Reference Manual
00809-0300-4248, Rev AA
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Rosemount 248 Wireless Temperature Transmitter

IEC

WirelessHART

ROSEMOUNT

EMERSON
Process Management

Rosemount 248 Wireless Temperature Transmitter

Rosemount 248 Hardware Revision	1
HART® Device Revision	1
Field Communicator Field Device Revision	Dev 1, DD v1

NOTICE

Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure to thoroughly understand the contents before installing, using or maintaining this product.

For technical assistance, contacts are listed below:

Customer Central
Technical support, quoting, and order-related questions.
United States - 1-800-999-9307 (7:00 am to 7:00 pm CST)
Asia Pacific- 65 777 8211
Europe/ Middle East/ Africa - 49 (8153) 9390
North American Response Center
Equipment service needs
1-800-654-7768 (24 hours—includes Canada)
Outside of these areas, contact your local Emerson Process Management representative.

⚠ CAUTION

The products described in this document are NOT designed for nuclear-qualified applications. Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact a Emerson Process Management Sales Representative.

⚠ WARNING

Failure to follow these installation guidelines could result in death or serious injury:

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury:

- Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approvals section of the 248 reference manual for any restrictions associated with a safe installation.
- Before connecting a Field Communicator in an explosive atmosphere, ensure the instruments are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

Process leaks may cause harm or result in death.

- Do not remove the thermowell while in operation.
- Install and tighten thermowells and sensors before applying pressure.

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.
- This device must be installed to ensure a minimum antenna separation distance of 20 cm from all persons.

The Power Module may be replaced in a hazardous area. The Power Module has surface resistivity greater than one gigaohm and must be properly installed in the wireless device enclosure. Care must be taken during transportation to and from the point of installation to prevent electrostatic charge build-up.

NOTICE

The Rosemount 248 Wireless and all other wireless devices should be installed only after the Smart Wireless Gateway has been installed and is functioning properly. Wireless devices should also be powered up in order of proximity from the Smart Wireless Gateway, beginning with the closest. This will result in a simpler and faster network installation.

NOTICE

Shipping considerations for wireless products (Lithium Batteries: Green Power Module, model number 701PGNKF):

The unit was shipped to you without the Power Module installed. Please remove the Power Module prior to shipping the unit.

Each Power Module contains one "D" size primary lithium-thionyl chloride battery. Primary lithium batteries are regulated in transportation by the U. S. Department of Transportation, and are also covered by IATA (International Air Transport Association), ICAO (International Civil Aviation Organization), and ARD (European Ground Transportation of Dangerous Goods). It is the responsibility of the shipper to ensure compliance with these or any other local requirements. Please consult current regulations and requirements before shipping.

NOTICE

Power Module Considerations:

The power module with the wireless unit contains one "D" size primary lithium-thionyl chloride battery (Green Power Module, model number 701PGNKF). Each battery contains approximately 5.0 grams of lithium. Under normal conditions, the battery materials are self-contained and are not reactive as long as the batteries and the pack integrity are maintained. Care should be taken to prevent thermal, electrical or mechanical damage. Contacts should be protected to prevent premature discharge.

Battery hazards remain when cells are discharged.
Power Modules should be stored in a clean and dry area. For maximum Power Module life, storage temperature should not exceed 30 °C.

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Section 1 Introduction

1.1 Using this manual

The sections in this manual provide information on installing, operating, and maintaining the Rosemount 248 Wireless temperature transmitter with *Wireless*HART® protocol. The sections are organized as follows:

- Section 2: Configuration provides instruction on commissioning and operating 248 Wireless transmitters. Information on software functions, configuration parameters, and on line variables is also included.
- Section 3: Installation contains mechanical and electrical installation instructions.
- Section 4: Commissioning contains techniques for properly commissioning the device.
- Section 5: Operation and Maintenance contains operation and maintenance techniques.
- Section 6: Troubleshooting provides troubleshooting techniques for the most common operating problems.
- Appendix A: Specifications and Reference Data supplies reference and specification data, as well as ordering information.
- Appendix B: Product Certifications contains approval information.
- Appendix C: Mapping for non-DD based Integration with Host Systems

Rosemount 248 Wireless Transmitter

Features of the Rosemount 248 Wireless include:

- An installation-ready solution that provides a variety of mounting options, transmitter configurations, and sensors/thermowells
- Flexibility to meet your most demanding applications
- Wireless output with >99% data reliability delivers rich HART data, protected by industry leading security
- Simple and easy installation practices already used today for robust installations

Refer to the following literatures for a full range of compatible connection heads, sensors, and thermowells provided by Emerson Process Management.

- English Temperature Sensors and Assemblies Product Data Sheet, Volume 1 (document number 00813-0100-2654)
- Temperature Sensors and Accessories (Metric Sensors) Product Data Sheet, Volume 2 (document number 00813-0200-2654)

1.2 Safety messages

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

1.2.1 Warnings

⚠ WARNING

Failure to follow these installation guidelines could result in death or serious injury.

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury.

- Before connecting a Field Communicator in an explosive atmosphere, make sure the instruments are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

Process leaks could result in death or serious injury.

- Do not remove the thermowell while in operation.
- Install and tighten thermowells and sensors before applying pressure

Electrical shock could cause death or serious injury.

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions.

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operations.
- This device must be installed to ensure a minimum antenna separation distance of 20 cm from all person.

The Power Module may be replaced in a hazardous area. The Power Module has surface resistivity greater than one gigaohm and must be properly installed in the wireless device enclosure. Care must be taken during transportation to and from the point of installation to prevent electrostatic charge build-up.

1.3 Considerations

1.3.1 General

Electrical temperature sensors such as RTDs and thermocouples produce low-level signals proportional to their sensed temperature. With simple HART configuration, the Rosemount 248 Wireless converts the low-level sensor signal to a wireless-enabled signal.

1.3.2 Commissioning

The transmitter can be commissioned before or after installation. It may be useful to commission it on the bench, before installation, to ensure proper operation and to become familiar with its functionality. When applicable, make sure the instruments are installed in accordance with intrinsically safe or non-incendive field wiring practices. The device will be powered whenever the power module is installed. To avoid depleting the Power Module, make sure it is removed when the device is not in use.

Power up sequence

The Power Module should not be installed on any wireless device until the Smart Wireless Gateway is installed and functioning properly. This transmitter uses the Green Power Module (order model number 701PGNKF). Wireless devices should also be powered up in order of proximity from the Smart Wireless Gateway, beginning with the closest. This will result in a simpler and faster network installation. Enable Active Advertising on the Gateway to ensure that new devices join the network faster. For more information, see the Smart Wireless Gateway Manual (Doc. No. 00809-0200-4420).

Internal antenna position

The internal antenna is designed for multiple mounting orientations. The transmitter should be mounted according to best practices for your temperature measurement application. The antenna should be approximately 3 ft (1 m) from any large structure or building to allow clear communication to other devices.

Network design best practices

When mounting the device, recommended practices should be considered to achieve the best wireless performance. See “Mounting” on page 23 for more information on recommended practices.

Field Communicator connections

The Power Module needs to be installed in the device for the Field Communicator to interface with the Rosemount 248 Wireless Temperature Transmitter. The Field Communicator connections are located on the Power Module. To communicate to the transmitter, connect the Field Communicator to the COMM port connections on the Power Module. This transmitter uses the Green Power Module; please order model number 701PGNKF. Field communication with this device requires a HART-based Field Communicator using the correct Rosemount 248 Wireless DD. The Power Module is keyed and can only be inserted in one orientation. Refer to Figure 3-1 for instructions on connecting the Field Communicator to the 248.

1.3.3 Mechanical

Location

When choosing an installation location and position, take into account the need for access to the mesh network, access to the transmitter and to the power module compartment for ease power module replacement.

Electronics cover

The electronics cover is tightened so that polymer contacts polymer. When removing the electronics cover, ensure that there is no damage done to the o-ring. If damaged replace before reattaching cover, ensuring polymer contacts polymer (i.e. no o-ring visible).

1.3.4 Electrical

Power Module

The Rosemount 248 Wireless Temperature transmitter is self-powered. The Power Module contains a primary lithium-thionyl chloride battery (Green Power Module, model number 701PGNKF). Each battery contains approximately 5 grams of lithium. Under normal conditions, the battery materials are self-contained and are not reactive as long as the battery and the Power Module are maintained. Care should be taken to prevent thermal, electrical, or mechanical damage. Contacts should be protected to prevent premature discharge.

⚠ Use caution when handling the power module, it may be damaged if dropped from heights in excess of 20 feet.

Battery hazards remain when cells are discharged.

Power Modules should be stored in a clean and dry area. For maximum Power Module life, storage temperature should not exceed 30 °C.

Sensor

Make sensor connections with the threaded $^{1}/_{2}$-inch. NPT connection sensor adapter.

1.3.5 Environmental

Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

Temperature effects

The transmitter will operate within specifications for ambient temperatures between –40 and 185 °F (–40 and 85 °C). Heat from the process is transferred from the thermowell to the transmitter housing. If the expected process temperature is near or beyond specification limits, consider the use of additional thermowell and extension, or remote mounting the transmitter to thermally isolate it from the process.

Temperature limits

Operating limit	Storage limit
–40 to 185 °F	–40 to 185 °F
–40 to 85 °C	–40 to 85 °C

1.4 Service support

To expedite the return process outside of the United States, contact the nearest Emerson Process Management representative.

Within the United States, call the Emerson Process Management Instrument and Valves Response Center using the 1-800-654-RSMT (7768) toll-free number. This center, available 24 hours a day, will assist you with any needed information or materials.

The center will ask for the following information:

- Product model
- Serial numbers
- The last process material to which the product was exposed

The center will provide:

- A Return Material Authorization (RMA) number
- Instructions and procedures that are necessary to return goods that were exposed to hazardous substances

⚠ CAUTION

Individuals who handle products exposed to a hazardous substance can avoid injury if they are informed of and understand the hazard. If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.

Note
If the device has been exposed to a hazardous substance, a Material Safety Data Sheet (MSDS) must be included with the returned materials. An MSDS is required by law to be available to people exposed to specific hazardous substances.

NOTICE

Shipping considerations for wireless products (Lithium Batteries: Green Power Module, model number 701PGNKF):

The unit was shipped to you without the Power Module installed. Please remove the Power Module prior to shipping the unit.

Each power module contains a primary lithium-thionyl chloride battery. Primary lithium batteries are regulated in transportation by the U. S. Department of Transportation, and are also covered by IATA (International Air Transport Association), ICAO (International Civil Aviation Organization), and ARD (European Ground Transportation of Dangerous Goods). It is the responsibility of the shipper to ensure compliance with these or any other local requirements. Please consult current regulations and requirements before shipping.

1.5 Product recycling/disposal

Recycling of equipment and packaging should be taken into consideration and disposed of in accordance with local and national legislation/regulations.

Section 2 Configuration

2.1 Overview

This section contains information on configuration and verification that should be performed prior to installation.

Field Communicator and AMS instructions are given to perform configuration functions. For convenience, Field Communicator fast key sequences are labeled “Fast Keys” for each software function below the appropriate headings.

Sensor Input Trim example

Fast Key sequence	1, 2, 3, etc.

2.2 Safety messages

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

Electrical grounds are indicated on drawings by a ground symbol (⚠). Always follow proper grounding practices.

2.2.1 Warnings

⚠ WARNING

Failure to follow these installation guidelines could result in death or serious injury.

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury.

- Before connecting a Field Communicator in an explosive atmosphere, make sure the instruments are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

Process leaks could result in death or serious injury.

- Do not remove the thermowell while in operation.
- Install and tighten thermowells and sensors before applying pressure

Electrical shock could cause death or serious injury.

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This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.
- This device must be installed to ensure a minimum antenna separation distance of 20 cm from all persons.
- The Power Module may be replaced in a hazardous area. The Power Module has surface resistivity greater than one gigaohm and must be properly installed in the wireless device enclosure. Care must be taken during transportation to and from the point of installation to prevent electrostatic charge build-up.

2.3 Sensor connections

The 248 Wireless is compatible with a number of RTD and thermocouple sensor types. Figure 2-1 shows the correct input connections to the sensor terminals on the transmitter. To ensure a proper sensor connection, anchor the sensor lead wires into the appropriate compression terminals and tighten the screws.

Thermocouple or Millivolts inputs

The thermocouple can be connected directly to the transmitter. Use appropriate thermocouple extension wire if mounting the transmitter remotely from the sensor.

RTD or Ohm inputs

The transmitters will accept a variety of RTD or ohmic configurations, including 2-wire, 3-wire or 4-wire connections. If the transmitter is mounted remotely from a 3-wire or 4-wire RTD, it will operate within specifications, without recalibration, for lead wire resistances of up to 5 ohms per lead (equivalent to 500 feet of 20 AWG wire). In this case, the leads between the RTD and transmitter should be shielded. If using a 2-wire connection, both RTD leads are in series with the sensor element, so significant errors can occur if the lead lengths exceed three feet of 20 AWG wire (approximately 0.05 °C/ft.). For longer runs, attach a third or fourth lead to achieve a 3-wire or 4-wire connection as described above.

Effect-RTD input

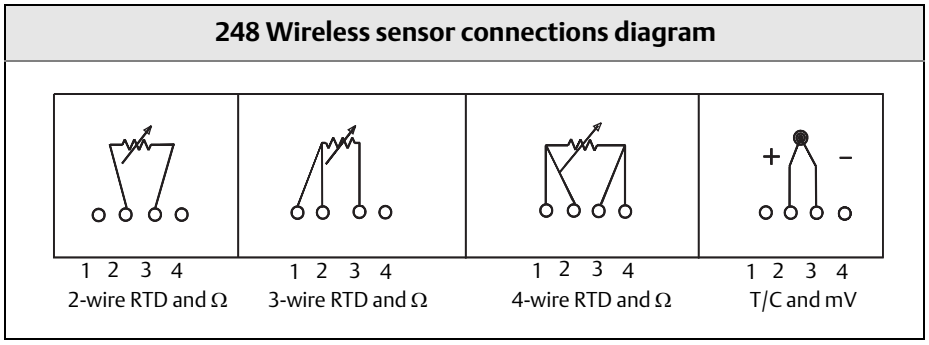
Since the lead wires are part of the RTD circuit, the lead wire resistance needs to be compensated for to achieve the best accuracy. This becomes especially critical in applications where long sensor and/or lead wires are used. There are three lead wire configurations commonly available. In a two-wire configuration there can be no compensation for lead wire resistance since the lead wires are in series with the element and appear to the transmitter as part of the sensor's resistance causing inherent accuracy degradation. In a three-wire configuration, compensation is accomplished using the third wire with the assumption that it will be the same resistance as the other two wires and the same compensation is applied to all three wires. A four-wire design is ideal because the lead wire resistance is inconsequential to the measurement. It uses a measurement technique where a very small constant current of about 150 micro amps is applied to the sensor through two leads and the voltage developed across the sensor is measured over the other two wires with a high-impedance and high resolution measuring circuit. In accordance with Ohm's Law, the high impedance virtually eliminates any current flow in the voltage measurement leads and therefore the resistance of the leads is not a factor.

Table 2-1. Examples of Approximate Basic Error

Sensor input	Approximate basic error
4-wire RTD	Negligible(1)
3-wire RTD	Error in reading is equivalent to unbalanced lead wire resistance(2)
2-wire RTD	Error in reading is equivalent to total lead wire resistance

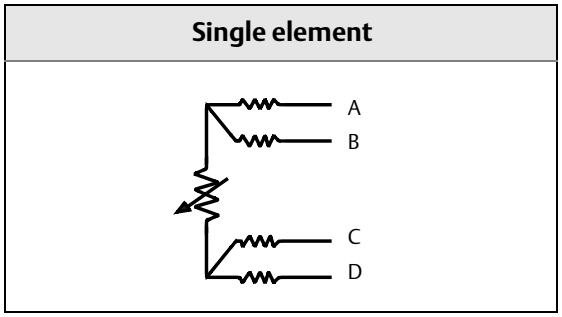
(1) Independent of lead wire resistance up to 5Ω per lead.
(2) Unbalanced lead wire resistance is the maximum resistance differences between any two leads.

Figure 2-1. Sensor Wiring Diagrams



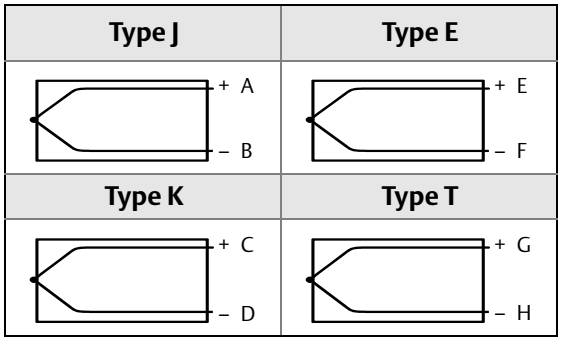
Note
Emerson Process Management provides 4-wire sensors for all single element RTDs. Use these RTDs in 3-wire or 2-wire configurations by leaving the unneeded leads disconnected and insulated with electrical tape.

Figure 2-2. Rosemount 65, 68Q, 78 Standard and High Temp, 58C and 68 RTD Lead Wire Configurations



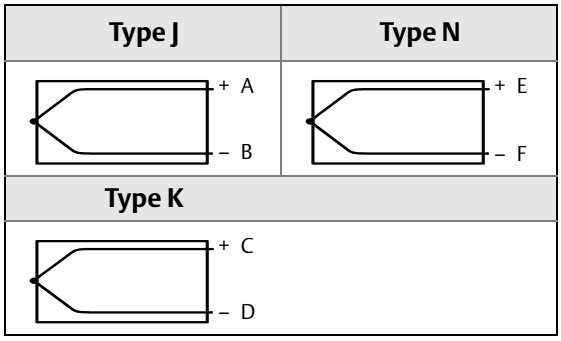
A. White (1)
B. White (2)
C. Red (3)
D. Red (4)

Figure 2-3. Rosemount 183 Thermocouple Lead Wire Configuration



A. White (2)
B. Red (3)
C. Yellow (2)
D. Red (3)
E. Purple (2)
F. Red (3)
G. Blue (2)
H. Red (3)

Figure 2-4. Rosemount 185 Thermocouple Lead Wire Configurations



A. Black (2)
B. White (3)
C. Green (2)
D. White (3)
E. Red (2)
F. White (3)

Note
Wire color examples apply to Rosemount sensors, but will vary by manufacturer.

Sensor leads

⚠ If the sensor is installed in a high-voltage environment and a fault condition or installation error occurs, the sensor leads and transmitter terminals could carry lethal voltages. Use extreme caution when making contact with the leads and terminals.

Use the following steps to wire the sensor and supply power to the transmitter:

1. Remove the transmitter enclosure cover (if applicable).
2. Attach the sensor leads according to the wiring diagrams.
3. Connect the Power Module.
4. Verify the connection.
5. Reattach and tighten the cover (if applicable).

2.4 Bench top configuration

Bench top configuration requires a Field Communicator, AMS, or any *Wireless*HART Communicator. Connect the Field Communicator leads to the terminals labeled "*COMM*" on the Power Module.

Bench top configuration consists of testing the transmitter and verifying transmitter configuration data. 248 Wireless transmitters must be configured before installation. Configuring the transmitter on the bench before installation using a Field Communicator, AMS, or any *Wireless*HART Communicator ensures that all network settings are working correctly.

When using a Field Communicator, any configuration changes made must be sent to the transmitter by using the **Send** key (**F2**). AMS configuration changes are implemented when the **Apply** button is clicked.

Field Communicator

If performing device configuration directly, connect the bench equipment and turn on the Field Communicator by pressing the **ON/OFF** key. When using a Field Communicator, any configuration changes must be sent to the transmitter by using the **Send** key (**F2**).

The Field Communicator will search for a HART-compatible device and indicate when the connection is made. If the Field Communicator fails to connect, it will indicate that no device was found. If this occurs, refer to Section 6: Troubleshooting.

AMS™ Device Manager and AMS Wireless Configurator

When configuring the Rosemount 248 Wireless using AMS Device Manager or AMS Wireless Configurator, double click the **Rosemount 248 Wireless device** icon (or right click and select **Con/Setup**), then choose the *Configure Menu*. AMS configuration changes are implemented when the **Apply** button is clicked.

During direct connection configuration, AMS will search for a HART-compatible device and indicate when the connection is made. If AMS fails to connect, it indicates that no device was found. If this occurs, refer to Section 6: Troubleshooting.

Emerson Smart Wireless Gateway

The Rosemount 248 Wireless supports limited remote configuration through the Smart Wireless Gateway. The Gateway allows configuration of the following device parameters: HART Tag, Short Tag, Descriptor, Engineering Units, Update Rate and Range Values.

Device sensor configuration

Every temperature sensor has unique characteristics. In order to ensure the most accurate measurement, the Rosemount 248 Wireless should be configured to match the specific sensor that it will be connected to. Prior to installation, verify the configuration and connection settings of the temperature sensor through a Field Communicator or AMS.

Default settings

The Rosemount 248 Wireless default configuration is shown below:

Sensor Type	Pt 100 (α = 0.00385)
Engineering Units	°C
Number of Lead Wires	4
Network ID	Factory Generated Network Parameters
Join Key	Factory Generated Network Parameters
Update Rate	1 Minute

Note
The C1 option code can be used to enable factory configuration of the Update Rate, Date, Descriptor and Message fields. This code is not required to have the factory configure the Sensor Type, Connection or the Self Organizing Network parameters.

2.5 Device network configuration

2.5.1 Join to network

Fast Keys	2, 1, 1

In order to communicate with the Smart Wireless Gateway, and ultimately the Host System, the transmitter must be configured to communicate over the wireless network. This step is the wireless equivalent of connecting wires from a transmitter to the host system.

1. From the *Home* screen, choose **2: Configure**.
2. Choose **1: Guided Setup**.
3. Choose **1: Join to Network**.

Using a Field Communicator or AMS to communicate with the transmitter, enter the Network ID and Join Key so they match the Network ID and Join Key of the Smart Wireless Gateway and the other devices in the network. If the Network ID and Join Key are not identical to those set in the Gateway, the transmitter will not communicate with the network. The Network ID and Join Key may be obtained from the Smart Wireless Gateway on the **Setup**>**Network**>**Settings** page on the web server.

2.5.2 Configure update rate

Fast Keys	2, 1, 2

The Update Rate is the frequency at which a new measurement is taken and transmitted over the wireless network. This by default is 1 minute. This may be changed at commissioning, or at any time via AMS. The Update Rate is user selectable from 1 second to 60 minutes.

1. From the *Home* screen, choose **2: Configure**.
2. Choose **1: Guided Setup**.
3. Choose **2: Configure Update Rate**.

When device configuration is completed, remove the Power Module and replace the housing cover.

2.5.3 HART menu tree

Figure 2-5. Field Communicator Menu Tree: Overview

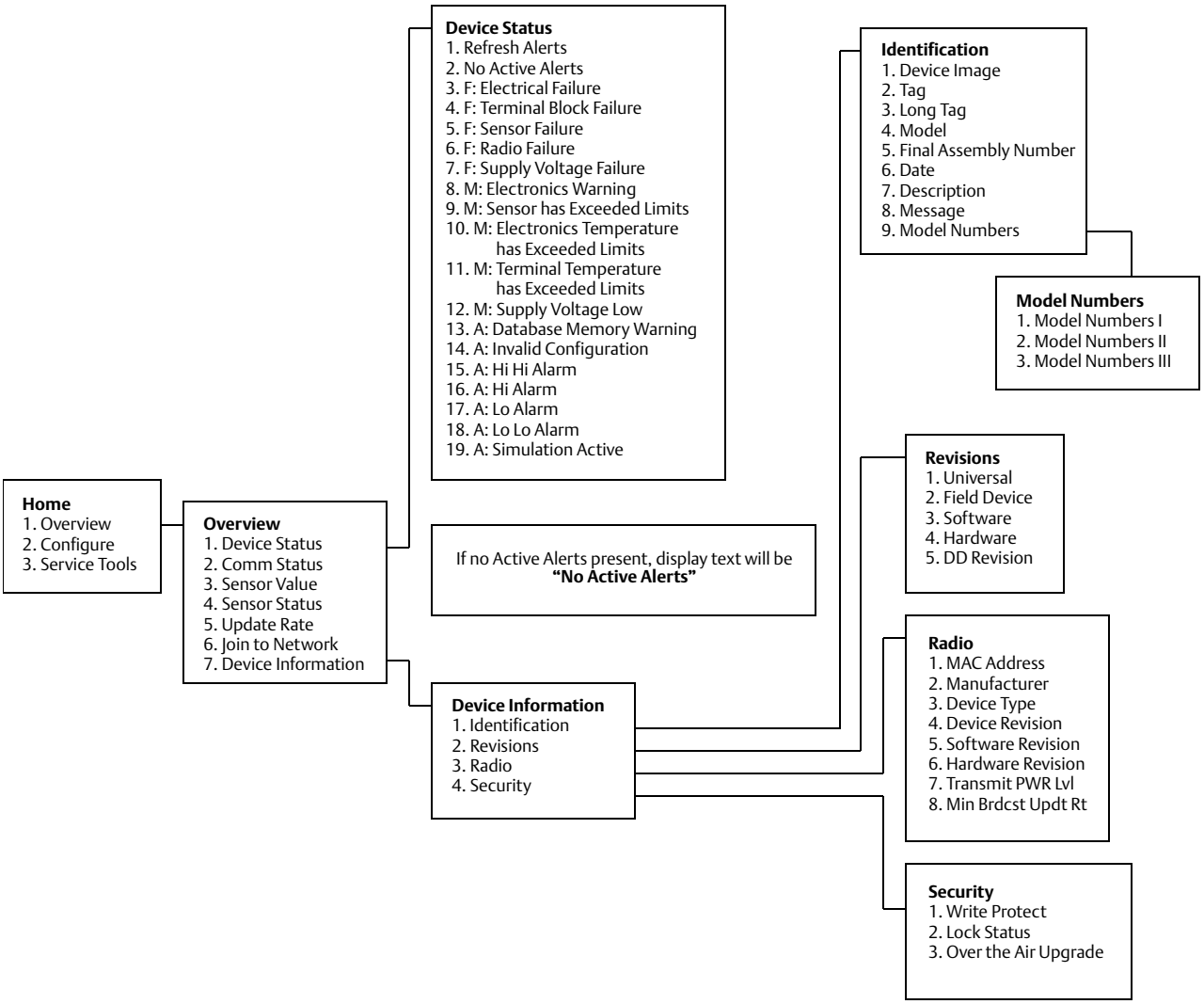


Figure 2-6. Field Communicator Menu Tree: Configure

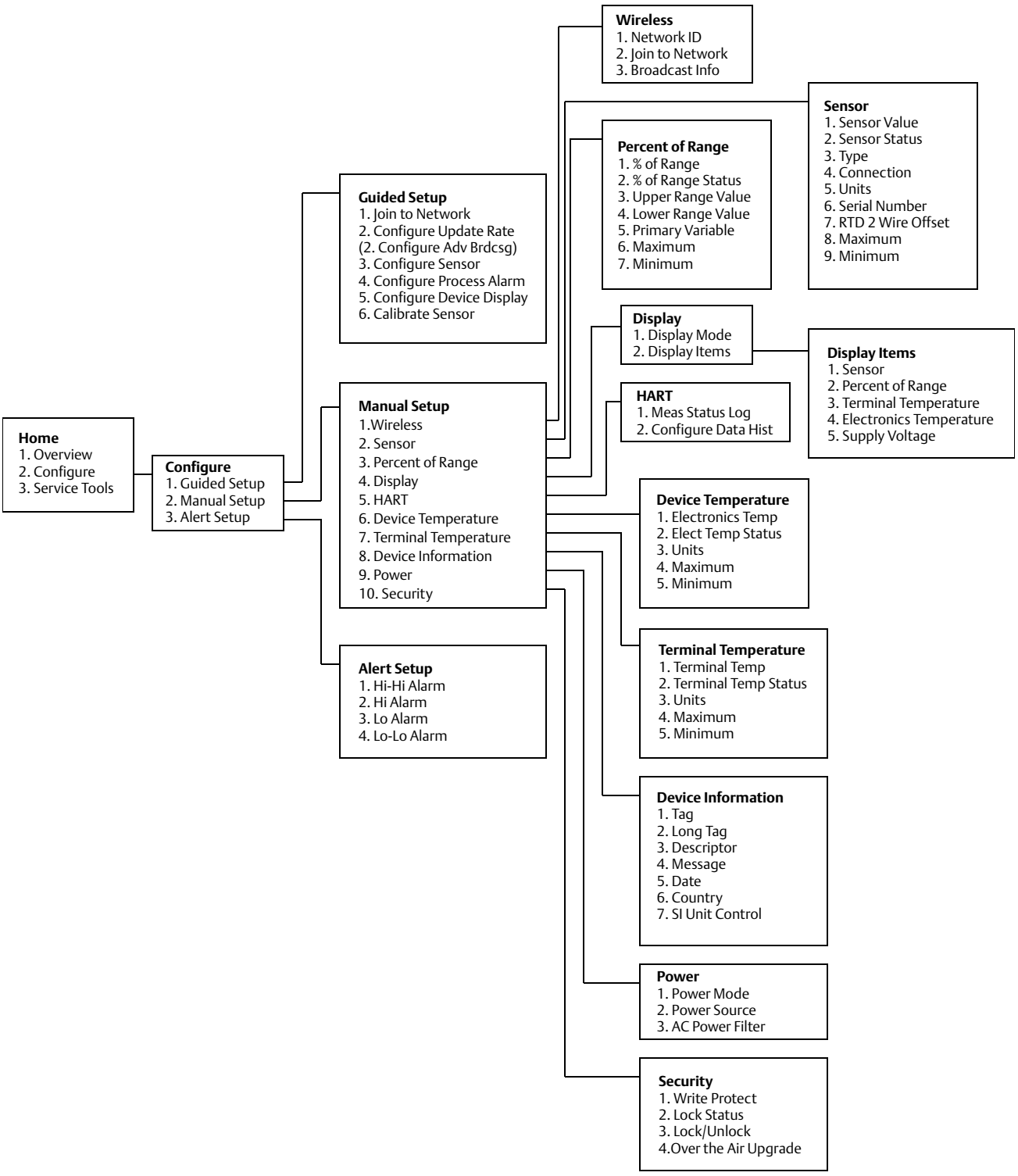
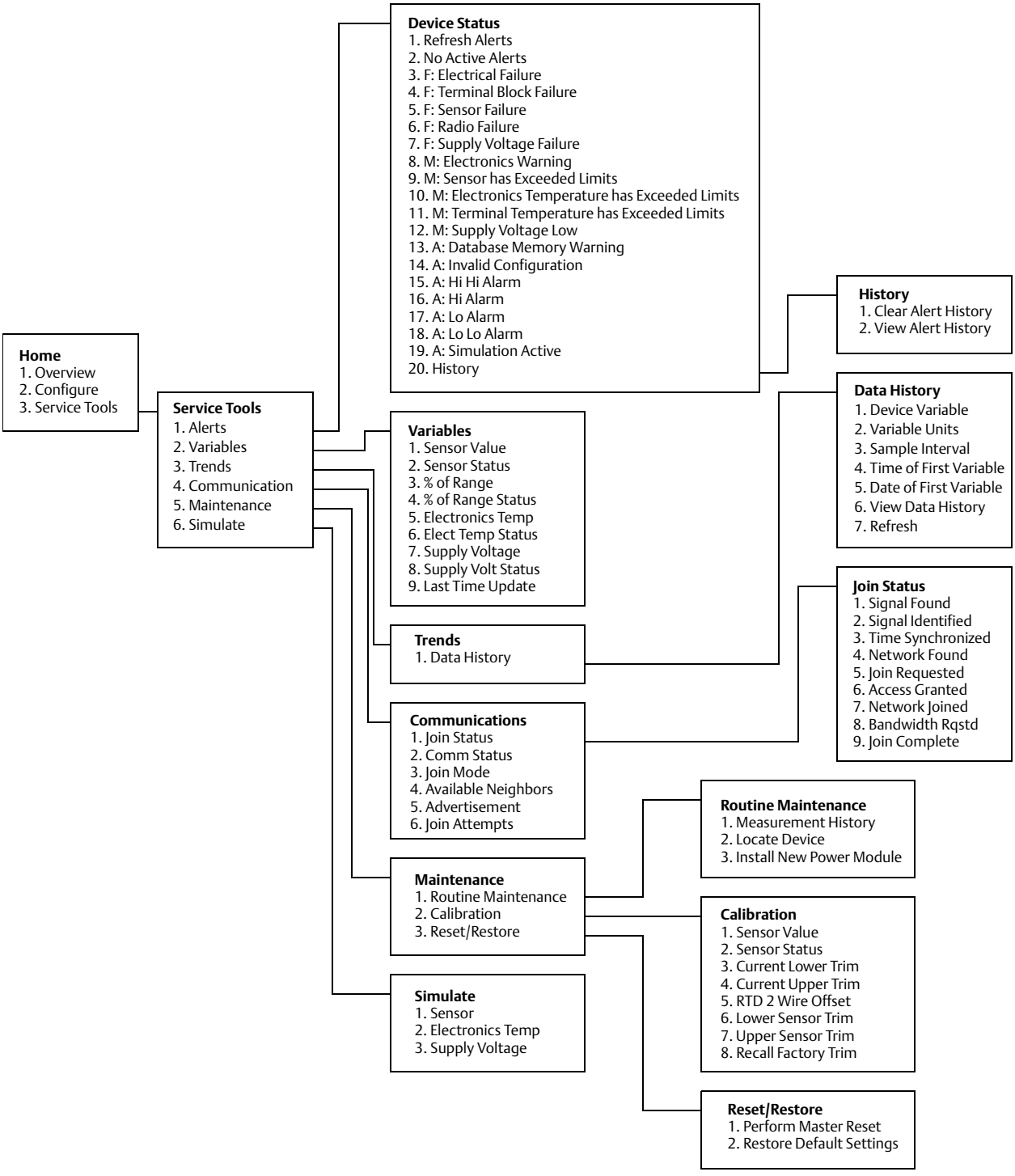


Figure 2-7. Field Communicators Menu Tree: Service Tools



2.5.4 Fast Key sequence

Table 2-2 lists the fast key sequences for common transmitter functions.

Note
The fast key sequences assume that DD Dev v1, DD v1 is being used.

Table 2-2. Rosemount 248 Wireless fast key sequence

Function	Key sequence	Menu items
Device Information	1, 7	Identification, Revisions, Radio, Security
PV Range Values	2, 2, 3	PV LRV, PV URV, LSL, USL
Lower Range Value	2, 2, 3, 4	Set the temperature for the 0% point to configure the Percent of Range
Upper Range Value	2, 2, 3, 3	Set the temperature for the 100% point to configure the Percent of Range
Sensor Trim (Calibration)	2, 1, 6, 1	Lower Sensor Trim, and Upper Sensor Trim
Wireless Network	2, 2, 1	Network ID, Join to Network, Broadcast Info
Sensor Configuration	2, 1, 3	Configure Sensor Type and Units, View Current Sensor Configuration

2.5.5 Calibration

Calibrating the transmitter increases the measurement precision by allowing corrections to be made to the factory-stored characterization curve by digitally altering the transmitter's interpretation of the sensor input.

To understand calibration, it is necessary to understand that smart transmitters operate differently from analog transmitters. An important difference is that smart transmitters are factory-characterized, meaning that they are shipped with a standard sensor curve stored in the transmitter firmware. In operation, the transmitter uses this information to produce a process variable output, in engineering units, dependent on the sensor input.

Calibration of the 248 Wireless may include the following procedure:

- Sensor Input Trim: Digitally alter the transmitter's interpretation of the input signal

Trim the transmitter

The Sensor Input Trim function may be used when calibrating.

Sensor calibration

Fast Keys	3, 5, 2

Perform a sensor trim if the transmitters digital value for the primary variable does not match the plant's standard calibration equipment. The sensor trim function calibrates the sensor to the transmitter in temperature units or raw units. Unless your site-standard input source is NIST-traceable, the trim functions will not maintain the NIST-traceability of the system.

The *Sensor Input Trim* command allows the transmitter's interpretation of the input signal to be digitally altered. The sensor reference command trims, in engineering(°F, °C,°R, K) or raw(Ω, mV) units, the combined sensor and transmitter system to a site standard using a known temperature source. Sensor trimming is suitable for validation procedures or for applications that require calibrating the sensor and transmitter together.

Use the following procedure to perform a sensor trim with a 248 Wireless:

1. Connect the calibration device or sensor to the transmitter. Refer to Figure 2-1 on page 10 or on the device terminal block for sensor wiring diagrams.
2. Connect the communicator to the transmitter.
3. From the *Home* screen, select **Service Tools, Maintenance, Calibration** to prepare to trim the sensor.
4. Select **6 Lower Sensor Trim** or **7 Upper Sensor Trim**.

Note
It is recommended to perform lower offset trims first, before performing upper slope trims.

5. Answer the question about configuring device for steady state sensor drive.
6. Select the appropriate sensor trim units at the prompt.
7. Adjust the calibration device to the desired trim value (must be within the selected sensor limits). If a combined sensor and transmitter system are being trimmed, expose the sensor to a known temperature and allow the temperature reading to stabilize. Use a bath, furnace or isothermal block, measured with a site-standard thermometer, as the known temperature source.
8. Select **OK** once the temperature stabilizes. The communicator displays the output value the transmitter associates with the input value provided by the calibration device.
9. Accept new calibration.

AMS

For AMS, configure the sensor as indicated above.

1. From the *Overview* screen choose the **Calibrate** button.
2. Choose **Lower Input Trim** or **Upper Limit Trim**.
3. The wizard will continue through the process.
4. The transmitter may be restored to the factory default by choosing: **Service Tools>Maintenance>Sensor Calibration>Recall Factory Trim**.
5. The *wizard* will revert the transmitter to the factory trim for a given sensor.
6. Apply changes.

2.6 Remove power module

After the sensor and network have been configured, remove the Power Module and replace the module cover. The Power Module should be inserted only when the device is ready to be commissioned. Use caution when handling the Power Module.

Section 3 Installation

3.1 Safety messages

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

3.1.1 Warnings

⚠ WARNING

Failure to follow these installation guidelines could result in death or serious injury:

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury:

- Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approvals section of the 248 reference manual for any restrictions associated with a safe installation.
- Before connecting a Field Communicator in an explosive atmosphere, ensure the instruments are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

Process leaks may cause harm or result in death.

- Do not remove the thermowells while in operation.
- Install and tighten thermowells and sensors before applying pressure.

Electrical shock can result in death or serious injury.

Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

⚠ WARNING

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.
- This device must be installed to ensure a minimum antenna separation distance of 20 cm from all persons.

The Power Module may be replaced in a hazardous area. The Power Module has surface resistivity greater than one gigaohm and must be properly installed in the wireless device enclosure. Care must be taken during transportation to and from the point of installation to prevent electrostatic charge build-up.

3.2 Wireless consideration

3.2.1 Power up sequence

The Rosemount 248 Wireless and all other devices should be installed only after the Smart Wireless Gateway (“Gateway”) has been installed and is functioning properly. Wireless devices should also be powered up in order of proximity from the Gateway, beginning with the closest. This will result in a simpler and faster network installation. Enable Active Advertising on the Gateway to ensure that new devices join the network faster. For more information see the Emerson Smart Wireless Gateway Manual (Doc. No. 00809-0200-4420).

3.2.2 Internal antenna position

The internal antenna is designed for multiple mounting orientations. The transmitter should be mounted according to best practices for your temperature measurement application. The antenna should be approximately 3 ft (1 m) from any large structure or building to allow clear communication to other devices.

3.3 Field Communicator connections

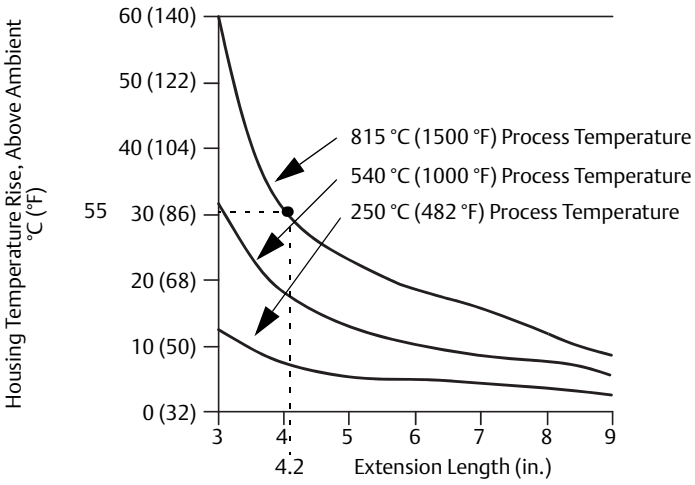
In order for the Field Communicator to interface with the Rosemount 248 Wireless Transmitter, the Power Module must be connected. Refer to Figure 3-1 for a diagram on how to connect the Field Communicator.

3.4 Mounting

The Rosemount 248 Wireless can be installed in one of two configurations: Direct Mount, where the sensor is connected directly to the 248 Wireless housing's conduit entry, or Remote Mount, where the sensor is mounted separate from the 248 Wireless housing, then connected to the 248 Wireless via conduit. Choose the installation sequence that corresponds to the mounting configuration.

Figure 3-1 provides an example of the relationship between transmitter housing temperature rise and extension length.

Figure 3-1. 248 Wireless Transmitter Temperature Rise vs. Extension Length



Example

The transmitter specification limit is 85 °C. If the ambient temperature is 55 °C and the max process temperature to be measured is 815 °C, the maximum permissible temperature rise is the transmitter specification limit minus the ambient temperature (moves 85 to 55 °C), or 30 °C.

In this case, an extension of 5-in. meets this requirement, but 6-in. provides an additional margin of thermowells protection, thereby reducing risk of ambient thermal damage.

3.5 Physical installation

The Rosemount 248 Wireless can be installed in one of two configurations: Direct Mount, where the thermocouple or sensor is connected directly to the 248 Wireless housing's conduit entry, or Remote Mount, where the thermocouple or sensor is mounted separate from the 248 Wireless housing, then connected to the 248 Wireless via conduit. Choose the installation sequence that corresponds to the mounting configuration.

Upon installation of the 248 Wireless, ensure that the conduit entry has an installed conduit fitting or cable gland with approved thread sealant.

3.5.1 Direct mount

The direct mount installation should not be used when installing with a Swagelok® fitting.

1. Install the sensor according to standard installation practices. Be sure to use an approved thread sealant on all connections.
2. Attach the 248 Wireless housing to the sensor using the threaded conduit entry.
3. Attach the sensor wiring to the terminals as indicated on the wiring diagram.
4. Connect the Green Power Module.

Note
Wireless devices should be powered up in order of proximity from the Smart Wireless Gateway, beginning with the closest device to the Gateway. This will result in a simpler and faster network installation.

5. Provide 1.75 in. (45 mm) of clearance for units without an LCD display. Three inches of clearance is required for cover removal if a meter is installed.
6. Always ensure a proper seal by installing the electronics housing cover(s) so that polymer contacts polymer (i.e. no o-ring visible). Use Rosemount O-rings.

3.5.2 Remote mount

1. Install the sensor according to standard installation practices. Be sure to use an approved thread sealant on all connections.
2. Run wiring (and conduit, if necessary) from the sensor to the 248 Wireless.
3. Pull the wiring through the threaded conduit entry of the 248 Wireless.
4. Attach the sensor wiring to the terminals as indicated on the wiring diagram.
5. Connect the Green Power Module.

Note
Wireless devices should be powered up in order of proximity from the Smart Wireless Gateway, beginning with the closest device to the Gateway. This will result in a simpler and faster network installation.

6. Provide 1.75 in. (45 mm) of clearance for units without an LCD display. Three inches of clearance is required for cover removal if a meter is installed.
7. Always ensure a proper seal by installing the electronics housing cover(s) so that polymer contacts polymer (i.e. no o-ring visible). Use Rosemount O-rings.

Section 4 Commissioning

4.1 Safety messages

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

4.1.1 Warnings

⚠ WARNING

Failure to follow these installation guidelines could result in death or serious injury:

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury:

- Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approvals section of the 248 reference manual for any restrictions associated with a safe installation.
- Before connecting a Field Communicator in an explosive atmosphere, ensure the instruments are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

Process leaks may cause harm or result in death.

- Do not remove the thermowells while in operation.
- Install and tighten thermowells and sensors before applying pressure.

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

⚠ WARNING

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.
- This device must be installed to ensure a minimum antenna separation distance of 20 cm from all persons.

The Power Module may be replaced in a hazardous area. The Power Module has surface resistivity greater than one gigaohm and must be properly installed in the wireless device enclosure. Care must be taken during transportation to and from the point of installation to prevent electrostatic charge build-up.

Note
The Rosemount 248 Wireless and all other wireless devices should be installed only after the Smart Wireless Gateway has been installed and is functioning properly.
Wireless devices should also be powered up in order of proximity from the Smart Wireless Gateway, beginning with the closest device to the Gateway. This will result in a simpler and faster network installation.

4.2 Verify operations

Operation can be verified in three locations: by using the Field Communicator, at the Smart Wireless Gateway's integrated web interface or via AMS™ Wireless Configurator.

4.2.1 Field Communicator

To verify operation using a Field Communicator, refer to the Fast Key Sequence in Table 4-1. Select the Communication Status parameter to verify operation. For connecting a 248 Wireless to a Field Communicator, refer to Figure 3-1 on page 23.

Table 4-1. 248 Wireless fast key sequence

Function	Key sequence	Menu items
Communications	3, 4	Join Status, Comm Status, Join Mode, Available Neighbors, Advertisement, Join Attempts

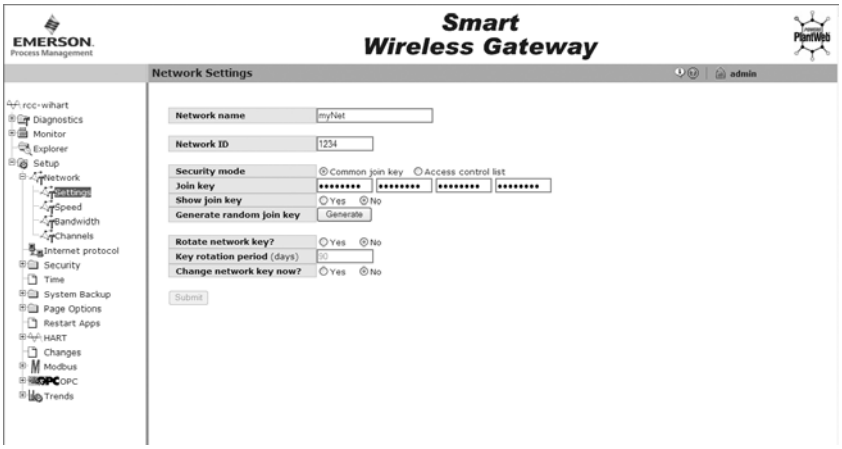
4.2.2 Emerson Smart Wireless Gateway

In the integrated web interface from the Gateway, navigate to the Explorer>Status page. This page shows whether the device has joined the network and if it is communicating properly.

Note
It may take several minutes for the device to join the network.

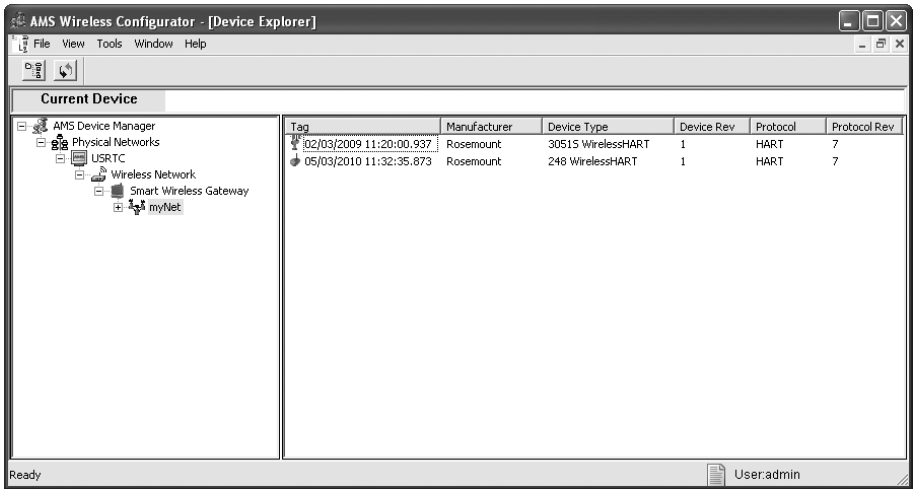
Note
If the device joins the network and immediately has an alarm present, it is likely due to sensor configuration. Check the sensor wiring (see "Rosemount 248 Wireless Terminal Diagram" on page 28) and the sensor configuration (see "248 Wireless fast key sequence" on page 26).

Figure 4-1. Smart Wireless Gateway Network Settings



4.3 AMS™ Wireless Configurator

When the device has joined the network, it will appear in the Wireless Configurator window as illustrated below.



4.4 Troubleshooting

If the device is not joined to the network after power up, verify the correct configuration of the Network ID and Join Key, and verify that Active Advertising has been enabled on the Smart Wireless Gateway. The Network ID and Join Key in the device must match the Network ID and Join Key of the Gateway.

The Network ID and Join Key may be obtained from the Gateway on the Setup>Network>Settings page on the web server (see Figure 4-1 on page 27). The Network ID and Join Key may be changed in the wireless device by using the following Fast Key sequence.

Function	Key sequence	Menu items
Join Device to Network	2,1,1	Join to Network

4.5 Reference information

Figure 4-2. Rosemount 248 Wireless Terminal Diagram

Waiting for updated drawing.

Note
In order to communicate with a Field Communicator, the device must be powered by connecting the Power Module.

Table 4-2. Rosemount WirelessHART 248 Fast Key Sequences

Function	Key sequence	Menu items
Device Information	2, 2, 5, 3	Manufacturer, Model, Final Assembly Number, Universal, Field Device, Software, Hardware, Descriptor, Message, Date, Model Number I, Model Number II, Model Number III, SI Unit Restriction, Country, Device ID
Guided Setup	2, 1	Join Device to Network, Configure Update Rate, Configure Sensor, Calibrate Sensor
Manual Setup	2, 2	Wireless, Process Sensor, Percent of Range, Device Temperatures, Device Information, Other
Wireless Configuration	2, 2, 1	Network ID, Join Device to Network, Update Rate, Configure Broadcast Power Level, Power Mode, Power Source
Sensor Calibration	3, 4, 1	Current Upper Trim, Current Lower Trim, Lower Sensor Trim, Upper Sensor Trim, Recall Factory Trim, RTD 2 Wire Offset

Section 5 Operation and Maintenance

5.1 Safety messages

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

5.1.1 Warnings

⚠ WARNING

Failure to follow these installation guidelines could result in death or serious injury:

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury:

- Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approvals section of the 248 reference manual for any restrictions associated with a safe installation.
- Before connecting a Field Communicator in an explosive atmosphere, ensure the instruments are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

Process leaks may cause harm or result in death.

- Do not remove the thermowells while in operation.
- Install and tighten thermowells and sensors before applying pressure.

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.
- This device must be installed to ensure a minimum antenna separation distance of 20 cm from all persons.

The Power Module may be replaced in a hazardous area. The Power Module has surface resistivity greater than one gigaohm and must be properly installed in the wireless device enclosure. Care must be taken during transportation to and from the point of installation to prevent electrostatic charge build-up.

5.2 Power module replacement

Expected Power Module life is 10 years at reference conditions.(1)

When Power Module replacement is required, remove the cover and remove the Power Module. Replace the Power Module (part number 701PGNKF) and replace the cover. Tighten to specification and verify operation.

Handling considerations

The power module with the wireless unit contains one “D” size primary lithium-thionyl chloride battery (Green Power Module, model number 701PGNKF). Each battery contains approximately 5.0 grams of lithium. Under normal conditions, the battery materials are self-contained and are not reactive as long as the batteries and the pack integrity are maintained. Care should be taken to prevent thermal, electrical or mechanical damage.

Contacts should be protected to prevent premature discharge.

Power Modules should be stored in a clean and dry area. For maximum Power Module life, storage temperature should not exceed 30 °C.

Use caution when handling the power module, it may be damaged if dropped from heights in excess of 20 feet.

⚠ Battery hazards remain when cells are discharged.

Environmental considerations

As with any battery, local environmental rules and regulations should be consulted for proper management of spent batteries. If no specific requirements exist, recycling through a qualified re-cycler is encouraged. Consult the materials safety data sheet for battery specific information.

Shipping considerations

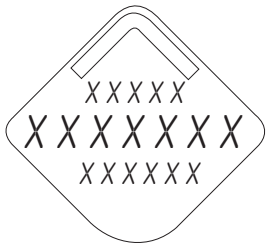
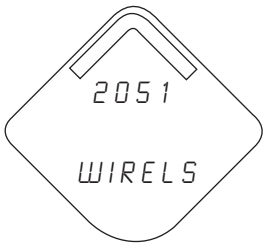
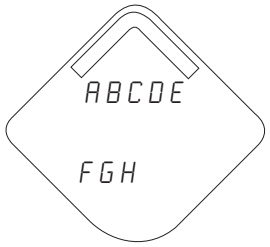
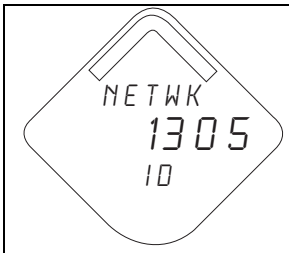
The unit was shipped to you without the Power Module installed. Please remove the Power Module prior to shipping the unit.

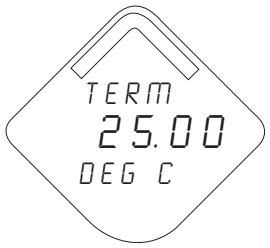
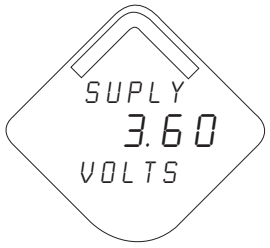
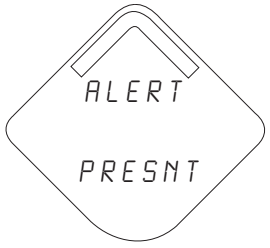
(1) Reference conditions are 70° F (21° C), transmit rate of once per minute, and routing data for three additional network devices.

5.3 LCD screen messages

5.3.1 Startup screen sequence

The following screens will display when the Power Module is first connected to the Rosemount 248 Wireless.

	**All Segments On:** used to visually determine if there are any bad segments on the LCD
	**Device Identification:** used to determine Device Type.
	**Device Information - Tag:** user entered tag which is eight characters long - will not display if all characters are blank
	**Software Revision:** device software revision
	**PV Screen:** process temperature, ohms, or mV value depending on how the device is configured

	**SV Screen:** terminal temperature value
	**TV Screen:** device temperature value
	**QV Screen:** voltage reading at the power supply terminals
	**Percent Range Screen:** percent range reading
	**Alert Screen:** at least one alert is present - this screen will not display if no alerts are present

Note
Use the Rosemount Wireless LCD Part Number: 00753-9004-0002.

Section 6 Troubleshooting

6.1 Overview

Table 6-2 provides summarized maintenance and troubleshooting suggestions for the most common operating problems. If you suspect malfunction despite the absence of any diagnostic messages on the Field Communicator display, follow the procedures described here to verify that transmitter hardware and process connections are in good working order. Always deal with the most likely checkpoints first.

6.2 Safety messages

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

6.2.1 Warnings

⚠ WARNING

Failure to follow these installation guidelines could result in death or serious injury:

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury:

- Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approvals section of the 248 reference manual for any restrictions associated with a safe installation.
- Before connecting a Field Communicator in an explosive atmosphere, ensure the instruments are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

Process leaks may cause harm or result in death.

- Do not remove the thermowells while in operation.
- Install and tighten thermowells and sensors before applying pressure.

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.
- This device must be installed to ensure a minimum antenna separation distance of 20 cm from all persons.
- The Power Module may be replaced in a hazardous area. The Power Module has surface resistivity greater than one gigaohm and must be properly installed in the wireless device enclosure. Care must be taken during transportation to and from the point of installation to prevent electrostatic charge build-up.

Table 6-1. Rosemount 248 Wireless device status information

Device status	Description	Recommended action
Electronics Failure	An electronics error that could impact the device measurement reading has occurred.	1. Reset the device 2. Reconfirm all configuration items in the device 3. If the condition persists, replace the electronics
Terminal Block Failure	A critical failure has occurred in the transmitter's terminal block	1. Reset the device 2. Replace the terminal block
Sensor Failure	The device has detected an open, short, or too much resistance for this sensor.	1. Verify the sensor connection and wiring. Refer to the wiring diagrams found on the terminal compartment to ensure proper wiring. 2. Verify the integrity of the sensor and sensor lead wires. If the sensor is faulty, repair or replace the sensor. 3. Reconfirm sensor configuration 4. Replace the sensor 5. If problem persists, replace the electronics
Radio Failure	The wireless radio has detected a failure or stopped communicating.	1. Reset the device 2. If the condition persists, replace the electronics
Supply Voltage Failure	The supply voltage is too low for the device to broadcast updates.	1. Replace the Power Module
Electronics Warning	The device has detected an electronics error that does not currently impact the device measurement reading.	1. Reset the device 2. Reconfirm all configuration items in the device 3. If the condition persists, replace the electronics
Sensor has Exceeded Limits	The sensor has exceeded the maximum measurement range.	1. Check process for possible saturation condition 2. Verify that the appropriate sensor was chosen for the application 3. Reconfirm sensor configuration 4. Reset the device 5. Replace the sensor
Electronics Temperatures has Exceeded Limits	The electronics temperature has exceeded the transmitter's maximum range.	1. Verify environmental temperature is within the transmitter’s range 2. Remote mount the transmitter away from process and environmental conditions 3. Reset the device 4. If the condition persists, replace the electronics
Terminal Temperature has Exceeded Limits	The terminal temperature has exceed the transmitter's maximum range	1. Verify environmental temperature is within the transmitter’s range 3. Remote mount the transmitter away from process and environmental conditions 4. Reset the device 5. If the condition persists, replace the electronics
Supply Voltage Low	The supply voltage is low and may soon affect broadcast updates	1. Replace the Power Module
Database Memory Warning	The device has failed to write to the database memory. Any data written during this time may have been lost.	1. Reset the device 2. Reconfirm all configuration items in the device 3. If logging dynamic data not needed, this advisory can be safely ignored 4. If the condition persists, replace the electronics
Invalid Configuration	The device has detected a configuration error based on a change to the device.	1. Click on details for more information 2. Correct the parameter that has a configuration error 3. Reset the device 4. If the condition persists, replace the electronics

Table 6-1. Rosemount 248 Wireless device status information

Device status	Description	Recommended action
Simulation Active	The device is in simulation mode and may not be reporting actual information.	1. Verify that simulation is no longer required 2. Disable Simulation mode in Service Tools 3. Reset the device

Table 6-2. Rosemount 248 Wireless troubleshooting

Symptom	Potential source	Recommended action
High Output Temperature Detected	Sensor Input Failure or Connection	Connect a Field Communicator and enter the transmitter test mode to isolate a sensor failure. Check for a sensor open or short circuit. Check the process variable to see if it is out of range.
	Electronics Module	Connect a Field Communicator and enter the transmitter status mode to isolate module failure. Connect a 375 Field Communicator and check the sensor limits to ensure calibration adjustments are within the sensor range.
Digital Temperature Output is Erratic	Wiring	Check sensor wiring integrity at all junctions to insure proper connections.
	Electronics Module	Connect a Field Communicator and enter the transmitter test mode to isolate module failure.
Low Output or No Output	Sensor Element	Connect a Field Communicator and enter the Transmitter test mode to isolate a sensor failure. Check the process variable to see if it is out of range.
	Electronics Module	Connect a Field Communicator and check the sensor limits to ensure calibration adjustments are within the sensor range. Connect a Field Communicator and enter the Transmitter test mode to isolate an electronics module failure.

Table 6-3. Wireless network troubleshooting

Symptom	Recommended action
Device not joining the network	Verify network ID and join key Verify network is in active network advertise Wait longer (30 min.) Check Power Module Verify device is within range of at least one other device Power Cycle device to try again Verify device is configured to join. Ensure the Join Mode is configured to “Join on Powerup or Reset” See troubleshooting section of Smart Wireless Gateway for more information
Short battery life	Check that “Power Always On” mode is off Verify device is not installed in extreme temperatures Verify that device is not a network pinch point Check for excessive network rejoins due to poor connectivity
Limited Bandwidth Error	Reduce the Update Rate on transmitter Increase communication paths by adding more wireless points Check that device has been on line for at least an hour Check that device is not routing through a “limited” routing node Create a new network with an additional Smart Wireless Gateway

Appendix A Specifications and Reference Data

A.1 Specifications

A.1.1 Functional specifications

Input

Supports Thermocouple, RTD, millivolt and ohm input types. See "Accuracy" on page 40 for sensor options.

Output

IEC 62591 (WirelessHART), 2.4 GHz DSSS.

Wireless radio (Internal antenna, WP option)

Frequency: 2.4 - 2.4835 GHz
Channels: 15
Modulation: IEEE 802.15.4 compliant DSSS

Local display

The optional 3-line, 7-digit LCD can display user-selectable information such as primary variable in engineering units, percent of range, and electronics temperature. The display updates based on the wireless update rate.

Humidity limits

0–99% relative humidity

Update rate

*Wireless*HART, User selectable, 1 sec. to 60 min.

Accuracy

(PT 100 @ reference conditions: 20 °C)
±0.45 °C (±0.81 °F)

A.1.2 Physical specifications

Electrical connections

Power Module

Field replaceable, keyed connection eliminates the risk of incorrect installation. Intrinsically Safe Lithium-Thionyl chloride Power Module (Green Power Module, model number 701PGNKF) with PBT/PC enclosure. Ten-year life at one minute update rate.(1)

Reference conditions are 70 °F (21 °C), and routing data for three additional network devices.

Note
Continuous exposure to ambient temperature limits of -40 °F or 185 °F (-40 °C or 85 °C) may reduce specified life by less than 20 percent.

Sensor terminals

Sensor terminals permanently fixed to terminal block.

Field Communicator connections

Communication terminals

HART interface connections fixed to the Power Module.

Materials of construction

Enclosure

Housing

PBT/PC with NEMA 4X and IP66/67

Cover O-ring

Silicone

Terminal Block and Power Module

PBT

Mounting

Transmitters may be attached directly to the sensor. Mounting brackets also permit remote mounting. See “Dimensional drawings” on page 44.

Weight

248 without LCD - 1.31 lb. (0.60 kg)
248 with M5 LCD - 1.43 lb. (0.65 kg)

(1) Reference conditions are 70° F (21° C), transmit rate of once per minute, and routing data for three additional network devices.

Enclosure ratings (Rosemount 248 Wireless)

NEMA 4X and IP66/67

A.1.3 Performance specifications

Conformance to specification (±3σ(Sigma))

Technology leadership, advanced manufacturing techniques, and statistical process control ensure specification conformance to at least ±3σ.

EMC (ElectroMagnetic Compatibility)

The 248 Wireless meets all requirements listed under IEC 61326.

Transmitter measurement stability

The 248 Wireless has a stability of ±0.15% of output reading or 0.15 °C (whichever is greater) for 12 months

Self calibration

The analog-to-digital measurement circuitry automatically self-calibrates for each temperature update by comparing the dynamic measurement to extremely stable and accurate internal reference elements.

Vibration effect

No effect when tested per the requirements of IEC60770-1: High Vibration Level - field or pipeline (10-60 Hz 0.21mm displacement peak amplitude / 60-2000 Hz 3g).

A.1.4 Accuracy

Table A-1. 248x Wireless accuracy

Sensor options	Sensor reference	Input ranges		Digital accuracy[1]	
2-, 3-, 4-wire RTDs		°C	°F	°C	°F
Pt 100 (α = 0.00385)	IEC 751	–200 to 850	–328 to 1562	± 0.45	± 0.81
Pt 200 (α = 0.00385)	IEC 751	–200 to 850	–328 to 1562	± 0.45	± 0.81
Pt 500 (α = 0.00385)	IEC 751	–200 to 850	–328 to 1562	± 0.57	± 1.026
Pt 1000 (α = 0.00385)	IEC 751	–200 to 300	–328 to 572	± 0.57	± 1.026
Pt 100 (α = 0.003916)	JIS 1604	–200 to 645	–328 to 1193	± 0.45	± 0.81
Pt 200 (α = 0.003916)	JIS 1604	–200 to 645	–328 to 1193	± 0.81	± 1.458
Ni 120	Edison Curve No. 7	–70 to 300	–94 to 572	± 0.45	± 0.81
Cu 10	Edison Copper Winding No. 15	–50 to 250	–58 to 482	± 4.16	± 7.488
Pt 50 (α = 0.00391)	GOST 6651-94	–200 to 550	–328 to 990	± 0.9	± 1.62
Pt 100 (α = 0.00391)	GOST 6651-94	–200 to 550	–328 to 990	± 0.45	± 0.81
Cu 50 (α =0.00426)	GOST 6651-94	–50 to 200	-58 to 392	± 1.44	± 2.592
Cu 50 (α = 0.00428)	GOST 6651-94	–185 to 200	-301 to 392	± 1.44	± 2.592
Cu 100 (α = 0.00426)	GOST 6651-94	–50 to 200	-58 to 392	± 0.72	± 1.296
Cu 100 (α = 0.00428)	GOST 6651-94	–185 to 200	–301 to 392	± 0.72	± 1.296
Thermocouples[2]					
Type B[3]	NIST Monograph 175, IEC 584	100 to 1820	212 to 3308	± 2.25	± 4.05
Type E	NIST Monograph 175, IEC 584	–50 to 1000	–58 to 1832	± 0.60	± 1.08
Type J	NIST Monograph 175, IEC 584	–180 to 760	–292 to 1400	± 1.05	± 1.89
Type K[4]	NIST Monograph 175, IEC 584	–180 to 1372	–292 to 2501	± 1.46	± 2.628
Type N	NIST Monograph 175, IEC 584	–200 to 1300	–328 to 2372	± 1.46	± 2.628
Type R	NIST Monograph 175, IEC 584	0 to 1768	32 to 3214	± 2.25	± 4.05
Type S	NIST Monograph 175, IEC 584	0 to 1768	32 to 3214	± 2.1	± 3.78
Type T	NIST Monograph 175, IEC 584	–200 to 400	–328 to 752	± 1.05	± 1.89
DIN Type L	DIN 43710	–200 to 900	–328 to 1652	± 1.05	± 1.89
DIN Type U	DIN 43710	–200 to 600	–328 to 1112	± 1.05	± 1.89
Type W5Re/W26Re	ASTM E 988-96	0 to 2000	–32 to 3632	± 2.1	± 3.78
GOST Type L	GOST R 8.585-2001	–200 to 800	–328 to 1472	± 1.80	± 3.24
Other Sensor types					
Millivolt Input		–10 to 100 mV		± 0.045 mV	
2-, 3-, 4-wire Ohm Input		0 to 2000 ohms		± 1.35 ohm	

(1) The published digital accuracy applies over the entire sensor input range. Digital output can be accessed by HART Communications or wireless protocol.
(2) Total digital accuracy for thermocouple measurement: sum of digital accuracy +0.8 °C. (cold junction accuracy).
(3) Digital accuracy for NIST Type B T/C is ±9.0 °C (±16.2 °F) from 100 to 300 °C (212 to 572 °F).
(4) Digital accuracy for NIST Type K T/C is ±2.1 °C (±3.79 °F) from –180 to –90 °C (–292 to –130 °F).

A.1.5 Ambient temperature effect

Table A-2. 248x Wireless Ambient temperature effects

Sensor options	Sensor reference	Input range	Temperature effects per 1.0 °C (1.8 °F) change in Ambient Temperature	Digital accuracy
2-, 3-, 4-wire RTDs		**°C**	**°F**	
Pt 100 (α = 0.00385)	IEC 751	–200 to 850	0.009 °C (0.0162 °F)	Entire Sensor Input Range
Pt 200 (α = 0.00385)	IEC 751	–200 to 850	0.012 °C (0.0216 °F)	Entire Sensor Input Range
Pt 500 (α = 0.00385)	IEC 751	–200 to 850	0.009 °C (0.0162 °F)	Entire Sensor Input Range
Pt 1000 (α = 0.00385)	IEC 751	–200 to 300	0.009 °C (0.0162 °F)	Entire Sensor Input Range
Pt 100 (α = 0.003916)	JIS 1604	–200 to 645	0.009 °C (0.0162 °F)	Entire Sensor Input Range
Pt 200 (α = 0.003916)	JIS 1604	–200 to 645	0.012 °C (0.0216 °F)	Entire Sensor Input Range
Ni 120	Edison Curve No. 7	–70 to 300	0.009 °C (0.0162 °F)	Entire Sensor Input Range
Cu 10	Edison Copper Winding No. 15	–50 to 250	0.06 °C (0.162 °F)	Entire Sensor Input Range
Pt 50 (α = 0.00391)	GOST 6651-94	–200 to 550	0.018 °C (0.0324 °F)	Entire Sensor Input Range
Pt 100 (α = 0.00391)	GOST 6651-94	–200 to 550	0.009 °C (0.0162 °F)	Entire Sensor Input Range
Cu 50 (α = 0.00426)	GOST 6651-94	–50 to 200	0.012 °C (0.0216 °F)	Entire Sensor Input Range
Cu 50 (α = 0.00428)	GOST 6651-94	–185 to 200	0.012 °C (0.0216 °F)	Entire Sensor Input Range
Cu 100 (α = 0.00426)	GOST 6651-94	–50 to 200	0.009 °C (0.0162 °F)	Entire Sensor Input Range
Cu 100 (α = 0.00428)	GOST 6651-94	–185 to 200	0.009 °C (0.0162 °F)	Entire Sensor Input Range
Thermocouples				
Type B	NIST Monograph 175, IEC 584	100 to 1820	0.0435 °C	T ≥ 1000 °C
			0.096 °C - (0.0075% of (T - 300))	300 °C ≤ T < 1000 °C
			0.162 °C - (0.033% of (T - 100))	100 °C ≤ T < 300 °C
Type E	NIST Monograph 175, IEC 584	–50 to 1000	0.015 °C + (0.00129% of absolute value T)	All
Type J	NIST Monograph 175, IEC 584	–180 to 760	0.0162 °C + (0.00087% of T)	T ≥ 0 °C
			0.0162 °C + (0.0075% of absolute value T)	T < 0 °C
Type K	NIST Monograph 175, IEC 584	–180 to 1372	0.0183 °C + (0.0027% of T)	T ≥ 0 °C
			0.0183 °C + (0.0075% of absolute value T)	T < 0 °C

Table A-2. 248x Wireless Ambient temperature effects

Sensor options	Sensor reference	Input range	Temperature effects per 1.0 °C (1.8 °F) change in Ambient Temperature	Digital accuracy
Type N	NIST Monograph 175, IEC 584	–200 to 1300	0.0204 °C + (0.00108% of absolute value T)	All
Type R	NIST Monograph 175, IEC 584	0 to 1768	0.048 °C	T ≥ 200 °C
			0.069 °C - (0.0108% of T)	T < 200 °C
Type S	NIST Monograph 175, IEC 584	0 to 1768	0.048 °C	T ≥ 200 °C
			0.069 °C - (0.0108% of T)	T < 200 °C
Type T	NIST Monograph 175, IEC 584	–200 to 400	0.0192 °C	T ≥ 0 °C
			0.0192 °C + (0.0129% of absolute value T)	T < 0 °C
DIN Type L	DIN 43710	–200 to 900	0.0162 °C + (0.00087% of T)	T ≥ 0 °C
			0.0162 °C + (0.0075% of absolute value T)	T < 0 °C
DIN Type U	DIN 43710	–200 to 600	0.0192 °C	T ≥ 0 °C
			0.0192 °C + (0.0129% of absolute value T)	T < 0 °C
Type W5Re/W26Re	ASTM E 988-96	0 to 2000	0.048 °C	T ≥ 200 °C
			0.069 °C - (0.0108% of T)	T < 200 °C
GOST Type L	GOST R 8.585-2001	–200 to 800	0.021 °C	T ≥ 0 °C
			0.0105 °C + (0.0045% of absolute value T)	T < 0 °C
Other Sensor Types				
Millivolt Input		–10 to 100 mV	0.0015 mV	Entire Sensor Input Range
2-, 3-, 4-wire Ohm		0 to 2000 Ω	0.0252 W	Entire Sensor Input Range

Transmitters can be installed in locations where the ambient temperature is between –40 and 85 °C (–40 and 185 °F). In order to maintain excellent accuracy performance, each transmitter is individually characterized over this ambient temperature range at the factory.

Temperature effects example

When using a Pt 100 (α = 0.00385) sensor input at 30 °C ambient temperature:

- Digital Temperature Effects: 0.009 °C x (30 - 20) = 0.09 °C
- Worst Case Error: Digital + Digital Temperature Effects = 0.45 °C + 0.09 °C = 0.54 °C
- Total Probable Error: $\sqrt{0.45^2 + 0.09^2} = 0.459$ °C

A.1.6 Lead wire resistance effect

Sensor lead wire resistance effect—RTD input

Examples of approximate lead wire resistance effect calculations

Given:	**αPt 100 385 RTD**
Total cable length:	150 m
Imbalance of the lead wires at 20 °C:	0.5 Ω
Resistance/length (18 AWG Cu):	0.025 Ω/m
Temperature coefficient of Cu (α_{Cu}):	0.039 Ω/Ω °C
Temperature coefficient of Pt (α_{Pt}):	0.00385 Ω/Ω °C
Change in Ambient Temperature (ΔT_{amb}):	25 °C
RTD Resistance at 0 °C (R_0):	100 Ω (for Pt 100 RTD)

- Pt100 4-wire RTD: Negligible (independent of lead wire resistance up to 5Ω per lead)
- Pt100 3-wire RTD:

  Basic Error = $\frac{\text{Imbalance of Lead Wires}}{(\alpha_{Pt} \times R_0)}$

  Error due to amb. temperature variation = $\frac{(\alpha_{Cu}) \times (\Delta T_{amb}) \times (\text{Imbalance of Lead Wires})}{(\alpha_{Pt} \times R_0)}$

  Lead wire imbalance seen by the transmitter = 0.5 Ω

  Basic Error = $\frac{0.5\ \Omega}{(0.00385\ \Omega/\Omega\ °C) \times (100\ \Omega)}$ = 1.3 °C

  Error due to amb. temp. var. of ±25 °C = $\frac{(0.0039\ \Omega/\ \Omega\ °C) \times (25\ °C) \times (0.5\ \Omega)}{(0.00385\ \Omega/\Omega\ °C) \times (100\ \Omega)}$ = ±0.1266 °C
- Pt100 2-wire RTD:

  Basic Error = $\frac{\text{Imbalance of Lead Wires}}{(\alpha_{Pt} \times R_0)}$

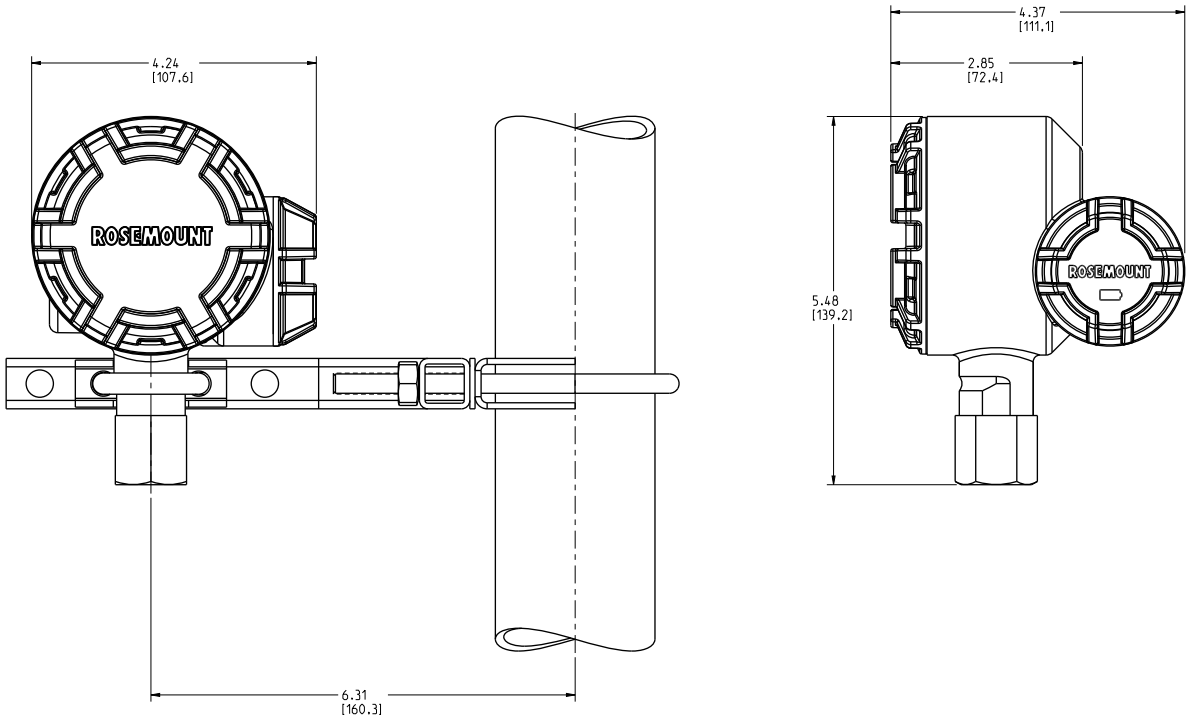
  Error due to amb. temperature variation = $\frac{(\alpha_{Cu}) \times (\Delta T_{amb}) \times (\text{Lead Wire Resistance})}{(\alpha_{Pt} \times R_0)}$

  Lead wire resistance seen by the transmitter = 150 m x 2 wires x 0.025 Ω/m = 7.5 Ω

  Basic Error = $\frac{7.5\ \Omega}{(0.00385\ \Omega/\Omega\ °C) \times (100\ \Omega)}$ = 19.5 °C
- Error due to amb. temp. var. of ±25 °C = $\frac{(0.0039\ \Omega/\ \Omega\ °C) \times (25\ °C) \times (7.5\ \Omega)}{(0.00385\ \Omega/\Omega\ °C) \times (100\ \Omega)}$ = ± 1.9 °C

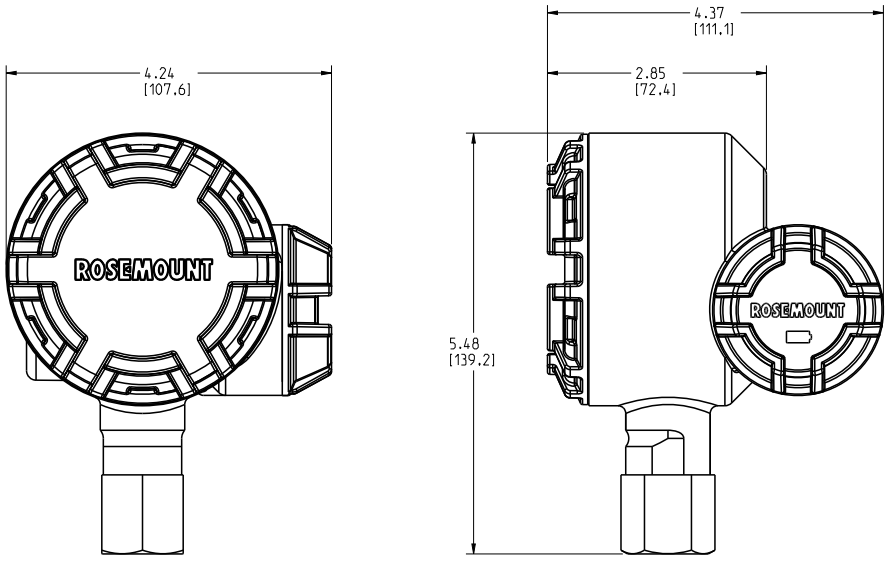
A.2 Dimensional drawings

Rosemount 248 Wireless Remote Mount



Remote mounted temperature sensor specified separately.

Rosemount 248 Wireless Direct Mount



Direct mounted temperature sensor specified separately (see ordering option code XA).

A.3 Ordering information

Table A-3. Rosemount 248 Wireless Temperature Transmitter

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Code	Product description			
248	Temperature Transmitter			
Transmitter type				
D	Wireless Field Mount			★
Transmitter output				
X	Wireless			★
Product certifications				
NA	No Approval			★
I5	FM Intrinsically Safe			★
N5	FM Non-incendive and Dust Ignition-proof			★
I6	CSA Intrinsically Safe			★
I1	ATEX Intrinsically Safety			★
I7	IECEx Intrinsic Safety			★
I2	INMETRO Intrinsic Safety			★
I4	TIIS Intrinsic Safety			★
I3	China Intrinsic Safety			★
IM	GOST Intrinsic Safety			★
Enclosure options		**Material**	**IP rating**	
P	Wireless Engineered Polymer Housing	Engineered Polymer	IP66/67	★
Conduit entry size				
2	1/2-14 NPT			★

Options (Include with selected model number)

Assemble to options		
NS	No Sensor	★
XA	Sensor Specified Separately and Assembled to Transmitter	★
XC	Hand Tight Assembly of a Transmitter and Sensor	★
Wireless update rate, Operating frequency and Protocol		
WA3	User Configurable Update Rate, 2.4GHz DSSS, *Wireless*HART®	★
Omni directional Wireless Antenna and SmartPower™		
WP5	Internal Antenna, Compatible with Green Power Module (I.S. Power Module sold separately)	★

Table A-3. Rosemount 248 Wireless Temperature Transmitter

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Mounting Bracket		
B5	Universal “L” Mounting Bracket for 2-in. pipe mounting - SST bracket and bolts	★
Display		
M5	LCD Display	★
Cable Gland option		
G2	Cable Gland (7.5 mm - 11.9 mm)	★
G4	Thin Wire Cable Gland (3 mm - 8 mm)	★
5-Point calibration		
C4	5-Point Calibration (Requires the Q4 option code to generate a Calibration Certificate)	★
Calibration certificate		
C4	Calibration Certificate (3-Point Calibration)	★
Line filter		
F5	50 Hz Line Voltage Filter	★
F6	60 Hz Line Voltage Filter	★
Software configuration		
C1	Custom Configuration of Date, Descriptor, Message and Wireless Parameters (Requires CDS with order)	★
Extended product warranty		
WR3	3-year warranty	
WR5	5-year warranty	
Typical Model Number: 248 D X NA D 2 WA3 WK1 B4 F6 NS		

Appendix B Product Certifications

B.1 Approved Manufacturing Locations

Rosemount Inc. - Chanhassen, Minnesota, USA
Rosemount Temperature GmbH - Germany
Emerson Process Management Asia Pacific - Singapore

B.2 European Directive Information

(Pending)

B.3 Ordinary Location Certification from FM Approvals

North America

(Pending)

Europe

(Pending)

International

(Pending)

Appendix C Mapping for non-DD based Integration with Host Systems

C.1 Mapping of alert messages in the HART command 48 additional status

This outlines the most important alerts in the HART command 48 Additional Status Field for 248 Wireless transmitter. The information in this section can be used by DeltaV™ for alert monitoring, and in the Rosemount 1420 Smart Wireless Gateway for Additional Status mapping in Modbus, OPC, etc.

A complete list of Additional Status bits is available in the Rosemount 1420 Smart Wireless Gateway.

Table C-1 to Table C-3 shows a list of the most important alert messages that may be displayed in the AMS Wireless Configurator and Field Communication together with the location of the Alert in the HART command 48 Additional Status field. For recommendation actions refer to Table 6-1. on page 35.

To view Active Alerts, from the *Home* screen, go to **Service Tools > Active Alerts**.

Table C-1. Failure Alerts (F:)

Message	Additional status(1)	Description
Electronics Failure	Byte 8 :: Bit 6	An electronics error that could impact the device measurement reading has occurred
Terminal Block Failure	Byte 3 :: Bit 3	A critical failure has occurred in the transmitter's terminal block
Sensor Failure	Byte 3 :: Bit 7	The device has detected an open, short, or too much resistance for this sensor
Radio Failure	Byte 1 :: Bit 1 Byte 1 :: Bit 7	The wireless radio has detected a failure or stopped communicating
Supply Voltage Failure	Byte 6 :: Bit 3	The supply voltage is too low for the device to broadcast

(1) Location of the Alert in the HART command 48 Status field.

Table C-2. Maintenance Alerts (M:)

Message	Additional status(1)	Description
Sensor has Exceeded Limits	Byte 3 :: Bit 5	The sensor has exceeded the maximum measurement range
Terminal Temperature has Exceeded Limits	Byte 3 :: Bit 1	The terminal temperature has exceeded the transmitter's maximum range

Table C-2. Maintenance Alerts (M:)

Message	Additional status(1)	Description
Supply Voltage Low	Byte 1 :: Bit 6	The supply voltage is low and may soon affect broadcast updates
Electronics Temperature has Exceeded Limits	Byte 1 :: Bit 3	The electronics temperature has exceeded the transmitter's maximum range

(1) Location of the Alert in the HART command 48 Status field.

Table C-3. Advisory alerts (A:)

Message	Additional status(1)	Description
Database Memory Warning	Byte 0 :: Bit 2	The device has failed to write to the database memory / Any data written during this time may have been lost
Invalid Configuration	Byte 2 :: Bit 6	The device has detected a configuration error based on a change to the device
Button Stuck	Byte :: Bit	A button on the Electronics Board is detected as stuck in the active position
Simulation Active	Byte 8 :: Bit 0	The device is in simulation mode and may not be reporting actual information

(1) Location of the Alert in the HART command 48 Status field.

C.2 Mapping of device variables index numbers

To integrate a device into the host system, it may be necessary to know what each device variable represents, and what index number it has been assigned to. The variable index number is an arbitrary number that is used to uniquely identify each variable that is supported in the field device.

Table C-4 to Table C-5 displays the device variable and variable mapping indexes for the 648 Wireless transmitter.

Table C-4. Device variable index

Device variable index	Description
0	Supply Voltage
1	Electronics Temperature
2	Process Temperature
3	Terminal Temperature (for CJC)
244	Percent of Range

Table C-5. Variable mapping

Process variables	Mapped variable index
PV	2 - Process Temperature
SV	3 - Terminal Temperature
TV	1 - Electronics Temperature
QV	0 - Supply Voltage

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