

WRS-TTx Series Radio Frequency (RF) Wireless Transmitters

Applications

The WRS-TTx Series Wireless Room Temperature Transmitters are designed to report temperature and set point (certain models) to a suitable JCI data receiver. They can be used in two separate types of control systems, depending on the application.

FCC and Industry Canada Compliance

Compliance Statement (Part 15.19)

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.

Warning (Part 15.21)

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

To comply with FCC's RF exposure limits for general population / uncontrolled exposure, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Industry Canada Statement

The term "IC" before the certification/registration number only signifies that the Industry Canada technical specifications were met.

Locating the Transmitters

The wireless design of the WRS-TTx transmitter allows a great deal of location flexibility without worrying about installing wiring. It is important to follow the standard guidelines for Sensor/Thermostat location so that the sensor is sensing the true room temperature. It is important to avoid outside walls, windows, and areas where sunshine can fall directly on the sensor or where drafts from HVAC equipment are likely.

Additionally, it is important to remember that the transmissions used by the WRS-TTx are basically line-of-site and you should review the likely path of the RF energy before installation. Generally it is important to avoid having large areas of metal such as elevators, duct work, or equipment rooms between the sensor and the receiver.

An optional signal strength site survey tool receiver is available to determine the appropriate location of the WRS Wireless Room Temperature Sensing System prior to its installation. Using any standard WRS-TTx transmitter in the rapid transmit mode (previously described in the section *Occupancy Button and LED*), along with the survey tool receiver TE-7820-100, you can verify that the RF transmission signal is sufficient to ensure proper system operation. See Table 1 and refer to the *TE-7820-100 RF Wireless Signal Strength Site Survey Tool Product Bulletin (LIT-xxxxxxx)* for more details.

Installation

Observe the following guidelines and see the *Mounting* section in this document.

- Transport the WRS-TTx in the original container to minimize vibration and shock damage to the WRS-TTx.
- Verify that all parts are shipped with the WRS-TTx.
- Do not drop the WRS-TTx or subject it to physical shock.
- Other than the mounting base, do not open the WRS-TTx. The WRS-TTx has no user-serviceable parts inside.

Parts Included

- one Wireless Transmitter
- two expandable wall anchors and two No. 8 pan-head, self-tapping screws
- three strips of double-sided adhesive foam tape
- one set of Installation Instructions
- two AA alkaline batteries

Tools Needed

- screwdriver for mounting screws
- 1/16 in. (2mm) Allen-head adjustment tool for small screw that secures transmitter to mounting base
- small straight blade screwdriver or coin for unsnapping transmitter from base

Set up/Commissioning

Ensuring the batteries are installed and setting the DIP switches appropriately are the only actions required after mounting/installation.

IMPORTANT: Before specifying the WRS Series RF Wireless Room Temperature Sensing System for plenum applications, verify acceptance of exposed plastic materials in plenum areas with the local building authority. Building codes for plenum requirements vary by location. Some local building authorities accept compliance to UL 1995, Heating and Cooling Equipment, while others use different acceptance criteria.

IMPORTANT: Use this WRS Series RF Wireless Room Temperature Sensing System only to provide an input to equipment under normal operating conditions. Where failure or malfunction of the sensing system could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices such as supervisory or alarm systems or safety or limit controls intended to warn of, or protect against, failure or malfunction of the sensing system.

Diagram or Picture of the 80 X 120mm Sensor Enclosure with Dimensions

**Figure 1: WRS-TTx Series RF Wireless Temperature and Set Point Transmitters
Dimensions, in. (mm)**

Accessories

Table 1: Accessories (Order Separately)

Code Number	Description
TP2420	Transformer, 120VAC Primary to 24Vac Secondary, 20VA, Wall Plug
TE-7820-100	RF Wireless Receiver Signal Strength Site Survey Tool
T-4000-119	Allen-Head Adjustment Tool (30 per Bag)

Mounting

Hardware is included with each component of the WRS Series RF Wireless Temperature Sensing System, allowing for a variety of mounting scenarios.

The preferred mounting method for the transmitter uses the two expandable wall anchors included with the unit. Double-sided adhesive foam tape is also provided with each transmitter for installations where building retention and its historical preservation are important, or in buildings featuring marble, granite, glass, mirrored, wood veneer, or other decorative surfaces.

Transmitter Location Considerations

Consider the following guidelines when selecting a mounting location for the WRS-TTx Series RF Wireless Temperature and Set Point Transmitter:

- Locate the transmitter so that it is easily accessible.
- Locate the transmitter on the same floor. (Mounting one floor above or one floor below the receiver may work, but will dramatically reduce the RF signal range.)
- Locate the transmitter on an inside wall away from water pipes and air ducts, minimally 54 in. (1.4 m) above the floor level, in an area that accurately represents the temperature of the controlled space.
- If possible, locate the transmitter in the line of sight with the receiver, to minimize signal transmission loss.
- Check that there are no metal objects (including equipment rooms and elevator shafts) blocking the RF transmission signal from the transmitter to the receiver.
- Do not mount the transmitter in recessed areas, in shelving units or metal enclosures, or behind curtains or doors.

- Do not mount the transmitter in areas that are exposed to direct sunlight or condensation, or in areas that are in close proximity to various heat sources.
- Do not mount the transmitter in areas susceptible to warm or cool drafts such as lobbies, walkways, or near a bank of computers.
- Do not mount the transmitter less than 2 ft (0.6 m) from the receiver.
- The distance between two or more transmitter mounting locations is irrelevant.

Removing the Transmitter from its Mounting Base

The WRS-TTx Series Transmitter ships from the factory pre-assembled to its mounting base. In order to secure the assembly to a surface, the transmitter must first be removed from its mounting base (as illustrated in Figure 2).

Diagram of Sensor Transmitter Cover and Base

Figure 2: Removing the Transmitter from its Mounting Base

Surface Mounting the Transmitter Using Two Expandable Wall Anchors and Two No. 8 Pan-Head, Self-Tapping Screws

Two expandable wall anchors and two No. 8 pan-head, self-tapping screws are included with each WRS-TTx Series Transmitter for surface mounting the unit as follows:

1. Remove the transmitter from its mounting base (as illustrated in Figure 2).
2. Select two mounting hole locations across from one another on the mounting base. Mark these two mounting hole locations on the wall surface using the mounting base as a template.

Note: Before marking the two mounting hole locations, be sure that the rectangular holes with the little notches are towards the top. With the notched rectangular holes at the top, the transmitter is oriented properly once it is secured to the mounting base.

3. Drill a 5/32 in. (4 mm) hole at each of the marked locations.
4. Install an expandable wall anchor into each of the drilled holes.
5. Secure the mounting base to the surface using the two No. 8 pan-head, self-tapping screws provided.

IMPORTANT: Do not overtighten the mounting screws. Overtightening the mounting screws may damage the mounting base and the mounting surface.

6. View the Property Code and Transmitter ID DIP switch arrays on the back of the transmitter.

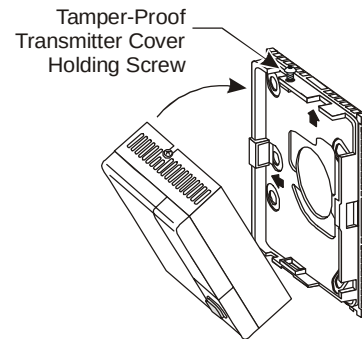
For a One-to-One application, set the Property Code DIP switch array to all "Zeros." Set the address portion of the Transmitter ID DIP switch array to match the corresponding TE-78XX receiver DIP switch array.

For a Many-to-One application, set the Property Code DIP switch array (1 to 31) and the address portion of the Transmitter ID DIP switch array (1 to 511) to desired addresses for the designated locations. (A "zero" setting is not allowed.) These addresses will be downloaded via the NAE to a WRS-RTN and be linked with specific Controllers.

See the *Setup and Adjustments* section for more details.

7. Install the batteries into the battery compartment located on the back of the transmitter, and set the power DIP switch (top DIP switch on the Transmitter ID DIP switch array) to the ON position.

8. Place the bottom edge of the transmitter against the bottom lip of the mounting base and rotate the transmitter up onto the mounting base (as illustrated in Figure 3).



Note: This diagram needs to be replaced with appropriate 80 X120 cover and base diagram

Figure 3: Securing the Transmitter to the Mounting Base

9. Tighten the tamper-proof transmitter cover holding screw using a 1/16 in. (2 mm) Allen-head adjustment tool (T-4000-119; ordered separately) to secure the transmitter to the mounting base.

Note: Once installed, the transmitter and mounting base assembly cannot be removed from the mounting surface without first loosening the tamper-proof transmitter cover holding screw and then depressing the tab at the top through the slot using a small coin or a screwdriver. (as illustrated in Figure 2).

Surface Mounting the Transmitter Using Three Strips of Double-Sided Adhesive Foam Tape

Each WRS-TTx Series Transmitter includes three 1/16 in. (2 mm) thick, 3/4 x 1 in. (19 x 25 mm) strips of double-sided adhesive foam tape for mounting locations where building retention and its historical preservation are important, or in buildings featuring marble, granite, glass, mirrored, wood veneer, or other decorative surfaces. To surface mount the transmitter using the three strips of foam tape, proceed as follows:

1. Remove the transmitter from its mounting base (as illustrated in Figure 2).
2. Clean the mounting surface to ensure that the foam tape holds the mounting base securely to the surface.

Note: The application temperature must be at least 50°F (10°C).

3. Peel and stick one side of the foam tape strips to the smooth surface of the mounting base, arranged as illustrated in Figure 4.

Diagram of back of sensor base plate showing foam tape strips applied.

Figure 4: Locations of Foam Tape Strips on the Smooth Surface of the Mounting Base

4. Peel the other side of the foam tape strips to expose the sticky surface.

Note: Before placing the mounting base on the surface, be sure that the rectangular holes with the little notches are towards the top (as illustrated in Figure 5). With the notched rectangular holes at the top, the transmitter is oriented properly once it is secured to the mounting base.

5. Place the mounting base on the desired surface and press firmly to secure it in place.
6. View the Property Code and Transmitter ID DIP switch arrays on the back of the transmitter.

For a One-to-One application, set the Property Code DIP switch array to all “Zeros.” Set the address portion of the Transmitter ID DIP switch array to match the corresponding TE-78XX receiver DIP switch array.

For a Many-to-One application, set the Property Code DIP switch array (1 to 31) and the address portion of the Transmitter ID DIP switch array (1 to 511) to desired addresses for the designated locations. (A “zero” setting is not allowed.) These addresses will be downloaded via the NAE to a WRS-RTN and be linked with specific Controllers.

See the *Setup and Adjustments* section for more details.

7. Install the batteries into the battery compartment located on the back of the transmitter, and set the power DIP switch (top DIP switch on the Transmitter ID DIP switch array) to the ON position.
8. Place the bottom edge of the transmitter against the bottom lip of the mounting base and rotate the transmitter up onto the mounting base (as illustrated in Figure 6).
9. Tighten the tamper-proof transmitter cover holding screw using a 1/16 in. (2 mm) Allen-head adjustment tool (T-4000-119; ordered separately) to secure the transmitter to the mounting base.

Note: Once installed, the transmitter and mounting base assembly cannot be removed from the mounting surface without first loosening the tamper-proof transmitter cover holding screw and then depressing the tab at the top through the slot using a small coin or a screwdriver. (as illustrated in Figure 2).

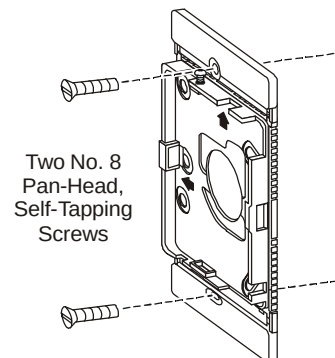
IMPORTANT: If the mounting base needs to be removed and repositioned, the foam tape used to secure it to the surface must be replaced with new foam tape (purchased locally; Can-Do model No. 99116 or equivalent). Remove the taped mounting base from the surface by carefully twisting it off, rather than pulling it off (to avoid damaging the mounting surface).

Wallbox Mounting the Transmitter Using Two No. 8 Pan-Head, Self-Tapping Screws

The mounting base included with each WRS-TTX Series Transmitter includes breakaway tabs that must remain in place when mounting on a standard 2 x 4 in. (51 x 102 mm) wallbox. To wallbox mount the transmitter using the two No. 8 pan-head, self-tapping screws included with the unit, proceed as follows:

1. Remove the transmitter from its mounting base (as illustrated in Figure 2).
2. Secure the mounting base to the wallbox using the two No. 8 pan-head, self-tapping screws (as illustrated in Figure 5).

Note: Before securing the mounting base to the wallbox, be sure that the rectangular holes with the little notches are towards the top (as illustrated in Figure 5). With the notched rectangular holes at the top, the transmitter is oriented properly once it is secured to the mounting base.



Note: This diagram needs to be replaced with appropriate 80 X120 base diagram

Figure 5: Securing the Mounting Base to the Wallbox

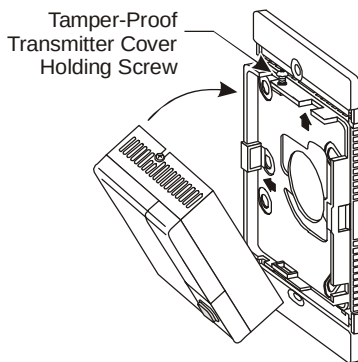
3. View the Property Code and Transmitter ID DIP switch arrays on the back of the transmitter.

For a One-to-One application, set the Property Code DIP switch array to all "Zeros." Set the address portion of the Transmitter ID DIP switch array to match the corresponding TE-78XX receiver DIP switch array.

For a Many-to-One application, set the Property Code DIP switch array (1 to 31) and the address portion of the Transmitter ID DIP switch array (1 to 511) to desired addresses for the designated locations. (A "zero" setting is not allowed.) These addresses will be downloaded via the NAE to a WRS-RTN and be linked with specific Controllers.

See the *Setup and Adjustments* section for more details.

4. Install the battery into the battery compartment located on the back of the transmitter, and set the power DIP switch (top DIP switch on the Transmitter ID DIP switch array) to the ON position.
5. Place the bottom edge of the transmitter against the bottom lip of the mounting base and rotate the transmitter up onto the mounting base (as illustrated in Figure 6).



Note: This diagram needs to be replaced with appropriate 80 X120 cover and base diagram

Figure 6: Securing the Transmitter to the Mounting Base

6. Tighten the tamper-proof transmitter cover holding screw using a 1/16 in. (2 mm) Allen-head adjustment tool (T-4000-119; ordered separately) to secure the transmitter to the mounting base.

Note: Once installed, the transmitter and mounting base assembly cannot be removed from the mounting surface without first loosening the tamper-proof transmitter cover holding screw and then depressing the tab at the top through the slot using a small coin or a screwdriver. (as illustrated in Figure 2).

Setup and Adjustments

For setup and commissioning details, refer to the *WRS-TTx Technical Bulletin (LIT-???????????)*

Repairs and Replacement

If the WRS-TTx Series RF Wireless Temperature and Set Point Transmitter, or the TE-7720 or TE-7730 Series RF Receiver, or the WRS-RTN Series RF Receiver fails to operate within its specifications, unit replacement is required. For a replacement transmitter or receiver, contact the nearest Johnson Controls representative.

Table 2 includes the only replacement parts available for the WRS Series RF Wireless Room Temperature Sensing System. Do not attempt any repairs on the temperature sensing system other than those related to the replacement parts included in Table 2.

Note: The printed circuit board used with the WRS Series RF Wireless Room Temperature Sensing System is retained with a tamper-resistant mechanism. Removing the printed circuit board from the plastic housing voids the product warranty.

Replacing the Transmitter Battery

The life of the 1.5-volt AA Alkaline batteries included with each WRS-TTx Series Transmitter is typically five or more years. The transmitter communicates diagnostic data, including battery condition, approximately every 60 seconds to the receiver, where it is converted into the appropriate units and electrical format to warn supervisory equipment (via the Johnson Controls digital controller) when the batteries need to be replaced.

For the WRS-RTN Series Receiver, a low battery signal is sent to the NAE via the Ethernet trunk, and this signal is not cleared until the transmitter battery is replaced. For the TE-7820 Series Receiver, a low battery signal is sent to the digital controller via the zone bus link, and this signal is not cleared until the transmitter battery is replaced.

For the TE-7830 Series Receiver, the low battery relay binary output is turned off for 1 minute every 48 hours and then back on again. This function is intended to retrigger a system alarm that may have been acknowledged without taking appropriate action to replace the transmitter battery.

See Figure 2 to remove the transmitter from its mounting base and access the battery for replacement. Replacement batteries must be purchased locally; suitable models include any good quality Alkaline (1.5V) or Lithium (1.6V) AA cells. Do not use Carbon/Zinc batteries as these will give a poor life and could give erratic operation.

Table 2: Replacement Parts (Order Separately)

Code Number	Description
Duracell Ultra 123, Panasonic CR123A, Toshiba CR123A, GE/Sanyo CR123A, or Equivalent	Replacement Battery (Purchase Locally), 3.0-Volt Lithium Battery (One Required for Receiver Signal Strength Site Survey Tool. These are NOT for the WRS-TTx Sensor Transmitters which use Alkaline or Lithium AA cells)

Technical Specifications

Product		WRS Series RF Wireless Room Temperature Sensing System
Digital Controller Interface	TE-7820-0	Power and Zone Bus Interface Between TE-7820-0 RF Receiver and VMA1400 Series Digital Controllers
	TE-7830-0	Power and Analog Interface Between TE-7830-0 RF Receiver and AS-AHU, AS-UNT, AS-VAV, DX-9100, and Compatible Competitors' Digital Controllers
	WRS-RTN0000-0 and NAE	Ethernet interface between WRS-RTN and NAE. N2 or MSTP interface between NAE and Digital Controllers
Power Requirements	Transmitter	Two AA cell Alkaline Batteries Included with Each Transmitter; Battery Life: 60 Months Typical (48 Months Minimum); Battery Condition Transmitted Approximately Every 60 Seconds
	Receiver	24 VAC +10%/-15%, 50/60 Hz, 4.5 VA, Class 2
Addressing (Transmitter and Receiver)	WRS-TTx0000-0	DIP Switches, Field Adjustable for Up to 510 Unique Transmitter ID Addresses and for up to 31 Unique Property Code Addresses.
	TE-7820-0	DIP Switches, Field Adjustable for Up to 510 Unique Addresses (For addresses 0 and 511, the TE-7720-0 matches the N2 address of the associated VMA1400 for its actual address.)
	TE-7830-0	DIP Switches, Field Adjustable for Up to 510 Unique Addresses (Addresses 0 and 511 are invalid.)
	WRS-RTN00000-0	Configurable via the NAE for Up to 512 Unique Transmitter ID Addresses and Up to 31 Unique Property Code Addresses.
System Accuracy	Measured Temperature	±1F° (±0.6C°) Over a Range of 55 to 85°F (13 to 29°C); ±1.5F° (±0.9C°) Over a Range of 32 to 55°F (0 to 13°C) and 85 to 110°F (29 to 43°C)
	Temperature Set Point	±1.5F° (±0.9C°) Over a Range of 55 to 85°F (13 to 29°C)
Transmitter Sensor		Internal Negative Temperature Coefficient Thermistor
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Technical Specifications (Cont.)

Transmitter Temperature Set Point	Adjustment	Single Temperature, Scaled °F/°C
	Resolution	Fahrenheit Scale Graduated in 5F° Intervals; Celsius Scale Graduated in 2C° Intervals
Transmission Range (Transmitter and Receiver)		500 ft (152.4 m) Maximum for Indoor Line-of-Sight; 200 ft (61 m) Practical Average Indoors
Transmissions		Every 60 Seconds (±20 Seconds)
Receiver Outputs	TE-7820-0	One Zone Bus Output for Temperature, Set Point, Field Strength Measurements, and Low Battery Indication
	TE-7830-0	Two Analog Outputs for Zone Temperature and Set Point: 0 to 5 VDC, 2 mA Maximum; Two Binary Outputs for Occupancy and Low Battery Indication: Dry Contacts Rated for 24 VAC, 50 mA Maximum
	WRS-RTN0000-0	One Ethernet connection for communicating Temperature, Set Point, Field Strength Measurements, and Low Battery Indication
Mounting Hardware	Transmitter	Two Expandable Wall Anchors (Preferred Mounting Method) or Double-Sided Adhesive Foam Tape
	Receiver	Four No. 6 Sheet Metal Screws
Ambient Operating Temperature Limits	Transmitter	0 to 122°F (-18 to 50°C)
	Receiver	32 to 122°F (0 to 50°C)
Ambient Storage Temperature Limits (Transmitter and Receiver)		-40 to 160°F (-40 to 71°C)
Ambient Humidity Limits (Transmitter and Receiver)	Operating	5 to 95% RH, Noncondensing
	Storage	5 to 90% RH, Noncondensing
Materials	Transmitter	NEMA 1 White Plastic Housing
	Receiver	Gray Plastic Housing with UL94-5VB Flammability Rating
Compliance	United States	Intended for NEC Class 2 Connection
		UL Listed, File E107041, CCN PAZX
		UL94-5VB Flammability Rating (Receiver Housing is Plenum Rated per UL 1995, Heating and Cooling Equipment)
		FCC Compliant to CFR 47, Part 15, Subpart B, Class A
		Transmission Complies with FCC Part 15.247 Regulations for Low Power Unlicensed Transmitters Transmitter FCC Identification: CB2-TMPSENS2400A Receiver Radio Module FCC Identification: CB2-RFMOD2400A
	Canada	Intended for CEC Class 2 Connection
		UL Listed, File E107041, CCN PAZX7
		UL94-5VB Flammability Rating (Receiver Housing is Plenum Rated per CSA C22.2 No. 236, Heating and Cooling Equipment)
		Industry Canada (Transmitter) IC: 279A-TSENS24A Industry Canada (Radio Module) IC: 279A-RFMOD24A
	Australia and New Zealand	Australia/NZ Emissions Compliant (C-Tick Mark)
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Technical Specifications (Cont.)

Receiver Terminations	TE-7820-0	Two Spade Terminals that Accept One Two-Position, Screw-Terminal Pluggable Block (Pluggable Block Included with Receiver)
	TE-7830-0	Eight Spade Terminals that Accept One Two-Position and Two Three-Position, Screw-Terminal Pluggable Blocks (Pluggable Blocks Included with Receiver)
	WRS-RTN0000-0	One Ethernet modular jack connector and a 3-Pin Header that Accepts One Three-Position, Screw-Terminal Pluggable Block (Pluggable Block Included with Receiver)
Cable Between Receiver and Johnson Controls Digital Controller	TE-7820-0	6 ft (1.8 m) Power and Zone Bus Interface Cable Included with Each Receiver; Maximum Recommended Cable Length: 300 ft (91.4 m) Cables to Connect Zone Bus Only (No Power) Measuring 25 ft (7.6 m), 50 ft (15.2 m), 75 ft (22.9 m), and 100 ft (30.5 m) are Available (Refer to the <i>TE-7800 Series Radio Frequency (RF) Wireless Room Temperature Sensing System Product Bulletin [LIT-xxxxxxx]</i> for more details.)
	TE-7830-0	6 ft (1.8 m) Power and Analog Interface Cable Included with Each Receiver; Maximum Recommended Cable Length: 100 ft (30.5 m)
Dimensions	Transmitter	120 mm Long x 80 mm Wide x 38 mm High
	Receiver	4-23/32 in. Long x 5-29/32 in. Wide x 1-31/32 in. High (120 mm Long x 150 mm Wide x 50 mm High)
Shipping Weights	Transmitter	0.3 lb (0.14 kg)
	Receiver	1.0 lb (0.45 kg)

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.



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Published in U.S.A.
www.johnsoncontrols.com