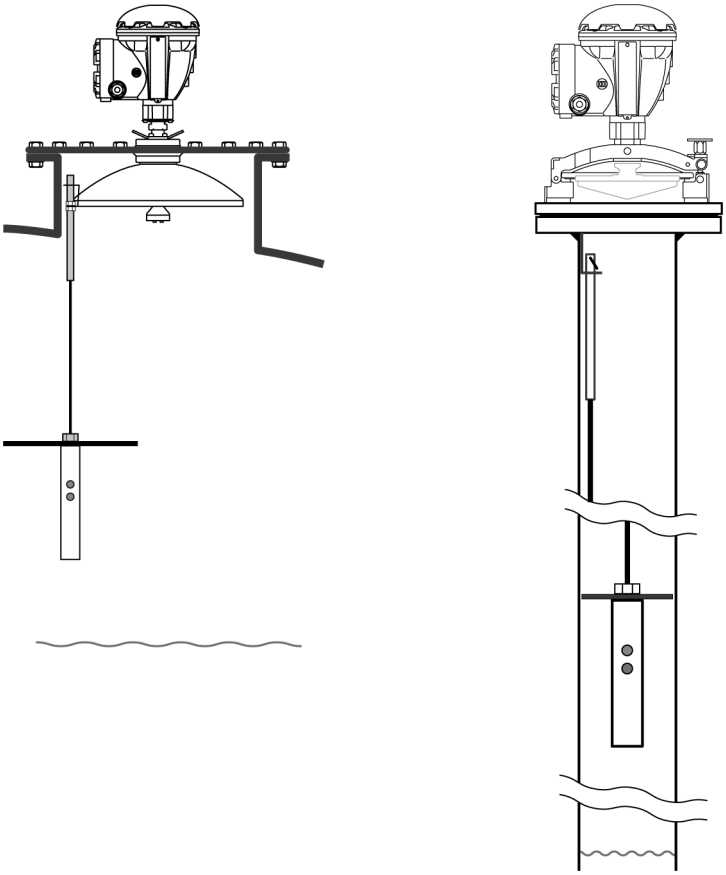
Reference Manual
00809-0200-5900, Rev AD
February 2023

Rosemount 5900 Proof Test

Instruction for Installation, Configuration, and Operation of Proof Test Function with Reference Reflector



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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.

⚠ CAUTION

The products described in this document are NOT designed for nuclear-qualified applications. Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings. For information on Rosemount nuclear-qualified products, contact your local Emerson Sales Representative.

⚠ CAUTION

Handle the wire and assembly with care to avoid permanent bends.

⚠ 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 service other than those contained in this manual unless you are qualified.

⚠ WARNING

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

Avoid contact with the leads and terminals.

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

⚠ WARNING

Electrical shock could cause death or serious injury.

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

⚠ 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.

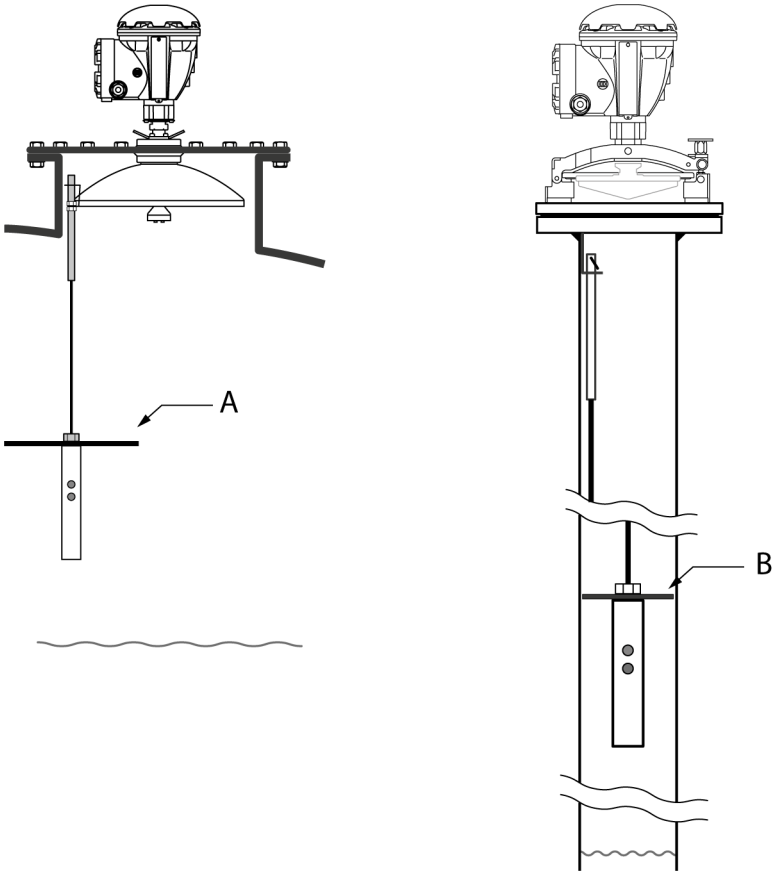
Physical security is an important part of any security program and fundamental to protecting your system. Restrict physical access by unauthorized personnel to protect end users' assets. This is true for all systems used within the facility.

Contents

1 Introduction

The Rosemount 5900 Radar Level Gauge is designed with functionality that lets you proof test high alarms and verify correct product surface measurement. The Rosemount 5900 allows you to combine continuous product level monitoring with proof testing at regular intervals. It is based on a dedicated Reference Reflector that introduces a radar echo at a predefined position in the tank.

Figure 1-1: The Rosemount 5900 can be equipped with an optional Reference Reflector that allows proof testing the gauge on a regular basis



A. Reference Reflector and parabolic antenna
B. Reference Reflector and array antenna

1.1 Section overview

This document is a supplement to the Rosemount 5900S Reference Manual. The sections in this reference manual provide information on installing, operating, and maintaining the Rosemount 5900 Proof Test System. The sections are organized as follows:

Section 1 Introduction gives a brief introduction to the Rosemount 5900 Proof Test function and the recommended installation procedure.

Section 2 Installation provides instructions on how to install the Reference Reflector on the Rosemount 5900 with Parabolic Antenna and Array Antenna.

Section 3 Configuration of Reference Reflector contains instructions on how to calibrate and configure the Rosemount 5900 Proof Test function.

Section 4 Operation provides instructions for how to use the proof test function.

Section 5 Service and Troubleshooting provides troubleshooting techniques for the most common operating problems.

1.2 Service support

For service support contact the nearest Emerson /Rosemount Tank Gauging representative. Contact information can be found on the web site www.Emerson.com/Rosemount Tank Gauging.

1.3 Installation procedure

Follow these steps for proper installation and configuration of the proof test reference reflector:

Procedure

1. Review installation considerations.
2. Mount the proof test reference reflector.
3. Wire the Rosemount 5900 gauge.
4. Ensure covers and cable gland/conduit connections are tight.
5. Configure the Rosemount 5900 for proof testing.
6. Verify operation.

Related information

Rosemount 5900S Reference Manual
Rosemount 5900C Reference Manual
Installation considerations
Install the Reference Reflector for Parabolic antenna
Install the Reference Reflector for Array antenna
Configuration of reference reflector

1.4 Firmware requirements for proof testing

Consider the following proof test requirements for wired and wireless applications respectively.

Wired proof test function requires:

- gauge firmware version **1.B9** or higher
- Rosemount TankMaster **6.E1** or higher

For wireless applications the proof test function requires:

- Rosemount 5900 and Rosemount 2410 ordered with model code **safety certification option "S"**
- Rosemount TankMaster **6.G0** or higher

2 Installation

Related information

Configuration procedure

2.1 Overview

The information in this section covers configuration and calibration of the Reference Reflector for proof testing the Rosemount 5900 Radar Level Gauge.

2.2 Installation considerations

Before you start installing the Reference Reflector, ensure that the following items are considered in order to fulfill the installation requirements for the Reference Reflector at the desired position:

- Maximum product level in the tank
- High Alarm position
- Minimum / maximum distance between **Gauge Reference Point** and **Reference Reflector**

Note
The Reference Reflector for **Array Antenna** may need to be removed to allow product sampling through the Still-pipe.

Related information

Tank geometry parabolic antenna
Tank geometry array antenna

2.3 Install the Reference Reflector for Parabolic antenna

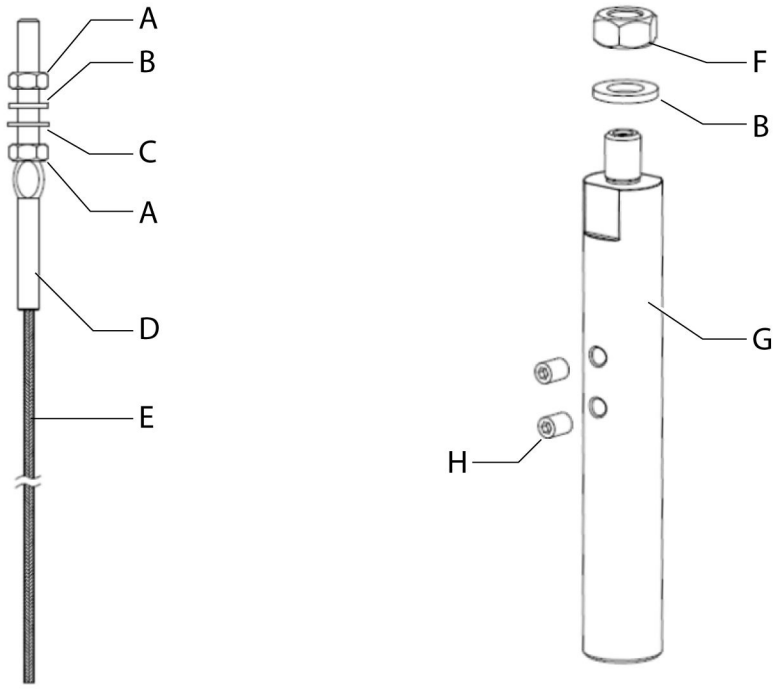
The Reference Reflector is installed under the antenna. It is attached to a wire fixed to the Parabolic Antenna. The Reference Reflector introduces a radar echo that is used for proof testing the Rosemount 5900 Radar Level Gauge. Proof testing can be performed without the need to open the tank.

2.3.1 Reference Reflector kit

The Reference Reflector is delivered with all parts needed for proper installation on a Rosemount 5900 with Parabolic Antenna. The Reference Reflector kit includes the following parts:

- Wire assembly
- Weight assembly
- Reference Reflector
- Clamp ring

Figure 2-1: Wire and Weight Assembly



A. Nut M8
B. Spring washer
C. Washer
D. M8 terminal
E. Wire diameter 4 mm (0.16 in.)
Length 5 m (16.4 ft.)
F. Nut M12
G. Weight
H. M6 screw (x2)
Allen key size 3

Figure 2-2: Reference Reflector

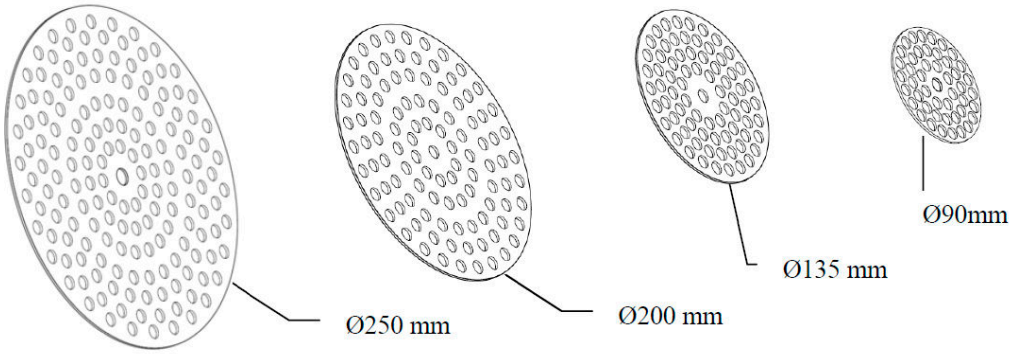
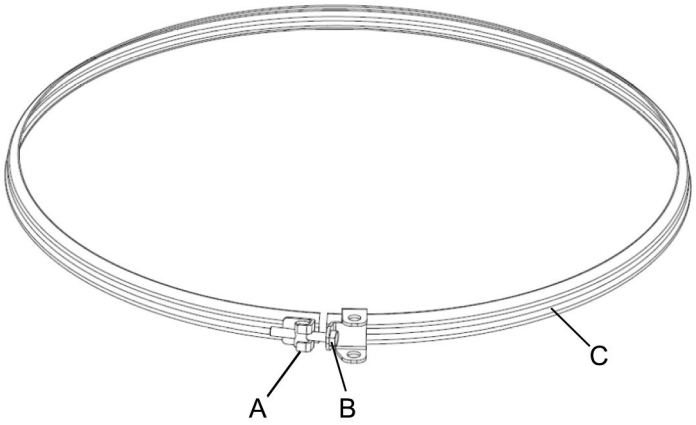


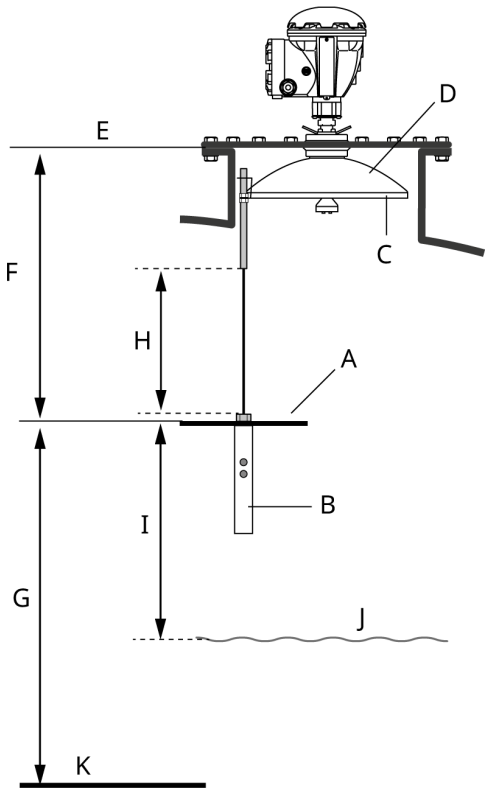
Figure 2-3: Clamp Ring



A. M6 cylinder nut
B. M6 screw
C. Clamping ring

2.3.2 Tank geometry parabolic antenna

Figure 2-4: Tank geometry for Rosemount 5900 with Parabolic Antenna and Proof Test Reference Reflector



A. Reference Reflector (RR). Maximum inclination 2.5°.
B. Weight
C. Clamping ring
D. Parabolic antenna
E. Gauge Reference Point
F. Reference Reflector (RR) distance
G. Reference Reflector (RR) position
H. Wire distance
I. Minimum 500 mm (19.7 in.)
J. Maximum product level
K. Zero Level

Reference Reflector distance:

- Minimum 600 mm (24 in.)
- Maximum 5000 mm (200 in.)

Note
See Safety Instrumented System (SIS) for installation requirements in Safety Instrumented Systems (SIS).

Related information

Configuration procedure

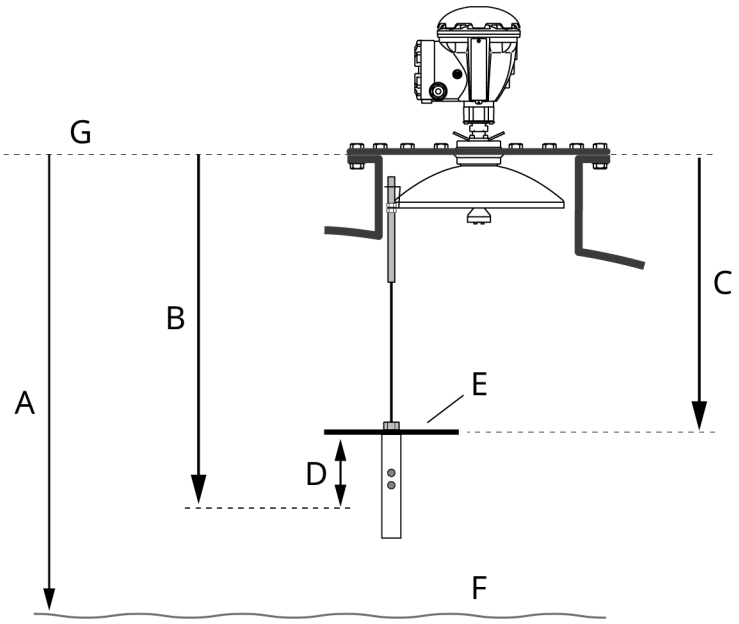
Safety Instrumented System (SIS)

This is a brief introduction to tank geometry for the Rosemount 5900 with Parabolic antenna and proof test reference reflector in a Safety Instrumented System (SIS)[1].

Procedure

1. Decide position of SIL High Alarm.
2. Find a position for the Reference Reflector (RR) that fulfills the following requirements:
   a. Minimum 500 mm above SIL High Alarm Limit
   b. Distance Reference Reflector - Gauge Reference Point: 600 to 5000 mm
   c. Minimum 500 mm to maximum product level

Figure 2-5: Tank geometry with Parabolic Antenna and Proof Test Reference Reflector in Safety Instrumented System (SIS).



A. SIL Surface Distance
B. SIL High Alarm Limit
C. Distance Reference Reflector - Gauge Reference Point: 600 to 5000 mm
D. Minimum distance Reference Reflector - SIL High Alarm = 500 mm
E. Reference Reflector (RR)
F. Maximum product level
G. Gauge Reference Point

(1) In the Rosemount 5900 and 2410 Safety Manual (Document No. 00809-0200-5100) you will find more information on how to install and configure the Rosemount 5900 Radar Level Gauge and 2410 Tank Hub in a Safety Instrumented System.

2.3.3 Install the reference reflector

This is a description of how to install a reference reflector on a Parabolic antenna. It also describes how to calculate the required Wire Distance parameter.

Prerequisites

The length of the wire (Wire Distance) that holds the Reference Reflector needs to be calculated before the Reference Reflector can be installed in the tank. The wire must be long enough to allow the reflector to be properly positioned in the tank including the weight that is attached under the reflector.

⚠ CAUTION

Handle the wire and assembly with care to avoid permanent bends.

Procedure

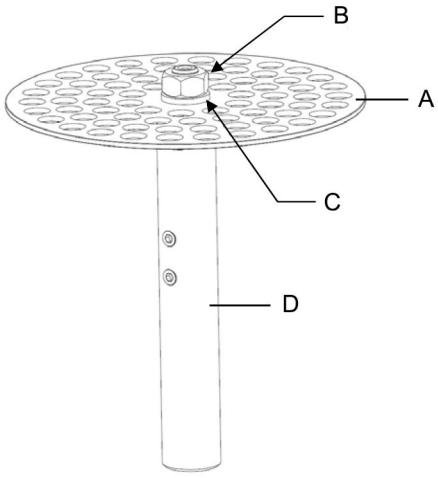
1. Specify the position of the Reference Reflector (RR) and calculate the Reference Reflector Distance (see Figure 2-4 and Figure 2-7).
2. Choose the appropriate reflector size. As a result of the radar beam geometry, a smaller reflector can be used further away from the radar gauge. There are four different Reference Reflectors to choose from depending on the Reference Reflector Distance as shown in Table 2-1.

   Table 2-1: Reference Reflector Size

Reference Reflector Distance (mm/inch)	Diameter (mm/inch)
600 to 2000 (24 to 79)	250 (10)
2000 to 3000 (79 to 118)	200 (7.9)
3000 to 4000 (118 to 157)	135 (5.3)
4000 to 5000 (157 to 197)	90 (3.5)

3. Mount the appropriate Reference Reflector on the weight.

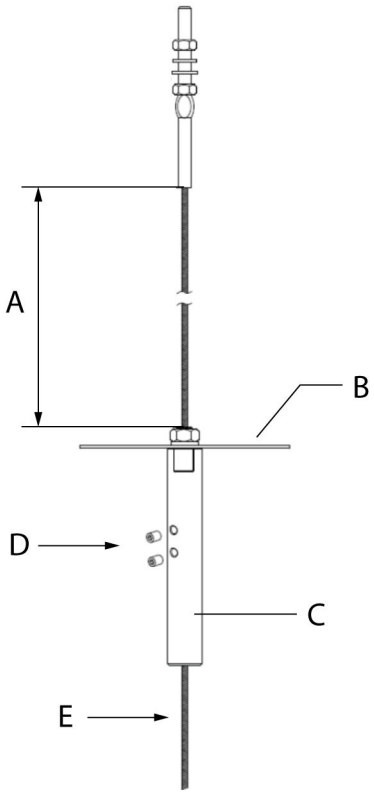
4. Tighten the M12 nut to a torque value of 18 Nm.



A. Reference Reflector (RR)
B. M12 nut. Torque=18 Nm.
C. Spring washer
D. Weight

5. Calculate the required **Wire Distance**. See Wire Distance calculation and Figure 2-7.

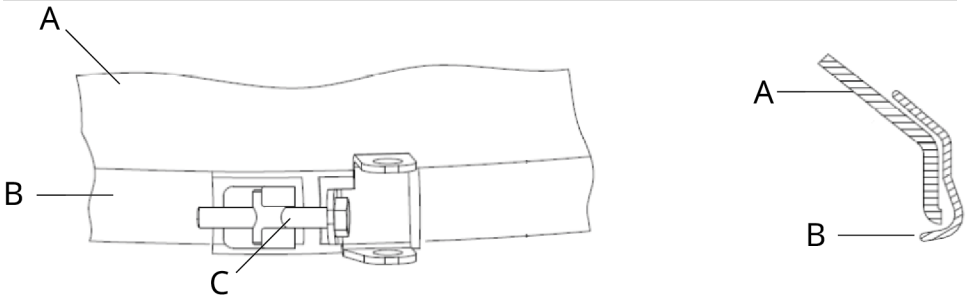
6. Feed the wire through the weight and the Reference Reflector (RR).



A. Wire Distance
B. Reference Reflector
C. Weight
D. M6 x 2. Allen key size 3. Torque 2.5 Nm.
E. Cut wire 0 - 150 mm under the weight.

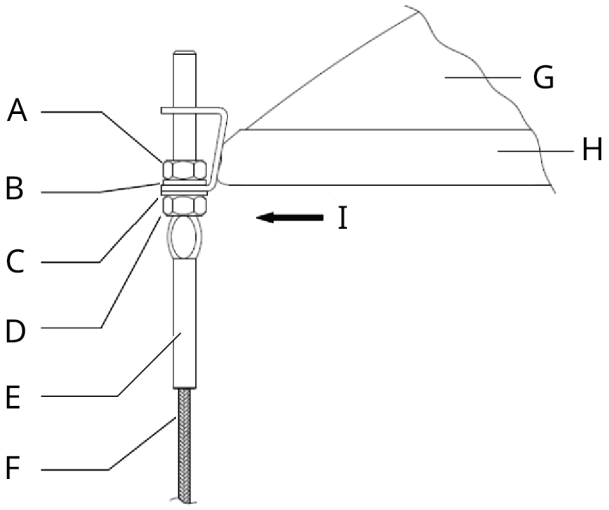
7. Place the weight in the calculated **Wire Distance** position.
8. Tighten the two screws (size M6) to a torque value of 2.5 Nm.
9. Cut the wire. You may leave 0 to 150 mm (0 to 6 in.) of the wire below the weight.

10. Mount the clamping ring on the Parabolic Antenna. Ensure that the Reference Reflector is directed towards the center of the tank (see Figure 2-6).



A. Parabolic antenna
B. Clamping ring
C. M6 screw
Torque=2.3 Nm

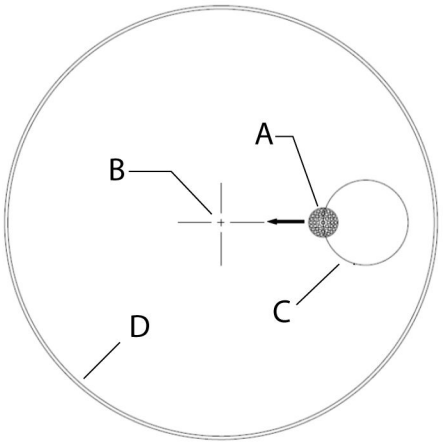
11. Mount the M8 terminal (that holds the weight and Reference Reflector) on the clamping ring.
12. Tighten the M8 nut to the specified torque of 8 Nm.



A. Nut M8
Torque=8 Nm
B. Spring washer
C. Washer
D. Nut M8
E. M8 terminal
F. Wire
G. Antenna
H. Clamping ring
I. Tank center

13. Ensure that:
    - the Reference Reflector is correctly aligned towards the center of the tank
    - inclination of Reference Reflector is less than 2.5°

Figure 2-6: Align the Reference Reflector



A. Reference Reflector (RR)
B. Tank center
C. Parabolic antenna
D. Tank wall

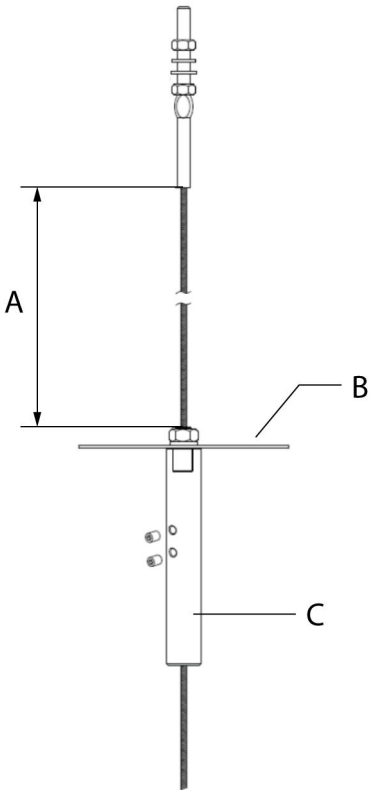
Related information

Tank geometry parabolic antenna
Wire Distance calculation

Wire Distance calculation

There are two different connections available for the Parabolic Antenna; the Welded and the Clamped versions. Since the vertical position of the flange will differ slightly for these two connections, you will have to use different formulas for calculating the proper Wire Distance in order to obtain the correct position (Reference Reflector Distance) of the Reference Reflector.

Figure 2-7: Wire Distance



A. Wire distance
B. Reference reflector
C. Weight

Welded tank connection

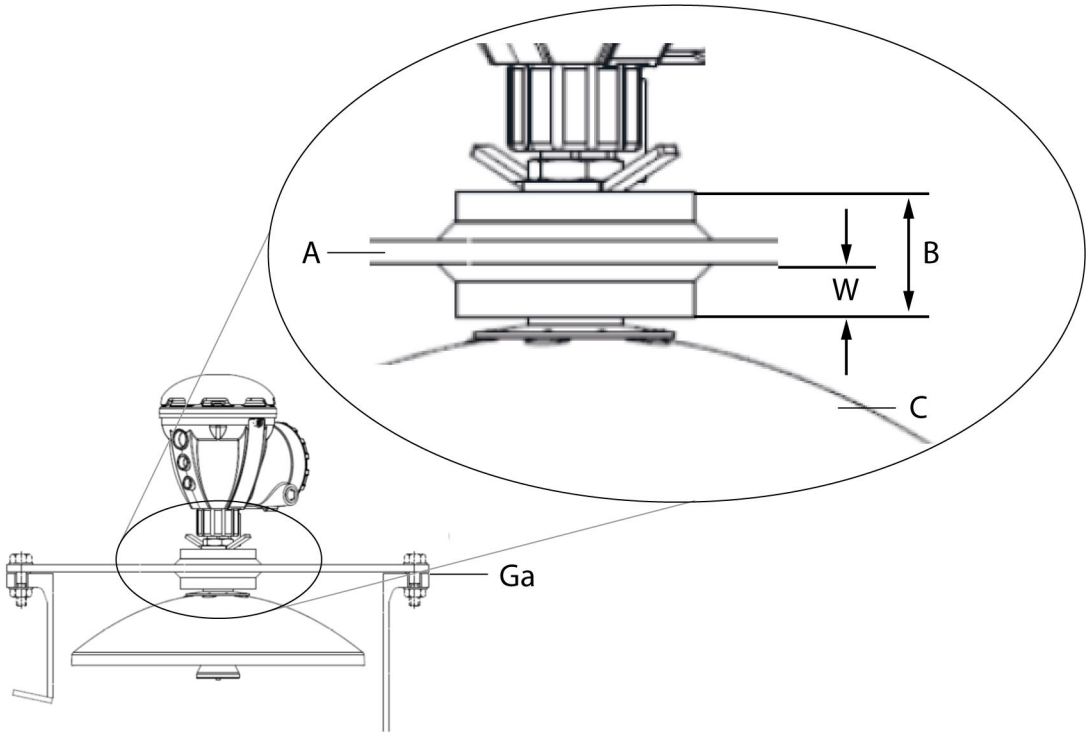
Use the following formula to calculate the required **Wire Distance** for a welded connection:

Wire Distance=**RR** + **Ga** -**W** - 194 (mm)

where:

W	See Figure 2-8
Ga	thickness of the flange gasket (see Figure 2-8)
RR	Reference Reflector Distance (see Figure 2-4)

Figure 2-8: Welded Connection



A. Flange
B. 60 mm (2.4 in.)
C. Antenna

Clamped tank connection

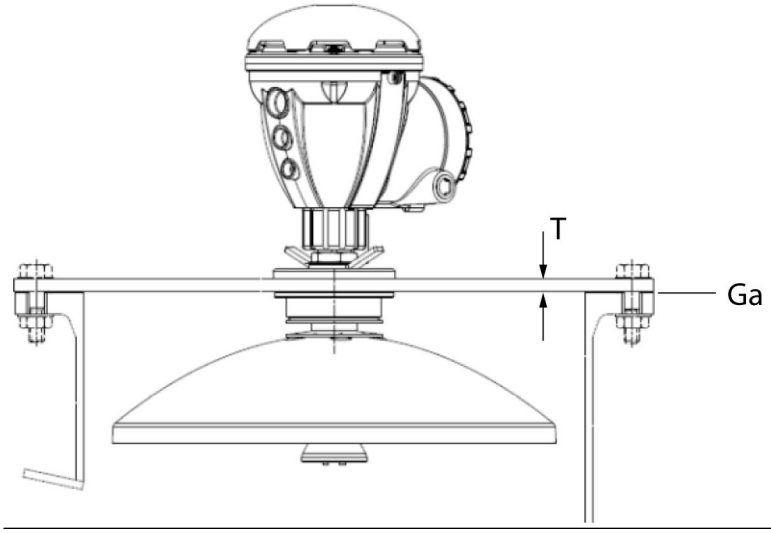
Use the following formula to calculate the required **Wire Distance** for clamped connection:

Wire Distance=**RR** + **Ga** +**T** - 243 (mm)

where:

T	flange thickness (see Figure 2-9)
Ga	thickness of the flange gasket (see Figure 2-9)
RR	Reference Reflector Distance (see Figure 2-4)

Figure 2-9: Clamped Connection



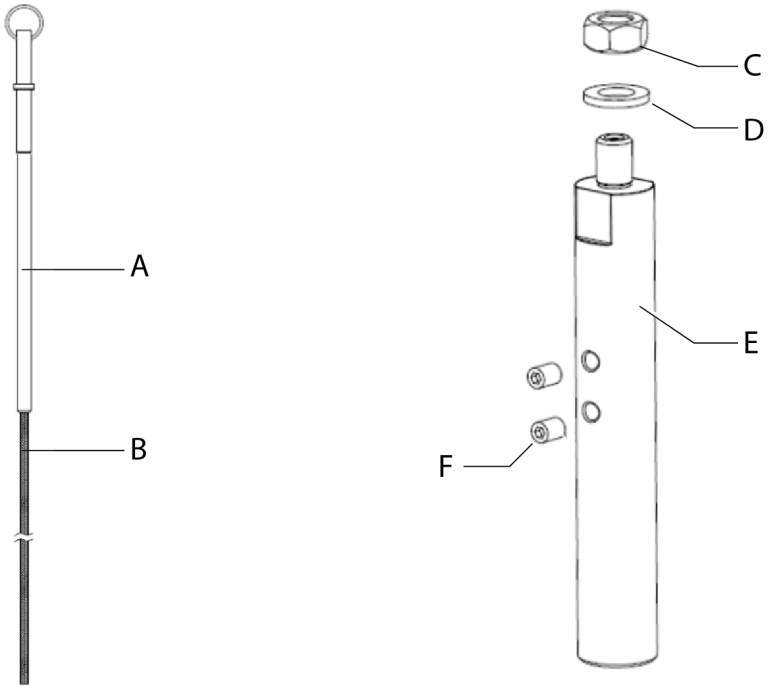
2.4 Install the Reference Reflector for Array antenna

2.4.1 Reference Reflector kit

The Reference Reflector is delivered with all parts needed for proper installation on a Rosemount 5900 with Array Antenna. The Reference Reflector kit includes the following parts:

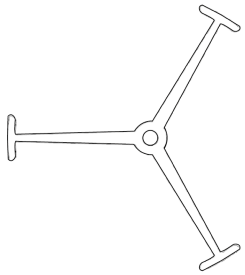
- Wire assembly
- Weight assembly
- Reference Reflector
- Safety wire
- Flexible Ring

Figure 2-10: Wire and Weight Assembly



A. Bronze rod
B. Wire diameter 4 mm (0.16 in.)
Length 8 m (26.2 ft.)
C. Nut M12
D. Spring washer
E. Weight
F. M6 screw (x2)
Allen key size 3

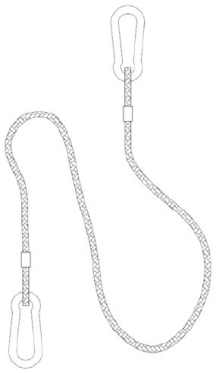
Figure 2-11: Reference Reflector



The Reference Reflector is designed to allow hand dipping.

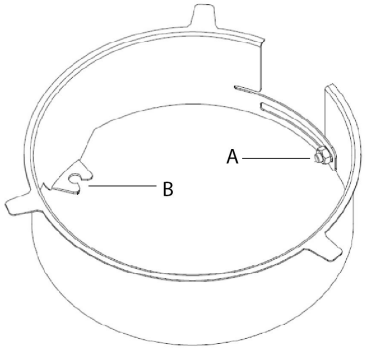
Note
The **Reference Reflector** may need to be removed for product sampling through the pipe.

Figure 2-12: Safety Wire



A **Safety Wire** should be use to secure the **Reference Reflector** during installation in a Still-Pipe.

Figure 2-13: Flexible Ring



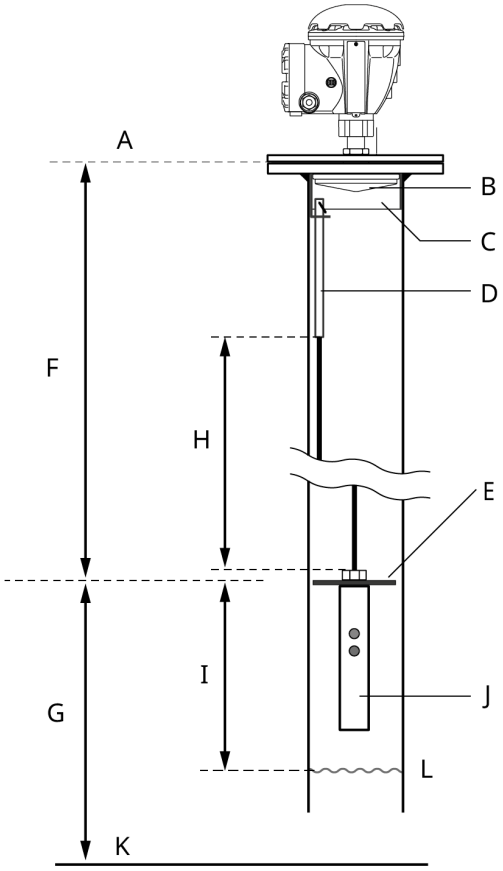
A. M6 nut
B. Rod attachment

The **Flexible Ring** provides an attachment point in the Still-Pipe for the wire and weight assembly.

2.4.2 Tank geometry array antenna

Fixed version

Figure 2-14: Tank Geometry for Rosemount 5900 with Array Antenna Fixed Version and Proof Test Reference Reflector



A. Gauge Reference Point
B. Array antenna
C. Flexible ring
D. Bronze rod
E. Reference Reflector (RR). Maximum inclination 2.5°.
F. Reference Reflector (RR) distance
G. Reference Reflector (RR) position
H. Wire distance
I. Minimum 500 mm (19.7 in.)
J. Weight
K. Zero Level
L. Maximum product level

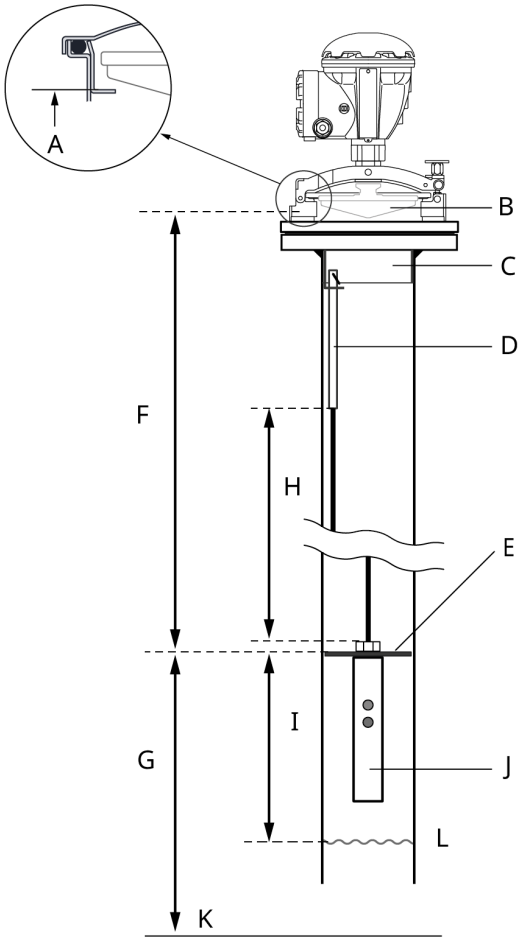
Reference Reflector distance:

- Minimum 1000 mm (39 in.)
- Maximum 8000 mm (26 ft.)

Note
See Safety Instrumented System (SIS) for installation requirements in Safety Instrumented Systems (SIS).

Hatched version

Figure 2-15: Tank Geometry for Rosemount 5900 with Array Antenna Hatched Version and Proof Test Reference Reflector



A. Gauge Reference Point
B. Array antenna hatched version
C. Flexible ring
D. Bronze rod
E. Reference Reflector (RR). Maximum inclination 2.5°.
F. Reference Reflector (RR) distance
G. Reference Reflector (RR) position
H. Wire distance
I. Minimum 500 mm (19.7 in.)
J. Weight
K. Zero Level
L. Maximum product level

Reference Reflector (RR) distance:

- Minimum 1000 mm (39 in.)
- Maximum 8000 mm (26 ft.)

Note
See Safety Instrumented System (SIS) for installation requirements in Safety Instrumented Systems (SIS).

Related information

Configuration procedure

Safety Instrumented System (SIS)

This is a brief introduction to tank geometry for the Rosemount 5900 with Array antenna and proof test reference reflector in a Safety Instrumented System (SIS)[(2)].

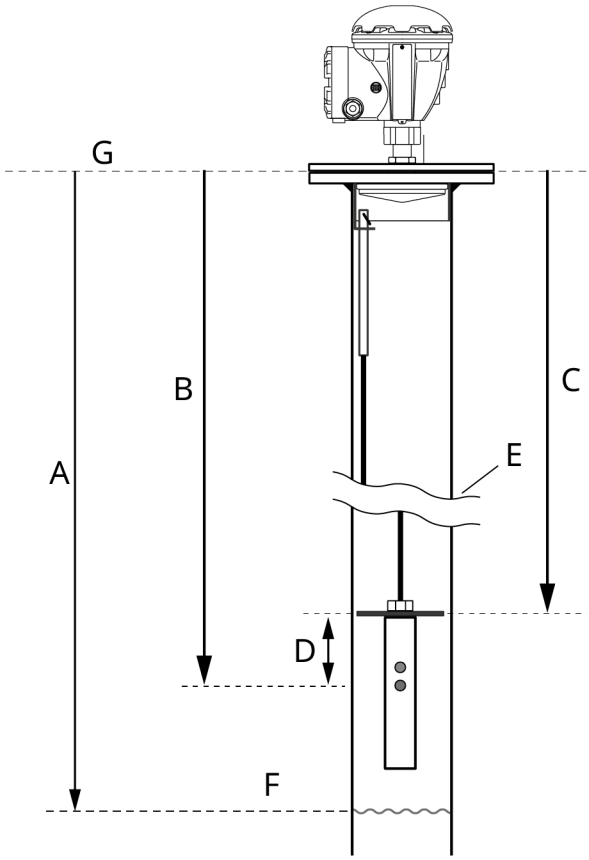
Procedure

1. Decide position of SIL High Alarm.

(2) In the Rosemount 5900 and 2410 Safety Manual (Document No. 00809-0200-5100) you will find more information on how to install and configure the Rosemount 5900 Radar Level Gauge and 2410 Tank Hub in a Safety Instrumented System.

2. Find a position for the Reference Reflector (RR) that fulfills the following requirements:
    a. Minimum 500 mm above SIL High Alarm Limit
    b. Distance RR - Gauge Reference Point: 600 to 5000 mm (see Table 2-2)
    c. Minimum 500 mm to maximum product level

Figure 2-16: Tank geometry for Rosemount 5900 with Array Antenna and Proof Test Reference Reflector in Safety Instrumented System.



A. SIL Surface Distance
B. SIL High Alarm Limit
C. Distance Reference Reflector to Gauge Reference Point (see Table 2-2)
D. Minimum distance Reference Reflector - SIL High Alarm = 500 mm
E. Reference Reflector (RR)
F. Maximum product level
G. Gauge Reference Point

Table 2-2: Distance Reference Reflector to Gauge Reference Point

Array antenna	Distance (mm)
6 inch	1100 to 8000
8 inch	1400 to 8000

Table 2-2: Distance Reference Reflector to Gauge Reference Point *(continued)*

Array antenna	Distance (mm)
10 inch	1800 to 8000
12 inch	2000 to 8000

2.4.3 Install the reference reflector

This is a description of how to install a reference reflector on an Array antenna. It also describes how to calculate the required Wire Distance parameter.

Prerequisites

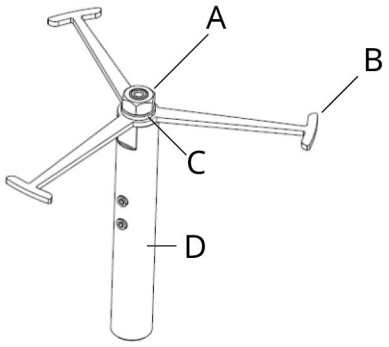
You need to calculate the length of the wire that holds the Reference Reflector before the Reference Reflector can be installed in the tank. The wire must be long enough to allow the Reflector to be properly positioned in the tank including the weight that is attached under the Reflector.

⚠ CAUTION

Handle the wire and assembly with care to avoid permanent bends.

Procedure

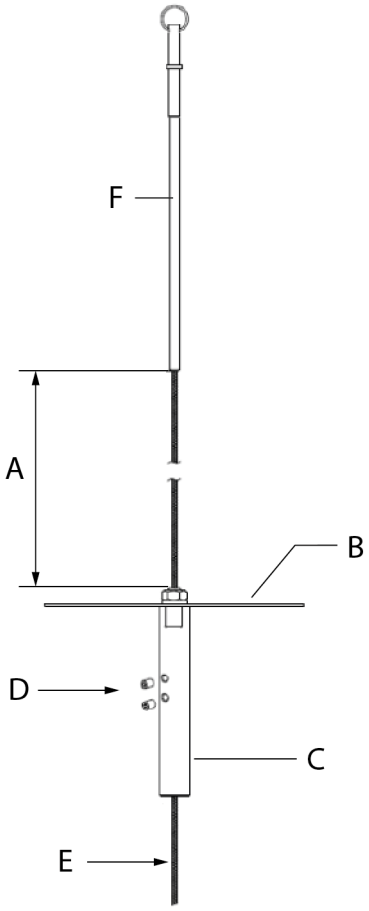
1. Specify the position of the Reference Reflector (RR) (see Tank geometry array antenna and Wire Distance calculation).
2. Calculate the Reference Reflector Distance. This is the distance from the **Gauge Reference Point** to the **Reference Reflector**.
3. Mount the **Reference Reflector** on the weight.
4. Tighten the M12 nut to a torque value of 18 Nm.



A. M12 nut
Torque=18 Nm
B. Reference Reflector (RR)
C. Spring washer
D. Weight

5. Calculate the Wire Distance as described in Wire Distance calculation.

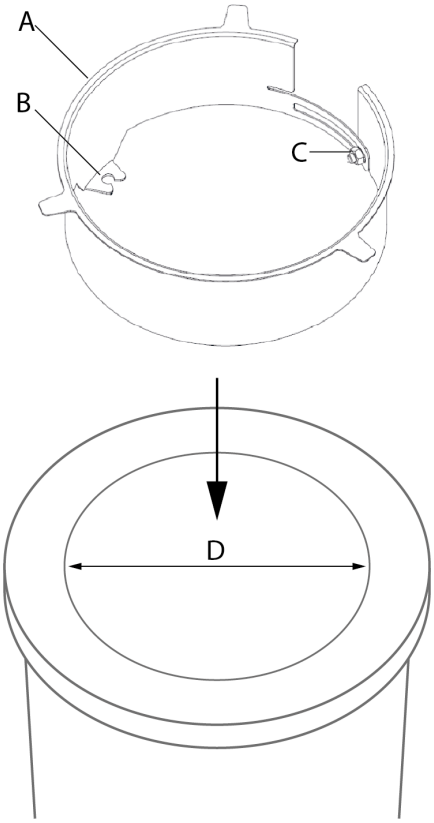
6. Feed the wire through the weight and Reference Reflector (RR).



A. Wire Distance
B. Reference Reflector (RR)
C. Weight
D. M6x2
Torque=2.5 Nm
E. Cut the wire 0 - 150 mm under the weight
F. Bronze rod

7. Position the weight to the correct Wire Distance.
8. Tighten the two screws. Torque=2.5 Nm.
9. Cut the wire 0 to 150 mm below the end of the weight.
10. Install the Flexible Ring at the top of the Still-pipe. The ring can be adjusted to fit a wide range of Still-Pipe inner diameters according to Table 2-3.
11. Ensure that the Flexible Ring fits tightly inside the pipe.

12. Tighten the M6 nut to the specified torque value of 5 Nm

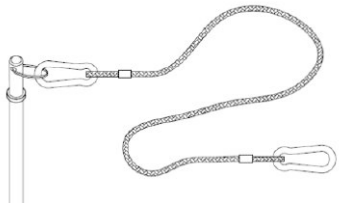


A. Flexible ring
B. Rod attachment
C. M6 nut
Torque=5 Nm
D. Still-Pipe inner diameter

Table 2-3: The Flexible Ring Fits a Wide Range of Still-pipe Inner Diameters

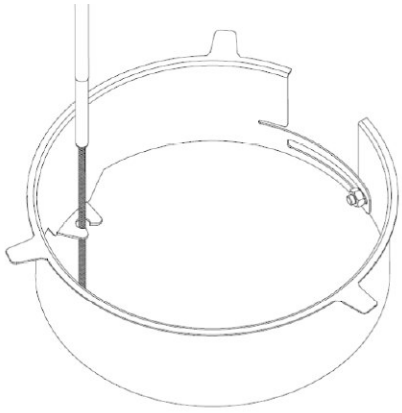
6 inch pipe	8 inch pipe	10 inch pipe	12 inch pipe
152 - 164 mm (5.98 - 6.46 in.)	195.5 - 210.2 mm (7.70 - 8.28 in.)	254.5 - 268 mm (10.02 - 10.55 in.)	298.4 - 318.1 mm (11.75 - 12.52 in.)

13. Fasten one end of the **Safety Wire** to the Bronze Rod and the other end to the tank.

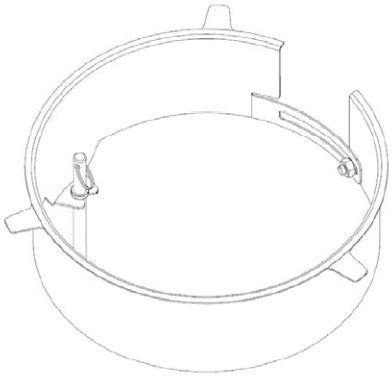


14. Lower the weight and reflector into the Still-pipe to the full length of the wire.

15. Put the wire into the rod attachment through the slot.



16. Lower the **Bronze Rod** until it stops as illustrated below.



17. Remove the **Safety Wire** from the Bronze Rod.

Wire Distance calculation

Use the following formula to calculate the required **Wire Distance** for clamped connection:

Array Antenna hatched version

Wire Distance=**RR** - **Ga** - 362 (mm)

where:

Ga	thickness of the flange gasket
RR	Reference Reflector Distance

Array Antenna fixed version

Wire Distance=**RR** - 324 (mm)

where:

RR	Reference Reflector Distance

3 Configuration of reference reflector

3.1 Overview

The information in this section covers configuration and calibration of the Reference Reflector for proof testing the Rosemount 5900 Radar Level Gauge.

3.2 Configuration using TankMaster WinSetup

3.2.1 Introduction

The Rosemount 5900 is configured by using the TankMaster WinSetup configuration program. WinSetup supports standard configuration of the Rosemount 5900 Radar Level Gauge as well as configuration of the Reference Reflector for Proof Test applications.

See the Tank Gauging System Configuration Manual for more information on using the TankMaster WinSetup program to configure a Rosemount Tank Gauging system.

See also the Rosemount 5900 Radar Level Gauge and Rosemount 2410 Tank Hub Safety Manual Option S for more information on proof testing in Safety Instrumented Systems (SIS).

Proof test features

The Rosemount 5900 Proof Test function in TankMaster WinSetup includes the following functions:

1. Configure proof test
2. Perform proof test
3. View proof test history
4. Schedule proof tests

3.2.2 Considerations

The following requirements and recommendations must be considered when using the Rosemount 5900 Proof Test function:

- Do not perform calibration of Proof Test function during activities in the tank, for example when it is filled or emptied.
- Do not perform calibration of Proof Test function during extreme environmental conditions.
- Proof Test calibration must be repeated whenever configuration of tank geometry parameters has been changed. This may for example include parameters such as Calibration Distance or Pipe Diameter.
- For Still-Pipes the slots must not be wider than one inch (1”)

3.2.3 Configuration procedure

The **Proof Test** function needs to be configured prior to any proof test can be performed. This means calibrating the reference reflector by specifying the actual position of the reflector and the nominal amplitude of the reflected radar signal.

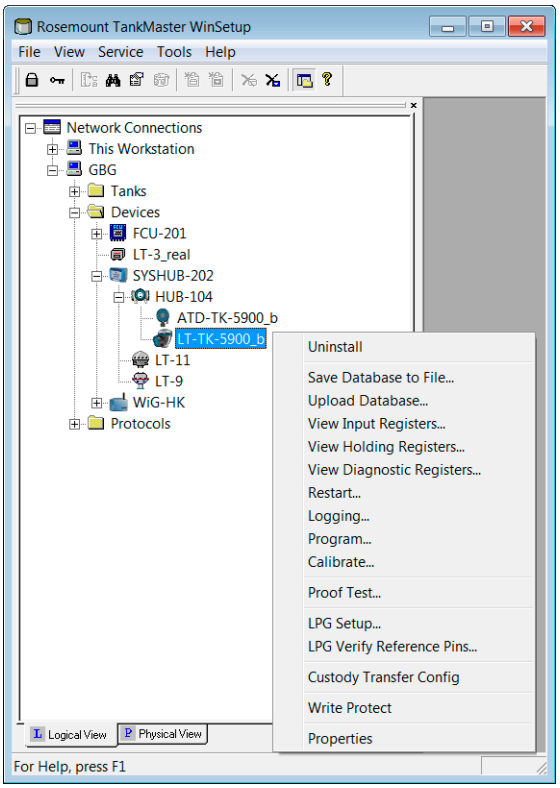
Configuration includes setting up the approved amplitude range (Min./Max. Amplitude Factor) and allowed deviations from the calibrated reflector position (Distance Tolerance). This step needs to be done for physical as well as simulated reference reflectors.

Prerequisites

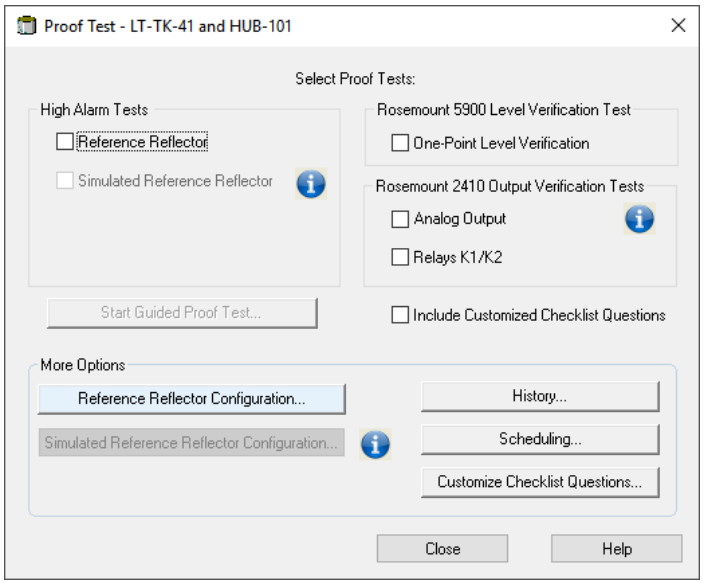
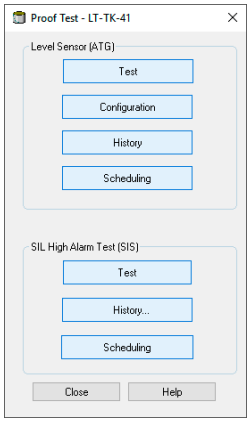
Ensure that a standard configuration of the Rosemount 5900 is performed prior to the proof test configuration.

Procedure

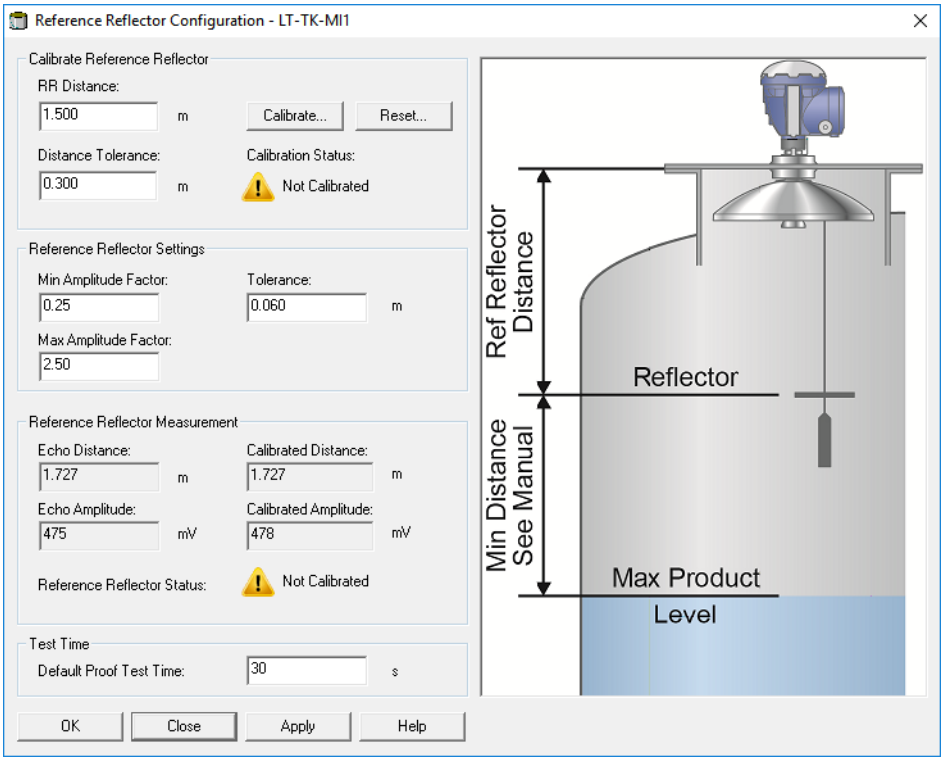
1. Ensure that the TankMaster WinSetup program is up and running.
2. In the WinSetup workspace, click the right mouse button on the Rosemount 5900 device icon and select the **Proof Test** option.



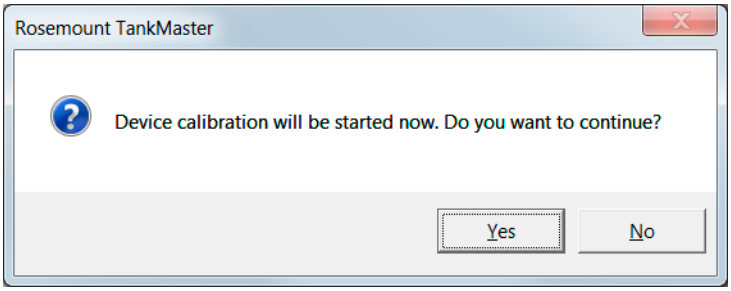
3. The ***Proof Test*** window appears. It lets you perform proof tests, view previous tests, and schedule future tests. There are two different versions:

Option	Proof Test window
SIL2 Model Code S and non-SIL	
SIL3	

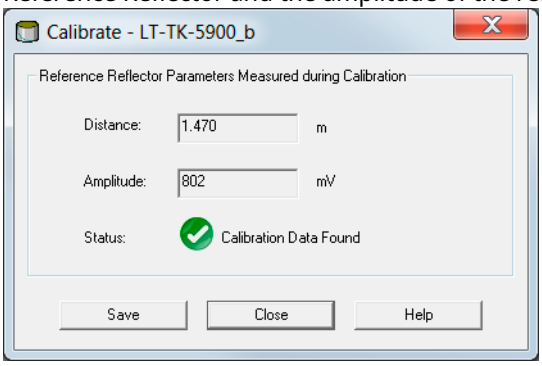
4. Click the **Reference Reflector Configuration/Configuration** button to open the ***Reference Reflector Configuration*** window:



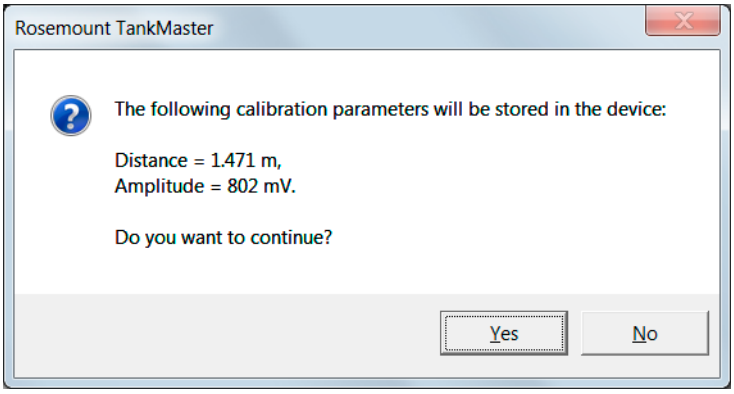
5. In case no previous proof test configuration has been performed, or if the proof test calibration has been reset, the status message ⚠ **Not Calibrated** will appear.
6. The ***Proof Test Configuration*** window lets you specify calibration parameters for the Reference Reflector. It also lets you set up the approved amplitude range and approved deviations from the calibrated reflector position.
7. In the ***Calibrate Reference Reflector*** pane, enter the actual position of the Reference Reflector (RR) in the **RR Distance** field. The **RR Distance** value will be used by the level gauge as a starting point when searching for the Reference Reflector. A position between 0.5 m and 8.0 m below the **Tank Reference Point** is allowed depending on the antenna type that is used.
8. Specify the desired **Distance Tolerance** value. This is the region around the specified RR Distance within which the level gauge searches for a radar echo when calibrating the Reference Reflector (see Figure 3-2). The default value is 0.3 m.
9. Click the **Calibrate** button.



10. Click **Yes**. Now the level gauge starts searching for the Reference Reflector. When the search is finished, the Calibrate window appears showing the distance to the Reference Reflector and the amplitude of the reflected radar signal.



11. Verify that the radar echo originates from the Reference Reflector and not from any other object in the tank. The measured Distance and Amplitude values will be used as reference values when future Proof Tests are performed.
12. For Safety Instrumented Systems (SIS) verify that the amplitude is within the following recommended range:
    - Rosemount 5900 with Parabolic antenna: 600 to 1200 mV
    - Rosemount 5900 with Array antenna (Still-Pipe): 1000 to 3500 mV
    - Rosemount 5900 with simulated antenna: approximately 600 mV
13. Click the **Save** button to store the current calibration.



14. In case the product surface is too close to the Reference Reflector during the calibration, a warning message will appear allowing you to choose whether to cancel or to save the calibration data.
15. If calibration failed you may consider the following:
    - Check that the actual position of the reference reflector (RR) is within the search window given by the calibration parameters RR Distance and Distance Tolerance.
    - Verify that the reference reflector is horizontal within the specifications for maximum inclination.
    - Verify that there are no disturbing objects near the reference reflector that may interfere.

Postrequisites

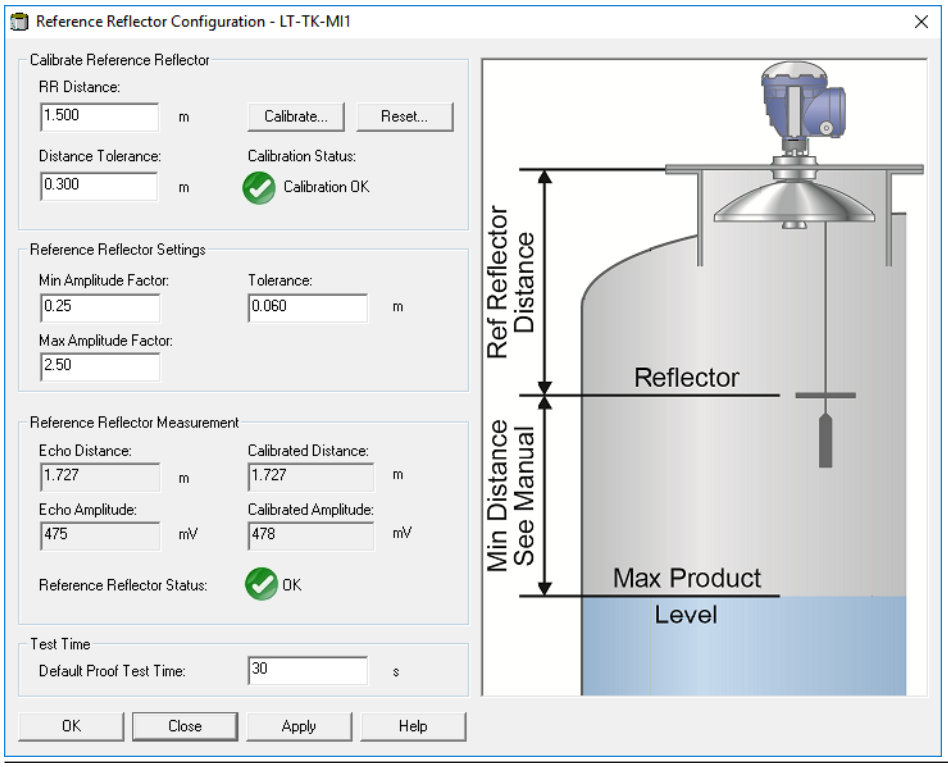
Return to the ***Proof Test Configuration*** window and proceed with configuration of Reference Reflector Settings.

Related information

Configure RR settings
Proof test configuration example
Installation
Tank geometry parabolic antenna
Tank geometry array antenna

3.2.4 Configure RR settings

Figure 3-1: Reference Reflector Settings



Procedure

1. Normally, the default settings of **Min./Max. Amplitude Factors** and **Tolerance** can be used without any changes. Proof tests must be within these limits in order to be approved. If needed, the settings can be changed.
2. Verify that **Reference Reflector Status** is OK. RR Status will be OK as long as the **Echo Distance** (actual distance) and **Echo Amplitude** are within the specified tolerances as specified in the ***Reference Reflector Settings*** pane. Click the **Apply** button to store the parameters.
3. Specify the desired **Default Test Time**. This value will be used as the default value in the ***Level Sensor Test*** window. The actual test time can be changed when running the test.

4. If Reference Reflector Status is OK, click the **OK** button to close the ***Proof Test Configuration*** window. Now the level gauge is ready for proof testing.

Related information

Configuration procedure

3.2.5 Proof test configuration example

An example of proof test configuration for a Rosemount 5900 Radar Level Gauge with Reference Reflector is shown in Table 3-1. The actual distance and amplitude as measured by the Rosemount 5900 gauge is shown in Table 3-2.

In the example, the measured distance to the Reference Reflector (Echo Distance) is 2.020 m. This is within the approved distance range as shown in Table 3-1. The amplitude of 450 mV (Echo Amplitude) is within the approved amplitude range. See also Figure 3-2.

Table 3-1: Configuration

Parameter	Configuration
Min. Amplitude Factor	0.25
Max. Amplitude Factor	2.5
Tolerance	0.06 m
Calibrated Amplitude	400 mV
Calibrated Distance	2.000 m
Approved amplitude	100 to 1000 mV
Approved distance	1.940 to 2.060 m

Table 3-2: Measurements

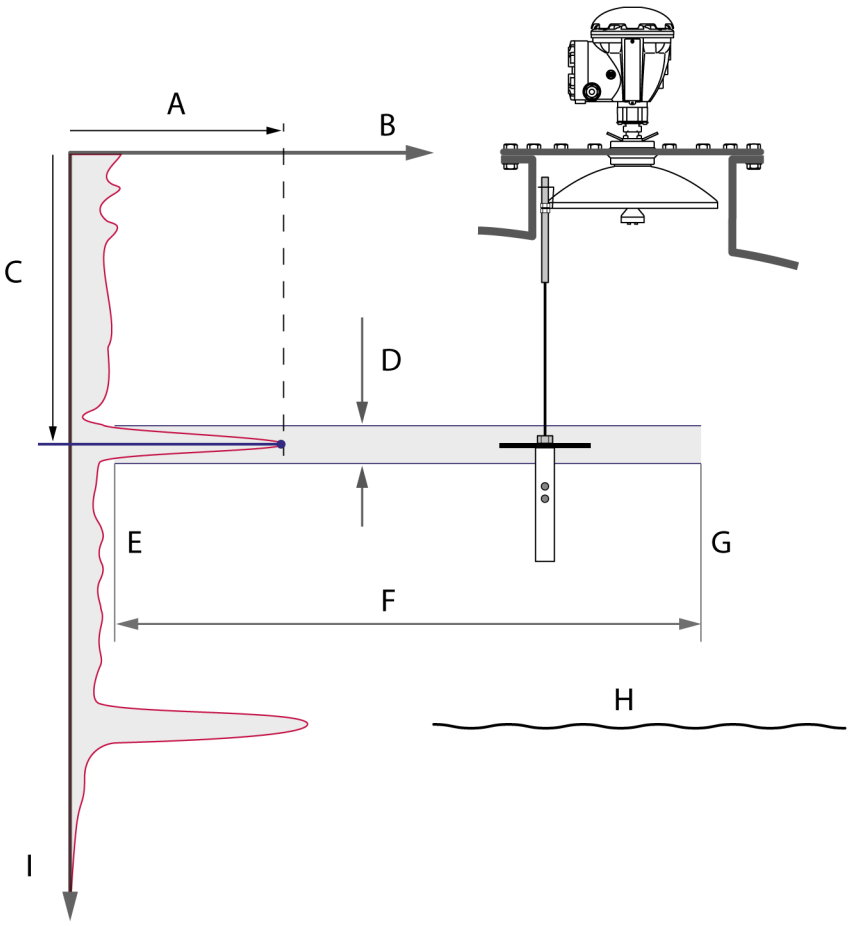
Parameter	Measurement
Echo Distance	2.020 m
Echo Amplitude	450 mV

Note

For Safety Instrumented Systems (SIS) the amplitude should be within the recommended range:

- Rosemount 5900 with Parabolic antenna: 600 to 1200 mV
- Rosemount 5900 with Array antenna (Still-Pipe): 1000 to 3500 mV

Figure 3-2: Proof Test Calibration



A. Calibrated Amplitude
B. Echo Amplitude
C. Calibrated Distance
D. Distance Tolerance
E. Minimum Amplitude
F. Approved Amplitude
G. Maximum Amplitude
H. Product surface
I. Distance

Table 3-3: Configuration Parameters for a Proof Test Setup

Calibrated Amplitude	Amplitude of the measurement signal that was reflected by the Reference Reflector during calibration.
Calibrated Distance	Distance to the Reference Reflector measured by the gauge during calibration.
Distance Tolerance	The region around the specified RR Distance within which the Rosemount 5900 searches for a radar echo when calibrating the Reference Reflector.

Table 3-3: Configuration Parameters for a Proof Test Setup *(continued)*

Approved Amplitude	Approved range of signal amplitudes during a proof test.
Min./Max. Amplitude	Minimum and maximum amplitude values that will be allowed during a proof test.
RR Distance	Distance from the Gauge Reference Point to the reference reflector (RR).

Related information

Configuration procedure

4 Operation

4.1 Proof Test operation

This is a description of how to perform proof tests with a Rosemount 5900 using the Rosemount TankMaster WinSetup program.

Supported proof tests:

- High level alarm

  Note
  Not for wireless applications

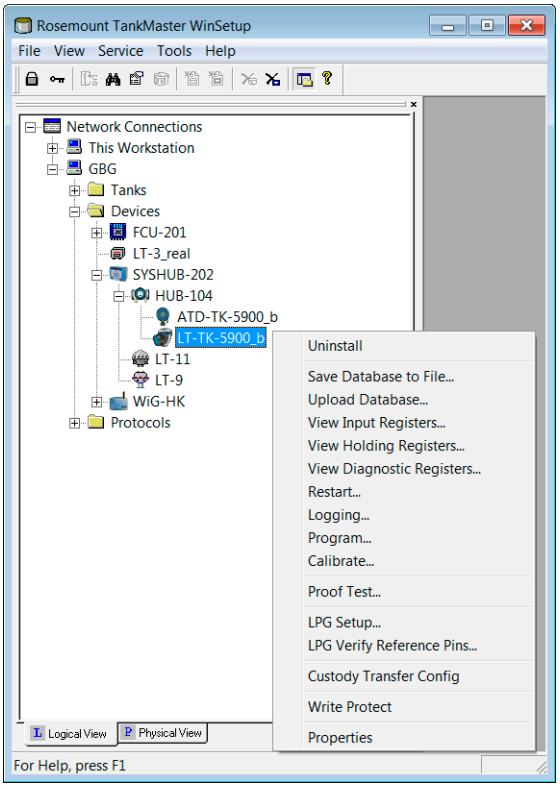
- One-point level verification
- Analog output verification
- Relay output verification

Prerequisites

Prior to running a proof test you will have to ensure that the proof test function is properly calibrated and configured.

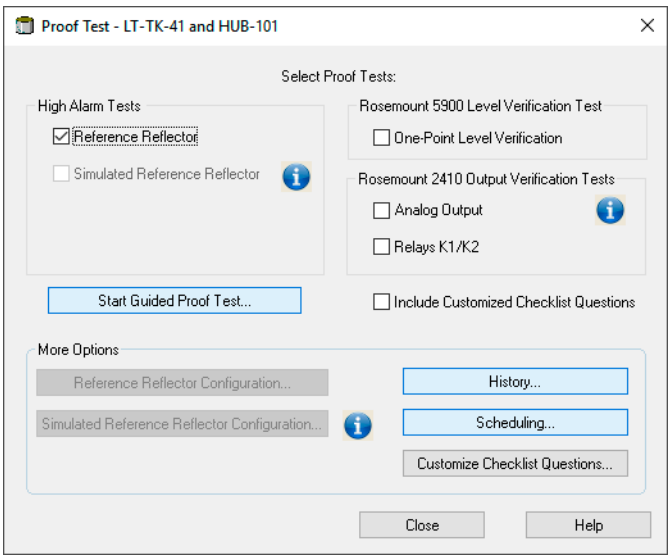
Procedure

1. Ensure that the TankMaster™ WinSetup program is up and running.
2. In the TankMaster Winsetup workspace, click the right mouse button on the Rosemount 5900 device icon and select the **Proof Test** option.

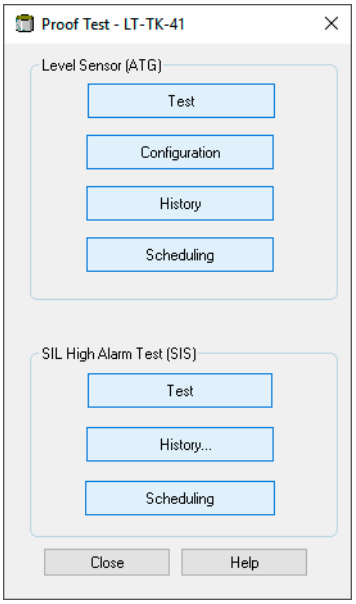


3. The ***Proof Test*** window appears. It lets you perform various tasks such as performing proof tests, viewing proof test history, and schedule future proof tests.

SIL2 model code S and non-SIL

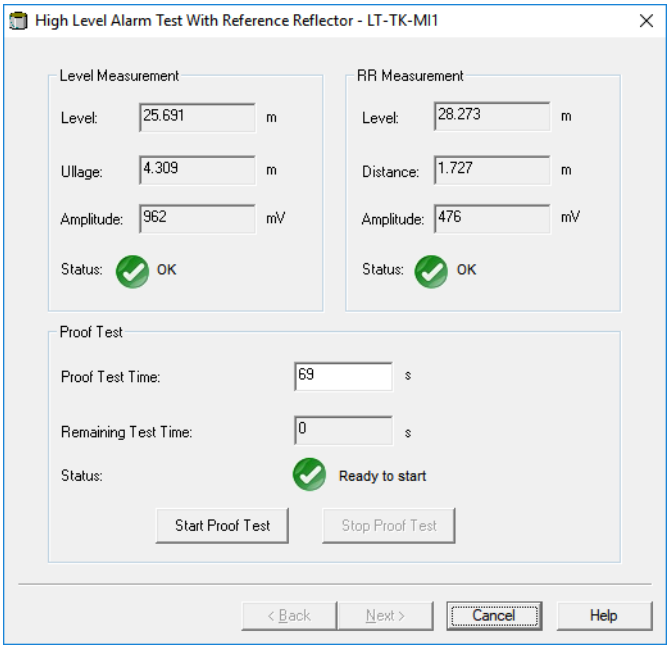


SIL3



4. To perform a High Level Alarm proof test:
   - Select the check box for **Reference Reflector** test, and click the **Start Guided Proof Test** button.
   - For **SIL3** gauges; in the Level Sensor (ATG) pane click the **Test** button.

5. The ***High Level Alarm Test*** window lets you start a proof test if a proof test configuration is performed. In case the **Start Proof Test** button is disabled it indicates that you will have to make a calibration of the Reference Reflector first.

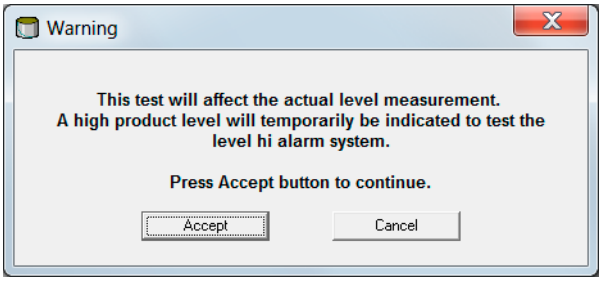


6. The following measurement data is presented:

Parameter	Description
Level	Distance from the **Zero Reference Point** to the product surface or the Reference Reflector, respectively.
Ullage	Distance from the **Gauge Reference Point** to the product surface.
Distance	Distance from the **Gauge Reference Point** to the Reference Reflector.
Amplitude	Amplitude of the radar signal reflected by the product surface or the Reference Reflector, respectively.

7. Specify duration of the test in the **Proof Test Time** field. It can be set to any value between 30 seconds and 60 minutes. The default value is 120 seconds.
8. Ensure that device status is OK. See different status messages that may appear according to Table 4-1.
9. Click the **Start Proof Test** button to perform the test for the specified Proof Test Time.

10. Note the warning that appears when starting the proof test. Ensure that the necessary actions are taken in order to maintain safety during the test.



11. A report in PDF format will be created automatically and will be available from the ***Proof Test History*** window. For SIL3 applications you will have to fill in a proof test form when the proof test is finished in order to create a report.

Related information

Reports
Viewing a report
Configuration using TankMaster WinSetup

4.1.1 Proof test status

Table 4-1: Proof Test Status Options

Status options
Proof Test Active
Test Finished
Test Ended by User
RR Not Found
RR not Calibrated
Level Surface Too Close
Proof Test Status not Available

Related information

Service and troubleshooting

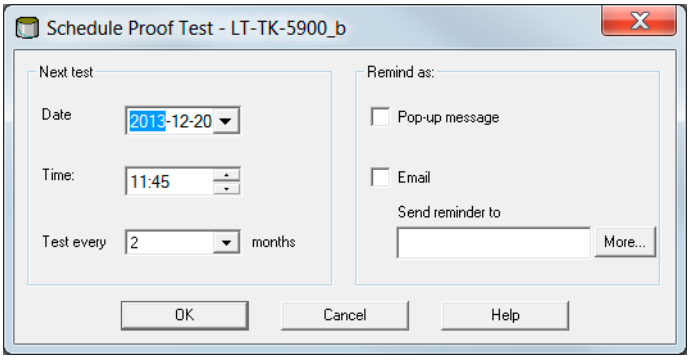
4.2 Scheduling

You may specify a scheduling interval in order to be reminded when it is time for a new Proof Test. There are two reminder options available:

- e-mail
- pop-up window

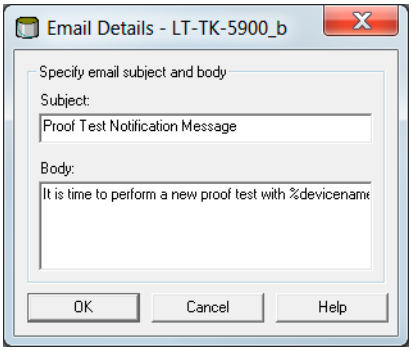
Procedure

1. Open the ***Proof Test*** window.
2. Click the **Scheduling** button.
3. Enter the desired date, time, and scheduling interval.



4. Choose one or both of the reminder options; **Pop-up Message** and/or **E-mail**.

   The **More** button opens the ***Email Details*** window which lets you type a subject line and a message text for the email reminder.

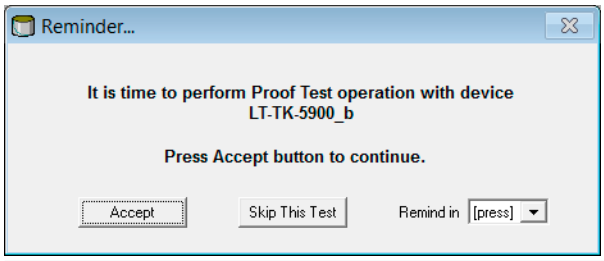


4.2.1 Pop-up message

The Reminder pop-up message will appear at the scheduled time.

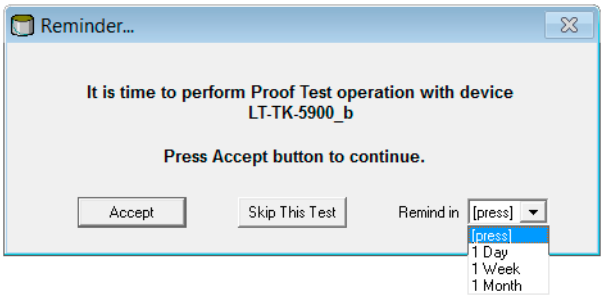
In case you choose to accept, you will be directed to the ***Proof Test*** window in order to start the proof test procedure.

Figure 4-1: Pop-up message with reminder to perform proof test



You may choose to skip the test altogether by clicking the **Skip This Test** button, or you may let WinSetup remind you later by choosing one of the options in the **Remind In** drop-down list: 1 Day, 1 Week, or 1 Month.

Figure 4-2: If proof test is skipped you may choose to be reminded later



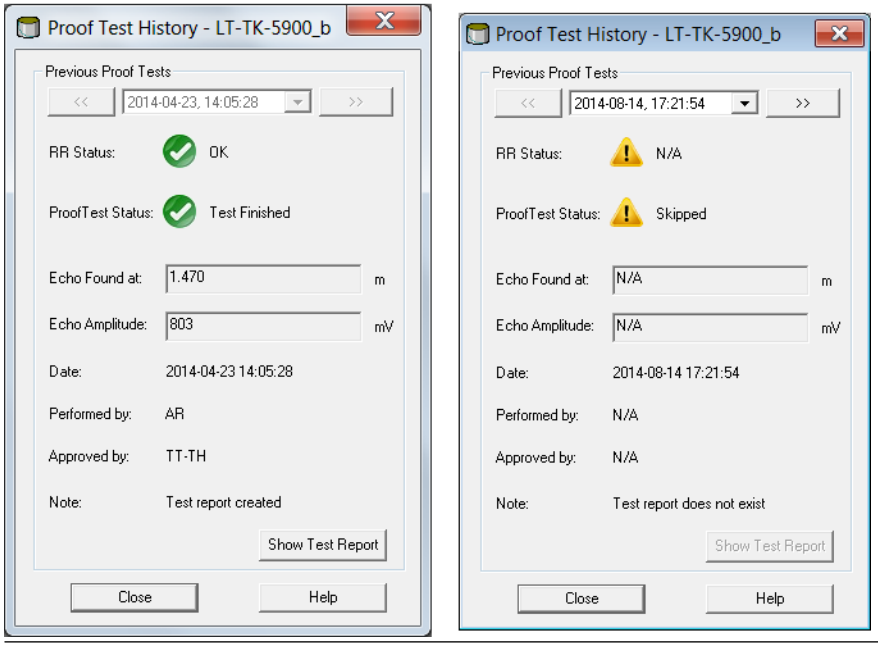
Related information

Proof Test operation

4.3 History

The **Proof Test History** function lets you view previously performed proof tests for a device. You can also view tests that were interrupted resulting in no report creation.

Figure 4-3: Proof Test History



Using **Back** and **Forward** buttons, or selecting the test date, you may navigate through the tests. The following information about test parameters will be shown:

- RR Status
- Proof Test Status
- Echo Distance
- Echo Amplitudes
- Date
- Performed By
- Approved By
- Note

Test reports are available by pressing the **Show Test Report** button.

Related information

Viewing a report

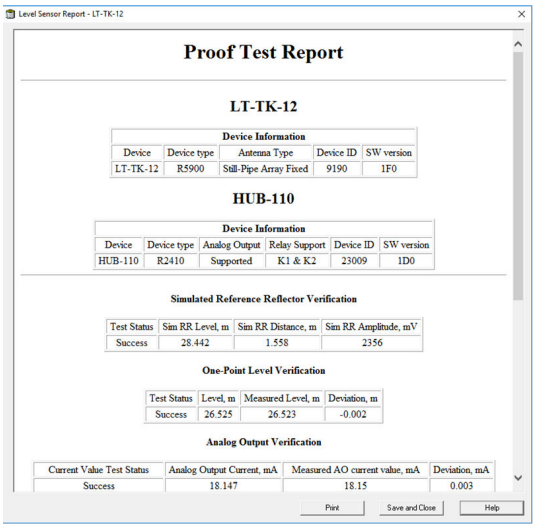
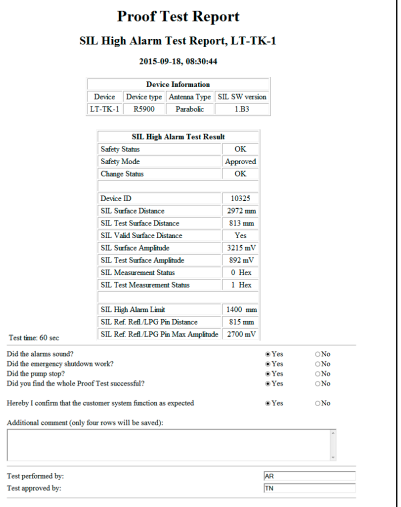
4.4 Reports

When a proof test is finished a report will be generated. For SIL3 you will have to fill in a questionnaire in order to create the report.

Procedure

1. When prompted, fill in the proof test report form.

Table 4-2: Proof Test Report

SIL2 model code "S" and non-SIL	SIL3
	

2. Click the **Save** button to store the proof test form.
3. A report in PDF format will be created automatically. It will be available from the ***Proof Test History*** window.

Related information

Viewing a report

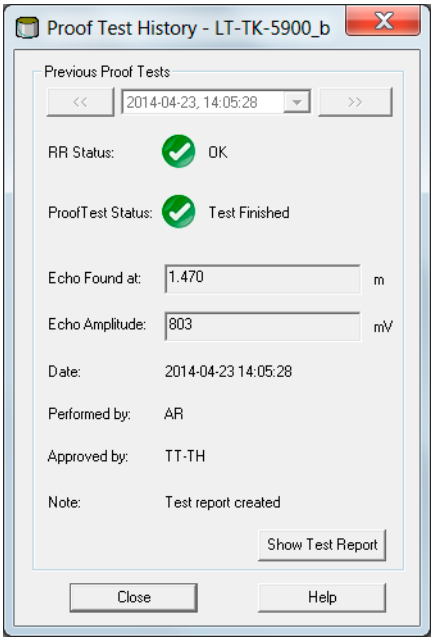
4.4.1 Viewing a report

Reports in Adobe Acrobat pdf format are available via the ***Proof Test History*** window.

Procedure

1. In TankMaster WinSetup, click the Rosemount 5900 icon and select the Proof Test option to open the ***Proof Test*** window.
2. Click the **History** button.

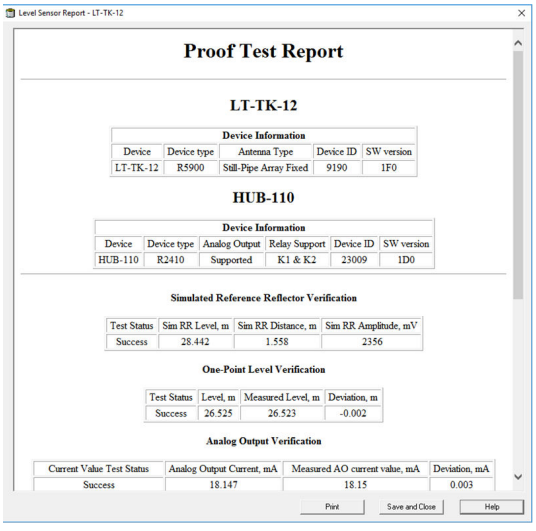
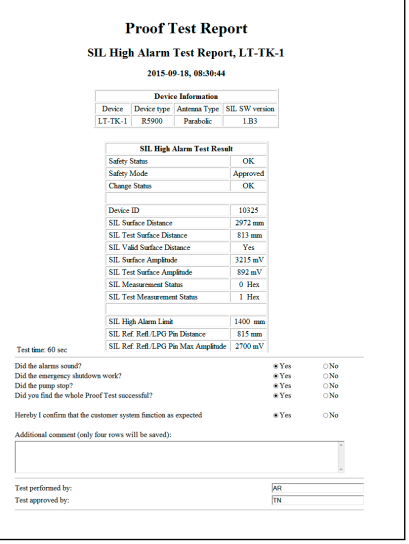
3. In the ***Proof Test History*** window, select the desired test.



4. Click the **Show Test Report** button. Acrobat Reader opens and displays a report for the selected proof test.

   The report includes device information and device status. There is also information regarding the result of the proof test, for example whether alarms did sound or if emergency shutdown was activated.

Table 4-3: Proof Test Report

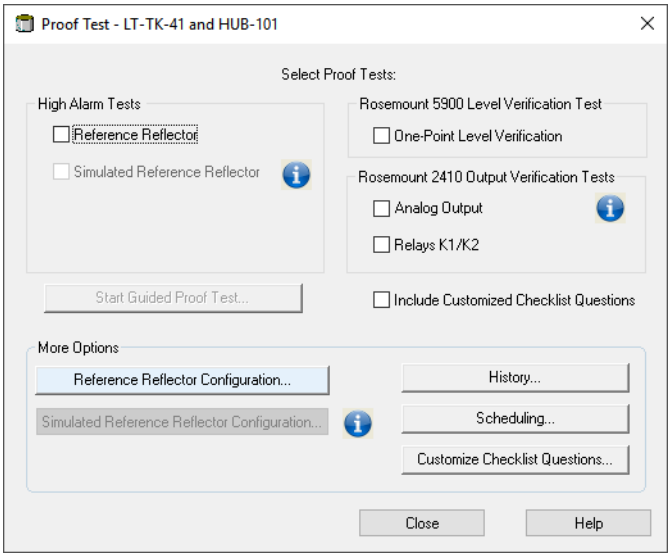
SIL2 model code "S" and non-SIL	SIL3
	

4.5 Removing a Reference Reflector

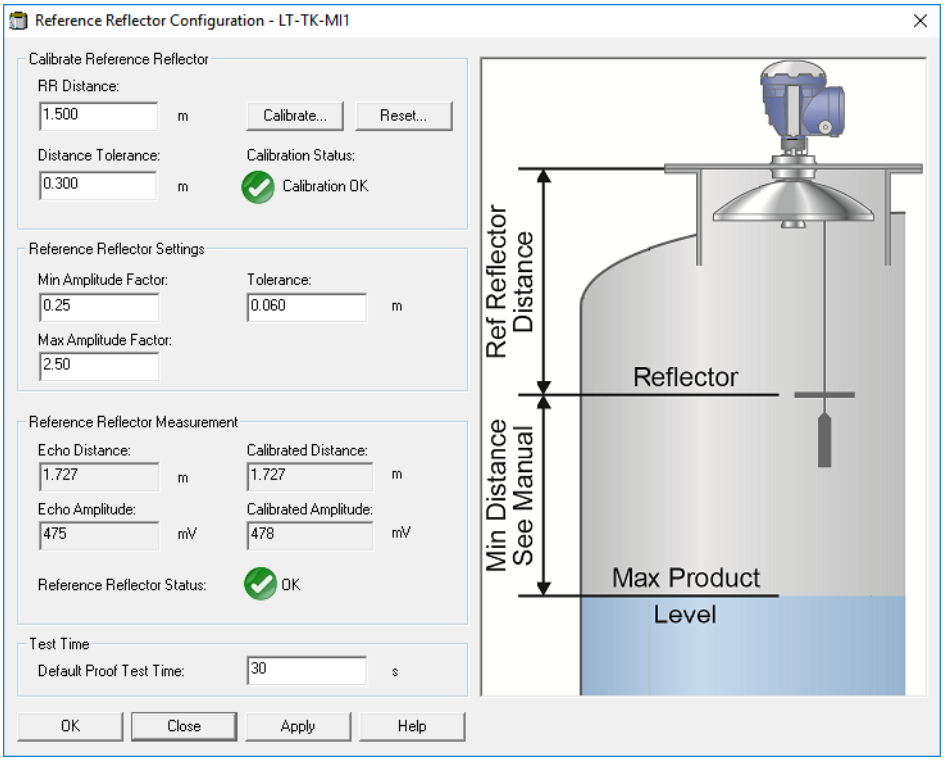
There may be a situation when you would like to remove the Reference Reflector and disable the Proof Test function. Then you can use the **Reset** function to remove all Proof Test calibration data. This ensures that there is no data stored in the Rosemount 5900 database that may interfere with the current measurements.

Procedure

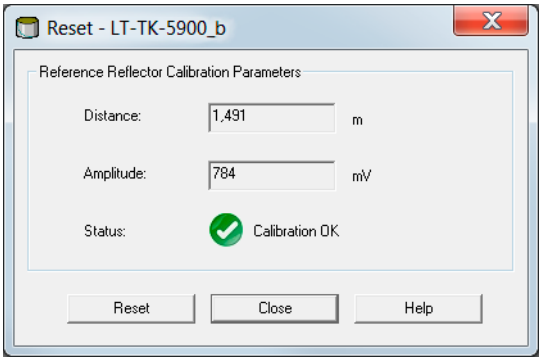
1. In the TankMaster Winsetup workspace, click the right mouse button on the Rosemount 5900 device icon and select the **Proof Test** option.
   The ***Proof Test*** window appears.
2. In the ***Proof Test*** window, click the **Reference Reflector Configuration** button.



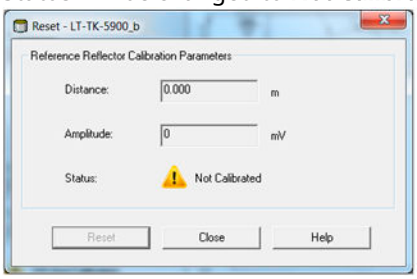
3. In the ***Reference Reflector Configuration*** window, click the **Reset** button to open the ***Reset*** window.



4. The ***Reset*** window shows the current Reference Reflector calibration data for the Rosemount 5900 Radar Level Gauge.



5. Click the **Reset** button to clear all calibration data.
Status will be changed to **Not Calibrated**.



5 Service and troubleshooting

5.1 Troubleshooting

5.1.1 Reference Reflector (RR) not found

Possible cause

Incorrect configuration

Recommended actions

- Check RR Distance
- Check Distance Tolerance

Possible cause

RR inclination too high

Recommended actions

- Adjust the Reference Reflector and make sure that it is horizontal within specified limit.

Possible cause

The Reference Reflector is within the Hold Off region.

Recommended actions

- Check that the reflector is installed according to the instructions.
- Ensure that the reflector is installed according to the requirements for minimum Reference Reflector Distance.

Possible cause

Wrong search window due to using incorrect reference system.

Recommended actions

- Ensure that distances are measured in the correct reference system. Note for example, that the Gauge Reference Point is located at the flange of the tank nozzle.

Possible cause

RR Calibration could not be performed.

Recommended actions

- See RR calibration could not be performed.

5.1.2 Proof test could not be started

Possible cause

Product surface too close to the reference reflector.

Recommended actions

- Make sure that the product surface is below the maximum level that is allowed for RR calibration.

5.1.3 Proof test was aborted unexpectedly

Possible cause

Product surface too close to the reference reflector.

Recommended actions

- Make sure that the product surface is below the maximum level that is allowed for RR calibration.

5.1.4 RR calibration could not be performed

Possible cause

Write protection is enabled.

Recommended actions

- Disable write protection.

5.1.5 Reference Reflector does not appear in Tank Scan

Possible cause

Tank Signal Mean (TSM) function (near-zone improvement) filters away the Reference Reflector.

Recommended actions

- Enable Peak Labels by checking the box.

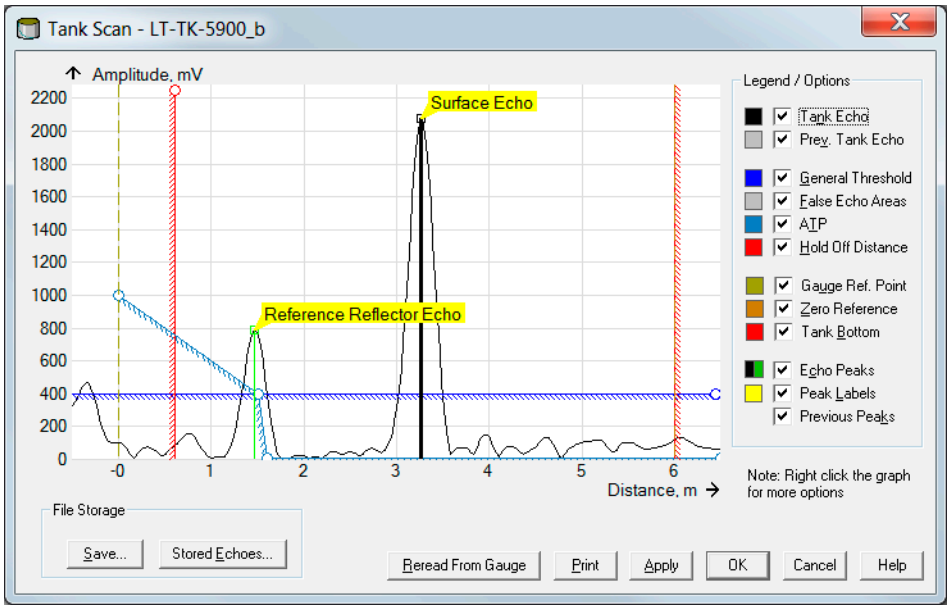
Related information

Tank scan

5.2 Tank scan

The **Tank Scan** function is a useful tool to verify that the Rosemount 5900 level gauge is able to locate the product surface and the reference reflector. It lets you locate possible disturbing objects, and you may also check that amplitude thresholds are properly set so that the Reference Reflector echo is not filtered away.

Figure 5-1: Tank Spectrum with Radar Echoes from Reference Reflector and Product Surface



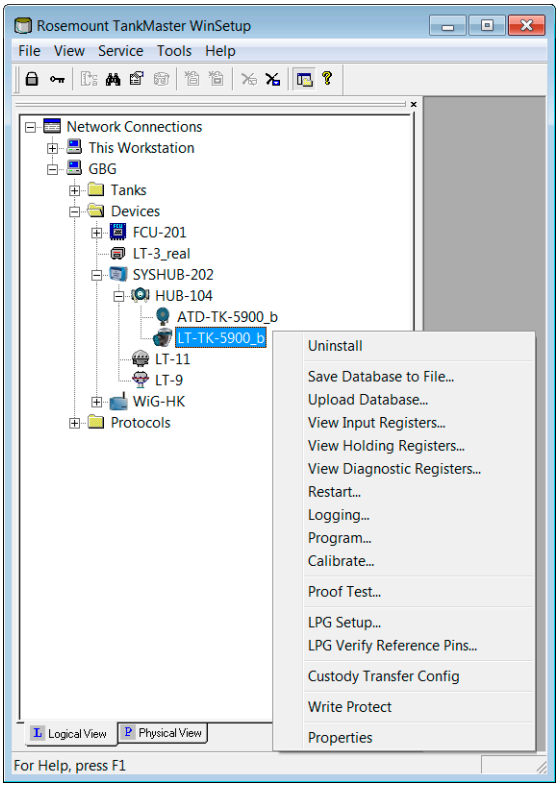
Note
Simulated Reference Reflector will not be shown in tank scan.

5.2.1 To open the Tank Scan window

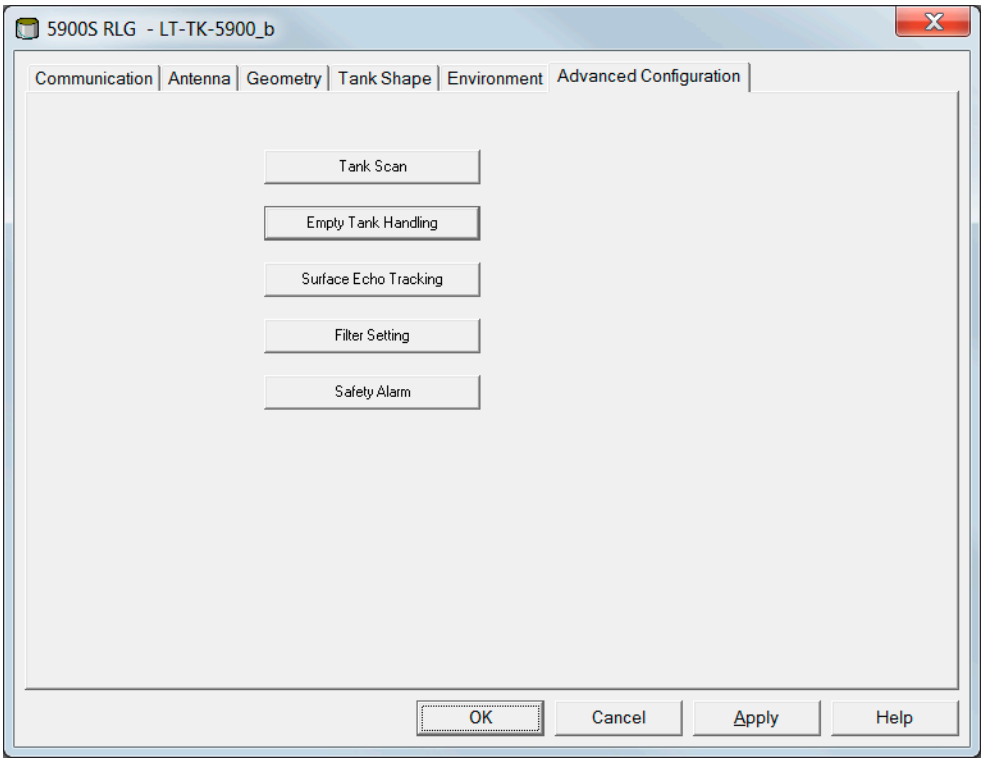
Procedure

1. In the WinSetup workspace, click the right mouse button on the device icon.

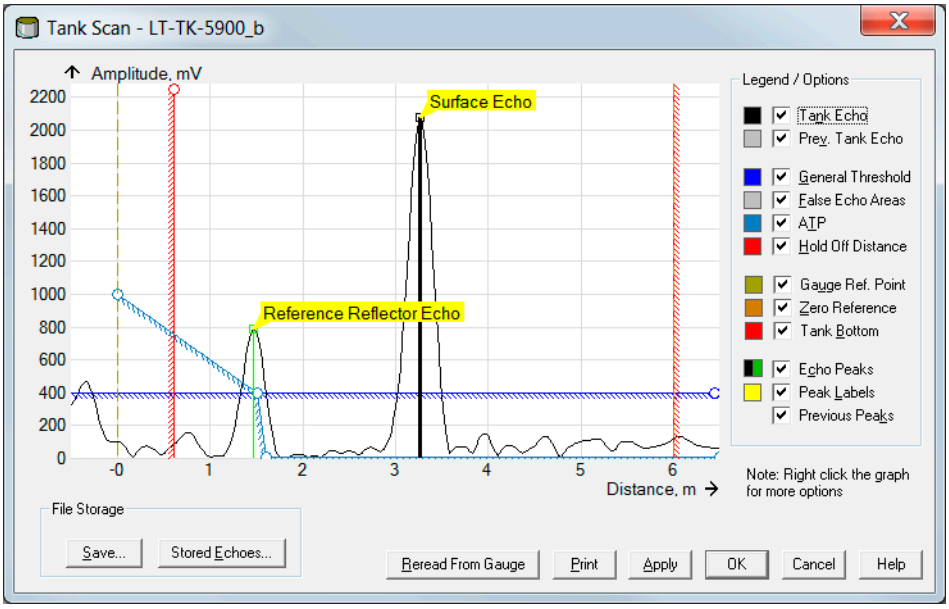
2. Select the **Properties** option.



3. Select the ***Advanced Configuration*** tab an click the **Tank Scan** button.



4. The ***Tank Scan*** window appears allowing you to analyze the various echoes in the tank.



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