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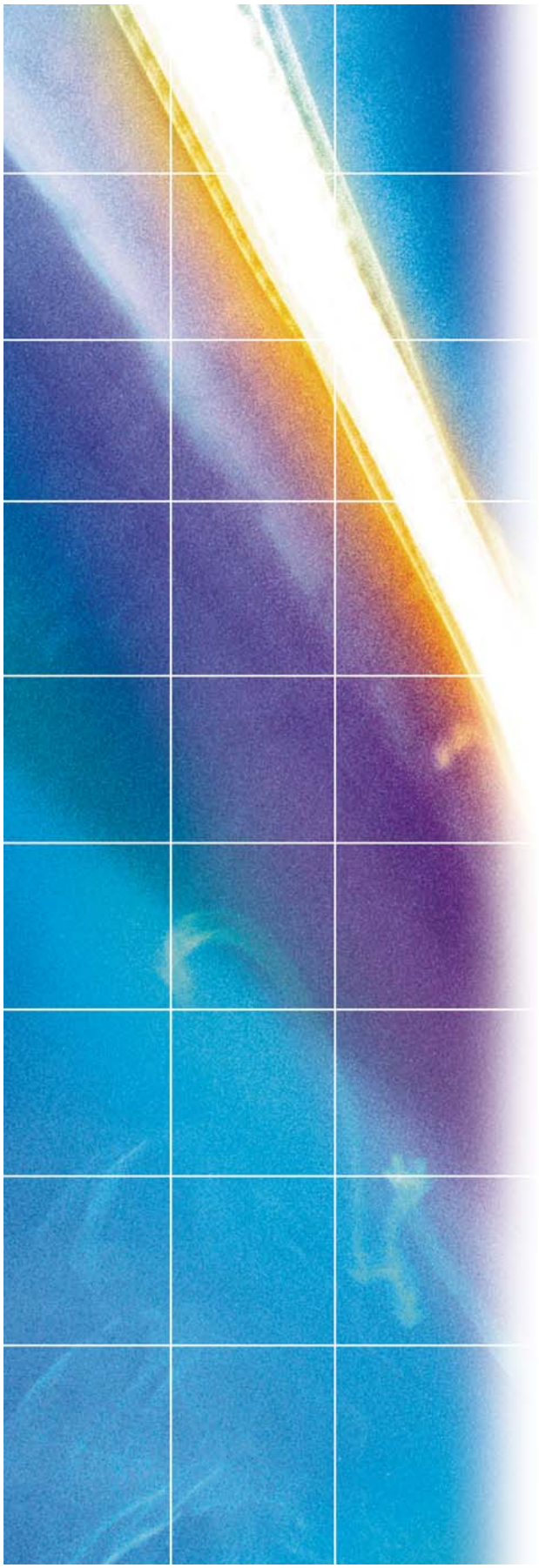
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Fortress Security System

ES520
Deployable Mesh Point

Hardware Guide

www.fortresstech.com
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Fortress ES520 Deployable Mesh Point [rev.2]

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IMPORTANT FCC INFORMATION

The Federal Communications Commission has released Office of Engineering and Technology Laboratory Division Knowledge Database (KDB) 44399, which refines the definition of Dynamic Frequency Selection (DFS) support. Since this device has the ability to use frequencies covered by DFS, KDB 443999 must be followed. It is published in full on the FCC web site: https://apps.fcc.gov/oetcf/kdb/forms/FTSSearchResultPage.cfm?switch=P&id=41732

In order to support FCC KDB 443999, Fortress has limited the use of certain frequencies within the 5400–5725 MHz range. Specifically, the frequencies defined by the FCC as being of primary interest are those in the 5600–5650 MHz range, which correspond to 802.11a channels 120, 124, and 128. In order to comply with the KDB 443999, these channels have been removed from use, or *notched*. Notched channels are unavailable for use on this device.

KDB 44399 provides additional restrictions on the use of channels within 30 MHz of notched channels when the device is within 35 km of a Terminal Doppler Weather Radar (TDWR) installation. Affected channels 116, 132, and 136 serve as a *guard* of 30 MHz around the critical notched frequencies. Guard frequencies are unavailable for use on this device by default. The FCC allows these channels to be used, however, as long as the device is not within 35 km of a TDWR installation, as described in this excerpt of KDB 443999:

> Any installation of either a master or a client device within 35 km of a TDWR location shall be separated by at least 30 MHz (center-to-center) from the TDWR operating frequency.
>
> In some instances it is possible that a device may be within 35 km of multiple TDWRs. In this case the device must ensure that it avoids operation within 30 MHz for each of the TDWRs. This requirement applies even if the master is outside the 35 km radius but communicates with outdoor clients which may be within the 35 km radius of the TDWRs.
>
> The requirement for ensuring 30 MHz frequency separation is based on the best information available to date. If interference is not eliminated, a distance limitation based on line-of-sight from TDWR will need to be used.

Please refer to the original KDB 443999 as posted on the FCC web site for the complete text.

In order to enable channels 116, 132, and/or 136, please contact Fortress to obtain a special license. This license will be issued after it is confirmed that the installation is not within 30 MHz and 35 km of registered TDWR sites. The following table (provided by the FCC in KDB 443999 published on 10/14/2010) describes the locations of TDWR sites, as well as the frequencies at which these sites operate:

TDWR Location Information				FREQUENCY	TERRAIN ELEVATION (MSL) [ft]	ANTENNA HEIGHT ABOVE TERRAIN [ft]
STATE	CITY	LONGITUDE	LATITUDE			
AZ	PHOENIX	W 112 09 46	N 33 25 14	5610 MHz	1024	64
CO	DENVER	W 104 31 35	N 39 43 39	5615 MHz	5643	64
FL	FT LAUDERDALE	W 080 20 39	N 26 08 36	5645 MHz	7	113
FL	MIAMI	W 080 29 28	N 25 45 27	5605 MHz	10	113
FL	ORLANDO	W 081 19 33	N 28 20 37	5640 MHz	72	97
FL	TAMPA	W 082 31 04	N 27 51 35	5620 MHz	14	80
FL	WEST PALM BEACH	W 080 16 23	N 26 41 17	5615 MHz	20	113
GA	ATLANTA	W 084 15 44	N 33 38 48	5615 MHz	962	113
IL	MCCOOK	W 087 51 31	N 41 47 50	5615 MHz	646	97
IL	CRESTWOOD	W 087 43 47	N 41 39 05	5645 MHz	663	113
IN	INDIANAPOLIS	W 086 26 08	N 39 38 14	5605 MHz	751	97
KS	WICHITA	W 097 26 13	N 37 30 26	5603 MHz	1270	80
KY	COVINGTON CINCINNATI	W 084 34 48	N 38 53 53	5610 MHz	942	97
KY	LOUISVILLE	W 085 36 38	N 38 02 45	5646 MHz	617	113
LA	NEW ORLEANS	W 090 24 11	N 30 01 18	5645 MHz	2	97
MA	BOSTON	W 070 56 01	N 42 09 30	5610 MHz	151	113
MD	BRANDYWINE	W 076 50 42	N 38 41 43	5635 MHz	233	113
MD	BENFIELD	W 076 37 48	N 39 05 23	5645 MHz	184	113
MD	CLINTON	W 076 57 43	N 38 45 32	5615 MHz	249	97
MI	DETROIT	W 083 30 54	N 42 06 40	5615 MHz	656	113
MN	MINNEAPOLIS	W 092 55 58	N 44 52 17	5610 MHz	1040	80
MO	KANSAS CITY	W 094 44 31	N 39 29 55	5605 MHz	1040	64
MO	SAINT LOUIS	W 090 29 21	N 38 48 20	5610 MHz	551	97
MS	DESOTO COUNTY	W 089 59 33	N 34 53 45	5610 MHz	371	113
NC	CHARLOTTE	W 080 53 06	N 35 20 14	5608 MHz	757	113
NC	RALEIGH DURHAM	W 078 41 50	N 36 00 07	5647 MHz	400	113
NJ	WOODBRIDGE	W 074 16 13	N 40 35 37	5620 MHz	19	113
NJ	PENNSAUKEN	W 075 04 12	N 39 56 57	5610 MHz	39	113
NV	LAS VEGAS	W 115 00 26	N 36 08 37	5645 MHz	1995	64
NY	FLOYD BENNETT FIELD	W 073 52 49	N 40 35 20	5647 MHz	8	97
OH	DAYTON	W 084 07 23	N 40 01 19	5640 MHz	922	97
OH	CLEVELAND	W 082 00 28	N 41 17 23	5645 MHz	817	113
OH	COLUMBUS	W 082 42 55	N 40 00 20	5605 MHz	1037	113
OK	AERO. CTR TDWR #1	W 097 37 31	N 35 24 19	5610 MHz	1285	80
OK	AERO. CTR TDWR #2	W 097 37 43	N 35 23 34	5620 MHz	1293	97
OK	TULSA	W 095 49 34	N 36 04 14	5605 MHz	712	113
OK	OKLAHOMA CITY	W 097 30 36	N 35 16 34	5603 MHz	1195	64
PA	HANOVER	W 080 29 10	N 40 30 05	5615 MHz	1266	113
PR	SAN JUAN	W 066 10 46	N 18 28 26	5610 MHz	59	113
TN	NASHVILLE	W 086 39 42	N 35 58 47	5605 MHz	722	97
TX	HOUSTON INTERCONTL	W 095 34 01	N 30 03 54	5605 MHz	154	97

In addition, the FCC recommends that all operators and installers register with the WISPA database used by government agencies to quickly find devices that may be causing interference and notify their owners/operators to shut them down. This registration is not required, but Fortress strongly recommends that all systems be registered, as described in this excerpt of KDB 44399:

> A voluntary WISPA sponsored database has been developed that allows operators and installers to register the location information of the UNII devices operating outdoors in the 5470 – 5725 MHz band within 35 km of any TDWR location (see http://www.spectrumbridge.com/udia/home.aspx). This database may be used by government agencies in order to expedite resolution of any interference to TDWRs.

KDB 443999 further specifies that the requirements of KDB 594280 must also be met. KDB 594280 is published in full on the FCC web site: https://apps.fcc.gov/oetcf/kdb/forms/FTSSearchResultPage.cfm?switch=P&id=39498. This device meets KDB 594280 by not allowing any configuration options to be made such that the device could be taken out of compliance. There is no ability for the user to change country codes or to select power levels that would take the device out of compliance.

For customers such as the U.S. military or others willing to produce evidence that particular devices will be used only outside of the United States, a special license can be obtained from Fortress that will allow those devices the option of selecting a different, non-U.S. country code. Fortress creates such licenses only for those customers who offer proof of non-U.S. device usage, and licenses are specific to particular devices and are not transferrable. Devices having such a license should NOT be considered to be compliant with FCC regulatory requirements. Please contact Fortress with questions about these special licences.

Only software that has been signed by Fortress using the Fortress private key can be loaded onto a Fortress device, thus insuring that no software other than that which is controlled and signed by Fortress can by loaded onto the device.

FCC EMISSIONS COMPLIANCE STATEMENT

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 THE USER WILL BE REQUIRED TO CORRECT THE INTERFERENCE AT HIS OWN EXPENSE.

THIS DEVICE COMPLIES WITH 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 INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

FCC CLASS A WARNING

MODIFYING THE EQUIPMENT WITHOUT FORTRESS AUTHORIZATION MAY RESULT IN THE EQUIPMENT NO LONGER COMPLYING WITH FCC REQUIREMENTS FOR CLASS A DIGITAL DEVICES. IN THAT EVENT, YOUR AUTHORITY TO USE THE EQUIPMENT MAY BE VOIDED UNDER FCC REGULATIONS, AND YOU MAY BE REQUIRED TO CORRECT ANY INTERFERENCE TO RADIO OR TELEVISION COMMUNICATIONS AT YOUR OWN EXPENSE.

TO COMPLY WITH FCC RF EXPOSURE COMPLIANCE REQUIREMENTS, THE ANTENNAS USED FOR THESE TRANSMITTERS MUST BE INSTALLED TO PROVIDE A SEPARATION DISTANCE OF AT LEAST 20 CM FROM ALL PERSONS AND MUST NOT BE CO-LOCATED OR OPERATED IN CONJUNCTION WITH ANY OTHER ANTENNA OR TRANSMITTER.

CAUTION: A 4.4 GHZ MILITARY BAND RADIO IS OPTIONAL EQUIPMENT IN THE ES520. THE 4.400 GHZ–4.750 GHZ FREQUENCY RANGE IS REGULATED BY THE UNITED STATES DEPARTMENT OF DEFENSE. THE FCC HAS NO REGULATORY OVERSIGHT OR JURISDICTION ON PRODUCTS CONTAINING RADIOS THAT OPERATE IN THIS RANGE. USE OF 4.4 GHZ RADIOS IS STRICTLY FORBIDDEN OUTSIDE OF U.S. MILITARY APPLICATIONS AND AUTHORITY.

WARNING: FORTRESS IS NOT RESPONSIBLE FOR ANY RADIO OR TELEVISION INTERFERENCE CAUSED BY UNAUTHORIZED MODIFICATION OF THE DEVICES INCLUDED WITH THE SECURE WIRELESS ACCESS MESH POINT, OR THE SUBSTITUTION OR ATTACHMENT OF CONNECTING CABLES AND EQUIPMENT OTHER THAN THAT SPECIFIED BY FORTRESS. THE CORRECTION OF INTERFERENCE CAUSED BY SUCH UNAUTHORIZED MODIFICATION, SUBSTITUTION OR ATTACHMENT IS THE RESPONSIBILITY OF THE USER. FORTRESS IS NOT LIABLE FOR ANY DAMAGE OR VIOLATION OF GOVERNMENT REGULATIONS THAT MAY ARISE FROM THE USER FAILING TO COMPLY WITH THESE GUIDELINES.

ANTENNA RESTRICTIONS

THIS DEVICE HAS BEEN DESIGNED TO OPERATE WITH ANTENNAS THAT HAVE A MAXIMUM GAIN OF 26 dB. ANTENNAS HAVING A GAIN GREATER THAN 26 dB ARE STRICTLY PROHIBITED FOR USE WITH THIS DEVICE. THE REQUIRED ANTENNA IMPEDANCE IS 50 OHMS.

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Chapter 1
Overview

1.1 This Document

This user guide covers preparing and installing the ES520 Fortress hardware. It also describes the LED indicators and recessed button operation, and provides specifications. Other Fortress hardware devices are covered in separate hardware guides, one for each Mesh Point (or Network Encryptor) model.

Fortress Mesh Point user guidance is intended for professional system and network administrators and assumes that its users have a level of technical expertise consistent with these roles.

Side notes throughout this document are intended to alert you to particular kinds of information, as visually indicated by their icons. Examples appear to the right of this section, in descending order of urgency.

WARNING: can cause physical injury or death and/or severely damage your equipment.

CAUTION: can corrupt your network, your data or an intended result.

NOTE: may assist you in executing the task, e.g. a convenient software feature or notice of something to keep in mind.

1.1.1 Related Documents

Each Fortress hardware series runs the same Fortress software, and differences between ES and FC series software are minor. Fortress software user guidance covers all current Fortress hardware platforms.

Fortress Mesh Point software guides include:

- *Mesh Point and Network Encryptor Software GUI Guide*
- *Mesh Point and Network Encryptor Software CLI Guide*
- *Mesh Point and Network Encryptor Software Auto Config Guide*

In addition to this guide, the Fortress hardware guides include:

- *ES210 Tactical Mesh Point Hardware Guide*
- *ES440 Infrastructure Mesh Point Hardware Guide*
- *ES820 Vehicle Mesh Point Hardware Guide*
- *FC-X Inline Network Encryptor Hardware Guide*

1.2 The ES520

The Fortress ES520 Deployable Mesh Point is a full-featured Fortress network device, providing strong data encryption and Multi-factor Authentication™, including native RADIUS authentication, to users and devices on the network it secures.

The ES520 comprises three, independent network components that can be used alone or simultaneously in any combination:

1. *Radio 1* is a dual-band 802.11a/b/g radio that can be configured to use either the 802.11b/g band or the 802.11a band. It can function as a wireless access point (AP), providing secure WLAN connectivity to wireless devices within range and as a wireless bridge or node in a mesh network.
2. The standard equipment *Radio 2* is fixed on the 802.11a band. The ES520 can be optionally equipped with a 4.4 GHz military band ***Radio 2***. In either case, as the higher powered of the two radios, it would normally be the first choice for the backhaul function in a mixed wireless Mesh Point/WLAN deployment.
3. The eight RJ-45 10/100 Mbps Auto-MDIX Ethernet ports (labeled **1-8**) are interfaces for the internal LAN switch.

NOTE: The internal LAN does not support NAT (network address translation).

The ES520 can function either as an 802.3af power-over-Ethernet (PoE) powered device (PD) or as an 802.3af power sourcing equipment (PSE) device. It functions as a PD when powered solely through its WAN port. It functions as an 8-port PSE switch when powered from local 48V power (from either the AC adapter or the 4-pin input). The ES520's 48V power supplies are highly isolated to meet PSE standards and will provide up to 36W of total PSE power to remote devices.

1.2.1 Hardware Models

You can identify whether the ES520 is equipped with a standard 5 GHz 802.11a radio (as Radio 2) or the optional 4.4 GHz military band radio by the full model number.

CAUTION: Use of 4.4 GHz radios is strictly forbidden outside of U.S. Department of Defense authority.

- ES520-35 - standard equipment
- ES520-34 - military option

The 4.400 GHz–4.750 GHz frequency range is regulated by the United States Department of Defense, rather than the Federal Communications Commission (FCC). FCC markings are therefore not applied to the ES520-34 chassis and there is no FCC ID associated with these products.

Each model is equipped with the appropriate antenna port (**ANT2**) for the type of radio installed as Radio 2.

The two ES520 models are otherwise identical.

1.2.2 Hardware Versions

Fortress's ES520 hardware platform includes two, distinct hardware versions, distinguishable by their different front panels.

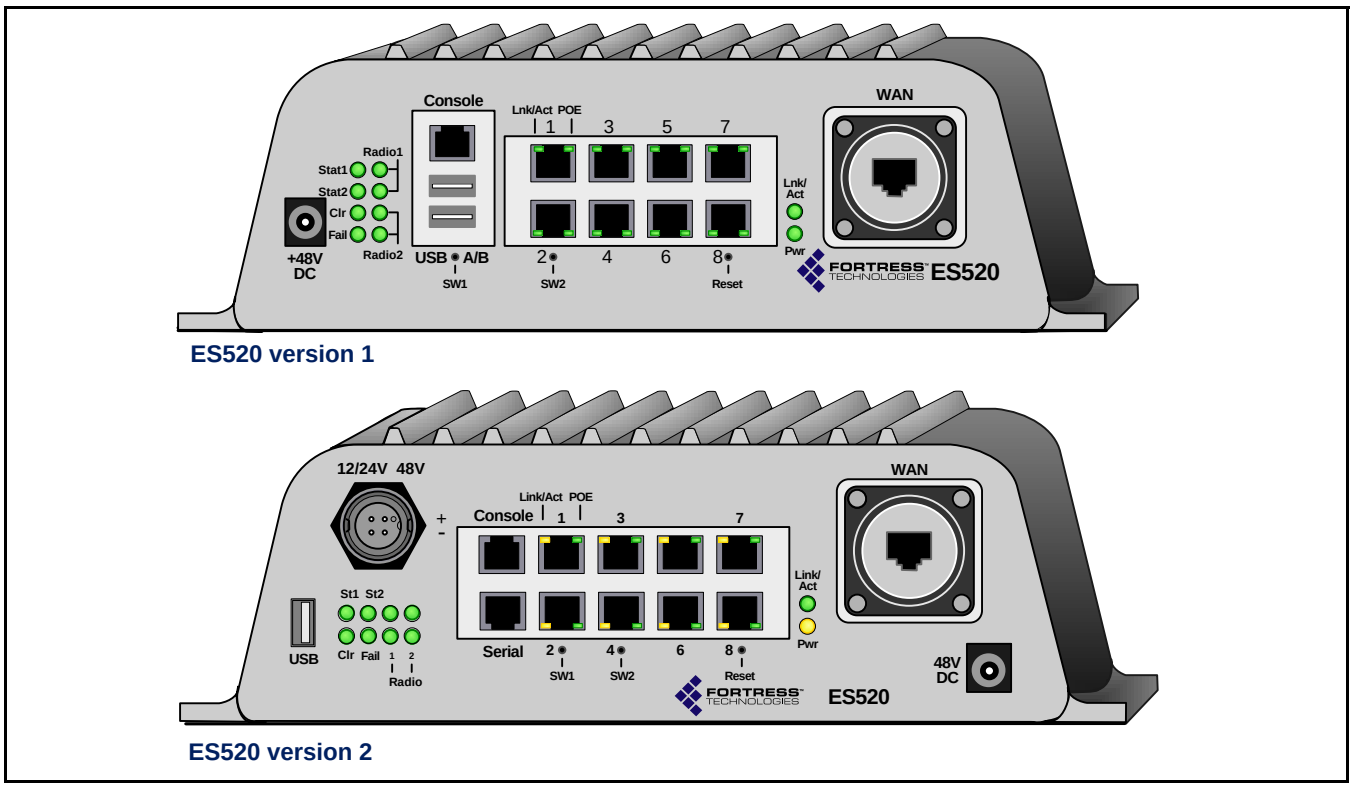


Figure 1.1. ES520 Hardware Versions

In particular, the version 2 chassis features a new weathertight, locking, multi-range DC power input on the upper left of the front panel and a second RJ-45 serial port. ES520 version 2 has one fewer USB ports than version 1 and is 1.5'" inches deeper.

Several front panel features were also repositioned between the two versions, including status and radio LEDs, the 48V barrel-style power inlet, the remaining USB port, and front-panel switches.

1.2.3 Shipped Parts

Included in each ES520 Deployable Mesh Point shipment:

- one ES520 version 1 or ES520 version 2 Mesh Point
- one universal AC-to-48V DC power adapter
- AC power cord
- one PoE midspan adapter[1]
- one RJ-45-to-DB9 serial port adapter (for use with a straight-through Cat5 cable assembly)

1. Refer to *Powering—for External Environments* on page 6 for outdoor surge and safety requirements.

- ES520 Weatherizing Kit, including:
  - one front-panel cover plate
  - one RJ-45 connector boot assembly (six pieces)
  - one antenna port cap
- ES520 Mast-Mounting Kit, including:
  - one mast mounting bracket
  - two 4" long, fully threaded 1/4"x20 hex bolts
  - two 1/4" split lock washers
  - four 1/4"x20 wingnuts
- software CD, including:
  - ES520 Mesh Point software package
  - Fortress and standard SNMP MIBs
  - RADIUS dictionary file with Fortress Vendor-Specific Attributes for administrative authentication
  - ES520 Mesh Point user guides and latest release notes

Chapter 2
Installation

2.1 Preparation

Before designing your Mesh Point deployment, review the powering and siting options and requirements described in sections 2.1.2 through 2.1.5

Before proceeding with installation, review the safety information in Section 2.1.1 below.

2.1.1 Safety Requirements

To prevent damage to the product and ensure your personal safety, operate the Deployable Mesh Point only within the operating specifications given in Section 4.1.2, and carefully follow these guidelines:

- ***General:*** This equipment must be installed by qualified service personnel according to the applicable installation codes. Do not locate the Mesh Point or antennas near power lines or power circuits. When installing an external antenna, take extreme care not to come into contact with such circuits as they can cause serious injury or death. Avoid metal ladders wherever possible. For proper installation and grounding, refer to national and/or local codes (WSNFPA 70 or, Canadian Electrical Code 54).
- ***Indoor/Outdoor Siting:*** All interconnected equipment connected to the indoor/outdoor Mesh Point must be contained within the same building, including the interconnected equipment's associated LAN connections.

  In outdoor environments, the Deployable Mesh Point ***must*** be mounted on a wall, pole, mast or tower using the included mounting bracket, so that the antenna connections are at the top and the WAN port is at the bottom. When mounted outside, the Mesh Point's Front Panel Cover Plate (included) provides the necessary water and dust resistance to environmentally protect the unit. In addition, the three Front Panel Cover Plate thumbscrews must be hand-tightened (taking care not to over-tighten) to prevent the operator-access area (USB, Console, Ethernet

WARNING: The Mesh Point contains a 3V (7 year) lithium battery for time-keeping purposes. It is *not* intended to be operator- or user-replaceable. To avoid risk of personal injury (and voiding of the Mesh Point's warranty), refer all hardware servicing to Fortress Technical Support. *There is a risk of explosion if the battery is replaced by an incorrect type.* Dispose of used batteries according to the new battery disposal instructions.

ports, and power inlets) from being exposed. The Mesh Point should not be used outside a home, school, or other public area where the general population has access to it.

FOR ES520 VERSION 1: When sited inside, the unit is powered with 48VDC PoE or 48VDC external power.

FOR ES520 VERSION 2: When sited inside, the unit is powered with 48VDC PoE, 48VDC external, or 7-30V (12/24) power. Do not exceed 30V on the 7-30V (12/24) power input or the unit can be damaged.

The included front-panel cover plate is not required for indoor installations of either hardware version.

- ***Ambient Temperature:***
  FOR ES520 VERSION 1: The temperature of the environment in which the Mesh Point operates should not exceed the maximum (122º F/50º C or drop below the minimum (14º F/-10º C) operating temperatures.
  FOR ES520 VERSION 2: The temperature of the environment in which the Mesh Point operates should not exceed the maximum (131º F/55º C) or drop below the minimum (14º F/-10º C) operating temperatures.
- ***Circuit Overloading:*** Both ES520 version Mesh Points include an internal 48V resettable fuse. PoE powered ports are protected with additional 48V resettable fuses.
  FOR ES520 VERSION 2: The Mesh Point includes internal resettable fuse on its 7-30V (12/24) power input. Do not exceed 30V on the 7-30V (12/24) power input or the unit can be damaged.
- ***Powering****—for External Environments:*
  FOR ES520 VERSION 1: To meet UL outdoor surge and safety requirements, the Mesh Point must be powered with the included 48V power supply through the included PoE midspan adapter (or equivalent).
  FOR ES520 VERSION 2: To meet UL outdoor surge and safety requirements, the Mesh Point must be powered with 1) the included 48V power supply through the included PoE midspan adapter (or equivalent), 2) a surge- and safety-isolated AC/DC power supply to the 4-pin connector, or 3) a DC battery to the 4-pin connection.
  The WAN port of both ES520 versions is lightning protected at the Mesh Point end. It is recommended that additional WAN port lightning protection be provided to protect customer premises and equipment.
- ***Powering****—for Internal Environments:*
  FOR ES520 VERSION 1: The Mesh Point can be 1) direct powered by the universal AC-to-48V DC (70 Watt) power adapter, 2) PoE powered over the WAN port with the included POE adapter (or equivalent), or 3) PoE powered from a remote 802.11af (13 Watt) PoE midspan source.

WARNING: To avoid the risk of severe electrical shock, never remove the cover, an exterior panel, or any other part of the Mesh Points's chassis. There are no user-serviceable parts inside. Refer all hardware servicing to Fortress Technical Support.

FOR ES520 VERSION 2: The Mesh Point can be 1) direct powered by the universal AC-to-48V DC (70 Watt) power adapter, 2) PoE powered over the WAN port with the included POE midspan adapter (or equivalent), 3) PoE powered from an 802.11af PSE, or 4) externally powered from a 7-30V (12/24) power source. Do not exceed 30V on the 7-30V (12/24) power input or the unit can be damaged.

The AC to 48V power adapter included with both hardware versions has reinforced isolation to meet the endspan requirements of 802.11af, *Power Sourcing Equipment*.

- ***Lightning/Electrostatic Protection:*** The Mesh Point's antenna ports conform to IEC1000-4-5 10 KV 8/20us waveform. The WAN port conforms to IEC-61000-4-2 8 KV waveform with 58 V additional transient protection.
- ***Grounding:*** The Mesh Point features a rear panel grounding stud which must be connected to protective earth ground via a 20 gauge (minimum) cable, before any other physical connection is made.

  The antenna/cable distribution system should be grounded (earthed) in accordance with ANSI/NFPA 70, the National Electrical Code (NEC), in particular, Section 820.93, Grounding of Outer Conductive Shield of a Coaxial Cable.

  The antenna mast and Deployable Mesh Point, when used outside, should be grounding per Article 810 of the NEC; of particular note is the requirement that the grounding conductor not be less than 10 AWG(Cu).
- ***Waterproofing:*** The Mesh Point has a UL (NEMA) 3/3S/4 raintight rating. The Front-panel Cover Plate of the ES520 Weatherizing Kit includes a "Raintight" label. The Mesh Point is water resistant when the Weatherizing Kit (cover plate, WAN-port RJ-45 connector boot assembly, and antenna cap—included) is properly installed.
- ***Cabling:*** Cables must be installed in accordance with NEC Article 725 and 800, and all requirements must be met in relation to clearances with power lines and lighting conductors. All cabling must be category 5e per TIA/EIA-568-B.2.
- ***Radio Frequency:*** The Mesh Point's internal radios conform to the FCC's safety standard for human exposure to RF electromagnetic energy, provided that you follow these guidelines:
  - Do not touch or move the antennas while the unit is transmitting or receiving.
  - To safeguard Mesh Point transmitting circuitry, relocate the Mesh Point and its antennas only when the Mesh Point is powered off.
  - When the Mesh Point is transmitting, do not hold it so that the antenna is very close to or touching any exposed parts of the body, especially the face or eyes.

WARNING: If the Mesh Point connects to outside-mounted antennas, failure to provide a low resistive earth ground can result in migration of voltage from lightning or line surges onto the premises wiring, which can cause electric shock and/or fire within the building or structure.

- Antennas must be installed to provide a separation of at least 20 cm (7.9") from all persons and any co-located antenna or transmitter.
- Regarding use in specific environments: *• Do not operate near unshielded blasting caps or in an explosive environment. • Limit use in a hazardous location to the constraints imposed by the location's safety director. • Abide by the rules of the Federal Aviation Administration for the use of wireless devices on airplanes. • Restrict the use of wireless devices in hospitals to the limits set forth by each hospital.*

NOTE: The ES520 complies with UL 60950-1 safety specifications. It has a UL (NEMA) 3/3S/4 (and IEC60529) environmental rating. The Front-panel Cover Plate of the ES520 Weatherizing Kit includes a "Raintight" label.

2.1.2 Outdoor Siting Requirements and Restrictions

Mesh Points intended to be used out-of-doors ***must*** be fully weatherized and mast-mounted (as described in sections 2.3 and 2.4), with significant follow-on effects:

- At minimum, essential connectivity and security parameters should preconfigured and tested on an outdoor Mesh Point in advance of its deployment in the field.
- The LAN switch ports on an outdoor Mesh Point are blocked by the required front-panel cover plate. The only available network connections on an outdoor Mesh Point are its front-panel WAN port and radio interfaces.
- The Mesh Point's optional PSE function is exclusive to the Mesh Point's LAN switch ports. It has no application in an outdoor Mesh Point.
- As described in Section 1.1, on ES520 version 1 hardware, outdoor Mesh Points *must* be powered via their WAN port using a compatible Power over Ethernet (PoE) source. On ES520 version 2 hardware, outdoor Mesh Points can be powered through their WAN ports or through their weatherized, 4-pin, multi-range DC power inputs.

CAUTION: Review the primary documentation in chapters 3 and 4 of the Mesh Point functions you intend to employ ***in advance of determining your hardware setup***. Some hardware features are configurable; some software functions have specific hardware limitations/requirements.

None of the above functional restrictions apply to Mesh Points installed indoors.

2.1.3 Hardware Version Powering Options

The two ES520 hardware versions (Section 1.2.2) are both equipped with a barrel-style 48V DC power input intended exclusively for indoor use.

Both hardware versions can optionally be powered through their WAN ports by a remote Power over Ethernet (PoE) midspan or endspan device. The WAN port PoE can be used to power the Mesh Point indoors or, when the Mesh Point is fully weatherized (Section 2.3), outdoors.

NOTE: ES520 power inputs are not intended to provide redundancy in either hardware version.

Included with both versions are one 70W universal AC-to-DC power adapter module and one PoE midspan device.

The ES520 version 2 is additionally equipped with a weathertight, 4-pin, multi-range DC input that can be used to

power an indoor Mesh Point or an outdoor, weatherized Mesh Point.

2.1.3.1 ES520 Version 1

As described in Section 2.3, when an ES520 version 1 Mesh Point is weatherized for outdoor installation, the only power input available for use is the WAN port PoE input.

When the an ES520 version 1 Mesh Point is installed indoors, you can connect either or both power inputs:

- barrel-style 48V DC input directly connected to the AC-to-DC (70 Watt) power adapter included with the Mesh Point
- WAN port PoE input connected to the remote PoE midspan adapter (or equivalent) included with the Mesh Point, or to a 802.11af PoE endspan source

When you connect both sources, they provide a measure of redundancy.

As the higher voltage of the two supplies, the barrel-style input connected directly to the 70 Watt power adapter is primary, backed up by the WAN port PoE supply. If the primary power supply is lost, a PoE midspan device can take over without interruption. A PoE endspan device may allow a lapse before sensing that the Mesh Point is powered down and resupplying it via the WAN port. When the 48V DC power input is again receiving power, it will again become primary.

2.1.3.2 ES520 Version 2

Two sets of connections comprise the weathertight, 4-pin, multi-range DC input: the left pair of pins is for 12/24V power (7–30 range); the right pair of pins is for 48V power (36V–60V range).

In order to use the 4-pin, multi-range DC input, you must obtain a suitable mating cable-end socket connector and attach it according to the pin-outs described in Section 4.3 to a cable composed of 18 gauge (minimum) to 16 gauge (maximum) wire.

7–30 Volt Powering

If you use the Mesh Point's 4-pin multi-range DC input to supply 7-30V (12V/24V) power to the Mesh Point, it will be the Mesh Point's sole source of power. All 48V DC power inputs are disabled.

Purchase a weathertight mating connector or molded cable end assembly from Fortress Technologies or Switchcraft® (Mini-Con-X® series part # 382-4SG-3DC).

48 Volt Powering

If you use the Mesh Point's weathertight 4-pin DC input to supply 48V power to a weatherized, ES520 version 2 Mesh Point installed outside, you can use WAN port PoE as a backup supply.

As the higher voltage of two power supplies in this scenario, the 4-pin 48V DC power input is primary. If it loses power, a PoE midspan device can take over without interruption. A PoE endspan device may allow a lapse before sensing that the Mesh Point is powered down and resupplying it via the WAN port. When the 4-pin, 48V DC power input is again receiving power, it will again become primary.

In an indoor installation of an ES520 version 2 Mesh Point using 48V power, you can connect any two or all three power inputs to provide redundancy. If both the 48V barrel-style and the 48V 4-pin DC power inputs are connected, the higher voltage power source will serve as the primary supply. If the two sources are supplying *identical* voltage, the two inputs share the supply.

CAUTION: When an ES520 version 2 Mesh Point is indoors and powered by a 48V power supply, that supply must be isolated from its AC power mains and chassis ground to adhere to 802.3af PSE Safety standards.

NOTE: All power inputs should be applied before the Mesh Point is put into regular operation. When powered by endspan PoE, particularly, plugging in a redundant 48V power source will cause the Mesh Point to reboot.

2.1.4 Internal LAN Switch PoE PSE Function

The Mesh Point's Power over Internet Power Sourcing Equipment (PoE PSE) function can supply up to 36 Watts of power overall, with an additional maximum limit—*per interface pair*—of 16 Watts. The LAN switch's eight Ethernet ports are paired in sequence: **1** and **2**, **3** and **4**, **5** and **6**, **7** and **8**, as they are vertically aligned on the Mesh Point's front panel.

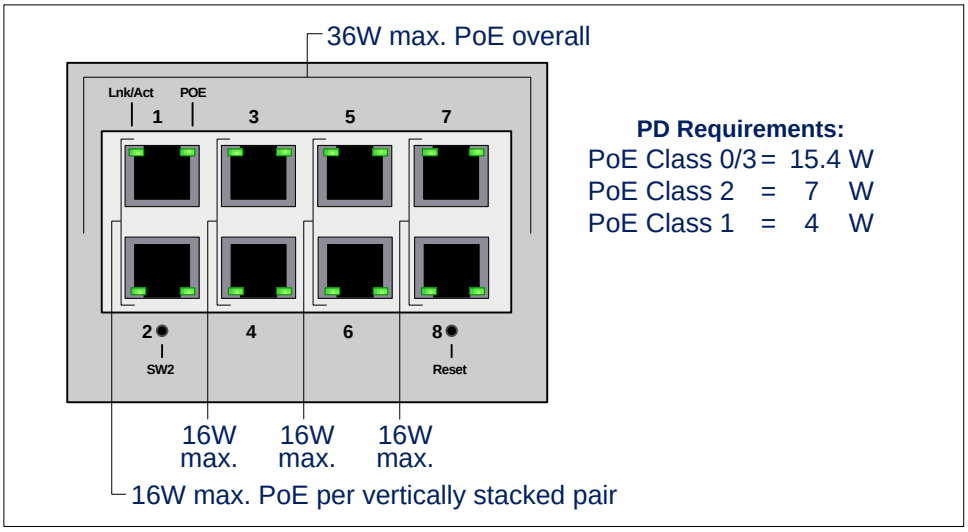


Figure 2.1. Internal LAN Switch PSE Maximums

The IEEE 802.3af standard classifies PoE powered devices (PDs) according to the amount of power allocated for them:

- Class 3 PDs are allocated 15.4 W.
- Class 2 PDs are allocated 7 W.
- Class 1 PDs are allocated 4 W.
- Class 0 is a catch-all for devices that cannot be otherwise classified; PDs in this class are allocated 15.4 W.

The Mesh Point supports a small set of legacy devices that do not comply with the 802.3af classification standard:

- Cisco® AP 1100 WAP
- Cisco AP 1200 WAP
- Cisco AP 350 WAP
- Cisco 7910 IP Phone
- Cisco 7940 IP Phone
- Cisco 7960 IP Phone
- Nortel® i2002 IP Phone Phase 1 sets (with Power-Splitter)
- Nortel i2004 IP Phone Phase 1 sets (with Power-Splitter)

These devices fall into the 802.3af catch-all Class 0 and are allocated 15.4 W regardless of their actual power requirements.

Table 2.1 shows the total number of PDs of various classes and combinations of classes that the Mesh Point can support overall.

Table 2.1. Maximum Connected PDs by PoE Class

802.3af Class			Total Power Allocated
0 & 3	2	1	
2	0	1	36 W
1	2	1	34 W
1	1	3	35 W
1	0	5	36 W
0	5	0	35 W
0	4	2	36 W
0	3	3	33 W
0	2	5	34 W
0	1	7	35 W
0	0	8	32 W

When a PD is plugged into a PoE-enabled LAN port, it will be powered up ***only*** if there is sufficient overall power available to allocate to a device of its class. If the Mesh Point would exceed its maximum of 36 Watts by allocating the amount of power

NOTE: In order to supply PoE, the Mesh Point must be locally powered by either the AC-to-DC adapter or 48V 4-pin input. Both 48V power supplies are highly isolated to meet PSE standards and will provide up to 36W of total PSE power.

required by the new PD's Class (as described above), the new PD will ***not*** be powered up.

In addition to the overall maximums, keep in mind that the distribution of PDs across LAN switch interfaces must not exceed the 16-Watt limit per vertically stacked port-pair (described above). A given pair of ports can therefore supply sufficient power to only one Class 3 or Class 0 PD or to two Class 2 and/or Class 1 PDs.

Each associated (vertically aligned) pair of PoE LAN switch interfaces shares a self-recovering fuse. If you exceed the 16-Watt port-pair maximum without exceeding the overall maximum, the breaker will trip, temporarily powering both ports off. The circuit resets automatically, re-enabling both ports. If the PSE overload has not been corrected, however, the circuit will break again. The process will recycle until one of the PDs on the pair is unplugged.

In order for the Mesh Point to supply PoE to PDs through a LAN switch port, you must enable PSE on the port, as described in the *Software GUI Guide*.

NOTE: If one port in a PSE pair is supplying power to a PoE Class 3 or Class 0 device, you can ensure that their shared fuse will not be overloaded by an attempt to supply power to another PD by leaving PSE **Disabled** (the default) on the second port in the pair.

2.1.5 Port Locations

The ES520 Mesh Point's dual antenna ports and grounding stud are located on the back panel. The rest of the ES520's ports are located on the front panel, shown below.

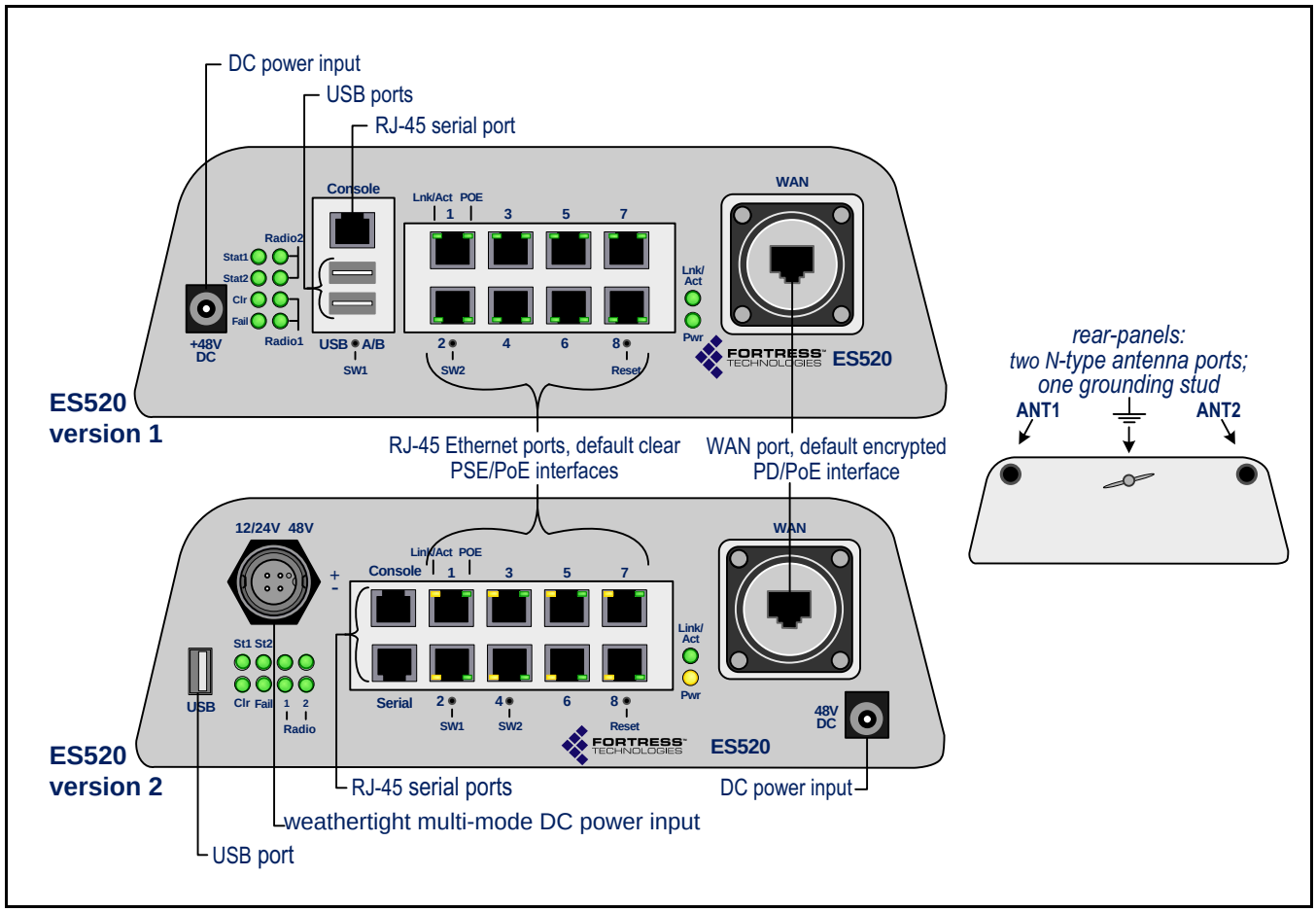


Figure 2.2. Fortress ES520 Mesh Point Port Locations

2.1.6 Network Interfaces

The ES520 Mesh Point's Ethernet **WAN** port and eight LAN switch ports, numbered **1**–**8**, comprise its wired network connections. Its two internal radios can be configured with up to four independent wireless interfaces, or Basic Service Sets (BSSs), each. You can configure the Mesh Point's network interfaces to meet various deployment and security requirements (see the *Software GUI Guide*).

2.2 Connecting the ES520

The ES520 can be connected temporarily for preconfiguration of the Mesh Point software and then permanently for deployment.

2.2.1 Connections for Preconfiguration

Mesh Point software should be configured in advance of deployment. This section provides instructions for temporarily connecting the ES520 Mesh Point for preconfiguration.

1. Position the Mesh Point so that it operates only within its safe temperature range (14º–122º F/-10º–50º C for ES520 version 1; 14º–131º F/-10º–55º C for ES520 version 2).
2. Connect the Mesh Point to an external power source: refer to Section 1.1, This Document.
3. Connect one of the Mesh Point's LAN switch ports (**1**–**8** on the front panel) to a computer or switch on the wired LAN.

To complete the configuration, refer to the *Software GUI Guide* or *Software CLI Guide* for instructions on Logging On, Licensing, and Configuring the Mesh Point software.

2.2.2 Connections for Deployment

Review the *Radio Frequency Safety Requirements* (Section 2.1.1) before installing or operating Mesh Point radios.

1. If the Mesh Point or its antenna(s) or any network component to which the Mesh Point will be physically connected will be located outside, connect the rear-panel grounding stud to protective earth ground with a 20 gauge (minimum) cable.
2. If your deployment uses Radio 1, connect a standard 2.4 GHz- or 5 GHz-capable antenna with an N-type male connector to antenna port 1 (**ANT1**).

   If the Mesh Point (or antenna) will be located outside, the antenna must be waterproof.
3. If your deployment uses Radio 2, connect an antenna cable with a N-type male connector between antenna port 2 (**ANT2**) and a high-gain omnidirectional or directional antenna.

   If the Mesh Point (or antenna) will be located outside, the antenna and cable must be waterproof.
4. If the Mesh Point is sited indoors where it does not need to be weatherized and your deployment will use one more of the LAN switch ports (labeled **1-8**), connect them with standard Cat5 Ethernet cables.

   By default, all LAN switch ports are in the clear (Fortress Security-disabled), but you can reconfigure them, per port, to provide encrypted or clear network interfaces (refer to the *Software GUI Guide*).

   If you are using the Mesh Point's PSE function, refer to Section 2.1.4 for guidance on the number of devices you can connect. If you are not using the Mesh Point's 802.3af power sourcing equipment (PSE) function to supply Power

WARNING: To comply with FCC regulations, antennas must be professionally installed and the installer is responsible for ensuring compliance with FCC limits.

CAUTION: The FCC requires co-located radio antennas to be at least 7.9" apart. The Mesh Point's antenna connectors are only 5" apart. *Avoid directly mounting two antennas to the Mesh Point's rear-panel connectors.*

NOTE: Third party antennas are subject to local regulatory requirements. For outdoor installations, they must be waterproof.

over Ethernet (PoE) to devices connected to its LAN switch, you can connect up to eight Ethernet devices. If your deployment uses the **WAN** port for data, connect it to the appropriate network device.

5 If your deployment uses the **WAN** port for data, connect it to the appropriate network device.

To plug in the RJ-45 connector with the boot assembly installed: orient the connector correctly with the WAN port, and then twist the outer ring of the connector boot clockwise until the channels in the ring align with the locking studs on the Mesh Point's WAN port casing. Continue twisting the boot's outer ring clockwise until the locking channels are fully engaged and the boot is flush with the port casing. A distinct click in the final turn of the boot's outer ring indicates that connector and boot are securely plugged into the Mesh Point. (Installing the connector boot assembly is covered in Section 2.3.)

By default, the **WAN** port is encrypted (Fortress Security-enabled), but you can configure it to provide a clear or encrypted network interface (refer to the *Software GUI Guide*).

6 Connect the Mesh Point (or verify its connection to) to the power source(s) it will use: refer to Section 1.1, This Document.

7 Verify that link/activity and power LEDs illuminate for all connected ports and that the upper radio LED illuminates for the enabled radio(s).

NOTE: Configure whether a given Ethernet interface is in the clear or encrypted (Fortress Security-enabled) on **Configure -> Ethernet Settings**.

2.3 Weatherizing the ES520 for Outdoor Installation

The weathertight, locking 4-pin DC power input (Switchcraft® Mini-Con-X® series) is present only in the ES520 version 2 Mesh Point. It is weathertight with or without the protective cap attached to the connector when it ships.

Obtain a weathertight mating connector or molded cable end assembly from Fortress Technologies or from Switchcraft.

All front-panel ports must be disconnected before you can install the Weatherizing Kit.

CAUTION: ***Do not*** assemble the connector boot without first referring to these instructions. Several assembly steps are irreversible. ***Incorrectly assembled connector boots are unusable***, and cannot be disassembled.

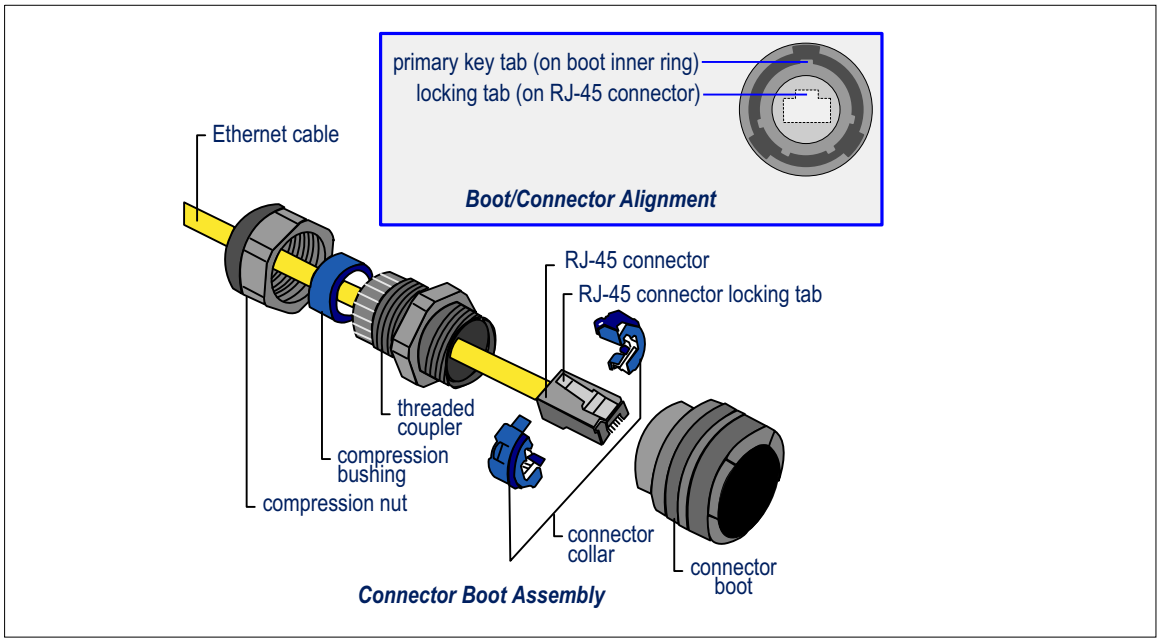


Figure 2.3. Installing the RJ-45 Connector Boot Assembly

1 Install the RJ-45 connector boot assembly on the end of the cable that you will be plugging into the Fortress Mesh Point's WAN port, as shown in Figure 2.3:

- If the RJ-45 connector is equipped with a molded plastic boot, remove it from the connector. (Some Ethernet cable connectors have a molded plastic outer casing that is not designed for removal. This style of connector is incompatible with the connector boot.)
- Slide the compression nut, with the threaded opening facing toward the connector, over the connector and onto the cable.
- Slide the compression bushing over the connector and onto the cable.
- Slide the threaded coupler, with the flanged end facing toward the compression nut and bushing, over the connector and onto the cable.
- With the smooth-side prongs on the two halves of the connector collar facing out and aligned with the RJ-45 connector's locking tab, fit the collar around the connector so that the connector's locking tab is compressed (the contact end of the connector extends approximately 1/2" from the collar). Fit the outer tabs on one half of the connector collar into the slots of the other, and squeeze the two halves of the connector collar together until they snap into place.

- Align the primary key tab on the inner ring of the connector boot with the cable connector's locking tab. Maintaining this alignment, fit the RJ-45 connector-collar assembly into the boot through the boot's threaded end and snap the collar tabs into the boot slots. Screw the connector boot securely onto the threaded coupler.
- Fit the compression bushing into the flanged end of the threaded connector, and fit the compression nut over the flanges. Screw the compression nut securely onto the threaded connector until the bushing is compressed around the cable to provide a water seal.

  Step 5 of Section 2.2.2 describes plugging the connector/boot into the Mesh Point's WAN port.

CAUTION: There are four different possible alignments between the RJ-45 connector and the connector boot. If the boot and connector are not in the correct alignment, the RJ-45 connector will not plug into the Mesh Point's WAN port.

2 Attach the cover plate to the Mesh Point's front panel with the plate's three captive screws, as shown in Figure 2.4.

The front-panel cover plate for ES520 version 2 Mesh Points features an additional opening for the weatherized, locking, multi-range DC power input.

WARNING: To avoid the risk of severe electrical shock, do not remove the cover plate while the Fortress Mesh Point is out of doors.

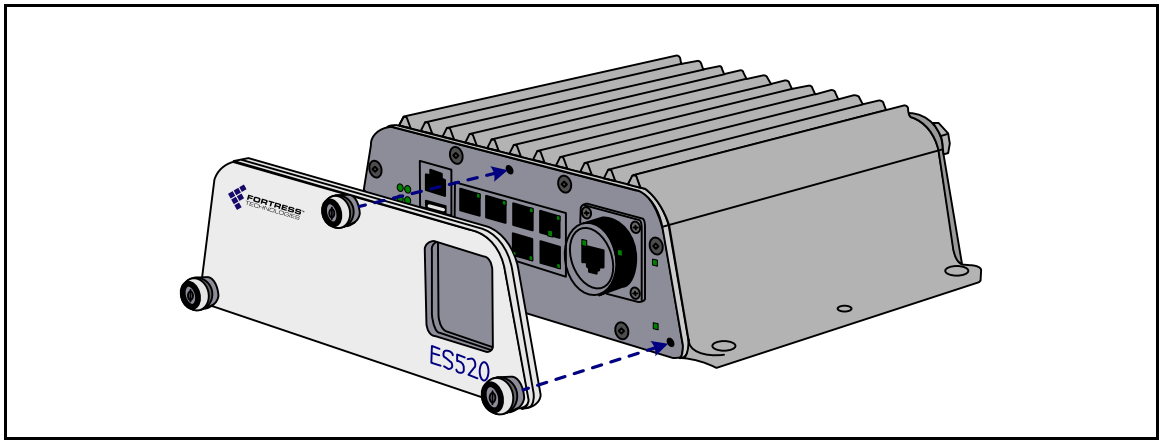


Figure 2.4. Attaching the Front-panel Cover Plate for an ES520 version 1

3 If only one antenna will be attached to the Mesh Point, screw the antenna port cap onto the unused antenna port.

2.4 Mast Mounting the ES520

The Mast-Mounting Kit accommodates masts from 1.5" to 3" in diameter.

1 Fit the two hex bolts through the center mounting holes in the lip extensions of the Mesh Point's underside, top to bottom.

2 Fix each bolt to the Mesh Point chassis with a wing nut, tightened securely to the underside of the Mesh Point.

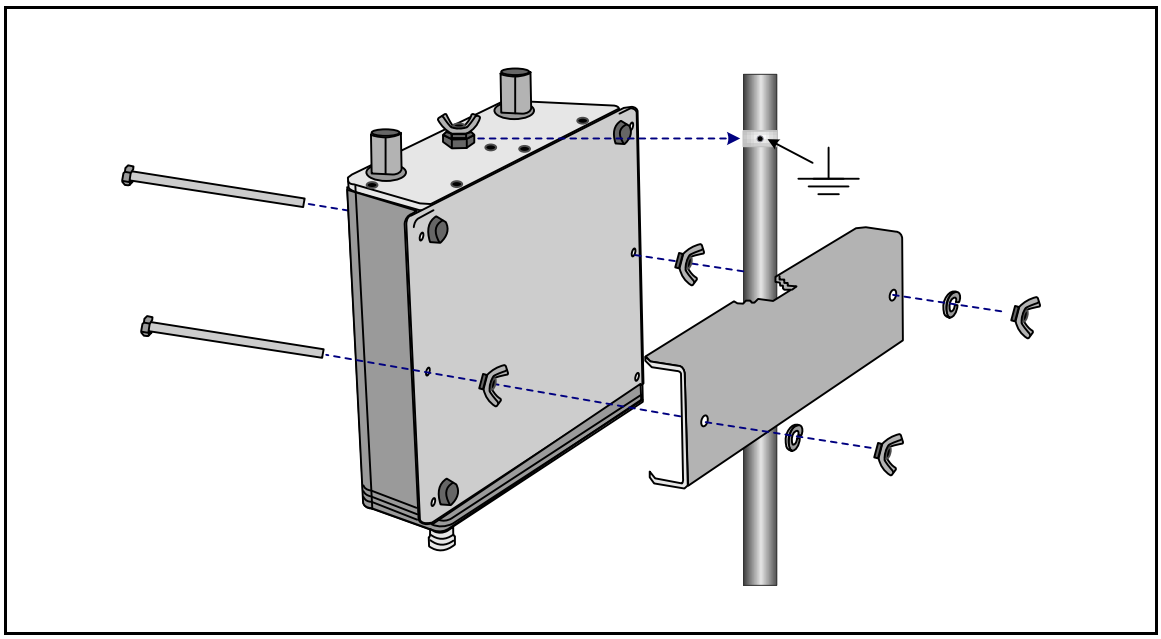


Figure 2.5. Attaching the Mast-Mounting Bracket and Grounding Stud

3 Position the Mesh Point at the desired position on the mast, with the Mesh Point's underside facing toward the mast and the front panel facing down, as shown in Figure 2.5.

4 Sandwiching the mast between the underside of the Mesh Point and the mounting bracket, fit the mast into the toothed cut-outs in the mounting bracket and the bolt shafts extending from the Mesh Point through the holes in the bracket.

5 Place a split lock washer and then a wing nut on each of the bolts ends, and tighten the nuts until the washers are flattened against the mounting bracket.

Chapter 3
LEDs and Recessed Button Operation

3.1 Front-Panel Indicators

The Fortress ES520 Mesh Point's front panel features five system LEDs (**Stat1**, **Stat2**, **Clr**, **Fail** and **Pwr**), four radio LEDs (two for each of **Radio1** and **Radio2**), as well as a pair of link/activity (**Lnk/Act**) and power-over-Ethernet (**POE**) LEDs for each of the Mesh Point's nine Ethernet ports.

NOTE: There are no LED indications in a Mesh Point in blackout mode (refer to Section 3.2.1.2).

3.1.1 Status, Cleartext and Failure LEDs

color	behavior	Stat1	Stat2	Clr	Fail	Pwr
		system status		*cleartext*	*failure*	*system power/ WAN PoE*
green	*solid*	normal operation	n/a	n/a	n/a	powered on
	slow flash	booting				-
	fast flash	-				-
off		-				powered off

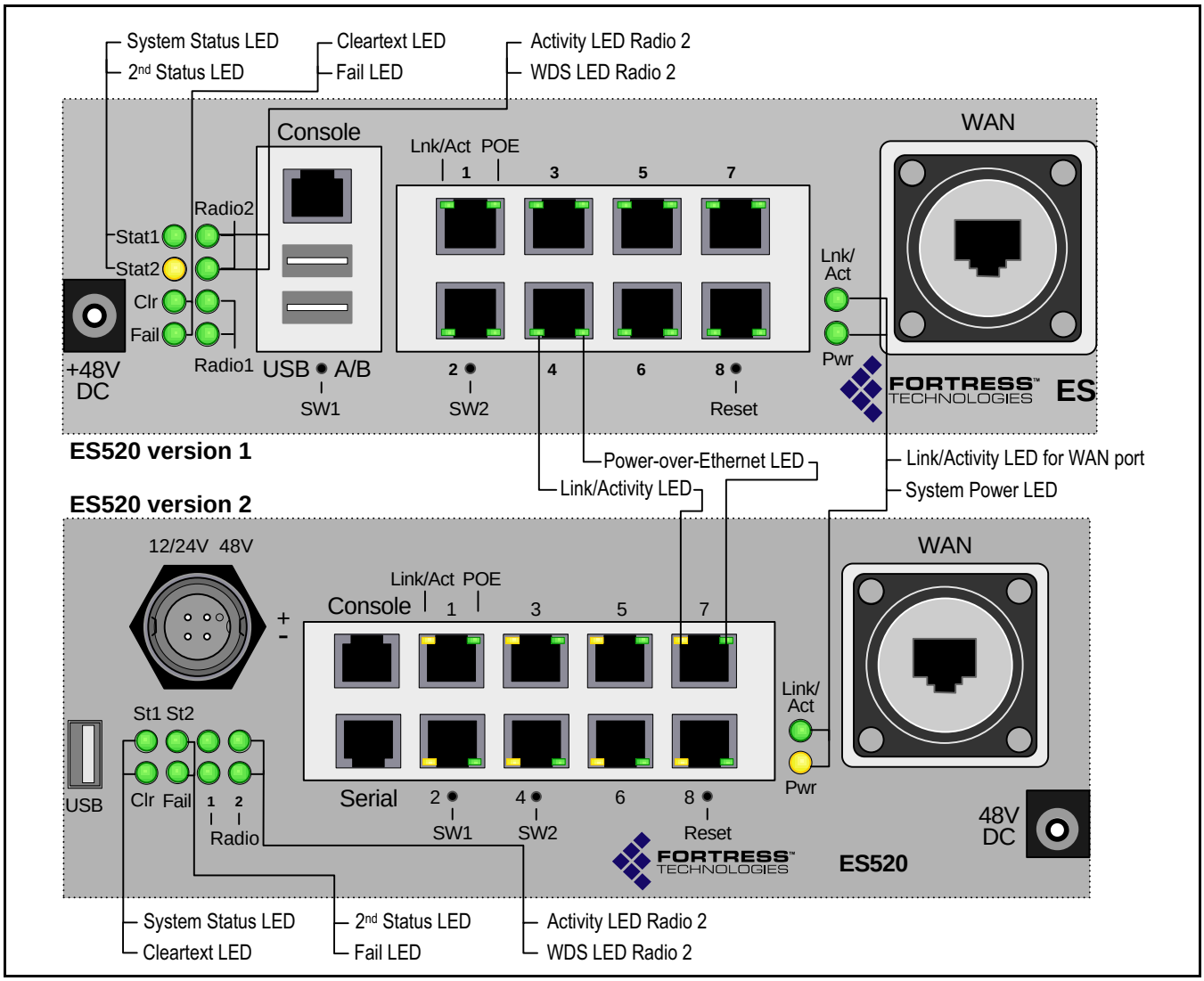


Figure 3.1. Fortress ES520 Mesh Point LED Indicators

Stat1 ***can exhibit:***

- *solid green* - The Mesh Point is operating normally.
- *slow green flash* - The Mesh Point is booting.

Stat2 is reserved for the Mesh Point's Automatic Configuration distribution function (refer to the *Auto Config Software Guide*).

Clr is reserved for a future function on the Mesh Point.

Fail is reserved for a future function on the Mesh Point.

Pwr ***can exhibit:***

- *solid green* - The Mesh Point is powered on, either through the +48V DC adapter inlet or the WAN port's PoE connection.
- *off* - The Mesh Point is powered off.

3.1.2 Radio LEDs

The Mesh Point's internal radios are each associated with a pair of front-panel LEDs, labeled **Radio1** and **Radio2**. Radio LEDs are arranged one above the other. Each radio then has an associated *upper* and *lower* LED.

When the Mesh Point's Received Signal Strength Indicator (RSSI) feature (refer to the *Software GUI Guide*) is **Disabled** (the default), **Radio1** and **Radio2** LEDs behave as shown below.

The upper LED can exhibit:

- *solid green* - The associated radio is on.
- *intermittent green flash* - The radio is passing traffic.
- *off* - The associated radio is off or *RF Kill* is activated.

The lower radio LEDs are reserved for future functions on the Mesh Point.

3.1.3 Port and Power LEDs

The Mesh Point's front-panel Ethernet ports, including the **WAN** and internal LAN switch ports, numbered **1** through **8** on the front panel, are equipped with a link/activity LED. LAN switch ports also feature a Power over Ethernet (PoE) status LED.

The Mesh Point's PSE function enables it to supply PoE to Powered Devices (PDs) connected to its internal LAN switch ports. The PoE status LED applies only when you have connected PDs to the Mesh Point's internal LAN switch (Section 2.1.4) and only to ports on which the PSE (Power Sourcing Equipment) function has been enabled (see the *Software GUI Guide*).

NOTE: The LEDs for the Mesh Point's **Console** port are not operational.

Lnk/Act *can exhibit:*

- *solid green* - A link has been established for the port.
- *intermittent green flash* - Traffic is passing on the link.

POE *can exhibit:*

- *solid green* - Power on: the port is supplying power to a connected PD.

3.2 Front-Panel Operation

The ES520 Mesh Point front panel is equipped with three, recessed buttons: two switches (labeled **SW1** and **SW2**) and a **Reset** button.

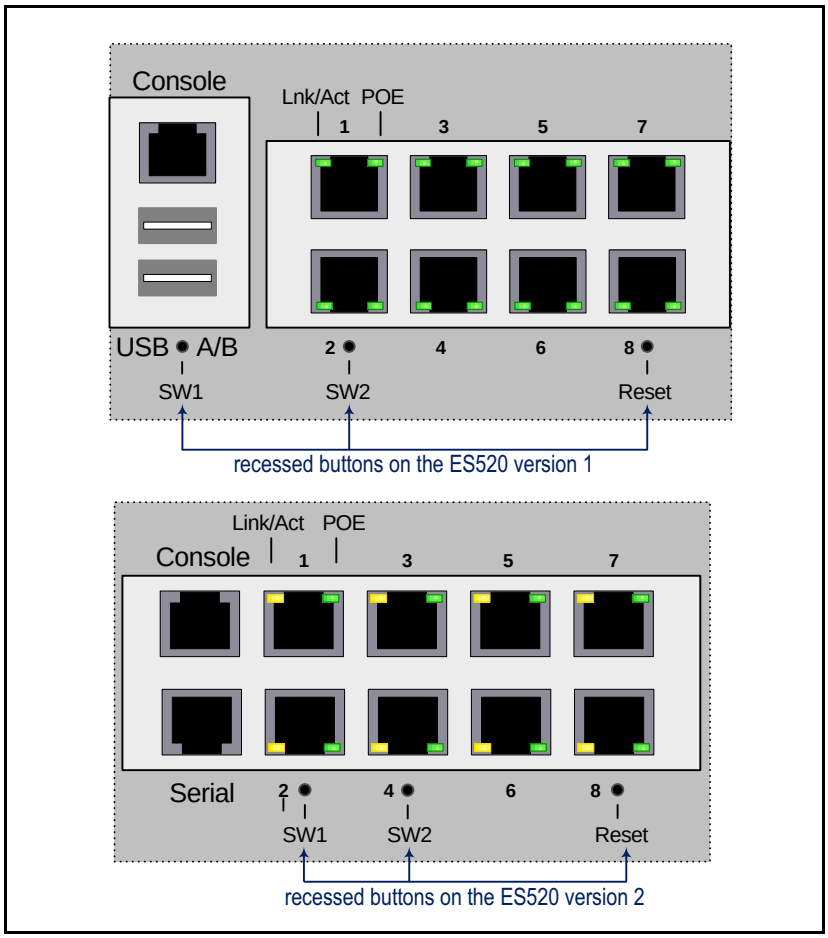


Figure 3.2. ES520 Front-Panel Buttons

3.2.1 Mode Selection from the Front Panel

The front-panel switches can be used to toggle RF (Radio Frequency) Kill mode on and off, as well as to turn the Mesh Point's front-panel LEDs off and on (*Blackout Mode*, **Enabled**/**Disabled**).

Each of these Mesh Point settings has only two possible values. Configuring them through the front-panel switches toggles the setting from its current value to the alternate value.

3.2.1.1 Togging the RF Kill Mode setting

The **SW1** button toggles the Mesh Point's RF Kill mode to turn both internal radios on and off.

The default RF Kill mode setting is **Disabled**, in which state the Mesh Point receives and transmits radio frequency signals normally.

NOTE: You can also change the RF Kill mode setting in the Mesh Point GUI (see the *Software GUI Guide*).

If the RF Kill mode is *Disabled*, the procedure below will enable it (turn off the radios). If the Mesh Point is already in *Kill All RF* mode, the procedure will disable it (turn on the internal radios):

1 Depress and hold **SW1** for five seconds.

2 Release **SW1**.

The new setting persists over reboots and upgrades, just as when changed through the Mesh Point GUI.

3.2.1.2 Toggling the Blackout Mode setting

The default blackout mode setting is *Disabled*, in which state the Mesh Point's front-panel LEDs illuminate to indicate various conditions on the Fortress Mesh Point. (Front-panel LED behaviors and their associated meanings are covered in Section 3.1.)

Enabling blackout mode turns all front-panel LEDs off.

If blackout mode is *Disabled*, the procedure below will enable it (turn off the front-panel LEDs). If the Mesh Point is already in blackout mode, the procedure will disable it (turn the front-panel LEDs back on)

1 Depress and hold **SW2** for five seconds.

If you are enabling blackout mode, the LEDs all go off, once you have held the switch long enough. If you are disabling blackout mode, hold the switch until the LEDs turn on.

2 Release **SW2**.

After you have saved the change, Mesh Point LEDs will either resume their normal operation (*Blackout Mode*: **Disabled**), or go completely dark (*Blackout Mode*: **Enabled**), according to the new setting.

NOTE: You can also change the *Blackout Mode* setting in the Mesh Point GUI (see the *Software GUI Guide*) or in the Mesh Point CLI (see the *Software CLI Guide*).

3.2.2 Rebooting the Mesh Point from the Front Panel

To reboot the Fortress Mesh Point from the front-panel:

1 Press the **Reset** button. All Ethernet port LEDs light solid green.

2 Release the button.

After the Mesh Point reboots the **Stat1** LED will again light solid green.

NOTE: There are no LED indications in a Mesh Point in blackout mode (refer to Section 3.2.1.2).

3.2.3 Restoring Defaults from the Front Panel

To restore the Mesh Point's configuration settings to their factory-default values:

1 With the Mesh Point powered on, simultaneously press and hold **SW1** and **SW2** until the **Stat1** LED begins to flash (about 10 seconds).

2 Release both switches.

After you have successfully initiated the restore operation, the Mesh Point will reboot automatically.

After booting, the Mesh Point LEDs will resume normal operation and all configuration settings, including the IP address of the Mesh Point's management interface will be at their factory-default values.

Chapter 4
Specifications

4.1 Hardware Specifications

4.1.1 Physical Specifications

hardware version:	ES520 version 1	ES520 version 2
form factor:	compact, rugged chassis	compact, rugged chassis
dimensions:	2.3" H x 8.75" W x 6.6" D (5.8 cm × 22.2 cm × 16.8 cm)	2.3" H x 8.75" W x 8.1" D (5.8 cm × 22.2 cm × 20.57 cm)
weight:	3.5 lbs. (1.6 kg), approximate	4.88 lbs. (2.21 kg) approximate
connections:	nine RJ-45 10/100 Mbps Ethernet ports one RJ-45 serial port two USB ports two N-type radio antenna ports (female): **ANT1** (configured as 802.11a/b/g dual-band port) **ANT2** (configured as high-gain 802.11a port, 5.7–5.8 GHz) one 48V DC power input port	nine RJ-45 10/100 Mbps Ethernet ports two RJ-45 serial ports one USB port two N-type radio antenna ports (female): **ANT1** (configured as 802.11a/b/g dual-band port) **ANT2** (configured as high-gain 802.11a port, 5.7–5.8 GHz) one 48V DC power input port one weathertight multi-range DC power input port
radios:	Radio1: 802.11a/b/g dual-band 5GHz/2.4GHz radio Radio2: 802.11a 5GHz (standard) *or* 802.11 4.4GHz (military)	Radio1: 802.11a/b/g dual-band 5GHz/2.4GHz radio Radio2: 802.11a 5GHz (standard) *or* 802.11 4.4GHz (military)
power supply:	external +48V AC-to-DC adapter *or* WAN port power over Ethernet (PoE)	external +48V AC-to-DC adapter *or* WAN port power over Ethernet (PoE)
system indicators:	eight front-panel system LEDs (G/Y): *Status 1* (**Stat1**), *Status 2* (**Stat2**), *Cleartext* (**Clr**), *Failure* (**Fail**), four front-panel radio LEDs (G/Y): *two LEDs for wireless* **Radio 2** *two LEDs for wireless* **Radio 1** nine pairs integrated port *link/activity* & *power* LEDs	eight front-panel system LEDs (G/Y): *Status 1* (**Stat1**), *Status 2* (**Stat2**), *Cleartext* (**Clr**), *Failure* (**Fail**), four front-panel radio LEDs (G/Y): *two LEDs for wireless* **Radio 2** *two LEDs for wireless* **Radio 1** nine pairs integrated port *link/activity* & *power* LEDs

4.1.2 Environmental Specifications

hardware version:	ES520 version 1	ES520 version 2
maximum AC draw:	70 Watts with per-port PoE PSE enabled 13 Watts without PSE enabled	70 Watts with per-port PoE PSE enabled 13 Watts without PSE enabled
maximum heat dissipation:	44.3 BTU/hr	44.3 BTU/hr
cooling:	fanless heat sink chassis	fanless heat sink chassis
operating temperature:	14º–122º F (-10º–50º C)	14º–131º F (-10º–55º C)
operating relative humidity (non-condensing):	5%–95%	5%–95%
storage temperature:	-4º–158º F (-20º–70º C)	-4º–158º F (-20º–70º C)

4.1.3 Compliance and Standards

hardware version:	ES520 version 1	ES520 version 2
safety:	UL60950-1, IEC60529 (CB test), UL (NEMA) 3/3S/4 “raintight”	UL60950-1 (pending), IEC60529 (pending), UL (NEMA) 3/3S/4 “raintight”
emissions:	CE, FCC Class A	CE, FCC Class A
immunity:	EN61000-3, EN61000-4	EN61000-3, EN61000-4
vibration:	MIL-STD 810G 514 / SC-18 (pending)	IEC 60068-2-6: Test Fc: Vibration Sinusoidal IEC 60068-2-27: Test Ea and guidance: Shock IEC 60068-2-64: Test Fh: Vibration Random IEC 60068-2-29: Test Eb and guidance: Bump

The Fortress ES520 is certified by the Wi-Fi Alliance® for the following standards:

IEEE:	802.11a/b/g
security:	WPA™, WPA2™—Personal and Enterprise
EAP types:	EAP-TLS, EAP-TTLS/MSCHAPv2, PEAPv0/EAP-MSCHAPv2, PEAPv1/EAP-GTC, EAP-SIM

4.2 RJ-45-to-DB9 Console Port Adapter

An RJ-45-to-DB9 adapter (included with each Mesh Point) is required in order to connect the Mesh Point's **Console** port to a DB9 terminal connection.

Figure 4.1 shows the pin numbers for the two connectors. With the RJ-45 connector facing you and oriented with the tab receptacle up, pins are numbered from right to left, as shown. With the DB9 connector facing you and oriented with the wide side up, pins are numbered from right to left, top to bottom.

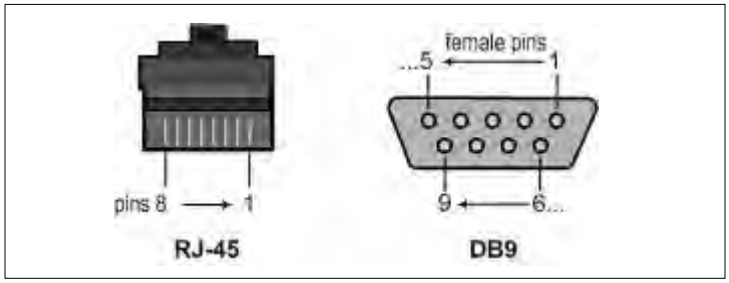


Figure 4.1 RJ-45 and DB9 Pin Numbering

Table 4.1 shows the adapter pin-outs.

Table 4.1. RJ-45-to-DBP Adapter Pin-Outs

RJ-45 pin	DB9 pin	standard color
1	8	grey
2	6	brown
3	2	yellow
4	5	green
5	-	red
6	3	black
7	4	orange
8	7	blue

4.3 4-Pin DC Input Connector and Cabling

The connector-cable assembly to power the Mesh Point version 2 chassis through its weather tight, multi-range, 4-pin DC input is not included with the Mesh Point.

Mating connectors include the Mini-Con-X® series (part # 382-4SG-3DC), manufactured by Switchcraft®. Figure 4.2 shows the pin numbers for mating connectors for the Mesh Point's 4-pin power input.

NOTE: *Hardware Version Powering Options* are covered in full in Section 1.1.

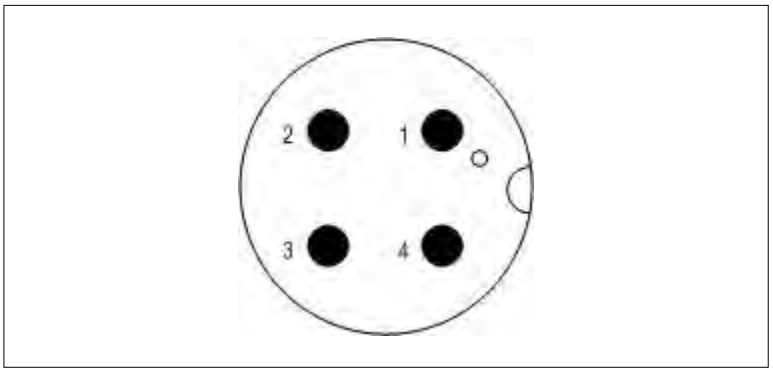


Figure 4.2 4-pin Power Connector Pin Numbering

Table 4.2 shows the power connector pin-outs.

Table 4.2. RJ-45-to-DBP Adapter Pin-Outs

pin	wire
1	48V positive
2	12V positive
3	12V negative
4	48V negative

Only two of the four pins in the ES520 version 2 Mesh Point's 4-pin DC power input should be connected at one time, according to whether the Mesh Point is connecting to a 12/24V (7-30V) or 48V power supply or battery.

The allowable input range for 48V power is 36V–60V.

Use only 18 gauge (minimum) to 16 gauge (maximum) wire cabling with the connector.

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