Reference Manual
00809-0100-2230, Rev DA
March 2021

Rosemount™ 2230 Graphical Field Display

ROSEMOUNT™

EMERSON™

NOTICE

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

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

Spare Parts

Any substitution of non-recognized spare parts may jeopardize safety. Repair, e.g. substitution of components etc, may also jeopardize safety and is under no circumstances allowed.

Rosemount Tank Radar AB will not take any responsibility for faults, accidents, etc caused by non-recognized spare parts or any repair which is not made by Rosemount Tank Radar AB.

⚠ WARNING

WARNING - Substitution of components may impair Intrinsic Safety.

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

AVERTISSEMENT - La substitution de composants peut compromettre la sécurité intrinsèque.

AVERTISSEMENT - Ne pas ouvrir en cas de presence d'atmosphere explosive.

⚠ WARNING

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.

Contents

1 Introduction

1.1 Safety messages

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

⚠ WARNING

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

- Ensure only qualified personnel perform the installation.
- Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

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 handheld communicator in an explosive atmosphere, ensure that the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Do not remove the cover in explosive atmospheres when the circuit is alive.
- Substitution of components may impair Intrinsic Safety.
- To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

Electrical shock could cause death or serious injury.

- Use extreme caution when making contact with the leads and terminals.

⚠ WARNING

Any substitution of non-recognized parts may jeopardize safety. Repair (e.g. substitution of components) may also jeopardize safety and is not allowed under any circumstances.

1.2 Symbols

Table 1-1: Symbols

	The CE marking symbolizes the conformity of the product with the applicable European Community Directives.
	The EU-Type Examination Certificate is a statement of a Notified Certification Body declaring that this product meets the Essential Health and Safety Requirements of the ATEX directive
	The FM APPROVED Mark indicates that the equipment is approved by FM Approvals according to applicable Approval Standards and is applicable for installation in hazardous locations
	Protective Earth
	Ground
75 C	External cabling must be approved for use in min. 75°C.

1.3 Manual overview

This manual provides information on installing, operating, and maintaining the Rosemount™ 2230.

Chapter Overview provides a brief description of the various components in a Rosemount Tank Gauging system and recommended installation procedure.

Chapter Installation covers installation considerations as well as mechanical and electrical installation.

Chapter Configuration and operation describes how to configure the Rosemount 2230 by using the soft-key functions or other tools such as a Rosemount 475 Field Communicator or the AMS Device Manager software.

Chapter Service and troubleshooting covers tools, troubleshooting, and various service instructions.

Appendix Specifications and reference data contains specifications, dimensional drawings, and ordering table.

Appendix Product certifications contains information on approvals and certifications.

Appendix FOUNDATION™ Fieldbus Block Information describes the various function and transducer blocks which are used for the Rosemount 2230.

1.4 Technical documentation

The Rosemount™ Tank Gauging System includes a wide portfolio of user documentation. For a complete list, see product pages on Emerson.com/Rosemount.

Reference manuals

- Rosemount Tank Gauging System Configuration Manual (00809-0300-5100)
- Rosemount 2460 System Hub (00809-0100-2460)
- Rosemount 2410 Tank Hub (00809-0100-2410)
- Rosemount 5900S Radar Level Gauge (00809-0100-5900)
- Rosemount 5900 Proof Test with Reference Reflector (00809-0200-5900)
- Rosemount 5900C Radar Level Gauge (00809-0100-5901)
- Rosemount 2240S Multi-Input Temperature Transmitter (00809-0100-2240)
- Rosemount 2230 Graphical Field Display (00809-0100-2230)
- Rosemount 5300 Guided Wave Radar (00809-0100-4530)
- Rosemount 5408 Radar Level Transmitter (00809-0300-4408)
- Rosemount Tank Gauging Wireless System (00809-0100-5200)
- Rosemount TankMaster WinOpi (00809-0200-5110)
- Rosemount TankMaster WinSetup (00809-0100-5110)
- Rosemount TankMaster Floating Roof Monitoring (00809-0500-5100)
- Rosemount TankMaster Network Configuration (00809-0500-5100)
- Rosemount 5900 Radar Level Gauge and Rosemount 2410 Tank Hub Safety Manual Option S (00809-0500-5100)

Product data sheets

- Rosemount Tank Gauging System Data Sheet (00813-0100-5100)
- Rosemount 2460 System Hub Product Data Sheet (00813-0100-2460)
- Rosemount 2410 Product Data Sheet (00813-0100-2410)
- Rosemount 5900S Product Data Sheet (00813-0100-5900)
- Rosemount 5900C Product Data Sheet (00813-0100-5901)
- Rosemount 2240S Product Data Sheet (00813-0100-2240)
- Rosemount 2230 Product Data Sheet (00813-0100-2230)
- Rosemount 5300 Product Data Sheet (00813-0100-4530)
- Rosemount 5408 Product Data Sheet (00813-0100-4408)

Drawings

Table 1-2: Installation Drawings for the Rosemount 2230 Graphical Field Display

Drawing	Title
D7000003-838	Mechanical Installation Drawing 2230
D9240041-953	Electrical Installation Drawing 2230 Display
D7000001-798	System Installation Drawing FOUNDATION™ Fieldbus FISCO
D7000001-811	System Installation Drawing FOUNDATION Fieldbus IS Entity

See also the product page for the Rosemount 2230 on Emerson.com/Rosemount.

1.5 Product recycling/disposal

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

1.6 Packing material

Rosemount Tank Radar AB is fully certified according to ISO 14001 environmental standards. By recycling the corrugated paperboard, or wooden boxes, used for shipping our products you can contribute to take care of the environment.

Reuse and recycling

Experience has shown that wooden boxes can be used several times for various purposes. After careful disassembly the wooden parts may be reused. Metal waste may be converted.

Energy recovery

Products which have served their time may be divided into wood and metal components and the wood can be used as fuel in sufficient ovens.

Due to its low moisture content (approximately 7%) this fuel has a higher calorific value than ordinary wood fuel (moisture content approximately 20%).

When burning interior plywood the nitrogen in the adhesives may increase emissions of nitrogen oxides to the air 3-4 times more than when burning bark and splinter.

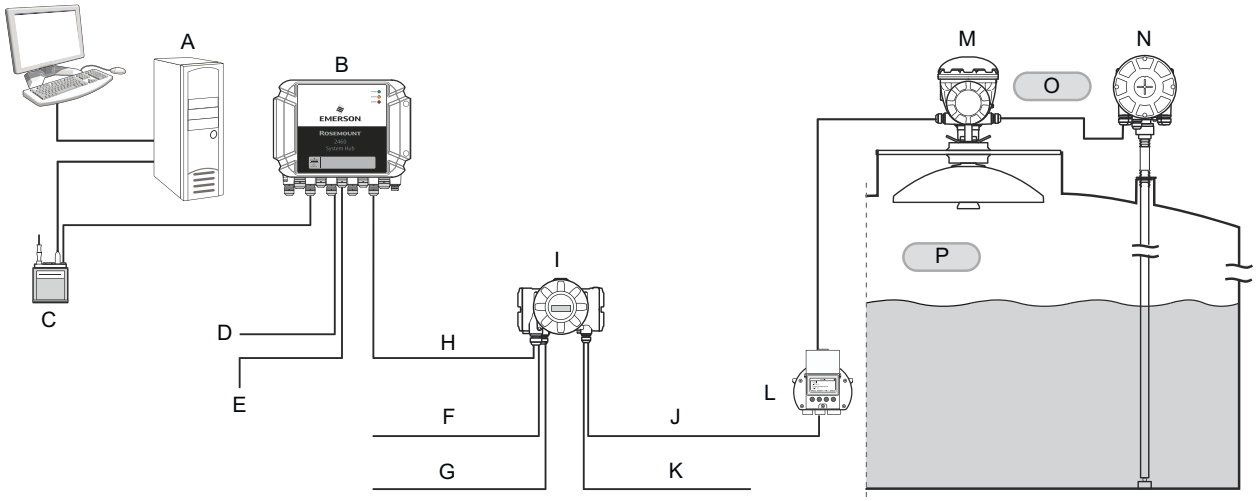
Note
Landfill is not a recycling option and should be avoided.

2 Overview

2.1 Introduction

The Rosemount™ 2230 Graphical Field Display presents inventory tank gauging data such as level, temperature, and pressure. The Rosemount 2230 display communicates with the Rosemount 2410 Tank Hub via the intrinsically safe 2-wire Tankbus(1). The Rosemount 2230 also supports installation in FOUNDATION™ Fieldbus systems.

Figure 2-1: System Integration



A. Rosemount TankMaster
B. Rosemount 2460 System Hub
C. Modem
D. Host
E. Servo gauges
F. Secondary Bus (Non-IS)
G. Relay Outputs
H. Primary Bus
I. Rosemount 2410 Tank Hub
J. Tankbus
K. Secondary bus (IS)
L. Rosemount 2230 Field Display
M. Rosemount 5900S Radar Level Gauge
N. Rosemount 2240S Temperature Transmitter
O. Zone 1
P. Zone 0

A Rosemount 2230 connected to the multiple tank version of the Rosemount 2410 Tank Hub allows you to view data from several tanks. It is possible to configure presentation of measurement variables for each tank individually.

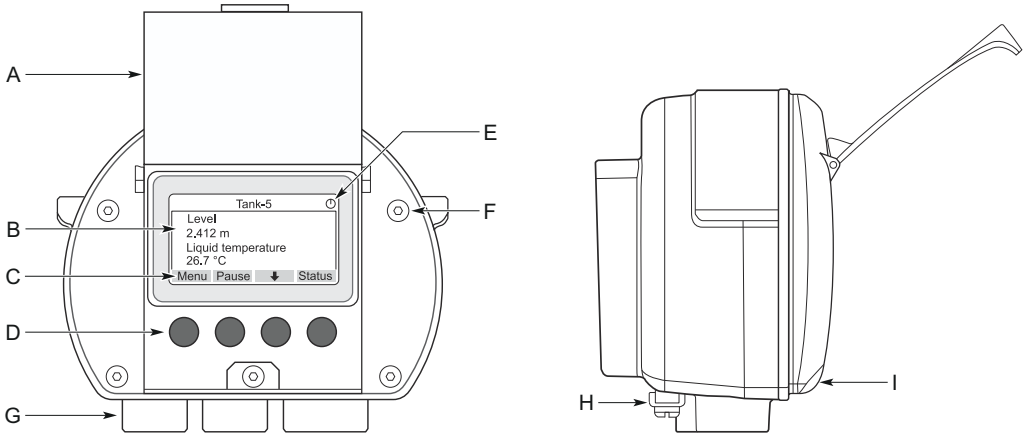
The four softkeys at the front of the Rosemount 2230 allow you to navigate through the different menus and provides all tank data, directly in the field.

(1) The intrinsically safe Tankbus complies with the FISCO FOUNDATION Fieldbus standard. See reference document IEC/TS 60079-27.

Data from a group of tanks is buffered by a Rosemount 2460 System Hub, and is distributed to a TankMaster™ PC, or a host system, whenever the Rosemount 2460 receives a request for data. In case no 2460 is included in the system, the Rosemount 2410 Tank Hub can communicate directly with the host computer.

2.2 Components

Figure 2-2: Rosemount 2230 Components



A. Weather protection lid(2)
B. Display
C. Menu
D. Soft keys
E. Activity indicator
F. Cover screw (x6)
G. Cable entries: two ½ - 14 NPT (optional: adapters for two M20 x 1.5)
H. Ground screw
I. Clip for locking the weather protection

(2) It is recommended that the lid is closed whenever possible to protect the LCD from exposure by ultraviolet radiation from the sun.

2.3 System overview

The Rosemount Tank Gauging system is a state-of-the art inventory and custody transfer radar tank level gauging system. It is developed for a wide range of applications at refineries, tank farms and fuel depots, and fulfills the highest requirements on performance and safety.

The field devices on the tank communicate over the intrinsically safe Tankbus. The Tankbus is based on a standardized fieldbus, the FISCO(3) FOUNDATION™ Fieldbus, and allows integration of any device supporting that protocol. By utilizing a bus powered 2-wire intrinsically safe fieldbus the power consumption is minimized. The standardized fieldbus also enables integration of other vendors' equipment on the tank.

The Rosemount Tank Gauging product portfolio includes a wide range of components to build small or large customized tank gauging systems. The system includes various devices, such as radar level gauges, temperature transmitters, and pressure transmitters for complete inventory control. Such systems are easily expanded thanks to the modular design.

The Rosemount Tank Gauging system is a versatile system that is compatible with and can emulate all major tank gauging systems. Moreover, the well-proven emulation capability enables step-by-step modernization of a tank farm, from level gauges to control room solutions.

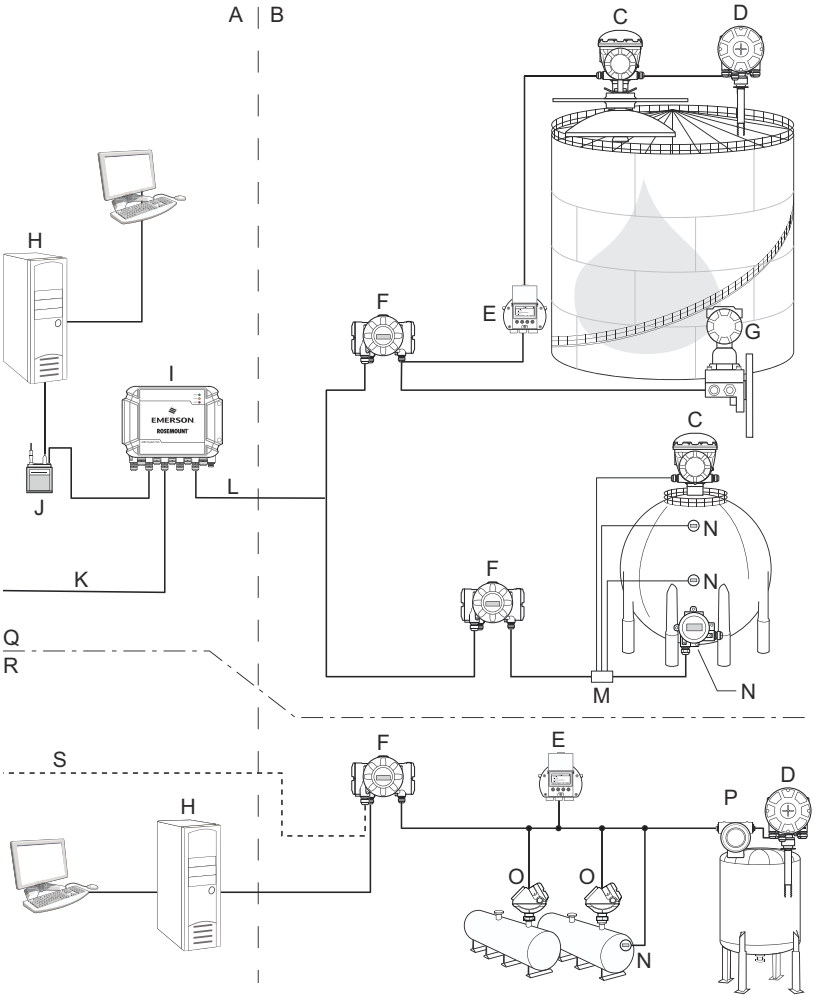
It is possible to replace old mechanical or servo gauges with modern Rosemount Tank Gauging devices, without replacing the control system or field cabling. It is further possible to replace old HMI/SCADA-systems and field communication devices without replacing the old gauges.

There is a distributed intelligence in the various system units which continuously collect and process measurement data and status information. When a request for information is received an immediate response is sent with updated information.

The flexible Rosemount Tank Gauging system supports several combinations to achieve redundancy, from control room to the different field devices. Redundant network configuration can be achieved at all levels by doubling each unit and using multiple control room work stations.

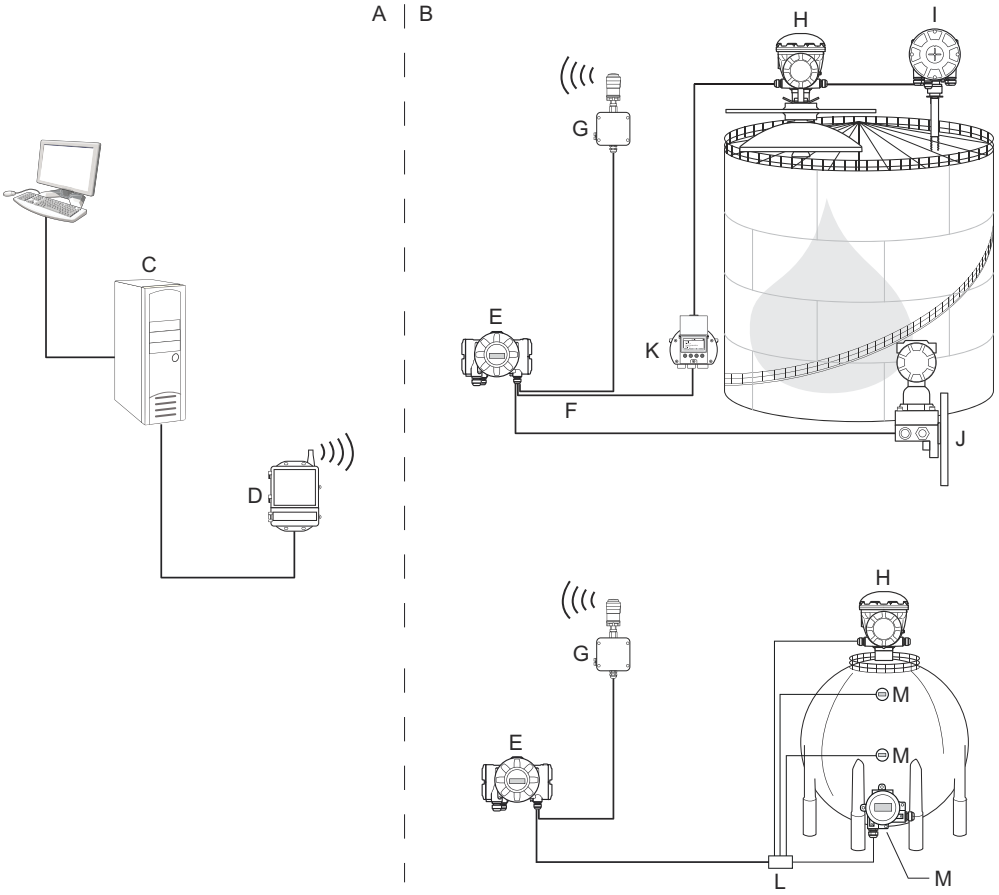
(3) See documents IEC 61158-2

Figure 2-3: Rosemount Tank Gauging System Architecture



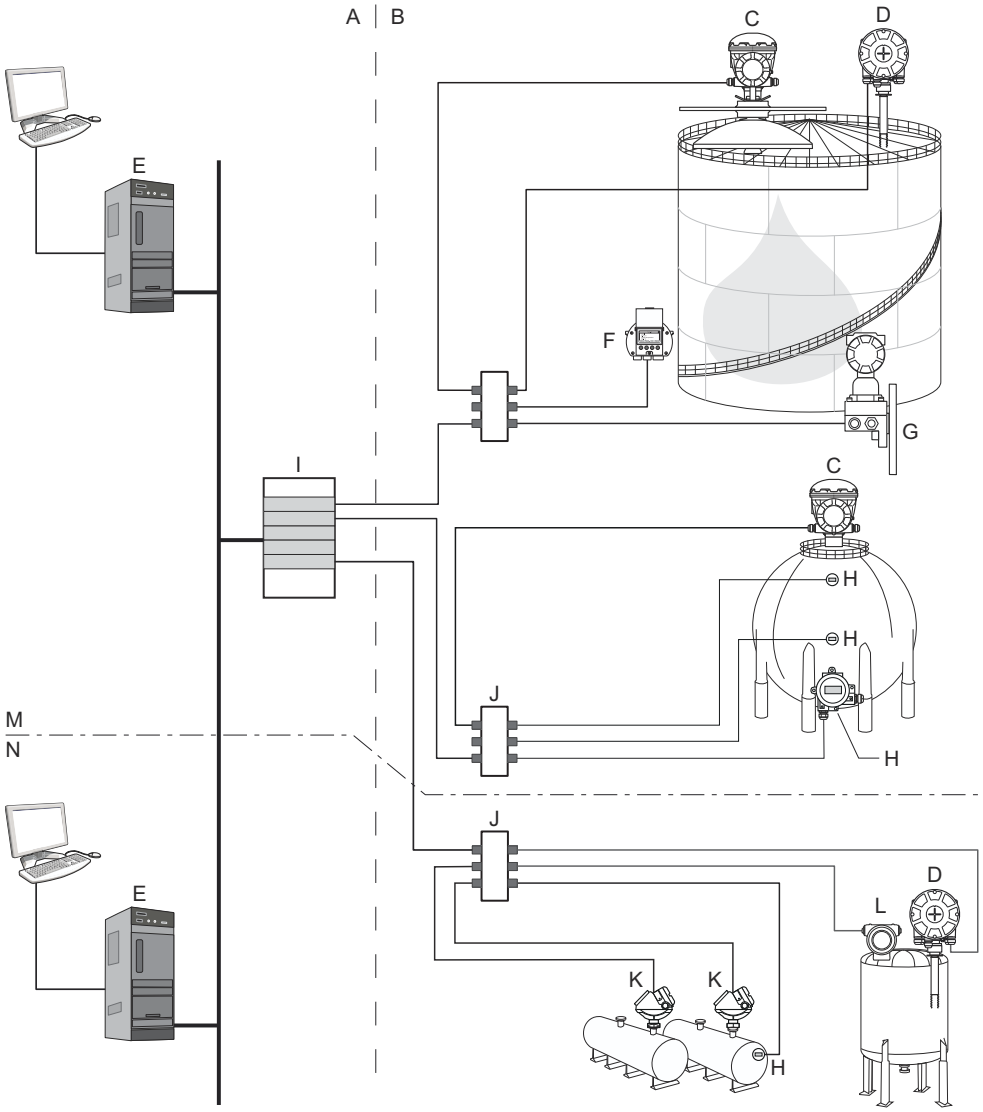
A. Non-hazardous area
B. Hazardous area
C. Rosemount 5900S Radar Level Gauge
D. Rosemount 2240S Temperature Transmitter
E. Rosemount 2230 Graphical Field Display
F. Rosemount 2410 Tank Hub
G. Rosemount 3051S Pressure Transmitter
H. Rosemount TankMaster PC
I. Rosemount 2460 System Hub
J. Rosemount 2180 Field Bus Modem
K. Plant Host Computer
L. TRL2 Modbus
M. Segment coupler
N. Rosemount 644 Temperature Transmitter
O. Rosemount 5300 Level Transmitter
P. Rosemount 5408 Level Transmitter
Q. Custody transfer / Inventory tank gauging
R. Operational control
S. Plant host computer

Figure 2-4: Rosemount Tank Gauging System Architecture for Wireless Systems



A. Non-hazardous area
B. Hazardous area
C. Rosemount TankMaster PC
D. Emerson Wireless 1420 Gateway
E. Rosemount 2410 Tank Hub
F. Tankbus
G. Emerson Wireless 775 THUM Adapter
H. Rosemount 5900S Radar Level Gauge
I. Rosemount 2240S Temperature Transmitter
J. Rosemount 3051S Pressure Transmitter
K. Rosemount 2230 Graphical Field Display
L. Segment coupler
M. Rosemount 644 Temperature Transmitter

Figure 2-5: Rosemount Tank Gauging System Architecture in a FOUNDATION Fieldbus Network



A. Non-hazardous area
B. Hazardous area
C. Rosemount 5900S Radar Level Gauge
D. Rosemount 2240S Temperature Transmitter
E. PC
F. Rosemount 2230 Graphical Field Display
G. Rosemount 3051S Pressure Transmitter
H. Rosemount 644 Temperature Transmitter
I. FOUNDATION Fieldbus Power Supply
J. Segment coupler
K. Rosemount 5300 Level Transmitter
L. Rosemount 5408 Level Transmitter
M. Custody transfer / Inventory tank gauging
N. Operational control

2.3.1 TankMaster HMI software

Rosemount TankMaster is a powerful Windows-based Human Machine Interface (HMI) for complete tank inventory management. It provides configuration, service, set-up, inventory, and custody transfer functions for Rosemount Tank Gauging systems and other supported instruments.

Rosemount TankMaster is designed to be used in the Microsoft® Windows environment providing easy access to measurement data from your Local Area Network (LAN).

The Rosemount TankMaster WinOpi program lets the operator monitor measured tank data. It includes alarm handling, batch reports, automatic report handling, historical data sampling as well as inventory calculations such as Volume, Observed Density and other parameters. A plant host computer can be connected for further processing of data.

The Rosemount TankMaster WinSetup program is a graphical user interface for installation, configuration and service of devices in the Rosemount Tank Gauging system.

2.3.2 Rosemount 2460 System Hub

The Rosemount 2460 System Hub is a data concentrator that continuously polls and stores data from field devices such as radar level gauges and temperature transmitters in a buffer memory. Whenever a request for data is received, the system hub can immediately send data from the updated buffer memory for a group of tanks.

Measured and calculated data from one or more tanks is communicated via the Rosemount 2410 Tank Hub to the system hub buffer memory. Whenever a request is received, the system hub can immediately send data from a group of tanks to a TankMaster PC, or a host.

The Rosemount 2460 can be used to connect devices from other vendors as well, such as Honeywell® Enraf and Whessoe.

The Rosemount 2460 has eight slots for communication interface boards. These boards can be individually configured for communication with hosts or field devices. They can be ordered either for TRL2, RS485, Enraf BPM or Whessoe 0-20 mA/RS485 communication. Two slots can also be configured for RS232 communication.

One of the system hub's three Ethernet ports is used for Modbus TCP connection to host systems. By simply connecting the system hub to the existing LAN network, communication over Ethernet is established.

The system hub can provide redundancy for critical operations, by using two identical devices. The primary system hub is active and the other one is in passive mode. If the primary unit stops working properly, the secondary unit is activated and a failure message is sent to TankMaster (or a DCS system).

2.3.3 Rosemount 2410 Tank Hub

The Rosemount 2410 Tank Hub acts as a power supply to the connected field devices in the hazardous area using the intrinsically safe Tankbus.

The tank hub collects measurement data and status information from field devices on a tank. It has two external buses for communication with various host systems.

There are two versions of the Rosemount 2410 Tank Hub; one for single tank operation and one for multiple tanks operation. The multiple tanks version of the Rosemount 2410 supports up to 10 tanks and 16 devices. With the Rosemount 5300 the Rosemount 2410 supports up to 5 tanks.

The Rosemount 2410 is equipped with two relays which support configuration of up to 10 “virtual” relay functions allowing you to specify several source signals for each relay.

The Rosemount 2410 supports Intrinsically Safe (IS) and Non-Intrinsically Safe (Non-IS) analog 4-20 mA inputs/outputs. By connecting an Emerson Wireless 775 THUM Adapter to the IS HART 4-20 mA output, the tank hub is capable of wireless communication with an Emerson Wireless Gateway in a *Wireless*HART® network.

2.3.4 Rosemount 5900S Radar Level Gauge

The Rosemount 5900S Radar Level Gauge is an intelligent instrument for measuring the product level inside a tank. Different antennas can be used in order to meet the requirements of different applications. The Rosemount 5900S can measure the level of almost any product, including bitumen, crude oil, refined products, aggressive chemicals, LPG and LNG.

The Rosemount 5900S sends microwaves towards the surface of the product in the tank. The level is calculated based on the echo from the surface. No part of the Rosemount 5900S is in actual contact with the product in the tank, and the antenna is the only part of the gauge that is exposed to the tank atmosphere.

The 2-in-1 version of the Rosemount 5900S Radar Level Gauge has two radar modules in the same transmitter housing allowing two independent level measurements using one antenna and one tank opening.

2.3.5 Rosemount 5300 Guided Wave Radar

The Rosemount 5300 is a premium 2-wire guided wave radar for level measurements on liquids, to be used in a wide range of medium accuracy applications under various tank conditions. Rosemount 5300 includes the Rosemount 5301 for liquid level measurements and the Rosemount 5302 for liquid level and interface measurements.

2.3.6 Rosemount 5408 Radar Level Transmitter

The Rosemount 5408 is a non-contacting level transmitter for accurate and reliable level measurement on small storage and buffer tanks.

The Rosemount 5408 provides accurate and reliable level measurements for metallic and non-metallic vessels. It is suitable for almost any liquid and is ideal for challenging applications with agitators, foam, high temperatures, and pressures. It is also an excellent choice for level measurement in tanks with small diameter (2- to 4-inch) stiling wells.

The narrow beam makes the Rosemount 5408 the ideal solution for bulk solids in small to medium sized silos with rapid level changes.

For safety functions such as overfill prevention, level deviation monitoring, or dry-run prevention, the Rosemount 5408:SIS is the ideal choice.

2.3.7 Rosemount 2240S Multi-Input Temperature Transmitter

The Rosemount 2240S Multi-input Temperature Transmitter can connect up to 16 temperature spot sensors and an integrated water level sensor.

2.3.8 Rosemount 2230 Graphical Field Display

The Rosemount 2230 Graphical Field Display presents inventory tank gauging data such as level, temperature, and pressure. The four softkeys allow you to navigate through the different menus to provide all tank data, directly in the field. The Rosemount 2230 supports up to 10 tanks. Up to three Rosemount 2230 displays can be used on a single tank.

2.3.9 Rosemount 644 Temperature Transmitter

The Rosemount 644 is used with single spot temperature sensors.

2.3.10 Rosemount 3051S Pressure Transmitter

The Rosemount 3051S series consists of transmitters and flanges suitable for all kinds of applications, including crude oil tanks, pressurized tanks and tanks with / without floating roofs.

By using a Rosemount 3051S Pressure Transmitter near the bottom of the tank as a complement to a Rosemount 2230 Radar Level Gauge, the density of the product can be calculated and presented. One or more pressure transmitters with different scalings can be used on the same tank to measure vapor and liquid pressure.

2.3.11 Rosemount 2180 Field Bus Modem

The Rosemount 2180 Field Bus Modem (FBM) is used for connecting a TankMaster PC to the TRL2 communication bus. The Rosemount 2180 is connected to the PC using either the USB or the RS232 interface.

2.3.12 Emerson Wireless Gateway and Emerson Wireless 775 THUM™ Adapter

An Emerson Wireless THUM Adapter allows wireless communication between a Rosemount 2410 Tank Hub and an Emerson Wireless Gateway. The gateway is the network manager that provides an interface between field devices and the Rosemount TankMaster inventory software or host / DCS systems.

See the Rosemount Tank Gauging System Data Sheet for more information on the various devices and options.

2.4 System start-up

The standard start-up procedure of a Rosemount Tank Gauging system that includes devices such as the Rosemount 2460 System Hub, Rosemount 2410 Tank Hub,

Rosemount 5900S Radar Level Gauge, and the Rosemount 2240S Multi-input Temperature Transmitter can be summarized as follows:

Procedure

1. Install the devices on the appropriate locations.
2. Assign Modbus addresses[4] for the Rosemount 2410 Tank Hub, for level gauges such as the Rosemount 5900S Radar Level Gauge, and for auxiliary tank devices (ATD) such as the Rosemount 2240S Multi-input Temperature Transmitter. The Modbus addresses will be stored in the built-in databases of the Rosemount 2410 Tank Hub and the Rosemount 2460 System Hub.
3. Verify that the total current consumption of devices connected to the Tankbus does not exceed 250 mA[5]. In an Emerson Wireless system the maximum current is 200 mA.
4. Wire the devices.
   a) Connect field devices to the Tankbus.

      Note
      Devices must be configured in the tank database[4][5] of the Rosemount 2410 Tank Hub in order to be able to communicate on the Tankbus.

   b) Connect the Rosemount 2410 Tank Hub to the Rosemount 2460 System Hub.
   c) Connect the Rosemount 2460 System Hub to the control room PC with TankMaster software. The 2460 may be connected via a Rosemount 2180 Field Bus Modem, or directly via RS 232 or RS 485.
5. Install the TankMaster software in the control room PC.
6. Configure the devices by using the TankMaster WinSetup configuration tool as described in the Rosemount Tank Gauging System Configuration Manual (Document no. 00809-0300-5100).

2.4.1 Start-up in a FOUNDATION™ Fieldbus system

To start up Rosemount Tank Gauging devices in a FOUNDATION Fieldbus system:

Procedure

1. Prepare the start-up by recording information that will be needed for configuration of various field devices as described in the Rosemount Tank Gauging System Configuration manual. This may for example include tank geometry, antenna type, number of temperature elements and other configuration parameters.
2. Connect the field devices, such as the Rosemount 5900S Radar Level Gauge and the Rosemount 2240S Multi-input Temperature Transmitter, to the FOUNDATION Fieldbus network.
3. Configure the field devices by using AMS Device Manager (or any other FOUNDATION Fieldbus host supporting DD4).

(4) See the Rosemount Tank Gauging System Configuration Manual (Document no. 00809-0300-5100) for more information.
(5) See the Rosemount 2410 Tank Hub Reference Manual (Document No. 00809-0100-2410) for more information.

See the Reference Manual for the respective field device and the Rosemount Tank Gauging System Configuration Manual (Document No. 00809-0300-5100) for more information on how to configure various Rosemount Tank Gauging devices.

Related information

Technical documentation

2.5 Installation procedure

Follow these steps for proper installation of the Rosemount 2230 Graphical Field Display:

Procedure

1. Review installation considerations (Installation considerations).
2. Mount the Rosemount 2230 in a suitable location (Mechanical installation).
3. Wire the Rosemount 2230 (Electrical installation).
4. Power up the Rosemount 2230.
5. Configure the Rosemount 2230 (Configuration and operation).

3 Installation

3.1 Safety messages

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

⚠ WARNING

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

- Ensure only qualified personnel perform the installation.
- 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 services other than those contained in this manual unless you are qualified.
- Substitution of components may impair Intrinsic Safety.
- To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

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 handheld communicator in an explosive atmosphere, ensure that the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Do not remove the cover in explosive atmospheres when the circuit is alive.

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

- Avoid contact with leads and terminals.
- Make sure the main power to the Rosemount 2410 Tank Hub is off and the lines to any other external power source are disconnected or not powered while wiring the device.

3.2 Installation considerations

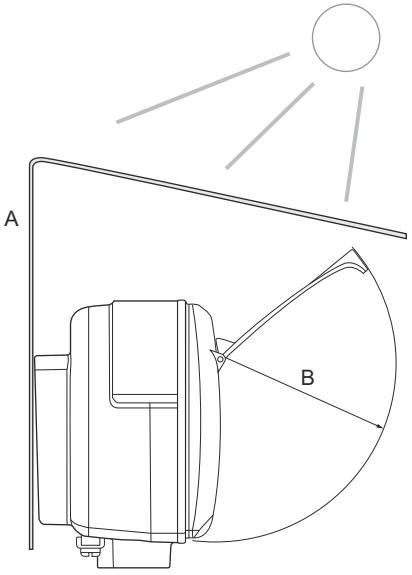
The Rosemount™ 2230 Graphical Field Display can be installed either on the tank roof or at the foot of the tank for a flexible and convenient read-out of tank data.

The Rosemount 2230 is designed for mounting on a wall or a pipe. It is important to provide space for opening the weather protection lid which prevents degradation of the LCD display due to sunlight exposure.

Consider the following when finding an appropriate location for the Rosemount 2230 Graphical Field Display:

- Mount the Rosemount 2230 in a location where it is protected from excessive sunlight. This will reduce exposure to ultra violet (UV) radiation and extend the life-time of the LCD.
- In case the LCD can not be protected from sunlight and UV radiation, it is recommended that the weather protection lid is closed whenever the Rosemount 2230 is not used.
- An external weather protection is recommended to protect the LCD from sunlight and UV radiation in order to extend its life-time. A weather protection can be sourced locally or ordered from factory.
- When mounting the Rosemount 2230 display ensure that sufficient space is provided for opening the lid, see Figure 3-1.

Figure 3-1: Space Required for Opening the Lid



A. Weather protection (optional)
B. 93 mm (3.7 in.)

Related information

Components

3.3 Mechanical installation

3.3.1 Mounting the graphical display

The Rosemount 2230 Graphical Field Display is designed for mounting on a wall or a pipe.

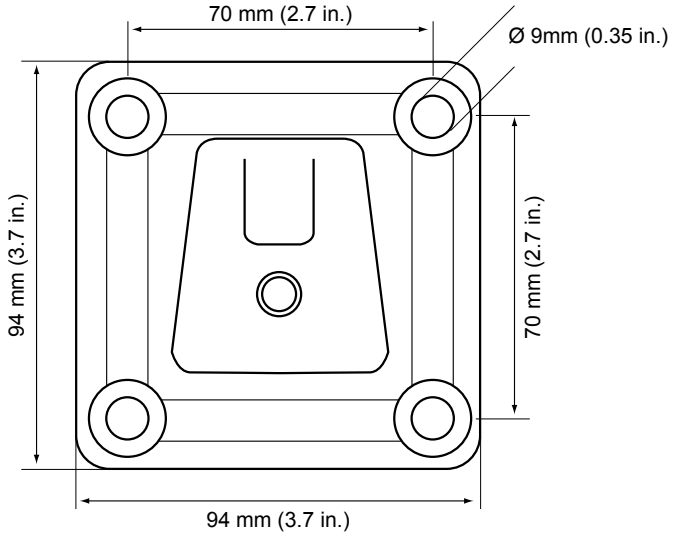
Wall mounting with bracket

The Rosemount 2230 Graphical Field Display can be mounted on a wall by using the mounting kit supplied by Emerson Automation Solutions/Rosemount Tank Gauging.

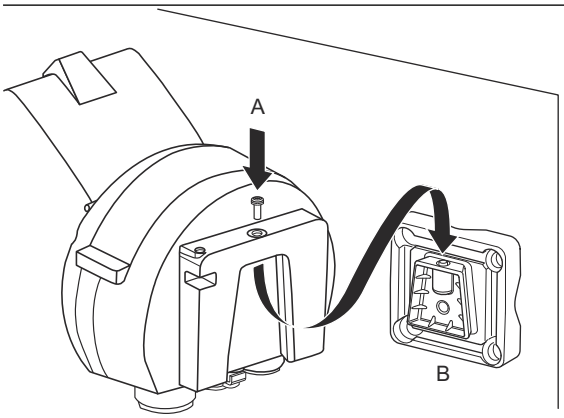
Procedure

1. Mount the bracket on the wall by using four M8 screws and flat washers.

Note
Countersunk screws are not suitable.



2. Attach the Rosemount 2230 display to the bracket on the wall by sliding it from the top downwards.



A. Locking screw
B. Bracket

3. Secure the display to the bracket by tightening the locking screw.

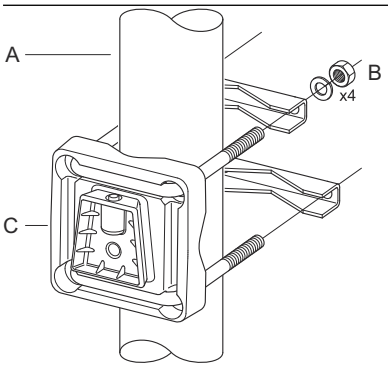
Pipe mounting

The Rosemount 2230 Graphical Field Display can be mounted on pipes ranging from a diameter of 33 mm to 60 mm by using an optional mounting kit supplied by Emerson Automation Solutions/Rosemount Tank Gauging.

Procedure

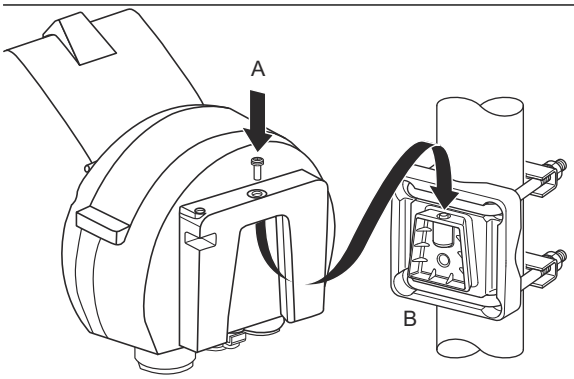
1. Attach the bracket to the pipe.

   Ensure that the Rosemount 2230 is placed in a direction so that the display is clearly visible and wiring can be properly connected.



A. 1 - 2 inches
B. 4 nuts and washers
C. Bracket

2. Tighten the nuts. Use moderate torque to ensure that the bracket does not break.
3. Attach the display to the bracket by sliding it from the top downwards.



A. Locking screw
B. Bracket

4. Secure the display to the bracket by tightening the locking screw.

3.4 Electrical installation

3.4.1 Cable/conduit entries

The electronics housing has two ½ - 14 NPT entries (optional: adapters for two M20×1.5). Minifast and Eurofast adapters are also available. The connections are made in accordance with local or plant electrical codes.

Make sure that unused ports are properly sealed to prevent moisture or other contamination from entering the electronics housing.

Note
Use enclosed metal plug to seal the unused entry/entries. The plastic plugs mounted at delivery are not sufficient as seal!

Note
Thread sealing (PTFE) tape or paste on male threads of conduit is required to provide a water/dust tight conduit seal and to meet the required degree of ingress protection as well as to enable future removal of the plug/gland.

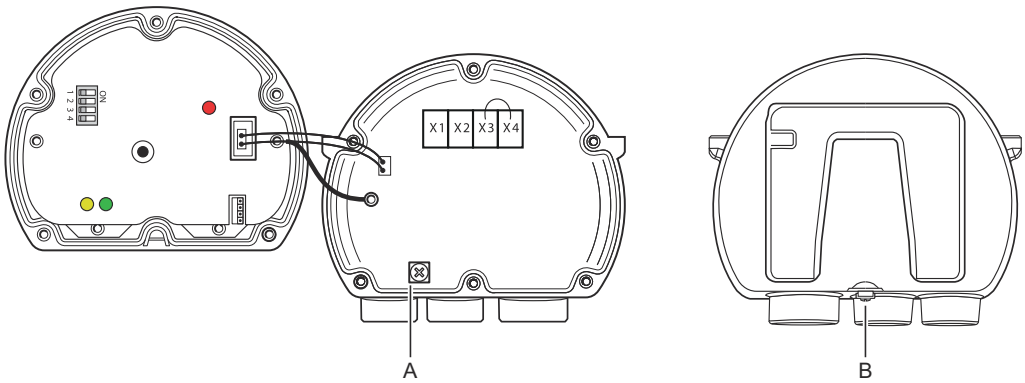
3.4.2 Grounding

The housing should always be grounded in accordance with national and local electrical codes. Failure to do so may impair the protection provided by the equipment. The most effective grounding method is direct connection to earth ground with minimal impedance.

There is an external grounding screw located at the bottom of the housing and an internal grounding screw located inside the housing, see Figure 3-2.

The internal ground screw is identified by a ground symbol: ⏚

Figure 3-2: Grounding Screws



A. Internal ground
B. External ground. Cable diameter minimum 4 mm²

Note
When grounding the display via threaded conduit, make sure the connection provides sufficient low impedance.

Grounding - FOUNDATION™ Fieldbus

Signal wiring of the fieldbus segment can not be grounded. Grounding out one of the signal wires may shut down the entire fieldbus segment.

Shield wire connection

To protect the fieldbus segment from noise, grounding techniques for shield wire usually require a single grounding point for shield wire to avoid creating a ground loop. The ground point is typically at the power supply (Rosemount 2410 Tank Hub).

The Rosemount Tank Gauging devices are designed for “daisy-chain” connection of shield wiring in order to enable a continuous shield throughout the Tankbus network. The shield wire terminal in the Rosemount 2230 is not connected to ground. It merely provides electrical continuity to daisy-chained Tankbus cables.

3.4.3 Cable selection

Use shielded twisted pair wiring for the Rosemount 2230 in order to comply with FISCO(6) requirements and EMC regulations. The cables must be approved for use in hazardous areas, where applicable. In the U.S. explosion-proof conduits may be used in the vicinity of the vessel.

We recommend cable size 0.75 mm^2 (18 AWG) in order to facilitate wiring. Cables within the range 22 AWG to 16 AWG (0.5 to 1.5 mm^2) can be used in order to minimize the voltage drop to the Rosemount 2230 display.

Tankbus cabling must be approved for use in minimum 85°C to match requirements for all devices in a Rosemount Tank Gauging system.

The FISCO specification requires that cables for the Tankbus comply with the following parameters:

Table 3-1: FISCO Cable Parameters

Parameter(1)	Value
Loop resistance	15 Ω/km to 150 Ω/km
Loop inductance	0.4 mH/km to 1 mH/km
Capacitance	45 nF/km to 200 nF/km
Maximum length of each spur(2) cable	60 m in apparatus class IIC and IIB
Maximum cable length including trunk(3) and spurs	1000 m in apparatus class IIC and 1900 m in apparatus class IIB

(1) For further information see requirements of the IEC 61158-2 standard
(2) A spur is an unterminated part of the network.

(6) See IEC 61158-2 and IEC/TS 60079-27:2002.

(3) A trunk is the longest cable path between two devices on the fieldbus network, and is the part of the network which has terminations at both ends. In the Rosemount Tank Gauging system, a trunk is typically located between the Rosemount 2410 Tank Hub and a segment coupler or the last device in a daisy-chain configuration.

3.4.4 Hazardous areas

When the Rosemount 2230 is installed in a hazardous area, national and local regulations and specifications in applicable certificates must be observed, see Product certifications.

3.4.5 Power requirements

The Rosemount 2230 is powered over the intrinsically safe Tankbus by the Rosemount 2410 Tank Hub. The 2410 feeds the intrinsically safe fieldbus segment by acting as a FISCO power supply on the Tankbus (9 - 17.5 Vdc, polarity insensitive). The Rosemount 2230 has a current consumption of 30 mA.

See the Rosemount 2410 Reference Manual (Document no. 00809-0100-2410) for more information.

When installed in a FOUNDATION™ Fieldbus system, the Rosemount 2230 is powered by the FF segment with standard fieldbus power supplies.

3.4.6 Tankbus

The Rosemount Tank Gauging system is easy to install and wire. Devices can be “daisy-chained” thus reducing the number of external junction boxes.

In a Rosemount Tank Gauging system devices communicate with a Rosemount 2410 Tank Hub via the intrinsically safe Tankbus. The Tankbus complies with the FISCO[7] FOUNDATION Fieldbus standard. The Rosemount 2410 acts as power supply to the field devices on the Tankbus. A FISCO system enables more field devices to be connected to the segment compared to conventional IS systems based on the entity concept.

Termination

A terminator is needed at each end of a FOUNDATION™ Fieldbus network. Generally, one terminator is placed in the fieldbus power supply, and the other one in the last device in the fieldbus network.

Note
Ensure that there are **two** terminators on the fieldbus.

In a Rosemount Tank Gauging system the Rosemount 2410 Tank Hub acts as power supply. Since the tank hub normally is the first device in the fieldbus segment, the built-in termination is enabled at factory.

Other devices such as the standard version of the Rosemount 5900S Radar Level Gauge, the Rosemount 2230 Graphical Field Display, and the Rosemount 2240S Multi-input Temperature Transmitter also have built-in terminators which can easily be enabled by inserting a jumper in the terminal block when necessary.

(7) FISCO=Fieldbus Intrinsically Safe Concept

Segment design

When designing a FISCO fieldbus segment a few requirements need to be considered. Cabling has to comply with FISCO requirements.

You will also have to ensure that the total operating current of the connected field devices is within the output capability of the Rosemount 2410 Tank Hub. The 2410 is able to deliver 250[8] mA. Consequently, the number of field devices has to be considered so that the total current consumption is less than 250 mA. See section “Power Budget” in the Rosemount 2410 Reference Manual (Document no. 00809-0100-2410) for more information.

Another requirement is to ensure that all field devices have at least 9 V input voltage at their terminals. Therefore you will have to take into account the voltage drop in the fieldbus cables.

Distances are normally quite short between the Rosemount 2410 Tank Hub and field devices on the tank. In many cases you can use existing cables as long as the FISCO requirements are fulfilled.

See chapter “The Tankbus” in the Rosemount 2410 Tank Hub Reference Manual for more information on segment design of a Rosemount Tank Gauging system.

Related information

Cable selection

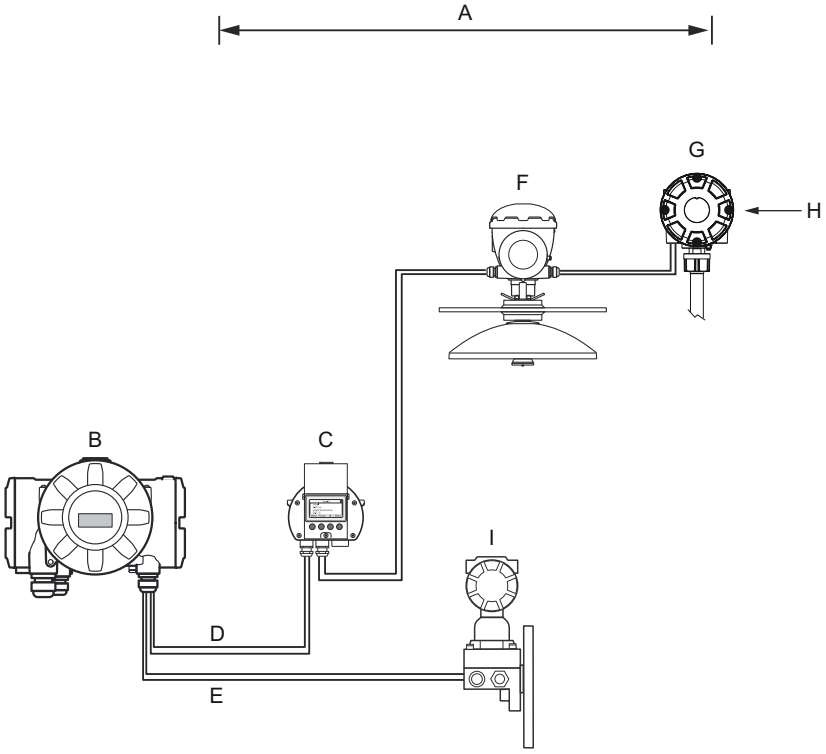
3.4.7 Typical installation

The example in Figure 3-3 illustrates a system with daisy-chained field devices on a single tank. Terminators are installed at both ends of the fieldbus segment as required in a FOUNDATION Fieldbus system. In this case terminators are enabled in the Rosemount 2410 Tank Hub and a field device at the end of the network segment.

In addition to the field instruments on the Tankbus, Figure 3-3 illustrates how an instrument such as a pressure transmitter can be connected to the intrinsically safe 4 -20 mA analog input of the 2410 Tank Hub.

(8) *In Smart Wireless Systems the 2410 can deliver 200 mA on the Tankbus*

Figure 3-3: Example of a Tankbus Connection for a Single Tank



A. Tankbus length up to 1000 meter depending on number of devices and cable type
B. Rosemount 2410 Tank Hub with intrinsically safe power supply, integrated power conditioner, and built-in terminator
C. Rosemount 2230 Display
D. Tankbus
E. IS Analog Input (Secondary bus)
F. Rosemount 5900S Radar Level Gauge
G. Rosemount 2240S Multi-input Temperature Transmitter
H. Built-in terminator enabled on the last device
I. Rosemount 3051S Pressure Transmitter

The maximum distance between the tank hub and the field devices on the tank depends on the number of devices connected to the Tankbus and the quality of cables.

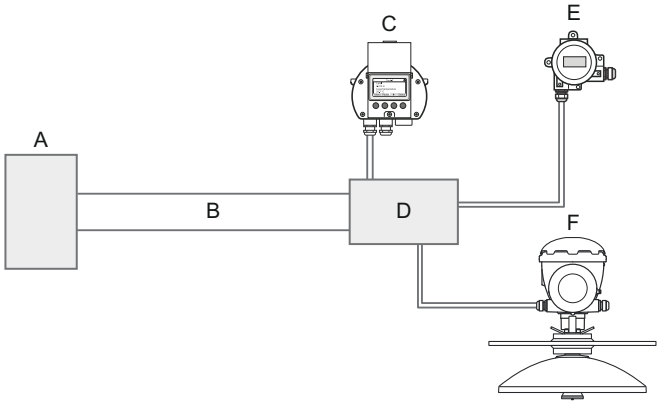
See chapter "Electrical Installation" in the Rosemount 2410 Tank Hub Reference Manual for more information about cable selection, power budget, the Tankbus, and more examples on how to install systems that include the Rosemount 2410 Tank Hub.

3.4.8 Rosemount 2230 in a FOUNDATION™ Fieldbus system

The Rosemount 2230 supports the FOUNDATION Fieldbus (FF) technology and lets you integrate it into an existing FF network.

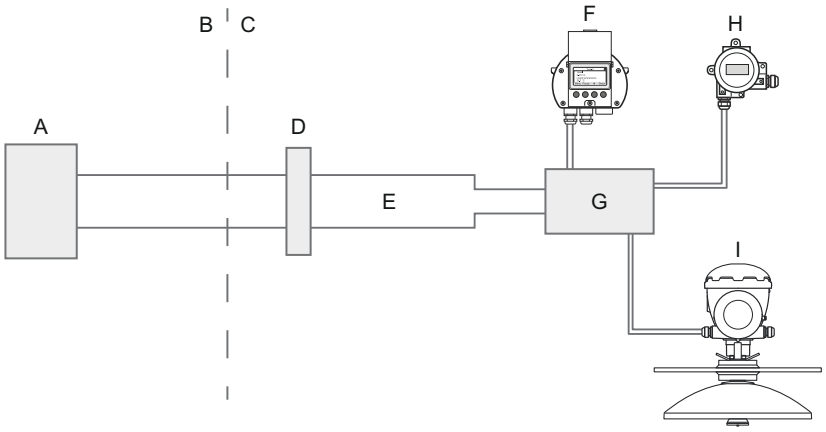
As long as the power supply meets certain requirements (see Figure 3-4 and Figure 3-5) the Rosemount 2230 will be able to operate as any other FF device.

Figure 3-4: Example of an I.S. FOUNDATION Fieldbus System



A. I.S. Power Supply
B. Trunk
C. Rosemount 2230 Display
D. Segment Coupler
E. Rosemount 644 Temperature Transmitter
F. Rosemount 5900S Radar Level Gauge

Figure 3-5: Example of a Non-I.S. FOUNDATION Fieldbus System



A. Non-I.S. Power Supply
B. SAFE AREA
C. HAZARDOUS AREA
D. Barrier
E. IS Trunk
F. Rosemount 2230 Display
G. Segment Coupler
H. Rosemount 644 Temperature Transmitter
I. Rosemount 5900S Radar Level Gauge

Ensure that:

- the power supply is able to provide the total current needed for all the connected devices.
- the Rosemount 2230 and other devices connected to the FOUNDATION Fieldbus (FF) system are compliant with the FISCO or Entity parameters of the power supply.
- the short circuit protection of the Segment Coupler[9] matches the current consumption of the connected devices.

Related information

Product certifications
Power requirements

3.4.9 Wiring

Use the following wiring procedure for the Rosemount 2230:

Prerequisites

Note
Ensure that o-rings and seats are in good condition prior to mounting the cover in order to maintain the specified level of ingress protection. The same requirements apply for cable inlets and outlets (or plugs). Cables must be properly attached to the cable glands.

Procedure

1. Unscrew and remove all screws at the front of the display.
2. Remove the cover carefully. Take care of the locking spring for the weather protection hatch.

   Note
   Do not disconnect the cables between the display front and the circuit board. Ensure that the compartment is protected against water in case of rain.

3. Run the Tankbus cable through the gland.
4. Connect the Tankbus wires to the **X2** and **X3** terminals.

   Ensure that the positive lead is connected to the terminal marked **FB+** and the negative lead to the terminal marked **FB-**.
5. Connect the cable shield to the “Shield Loop Through” (X1) terminal.
6. If the Rosemount 2230 display is the last device on the Tankbus, connect a jumper for the built-in termination.
7. Replace the cover. Make sure that the sealing and the locking device for the weather protection hatch are placed in the correct positions.
8. Firmly tighten the screws on the front cover.

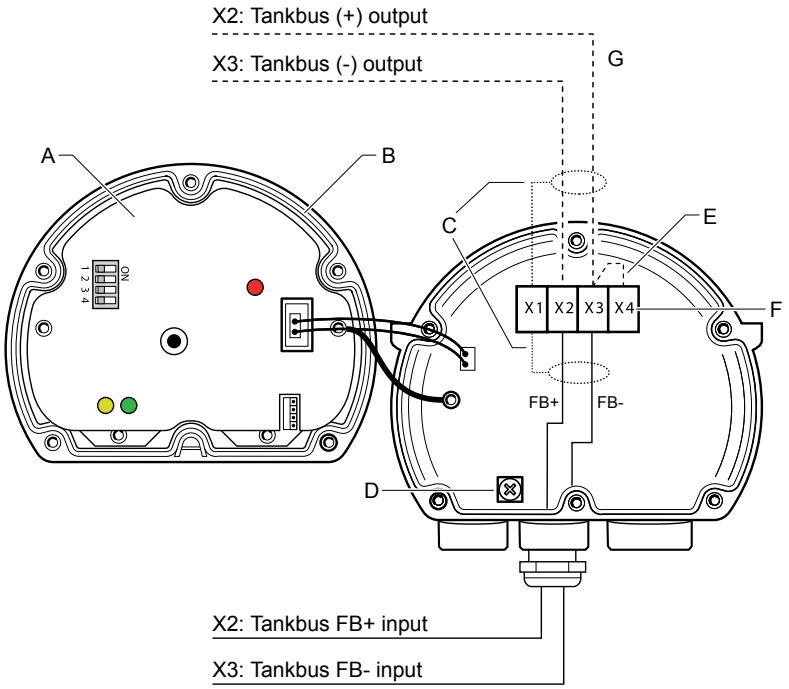
(9) *See the Rosemount 2410 Reference Manual (Document No. 00809-0100-2410) for more information on the Segment Coupler.*

Related information

Components
Cable connections
Termination

Cable connections

Figure 3-6: Rosemount 2230 Cable Connections



A. *Front cover*
B. *X4: Tankbus terminator /Sealing*
C. *Cable Shield*
D. *Internal grounding*
E. *Jumper for built-in termination*
F. *X4: Tankbus terminator*
G. *Daisy-chain connection to other field devices*

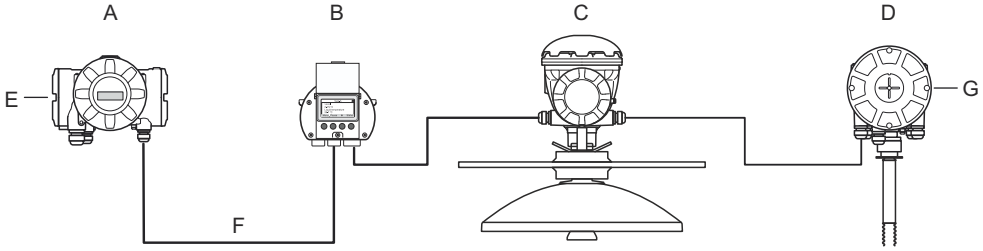
Related information

Daisy-chain connection

Daisy-chain connection

The Rosemount 2230 can be daisy-chained to other field devices via the Tankbus, see Figure 3-7.

Figure 3-7: Wiring Diagram for Rosemount 2230



A. Rosemount 2410
B. Rosemount 2230
C. Rosemount 5900
D. Rosemount 2240S
E. Shield Wire connected at power supply
F. Tankbus
G. Built-in terminator enabled on the last device

Procedure

1. Unscrew and remove all six screws on the front of the Rosemount 2230.
2. Remove the cover carefully. Take care of the locking device for the weather protection hatch.

   Note
   Do not disconnect the cables between the display front and the circuit board.

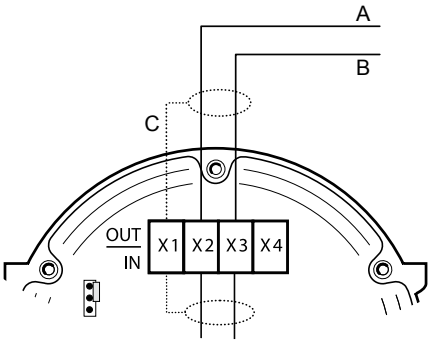
3. Disconnect the termination jumper from the X3 terminal.

   Note
   Ensure that a terminator is enabled on the last device that is connected to the Tankbus.

4. Run the new Tankbus cable into the Rosemount 2230 compartment through a suitable gland.

5. Connect the outgoing Tankbus wires to the X2-out and X3-out terminals as shown in Figure 3-8.

Figure 3-8: Daisy-chain Wiring



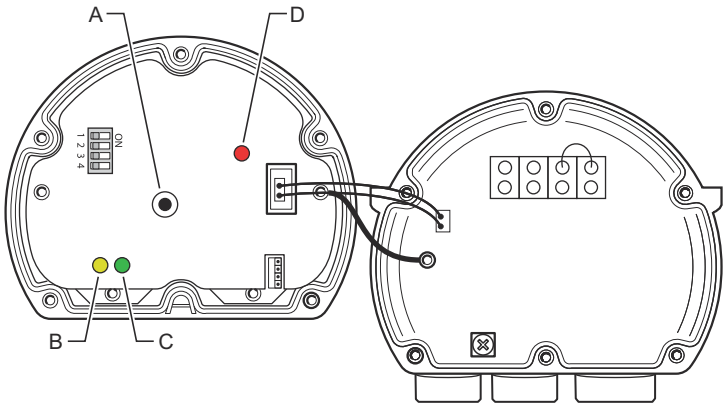
A. X2: out
B. X3: out
C. X1: Cable Shield

6. Connect the cable shield to the X1 terminal.
7. Replace the cover. Make sure the sealing and the locking device for the weather protection hatch are placed in the correct positions.
8. Firmly tighten the six screws on the front cover.

3.5 LED signals and reset button

The Rosemount 2230 has three LED signals that show communication and status.

Figure 3-9: LED Signals



A. Reset button
B. Tankbus Receive (yellow)
C. Tankbus Transmit (green)
D. Status LED

Status LED

The status LED indicates error codes using different blinking sequences. In normal operation the LED flashes every other second. When an error occurs, the LED flashes a sequence that corresponds to a code number followed by a five second pause. This sequence is continuously repeated.

Communication LEDs

Tankbus communication is indicated by a pair of LEDs, see Figure 3-9. When you connect the Tankbus cables you can check the communication status with the LEDs.

Reset button

You may use the **Reset** button to force a restart of the Rosemount 2230 display. Restarting the Rosemount 2230 has the same effect as switching off and on the power supply.

The Restart option will connect the Rosemount 2230 display to the Rosemount 2410 Tank Hub and perform start-up tests of software and hardware.

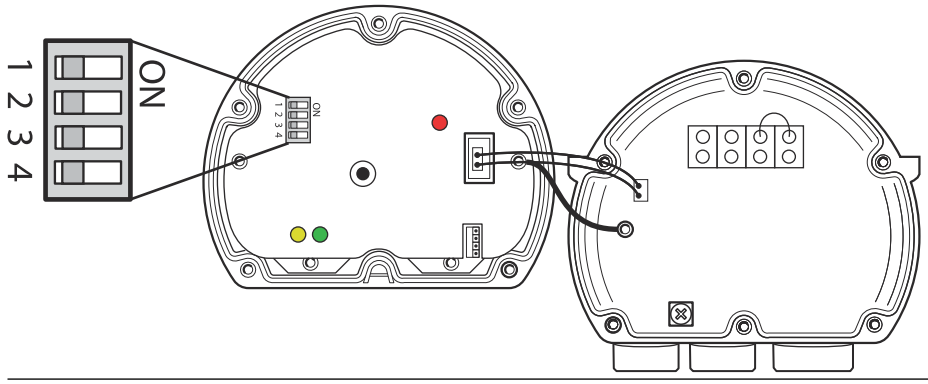
Related information

Device error signals

3.6 DIP switches

The Rosemount 2230 is equipped with four DIP switches as illustrated in Figure 3-9.

Figure 3-10: DIP Switches



The switches control the following settings:

Table 3-2: Rosemount 2230 DIP Switches

Number	Name	Description
1	Simulate	Enables simulation for test of Field Diagnostics in open FF systems.
2	Write Protect	Enables write protection of configuration data.
3	Spare	Not used.
4	Spare	Not used.

Simulate switch

The Simulate switch is used for simulation of Field Diagnostics conditions. It may be useful when testing the alarm setup.

Write protect switch

The Write Protect switch can be used to protect the Rosemount 2230 from unintentional changes of the current configuration.

Related information

Write protection

3.7 Ambient temperature

The Rosemount 2230 is equipped with a temperature sensor for measuring ambient temperature. The temperature can be displayed on the field display and in the TankMaster software.

Ambient temperature affects the readability and response time of the LCD. This is particularly notable in extremely cold weather. The Rosemount 2230 automatically adjusts the LCD contrast based on the ambient temperature. The temperature sensor also controls the minimum toggle time used by the Rosemount 2230.

4 Configuration and operation

4.1 Safety messages

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

⚠ WARNING

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

- Ensure only qualified personnel perform the installation.
- 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 services other than those contained in this manual unless you are qualified.

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 handheld communicator in an explosive atmosphere, ensure that the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Do not remove the cover in explosive atmospheres when the circuit is alive.

4.2 Introduction

This chapter provides information about configuration and operation of the Rosemount™ 2230 Graphical Field Display.

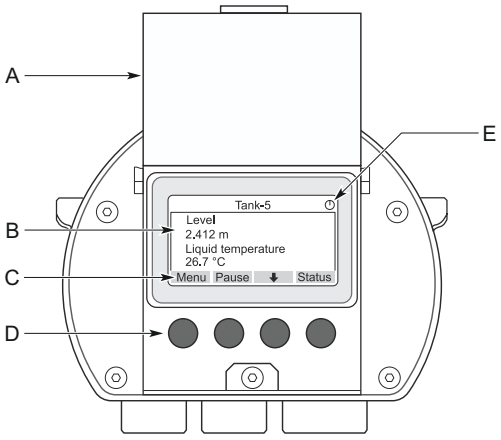
For information on how to use TankMaster WinSetup to configure the Rosemount 2230, see the Rosemount Tank Gauging System Configuration Manual (Document no. 00809-0300-5100).

4.2.1 The Rosemount 2230 Graphical Field Display

The Rosemount 2230 is a graphical display designed for viewing tank data in tough environments. It features adjustable LCD contrast, backlight, multi-language support, and communication failure indication.

The Rosemount 2230 can be used in systems based on the Rosemount™ 2410 Tank Hub as well as in FOUNDATION™ Fieldbus networks. The Rosemount 2230 is powered by the Tankbus and automatically detects which kind of system it is connected to.

Figure 4-1: The Rosemount 2230 Display



A. Weather protection lid
B. Display
C. Softkey functions
D. Softkeys
E. Activity indicator

Note
It is recommended that the lid is closed whenever possible to protect the LCD from exposure by ultraviolet radiation from the sun.

The four softkeys allow you to navigate through the different menus and to select various functions for tank data viewing and service.

Menu	Opens the Main Menu with various options for configuration of the Rosemount 2230 display.

Pause	Stops toggling the measurement variables until the Resume button is pressed.
Down arrow ↓	Lets you scroll through the list of measurement variables and tanks.
Status	Lets you view the current status of the presented measurement variable.

A symbol in the upper right-hand corner of the display indicates that the Rosemount 2230 is operating and communicates on the Tankbus.

Adjust the display contrast

The Rosemount 2230 automatically adjusts display contrast to optimize for changes of ambient temperature. The contrast can be manually adjusted when further fine-tuning is desired. To increase the display contrast, press the two buttons on the right-hand side simultaneously. To decrease the contrast, press the two buttons on the left-hand side. It takes approximately 10 seconds to adjust from minimum to maximum contrast. The contrast can also be adjusted by using the **Contrast** service command: **Menu** → **Service** → **LCD Contrast**.

Related information

Adjust the LCD contrast
Status information
Power requirements

4.2.2 Configuration tools

Different tools are available for configuration of a Rosemount 2230.

In systems with Rosemount 2410 Tank Hub:

- Rosemount TankMaster Winsetup

In FOUNDATION™ Fieldbus systems:

- Rosemount 475 Field Communicator
- AMS Device Manager for FOUNDATION Fieldbus systems
- FOUNDATION Fieldbus hosts supporting DD4

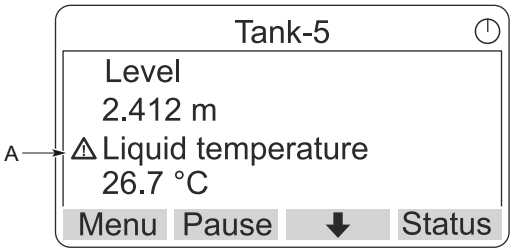
TankMaster is an Emerson Automation Solutions/Rosemount Tank Gauging inventory management software package for installation and configuration of tank gauging field devices. The WinSetup package provides you with powerful and easy-to-use tools for installation and configuration. See the Rosemount System Configuration Manual. For more information on how to configure the Rosemount 2230 Display by using TankMaster Winsetup.

For DeltaV users, the DD can be found at Emerson.com/DeviceInstallKits. For other hosts that use Device Descriptions (DD) and DD Methods for device configuration, the latest DD versions can be found on FOUNDATION's website at Fieldbus.org.

4.2.3 Activity and alarm indication

The Rosemount 2230 display shows an alarm warning symbol for simulated or manual measurement values as illustrated in Figure 4-2 and Figure 4-3.

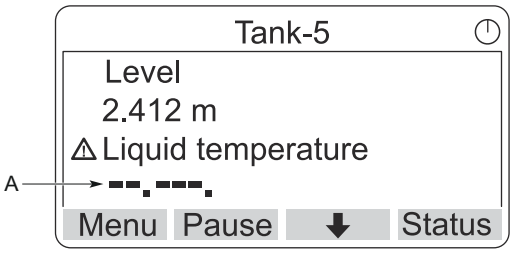
Figure 4-2: Simulated or Manual Value



A. Alarm symbol

For invalid measurement data, the alarm symbol is displayed and no data appears in the measurement value field as illustrated in Figure 4-3.

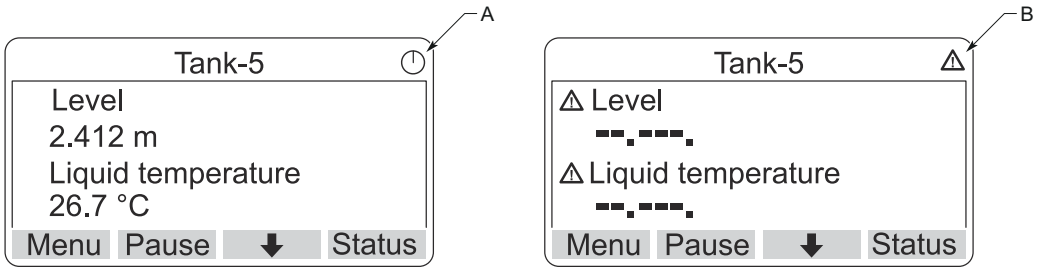
Figure 4-3: Invalid Value



A. Invalid value

The activity indicator spins continuously to indicate that the Rosemount 2230 is operating normally. In case of a communication problem an alarm symbol is displayed instead.

Figure 4-4: Activity Indicator

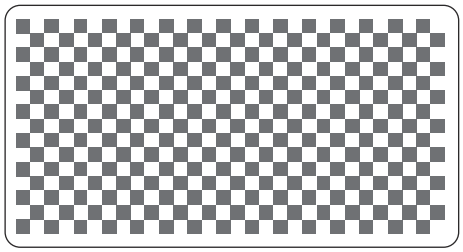


A. Normal operation
B. Communication problems

4.2.4 Start-up procedure

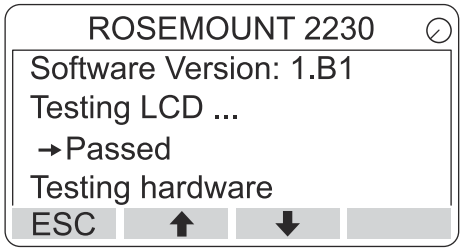
The Rosemount 2230 display performs a test of the LCD screen when powered on.

Figure 4-5: Test Screen



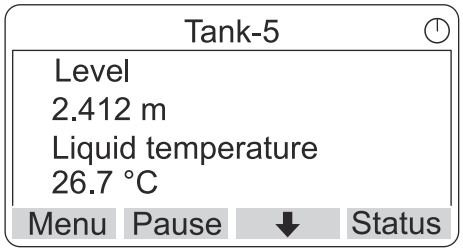
After the LCD test is done the start-up screen will appear.

Figure 4-6: Start-up Screen



Once the start-up procedure is finished, the Rosemount 2230 will return to the view that was used last time the display was powered on.

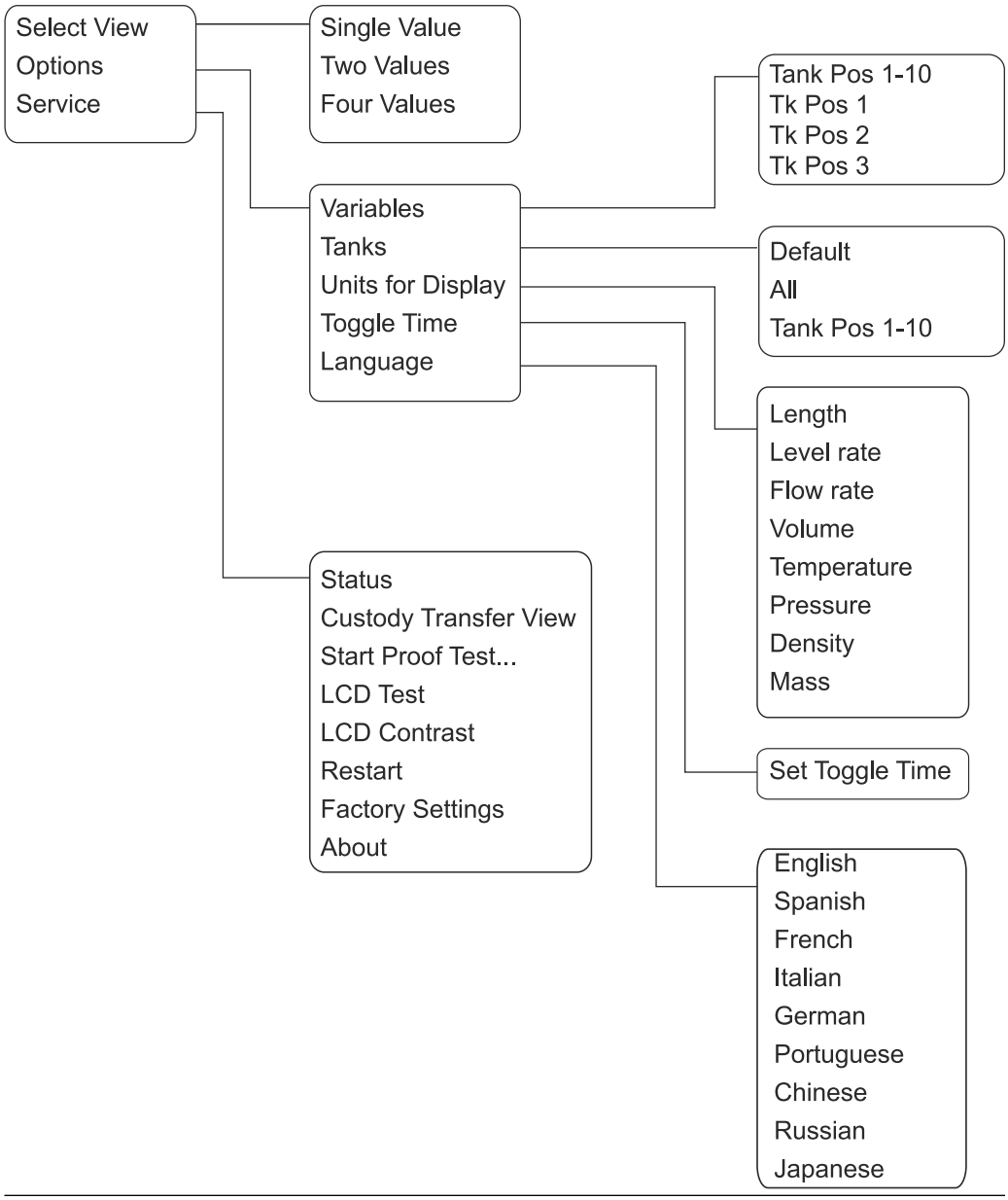
Figure 4-7: View Mode



4.3 Menu tree

The Rosemount 2230 lets you navigate in a menu structure as illustrated in Figure 4-8.

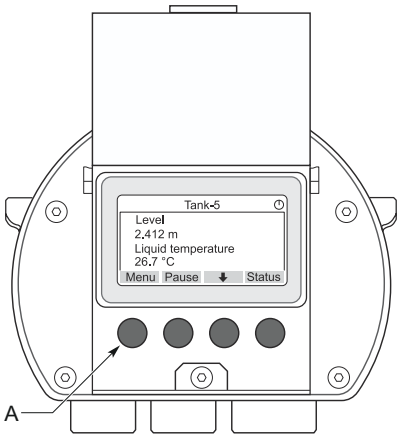
Figure 4-8: Rosemount 2230 Menu Tree



4.4 Main menu

In normal operation the Rosemount 2230 display is in View Mode and shows the current measurement values for the selected tanks. In case of an alarm, a graphical symbol appears on the screen.

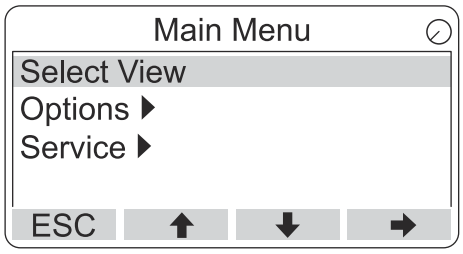
Figure 4-9: Rosemount 2230 Graphical Field Display in View Mode



A. Press the Menu softkey to navigate to the Main Menu

To navigate from View Mode to the Main Menu, press the **Menu** softkey on the left-hand side.

Figure 4-10: Main Menu



The Main Menu includes the following options:

Select View	Select the preferred view.
Options	Select variables and tanks to display, as well as measurement units, toggle time, and language.
Service	Includes the functions Status, Custody Transfer View, LCD Test, Restart, and Factory Settings. It also includes the About option which shows the current software version.

Related information

Select the number of data fields
Options menu

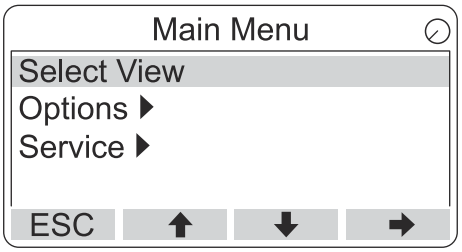
Service menu

4.5 Select the number of data fields

In the Select View menu, you can specify the number of measurement values to be displayed in View Mode.

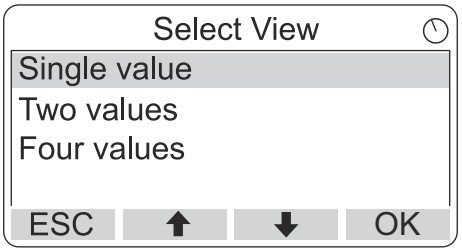
Procedure

1. In View Mode, press the **Menu** button to navigate to the Main menu.
2. Highlight the **Select View** menu item using the ↑ and ↓ softkeys.



3. Press the → softkey.
4. In the ***Select View*** menu, use the ↑ and ↓ softkeys to navigate to the desired option.

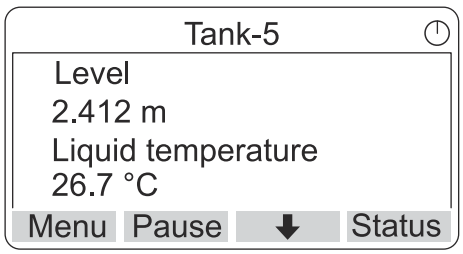
   ### Example



5. Press the **OK** softkey to select the desired option.
   Then the Rosemount 2230 returns to View Mode.

Example

For example, using the Two Values option will present a view like this:



4.6 Options menu

In the Options menu, the following items are available for a Rosemount 2230 connected to a Rosemount 2410 Tank Hub:

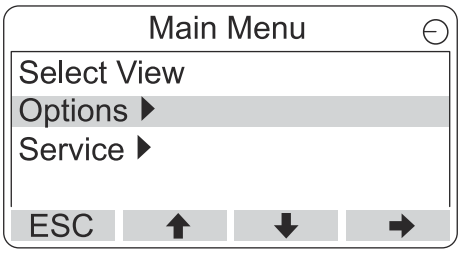
- Variables(10)
- Tanks(10)
- Units for Display
- Toggle Time
- Language

(10) *Not available in FOUNDATION™ Fieldbus systems without Rosemount 2410 Tank Hub.*

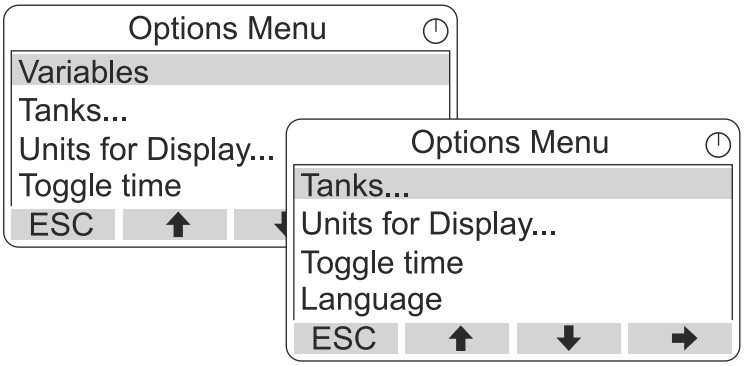
4.6.1 Choose an item in the options menu

Procedure

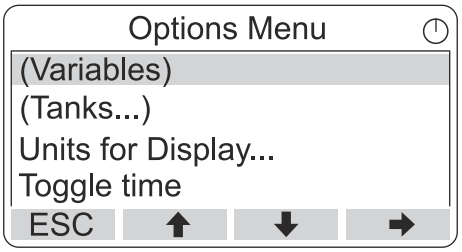
1. In View Mode, press the **Menu** button to open the Main menu.
2. Highlight the **Options** menu item by using the ⬆ and ⬇ softkeys.



3. Press the ➡ softkey.
4. In the ***Options Menu***, use the ⬆ and ⬇ softkeys to navigate to the desired menu item.



In FOUNDATION™ Fieldbus systems some options are not available. This is indicated as illustrated below:



5. Press the ➡ softkey to continue to the selected menu.

4.6.2 Variables

In the Select Variables menu[11], you can choose which variables to present in View Mode.

The following options are available:

Tank Pos 1-10	Configure a common set of variables to be presented for all tanks. Tank Position refers to the position in the tank database of the Rosemount 2410 Tank Hub.
Tk Pos 1, 2, 3...	Configure variables individually for each tank.

See Table 4-2 for a list of available variables.

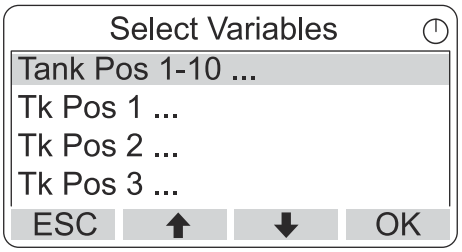
Select variables to be displayed

The Select Variables menu allows you to select variables to be displayed in View Mode.

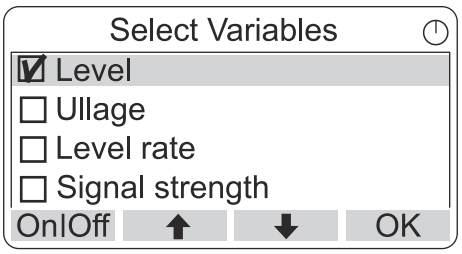
Option “Tank Pos 1-10” can be used to specify a common set of variables to be used for all tanks connected to the same Rosemount 2410 Tank Hub. In addition to this you can configure tanks individually by specifying a unique set of variables for each tank. Note that the individual configuration will be added to the configuration that is common for all tanks.

Procedure

1. In View Mode, press **Menu** → **Options** → **Variables**.
2. Use the ⬆ and ⬇ softkeys to navigate to the desired Tank Position item.



3. Press the **OK** softkey to continue to the ***Selected Variables*** list.
4. In the ***Select Variables*** list, choose the variables you wish to show in View Mode.



5. When finished, press **OK** to return to View Mode.

(11) *Not available in FOUNDATION™ Fieldbus systems.*

Table 4-2: Selectable Variables

Variable	Description
Level	Product level in the displayed tank
Ullage	Ullage is the distance from the Tank Reference Point to the product surface
Level Rate	How the product in the tank moves when emptying or filling the tank
Signal Strength	The signal strength of the radar level gauge
Free Water Level	The level of water in the bottom of the tank. Available when a water level sensor is connected to the tank
Vapor Pressure	Measured vapor pressure
Liquid Pressure	Measured liquid pressure
Air Pressure	Measured air pressure in the tank
Ambient Temperature	Air temperature outside the tank
Vapor Temperature	Temperature of vapor inside the tank
Liquid Average Temperature	Averagte temperature of the product in the tank
Tank Temperature	Average temperature of the product and vapor in the tank
Temperature 1 To 16	Individual temperature of each selected temperature spot element
Observed Density	Calculated density based on the product level and pressure
Reference Density	Reference density as specified with the configuration tool
Flow rate	Measured flow rate
Tot Obs Volume	Total observed product volume in the tank
User defined 1 t o5	Custom measurement variable
Middle Pressure	Measured pressure from transmitter P2
Tank Height	Tank Reference Height
ΔLevel	Difference between two product levels
Custom TMV 1-10	Custom tank variables
Level %	Product level presented in a bargraph
Ullage %	Ullage value presented in a bargraph

Select variables using a configuration tool

Variables to present in the View Mode can also be configured by using the TankMaster WinSetup configuration program, a 475 Field Communicator, the AMS Device Manager or other host system. For more information see the Rosemount Tank Gauging System Configuration Manual (Document no. 00809-0300-5100).

4.6.3 Select tanks menu

In the **Select Tanks** menu[12], you can specify which tanks to show in View Mode.

The following items are available:

Default	View all tanks that are configured in the Tank Database of the 2410 Tank Hub.
All	Display all available tanks in View Mode.
Tank Pos 1-10	Specify which tanks to present in View Mode.

Select which tanks to present

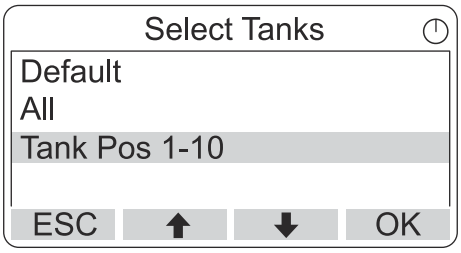
The Tank Pos 1-10 menu lets you select which tanks to present in View Mode. Up to ten tanks can be displayed.

Prerequisites

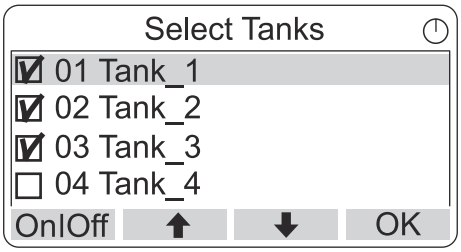
Note that the tanks need to be configured in the tank database of the Rosemount 2410 Tank Hub[13].

Procedure

1. In View Mode, press **Menu** → **Options** → **Tanks**.
2. Use the ⬆ and ⬇ softkeys to navigate to the **Tank Pos 1-10** menu item.



3. Press the **OK** softkey to continue to the list of tanks.
4. Use the ⬆ and ⬇ softkeys to navigate to the desired tank.



5. Press the **On/Off** softkey to select the tank.
6. When finished, press the **OK** softkey to return to View Mode.

(12) *Not available in FOUNDATION™ Fieldbus systems.*
(13) *See the Rosemount 2410 Tank Hub Reference Manual (Document no. 00809-0100-2410).*

4.6.4 Set the measurement units for displayed variables

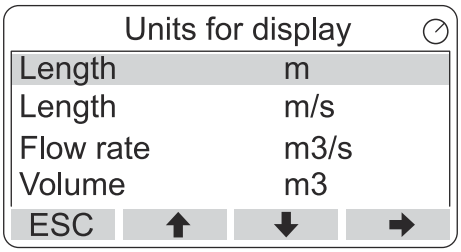
In the Units for Display menu, you can see which measurement units that are used for the displayed variables. To change measurement unit:

Procedure

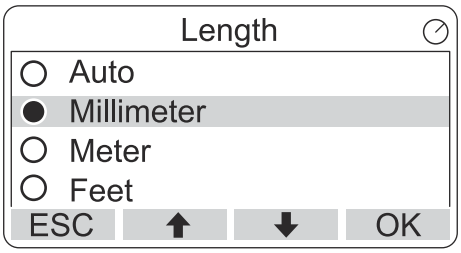
1. In View Mode, press **Menu** → **Options** → **Units for Display**.
2. Use the ⬆ and ⬇ softkeys to navigate to the desired variable menu item.

   #### Example

   In the example, the Length variable was chosen.

3. Press the ➡ softkey to continue to the list of options for the selected variable.
4. Use the ⬆ and ⬇ softkeys to navigate to the desired measurement unit.

5. Press the **OK** softkey to select the unit and return to Units for Display.

Related information

Measurement units

Measurement units

Table 4-3: Available Measurement Units for the Rosemount 2230

Variable	Available Measurement Units
Auto	The display is controlled by the Multiple Analog Output Block configuration.
Length	The following units are available for Level and Ullage: • Millimeter • Meter • Feet • Imperial 1/16
Level rate	The following units are available for Level rate: • Meter/second • Meter/hour • Feet/second • Feet/hour
Flow rate	The following units are available for Flow rate: • Cubic meter/hour • Barrel/hour • US gallon/hour • UK gallon/hour • Liter/minute
Volume	The following units are available for Volume: • Cubic meter • Barrel • US gallon • UK gallon • Liter
Temperature	The following units are available for Temperature: • Degrees Celsius • Degrees Fahrenheit • Kelvin

Table 4-3: Available Measurement Units for the Rosemount 2230 *(continued)*

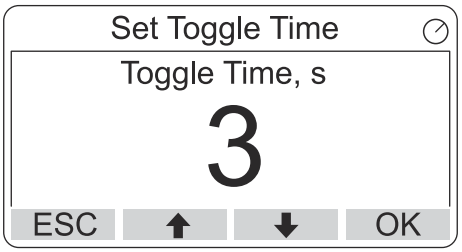
Variable	Available Measurement Units
Pressure	The following units are available for Pressure: • Bar • Pascal • Kilo pascal • Atmosphere • PSI • Bar Absolute • Bar Gauge • PSI Absolute • PSI Gauge
Density	The following units are available for Density: • Kilogram/Cubic m • Kilogram/Liter • Degrees API
Voltage	Millivolt

4.6.5 Set the toggle time

The Toggle Time parameter specifies the time period that each value, or set of values, is presented on the display.

Procedure

1. From View Mode, press **Menu** → **Options** → **Toggle Time**.
2. Use the ⬆ and ⬇ softkeys to increase or decrease the Toggle Time.

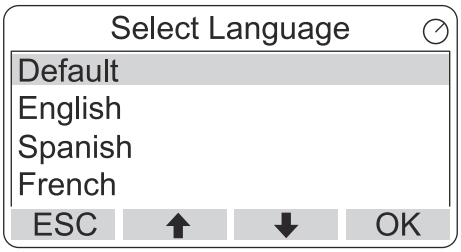


3. Press the **OK** softkey to select the desired value and return to View Mode.

4.6.6 Set the display language

Procedure

1. From View Mode, press **Menu** → **Options** → **Language**.
2. Use the ⬆ and ⬇ softkeys and navigate to the preferred language option:



3. Press the **OK** softkey to select the language and return to View Mode.

4.7 Service menu

In the Service Menu, the following items are available:

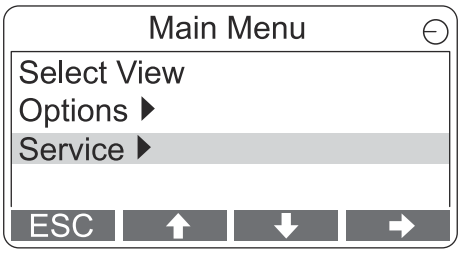
- Status
- Custody Transfer View(14)
- Start Proof Test
- LCD Test
- LCD Contrast
- Restart
- Factory Settings(14)
- About

(14) *Not available in FOUNDATION™ Fieldbus systems*

4.7.1 Choose a service menu item

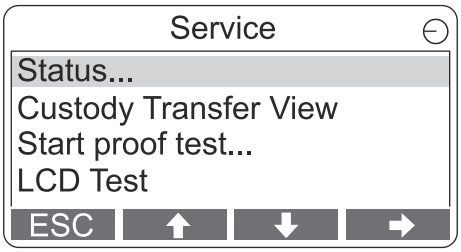
Procedure

1. In View Mode, press the **Menu** button to open the Main menu.
2. Use the ⬆ and ⬇ softkeys to navigate to the **Service** option.



3. Press the ➡ softkey.
4. Use the ⬆ and ⬇ softkeys to navigate to the desired menu item.

Example



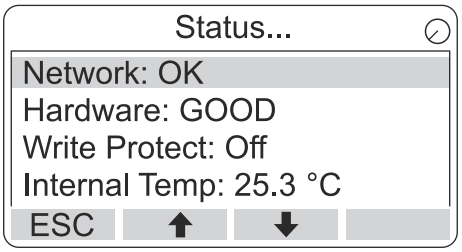
5. Press the ➡ softkey to continue to the selected menu.

4.7.2 View the current device status

The Status screen shows the current status of the Rosemount 2230. Various error messages and warnings can be displayed in case of software or hardware malfunctions.

Procedure

1. In the View Mode, press **Menu** → **Service** → **Status**.
2. Press **Esc** to return to the Service menu.



Related information

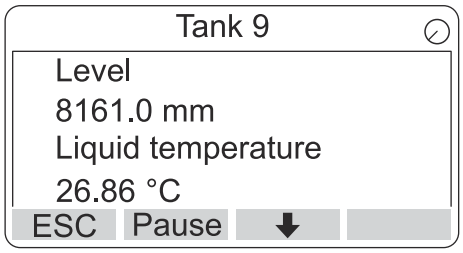
Status messages

4.7.3 Open the custody transfer view

The Custody Transfer view presents Level and Liquid Temperature for each tank.

Procedure

In View Mode, press **Menu** → **Service** → **Custody Transfer**.



- Press the **Esc** softkey to return to View Mode.
- Press the **Pause** softkey to pause the display toggling.
- Press the down arrow softkey to display the next tank.

4.7.4 Start proof test

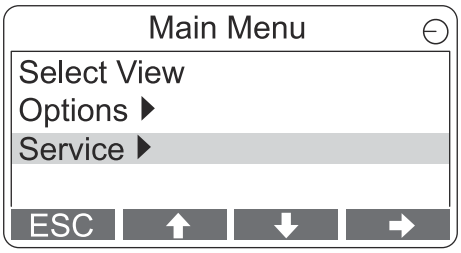
It is possible to initiate a pre-configured proof test of a Rosemount™ 5900 level gauge. This is a short introduction how to perform a proof test. See the Rosemount 5900 and Rosemount 2410 Safety Manual for a complete instruction.

Prerequisites

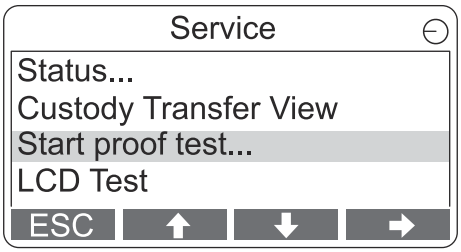
Note that the relay and/or analog output is active during the proof test.

Procedure

1. In the ***Display Tank*** view, select **Menu** to open the ***Main Menu*** view.
2. Select the **Service** option.

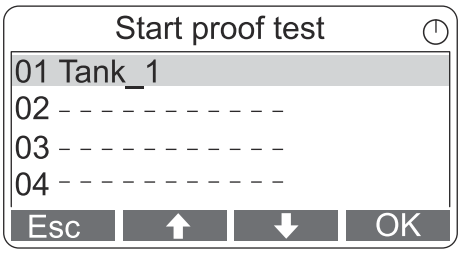


3. Select **Start proof test**.



4. Enter the **password**. Note that default password is “000”.

5. Choose the desired tank.



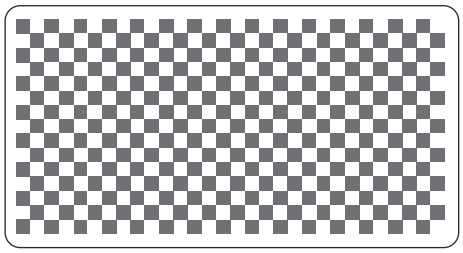
6. Select **OK** to continue and follow the instructions on the display.

4.7.5 Open the LCD test view

In the LCD test two checkered patterns will be displayed testing the whole display area.

Procedure

In View Mode, press **Menu** → **Service** → **LCD Test**.



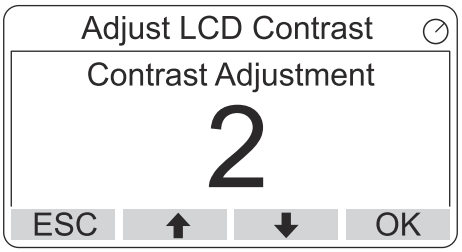
After the test is completed, the display will return to normal View Mode.

4.7.6 Adjust the LCD contrast

The Rosemount 2230 automatically adjusts display contrast to optimize for changes of ambient temperature. The contrast can be manually adjusted when further fine-tuning is desired.

Procedure

1. In View Mode, press **Menu** → **Service** → **LCD Contrast**.
2. Use the ⬆ and ⬇ softkeys to increase or decrease the LCD contrast.



3. Press the **OK** softkey to select the desired value and return to View Mode.

Need help?

In case the contrast is so low that the LCD cannot be properly read, it can be adjusted by pressing the appropriate buttons:

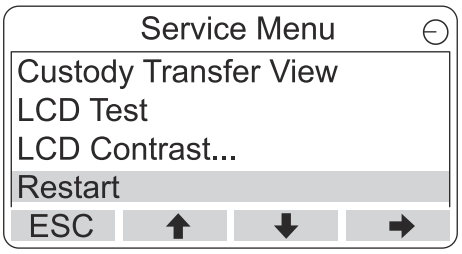
- To increase the contrast of the LCD, press the two buttons on the right-hand side simultaneously.
- To decrease the contrast, press the two buttons on the left-hand side.

4.7.7 Restart the Rosemount 2230

The Restart option will perform start-up tests of software and hardware. In a Rosemount Tank Gauging system it will connect the Rosemount 2230 to the Rosemount 2410 Tank Hub.

Procedure

1. In View Mode, press **Menu** → **Service**.
2. Choose the **Restart** option and press the ➡ softkey.

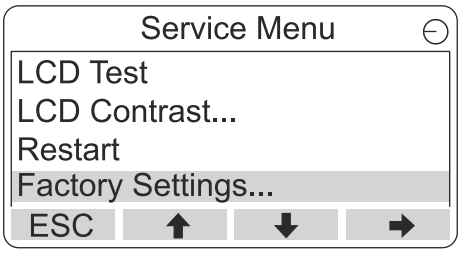


4.7.8 Restore to factory settings

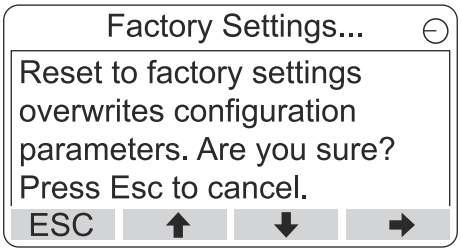
All user configuration will be lost when the Rosemount 2230 is restored to factory settings.

Procedure

1. In View Mode, press **Menu** → **Service**.
2. Choose the Factory Settings option and press the ➡ softkey.



3. Press the **OK** softkey to restore the Rosemount 2230 to factory settings, or press the **Esc** softkey to cancel.

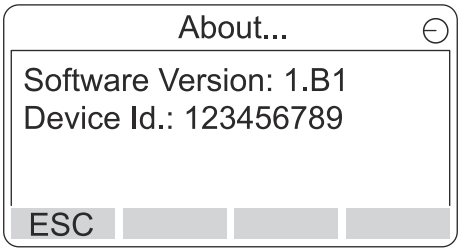


4.7.9 View the about information

The About option will present the current software version and the Rosemount 2230 serial number.

Procedure

1. In View Mode, press **Menu** → **Service**.
2. Choose the **About** option and press the ➡ softkey.
3. Press the **Esc** softkey to return to the Service menu.



4.8 FOUNDATION™ Fieldbus overview

This section provides a brief overview of FOUNDATION Fieldbus block operation with the Rosemount 2230 Graphical Field Display.

For detailed information about FOUNDATION Fieldbus technology and function blocks used in the Rosemount 2230 Series, refer to FOUNDATION™ Fieldbus Block Information and the FOUNDATION Fieldbus Block Manual (Document No. 00809-0100-4783).

4.8.1 FOUNDATION™ Fieldbus block operation

Function blocks within the fieldbus device perform the various functions required for process control, such as analog input (AI) functions, as well as proportional-integral derivative (PID) functions and multiple analog output (MAO) functions.

The standard function blocks provide a common structure for defining function block inputs, outputs, control parameters, events, alarms, and modes, and combining them into a process that can be implemented within a single device or over the fieldbus network. This simplifies the identification of characteristics that are common to function blocks.

In addition to function blocks, fieldbus devices contain two other block types to support the function blocks. These are the resource block and the transducer block.

Resource blocks contain the hardware specific characteristics associated with a device; they have no input or output parameters. The algorithm within a resource block monitors and controls the general operation of the physical device hardware. There is only one resource block defined for a device.

Transducer blocks connect function blocks to local input/output functions. They read sensor hardware and write to effector (actuator) hardware.

Resource block

The resource block contains diagnostic, hardware, electronics, and mode handling information. There are no linkable inputs or outputs to the resource block.

Main transducer block (TB1100)

The Main Transducer Block contains parameters for configuration of the Rosemount 2230. It contains device information including diagnostics and the ability to configure, set to factory defaults and restart the Rosemount 2230.

Register transducer block (TB1200)

The register transducer block allows a service engineer to access all database registers in the device.

Multiple analog output block

A Multiple Analog Output (MAO) Block accepts output values from field devices and assigns them to specified I/O channels in order to make them available for the display.

Display transducer block (TB1300)

The Display Transducer Block includes parameters for setup of the Rosemount 2230 for use in a Fieldbus system. It handles mapping of the MAO block inputs to the various field device outputs.

4.9 Device capabilities

4.9.1 Link Active Scheduler

The Rosemount 2230 can be designated to act as the backup Link Active Scheduler (LAS) in the event that the LAS is disconnected from the segment. As the backup LAS, the Rosemount 2230 will take over the management of communications until the host is restored.

The host system may provide a configuration tool specifically designed to designate a particular device as a backup LAS. Otherwise, this can be configured manually.

4.9.2 Device addressing

FOUNDATION™ Fieldbus devices use addresses divided into four sub ranges as shown in Table 4-4.

Table 4-4: Address Ranges for FOUNDATION Fieldbus Devices

Address range (decimal)	Address range (hexadecimal)	Allocation
0 through 15	00 through 0F	Reserved.
16 through 247	10 through F7	Permanent devices. Address range 16 - 247 is subdivided into addresses that are LAS capable (lower end) and not LAS capable (upper end).
248 through 251	F8 through FB	New or decommissioned devices.
252 through 255	FC through FF	Temporary (“visitor”) devices. Example: 375/475 Field Communicator.

The Link Active Scheduler device (LAS device) probes a list of addresses to allow devices to come online during normal operation. The LAS can "skip" probing certain addresses in the range to speed up how long it takes to detect new devices on the bus.

4.9.3 Capabilities

Table 4-5: Virtual Communication Relationship (VCRs)

Item	Number of VCRs
Maximum number of VCRs	38
Number of client and server VCRs	20
Number of publisher VCRs	20
Number of subscribers VCRs	32
Number of source VCRs	2
Number of sink VCRs	0

4.10 General block information

4.10.1 Modes

Changing modes

⚠ To change the operating mode, set the MODE_BLK.TARGET to the desired mode. After a short delay, the parameter MODE_BLOCK.ACTUAL should reflect the mode change if the block is operating properly.

Permitted modes

It is possible to prevent unauthorized changes to the operating mode of a block. To do this, configure MODE_BLOCK.PERMITTED to allow only the desired operating modes. It is recommended to always select OOS as one of the permitted modes.

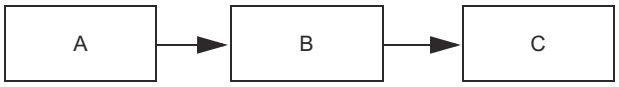
Types of modes

For the procedures described in this manual, it will be helpful to understand the following modes:

AUTO	The functions performed by the block will execute. If the block has any outputs, these will continue to update. This is typically the normal operating mode.
Out of Service (OOS)	The functions performed by the block will not execute. If the block has any outputs, these will typically not update and the status of any values passed to downstream blocks will be “BAD”. To make some changes to the configuration of the block, change the mode of the block to OOS. When the changes are complete, change the mode back to AUTO.
MAN	In this mode, variables that are passed out of the block can be manually set for testing or override purposes.

Note
When an upstream block is set to OOS, this will impact the output status of all downstream blocks. Figure 4-11 depicts the hierarchy of blocks.

Figure 4-11: Hierarchy of Blocks



A. Resource Block
B. Transducer Block
C. Other function blocks

4.11 Factory configuration

The following fixed configuration of function blocks is provided:

Table 4-6: Available Function Blocks for the Rosemount 2230

Function Block	Index	Default Tag	Available
Multiple Analog Output	1400	MAO_1400	Permanent
Multiple Analog Output	1500	MAO_1500	Permanent
Multiple Analog Output	1600	MAO_1600	Permanent
Multiple Analog Output	1700	MAO_1700	Permanent

4.12 Multiple Analog Output blocks

To show input data from MAO blocks on the display, the Rosemount 2230 needs to be configured by using FOUNDATION™ Fieldbus parameters which are available in the Display Transducer Block.

Related information

Display Transducer block
Configure the MAO blocks

4.12.1 Configure the MAO blocks

Configure the MAO blocks

A MAO Block is used for receiving measurement data from devices such as the Rosemount 5900S Radar Level Gauge. The Rosemount 2230 is supplied with four pre-configured MAO blocks according to Table 4-6. Each MAO block has eight inputs.

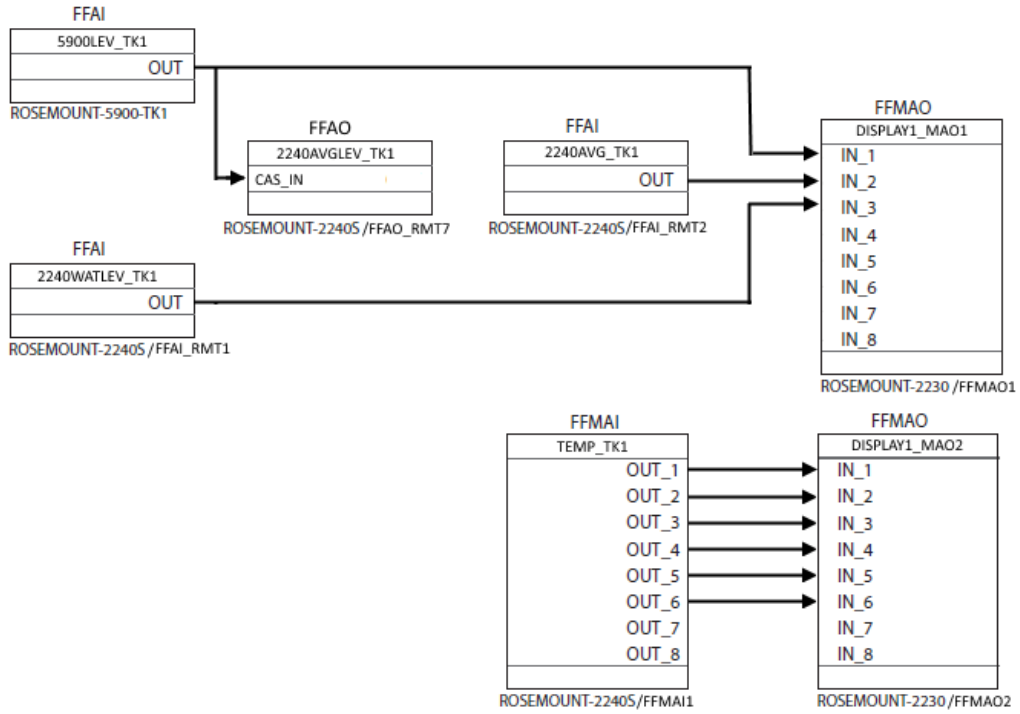
Note that the CHANNEL parameter value has to be equal to 1 (auto) in order to provide data output from the MAO block.

An example of a setup with a Rosemount 2230 receiving data from a Rosemount 5900S and a Rosemount 2240S is shown in Figure 4-12.

Application example

Figure 4-12 shows a Rosemount 2230 Graphical Field Display configured for receiving level and temperature measurement data from devices such as the Rosemount 5900S Radar Level Gauge and the Rosemount 2240S Temperature Transmitter.

Figure 4-12: Example of a Function Block Configuration of the Rosemount 2230 Using DeltaV™ Control Studio Online



In Figure 4-12 a Rosemount 2230 Graphical Field Display receives data from two field devices installed on Tank 1: a Rosemount 2240S Multiple-input Temperature Transmitter and a Rosemount 5900S Radar Level Gauge.

Product Level is output from the Rosemount 5900S via an Analog Input block to the Multiple Analog Output Block 1 (FFMAO1) in the Rosemount 2230 display, as well as to the Analog Output Block (FFAO_RMT7) in the Rosemount 2240S Temperature Transmitter, for Average Product Temperature calculations.

Water Level and Average Product Temperature is output from the Rosemount 2240S via Analog Input blocks to the Multiple Analog Output Block 1 (FFMAO1) in the Rosemount 2230 display.

Temperature from six elements is output from the Rosemount 2240S via a Multiple Analog Input Block (FFMAI1) to the Multiple Analog Output Block 2 (FFMAO2) in the Rosemount 2230 display.

The Rosemount 2230 display can be configured for output of measurement data by using the AMS Device Manager.

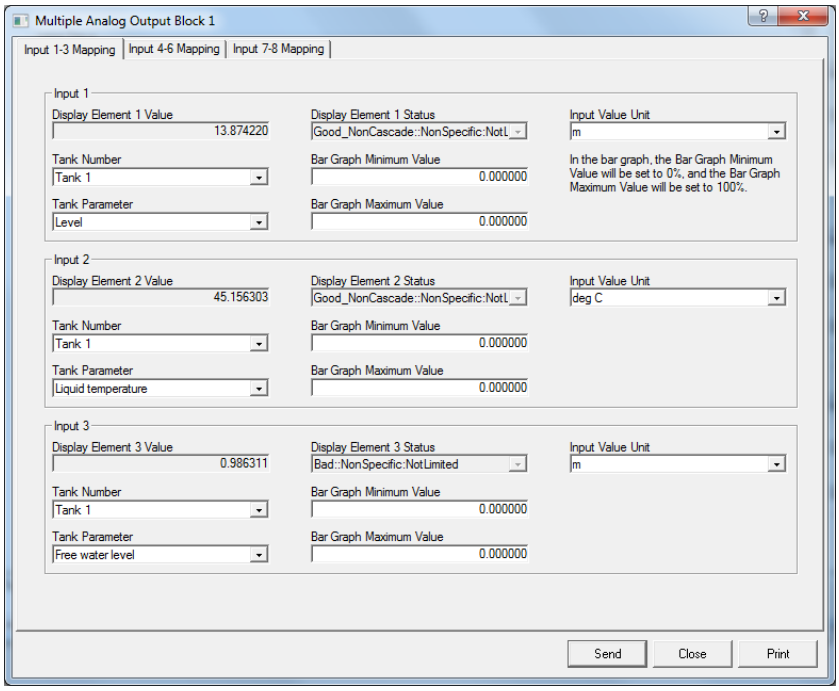
Example of MAO block configuration using AMS Device Manager

In control strategy software, such as Control Studio, function blocks are connected to various tank process variables. In AMS Device Manager the Guided Setup provides easy access for configuration of function blocks that are available for the Rosemount 2230.

The Control Studio diagram in Figure 4-12 shows which tank variables that are connected to the Multiple Analog Output blocks in this example. MAO Block 1 and MAO Block 2 are

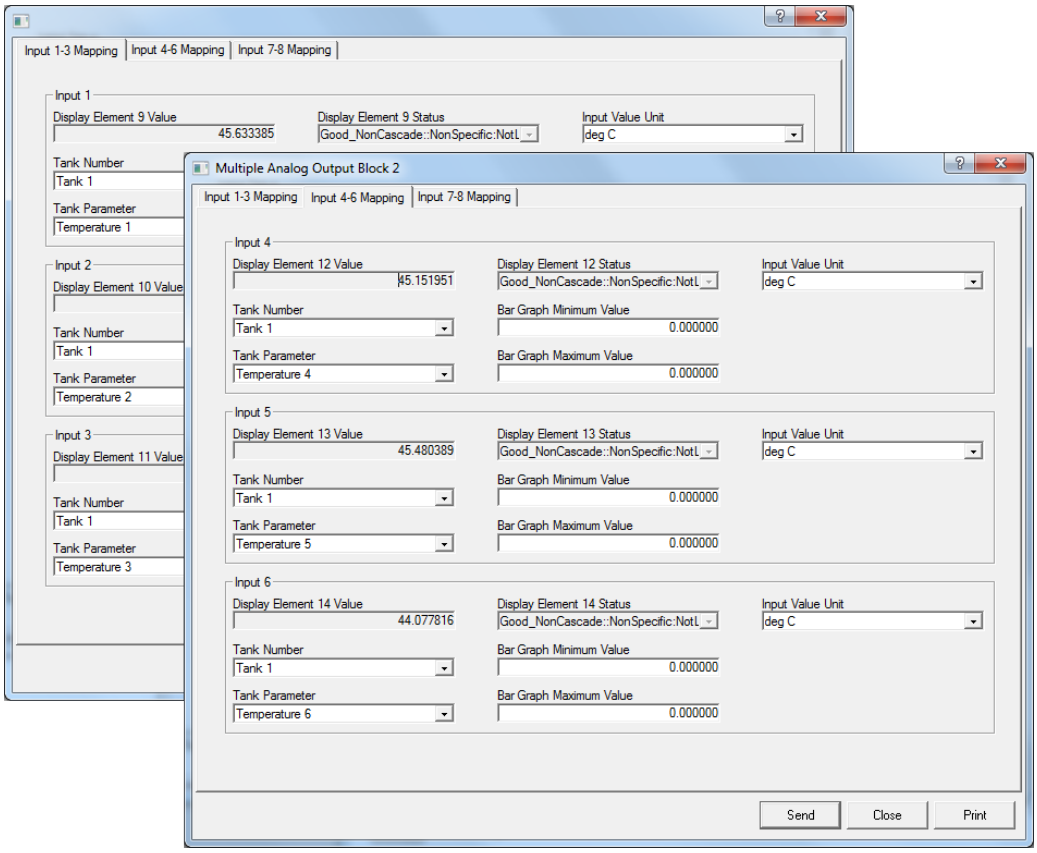
configured by using AMS Device Manager as shown in Figure 4-13. MAO Block 1 is configured for Level, Liquid Temperature, and Free Water Level.

Figure 4-13: MAO Block 1



MAO Block 2 is configured for Temperature inputs 1 to 6.

Figure 4-14: MAO Block 2



Related information

Configuration using AMS Device Manager

4.13 Resource block

4.13.1 FEATURES and FEATURES_SEL

The FEATURES parameter is read only and defines which features are supported by the Rosemount 2230. Below is a list of FEATURES the Rosemount 2230 supports.

FEATURES_SEL is used to turn on any of the supported features that are found in the FEATURES parameter. The default setting of the Rosemount 2230 is HARD W LOCK. Choose one or more of the supported features if any.

UNICODE

All configurable string variables in the Rosemount 2230, except tag names, are octet strings. Either ASCII or Unicode may be used. If the configuration device is generating Unicode octet strings, you must set the Unicode option bit.

REPORTS

The Rosemount 2230 supports alert reports. The Reports option bit must be set in the features bit string to use this feature. If it is not set, the host must poll for alerts. If this bit is set, the transmitter will actively report alerts.

MULTI-BIT ALARM

The Rosemount 2230 supports Multi-bit alarms. With the multi-bit option enabled each condition may send a message when it occurs and when it clears so that there is no masking of active conditions.

SOFT W LOCK and HARD W LOCK

Inputs to the security and write lock functions include the hardware security switch, the hardware and software write lock bits of the FEATURE_SEL parameter, and the WRITE_LOCK parameter.

The WRITE_LOCK parameter prevents modification of parameters within the device except to clear the WRITE_LOCK parameter. During this time, the block will function normally updating inputs and outputs and executing algorithms. When the WRITE_LOCK condition is cleared, a WRITE_ALM alert is generated with a priority that corresponds to the WRITE_PRI parameter.

The FEATURE_SEL parameter enables the user to select a hardware or software write lock or no write lock capability. To enable the hardware security function, enable the HARDW_LOCK bit in the FEATURE_SEL parameter. When this bit has been enabled the WRITE_LOCK parameter becomes read only and will reflect the state of the hardware switch.

In order to enable the software write lock, the SOFTW_LOCK bit must be set in the FEATURE_SEL parameter. Once this bit is set, the WRITE_LOCK parameter may be set to “Locked” or “Not Locked.” Once the WRITE_LOCK parameter is set to “Locked” by the software lock, all user requested writes shall be rejected.

Table 4-7 displays all possible configurations of the WRITE_LOCK parameter.

Table 4-7: Write_Lock Parameter

FEATURE_SEL HARDW_LOCK bit	FEATURE_SEL SOFTW_LOCK bit	SECURITY SWITCH	WRITE_LOCK	WRITE_LOCK Read/Write	Write access to blocks
0 (off)	0 (off)	NA	1 (unlocked)	Read only	All
0 (off)	1 (on)	NA	1 (unlocked)	Read/Write	All
0 (off)	1 (on)	NA	2 (locked)	Read/Write	Function Blocks Only
0 (off)	1 (on)	NA	2 (locked)	Read/Write	None
1 (on)	0 (off)(1)	0 (unlocked)	1 (unlocked)	Read only	All
1 (on)	0 (off)	1 (locked)	2 (locked)	Read only	Function Blocks Only
1 (on)	0 (off)	1 (locked)	2 (locked)	Read only	None

(1) The hardware and software write lock select bits are mutually exclusive and the hardware select has the highest priority. When the HARDW_LOCK bit if set to 1 (on), the SOFTW_LOCK bit is automatically set to 0 (off) and is read only.

4.13.2 MAX_NOTIFY

The MAX_NOTIFY parameter value is the maximum number of alert reports that the resource can have sent without getting a confirmation, corresponding to the amount of buffer space available for alert messages. The number can be set lower, to control alert flooding, by adjusting the LIM_NOTIFY parameter value. If LIM_NOTIFY is set to zero, then no alerts are reported.

4.13.3 Field diagnostic alerts

The Resource Block acts as a coordinator for Field Diagnostic alerts. There are four alert parameters (FD_FAIL_ALM, FD_OFFSPEC_ALM, FD_MAINT_ALM, and FD_CHECK_ALM) which contain information regarding some of the device errors which are detected by the transmitter software.

There is a FD_RECOMMEN_ACT parameter which is used to display the recommended action text for the highest priority alarm. FD_FAIL_ALM has the highest priority followed by FD_OFFSPEC_ALM, FD_MAINT_ALM, and FD_CHECK_ALM which has the lowest priority.

Failure alerts

A Failure alert indicates a condition within a device that will make the device or some part of the device non-operational. This implies that the device is in need of repair and must be fixed immediately. There are five parameters associated with Failure alerts specifically, they are described below.

FD_FAIL_MAP

This parameter maps conditions to be detected as active for this alarm category. Thus the same condition may be active in all, some, or none of the four alarm categories. The

parameter contains a list of conditions in the device which makes the device non-operational that will cause an alarm to be sent. Below is a list of the conditions with the highest priority first. This priority is not the same as the FD_FAIL_PRI parameter described below. It is hard coded within the device and is not user configurable.

1. Electronics Failure - FF I/O Board
2. Internal Communication Failure
3. Electronics Failure - Main Board
4. Memory Failure - FF I/O Board
5. Database Error
6. Software Failure

FD_FAIL_MASK

This parameter will mask any of the failed conditions listed in FD_FAIL_MAP. A bit on means that the condition is masked out from alarming and being broadcast to the host through the alarm parameter.

FD_FAIL_PRI

Designates the alarming priority of the FD_FAIL_ALM. The default is 0 and the recommended values are between 8 and 15.

FD_FAIL_ACTIVE

This parameter displays which of the conditions is active.

FD_FAIL_ALM

Alarm indicating a condition within a device which makes the device non-operational.

Related information

Alarm priority

Out of specification alerts

An Out of Specification alert indicates that the device operates out of the specified measurement range. If the condition is ignored, the device will eventually fail. There are five parameters associated with Out of Specification alerts, they are described below.

FD_OFFSPEC_MAP

The FD_OFFSPEC_MAP parameter contains a list of conditions indicating that the device or some part of the device operates out of specification. Below is a list of the conditions with the highest priority first. This priority is not the same as the FD_OFFSPEC_PRI parameter described below. It is hard coded within the device and is not user configurable.

Below is a list of the conditions:

1. Invalid Model Code
2. Internal Temperature Out of Limits
3. MAO Fault State Mode Enabled

FD_OFFSPEC_MASK

The FD_OFFSPEC_MASK parameter will mask any of the failed conditions listed in FD_OFFSPEC_MAP. A bit on means that the condition is masked out from alarming and being broadcast to the host through the alarm parameter.

FD_OFFSPEC_PRI

This parameter designates the alarming priority of the FD_OFFSPEC_ALM. The default is 0 and the recommended values are 3 to 7.

FD_OFFSPEC_ACTIVE

The FD_OFFSPEC_ACTIVE parameter displays which of the conditions is detected as active.

FD_OFFSPEC_ALM

An alarm indicating that the device operates out of the specified measurement range. If the condition is ignored, the device will eventually fail.

Related information

Alarm priority

Maintenance required alerts

A Maintenance required alert indicates that the device or some part of the device needs maintenance soon. If the condition is ignored, the device will eventually fail. There are five parameters associated with Maintenance Required alerts, they are described below.

FD_MAINT_MAP

The FD_MAINT_MAP parameter contains a list of conditions indicating that the device or some part of the device needs maintenance soon. The priority is not the same as the MAINT_PRI parameter described below. It is hard coded within the device and is not user configurable.

Note that maintenance alarms are not enabled by default for the Rosemount 2230.

FD_MAINT_MASK

The FD_MAINT_MASK parameter will mask any of the failed conditions listed in FD_MAINT_MAP. A bit on means that the condition is masked out from alarming and being broadcast to the host through the alarm parameter.

FD_MAINT_PRI

FD_MAINT_PRI designates the alarming priority of the FD_MAINT_ALM. The default is 0 and the recommended values are 3 to 7.

FD_MAINT_ACTIVE

The FD_MAINT_ACTIVE parameter displays which of the conditions is active.

FD_MAINT_ALM

An alarm indicating that the device needs maintenance soon. If the condition is ignored, the device will eventually fail.

Related information

Alarm priority

Function check alerts

A Function Check alert indicates that the device is temporary non-valid due to some activities, for example maintenance, on the device.

There are five parameters associated with Function Check alerts, they are described below.

FD_CHECK_MAP

The FD_CHECK_MAP parameter contains a list of informative conditions that do not have a direct impact on the primary functions of the device. Below is a list of the conditions:

1. Check function

FD_CHECK_MASK

The FD_CHECK_MASK parameter will mask any of the failed conditions listed in FD_CHECK_MAP. A bit on means the condition is masked out from alarming and being broadcast to the host through the alarm parameter.

FD_CHECK_PRI

FD_CHECK_PRI designates the alarming priority of the FD_CHECK_ALM. The default is 0 and the recommended values are 1 or 2.

FD_CHECK_ACTIVE

The FD_CHECK_ACTIVE parameter displays which of the conditions is active.

FD_CHECK_ALM

FD_CHECK_ALM is an alarm indicating that the device output is temporary invalid due to on-going work on the device.

Related information

Alarm priority

4.13.4 Recommended actions for alerts

The RECOMMENDED_ACTION parameter displays a text string that will give a recommended course of action to take based on which type and which specific event of the alerts is active.

Related information

Recommended actions

4.13.5 Alarm priority

Alarms are grouped into five levels of priority:

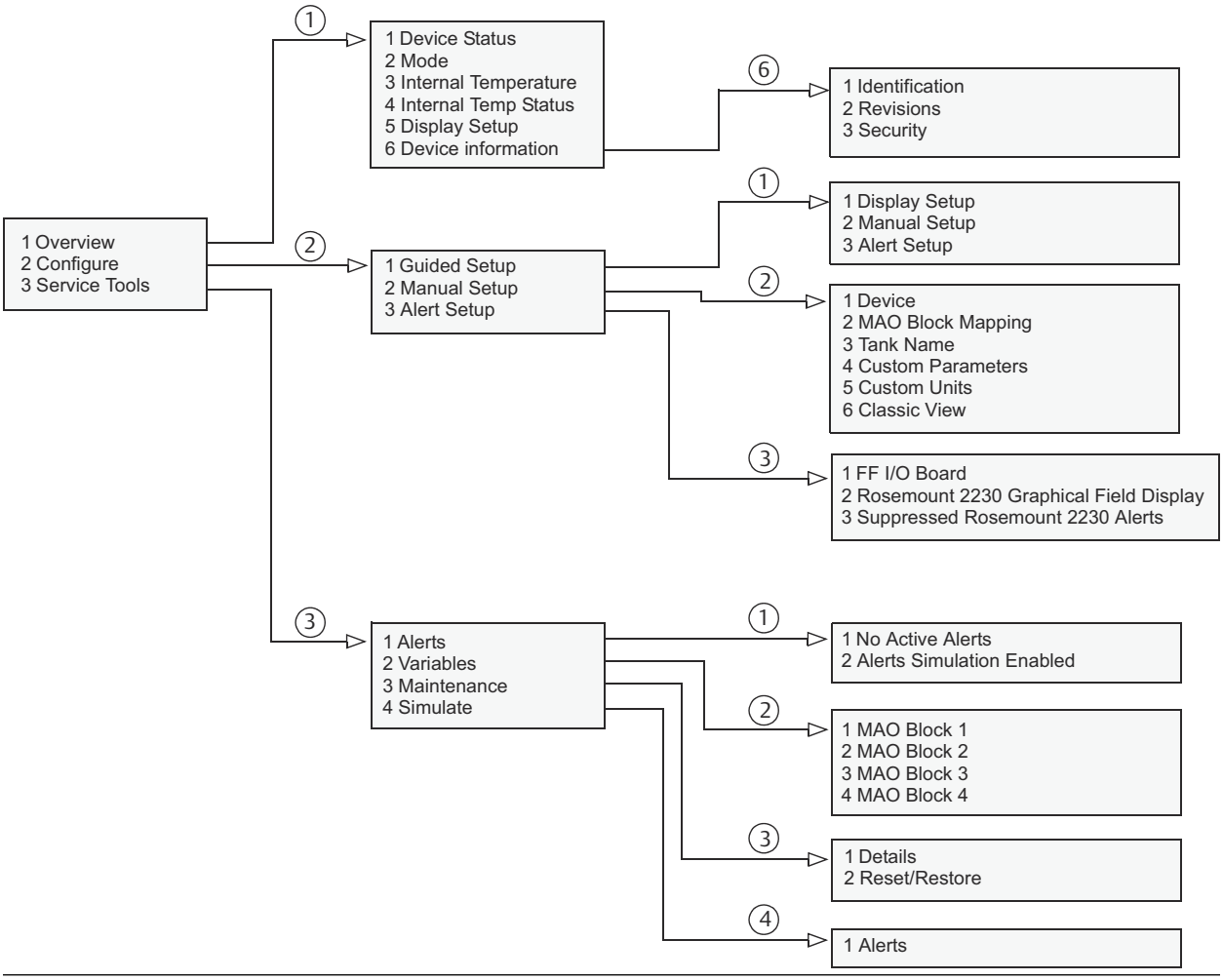
Table 4-8: Alarm Levels of Priority

Priority number	Priority description
0	The priority of an alarm condition changes to 0 after the condition that caused the alarm is corrected.
1	An alarm condition with a priority of 1 is recognized by the system, but is not reported to the operator.
2	An alarm condition with a priority of 2 is reported to the operator, but does not require operator attention (such as diagnostics and system alerts).
3-7	Alarm conditions of priority 3 to 7 are advisory alarms of increasing priority.
8-15	Alarm conditions of priority 8 to 15 are critical alarms of increasing priority.

4.14 475 Field Communicator menu tree

The Rosemount 2230 can be configured by using a 475 Field Communicator. Figure 4-15 shows the available options for configuration and service.

Figure 4-15: Field Communicator Menu Tree



4.15 Configuration using AMS Device Manager

The Rosemount 2230 Graphical Field Display supports DD Methods to facilitate device configuration. The following description shows how to use the AMS Device Manager application to configure the Rosemount 2230 in a FOUNDATION™ Fieldbus system.

4.15.1 Starting the guided setup

To configure the Rosemount 2230 in AMS Device Manager:

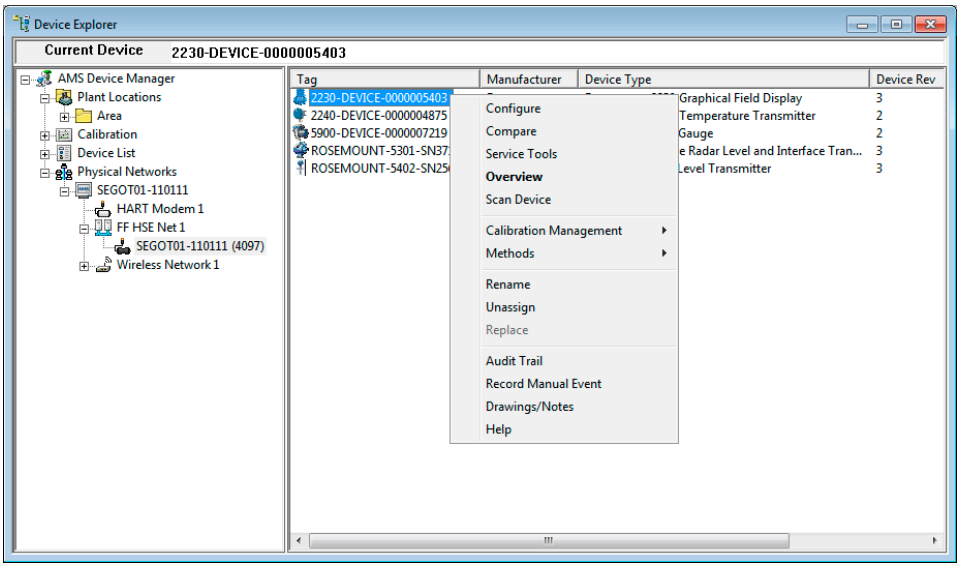
Prerequisites

Before starting the Guided Setup it is recommended to configure the Multiple Analog Output (MAO) blocks and connect them to appropriate tank process variables using Control Studio or a similar application.

Procedure

1. From the **Start** menu, open the AMS Device Manager application.
2. Open the Device Explorer and select the appropriate network node (in the example below SEGOT01-110111).

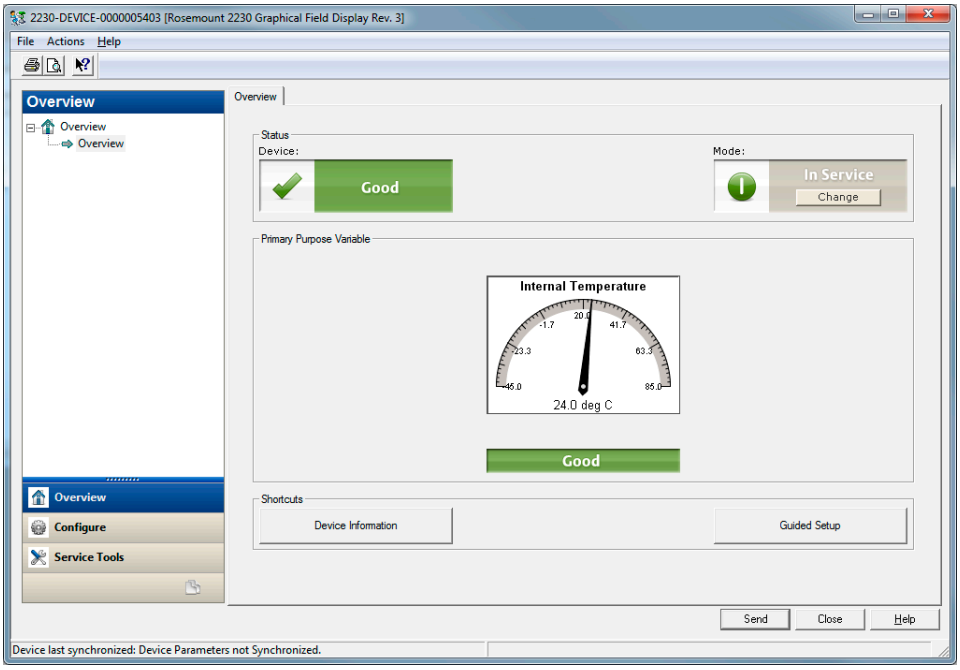
Example



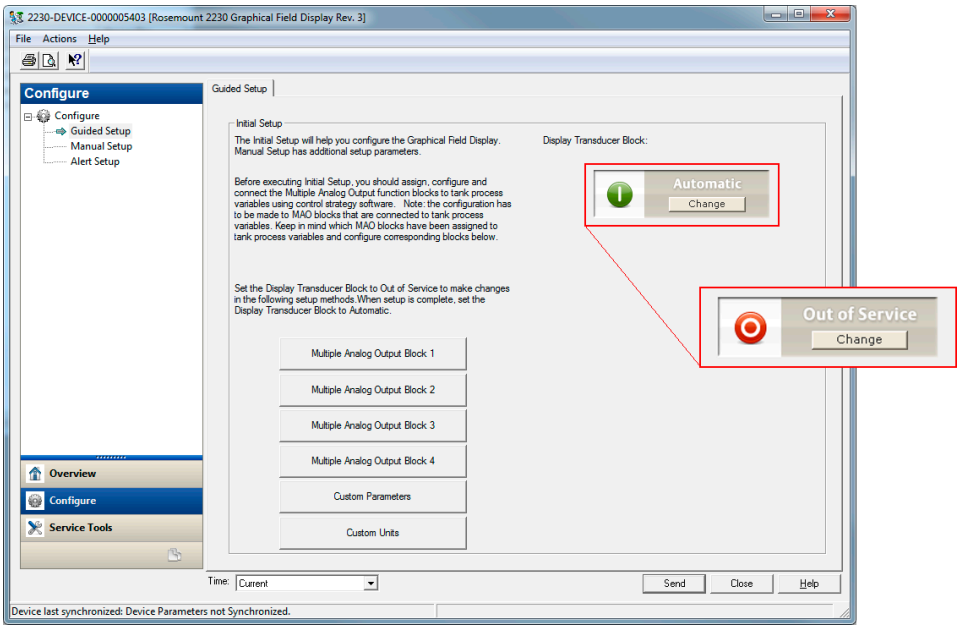
3. Right-click or double-click the desired device icon to open the list of menu options.

4. Select the **Overview** option.

   The ***Overview*** window shows information about the current device status: Good or Bad. It also gives you access to more device information by clicking the **Device Information** button.



5. Select **Configure** → **Guided Setup**, or click the **Guided Setup** button, to open the ***Guided Setup*** window.
6. Set the Display Transducer Block to Out Of Service (OOS) mode by clicking the **Change** button.



7. Proceed with configuration of Multiple Analog Output (MAO) blocks by pressing the appropriate button; **Multiple Analog Output Block #**.
8. Configure all inputs that are used for the MAO Block.

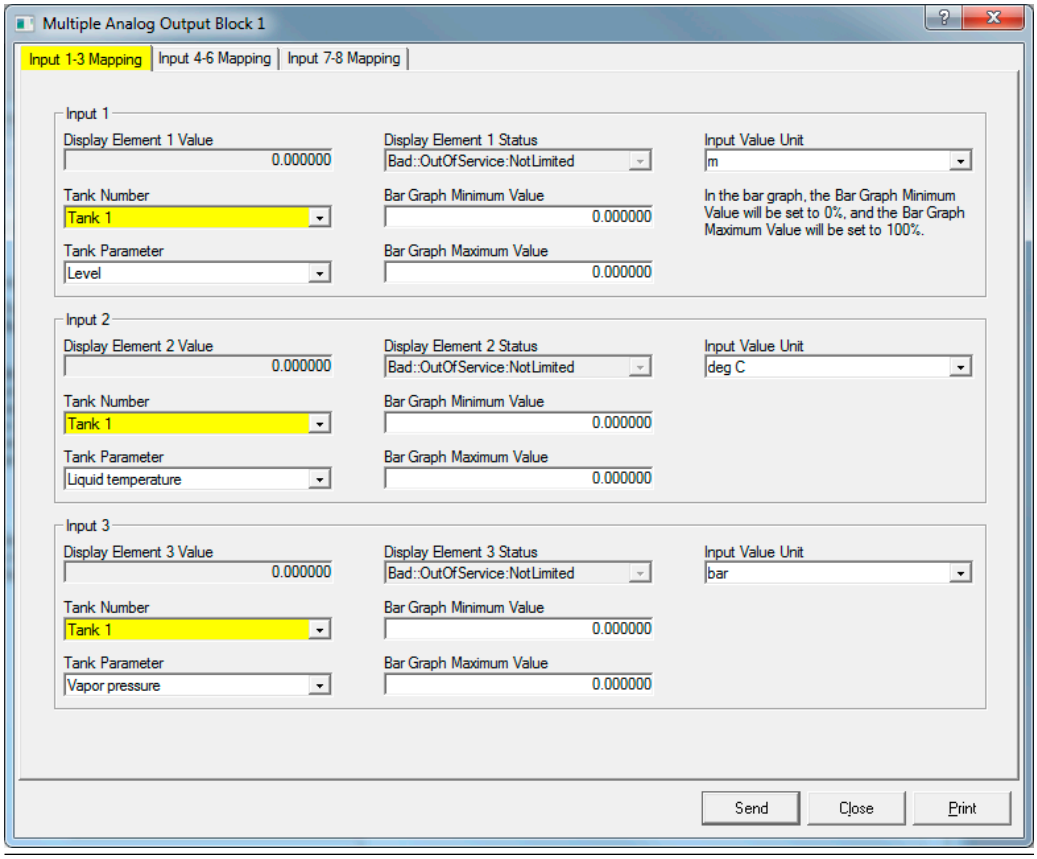
Related information

Viewing device status in AMS Device Manager
Multiple Analog Output blocks
Multiple analog output block window

Multiple analog output block window

The ***Multiple Analog Output Block window*** lets you map tanks and tank parameters from the Multiple Analog Output (MAO) block inputs 1 - 8 to the tanks and tank parameters in the Rosemount 2230 transducer block. This configuration is required in order to make the field device parameters available on the display output.

Figure 4-16: Multiple Analog Output Block Window



Note that MAO Block 1 to MAO Block 4 refer to index number 1400 to 1700 (MAO_1400 - MAO_1700).

For each tank you may not configure more than one Tank Parameter of a certain type. This means that for each tank you may specify one Level, one Liquid Temperature, etc.

The Bar Graph Minimum and Maximum Value correspond to 0 % and 100 %, respectively. In case you don't want any bar graph to be displayed simply leave Minimum Value=0 and Maximum Value=0.

Note that tank names can be configured in the ***Manual Setup*** window.

Related information

Factory configuration
Manual setup

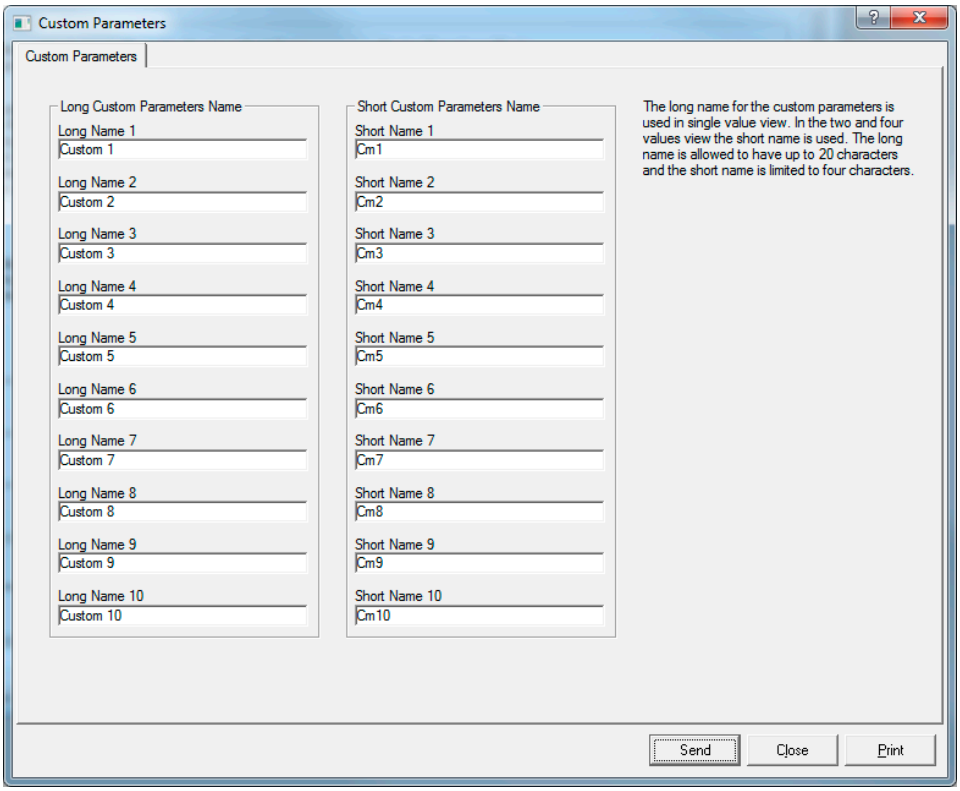
Configure custom parameters and units

In case there is no tank parameter available that matches the output from a specific device in the fieldbus network, a custom parameter can be used instead. A custom parameter can be anything from any device in the network.

Procedure

1. In the ***Guided Setup*** window click the **Custom Parameters** button.
2. Configure all the MAO Blocks that are used. Ensure that unused MAO block inputs are unconfigured, i.e. that there are no tank numbers or tank parameters configured for these inputs.
3. Click the **Send** button to store the current configuration in the device configuration database.

4. Once the MAO Block mapping is finished, you may proceed with configuration of custom parameters if needed. Return to the ***Guided Setup*** window and click the **Custom Parameters** button to open the ***Custom Parameters*** window.

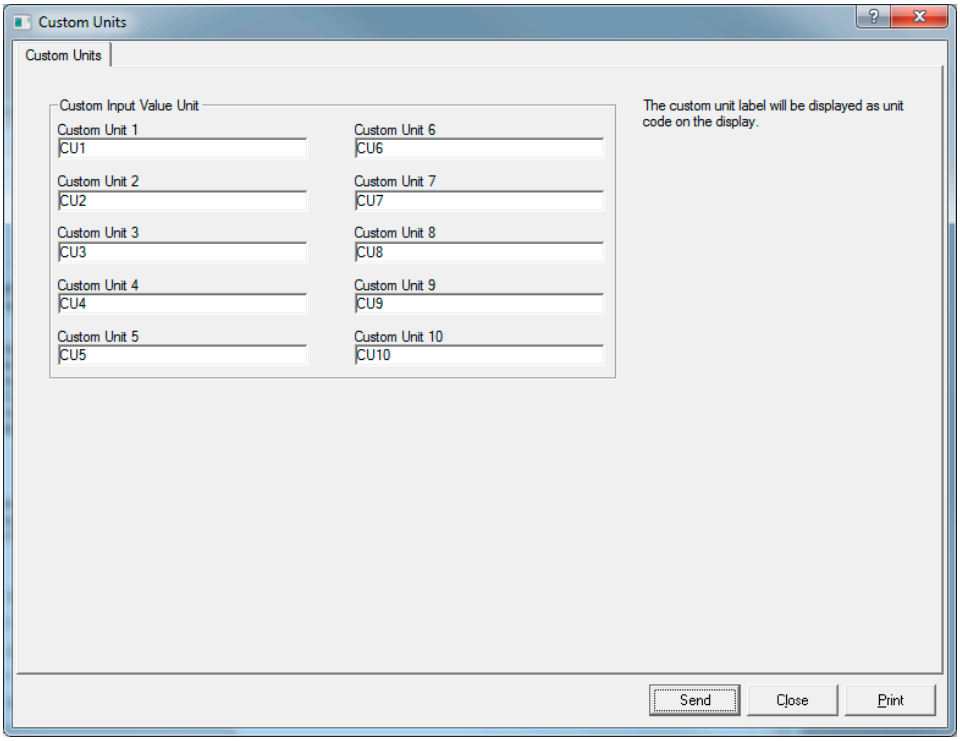


This window lets you specify names for various custom parameters:

- The **Long Custom Parameter Name** is used for the Single Value view and the Two Values View on the Rosemount 2230 display. It may be up to 20 characters long.
- The **Short Custom Parameter Name** is used for the Four Values View on the Rosemount 2230 display. It may be up to four characters long.

5. Press the **Send** button to store the current configuration in the device configuration database.
6. Press the **Close** button to return to the ***Guided Setup*** window.

7. Proceed with configuration of custom units by clicking the **Custom Units** button.



In the ***Custom Units*** window specify units for the various custom parameters. The unit label can be specified anyway you like. It does not need to be a standard unit such as metric or imperial units.

8. Click the **Send** button to store the current configuration in the device configuration database.

Postrequisites

In case you wish to extend device configuration with options not available in the ***Guided Setup*** window, return to the ***Overview*** window, select the **Configure** → **Manual Setup** option, and choose the desired tab.

Related information

Manual setup

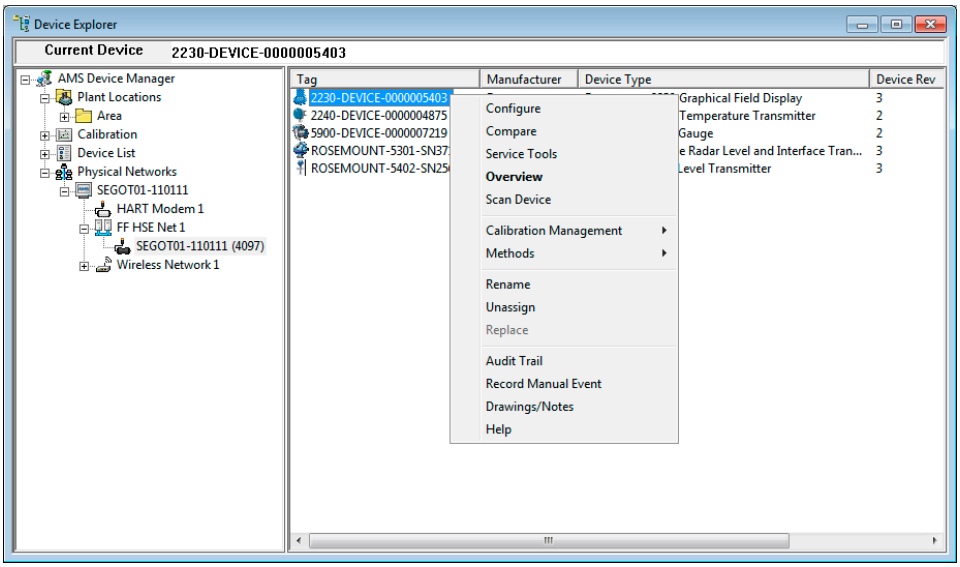
4.15.2 Manual setup

In case you wish to configure device options not available in the ***Guided Setup*** window, for example specifying tank names, you may use the **Manual Setup** option.

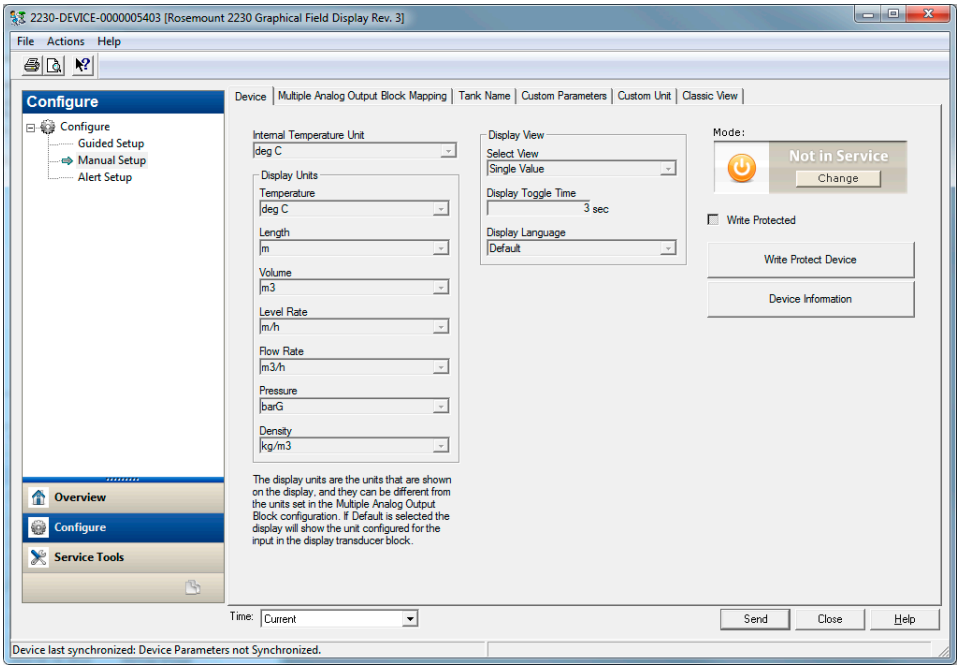
Procedure

1. From the **Start** menu, open the AMS Device Manager application.

2. Open the **Device Explorer** and select the appropriate network node (in the example below SEGOT01-110111).



3. Right-click or double-click the desired device icon to open a list of menu options.
4. Select the **Configure** option.
5. Select the **Configure** → **Manual Setup** option.

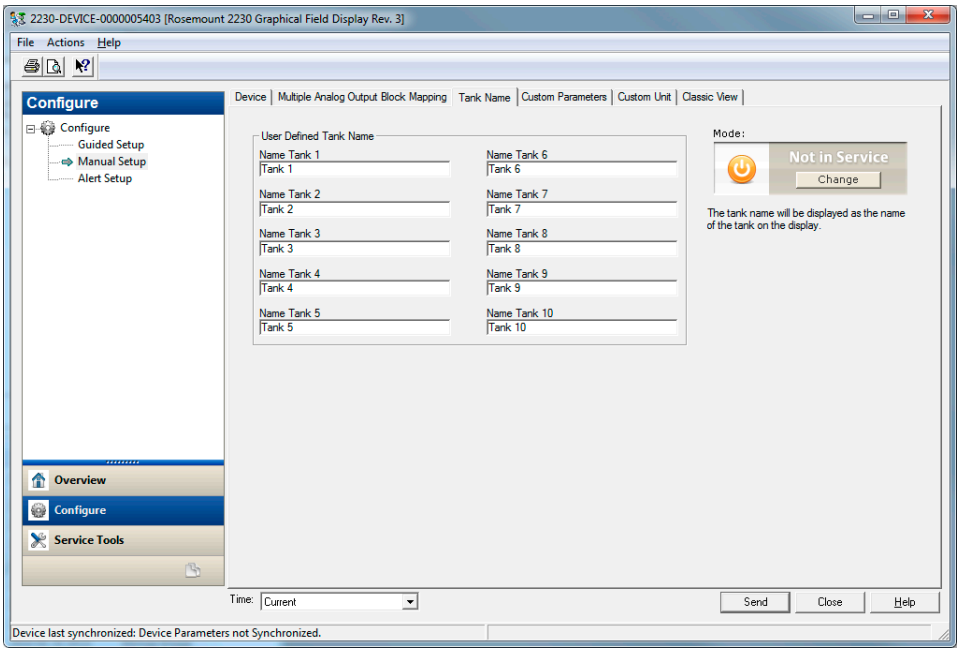


6. Set the device to Out Of Service (OOS) mode by clicking the **Change** button.
7. Select the desired tab (**Device**, **Multiple Analog Output Block Mapping**, **Tank Name** etc.) and configure the device.

The **Device** tab lets you configure display units, display view and language. It also provides the option to write protect the Rosemount 2230.

In addition to the **Device** tab there are various tabs that give you access to options such as block parameter mapping, configuration of custom parameters and units, as well as tank name specification.

8. When configuration is finished, click the **Send** button to store the current configuration in the device database.



9. Press the **Change** button to set the device back to operating (Auto) mode.
10. Press the **Close** button to close the window.

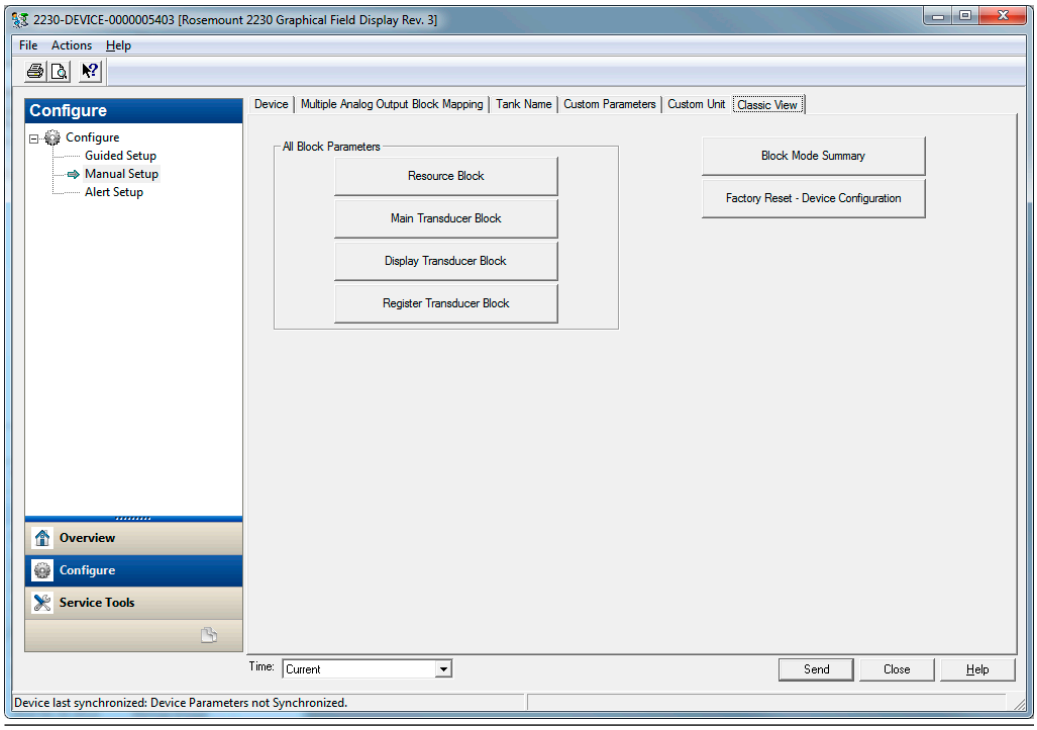
Related information

Write protection

Classic view

The **Classic View** gives you access to the different FOUNDATION™ Fieldbus blocks. Also **Block Summary Mode** and **Factory Reset** is available from this window.

Figure 4-17: Classic View



Related information

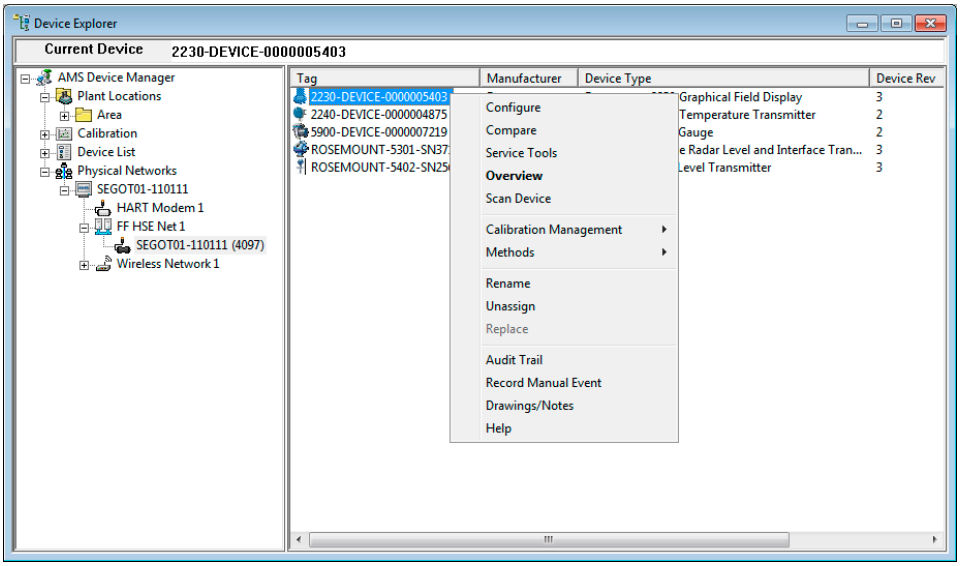
Resource block
Main transducer block (TB1100)
Display transducer block (TB1300)
Register transducer block (TB1200)

4.16 Configure and enable/disable alerts

The *Alert Setup* window allows you to configure and enable/disable alerts.

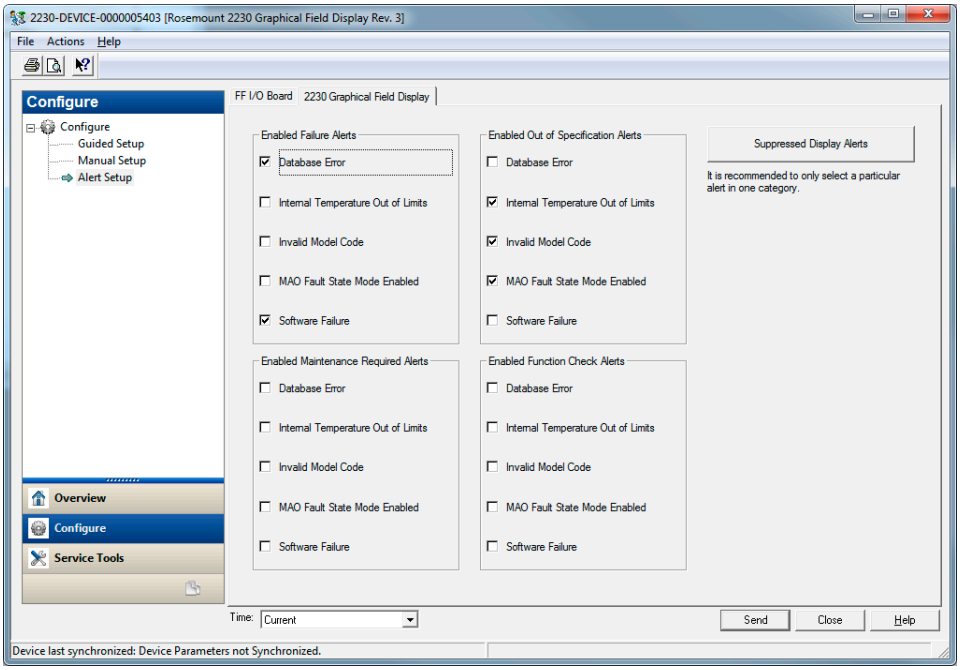
Procedure

1. From the **Start** menu, open the AMS Device Manager application.
2. Open the **View** → **Device Explorer** and select the appropriate network node (in the example below SEGOT01-110111).



3. Right-click or double-click the desired device icon to open the list of menu options.
4. Choose the **Configure** option.

5. Select **Configure** → **Alert Setup**.



6. Select the desired tab (**FF I/O Board** or **Rosemount 2230 Graphical Field Display**).
7. Configure alerts for the different error types.

   You may change the configuration for each error type by selecting the appropriate check box to match your requirements. Note that it is possible to map an error condition to several alert categories if desired.

   Note that when simulating alerts, only alerts which are setup according to the default configuration will be simulated.

8. Once the configuration is finished, click the **Send** button to save the current alert setup.

Related information

Viewing active alerts in AMS Device Manager
Alert default settings

4.16.1 Alert default settings

The following default settings are used for the FF I/O Board and the Rosemount 2230 Graphical Field Display. You may configure error types in a different way if you like. For example, the Internal Temperature Out of Limits error is configured as a Out of Specification alert for the Rosemount 2230 by default. The ***Alert Setup*** window allows you to enable the alert as Failed or Function Check instead.

Table 4-9: Default Alert Configuration for FF I/O Board

Error type	Default configuration	Enabled / Disabled
Check Function	Function Check	Enabled
MAO Fault State Mode Enabled	Out of Specification alert	Enabled
Memory Failure FF I/O Board	Failed alert	Enabled
Internal communication failure	Failed alert	Enabled
Electronics failure FF I/O Board	Failed alert	Enabled

Table 4-10: Default Alert Configuration for Rosemount 2230

Error type	Default configuration	Enabled / Disabled
Internal Temperature Out of Limits	Out of Specification alert	Enabled
Invalid Model Code	Out of Specification alert	Enabled
Software failure	Failed alert	Enabled
Database error	Failed alert	Enabled
Electronics failure Main Board	Failed alert	Enabled

5 Service and troubleshooting

5.1 Safety messages

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

⚠ WARNING

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

- Ensure only qualified personnel perform the installation.
- 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 services other than those contained in this manual unless you are qualified.

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 handheld communicator in an explosive atmosphere, ensure that the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Do not remove the cover in explosive atmospheres when the circuit is alive.

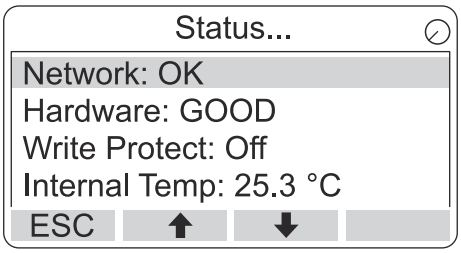
5.2 Service

5.2.1 View the current device status

The Status screen shows the current status of the Rosemount 2230. Various error messages and warnings can be displayed in case of software or hardware malfunctions.

Procedure

1. In the View Mode, press **Menu** → **Service** → **Status**.
2. Press **Esc** to return to the Service menu.



Related information

Status messages

Status messages

Various Status messages that may appear on the Rosemount 2230 display are listed in Table 5-1.

Table 5-1: Status Information

Status Message
Network
Hardware
Write Protect
Internal Temperature
Maximum Temperature
Minimum Temperature
Operation time
Last restart

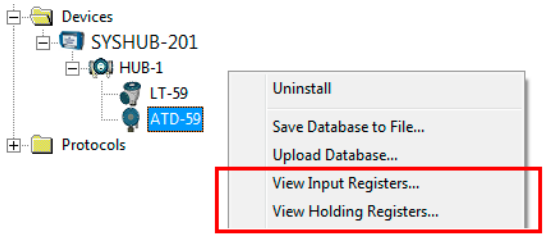
5.2.2 Viewing input and holding registers using TankMaster™

In a Rosemount Tank Gauging system, measurement data is continuously stored in **Input Registers** of devices such as the Rosemount 2410 Tank Hub, Rosemount 5900 Radar Level Gauge, and others. By viewing the input registers of a device, you can verify that the device is working properly.

Holding Registers store various device parameters used to control measurement performance.

Procedure

1. Start the TankMaster WinSetup program.
2. In the *TankMaster WinSetup* workspace window, select the device icon.



3. Right-click and select **View Input/View Holding Registers option**, or from the **Service** menu choose **Devices → View Input/View Holding Registers**.
   Now the View Input/Holding Register window appears.
4. In the **Registers Type** list, select **Predefined** or **All**.

Option	Description
Predefined	View a basic selection of registers.
All	View a range of registers by your own choice (for advanced service).

5. For the **All** option, you have to specify a range of registers by setting a start value in the **Start Register input** field, and the total number of registers to be displayed in the **Number of Registers** field (1-500). Up to 50 registers is recommended for a quick update of the list.
6. The **Registers Scope** drop-down list has three options:

Scope	Description	Access level
Basic	Standard setting that includes the most commonly used registers	View Only
Service	Includes a wider range of registers for advanced service and troubleshooting	Supervisor
Developer	For advanced users only	Administrator

7. In the **Show Values in** pane, choose the appropriate register format Decimal or Hexadecimal.
8. Click the **Read** button.
   Now the *View Input/Holding Registers* window is updated with the current register values.

Related information

Viewing input/holding registers using AMS Device Manager

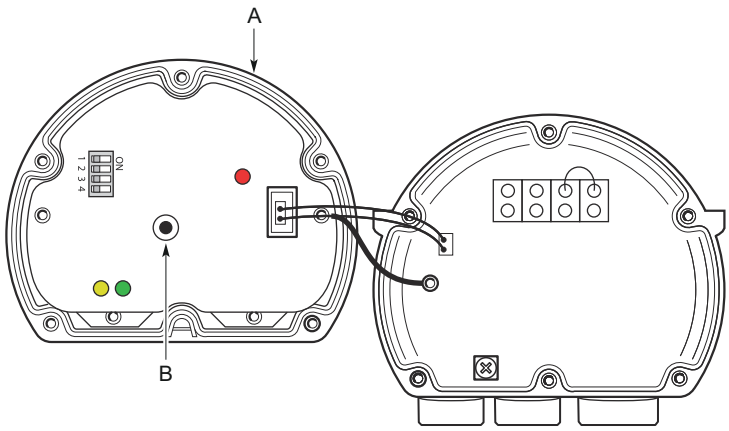
5.2.3 Restarting the Rosemount 2230 display

In Tankbus systems the Restart option will connect the Rosemount 2230 display to the Rosemount 2410 Tank Hub and perform start-up tests of software and hardware.

Procedure

- To restart the Rosemount 2230 choose one of the following options:
  - Select the **Restart** option in the Service menu.
  - Select the **Reset** button inside the display cover, see Figure 5-1.
  - Use the **Restart** command in TankMaster WinSetup (**Right click** → **Restart**).
  - In FOUNDATION™ Fieldbus systems you may use the **Service Tools/Restart** option in AMS Device Manager.

Figure 5-1: Reset Button



A. Cover
B. Reset button

Note
Ensure that o-rings and seats are in good condition prior to mounting the cover in order to maintain the specified level of ingress protection. Cables must be properly attached to the cable glands. It is recommended that the O-ring is changed when the cover is opened. O-rings are available as spare parts.

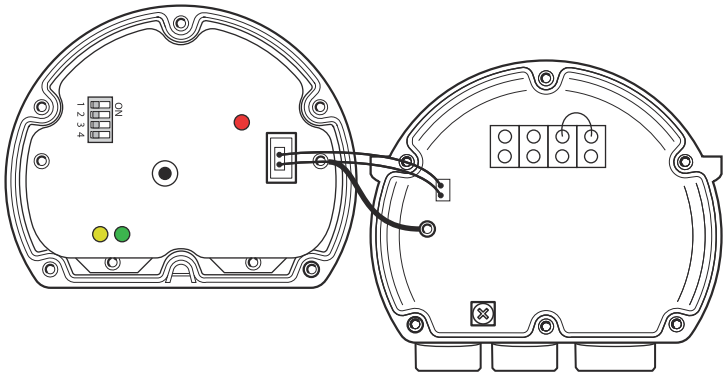
Related information

Restart the Rosemount 2230

5.2.4 Device error signals

A Light Emitting Diode (LED) inside the Rosemount 2230 cover is used for presentation of device status using different blinking sequences.

Figure 5-2: Error signals



A. Status LED

In normal operation the LED flashes once every two seconds. When an error occurs, a sequence of LED flashes presents a code number followed by a five second pause (see Table 5-2). The flash sequence is continuously repeated.

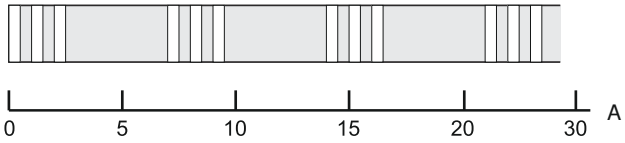
Table 5-2: Status LED Error Codes

LED Status Code	Error Type
0	RAM error
1	FPROM error
2	HREG error
3	SW error
4	Other memory error
9	Internal temperature error
11	Measurement error

Example

Error code 3 is displayed as the following flash sequence:

Figure 5-3: Error Code 3



A. Time (seconds)

Note
Only the first detected error is indicated.

Note
Ensure that o-rings and seats are in good condition prior to mounting the cover in order to maintain the specified level of ingress protection. Cables must be properly attached to the

cable glands. It is recommended that the O-ring is changed when the cover is opened. O-rings are available as spare parts.

Related information

Device errors

5.3 Troubleshooting

5.3.1 Troubleshooting the Rosemount 2230

Table 5-3 provides summarized maintenance and troubleshooting suggestions for the most common operating problems.

Table 5-3: Troubleshooting Chart for the Rosemount 2230 Display

Symptom	Possible cause	Action
No communication with the Rosemount 2230	Wiring	• Check that wires are properly connected to the terminals • Check for dirty or defective terminals • Check wire insulation for possible short circuits to ground • Check that there are no multiple shield grounding points • Check that the cable shield is grounded at the power supply end only • Check that the cable shield is continuous throughout the fieldbus network • Check that the shield inside the instrument housing does not come into contact with the housing • Check that there is no water in conduits • Use shielded twisted pair wiring • Connect wiring with drip loops
	Cables are too long	• Check that the input voltage on the device terminal is 9 V or more
	Hardware failure	• Check the Rosemount 2230 if other devices such as the Rosemount 2410 Tank Hub are detected by the host system. In a FOUNDATION™ Fieldbus system you can check the Device Live List to confirm that the host can detect other devices. • Contact Emerson Automation Solutions/ Rosemount TankGauging service department

Table 5-3: Troubleshooting Chart for the Rosemount 2230 Display *(continued)*

Symptom	Possible cause	Action
	Software failure	• Restart the Rosemount 2230. Use for example the **Restart** command in TankMaster WinSetup. • Restart all devices by disconnecting and connecting the power supply to the Rosemount 2410 Tank Hub • Contact Emerson Automation Solutions/ Rosemount TankGauging service department
	Field Bus Modem (FBM)	• Check that the FBM is connected to the right port on the control room PC • Check that the 2180 modem is connected to the right port on the Rosemount 2460 System Hub/2160 Field Communication Unit
The Status LED is blinking error codes	• Hardware errors • Software errors	• See Device error signals • Check Device Status information. See View the current device status and Viewing input and holding registers using TankMaster™) • See Device errors
Configuration can not be saved	Write protection switch is set to the ON position	Check write protection switch on the Rosemount 2230
Invalid measurement data (--.---)	Device failure	Check the field devices for possible hardware or software failure
Warning symbol appears in front of measurement value	Simulation mode active	Stop simulation mode in WinSetup (open WinSetup ***Set Simulation Mode*** window and click the Stop button)
Nothing appears on the LCD display	• No power supply • FISCO fuse broken • Contrast settings	Check status LED (see Device error signals). If Status LED does not light: • check power on Tankbus wiring • check FISCO fuse If Status LED lights: • check contrast settings of the LCD display

5.3.2 Troubleshooting the Tankbus system

This section covers systems with field devices connected to a Rosemount 2410 Tank Hub.

Table 5-4: Troubleshooting Chart for Tankbus Related Problems

Symptom	Possible cause	Action
No communication with the Rosemount 2230 Graphical Field Display	Incorrect termination on the Tankbus	• Check that there are two terminators on the Tankbus. Normally the built-in termination in the Rosemount 2410 Tank Hub is enabled. • Check that terminations are placed at both ends of the Tankbus
	Too many devices on the Tankbus	• Check that the total current consumption of the devices on the Tankbus is less than 250 mA. See the Rosemount 2410 Reference Manual (Document no. 00809-0100-2410) for more information. • Remove one or more devices from the Tankbus. The Rosemount 2410 Tank Hub supports a single tank. The multiple tank version of the Rosemount 2410 supports up to 10 tanks.
	Connection to Rosemount 2460 System Hub	• Check that the right field port on the Rosemount 2460 System Hub is connected to the Primary bus on the Rosemount 2410 Tank Hub. • Check communication port LED:s inside the Rosemount 2460 System Hub.
	Incorrect configuration of Rosemount 2460 System Hub	• Check the Modbus communication address specified for the appropriate ATD device, i.e. the device that represents the Rosemount 2240S Multi-input Temperature Transmitter in the system hub's tank database. For the single tank version, this address is equal to the Modbus address of the Rosemount 2410 Tank Hub itself. • Check configuration of communication parameters for the Rosemount 2460 System Hub field ports. • Check that the correct communication channel is selected. See the Rosemount Tank Gauging System Configuration Manual (Document no. 00809-0300-5100) for more information on how to configure the system hub.

Table 5-4: Troubleshooting Chart for Tankbus Related Problems *(continued)*

Symptom	Possible cause	Action
	Legacy system: incorrect configuration of 2160 Field Communication Unit (FCU)	• Check the Modbus communication address specified for the ATD device that represents the Rosemount 2230 display in the 2160 FCU Slave Database. For the single tank version, the ATD address is equal to the Modbus address of the Rosemount 2410 Tank Hub itself. • Check configuration of communication parameters for the FCU Fieldbus ports • Check that the correct communication channel is selected • See the Rosemount Tank Gauging System Configuration Manual (Document no. 00809-0300-5100) for more information on how to configure the 2160 FCU
No communication with the Rosemount 2230 Graphical Field Display	Incorrect configuration of tank database in Rosemount 2410 Tank Hub	• Check the Rosemount 2410's tank database; ensure that the Rosemount 2230 device is available and mapped to the right tank • Rosemount 2410 tank database; check that the ATD Modbus address is equal to the 2410 Temp Modbus address in the Rosemount 2460 System Hub's tank database/2160 Field Communication Unit's slave database • See the Rosemount Tank Gauging System Configuration Manual (Document no. 00809-0300-5100) for more information on how to configure the Rosemount 2410 's tank database
	Connection to Rosemount 2410 Tank Hub	• Check wiring to the Rosemount 2410 Tank Hub • Check the Rosemount 2410 Tank Hub; check the Error LED or the integral display for information
	Configuration of communication protocol	In TankMaster WinSetup: • Open the Protocols folder and check that the protocol channel is enabled • Check the protocol channel configuration (right-click the protocol channel MbMaster icon, choose the Properties option, and check port, parameters, modem)

Table 5-4: Troubleshooting Chart for Tankbus Related Problems *(continued)*

Symptom	Possible cause	Action
	Legacy system: Connection to 2160 Field Communication Unit (FCU)	• Check that the right field bus port on the 2160 FCU is connected to the Primary bus on the Rosemount 2410 Tank Hub • Check communication port LED:s inside the Field Communication Unit 2160 (FCU)
Activity indicator shows a warning symbol	Communication failure	Check that the Rosemount 2230 is configured in the Rosemount 2410 tank database. See the Rosemount Tank Gauging System Configuration Manual (Document no. 00809-0300-5100) for more information on how to configure the tank database.

5.3.3 FOUNDATION™ Fieldbus troubleshooting

This section covers Rosemount Tank Gauging systems in FOUNDATION Fieldbus networks.

Table 5-5: Troubleshooting Chart for FOUNDATION Fieldbus Related Problems

Symptom	Possible cause	Action
No communication with the Rosemount 2230	No temporary address available in the FOUNDATION Fieldbus segment	There is more than four new devices on the FOUNDATION Fieldbus segment. Wait until a temporary address is available.
	The device address is within a range that is not probed by the Link Active Scheduler (LAS)	Make sure that the device address is scanned by the LAS.
	Missing or too many terminations	Ensure that there are two terminations on the FOUNDATION Fieldbus segment.
Configuration can not be saved	• Write protection switch is set to the ON position • Software Write Protect is enabled	• Check write protection switch on the Rosemount 2230 • Disable software write protect. See Write protection.
Activity indicator shows a warning symbol	• Communication failure • Out of Service (OOS)	• See “No communication with the Rosemount 2230” • Set the device to “Auto” mode

Table 5-5: Troubleshooting Chart for FOUNDATION Fieldbus Related Problems *(continued)*

Symptom	Possible cause	Action
Wrong unit appears on the display	• Incorrect configuration in AMS Device Manager. Measurement unit that was chosen in the Display Setup window does not match selected unit in the Manual Setup window	Ensure that the “Default” option is selected for Unit in the Manual Setup window
Cannot commission the display to FOUNDATION Fieldbus segment	• Missing Device Description (DD)	Add Rosemount 2230 DD to the FF host

5.3.4 Device errors

Table 5-6 shows a list of error messages for the Rosemount 2230. Detailed information about the different error types can be found in Input registers 1100 - 1134 as shown in Table 5-6.

Table 5-6: Device Errors

Message	Description	Action
RAM Error	Input register no. 1100(1). The following bits indicate a serious RAM problem. Bit 0: RAM	Contact Emerson Automation Solutions / Rosemount TankGauging service department.
FPROM Error	Input register no. 1102. The following bits indicate a serious FPROM problem or wrong software versions loaded. Bit 0: Checksum Error Bit 4: Boot Checksum Bit 5: Boot Version (Invalid version number) Bit 6: Application Checksum Bit 7: Application Version (Invalid version number)	

Table 5-6: Device Errors *(continued)*

Message	Description	Action
Hreg Error	Input register no. 1104. The following bits indicate a serious Holding register problem: Bit 0: Checksum Error Bit 1: Limit Error. One or more Holding register is out of range. Bit 2: Version Error. Invalid SW version detected. Bit 3: HREG Read Error. Bit 4: HREG Write Error. Failed to program a cell in the EEPROM. **Note** The Holding register default values are used in case of an error.	
SW Error	Input register no. 1106. Bit 0: Undefined SW error. Bit 1: Task not running Bit 2: Out of stack space Bit 3: Unused RAM access. Bit 4: Divide by zero error Bit 5: Reset counter overflow Bit 15: Simulated SW error	
Other Memory Error	Input register no. 1108. Bit 0: NVRAM_Access	
Display Error	Input register no. 1112.	Not used
Modem Error	Input register no. 1114.	Not used
Internal Temperature Error	Input register no. 1118. Bit 0: Internal temperature out of range Bit 1: Communication error with temp chip Bit 2: Device error	Contact Emerson Automation Solutions / Rosemount TankGauging service department.
Measurement Error	Input register no. 1122.	Not used
Configuration Error	Input register no. 1124. Bit 1: Unit Not Supported	Choose a supported measurement unit

Table 5-6: Device Errors *(continued)*

Message	Description	Action
numHiddenErrors	Input register no. 1132. Number of hidden errors.	Contact Emerson Automation Solutions / Rosemount TankGauging service department.
numOtherErrors	Input register no. 1134. Number of other errors.	

(1) The register number refers to the internal Input Register of the Rosemount 2230 database. Note that Input Register data from the Rosemount 2230 display is temporarily stored in the Input Register database of the Rosemount 2410 Tank Hub. The Input Registers presented in TankMaster WinSetup refer to the internal register area of the Rosemount 2410. Therefore, for tank 1 you will have to add 16000 to the Rosemount 2230 internal register number as given by Table 5-6 in order to find the register presented by WinSetup. For the second and third Rosemount 2230 display you will have to add 18000 and 20000, respectively.

5.3.5 Device warnings

Device warnings are signaled in the Input Register Device Warnings. Warnings are less serious than errors. Detailed information about the different warning types can be found in Input registers 1050 - 1070.

Table 5-7: Device Warnings

Message	Description	Action
RAM warning	Input register no. 1050(1). The application software could not be started. Bit 0: Stack low	Contact Emerson Automation Solutions / Rosemount TankGauging service department.
FPROM warning	Input register no. 1052	Not used
Hreg warning	Input register no. 1054. Bit 0: Default Holding register values used	Contact Emerson Automation Solutions / Rosemount TankGauging service department.
Other memory warning	Input register no. 1056	Not used
Display warning	Input register no. 1058	Not used
Modem warning	Input register no. 1060	Not used
Other hardware warning	Input register no. 1062	Not used
Measurement warning	Input register no. 1064	Not used
ITEMP warning	Input register no. 1066. Bit 0: The internal temperature is out of range	Contact Emerson Automation Solutions / Rosemount TankGauging service department.

Table 5-7: Device Warnings *(continued)*

Message	Description	Action
Software warning	Input register no. 1068. Bit 1: Stack low (less then 10% left of stack) Bit 2: Software startup	
Configuration warning	Input register no. 1070 Bit 11: Invalid Model Code String Bit 12: Invalid Model Code	

(1) The register number refers to the internal Input Register of the Rosemount 2230 database. The Input Registers presented in TankMaster WinSetup refer to the internal register area of the Rosemount 2410 Tank Hub. For tank 1 add 16000 to the Rosemount 2230 internal register number as given by Table 5-7 in order to find the register presented by WinSetup. For the second and third 2230 display you will have to add 18000 and 20000, respectively.

5.3.6 Status information

Status information is available for each measurement variable via the **Status** button in the ***View*** menu.

Figure 5-4: Status Information

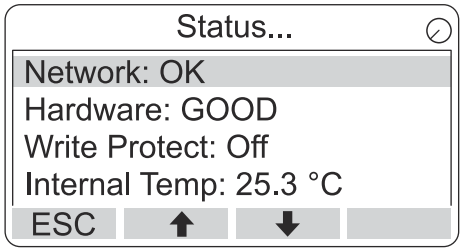


Table 5-8: Status Information

Status	Description
Invalid_TV_Value	Invalid source value.
InvalidSourceConfig	The source value (Tank Variable) is invalid due to one of the following reasons: • Incorrect configuration • Out of service in FF • Incorrect configuration of measurement units
DataFrozen	Tank measurement variable not updated for a configurable time or the source data is frozen.
Saturated Low	Tank measurement variables is outside lower range or saturated.
Saturated High	Tank measurement variables is outside upper range or saturated.
Simulated	The tank measurement variable is simulated.
Manual Value	The tank measurement variable value is manual (constant).
Approved Value	The tank measurement variable value is inside approval range and the device is write protected.
Invalid Value	The tank measurement variable value is invalid.

5.4 Resource block error messages

Error conditions found in the Resource block.

Table 5-9: Resource Block BLOCK_ERR Messages

Condition Name	Description
Block configuration error	Configuration Error is used to indicate that you have selected an item in FEATURES_SEL or CYCLE_SEL that was not set in FEATURES or CYCLE_TYPE, respectively.
Simulate active	This indicates that the simulation switch is in place. This is not an indication that the I/O blocks are using simulated data.
Power up	This bit is set when resource block is in initialization state or at the time of device power up.
Out of Service	The actual mode is out of service.
Device Fault State	Set and cleared using SET_FSTATE and CLR_FSTATE.

5.5 Transducer block error messages

Error conditions found in the transducer block.

Table 5-10: Transducer Block BLOCK_ERR Messages

Condition Name	Description
Other error	Set whenever XD_ERROR is non-zero. See also Viewing device status in AMS Device Manager.
Out of Service	The actual mode is out of service.

5.6 Alerts

The AMS Device Manager lets you view active alerts. The alarm parameters (FD_FAIL_ALM, FD_OFFSPEC_ALM, FD_MAINT_ALM, and FD_CHECK_ALM) contain information regarding some of the device errors. Active error conditions are displayed in the FD_xxx_ACTIVE parameter and can easily be listed by using the Service Tools option in AMS Device Manager.

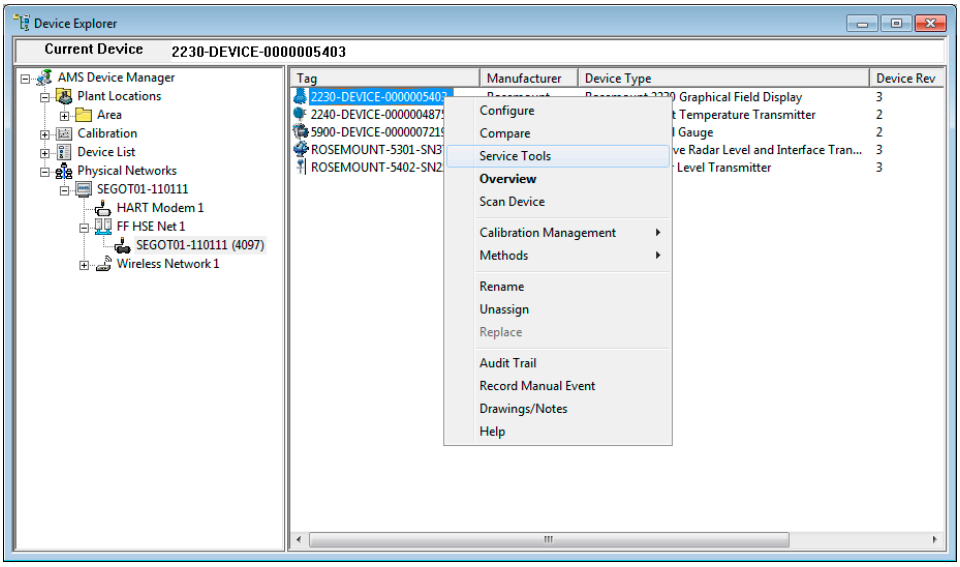
Related information

Field diagnostic alerts

5.6.1 Viewing active alerts in AMS Device Manager

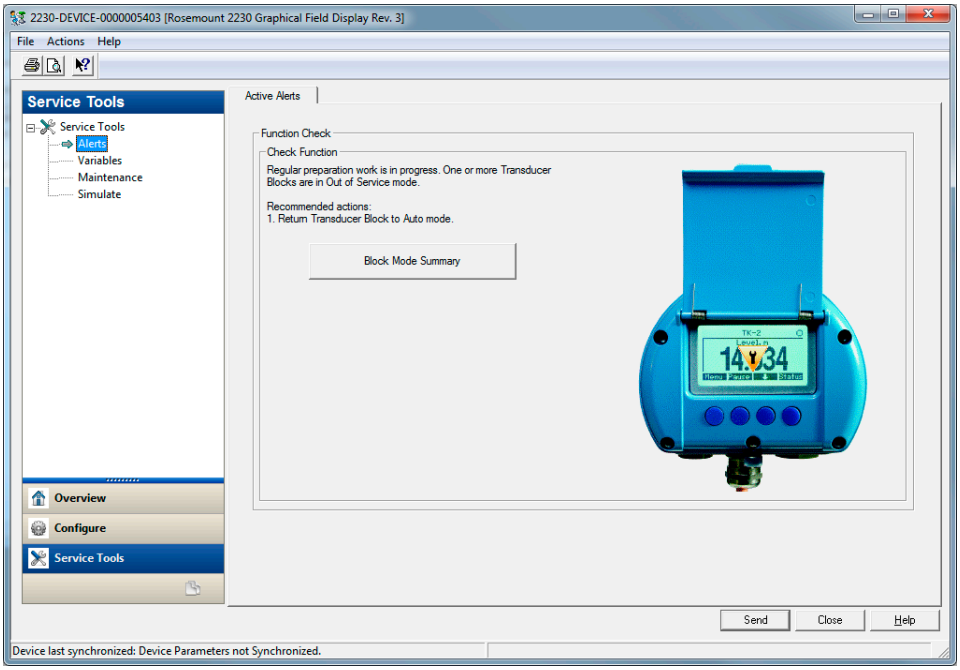
Procedure

1. From the **Start** menu; open the **AMS Device Manager** application.
2. Open the **View → Device Connection View**.
3. Double-click the FF network icon and expand the network node to view the devices.
4. Right-click or double-click the desired device icon to open the list of menu options.



5. Select the **Service Tools** option.

6. In the *Navigation Pane* select the **Alerts** option.

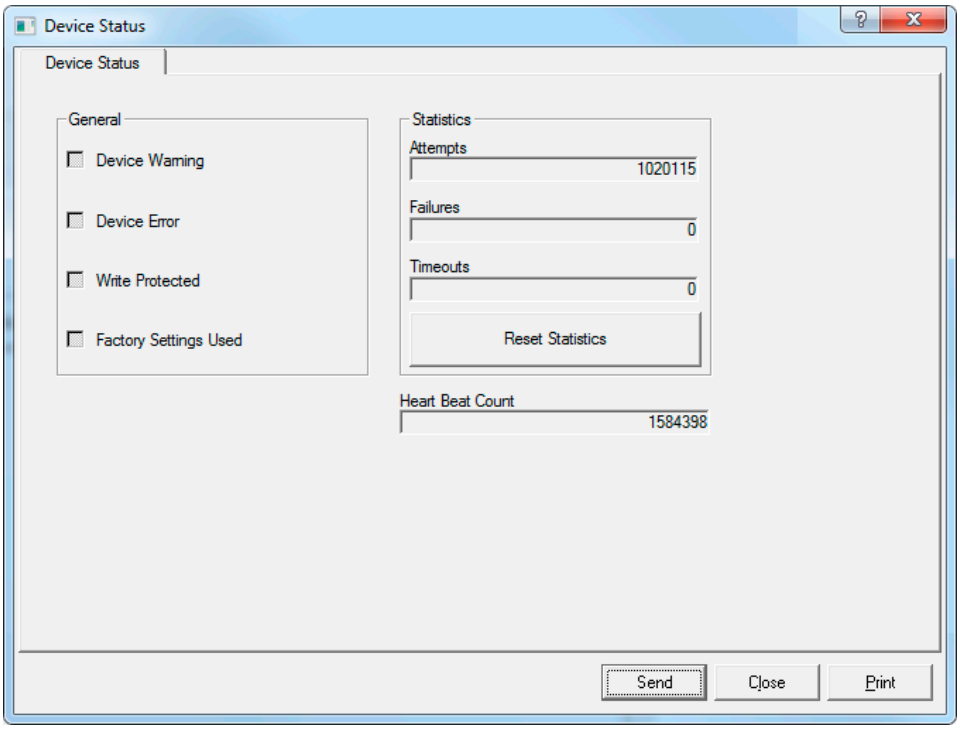


The **Active Alerts** tab shows the alerts that are currently active. All types of alerts can be shown; Failure, Out of Specification, Maintenance Required, and Function Check. A brief description of the error is presented as well as the recommended action.

7. Alerts are listed in order of priority beginning with Failure. By scrolling down you will see Out of Specification, Maintenance Required, and Function Check alerts as well.

8. Click the **Device Status** button (if available) to view a summary of active device information such as errors and warnings.

   The ***Device Status*** window shows Errors, Warnings, and Status information related to the Rosemount 2230. Note that this window does not show active alerts.



Related information

Viewing device status in AMS Device Manager
Configure and enable/disable alerts

5.6.2 Recommended actions

The FD_RECOMMEN_ACT and RECOMMENDED_ACTION parameters display text strings that will give a recommended course of action to take based on which type and which specific event of the alert that is active. Table 5-11 provides recommended actions for Field Diagnostic Alerts as given by the alert default setting for the Rosemount 2230 Display.

Table 5-11: Recommended Actions for Field Diagnostics Alerts

Alert Type	Description	Recommended Action
Failure	Software Failure	1. Restart communication. 2. Load default database to the device and reconfigure the device. 3. Contact Rosemount Tank Gauging Service Department.
	Database Error	1. Restart communication. 2. Load default database to the device. 3. Reconfigure the device.
	Electronics failure - Main Board	Replace the device.
	Electronics failure - FF I/O Board	Replace the device.
	Memory Failure - FF I/O Board	1. Restart communication. 2. If error persists it may indicate a faulty memory chip. Replace the device.
	Internal Communication Failure	1. Restart communication. 2. Replace the device.
Out of Specification	Internal Temperature Out of Limits	Check ambient temperature at installation site.
	Invalid Model Code	Contact Emerson Automation Solutions / Rosemount Tank Gauging service department.
	MAO Fault State Mode enabled	One or several Multiple Analog Output (MAO) blocks are configured with fault-state mode enabled. With this configuration, the output on the display will show the fault-state data not the actual data from the connected devices. Turn fault state mode off in MAO block.
Function Check	Check Function	One or more transducer blocks are in Out of Service mode. Return transducer block to Auto mode.

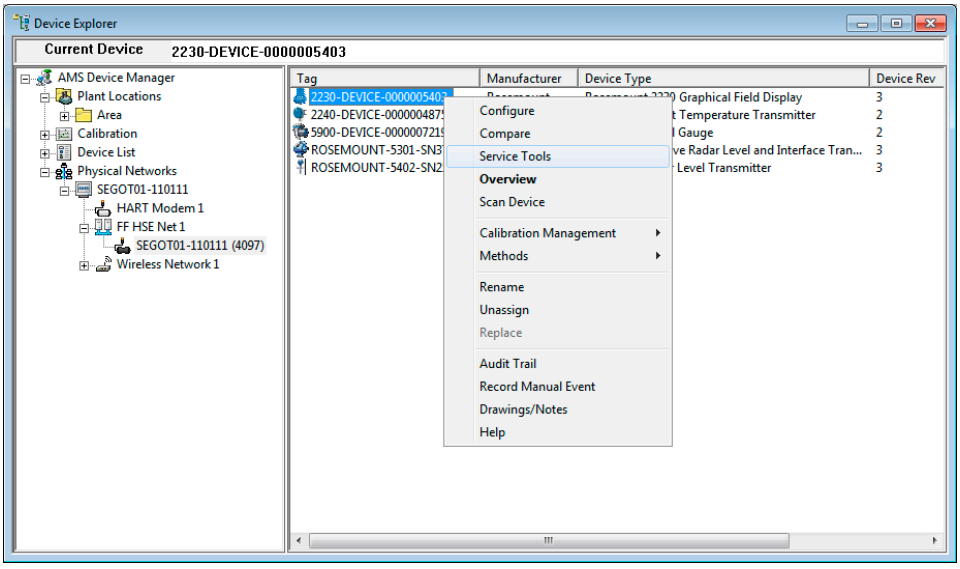
5.7 Service tools in AMS Device Manager

5.7.1 View the service tools in AMS Device Manager

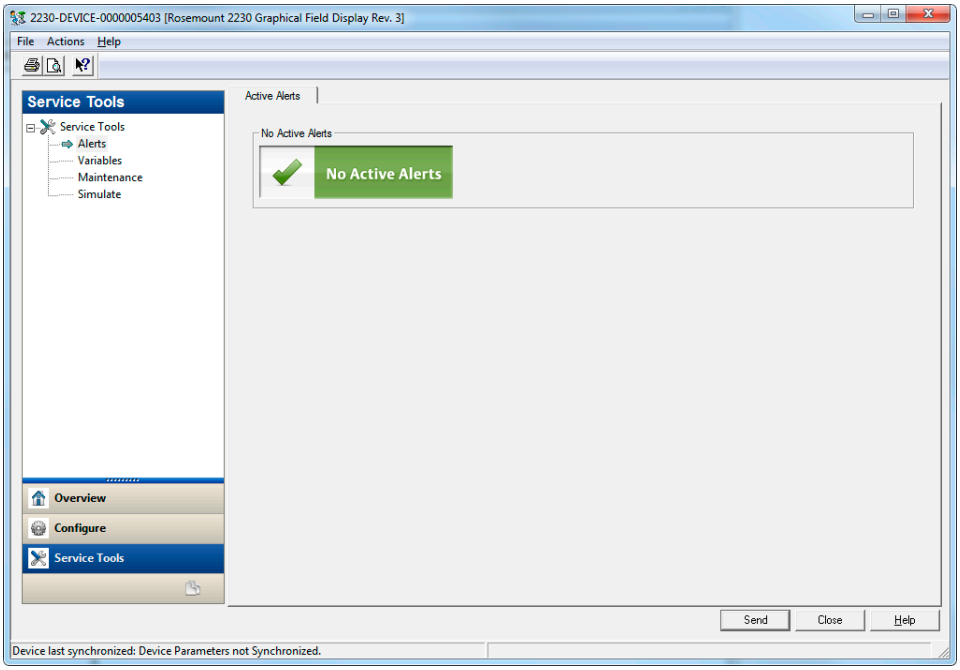
AMS Device Manager supports a number of service functions for the Rosemount 2230 display.

Procedure

1. Start AMS Device Manager and open the **View** → **Device Explorer**.
2. Right-click or double-click the desired device icon to open the list of menu options.



3. Select the **Service Tools** option.



4. In the ***Navigation Pane***, select the desired **Service Tools** option.

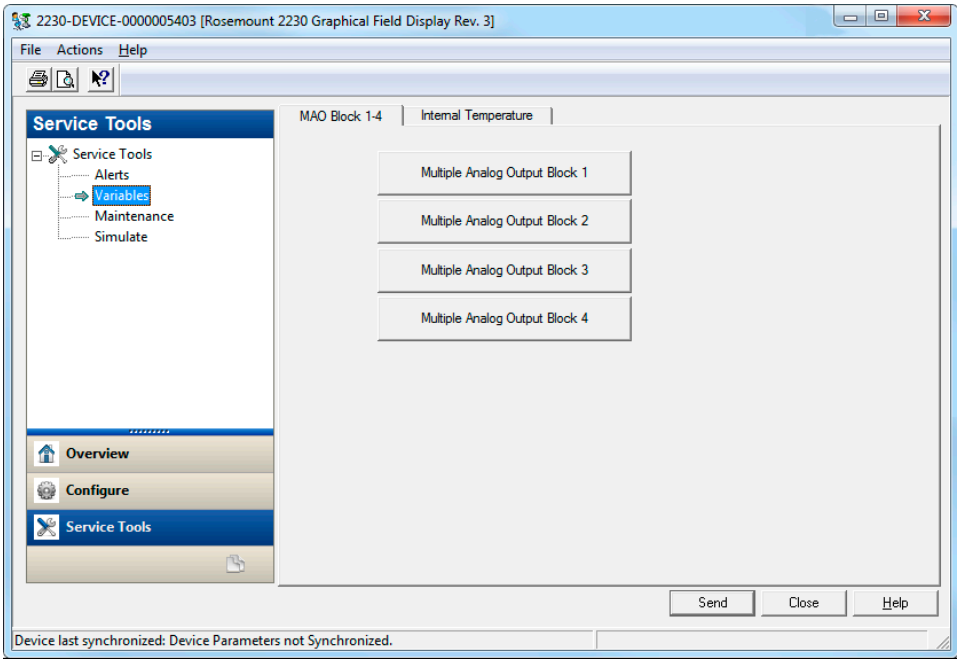
5.7.2 View variables using AMS Device Manager

The Service Tools/Variables option lets you view the current values of the Multiple Analog Output Block inputs as well as the Internal Temperature of the Rosemount 2230 display.

Procedure

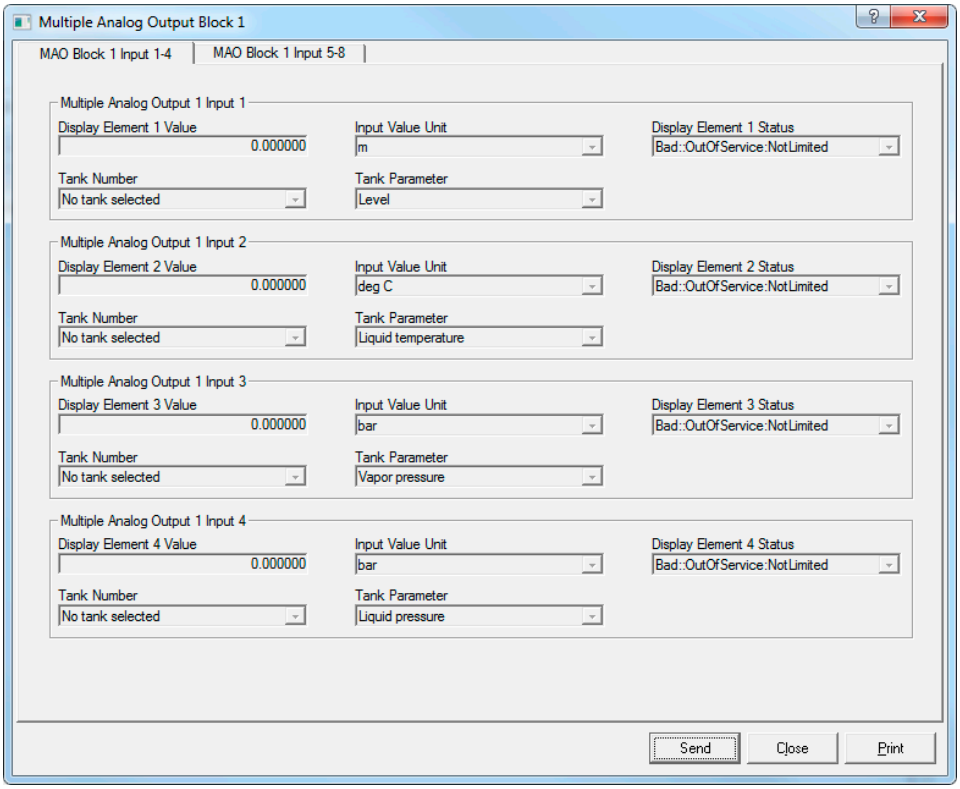
1. In AMS Device Manager, open **Service Tools**.

2. In the ***Navigation Pane***, select the **Variables** option.



3. View the desired variables by selecting the appropriate tab.

   For each MAO Block there is a button which lets you view all the inputs for the selected block.



Related information

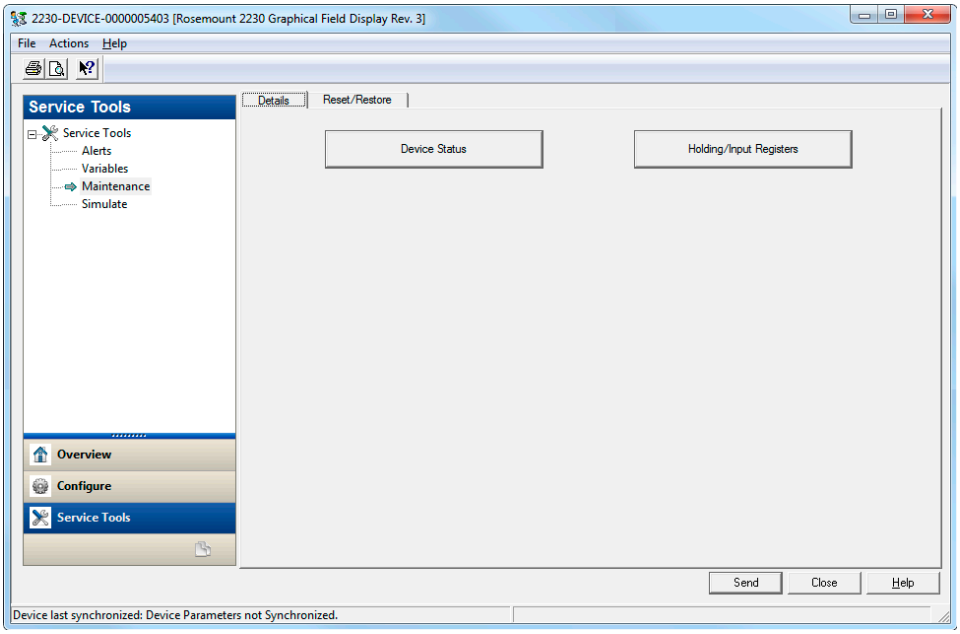
Configure the MAO blocks
View the service tools in AMS Device Manager

5.7.3 Viewing device status in AMS Device Manager

To view the current device status:

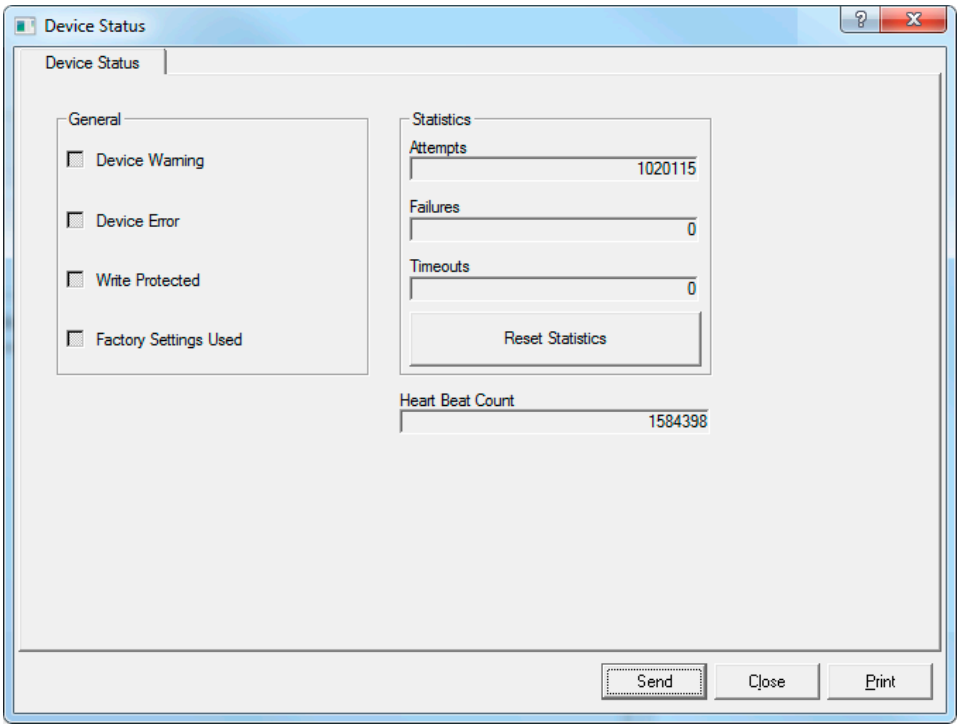
Procedure

1. Start AMS Device Manager and open the **View** → **Device Connection View**.
2. Double-click the FF network icon and expand the network node to view the devices.
3. Right-click or double-click the desired device icon to open the list of menu options.
4. Choose **Service Tools**.
5. In the ***Navigation Pane***, select the **Maintenance** option.



6. Select the **Details** tab and click the **Device Status** button.

   In the ***Device Status*** tab, the current status of the Rosemount 2230 is grouped in separate categories. In the ***General*** pane check boxes indicate the current status of the Rosemount 2230.



Related information

View the service tools in AMS Device Manager
Configure and enable/disable alerts

5.7.4 Viewing input/holding registers using AMS Device Manager

Measurement data is continuously updated in the Rosemount 2230 Input Registers. They can be used for verifying that the Rosemount 2230 works properly and for advanced troubleshooting.

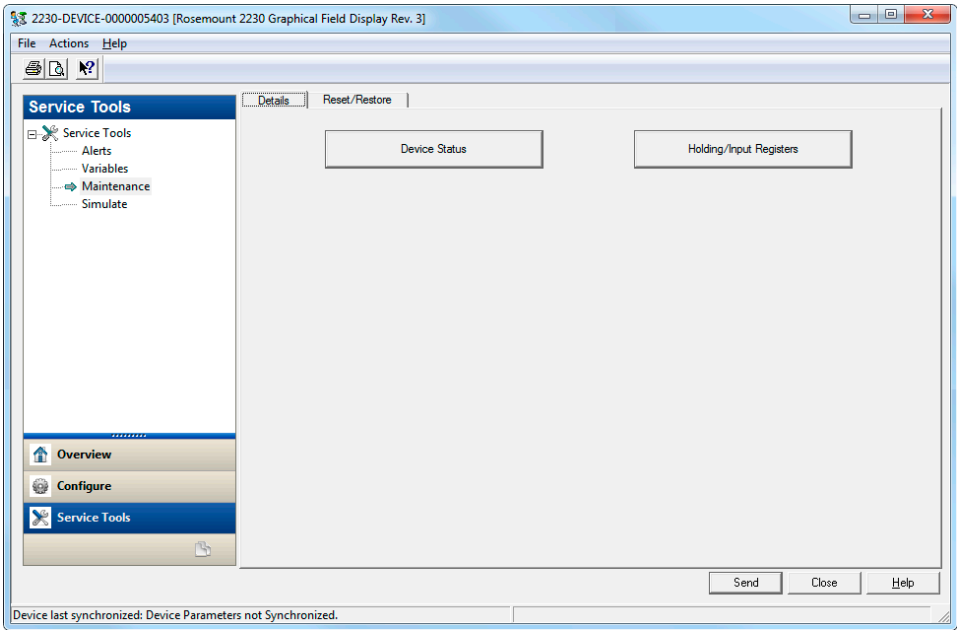
The holding registers store various configuration parameters which are used to control the display presentation.

To view input or holding registers for a Rosemount 2230:

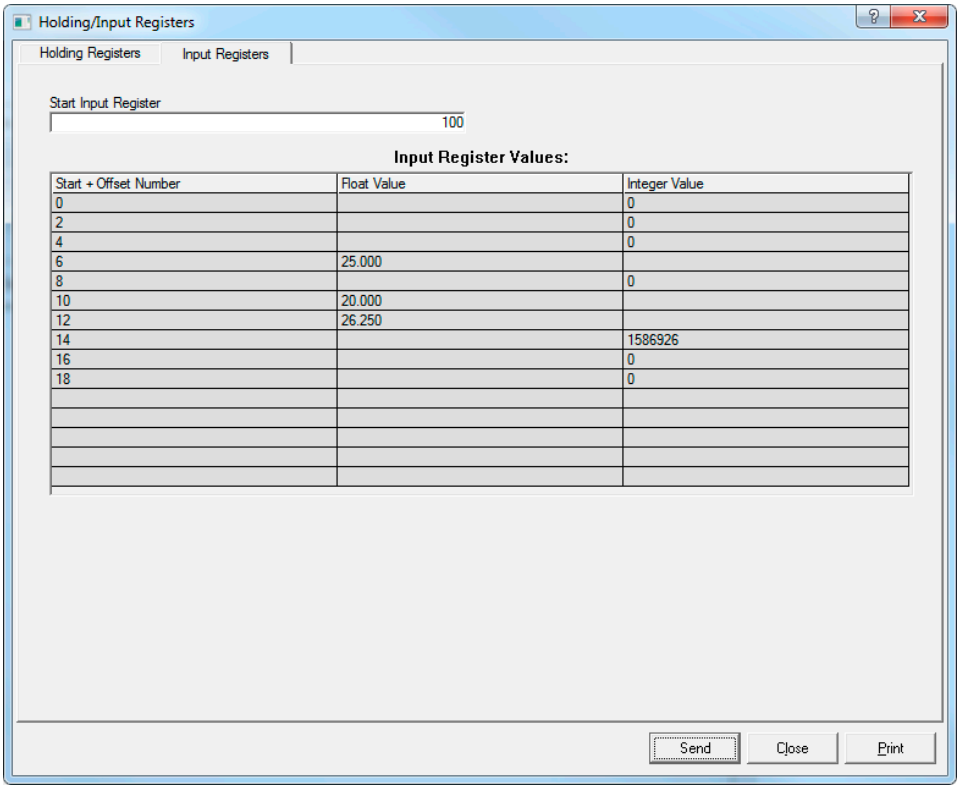
Procedure

1. In AMS Device Manager, open **Service Tools**.

2. In the ***Navigation Pane***, select the **Maintenance** option.



3. Select the **Details** tab.
4. Click the **Holding/Input Registers** button.



5. Select one of the tabs, **Holding Registers** or **Input Registers**, depending on what type of register you are interested in.

6. Type a start value in the **Start Holding/Input Register** field, and click the **Send** button to view the current register values.

⚠ WARNING

Writing to Holding registers may cause the device to change behavior. Make sure systems and people relying on data from the device are made aware of the changed conditions due to this action. Failure to do so could result in death, serious injury and/or property damage.

Related information

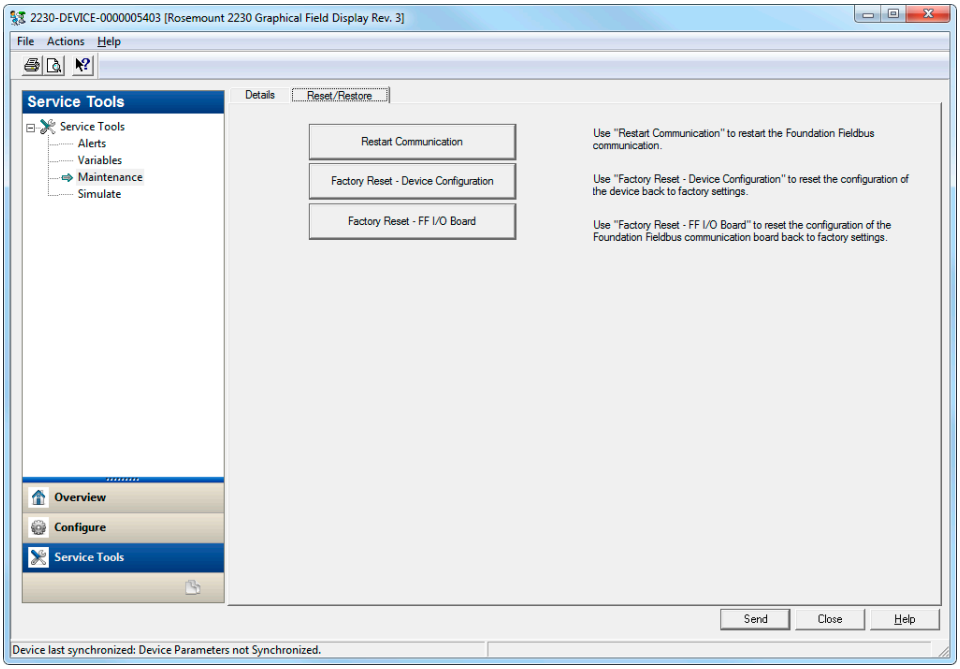
View the service tools in AMS Device Manager

5.7.5 Reset/restore the display using AMS Device Manager

The Service Tools/Maintenance option lets you restart the Rosemount 2230 Display if needed. You may also reset the display to factory configuration.

Procedure

1. In AMS Device Manager, open **Service Tools**.
2. In the ***Navigation Pane***, select the **Maintenance** option.



3. Select the **Reset/Restore** tab.
4. Click the desired button. You may choose between the following options:

Option	Description
Restart communication	Restarts the FOUNDATION Fieldbus communication.

Option	Description
Factory Reset - Device Configuration	This option will reset the device specific configuration to the factory settings.
Factory Reset - FF I/O Board	This option will reset the FOUNDATION Fieldbus communication board to the factory configuration.

5. Click the **Send** button to close the window when finished.

Related information

View the service tools in AMS Device Manager

5.7.6 Simulate field diagnostics alerts with AMS Device Manager

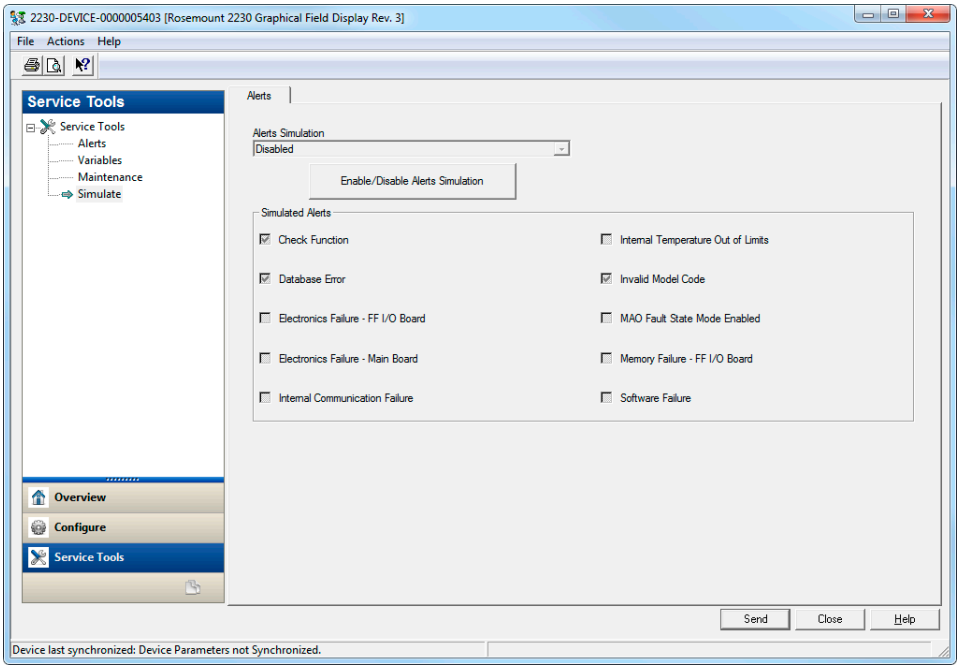
The Service Tools/Maintenance option lets you simulate Field Diagnostics alerts.

Prerequisites

Ensure that the Simulation switch is set to "ON".

Procedure

1. In AMS Device Manager, open **Service Tools**.
2. In the ***Navigation Pane***, select the **Simulate** option.



3. Check the error conditions that you wish to simulate.
4. Click the **Enable/Disable Alerts Simulation** button to enable simulation of alerts.
5. Click the **Send** button to start simulation.

Related information

Write protection
View the service tools in AMS Device Manager

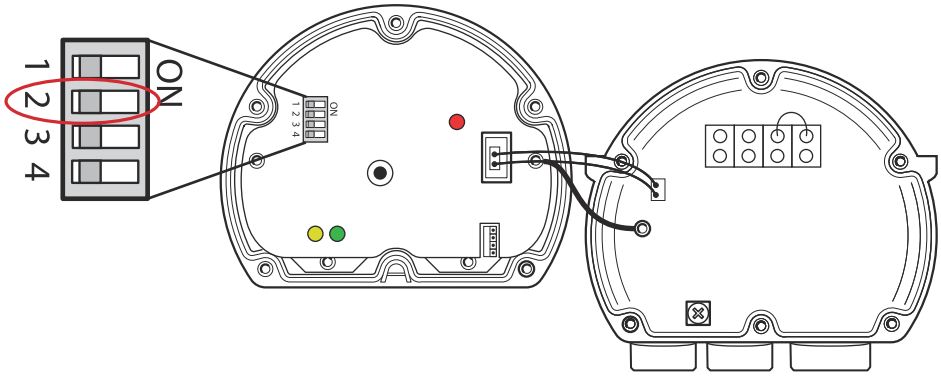
5.8 Write protection

There are two write protection options available for the Rosemount 2230 display: hardware switch and software protection.

Hardware switch

The Write Protect switch enables write protection of configuration data and FOUNDATION™ Fieldbus parameters. The switch is located inside the cover of the Rosemount 2230 display as illustrated in Figure 5-5.

Figure 5-5: Write Protect switch



FOUNDATION Fieldbus

In order to enable the hardware switch the HARDW_LOCK bit in the FEATURE_SEL parameter must be enabled.

Related information

FEATURES and FEATURES_SEL

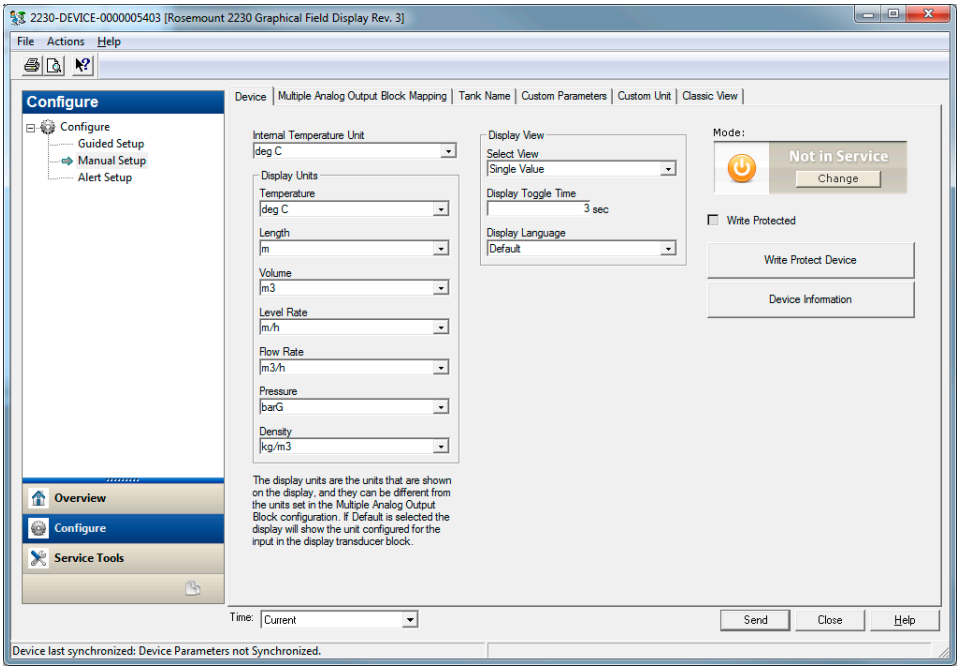
5.8.1 Enable software write protection using AMS Device Manager

A Rosemount 2230 display that is used in FOUNDATION Fieldbus systems can be software write protected in order to prevent changes of the configuration database and fieldbus parameters.

Procedure

1. Open the AMS Device Manager software.
2. Select the **Configure** → **Manual Setup** option.

3. Select the **Device** tab.



4. Enable write protection by clicking the **Write Protect Device** button.

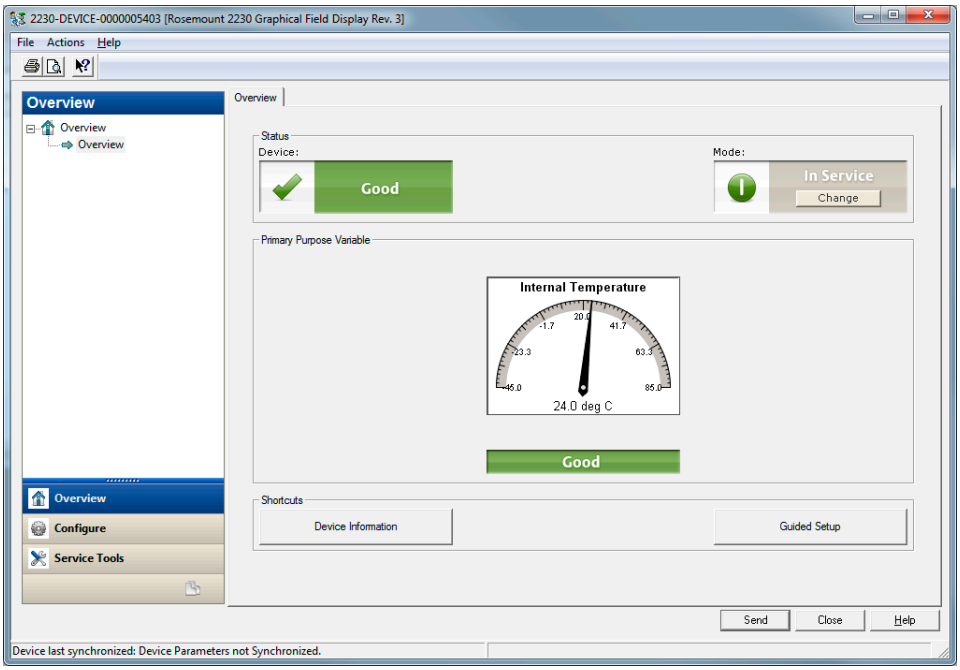
   When the Rosemount 2230 is software write protected, the push buttons on the front of the housing can no longer be used to change device configuration. All holding registers and Fieldbus parameters will be protected. Write protection can be disabled at anytime by clicking the **Write Protect Device** button again.

5.9 View device information using AMS Device Manager

The ***Overview*** window shows information about the current device status and gives you access to more detailed information by pressing the Device Information button.

Procedure

1. From the ***Start*** menu, open the AMS Device Manager application.
2. Open the Device Explorer and select the appropriate network node.
3. Click the right mouse button and choose the **Overview** option.
4. Click the **Device Information** button.



5.9.1 Device information window

In the ***Device Information*** window, the **Identification** and **Revisions** tabs provide information such as model code, software and hardware versions and other device related information. The **Security** tab lets you enable software write protection.

Figure 5-6: Identification

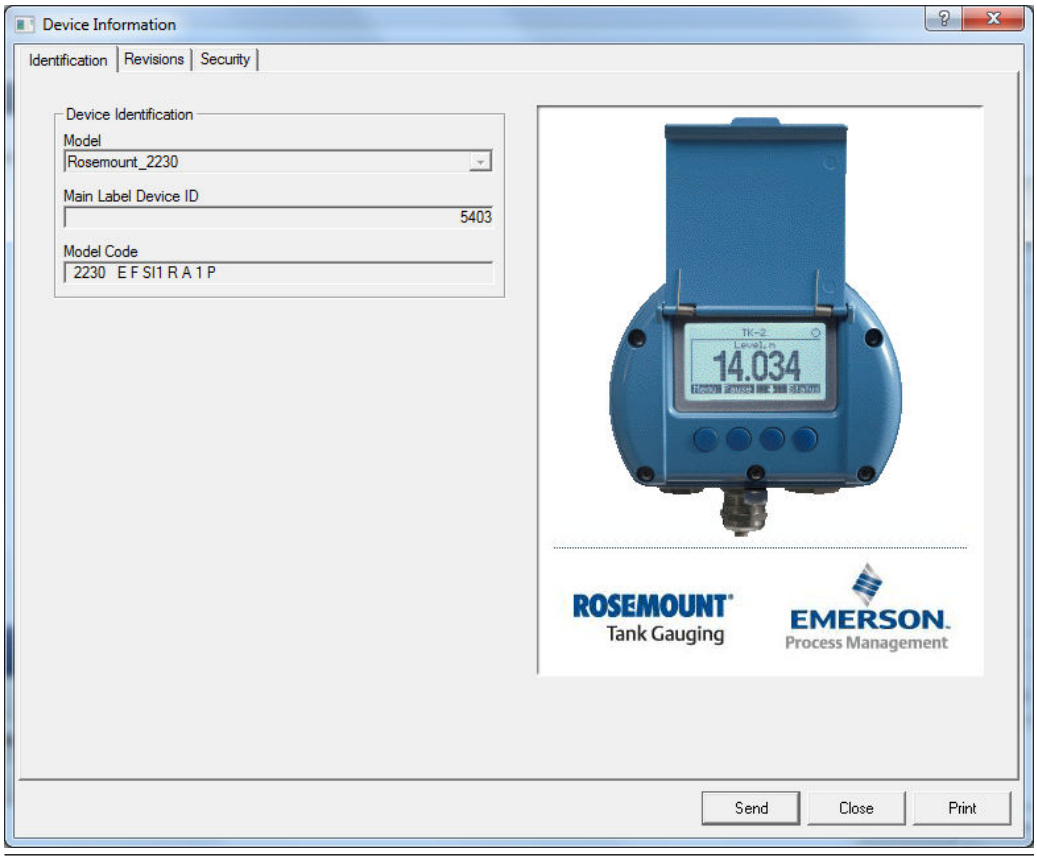


Figure 5-7: Revisions

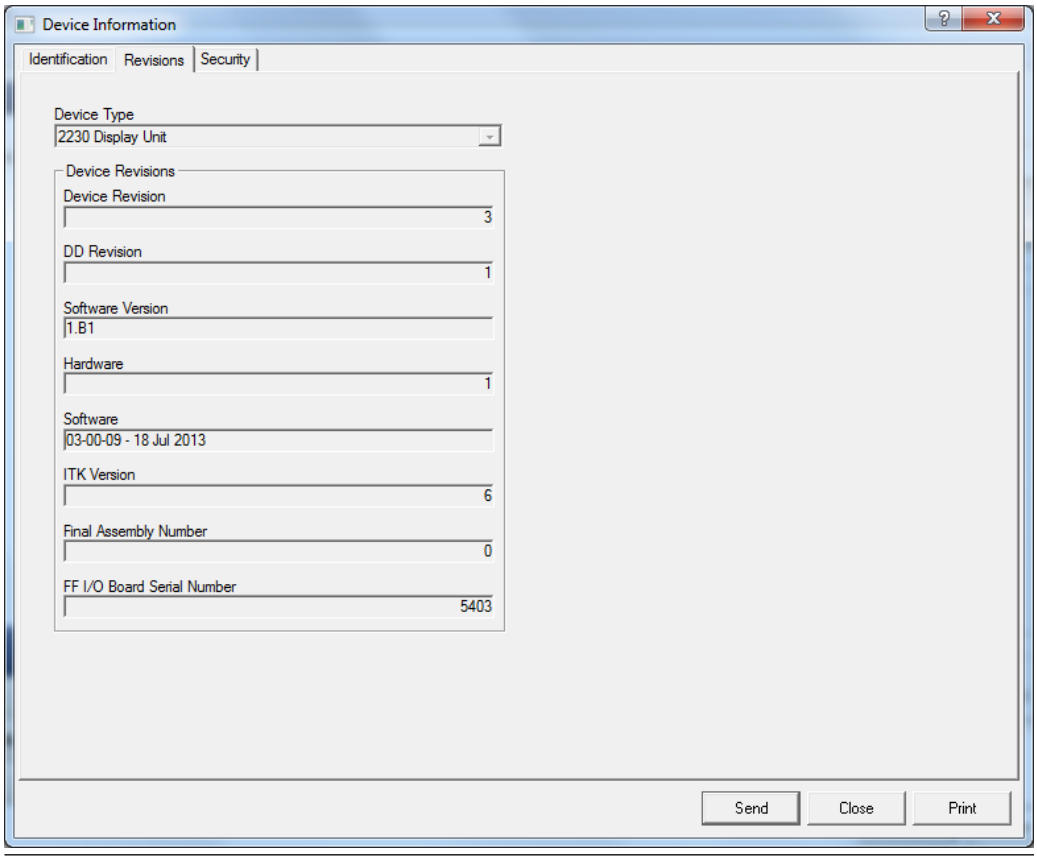
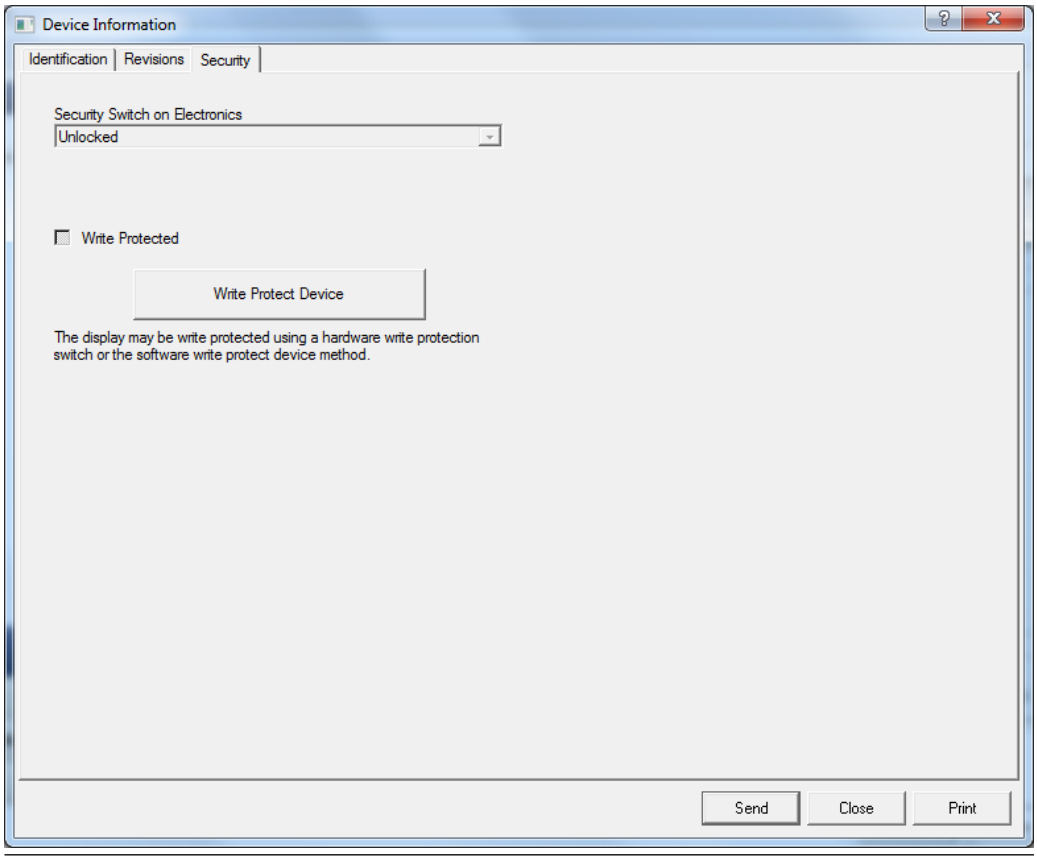


Figure 5-8: Security



A Specifications and reference data

A.1 General

A.1.1 Material selection

Emerson provides a variety of Rosemount products with various product options and configurations including materials of construction that can be expected to perform well in a wide range of applications. The Rosemount product information presented is intended as a guide for the purchaser to make an appropriate selection for the application. It is the purchaser's sole responsibility to make a careful analysis of all process parameters (such as all chemical components, temperature, pressure, flow rate, abrasives, contaminants, etc.), when specifying product, materials, options, and components for the particular application. Emerson is not in a position to evaluate or guarantee the compatibility of the process fluid or other process parameters with the product, options, configuration or materials of construction selected.

A.1.2 Toggle time

The time each value or set of values are displayed: 2-30 s.

A.1.3 Language selection possibilities

English, French, German, Spanish, Italian, Chinese, Portuguese, Japanese, and Russian.

A.1.4 Variables to display

Level, ullage, level rate, signal strength, free water level (FWL), vapor pressure, liquid pressure, air pressure, ambient temperature, vapor average temperature, liquid average temperature, tank temperature, 1-16 spot temperature, observed density, reference density, flow rate, volume (TOV), mass, free water volume (FWV), net standard volume (NSV), middle pressure, tank height, delta level, bargraph level, and bargraph ullage.

A.1.5 Units to display

- Level, free water level, and ullage: meter, millimeter, feet, or imperial 1/16
- Level rate: meter/second, meter/hour, feet/second, or feet/hour
- Flow rate: $meter^3$/hour, liter/minute, barrel/hour, UK gallon/hour, or US gallon/hour
- Total Observed Volume (TOV): $meter^3$, liter, barrel, UK gallon, or US gallon
- Temperature: °F, °C, or °K.
- Pressure: psi, psiA, psiG, bar, barA, barG, atm, Pa, kPa, kPaA, kPaG or kg/cm^2
- Density: kg/m^3, kg/liter, or °API
- Signal strength: mV

- Mass: kg, tonne (metric, short, long), pound

A.1.6 View options

- Select View: “Single Value”, “Two Values”, or “Four Values”. The single value view presents large 25-mm (1-in.) digits
- Options: Units, tanks (all/default/custom), variables to display, toggle time, and display language
- Service: To adjust LCD contrast, show custody transfer view, make a factory reset, or activate an LCD test feature

A.2 Electric

A.2.1 Power supply

Input voltage U_i for FOUNDATION™ Fieldbus:

- 9.0 to 17.5 VDC in FISCO applications
- 9.0 to 30 VDC in Entity applications

A.2.2 Bus current draw

30 mA

A.2.3 Display type

Back-lit LCD monochrome display, 128x64 pixels.

A.2.4 Start-up time

5 seconds

A.2.5 Update rate

New values to display once every two seconds

A.2.6 Response time

< 0.5 seconds from released button to new image

A.2.7 Cable entry (connection/glands)

Two ½ - 14 NPT entries for cable glands or conduits. A metal plug to seal unused port is included in the delivery.

Optional:

- M20×1.5 conduit/cable adapters
- Cable glands in metal (½ - 14 NPT)
- 4-pin male eurofast connector or A size Mini 4-pin male minifast connector

A.2.8 Tankbus cabling

AWG 0.5-1.5 mm^2 (22-16), shielded twisted pairs.

A.2.9 Built-in Tankbus terminator

Yes (to be connected if required)

A.3 FOUNDATION™ Fieldbus characteristics

A.3.1 Polarity sensitive

No

A.3.2 Quiescent current draw

30 mA

A.3.3 Lift-off minimum voltage

9.0 VDC

A.3.4 Device capacitance / inductance

See Product certifications

A.3.5 FOUNDATION Fieldbus class (basic or Link Master)

Link Master (LAS)

A.3.6 Number of available VCRs

Maximum 38. Client and server=20, Publisher=20, Subscribers=20, Source=2, Sink=0.

A.3.7 Links

Maximum 32

A.3.8 Minimum slot time / maximum response delay / minimum intermessage delay

8/5/8

A.3.9 Blocks and execution time

Block	Execution time
1 Resource	N/A
3 Transducer (Main, Register, Display)	N/A
4 Multiple Analog Output (MAO)	15 ms

For more information, see the FOUNDATION™ Fieldbus Blocks Manual.

A.3.10 Instantiation

No

A.3.11 Conforming FOUNDATION™ Fieldbus

ITK 6

A.3.12 Field Diagnostics support (NAMUR 107)

Yes

A.3.13 Action support wizards

Write protect device, factory reset - device configuration, reset statistics, start/stop alerts simulation, restart communication

A.3.14 Advanced diagnostics

Software, memory/database, electronics, internal communication, configuration, model code, internal temperature, MAO fault state

A.4 Mechanical

A.4.1 Housing material

Polyurethane-coated die-cast aluminum

A.4.2 Dimensions (width x height x depth)

150 x 120 x 78 mm (5.9 x 4.7 x 3.1 in.)

A.4.3 Weight

1.3 kg (2.9 lbs)

A.5 Environment

A.5.1 Ambient temperature

-20 to 70 °C (-4 to 158 °F)

A.5.2 Storage temperature

-30 to 85 °C (-22 to 185 °F)

A.5.3 Humidity

0-100% relative humidity, non-condensing.

A.5.4 Ingress protection

IP 66 and 67 (NEMA® 4)

A.5.5 Metrology sealing possibility

Yes

A.5.6 Write protect switch

Yes

A.5.7 Transient / built-in lightning protection

According to IEC 61000-4-5, level 1 kV line to ground.

Complies with IEEE 587 Category B transient protection and IEEE 472 surge protection.

A.6 Installation and configuration

The Rosemount 2230 Graphical Field Display can be installed either on the tank roof or at the foot of the tank for a flexible and convenient read-out of tank data.

Cabling can be daisy-chained via the Rosemount 2230 terminals to other devices on the Tankbus. A terminator is required at each end of the Tankbus to ensure the fieldbus

network will have proper signal levels. Generally, one terminator is at the fieldbus power supply and the other is in the last device in the network.

Rosemount 2230 has a built-in terminator which can be connected if required.

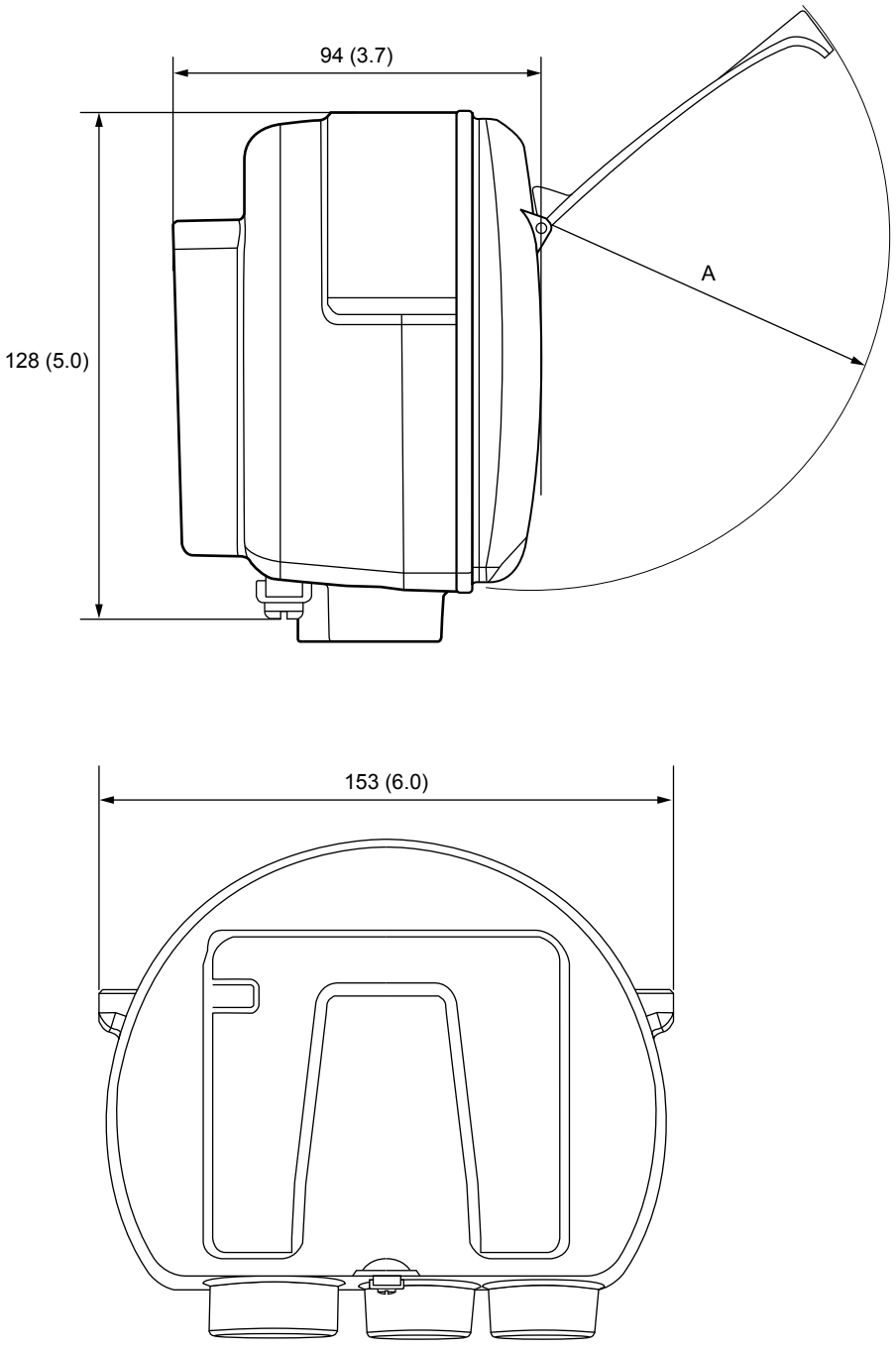
The Rosemount 2230 display can be installed on a wall or a 33.4-60.3 mm (1-2 in.) diameter pipe. It is important to provide space for opening the lid. The hinged lid protects the LCD display from sunlight exposure.

Configuration is done locally via the device's graphical menu and built-in buttons or remotely by using the TankMaster WinSetup software.

For more information, see the Rosemount 2230 Reference Manual or the Rosemount TankMaster System Configuration Manual.

A.7 Dimensional drawings

Figure A-1: Rosemount 2230 Graphical Field Display



A. Radius 93 mm (3.7 in.)

Dimensions are in millimeters (inches).

A.8 Ordering information

A.8.1 Model codes

Model codes contain the details related to each product. Exact model codes will vary; an example of a typical model code is shown in Figure A-2.

Figure A-2: Model Code Example

1. Required model components (choices available on most)
2. Additional options (variety of features and functions that may be added to products)

A.8.2 Rosemount 2230 Graphical Field Display

Required model components

Model

Code	Description
2230	Graphical Field Display

Default language

Code	Description
E	English
S	Spanish
G	German
F	French
P	Portuguese
I	Italian
C	Chinese
J	Japanese
R	Russian

Tankbus: Power and communication

Code	Description
F	Bus powered 2-wire FOUNDATION™ Fieldbus (IEC 61158)

Firmware

Code	Description
S	Standard

Hazardous location certification

Code	Description
I1	ATEX Intrinsic Safety
I2	INMETRO Intrinsic Safety (Brazil)
I4	Japan Intrinsic Safety
I5	FM-US Intrinsic Safety
I6	FM-Canada Intrinsic Safety
I7	IECEx Intrinsic Safety
IM	Technical Regulations Customs Union (EAC) Intrinsic Safety

Code	Description
IP(1)	KC Intrinsic Safety (South Korea)
IW	CCOE/PESO Intrinsic Safety (India)
NA	None

(1) Requires Custody transfer type approval code R or 0.

Custody transfer type approval

Requires Rosemount 5900S Radar Level Gauge and Rosemount 2410 Tank Hub with corresponding Custody transfer type approval.

Code	Description
R	OIML R 85 edition 2008
C	PTB Eich (Germany)
K(1)	GOST (Kazakhstan)
L	LNE (France)
N	NMi (The Netherlands)
O	ONML (Algeria)
S(1)	GOST (Russia)
T	ANM (Tunisia)
0	None

(1) Requires Hazardous location certification code IM.

Housing

Code	Description
A	Standard enclosure (polyurethane-covered aluminium), IP 66/67

Cable/conduit connections

Code	Description
1	½–14 NPT, female thread (includes 1 plug)
2	M20 x 1.5 adapters, female thread (includes 2 adapters and 1 plug)
G(1)	Metal cable glands (½–14 NPT) (includes 2 glands and 1 plug)
E	eurofast® male connector (includes 1 connector and 1 plug)
M	minifast® male connector (includes 1 connector and 1 plug)

(1) Minimum temperature -20 °C (-4 °F). ATEX/IECEx Exe approved.

Mechanical installation

Code	Description
W	Installation kit for wall mounting
P	Installation kit for wall and pipe mounting (1-2 in. vertical and horizontal pipes)

Additional options

Tag plate

Code	Description
ST	Engraved SST tag plate (tag shall be submitted with order)

Extended product warranty

Rosemount extended warranties have a limited warranty of three or five years from date of shipment.

Code	Description
WR3	3-year limited warranty
WR5	5-year limited warranty

B Product certifications

Rev 5.4

B.1 European directive information

The most recent revision of the EU Declaration of Conformity can be found at Emerson.com/Rosemount.

B.2 Ordinary location certification

As standard, the transmitter has been examined and tested to determine that the design meets the basic electrical, mechanical, and fire protection requirements by a nationally recognized test laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

B.3 Installing equipment in North America

The US National Electrical Code® (NEC) and the Canadian Electrical Code (CEC) permit the use of Division marked equipment in Zones and Zone marked equipment in Divisions. The markings must be suitable for the area classification, gas, and temperature class. This information is clearly defined in the respective codes.

B.4 North America

B.4.1 I5 USA Intrinsic Safety

Certificate FM17US0035X

Standards
FM Class 3600 – 2011
FM Class 3610 – 2010
FM Class 3810 – 2005
ANSI/NEMA 250 – 2008
ANSI/IEC 60529 – 2004
ANSI/ISA 61010-1:2004
ANSI/ISA 60079-0 – 2013
ANSI/ISA 60079-11 – 2013

Markings
IS/I,II,III/1/ABCDEFG/T4 Ta = -50 °C to +70 °C
Control Dwg D9240040-949
I/0/AEx ia IIC Ga T4 Ta = -50 °C to +70 °C
Control Dwg D9240040-949
Type 4X; IP66, IP67

	Ui	Ii	Pi	Ci	Li
Entity parameters	30 V	300 mA	1.3 W	2.1 nF	1.1 µH
FISCO parameters	17.5V	380 mA	5.32 W	N/A	N/A

Specific Conditions for Safe Use (X):

1. The non-metallic parts incorporated in the enclosure of this equipment may generate an ignition-capable level of electrostatic charge. Therefore particularly when it is used for applications that specifically require Division 1 and Group II, Zone 0 located equipment, the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. Additionally, the equipment shall only be cleaned with a damp cloth.
2. The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.
3. The Rosemount 2230 Graphical Field Display will not pass the 500Vrms dielectric strength test and this must be taken into account during installation.
4. To maintain ingress protection ratings IP66 and IP67, PTFE tape or pipe dope is required for cable entries and blanking plugs.

B.4.2 I6 Canada Intrinsic Safety

Certificate FM17CA0019X

Standards CAN/CSA C22.2 No.157-1992 (R2012)
CAN/CSA C22.2 No. 1010.1:2004
CAN/CSA C22.2 No. 25-1966 (R2014)
CAN/CSA C22.2 No.94-M91:1991 (R2011)
CAN/CSA-C22.2 NO. 60529-2005 (R2015)
CAN/CSA C22.2 No. E60079-0:2011
CAN/CSAC22.2 No. E60079-11:2011

Markings IS/I,II,III/1/ABCDEFG/T4 Ta = -50 °C to +70 °C
Control Drawing D9240040-949
I/0/Ex ia IIC Ga T4 Ta = -50 °C to +70 °C
Control Drawing D9240040-949
Type 4X; IP66, IP67

	Ui	Ii	Pi	Ci	Li
Entity parameters	30 V	300 mA	1.3 W	2.1 nF	1.1 µH
FISCO parameters	17.5V	380 mA	5.32 W	N/A	N/A

Specific Conditions for Safe Use (X):

1. The non-metallic parts incorporated in the enclosure of this equipment may generate an ignition-capable level of electrostatic charge. Therefore particularly when it is used for applications that specifically require Division 1 and Group II, Zone 0 located equipment, the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. Additionally, the equipment shall only be cleaned with a damp cloth.
2. The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.
3. The Rosemount 2230 Graphical Field Display will not pass the 500Vrms dielectric strength test and this must be taken into account during installation.
4. To maintain ingress protection ratings IP66 and IP67, PTFE tape or pipe dope is required for cable entries and blanking plugs.

B.5 Europe

B.5.1 I1 ATEX Intrinsic Safety

Certificate FM10ATEX0046X

Standards EN 60079-0:2012+A11:2013, EN 60079-11:2012, EN 60529:2013

Markings II 1 G Ex ia IIC Ga T4 Ta = -50 °C to +70 °C; IP66, IP67

	Ui	Ii	Pi	Ci	Li
Entity parameters	30 V	300 mA	1.3 W	2.1 nF	1.1 µH
FISCO parameters	17.5V	380 mA	5.32 W	N/A	N/A

Specific Conditions for Safe Use (X):

1. The non-metallic parts incorporated in the enclosure of this equipment may generate an ignition-capable level of electrostatic charge. Therefore particularly when it is used for applications that specifically require Division 1 and Group II, Zone 0 located equipment, the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. Additionally, the equipment shall only be cleaned with a damp cloth.
2. The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.
3. The Rosemount 2230 Graphical Field Display will not pass the 500Vrms dielectric strength test and this must be taken into account during installation.
4. To maintain ingress protection ratings IP66 and IP67, PTFE tape or pipe dope is required for cable entries and blanking plugs.

B.6 International

B.6.1 I7 IECEx Intrinsic Safety

Certificate IECEx FMG 10.0021X

Standards IEC 60079-0:2011, IEC 60079-11:2011

Markings Ex ia IIC Ga T4 (-50 °C ≤ Ta ≤ +70 °C); IP66/IP67

	Ui	Ii	Pi	Ci	Li
Entity parameters	30 V	300 mA	1.3 W	2.1 nF	1.1 µH
FISCO parameters	17.5V	380 mA	5.32 W	N/A	N/A

Specific Conditions for Safe Use (X):

1. The non-metallic parts incorporated in the enclosure of this equipment may generate an ignition-capable level of electrostatic charge. Therefore particularly when it is used for applications that specifically require Division 1 and Group II, Zone 0 located equipment, the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. Additionally, the equipment shall only be cleaned with a damp cloth.
2. The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.
3. The Rosemount 2230 Graphical Field Display will not pass the 500Vrms dielectric strength test and this must be taken into account during installation.
4. To maintain ingress protection ratings IP66 and IP67, PTFE tape or pipe dope is required for cable entries and blanking plugs.

B.7 Brazil

B.7.1 I2 INMETRO Intrinsic Safety

Certificate UL-BR 17.0949X

Standards ABNT NBR IEC 60079-0:2013, ABNT NBR IEC 60079-11:2013

Markings Ex ia IIC T4 Ga (-50 °C ≤ Tamb ≤ + 70 °C)

	Ui	Ii	Pi	Ci	Li
Entity parameters	30 V	300 mA	1.3 W	2.1 nF	1.1 µH
FISCO parameters	17.5V	380 mA	5.32 W	N/A	N/A

Special Condition for Safe Use (X):

1. See certificate for special condition.

B.8 China

B.8.1 I3 NEPSI Intrinsic Safety

Certificate GYJ 20.1391X (CCC)

Standards GB 3836.1 – 2010, GB 3836.4 – 2010, GB 3836.20 – 2010

Markings Ex ia IIC T4 Ga (-50 °C ≤ Tamb ≤ + 70 °C)

	Ui	Ii	Pi	Ci	Li
Entity parameters	30 V	300 mA	1.3 W	2.1 nF	1.1 µH
FISCO parameters	17.5V	380 mA	5.32 W	N/A	N/A

Special Condition for Safe Use (X):

1. See certificate for special condition.

B.9 Technical Regulations Customs Union (EAC)

TR CU 020/2011 “Electromagnetic Compatibility of Technical Products”

TR CU 032/2013 “On safety of equipment and vessels under pressure”

Certificate RU C-US.АД07.B.00770-19

TR CU 012/2011 “On safety of equipment intended for use in explosive atmospheres”

B.9.1 IM EAC Intrinsic Safety

Certificate RU C-SE.AA87.B.00348

Markings 0Ex ia IIC T4 Ga X
Ta = -50 °C to +70 °C
IP66, IP67

	Ui	Ii	Pi	Ci	Li
Entity parameters	30 V	300 mA	1.3 W	2.1 nF	1.1 µH
FISCO parameters	17.5V	380 mA	5.32 W	N/A	N/A

B.10 Japan

B.10.1 I4 Japan Intrinsic Safety

Certificate CML 17JPN2203X

Markings Ex ia IIC T4 Ga ; FISCO (-50 °C ≤ Ta ≤ +70 °C)

	Ui	Ii	Pi	Ci	Li
Entity parameters	30 V	300 mA	1.3 W	2.1 nF	1.1 µH
FISCO parameters	17.5V	380 mA	5.32 W	N/A	N/A

B.11 Republic of Korea

B.11.1 IP Korea Intrinsic Safety

Certificate KTL 11-KB4BO-0073X

Markings Ex ia IIC T4 (-50 °C ≤ Ta ≤ +70 °C)

	Ui	Ii	Pi	Ci	Li
Entity parameters	30 V	300 mA	1.3 W	2.1 nF	1.1 µH
FISCO parameters	17.5V	380 mA	5.32 W	N/A	N/A

B.12 India

B.12.1 India Intrinsic Safety

Certificate P488693/1; P428259/1

Markings Ex ia IIC T4 Ga

B.13 United Arab Emirates

B.13.1 UAE Intrinsic Safety

Certificate 20-11-28736/Q20-11-001012

Markings same as IECEx (I7)

C FOUNDATION™ Fieldbus Block Information

C.1 Resource block parameters

This section contains information on the resource block of the Rosemount 2230.

The resource block defines the physical resources of the device. The resource block also handles functionality that is common across multiple blocks. The block has no linkable inputs or outputs.

Table C-1: Resource Block Parameters

Index Number	Parameter	Description
01	ST_REV	The revision level of the static data associated with the function block.
02	TAG_DESC	The user description of the intended application of the block.
03	STRATEGY	The strategy field can be used to identify grouping of blocks.
04	ALERT_KEY	The identification number of the plant unit.
05	MODE_BLK	The actual, target, permitted, and normal modes of the block: Target: The mode to “go to” Actual: The mode the “block is currently in” Permitted: Allowed modes that target may take on Normal: Most common mode for actual
06	BLOCK_ERR	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
07	RS_STATE	State of the function block application state machine.
08	TEST_RW	Read/write test parameter - used only for conformance testing.
09	DD_RESOURCE	String identifying the tag of the resource which contains the Device Description for this resource.
10	MANUFAC_ID	Manufacturer identification number – used by an interface device to locate the DD file for the resource.
11	DEV_TYPE	Manufacturer’s model number associated with the resource - used by interface devices to locate the DD file for the resource.
12	DEV_REV	Manufacturer revision number associated with the resource - used by an interface device to locate the DD file for the resource.

Table C-1: Resource Block Parameters *(continued)*

Index Number	Parameter	Description
13	DD_REV	Revision of the DD associated with the resource - used by an interface device to locate the DD file for the resource. The DD_REV specifies the minimum DD revision that is compatible with the device (within the same device revision). A vendor can release an updated DD with the DD_REVISION higher than the DD_REV. This allows a vendor to release an updated DD files set that will be compatible with an existing device revision in the field. The host can always load a higher DD_REVISION for a given DEV_REV/DEV_REVISION. As per Foundation requirement the DD_REV will always be 01.
14	GRANT_DENY	Options for controlling access of host computers and local control panels to operating, tuning, and alarm parameters of the block. Not used by device.
15	HARD_TYPES	The types of hardware available as channel numbers.
16	RESTART	Allows a manual restart to be initiated. Several degrees of restart are possible. They are the following: 1 Run – is the passive state of the parameter 2 Restart resource – not used 3 Restart with defaults – intended to reset parameters to default values, i.e. their value before any configuration was done 4 Restart processor – does a warm start of CPU
17	FEATURES	Used to show supported resource block options. The supported features are: • HARD_WRITE_LOCK_SUPPORT • SOFT_WRITE_LOCK_SUPPORT • REPORT_SUPPORT • UNICODE_SUPPORT • MULTI_BIT ALARM • FAULT_STATE_SUPPORT
18	FEATURES_SEL	Used to select resource block options.
19	CYCLE_TYPE	Identifies the block execution methods available for this resource.
20	CYCLE_SEL	Used to select the block execution method for this resource. The Rosemount 2230 supports the following: Scheduled: Blocks are only executed based on the function block schedule. Block Execution: A block may be executed by linking to another blocks completion.
21	MIN_CYCLE_T	Time duration of the shortest cycle interval of which the resource is capable.
22	MEMORY_SIZE	Available configuration memory in the empty resource. To be checked before attempting a download.

Table C-1: Resource Block Parameters *(continued)*

Index Number	Parameter	Description
23	NV_CYCLE_T	Minimum time interval specified by the manufacturer for writing copies of NV parameters to non-volatile memory. Zero means it will never be automatically copied. At the end of NV_CYCLE_T, only those parameters which have changed need to be updated in NVRAM.
24	FREE_SPACE	Percent of memory available for further configuration. Zero in a pre-configured device.
25	FREE_TIME	Percent of the block processing time that is free to process additional blocks.
26	SHED_RCAS	Time duration at which to give up on computer writes to function block RCas locations. Shed from RCas shall never happen when SHED_ROUT = 0
27	SHED_ROUT	Time duration at which to give up on computer writes to function block ROut locations. Shed from ROut shall never happen when SHED_ROUT = 0
28	FAULT_STATE	Condition set by loss of communication to an output block, fault promoted to an output block or physical contact. When FAIL_SAFE condition is set, then output function blocks will perform their FAIL_SAFE actions.
29	SET_FSTATE	Allows the FAIL_SAFE condition to be manually initiated by selecting Set.
30	CLR_FSTATE	Writing a Clear to this parameter will clear the device FAIL_SAFE if the field condition has cleared.
31	MAX_NOTIFY	Maximum number of unconfirmed notify messages possible.
32	LIM_NOTIFY	Maximum number of unconfirmed alert notify messages allowed.
33	CONFIRM_TIME	The time the resource will wait for confirmation of receipt of a report before trying again. Retry will not happen when CONFIRM_TIME=0.
34	WRITE_LOCK	When hardware write protection is selected, WRITE_LOCK becomes an indicator of the jumper setting and is unavailable for software write protection. When software write lock is selected, and WRITE_LOCK is set, no writings from anywhere else are allowed, except to clear WRITE_LOCK. Block input will continue to be updated.
35	UPDATE_EVT	This alert is generated by any change to the static data.
36	BLOCK_ALM	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alarm is entered in the subcode field. The first alarm to become active will set the Active status in the Status parameter. As soon as the Unreported status is cleared by the alarm reporting task, another block alarm may be reported without clearing the Active status, if the subcode has changed.
37	ALARM_SUM	The current alarm status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
38	ACK_OPTION	Selection of whether alarms associated with the function block will be automatically acknowledged.

Table C-1: Resource Block Parameters *(continued)*

Index Number	Parameter	Description
39	WRITE_PRI	Priority of the alarm generated by clearing the write lock.
40	WRITE_ALM	This alert is generated if the write lock parameter is cleared.
41	ITK_VER	Major revision number of the inter operability test case used in certifying this device as interoperable. The format and range are controlled by the Fieldbus Foundation.
42	FD_VER	A parameter equal to the value of the major version of the Field Diagnostics specification that this device was designed to.
43	FD_FAIL_ACTIVE	This parameter reflects the error conditions that are being detected as active as selected for this category. It is a bit string, so that multiple conditions may be shown.
44	FD_OFFSPEC_ACTIVE	
45	FD_MAINT_ACTIVE	
46	FD_CHECK_ACTIVE	
47	FD_FAIL_MAP	This parameter maps conditions to be detected as active for this alarm category. Thus the same condition may be active in all, some, or none of the 4 alarm categories.
48	FD_OFFSPEC_MAP	
49	FD_MAINT_MAP	
50	FD_CHECK_MAP	
51	FD_FAIL_MASK	This parameter allows the user to suppress any single or multiple conditions that are active, in this category, from being broadcast to the host through the alarm parameter. A bit equal to '1' will mask i.e. inhibit the broadcast of a condition, and a bit equal to '0' will unmask i.e. allow broadcast of a condition.
52	FD_OFFSPEC_MASK	
53	FD_MAINT_MASK	
54	FD_CHECK_MASK	
55	FD_FAIL_ALM	This parameter is used primarily to broadcast a change in the associated active conditions, which are not masked, for this alarm category to a Host System.
56	FD_OFFSPEC_ALM	
57	FD_MAINT_ALM	
58	FD_CHECK_ALM	
59	FD_FAIL_PRI	This parameter allows the user to specify the priority of this alarm category.
60	FD_OFFSPEC_PRI	
61	FD_MAINT_PRI	
62	FD_CHECK_PRI	
63	FD_SIMULATE	This parameter allows the conditions to be manually supplied when simulation is enabled. When simulation is disabled both the diagnostic simulate value and the diagnostic value tracks the actual conditions. The simulate jumper is required for simulation to be enabled and while simulation is enabled the recommended action will show that simulation is active. Elements: see Table C-2.

Table C-1: Resource Block Parameters *(continued)*

Index Number	Parameter	Description
64	FD_RECOMMEN_ACT	This parameter is a device enumerated summarization of the most severe condition or conditions detected. The DD help should describe by enumerated action, what should be done to alleviate the condition or conditions. 0 is defined as Not Initialized, 1 is defined as No Action Required, all others defined by manufacturer.
65	FD_EXTENDED_ACTIVE	An optional parameter or parameters to allow the user finer detail on conditions causing an active condition in the FD_*_ACTIVE parameters.
66	FD_EXTENDED_MAP	An optional parameter or parameters to allow the user finer control on enabling conditions contributing to the conditions in FD_*_ACTIVE parameters.
67	COMPATIBILITY_REV	This parameter is used when replacing field devices. The correct value of this parameter is the DEV_REV value of the replaced device.
68	HARDWARE_REVISION	Hardware revision.
69	SOFTWARE_REV	Software revision of source code with resource block.
70	PD_TAG	PD tag description of device.
71	DEV_STRING	This is used to load new licensing into the device. The value can be written but will always read back with a value of 0.
72	DEV_OPTIONS	Indicates which miscellaneous device licensing options are enabled.
73	OUTPUT_BOARD_SN	Output board serial number. For the Rosemount 2230 this is the same as Main Label Device ID which can be found on the main label that is attached to the housing.
74	FINAL_ASSY_NUM	Final assembly number given by manufacturer.
75	DOWNLOAD_MODE	Gives access to the boot block code for over-the-wire downloads. 0 = Uninitialized 1 = Run mode 2 = Download mode
76	HEALTH_INDEX	Parameter representing the overall health of the device, 100 being perfect and 1 being non-functioning. The value is based on the active PWA alarms.
77	FAILED_PRI	Designates the alarming priority of the FAILED_ALM and also used as switch b/w FD and legacy PWA. If value is greater than or equal to 1 then PWA alerts will be active in device else device will have FD alerts.
78	RECOMMENDED_ACTION	Enumerated list of recommended actions displayed with a device alert.
79	FAILED_ALM	Alarm indicating a failure within a device which makes the device non-operational.
80	MAINT_ALM	Alarm indicating the device needs maintenance soon. If the condition is ignored, the device will eventually fail.
81	ADVISE_ALM	Alarm indicating advisory alarms. These conditions do not have a direct impact on the process or device integrity.

Table C-1: Resource Block Parameters *(continued)*

Index Number	Parameter	Description
82	FAILED_ENABLE	Enabled FAILED_ALM alarm conditions. Corresponds bit for bit to the FAILED_ACTIVE. A bit on means that the corresponding alarm condition is enabled and will be detected. A bit off means the corresponding alarm condition is disabled and will not be detected. This parameter is the Read Only copy of FD_FAIL_MAP.
83	FAILED_MASK	Mask of FAILED_ALM. Corresponds bit of bit to FAILED_ACTIVE. A bit on means that the condition is masked out from alarming. This parameter is the Read Only copy of FD_FAIL_MASK.
84	FAILED_ACTIVE	Enumerated list of failure conditions within a device. All open bits are free to be used as appropriate for each specific device. This parameter is the Read Only copy of FD_FAIL_ACTIVE.
85	MAINT_PRI	Designates the alarming priority of the MAINT_ALM
86	MAINT_ENABLE	Enabled MAINT_ALM alarm conditions. Corresponds bit for bit to the MAINT_ACTIVE. A bit on means that the corresponding alarm condition is enabled and will be detected. A bit off means the corresponding alarm condition is disabled and will not be detected. This parameter is the Read Only copy of FD_OFFSPEC_MAP.
87	MAINT_MASK	Mask of MAINT_ALM. Corresponds bit of bit to MAINT_ACTIVE. A bit on means that the condition is masked out from alarming. This parameter is the Read Only copy of FD_OFFSPEC_MASK.
88	MAINT_ACTIVE	Enumerated list of maintenance conditions within a device. This parameter is the Read Only copy of FD_OFFSPEC_ACTIVE.
89	ADVISE_PRI	Designates the alarming priority of the ADVISE_ALM.
90	ADVISE_ENABLE	Enabled ADVISE_ALM alarm conditions. Corresponds bit for bit to the ADVISE_ACTIVE. A bit on means that the corresponding alarm condition is enabled and will be detected. A bit off means the corresponding alarm condition is disabled and will not be detected. This parameter is the Read Only copy of FD_MAINT_MASK & FD_CHECK_MASK.
91	ADVISE_MASK	Mask of ADVISE_ALM. Corresponds bit by bit to ADVISE_ACTIVE. A bit on means that the condition is masked out from alarming. This parameter is the Read Only copy of FD_MAINT_MASK & FD_CHECK_MASK.
92	ADVISE_ACTIVE	Enumerated list of advisory conditions within a device. All open bits are free to be used as appropriate for each specific device. This parameter is the Read Only copy of FD_MAINT_ACTIVE & FD_CHECK_ACTIVE.

Table C-2: FD_SIMULATE elements

Index	Parameter	Data Type	Size	Description
1	Diagnostic Simulate Value	Bit string	4	Writable. Used for diagnostics when simulation is enabled
2	Diagnostic Value	Bit string	4	Current diagnostics detected by the device.
3	Enable	Unsigned 8	1	Enable/Disable simulation. Dynamic, so simulation will always be disabled after a device restart.

C.2 Register Transducer block parameters

The Register Transducer Block (TB 1200) allows access to Database registers and Input registers of the Rosemount 2230 Graphical Field Display. This makes it possible to read a selected set of registers directly by accessing the memory location.

The Register Transducer block is only available with advanced service.

⚠ CAUTION

Since the Register Transducer block allows access to most registers, it should be handled with care and ONLY to be changed by trained and certified service personnel, or as guided by Emerson Automation Solutions support personnel.

Table C-3: Register Transducer Block Parameters

Index Number	Parameter	Description
1	ST_REV	The revision level of the static data associated with the function block. The revision value increments each time a static parameter value in the block is changed.
2	TAG_DESC	The user description of the intended application of the block.
3	STRATEGY	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	ALERT_KEY	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	MODE_BLK	The actual, target, permitted, and normal modes of the block. Target: The mode to “go to” Actual: The mode the “block is currently in” Permitted: Allowed modes that target may take on Normal: Most common mode for target
6	BLOCK_ERR	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
7	UPDATE_EVT	This alert is generated by any change to the static data
8	BLOCK_ALM	The 2230 transducer block does not support update of BLOCK_ALM information, and it does not publish BLOCK_ALM on segment/FF bus.

Table C-3: Register Transducer Block Parameters *(continued)*

Index Number	Parameter	Description
9	TRANSDUCER_DIRECTORY	Directory that specifies the number and starting indices of the transducers in the transducer block.
10	TRANSDUCER_TYPE	Identifies the transducer.
11	TRANSDUCER_TYPE_VER	Transducer type version
12	XD_ERROR	A transducer block alarm sub code.
13	COLLECTION_DIRECTORY	A directory that specifies the number, starting indices, and DD Item ID's of the data collections in each transducer within a transducer block.
14	RB_PARAMETER	
15-44	INP_REG_n_TYPE	Describes characteristics of input register n. Indicates requested value is displayed as a floating point (/ decimal) number.
	INP_REG_n_FLOAT	Input register n value, displayed as floating point number
	INP_REG_n_INT_DEC	Input register n value, displayed as decimal number
45-74	DB_REG_n_TYPE	Describes characteristics of holding register n. Indicates requested value is displayed as a floating point (/ decimal) number.
	DB_REG_n_FLOAT	Holding register n value, displayed as floating point number.
	DB_REG_n_INT_DEC	Holding register n value, displayed as decimal number.
75	RM_COMMAND	Defines what action to perform; Read Input/Holding Register, Restart Device, Poll Program Complete.
76	RM_DATA	
77	RM_STATUS	
78	INP_SEARCH_START_NBR	Input register search start number
79	DB_SEARCH_START_NBR	Holding register search start number

C.3 Main Transducer block

The Main Transducer (TB1100) block contains parameters for configuration of the Rosemount 2230 Graphical Field Display. It contains device information including diagnostics and the ability to configure, set to factory defaults and restart the 2230 Display.

Table C-4: Main Transducer Block Parameters

Index Number	Parameter	Description
1	ST_REV	The revision level of the static data associated with the function block. The revision value increments each time a static parameter value in the block is changed.
2	TAG_DESC	The user description of the intended application of the block.
3	STRATEGY	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	ALERT_KEY	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	MODE_BLK	The actual, target, permitted, and normal modes of the block. Target: The mode to “go to” Actual: The mode the “block is currently in” Permitted: Allowed modes that target may take on Normal: Most common mode for target
6	BLOCK_ERR	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
7	UPDATE_EVT	This alert is generated by any change to the static data.
8	BLOCK_ALM	The 2230 transducer block does not support update of BLOCK_ALM information, and it does not publish BLOCK_ALM on segment/FF bus.
9	TRANSDUCER_DIRECTORY	Directory that specifies the number and starting indices of the transducers in the transducer block.
10	TRANSDUCER_TYPE	Identifies the transducer.
11	TRANSDUCER_TYPE_VER	Transducer type version
12	XD_ERROR	A transducer block alarm subcode. Provides additional error codes related to transducer blocks.
13	COLLECTION_DIRECTORY	A directory that specifies the number, starting indices, and DD Item ID’s of the data collections in each transducer within a transducer block.
14	HOUSING_TEMPERATURE	Temperature inside device housing.
15	HOUSING_TEMP_UNIT	Measurement unit for temperature.
16	ENV_DEVICE_MODE	Restart/Reset Device to factory default.
17	DIAGN_DEVICE_ALERT	Tank Hub diagnostic information, see Table C-5.
18	DEVICE_VERSION_NUMBER	Device software version number

Table C-4: Main Transducer Block Parameters *(continued)*

Index Number	Parameter	Description
19	DIAGN_REVISION	Internal revision number
20	SERIAL_NO	Main Label Device ID (serial number)
21	STATS_ATTEMPTS	Internal communication attempts
22	STATS_FAILURES	Internal communication failures
23	STATS_TIMEOUTS	Internal communication timeouts
24	FF_WRITE_PROTECT	FF write protect status. The device is write protected by a hardware switch.
25	P1451_SLAVE_STATS	P1451 Slave Stats
26	P1451_HOST_STATS	P1451 Host Stats
27	SB_HEART_BEAT_CNT	This number should be incrementing. It is an indication that the device is alive.
28	SLAVE_REQ_ID	Slave request ID
29	DEVICE_COMMAND	Device command
30	DEVICE_STATUS	Sensor application device status
31	FF_SUPPORT_INFO	
32	SENSOR_DIAGNOSTICS	
33	MODEL_CODE	Shows device model code
34	RAW_DISPLAY_DATA_1	Raw Display Data
35	RAW_DISPLAY_DATA_2	Raw Display Data
36	RAW_DISPLAY_DATA_3	Raw Display Data
37	RAW_DISPLAY_DATA_4	Raw Display Data
38	DEVICE_MODEL	Shows device model
39	DISPLAY_LANGUAGE	Select the preferred language to use for the display. If Default is selected then the language is determined by the model code.
40	DISPLAY_VIEW_MODE	The preferred view is selected: Single Value, Two Values or Four Values. The Single Value view presents large-size digits, 25 mm.
41	DISPLAY_TOOGLE_TIME	The time each value or set of values are shown on the display: 2-30 s.
42	CONNECTED_TANKS	Connected tanks
43	DISPLAY_OPTIONS	Display options
44	DISPLAY_UNIT_LENGTH	Unit for all length parameters shown on display
45	DISPLAY_UNIT_VOLUME	Unit for all volume parameters shown on display

Table C-4: Main Transducer Block Parameters *(continued)*

Index Number	Parameter	Description
46	DISPLAY_UNIT_TEMPERATURE	Unit for all temperature parameters shown on display
47	DISPLAY_UNIT_LEVELRATE	Unit for all level rate parameters shown on display
48	DISPLAY_UNIT_FLOW_RATE	Unit for all level rate parameters shown on display
49	DISPLAY_UNIT_PRESSURE	Unit for all level rate parameters shown on display
50	DISPLAY_UNIT_DENSITY	Unit for all density parameters shown on display

Diagnostic device alerts

Table C-5 lists conditions reported in the DIAGN_DEVICE_ALERT parameter.

Table C-5: Diagnostic Device Alerts

Value	Description
	No alarm active
0x00100000	Database error
0x00200000	Hardware error
0x00400000	Configuration error
0x00800000	Software error
0x01000000	Internal temperature warning
0x02000000	Database warning
0x04000000	Hardware warning
0x08000000	Configuration warning
0x10000000	Software warning
0x20000000	Simulation mode
0x40000000	Software write protected

C.4 Display Transducer block

The Display Transducer block (TB 1300) includes parameters for setup of the 2230 Graphical Field Display for use in a FOUNDATION™ Fieldbus system.

Table C-6: Display Transducer Block Parameters

Index Number	Parameter	Description
1	ST_REV	The revision level of the static data associated with the function block. The revision value increments each time a static parameter value in the block is changed.
2	TAG_DESC	The user description of the intended application of the block.
3	STRATEGY	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	ALERT_KEY	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	MODE_BLK	The actual, target, permitted, and normal modes of the block. Target: The mode to “go to” Actual: The mode the “block is currently in” Permitted: Allowed modes that target may take on Normal: Most common mode for target
6	BLOCK_ERR	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
7	UPDATE_EVT	This alert is generated by any change to the static data.
8	BLOCK_ALM	The 2230 transducer block does not support update of BLOCK_ALM information, and it does not publish BLOCK_ALM on segment/FF bus.
9	TRANSDUCER_DIRECTORY	Directory that specifies the number and starting indices of the transducers in the transducer block.
10	TRANSDUCER_TYPE	Identifies the transducer.
11	TRANSDUCER_TYPE_VER	Transducer type version
12	XD_ERROR	A transducer block alarm subcode. Provides additional error codes related to transducer blocks.
13	COLLECTION_DIRECTORY	A directory that specifies the number, starting indices, and DD Item ID’s of the data collections in each transducer within a transducer block.
14	MAO_1_INPUT_1	TANK_NUMBER TANK_PARAMETER ENGINEERING_UNIT MIN_VALUE MAX_VALUE
15	MAO_1_INPUT_2	

Table C-6: Display Transducer Block Parameters *(continued)*

Index Number	Parameter	Description
16	MAO_1_INPUT_3	
17	MAO_1_INPUT_4	
18	MAO_1_INPUT_5	
19	MAO_1_INPUT_6	
20	MAO_1_INPUT_7	
21	MAO_1_INPUT_8	
22	MAO_2_INPUT_1	
23	MAO_2_INPUT_2	
24	MAO_2_INPUT_3	
25	MAO_2_INPUT_4	
26	MAO_2_INPUT_5	
27	MAO_2_INPUT_6	
28	MAO_2_INPUT_7	
29	MAO_2_INPUT_8	
30	MAO_3_INPUT_1	
31	MAO_3_INPUT_2	
32	MAO_3_INPUT_3	
33	MAO_3_INPUT_4	
34	MAO_3_INPUT_5	
35	MAO_3_INPUT_6	
36	MAO_3_INPUT_7	
37	MAO_3_INPUT_8	
38	MAO_4_INPUT_1	
39	MAO_4_INPUT_2	
40	MAO_4_INPUT_3	
41	MAO_4_INPUT_4	
42	MAO_4_INPUT_5	
43	MAO_4_INPUT_6	
44	MAO_4_INPUT_7	
45	MAO_4_INPUT_8	
46	CUSTOM_TMV_1	Set the preferred name for the custom tank parameter 1.

Table C-6: Display Transducer Block Parameters *(continued)*

Index Number	Parameter	Description
47	CUSTOM_TMV_1_SHORT	Set the preferred short name for the custom tank parameter 1. The name can have maximum 4 characters.
48	CUSTOM_TMV_2	Set the preferred name for the custom tank parameter 2.
49	CUSTOM_TMV_2_SHORT	Set the preferred short name for the custom tank parameter 2. The name can have maximum 4 characters.
50	CUSTOM_TMV_3	Set the preferred name for the custom tank parameter 3.
51	CUSTOM_TMV_3_SHORT	Set the preferred short name for the custom tank parameter 3. The name can have maximum 4 characters.
52	CUSTOM_TMV_4	Set the preferred name for the custom tank parameter 4.
53	CUSTOM_TMV_4_SHORT	Set the preferred short name for the custom tank parameter 4. The name can have maximum 4 characters.
54	CUSTOM_TMV_5	Set the preferred name for the custom tank parameter 5.
55	CUSTOM_TMV_5_SHORT	Set the preferred short name for the custom tank parameter 5. The name can have maximum 4 characters.
56	CUSTOM_TMV_6	Set the preferred name for the custom tank parameter 6.
57	CUSTOM_TMV_6_SHORT	Set the preferred short name for the custom tank parameter 6. The name can have maximum 4 characters.
58	CUSTOM_TMV_7	Set the preferred name for the custom tank parameter 7.
59	CUSTOM_TMV_7_SHORT	Set the preferred short name for the custom tank parameter 7. The name can have maximum 4 characters.
60	CUSTOM_TMV_8	Set the preferred name for the custom tank parameter 8.
61	CUSTOM_TMV_8_SHORT	Set the preferred short name for the custom tank parameter 8. The name can have maximum 4 characters.
62	CUSTOM_TMV_9	Set the preferred name for the custom tank parameter 9.
63	CUSTOM_TMV_9_SHORT	Set the preferred short name for the custom tank parameter 9. The name can have maximum 4 characters.

Table C-6: Display Transducer Block Parameters *(continued)*

Index Number	Parameter	Description
64	CUSTOM_TMV_10	Set the preferred name for the custom tank parameter 10.
65	CUSTOM_TMV_10_SHORT	Set the preferred short name for the custom tank parameter 10. The name can have maximum 4 characters.
66	CUSTOM_UNIT_1	Set the preferred text to show on the display for custom unit 1.
67	CUSTOM_UNIT_2	Set the preferred text to show on the display for custom unit 2.
68	CUSTOM_UNIT_3	Set the preferred text to show on the display for custom unit 3.
69	CUSTOM_UNIT_4	Set the preferred text to show on the display for custom unit 4.
70	CUSTOM_UNIT_5	Set the preferred text to show on the display for custom unit 5.
71	CUSTOM_UNIT_6	Set the preferred text to show on the display for custom unit 6.
72	CUSTOM_UNIT_7	Set the preferred text to show on the display for custom unit 7.
73	CUSTOM_UNIT_8	Set the preferred text to show on the display for custom unit 8.
74	CUSTOM_UNIT_9	Set the preferred text to show on the display for custom unit 9.
75	CUSTOM_UNIT_10	Set the preferred text to show on the display for custom unit 10.
76	TANK_NAME_1	Set the preferred name for tank number 1.
77	TANK_NAME_2	Set the preferred name for tank number 2.
78	TANK_NAME_3	Set the preferred name for tank number 3.
79	TANK_NAME_4	Set the preferred name for tank number 4.
80	TANK_NAME_5	Set the preferred name for tank number 5.
81	TANK_NAME_6	Set the preferred name for tank number 6.
82	TANK_NAME_7	Set the preferred name for tank number 7.
83	TANK_NAME_8	Set the preferred name for tank number 8.
84	TANK_NAME_9	Set the preferred name for tank number 9.
85	TANK_NAME_10	Set the preferred name for tank number 10.

C.5 Multiple Analog Output block

The Multiple Analog Output Block (MAO_1400 to MAO_1700) accepts output values from field devices and assigns them to specified I/O channels in order to make them available for the display.

Table C-7: Multiple Analog Output Block Parameters

Index Number	Parameter	Description
1	ST_REV	The revision level of the static data associated with the function block. The revision value increments each time a static parameter value in the block is changed.
2	TAG_DESC	The user description of the intended application of the block.
3	STRATEGY	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	ALERT_KEY	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	MODE_BLK	The actual, target, permitted, and normal modes of the block. Target: The mode to “go to” Actual: The mode the “block is currently in” Permitted: Allowed modes that target may take on Normal: Most common mode for target
6	BLOCK_ERR	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
7	CHANNEL	Defines the output that drives the field device.
8	IN_1	Numbered input parameter for multiple output function blocks
9	IN_2	Numbered input parameter for multiple output function blocks
10	IN_3	Numbered input parameter for multiple output function blocks
11	IN_4	Numbered input parameter for multiple output function blocks
12	IN_5	Numbered input parameter for multiple output function blocks
13	IN_6	Numbered input parameter for multiple output function blocks
14	IN_7	Numbered input parameter for multiple output function blocks

Table C-7: Multiple Analog Output Block Parameters *(continued)*

Index Number	Parameter	Description
15	IN_8	Numbered input parameter for multiple output function blocks
16	MO_OPTS	Options that the user may select to alter multiple output block processing. In case a Fault State option is set, the 2230 will send a Field Diagnostic alert.
17	FSTATE_TIME	
18	FSTATE_VAL1	The preset analog value to use when failure occurs in IN_1. Ignored if the “Fault state to value 1” in the MO_OPTS parameter is false.
19	FSTATE_VAL2	The preset analog value to use when failure occurs in IN_2. Ignored if the “Fault state to value 2” in the MO_OPTS parameter is false.
20	FSTATE_VAL3	The preset analog value to use when failure occurs in IN_3. Ignored if the “Fault state to value 3” in the MO_OPTS parameter is false.
21	FSTATE_VAL4	The preset analog value to use when failure occurs in IN_4. Ignored if the “Fault state to value 4” in the MO_OPTS parameter is false.
22	FSTATE_VAL5	The preset analog value to use when failure occurs in IN_5. Ignored if the “Fault state to value 5” in the MO_OPTS parameter is false.
23	FSTATE_VAL6	The preset analog value to use when failure occurs in IN_6. Ignored if the “Fault state to value 6” in the MO_OPTS parameter is false.
24	FSTATE_VAL7	The preset analog value to use when failure occurs in IN_7. Ignored if the “Fault state to value 7” in the MO_OPTS parameter is false.
25	FSTATE_VAL8	The preset analog value to use when failure occurs in IN_8. Ignored if the “Fault state to value 8” in the MO_OPTS parameter is false.
26	FSTATE_STATUS	Shows which points are in fault state.
27	UPDATE_EVT	This alert is generated by any change to the static data.
28	BLOCK_ALM	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status parameter. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.

C.6 Supported units

Unit codes

Table C-8: Temperature Units

ID	Display	Description
1000	K	Kelvin
1001	deg C	Degree Celsius
1002	deg F	Degree Fahrenheit

Table C-9: Length Units

ID	Display	Description
1010	m	Meter
1013	mm	Millimeter
1018	ft	Feet
132090	Imp 16	Imperial 1/16 inch

Table C-10: Volume Units

ID	Display	Description
1034	m^3	Cubic meter
1038	L	Liter
1048	gallon	US gallon
1049	ImpGal	Imperial gallon (UK gallon)
1051	bbl	Barrel

Table C-11: Level Rate Units

ID	Display	Description
1061	m/s	Meter / second
1063	m/h	Meter / hour
1067	ft/s	Feet / second
1073	ft/h	Feet / hour

Table C-12: Flow Rate Units

ID	Display	Description
1349	m^3/h	Cubic meter / hour
1352	L/min	Liter / minute
1364	gal/h	US gallon / hour
1369	ImpGal/h	Imperial gallon / hour (UK gallon / hour)
1373	Bbl/h	Barrel / hour

Table C-13: Pressure Units

ID	Display	Description
1130	Pa	Pascal
1133	kPa	Kilo Pascal
1137	Bar	Bar
1140	atm	Atmospheres
1141	psi	Pounds / square inch
1142	psiA	Pounds / square inch (absolute)
1143	psiG	Pounds / square inch (gauge)
1590	bar G	Bar Gauge relative
1597	bar A	Bar Absolute

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