled, or for a spare BBU, is typically 6 to 12 months.
- Prior to connection to an AC source, the BBU shelf life is a minimum of 21 days.
- When long term storage at a customer site is anticipated, Cisco requires that the BBUs be recharged prior to expiration of shelf life.
- When AC power is disconnected and the Cisco IR8140H router is removed from service:
  - The router switches to DC power supplied by the BBU(s) and remains powered for approximately 8 hours.
  - After 8 hours the BBU(s) reaches low voltage disconnect, and the remaining shelf life is a minimum of 21 days.
  - The BBU should be placed in "BBU disable mode" when the router is removed from service in order to extend BBU shelf life up to 365 + 21 days
  - The remaining shelf life depends on the State of Charge prior to removal of AC power and the BBU being placed in a "BBU disable mode".
  - Disabling a BBU at 0% SOC means a minimum remaining shelf life of 21 days, and disabling a BBU 100% SOC means a maximum remaining shelf life of 386 days.

Recharging a BBU

To recharge a BBU:

Step 1 Connect the router to an AC power source.

Step 2 Enable the BBU.

Step 3 Allow at least 8 hours of charge time per BBU, i.e. for routers with 3 BBUs each, allow 24 hours charge time per router.

Step 4 When the charge time is finished, disable the BBU if the BBU will not be used as backup power for this router.

Replacing a BBU

When you replace a BBU in the router, we highly recommend:

- Replacing all the BBUs.
- Verifying all the replacement BBUs are the same version.

When a router operates with different BBU versions, it may result in misbehavior in the BBU functionality.

To replace a BBU:

Step 1 Disconnect the BBU module from the router per instructions.

Step 2 Replace all BBUs of the router at the same time.

Note Do not mix used BBUs with new BBUs.

BBU Disposal Guidelines

Instructions for disposal of BBUs

- For routers under warranty, follow the standard Cisco RMA procedures.
- If Cisco identifies a BBU or set of BBUs as a non-functional item that can be discarded without being returned for failure analysis, BBUs removed for replacement must be disposed of in accordance with local guidelines.
- US and Canadian customers should utilize www.call2recycle.org to properly recycle the lithium ion BBUs.
- For local recycling outside of the US and Canada, customers should contact the following Cisco email for guidance specific to customer's country/region: environment@cisco.com
- For further local take-back and recycling information, customers can refer to: www.cisco-returns.com.

Preparing to Install the BBU

Before installing BBUs in the router, ensure that the following guidelines have been met:

Tools You Supply

You must provide a #1 Phillips screwdriver to install or remove the BBU modules inside the BBU cage. You also need these tools:

- T15 Torx Driver
- 10mm Socket Driver

Safety Warnings

Read the safety warnings in Installation Safety and Site Preparation, on page 19.

Warning There is the danger of explosion if the battery is replaced incorrectly. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions. Statement 1015

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

Note When you replace a BBU in the router, we highly recommend:

- Replacing all the BBUs.
- Verifying all the replacement BBUs are the same version.

When a router operates with different BBU versions, it may result in misbehavior in the BBU functionality.

Preventing Electrostatic Discharge Damage

The BBUs are sensitive to electrostatic discharge (ESD) damage which can occur when electronic cards or components are handled improperly, and can result in complete or intermittent failures.

To prevent ESD damage, follow these guidelines:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.
- Place the BBU on an antistatic surface or in a static shielding bag. If the BBU will be returned to the factory, immediately place it in a static shielding bag.
- Avoid contact between the battery and clothing. The wrist strap protects the battery from ESD voltages on the body only; ESD voltages on clothing can still cause damage.
- Do not remove the wrist strap until the installation is complete.

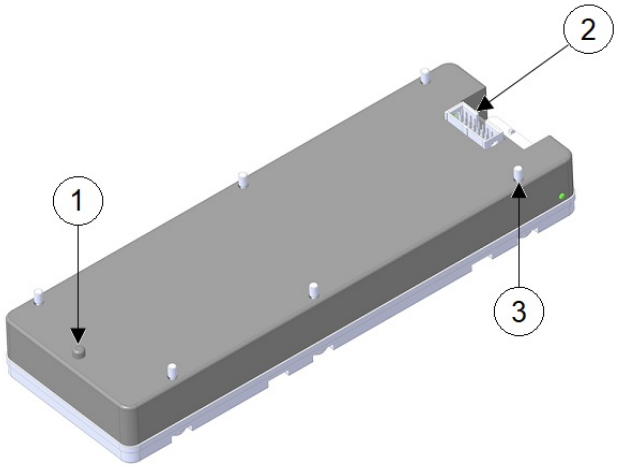
BBU Components

This section illustrates and describes the BBU components you should be familiar with when installing the BBU.

Note For technical specifications of the components described in this section, see BBU Technical Specifications, on page 90.

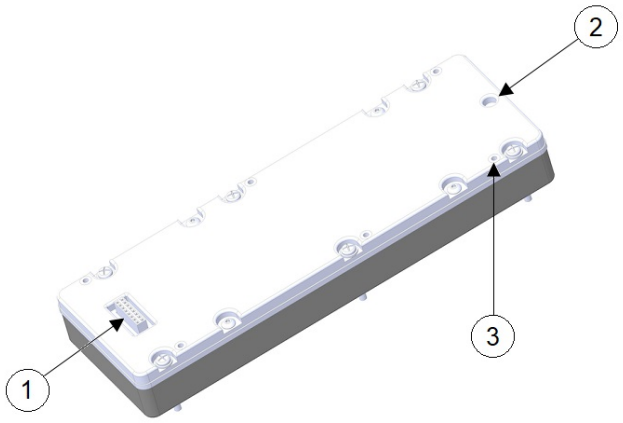
There is a plug connector on the back and a socket connector on the front of each BBU. Also, there is a BBU alignment pin on the back and an alignment hole on the front. When BBUs are plugged into each other, they mate front to back. The plug connector engages with the socket connector, and the alignment pin with the alignment hole. When you connect a second or third battery to a battery already installed, use the alignment pin and hole to ensure correct battery position and align the battery connectors.

Figure 42: Rear of Battery Backup Unit



Item	Description
1	BBU Alignment Pin
2	BBU Interface Plug
3	Captive screws (6) for installing the BBU for stacking or installing BBUs inside the BBU bracket of the BBU module

Figure 43: Front of Battery Backup Unit



Item	Description
1	BBU Interface Socket
2	BBU Alignment Hole
3	Captive Nut (6) for installing the BBU for stacking or installing BBUs inside the BBU bracket of the BBU module

Installing BBUs in the Router

This section describes how to install a BBU in the router. A new BBU will be about 50% charged when you receive it.

Caution When you install a BBU in the router, if there is no AC power being supplied to the router, the BBU (if not in a disabled state) will immediately begin to power the router when it is connected.

To prevent the BBU from powering the router prior to installation in the field, the BBU is disabled during shipment. To ensure the BBU can be charged and power the router when required, enable the BBU right after installation.

Note When you replace a BBU in the router, we highly recommend:

- Replacing all the BBUs.
- Verifying all the replacement BBUs are the same version.

When a router operates with different BBU versions, it may result in misbehavior in the BBU functionality.

Follow these steps to install BBUs in the router:

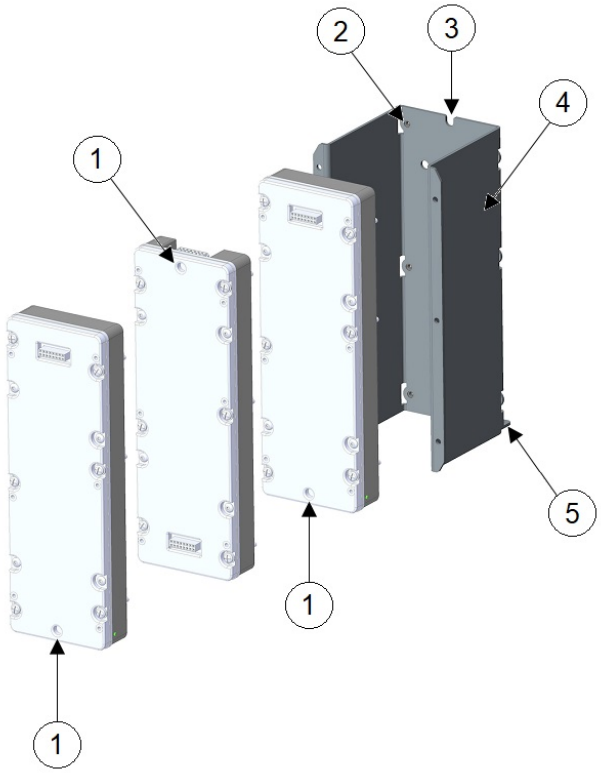
1. Installing BBU Modules to the BBU Cage, on page 83
2. Attaching BBU Cage to the Faceplate, on page 84
3. Installing BBU Assembly or Blank to the Router, on page 87

Follow these steps to remove BBUs from the router:

1. Removing BBU Assembly or Blank From the Router, on page 90
2. Removing the BBU Cage from the Faceplate, on page 87
3. Removing BBU Modules from the BBU Cage, on page 84

Installing BBU Modules to the BBU Cage

Follow these steps to install BBU modules to the BBU cage:



1	Alignment hole	4	BBU cage
2	Captive nuts (6)	5	BBU security tab
3	BBU cage pin notch		

Step 1 To install the first BBU Module, line up the BBU pin with the BBU cage pin notch, then torque the six captive screws to 7-9 in-lbs with a #1 Phillips screwdriver in sequence as shown in the following figure.

Step 2 To install a second BBU module, line up the BBU alignment pin with the BBU alignment hole, and press the plug and socket connectors together. Torque the six captive screws to 7-9 in-lbs with a #1 Phillips screwdriver in sequence as shown in the following figure.

Step 3 To install a third BBU module, line up the BBU alignment pin with the BBU alignment hole and press the plug and socket connectors together. Torque the six captive screws to 7-9 in-lbs with a #1 Phillips screwdriver in sequence as shown in the following figure.

Removing BBU Modules from the BBU Cage

To remove BBU modules from the BBU cage, you must start with the last BBU module and work inward towards the back of the BBU cage.

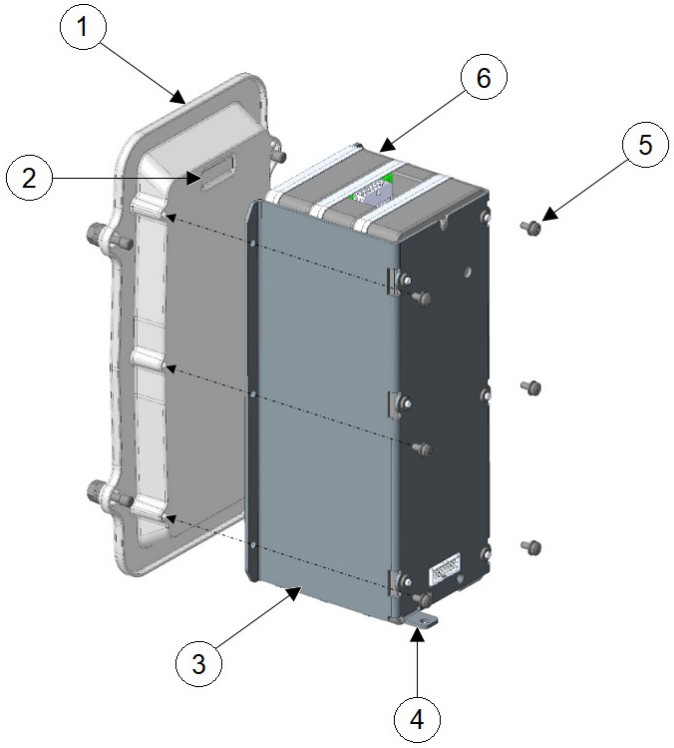
Step 1 Loosen the 6 captive screws using a #1 Phillips screwdriver and pull off the BBU module.

Step 2 Proceed to the next BBU module until all modules are removed.

Attaching BBU Cage to the Faceplate

Follow these steps to attach the BBU cage to the faceplate:

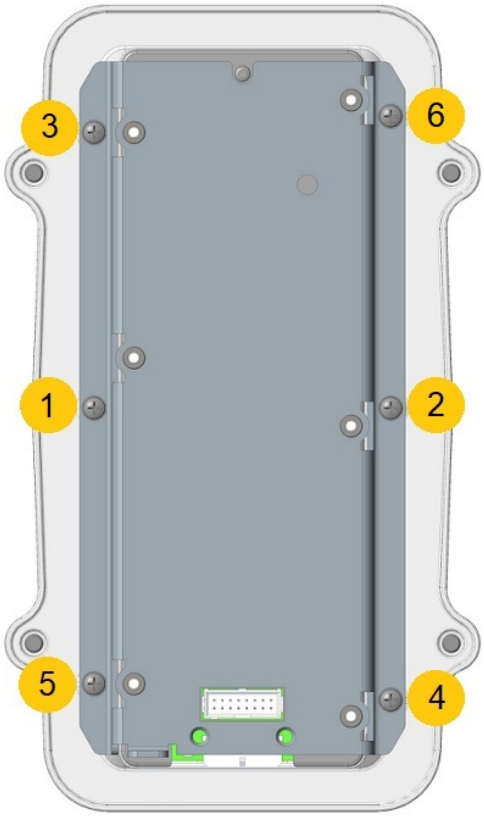
Figure 44: Attaching BBU Cage to Faceplate



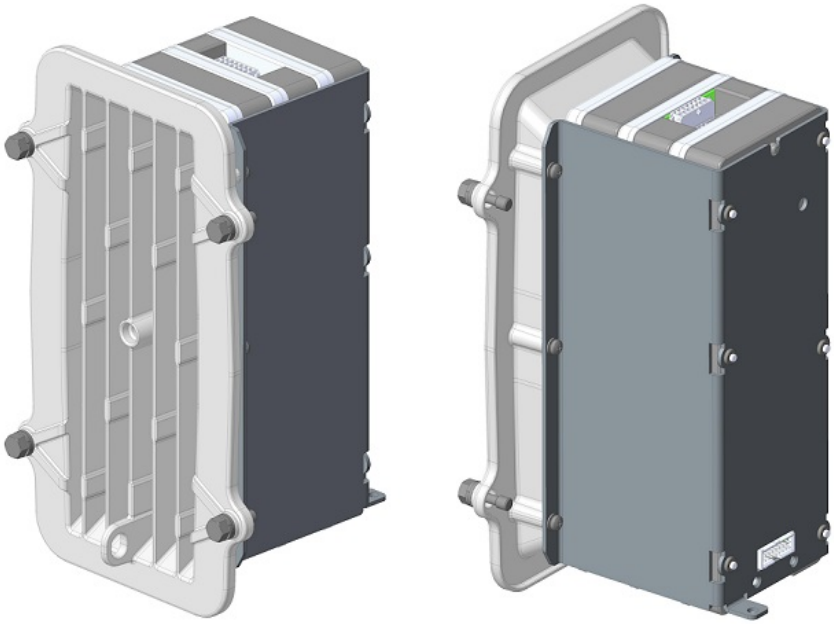
1	Faceplate	4	BBU security tab
2	Connector relief	5	M3.5 screws (6)
3	BBU cage	6	BBU module

Step 1 Orientate BBU cage or assembly to the faceplate as shown in the figure. Note the location of BBU security tab in relation to the faceplate connector relief.

Step 2 Insert six M3.5 screws in the locations as shown in . Torque screws to 10-12 in-lbs in sequence as shown in the following figure.



Step 3 The BBU assembly is now ready to be mounted to the router.



Removing the BBU Cage from the Faceplate

Follow these steps to remove the BBU cage from the faceplate:

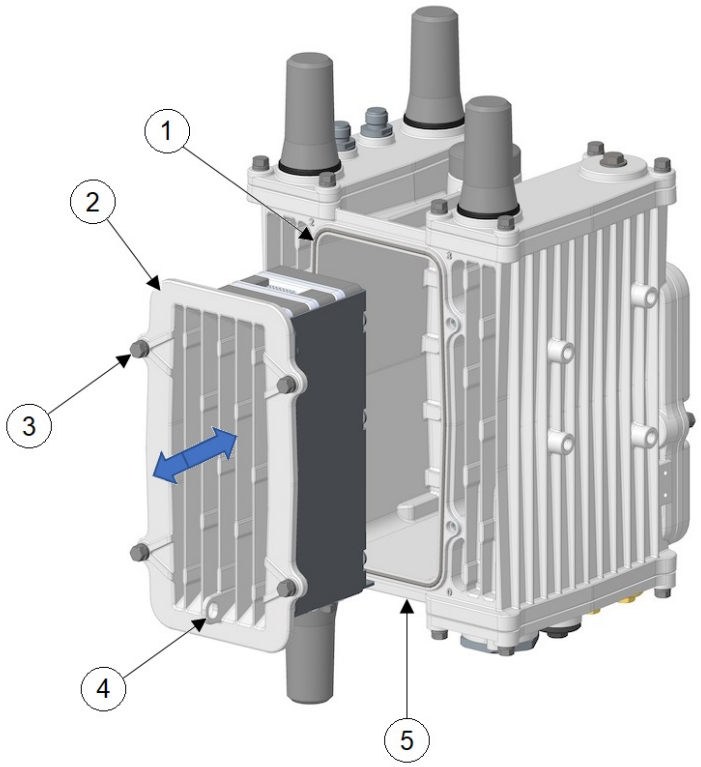
Step 1 Use a T15 Torx driver to remove the six M3.5 screws that attach the BBU cage to the faceplate. Do not discard the screws.

Step 2 Remove the BBU cage or assembly from the faceplate.

Installing BBU Assembly or Blank to the Router

Follow these steps to install the BBU assembly or blank to the router:

Figure 45: BBU Assembly or Blank Mounted on the Router



1	BBU gasket	4	Padlock tab
2	BBU assembly/blank	5	BBU security screw, in the bottom of the router
3	M6 bolts (4)		

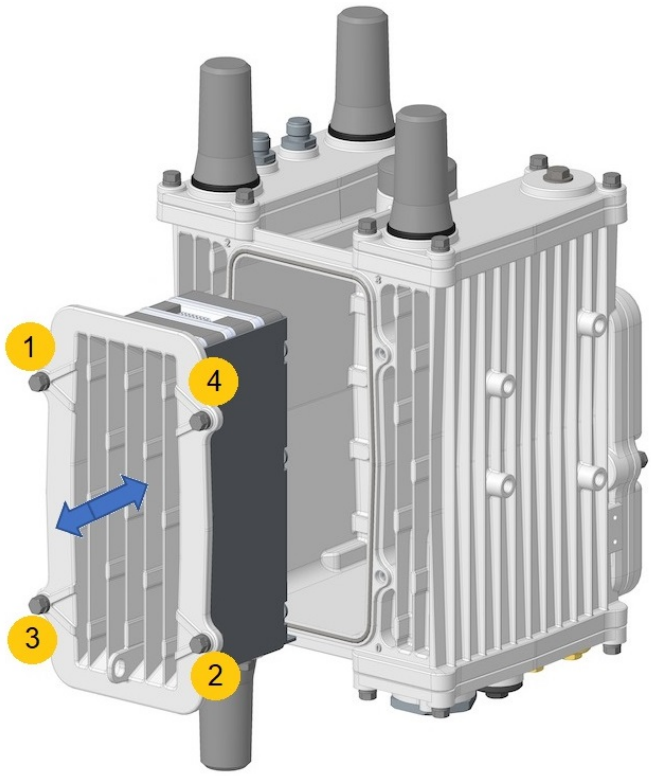
Step 1 Ensure that BBU gasket is fully installed in the gasket groove and the sealing surface is clean.

Step 2 Ensure the BBU Security Screw is fully backed out (see BBU Security Screw, on page 89).

Step 3 Align the BBU assembly or blank with the router chassis, note the location of padlock tab.

Step 4 Carefully push the BBU assembly fully into cavity. BBU is self aligning with internal guide pins. Do not leave the BBU assembly unattended until the M6 bolts have been tightened.

Step 5 Torque M6 bolts with 10mm socket driver. Torque to 15-20 in-lbs in the sequence shown below.



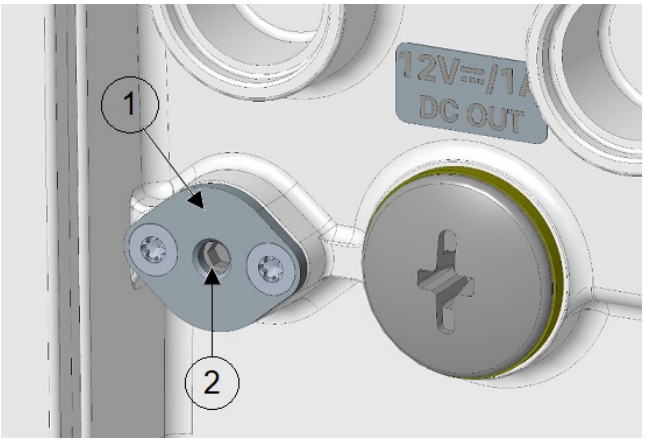
BBU Security Screw

The BBU security screw is located at the bottom of the router.

Follow these steps to install the BBU security screw:

Step 1 Ensure the BBU security screw is backed out until it hits retention plate.

Figure 46: BBU Security Screw



1	Retention plate (do not remove)	2	BBU security screw (require 3mm Hex Head)

Step 2 Install the BBU assembly and torque bolts per detailed instructions in Installing BBU Assembly or Blank to the Router, on page 87.

Step 3 Tighten and torque the BBU security screw to 10-12 in-lbs.

Removing BBU Assembly or Blank From the Router

Follow these steps to remove the BBU assembly or blank from the router:

Step 1 Back out the BBU security screw until it hits retention plate. See Figure 46: BBU Security Screw, on page 90.

Step 2 Loosen four M6 bolts with 10mm socket on the BBU faceplate (do not remove the bolts from the faceplate).

Step 3 Pull the BBU assembly or blank out straight.

Caution The BBU assembly is heavy.

Step 4 Ensure the BBU gasket stays in place and the sealing surface is clean.

BBU Technical Specifications

This section describes the specifications and standards supported by the BBU.

Router Power Path Selection

During normal operation, the router is powered by the integrated AC power supply. The BBU enters discharge mode and begins providing power to the router when the AC power is interrupted outside a range of 85V to 250V for more than 20 ms. The BBU charges or discharges only; it does not support both simultaneously.

Discharge Conditions

Table 10: Battery Backup Unit—Discharging Specifications

Discharge Conditions	Description
Duration	4 hours minimum with a 10W power load
Entry to discharge[7]	• AC power (range of 85V to 250V) not detected for more than 20 ms • Remaining BBU capacity >5% • External ambient temperature is within -40 to 122°F (-40 to 50°C)
Exit discharge[8]	• AC power restored in the range of 85V to 250V for more than 20 ms. • Remaining BBU capacity <5% • External ambient temperature is outside the range of -40 to 122°F (-40 to 50°C)

7 All conditions met.
8 Any condition met and system is detected.

Charge Conditions

Table 11: Battery Backup Unit—Charging Specifications

Charge Conditions	Description
Power draw	No more than 20 W when charging
Entry to charging limit[9]	• State of Charge (SOC) <85% • AC power detected in the range of 85V to 250V for more than 20 ms. • External ambient temperature is within -4 to 104°F (-20 to 40°C)
Exit charging[10]	• AC power (range of 85V to 250V) not detected for more than 20 ms. • External ambient temperature is outside the range of -4 to 104°F (-20 to 40°C)

9 All conditions met.
10 Any condition met and system is detected.

Operating and Storage Temperatures

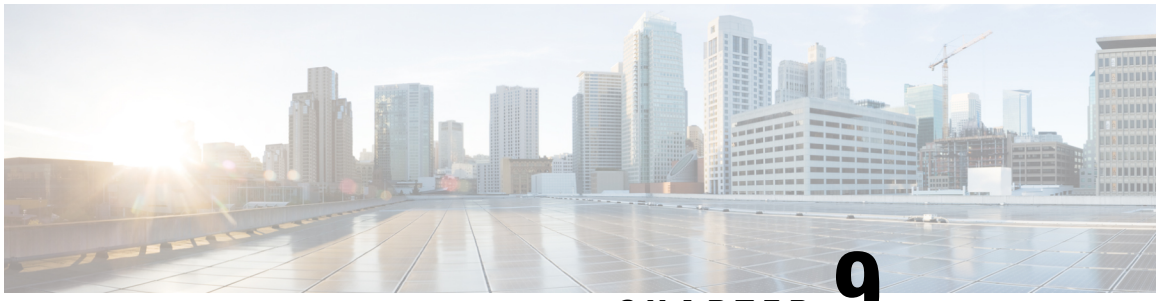
Table 12: Battery Backup Unit—Operating and Storage Temperatures

BBU State	Local BBU Internal Temperature	External Ambient Temperature
Charging	+32 to 122°F (0 to 50°C)	-4 to 104°F (-20 to 40°C)
Discharging	-4 to 140°F (-20 to 60°C)	-40 to 122°F (-40 to 50°C)
Operation (Idle)	-4 to 185°F (-20 to 85°C)	-40 to 158°F (-40 to 70°C)
Storage and shipping	+14 to 113°F (-10 to 45°C) for 3 months maximum	• Short-term: +14 to 113°F (-10 to 45°C) for 3 months maximum • Long-term: +27 to 77°F (-3 to 25°C) - 65% Relative Humidity - 40 to 90% SOC

Battery Life

Table 13: Battery Backup Unit — Battery Life

Product ID	Battery Life	Charge-Discharge Cycles
IRMH-BATT-4AH	5 years	500



CHAPTER 9

Starting a Router Terminal Session

This section describes how to start a terminal session with the IR8140H using the console port. The console port is found on the CPU module.

Start a terminal session with the router when you are at the router installation location and want to administer the router with a direct connection using the command-line interface (CLI) software.

These topics are discussed:

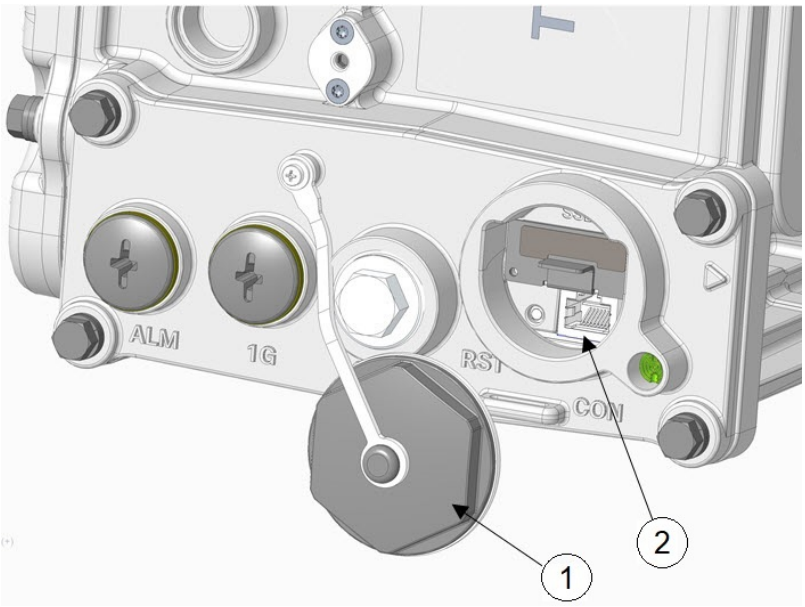
Before You Begin

Before you start a terminal session with the router, you must connect a PC or PC terminal to the router console port.

About the Console Port

The console port is found on the CPU module, as shown in the following figure.

Figure 47: CPU Module with Console Port



1	M42 plug	2	Console port

To access the console port, open the M42 plug.

The console port is an asynchronous serial port that allows you to connect to the device for initial configuration through a standard RS-232 port with an RJ-45 connector. Any device connected to this port must be capable of asynchronous transmission.

Caution The console port does not support cable glands. When a cable is connected to this port, the router interior is exposed to environmental elements, which can damage the port and the router interior. This port should be exposed only during terminal sessions, when a cable is connected to the port. This port should never be left unattended when in use.

The console port is an asynchronous serial port that allows you to connect to the device for initial configuration through a standard RS-232 port with an RJ-45 connector. Any device connected to this port must be capable of asynchronous transmission.

Console Port Settings

Configure the following parameters for the console port:

Parameter	Console Port Setting	Description
Baud	9600	Specifies the transmission speed for the connection.
Data bits	8	Specifies the number of bits in an 8-bit byte that is used for data.
Parity	None	Specifies the odd or even parity for error detection.

Parameter	Console Port Setting	Description
Stop bits	1	Specifies the number of stop bits for an asynchronous line.

Using the Ctrl-C Command

The router console port is located on the router exterior and is accessible by removing the seal over the console port (see Figure: CPU Module with Console Port).

On many Cisco routers, you can enter **Ctrl-C** to interrupt the router startup process and then delete or change the admin password, or view or delete the router configuration.

To prevent unauthorized access to the router configurations and passwords, the Ctrl-C command is disabled on the router while it is booting up and loading the system software.

Connecting to the Console Port with Microsoft Windows

To connect to the router console port using Microsoft Windows:

Step 1 Start a terminal emulator application, such as Windows HyperTerminal (included with some versions of Windows OS) or PuTTY .

Step 2 Configure the terminal emulation software with the parameters described in About the Console Port, on page 93.

Step 3 Connect to the router.

Connecting to the Console Port with Mac OS X

To connect a Mac OS X system USB port to the console using the built-in OS X Terminal utility:

Step 1 Use the Finder to go to **Applications** > **Utilities** > **Terminal**.

Step 2 Connect the OS X USB port to the router.

Step 3 Enter the following commands to find the OS X USB port number:

Example:

```
macbook:user$ cd /dev
macbook:user$ ls -ltr /dev/*usb*
crw-rw-rw-  1 root    wheel       9,  66 Apr  1 16:46 tty.usbmodem1a21 DT-macbook:dev user$
```

Step 4 Connect to the USB port with the following command followed by the router USB port speed:

Example:

```
macbook:user$ screen /dev/tty.usbmodem1a21 9600
```

To Disconnect the OS X USB Console from the Terminal Window

Enter **Ctrl+A** followed by **Ctrl+**

Connecting to the Console Port with Linux

To connect a Linux system USB port to the console using the built-in Linux Terminal utility:

Step 1 Open the Linux Terminal window.

Step 2 Connect the Linux USB port to the router.

Step 3 Enter the following commands to find the Linux USB port number:

Example:

```
root@usb-suse# cd /dev
root@usb-suse /dev# ls -ltr *ACM*
crw-r--r--    1 root     root     188,   0 Jan 14 18:02 ttyACM0
root@usb-suse /dev#
```

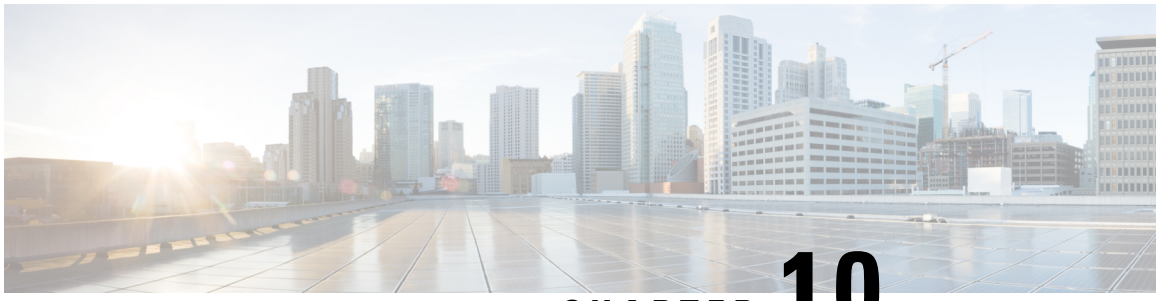
Step 4 Connect to the USB port with the following command followed by the router USB port speed:

Example:

```
root@usb-suse /dev# screen /dev/ttyACM0 9600
```

To Disconnect the Linux USB Console from the Terminal Window

Enter **Ctrl+A** followed by **:**, and then type **quit**.



CHAPTER 10

Unmounting the Router

This section describes the safety information, equipment, and procedures required to remove the Cisco Catalyst Industrial Router 8140 Heavy Duty Series Router (Cisco Catalyst IR8140H) from a vertical pole.

These topics are discussed:

Materials and Tools You Supply

- 1/2-inch (13-mm) socket wrench
- #2 Phillips head screwdriver

Unmounting Instructions

To unmount the router on any supported pole type:

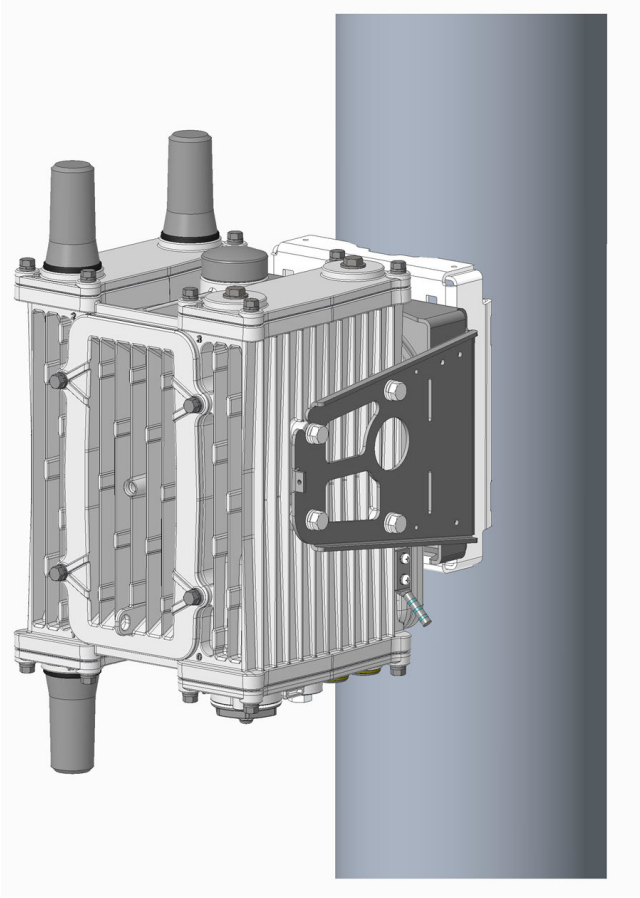
Step 1 Disable any installed battery backup units, and disconnect the router from AC power.

Step 2 Remove/disconnect any external cables (for example, the external Ethernet connector at base of unit).

Step 3 Disconnect the internal cables, taking care to remove cable from cable glands.

Step 4 Remove the ground wire located at the side of the router.

Figure 48: IR8140 Installed on a Pole



Step 5 Remove 3 of the 4 bolts that attach the mounting bracket to the router. Do not remove the hinge bolt, which is the fourth bolt. Remove the equivalent bolts on the opposite side of the router.

Step 6 Loosen hinge bolts two complete turns (do not loosen so that the bolts are removed from chassis).

Step 7 Remove the router from the bracket.

Transporting the Router

To transport the router:

Step 1 Disconnect lightning arrestors that might be installed on the router.

Step 2 (Optional) Configure BBU to transport mode if BBU is installed.

Step 3 Verify that all open chassis ports are sealed with the cable port seal plugs shipped with the router.