



Digi Connect SP and Digi Connect Wi-SP

Digi Connect Family

Hardware Reference

Revision history—90000540

Revision	Date	Description
H	November 2022	Updated the Immunity values. See Certifications .
G	October 2015	In Specifications > Digi Connect Wi-SP , lowered transmit power for the Digi Connect Wi-ME 7520 radio used in the Digi Connect Wi-SP from 16 dBm to 14 dBm to be lowered to comply with new European Wi-Fi requirements. Changed Programming considerations > GPIO section to minimize content and state that GPIO control is available as GPIOxx if using the Digi Connect SP and Digi Connect Wi-SP with NET+OS firmware, with a reference to NET+OS and hardware reference information. Applied new front cover format. Moved Change Log to front matter. Applied new documentation template.
F	8/12/2011	Changed barrel connector to locking barrel connector in the “Power Jack” section of Chapter 1. Added Digi contact information.
E	12/28/2006	Digi branding changes.
D	8/12/2005	Updated Antenna drawing. Changed antenna restriction in North America. Added product weight.

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Warranty

To view product warranty information, go to the following website:

www.digi.com/howtobuy/terms

Customer support

Gather support information: Before contacting Digi technical support for help, gather the following information:

- ✓ Product name and model
- ✓ Product serial number (s)
- ✓ Firmware version
- ✓ Operating system/browser (if applicable)
- ✓ Logs (from time of reported issue)
- ✓ Trace (if possible)
- ✓ Description of issue
- ✓ Steps to reproduce

Contact Digi technical support: Digi offers multiple technical support plans and service packages. Contact us at +1 952.912.3444 or visit us at www.digi.com/support.

Feedback

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techcomm@digi.com

Include the document title and part number (Digi Connect SP and Digi Connect Wi-SP Hardware Reference, 90000540 H) in the subject line of your email.

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Digi Connect SP and Wi-SP

The purpose of this guide is to assist developers creating custom embedded software for the Digi Connect SP and Digi Connect Wi-SP platform using the NET+OS operating system and tools.

Related documentation

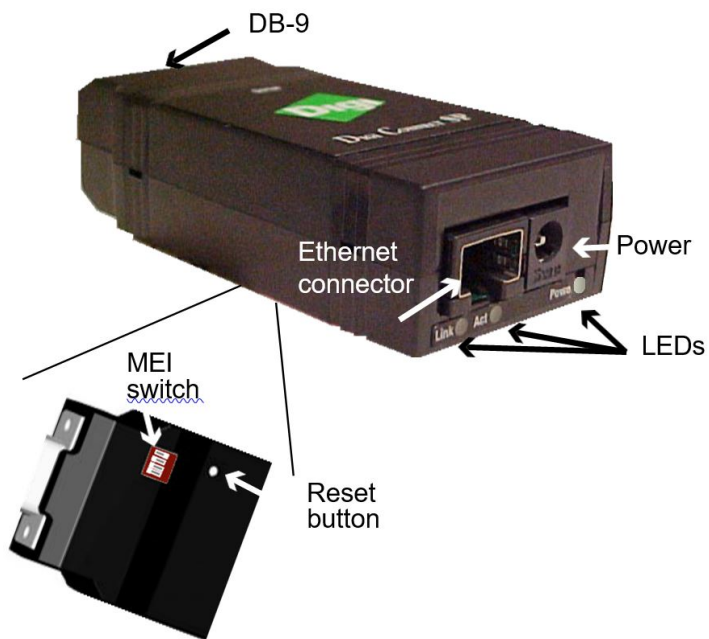
See the Digi website for the following related documentation:

- See the [NS7520 Hardware Reference manual](#) for information on the NS7520 chip.
- See the NET+Works BSP Porting Guide for additional programming information.

Hardware

The figures identify various Digi Connect SP and Digi Connect Wi-SP connectors, LEDs and switches. MEI switches and the Reset button are in the same location for both the Digi Connect SP and Digi Connect Wi-SP.

Digi Connect SP hardware



Digi Connect Wi-SP hardware



LEDs

Digi Connect SP and Digi Connect Wi-SP have three LEDs: PWR, Link, and ACT.

LED	Color	Purpose
PWR	Red	This LED is software programmable. The default is that this LED indicates power and is therefore always on. See LEDs for more information.
Link	Green	Network link status: <ul style="list-style-type: none"> ■ On: unit is associated with an access point. ■ Blinking slowly: unit is in ad hoc mode. ■ Blinking quickly: unit is scanning for a network.
ACT	Yellow	Ethernet status: <ul style="list-style-type: none"> ■ On: indicates bad initialization. ■ Off: indicates Ethernet network is ready. ■ Blinking: indicates network activity.

Reset button

The behavior of the reset button is user-defined.

See [Reset button](#) and the *NS520 BSP Porting Guide* for LED programming information.

Antenna description

The Digi Connect Wi-SP is available with 1 RP-SMA connector. The antenna is connected to the product with a reverse polarity SMA connector (sub-miniature size A). The antenna fits on the product one way only to ensure a proper connection. Another option for both signal reception and design flexibility is to use a 30cm antenna extension cord (Digi part number **DC-ANT-E-24DP**) with .5dB loss to separate the antenna from the product.



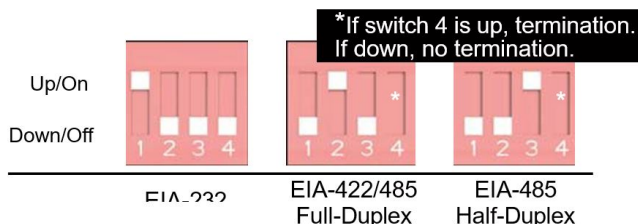
CAUTION! This FCC Part 15 Class A radio device operates on a non-interference basis with other devices operating at this frequency when using the antennae listed in the Antenna Specification table. Any changes or modification to the product not expressly approved by Digi International could void the user’s authority to operate the device.

Type	Desktop	Dipole	30 cm Antenna Extension Cord
Part number	DC-ANT-24DT	DC-ANT-24DP	DC-ANT-E-24DP
Gain	1.8 dBi	2 dBi	-0.5 dBi

MEI 232/422/485 switch settings

These switches set the MEI (multiple electrical interface) line protocol on the serial interface.

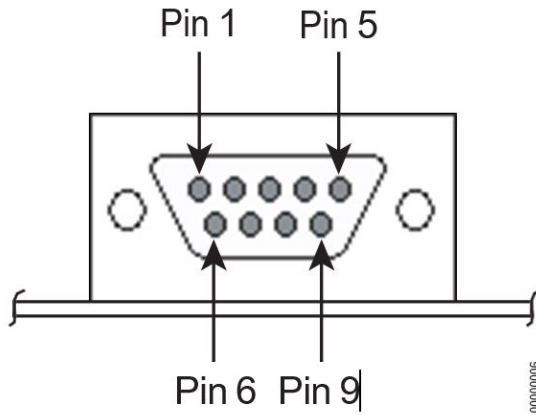
Function	Switch Setting			
	1	2	3	4
EIA-232	Up	Down	Down	Down
EIA-422/485 full-duplex	Down	Up	Down	If up, termination. If down, no termination.
EIA-485 half-duplex	Down	Down	Up	



DB-9 connector

The figure and table provide information on DB-9 pin orientation and pin assignments.

DB-9 pin orientation



DB-9 pin assignments

Pin	EIA-232	EIA-422/485 Full-Duplex	EIA-485 Half-Duplex
1	DCD	CTS-	Not used
2	RXD	RXD+	RXD+
3	TXD	TXD+	TXD+
4	DTR	RTS-	Not used
5	GND	GND	GND
6	DSR	RXD-	RXD-
7	RTS	RTS+	Not used
8	CTS	CTS+	Not used
9	NA	TXD-	TXD-

JTAG interface

The Digi Connect SP Development Kit is provided with the case opened, providing access to the JTAG interface which mates with a JTAG debugger plug; for example, the Macraigor Raven included in the Development Kit.

Digi Connect SP JTAG debugger connector



JTAG debugger pin assignments

Pin	Assignment
Pin1	VCC+
Pin 2	GND
Pin 3	/TRST
Pin 4	GND
Pin 5	TDI
Pin 6	GND
Pin 7	TMS
Pin 8	GND
Pin 9	TCK
Pin 10	GND
Pin 11	TDO
Pin 12	/SRST
Pin 13	VCC+
Pin 14	GND

Power jack

The power jack is a locking barrel connector that accepts 9 to 30 VDC +/- 5%. The jack is labeled as **P11** on the development board.

Power jack polarity

Contact	Polarity
Center	+9 to +30 VDC
Outer	Ground

The following figure schematically represents the polarity of the power jack. To purchase the locking barrel connector for your DC supply, please contact Digi.



Programming considerations

This topic presents programming considerations for the Digi Connect SP and Digi Connect Wi-SP and the NS7520 processor on which these products are based.

General Purpose I/O (GPIO) control

General purpose I/O (GPIO) control is available as GPIOxx if using the Digi Connect SP and Digi Connect Wi-SP with NET+OS firmware. See the NET+OS documentation and the [NS7520 Hardware Reference manual](#) for more details.

LEDs

The device server has two types of LEDs:

- LEDs connected directly to GPIO pins on the processor and controlled directly in software
- LEDs connected to other hardware components, normally the Ethernet hardware, and not directly programmable by the operating system

The development kit supplies software to control the LEDs. This behavior can often be modified by manipulating the LED table in the BSP code. In the development kit, see the file `gpio.c` for details.

As with any GPIO output, the GPIO register must be properly configured in order to assert values on the pin. The appropriate bits should be configured as:

- **CMODE** = 0
- **CDIR** = 1
- **CSF** = 0

The device server has three LEDs:

- The **green** LED is wired directly to the Ethernet hardware and indicates that a link has been established.
- The **yellow** LED is wired directly to the Ethernet hardware and signals Ethernet activity.
- The **red** LED is software-programmable. It is wired to processor GPIO register bit PORTC6. The LED is wired to be active high. The development kit software is implemented by default so that this LED reflects "power" (and is, therefore, always lit).

Memory

Flash memory

Digi Connect SP and Digi Connect Wi-SP have 4 MB of flash memory, which is controlled by chip select 0, located at **0x02000000**.

SDRAM memory

Digi Connect SP and Digi Connect Wi-SP have 16 MB of SDRAM memory, which is controlled by chip select 1, located at **0x00000000** in the processor address space and aliased at **0x04000000** and **0x08000000**. The application program (EOS) is loaded at address **0x08080000**.

Reset button

Digi Connect SP and Digi Connect Wi-SP have a push button connected to a GPIO pin. This pin is named **/INIT**. In the processor, the GPIO register bit associated with **/INIT** is **PORTC5**. The GPIO pin will read as high normally, and low when the button is pushed.

See [Digi Connect SP hardware](#) and [Digi Connect Wi-SP hardware](#) for the external location.

Specifications

Network interfaces

Digi Connect SP

- RJ-45 connector
- 10/100Base-T
- Half- and full-duplex support

Digi Connect Wi-SP

- Standard: IEEE 802.11b
- Data Rate: Up to 11 Mbps with automatic fallback
- WEP (64-bit and 128-bit encryption)
- WPA (Wi-Fi Protected Access)/WPA2/802.11i
- Frequency: 2.4 GHz
- Modulation: CCK (11/5 Mbps), DQPSK (2 Mbps), DBPSK (1 Mbps)
- Transmit power: 14 dBm typical
- Receive sensitivity:
 - 1Mbps: -92 dBm
 - 2Mbps: -89 dBm
 - 5.5Mbps: -87 dBm
 - 11Mbps: -82 dBm
- Antenna connector: RP-SMA
- 10/100Base-T auto-sensing
- Half- and full-duplex support

Serial interface

One EIA-232/422/485 switch-selectable serial port with full modem control.

Data rates (bps)

50, 110, 134, 150, 200, 300, 600, 1200, 2400, 3600, 4800, 9600, 19200, 38400, 57600, 115200, 230400

Flow control options

RTS/CTS, XON/XOFF, None

Environmental specifications

Specification	Digi Connect SP	Digi Connect Wi-SP
Ambient temperature	-40° F to 185° F (-40° C to 85° C)	-4° F to 185° F (-20° C to 85° C)
Storage temperature	-40° F to 257° F (-40° C to 125° C)	-40° F to 257° F (-40° C to 125° C)
Humidity	5% to 90%	5% to 90%
Altitude	12,000 feet (3,657.60 meters)	12,000 feet (3,657.60 meters)

Power requirements

The Digi Connect SP and Digi Connect Wi-SP must be powered by a Listed LPS or Class II power supply rated 9-30 VDC, 0.37 A minimum.

Mechanical specifications

Digi Connect SP

- Length: 3.876 inches (9.846 cm)
- Width: 1.680 inches (4.267 cm)
- Height: 0.999 inches (2.537 cm)
- Unit Weight: 2.29 oz (64.92 g)

Digi Connect Wi-SP

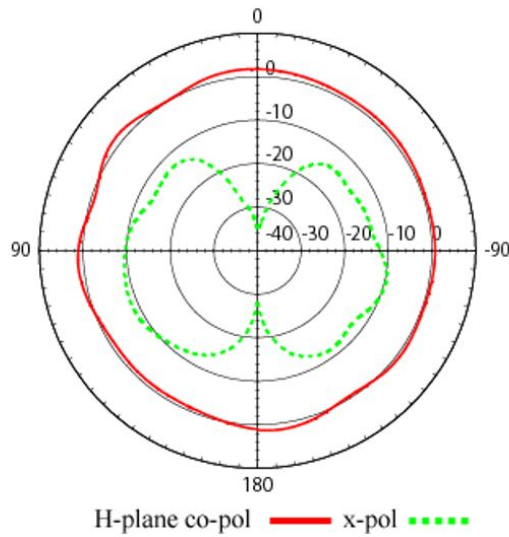
- Length: 3.876 inches (9.846 cm)
- Width: 1.680 inches (4.267 cm)
- Height: 0.999 inches (2.537 cm)
- Unit Weight: 1.968 oz (55.792 g)
- Antenna: .408 oz (11.567 g)
- Total Unit with Antenna: 2.376 oz (67.359 g)

Antenna information

Antenna strength and radiation patterns

The following diagram demonstrates the strength of the signal received by the antenna on both a horizontal and vertical plane. The diagram shows the magnetic field when the antenna is in a vertical

position. The red line represents the horizontal plane and the dotted green lined represents the vertical plane. You can see in the illustration that at 90degrees, the signal strength is, as expected, 0.



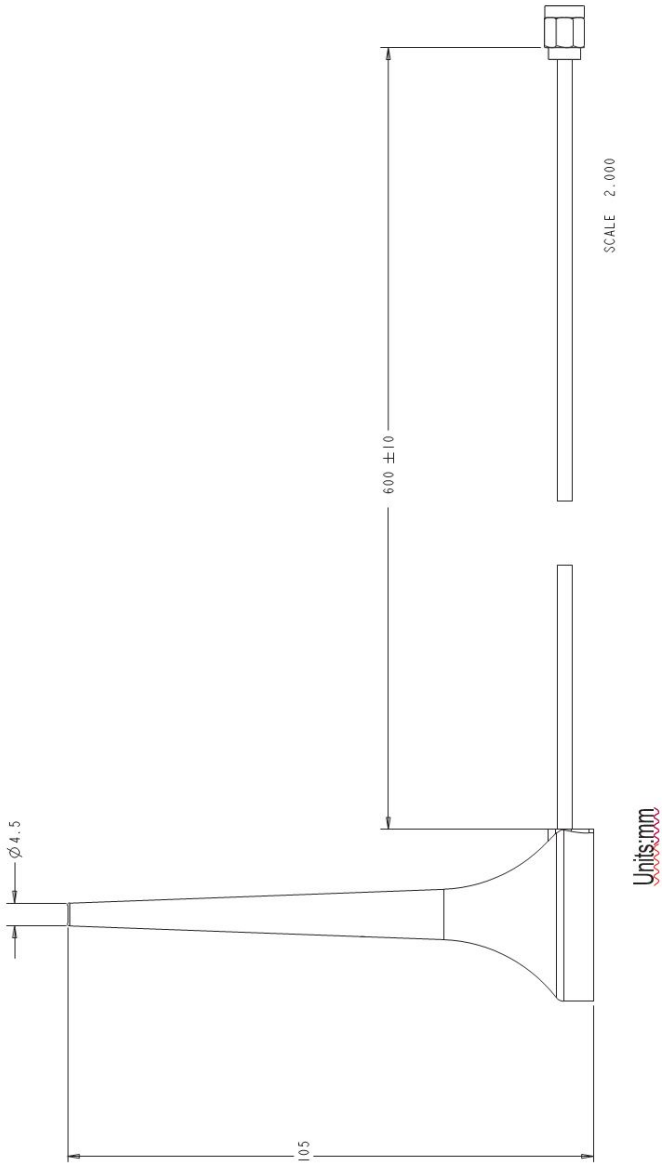
Antenna details

Antenna Description	Dipole	Desktop
Part number	DC-ANT-24DP	DC-ANT-24DT
Frequency	2.4~2.5 GHz	2.4~2.5 GHz
Power Output	2 W	1 W
DB Gain	2 dBi	1.8 dBi
VSWR	< or = 2.0	1.92 max
Dimension	10.0 x 108.5 mm	105 x 4.5 mm
Weight	10.5 g	11 g
Connector	RP-SMA	RP-SMA

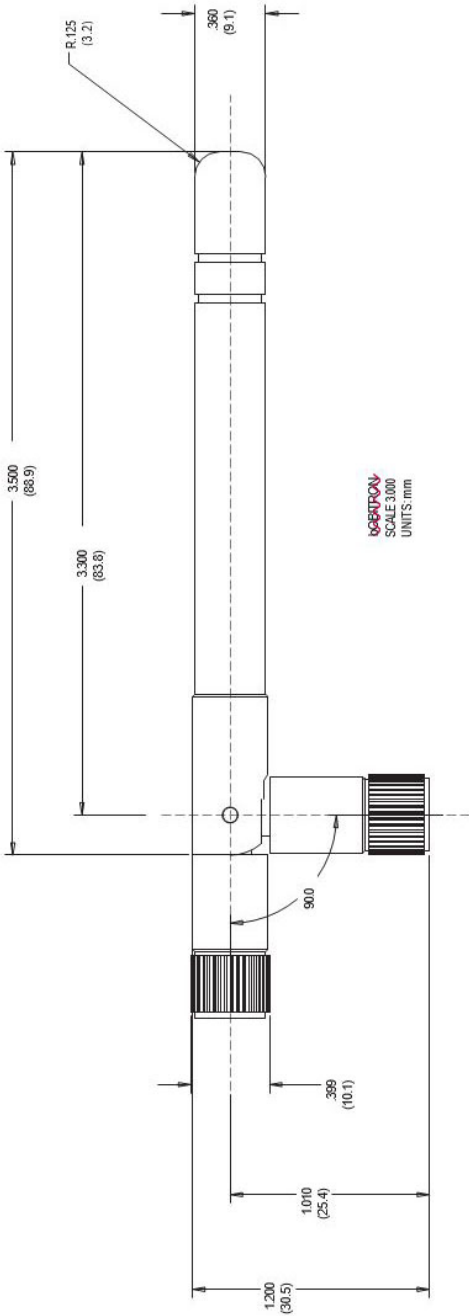
Antenna restriction in North America

Only antennae of the same type listed on the FCC grant, with equal or lower antenna gain, may be used with the Digi Connect Wi-SP.

Desktop antenna dimensions

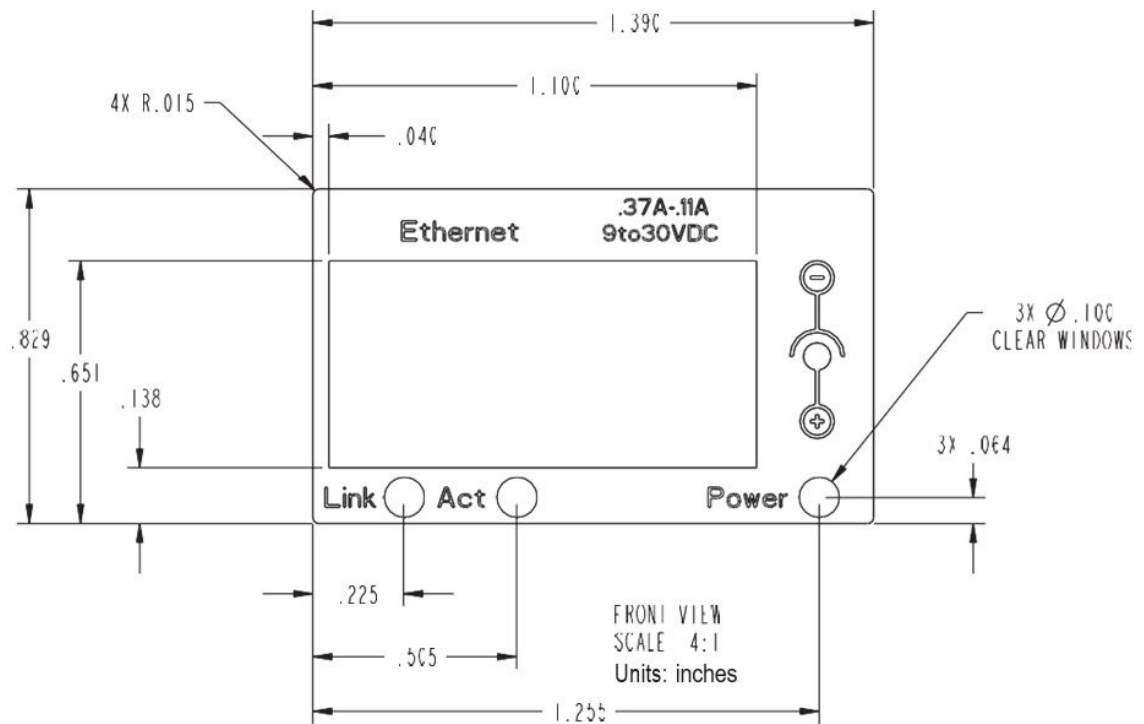
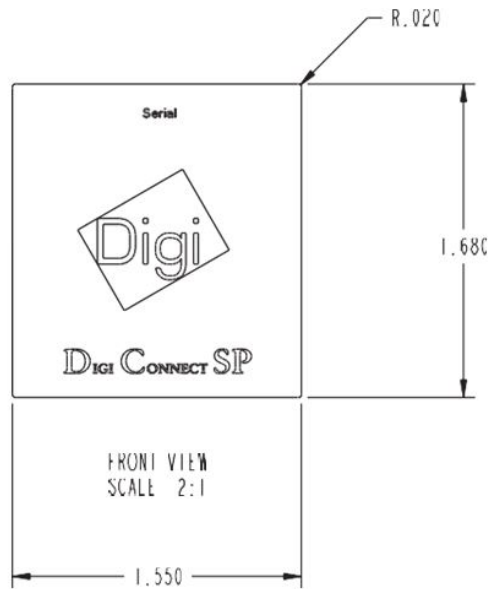


Dipole antenna dimensions

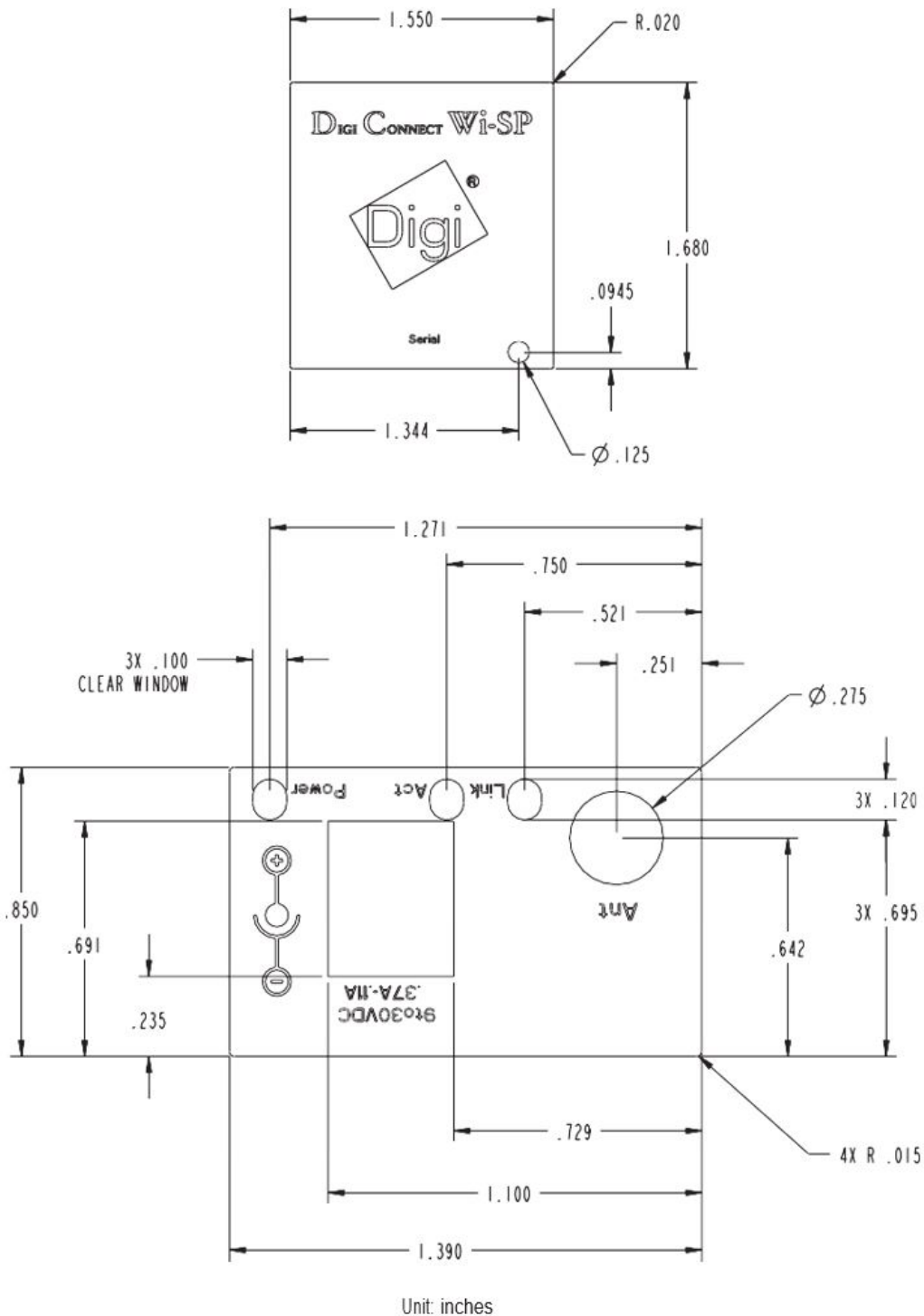


Overlay specifications

Digi Connect SP



Digi Connect Wi-SP



RF exposure statement for Digi Connect Wi-SP

The Digi Connect Wi-SP device complies with the RF exposure limits for humans as called out in RSS-102. It is exempt from RF evaluation based on its operating frequency of 2400 MHz, and effective radiated power of less than (<) 400 milliwatts. This would be less than the 3 watt requirement for a mobile device (>20 cm separation) operating at 2400 MHz.

To comply with FCC RF exposure limits, the dipole antenna should be located at a minimum distance of **7.9 inches (20 cm)** or more from the body of all persons.

Certifications

These products comply with the following standards.

FCC Part 15 Class A

Radio Frequency Interference (RFI) (FCC 15.105(a))

The Digi Connect SP and Digi Connect Wi-SP have been tested and found to comply with the limits for Class A digital devices 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 the user will be required to correct the interference at his own expense.

Labeling requirements (FCC 15.19)

This device complies with Part 15 of 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.

Modifications (FCC 15.21)

Changes or modifications to this equipment not expressly approved by Digi may void the user's authority to operate this equipment.

Cables (FCC 15.27)

Shielded cables must be used to remain within the Class A limitations.

Innovation, Science and Economic Development Canada

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la class A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

International EMC standards

The Digi Connect SP and Digi Connect Wi-SP meet the following standards.

Standards	Digi Connect SP	Digi Connect Wi-SP
Emissions	AS/NZS 3548	AS/NZS 3548 CISPR 22
	ICES-003	IC RSS 210 (IC:1846A-50M1312)
	EN 55022	ICES-003
	EN 61000-3-2	EN 55022
	EN 61000-3-3	EN 61000-3-2
	EN 301 489-3	EN 61000-3-3
	EN 300 328	EN 301 489-3
	VCCI	EN 300 328
		VCCI
Immunity	EN 55035: 2017	EN 55035: 2017
Safety	UL 60950-1	UL 60950-1
	CSA 22.2 No. 60950--1	CSA 22.2 No. 60950--1
	EN 60950	EN 60950