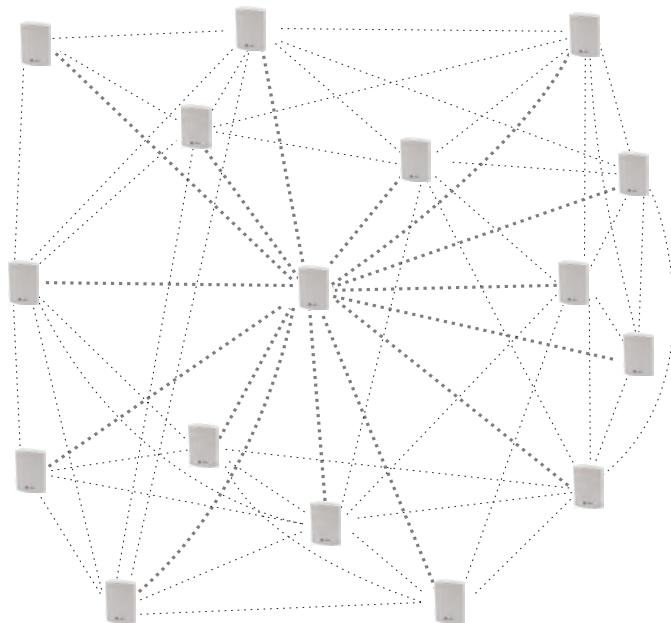




Installation, Operation, and Maintenance

Air-Fi™ Wireless System



⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.
NOTICE:	Indicates a situation that could result in equipment or property-damage only.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants-including industry replacements for CFCs such as HCFCs and HFCs.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified. The Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.

WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- Before installing/servicing this unit, technicians MUST put on all PPE recommended for the work being undertaken. ALWAYS refer to appropriate MSDS sheets and OSHA guidelines for proper PPE.
- When working with or around hazardous chemicals, ALWAYS refer to the appropriate MSDS sheets and OSHA guidelines for information on allowable personal exposure levels, proper respiratory protection, and handling recommendations.
- If there is a risk of arc or flash, technicians MUST put on all PPE in accordance with NFPA 70E or other country-specific requirements for arc flash protection, PRIOR to servicing the unit.

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Trademarks

All trademarks referenced in this document are the trademarks of their respective owners.

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Overview

This section provides an overview of Trane Air-Fi™ wireless systems and the two Trane Air-Fi™ wireless devices.

Air-Fi Wireless Communications Interface (WCI)

The Air-Fi Wireless Communications Interface (WCI) enables wireless communications between system controls, unit controls, and wireless sensors for Trane® control products that use the BACnet protocol. The WCI replaces the need for communications wire in all system applications.

The WCI is available in three configurations:

- The universal model is the most common. It installs the same as a wired zone sensor in indoor applications.
- The outdoor model is housed in an enclosure suitable for outdoor environments. It is usually used on equipment above the roof deck.
- The flush mount model is used on fan coils, blower coils, and unit ventilators.

Air-Fi™ Wireless Communications Sensor (WCS)

The Air-Fi™ Wireless Communications Sensor (WCS) is compatible with any Trane controller that uses a WCI. The WCS provides the same functions as many currently available Trane wired sensors. No further software or hardware is necessary for site evaluation, installation, or maintenance. Space temperature is standard on all models. (A service tool cannot be connected to a Trane wireless sensor.)

Three WCS models are available:

- Digital display (WCS-SD) model
- Base (WCS-SB) model has no exposed display or user interface
- 2% relative humidity sensor module (WCS-SH), which can be field installed inside either the WCS-SD or WCS-SB.

In most applications, one WCS-SD or WCS-SB sensor will be used per WCI acting as a router. However, up to 6 WCS-SD or WCS-SB sensors can be associated to a single equipment controller or BCI.

Compatibility with Previous Generation Wireless Zone Products

Our previous line of wireless zone sensors (WZS, WTS, and WDS) are not compatible with the Air-Fi Wireless Communications Interface (WCI).

The new Air-Fi Wireless Communications Sensor (WCS) are compatible with old WCIs that have updated firmware.

Wired Zone Sensors

Wired zone sensors can be used with Air-Fi™ wireless systems.

Devices Supported by Air-Fi™ Wireless Systems

- Tracer™ SC system controller
- Tracer™ UC210 programmable controller
- Tracer™ UC400 programmable controller
- Tracer™ UC600 programmable controller
- BCI-I: BACnet Communications Interface for IntelliPak™ systems
- BCI-R: BACnet Communications Interface for ReliaTel™ systems

- Tracer™ TU service tool

Quantity of Air-Fi™ Devices per Network

Each Air-Fi network should be limited, in addition to the coordinator WCI and, at times, one TU Adapter, to a maximum of 30 other WCIs and a total of 60 Air-Fi devices (WCIs and WCSs).

Quantity of Air-Fi™ Networks per Tracer SC

A Tracer SC can support up to 8 Air-Fi networks.

Notes:

- *The number of WCIs that can be installed at a site is determined by the applicable Tracer SC license, which specifies the total number of controllers.*
- *For instructions on installing a WCI on a Tracer SC, see “WCI Installation,” p. 15 and Figure 5, p. 19.*

Automatic Network Formation and Sensor Association

A WCI that is connected to a Tracer SC is auto-assigned as the network coordinator. The coordinator WCI allows all WCIs and WCSs having matching addresses to automatically join the network. (For more details about the process of network establishment, see “Establishing an Air-Fi™ Network,” p. 35.)

If no Tracer SC is present, a centrally located WCI connected to a programmable controller or a BCI must be designated as the coordinator. You can designate a WCI to be a coordinator either manually on the WCI or by using Tracer TU.

After the network is formed, WCSs automatically associate with their designated controllers.

Note: *The network must be open for a WCS to join the network, but does not need to be open for the WCS to be manually assigned to a controller.*

Network Security

Air-Fi™ wireless communications use standard ZigBee™ Building Automation security, which includes authenticated encryption of data using AES-128 (FIPS Pub 197) and HMAC (FIPS Pub 198).



Overview

Air-Fi™ Device Part Numbers

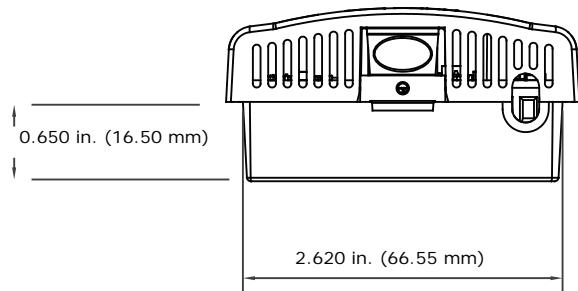
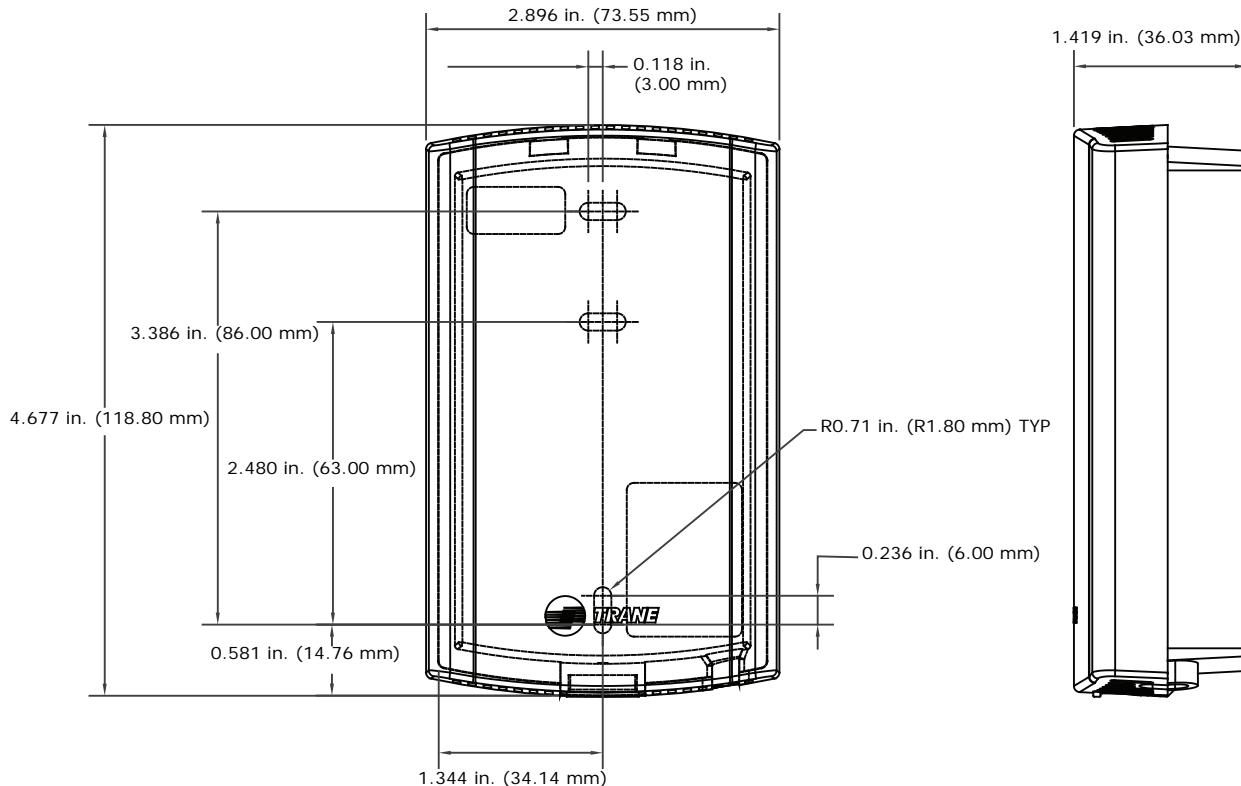
Air-Fi™ device			Part number	BAYSENS	Global part
Wireless communications interface (WCI)	Indoor	Field installed or service	X13790901020	BAYWCII002A	MOD02602
	Outdoor		X13790941020	BAYWCII202A	MOD02604
	Indoor—BAA		X13790963010	BAYWCII003A	MOD02608
	Outdoor—BAA		X13790964010	BAYWCII203A	MOD02609
	Indoor flush	Service part only	X13790902020	N/A	MOD02603
	Indoor	Factory only	X13790903020	BAYWCII152A	N/A
	Indoor flush	Factory only	X13790904020	N/A	N/A
Wireless communications sensor—Digital display (WCS-SD)	Universal	Field, factory, or service	X13790955010	N/A	SENO2362
	FC BC UV		X13790955040	N/A	N/A
	RTU WSHP		X13790955050	BAYSENS202A	SENO2263
	Universal—BAA		X13790968010	BAYSENS212A	SENO2265
Wireless communications sensor—Base model (WCS-SB)	Universal		X13790956010	BAYSENS203A	SENO2264
	Universal—BAA		X13790969010	BAYSENS213A	SENO2266
Wireless communications sensor accessory—2% relative humidity sensor module (WCS-SH)			X13790973010	BAYSENS220A	SENO2347

Firmware Requirements for Devices on an Air-Fi™ Network

The following table lists the minimum firmware levels required to allow devices to participate on an Air-Fi network:

Device	Minimum firmware level required for devices on a Air-Fi network	
	One or no WCSs	Multiple WCSs or an RH sensor module (WCS-SH)
Tracer SC	V3.6.xxx	N/A
UC210	All versions	V2.00.xxx.mod
UC400	V6.00.xxx.mod	V8.00.xxx.mod
UC600	V4.00.xxx.mod	V5.00.xxx.mod
BCI-I	V25.00.xxx.mod	V28.00.xxx.mod
BCI-R	V5.02.xxx.mod	V6.00.xxx.mod
RTRM	V12 or higher (requires physical board replacement)	N/A
Tracer TU	V8.2	V8.6
TU Adapter	V1.00.xxx.mod	N/A

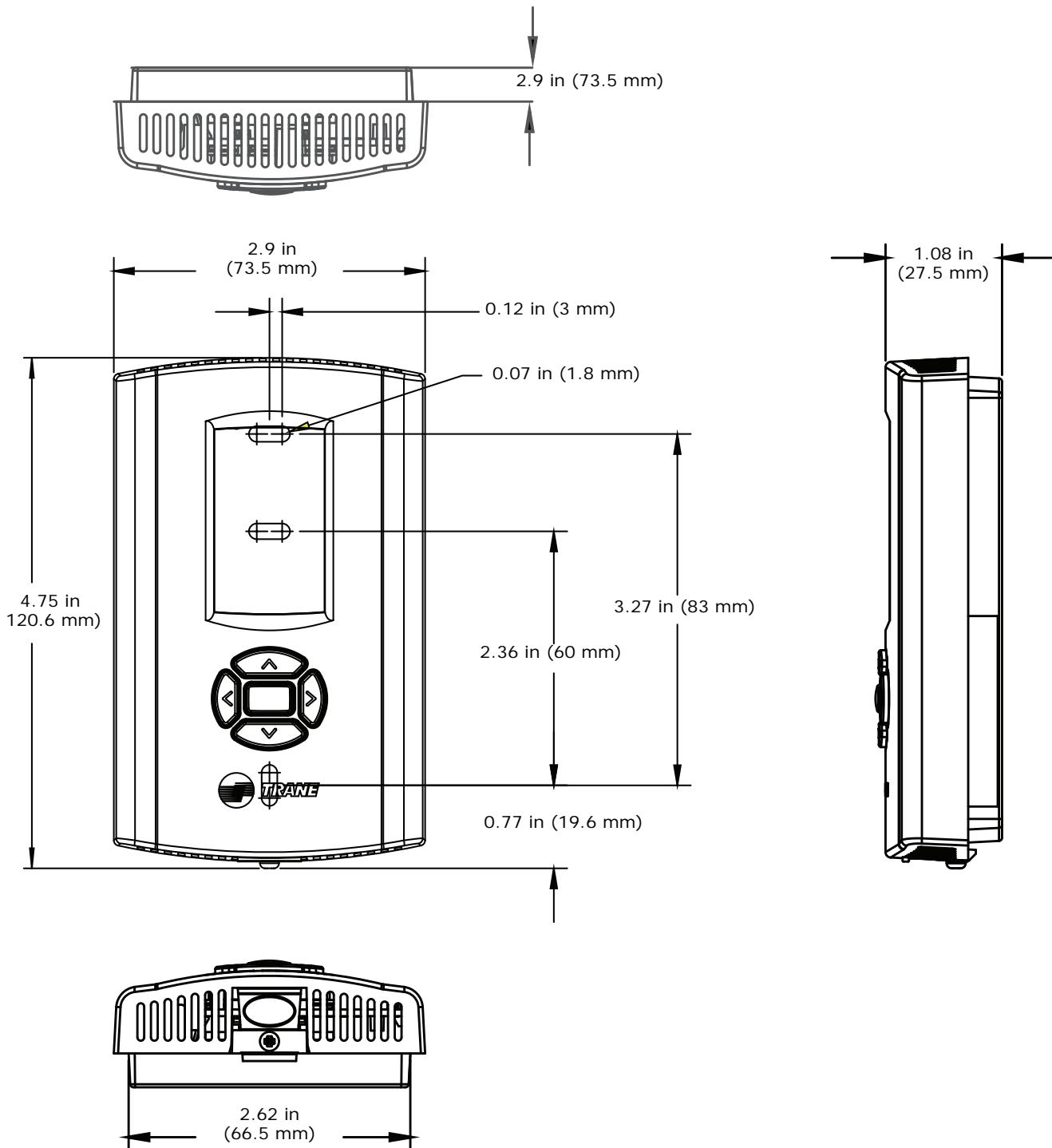
WCI Dimensions



Overview

WCS Dimensions

The dimensions are the same for all WCS models. The illustration shows a SD (display model) which contains an LCD display and a keypad.



Specifications

General Specifications	
Operating temperature	32 to 122°F (0 to 50°C)
Storage temperature	-40 to 185°F (-40 to 85°C)
Storage and operating humidity range	5% to 95% relative humidity (RH), non-condensing
Housing material	Polycarbonate/ABS (suitable for plenum mounting), UV protected, UL 94: 5 VA flammability rating
Range ^(a)	Open range: 2,500 ft (762 m) with packet error rate of 2%. Indoor: Typical range is 200 ft (61 m); actual range is dependent on the environment. See BAS-SVX55* for more detail.
Output power	100 mW
Radio frequency	2.4 GHz (IEEE Std 802.15.4-2003 compliant) (2405–2480 MHz, 5 MHz spacing)
Radio channels	16
Wireless Communications Interface (WCI) Specifications	
Voltage	24 Vac/Vdc nominal ±10%. If using 24 Vdc, polarity must be maintained.
Power consumption	<2.5 VA
Indoor mounting	Fits a standard 2 in. by 4 in. junction box (vertical mount only). Mounting holes are spaced 3.2 in. (83 mm) apart on vertical center line. Includes mounting screws for junction box or wall anchors for sheet-rock walls. Overall dimensions: 2.9 in. (74 mm) by 4.7 in. (119 mm).
Outdoor mounting	Position enclosure in desired flat mounting location and mount using four (4) #8 sheet metal screws with the conduit connection pointing down. If not mounted to the HVAC equipment exterior wall, the conduit connection on the bottom of the enclosure is also available. Please note that the supplied plug must be installed into the unused conduit connection. Overall dimensions: 3.9 in. (98 mm) by 6.4 in. (163 mm) by 1.7 in. (42 mm).
Wireless protocol	 ZigBee® Certified product  ZigBee PRO—ZigBee Building Automation Profile, ANSI/ASHRAE Standard 135-2008 Addendum q (BACnet®/ZigBee®)
Wireless Communications Sensor (WCS) Specifications	
Accuracy	0.5°F for a range of 55 to 85°F (12.8 to 29.4°C)
Resolution	+0.125°F over a range of 60°F to 80°F (15.56°C to 26.67°C)/±0.25°F outside this range
Setpoint functional range	45°F to 95°F (7.22°C to 35°C)
Sensor battery	Two (2) AA lithium 1.5 V batteries, 2800 mA with an expected life of 15 years under typical operating conditions
Address range	000 to 999
Maximum time between transmissions	15 minutes
Minimum time between transmissions	10 seconds. Time between transmissions can be shorter during user interaction.
Mounting	Fits a standard 2 in. by 4 in. junction box (vertical mount only). Mounting holes are spaced 3.2 in. (83 mm) apart on vertical center line. Includes mounting screws for junction box and wall anchors for sheet-rock walls. Overall dimensions: 2.9 in (74 mm) by 4.7 in. (119 mm)



Overview

2% Relative Humidity (RH) Sensor Module	
Accuracy	±1.8% (typical)
Hysteresis	±1% (typical)
Response time	8 seconds
Long-term drift	<0.5%RH/year

(a) Range values are estimated transmission distances for satisfactory operation. Actual distance is job specific and must be determined during site evaluation. Placement of the WCI is critical to proper system operation. In most general office space installations, distance is not the limiting factor for proper signal quality. Signal quality is more greatly affected by walls, barriers, and general clutter. Note that sheetrock walls and ceiling tiles offer little restriction to the propagation of the radio signal throughout the building as opposed to concrete or metal barriers. More details information, including wiring schematics, are available at <http://www.trane.com>.

Agency Compliance

United States	<p>UL listed: UL 94, 5 VA flammability rating and UL916.</p> <p>Energy Management Equipment FCC CFR47, Sec. 15.247 & subpart E, Digital Modulation Transmission with no SAR (FCC ID: TPF-251701).</p> <p>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 any interference received, including interference that may cause undesired operation.</p> <p>Changes or modifications not expressly approved by the manufacturer for compliance could void the user's authority to operate the equipment.</p> <p>Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:</p> <ul style="list-style-type: none"> • Reorient or relocate the receiving antenna. • Increase the separation between the equipment and receiver. • Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. • Consult the dealer or an experienced radio/TV technician for help.
Canada	<p>CSA-C22.2 No. 205-M1983 Signal Equipment Industry Canada (IC: 6178A-251701)</p> <p>Cet appareil est conforme à la partie 15 du règlement du FCC. Son fonctionnement fait l'objet des deux conditions suivantes : (1) Cet appareil ne produit pas de brouillages nuisibles, et (2) cet appareil doit pouvoir recevoir n'importe quel type d'interférence, y compris les brouillages pouvant occasionner un fonctionnement non désiré.</p> <p>Les changements et les modifications n'ayant pas été approuvés expressément par le fabricant comme étant conformes, pourraient rendre nulle le droit de l'utilisateur à faire fonctionner cet équipement.</p> <p>Remarque: Cet équipement a été testé et reconnu comme étant conforme aux limites des appareils numériques de classe B, tel qu'indiqué dans la partie 15 du règlement du FCC. Ces limites ont été établies afin de fournir un niveau de protection raisonnable contre le brouillage nuisible dans les installations résidentielles. Cet appareil produit, utilise, et peut aussi émettre des fréquences radioélectriques. Si celui-ci n'est pas installé et utilisé conformément aux instructions, il peut provoquer des brouillages nuisibles dans les communications radioélectriques. L'absence d'interférence n'est cependant pas garantie dans toutes les installations. Si cet équipement provoque des brouillages nuisibles dans la réception des communications radioélectriques ou de télévision (ceci pouvant être déterminé en allumant et en éteignant l'équipement), l'utilisateur est encouragé à essayer de corriger l'interférence en utilisant un ou plusieurs des moyens suivants :</p> <ul style="list-style-type: none"> • Réorienter ou changer l'emplacement de l'antenne réceptrice. • Éloigner l'équipement et le récepteur l'un de l'autre. • Brancher l'équipement à une prise de courant se trouvant sur un circuit différent de celui sur lequel le récepteur est branché. • Faire appel aux services du fournisseur ou d'un technicien radio/TV qualifié.
IEEE/radio frequency range	IEEE 802.15.4-2003, IEEE Standard for Information Technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements, Part 15.4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low Rate Wireless Personal Area Networks (LR-WPANS)



Pre-Installation

Location Considerations

For most installations, barriers limit proper radio signal quality more than distance. To provide the best signal quality between wireless devices and to reduce the number of WCIs needed for an application, mount WCIs and WCSs in direct, unobstructed, line-of-sight paths. Where this is not possible, try to minimize the number of barriers between a WCS and a WCI. In general, sheetrock walls and ceiling tiles offer little restriction to the transmission of the radio signal throughout the building.

For more detailed information about WCI placement, see the *Air-Fi™ Network Design Best Practices Guide* (BAS-SVX55).

⚠ CAUTION

Avoid exposure to electromagnetic energy!

The WCI produces very low levels of electromagnetic energy. To avoid exposure, keep the WCI a minimum of 8 in. (20 cm) from your body.

Risque d'exposition à l'énergie électromagnétique!

L'interface de communication (WCI) sans fil produit de l'énergie électromagnétique de très bas niveau. Afin d'empêcher toute exposition, maintenez-la à au moins 20 cm (8 pouces) de votre corps.

WCI Maximum Wire Length

The maximum wire length between the WCI and its power source is 656 ft (200 m).

Note: The connector that comes with the WCI is one meter in length.

WCI Installation Locations

Unit controller

For a unit controller installation, the most typical WCI mounting location is on the sheet metal enclosure of the unit controller or HVAC equipment housing.

Coordinator Location

For optimum network performance and reliability, the coordinator WCI should be centrally located within the network. See the *Air-Fi™ Network Design Best Practices Guide* (BAS-SVX55) for more detail.

Repeater location

A WCI can be installed to route messages between a network and WCIs and WCSs that would otherwise be out of range of the network. When choosing a location for a repeater WCI, consider the availability of a 24 Vac/Vdc power source to meet its power requirement. (See “[Controller Applications](#),” p. 17 for installation information.)

Coordinator and repeater placement recommendations on sites without VAV boxes

The recommended mounting location for RTU installations is in the return plenum, above the roof penetration. This location provides the best overall sensor and communication link quality, and makes access to the WCI easier than below the roof deck for improved serviceability.

In RTU/VAV systems, there is adequate network density minimizing the need for repeaters. However, the increased distance between devices on single zone rooftops means that repeaters will be required in many of these installations. Unlike VAV boxes, which may be within line of site, RTUs have greater obstructions between devices, such as steel roof decks and return ducts.



Pre-Installation

Consequently, the design range between these devices is shorter. Based on our tests, we recommend a design range of 100 ft.

WCS Installation Locations

When selecting a WCS location, avoid the following:

- Areas of direct sunlight
- Areas in the direct airstream of air diffusers
- Exterior walls and other walls that have a temperature differential between the two sides
- Areas that are close to heat sources such as sunlight, appliances, concealed pipes, chimneys, or other heat-generating equipment
- Drafty areas
- Dead spots behind doors, projection screens, or corners
- Walls that are subject to high vibration
- Areas with high humidity
- High traffic areas (to reduce accidental damage or tampering)
- Placing the sensor inside metal enclosures

WCS Height Requirements

The recommended maximum mounting height is 54 inches from the bottom of the back plate to the floor. If a parallel approach by a person in a wheelchair is required, reduce the maximum height to 48 inches.

Note: Consult section 4.27.3 of the 2002 ADA (Americans with Disability Act) guideline, and local building codes, for further details regarding wheelchair requirements.

WCS Mounting Surfaces

Using the hardware provided, mount the back plate of the sensor to a flat surface such as sheetrock or plaster, or to an electrical junction box. The sensor must be mounted plumb for accurate temperature control and to ensure proper air movement through the sensor.

- If mounting onto sheetrock or plaster, use the plastic threaded anchors (pre-drilling holes is not usually necessary) and the two M3.5 x 20 mm mounting screws.
- For mounting onto an electrical junction box, use the two 6-32 x 3/4 in. screws.



WCI Installation

WCI installation includes addressing, mounting, and wiring. Follow the instructions given in the following sections.

WCI Addressing

This section describes the addressing scheme and procedure for the Air-Fi Wireless Communications Interface (WCI). WCIs can be ordered either pre-addressed or without addresses. Verify pre-addressed WCI prior to installation.

Note: The default address is 1,1.

[Figure 1](#) illustrates the addressing scheme used for WCIs. Four networks and two Tracer SCs are shown, with each Tracer SC communicating on two networks. Follow this procedure to set the WCI address for network communication. [Table 1, p. 16](#) provides address setting details.

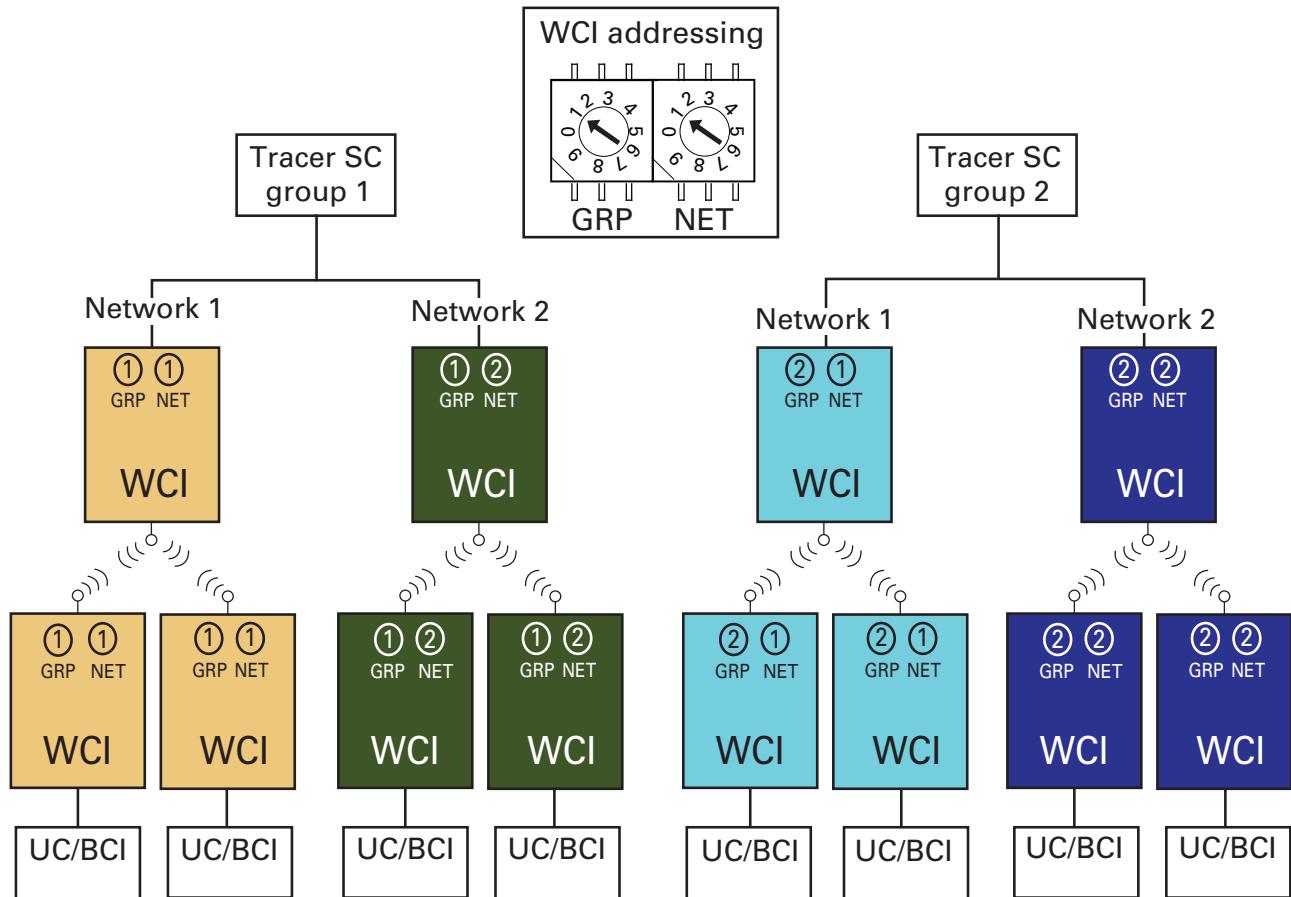
Important: Addresses must be set on WCIs before applying power to them.

1. Set the left (**GRP**) rotary address switch for each WCI that is in the same Tracer SC group to an identical number. (A Tracer SC group refers to all of the networks that communicate with the same Tracer SC.)
2. Set the right (**NET**) rotary address switch for each WCI that is to be on the same network to an identical number. If there are multiple networks in a Tracer SC group, each network in that group must have a unique number.

Note: The NET address (ranging from 1–8) must match the wireless link on Tracer SC.

WCI Installation

Figure 1. Air-Fi addressing example: WCIs



Note: Refer to the *Air-Fi™ Network Design Best Practices Guide (BAS-SVX55)* to see an example of network addressing from a floor plan perspective.

Table 1. Address settings

Function/Purpose	GRP	NET
Trane BACnet communication	0–8	1–8 ^(a)
Return to default configuration	0	0
Future use	9	1–9
Future use	0–8	9

(a) Must match the Air-Fi Wireless network number. (See "Tracer SC Addressing" in the *Air-Fi™ Network Design Best Practices Guide (BAS-SVX55.)*)

WCI Mounting and Wiring

Mounting and wiring instructions for controller applications and repeater applications are given in this section.

WARNING

Hazardous Service Procedures!

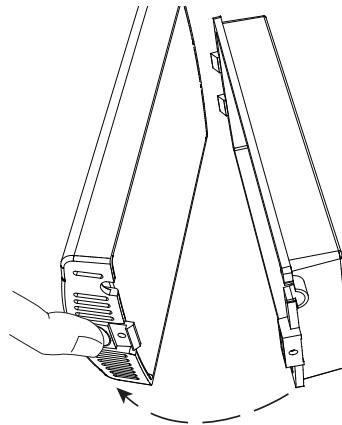
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

Controller Applications

1. Remove power from the controller that is to have the WCI wired to it.
2. Remove the WCI cover by firmly pressing the thumb tab at the bottom of the cover and pulling the cover away from the back plate ([Figure 2](#)).

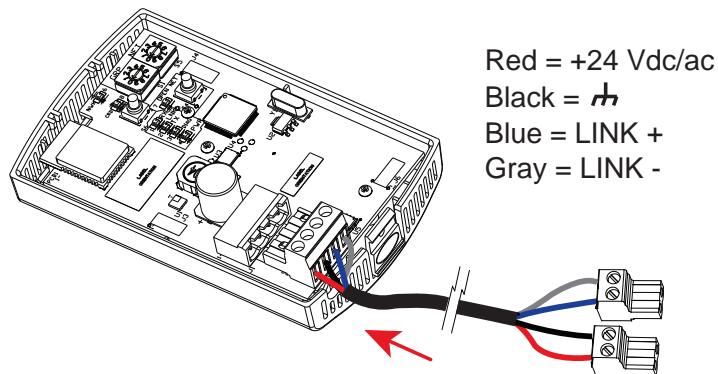
Note: If present, remove the security screw before removing the cover.

Figure 2. Removing the cover



3. Secure the backplate to the mounting surface using appropriate hardware. (M3.5 x 20 mm self-drilling screws are provided.)
4. Attach the 4-connector screw terminal block on the wiring harness to the receptacle on the WCI ([Figure 3](#)).

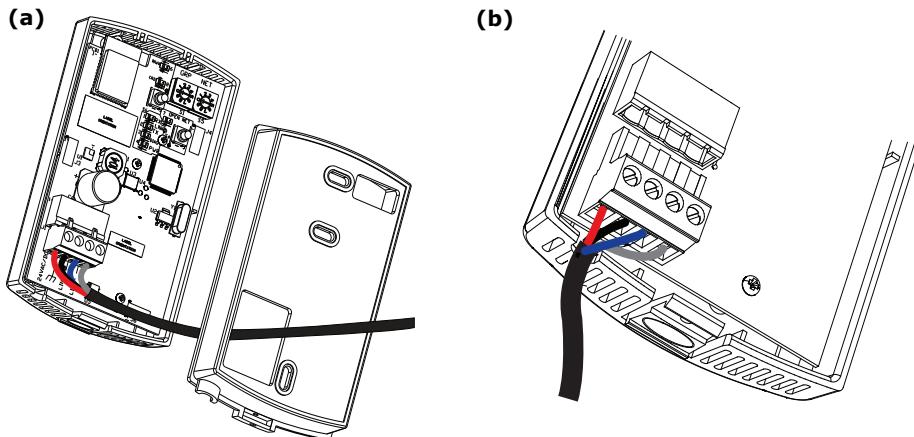
Figure 3. Connecting wiring harness



WCI Installation

5. Route the wires from the WCI through either:
 - a. The opening in the back plate ([Figure 4, a](#)).
 - b. The bottom exit port ([Figure 4, b](#)).

Figure 4. Routing the wires through the WCI backplate (a) or bottom exit port (b)



6. Connect the wiring harness according to the illustration that is appropriate for your application. Wiring between a WCI and a controller cannot exceed 656 ft (200 m). If the wiring harness does not provide enough length, use 18 AWG (24 pF/ft max.) communication wire (Trane purple wire, which is shielded).

When running new wire to a WCI, always use a 4-conductor cable and power the WCI from the UC. If this is difficult—for example, when re-using an existing 2-conductor cable—then remote powering of the WCI is permissible.

To wire the WCI to a:

- Tracer SC, see [Figure 5, p. 19](#)
- UC210, UC400, or UC600, see [Figure 7, p. 20](#)
- BCI-I, see [Figure 8, p. 20](#)
- BCI-R, see [Figure 9, p. 20](#)

For detailed information, refer to the *BACnet MS/TP Wiring and Link Performance Best Practices and Troubleshooting Guide* (BAS-SVX51)

7. Restore power to the controller.

Important: *The WCI must be wired to the controller prior to power up in order to establish network communication. If you cannot apply power to the WCI and the controller at the same time, apply power to the WCI first by using a remote power source.*

8. The network is ready to be formed. Refer to "[Establishing an Air-Fi™ Network](#)," p. 35.

Figure 5. Wiring the WCI to a Tracer SC

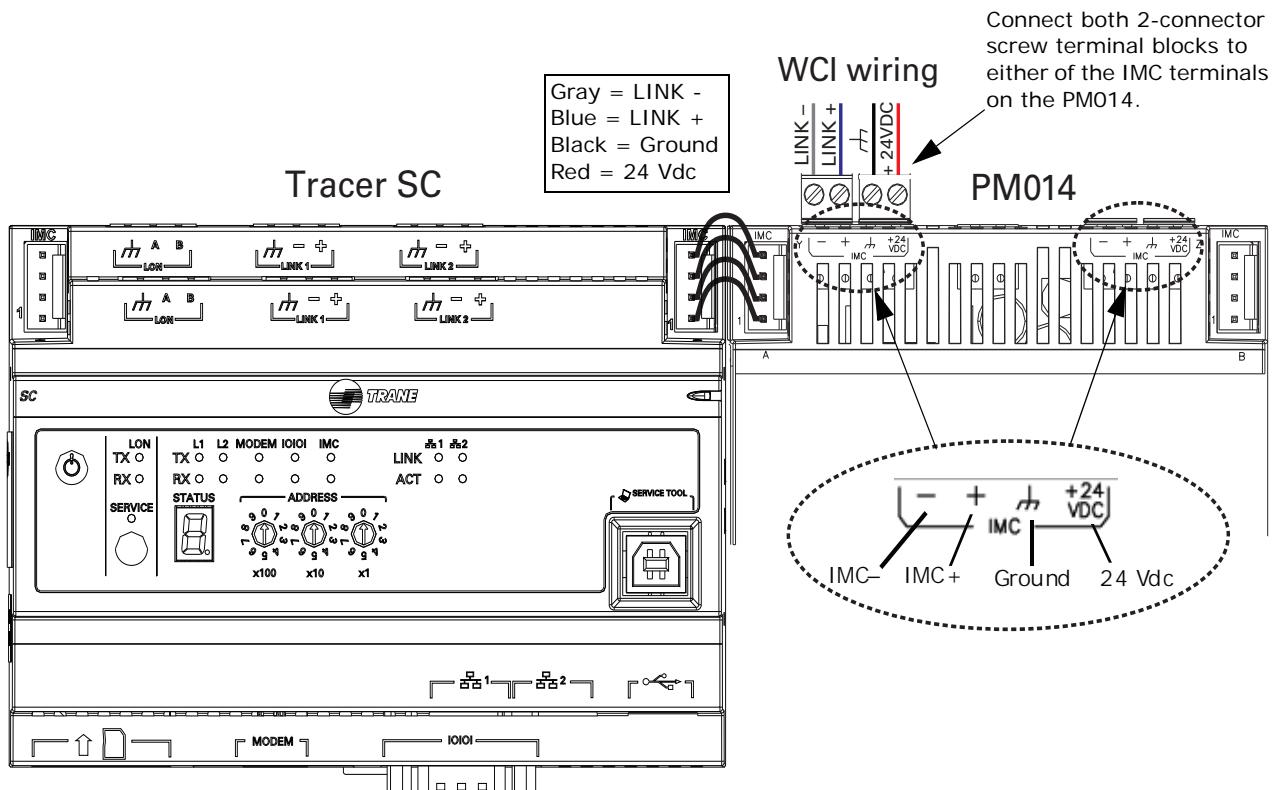
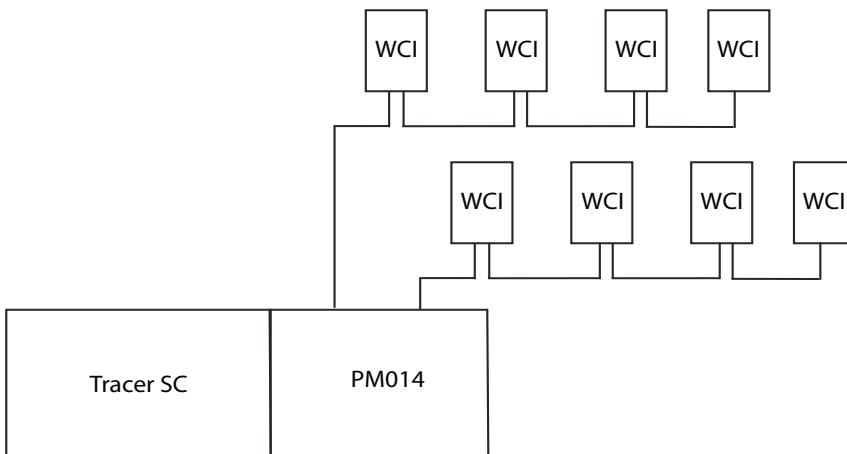


Figure 6. Wiring multiple WCIs to a Tracer SC



Notes:

- A maximum of eight WCIs can be daisy-chained to the Tracer SC.
- Use both IMC terminals on the PM014 for wiring multiple WCIs (see the detail in Figure 6).
- The WCIs on both links can span a total of 200 meters.
- Use 18-22 AWG, stranded, tinned-copper, shielded, twisted-pair wire between the WCIs.



WCI Installation

Figure 7. Wiring the WCI to a UC210, UC400, or a UC600

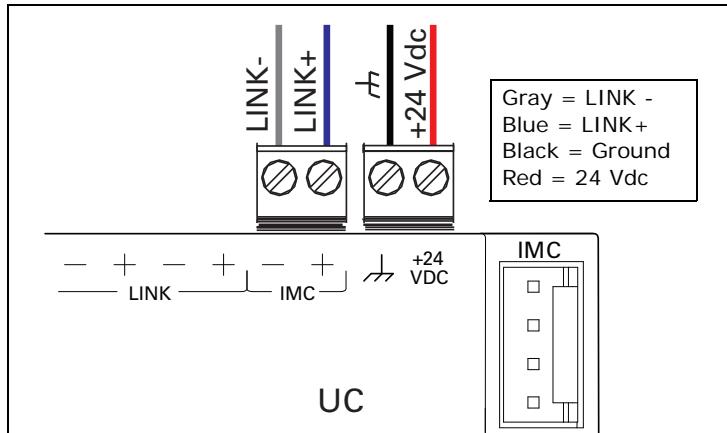


Figure 8. Wiring the WCI to a BCI-I

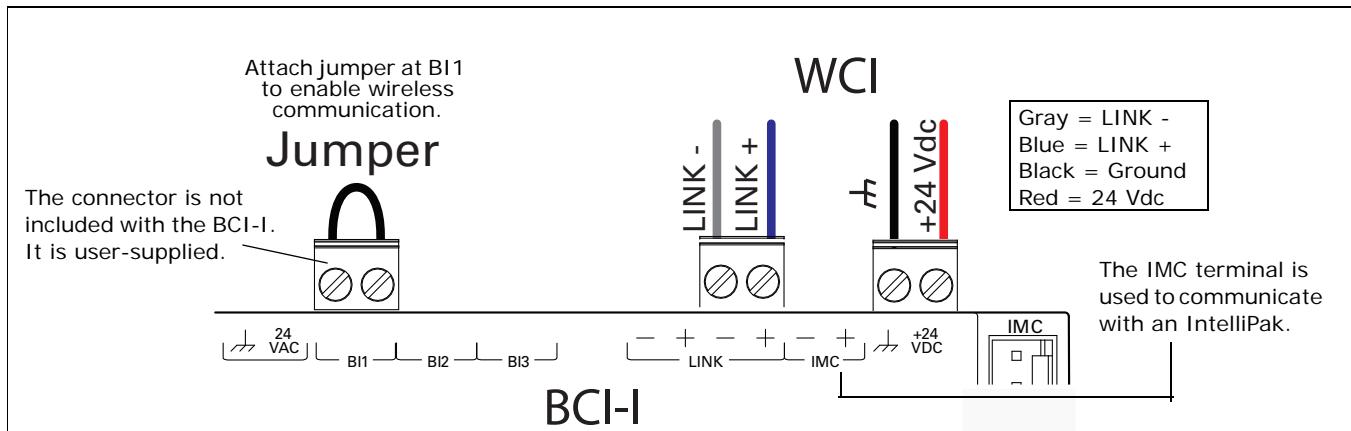
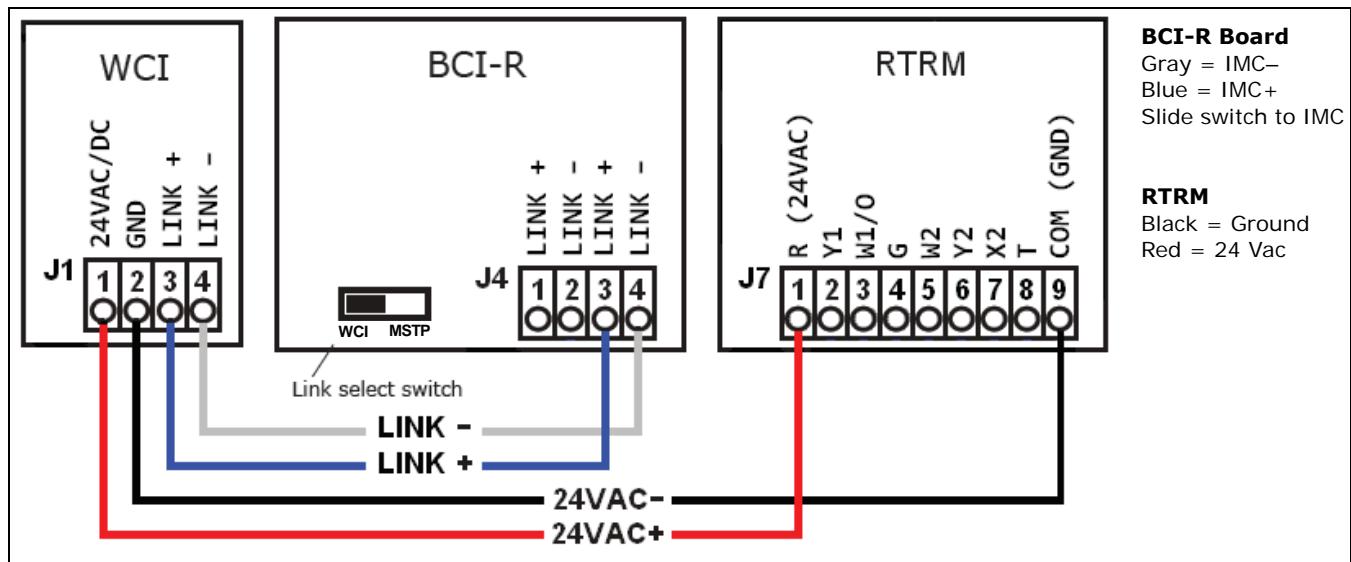


Figure 9. Wiring the WCI to a BCI-R



Repeater Applications

The following procedures describe how to

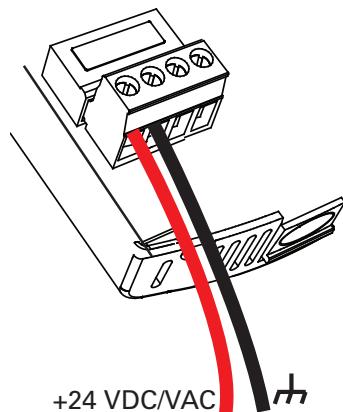
- Install a WCI as a repeater.
- Change a WCI from device association to repeater.

For more information about the use of repeaters with Air-Fi Wireless, see *Air-Fi™ Network Design Best Practices* (BAS-SVX55).

Installation Procedure

1. Remove the WCI cover by firmly pressing the thumb tab at the bottom of the cover and pulling the cover away from the back plate ([Figure 2, p. 17](#)).
- Note:** If present, remove the security screw before removing the cover.
2. Secure the backplate to the mounting surface using appropriate hardware. (M3.5 x 20 mm self-drilling screws are provided.)
3. Address the unit.
4. Attach the 4-connector screw terminal block on the wiring harness to the receptacle on the WCI ([Figure 3](#)).
5. Remove the blue (IMC+) and gray (IMC-) wires from the wiring harness.
6. Connect the red (24 Vdc/Vac) wire and black (ground) wire through the opening in the backplate ([Figure 4a](#)) or the bottom exit port ([Figure 4b](#)) to a 24 V power source (AC or DC).

Figure 10. Wiring a WCI as a repeater



7. Apply power to the WCI.

Changing a WCI from Device Association to Repeater

If the WCI communication wire was previously connected to a controller, return the WCI to its default configuration as follows:

1. Set its rotary address switch to 0,0 (the WCI must be powered).
2. Observe its LEDs blink On briefly (<1 second). (It takes about 10 seconds for the blink to occur.)
3. Reset its rotary address switches to the correct network address.

You are now ready to add the repeater to an existing network (refer to "[Adding Additional WCIs to an Existing Network](#), p. 39") or to proceed with establishing a new network (refer to "[Establishing an Air-Fi™ Network](#), p. 35").

Note: When the repeater is added, its DIAG LED blinks constantly. This behavior is normal.



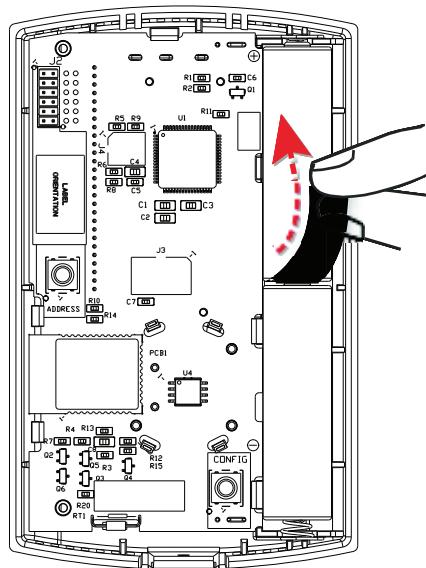
WCS Installation

A WCI, in addition to providing wireless communications between controllers, can provide wireless communication to Air-Fi™ Wireless Communications Sensors (WCSs). To enable a WCI to receive the signal of a WCS, the WCS must be powered up and addresses must be set up on it. Use the following procedures.

Powering the WCS

Power up the WCS as follows:

1. Remove the WCS cover by firmly pressing the thumb tab at the bottom of the cover and pulling the cover away from the back plate.
2. Power the sensor by removing the insulation strip from between the two batteries.



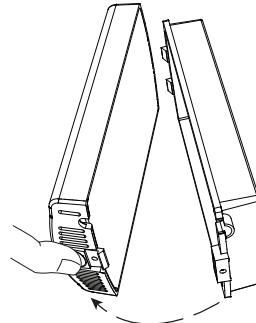
WCS Addressing

Prior to setting addresses on the WCS, you need to know the group and network address (2 digits), the network address (2 digits), and the unit controller address (3 digits).

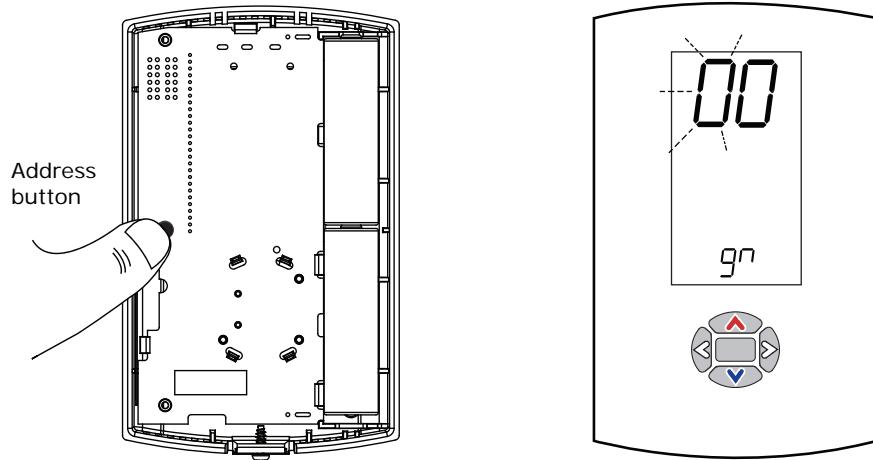
Notes:

- A Tracer SC group refers to all of the networks that communicate with the same Tracer SC.
- Unit controller addresses above 127 may be used for Air-Fi Wireless systems. (Previously, with hardwired MS/TP communication, no addresses higher than 127 were allowed.)

1. Remove the cover of the sensor.



2. Press and hold the Address button located on the back of the sensor until two numbers appear at the top of the display, with the left number flashing. At the bottom of the display, the letters **gn** appear.

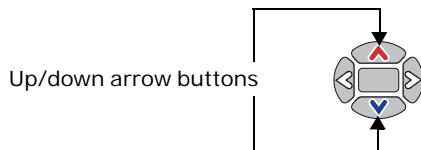


The **g** corresponds to the Tracer SC group (GRP) and the **n** corresponds to the network (NET).

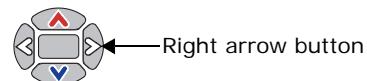
Note:

- Use the up/down arrow buttons to change the value of the number that is flashing.
- Use the left/right arrow buttons to scroll to the other address settings.
- If no button is pressed, the display will return to the normal screen after several seconds.

3. Press the up/down arrow buttons on the front of the sensor to set the left number to match the corresponding group (GRP).



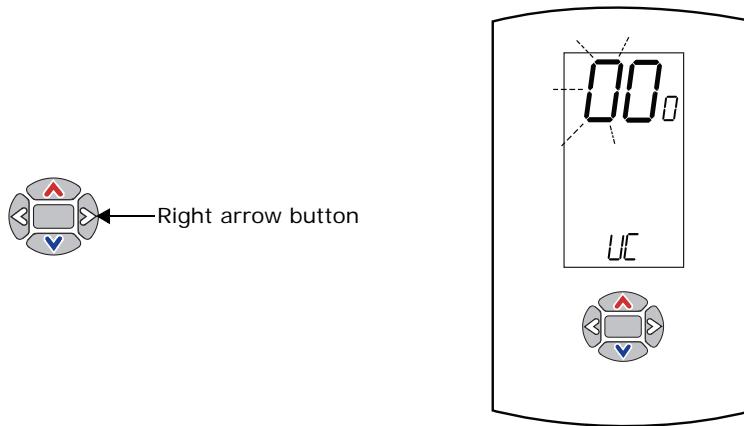
4. Press the right arrow button to make the right number flash.





WCS Installation

5. Press the up/down arrow buttons to set the right number to match the corresponding network (NET).
6. Press the right arrow button to proceed to the next address setting. Three numbers appear at the top of the display, with the left number flashing. At the bottom of the display, the letters **U C** indicate that the three numbers correspond to the three-digit address of the unit controller.



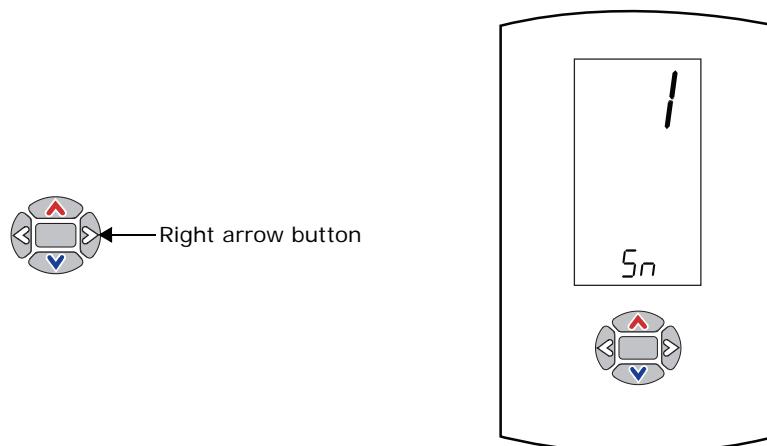
7. Press the up/down arrow buttons to set the flashing number to match the first number of the rotary address setting of the appropriate unit controller.
8. Press the right arrow button to make the second number flash.
9. Set the second number as for the first. Repeat the same procedure for the third number.
10. If only one WCS is associated with a WCI, proceed to the last step.

If multiple WCSs (maximum of 6) are associated with the same WCI, each WCS must have a unique sensor address. WCS address numbers must be consecutive.

Note: *The total number of associated sensors affects the total number of WCIs that can communicate on the network. Refer to “Quantity of Air-Fi™ Devices per Network,” p. 7.*

For multiple WCS installations, press the right arrow button to proceed to the WCS address setting. One number (default is “1”) will appear at the top of the display. At the bottom of the display, the letters **S n** indicate that the top number corresponds to a sensor address.

Note: *Additional setup is required in Tracer TU for multiple WCS installations. For details, see “Using the Tracer™ TU Service Tool with a Wireless Network,” p. 47.*



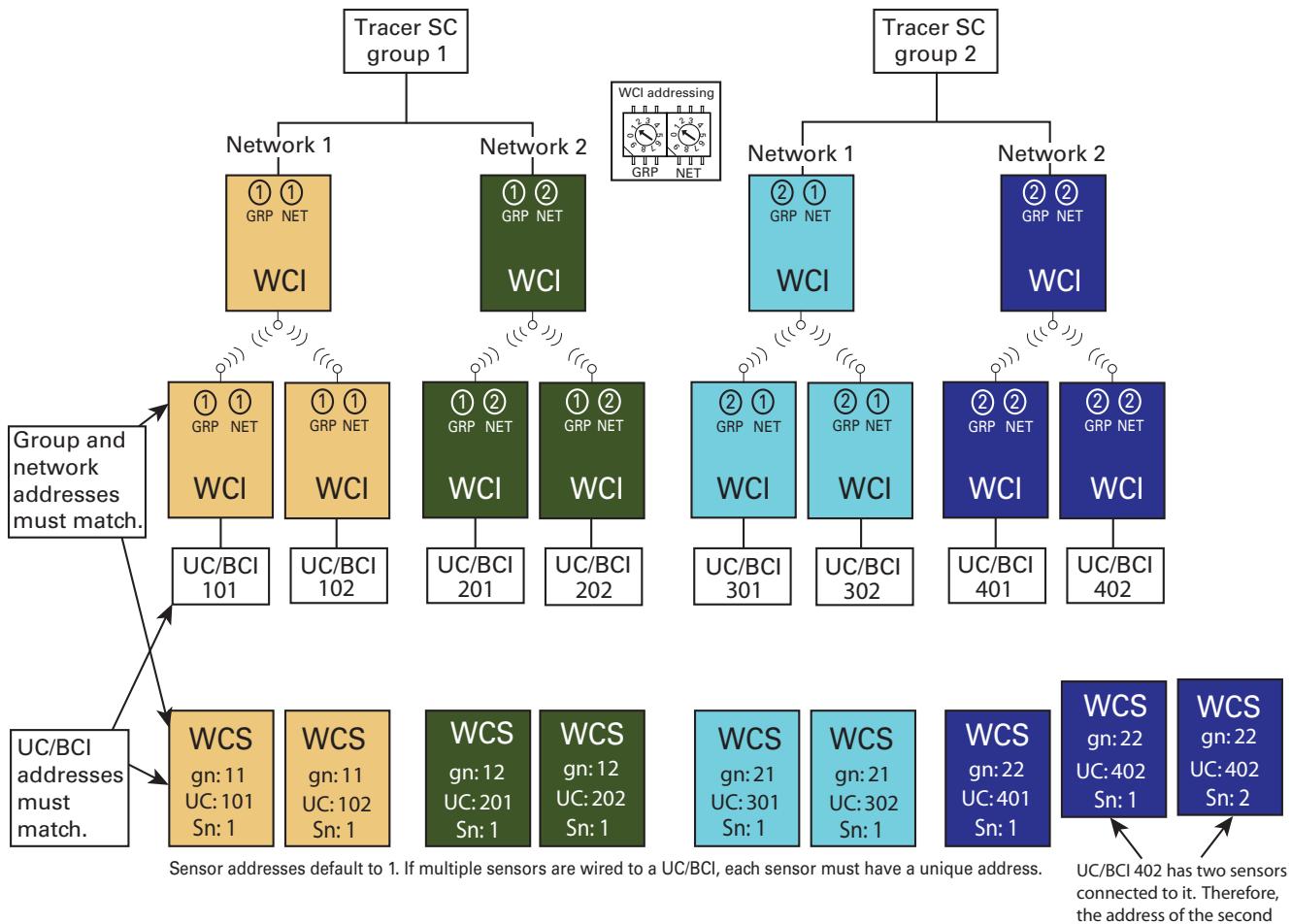
11. Press the up/down arrow button to set a unique sensor address (1 through 6) for the WCS.

12. Addressing is finished. Press the center button to return to the normal display.

Note: To verify addressing, press and hold the Address button until the display changes to addressing mode. Then use the right arrow button to scroll through the settings.

Figure 11 shows the same Air-Fi Wireless example given in Figure 1, p. 16, but with WCSs added.

Figure 11. Air-Fi addressing example: WCIs and WCSs



WCS: Network Joining and Controller Association

After addresses are set, the WCS will immediately attempt to join the network and associate with the controller.

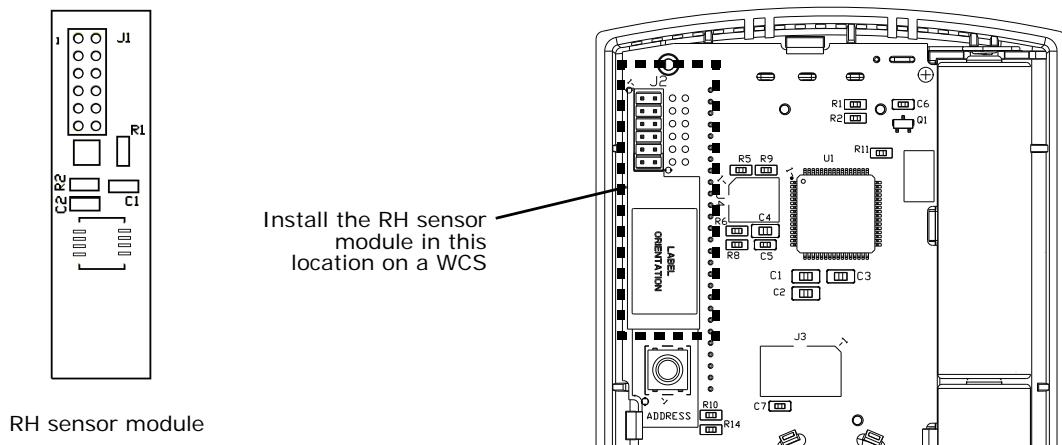
- Error code **E2** will appear on the sensor display until the WCS successfully joins the network. Until network joining is successful, the WCS will repeat its attempt to join every 60 minutes.
- Association between the WCS and the controller will automatically be initiated. The WCS will repeat its attempt to associate every 15 minutes until successful. Error code **E1** will be displayed until association is successful.
- You can press the center button twice at any time to cause the WCS to re-attempt to join the network and to associate with the WCI.
- To verify the strength of the network signal quality and of the WCS battery charge, refer to “Testing WCS Signal Quality and Battery Life,” p. 43.

WCS Installation

2% Relative Humidity Sensor Module

A 2% relative humidity (RH) sensor module, available as a separate part (X13790973010; model WCS-SH), can be installed on a WCS either before or after the WCS is powered up (see [Figure 12](#)). If the RH sensor module is installed on the WCS after power-up, the WCS will detect it the next time its backlight turns on. (The backlight turns on whenever a keypad button is pressed.)

Figure 12. RH sensor module (WCS-SH)



A WCS with an RH sensor module installed on it will display the humidity measurement icon at the bottom center of the display (see [Figure 13](#)). The humidity measurement icon alternates with error codes, if any exist.

Figure 13. Display screen of a WCS with an RH sensor module

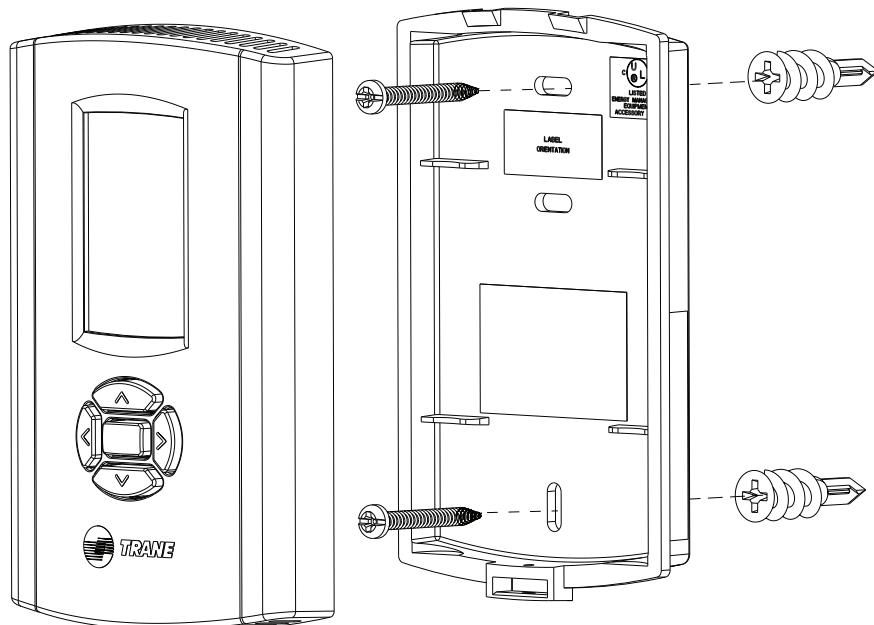


Mounting the Sensor Back Plate

To mount the sensor back plate:

1. Hold the back plate against the mounting surface and mark the screw locations.
2. Secure the back plate against the mounting surface using included hardware.

The figure shows an example of mounting the back plate of the sensor into sheetrock or plaster.





WCS Configuration

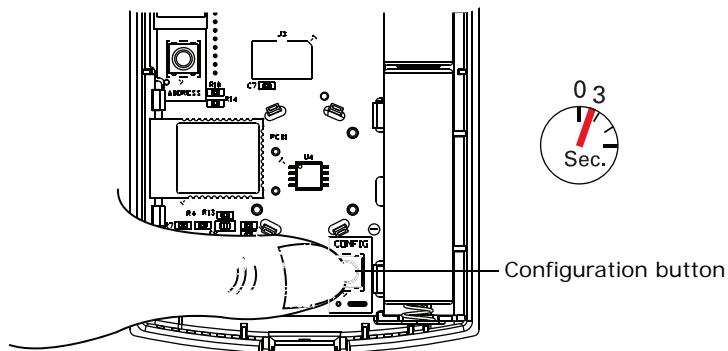
The configuration of the WCS determines which system features can be accessed and changes can be made by the tenant (for example, changes to cooling/heating mode, setpoint, or fan speed). Verify system and associated unit features before configuring the sensor.

The building owner or operator may choose to limit tenant access to certain features. This can be done through configuration. Or, if a sensor is configured to match all controllable features of the associated equipment, the locking feature can be used to restrict the tenant from making changes.

Configuration Procedure

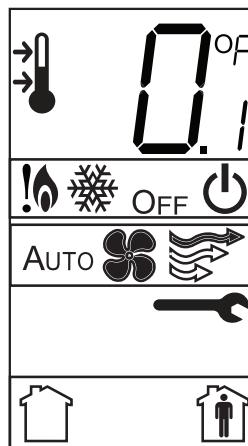
To configure the features of the WCS, follow this procedure in the order presented.

1. Remove the cover of the WCS.
2. Press the configuration button for 3 seconds.

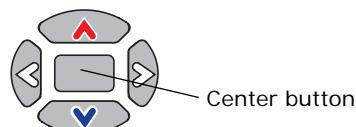


The display will change to configuration mode. In configuration mode, a wrench symbol appears on the display and the menus are separated by lines, as illustrated below.

Note: To view the display on the base model of the sensor (WCS-SB), turn the sensor over to the back.



1. Press the center button on the keypad one time to begin the configuration process.

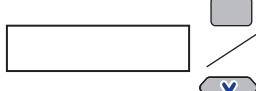
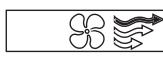
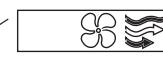
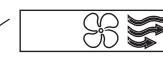
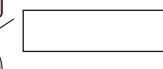
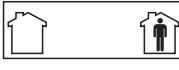
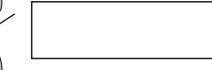


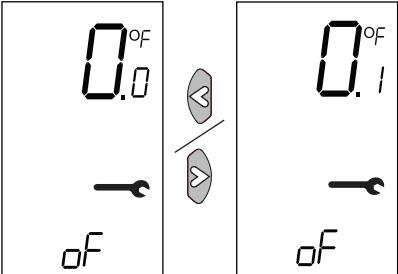
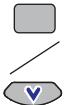
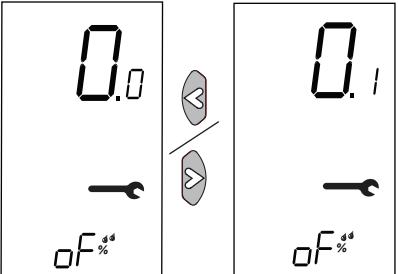
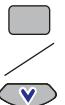
2. Configure the sensor options in the order shown in the table.
 - Press or to scroll to the next selection (as illustrated).

- Press or to move to the next menu (as illustrated).

Setting	Configuration options
Temperature • Choose Fahrenheit or Celsius • Choose the degree resolution (whole degrees, half degrees, or tenths of degrees).	
Setpoint	 no setpoint single setpoint dual setpoint
Deadband (available for dual setpoint system only) Note: Deadband refers to the minimum difference between the heating and cooling setpoints.	 heat/cool setpoint offset (1.8°F – 10.8°F, 1°C – 6°C)
System a) Single setpoint	 emergency heat/heat/cool/off heat/cool/auto/off heat/cool/off auto/off no system options enabled

WCS Configuration

Setting	Configuration options
System (continued) b) Dual setpoint	   emergency heat/ heat/cool/auto/off heat/cool/ auto/off emergency heat/ heat/cool/off
c) No setpoint	 no system options enabled
Fan Note: Not all fan options are available for all systems.	    auto/off auto/off/low high auto/off/low med/high auto/high (on)     off/high (on) off/low/high off/low/med/high no fan options enabled
Occupancy (timed override)	  occupancy enabled occupancy disabled

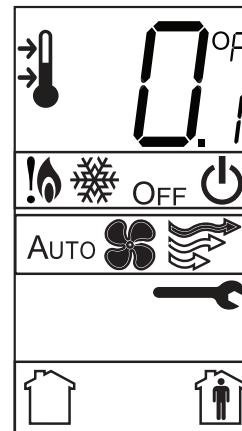
Setting	Configuration options
Temperature measurement calibration	<p>The reported temperature can be adjusted in increments of 0.1°F or 0.1°C, depending on unit configuration, to a maximum of ±3.6°F (±2°C).</p>  <p>Adjustable in increments of 0.1°F or 0.1°C to a maximum of ±3.6°F or ±2°C</p> 
Humidity measurement calibration Note: Available if the RH module is installed on the WCS.	<p>The reported humidity can be adjusted in increments of 0.1% RH to a maximum of ±5%RH.</p>  <p>Adjustable in increments of 0.1%RH to a maximum of 5.0%RH</p> 

3. Review the display to ensure that you have selected the correct configuration options.

Figure 14.

The example shows a display that has been configured for:

- Dual setpoint
- Temperature units (Fahrenheit)
- Temperature resolution to tenths of a degree
- System settings: Emergency Heat, Heat, Cool, Off
- Fan settings: Auto or On
- Occupied/unoccupied option enabled



4. To return the display to operating mode, press the configuration button, press the center button on the keypad once.

Note: The sensor will revert to operating mode if no buttons are pressed for 10 minutes.

WCS Configuration

Example of a Configured WDS Display

The following example shows a configured display in operating mode.



Display shows the following:

- Temperature units (Fahrenheit)
- Temperature resolution to tenths of a degree
- System setting: Cooling
- Fan setting: Auto
- Occupied/Unoccupied option enabled

If an error code exists, it appears at the bottom center of the display, as shown below. View definitions on the inside of the back plate or see ["Error Codes on the WCS Display," p. 43.](#)

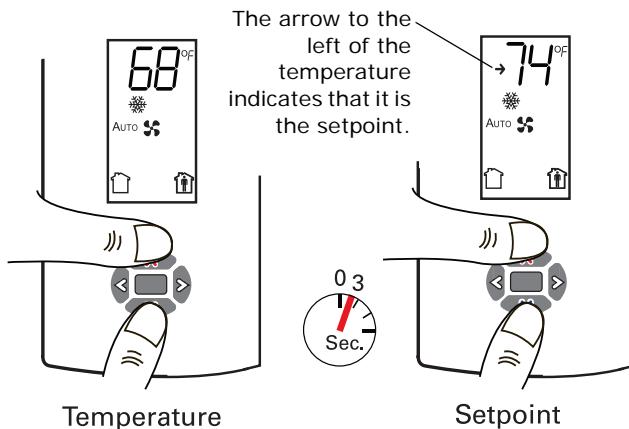


Optional Features

Displaying Setpoint or Temperature

You can configure the sensor to display either the temperature (default) or the setpoint. To select either option:

1. Verify that the sensor is in operating mode and that the home screen is displayed.
2. Toggle between the temperature and setpoint screens by pressing the up and down arrows for 3 seconds. The arrow to the left of the temperature indicates that it is the setpoint.



Locking or Unlocking Settings

You can lock or unlock the setpoint, system, or fan setting to prevent changes.

To lock or unlock a setting:

1. Verify that the sensor is in operating mode and at the home screen.
2. Choose a setting to lock or unlock:
 - Select the setpoint by pressing the up or down arrow.



Setpoint

- Select the system menu by pressing the center button. Use the left or right arrow to choose the setting.



System menu

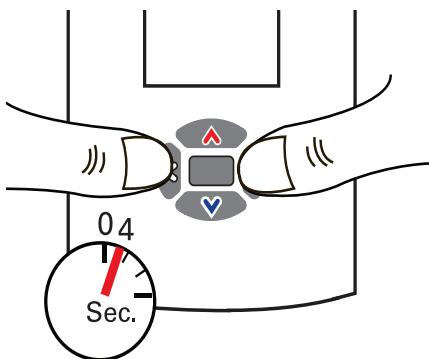
- From the system menu press the down arrow to select the fan menu. Use the left or right arrow to choose the setting.



Fan menu

3. Press the left and right arrows for 4 seconds.

Table 2.



Note: If you try to access a feature that is locked, the locked symbol  will appear on the display. The locked symbol will flash if you press a keypad button to try change the setting of a locked feature.

Replacing the Sensor Cover

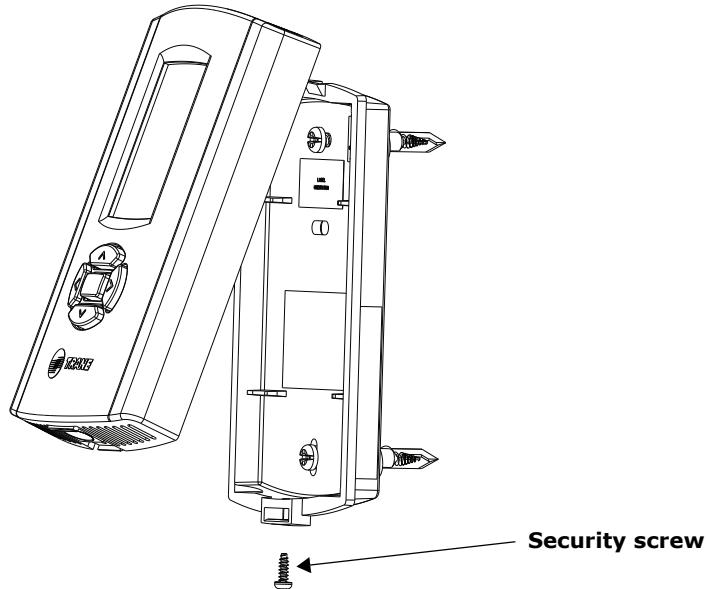
To replace the cover:

1. Hook the cover over the top of the back plate. Apply light pressure to the bottom of the cover until it snaps in place.



WCS Configuration

2. Install the security screw into the bottom of the cover (if desired).



Viewing Unit Controller Operating Status

To view unit controller operating data on the WCS display, press the center button twice. This data will appear in addition to the signal test report and battery status (see “[Testing WCS Signal Quality and Battery Life](#),” p. 43) if the WCS is associated with a unit controller that provides this additional information. The data may include the active setpoint (displayed in the top digits area), the system mode (displayed in the heat/cool/auto/off icon area), and the system fan status (on/off displayed in the fan speed area). If there is an error, the error code will be displayed instead of the unit controller data. Areas for which no data is provided by the unit controller remain blank. (Unit controllers with old firmware are compatible with the WCS, but they do not provide additional data for the WCS to display.)

Establishing an Air-Fi™ Network

When all aspects of hardware installation are complete, you are ready to power up the system and establish the wireless network. Before powering up, ensure that all of the procedures described in [“WCI Installation,” p. 15](#) and [“WCS Installation,” p. 22](#) have been completed.

Best Practice: Power up all devices in the network at the same time. If you are unable to do this, power them up in the following order:

1. All WCIs.
2. All unit controllers: UC210, UC400, UC600, BCI-I, BCI-R.
3. The Tracer SC.
4. WCSs, if present.

Note: If the coordinator WCI is powered up 1 hour or more before the other devices on the network, then you must open the network manually or with Tracer TU.

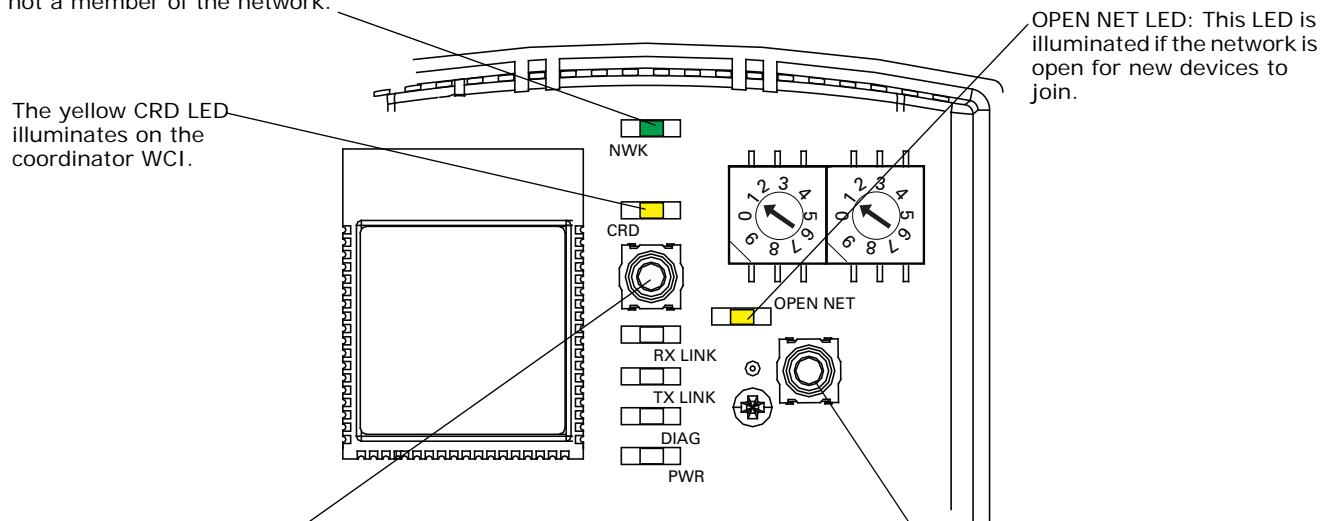
WCI LEDs and Buttons

Before establishing a network, you should be familiar with the layout of the WCI board, the behavior of its LEDs, and the function of its buttons. The WCI board contains two buttons and several LEDs. The LEDs relevant to network formation are shown in [Figure 15](#).

Figure 15. LEDs and buttons related to network formation

The green NWK LED:

- Illuminates on every WCI that has joined the network.
- Flashes for 10 seconds every 2.5 minutes if the WCI is not a member of the network.



Pressing the START button:

- On a network without a Tracer SC, designates a WCI as the network coordinator and opens the network for new devices to join (see [“Establishing the Network Prior to Tracer SC Installation or Without Tracer SC Installation,” p. 37](#)).
- Removes a member WCI from the network (see [“Removing a WCI from a Network,” p. 40](#)).
- Disbands the network (see [“Disbanding a Network,” p. 40](#)).

Pressing the OPEN NET button:

- On a coordinator WCI, opens or closes all devices for at least one hour. (Time may be extended if devices are joining.)
- On other WCIs, opens or closes only that WCI for 10 minutes.



Establishing an Air-Fi™ Network

On power-up, the WCI goes through a check list and updates LED activity according to the type of device associated with the WCI and the status of the WCI in the network. The LED flash patterns vary depending on current conditions. LED behavior is described in [Table 3](#).

Table 3. LED identification and interpretation

LED	LED activity	Indicates...
Network LED (green) NWK	On solid	WCI is a network member.
	Flashes for 10 seconds every 2.5 minutes.	The WCI will join a network when the NWK LED is flashing. If there is an open network nearby with the same rotary settings and the WCI joins the network, the NWK LED turns on solid and then the OPEN LED turns on solid.
Coordinator LED (yellow) CRD	On solid	WCI is network coordinator.
Open Net LED (yellow) OPEN NET	On solid	Network is open for joining.
	Off	Network is closed for joining.
Reception LED (yellow) RX LINK	Flashes	Data is being received.
Transmission LED (green) TX LINK	Flashes	Data is being transmitted.
Diagnostic LED (red) DIAG^(a)	Flashes	Hardware failure or failed re-flash of a radio. Corrective action: Update the firmware.
	Triple flash pattern. Occurs for 30 seconds after failing to join a network.	WCI is not configured correctly, or the controller, IMC communication, or a repeater is down. Corrective action: Cycle power.
	Double flash pattern	<ul style="list-style-type: none">Normal for a repeater.WCI lost IMC communication to the UC/BCI/Tracer SC. Corrective action: Reset or cycle power to the controller to establish communication. <ul style="list-style-type: none">WCI lost MAC address on radios or lost the ability to communicate with the radio. Corrective action: The MAC address can be checked on TU>Wireless>Advanced page when connected directly to the controller (if UC to WCI Comm is up).
Power LED (green) PWR	On solid	WCI has power.

(a)If more than one condition is present, the priority is in the order listed.

Three Ways to Establish an Air-Fi Network

An Air-Fi network can be established:

- After a Tracer SC has been installed.
- Prior to Tracer SC installation.
- On a network that will not have a Tracer SC installed on it.

Establishing the Network After Tracer SC Installation

If a Tracer SC is installed prior to establishing the Air-Fi network, the WCI that is installed on a Tracer SC automatically becomes the network coordinator after power is applied to the Tracer SC. If multiple WCIs are installed on a Tracer SC, each WCI forms an independent network for which it is the coordinator.

Follow this procedure:

1. Observe the yellow CRD LED on the WCI illuminate to identify the WCI wired to the Tracer SC as the network coordinator (see [Figure 15, p. 35](#)).
2. Observe the yellow OPEN_NET LED illuminate on the coordinator WCI. This LED remains lit for 1 hour, indicating that the network is open to allow WCIs with matching addresses to join the network for that duration. After each WCI joins, the 1 hour timer starts over.

Note: *If the network closes because the timer has expired, you can open the network for an additional hour by pressing the OPEN_NET button on the network coordinator WCI. To extend time on a network that has not yet closed, press the OPEN_NET button on the coordinator to close the network, then press it again to open the network for an additional hour. As an alternative, you can use Tracer TU to open the network.*

3. Observe the green NWK LED illuminate:
 - On the coordinator WCI, indicating that it is a member of its own network.
 - On each additional WCI as it joins the network.

Note: *Typically, it takes about 10 minutes for a WCI to join the network. However, the time is dependent on the distance between the WCIs in network as well as the size and type of structures that may exist between them.*

4. After the network is formed, press the OPEN_NET button on the coordinator to close the network if it is still open (indicated by an illuminated OPEN_NET LED).
5. To enable and configure Tracer SC for the new wireless network, see Tracer SC Online Help and the current edition of the *Tracer SC System Controller Installation and Setup guide* (BAS-SVX31).

Establishing the Network Prior to Tracer SC Installation or Without Tracer SC Installation

If a Tracer SC has not been installed at the time that you are ready to establish the network or will never be installed on the network, follow this procedure to establish the network.

Task 1: Activate Communication Among Existing WCIs

1. Choose a centrally located WCI that has been wired to a unit controller to become the network coordinator.

Note: *Record the location of this WCI if the network is to have a Tracer SC installed on it at a later time. In that case, you will have to disband the network from the coordinator WCI so that the WCI that has been installed on the Tracer SC can become the network coordinator and establish a new network, as explained in detail in Task 2.*

2. Press the START button for 5 seconds to establish the WCI as the coordinator and to open the network for joining. The yellow CRD LED on the WCI illuminates to identify the WCI as the network coordinator (see [Figure 15, p. 35](#)).



Establishing an Air-Fi™ Network

3. Observe the yellow OPEN_NET LED illuminate on the coordinator WCI. This LED remains lit for 1 hour, indicating that the network is open to allow WCIs with matching addresses to join the network for that duration. After each WCI joins, the 1 hour timer starts over.

Note: If the network closes because the timer has expired, you can open the network for an additional hour by pressing the OPEN_NET button on the network coordinator WCI. To extend time on a network that has not yet closed, press the OPEN_NET button on the coordinator to close the network, then press it again to open the network for an additional hour.

4. Observe the green NWK LED illuminate:
 - On the coordinator WCI, indicating that it has joined its own network.
 - On each additional WCI as it joins the network.

Note: Typically, it takes about 10 minutes for a WCI to join the network. However, the time is dependent on the distance between the WCIs in network as well as the size and type of structures that may exist between them.

5. After the network is formed, press the OPEN_NET button on the coordinator to close the network if it is still open (indicated by an illuminated OPEN_NET LED).

Task 2: Installing a Tracer SC After Network Formation

After a Tracer SC is installed on a previously established network, the network must be disbanded and then re-established. Follow this procedure:

1. On the WCI that is currently the network coordinator, press the START button for 10 seconds. The network will disband.
2. Install an addressed WCI on the Tracer SC following addressing and wiring instructions (see "[WCI Installation](#)," p. 15).

After power is restored to the Tracer SC, the WCI that is installed on the Tracer SC automatically becomes the network coordinator and a new network is established.

3. Observe the yellow OPEN_NET LED illuminate on the coordinator WCI. This LED remains lit for 1 hour, indicating that the network is open to allow WCIs with matching addresses to join the network for that duration. After each WCI joins, the 1 hour timer starts over.

Note: If the network closes because the timer has expired, you can open the network for an additional hour by pressing the OPEN_NET button on the network coordinator WCI. To extend time on a network that has not yet closed, press the OPEN_NET button on the coordinator to close the network, then press it again to open the network for an additional hour.

4. Observe the green NWK LED illuminate:
 - On the coordinator WCI, indicating that it has joined its own network.
 - On each additional WCI as it joins the network.

Note: Typically, it takes about 10 minutes for a WCI to join the network. However, the time is dependent on the distance between the WCIs in network as well as the size and type of structures that may exist between them.

Note: Sensors do not immediately figure out that the old network has been disbanded. They are asleep to conserve battery power, and they do not display an E2 right away. It can take up to five minutes for a sensor to detect that the old network is gone, but then they will display an E2 until they join the new network.

5. After the network is formed, press the OPEN_NET button on the coordinator to close the network if it is still open (indicated by an illuminated OPEN_NET LED).
6. To enable and configure Tracer SC for the new wireless network, see Tracer SC Online Help and the current edition of the *Tracer SC System Controller Installation and Setup guide (BAS-SVX31)*.



Modifying an Air-Fi™ Network

This section describes how to modify an established Air-Fi network. Most modifications can be made by using either the Tracer TU service tool or the WCI.

To use Tracer TU, you must establish communication with a wireless network and attach to a wireless device. For instructions, see "[Using the Tracer™ TU Service Tool with a Wireless Network](#)," p. 47.

Adding Additional WCIs to an Existing Network

Using Tracer TU

1. After attaching Tracer TU to a wireless device, select **Open Network** from the **Wireless** menu. Every member WCI will indicate that the network is open. Any WCI with a correct rotary address setting that is located within radio range of a network member, will join the network.
2. Observe the green NWK LED illuminate on a WCI that joins the network.

Using a WCI

1. Press the OPEN_NET button on the network coordinator WCI to open the network for joining for one hour. Every member WCI will indicate that the network is open. Any WCI with a correct rotary address setting that is located within radio range of a network member, will join the network.

Note: Pressing the OPEN_NET button on a member WCI will open only that one WCI.

2. Observe the green NWK LED illuminate on a WCI that joins the network.

Adding Coordinators to a Tracer SC

A Tracer SC can have a total of eight WCIs installed on it. Each WCI installed on a Tracer SC becomes the coordinator of a separate network. If additional coordinator WCIs/networks are needed on a Tracer SC after the network has been formed, follow these steps.

1. Address the new WCI(s) according to the scheme explained in "[WCI Installation](#)," p. 15, making sure the addresses do not conflict with existing WCIs.
 2. Install the WCI(s) on the Tracer SC as described in "[WCI Installation](#)," p. 15, [Figure 5](#), p. 19, and [Figure 6](#), p. 19. Use a daisy-chain configuration to install multiple WCIs.
 3. Use the Tracer SC UI to enable the proper wireless networks.
 4. A new network will be created for each newly installed WCI, with each WCI as coordinator of the newly created network. Allow sufficient time for all member WCIs to join the new network.
 5. Start Tracer SC Device discovery. (Refer to Tracer SC Online Help for the discovery procedure.) Devices that previously existed on the wireless network do not need to be rediscovered.
- A WCI has to be a network member before Tracer SC can discover the controller associated with the WCI. Tracer SC does not discover repeater WCIs.



Modifying an Air-Fi™ Network

Removing a WCI from a Network

If the other WCIs that were members of the disbanded network find an open network within radio range, they will try to join that network. To prevent that from occurring, you can remove WCIs from the network until the coordinator WCI is replaced.

Using Tracer TU

After attaching Tracer TU to a wireless device, select **Remove from Network** from the **Wireless** menu.

Using the WCI

To remove a member (non-coordinator) WCI from a network, do either of the following:

- Press the WCI START button (10–15 seconds) until the green NWK LED turns off.
Note: The same action performed on the coordinator WCI will disband the network.
- Change the rotary address on the WCI.

After the WCI is dropped from the network, the equipment managed by the associated unit controller is under the direct, local control of the unit controller.

Replacing a WCI on a Network

See “Replacing a Failed WCI,” p. 42.

Closing the Network

To prevent WCIs from joining an open network (indicated by an illuminated OPEN_NET LED), you can close the network by using Tracer TU or the coordinator WCI.

Using Tracer TU

After attaching Tracer TU to a wireless device, select **Close Network** from the **Wireless** menu.

Using a WCI

To close an open network (indicated by an illuminated OPEN NET LED) so that other WCIs cannot join, push the OPEN NET button on the network coordinator WCI. (Pushing the OPEN NET button on an open member WCI closes just that one WCI.)

Disbanding a Network

Some rare circumstances may require disbanding the network.

Using Tracer TU

After attaching Tracer TU to the network coordinator, select **Disband Network** from the **Wireless** menu. As the network disbands, the NWK LEDs on all WCIs on the network respond by turning Off.

Using a WCI

Press the START button (for approximately 10-15 seconds) on the coordinator WCI until the yellow CRD LED and the green NWK LED turn Off. As the network disbands, the NWK LEDs on all WCIs on the network respond by turning Off.

Troubleshooting and Maintenance

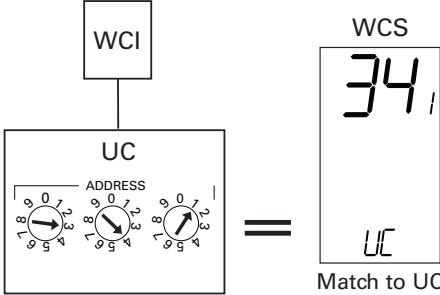
WCI does not join network

Possible cause	Explanation/Resolution
Not enough time allowed for joining.	Give the WCI more time to join. If the network closes before the WCI has joined, re-open if necessary by pressing the OPEN NET button on another member WCI.
Wrong address	For factory addressed WCIs, verify address is correct. Verify each WCI address after installation. If sensor is installed, check for error code at sensor. Initiate network formation and resolve by exception.
No power	Ensure that: <ul style="list-style-type: none"> • The WCI is wired correctly. • The corresponding controller is wired to equipment correctly and is powered On.
Too much traffic	Try a different channel by selecting a different net address or by using Tracer TU. A better channel may be found by trial and error or by using a purchased tool such as WiSpy.
Outside of radio range or too many obstacles	Relocate WCI or add a repeater.
Defective WCI	Replace

Tracer SC does not communicate with WCI

Possible cause	Explanation/Resolution
No power to the WCI	Ensure that the WCI is wired properly to the Tracer SC
Wireless link on the Tracer SC	Ensure that the wireless link on the Tracer SC is enabled and configured to match WCI address, and is unique within the building.
One of the devices is outside of radio range	Move network components to within radio range or break up networks to make them smaller so that all components are within radio range. Alternatively, you can add a repeater to extend the radio range.

Sensor does not communicate with WCI

Possible cause	Explanation/Resolution
Sensor is not associated with UC (E1)	The configured address in the sensor does not match the dials of a UC for any WCI in the same wireless network. Re-associate the sensor with the WCI by correcting the UC address in the sensor. 
Sensor is not communicating (E2)	Normal for sensor configured with GRP-NET 0-0. Verify that the sensor has the correct group (GRP) and network (NET) addresses. Verify that the sensor is within radio range. If the sensor has previously joined the network, verify that WCIs in range are powered up. Press the center button on the front of the sensor twice to force association. Otherwise, set the correct GRP and NET addresses and open the wireless network to allow the sensor to join.
Sensor drains battery current during sleep (E3)	If the error persists and batteries drain prematurely, the sensor may have defective components and need to be replaced.
Internal failure (E7)	Sensor display fails to communicate with the radio. Replace the sensor.



Troubleshooting and Maintenance

Possible cause	Explanation/Resolution
Wrong sensor address (E8)	The configured sensor address does not match the sensor address that is expected by the UC. Use Tracer TU to configure the UC for the quantity of sensors it should accept, if more than one.
Duplicate sensor (E9)	Another sensor with the same configured UC address and sensor address is already associated with the UC. Resolve the duplication. This may involve waiting (up to 51 minutes) for the UC to forget the address of a failed sensor.

No communication

Possible cause	Explanation/Resolution
Power loss	Communication will automatically be restored when power is restored.
Signal obstruction	Routes in the mesh network are updated every 10–30 seconds.
One of the devices is outside of radio range	Move network components to within radio range or break up networks to make smaller networks so that all components are within radio range. Alternatively, you can add a repeater to extend the radio range.
Incorrect power-up sequence	Cycle power on the controller or Tracer SC connected to the WCI.

Slow communication

Possible cause	Explanation/Resolution
Duplicate unit controller BACnet Device IDs.	Make sure that every device on the network has a unique BACnet Device ID. Refer to the current version of BAS-SVX51, <i>BACnet MS/TP Wiring and Link Performance Best Practices and Troubleshooting Guide</i> .

Replacing a Failed WCI

Task 1: Remove the failed WCI

WARNING

Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

1. Remove power from the controller that has the failed WCI wired to it.
2. Remove the WCI cover by firmly pressing the thumb tab at the bottom of the cover and pulling the cover away from the back plate.
Note: If present, remove the security screw before removing the cover.
3. Detach the 4-connector screw terminal block on the wiring harness from the receptacle on the WCI and remove the WCI.

Task 2: Install the new WCI

WARNING

Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

New member (non-coordinator) WCI

1. Set (or verify if pre-addressed) the rotary address switches on the new WCI.

2. Attach the terminal block on the wiring harness to the receptacle on the new WCI and route the wires as before (through either the back plate or the bottom exit port).
3. Restore power to the controller that the WCI is installed on. Use Tracer TU to open the network (**Tools > Wireless > Open Network**) or press the OPEN NET button when connected to the coordinator or to a WCI that is already a member of the network. The new WCI should find the network and join it.

New coordinator WCI when Tracer SC is present

1. Set (or verify if pre-addressed) the rotary address switches on the new WCI.
2. Attach the terminal block on the wiring harness to the receptacle on the new WCI and route the wires as before (through either the back plate or the bottom exit port).
3. Using a USB cable, connect Tracer TU to another WCI on the network and disband the network (see "[Disbanding a Network](#)," p. 40).
4. If a Tracer SC is present on the network, restore power to the Tracer SC. The network will re-form itself.

New coordinator WCI when no Tracer SC is present

1. Set (or verify if pre-addressed) the rotary address switches on the new WCI.
2. Attach the terminal block on the wiring harness to the receptacle on the new WCI and route the wires as before (through either the back plate or the bottom exit port).
3. Using a USB cable, connect Tracer TU to another WCI on the network and disband the network (see "[Disbanding a Network](#)," p. 40).
4. Restore power to the controller that the WCI is installed on.
5. Push the START button for 5 seconds or use Tracer TU to re-form the network.

Error Codes on the WCS Display

If a diagnostic occurs, an error code appears at the bottom center of the WCS display. For an explanation of error codes, see "[Sensor does not communicate with WCI](#)," p. 41.

Testing WCS Signal Quality and Battery Life

To test the radio signal quality between the WCS and the WCI, and WCS battery life:

1. Press the WCS center keypad button twice.
 2. Observe the radio signal quality symbol on the display and refer to [Table 4, p. 44](#).
 3. Record the results in your commissioning statement.
- Note:** Additional unit controller operating status data may appear on the display. For more information, see "[Viewing Unit Controller Operating Status](#)," p. 34.

Troubleshooting and Maintenance

Table 4. Testing radio signal quality between the WCS and the WCI, and WCS battery life

User action	Symbol on WCS display	Indicates...
Press the WCS center keypad button	 	Associated but no communication with the WCI. In this situation, only the battery level and error code will appear.
	 	Excellent signal quality • Good signal margin for reliable communication. • Corresponds to a green link on the Tracer TU network health map.
	 	Satisfactory signal quality: • Adequate signal quality for reliable communication. • Corresponds to a yellow link on the Tracer TU network health map.
	 or 	Poor signal quality: • Unreliable communication. • Recommend moving the sensor or the WCI to a better location if the quality remains low for repeated signal tests. • Corresponds to a red link on the Tracer TU network health map.
		100–50% battery life remaining.
		50–3% battery life remaining.
		Less than 3% battery life remaining. When the remaining battery power is approximately 1%, the battery symbol will flash on the main display screen. In the test mode display screen, the empty battery symbol will not flash.

Checking Signal Quality on a Site

Follow these steps to check the signal quality on a site:

1. Power up a WCI with a 24 V transformer (user supplied).
2. Associate the WCS to a WCI of the same model that is intended for the job.
3. Place the WCI at the desired location.
4. Place or hold the WCS at the desired location.
5. Press the WCS center keypad button and observe the test symbols on the WCS display ([Table 4, p. 44](#)).

Battery Information

Sensor battery type, length of life, and installation are addressed in this section.

Battery Type

NOTICE:

Equipment Damage!

The batteries are manufactured in a ready-to-use state. They are not designed for recharging. Recharging can cause battery leakage or, in some cases, can cause the safety release vent to open.

NOTICE:

Equipment Damage!

Do not attempt to hook up the sensor to a power supply. Equipment damage may result.

It is unlikely that you will have to replace the battery. If replacement becomes necessary, use only an Energizer L91 Ultimate Lithium AA battery or equivalent.

Battery Life

Battery life is fifteen years under normal conditions. If the sensor is not used for an extended period of time, do one of the following:

- Set the group and net addresses to 0,0 to place the sensor into a low-power hibernation mode.
- Remove the batteries or place insulator between batteries.

Note:

- *If lithium batteries are temporarily unavailable, alkaline batteries can be used. However, alkaline battery life is very short by comparison.*
- *The battery life for a model WDS may decrease with extended LCD display activity.*

Battery Installation

⚠WARNING

Prevent Injury!

Batteries can explode or leak and cause burns if installed backwards, disassembled, charged, or exposed to water, fire, or high temperature.

⚠WARNING

Prevent Injury!

Keep batteries away from small children. If swallowed, contact your local poison control center immediately.

1. Observe the polarity indicators that are molded into the cover.
2. Install two batteries (of the type specified in "Battery Type," p. 45) in the battery-holding slot that is molded into the sensor cover.



Troubleshooting and Maintenance

The sensor has been designed to prevent damage if the batteries are installed backwards, to reduce the potential for injury.

Manual Association Process

If an association was previously established between a WCI and a sensor and needs to be re-established, the manual association process may be used. To activate this process, push the center button twice on the WCS keypad. The association process will be repeated.

Note: *Pressing the center button twice will repeat the joining/associating process from the last point of failure. In other words, if there is an E2 (not in a network), the sensor will start by looking for an open network to join. If there is an E1, the sensor will look for a unit. If there is an E8 or E9, the sensor will request association with the unit. The process continues until a step fails or the unit provides system data to display.*

Disassociation

If any address—group/net, unit controller, or sensor—is changed in a sensor that is associated with a controller, the sensor will transmit a request for the controller to disassociate the sensor immediately.

If a controller does not receive any messages from a sensor for 51 minutes, it will disassociate that sensor. Only after a sensor has been disassociated can the controller accept association from a replacement sensor.

Replacing a Failed WCS

To replace a failed WCS:

1. Set the addresses on the replacement sensor (see “[WCS Installation](#),” p. 22).

Note: *There is no need to remove power from the remaining device.*

2. If the network is closed, open it manually using a WCI or Tracer TU. If the network is open, the sensor will automatically join the network and associate with the designated device.

Note: *Reconfigure the WCS, if required, to match prior sensor (see “[WCS Configuration](#),” p. 28).*

Output Power Level

The maximum output power level of a wireless sensor set is controlled by software and restricted by channel of operation and agency requirements per country or region. The sensor has a default maximum power level of 10 mW, but the WCI determines the ultimate output power level of the sensor.

Cleaning the Sensor

NOTICE:

Equipment damage!

Spraying glass cleaner or any other solution directly on the sensor may damage it.

You can clean the sensor by applying glass cleaner to a soft, non-abrasive cloth, and gently wiping the face, including the buttons and LCD display. Use of a pre-moistened towelette designed for lens or screen cleaning is also acceptable.

While you clean it, avoid inadvertent pressing of the keypad buttons on the sensor, as this may result in an unwanted timed override or settings change.



Using the Tracer™ TU Service Tool with a Wireless Network

To monitor, troubleshoot, or make modifications to devices on a wireless network, the Tracer TU service tool must connect to a device that is a member of that network. This appendix describes that process and how to access wireless network management information and functions.

For instructions on using Tracer TU to make changes to a wireless network, see “[Modifying an Air-Fi™ Network](#),” p. 39.

Requirements for Joining a Wireless Network

The requirements for joining Tracer TU to a wireless network are:

- Tracer TU version 8.2 (minimum)
- The Tracer TU Communications Adapter (wireless) connected to the service tool laptop.

Note: For instructions on Tracer TU Communications Adapter Wired/Wireless installation and best practices, see the current version of X39641157.

- A user ID and password, if the network includes a Tracer SC.

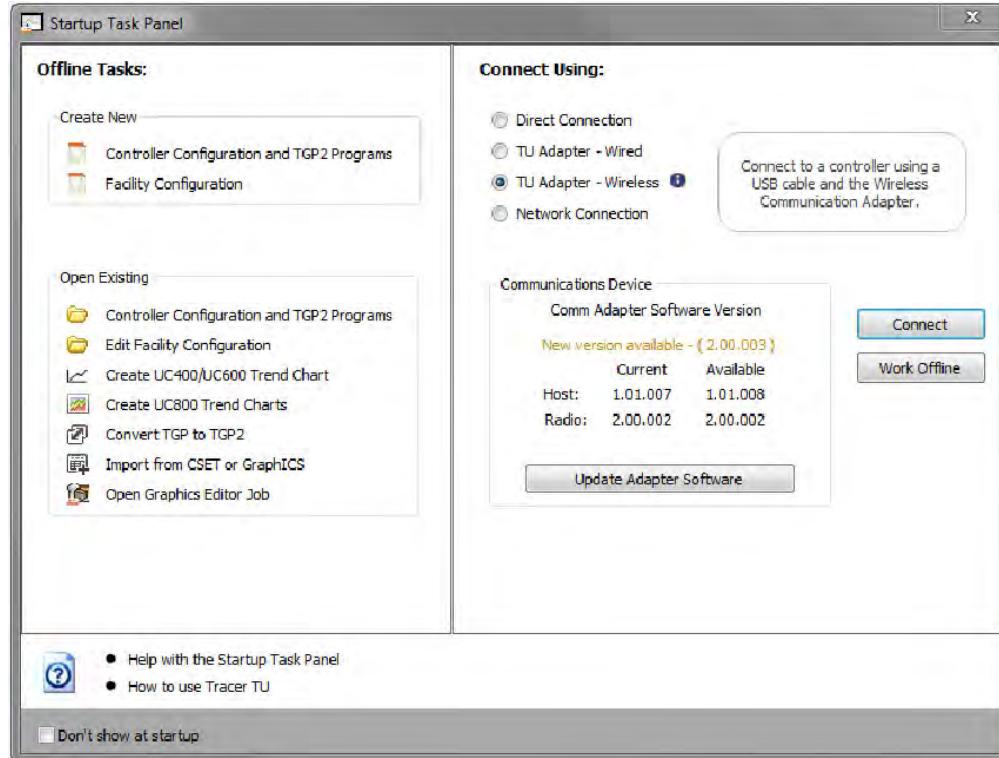
Note: All wireless features are available through all connection types as of Tracer TU 8.3.

Joining Tracer TU to a Wireless Network

To join Tracer TU to a wireless network:

1. Locate the TU Adapter within radio range of any WCI that is a network member.
2. Launch Tracer TU. The **Startup Task Panel** appears (Figure 16).

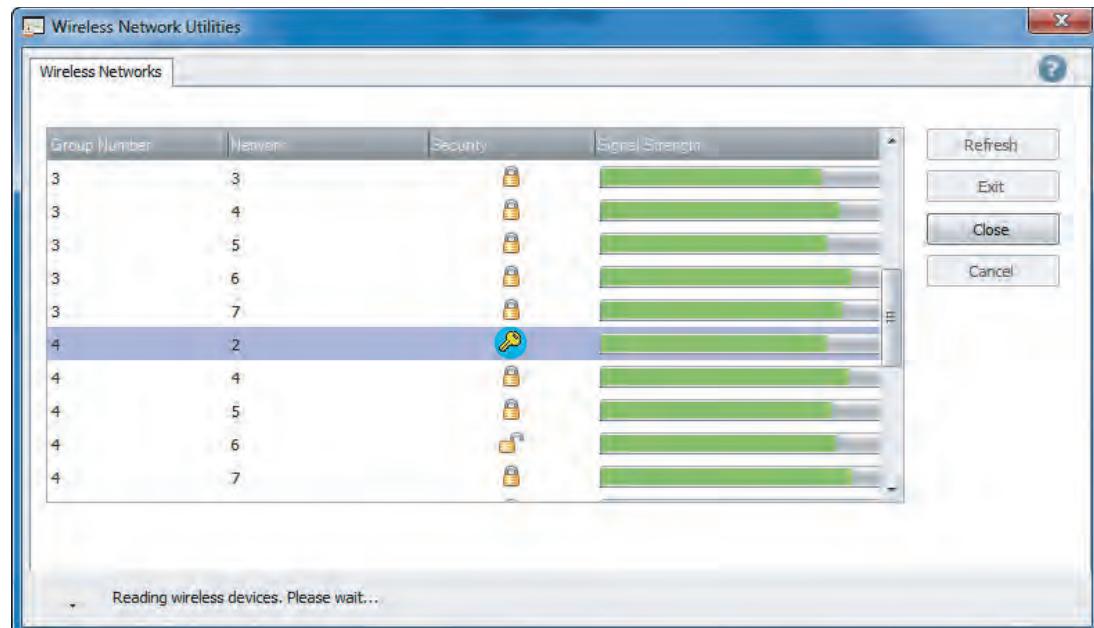
Figure 16. Tracer TU Startup Task Panel



Using the Tracer™ TU Service Tool with a Wireless Network

3. On the right side of the **Startup Task Panel**, select **TU Adapter - Wireless** and then click the **Connect** button. The **Wireless Network Utilities** screen appears (Figure 17) showing the group and subnetwork numbers (which correspond to WCI address settings) and the signal quality for all existing wireless networks within radio range of Tracer TU. A closed padlock icon indicates that a Tracer SC login is required. An open padlock icon indicates that no Tracer SC login is required.

Figure 17. Wireless Network Utilities



4. Select the network you want Tracer TU to join. Click the **Join** button.

Note: *Tracer TU can join only one network at a time.*

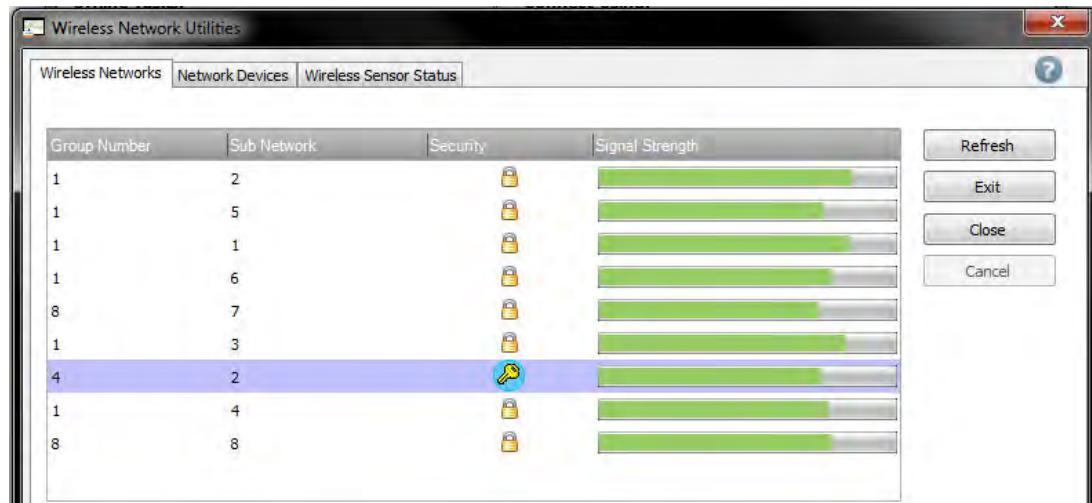
5. If a Tracer SC is present on the network, a log-in prompt appears. Enter your Tracer SC user-ID and password. After log-in, the **Wireless Network Utilities** screen appears as shown in Figure 18.

Note: *If no Tracer SC is present on the network, the screen shown in Figure 18 appears without the need to log in.*

In the Security column, the lock icon is replaced by a key icon to identify the network that Tracer TU has joined, and two additional tabs appear on the screen.

Using the Tracer™ TU Service Tool with a Wireless Network

Figure 18. Wireless Network Utilities screen after joining the network



Managing a Wireless Network and Devices

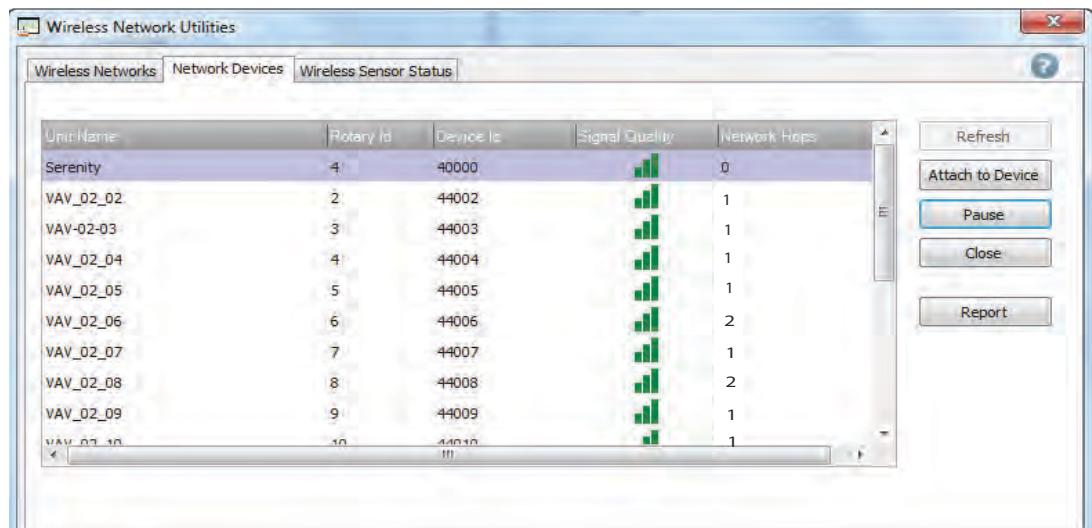
After communication has been established between Tracer TU and a wireless network, you can manage the network and the devices on it by connecting to a device on the network.

Connecting to a Device

To connect to a device:

- From the **Wireless Network Utilities** screen, select the **Network Devices** tab ([Figure 19](#)).

Figure 19. Network Devices tab



- Select a device from the list of network devices and click the **Attach to Device** button. The **Unit Summary** screen for the selected device appears ([Figure 20](#)) and Tracer TU capabilities are available.



Using the Tracer™ TU Service Tool with a Wireless Network

Figure 20. Connected device: Unit Summary screen

The screenshot shows the Tracer TU Service Tool interface with the following details:

- Connected to:** VAV_02_10
- Model:** UC400
- BAS Communication:** Comm. Up
- IMC Communication:** Comm Up

Operating Status:

Occupancy Status	Occupied
Heat / Cool Status	Heat
Actual Air Valve Position	38.37 %
Air Valve Position Control	Pressure Independent

Ventilation:

Ventilation Ratio	0 —
Ventilation Setpoint	0 cfm
Air Flow Stpt Active Min	100 cfm
Air Flow Stpt Active Min Source	Cooling Minimum

Space:

Space Temperature	71.17 °F
Space Temperature Setpoint Active	71 °F
Space Temperature Setpoint BAS	72 °F
Space Temperature Setpoint Local	74 °F
Space Temp Setpoint Default	72.5 °F
Discharge Air Temperature	66.98 °F
DA Temperature Setpoint BAS	—
Discharge Air Flow	107 cfm
Air Flow Setpoint	100 cfm
Space CO ₂ Concentration	— ppm

Outputs:

Supply Fan Status	—
Air Valve Position Command	38.37 %
Heat Output Secondary Status	0 %

Wireless Sensor:

Sensor Type	WCS
Last Reception	09:29 (mm:ss)
Battery Strength	██████████ (full)

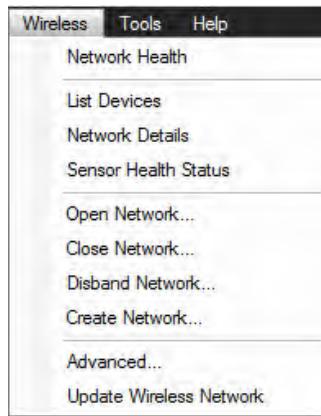
Wireless Menu

After Tracer TU is connected to a device, a **Wireless** submenu becomes available for wireless network management. To access the menu, select **Wireless** from the toolbar.

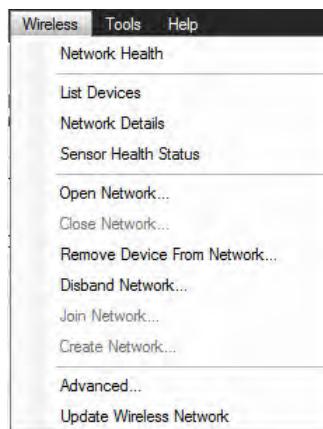
The **Wireless** submenu options depend on the type of connection, as shown in Figure 21. Each of the options are described in this section.

Figure 21. Wireless submenu

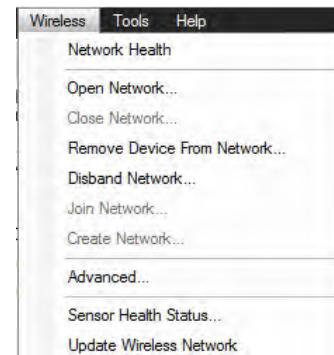
Wireless connection to a Tracer SC through a TU Adapter



Wireless connection to a UC



Connection to a UC through a connection type other than TU Adapter



Using the Tracer™ TU Service Tool with a Wireless Network

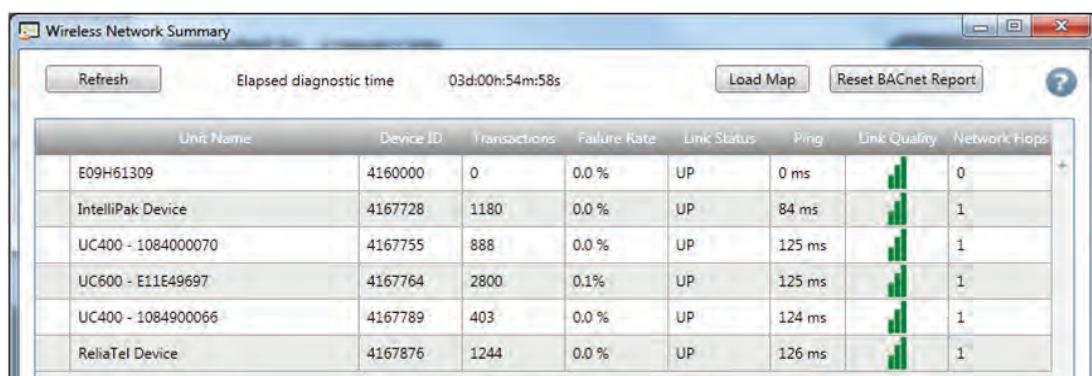
Network Health

Displays the **Wireless Network Summary Report**, shown in [Figure 22](#), which presents unit activity information including:

- The number of times Tracer SC has attempted to communicate with each device.
- The failure rate
- Link status and signal quality
- The amount of time it took for Tracer SC to get a response to a comm request from each device

Note: You can also access the **Wireless Network Summary Report** by clicking **Report** on the **Network Devices** tab ([Figure 17](#), p. 48).

Figure 22. Wireless Network Summary Report

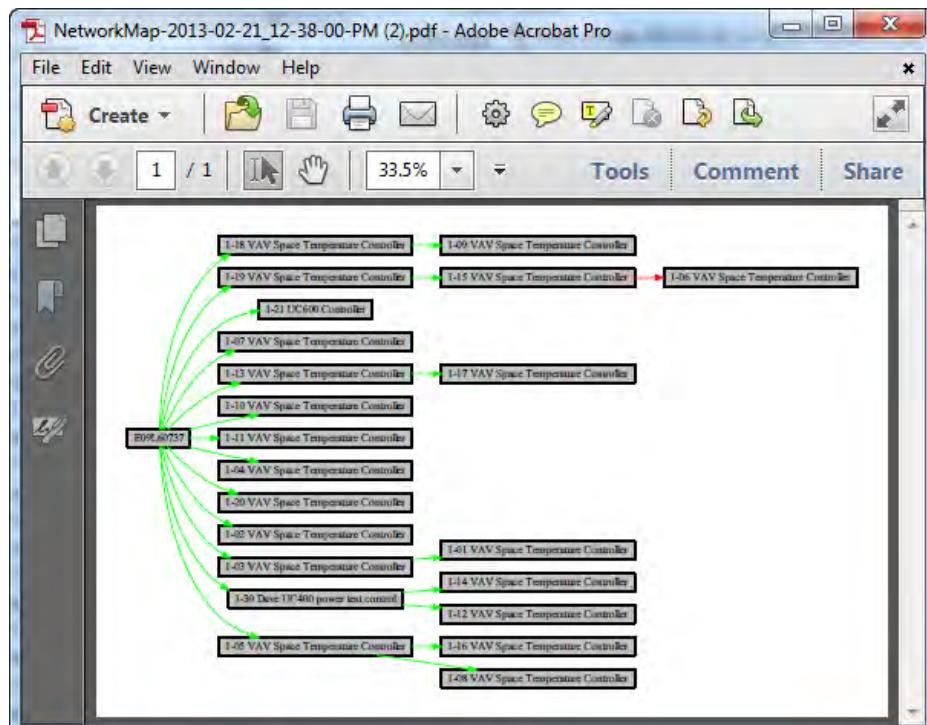


The screenshot shows a Microsoft Windows application window titled "Wireless Network Summary". At the top, there are buttons for "Refresh", "Elapsed diagnostic time" (showing 03d:00h:54m:58s), "Load Map", and "Reset BACnet Report". Below the header is a table with the following columns: Unit Name, Device ID, Transactions, Failure Rate, Link Status, Ping, Link Quality, and Network Hops. The table lists six devices:

Unit Name	Device ID	Transactions	Failure Rate	Link Status	Ping	Link Quality	Network Hops
E09H61309	4160000	0	0.0 %	UP	0 ms		0
IntelliPak Device	4167728	1180	0.0 %	UP	84 ms		1
UC400 - 1084000070	4167755	888	0.0 %	UP	125 ms		1
UC600 - E11E49697	4167764	2800	0.1%	UP	125 ms		1
UC400 - 1084900066	4167789	403	0.0 %	UP	124 ms		1
ReliaTel Device	4167876	1244	0.0 %	UP	126 ms		1

Click **Load Map** to view a graphical representation or “map” of the network showing its structure and signal quality. [Figure 23](#) shows an example of a network map.

Figure 23. Network Map



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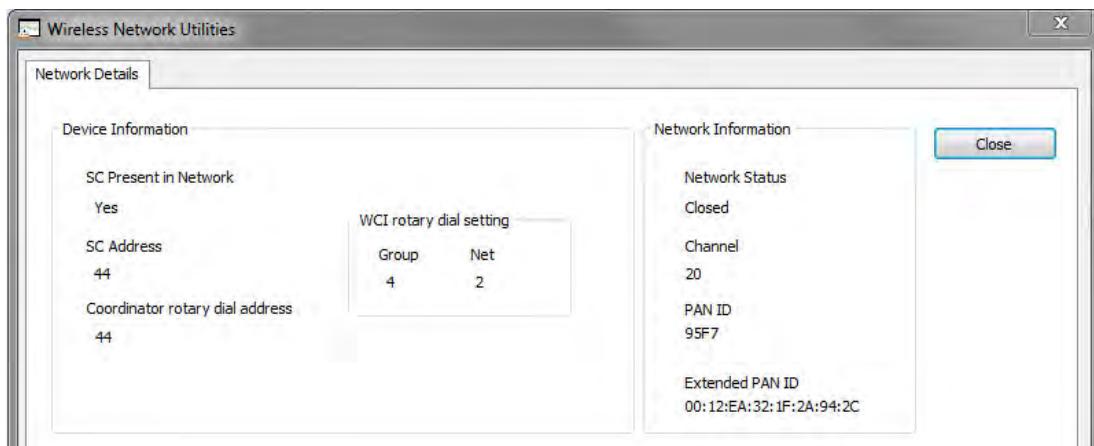
List Devices

This **Tools** menu options provides an alternate way to view the **Network Devices** tab (see [Figure 19](#)). (This option is available only when you connect to the network through the Tracer TU Wireless Adapter.

Network Details

Opens the **Network Details** tab (see [Figure 24](#)).

Figure 24. Network Details tab



Sensor Health Status

This **Tools** menu options provides an alternate way to view the **Wireless Sensor Status** tab (see [Figure 25](#)).

Figure 25. Wireless Sensor Status tab

Unit Name	ID	Sensor Type	Signal	Last Recv.	Battery	Refresh
VAV-02-03	0	VACS	09:55	09:55		
VAV 02 04	0	VACS	04:55	04:55		
VAV 02 06	0	Display	02:36	02:36		
VAV 02 07	0	VACS	12:06	12:06		
VAV 02 08	0	Zone	02:36	02:36		
VAV 02 09	0	Display	19:14	19:14		
VAV 02 10	0	VACS	02:32	02:32		
FP VAV 02 03	0	Display	03:45	03:45		
FP VAV 02 04	0	Zone	00:17	00:17		
FP VAV 02 05	0	VACS	12:51	12:51		
FP VAV 02 06	-	VACS	02:43	02:43		
FP VAV 02 06	2	VACS	14:53	14:53		
VAV 02 01	0	Display	01:45	01:45		

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Open Network

Select this **Tools** menu option to allow a new member to join. Any WCI with a correct rotary address setting that is located within radio range of the open network will join the network. (Similar to OPEN_NET button on WCI.)

Close Network

Select this **Tools** menu option to prevent new members from joining the network.

Remove Device From Network

Select this **Tools** menu option to remove the WCI and its associated unit controller to which Tracer TU is currently connected from the wireless network.

Disband Network

Select this **Tools** menu option to disband the network. Tracer TU must be attached to the network coordinator.

Join Network

Select this **Tools** menu option to allow the WCI to join the network. (Appears when you are connecting to a member WCI. It is grayed out if you have already joined the network.)

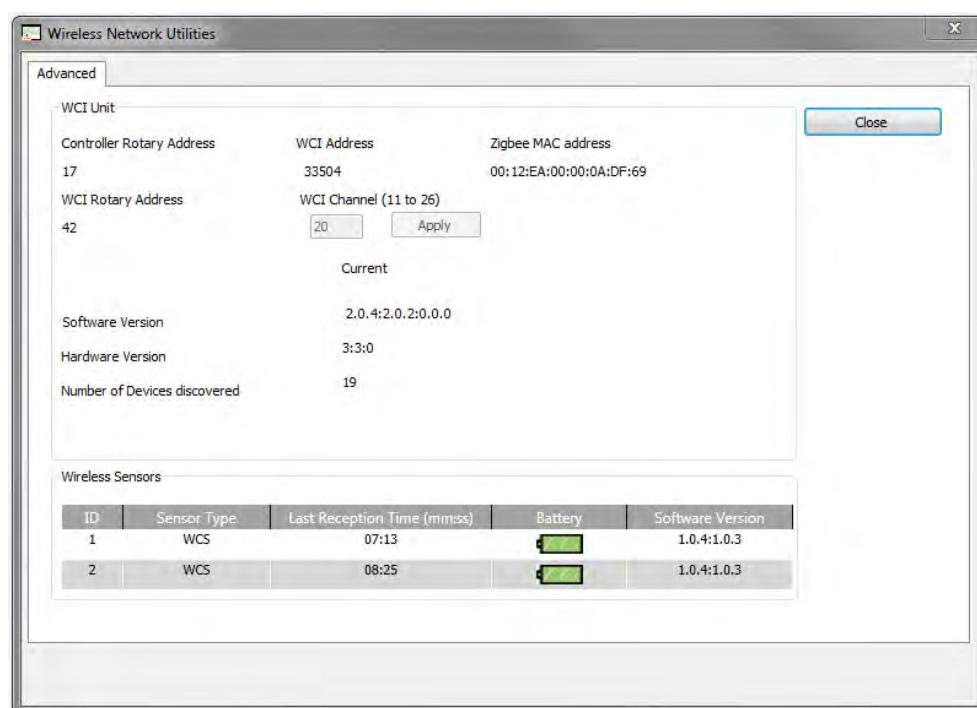
Create Network

Select this **Tools** menu option to create a new network in which the attached device will be network coordinator. Typically, used for a unit controller that will be network coordinator when no Tracer SC is present.

Advanced

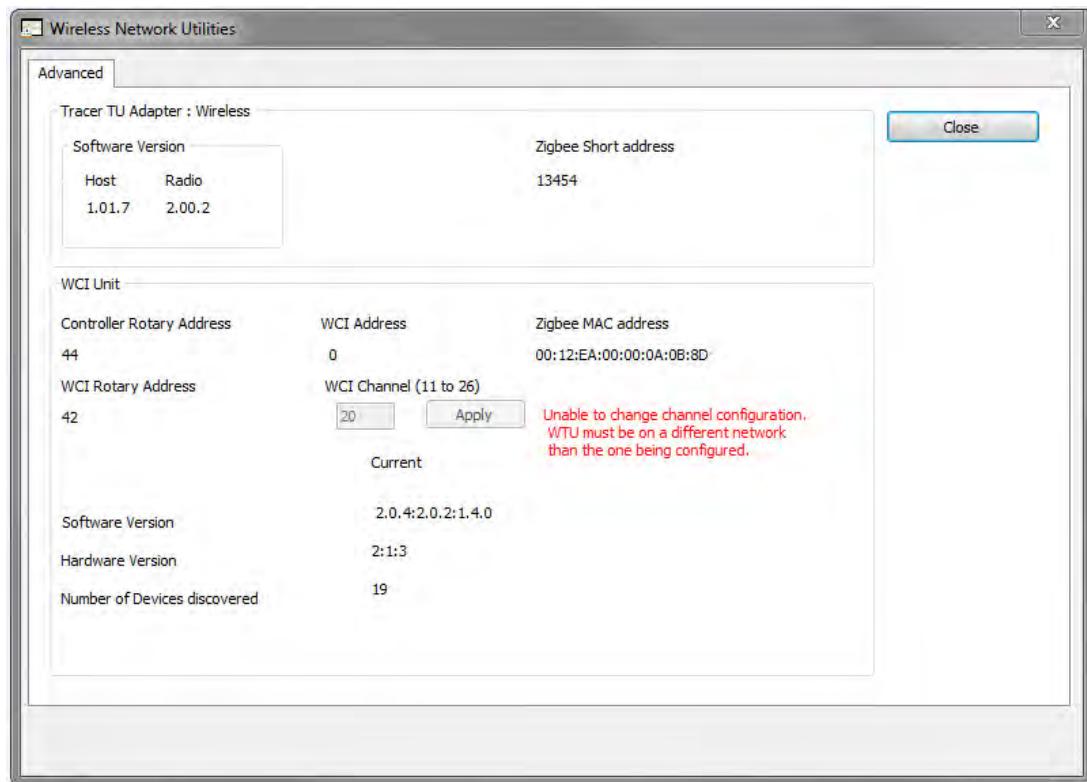
Select this **Tools** menu option to display the **Advanced** tab. Examples are shown in [Figure 26](#) and [Figure 27](#).

Figure 26. Advanced tab: When connected to a unit controller that has associated sensors



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Figure 27. Advanced tab: When connected to a Tracer SC



Wireless Sensor Setup

Disabling a Wireless Sensor when a Wired Sensor is Connected to the Unit Controller

If a unit controller's WCI is a sensor receiver, the wireless sensor is detected and the necessary references are created automatically. The **Enable Wireless Space Sensor** setting in the **Wireless Sensor Configuration** group box on the **Controller Settings** screen is enabled (selected) by default.

However, if a wired sensor is connected to the unit controller, and a wireless sensor is within range, the wireless sensor has priority and the unit controller may use the wireless sensor even though a sensor is wired to the unit controller. In such a case, you must de-select the **Enable Wireless Space Sensor** setting in the **Wireless Sensor Configuration** group box on the **Controller Settings** screen so that the wireless sensor is disabled from use by the unit controller and wired sensor is used instead. (Also see “Disassociating a Wireless Sensor From a Controller” in the *Tracer TU for Programmable Controllers Help*.)

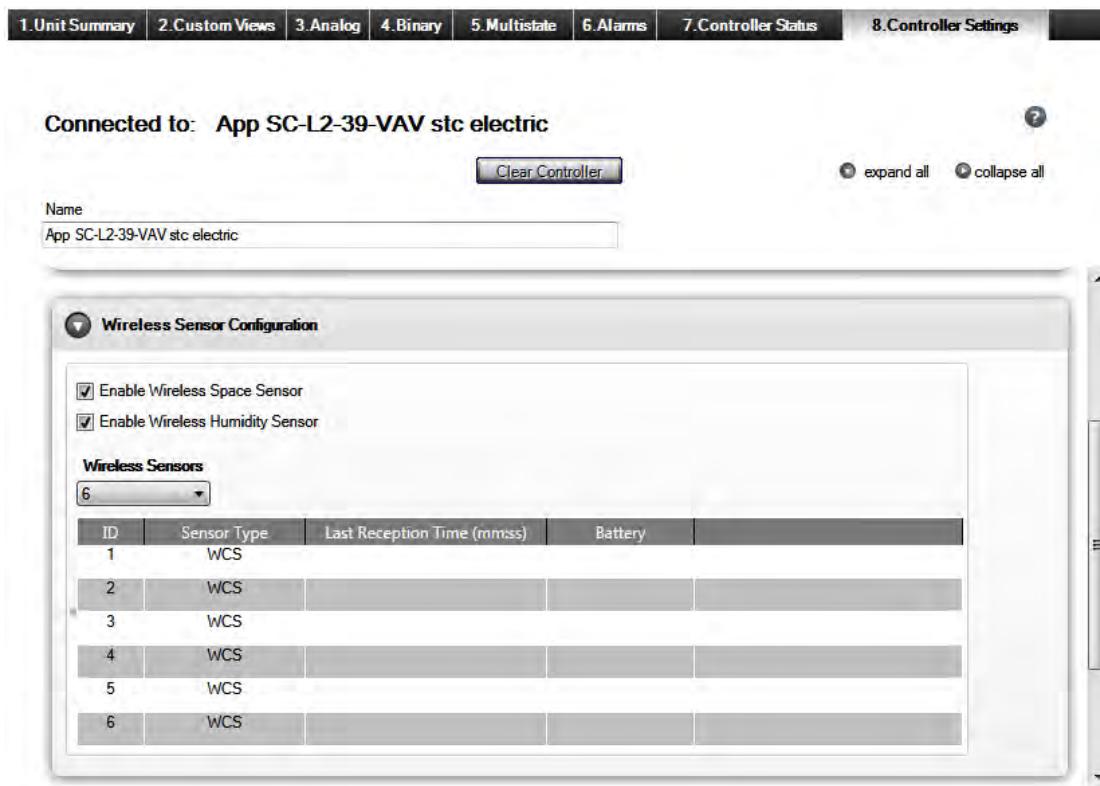
It is also possible to disable only the wireless humidity sensor. This option would be chosen in cases where a wireless space sensor is used in conjunction with a wired humidity sensor. To disable the wireless humidity sensor de-select the **Enable Wireless Humidity Sensor** setting in the **Wireless Sensor Configuration** group box on the **Controller Settings** screen.

Multiple WCS Installation Setup

Setup is required in Tracer TU if multiple wireless sensors are installed on a controller. To set up a controller for multiple sensors, connect to TU and navigate to the **Wireless Sensor Configuration** box on the **Controller Settings** screen. Using the drop-down menu, select the number of sensors that are to be associated with the controller.

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Figure 28. Setting up Tracer TU for multiple wireless sensors



Default Sensor Values for Trane® Standard Programs

If multiple sensors are associated with a controller that has a Trane® standard program, the controller will automatically use the following values:

- **Space Temperature Local:** This point will automatically use the average space temperature value from all associated sensors.
- **Space Humidity Local:** This point will automatically use the average humidity value from all associated sensors.

Note: if a sensor value does not exist or is not valid, it will not be included in the average calculation.

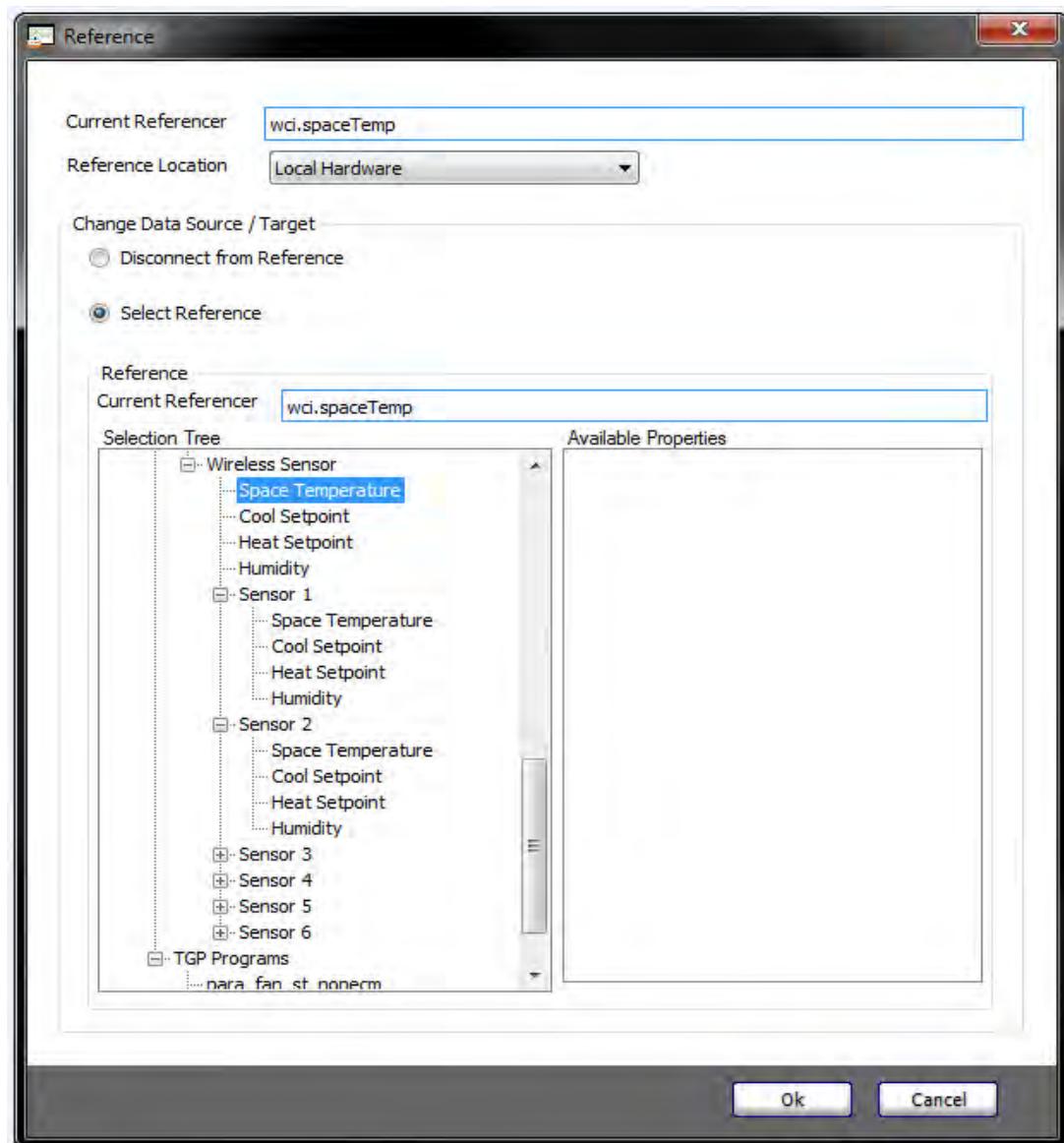
- **Setpoints, Timed Overrides (TOVs), and Equipment Operation Settings:** All user inputs from the associated sensors will automatically follow a round-robin sequence in which the last value received will take priority.

All individual sensor values can be referenced within the controller (see [Figure 23, p. 51](#)). This allows for the individual values to be displayed on graphics or used in custom TGP2 programs. To reference individual values, navigate to the point configuration page of an existing or newly created point. In addition to the Wireless Sensor values (which are the average or last received values, as discussed previously), the individual sensor values are available according to the sensor address.



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Figure 29. Sensor reference screen





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