

Rosemount™ 248 Wireless Temperature Transmitter



Rosemount 248 Wireless Hardware Revision	1
HART Device Revision	1
Device Install Kit/DD Revision	Device Revision 01, DD Revision 01 or greater
Device Type	2676

⚠ WARNING

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

Ensure 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. Review the approvals section of the [Quick Start Guide](#) 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 environment of the device 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.

Before applying pressure, install and tighten thermowells and sensors.

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 Federal Communication Commission (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 8-in. (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.

Changes or modifications not expressly approved by Rosemount can void the user's authority to operate the equipment.

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s).

Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Physical access

Unauthorized personnel may potentially cause significant damage to and/or misconfiguration of end users' equipment. This could be intentional or unintentional and needs to be protected against.

Physical security is an important part of any security program and fundamental to protecting your system. Restrict physical access by unauthorized personnel to protect end users' assets. This is true for all systems used within the facility.

⚠ 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 Emerson nuclear-qualified products, contact your local Emerson Sales Representative.

NOTICE

Read this manual before working with the product. For personal and system safety, and for optimum product performance, ensure the contents are thoroughly understood before installing, using, or maintaining this product. For more information, contact [Emerson.com/global](https://www.emerson.com/global).

NOTICE

Before installing the wireless transmitters

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

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

The unit was shipped without the power module installed. Prior to re-shipment, ensure that the power module has been removed.

Each Green 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. Consult current regulations and requirements before shipping.

Power Module Considerations (Green Power Module, model number 701PGNKF):

The Green Power Module with the wireless unit contains one “D” size primary lithium-thionyl chloride battery (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. Ensure care is taken to prevent thermal, electrical, or mechanical damage. Contacts must be protected to prevent premature discharge.

Battery hazards remain when cells are discharged.

Power modules must be stored in a clean and dry area. For maximum battery life, storage temperature must not exceed 86 °F (30 °C).

Contents

Chapter 1	Introduction.....	7
	1.1 Product recycling/disposal.....	7
Chapter 2	Configuration.....	9
	2.1 Overview.....	9
	2.2 Sensor connections.....	9
	2.3 Bench top configuration.....	13
	2.4 Device network configuration.....	15
	2.5 Remove power module.....	24
Chapter 3	Installation.....	25
	3.1 Wireless considerations.....	25
	3.2 Field Communicator connections.....	25
	3.3 Mounting.....	27
	3.4 Physical installation.....	28
Chapter 4	Commissioning.....	33
	4.1 Verify operations.....	33
	4.2 Reference information.....	35
Chapter 5	Operation and maintenance.....	39
	5.1 LCD display screen messages.....	39
	5.2 Power module replacement.....	41
Chapter 6	Troubleshooting.....	43
	6.1 Overview.....	43
	6.2 Device status information.....	43
	6.3 Transmitter troubleshooting.....	46
	6.4 LCD display troubleshooting.....	47
	6.5 Wireless network troubleshooting.....	47
Appendix A	Reference data.....	49
	A.1 Product Certifications	49
	A.2 Ordering information, specifications, and drawings.....	49
Appendix B	Alert message mapping.....	51

1 Introduction

1.1 Product recycling/disposal

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

2 Configuration

2.1 Overview

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

Field Communicator and AMS Device Manager 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 Sensor connections

The Rosemount 248 Wireless Transmitter 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. If mounting the transmitter remotely from the sensor, use appropriate thermocouple extension wire.

RTD or ohm inputs

The transmitters will accept a variety of RTD or ohmic configurations, including 2-, 3- or 4-wire connections.

If the transmitter is mounted remotely from a 3- 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 3 feet of 20 AWG wire (approximately 32 °F [0.05 °C]). For longer runs, attach a third or fourth lead to achieve a 3- or 4-wire connection as described in previous paragraph.

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:

- **2-wire:** In a 2-wire configuration, there can be no compensation for lead wire resistance. This is because 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.
- **3-wire:** In a 3-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.

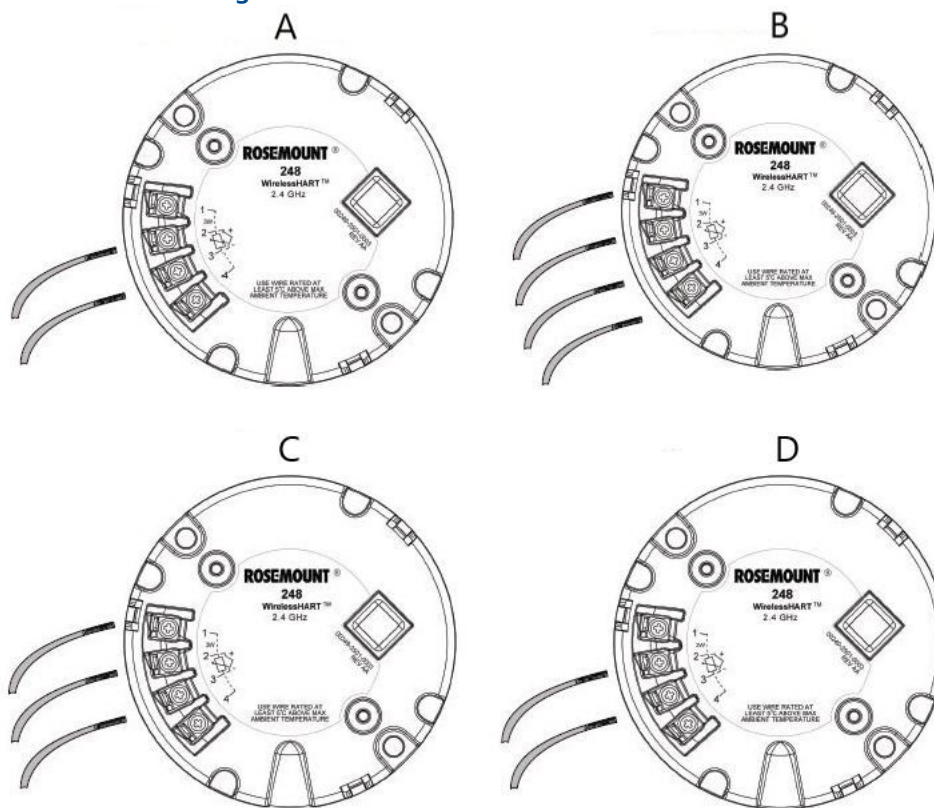
- 4-wire:** A 4-wire design is ideal because the lead wire resistance is inconsequential to the measurement. It uses a measurement technique where a very small constant current of about 150 microamps is applied to the sensor through two leads and the voltage developed across the sensor is measured over 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. 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

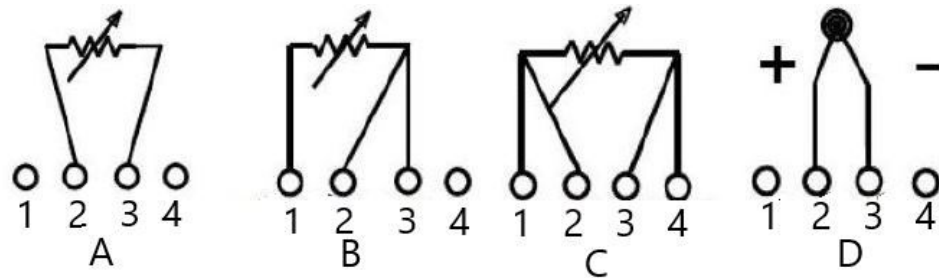
- (1) Independent of lead wire resistance up to 5 Ω per lead.
 (2) Unbalanced lead wire resistance is the maximum resistance differences between any two leads.

Figure 2-1: Sensor Wiring



- A. Thermocouple and mV
 B. 4-wire RTD and Ω
 C. 3-wire RTD and Ω
 D. 2-wire RTD and Ω

Figure 2-2: Sensor Connections

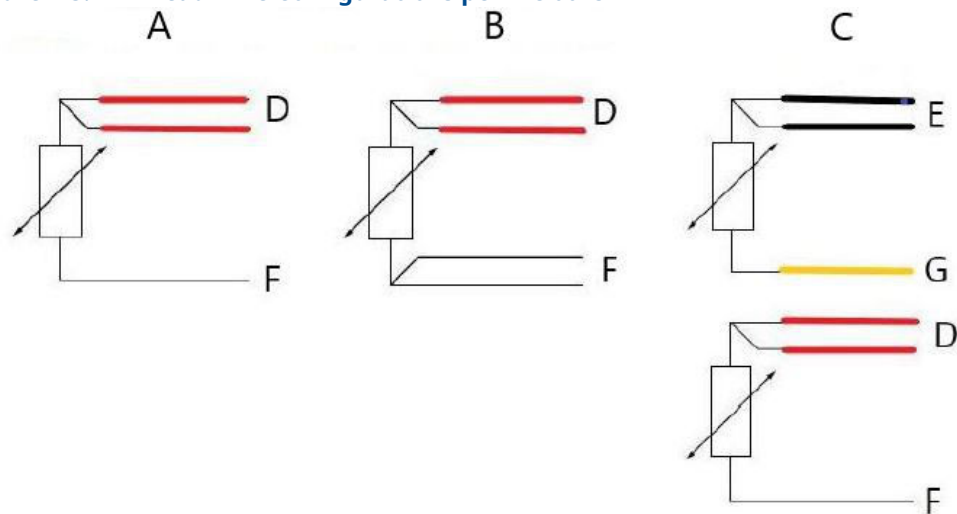


- A. 2-wire RTD and Ω
- B. 3-wire RTD and Ω
- C. 4-wire RTD and Ω
- D. T/C and mV

Note

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

Figure 2-3: RTD Lead Wire Configurations per IEC 60751

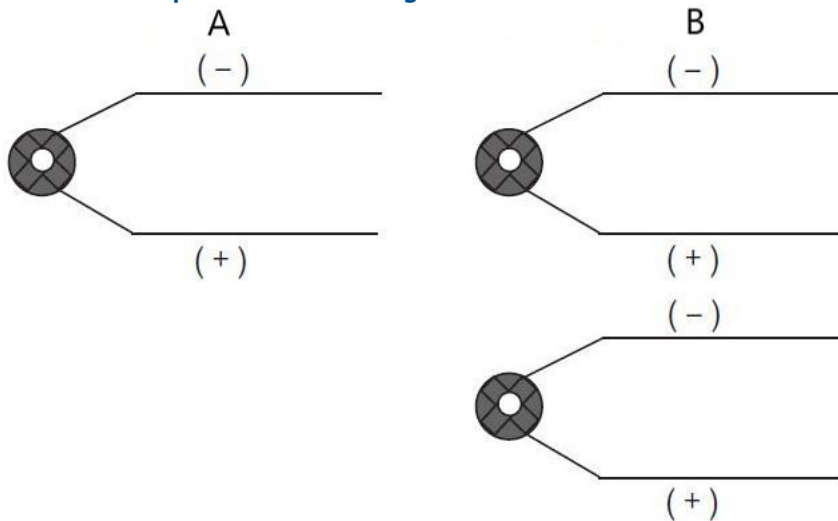


- A. Single element, 3-wire
- B. Single element, 4-wire
- C. Dual element, 3-wire
- D. Red
- E. Black
- F. White
- G. Yellow

Note

To configure a single element, 4-wire RTD as a 3-wire system, connect only one white lead. Insulate or terminate the unused white lead in a manner that prevents shorting to the ground. To configure a single element, 4-wire RTD as a 2-wire system, connect matching colored wires first and then connect the paired wires to the terminal.

Figure 2-4: Thermocouple Lead Wire Configurations



- A. Single thermocouple, 2-wire
B. Dual thermocouple, 4-wire

Type	IEC 60584 thermocouple colors		ASTM E- 230 thermocouple colors	
	POS (+)	NEG (-)	POS (+)	NEG (-)
J	Black	White	White	Red
K	Green	White	Yellow	Red
T	Brown	White	Blue	Red

Note

Dual thermocouple sensors are shipped with one pair of the wires shrink-wrapped together.

2.2.1 Sensor leads

⚠ WARNING

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.

To wire the sensor and supply power to the transmitter:

Procedure

1. Remove the power module cover (if applicable).
2. Remove the transmitter enclosure cover (if applicable).
3. Remove the LCD display (if applicable).
4. Loosen the captive screws and remove LCD adapter plate (if applicable).
5. Attach the sensor leads according to [Figure 2-1](#).
6. Reattach and secure LCD adapter plate to 5 in-lbs of torque (if applicable).

7. Reattach the LCD display (if applicable).
8. Connect the Green Power Module.
9. Verify the connection by observing the LCD display (if applicable).
10. Reattach and tighten the covers (if applicable).

Note

Always ensure a proper seal by installing the covers so that polymer contacts polymer (i.e. no O-ring visible). Emerson recommends using Rosemount O-rings.

2.3 Bench top configuration

Bench top configuration consists of testing the transmitter and verifying transmitter configuration data. The transmitter must be configured before installation, which may be performed either directly or remotely.

Direct configuration can be performed using a Field Communicator, AMS Device Manager, AMS Wireless Configurator, or any *WirelessHART*[®] Communicator.

Remote configuration can be performed using AMS Device Manager, AMS Wireless Configurator, or the Wireless Gateway.

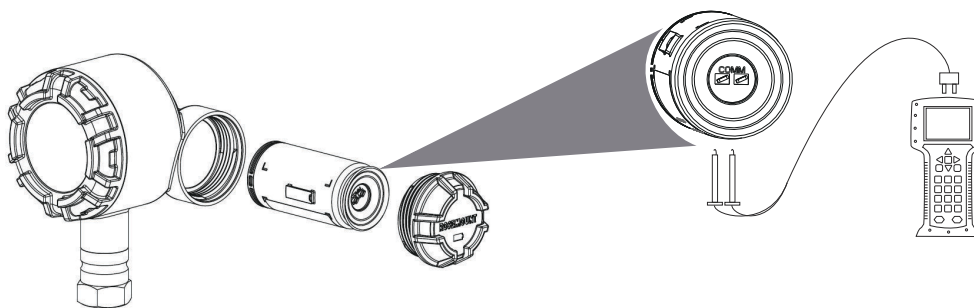
When using a Field Communicator, any configuration changes made must be sent to the transmitter by using the **Send (F2)** key. AMS configuration changes are implemented after the **Apply** button has been selected.

The power module must be installed to provide power to the Rosemount 248 Wireless for configuration.

To communicate with the transmitter:

1. Remove the power module cover. This will expose the HART[®] communication terminals located on the Green Power Module.
2. Connect the Field Communicator leads to the COMM port connections on the Green Power Module.

Figure 2-5: Field Communicator Connections



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 (F2)** key.

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, then refer to [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 select the **Configure Menu**. AMS configuration changes are implemented after the **Apply** button has been selected.

During direct connection configuration, AMS Device Manager will search for a HART-compatible device and indicate when the connection is made.

- If AMS Device Manager fails to connect, it indicates that no device was found.
- If this occurs, refer to [Troubleshooting](#).

Emerson Wireless Gateway

The Rosemount 248 Wireless Transmitter supports limited remote configuration through the Wireless Gateway.

The Gateway allows configuration of the following device parameters:

- HART® Tag
- Short Tag
- Descriptor
- Engineering Units
- Update Rate
- Range Values

Device sensor configuration

Every temperature sensor has unique characteristics. To ensure the most accurate measurement, the transmitter must 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 ($\alpha = 0.00385$)
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.

2.4 Device network configuration

2.4.1 Join to network

Fast Keys: 2, 1, 2

To communicate with the 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.

Procedure

1. From the **Home** screen, select **2: Configure**.
2. Select **1: Guided Setup**.
3. Select **2: Join to Network**.
4. Using a Field Communicator or AMS Device Manager to communicate with the transmitter, enter the Network ID and Join Key so they match the Network ID and Join Key of the Wireless Gateway and the other devices in the network.

Note

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 Wireless Gateway on the **Setup** → **Network** → **Settings** page on the web server.

2.4.2 Configure update rate

Fast Keys: 2, 1, 3

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 Device Manager. The update rate is user-selectable from 1 second to 60 minutes.

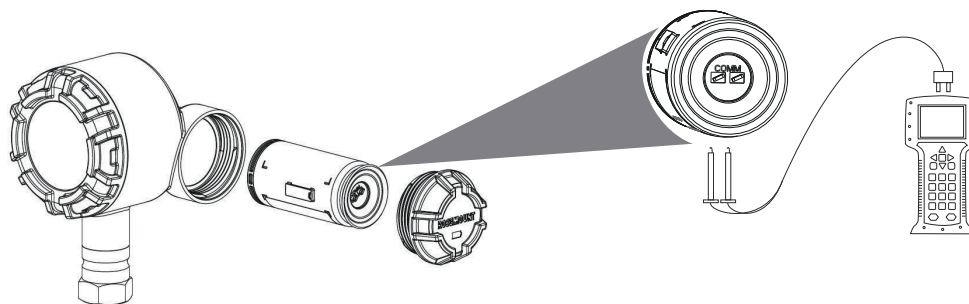
Procedure

1. From the **Home** screen, select **2: Configure**.
2. Select **1: Guided Setup**.
3. Select **3: Configure Update Rate**.
4. When the device configuration is completed, remove the power module and replace the module cover.

⚠ CAUTION

Only insert the power module when the device is ready to be commissioned. Use caution when handling the power module.

Figure 2-6: Field Communicator Connections



2.4.3 HART® menu tree

Figure 2-7: Overview

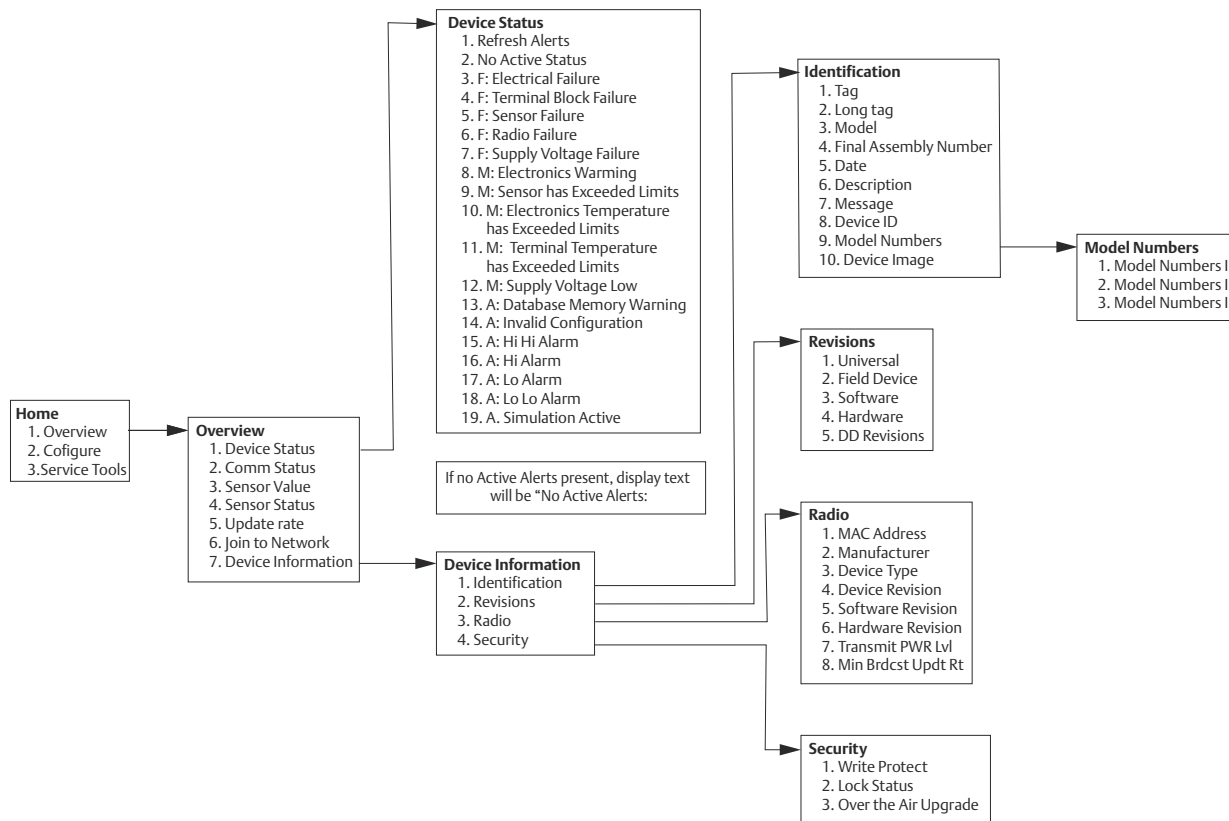


Figure 2-8: Configure

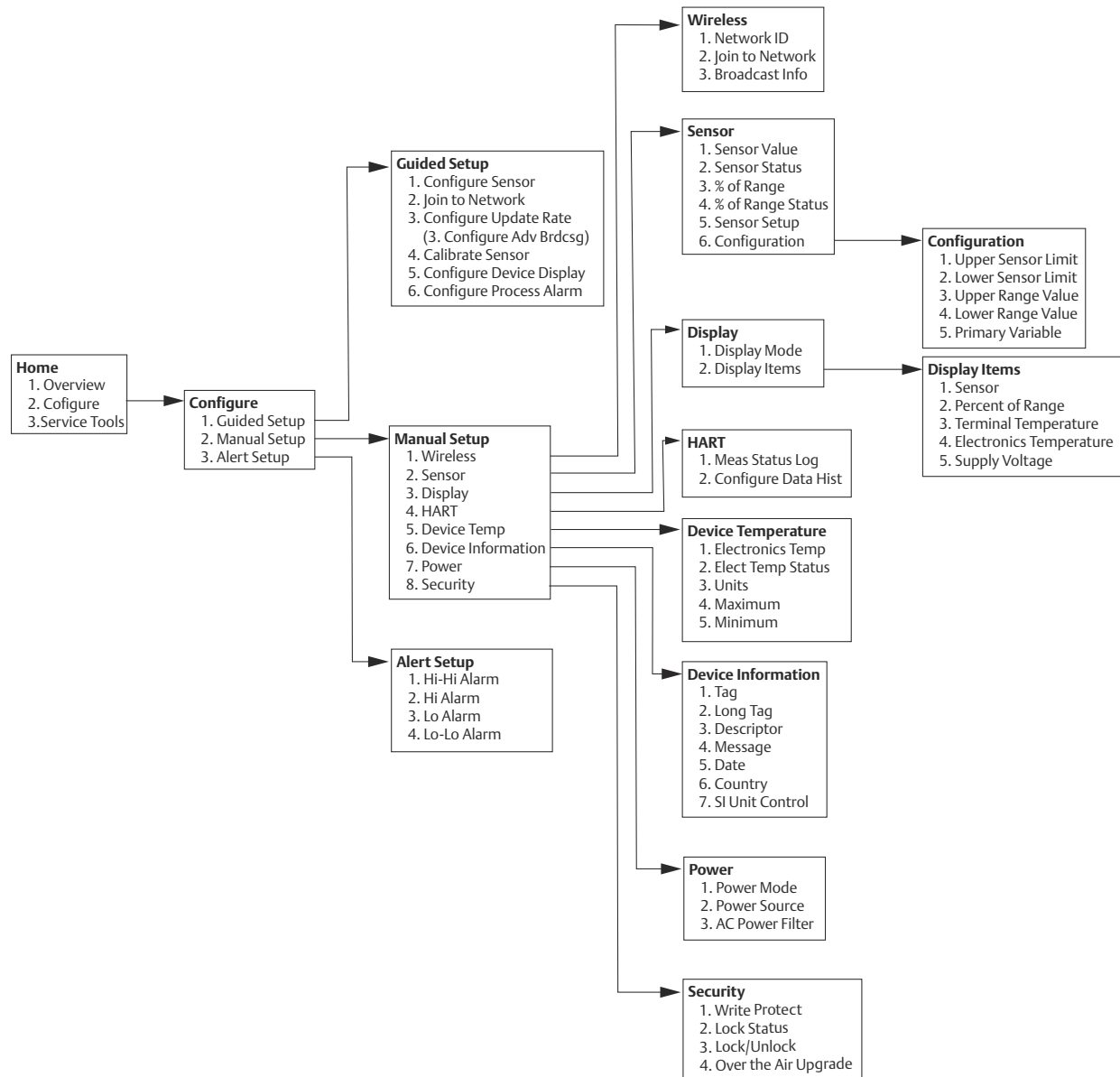
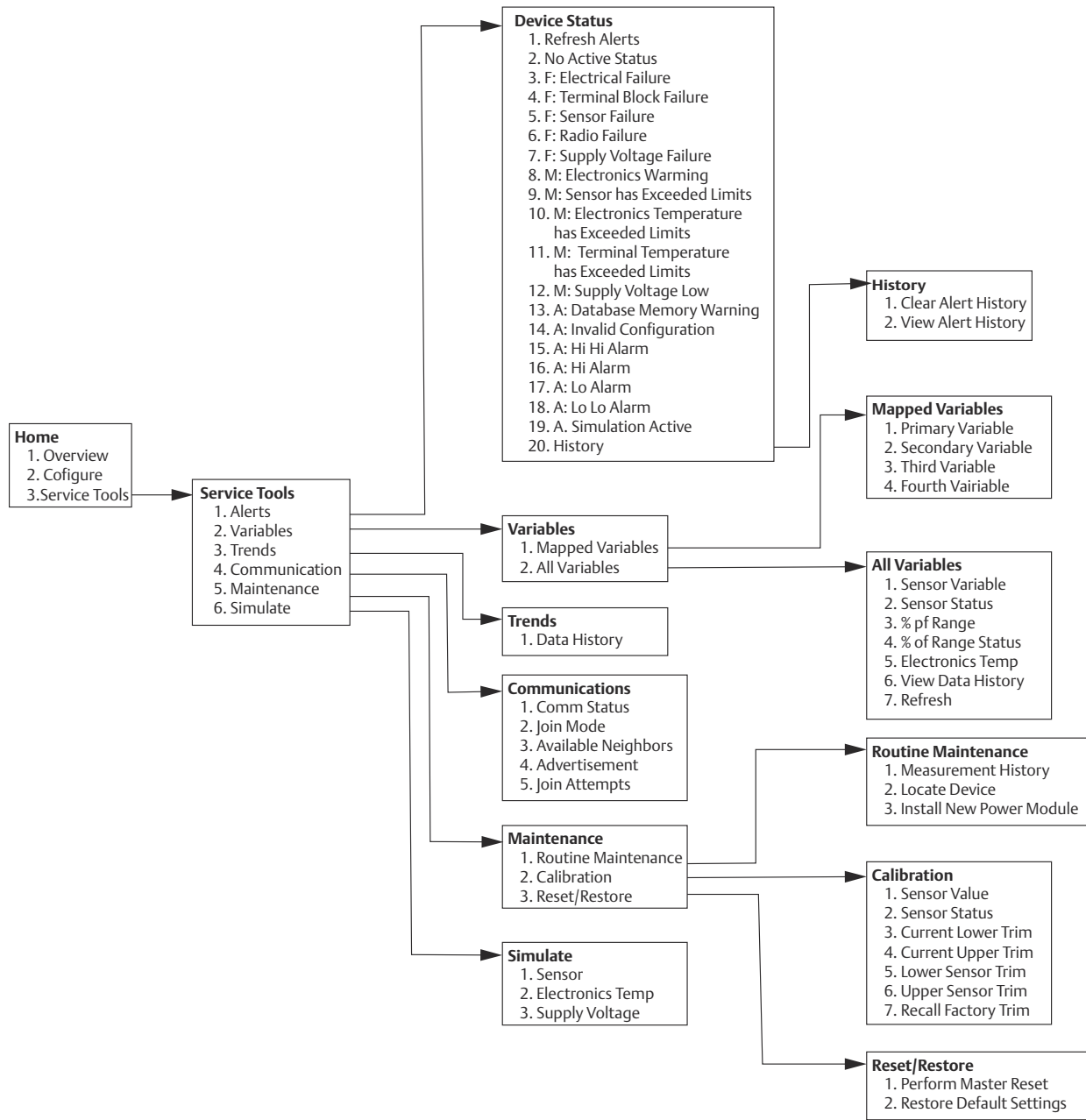


Figure 2-9: Service Tools



2.4.4 Fast Key sequence

This section lists the Fast Key sequences for common transmitter functions.

Note

The Fast Key sequences assume that Device Revision 01, DD Revision 01 or greater is being used.

Table 2-2: Fast Key Sequence

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

2.4.5 Calibration

Calibrating the transmitter increases the measurement precision by allowing corrections to be made to the factory-stored characterization curve. It does this 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.

Note

Calibration of the transmitter may include **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 performing calibrations.

Sensor calibration

Fast Keys: 3, 5, 2

If the transmitter's digital value for the primary variable does not match the plant's standard calibration equipment, then Emerson recommends performing a sensor trim. 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.

To perform a sensor trim with a transmitter:

Procedure

1. Connect the calibration device or sensor to the transmitter. Refer to [Figure 2-1](#) 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 one:
 - **6 Lower Sensor Trim**
 - **7 Upper Sensor Trim**

Note

Emerson recommends performing lower offset trims first and upper slope trims second.

5. Answer the prompt 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. After the temperature has stabilized, select **OK**. The communicator displays the output value the transmitter associates with the input value provided by the calibration device.
9. Accept new calibration.

AMS Device Manager

For AMS Device Manager, configure the sensor as indicated above.

Procedure

1. From the *Overview* screen, select the **Calibrate** button.
2. Select **Lower Input Trim** or **Upper Limit Trim**. The wizard will continue through the process.
3. To restore the transmitter to factory default, select **Service Tools** → **Maintenance** → **Sensor Calibration** → **Recall Factory Trim**. The wizard will revert the transmitter to the factory trim for a given sensor.
4. Apply changes.

2.4.6 Configuring the LCD display

The LCD display configuration command allows customization of the LCD to suit application requirements. The LCD will alternate between the selected items:

- Temperature Units
- Sensor Temperature

- % of Range
- Supply Voltage

Related information

[LCD display screen messages](#)

Enabling and configuring LCD display with a Field Communicator

From the *Home* screen, enter the Fast Key sequence: 2, 1, 5

Transmitters ordered with the LCD display will be shipped with the display enabled and installed.

If the transmitter was ordered without the LCD display (and the LCD display was ordered as a spare part) or if the LCD display was disabled, follow these steps to enable the LCD display on the transmitter:

Procedure

1. From the *Home* screen, select **2: Configure**.
2. Select **1: Guided Setup**.
3. Select **5: Configure Device Display**.
4. Select the option **Periodic**.
5. Select desired display options and click **Enter**.

Configuring LCD display with AMS Device Manager

Procedure

1. Right-click on the device and select **Configure**.
2. Select **Configure Device Display** button under **Optional Setup**.
3. Select desired display options and select **Enter**.

2.4.7 Alerts

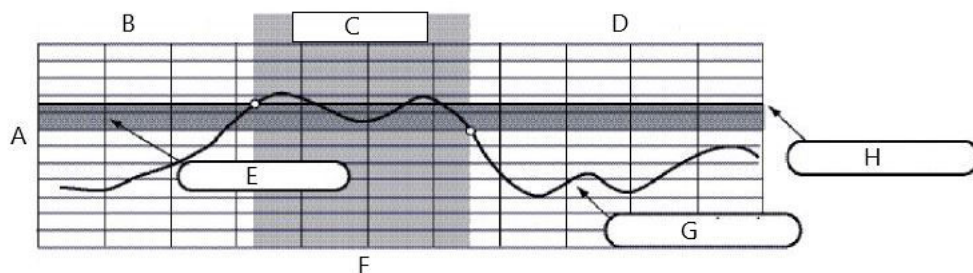
Fast Keys: 2, 3

Alerts allow the user to configure the transmitter to output a HART® message when the configured data point is exceeded. A process alert will be transmitter continuously if the set points are exceeded and the alert mode is ON. An alert will be displayed on a Field Communicator, AMS Device Manager status screen, or in the error section of the LCD display. The alert will reset once the value returns within range.

NOTICE

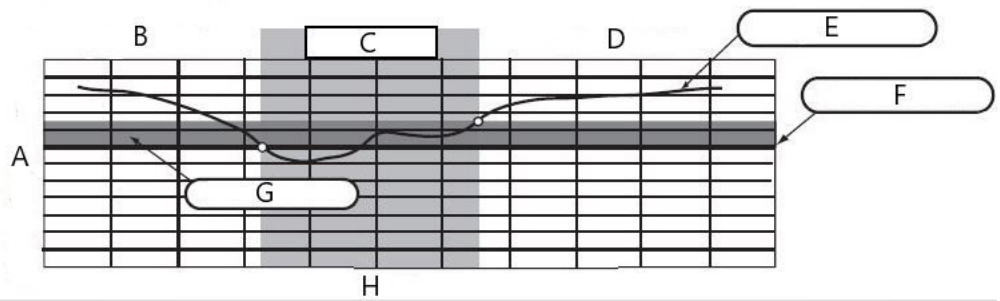
HI alert value must be higher than the LO alert value. Both alert values must be within the temperature sensor limits.

Figure 2-10: Rising Alert



- A. Units of measurement
- B. Alert "OFF"
- C. Alert "ON"
- D. Alert "OFF"
- E. Deadband
- F. Time
- G. Assigned value
- H. Alert set point

Figure 2-11: Falling Alert



- A. Units of measurement
- B. Alert "OFF"
- C. Alert "ON"
- D. Alert "OFF"
- E. Assigned value
- F. Alert set point
- G. Deadband
- H. Time

Field Communicator

To configure the process alerts with a Field Communicator:

Procedure

1. From the *HOME* screen, follow the Fast Key sequence, **2 Configure** → **3 Alert Setup**:
 - Select **1** for HI-HI Alarm
 - Select **2** for HI Alarm
 - Select **3** for LO Alarm
 - Select **4** for LO-LO Alarm
2. Select **1** to configure the alert.

2.5 Remove power module

After the sensor and network have been configured, remove the Power Module and replace the module cover. Emerson recommends inserting the power module only when the device is ready to be commissioned.

⚠ CAUTION

Exercise caution when handling the power module. The power module may be damaged if dropped from heights in excess of 20 feet (6 m).

3 Installation

3.1 Wireless considerations

3.1.1 Power up sequence

Emerson recommends installing the Rosemount 248 Wireless Transmitter and all other devices only after the Wireless Gateway has been installed and is functioning properly. Wireless devices must 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 new devices join the network faster. Emerson Wireless 1410S Gateway and 781S Smart Antenna

Related information

[Emerson Wireless 1410S Gateway and 781S Smart Antenna](#)

3.1.2 Antenna position

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

3.1.3 Network design best practices

When mounting the device, follow recommended practices to achieve the best wireless performance.

Related information

[Mounting](#)

3.2 Field Communicator connections

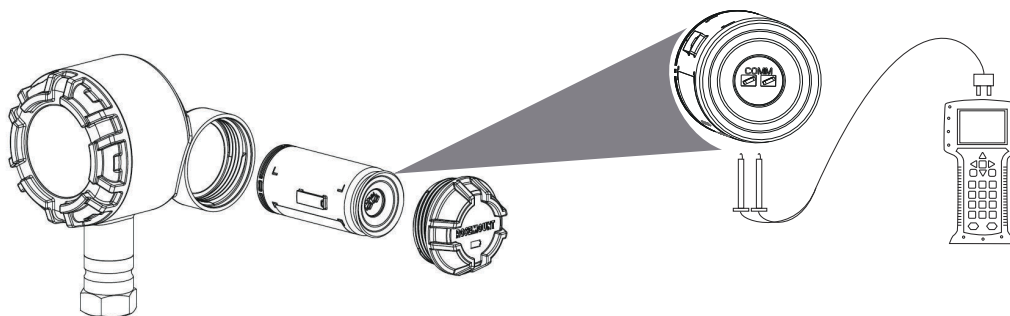
The power module must be installed in the device for the Field Communicator to interface with the transmitter. The Field Communicator connections are located on the Green Power Module.

To communicate with the transmitter:

1. Remove the power module cover. This will expose the HART[®] communication terminals located on the Green Power Module.
2. Connect the Field Communicator leads to the COMM port connections on the Green Power Module.

This transmitter uses the Green Power Module; Order Model number: 701PGNKF. The power module is keyed and can only be inserted in one orientation. Field communication with this device requires a HART-based Field Communicator. Refer to [Figure 3-1](#) for instructions on connecting the Field Communicator to the transmitter.

Figure 3-1: Field Communicator Connection



3.2.1 Mechanical

Location

When choosing an installation location and position, consider the need for access to the mesh network, access to the transmitter, and to the power module compartment for ease of 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, Emerson recommends replacing it with a Rosemount O-ring. Reattach cover. Ensure polymer contacts polymer (i.e. no O-ring visible).

3.2.2 Electrical

Power module

The 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.

⚠ CAUTION

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.

NOTICE

Care must be taken to prevent thermal, electrical, or mechanical damage. Contacts must be protected to prevent premature discharge.

Power modules must be stored in a clean and dry area. For maximum power module life, storage temperature must not exceed 86 °F (30 °C).

Sensor

Make sensor connections with the threaded 1½-in. NPT connection sensor adapter.

3.2.3 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, then consider the use of additional thermowell and extension, or remote mounting the transmitter to thermally isolate it from the process.

3.3 Mounting

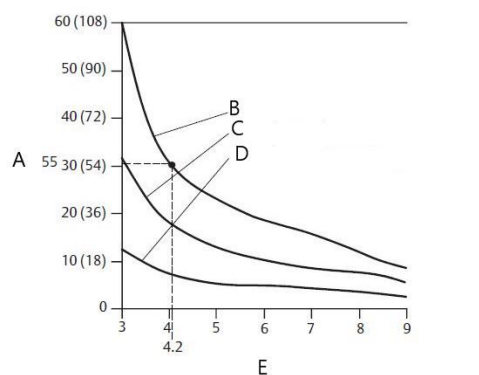
The transmitter can be installed in one of two configurations:

- **Direct Mount:** This is where the sensor is connected directly to the transmitter housing's conduit entry.
- **Remote Mount:** This is where the sensor is mounted separate from the transmitter housing, then connected to the transmitter via conduit.

Select the installation sequence that corresponds to the mounting configuration.

Figure 3-2 provides an example of the relationship between transmitter housing temperature rise and extension length.

Figure 3-2: Temperature Rise vs. Extension Length



- A. Housing Temperature Rise, above Ambient (°C [°F])
- B. 815 °C (1500 °F) Process Temperature
- C. 540 °C (1000 °F) Process Temperature
- D. 250 °C (482 °F) Process Temperature
- E. Extension Length (in.)

Example

The transmitter specification limit is 185 °F (85 °C).

If the ambient temperature is 131 °F (55 °C) and the max process temperature to be measured is 1499 °F (815 °C), the maximum permissible temperature rise is the transmitter specification limit minus the ambient temperature (moves 85 to 55 °C), or 86 °F (30 °C).

In this case, an extension of 5-in. (127 mm) meets this requirement, but 6-in. (152 mm) provides an additional margin of thermowells protection, thereby reducing risk of ambient thermal damage.

Temperature limits

	Operating limit	Storage limit
With LCD display	-4 to 185 °F -20 to 85 °C	-40 to 185 °F -40 to 85 °C
Without LCD display	-40 to 185 °F -40 to 85 °C	-40 to 185 °F -40 to 85 °C

3.4 Physical installation

Choose the installation sequence that corresponds to the mounting configuration.

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

3.4.1 Direct mount

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

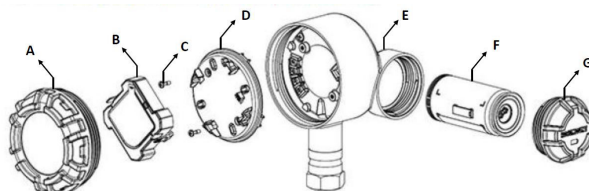
Procedure

1. Remove the transmitter enclosure cover.
2. Remove the LCD display (if applicable).
3. Loosen the captive screws and remove LCD display adapter plate (if applicable).
4. Attach the sensor to the transmitter housing using the threaded conduit entry.

Note

Ensure that an approved thread sealant is used on all connections.

Figure 3-3: Exploded View of LCD Display Assembly

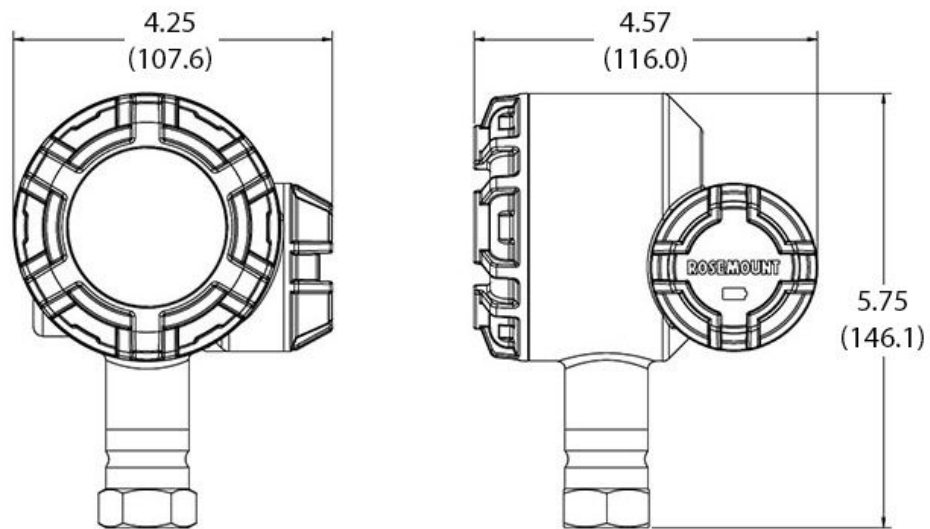


- A. Housing cover
- B. LCD meter
- C. Terminal screws
- D. LCD adapter plate
- E. Housing
- F. Green power module
- G. Power module cover

5. Attach the sensor wiring to the terminals as indicated on [Figure 2-1](#).
6. Reattach and secure LCD display adapter plate to 5 in.-lb. of torque (if applicable).
7. Reattach the LCD display (if applicable).

8. Reattach and tighten the transmitter enclosure cover.
9. Remove the power module cover.
10. Connect the Green Power Module.
11. Reattach and tighten the power module cover.
12. Always ensure a proper seal by installing the electronics housing cover(s) so that polymer contacts polymer (i.e. no O-ring visible). Emerson recommends using Rosemount O-rings.
13. Provide 1.75 in. (45 mm) of clearance for units without an LCD display. Provide 3 in. (76 mm) of clearance for units with an LCD display for cover removal.

Figure 3-4: Direct Mount



Note

Dimensions are in inches (millimeters).
Wireless devices must be powered up in order of proximity from the Gateway, beginning with the closest device to the Gateway. This will result in a simpler and faster network installation.

3.4.2 Remote mount

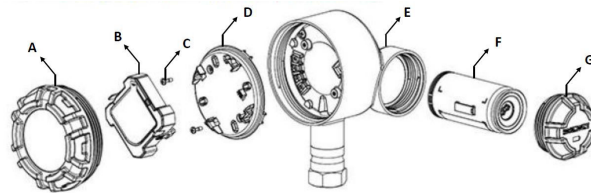
Procedure

1. Remove the transmitter enclosure cover.
2. Remove the LCD display (if applicable).
3. Loosen the captive screws and remove LCD display adapter plate (if applicable).
4. Run wiring (and conduit, if necessary) from the sensor to the transmitter.

Note

Use a ½-in. NPT when mating conduit to the transmitter.

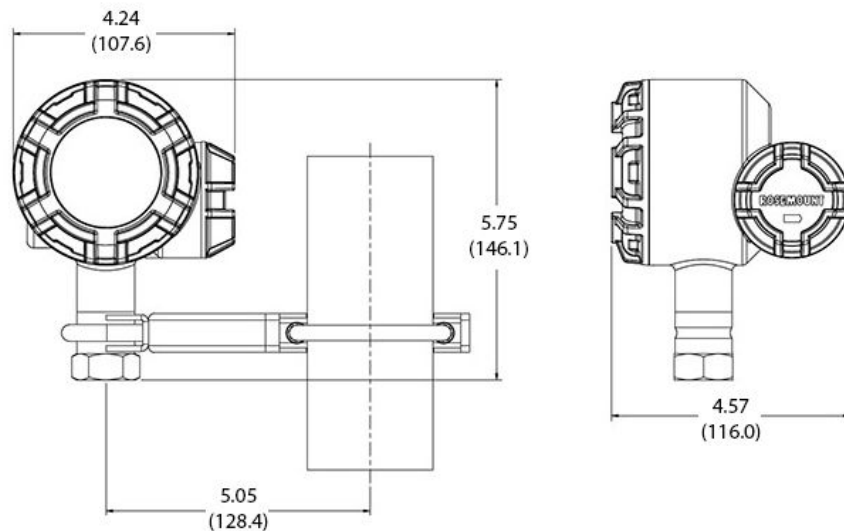
Figure 3-5: Exploded View of LCD Display Assembly



- A. *Housing cover*
- B. *LCD meter*
- C. *Terminal screws*
- D. *LCD adapter plate*
- E. *Housing*
- F. *Green power module*
- G. *Power module cover*

5. Pull the wiring through the threaded conduit entry of the transmitter.
6. Attach the sensor wiring to the terminals as indicated on [Figure 2-1](#).
7. Reattach and secure LCD display adapter plate to 5 in.-lb. of torque (if applicable).
8. Reattach the LCD display (if applicable).
9. Reattach and tighten the transmitter enclosure cover.
10. Remove the power module cover.
11. Connect the Green Power Module.
12. Reattach and tighten the power module cover.
13. 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.
14. Provide 1.75 in. (45 mm) of clearance for units without an LCD display. Provide 3 in. (76 mm) of clearance for units with an LCD display for cover removal.

Figure 3-6: Remote Mount



Note

Dimensions are in inches (millimeters).
Wireless devices must be powered up in order of proximity from the Wireless Gateway, beginning with the closest device to the Gateway. This will result in a simpler and faster network installation.

3.4.3 LCD display

Transmitters ordered with the LCD display will be shipped with the display installed.

The optional LCD display can be rotated in 90-degree increments by squeezing the two tabs, pulling out, rotating and snapping back into place.

Use the following procedure and [Figure 3-7](#) to install the LCD display:

Procedure

1. Remove the power module cover and Green Power Module.
2. Remove the transmitter enclosure cover.

CAUTION

When the circuit is live, do not remove the instrument covers in explosive environments.

3. Tighten the captive screws and secure LCD adapter plate to 5 in-lb of torque.
4. Attach the LCD display on the LCD adapter plate, rotate to the desired position, and snap into place.
5. Reattach and tighten the transmitter enclosure cover.
6. Connect the Green Power Module.
7. Reattach and tighten the power module cover.

8. Always ensure a proper seal by installing the covers so that polymer contacts polymer (i.e. no O-ring visible). Emerson recommends using Rosemount O-rings.

To enable and configure the LCD display, refer to [Configuring the LCD display](#).

Note the following LCD display temperature limits:

Operating: -40 to 185 °F (-40 to 85 °C)

Storage: -40 to 185 °F (-40 to 85 °C)

Note

Only use Rosemount wireless LCD display part number: 00753-3203-0001.
An LCD display from a wired device will not function in a wireless device.

Figure 3-7: Optional LCD Display



4 Commissioning

4.1 Verify operations

Operations can be verified in four locations:

- At the device via the Local Display
- Using the Field Communicator
- At the Gateway's integrated web interface
- Using AMS Wireless Configurator or AMS Device Manager

4.1.1 Local display

During normal operation, the LCD display will display the PV value at the configured update rate.

For **Device Status** screens, see [LCD display screen messages](#).

4.1.2 Field Communicator

For HART® communication, a Rosemount 248 Wireless Device Driver (DD) is required. To obtain the latest DD, see [Emerson.com/Rosemount/Device-Install-Kits](https://emerson.com/Rosemount/Device-Install-Kits).

The communication status may be verified in the wireless device using the following Fast Key sequence.

Table 4-1: Fast Key Sequence

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

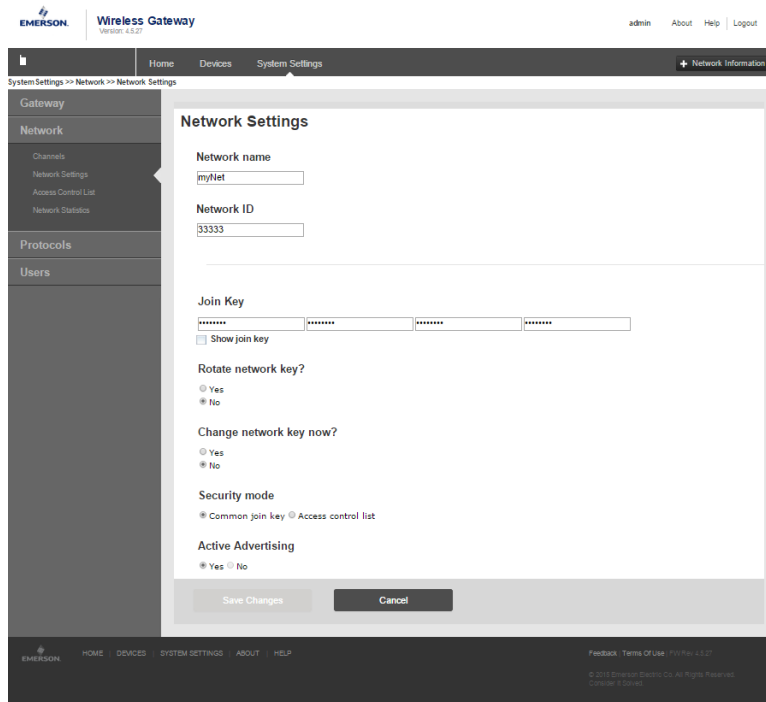
4.1.3 Emerson wireless gateway

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. If the device joins the network and immediately has an alarm present, then it is likely due to sensor configuration. Check the sensor wiring. See [Figure 4-3](#) and [Table 4-2](#).

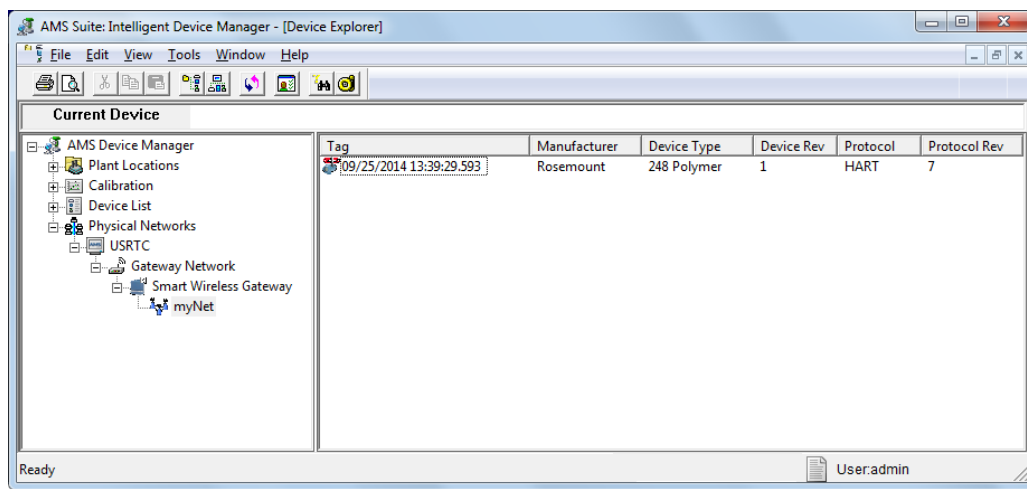
Figure 4-1: Wireless Gateway Network Settings



4.1.4 AMS wireless configurator

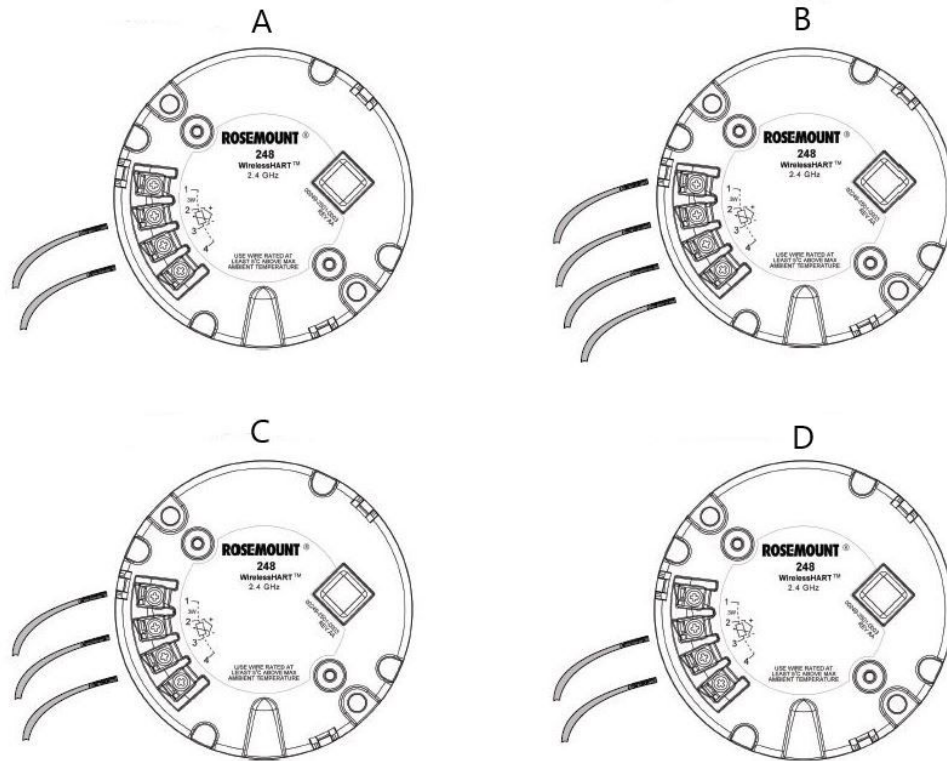
When the device has joined the network, it will appear in the **Wireless Configurator** window as shown in Figure 4-2. For HART® communication, a Rosemount 248 Wireless DD is required. To obtain the latest DD, see Emerson.com/Rosemount/Device-Install-Kits.

Figure 4-2: AMS Wireless Configurator



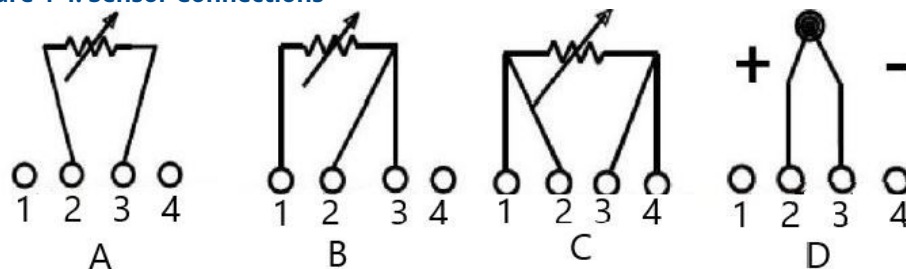
4.2 Reference information

Figure 4-3: Sensor Wiring



- A. Thermocouple and mV
- B. 4-Wire RTD and Ω
- C. 3-Wire RTD and Ω
- D. 2-Wire RTD and Ω

Figure 4-4: Sensor Connections



- A. 2-wire RTD and Ω
- B. 3-wire RTD and Ω
- C. 4-wire RTD and Ω
- D. T/C and mV

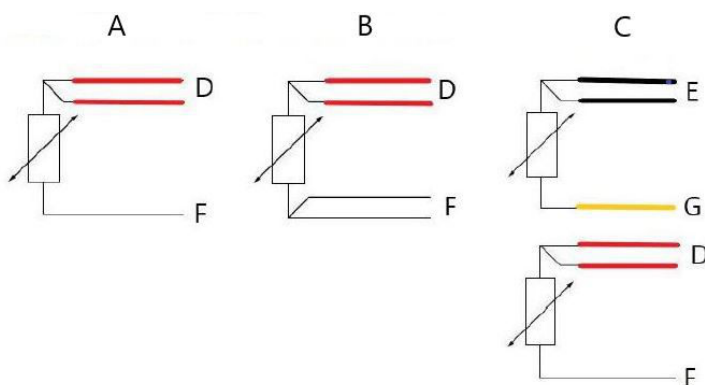
Note

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

Table 4-2: Wireless HART® Fast Key Sequences

Function	Key sequence	Menu items
Device Information	1, 7	Identification, Revisions, Radio, Security
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 to Network, Broadcast Info
Sensor Calibration	3, 5, 2	Sensor Value, Sensor Status, Current Lower Trim, Current Upper Trim, Lower Sensor Trim, Upper Sensor Trim, Recall Factory Trim

Figure 4-5: RTD Lead Wire Configuration per IEC 60751



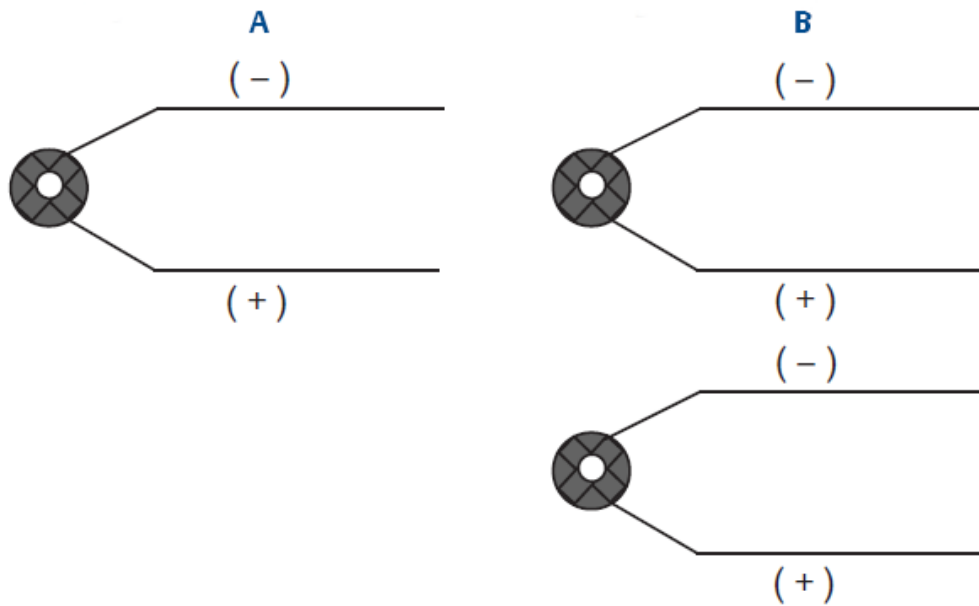
- A. Single element, 3-wire
- B. Single element, 4-wire
- C. Dual element, 3-wire
- D. Red
- E. Black
- F. White
- G. Yellow

Note

To configure a single element, 4-wire RTD as a 3-wire system, connect only one white lead. Insulate or terminate the unused white lead in a manner that prevents shorting to the ground.

To configure a single element, 4-wire RTD as a 2-wire system, connect matching colored wires first and then connect the paired wires to the terminal.

Figure 4-6: Thermocouple Lead Wire Configurations



- A. Single thermocouple, 2-wire
- B. Dual thermocouple, 4-wire

Type	IEC 60584 thermocouple colors		ASTM E-230 thermocouple colors	
	Positive (+)	Negative (-)	Positive (+)	Negative (-)
J	Black	White	White	Red
K	Green	White	Yellow	Red
T	Brown	White	Blue	Red

Note

Dual thermocouple sensors are shipped with one pair of the wires shrink-wrapped together.

5 Operation and maintenance

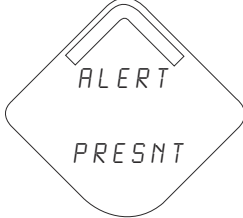
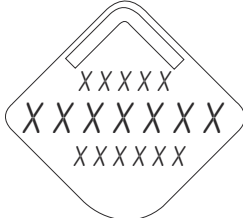
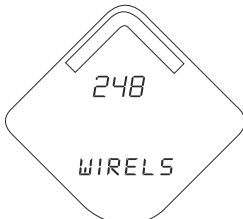
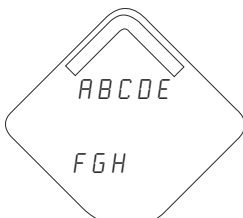
5.1 LCD display screen messages

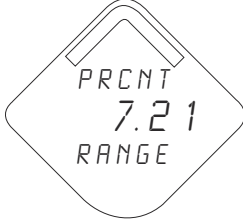

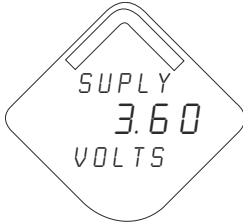
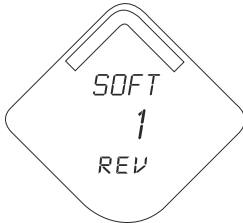

5.1.1 Startup screen sequence

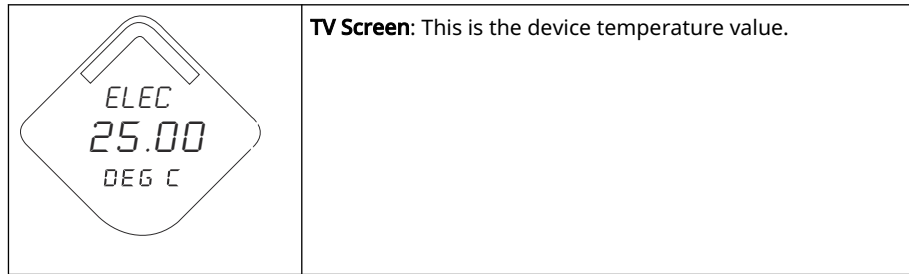
Note

Use the Rosemount Wireless LCD Part Number: 00753-3203-0001.

The following screens will display when the power module is first connected to the transmitter:

	<p>Alert Screen: There is at least one alert that is present. This screen will not display if no alerts are present.</p>
	<p>All Segments On: This is used to visually determine if there are any bad segments on the LCD display.</p>
	<p>Device Identification: This is used to determine device type.</p>
	<p>Device Information - Tag: This is the user-entered tag which is eight characters long. It will not display if all characters are blank.</p>

	<p>Percent Range Screen: This is the percent range reading.</p>
	<p>PV Screen: This is the process temperature, ohms, or mV value, depending on how the device is configured.</p>
	<p>QV Screen: This is the voltage reading at the power supply terminals.</p>
	<p>Software Revision: This is the device software revision.</p>
	<p>SV Screen: This is the terminal temperature value.</p>

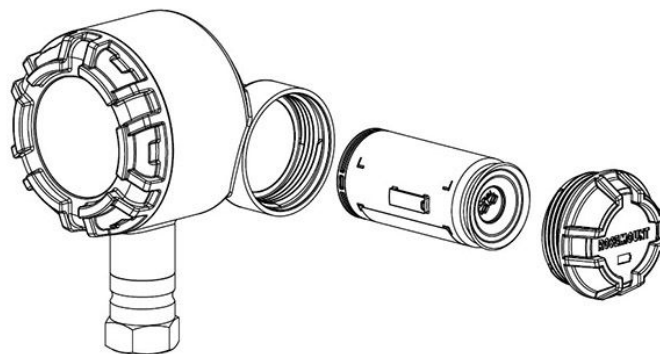


5.2 Power module replacement

Expected power module life is 10 years at reference conditions.⁽¹⁾

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

Figure 5-1: Exploded Power Module View



5.2.1 Handling considerations

The Green 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.

⚠ CAUTION

Care must be taken to prevent thermal, electrical or mechanical damage. Contacts must 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 ft (6.1m).

Battery hazards remain when cells are discharged.

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

NOTICE

Power modules must be stored in a clean and dry area. For maximum power module life, storage temperature must not exceed 86 °F (30 °C).

5.2.2 Environmental considerations

As with any battery, local environmental rules and regulations must be consulted for proper management of spent batteries. If no specific requirements exist, then Emerson recommends recycling through a qualified recycler. For battery specific information, consult the material's Safety Data Sheet.

5.2.3 Shipping considerations

The unit was shipped without the power module installed. Before shipping the unit, remove the power module.

6 Troubleshooting

6.1 Overview

This section provides summarized maintenance and troubleshooting suggestions for the most common operating problems. If malfunction is suspected, despite the absence of any diagnostic messages on the Field Communicator display, then 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 Device status information

6.2.1 Electronics failure

Description

An electronics error that could impact the device measurement reading has occurred.

Recommended actions

1. Reset the device.
2. Reconfirm all configuration items in the device.
3. If the condition persists, replace the electronics.

6.2.2 Electronics temperatures has exceeded limits

Description

The electronics temperature has exceeded the transmitter's maximum range.

Recommended actions

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.

6.2.3 Electronics warning

Description

The device has detected an electronics error that does not currently impact the device measurement reading.

Recommended actions

1. Reset the device.
2. Reconfirm all configuration items in the device.
3. If the condition persists, replace the electronics.

6.2.4 Database memory warning

Description

The device has failed to write to the database memory. Any data written during this time may have been lost.

Recommended actions

1. Reset the device.
2. Reconfirm all configuration items in the device.
 - If logging dynamic data not needed, then this advisory can be safely ignored.
 - If the condition persists, then replace the electronics.

6.2.5 Hi alarm

Description

The primary variable has surpassed the user-defined limit.

Recommended actions

1. Verify the process variable is within user-specified limits.
2. Reconfirm the user-defined alarm limit.
3. If not needed, then disable this alert.

6.2.6 Hi Hi alarm

Description

The primary variable has surpassed the user-defined limit.

Recommended actions

1. Verify the process variable is within user-specified limits.
2. Reconfirm the user-defined alarm limit.
3. If not needed, then disable this alert.

6.2.7 Lo alarm

Description

The primary variable has surpassed the user-defined limit.

Recommended actions

1. Verify the process variable is within user-specified limits.
2. Reconfirm the user-defined alarm limit.
3. If not needed, then disable this alert.

6.2.8 Lo Lo alarm

Description

The primary variable has surpassed the user-defined limit

Recommended actions

1. Verify the process variable is within user-specified limits.
2. Reconfirm the user-defined alarm limit.
3. If not needed, then disable this alert.

6.2.9 Radio failure

Description

The wireless radio has detected a failure or stopped communicating.

Recommended actions

1. Reset the device.
2. If the condition persists, replace the electronics.

6.2.10 Simulation active

Description

The device is in simulation mode and may not be reporting actual information.

Recommended actions

1. Verify simulation is no longer required.
2. Disable **Simulation** mode in **Service Tools**.
3. Reset the device.

6.2.11 Supply voltage failure

Description

The supply voltage is too low for the device to broadcast updates.

Recommended actions

Replace the power module.

6.2.12 Supply voltage low

Description

The supply voltage is low and may soon affect broadcast updates.

Recommended actions

Replace the power module.

6.3 Transmitter troubleshooting

6.3.1 Digital temperature output is erratic

Potential cause

Wiring

Recommended actions

Check sensor wiring integrity at all junctions to ensure proper connections.

Potential cause

Electronics module

Recommended actions

Connect a communication device and enter the **Transmitter test** mode to isolate module failure.

6.3.2 High output temperature detected

Potential cause

Sensor input failure or connection

Recommended actions

1. Connect a communication device and enter the transmitter test mode to isolate a sensor failure.
2. Check for a sensor open or short circuit.
3. Check the process variable to see if it is out of range.

Potential cause

Electronics module

Recommended actions

1. Connect a communication device and enter the **Transmitter status** mode to isolate module failure.
2. Connect a communication device and check the sensor limits to ensure calibration adjustments are within the sensor range.

6.3.3 Low output or no output

Potential cause

Sensor element

Recommended actions

1. Connect a communication device and enter the **Transmitter test** mode to isolate a sensor failure.
2. Check the process variable to see if it is out of range.

6.4 LCD display troubleshooting

6.4.1 LCD display not operating

Potential cause

Electronic module

Recommended actions

Ensure the LCD display is enabled.

Potential cause

Connector

Recommended actions

Ensure the LCD display pins are not bent.

Potential cause

LCD display

Recommended actions

Ensure the LCD display is properly seated with the tabs snapped in place and fully engaged.

6.5 Wireless network troubleshooting

6.5.1 Device not joining the network

Recommended actions

1. Verify Network ID and join key.
2. Verify network is in **Active network advertise**.
3. Continue waiting; up to 30 minutes maximum.
4. Check power module.
5. Verify device is within range of at least one other device.
6. Power cycle device to try again.
7. Verify device is configured to join. Ensure the **Join** mode is configured to **Join on Powerup or Reset**.

6.5.2 Limited bandwidth error

Recommended actions

1. Reduce the update rate on transmitter.
2. Increase communication paths by adding more wireless points.
3. Check that device has been on line for at least an hour.
4. Check that device is not routing through a "limited" routing node.
5. Create a new network with an additional Wireless Gateway.

6.5.3 Short battery life

Recommended actions

1. Check that **Power Always On** mode is off.
2. Verify device is not installed in extreme temperatures.
3. Verify device is not a network pinch point.
4. Check for excessive network rejoins due to poor connectivity.

A Reference data

A.1 Product Certifications

To view current Rosemount 248 Wireless Temperature Transmitter Product Certifications:

Procedure

1. Go to [Emerson.com/Rosemount/Rosemount-248-Wireless](https://emerson.com/Rosemount/Rosemount-248-Wireless).
2. Scroll as needed to the green menu bar and click **Documents & Drawings**.
3. Click **Manuals & Guides**.
4. Select the appropriate Quick Start Guide.

A.2 Ordering information, specifications, and drawings

To view current Rosemount 248 Wireless Temperature Transmitter Ordering Information, Specifications, and Drawings:

Procedure

1. Go to [Emerson.com/Rosemount/Rosemount-248-Wireless](https://emerson.com/Rosemount/Rosemount-248-Wireless).
2. Scroll as needed to the green menu bar and select **Documents & Drawings**.
3. For installation drawings, select **Drawings & Schematics**.
4. Select the appropriate document.
5. For ordering information, specifications, and dimensional drawings, select **Data Sheets & Bulletins** and select the appropriate Product Data Sheet.

B Alert message mapping

This appendix outlines the most important alerts in the HART® command 84 Additional Status Field for the transmitter. The information in this section can be used by DeltaV™ for alert monitoring, and in the Emerson Wireless Gateway for Additional Status mapping in Modbus®, OPC, etc.

A complete list of additional status bits is available in the Wireless Gateway.

Table B-1 to Table B-2 display the device variable and variable mapping indexes for the transmitter.

Table B-3 to Table B-4 show 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.

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

Table B-1: Device Variable Index

Device variable	Index
0	Supply voltage
1	Electronics temperature
2	Totalized volume
3	Average flow rate

Table B-2: Default Variable Mapping Index

Variables	Index
PV	Totalized volume
SV	Average flow rate
TV	Electronics temperature
QV	Supply voltage

Note

This index can be modified.

Table B-3: Failure Alerts (F:)

Message	Additional status ⁽¹⁾	Description
Electronics Failure	Byte 8 :: Bit 6	A failure has been detected in the device memory and/or electronics.
Configuration Error	Byte 2 :: Bit 6	The device has detected a configuration error based on a change to the device.
Radio Failure	Byte 1 :: Bit 6	The wireless radio has detected a failure or stopped communicating.
Supply Voltage Failure	Byte 6 :: Bit 2	The supply voltage is too low for the device to broadcast.

⁽¹⁾ Location of the alert in the HART command 48 status field.

Table B-4: Maintenance Alerts (M:)

Message	Additional status ⁽¹⁾	Description
Totalized Volume Rollover	Byte 3 :: Bit 2	The totalized volume has exceeded the maximum value and automatically reset to zero.
Average Flow Rate Saturated	Byte 3 :: Bit 0	The average flow rate is beyond the operating limits of the device and the reported value is saturated.
Electronics Temperature Beyond Limits	Byte 8 :: Bit 5	The terminal temperature has exceeded the transmitter's maximum range.
Supply Voltage Low	Byte 8 :: Bit 4	The supply voltage is low and may soon affect broadcast updates.

(1) Location of the alert in the HART command 48 status field.

For more information: [Emerson.com/global](https://emerson.com/global)

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