SMART HOPPING™ 2.0 Remote Antenna 1.4GHz (RTX3466)

Installation guide

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1 Document info

1.1 Document scope

This installation guide provides the technical description of the SMART HOPPING® 2.0 Remote Antenna 1.4GHz. The guide covers instructions for installing the Remote Antenna (RA) with both SMART HOPPING® 1.0 and 2.0 Access Points 1.4GHz (APs).

1.2 References

Readers of this guide may find additional information and supportive specifications in the following documents.

Reference	Name
1	*SMART HOPPING® 2.0 1.4GHz Access Point Installation Guide* - shows how to install the AP at the clinical site to a wall, above, or below a ceiling tile.
2	*SMART HOPPING® Access Point Controller Installation Guide* - provides procedures to physically install and power the APC at the clinical site.
3	*SMART HOPPING® Infrastructure Installation and Service Guide* - provides complete information and procedures to install, configure, connect, and deploy the SMART HOPPING® infrastructure at the clinical site. This document includes site planning guidelines, procedures for use of the APC command line and graphical user interfaces, AP configuration procedures, and APC and AP firmware deployment procedures.
4	*SMART HOPPING® Sync Unit Installation Guide* - lists procedures to install the SMART HOPPING® Sync Unit at the clinical site.
5	*Upgrading SMART HOPPING® Access Point Controllers and Access Points* - gives procedures to use the SMART HOPPING® APC and Access Point Upgrade Tool to install and synchronize the firmware version on the APCs and APs.
6	*SMART HOPPING® 1.0 1.4GHz Access Point Installation Guide* - shows how to install the SMART HOPPING® 1.0 Access Point 1.4GHz at the clinical site to a wall, above, or below a ceiling tile.

1.3 Terms and abbreviations

Terms / abbreviations	Description
Access Point (AP)	A SMART HOPPING® component that provides bidirectional wireless access to the monitoring network for patient monitor devices.
Access Point Controller (APC)	A SMART HOPPING® component used to manage the operation of the APs. One APC is elected as the primary APC. The primary APC supports the web interface to the system and manages the configuration.
Access Point group	A logical grouping of APs. AP members of the same AP group will inherit common configuration settings (defaults). AP groups will often map logically to the clinical units in which the SMART HOPPING® infrastructure is being installed.
BNC connector	Bayonet Neill Concelman connector
FCC	Federal Communications Commission
Patient monitor devices	Patient monitor devices relay real-time physiological waveforms and trends to the Information Center.
POST	Power-on-Self-Test
Power over Ethernet (PoE) switch	PoE switch is a 24-port PoE device that provides 48 VDC power to APs (and remote Sync Units if connected) via 100Base-TX Ethernet LAN cabling. For systems using a PoE switch, the ITS4844A Telemetry Synchronization Unit is required to use the PoE feature of the PoE switch.
Power over Ethernet (PoE) unit	The Power over Ethernet (PoE) unit is a 6- or 12-port Power-over-Ethernet device that provides 48 VDC power to APs (and remote Sync Units if connected) via 100Base-TX Ethernet LAN cabling.
Remote Antenna (RA)	The RA provides bidirectional wireless access to the monitoring network for patient monitor devices. RAs connect to an AP (1.4GHz SMART HOPPING® 2.0 networks only) using 74-foot (22.6 m) coaxial and UTP cable bundles. The purpose of an RA is to increase the wireless coverage area of an AP.
RF	Radio Frequency
RF Access Code	Configurable element in the SMART HOPPING® AP defaults shared among APs and patient monitor devices to control wireless access to the monitoring network. Portable devices will only connect to APs with which they share access codes. The RF Access Code allows a specific wireless client that is programmed with a matching AP RF Access Code to connect to that AP.
SMART HOPPING® infrastructure	Proprietary wireless network designed for continuous monitoring that provides two-way communications between patient monitor devices, and the Information Center.
SMART HOPPING® network	This term refers to the entire SMART HOPPING® network. In a routed topology, the network includes the routers and all inter-connected database domain(s) and the SMART HOPPING® infrastructure wireless subnet.
System ID	Configurable element in the APC configuration to logically associate APs and APCs operating within the same SMART HOPPING® infrastructure.
Uninterruptible Power Supply (UPS)	The UPS supplies backup power to protect against hospital generator change-over interruptions and short power-line voltage transients.
UTP cable	Unshielded twisted pair cable
VDC	Volts Direct Current

1.4   Document history

Revision	Resp.	Date	Comments
1.0	HDJ/BKI	26-Mar-2025	First published version.

2 Overview

This section provides a high-level overview of the SMART HOPPING® 2.0 AP and SMART HOPPING® 2.0 RAs. This section includes:

- Introduction
- Connectors and status indicators
- Specifications
- Ordering information

2.1 Introduction

The SMART HOPPING® 2.0 AP with RAs, shown in 1 figure below, provide a wireless link to transmit and receive data between patient monitor devices and the Information Center via the SMART HOPPING® infrastructure.

Figure 1: SMART HOPPING® 2.0 Access Point with Remote Antennas
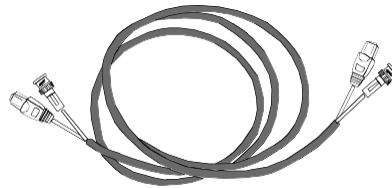

Figure 2: UTP and BNC coaxial cable bundle

The AP is a modular antenna infrastructure consisting of an AP with up to two connected RAs. A 74-foot (22.6 m) UTP and BNC coaxial cable bundle is used to connect a RA to an AP (cable bundle may vary in length from 69 ft. to 79 ft.) – please see figure 2 above. APs are only available for the 1.4GHz SMART HOPPING® infrastructure.

Caution   The coaxial cable bundle length may vary from 68 - 79 feet. When planning RA placement, ensure the maximum length between the AP and the RAs is 68 feet.

The effective range of the AP and each the RAs is typically 32 feet. The AP supports a maximum of 18 patient monitor devices regardless of its component configuration.
- When used with a single RA, the AP supports nine patient monitor devices, and its connected RA supports nine patient monitor devices (9+9=18).
- When used with two RAs, the AP supports six patient monitor devices and its connected RAs each support six patient monitor devices (6+6+6=18).

When monitored patients are ambulatory, data roaming is handled seamlessly between the other APs in the coverage area. The AP and each RA are always used with their two supplied antennas installed. The AP and its attached RAs can be mounted out of the way on corridor walls, or above or below ceiling tiles.

2.1.1 Remote Antenna mounting options

Before mounting the RA, please take the following advice into account:

- Consider the building construction when mounting the RA to avoid interference from ceramic wall tile, lead lined walls, elevator shafts, reinforced windows, and other obstacles which may cause signal degradation.

- Mount the RA in a location where there is no more than one wall between the RA and the coverage area.

- Ensure that the coverage area considers bathrooms, hallways, and windows.

- RA (internal) must be more than 4 inches (10 cm) away from metal structures. If the RA is too close to the structure, the performance can be degraded.

- The AP or RA shall not be placed closer than three feet (1 m) from other APs or RAs to prevent signal overload conditions.

- The coaxial cable bundle length may vary from 69-79 feet. Therefore, ensure the maximum length between the AP and the RA is 69 feet.

- Try to avoid mounting the RA close to other electrical devices (exit lights, light fixtures, speakers, etc.). Devices, such as florescent light ballasts, can create a significant amount of interference that can impact system performance.

Wall-mounting hardware is standard. There are also options available for mounting the RA to ceiling tiles (mounted on the tile or flush-mounted with the tiles). The part numbers for these options include the following:

- **94100010**: RTX3466 SH2.0 Remote Antenna 1.4GHz (includes hardware for wall mounting)
  - o **94100014**: SH2.0 Cosmetic cover (optional)

- **94100010**: RTX3466 SH2.0 Remote Antenna 1.4GHz mounting hardware options:
  - o Basic ceiling mount – **94100012**: SH2.0 Frame rail with **94100014**: SH2.0 Cosmetic cover (optional)
  - o Flush ceiling mount – **94100012**: SH2.0 Frame rail with **94100013**: SH2.0 Cosmetic ring

2.1.2 Power source

The CAT-5 UTP cable within the 74 ft.-cable bundle carries 5 VDC power, transmit and receive control signals, and antenna diversity signals from the AP to a connected RA.

The 75 Ohm coaxial cable within the 74 ft.-cable bundle carries RF and DC sense signals from the AP to a connected RA.

2.1.3 Connectors and status indicators

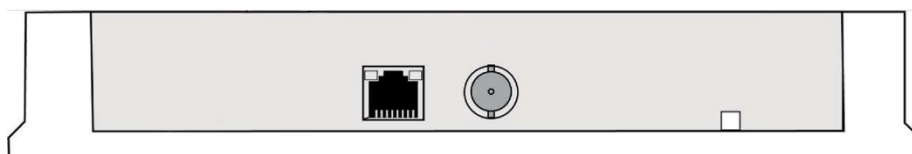Figure 3 below shows the connectors on the RA.

Figure 3: 1.4GHz Remote Antenna connectors

2.1.4   Remote Antenna connectors

Note the following connectors on the RA:

- UTP cable connector to AP - A standard RJ-45 connector is provided for the UTP cable that connect the RA to its AP. The UTP cable carries 5 VDC power, transmit, receive and antenna diversity control signals to the RA.

- Coaxial cable connector to AP - A standard 75 Ohm connector is provided for the coaxial cable that connects the RA to its AP. The coaxial cable carries RF and DC sense signals from the AP.

Note   If an installed, powered RA becomes disconnected from its AP via its Coax/UTP cable bundle, you must reconnect the Coax/UTP cable bundle to the RA and AP, and then cycle power to the connected AP before the RA reestablishes communications with the AP.

2.1.5   Remote Antenna coverage area

SMART HOPPING® 2.0 RA has the same coverage as SMART HOPPING® 1.0 RA.

Recommendations:

Area	1.4GHz
Patient rooms	32 feet (9.8m)
Dense, congested area/RF impermeable materials	30 feet (9.1m)
Line of sight, hallway corridor	60 feet (18.3)

Note   When working with the RA, the coaxial cable bundle length is 68 feet (20.7m).

2.1.6   Remote Antenna status LEDs

The RA has four LED indicators (read from left to right) under the same light guide as the SMART HOPPING® 2.0 Access Point (same mechanical design) but only the two first LEDs are used on the RA.
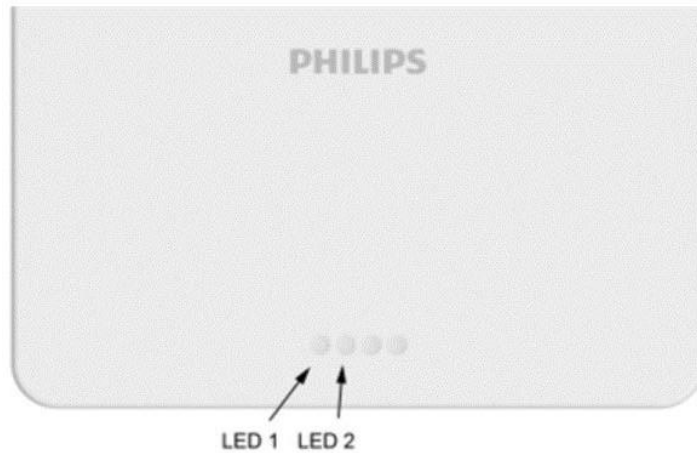

Figure 4: Remote Antenna status LEDs

LED1 – Power/Sync	LED2 – Network	LED3 – Radio	LED4	Status
Off ○	Off ○	Off ○	Off ○	No power, check connection to AP. **Note**: RA receives power from the AP. When the SMART HOPPING® 2.0 system 'Mute LED' setting is enabled, the LEDs will turn off 120 sec after entering normal operation.
Red ●	Off ○	Off ○	Off ○	Default state by HW during power up. Red until 'Power On' state.
Amber ●	Off ○	Off ○	Off ○	Power On
Amber ●	Green ●	Off ○	Off ○	Operational
Flashing Red ●	Off ○	Off ○	Off ○	Error detected

Table 1: Remote Antenna LED states

Note   LED categories on Power/Sync, Network, and Radio are not printed on the RA.

2.2 Specifications

Specification	Value
Physical:	
Chassis (only) dimensions (H x W x L)	30 mm x 163 mm x 163 mm (1.2 in x 6.38 in x 6.38 in)
Weight with internal antennas	<600 g (<1.32 lb)
Mounting options	• Wall mount (standard) • Wall mount with cosmetic cover • Flush ceiling mount with cosmetic ring • Mount below ceiling tile • Mount below ceiling tile with cosmetic cover
Environmental:	
Operating temperature	0 to +55°C (32 to 131°F)
Storage temperature	-40 to +60°C (-40 to 140°F)
Humidity range (operating)	< 95% RH @ 40°C non-condensing
Humidity range (storage)	< 90% RH @ 60°C non-condensing
Altitude	Operating and storage up to 3,048 m (10,000 ft)
Electrical:	
Power (input)	Power input 5V Nom (4.5 5.5) 110mA (from SMART HOPPING® Access Point)
Electrical installation:	
Fire safety	SMART HOPPING® 2.0 RA is listed for use within 'Other Spaces Used for Environmental Air (Plenum)' per NFPA70: 2011, Article 300.22. **Note**: The term 'plenum' as used in Article 300.22 Section C correlates with the use of the term 'plenum' in NFPA 90A-2009, Standard for the Installation of Air-Conditioning and Ventilating Systems, and other mechanical codes where the plenum is used for return air purposes, as well as some other air-handling spaces. The area above dropped ceilings is an example of plenum space.
Interface connections:	
Control signals	RJ-45 female socket
AP 75 Ohm coaxial cable connector	One standard 75 Ohm connector is provided for the coaxial cable on which RF and DC sense signals are carried to the RA.

Table 2: Remote Antenna hardware specifications

2.2.1   Ordering information

Device	Part number
RTX3466 SH2.0 Remote Antenna 1.4GHz	94100010
SMART HOPPING® Remote Antenna cable	989803223741 (Philips)

Table 3: SMART HOPPING® 2.0 Remote Antenna part numbers

Mounting option	Product type
SH2.0 Frame rail	94100012
SH2.0 Cosmetic ring	94100013
SH2.0 Cosmetic cover	94100014
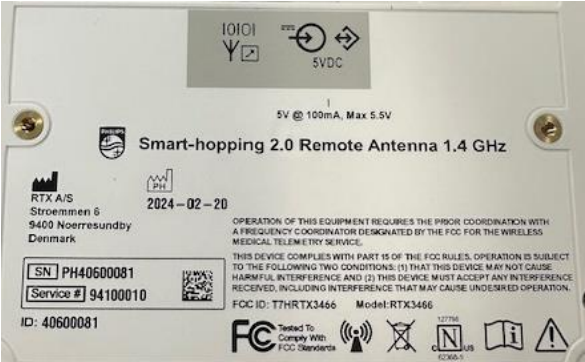
Table 4: SMART HOPPING® 2.0 Remote Antenna mounting accessories

2.2.2   FCC Compliance

Operation of this equipment requires prior coordination with a frequency coordinator designated by the FCC for the Wireless Medical Telemetry Service. The transceiver and the SMART HOPPING® infrastructure are subject to radio frequency interference. In the event of suspected radio frequency interference with your device, please contact your service provider. This device complies with Parts 15 and 95H of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference. This equipment complies with the FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and any part of your body.

2.2.3   Symbol definitions

Table 5 below illustrates and defines the symbols appearing on the SMART HOPPING® RA.

Symbol	Description
	RA rear label example
	Legal manufacturer information
	Date of manufacture
	Wireless device indicator
	Contains parts that may not be put into normal waste disposal but must be recycled or dealt with as chemical waste. Dispose of in accordance with the local country requirements.
	Serial number
	Tested to comply with FCC standards
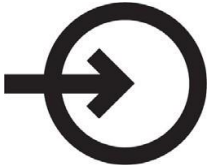
Symbol	Description
N	Tested to comply with Nemko standards
	Consult instructions for use
⚠	See product warnings in Table 6 below
	Input power source
	Data input/output
5 VDC	Direct Current - 5 volts
	BNC coaxial RA connection

Table 5: SMART HOPPING® 2.0 Remote Antenna symbol definitions

2.2.3.1 Warnings

Please see table 6 below for product warnings:

⚠	Warnings
	Consult the instructions for use.
	This product can expose you to chemicals including Lead and Lead Compounds, which are known to the State of California to cause cancer. For more information, go to www.P65Warnings.ca.gov.
	Disposables (product cannot be repaired): • Wash hands after use, wear gloves, where possible, and avoid food intake while handling the product.
	Operation of this equipment requires the prior coordination with a frequency coordinator designated by the FCC for the Wireless Medical Telemetry Service.
	This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: • That this device may not cause harmful interference • This device must accept any interference received, including interference that may cause undesired operation.

Table 6: Product warnings

3 Mount and install the SMART HOPPING® 2.0 Remote Antenna

This section provides procedures on how to physically install the SMART HOPPING® 2.0 RA and includes:

- *Remote Antenna placement guidelines* in 3.1
- *Mounting the SMART HOPPING® 2.0 Remote Antenna to a wall* in 3.2
- *Mounting the SMART HOPPING® 2.0 Remote Antenna to a wall (with cosmetic cover)* in 3.3
- *Flush ceiling mount (with cosmetic ring)* in 3.4
- *Below ceiling mount (with cosmetic cover)* in 3.5
- *Mounting the SMART HOPPING® 2.0 Remote Antenna with a tether mount (optional)* in 3.6

3.1 Remote Antenna placement guidelines

Note the following important guidelines when locating the SMART HOPPING® 2.0 RA:

- Consider building construction when placing the RA to account for interference from ceramic wall tile, lead lined walls, elevator shafts, reinforced windows, and other obstacles which may cause signal degradation.
- Place the RA in locations where there is no more than one wall between the RA and the coverage area.
- Ensure that the coverage area considers bathrooms, hallways, and windows.
- RA (internal) antennas must be more than 4 inches (10 cm) away from metal structures. If the antennas are too close to the structure, antenna performance can be degraded.
- APs or RAs shall not be placed closer than three feet (1 m) from other APs or RAs to prevent signal overload conditions.
- The coaxial cable bundle cable length may vary from 69 - 79 feet. When planning RA placement, ensure the maximum length between the AP and the RA is 69 feet.
- Try to avoid placing RA close to other electrical devices (exit lights, light fixtures, speakers, etc.). Devices, such as florescent light ballasts can create a significant amount of interference that can impact system performance.

Warning   Qualified personnel must mount the RA and use certified conductors and follow national and local electrical codes.

All SMART HOPPING® devices are intended for indoor use only.

Caution   Make sure you properly insulate (e.g., use firestop discs) the RA and any openings around it when mounting a RA in an area with an air plenum.

Do not wall mount or flush mount a RA in an area containing an air plenum.

3.2 Mounting the SMART HOPPING® 2.0 Remote Antenna to a wall

You can mount the SMART HOPPING® 2.0 RA to a wall, using the mounting screws and screw anchors supplied with the RA. We recommend that you mount the RA high on the wall as close to the ceiling as possible. Table 6 below list the required parts to mount the SMART HOPPING® 2.0 Remote Antenna to a wall:

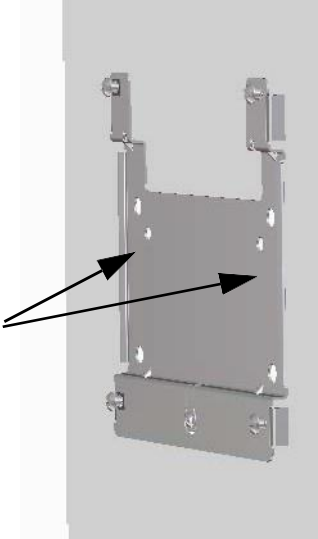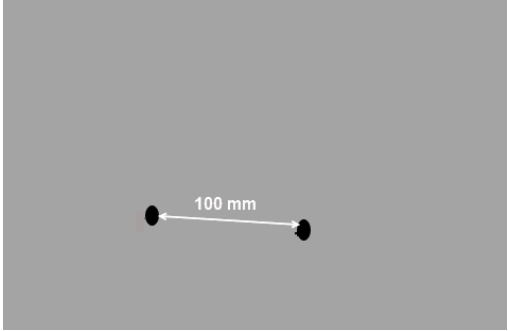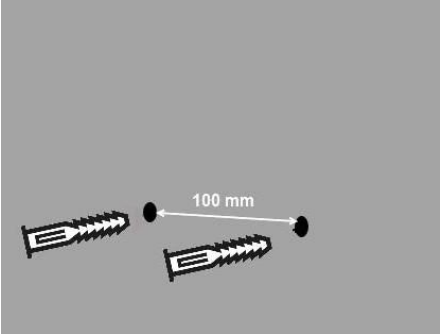| Required parts		
Illustration	**Part name**	**Quantity**
94100010: SH2.0 Remote Antenna 1.4GHz – includes the following:		1
	Access Point	1
	Mounting bracket	1
	Wall anchors	2
	#6 1.25-inch self-tapping screws	2
	Grommets (included with kit)	2* *Only 1 need to be used.

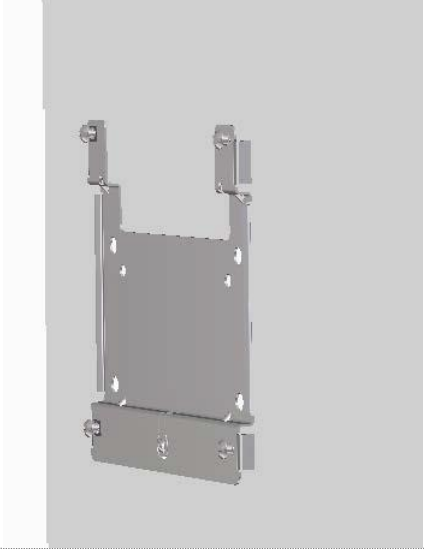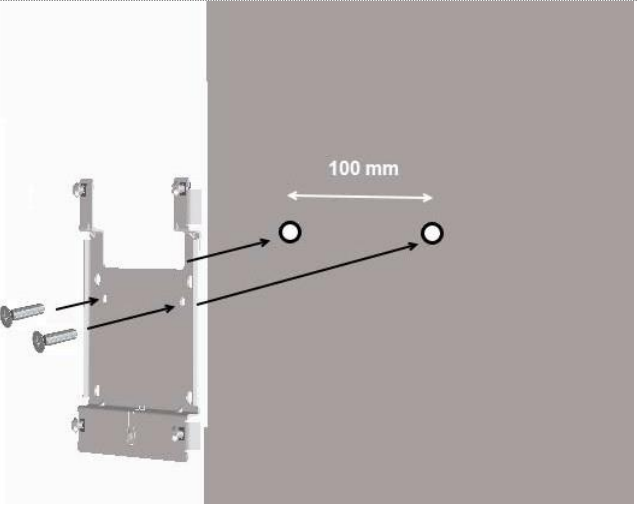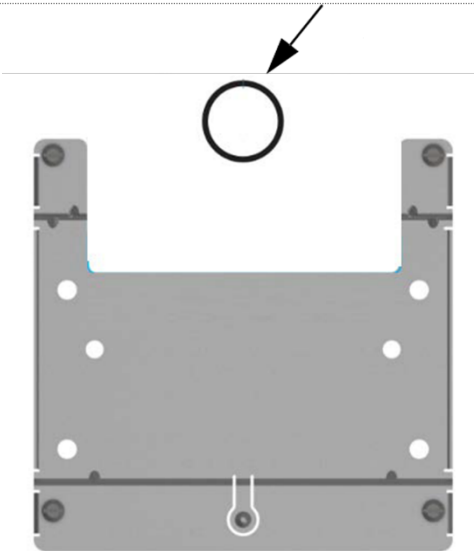Table 7: Required wall mounting material

Required tools:
- Tape measure
- Level
- Hammer (when using wall anchors)
- Drill
- 7/32-inch drill bit
- 1-inch hole saw bit
- Philips head screwdriver
- Marker
- Silicone adhesive

3.2.1 Installation

Table 7 below shows step-by-step how to mount the SMART HOPPING® 2.0 Remote Antenna to a wall.

Note   To mount the RA to a wall, connector cables must come through the wall.

Step	Description	Illustration
1	Place the mounting bracket against the wall (as shown in the illustration). Use a marker on the two inner holes to mark the points that you want to drill holes for the screws that hold the mounting bracket to the wall. The holes ought to be level with the wall and approximately 100 mm apart (center of one hole to the center of the other hole). Put marker through the holes (see arrows) to mark points on the wall where you drill.	
2	Using a 7/32-inch drill bit, drill the two pilot holes into the marks you drew in step 1. The holes ought to be level with the wall and approximately 100 mm apart (center of one hole to the center of the other hole).	
3	If the screw holes that you put in the wall do not go into building studs, use a hammer to tap a supplied screw anchor into each pilot hole until it is flush with the wall surface.	

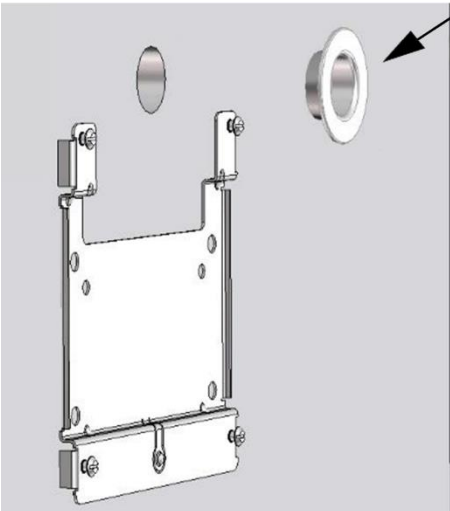| Step	Description	Illustration
4	Place the mounting bracket against the wall and line up the two holes.	
5	Screw a supplied #6 x 1 1/4-inch self-tapping screw through each hole in the mounting bracket and into each screw anchor (or pilot hole).	
6	Mark one hole in the middle of the gap in the open space between the left and right sides of the mounting bracket (see illustration) to feed cable through the wall to the RA. Mark one hole for cable to AP.	

Step	Description	Illustration
7	Using a 1-inch hole saw, drill out a 1-inch hole around the mark. This is for connector cables to come out of the wall and attach to the RA. On the finished side of the wall, secure the 1-inch grommets to the 1-inch holes you drilled. You need adhesive to secure the grommet to the wall. Drill one hole and install grommet for cable to AP.	
8	Pull the cables out of the wall (through the grommets) and connect them to the appropriate connectors on the RA. Connect the coaxial cables (from the same side of the strand) to the RA coaxial connector. Connect the RJ-45 connector to the RA RJ-45 connector.	
9	While holding the RA, fit the four keyholes in the back of the RA chassis over the four keyhole screw heads that protrude from the mounting bracket. Slide the RA down so that all four screw heads are securely in the slots of the keyholes in the back of the RA chassis. When the RA is securely placed in the mounting bracket, you hear a 'click' sound.	

Table 8: Step-by-step guide - how to mount Remote Antenna to a wall

3.3 Mounting the SMART HOPPING® 2.0 Remote Antenna to a wall (with cosmetic cover)

You can mount the SMART HOPPING® 2.0 RA to a wall using the mounting screws and screw anchors supplied with the RA. We recommend that you mount the RA high on the wall as close to the ceiling as possible.

Table 8 below list the required parts to mount the SMART HOPPING® 2.0 RA with cosmetic cover to a wall:

Required parts		
Illustration	**Part name**	**Quantity**
94100010: SH2.0 Remote Antenna 1.4GHz – includes the following:		1
	Access Point	1
	Mounting bracket	1
	Wall anchors	2
	#6 1.25-inch self-tapping screws	2
	Grommets (included with kit)	2* *Only 1 is needed
94100014: SH2.0 Cosmetic cover – includes the following:		
	Cosmetic cover	1
	M3 x 0.5 x8 machine screws	2

Table 9: Required wall mounting material
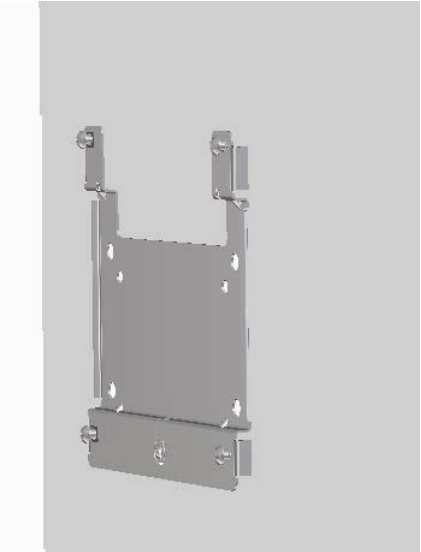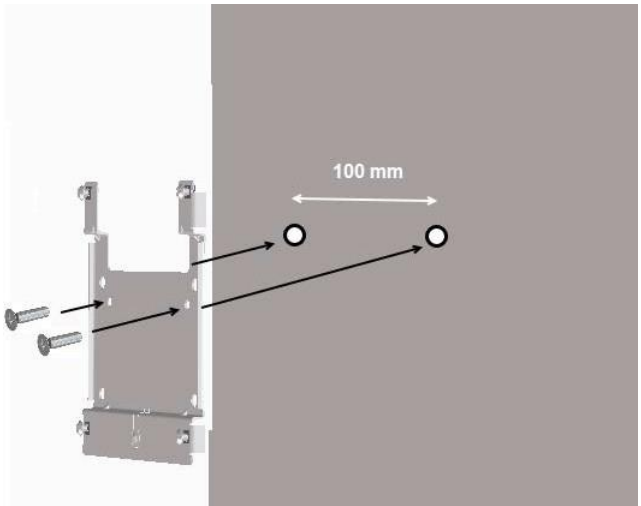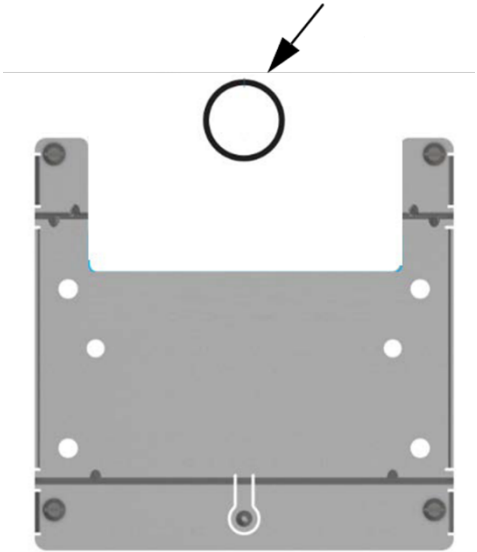
Required tools:
- Tape measure
- Level
- Hammer (when using wall anchors)
- Drill
- 7/32-inch drill bit
- 1-inch hole saw bit
- Philips head screwdriver
- T-8 torx driver
- Silicone adhesive
- Marker
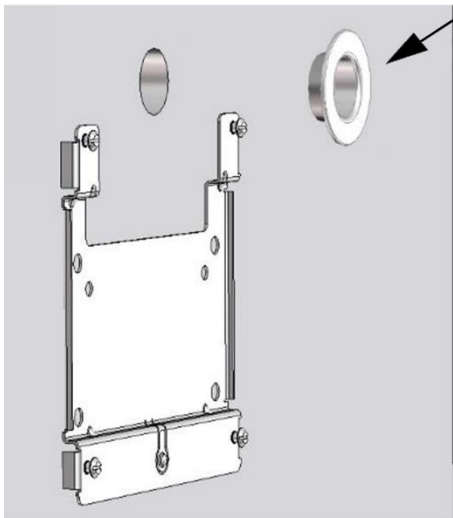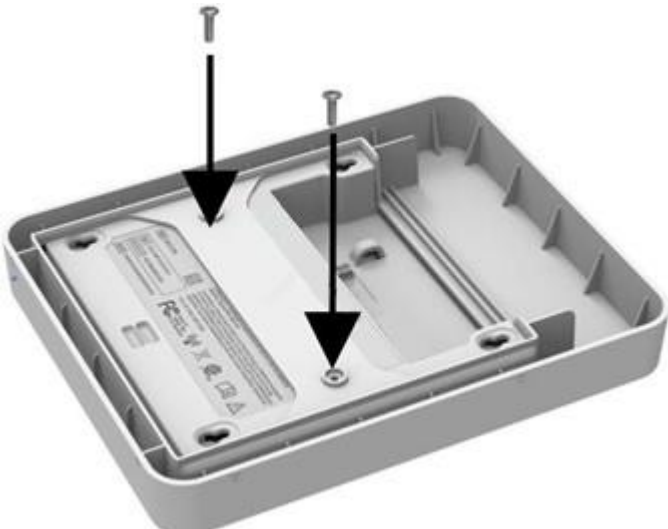
3.3.1 Installation

Table 4 below shows step-by-step how to mount the SMART HOPPING® 2.0 RA with cosmetic cover to a wall.

Note To mount the RA to a wall, connector cables must come through the wall.

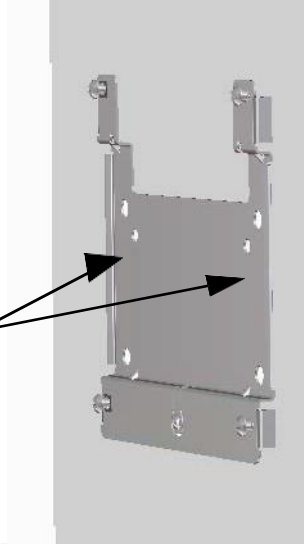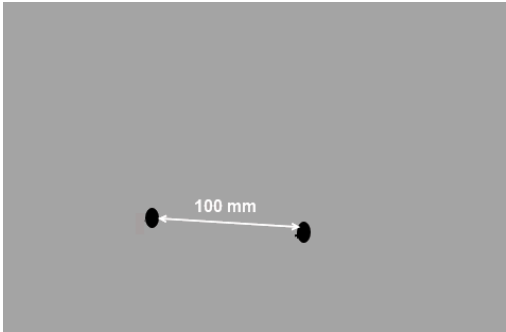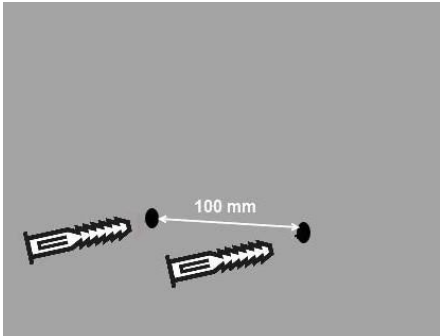| Step	Description	Illustration
1	Place the mounting bracket against the wall (as shown in the illustration). Use a marker on the two inner holes to mark the points that you want to drill holes for the screws that hold the mounting bracket to the wall. The holes ought to be level with the wall and approximately 100 mm apart (center of one hole to the center of the other hole). Put marker through the holes (see arrows) to mark points on the wall where you drill.	
2	Using a 7/32-inch drill bit, drill the two pilot holes into the marks you drew in step 1. The holes ought to be level with the wall and approximately 100 mm apart (center of one hole to the center of the other hole).	
3	If the screw holes that you put in the wall do not go into building studs, use a hammer to tap a supplied screw anchor into each pilot hole until it is flush with the wall surface.	

Step	Description	Illustration
4	Place the mounting bracket against the wall and line up the two holes.	
5	Screw a supplied #6 x 1 1/4-inch self-tapping screw through each hole in the mounting bracket and into each screw anchor (or pilot hole).	
6	Mark one hole in the middle of the gap in the open space between the left and right sides of the mounting bracket (see illustration) to feed cable through the wall to the RA. Mark one hole for cable to AP.	

Step	Description	Illustration
7	Using a 1-inch hole saw, drill out a 1-inch hole around the mark. This is for connector cables to come out of the wall and attach to the RA. On the finished side of the wall, secure the 1-inch grommets to the 1-inch holes you drilled. You need adhesive to secure the Grommet to the wall. Drill one hole and install grommet for cable to AP.	
8	Attach the RA to the cosmetic cover using the two M3 x 0.5 x8 screws. Place the RA face down. Place the cosmetic cover over the RA. Make sure the two holes in the cosmetic cover align with the corresponding holes in the RA. Secure the RA to the cosmetic cover by screwing in the two M3 x 0.5 x 8 machine screws into the holes in the cosmetic ring and into the RA.	
9	Pull the cables out of the wall (through the grommets) and connect them to the appropriate connectors on the RA. Connect the coaxial cables (from the same side of the strand) to the RA coaxial connector. Connect the RJ-45 connector to the RA RJ-45 connector.	

Step	Description	Illustration
10	While holding the RA and the cosmetic cover, fit the four keyholes in the back of the RA chassis over the four keyhole screw heads that protrude from the mounting bracket. Slide the RA down so that all four screw heads are securely in the slots of the keyholes in the back of the RA chassis. When the RA is securely placed in the mounting bracket, you hear a 'click' sound.	

Table 10: Step-by-step guide - how to mount Remote Antenna (with cosmetic cover) to a wall

3.4 Flush ceiling mount (with cosmetic ring)

You can mount the SMART HOPPING® 2.0 RA on a ceiling tile and make it flush with the tile (the RA protrudes 7-10 mm from the finished side of the tile). To mount the RA with cosmetic ring to a tile, please see the list of the required parts in table 10 below.

Note Wall anchors, grommets, and #6 1.25-inch self-tapping screws are included with the RA. We do not use them in this mounting method.

3.4.1 Required materials
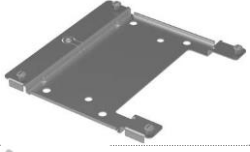
Required parts		
Illustration	**Part name**	**Quantity**
94100010: SH2.0 Remote Antenna 1.4GHz – includes the following:		1
	Access Point	1
	Mounting bracket	1
	Wall anchors	2
	#6 1.25-inch self-tapping screws	2
	Grommets (included with kit)	2* *Only one is needed
94100012: SH2.0 Frame rail - includes the following:		1
	Mounting rail	1
	M6 push nut	4
	M6 x 1 nut	4
	Adapter plates	2
94100013: SH2.0 Cosmetic ring - includes the following:		1
	Cosmetic ring	1
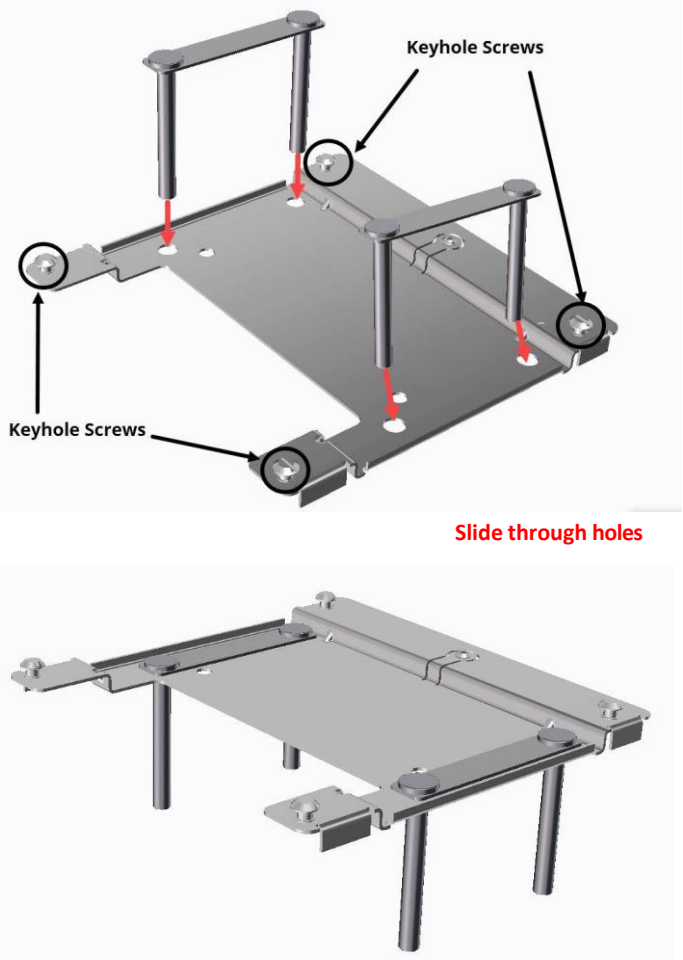
Table 11: Required parts for flush ceiling mount with cosmetic ring

Required tools:
- Tape measure
- Pliers (or wrench)
- Utility knife
- Marker

3.4.2 Assemble the Remote Antenna, adapter plates, mounting bracket, and cosmetic ring

Table 11 below shows step-by-step how to flush ceiling mount the SMART HOPPING® 2.0 RA with cosmetic ring.

Step	Description	Illustration
1	Perform these steps to connect both adapter plates to the mounting bracket: Orient the adapter plate so the bolt heads are on the same surface as the four keyhole screw heads that are attached to the mounting bracket. Place the bolts through one set of outer holes on the bracket.	**Slide through holes**

Step	Description	Illustration
2	Align the side of the mounting bracket with the rectangular cutout with the connectors on the back of the RA. Fit the four keyhole screw heads on the mounting bracket into the four keyholes on the back of the RA. Slide the mounting bracket toward the connectors on the RA. You hear a 'click' sound when the bracket is securely attached to the RA.	
3	Place the RA assembly, finished side down, on a flat surface. Place the cosmetic ring over the RA assembly.	

Step	Description	Illustration
4	Prepare and mount the RA to the ceiling tile. Get the tile which you wish to mount the RA on. Place the mounting rail on the finished side of the tile. Align the center of the mounting rail with the center of the tile. Using the rail as a template, measure the tile and mark an X on the top edge of the tile. This ensures that the mounting rail faces the correct direction when you flip the tile to mount the mounting rail on its unfinished side (in a later step). Make sure the side of the mounting rail labeled (**Cable Access** / **Flush Mount**) faces you. Place four marks on the inner edge of the tile at the points where the arrows of the markings on the mounting rail end. **<--Flush Mount Cutout-->**	Mark an X on the edge of the tile at its center Center of tile Draw Marks Here and Here Flush Mount Cutout F O O F Flush Mount Cutout O Cable Access O F O Flush Mount O F O O
5	Remove the mounting rail from the tile and draw lines to create a rectangle. Using a utility knife, cut out the rectangle. This is where you recess the RA. Put the tile and mounting rail aside.	

Step	Description	Illustration
6	Get the ceiling tile in which you cut the hole (from the previous steps). Place the tile, with the unfinished side facing you, over the RA and cosmetic cover. Make sure the RA is aligned along the bottom edge of the rectangular cutout in the tile (the bottom edge of cutout refers to the edge furthest away from the mark you made on the tile when preparing the tile). This leaves space for the minimum bending radius of the cables.	
7	Place the mounting rail over the RA assembly, on top of the unfinished side of the tile. Make sure the **Cable Access / Flush Mount** label on the mounting rail faces you and the label points toward the RA connectors. Feed the four bolts through the holes marked **F**. The **Flush Mount Cutout** arrows must align with the rectangular cutout in the tile.	
8	Secure the RA assembly and mounting rail to the tile: Place an M6 x 1 nut on each of the bolts from the adapter plate that stick through the holes in the mounting rail. Tighten the nuts enough to secure the adapter plates flat and tight against the tile, and not over tighten the nuts, which may break the tile.	
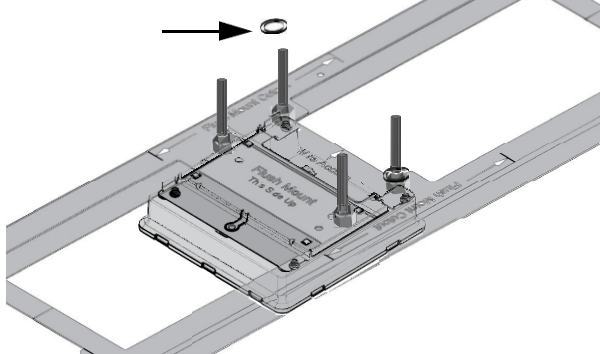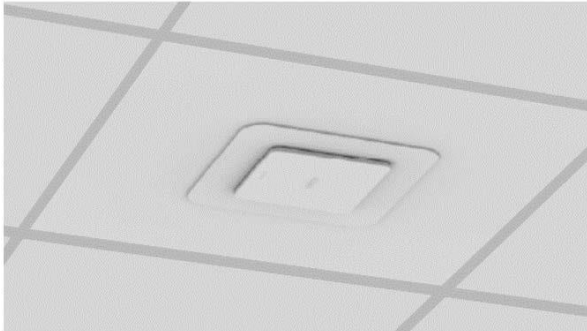
Step	Description	Illustration
9	To secure the nuts, place a push nut over each of the bolts and push down until it sits on top of each nut. You can do this by hand or use a tool, such as pliers or an open-ended wrench.	
10	Connect the cables to the RA in the following order: Connect the coaxial cables (from the same side of the strand) to the RA coaxial connector. Connect the RJ-45 connector to the RA RJ-45 connector.	
11	Place the tile into the ceiling. Replace other adjacent tiles, if necessary.	

Table 12: Step-by-step guide - flush ceiling mount with cosmetic ring

3.5   Mount below ceiling tile (with cosmetic cover)

You can mount the SMART HOPPING® 2.0 RA below a ceiling tile and place a cosmetic cover over it to hide exposed cables - please see the list of the required parts in table 12 below.

Note   Wall anchors and #6 1.25-inch self-tapping screws are included with the RA.
These are not used in this mounting method.
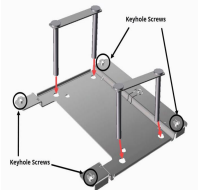
Required parts		
Illustration	**Part name**	**Quantity**
94100010: SH2.0 Remote Antenna 1.4GHz – includes the following:		1
	Access Point	1
	Mounting bracket	1
	Wall anchors	2
	#6 1.25-inch self-tapping screws	2
	Grommets (included with kit)	2* *Only 1 is needed
94100012: SH2.0 Frame rail - includes the following:		1
	Mounting rail	1
	M6 push nut	4
	M6 x 1 nut	4
	Adapter plates	2
94100014: SH2.0 Cosmetic cover – includes the following:		1
	Cosmetic cover	1
	M3 x 0.5 x8 machine screws	2
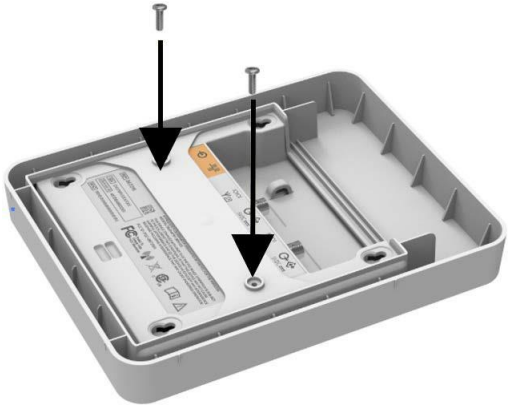
Table 13: Required parts to mount below ceiling tile with cosmetic cover
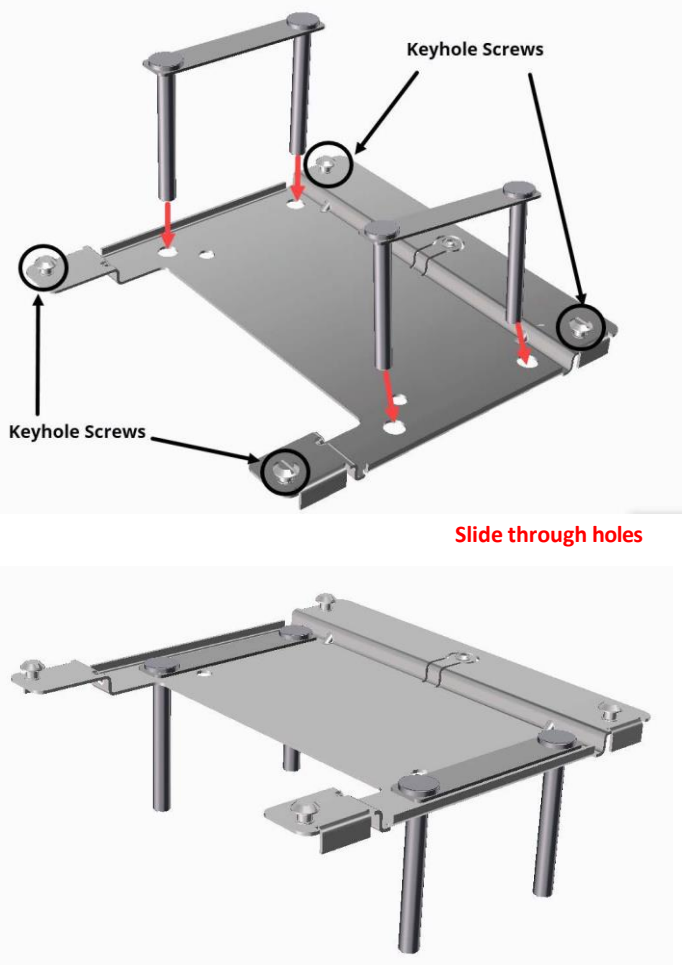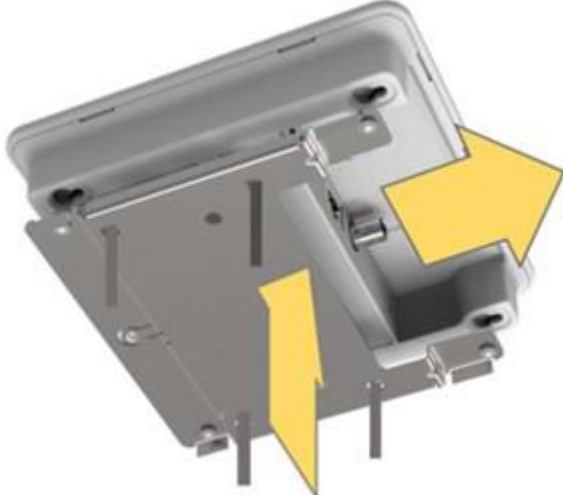
Required tools:

- Tape measure
- Drill
- 1/4-inch drill bit
- 1-inch hole saw bit
- Pliers (or wrench)
- Philips head screwdriver
- T-8 torx driver
- Silicone adhesive
- Marker
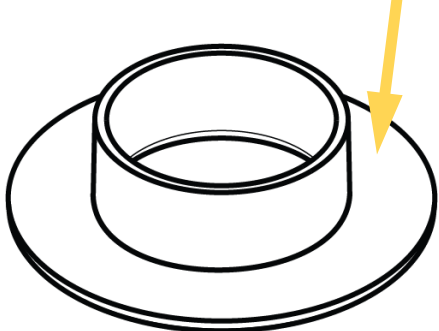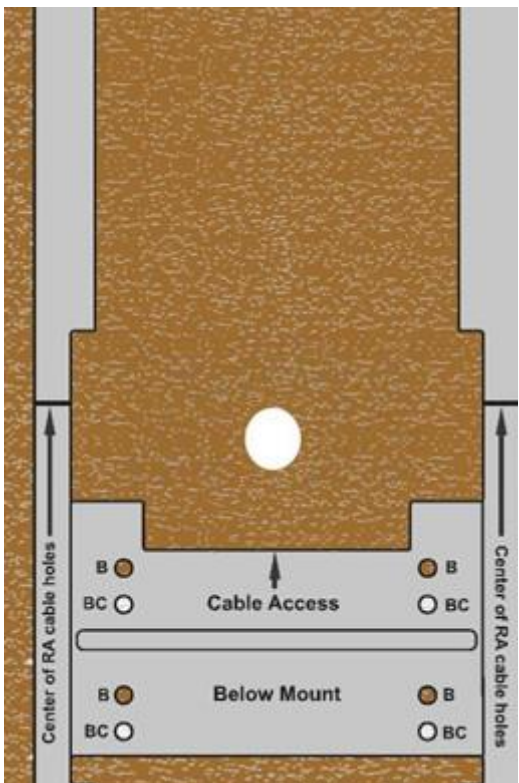
3.5.1   Mount the cosmetic cover and attach the adapter plates to the mounting bracket

Table 13 below shows step-by-step how to mount the SMART HOPPING® 2.0 RA with cosmetic cover below a ceiling tile.

Step	Description	Illustration
1	Attach the RA to the cosmetic cover using the two M3 x 0.5 x8 screws. Place the RA face down. Place the cosmetic cover over the RA. Make sure the two holes in the cosmetic cover align with the corresponding holes in the RA. Secure the RA to the cosmetic cover by screwing in the two M3 x 0.5 x8 machine screws into the holes in the cosmetic cover and into the RA.	

Step	Description	Illustration
2	Perform these steps to connect both adapter plates to the mounting bracket: Orient the adapter plate so the bolt heads are on the same surface as the four keyhole screw heads that are attached to the mounting bracket. Place the bolts through one set of outer holes on the bracket.	Keyhole Screws Keyhole Screws **Slide through holes**
3	Align the side of the mounting bracket with the rectangular cutout with the connectors on the back of the RA. Fit the four keyhole screw heads on the mounting bracket into the four keyholes on the back of the RA. Slide the mounting bracket toward the connectors on the RA. You hear a 'click' sound when the bracket is securely attached to the RA.	

Step	Description	Illustration
4	Select the ceiling tile which you wish to mount the RA on. Place the mounting rail on the finished side of the tile. Align the center of the mounting rail with the center of the tile. Using the rail as a template, measure the tile and mark an X on the top edge of the tile. Make sure the side of the mounting rail labeled: **Cable Access** **Below Mount** faces you. Place marks on the tile in the holes labeled **BC** on the mounting rail. Use a ruler (recommended) or visually mark two RA cable hole marks on the tile, where the **Cable Access** arrows and the lines at the end of **Center of RA cable holes** intersect.	
5	Remove the mounting rail. With the finished side of the ceiling tile facing you, use the drill and 1/4-inch drill bit to drill four holes where you marked in the **BC** holes in the previous steps. Using the marks, you made in step 4 as the center point, use a 1-inch hole saw to drill out two 1-inch holes in the tile. These holes are to pass cable connectors through the ceiling to the RA.	

Step	Description	Illustration
6	Lightly coat the inner ring (where the grommet touches the ceiling tile) of both grommets with silicone adhesive. Coat all of the area (see yellow arrow) of the grommet with silicone adhesive.	
7	Insert the grommets into the 1-inch hole in the ceiling tile (insert the grommet from the unfinished side of the tile).	
8	Place the ceiling tile on a flat surface with the unfinished side of the tile facing you. Place the mounting rail on the tile. Make sure the **Cable Access** arrows on the mounting rail are pointed toward the 1-inch hole you drilled in the tile for the cable. The four 1/4-inch holes you drilled must align with the **BC** holes in the mounting rail.	

Step	Description	Illustration
9	Connect the mounting bracket and the mounting rail to the ceiling tile: Pick up the mounting bracket and orient it so that the rectangular cutout on the bracket is in the same direction as the **Cable Access** arrows on the mounting rail. With the adapter plates adhered to the mounting bracket, insert the four bolts from the finished side of the tile through the four 1/4-inch holes in the tile and through the **B** holes in the mounting rail.	
10	Secure the RA assembly and mounting rail to the ceiling tile: Place an M6 x 1 nut on each of the bolts from the adapter plate that stick through the holes in the mounting rail. Tighten the nuts enough to secure the adapter plates flat and tight against the tile, and not over tighten the nuts, which may break the tile.	
11	To secure the nuts, place a push nut over each of the bolts and push down until it sits on top of each nut. You can do this by hand or use a tool, such as pliers or an open-ended wrench.	

Step	Description	Illustration
12	Pull the LAN cable and AP cables (if applicable) through the 1-inch hole on the unfinished side of the ceiling tile so the cable connectors end up on the finished side of the tile. Feed the cable from the ceiling through the hole on the inside edge of the tile. Connect the cables to the RA in the following order: Connect the coaxial cables (from the same side of the strand) to the RA coaxial connector. Connect the RJ-45 connector to the RA RJ-45 connector.	
13	With all the necessary cables connected, place the tile into the ceiling. Replace other adjacent tiles, if necessary. **Note**: You can now remove and reattach the RA with cosmetic cover without removing the tile by sliding the RA with cosmetic cover horizontally in the opposite direction of the four marks in the bottom on the front. Reattach the RA with cosmetic cover by inserting the four small shoulder screws on the mounting bracket into the keyholes on the RA and sliding the RA with cosmetic cover toward the four marks in the bottom on the front. You hear a 'click' noise when the RA is secured to the mounting bracket.	
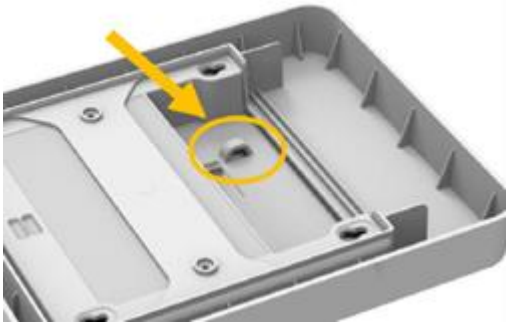
Table 14: Step-by-step guide – how to mount the Remote Antenna with cosmetic cover below ceiling tile

3.6   Mounting the SMART HOPPING® 2.0 Remote Antenna with a tether mount (optional)

In addition to (not as a substitute for) any of the other installation options described in this section, you can add a tether from the tether point on the RA to a permanent building structure for extra security (where local building codes require this type of installation [such as earthquake-prone areas]).

Note   You must connect the other end of the tether to a stable part of the building frame.

Perform these steps outlined in the below table before replacing the ceiling tile onto the ceiling frame structure, or prior to attaching the RA to a wall:

There is a tether point on the RA housing to allow for tethering to other permanent structures. Use an 18-gauge galvanized steel wire. Make sure the tether wire complies with national and local building standards. Thread the wire through the tether point in the RA housing. The tether wire must have three tight turns of the wire within 1.5 inches of the end of the wire. Connect the other end of the tether wire to a permanent structure within the ceiling. The tether wire may be attached to any of the following: • Wood or metal stud framing • Blocking attached to wood or metal framing • Plywood adequately attached to wood or metal stud framing, reinforced concrete, or reinforced masonry • Reinforced concrete • Reinforced masonry	

4   Connecting the SMART HOPPING® 2.0 Remote Antenna

This section explains how to physically connect the SMART HOPPING® 2.0 RA to the AP.

4.1   Connecting Remote Antenna to the Access Point

1. Connect the first RA to the AP using the UTP and coaxial cable connectors labeled **RA1** in figure 5 below.
2. Connect the second RA to the AP using the UTP and coaxial cable connectors labeled **RA2** in figure 5 below.
3. Be sure to label the UTP cable bundles and the RAs themselves as **RA1** and **RA2** corresponding to the cable connections you made in step 1 and 2.
4. Reboot the AP.
5. The AP and its connected RAs should now be listed in the APC web interface. Press F5 to refresh the web interface display if the AP and RAs are not listed. For instructions on the AP startup sequence, please refer to reference no. 1.

SMART HOPPING® 2.0 Access Point

BNC coaxial cable connectors to RAs (1 & 2)
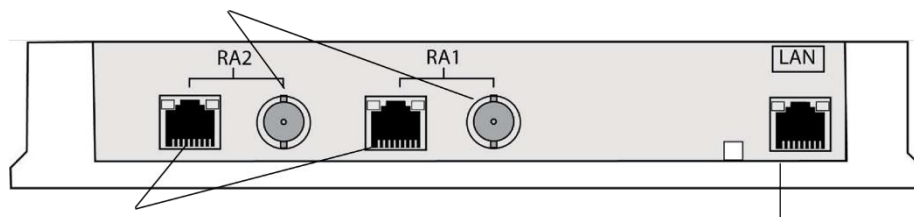
Figure 5: SMART HOPPING® 2.0 Access Point 1.4GHz connectors

UTP cable connectors to RAs (1 & 2)

Ethernet interface that connects to the SMART HOPPING® Sync Unit
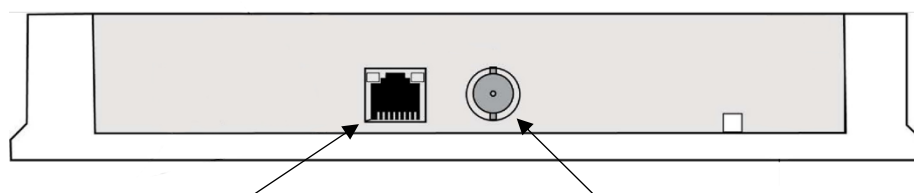
Figure 6: SMART HOPPING® 2.0 Remote Antenna connectors

UTP cable connectors to AP

BNC coaxial cable connector to AP

Note   If after connecting and powering the AP, its LEDs are lit red and the RA LEDs do not light at all, open the APC web interface, click **System** in the **View Device** tree, click **Configure** and then select the **Advanced** tab. Verify that the **Allow new Access Points to be added automatically** option is set to **True**. This option must be set to **True** for the AP and RA LEDs to light properly.

4.1.1   Access Point and Remote Antenna startup sequence

Upon power on/start up, the SMART HOPPING® 2.0 AP performs a Power-on-Self-Test (POST) to ensure that its basic components are fully functional. This test detects critical system failures.

As the test progresses, the state of the system is displayed through a series of color combinations on the power/sync, radio, and network LEDs on the front of the AP. All three LEDs illuminate amber color, then the power/sync LED illuminates green and the other two LEDs turn off (not illuminated) indicating correct startup.

Should a test fail, the LEDs are left in a state which indicates the point at which the test failed. When the system is transmitting data, the radio and network LEDs on the AP will flicker on and off as data is transmitted. After the AP is fully running, examine the LEDs on the RA. For RA LEDs indication, please refer to subsection 2.1.6.

4.1.2   Access Point configuration information

For details about configuring the SMART HOPPING® 2.0 Access Points, please refer to reference no. 4.

5 Installing SMART HOPPING® 2.0 Remote Antenna with SMART HOPPING® 1.0 Access Point

This section explains how to physically connect the SMART HOPPING® 2.0 RA to SMART HOPPING® 1.0 AP.

The SMART HOPPING® 2.0 RA is compatible with all SMART HOPPING® 1.4GHz APs. When connecting the RA to a SMART HOPPING® 1.0 AP, the RA will seamlessly adapt to align with the features of the SMART HOPPING® 1.0 AP.

5.1 Connecting the SMART HOPPING® 2.0 Remote Antenna to SMART HOPPING® 1.0 Access Point
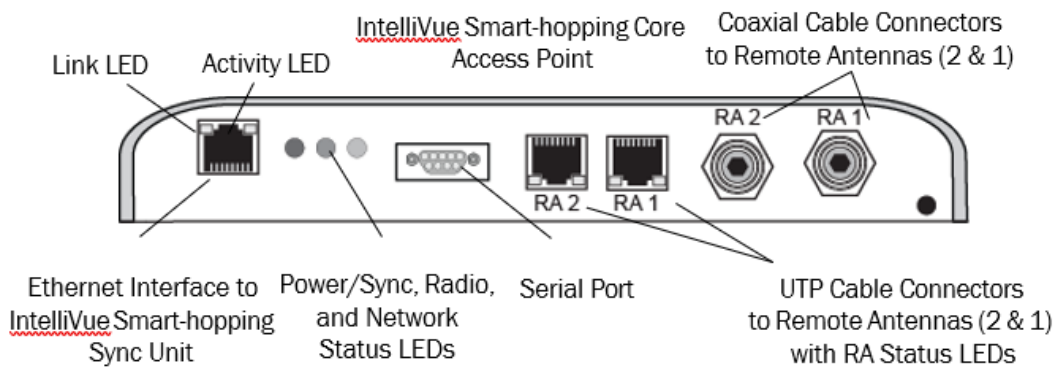
Figure 7: SMART HOPPING® 1.0 Access Point controls and connectors
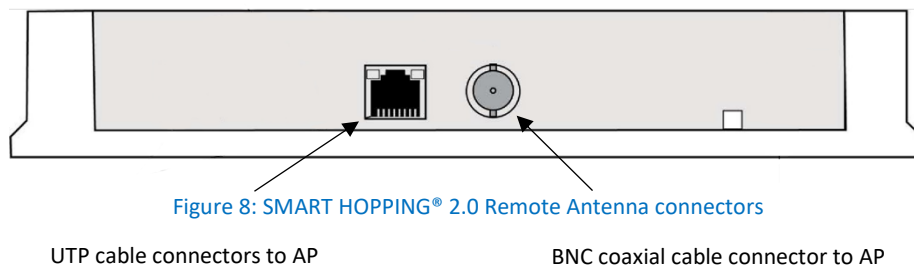
Figure 8: SMART HOPPING® 2.0 Remote Antenna connectors

UTP cable connectors to AP   BNC coaxial cable connector to AP

Note   If after connecting and powering the AP, its LEDs are lit red and the RA LEDs do not light at all, open the APC web interface, click **System** in the **View Device** tree, click **Configure** and then select the **Advanced** tab. Verify that the **Allow new Access Points to be added automatically** option is set to **True**. This option must be set to **True** for the AP and RA LEDs to light properly.

5.1.1 Access Point and Remote Antenna startup sequence

Upon power on/start up, the SMART HOPPING® AP performs a POST to ensure that its basic components are fully functional. This test detects critical system failures.

As the test progresses, the state of the system is displayed through a series of color combinations on the power/sync, radio, and network LEDs on the front of the AP. All three LEDs illuminate amber color, then the power/sync LED illuminates green and the other two LEDs turn off (not illuminated) indicating correct startup.

Should a test fail the LEDs are left in a state which indicates the point at which the test failed. When the system is transmitting data the radio and network LEDs on the AP will flicker on and off as data is transmitted.
After the AP is fully running, examine the LEDs on the RA. For RA LEDs indication, please refer to subsection 2.1.6.

For SMART HOPPING® 1.0 AP, the LEDs will also indicate the state of the RA. In the last phase of booting up the SMART HOPPING® 1.0 AP, Power/Sync, Network and Radio LEDs are initially all red and then Power/Sync turns steady green and Network flashes green. When the RA is fully operational the Power/Sync LED will illuminate amber, and Network LED will illuminate green.

If SMART HOPPING® 1.0 AP detects an error on the RA, it will cut of the connection, both under startup and normal operation. In case the RA fails, the AP will continue to operate as normal.

5.1.2 Access Point configuration information

For details about configuring the SMART HOPPING® 2.0 Access Points, please refer to reference no. 4.

6 Test and inspection procedures

6.1 Before installation

RA visual inspection
Inspect all components (RA, cables, connectors, etc.) and check for signs of abrasion wear and other damages.

6.2 After installation

RA power-on
Check the LEDs on the front of the RA - the Power/Sync LED should illuminate amber, and the Network LED should illuminate green.

Check status on APC
Check that the RA is connected on the APC by checking the basic status of the AP that the RA is connected to and observe the 'Remote Antenna Status' and verify that the RA connection is 'OK'.

7 Maintaining the SMART HOPPING® 2.0 Remote Antenna

This section provides procedures and information about maintaining the SMART HOPPING® 2.0 RA and includes:

- Maintenance procedures
- Troubleshooting the RA using its LEDs
- Replacing the RA
- Ordering accessories

7.1 Maintenance procedures

To make sure your RA continues to operate properly, perform the following maintenance tasks periodically:

Ventilation - the RA cases are vented to provide air circulation and cooling for the devices. Keep the immediate area around the AP and RA open to allow for natural air circulation around the devices. Periodically, dust the AP and RA cases to keep their ventilation holes open.

7.2 Troubleshooting the Remote Antenna using its LEDs

Subsection 2.1.6 provides a summary of the RA status LEDs to help you troubleshoot issues that may arise.

If you cannot resolve the problem with the LEDs, then note the LED lighting and sequence of colors, replace the unit, and return the defective unit to your supplier with the explanation of LEDs sequence and colors displayed. For complete RA replacement procedure, please refer to section 7.3.

7.3 Replacing the Remote Antenna

To repair a non-working RA, replace the unit. Individual RA components, PC assemblies, or subassemblies are not available for purchase.

If a RA does not work properly, contact your supplier for information on ordering a replacement unit and returning the defective unit.

When replacing defective equipment on your SMART HOPPING® infrastructure, be sure to follow the procedures given in this guide.

7.4 Replacement parts

For SMART HOPPING® 2.0 Remote Antenna 1.4GHz, you can order the following replacement parts:

Item	Part number
RTX3466 SH2.0 Remote Antenna 1.4GHz	94100010
SMART HOPPING® Remote Antenna cable	989803223741 (Philips)

Table 15: Ordering Remote Antenna replacement parts