Understand Aironet and Catalyst AP Power Requirements Reference

Contents

Introduction

PoE Standards

Power Cisco Access Points

- Compatible Power Injectors and DC Power Supplies
- Compatible PoE Standards
- Powering WiFi 7 Access Points

Troubleshoot

- Verify Switch Power Budget
- Verify Power Negotiation
- Common Issues Cisco TAC Encounters

Related Information

Introduction

This document describes different Power over Ethernet standards, lists power requirements, and compatible power supplies for Cisco Access Points (AP).

PoE Standards

Power over Ethernet (PoE) refers to the system where electrical power is transferred along with data via twisted pair Ethernet cabling. The convenience of PoE allows Cisco APs to use a single cable to provide both power and data, which makes deployments much more cost-effective.

As of 2020, there are four Powers over Ethernet standards utilized by Cisco access points. This table lists them along with their characteristics:

Table 1. PoE Standards

Codename	Maximum Power [W]	IEEE Standard
PoE	15.4	802.3af
PoE+	30	802.3at

UPoE	60	Cisco proprietary
UPoE+ or sometimes PoE++	90	802.3bt

Power Cisco Access Points

There is no power difference between different regulatory domains of the same AP model. For example, Cisco 4800I-E and 4800I-S have identical power draw and power requirements.

Compatible Power Injectors and DC Power Supplies

Table 2. lists all officially supported PoE injectors for the latest Cisco AP models:

Table 2. Power Injectors and DC Power Adapters

AP Model	PoE Injectors	AC/DC Power Adapter
9179F	**CW-INJ-8** (full power & 10Gbps), **AIR-PWRINJ7=** (full power), **MA-INJ-6** (full power), **AIR-PWRINJ6=** (medium power)	X
9178	**CW-INJ-8** (full power & 10Gbps)**, AIR-PWRINJ7=** (full power)**, MA-INJ-6** (full power), **AIR-PWRINJ6=** (medium power)	X
9177	**CW-INJ-8** (full power & 10Gbps)**, AIR-PWRINJ7** (full power), **AIR-PWRINJ-60RGD** (full power), **IW-PWRINJ-60RGDMG** (full power & 10Gbps)	**CW-ACC-PWR-RGD2U** (full power, US) **CW-ACC-PWR-RGD2** (full power, international)
9176	**CW-INJ-8** (full power & 10Gbps)**, AIR-PWRINJ7=** (full power)**, MA-INJ-6** (full power), **AIR-PWRINJ6=** (medium power)	X

9174	**CW-INJ-8** (full power & 10Gbps)**, AIR-PWRINJ7=** (full power)**, MA-INJ-6** (full power), **AIR-PWRINJ6=** (medium power)	**MA-PWR-50WAC** (full power)
9172	**CW-INJ-8** (full power & 10Gbps)**, AIR-PWRINJ7=** (full power)**, MA-INJ-6** (full power), **AIR-PWRINJ6=** (medium power)	**MA-PWR-50WAC** (full power)
9171	**CW-INJ-8** (full power & 10Gbps)**, AIR-PWRINJ7=** (full power)**, MA-INJ-6** (full power)**, AIR-PWRINJ6=** (full power)	**MA-PWR-50WAC** (full power)
IW9167	**IW-PWRINJ-60RGDMG** (full power & 10Gbps), **AIR-PWRINJ-60RGD** (full power)	**IW-PWRADPT-MFIT4P** (full power)
9166	**AIR-PWRINJ7=** (full power), **AIR-PWRINJ6=** (medium power), **MA-INJ-6** (full power)	**MA-PWR-50WAC** (full power)
IW9165	**IW-PWRINJ-60RGDMG** (full power & 10Gbps), **AIR-PWRINJ-60RGD** (full power)	**IW-PWRADPT-MFIT4P** (full power)
9164	**AIR-PWRINJ7=** (full power), **AIR-PWRINJ6=** (medium power), **MA-INJ-6** (full power)	**MA-PWR-50WAC** (full power)
9162	**AIR-PWRINJ7=** (full power), **AIR-PWRINJ6**= (full power), **MA-INJ-6** (full power)	**MA-PWR-30W** (full power)
9136	**AIR-PWRINJ7**= (full power)	X
9130	**AIR-PWRINJ6**= (full power), **AIR-PWRINJ5**= (medium power)	X
9124	**AIR-PWRINJ6**= (medium	X

	power), **AIR-PWRINJ-60RGD1**= (full power), **AIR-PWRINJ-60RGD2**= (full power), **AIR-PWRINJ7=** (full power)	
9120	**AIR-PWRINJ6**= (full power), **AIR-PWRINJ5**= (medium power)	X
9117	**AIR-PWRINJ6**= (full power), **AIR-PWRINJ5**= (medium power)	X
9115	**AIR-PWRINJ6**= (full power), **AIR-PWRINJ5**= (medium power)	X
9105	**AIR-PWRINJ6**= (full power), **AIR-PWRINJ5**= (medium power)	X
4800	**AIR-PWRINJ6=** (full power)	**AIR-PWR-50**= (full power)
3800	**AIR-PWRINJ6=** (full power)	**AIR-PWR-50**= (full power)
2800	**AIR-PWRINJ6=** (full power)	X
3700	**AIR-PWRINJ6**= (full power), **AIR-PWRINJ4**= (medium power)	**AIR-PWR-B**= (full power)
2700	**AIR-PWRINJ6**= (full power), **AIR-PWRINJ4**= (full power)	**AIR-PWR-C**= (full power), **AIR-PWR-D**= (full power)
1700	**AIR-PWRINJ5**= (full power)	**AIR-PWR-C**= (full power), **AIR-PWR-D**= (full power)
1850	**AIR-PWRINJ4**= (full power), **AIR-PWRINJ5**= (medium power)	**AIR-PWR-C**= (full power)
1840	**AIR-PWRINJ6**= (full power), **AIR-PWRINJ5**= (medium power)	X
1830	**AIR-PWRINJ6**= (full power), **AIR-PWRINJ5**= (medium power)	**AIR-PWR-C**= (full power)

1815i and 1815m	**AIR-PWRINJ6**= (full power), **AIR-PWRINJ5**= (full power)	X
1815t	X	**AIR-PWR-D**= (full power)
1815w	**AIR-PWRINJ6**= (full power), **AIR-PWRINJ5**= (full power)	X
1810	**AIR-PWRINJ6**= (full power), **AIR-PWRINJ5**= (full power)	**AIR-PWR-D**= (full power)
1572	**AIR-PWRINJ1500-2**= (full power)	
1562I	**AIR-PWRINJ-60RGD1**= (full power),**AIR-PWRINJ-60RGD2**= (full power), **AIR-PWRINJ6**= (medium power)	**AIR-PWRADPT-RGD1**= (full power)
1562E and 1562D	**AIR-PWRINJ-60RGD1** = (full power), **AIR-PWRINJ-60RGD2** = (full power), **AIR-PWRINJ6** = (full power)	**AIR-PWRADPT-RGD1** = (full power)
1542	**AIR-PWRINJ-60RGD1** = (full power), **AIR-PWRINJ-60RGD2** = (full power), **AIR-PWRINJ6** = (full power), **AIR-PWRINJ5** = (full power)	X
IW6300	**AIR-PWRINJ6** = (full power)	**IW-6300H-AC-X-K9** (full power), **IW-6300H-DC-X–K9** (full power), **IW-6300H-DCW-X-K9** (full power)
IW3700	**AIR-PWRINJ1500-2** = (full power), **AIR-PWRINJ-60RGD1** = (full power), **AIR-PWRINJ-60RGD2** = (full power)	**AIR-PWRADPT3700NA** = (full power), **AIR-PWRADPT3700IN** = (full power)

Compatible PoE Standards

Table 3. contains information about what features are available when APs are powered with the use of different PoE standards. As of this article last update, all APs have full functionality with UPoE+ standard (802.3bt), so it is not included in the table. This table assumes that no PoE passthrough (PoE Out) is used.

Note: Unless APs are provided the full power they require, they show up with a Low/Medium Power in Wireless Controller Web interface.

Table 3. Compatible PoE Standards

AP Model	Max Power Draw [W]	If powered with 60W	If powered with 30W	If powered with 15W
9179F	47	Full functionality	2.4GHz & 6GHz radios at 2x2, single 5GHz radio at 4x4 or dual 5GHz radios at 2x2, Multigigabit port speed 2 x 1000mbps (Tri Radio Mode) or 2 x 2500mbps (Quad Radio Mode)	Multigigabit port speed 1 x 1000mbps (single port only), all radios are shut down
9178	47	Full functionality	2.4GHz & 6GHz radios at 2x2, single 5GHz radio at 4x4 or dual 5GHz radios at 2x2, Multigigabit port speed 2 x 1000mbps (Tri Radio Mode) or 2 x 2500mbps (Quad Radio Mode), USB port disabled. MLO possible on PoE+ in 17.18.1 and later	Multigigabit port speed 1 x 1000mbps (single port only), all radios are shut down, USB port disabled
9177	45.1	Full functionality	5GHz radio at 4x4 disables the 6GHz radio (otherwise all radios can be at 2x2), Multigigabit port speed 2500mbps	Multigigabit port speed 1000mbps, all radios operational at 1x1
9176	39	Full functionality	2.4GHz radio at 2x2, 5GHz & 6GHz	Multigigabit port speed 1000mbps, all

			radios at 4x4, Multigigabit port speed 2500mbps, USB port disabled. MLO possible on PoE+ in 17.18.1 and later	radios are shut down, USB port disabled
9174	37	Full functionality	Multigigabit port speed 2500mbps, USB port disabled	Multigigabit port speed 1000mbps, 2.4GHz radio at 1x1, USB port disabled
9172H	41	Full functionality	USB port disabled	Multigigabit port speed 1000mbps, all radios are shut down, USB port disabled
9172I	32	Full functionality	5GHz radio at 4x4 disables the 6GHz radio (otherwise all radios can be at 2x2), USB port disabled	Multigigabit port speed 1000mbps, all radios are shut down, USB port disabled
9171	30	Full functionality	Full functionality	Multigigabit port speed 1000mbps, 2.4GHz radio at 1x1, USB port disabled
IW9167	48	Full functionality	All radios at 2x2, Multigigabit and SFP port speed 1000mbps	TBD (no information in data sheet or install guide)
9166	30.5	Full functionality	USB port disabled	Multigigabit port speed 1000mbps, all radios are shut down, USB port disabled
IW9165	20	Full functionality	Full functionality	Multigigabit port speed 1000mbps, all radios operational at

				1x1, USB port disabled
9164	30	Full functionality	USB port disabled	Multigigabit port speed 1000mbps, all radios are shut down, USB port disabled
9162	25.5	Full functionality	Full functionality	2.4 GHz radio disabled 5GHz & 6GHz radios at 1x1, Multigigabit port speed 1000mbps, USB port disabled
9136	47.3	Full functionality	2.4GHz radio at 2x2, 5GHz radio at 4x4, 6GHz radio at 2x2, Multigigabit port speed 2.5gbps, second multigigabit port disabled, USB port disabled	Multigigabit port speed 1000mbps, all radios are shut down, USB port disabled
9130	30.5	Full functionality	Before 17.10: USB port disabled, 17.10 and later: full functionality	USB port disabled, ethernet port speed 1000mbps, both radios at 1x1
9124	TBD (Not published in the datasheet)	Full functionality	Multigigabit port speed 1000mbps, both radios at 2x2, SFP port disabled, PoE out disabled (AUX port still operational for data)	Multigigabit port speed 1000mbps, both radios disabled, SFP port disabled, PoE out/AUX port disabled
9120	25.5	Full functionality	Full functionality	USB port disabled, ethernet port speed 1000mbps, with both radios at 1x1 or one of the radios on 2x2 with another one disabled
9117	28.9	Full functionality	If the USB port is	USB port disabled,

			enabled, the 5GHz radio is reduced to 4x4	ethernet port speed 2500mbps, both radios at 2x2
9115	21.4	Full functionality	Full functionality	USB port disabled, ethernet port speed 1000mbps, both radios at 2x2
9105	TBD (Not published in the datasheet)	Full functionality	Full functionality	USB port disabled, PoE out disabled
4800	31	Full functionality	USB port disabled, primary ethernet port speed 1000mbps, second AUX ethernet port disabled	AP does not power on
3800	30	Full functionality	Full functionality	Both radios are shut down, but AP powers up and is able to join WLC
2800	26.5	Full functionality	Full functionality	Both radios are shut down, but AP powers up and is able to join WLC
3700	19.6	Full functionality	Full functionality	Both radios at 3x3 without Wireless Security Module (WSM) or both radios at 2x2 with WSM
2700	15	Full functionality	Full functionality	Both radios at 3x3
1700	15	Full functionality	Full functionality	Full functionality
1850	20.9	Full functionality	Full functionality	USB port disabled, AUX ethernet port disabled, 2.4 GHz radio at 2x3

1840	17.8	Full functionality	Full functionality	USB port disabled
1830	15.4	Full functionality	Full functionality	USB port disabled
1815i & 1815w	8.5	Full functionality	Full functionality	Full functionality
1815m	13.9	Full functionality	Full functionality	Full functionality
1810	15.4	Full functionality	Full functionality	Full functionality
1572	31	No PoE out	AP does not power up	AP does not power up
1562i	32	Full functionality	Both radios at 2x2	Both radios are shut down, but AP powers up and is able to join WLC
1562e & 1562d	25	Full functionality	Full functionality	Both radios are shut down, but AP powers up and is able to join WLC
1542	13.9	Full functionality	Full functionality	Full functionality
IW6300	28	No PoE out	No PoE out	AP does not power up
IW3700	30	1 heater active, no PoE out	1 heater active, no PoE out	No heaters are active, and both radios are at 2x2

Powering WiFi 7 Access Points

Due to ever increasing bandwidths on the wireless side, the ethernet ports also saw a bump up in speed, namely the support for 10 Gbps speeds.
While older 802.3bt power injectors like the AIR-PWRINJ7= can provide the power required, they are not certified to work at these speeds (max 5 Gbps), hence the need for a new power injector model, the CW-INJ-8.

The ethernet port of the CW-INJ-8 is capable of connecting to a 10M/100M/1G/2.5G/5G/10G Ethernet switch.

Sometimes, when the AP is connected to the CW-INJ-8 that is cabled to a 802.3af PoE-enabled switchport, the AP can potentially not function properly. To resolve this issue, disable PoE on the switchport connected to the CW-INJ-8 injector ().
To disable PoE on the connected switchport, execute the power inline never command at the CLI prompt of the Cisco switch when it is in the interface config mode.

Some WiFi 7 features like MLO (Multi-Link Operation) have been enhanced in later Cisco IOS XE releases to operate also in low/medium power modes on the 9178 (from 17.15.3) and on the 9176 (from 17.18.1) AP models.

The Wi-Fi 7 APs only support standard-based PoE (including 802.3bt) but do not support Cisco proprietary UPoE (even if it provides potentially enough wattage). Check the datasheet of the access point for accurate information. It is a classically reported issue that an AP does not power up or does not power up with enough power on a 60W Cisco UPoE switch that is not 802.3bt standard. Some switches support both Cisco UPoE and 802.3bt standard while others support only one of these protocols, this is an important point to verify.
For more details, make sure to check out the relevant Cisco IOS XE release notes.

Note: For additional information about each AP model refer to their data sheets and the installation guides.

Troubleshoot

Verify Switch Power Budget

These switch commands display the current switch, port, power allocation, and budget:

<#root>

Switch#

show power inline

```
Module   Available     Used     Remaining
          (Watts)     (Watts)    (Watts)
------   ---------   --------   ---------
1           472.0      344.5       127.5
Interface Admin  Oper       Power   Device              Class Max
                            (Watts)
--------- ------ ---------- ------- ------------------ ----- ----
Gi1/0/1   auto   on         25.5    C9120AXI-A          4     30.0
Gi1/0/2   auto   on         25.5    C9120AXI-A          4     30.0
```

```
Gi1/0/3   auto   on         25.5    C9120AXI-A          4     30.0
Gi1/0/4   auto   on         25.5    C9120AXI-A          4     30.0
...
```

Verify Power Negotiation

The default interface configuration works well in most deployments provided there is enough power budget, and the switch supports the minimum PoE standard requirement for a given AP model.
Particular caution has to be paid when you deal with power requirements greater than PoE (802.3af), as either CDP or LLDP needs to remain enabled (both globally and on the port level) to ensure proper power negotiation with the connected AP.

Ensure these options are not disabled (these commands are not visible in a normal running configuration as they are there by default):

<#root>

```
Switch(config)#
```

cdp advertise-v2

```
Switch(config)#interface GigabitEthernet1/0/1
Switch(config-if)#
```

cdp enable

To verify if CDP is enabled you can use this command:

<#root>

```
Switch#
```

show cdp

```
Global CDP information:
        Sending CDP packets every 60 seconds
        Sending a holdtime value of 180 seconds
        Sending CDPv2 advertisements is  enabled
```

Common Issues Cisco TAC Encounters

- Power an Access Point with PoE standard that does not provide enough power that it requires and results in AP showing up in the WLC web interface with a Low/Medium Power . In some cases, this results in a non-functional AP that cannot even turn on its radios (for example, when 3800 AP is powered with the use of 802.3af), or it can result in reduced performance (for example, when 9115 AP is powered with the use of 802.11af and radios fall back to 2x2). Please take a look at Table 3. for the exact behavior of each AP model.
- Not all APs from the same series have the same power draw. For example, the 1562i can draw up to seven watts more than the 1562d version.
- Connecting AP to the power source with the use of a very long or non-certified cable can result in a higher power draw at the power source.
- When you use external or industrial APs, it is crucial to ground them. Refer to the 'AP deployment guides' for further information on the results of not properly grounding the AP.
- When you use power injectors, it is impossible to have mGig port speeds higher than 1000 Mbps.

Related Information

- **Cisco Technical Support & Downloads**