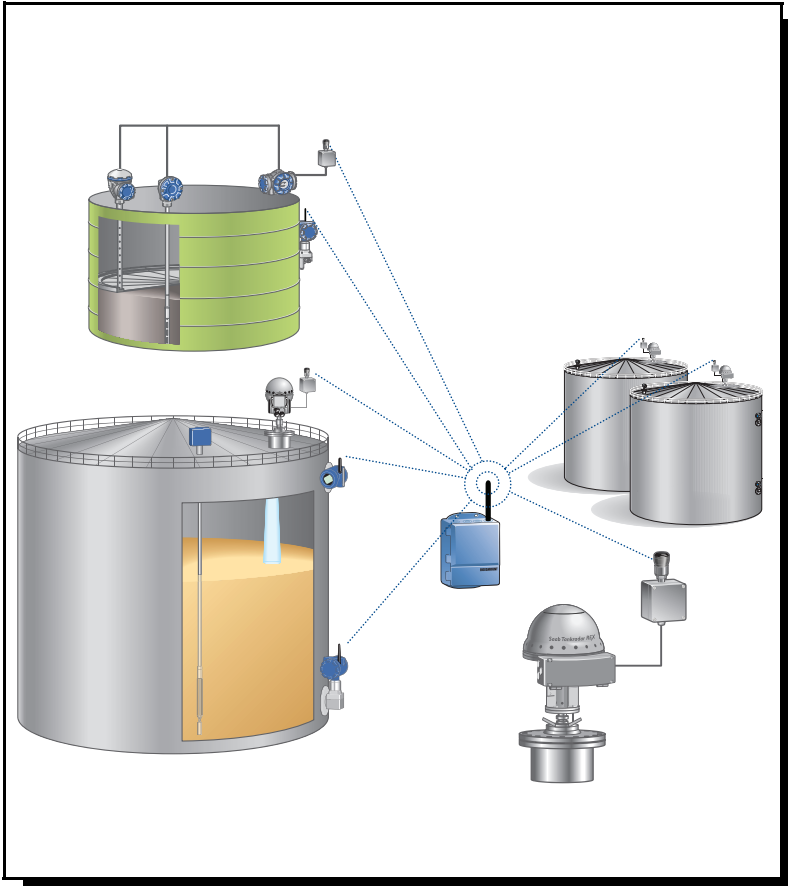


Wireless Tank Gauging

System Setup Using AMS Wireless Configurator



Wireless Tank Gauging

System Setup Using AMS

Wireless Configurator

NOTICE

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

For equipment service or support needs, contact your local Emerson Process Management/Rosemount Tank Gauging representative.

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Section 1 Introduction

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1.1 THE SMART WIRELESS SYSTEM

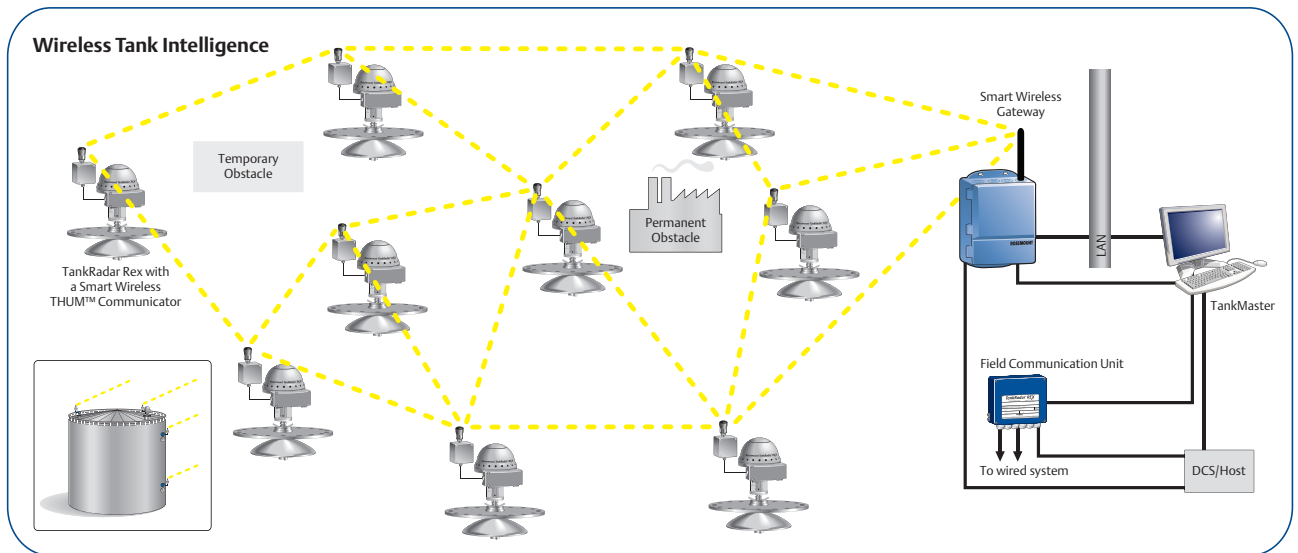
The Smart Wireless System is based on IEC 62591 (*WirelessHART*), the industry standard for wireless field networks.

The reduced field wiring leads to large savings in infrastructure, design and labor required for installation and commissioning.

No hot work is required and production downtime is minimized.

In addition, compared to other systems, the time between project start-up and an up-and-running wireless system is drastically reduced.

Figure 1-1. Wireless Tank Gauging Network.



1.2 WIRELESSHART – THE INDUSTRY STANDARD

WirelessHART is the first simple, reliable and secure wireless communication standard for process monitoring and control applications (IEC 62591Ed. 1.0).

1.2.1 Self-Organizing, Adaptive Mesh Routing

- No wireless expertise required, devices automatically find the best communication paths
- Network continuously monitors paths for degradation and repairs itself
- Adaptive behavior provides reliable, hands-off operation and simplifies network deployments, expansion and reconfiguration
- Supports both star and mesh topologies

1.2.2 Industry Standard Radio With Channel Hopping

- Standard IEEE 802.15.4 radios
- 2.4 GHz ISM band sliced into 16 radio-channels
- Continuously “hop” across channels to avoid interference and increase reliability
- Direct Sequence Spread Spectrum (DSSS) technology delivers high reliability in challenging radio environment

1.2.3 Self-Healing Network

- If an obstruction is introduced into the mesh network, devices will automatically find the best alternative communication path. This alternative path will be created and the information will continue to flow

1.2.4 Seamless Integration To Existing Hosts

- Transparent and seamless integration
- Same control system applications
- Gateways connect using industry protocols

1.3 MANUAL OVERVIEW

This manual provides configuration, installation and commissioning information on the Wireless Tank Gauging system including TankRadar Rex, TankRadar Pro and the 2410 Tank Hub.

Section 1: Introduction

- The Smart Wireless system
- *Wireless*HART – The industry standard
- Wireless tank gauging system components
- Installation procedure
- References

Section 2: Network Planning

- Scope
- Design
- Fortify

Section 3: Configuration

- Configuration overview
- THUM Adapter configuration
- Level gauge / Tank Hub configuration
- Repeater configuration

Section 4: Installation

- Installation considerations
- Mechanical installation
- Electrical installation

Section 5: Commissioning

- Starting up devices
- Verify network device connection
- Verify network device status
- Verify network design rules
- View network live (Optional)

Appendix A: Configuration Preparations

- HART modem connection
- Gateway connection

Appendix B: THUM Adapter Serial Number

- Serial number on label
- Serial number in AMS Wireless Configurator

Appendix C: HART Menu Tree

- TankRadar Rex
- TankRadar Pro

Appendix D: Configure 8 Process Variables

- Configure THUM for 8 process variables

1.4 WIRELESS TANK GAUGING SYSTEM COMPONENTS

1.4.1 Smart Wireless Gateway

The Smart Wireless Gateway enables communication between wireless devices and host applications, such as Rosemount TankMaster. Each gateway will manage its own unique wireless network.

In a wireless Rosemount Tank Gauging system a single gateway supports approximately 50 nodes.

Each wireless node in a tank gauging system consists of either a Tank Hub, a TankRadar Rex or Pro level gauge, connected to mains power and supplied with a Smart Wireless THUM Adapter.



1.4.2 Smart Wireless THUM™ Adapter

The Smart Wireless THUM Adapter acts as a wireless data link between the level gauge and a Smart Wireless Gateway in a *WirelessHART* network.

The THUM Adapter is connected to the 2410 Tank Hub or a TankRadar Rex or TankRadar Pro level gauge.



1.4.3 TankRadar Rex

TankRadar Rex is a powerful radar level gauge suitable for non-contact level measurements in storage tanks and other types of tanks.

Features with wireless option enabled:

- 8 process variables
- Combined wired and wireless communication
- Emulation/TRL2 communication
- Slave Data Acquisition Unit (SDAU) can be used for connection to temperature sensors
- Configuration via AMS Device Manager



1.4.4 TankRadar Pro

TankRadar Pro is a powerful radar level gauge suitable for non-contact level measurements in storage tanks and other types of tanks.

Features with wireless option enabled:

- 8 process variables via wireless communication
- Analog Output
- Display DU2210
- Configuration via AMS Device Manager



1.4.5 Rosemount 2410 Tank Hub

Rosemount 2410 is handling communication between the field devices and the control room, and it is available in two versions, for single or multiple tanks. In a wireless network, it is connected to a Smart Wireless THUM™ Adapter.

It also feeds power to the units on the Tankbus, collects and calculates tank data.



1.4.6 Repeater

A repeater can be any wireless device used to strengthen the wireless network or expand the distance between wireless measurements.

The Rosemount 702 is an example of a device that is frequently used as a repeater.



1.4.7 AMS Wireless Configurator

Software supplied with Smart Wireless Gateway for configuration of wireless devices. AMS Wireless Configurator can be used to deploy and configure wireless networks.

AMS Wireless Configurator provides an integrated operating environment that leverages the full capabilities of *WirelessHART* devices, including embedded data trending, charting and graphical display capabilities provided by enhanced EDDL technology.

Features:

- Display and modify device configurations
- View Device Diagnostic
- View Process Variables
- Set the Network ID and Join Key in a wireless device so it can join a gateway's self-organizing network

1.4.8 AMS Wireless SNAP-ON

Optional software for designing and monitoring *WirelessHART* network. AMS Wireless SNAP-ON is a tool that can be used with plot plans or simple scaled drawings to layout the network.

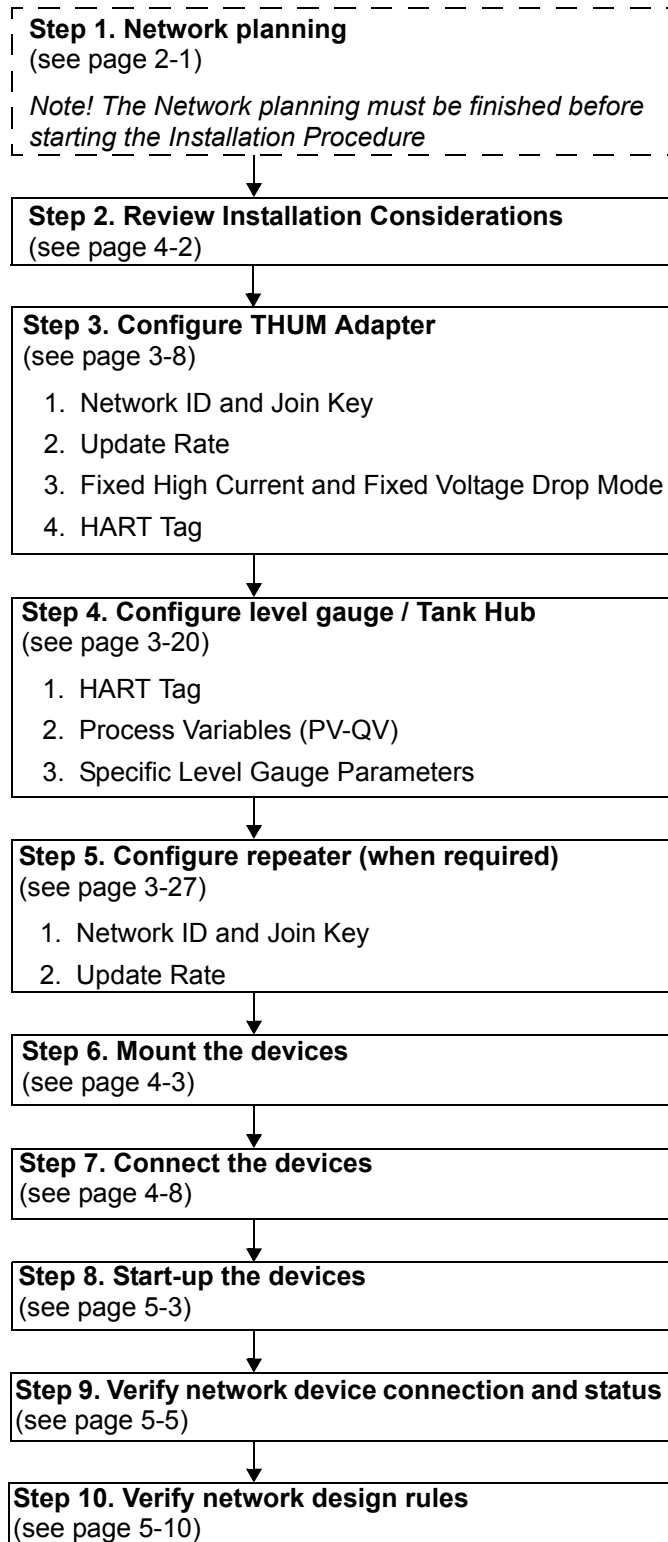
AMS Wireless SNAP-ON can be used as a stand-alone application for site planning and in a real-time mode to monitor the network. This tool incorporates the best practices of design rules recommended for planning a network.

Features:

- AMS Device Manager Plug-in software for wireless mesh network planning and monitoring
- Can be installed "offline" without AMS Device Manager

1.5 INSTALLATION PROCEDURE

Figure 1-2. Installation procedure.



1.6 REFERENCES

Document Title	Document No.
Smart Wireless Gateway Reference Manual	00809-0200-4420
Smart Wireless THUM Adapter Reference Manual	00809-0100-4075
Rosemount 702 Reference Manual	00809-0200-4702
TankRadar Rex Installation Manual	308014EN
TankRadar Rex Service Manual	308012EN
TankRadar Pro Reference Manual	306010EN
Raptor System Configuration Manual	300510En
Rosemount 2410 Tank Hub Reference Manual	300530En
THUM Adapter Mechanical Installation Drawing	9150070-981
2410 Tank Hub to Wireless 775 Assy (THUM) Electrical Installation Drawing	9150070-991
TankRadar Rex Electrical Installation Drawing	9150070-992
TankRadar Pro Electrical Installation Drawing	9150070-993
Single Tank with THUM Electrical Installation Drawing	9240041-997
TankRadar Rex Technical Description	703010EN
TankRadar Pro Technical Description	501026EN
Raptor Tank Gauging System Technical Description	704010En
475 Field Communicator User's Manual	
Smart Wireless Field Network: Recommendations for Planning, Installation, and Commissioning	00840-0400-4180
IEC 62591 <i>Wireless</i> HART System Engineering Guide	
	
AMS Device Manager Books Online 10.1 http://www.emersonprocess.com/Optimize/BooksOnLine/	

Section 2 Network Planning

2.1	Overview	page 2-1
2.2	Scope	page 2-2
2.3	Design	page 2-3
2.4	Fortify	page 2-6

2.1 OVERVIEW

This section provides a brief overview of network planning and recommendations to ensure proper network performance. The network planning must be done before the wireless devices are installed.

There are three fundamental design rules for designing a network:

- **Scope** - Divide the tank farm in logical groups or subsections of a tank area
- **Design** - Apply design rules to ensure optimum connectivity
- **Fortify** - Fix any potential weaknesses in the network design

The guidelines support design of small networks, less than 10 wireless devices, as well as multiple networks containing a larger number of devices.

Designing a wireless network requires a scaled drawing for selecting a gateway location, arranging wireless devices and testing the layout against network design recommendations.

The optional software AMS Wireless SNAP-ON, is a design tool that is recommended to be used for the network planning.

The wireless devices are located according to their tank connection. Only an approximate location on the scaled drawing is required since the self-organizing mesh technology will adapt to conditions as they exist and change from the point of installation.

For more information see the following documents:

- IEC 62591 *WirelessHART* System Engineering Guide
- Smart Wireless Field Network: Recommendations for Planning, Installation, and Commissioning (Document No. 00840-0400-4180)

2.2 SCOPE

2.2.1 Define The Network Area

Obtain a scaled drawing of the tank farm. An existing location plan or aerial picture can be used.

The tank farm often has a natural organization that can be used for scoping networks. Wireless points are ideally organized by tank groups. Divide the tank farm in logical units.

Find a suitable location of the gateway, as close to the centre of the mesh network as possible. Look at available wired infrastructure.

Determine number of wireless devices per gateway. The wireless network gets more robust as more devices are added. 20 to 40 tanks per gateway is recommended. Look at the physical location of the critically located tanks.

If an update rate of 8 seconds⁽¹⁾ is required, maximum 50 wireless devices per gateway are allowed provided that the best practice design guidelines are fulfilled.

2.2.2 Define Area Density

The area density is defined by the obstruction height and obstruction density and sets the expectations for the wireless network range. A tank farm has typically an area density of "light infrastructure"⁽²⁾.

A walk through the tank farm is recommended to get a good overview of the topology and high buildings that may block communication paths. Look for a good position to place the gateway antenna and other wireless devices.

(1) 8 seconds is the highest possible update rate.

(2) For further information, see the IEC 62591 WirelessHART System Engineering Guide.

2.3 DESIGN

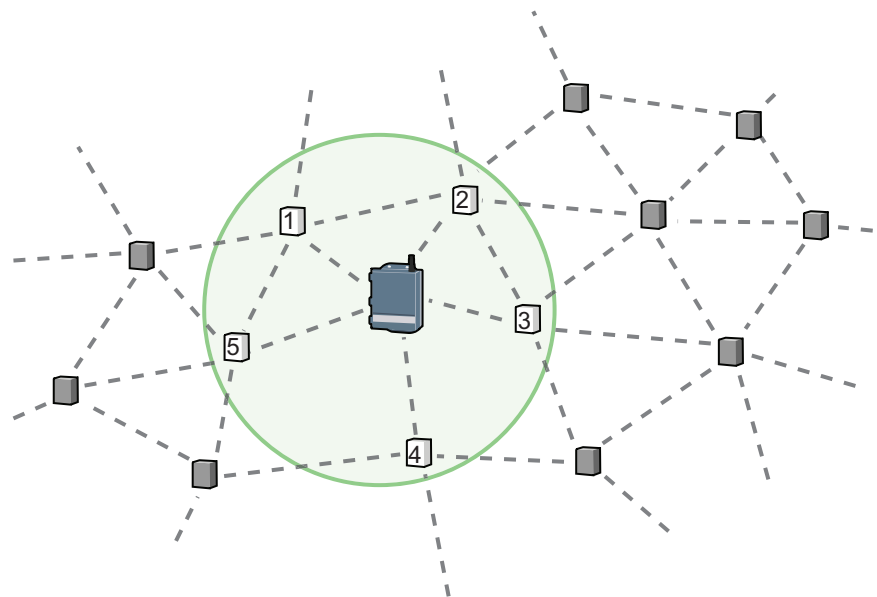
There are three fundamental design rules: Rule of 5, Rule of 3, and Rule of 25%.

The design rules are worked out to ensure a secure margin when implementing a wireless network. During commissioning the implementation of the design rules must be verified. See “Verify Network Design Rules” on page 5-10.

2.3.1 Rule of 5

Every wireless network should have a minimum of 5 devices within effective range of the gateway.

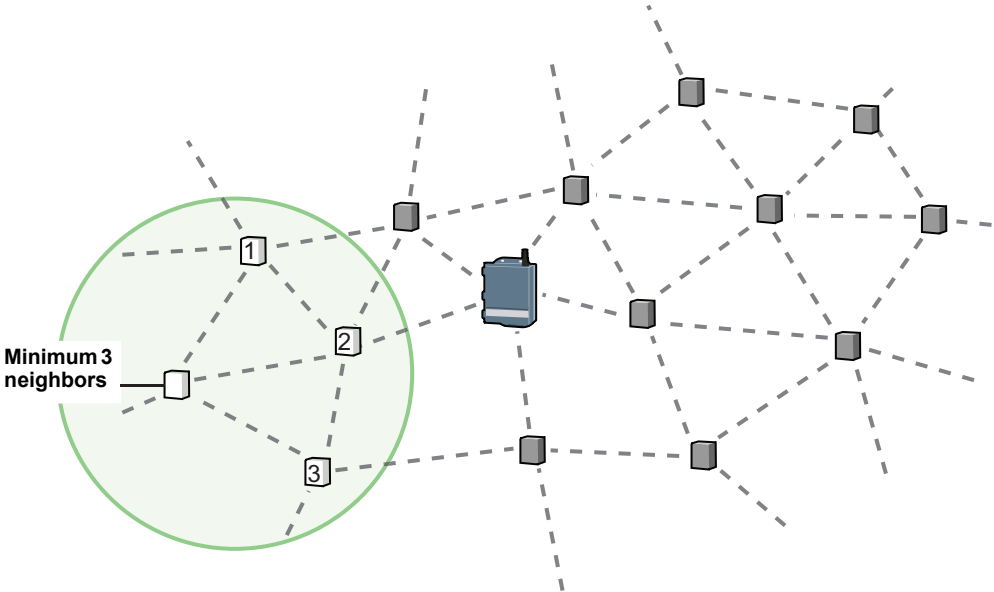
Figure 2-1. Rule of 5.



2.3.2 Rule of 3

When designing, every wireless device should have a minimum of 3 neighbors within effective range. This ensures there will be at least 2 possible connections once commissioned.

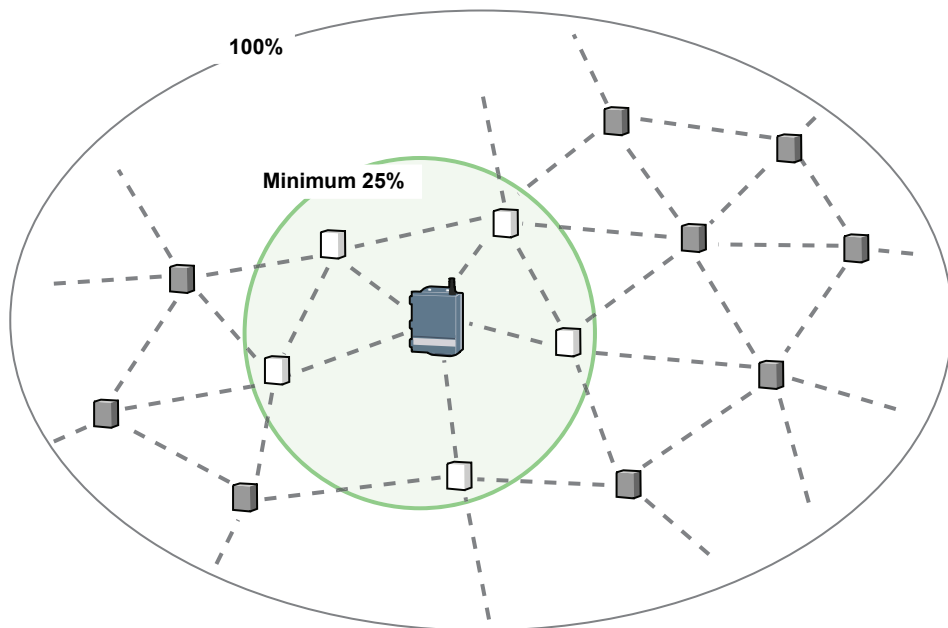
Figure 2-2. Rule of 3.



2.3.3 Rule of 25%

Every wireless network with more than 5 devices should have a minimum of 25% of the devices within effective range of the gateway.

Figure 2-3. Rule of 25%.



2.4 FORTIFY

2.4.1 Stress Testing

Stress testing the network design by altering the effective range of devices is recommended to identify potential weaknesses in the network. To stress test the network, reduce the effective range of the devices in 10% increments. Then test the design rules against reduced effective ranges.

For example, suppose an effective range of 150 m was used for initial design. Reducing effective range by increments of 15 m (10%) will reveal where the weak spots exist. This process builds confidence in the design.

2.4.2 Fortify The Network

When stress testing a network, the weaknesses are identified. Fortify the network by resolving the weaknesses.

Using repeaters is an alternative to support the fortification of a network. Instead of another wireless device with a specific measurement purpose, the repeater is used specifically for the purpose of providing more connection within the network. Repeaters can be used effectively within dense infrastructure if they are placed above the infrastructure to maximize effective range of devices below.

Rule of 5 minimum can be resolved by adding another device within the effective range of the gateway.

When rule of 3 is broken, it can be fortified by adding more devices.

Rule of 25% can be resolved in several different ways. Below are three options to fortify the network design, each with its own consideration:

1. Add more devices within the effective range of the gateway. While this is a good solution, there may not be more points of value within effective range of the gateway.
2. Move the gateway into a more central location relative to the distribution of wireless devices. In this case, there may not be a convenient host system integration point at the center of the network.
3. Add another gateway. The increased concentration of field devices within effective range of the added gateway ensures long-term, trouble-free scalability. There may still be the issue with a convenient host system integration point as with option 2.

Section 3 Configuration

3.1	Safety Messages	page 3-1
3.2	Configuration Overview	page 3-3
3.3	THUM Adapter Configuration	page 3-8
3.4	Rex/Pro/Tank Hub Configuration	page 3-20
3.5	Repeater Configuration	page 3-27

In order to communicate with the Smart Wireless Gateway, and ultimately the Host System (e.g. TankMaster), the Smart Wireless THUM Adapter and other wireless devices must be configured with a proper Network ID and Join Key to communicate with the wireless network. The wireless devices can be ordered with Network ID and Join Key configured at factory.

When the Network ID and Join Key have been configured, the remaining configuration (Section 3: THUM Adapter Configuration) and installation (Section 4: Installation) shall be done. Configuration and installation can be performed in desired order.

3.1 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 (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Explosions could result in death or serious injury:

Verify that the operating environment of the device is consistent with the appropriate hazardous locations certifications.

Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

Do not remove the transmitter cover in explosive atmospheres when the circuit is alive.

⚠ WARNING

Failure to follow safe installation and servicing guidelines could result in death or serious injury:

Make sure the device is installed by qualified personnel and in accordance with applicable code of practice.

Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

Do not perform any service other than those contained in this manual unless you are qualified.

To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

⚠ WARNING

High voltage that may be present on leads could cause electrical shock:

Avoid contact with leads and terminals.

Make sure the mains power to the device is off and the lines to any other external power source are disconnected or not powered while wiring the device.

3.2 CONFIGURATION OVERVIEW

The wireless devices such as the THUM Adapter, level gauge, Tank Hub, and repeater have to be configured in order to set up a wireless network. Configuration of the devices includes the following steps:

THUM Adapter configuration:

- Network ID and Join Key
- Update Rate
- Fixed current and Fixed voltage drop mode
- HART Tag

Level gauge / Tank Hub configuration:

- HART Tag
- Level gauge / Tank Hub process variables (PV-QV)
- Level gauge specific parameters

Repeater configuration:

- Network ID and Join Key
- Update Rate

3.2.1 Configuration Tools

The following configuration tools can be used to configure the wireless network devices.

- AMS Wireless Configurator
- Field Communicator

3.2.2 AMS Wireless Configurator

The AMS Wireless Configurator software is the recommended software tool for the wireless network devices, and is supplied with the Smart Wireless Gateway.

Configuration can be done with the devices connected by wires, or with wireless connection. The AMS Wireless Configurator can connect to the wireless network devices using a HART modem (wired) or through the gateway (wireless).

See AMS Device Manager Books Online for more information about the AMS Wireless Configurator and how to get started.

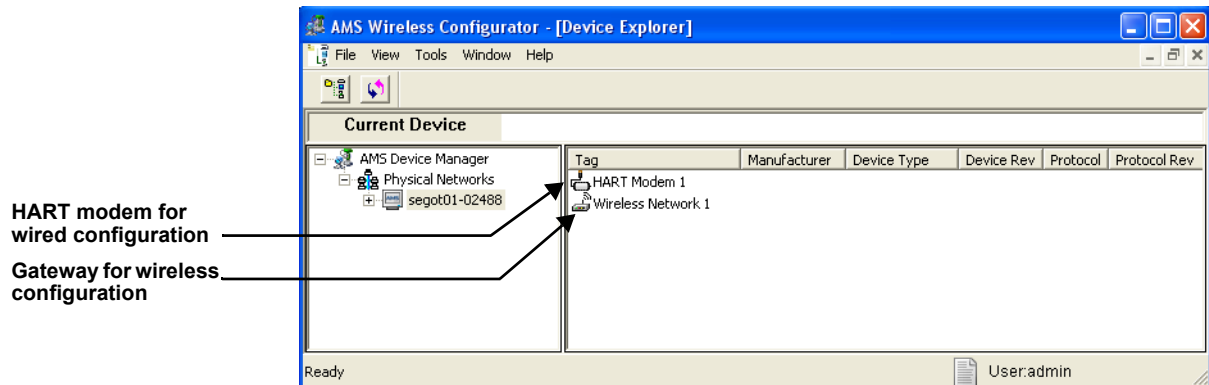
<http://www.emersonprocess.com/Optimize/BooksOnLine/>

Default Log In

Username: admin

Password: " " (blank)

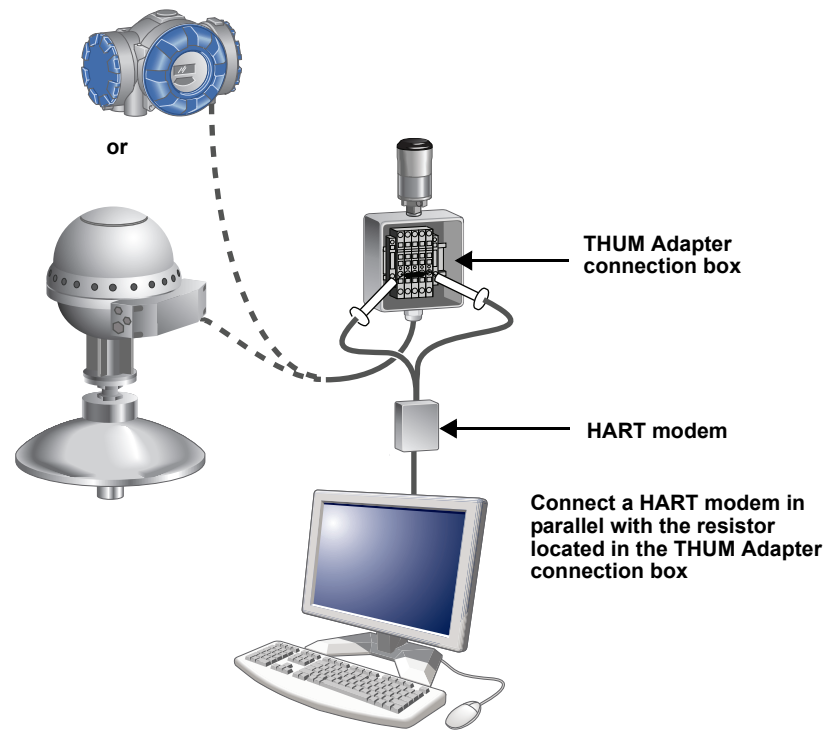
Figure 3-1. AMS Wireless Configurator.



See Appendix A: Configuration Preparations for more information about the AMS Wireless Configurator including how to configure a HART modem and Gateway connection.

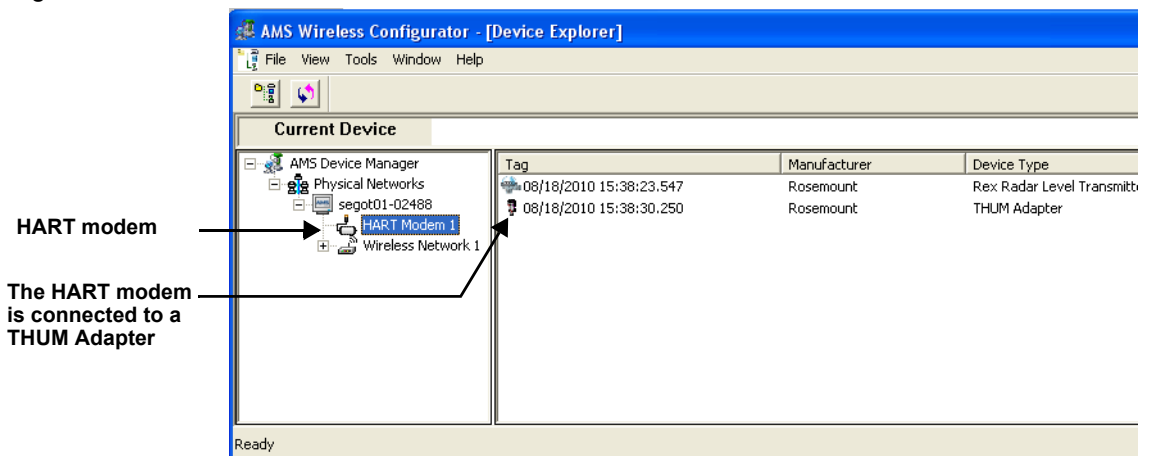
To perform a wired configuration, connect a HART modem to the THUM Adapter as shown in Figure 3-2. See “HART Modem Connected to THUM Adapter” on page 4-10 for more information about how to connect to the wireless device using a HART modem.

Figure 3-2. Wired configuration using a HART modem.



In the AMS Wireless Configurator, select the HART modem in the left-hand side of the workspace. The connected device will appear in the right-hand side of the workspace window.

Figure 3-3. HART modem in AMS Wireless Configurator.



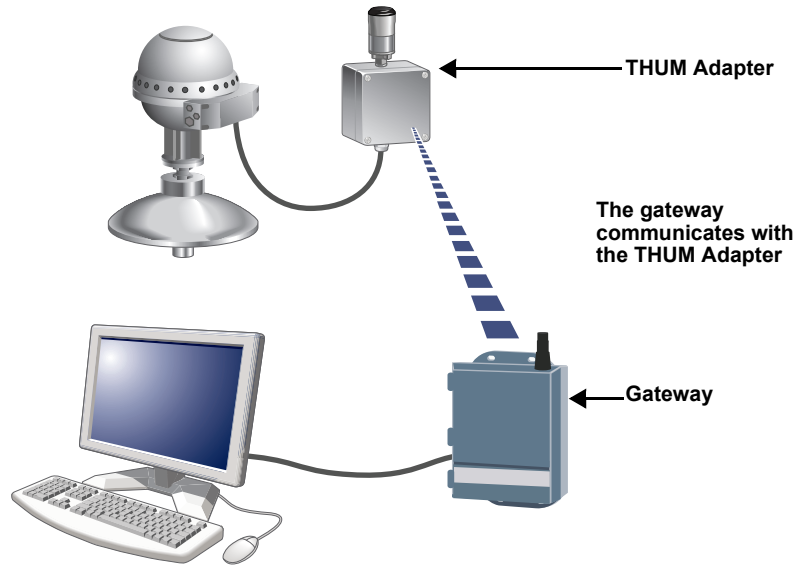
NOTE!

After selecting the HART modem it may take up to a minute for all devices to appear in the right-hand side of the workspace.

Wireless Tank Gauging

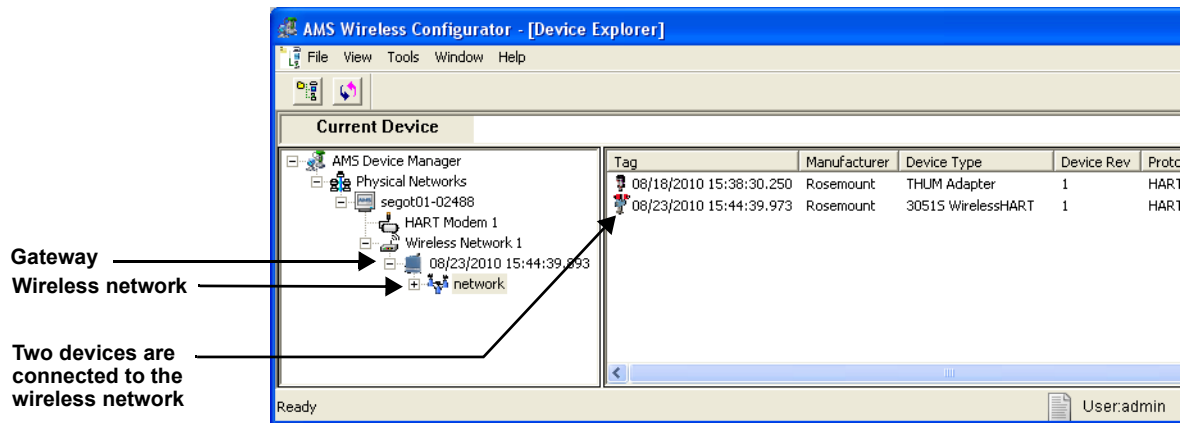
When performing a wireless configuration, the gateway communicates with the device as shown in Figure 3-4. The wireless devices can be configured once they have joined the network.

Figure 3-4. Wireless configuration.



In the AMS Wireless Configurator, choose the gateway and its network in the left-hand side of the workspace. Devices that have joined the wireless network will appear in the right-hand side of the workspace.

Figure 3-5. Gateway in AMS Wireless Configurator.



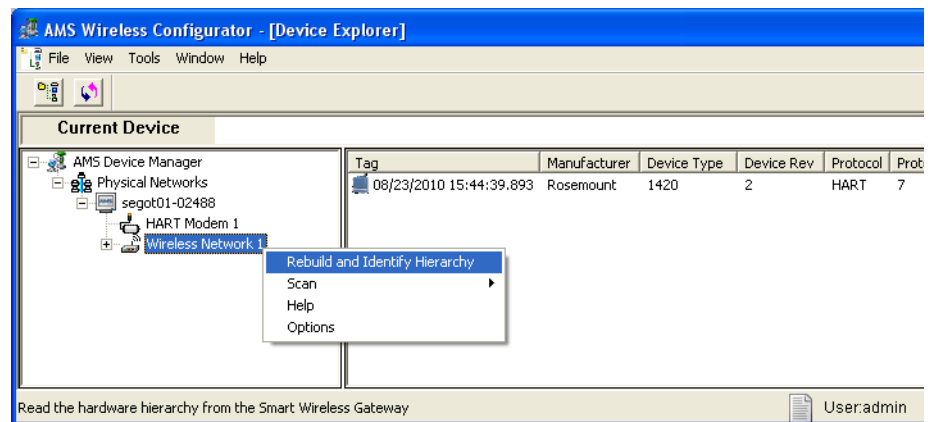
Tip!

To ensure that the device information in AMS Wireless Configurator is current, rebuild the hierarchy right after a new wireless network is configured or when a device is added or removed from the network.

To rebuild the hierarchy, do the following:

Right click the HART modem in the left-hand side of the workspace, and select **Rebuild and Identify Hierarchy**.

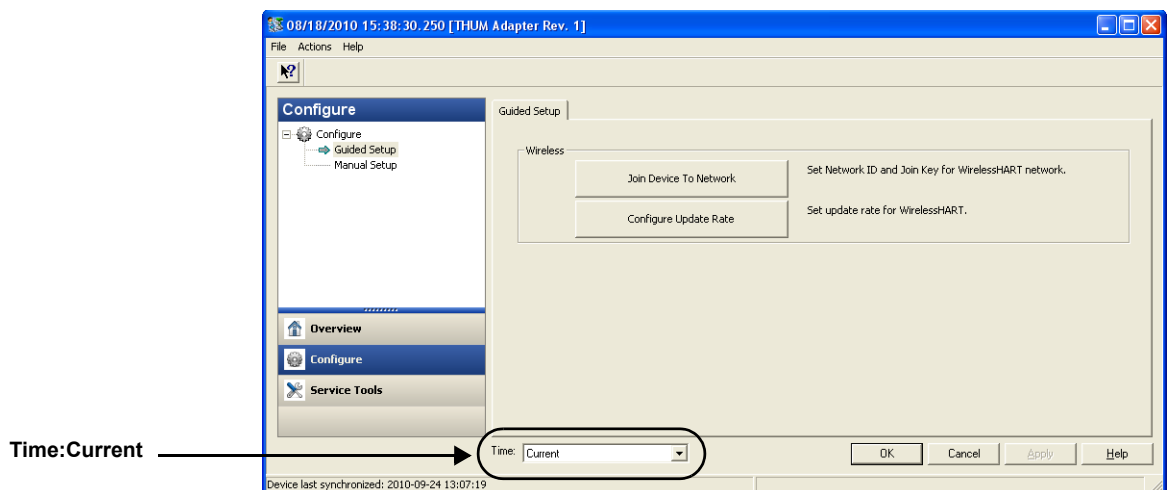
Figure 3-6. Rebuild and Identify Hierarchy.



Tip!

During the configuration procedure regardless of configuration wired/wireless, ensure that **Current** is selected in the **Time drop down** menu at the bottom of the window.

Figure 3-7. Current Time.



3.3 THUM ADAPTER CONFIGURATION

THUM Adapter configuration steps:

- Network ID and Join Key
- Update Rate
- Fixed current and Fixed voltage drop mode
- HART Tag

NOTE!

Note the serial number of each THUM Adapter for future reference. The serial number is found on the label attached to the THUM Adapter and in the AMS Wireless Configurator. See Appendix B: THUM Adapter Serial Number for further information.

3.3.1 Network ID And Join Key

The THUM Adapter has to be configured with the same **Network ID and Join Key** as the gateway, in order to join the network. The current Network ID and Join Key can be obtained from the Smart Wireless Gateway's web server. To view the Network ID and Join Key follow the instructions in section "View Network ID and Join Key" on page 3-9.

The Network ID and Join Key are either configured at factory or have to be configured locally.

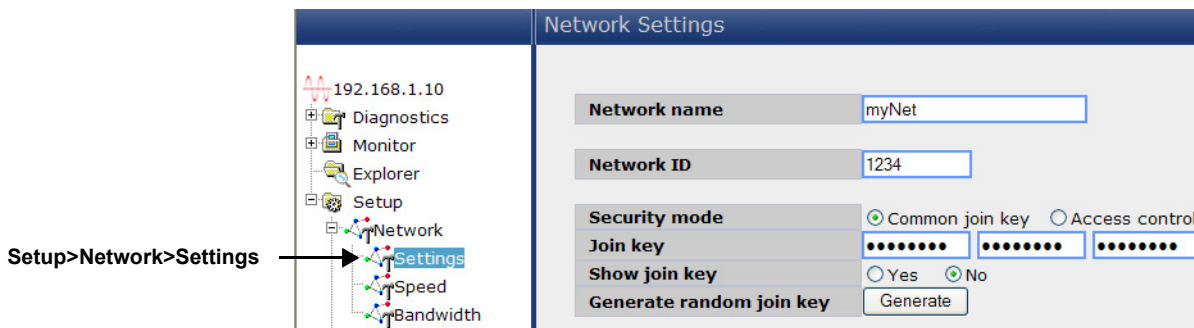
If Network ID and Join Key are configured at factory, the THUM Adapter connects directly to the *WirelessHART* network without any local wired configuration of Network ID and Join Key.

To configure Network ID and Join Key, follow the instructions in section "Configure Network ID And Join Key" on page 3-10.

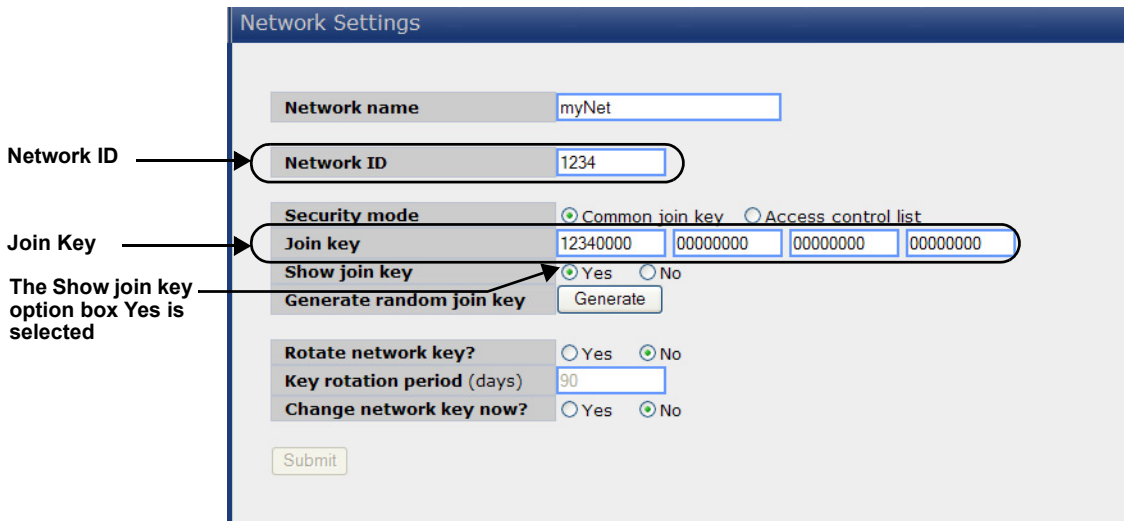
View Network ID and Join Key

To view the current **Network ID and Join Key**, do the following:

1. Open the Smart Wireless Gateway's integrated web server.
2. Log on to the gateway, for instructions see the Smart Wireless Gateway Reference Manual (Document No. 00809-0200-4420).



3. Navigate to **Setup > Network > Settings**.



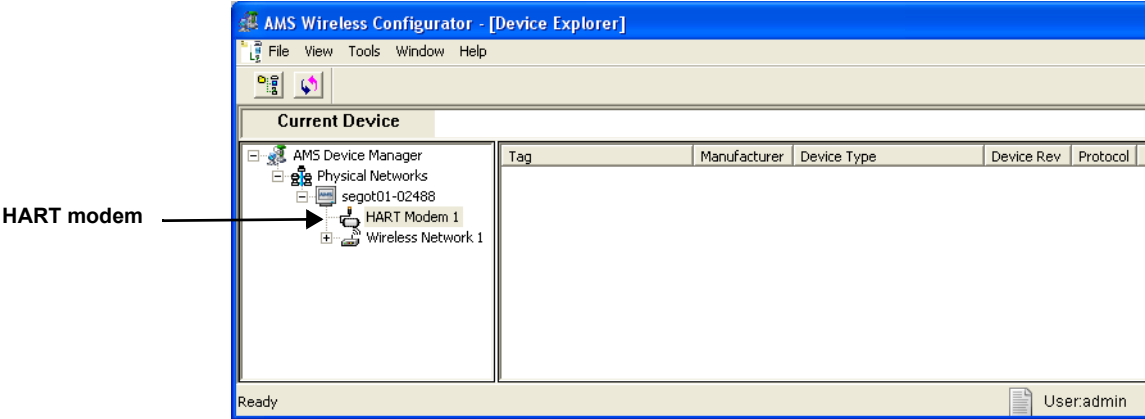
4. Make sure that the **Show join key** option box is set to yes in order to view the Join Key.

Configure Network ID And Join Key

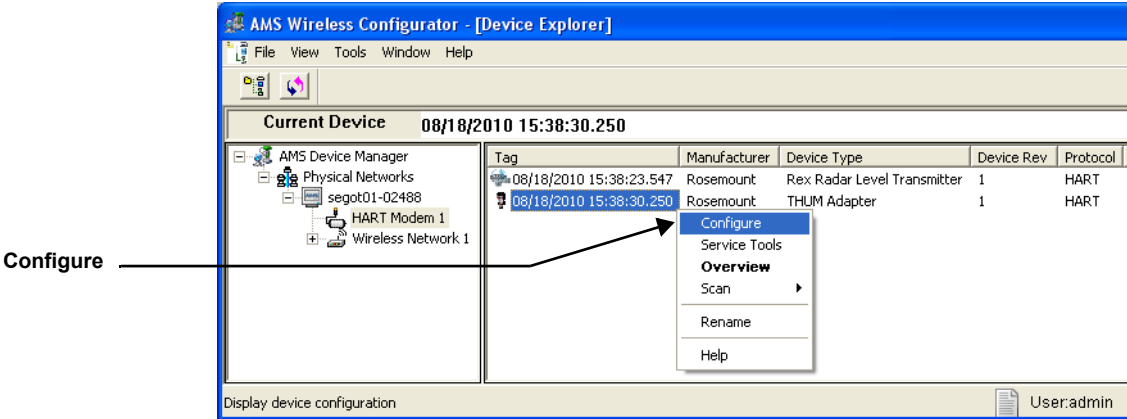
To configure the THUM Adapter, connect using a HART modem in parallel with the resistor located in the THUM connection box. See “HART Modem Connected to THUM Adapter” on page 4-10 to ensure proper wiring.

Use the following procedure to configure **Network ID and Join Key**:

- 1. Open the **AMS Wireless Configurator**.

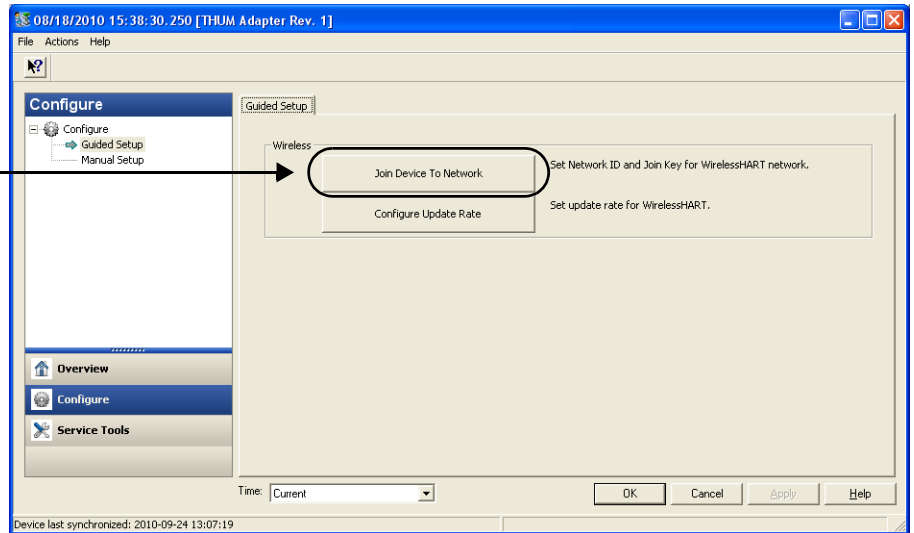


- 2. Select the HART modem.

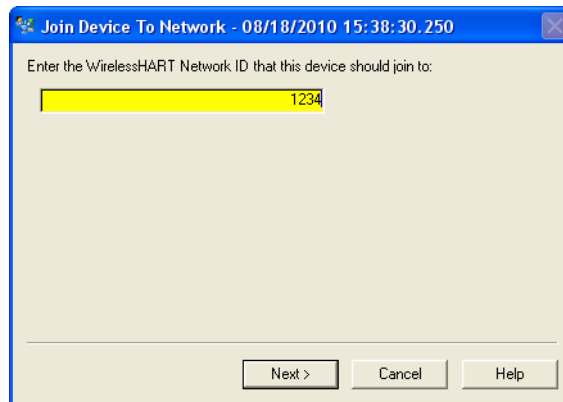


- 3. Right click on the THUM icon and select **Configure**.

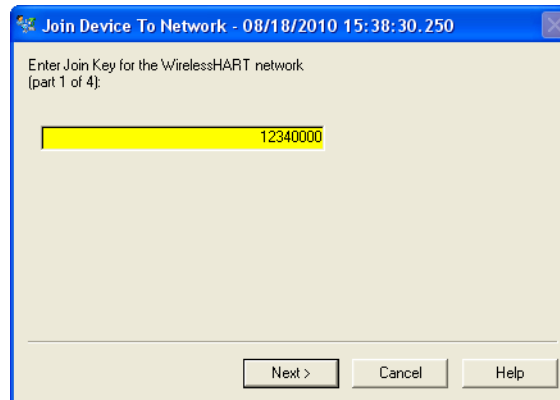
Join Device to Network button



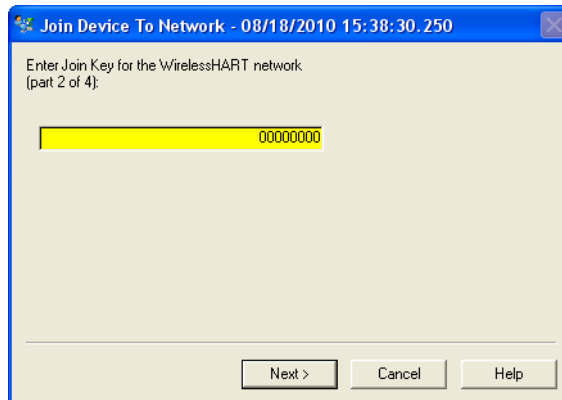
4. Click the **Join Device To Network** button.



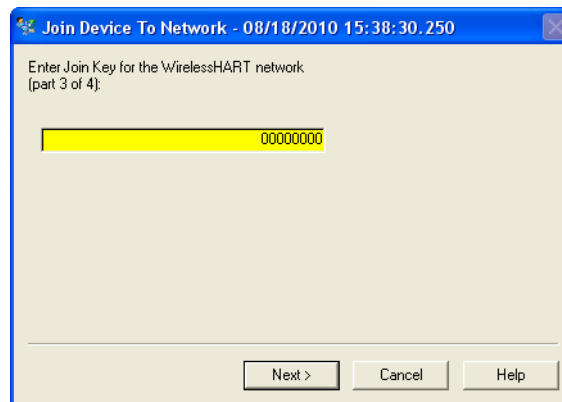
5. Enter Network ID.



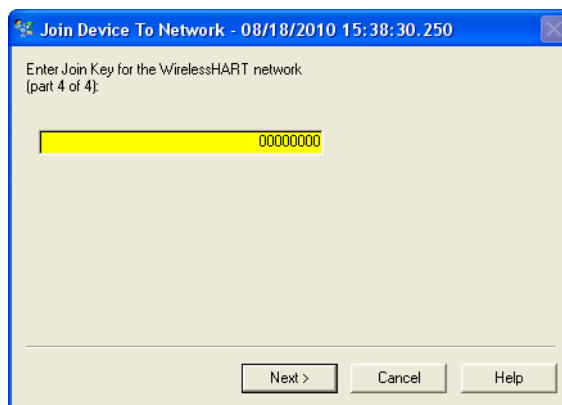
6. Enter Join Key, part 1 of 4.



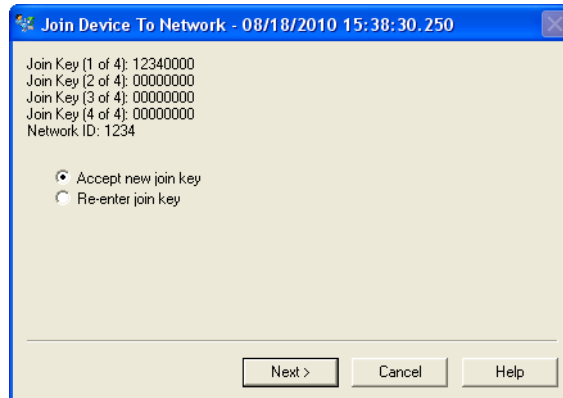
7. Enter Join Key, part 2 of 4.



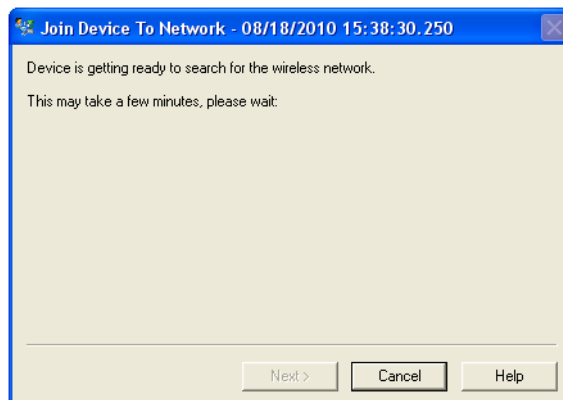
8. Enter Join Key, part 3 of 4.



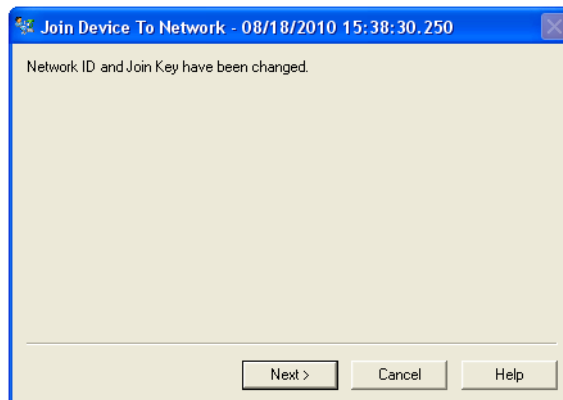
9. Enter Join Key, part 4 of 4.



10. Make sure that the Network ID and Join Key are correct. Click the **Next** button.



11. Wait while the device is getting ready.



12. Network ID and Join Key have been changed. Click the **Next** button to complete the operation.

For more information about Network ID and Join Key, see the THUM Adapter Reference Manual (Document No. 00809-0100-4075).

3.3.2 Update Rate

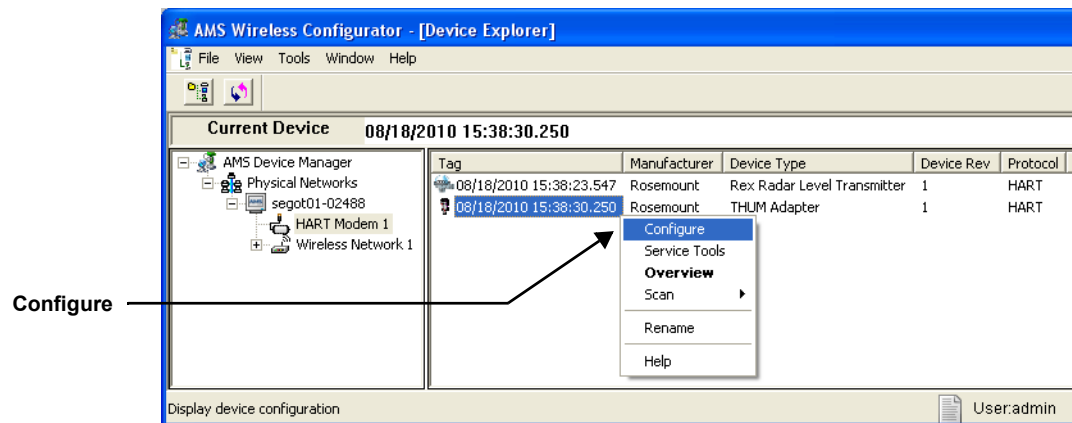
The Update Rate is the user specified interval at which the THUM Adapter will transmit measurement data to the gateway. By default the Update Rate is 1 minute. The Update Rate is selectable from 8 seconds to 60 minutes.

The THUM transmits 3 messages, one message for the THUM and two messages for the level gauge / Tank Hub.

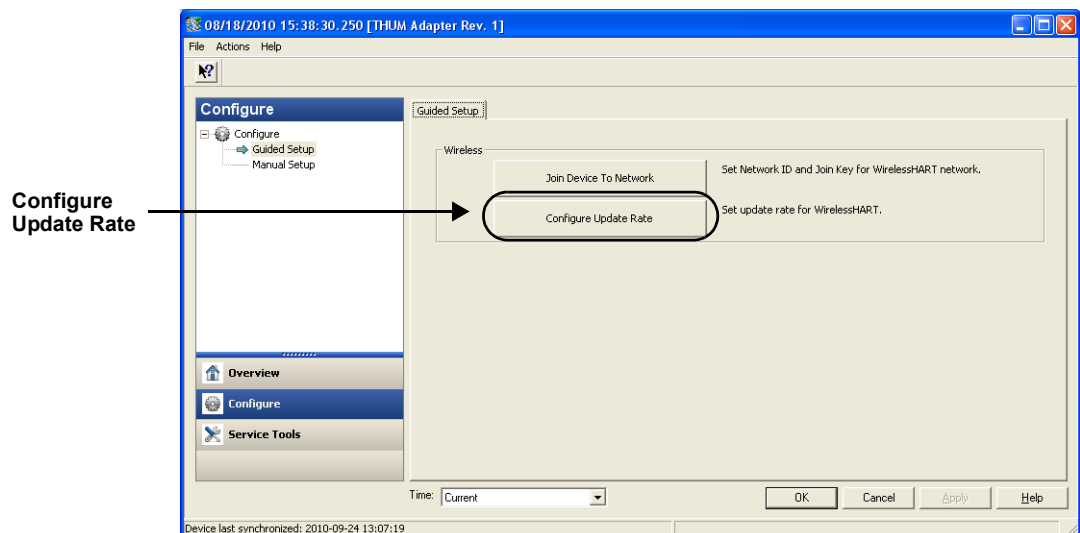
- Message 1, THUM Adapter process variable and status
- Message 2, Level gauge / Tank Hub process variables
- Message 3, Level gauge / Tank Hub additional status information

Use the following wizard to set the Update Rate:

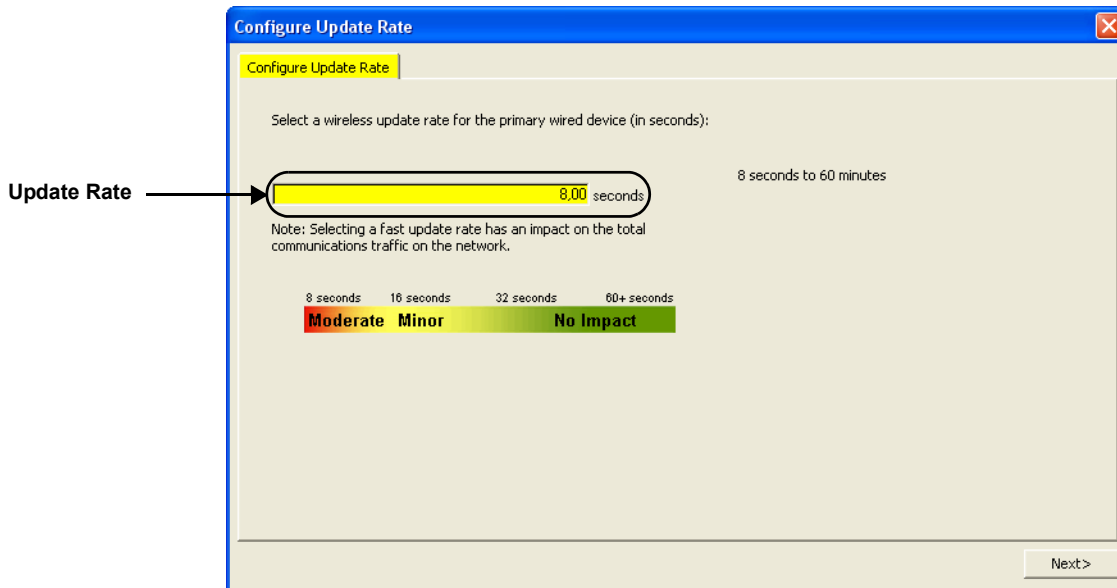
1. Open the AMS Wireless Configurator.



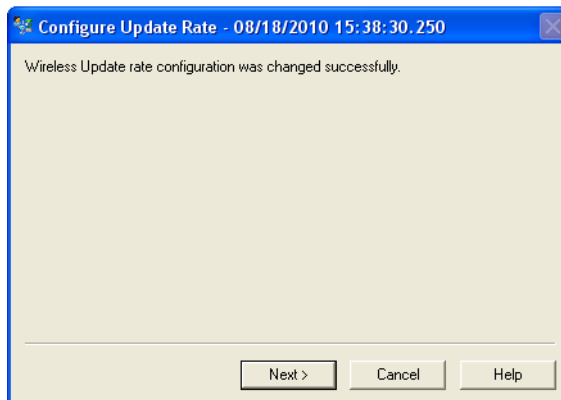
2. Right click the THUM icon and select **Configure**.



3. Click on the **Configure Update Rate** button.



4. Set the Update Rate in seconds and click the **Next** button.



5. The Update Rate configuration was changed successfully. Click the **Next** button to complete the configuration.

Example:

Setting update rate to 8 seconds will result in the following:

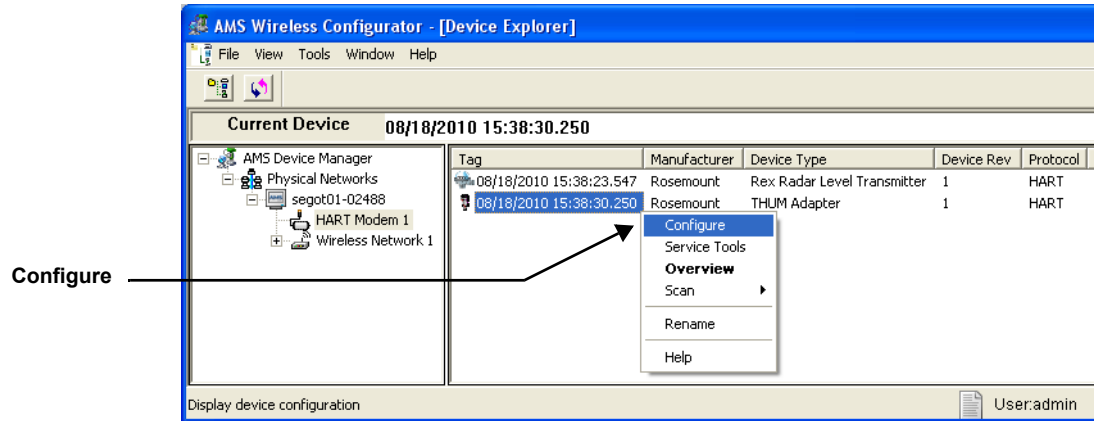
- Message 1 at 60 seconds (THUM process variable and status)
- Message 2 at 8 seconds (Level gauge / Tank Hub process variables)
- Message 3 at 16 seconds (Level gauge / Tank Hub additional status information)

3.3.3 Fixed High Current And Fixed Voltage Drop Mode

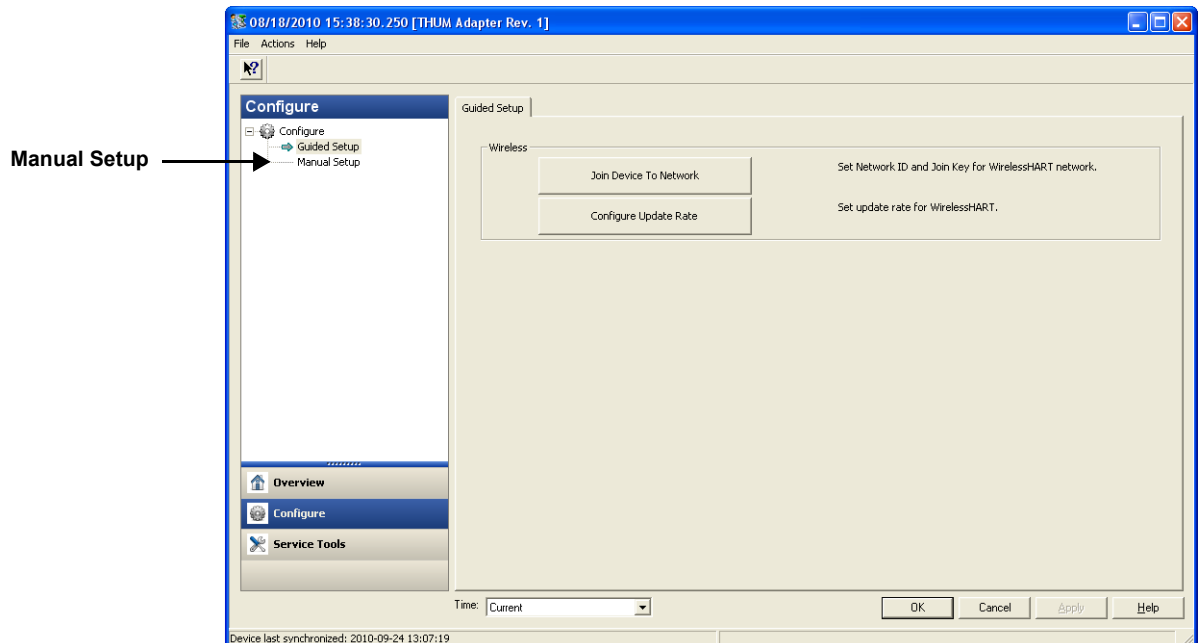
The Tank Hub, TankRadar Rex and Pro level gauges power the THUM with a 20 mA fixed current. Set the THUM in **Fixed High Current** mode and **Fixed Voltage Drop** mode.

To set the **Fixed High Current** and **Fixed Voltage Drop** mode, do the following:

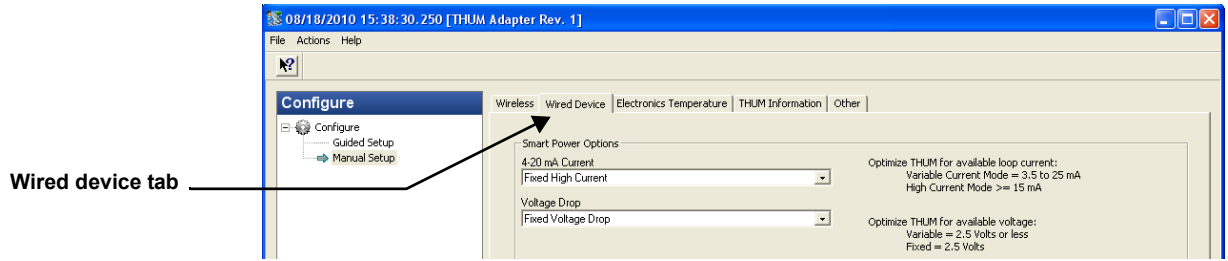
1. Open the AMS Wireless Configurator.



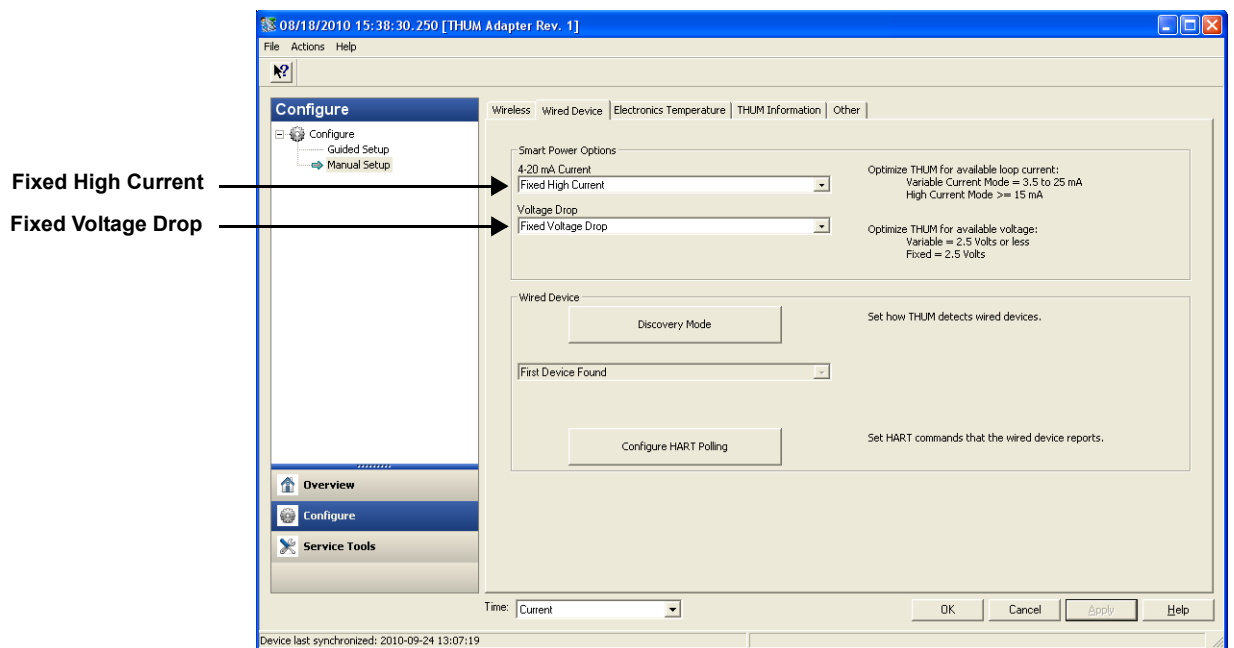
2. Right click the THUM icon and select **Configure**.



3. Select **Manual Setup**.



4. Select the **Wired Device** tab.



5. Select **Fixed High Current** and **Fixed Voltage Drop** in the drop down menus in the Smart Power Options box.
6. Click the **Apply** button to make any changes.

3.3.4 HART Tag

The THUM Adapter is identified in the gateway by its unique HART tag. The THUM Adapter HART tag is set by the **Long tag** parameter.

Each THUM Adapter is connected to a level gauge or a Tank Hub. It is recommended that the THUM and the level gauge / Tank Hub are given the same HART Tag name, with different suffix.

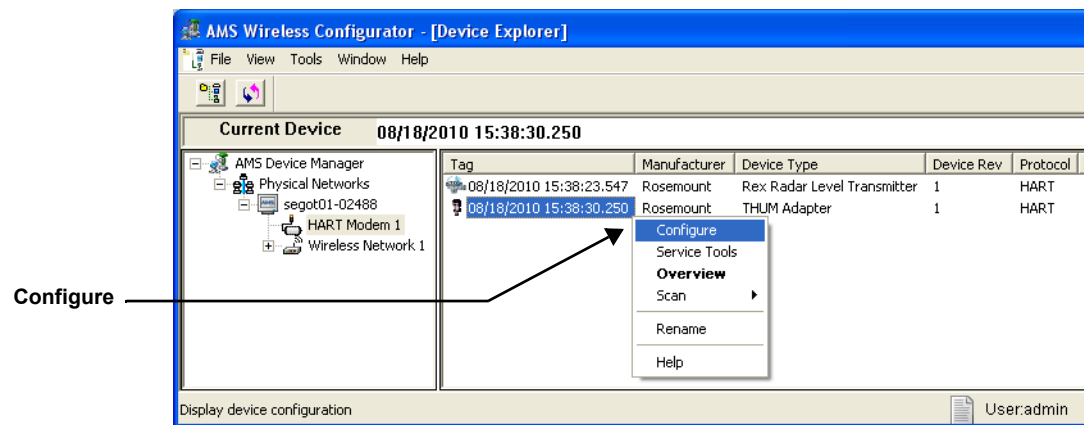
Example:

THUM: TK300_THUM

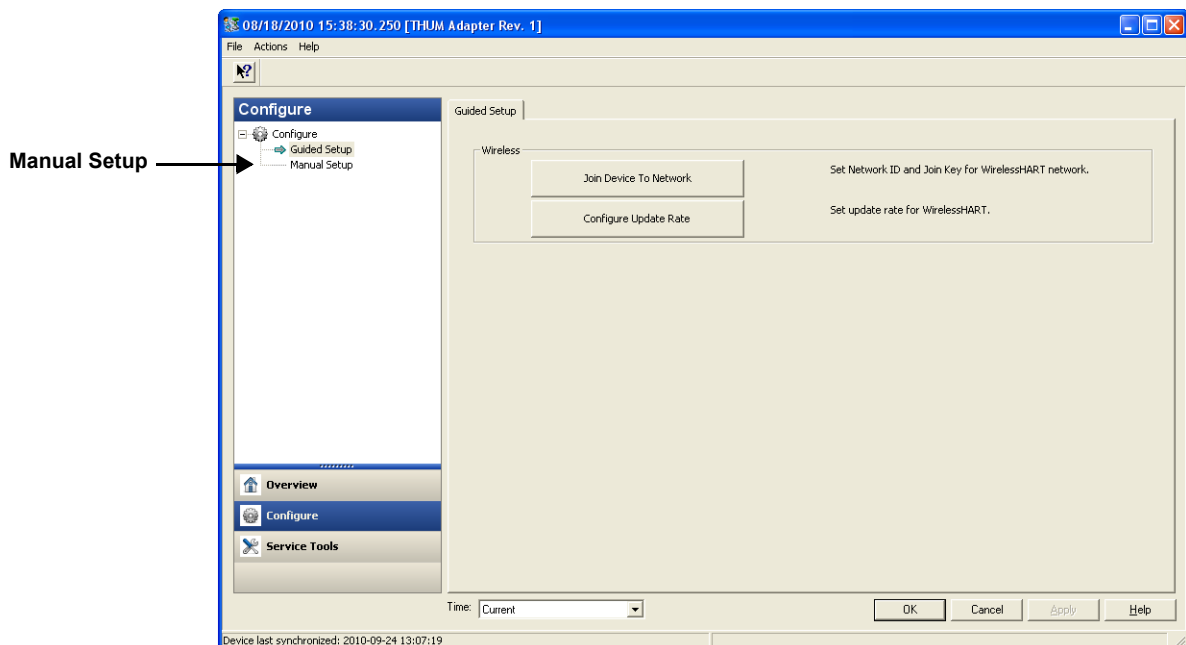
Level gauge: TK300_REX

To set the **Long tag** parameter, do the following:

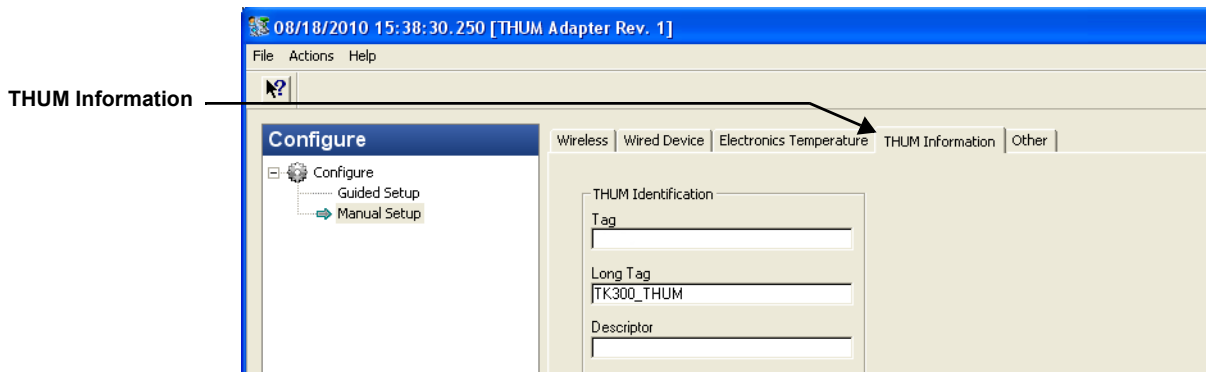
1. Open the AMS Wireless Configurator.



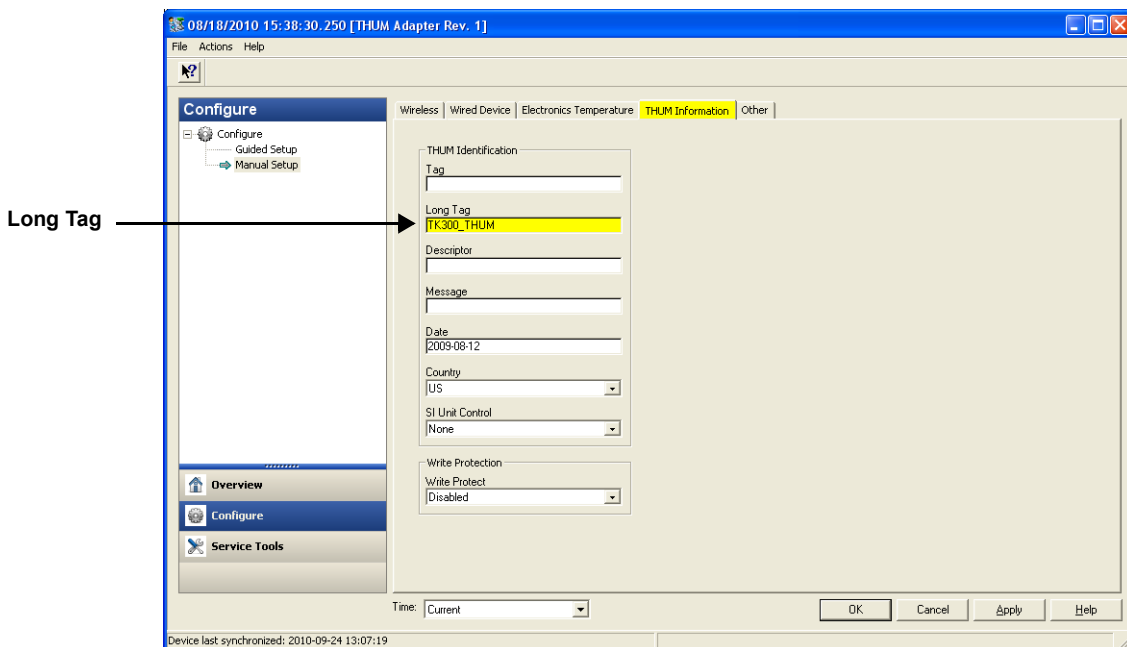
2. Right click the THUM icon and select **Configure**.



3. Select **Manual Setup**.



4. Select the **THUM Information** tab.



5. Set **Long Tag**. (In this example “TK300_THUM”)

6. Click the **Apply** button to make any changes.

Example:

THUM **Long tag** parameter set to “TK300_THUM” is displayed as the HART tag in the gateway’s integrated web server.

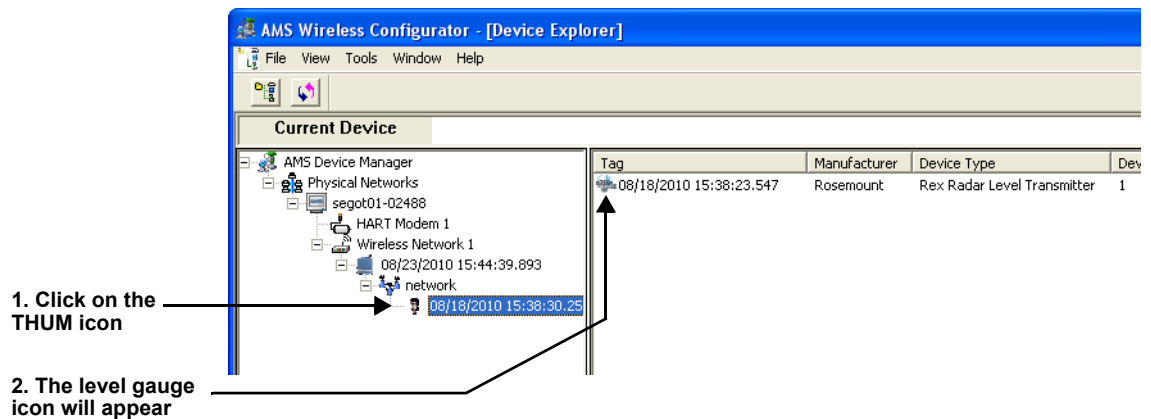
HART Tag	HART status	Last update	PV	SV	TV	QV	Burst rate
TK01-PT1a	●	10/27/10 17:57:11	12.419 mbar ●	23.144 DegC ●	22.250 DegC ●	7.012 V ●	00:10:00
TK300_REX	●	10/27/10 17:58:43	6.074 m ●	NaN ft^3 ●	NaN DegC ●	5027.790 mV ●	8...16
TK300_THUM	●	10/27/10 17:58:06	23.313 DegC ●				00:01:00

3.4 REX/PRO/TANK HUB CONFIGURATION

Configuration steps:

- HART Tag
- Process variables (PV-QV)
- Specific level gauge parameters

The level gauge / Tank Hub acts as a sub-device to the THUM Adapter. To view it in the AMS Wireless Configurator's workspace, click on the THUM icon, and it will appear in the right-hand side of the workspace.



3.4.1 HART Tag

The level gauge/Tank Hub is identified in the gateway by its unique HART tag. The level gauge (Rex and Pro) HART tag is set by the **Message** parameter.

NOTE!

For the Tank Hub, the Long Tag parameter is displayed as the HART tag in the gateway. This HART tag can be set via the gateway webserver interface.

A THUM Adapter is connected to each level gauge or Tank Hub. It is recommended that the THUM and the level gauge / Tank Hub are given the same HART Tag name, with different suffix.

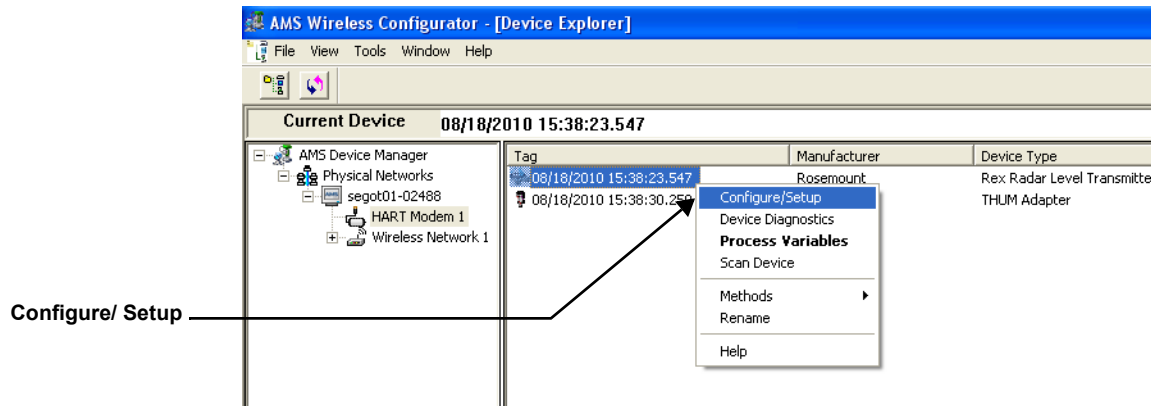
Example:

Level gauge: TK300_REX

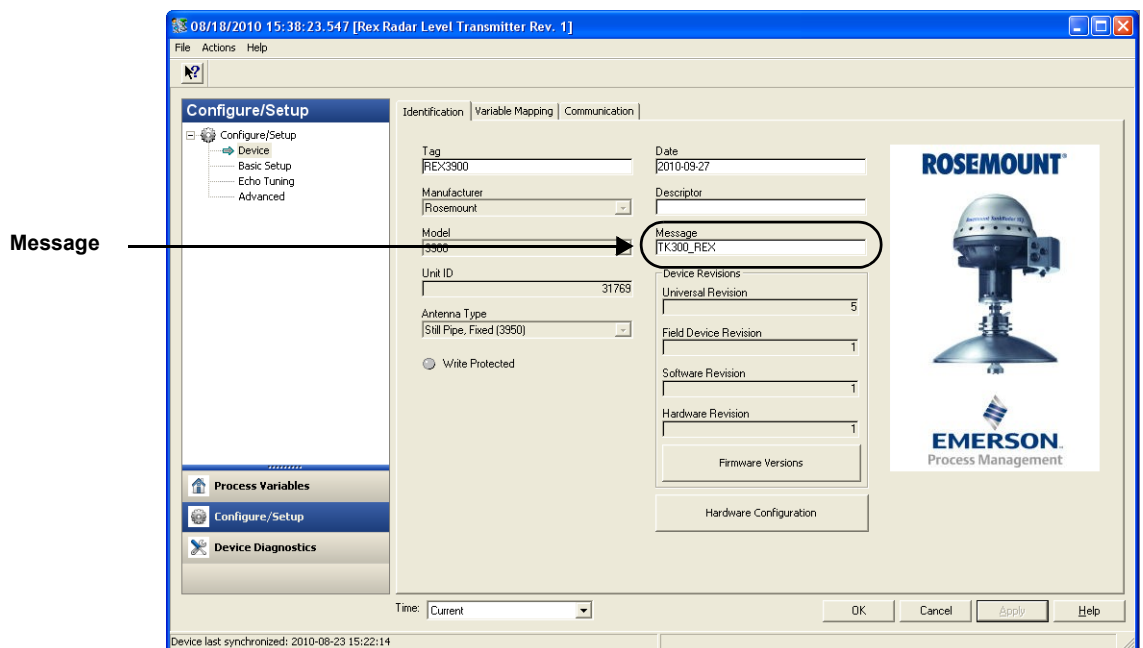
THUM: TK300_THUM

To set the level gauge **Message** parameter, do the following:

1. Open the AMS Wireless Configurator.



2. Right click on the level gauge icon and select **Configure/Setup**.



3. Enter **HART Tag** in the **Message** field. (In this example “TK300_REX”).

Example:

Level gauge Message set to "TK300_REX" is displayed as the HART Tag in the gateway's integrated web server.

The screenshot shows a web browser window titled "Explorer" with a user profile "admin". It displays a table of HART tags. The table has the following columns: HART Tag, HART status, Last update, PV, SV, TV, QV, and Burst rate. The row for "TK300_REX" is highlighted with a red border.

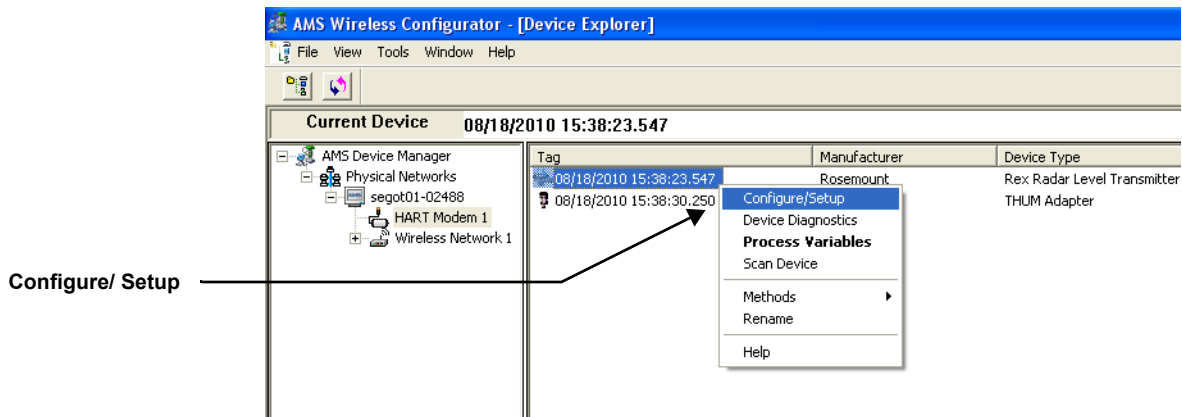
HART Tag	HART status	Last update	PV	SV	TV	QV	Burst rate
TK01-PT1a	●	10/27/10 17:57:11	12.419 mbar ●	23.144 DegC ●	22.250 DegC ●	7.012 V ●	00:10:00
TK300_REX	●	10/27/10 17:58:43	6.074 m ●	NaN ft^3 ●	NaN DegC ●	5027.790 mV ●	8...16
TK300_THUM	●	10/27/10 17:58:06	23.313 DegC ●				00:01:00

3.4.2 Process Variables (PV-QV)

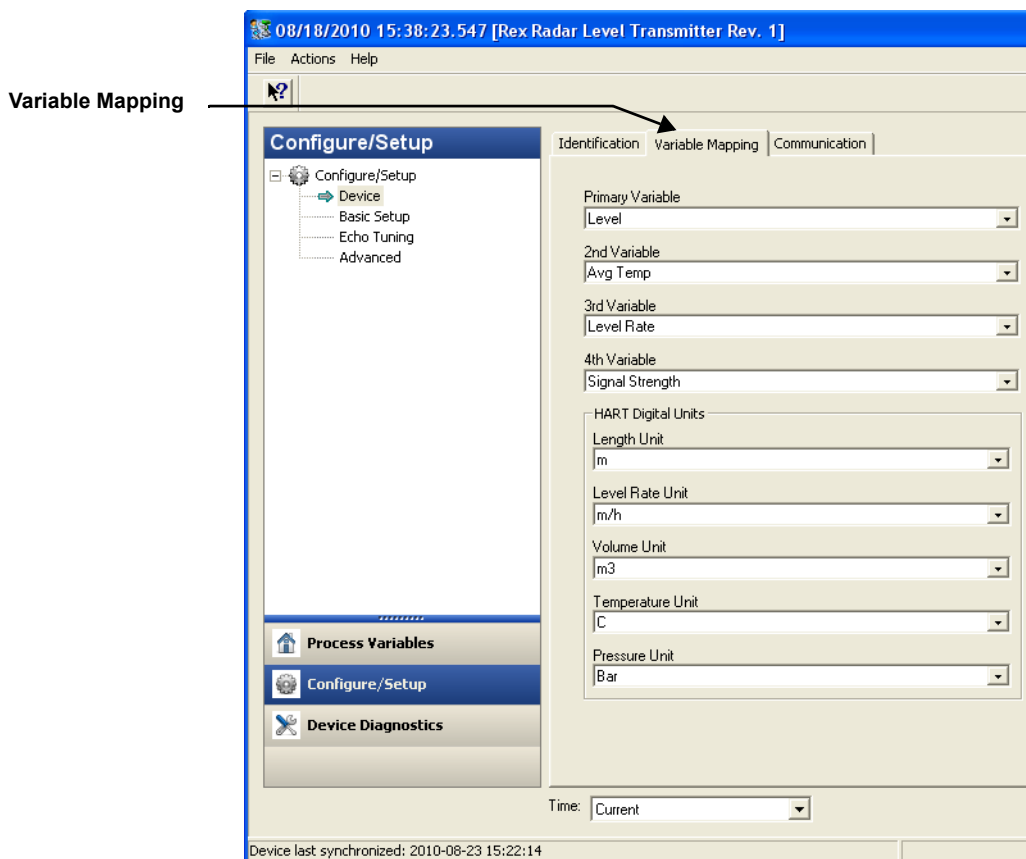
To select four process variables (PV-QV) for TankRadar Pro and Rex, follow the instructions below. When the THUM Adapter is connected to the Tank Hub, follow the instructions in Appendix D: Configure 8 Process Variables. These instructions can also be applied for TankRadar Rex and Pro if eight process variables are required.

To map four process variables (Rex and Pro), do the following:

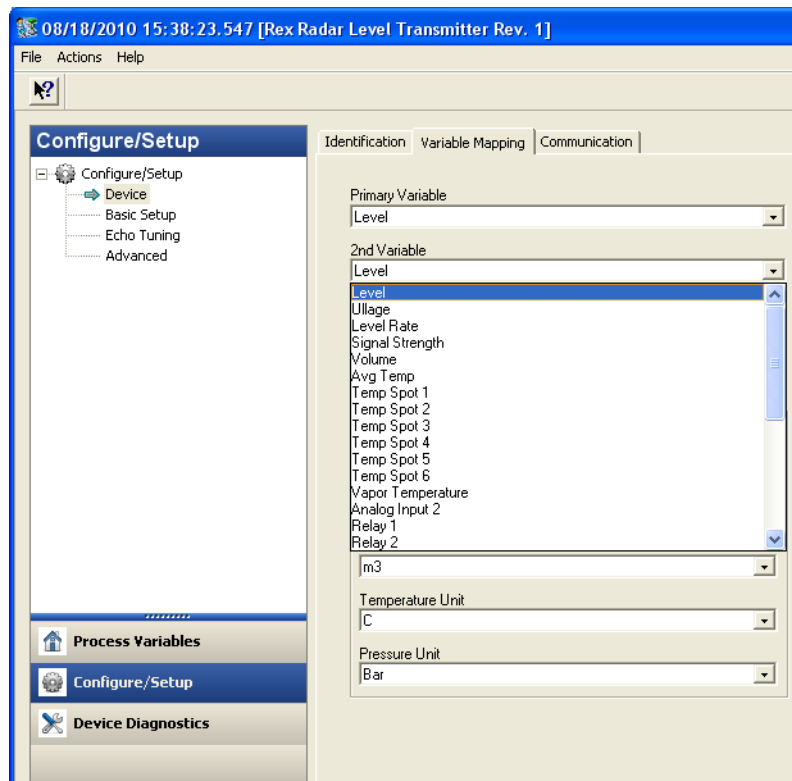
1. Open the AMS Wireless Configurator.



2. Right click the level gauge/Tank Hub icon and select **Configure/Setup**.

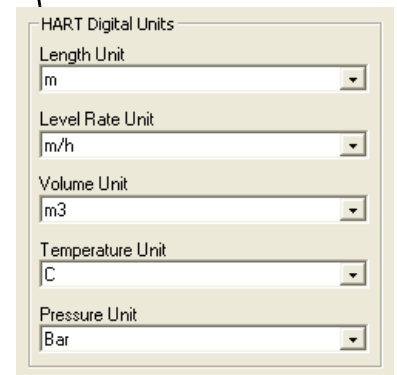
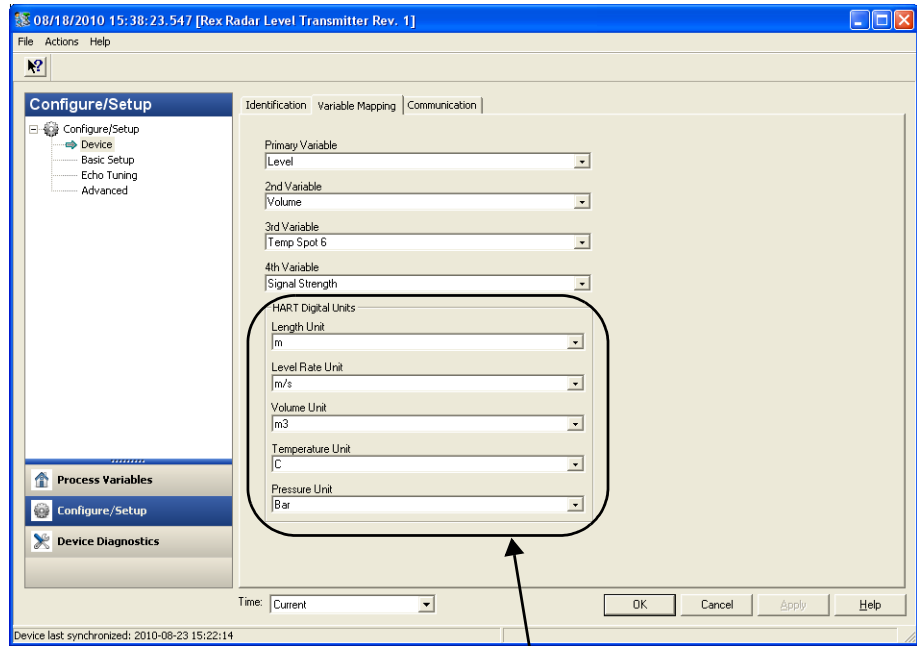


3. From the Device menu, select the **Variable Mapping** tab.



4. Select the transmitter parameters to map in the drop down menus of each process variable. See lists of variables in Appendix D: Configure 8 Process Variables on page D-7.

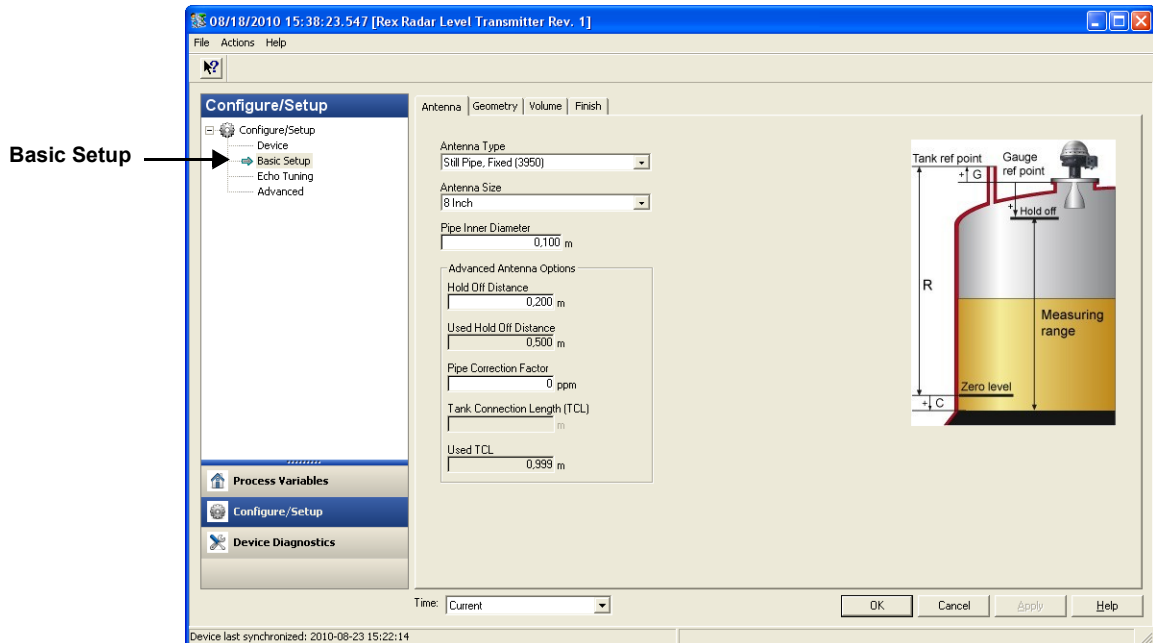
Use the drop down menus in the HART Digital Units box to specify measurement units:



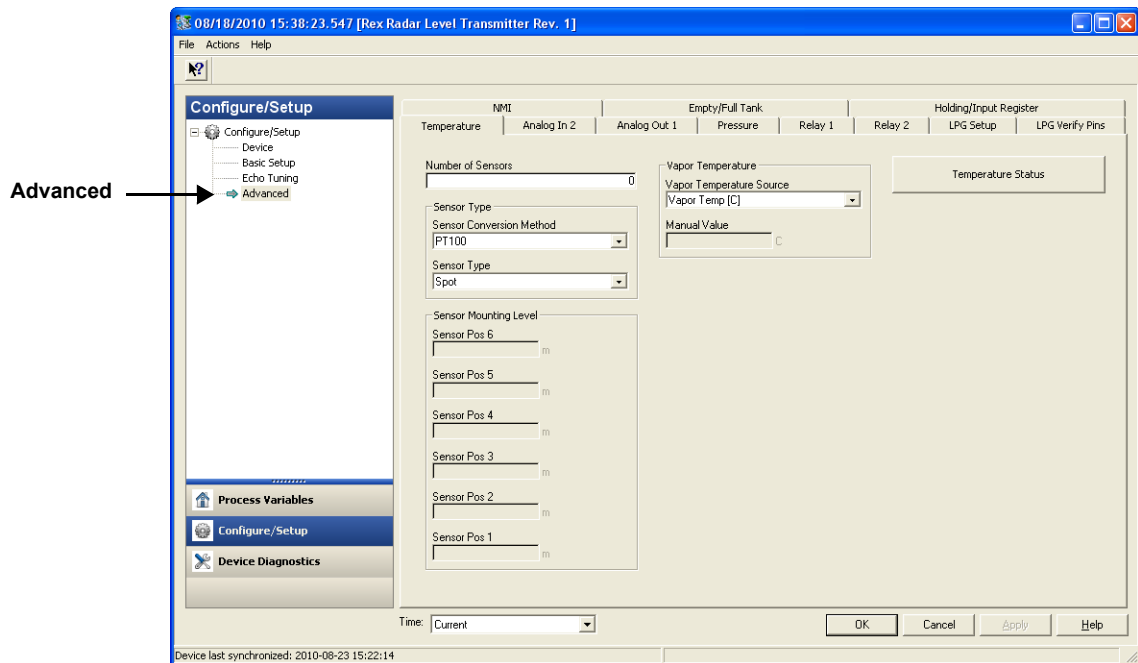
3.4.3 Specific Level Gauge Parameters

The AMS Wireless Configurator can be used for configuration of level gauge specific parameters.

The level gauge basic parameters are available in the **Basic Setup** menu.



Advanced level gauge parameters can be found in the **Advanced** menu.



For further information about specific level gauge parameters see the documents TankRadar Rex Installation Manual (Document No. 308014), TankRadar Pro Installation Manual (Document No. 306010), and TankMaster WinSetup Reference Manual (Document No. 303027).

3.5 REPEATER CONFIGURATION

Any *WirelessHART* device can work as a repeater. To use a device only as a repeater, it is recommended to choose a device with a long life power module and an extended range antenna. Use AMS Wireless Configurator or a Field Communicator to configure the device.

Repeater configuration steps:

- Network ID and Join Key
- Update Rate

3.5.1 Network ID And Join Key

The wireless device used as a repeater has to be configured with the same **Network ID and Join Key** as the gateway in order to join the wireless network.

If Network ID and Join Key are configured at factory, the wireless device connects directly to the wireless network without any local wired configuration of Network ID and Join Key.

Consult the Reference Manual of the specific wireless device on how to configure Network ID and Join Key.

3.5.2 Update Rate

The update rate is the frequency at which the repeater transmits its data over the wireless network.

When using a wireless device only as a repeater, the Update Rate should be set to a high value in order to save power. It is recommended to set the Update Rate to a value from 1 minute to 10 minutes.

NOTE!

Regardless of the repeater Update Rate, the repeater can relay other wireless device data over the network at any update rate.

When a wireless device is used only as a repeater, it is recommended that the device's inputs are disabled if possible.

Consult the Reference Manual of the specific wireless device on how to configure Update Rate.

Section 4 Installation

4.1	Safety Messages	page 4-1
4.2	Installation Considerations	page 4-2
4.3	Preparation Checklist	page 4-2
4.4	Mechanical Installation	page 4-3
4.5	Electrical Installation	page 4-8

4.1 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 (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Explosions could result in death or serious injury:

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

Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

Do not remove the transmitter cover in explosive atmospheres when the circuit is alive.

Failure to follow safe installation and servicing guidelines could result in death or serious injury:

Make sure the transmitter is installed by qualified personnel and in accordance with applicable code of practice.

Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

Do not perform any service other than those contained in this manual unless you are qualified.

To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

High voltage that may be present on leads could cause electrical shock:

Avoid contact with leads and terminals.

Make sure the mains power to the device is off and the lines to any other external power source are disconnected or not powered while wiring the transmitter.

**4.2 INSTALLATION
CONSIDERATIONS**

For installation considerations consult the Reference Manual of the specific device. See the reference list in section “References” on page 1-7.

**4.3 PREPARATION
CHECKLIST**

Before starting the installation, make sure the tasks in the preparation checklist below have been performed:

- Verify that a network diagram has been designed according to best practice installation guidelines
- Make sure the THUM Adapters and other wireless devices have been configured with correct Network ID and Join Key

NOTE!

If THUM Adapters are going to join an existing network, verify that the gateway firmware is of version 3.8.9 or later.

NOTE!

For connection of Tank Hub with THUM, verify that the gateway firmware is minimum version 3.9.6 (for 3.x.x gateway) or 4.3.17 (for 4.x.x gateway)

4.4 MECHANICAL INSTALLATION

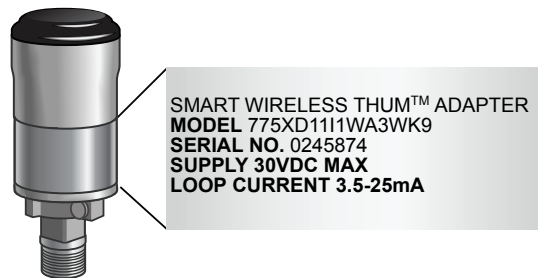
4.4.1 THUM Adapter

NOTE!

Note serial number of each THUM Adapter and tank name. The serial number will be needed to identify the THUM Adapters in the gateway.

The serial number is found on the label attached to the THUM Adapter, and in the AMS Wireless Configurator. For more information about the THUM Adapter serial number, see Appendix B: THUM Adapter Serial Number.

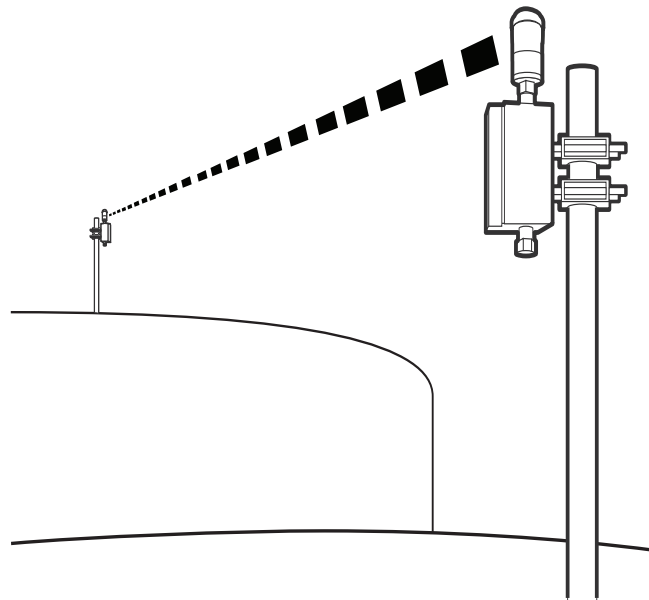
Figure 4-1. Label with serial number.



THUM Adapter Location

The THUM Adapter shall be positioned in such a way that good communication is established between the nearest nodes. If possible, try to find a position where the THUM Adapter has line of sight to at least one other node. Otherwise move the THUM Adapter along the tank until a good position is found.

Figure 4-2. Line of sight between two THUM Adapters.

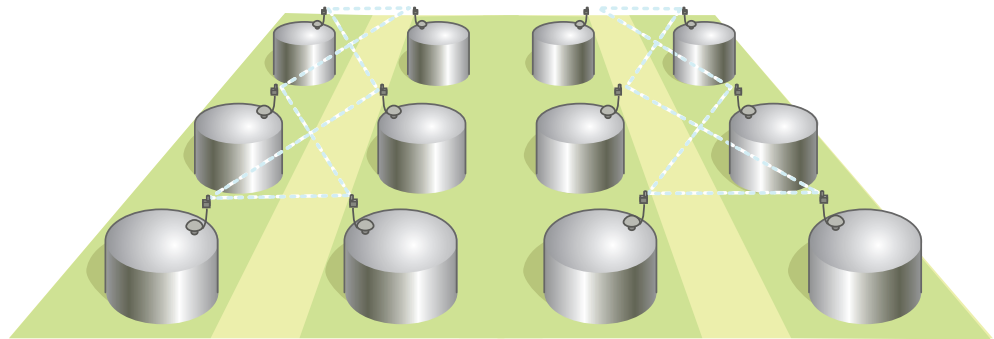


The THUM Adapter shall be positioned vertically, as shown in Figure 4-2. The THUM Adapter is recommended to be installed at a minimum of 2 m (6 ft.) above tank roofs, away from any large structure for optimal range performance.

See the THUM Adapter Mechanical Installation Drawing (Document No. 9150070-981) for more details.

In a tank farm, tanks are often located on both sides along a road. In such a case, it is recommended to install the THUM Adapters on the tank side pointing towards the road. This way the THUM Adapters will form communication paths to devices along the road.

Figure 4-3. THUM Adapter positions in a tank farm.

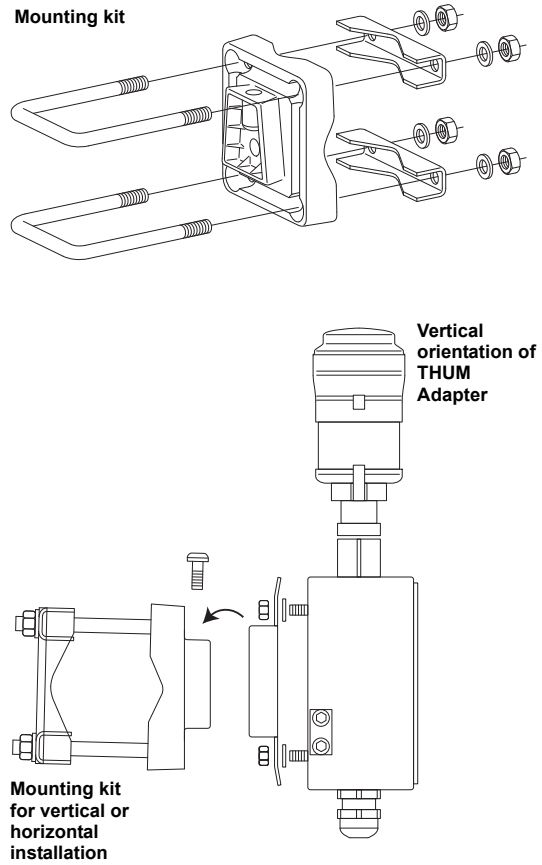


Mounting Kit

The THUM Adapter is supplied with a mounting kit, which allows the THUM to be installed away from the level gauge / Tank Hub at the best possible tank roof position.

The THUM can be installed on a vertical or horizontal pipe or an angle bar, 25-50 mm (1-2 in.) in diameter, as shown in Figure 4-4.

Figure 4-4. Installation of THUM Adapter using the mounting kit.

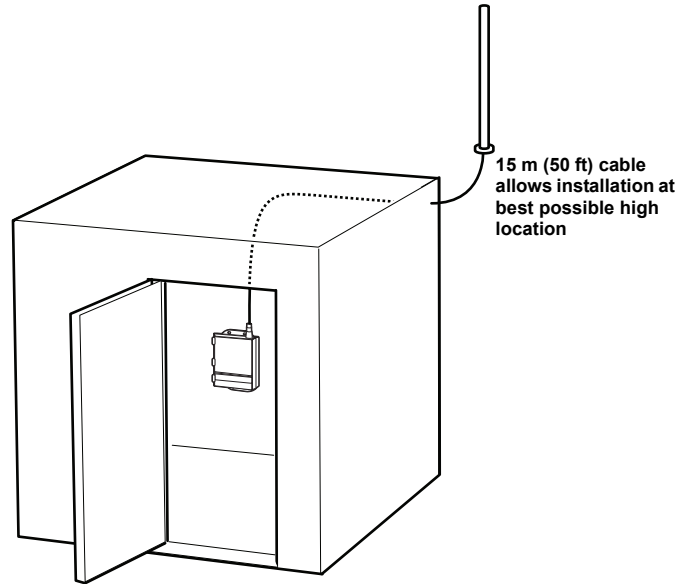


4.4.2 Smart Wireless Gateway

For optimal wireless coverage, the gateway remote antenna should be positioned as high as possible.

The gateway is recommended to be located in the tank area, where the maximum number of connections with wireless devices can be achieved. The gateway can be installed both indoors and outdoors. The Smart Wireless Gateway is approved for installation in hazardous area Zone 2 Div II.

Figure 4-5. Smart Wireless Gateway Remote Antenna.

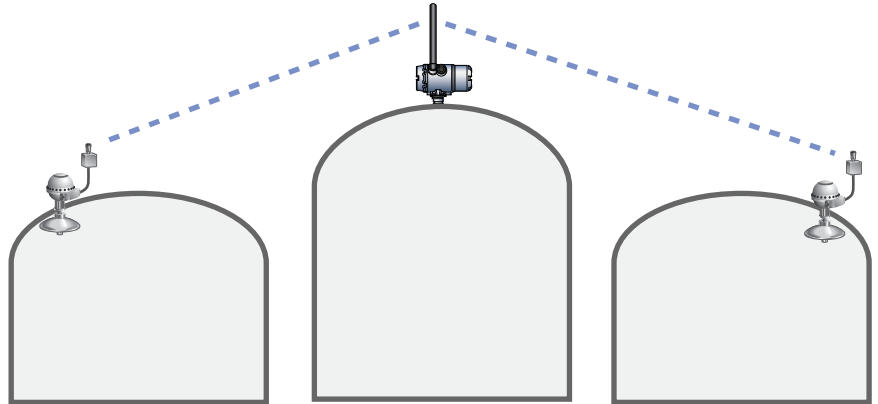


See Smart Wireless Gateway Reference Manual (Document No. 00809-0200-4420) for further information.

4.4.3 Repeater

Verify in the network diagram where the repeater shall be positioned. Install the repeater in a position which provides the best possible conditions for wireless communication according to the network planning.

Repeaters are installed in a location where the maximum number of connections with wireless devices can be achieved, near the location that needs additional wireless connectivity.



When choosing an installation location and position, take into account service space for the repeater.

The repeater shall be positioned vertically (straight up). The wireless device is recommended to be installed at a minimum of 2 m (6 ft.) above tank roofs, away from any large structure for optimal range performance.

Wireless Tank Gauging

4.5 ELECTRICAL INSTALLATION

4.5.1 Grounding

Make sure the devices are grounded in accordance with national and local electrical codes. For further information, also see the electrical installation drawings, listed in section “References” on page 1-7.

4.5.2 Wiring

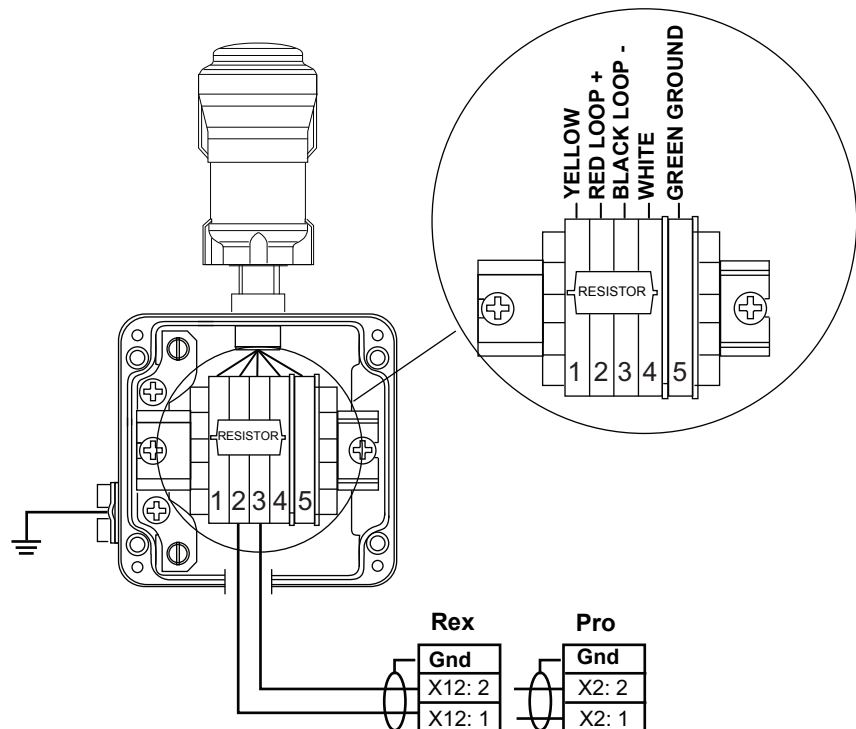
THUM Adapter Connected to Level Gauge

The THUM Adapter is powered by the current loop when connected to a Rex or Pro level gauge.

The THUM connects to:

- TankRadar Rex analog input 1 (IS)
- TankRadar Pro primary active analog output (IS)

Figure 4-6. THUM Adapter connection box.



NOTE!

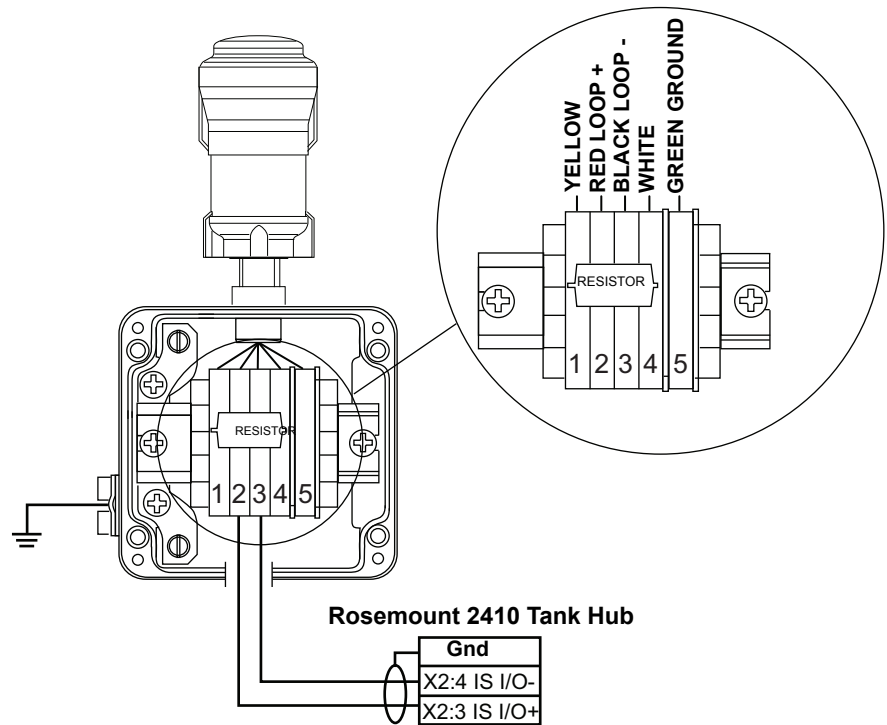
The connection box shall be externally grounded.

Connection	Description
1	Resistor
2	Loop +
3	Loop -
4	Resistor
5	Ground not connected

THUM Adapter Connected to Rosemount 2410 Tank Hub

The THUM Adapter is powered by the 2410 Tank Hub.

Figure 4-7. THUM Adapter connection box.



NOTE!

The connection box shall be externally grounded.

Connection	Description
1	Resistor
2	Loop +
3	Loop -
4	Resistor
5	Ground not connected

⚠ Only intrinsically safe circuitry is allowed to be connected.

NOTE!

The THUM does not limit the current in the loop. The special resistor, located inside the THUM connection box, must not be removed or exchanged.

- TankRadar Rex (680 ohm)
- TankRadar Pro (220 ohm)
- Rosemount 2410 Tank Hub (220 ohm)

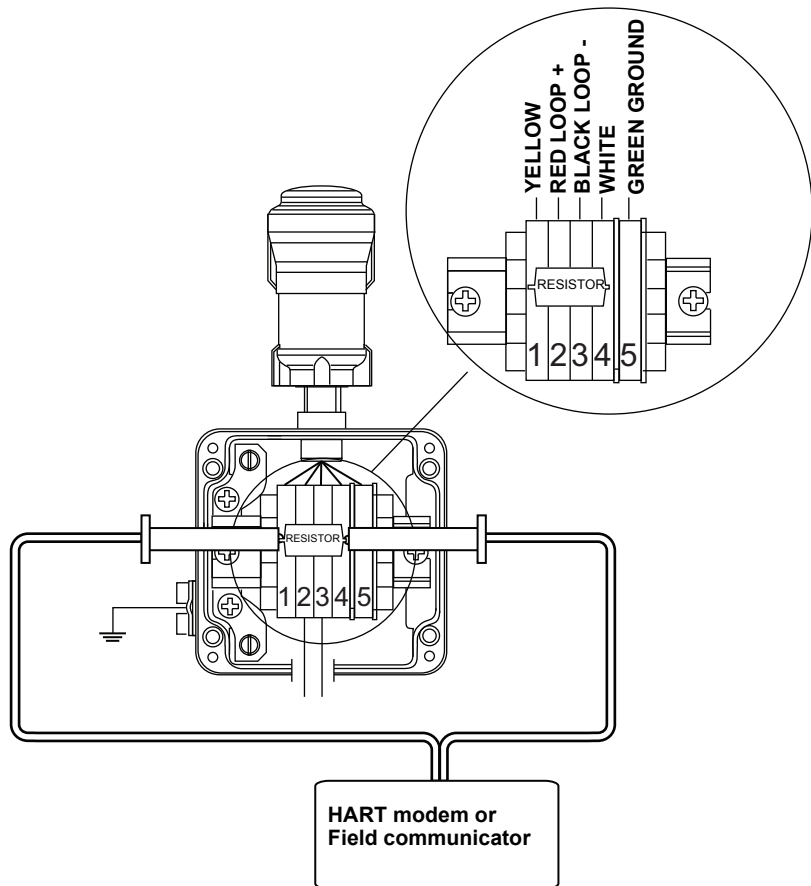
For details, see Electrical Installation Drawings:

- TankRadar Rex (Drawing No. 9150070-992)
- TankRadar Pro (Drawing No. 9150070-993)
- 2410 Tank Hub to Wireless 775 Assy (Drawing No. 9150070-991)

HART Modem Connected to THUM Adapter

Connect the HART modem⁽¹⁾ in parallel with the resistor located in the THUM connection box.

Figure 4-8. HART modem connected to THUM Adapter.

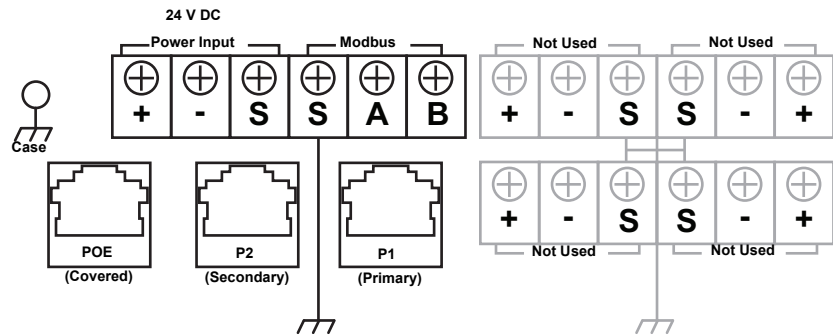


(1) Supported HART modems are: MACTek VIATOR HART RS-232 serial modem, and MACTek VIATOR HART USB modem.

Smart Wireless Gateway

All connections to the gateway can be made at the terminal block, which is located in the lower junction box section of the enclosure. See Figure 4-9 for the standard terminal block.

Figure 4-9. Smart Wireless Gateway Standard Terminal Block Diagram.



Connection	Description
+	Power supply +
-	Power supply -
S	Ground
A	Optional connection for Modbus (Tx+)
B	Optional connection for Modbus (Rx-)
P1 (Ethernet 1)	The primary Ethernet port is used to connect to host systems or other application systems
P2 (Ethernet 2)	The secondary Ethernet port can be used as a back up connection or a maintenance port for local access to the gateway
POE (Ethernet 2 with Power)	For connection to Pervasive Field Network Wi-Fi hotspot

NOTE!

Ensure only POE (Power Over Ethernet) devices are connected to the POE port.

For further information see the Smart Wireless Gateway Reference Manual (Document No. 00809-0200-4420).

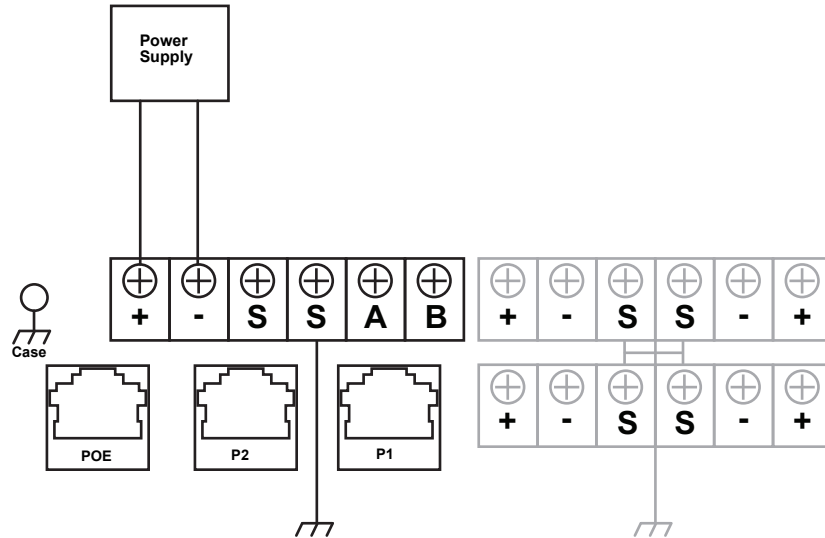
4.5.3 Power Supply

Smart Wireless Gateway

The gateway is designed to be powered by 10.5 - 30 VDC.

Connect power supply to the positive (+) and negative (-) power terminals found on the left side of the terminal block. An additional internal case ground can be found on the left side of the enclosure.

Figure 4-10. Gateway connection of power supply.

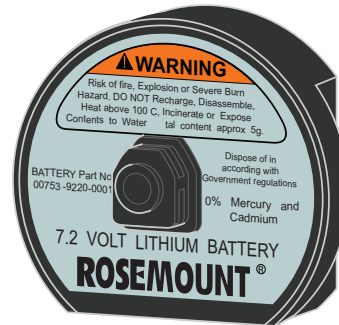


NOTE!

Using an uninterruptible power supply (UPS) is recommended to ensure availability in case of a power outage.

Rosemount 701P Power Module

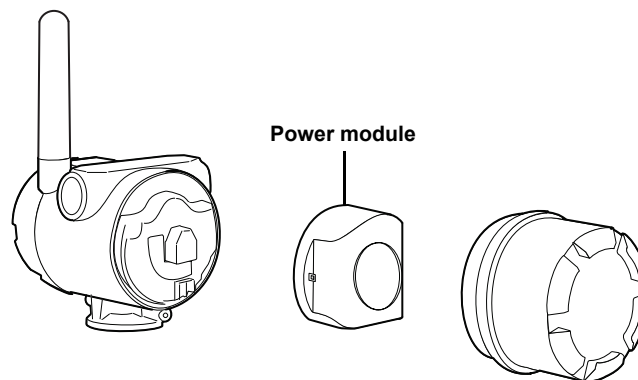
Figure 4-11. 701P Black Power Module.



All Rosemount wireless devices are powered by the 701P Power Module.

The power module is intrinsically safe, which means it can be changed in hazardous locations. The power module is designed with short circuit protection. There is no need to remove the wireless device from the process in order to switch power modules. The power module alerts when battery status is low and it is easy to replace using a fail-safe connection.

Figure 4-12. How to replace a power module.



To replace a power module, do the following:

1. Open the power module cover by hand.
2. Replace the power module.
3. Close the enclosure by hand.
4. Verify the wireless device operation.

⚠ Be sure to follow local regulations regarding intrinsic safety when replacing the power module.

Section 5 Commissioning

5.1	Safety Messages	page 5-1
5.2	Commissioning Introduction	page 5-2
5.3	Starting Up Devices	page 5-3
5.4	Verify Network Device Connection	page 5-5
5.5	Verify Network Device Status	page 5-7
5.6	Verify Network Design Rules	page 5-10
5.7	View Network Live	page 5-14

5.1 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 (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Explosions could result in death or serious injury:

Verify that the operating environment of the device is consistent with the appropriate hazardous locations certifications.

Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

Do not remove the transmitter cover in explosive atmospheres when the circuit is alive.

Failure to follow safe installation and servicing guidelines could result in death or serious injury:

Make sure the device is installed by qualified personnel and in accordance with applicable code of practice.

Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

Do not perform any service other than those contained in this manual unless you are qualified.

To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

High voltage that may be present on leads could cause electrical shock:

Avoid contact with leads and terminals.

Make sure the mains power to the device is off and the lines to any other external power source are disconnected or not powered while wiring the device.

5.2 COMMISSIONING INTRODUCTION

The wireless devices can be commissioned once they are configured and installed properly. The following steps are included in the commissioning procedure:

1. Start up the devices
2. Verify that all devices are connected to the network
3. Verify network device status
4. Verify network design rules
5. View network live using the AMS Wireless SNAP-ON software (optional)

During the commissioning use the Smart Wireless Gateway's integrated web server. The initial view of the gateway's web server is illustrated in Figure 5-1.

Figure 5-1. Smart Wireless Gateway's integrated web server.



For information on how to log on to the gateway, see the Smart Wireless Gateway Reference Manual (Document No. 00809-0200-4420).

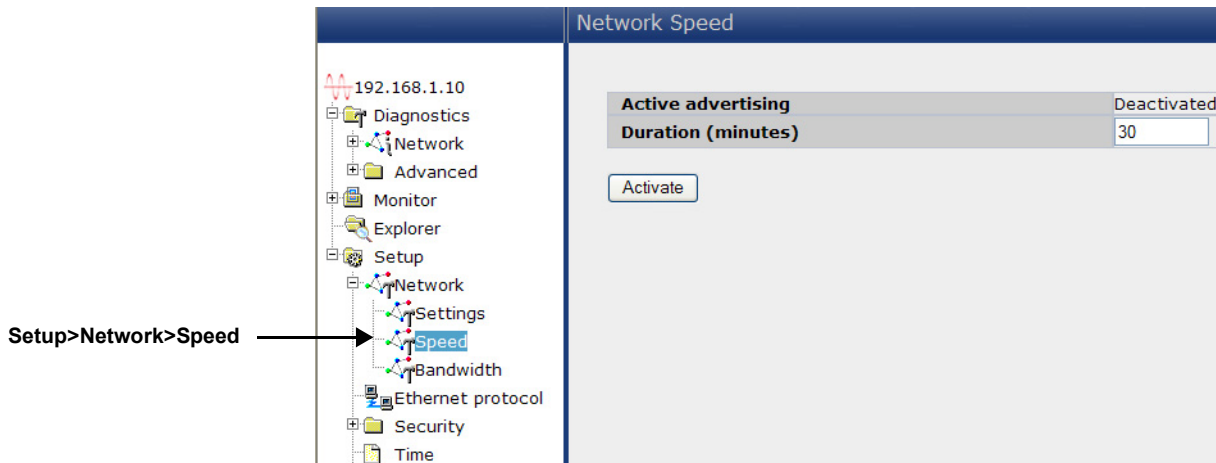
5.3 STARTING UP DEVICES

5.3.1 Set Active Advertising Mode

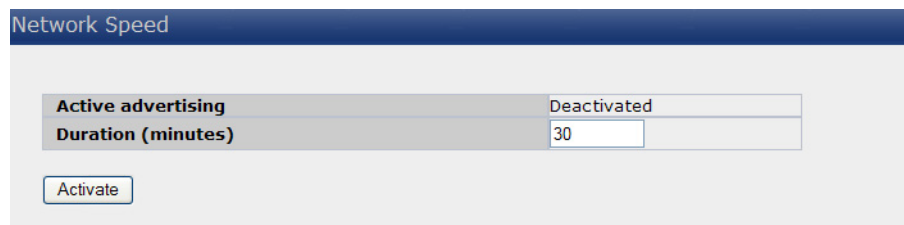
Before powering up the devices set the Active advertising mode in the Smart Wireless Gateway. The Active advertising mode makes the network search for new devices, which will make the devices join the network faster.

To set the Active advertising mode, do the following:

1. Log on to the gateway's integrated web server.



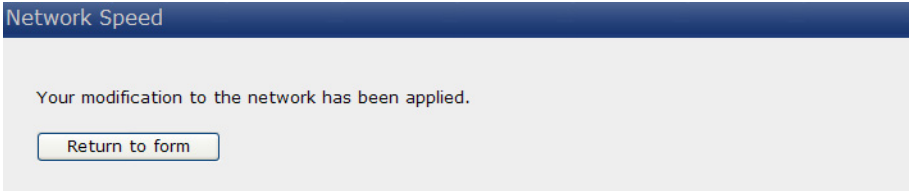
2. Navigate to **Setup>Network>Speed**.



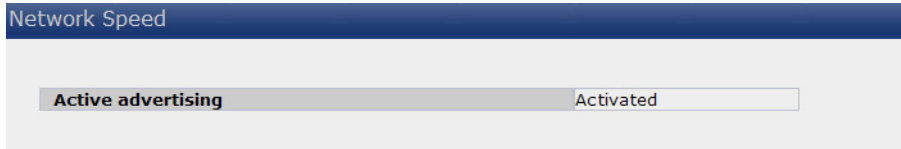
3. Enter the desired Active advertising duration.

The Active advertising mode is power consuming for the devices power modules. Don't set the duration time longer than needed. A proper duration time is 30-60 minutes.

4. Click the **Activate** button.



5. The modification to the network has been applied. Click the **Return to form** button.



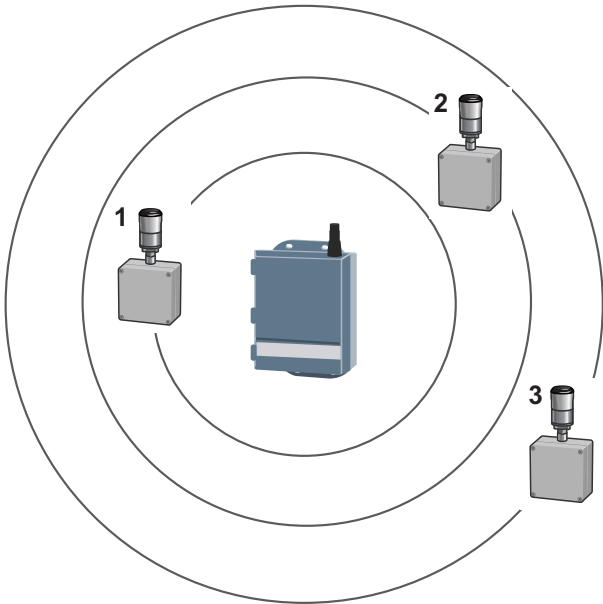
6. The Active advertising mode is activated. The Active advertising will be deactivated after duration time has passed.

5.3.2 Starting The Devices

To start up the devices, use the following guidelines:

- The gateway should be up and running before any wireless devices are powered.
- If any repeaters are included these shall be started up before the THUM Adapters.
- The THUM Adapters should be started up beginning with the one closest to the gateway. See Figure 5-2.

Figure 5-2. Starting up order.



5.4 Verify Network Device Connection

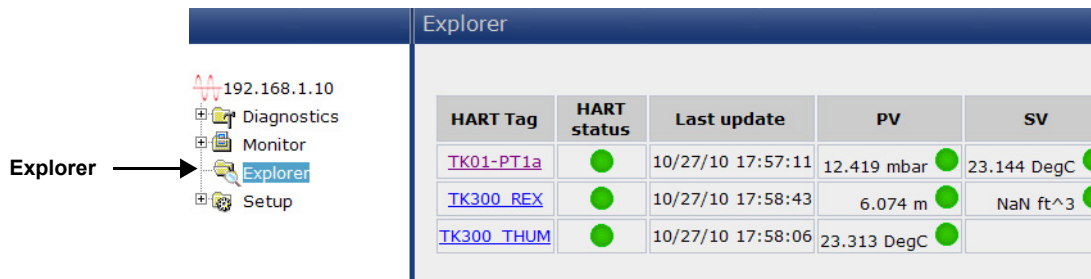
When started up, the devices will join the wireless network. The time required to join the network depends on network size and number of devices.

NOTE!

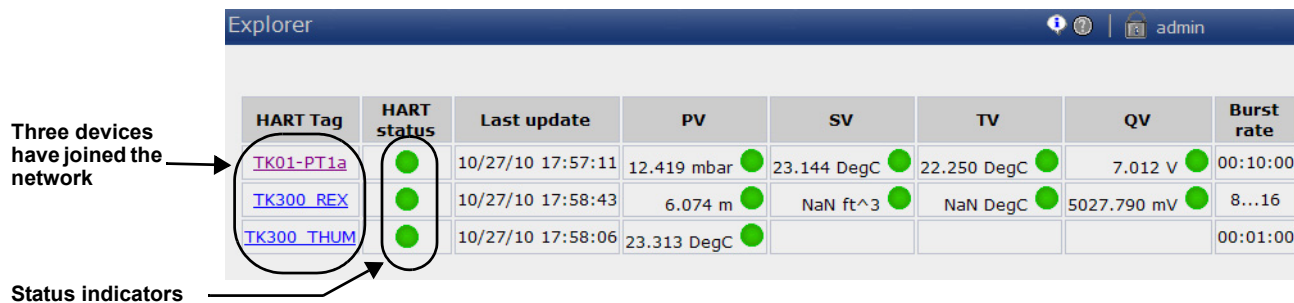
It normally takes 5 to 10 minutes for a device to join the wireless network.

To verify device operation and connection to the network, do the following:

1. Log on to the gateway's integrated web server.

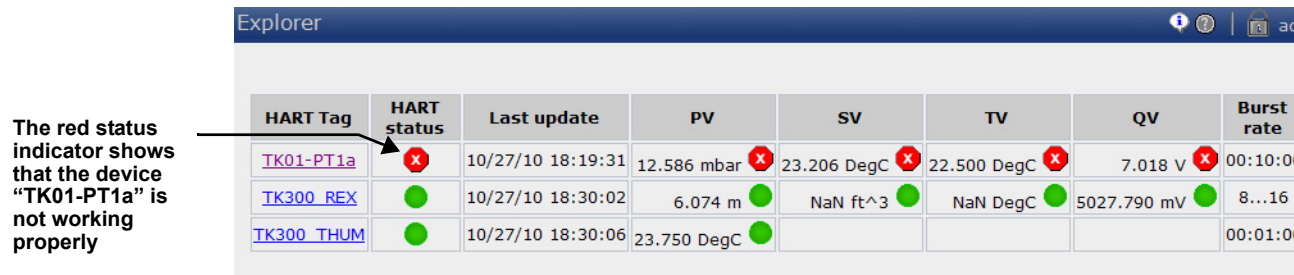


2. Navigate to Explorer.



3. Verify that all wireless devices have appeared.

A green status indicator shows that the device is working properly.

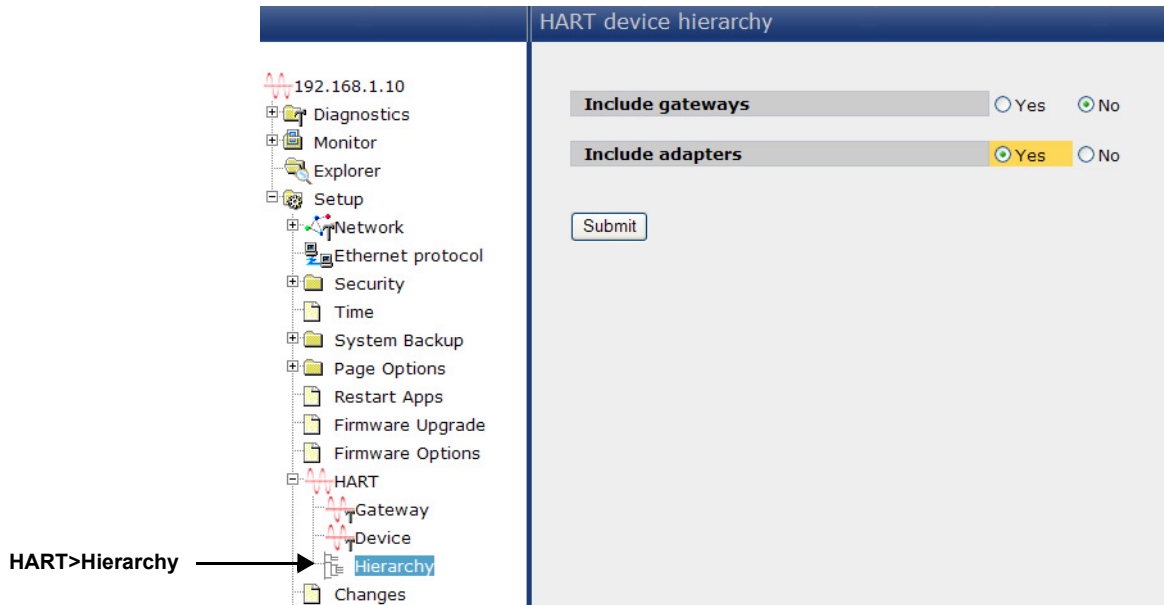


4. A red status indicator shows that there is a malfunctioning device. See the example above.

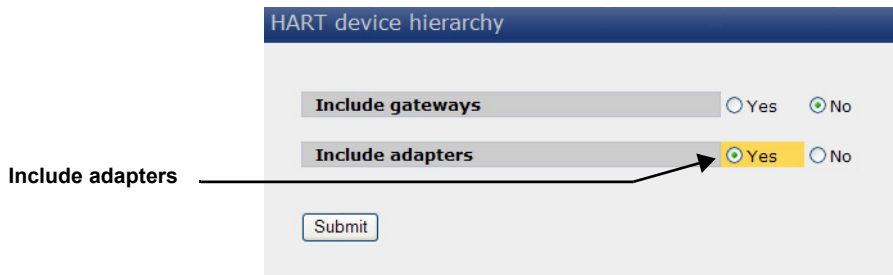
Tip!

THUM Adapter is not shown in the gateway's web interface by default. Do the following to make the THUM visible in the gateway:

1. Log on to the gateway's integrated web server.



2. Navigate to **HART>Hierarchy**.



3. Set the **Include adapters** check box to **Yes**.
4. Click the **Submit** button to make any changes.

5.5 VERIFY NETWORK DEVICE STATUS

When all devices have joined the network, the network device status must be verified. Verify the number of active neighbors, reliability, signal strength and path stability. See the network device status requirements in the list below.

Network Device Status Requirements

- The devices must have at least two active neighbors. It is recommended that the devices have three neighbors or more
- Reliability should be greater than 99%
- The signal strength to each neighbor should be greater than -75db
- The path stability to each neighbor should be at least 60%

NOTE!

At least two active neighbors must fulfill the requirements of signal strength and path stability.

To verify that all devices connected fulfills the network device status requirements, do the following:

1. Log on to the gateway's integrated web server.

HART Tag	Node state	Active neighbors	Neighbors	Service denied	Reliability
TK01-PT1a	●	wihartgw TK300_THUM	2	●	100.0 %
TK300_THUM	●	wihartgw TK01-PT1a	2	●	100.0 %

2. Navigate to **Diagnostics > Network > Devices**.

HART Tag	Node state	Active neighbors	Neighbors	Service denied	Reliability	Missed updates	Path stability	RSSI	Joins	Join Time
TK01-PT1a	●	wihartgw	2	●	100.0 %	0	100.0 %	-31 db	1	10/27/10 17:25:24
TK300_THUM	●	wihartgw	2	●	100.0 %	0	100.0 %	-26 db	1	10/27/10 17:26:48

3. Verify that each device has **at least two neighbors** and that **reliability is greater than 99%** for each device.

Both devices in the example have two neighbors and reliability is 100%. The number of neighbors and reliability requirements are fulfilled.

HART Tag	Node state	Active neighbors	Neighbors	Service denied	Reliability	Missed updates	Path stability
TK01-PT1a	●	wihartgw	2	●	100.0 %	0	100.0 %
TK300_THUM	●	wihartgw	2	●	100.0 %	0	100.0 %

4. Click the HART tag of each wireless device to view path stability and signal strength for all communication paths. TK300_THUM in this example.

Network details

Device	
Name	TK300_THUM
Node state	Live
Monitor status	responding

Network information

Radio node id	5
Radio mac id	00-1B-1E-26-4F-2D-C7-D5
Network joins	1
Neighbor needed	Yes
Join time	10/27/10 17:26:48
Neighbor count	2

Neighbor 1

Name	wihartgw
Receive signal strength to neighbor	-33 db
Receive signal strength from neighbor	-26 db
Path stability	100.0 %

Neighbor 2

Name	TK01-PT1a
Receive signal strength to neighbor	-31 db
Receive signal strength from neighbor	-33 db
Path stability	100.0 %

Detailed communication of TK300_THUM is shown

Signal strength and path stability of Neighbor 1

Signal strength and path stability of Neighbor 2

- Verify that the device has at least two neighbors with **signal strength greater than -75db** and **path stability at least 60%**.

“TK300_THUM” has two active neighbors meaning that there are two communication paths for the THUM Adapter:

- Neighbor 1, “wihartgw” (gateway)
- Neighbor 2, “TK01-PT1a” (repeater)

Signal strength to both neighbors is greater than -75db and path stability is greater than 60%. The requirements of signal strength and path stability are fulfilled for TK300_THUM.

- Repeat steps 3-5 for each device in the network.

Tip!

If the network device status requirements are not fulfilled, let the network settle for up to 24 hours, then verify again. If requirements are still not fulfilled, try to relocate the THUM Adapter or repeater and verify again.

5.6 VERIFY NETWORK DESIGN RULES

During the commissioning, make sure to verify the network design rules described in chapter “Design” on page 2-3.

The design rules are worked out to ensure a secure margin when implementing a wireless network. This will eliminate any potential pinch points or isolated devices.

Do the following to verify the network design rules:

1. Log on to the gateway’s integrated web server.

HART Tag	Node state	Active neighbors	Neighbors	Service denied	Rel
TK01-PT1a	●	wihartgw TK400_THUM	2	●	10
TK200_THUM	●	wihartgw TK300_THUM	2	●	10
TK300_THUM	●	wihartgw TK200_THUM TK500_THUM	3	●	10
TK400_THUM	●	wihartgw TK01-PT1a TK500_THUM	3	●	10

2. Navigate to Diagnostics>Network>Devices.
3. Verify the three network design rules according to the following examples.

5.6.1 Rule of 5

The network should have a minimum of 5 devices within effective range of the gateway.

Example Rule of 5

Five devices within effective range of the gateway (wihartgw)

HART Tag	Node state	Active neighbors	Neighbors	Service denied	Reliability	Missed updates	Path stability	RSSI
TK01-PT1a	●	wihartgw TK300_THUM	2	●	100.0 %	0	100.0 %	-9 db
TK200_THUM	●	wihartgw TK400_THUM TK300_THUM TK500_THUM	4	●	100.0 %	0	100.0 %	-9 db
TK300_THUM	●	wihartgw TK200_THUM TK01-PT1a	3	●	100.0 %	0	100.0 %	-9 db
TK400_THUM	●	wihartgw TK200_THUM	2	●	100.0 %	0	100.0 %	-9 db
TK500_THUM	●	wihartgw TK200_THUM	2	●	100.0 %	0	100.0 %	-12 db

The devices that have the gateway as an active neighbor are within effective range. In this example, the gateway “wihartgw” has 5 devices within effective range which means that rule of 5 is fulfilled.

5.6.2 Rule of 3

The wireless network should be designed for a minimum of three neighbors within effective range. This ensures there will be at least 2 possible connections once commissioned.

Verify that each device has at least two neighbors.

Example Rule of 3

All devices have two or more neighbors →

HART Tag	Node state	Active neighbors	Neighbors	Service denied	Reliability	Missed updates	Path stability	RSSI
TK01-PT1a	●	wihartgw	2	●	100.0 %	0	100.0 %	-9 db
		TK300_THUM						
TK200_THUM	●	wihartgw	4	●	100.0 %	0	100.0 %	-9 db
		TK400_THUM						
		TK300_THUM						
TK300_THUM	●	wihartgw	3	●	100.0 %	0	100.0 %	-9 db
		TK01-PT1a						
TK400_THUM	●	wihartgw	2	●	100.0 %	0	100.0 %	-9 db
TK500_THUM	●	wihartgw	2	●	100.0 %	0	100.0 %	-12 db
		TK200_THUM						

All devices have two or more neighbors. Rule of 3 is fulfilled.

5.6.3 Rule of 25%

The network should be designed for a minimum of 25% of the devices within effective range of the gateway. When implemented at least 15% of the devices should be directly connected to the gateway.

Example Rule of 25%

HART Tag	Node state	Active neighbors	Neighbors	Service denied	Reliability	Missed updates	Path stability	RSSI
TK01-PT1a	●	wihartgw TK300 THUM	2	●	100.0 %	0	100.0 %	-9 db
TK200 THUM	●	wihartgw TK400 THUM TK300 THUM TK500 THUM	4	●	100.0 %	0	100.0 %	-9 db
TK300 THUM	●	wihartgw TK200 THUM TK01-PT1a	3	●	100.0 %	0	100.0 %	-9 db
TK400 THUM	●	wihartgw TK200 THUM	2	●	100.0 %	0	100.0 %	-9 db
TK500 THUM	●	wihartgw TK200 THUM	2	●	100.0 %	0	100.0 %	-12 db

Five devices within effective range of the gateway (wihartgw)

The gateway “wihartgw” has 5 devices within effective range. Totally 5 devices are connected to the network. 100% of the devices are directly connected to the gateway. Rule of 25% is fulfilled.

Wireless Tank Gauging

5.7 VIEW NETWORK LIVE

5.7.1 AMS Wireless SNAP-ON

After commissioning the wireless network, the optional software tool AMS Wireless SNAP-ON can be used to view the network diagram in live mode. All formed communication paths are shown in a graphical layout.

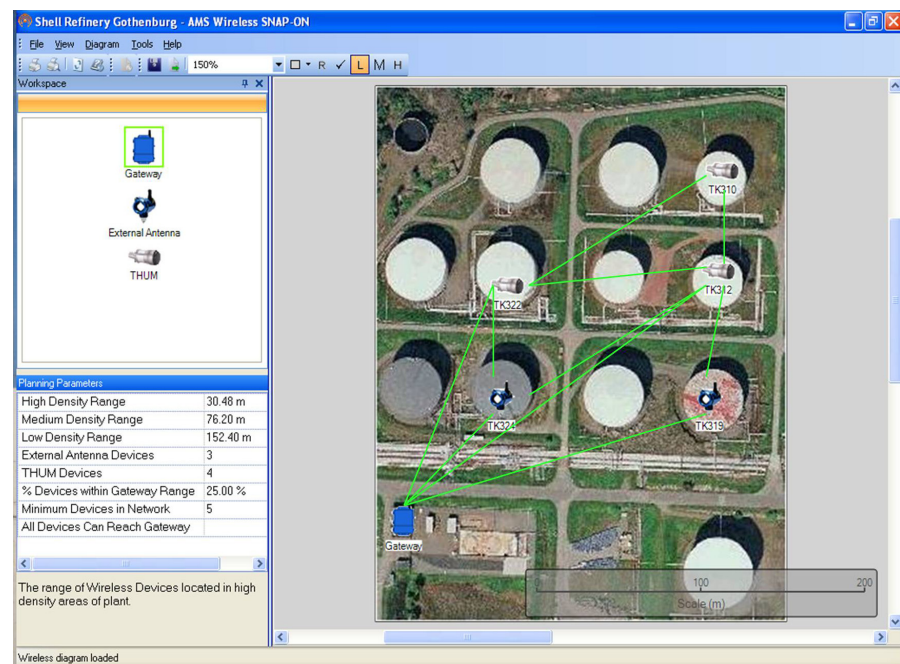
Viewing the network diagram in live mode gives a good overall picture on how the mesh network is formed. The graphical layout can be used to view any pinch points or areas that requires a repeater to be added or relocated.

The mesh network continuously changes in order to optimize stability and minimize number of hops when the environment changes.

The AMS Wireless SNAP-ON can be used to:

- Identify devices in the wireless network that may not be able to communicate effectively
- Evaluate the condition of the network by displaying key data such as layout issues, status, PV, device battery life, and average reliability of wireless devices
- Export report data to Excel spreadsheets
- Export diagrams in .jpg or .bmp formats

Figure 5-3. The graphical layout in AMS Wireless SNAP-ON.



Appendix A Configuration Preparations

A.1	Configure A HART Modem Connection	page A-2
A.2	Configure A Gateway Connection	page A-4

A two disk software pack is provided with the Smart Wireless Gateway.

- Disk 1, Gateway Security Setup (only required for secure host connections or OPC communications)
- Disk 2, AMS Wireless Configurator

For instructions on how to install the software, see the Smart Wireless Gateway Reference Manual (Document No. 00809-0200-4420).

AMS Wireless Configurator supports connectivity to a wireless network and a HART modem. Both of these interfaces must be configured through the Network Configuration application.

For instructions on how to configure a HART modem connection and a gateway connection in AMS Wireless Configurator see chapter “Configure A HART Modem Connection” on page A-2 and “Configure A Gateway Connection” on page A-4.

A.1 CONFIGURE A HART MODEM CONNECTION

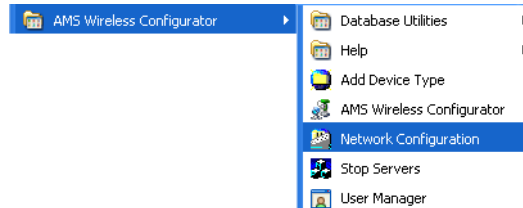
A HART modem is required for wired HART configuration.

Supported HART modems are:

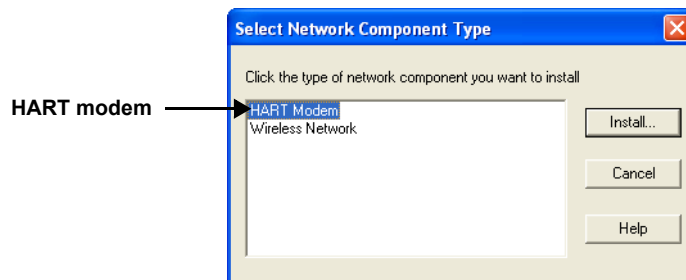
- MACTek VIATOR HART RS-232 serial modem
- MACTek VIATOR HART USB modem

To configure a HART modem connection do the following:

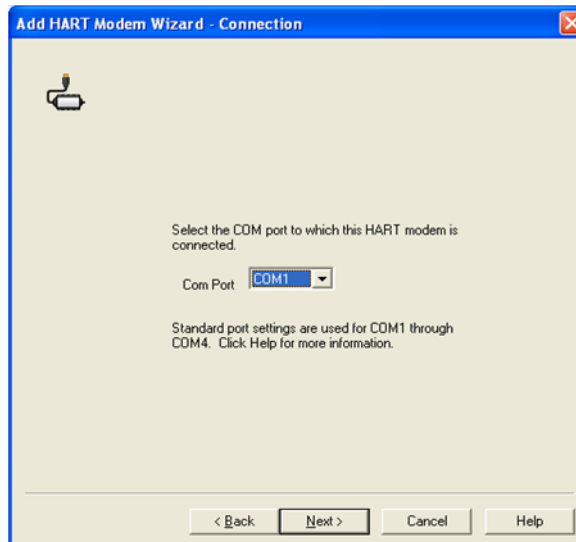
1. Open the **Start** menu.



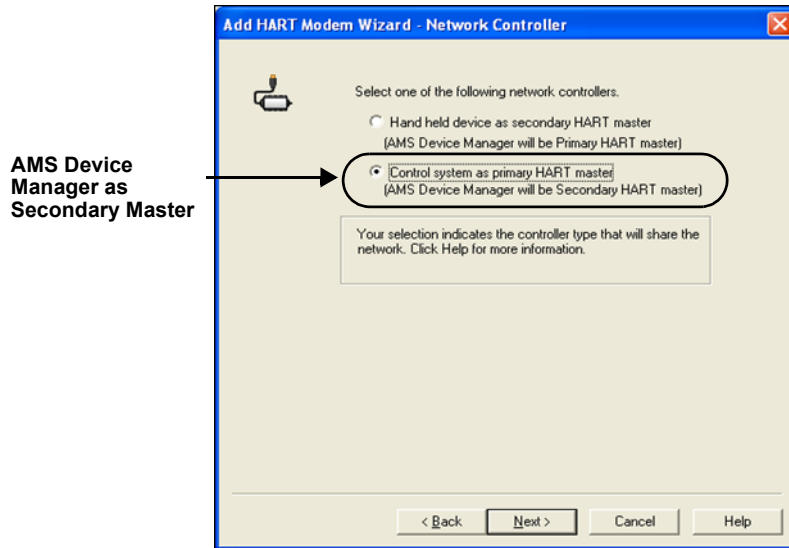
2. Choose **AMS Wireless Configurator>Network Configuration**.



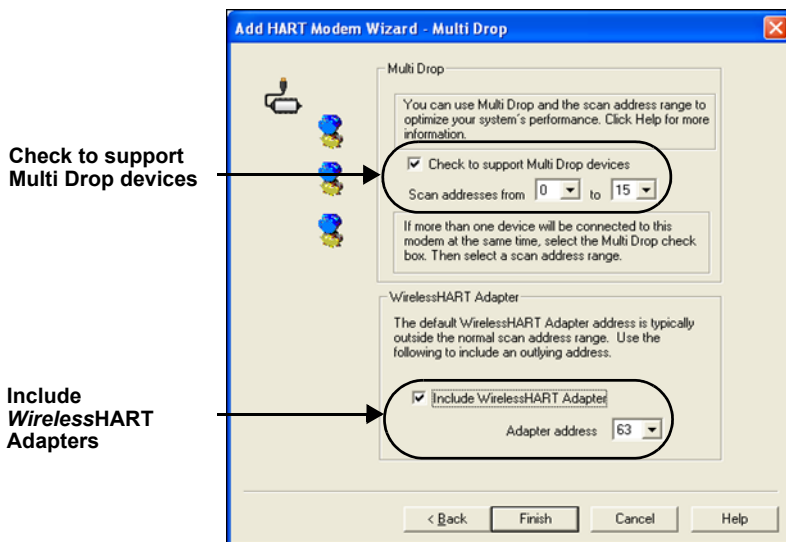
3. Select **HART Modem** and click the **Install** button.



4. Select desired **Com Port** and click the **Next** button.



5. Set AMS Device Manager as Secondary Master.



6. Select the **Multidrop devices** and **Include WirelessHART Adapters** check boxes.

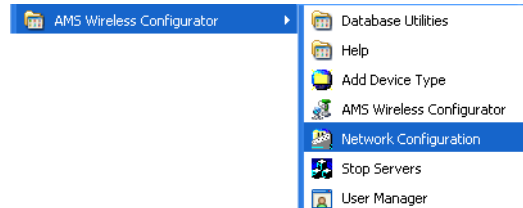
7. Click the **Finish** button.

A.2 CONFIGURE A GATEWAY CONNECTION

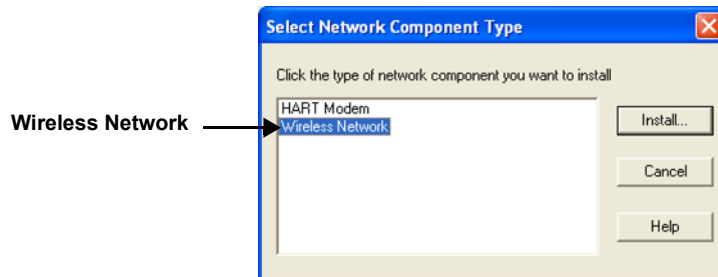
Installing a connection to the gateway in AMS Wireless Configurator enables wireless configuration of all wireless field devices online in the network.

To configure a connection to a Smart Wireless Gateway do the following:

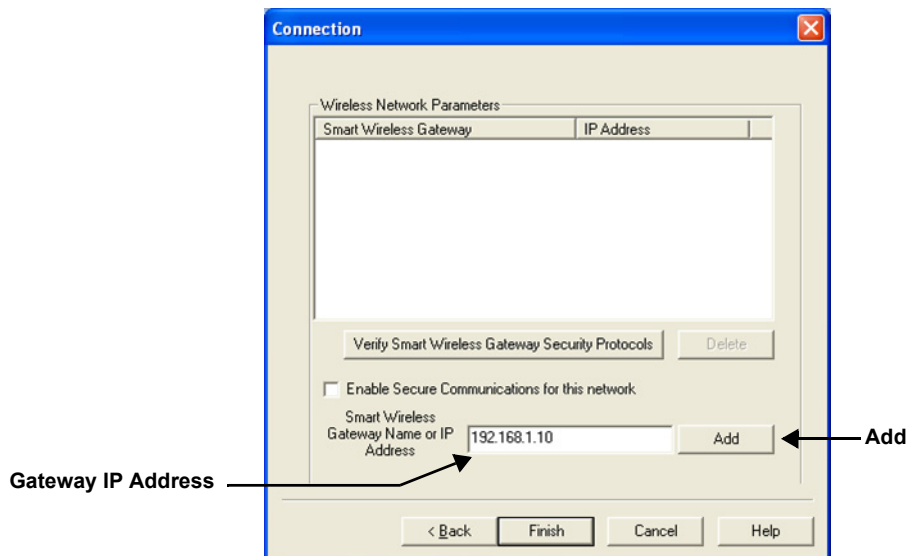
1. Open the **Start** menu.



2. Choose **AMS Wireless Configurator>Network Configuration**.

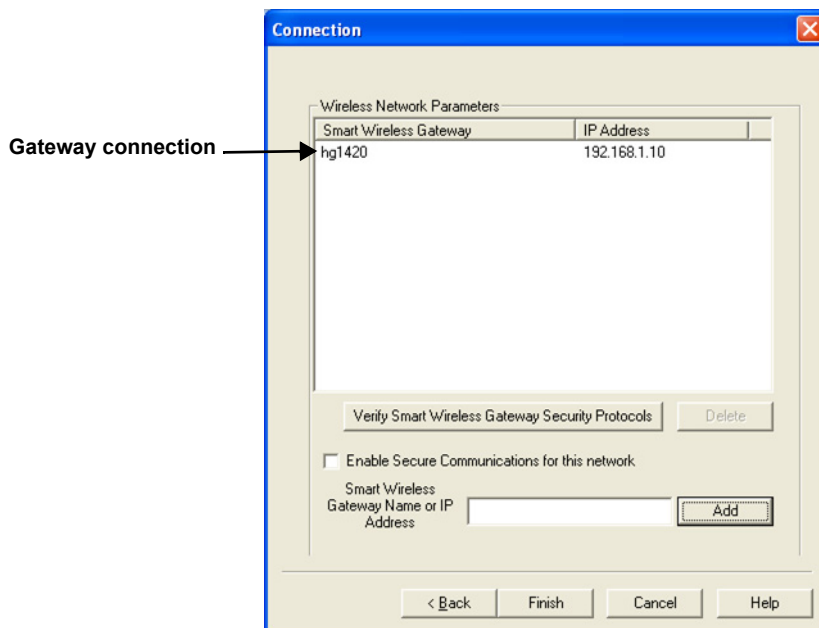


3. Select **Wireless Network** and click the **Install** button.



4. Specify the gateway IP address and click the **Add** button.
5. If **Secure Communication** is enabled in the gateway, the check box **Enable Secure Communication for this network** must be selected.

For information about **Secure Communication** see the Smart Wireless Gateway Reference Manual (Document No. 00809-0200-4420).



6. The gateway connection appears in the **Wireless Network Parameters**.
7. Click the **Finish** button.

For information on how to establish a connection and log on to the gateway, see the Smart Wireless Gateway Reference Manual (Document No. 00809-0200-4420).

Appendix B THUM Adapter Serial Number

B.1 Label With Serial Number page B-1
B.2 Serial Number In AMS Wireless Configurator page B-2

The THUM Adapter serial number can be used to identify the THUM Adapter in the network. This may be useful if the THUM has been commissioned without a configured HART tag. Once the THUM Adapter has been identified, a correct HART tag can be configured using AMS Wireless Configurator.

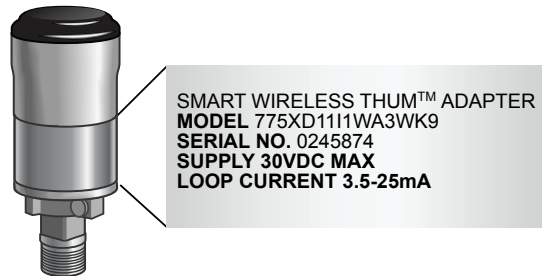
The serial number is found:

1. On the label attached to the THUM Adapter
2. In the software tool AMS Wireless Configurator

B.1 LABEL WITH SERIAL NUMBER

Figure B-1. Label with serial number.

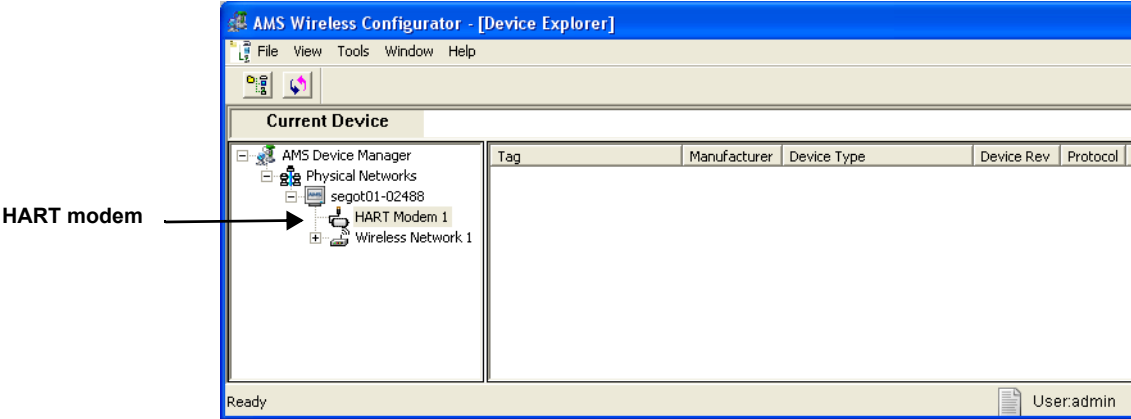
The serial number is printed on the label attached to the THUM Adapter housing.



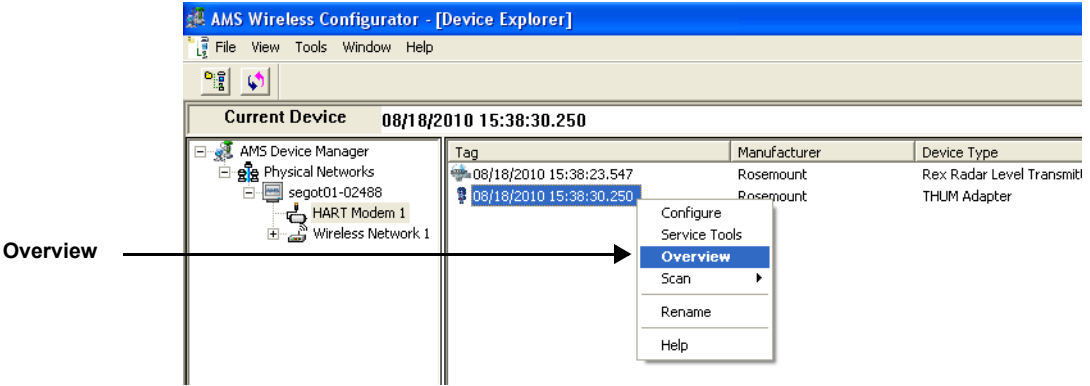
**B.2 SERIAL NUMBER IN
AMS WIRELESS
CONFIGURATOR**

To view the serial number in AMS Wireless Configurator, do the following:

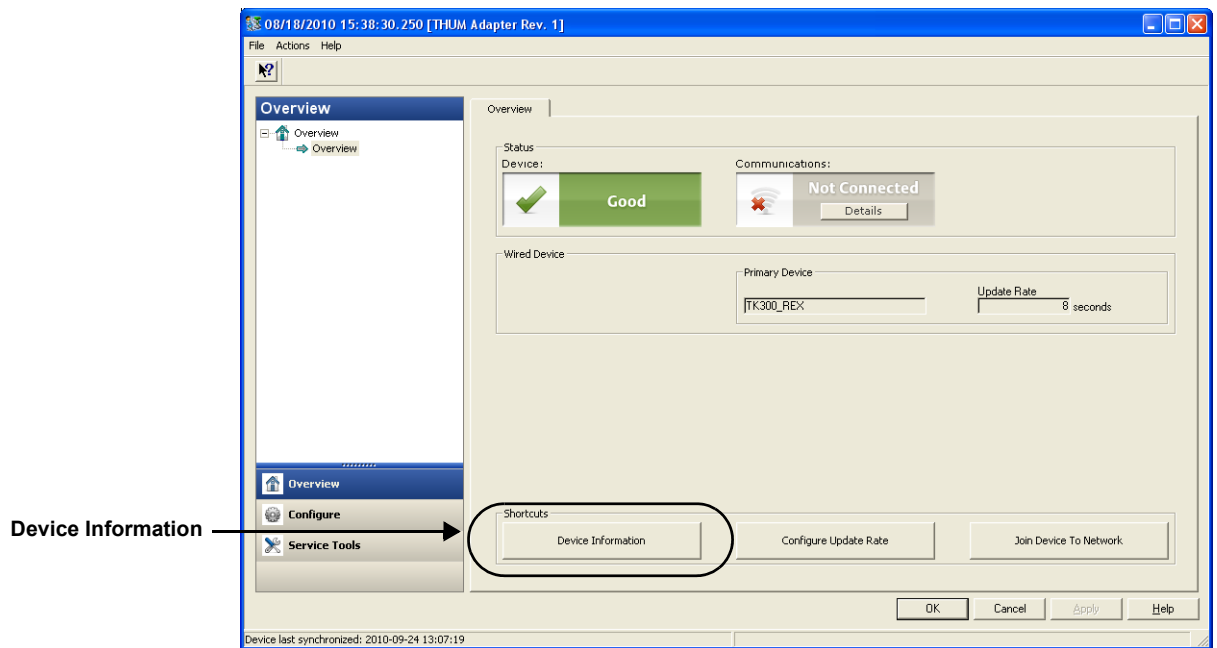
- 1. Open the AMS Wireless Configurator.



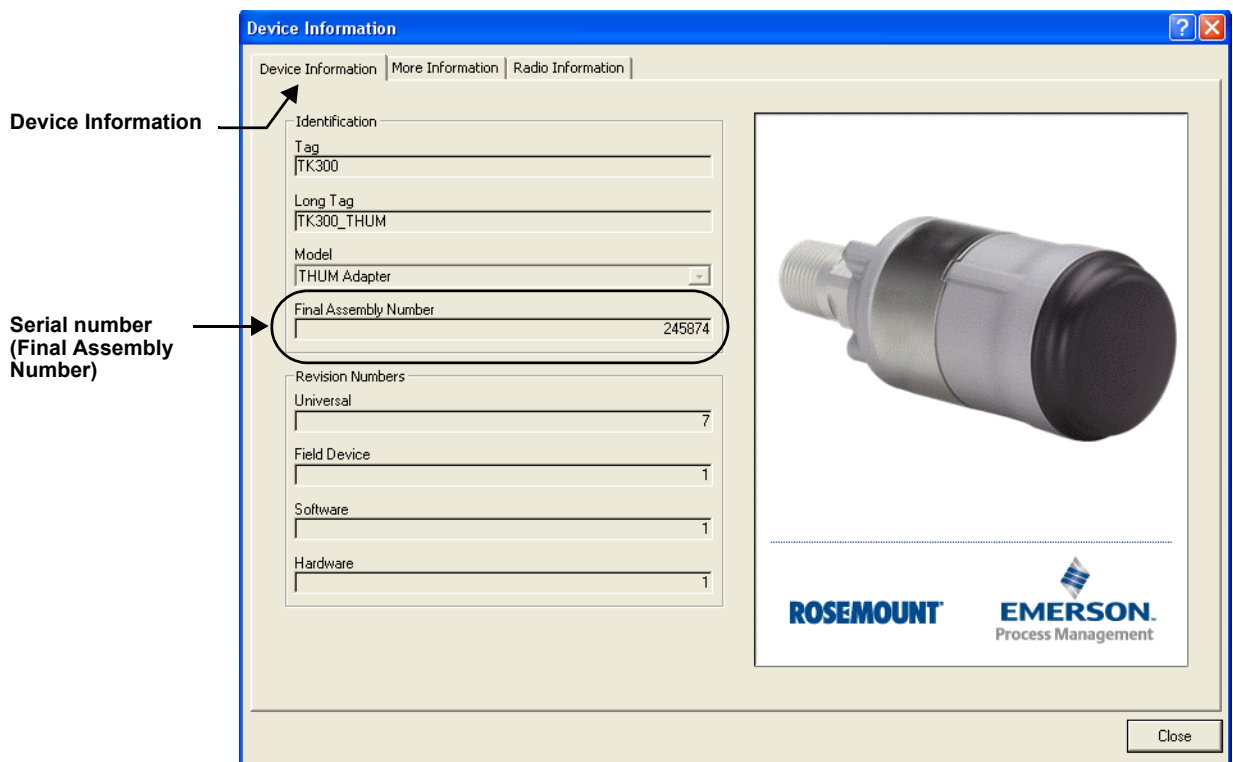
- 2. Select the HART modem.



- 3. Right click on the THUM icon and select **Overview**.



4. Click the **Device Information** button.



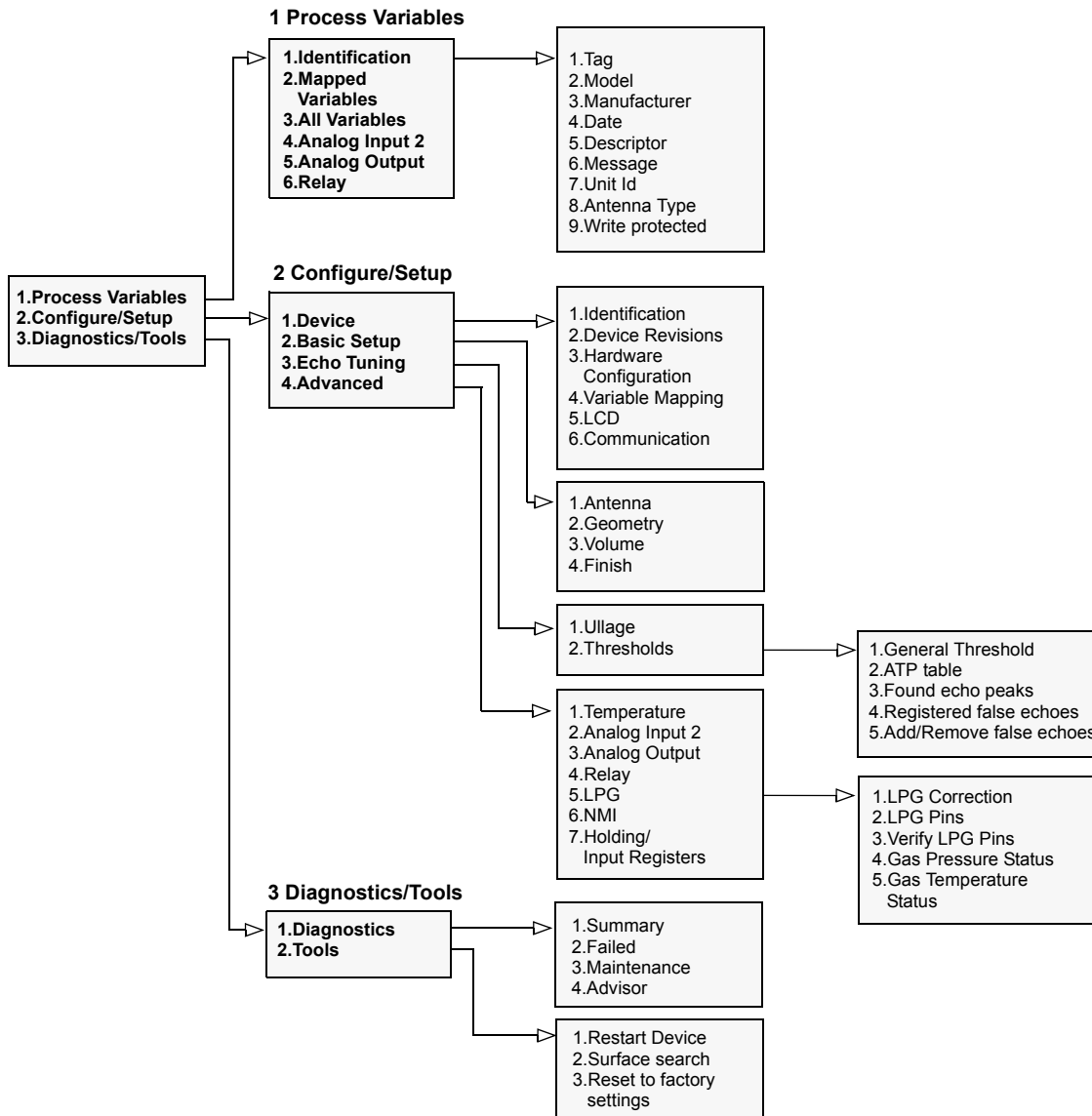
5. Select the **Device Information** tab. The serial number is shown in the Final Assembly Number field.

Appendix C HART Menu Tree

C.1	TankRadar Rex	page C-1
C.2	TankRadar Pro	page C-2

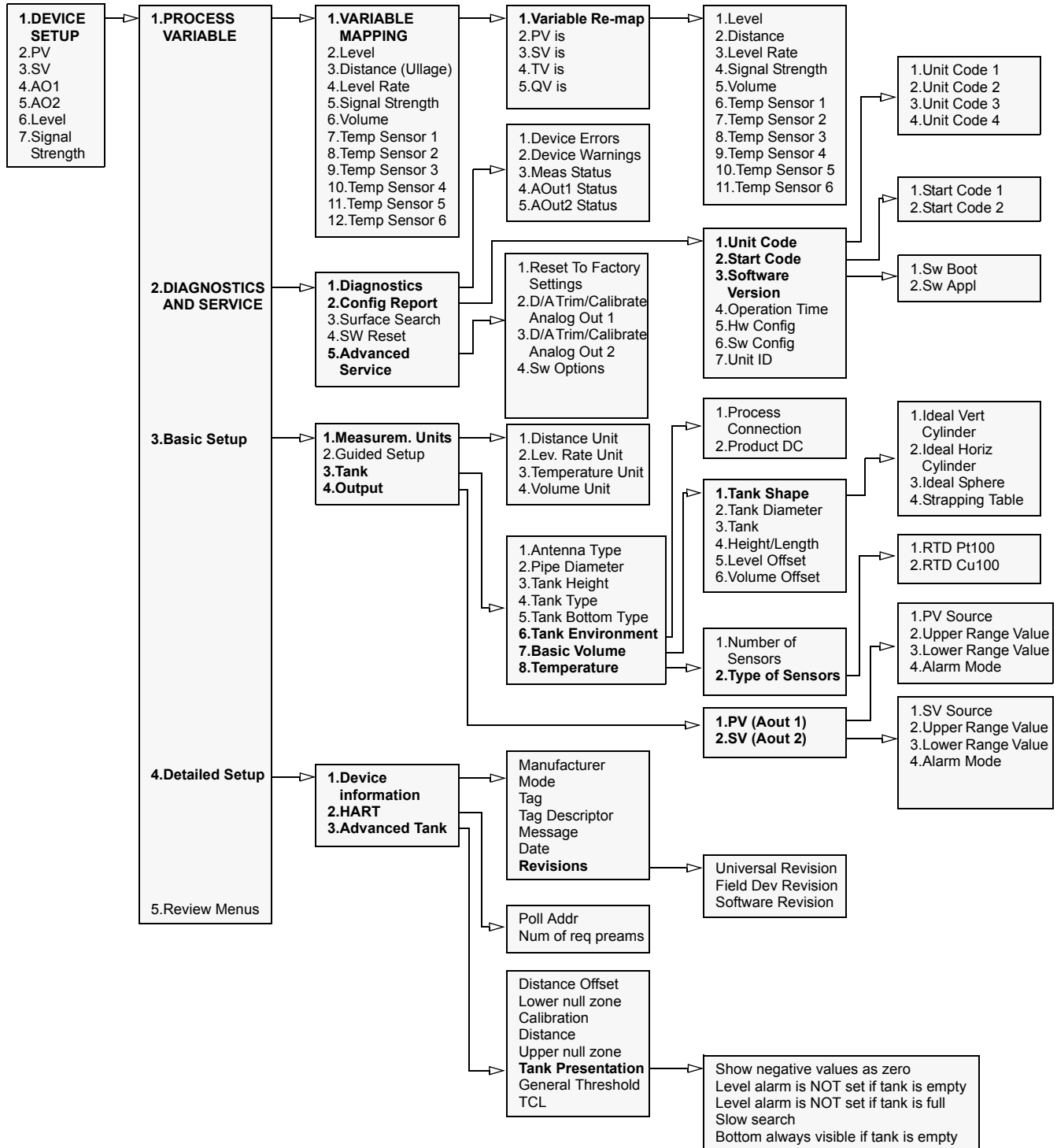
C.1 TANKRADAR REX

Figure C-1. HART Menu Tree for the TankRadar Rex level gauge.



C.2 TANKRADAR PRO

Figure C-2. HART Menu Tree for the TankRadar Pro level gauge.



Appendix D Configure 8 Process Variables

D.1 Overviewpage D-1
 D.2 Configure Eight Process Variablespage D-1
 D.3 Level Gauge and 2410 Tank Hub Variablespage D-7

D.1 OVERVIEW

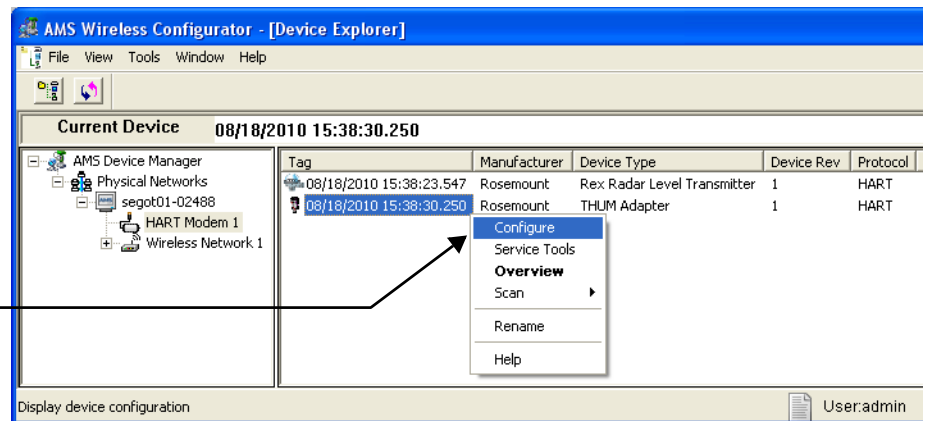
The THUM Adapter can transmit up to eight process variables from TankRadar Rex⁽¹⁾, Pro⁽²⁾ and Rosemount 2410 Tank Hub.

D.2 CONFIGURE EIGHT PROCESS VARIABLES

To configure the THUM Adapter for eight process variables, do the following:

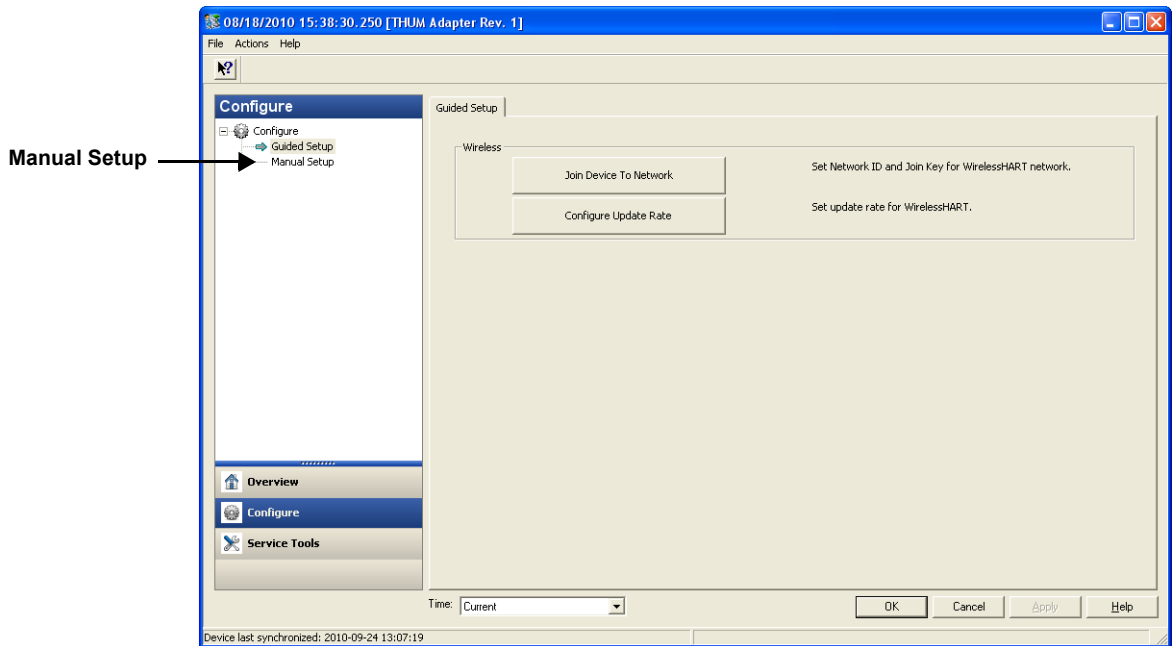
1. Log on to the AMS Wireless Configurator.

Right click the THUM icon and select Configure

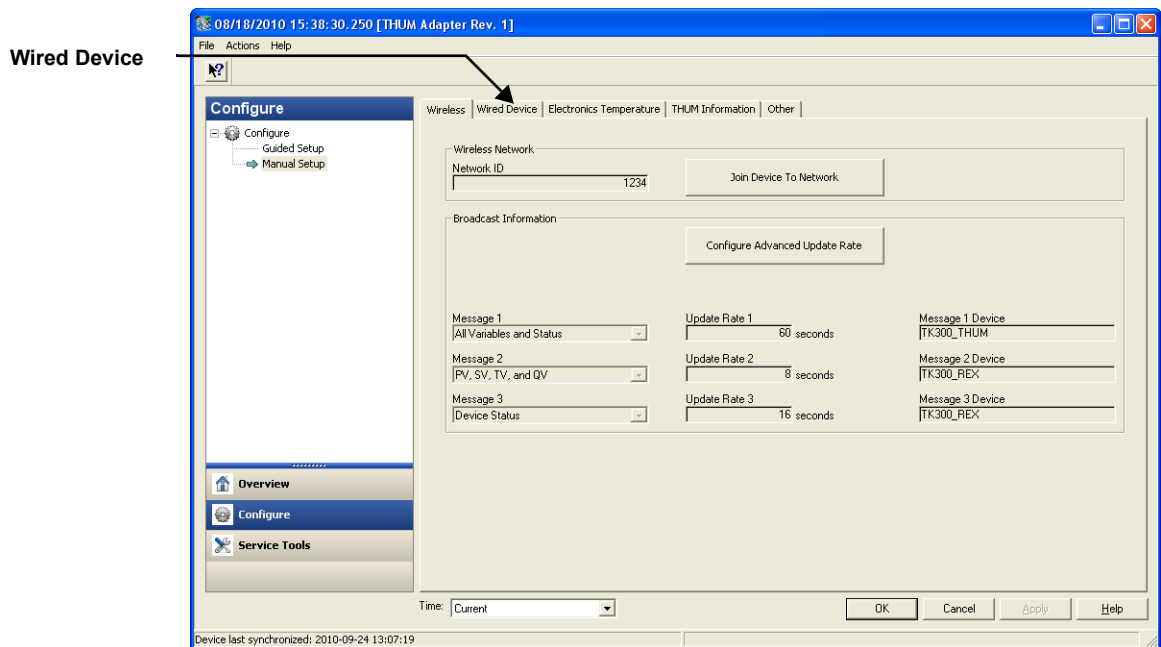


2. In the left-hand side of the workspace navigate to the HART modem for wired configuration (as shown in figure) or the gateway for wireless configuration.
3. Right click the THUM icon and select Configure.

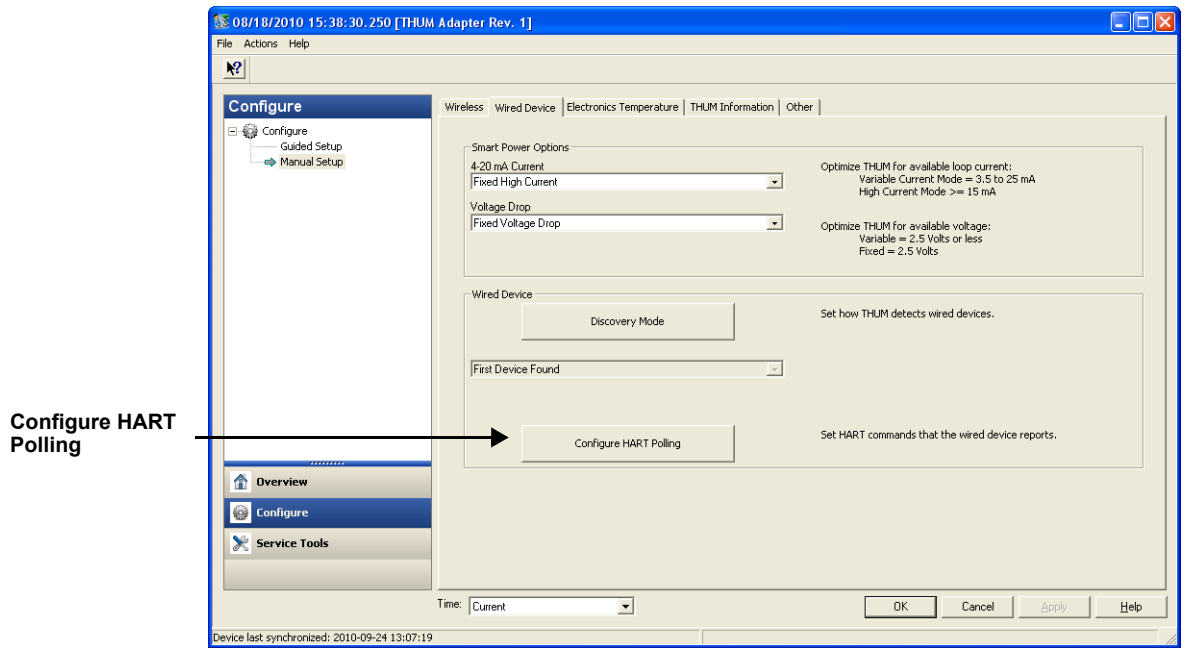
(1) Rex firmware 1.K4 or later required.
 (2) Pro firmware 3.B0 or later required.



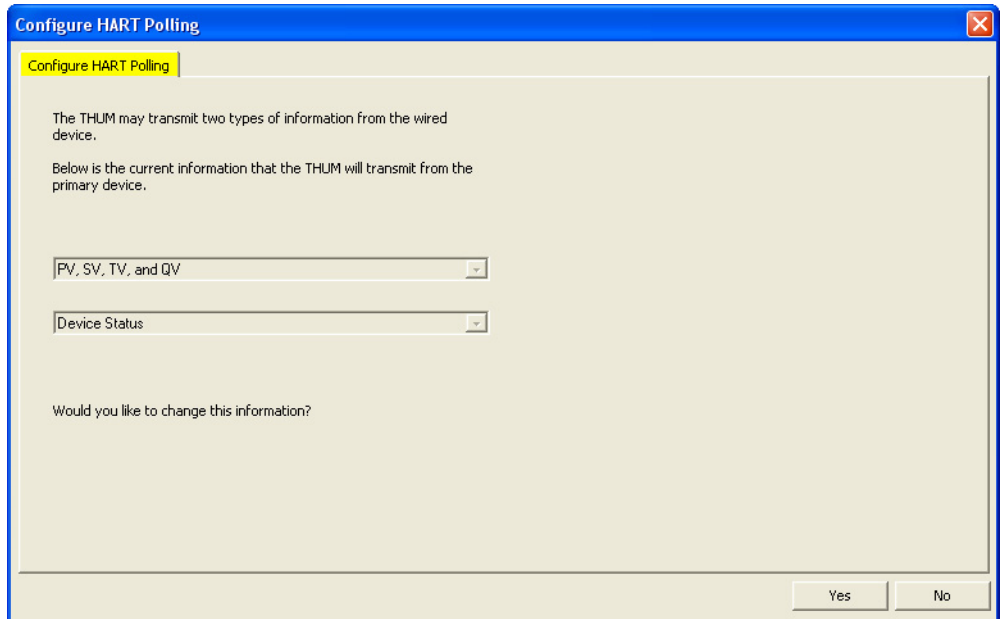
4. Select Manual Setup.



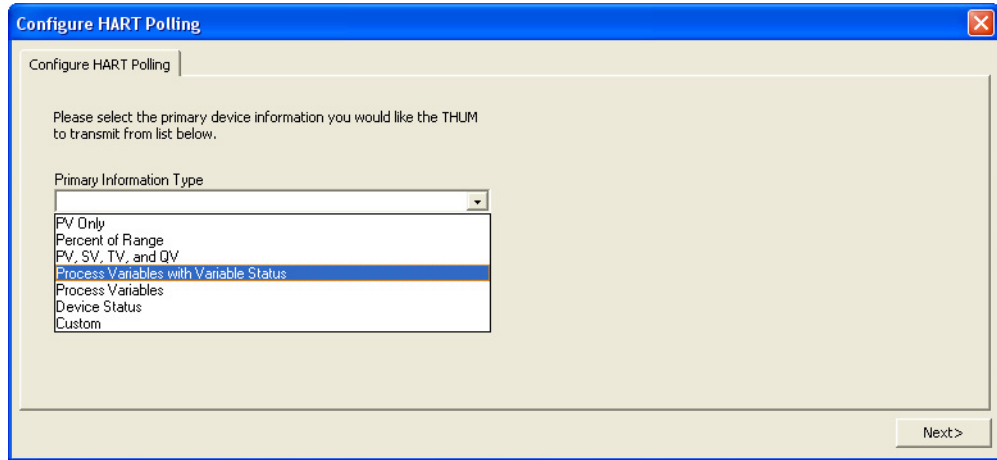
5. Select the **Wired Device** tab.



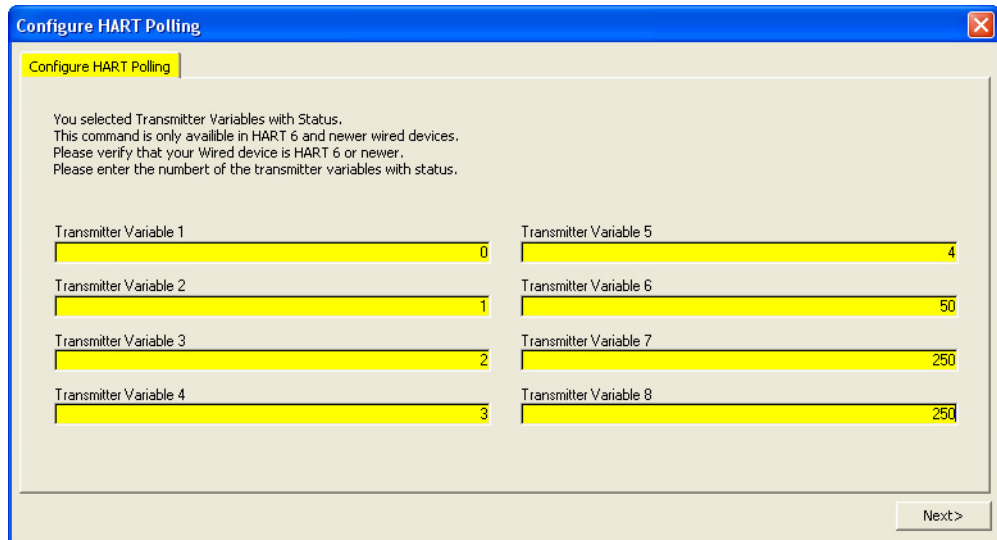
6. Click the **Configure HART Polling** button.



7. Click the **Yes** button.



- In the drop down menu select **Process Variables with Variable Status**. Click the **Next** button.



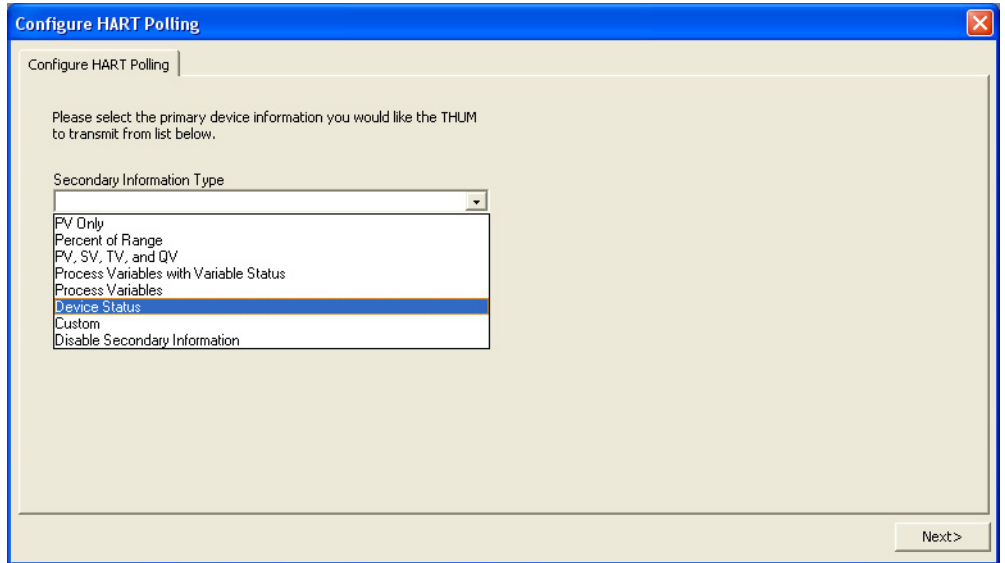
- Map the desired level gauge / Tank Hub transmitter variables. Transmitter variables not used shall be set to 250 (NULL).

In this example, the following six transmitter variables are transmitted:

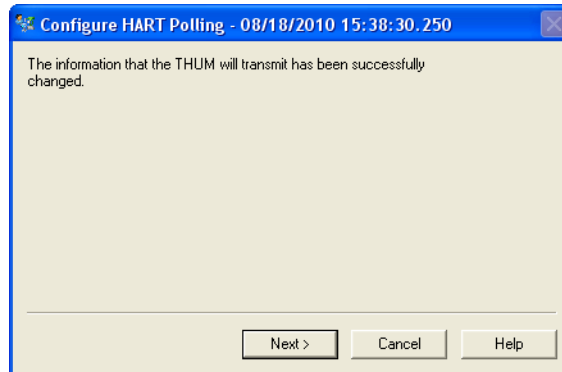
Transmitter Variable	TV#	TV Name
Transmitter Variable 1	0	Level
Transmitter Variable 2	1	Ullage
Transmitter Variable 3	2	Level rate
Transmitter Variable 4	3	Signal Strength
Transmitter Variable 5	4	Volume
Transmitter Variable 6	50	Average temperature
Transmitter Variable 7	250	NULL
Transmitter Variable 8	250	NULL

See Table D-1 on page D-7 and Table D-2 on page D-8 for complete lists of TankRadar Rex and Pro transmitter variables.

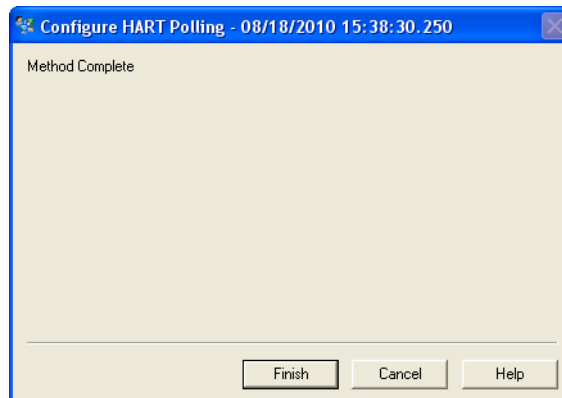
- Click the **Next** button.



11. In the **Secondary Information Type** drop down menu select **Device Status**.



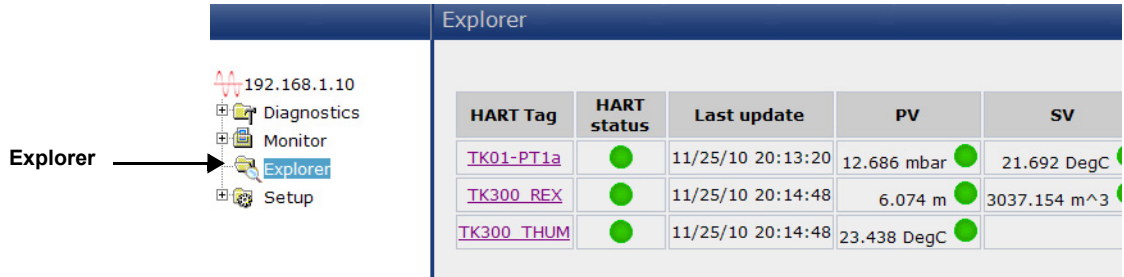
12. The information that the THUM will transmit has been successfully configured. Click the **Next** button.



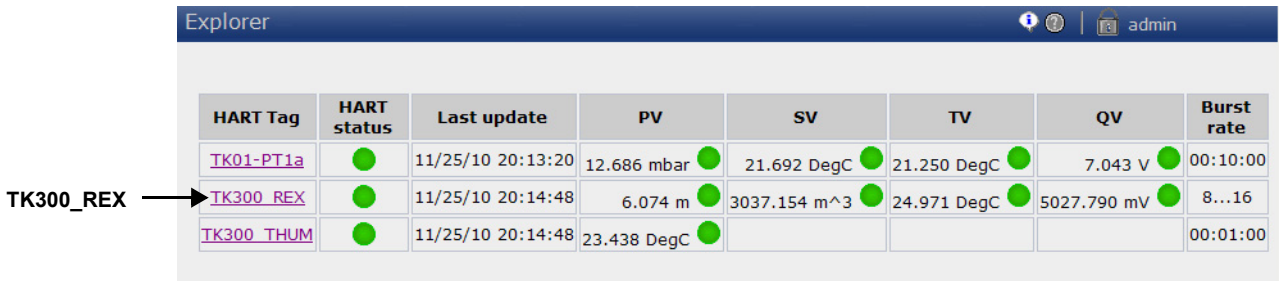
13. Method Complete. Click the **Finish** button.

To view the parameters in the gateway, do the following:

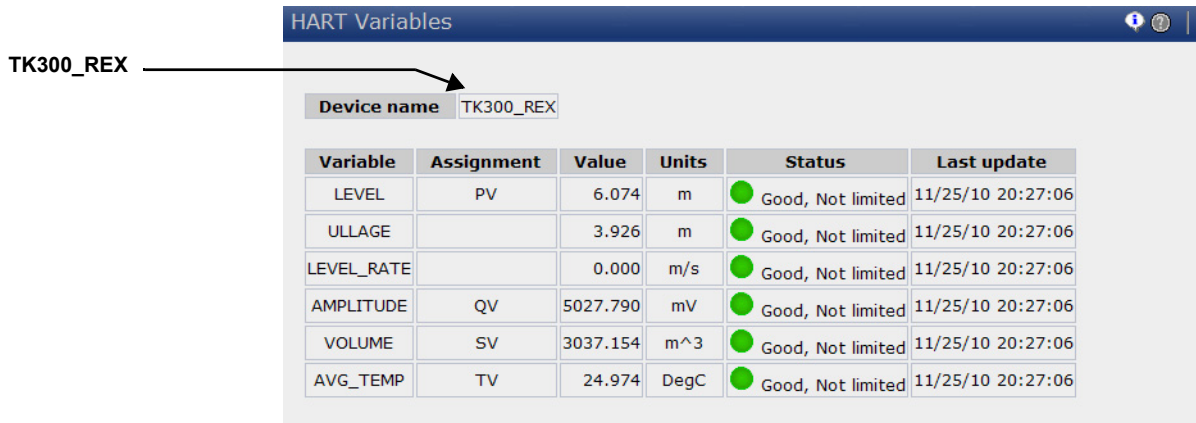
1. Log on to the gateway's integrated web server.



2. Navigate to **Explorer**.



3. Click on the level gauge / Tank Hub HART Tag.



4. The chosen six transmitter variables are shown. (Up to eight variables can be used).

D.3 LEVEL GAUGE AND 2410 TANK HUB VARIABLES

Table D-1. TankRadar Rex
Transmitter Variables.

TV#	TV Name	Default
0	Level	PV
1	Ullage	
2	Level rate	TV
3	Signal strength	QV
4	Volume	
50	Average temperature	SV
51	Temp spot 1	
52	Temp spot 2	
53	Temp spot 3	
54	Temp spot 4	
55	Temp spot 5	
56	Temp spot 6	
178	Vapor temp.	
81	Analog input 2	
85	Relay 1	
86	Relay 2	
200	SDAU Average temp.	
201	SDAU Temp spot 1	
202	SDAU Temp spot 2	
203	SDAU Temp spot 3	
204	SDAU Temp spot 4	
205	SDAU Temp spot 5	
206	SDAU Temp spot 6	
207	SDAU Temp spot 7	
208	SDAU Temp spot 8	
209	SDAU Temp spot 9	
210	SDAU Temp spot 10	
211	SDAU Temp spot 11	
212	SDAU Temp spot 12	
213	SDAU Temp spot 13	
214	SDAU Temp spot 14	
250	NULL	

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Table D-2. TankRadar Pro Transmitter Variables.

TV#	TV Name	Default
0	Level	PV
1	Ullage	SV
2	Level rate	TV
3	Amplitude	QV
4	Volume	
5	Temp spot 1	
6	Temp spot 2	
7	Temp spot 3	
8	Temp spot 4	
9	Temp spot 5	
10	Temp spot 6	
12	Average temperature	
250	NULL	

Table D-3. Rosemount 2410 Tank Hub Variables.

TV#	TV Name	Default
Tank 1 (TK 1)		
0	Level	
1	Ullage	
2	Level rate	
3	Signal strength	
4	Free water level	
5	Vapor pressure	
6	Liquid pressure	
7	Air pressure	
8	Ambient temperature	
9	Vapor average temperature	
10	Liquid average temperature	
12	Temperature 1	
13	Temperature 2	
14	Temperature 3	
15	Temperature 4	
16	Temperature 5	
17	Temperature 6	
18	Temperature 7	
19	Temperature 8	
20	Temperature 9	
21	Temperature 10	
22	Temperature 11	
23	Temperature 12	
24	Temperature 13	
25	Temperature 14	
26	Temperature 15	
27	Temperature 16	
50	Observed density	
51	Reference density	
52	Flow rate	
53	Tank volume	
55	Middle pressure	
56	Delta Level	
60	User defined 1	
61	User defined 2	

TV#	TV Name	Default
Tank 1 (TK 1)		
62	User defined 3	
63	User defined 4	
64	User defined 5	
85	Relay_K1	Value: 0.0 (alarm state) Value: 1.0 (normal state) Value: 2.0 (toggle state) Unit: 240 (no unit)
86	Relay_K2	See Relay_K1
87	SIL AR (alarm relay)	Value: 0.0 (alarm state) Value: 1.0 (normal state) Unit: 240 (no unit)
Tank 2 (TK 2)		
90	Level	
91	Ullage	
92	Level rate	
93	Signal strength	
94	Free water level	
95	Vapor pressure	
96	Liquid pressure	
99	Vapor average temperature	
100	Liquid average temperature	
102	User defined 1	
103	User defined 2	
104	User defined 3	
105	User defined 4	
106	User defined 5	
Tank 3 (TK 3)		
110	Level	
111	Ullage	
112	Level rate	
113	Signal strength	
114	Free water level	
115	Vapor pressure	
116	Liquid pressure	
119	Vapor average temperature	
120	Liquid average temperature	
122	User defined 1	
123	User defined 2	
Tank 4 (TK 4)		
130	Level	
131	Ullage	
132	Level rate	
133	Signal strength	
134	Free water level	
135	Vapor pressure	
136	Liquid pressure	
139	Vapor average temperature	
140	Liquid average temperature	
142	User defined 1	
143	User defined 2	

TV#	TV Name	Default
Tank 5 (TK 5)		
150	Level	
151	Ullage	
152	Level rate	
153	Signal strength	
154	Free water level	
155	Vapor pressure	
156	Liquid pressure	
159	Vapor average temperature	
160	Liquid average temperature	
162	User defined 1	
163	User defined 2	
Tank 6 (TK 6)		
170	Level	
171	Ullage	
172	Level rate	
173	Signal strength	
174	Free water level	
175	Vapor pressure	
176	Liquid pressure	
179	Vapor average temperature	
180	Liquid average temperature	
182	User defined 1	
183	User defined 2	
Tank 7 (TK 7)		
190	Level	
191	Ullage	
192	Level rate	
193	Signal strength	
194	Free water level	
195	Vapor pressure	
196	Liquid pressure	
199	Vapor average temperature	
200	Liquid average temperature	
202	User defined 1	
203	User defined 2	
Tank 8 (TK 8)		
210	Level	
211	Ullage	
212	Level rate	
213	Signal strength	
214	Free water level	
215	Vapor pressure	
216	Liquid pressure	
219	Vapor average temperature	
220	Liquid average temperature	
222	User defined 1	
223	User defined 2	

TV#	TV Name	Default
Tank 9 (TK 9)		
226	Level	
227	Level rate	
228	Free water level	
229	Liquid average temperature	
230	User defined 1	
231	User defined 2	
Tank 10 (TK 10)		
233	Level	
234	Level rate	
235	Free water level	
236	Liquid average temperature	
237	User defined 1	
238	User defined 2	
250	Null	

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Reference Manual

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