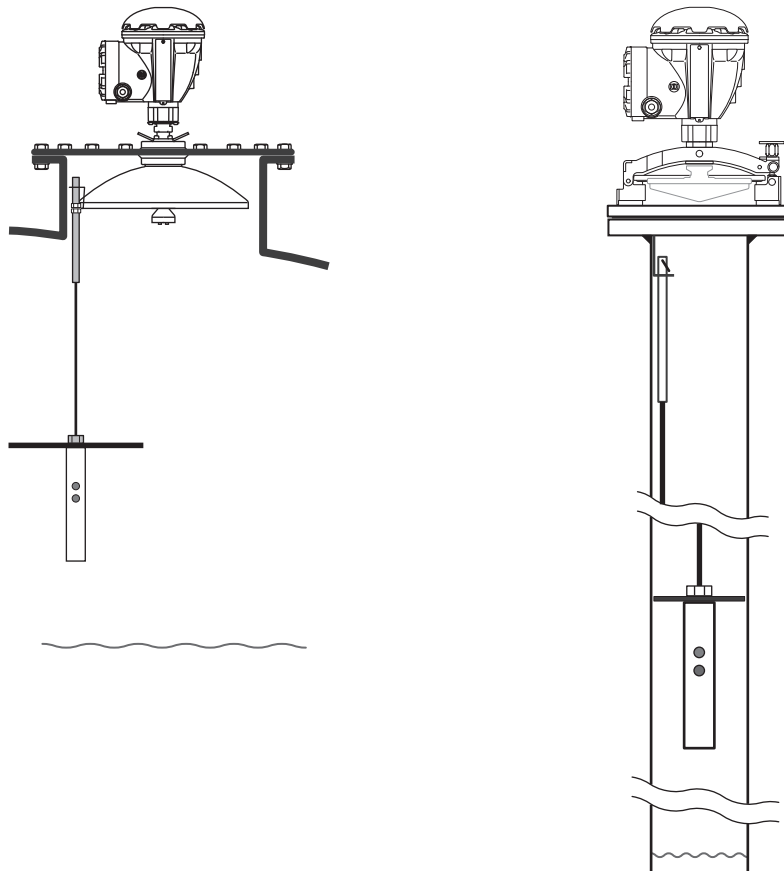


# Rosemount™ 5900

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





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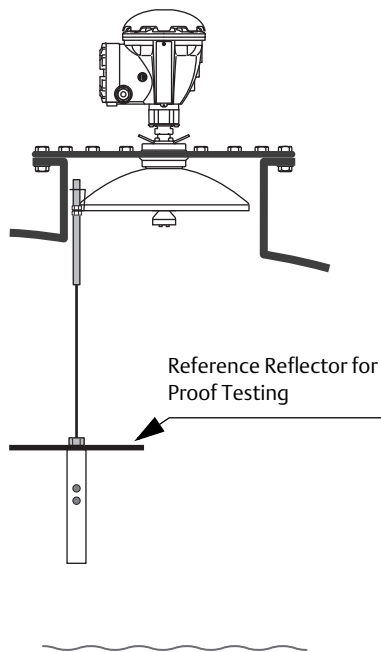
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# Section 1 Introduction

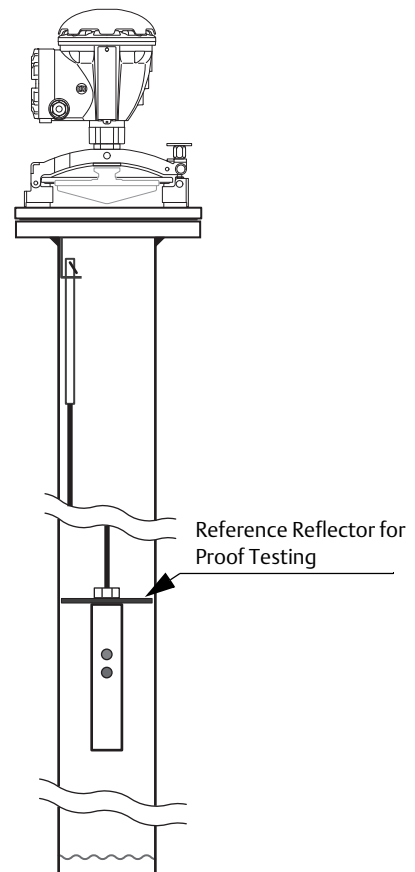
The Rosemount 5900 Radar Level Gauge is designed with functionality that lets you proof test high alarms and verify correct product surface measurement. The Rosemount 5900 allows you to combine continuous product level monitoring with proof testing at regular intervals. It is based on a dedicated Reference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

**ROSEMOUNT 5900 WITH PARABOLIC ANTENNA**



**ROSEMOUNT 5900 WITH ARRAY ANTENNA**



## 1.1 Section overview

This document is a supplement to the Rosemount 5900S [Reference Manual](#) (Document No. 00809-0100-5900).

The sections in this reference manual supplement 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** 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.

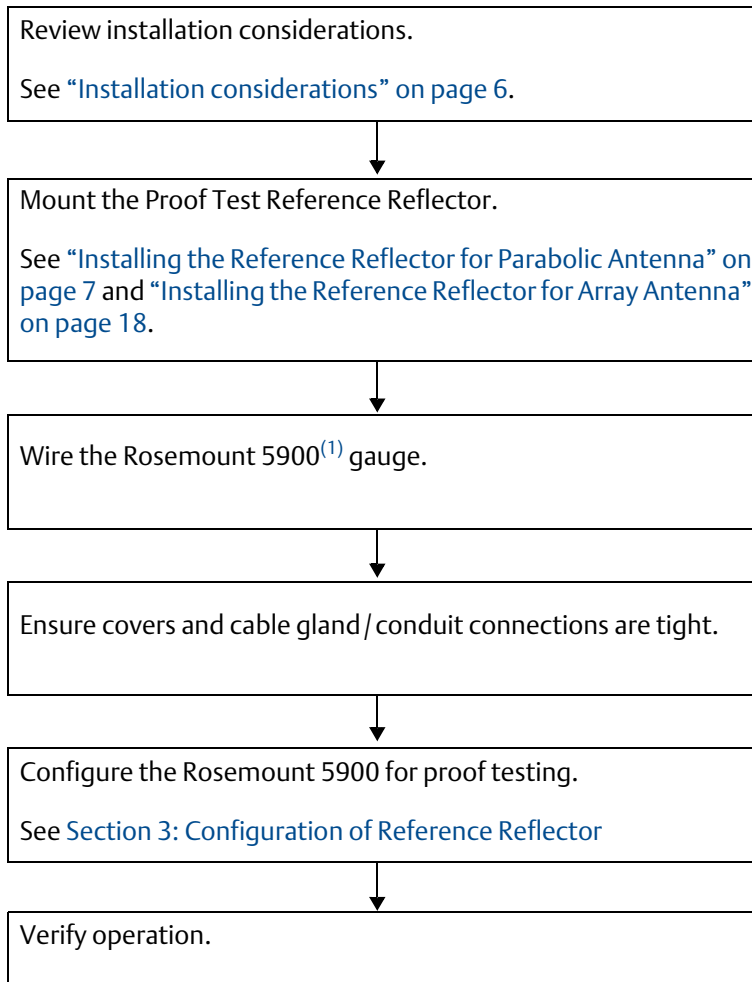
**Section 5: Service and Troubleshooting** provides troubleshooting techniques for the most common operating problems.

## 1.2 Service support

For service support contact the nearest *Emerson Process Management/Rosemount Tank Gauging* representative. Contact information can be found on the web site [www.Emerson.com](http://www.Emerson.com).

## 1.3 Installation procedure

Follow these steps for a proper installation of the Reference Reflector for Proof Testing a Rosemount 5900 Radar Level Gauge.



(1) See the Rosemount 5900S Reference manual (Document No. 00809-0100-5900 or the Rosemount 5900C Reference manual (Document No. 00809-0100-5901)



# Section 2      Installation

Overview .....	page 5
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Installation considerations .....	page 6
Installing the Reference Reflector for Parabolic Antenna .....	page 7
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## 2.1      Overview

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

## 2.2      Safety messages

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

⚠ WARNING

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

- Make sure 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.

**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 2460 System Hub is off and the lines to any other external power source are disconnected or not powered while wiring the 2460.

**Electrical shock could cause death or serious injury:**

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

⚠ CAUTION

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

---

## 2.3 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

See [“Tank Geometry - Parabolic Antenna” on page 9](#) and [“Tank Geometry - Array Antenna” on page 20](#) for further information on tank geometry and position of the Reference Reflector.

---

### Note

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

---

## 2.4 Installing 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.

### 2.4.1 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
- Ring Clamping assembly

Figure 2-1. Wire and Weight Assembly

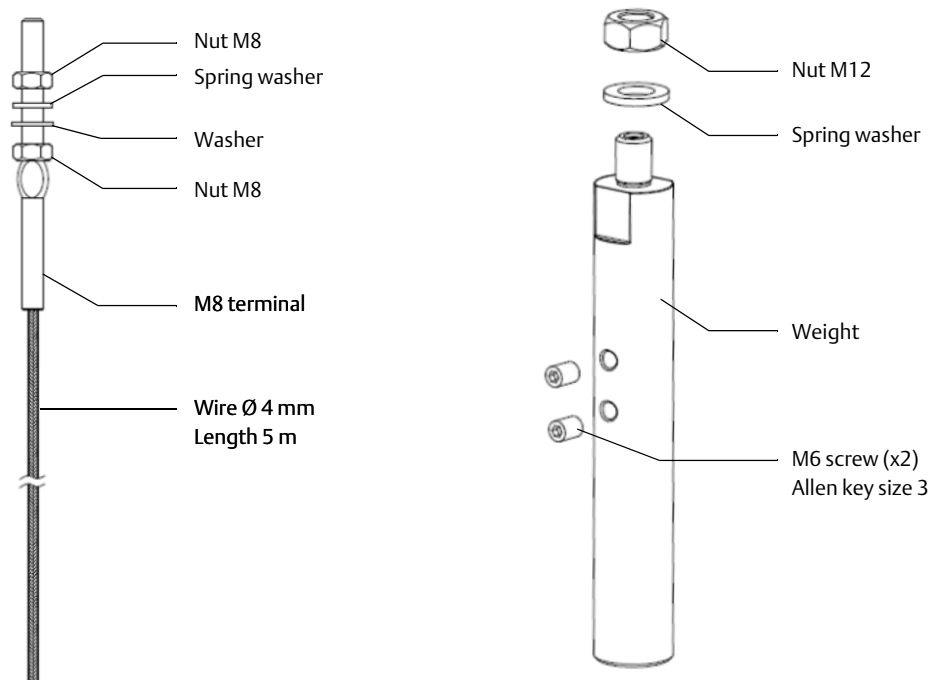


Figure 2-2. Reference Reflector

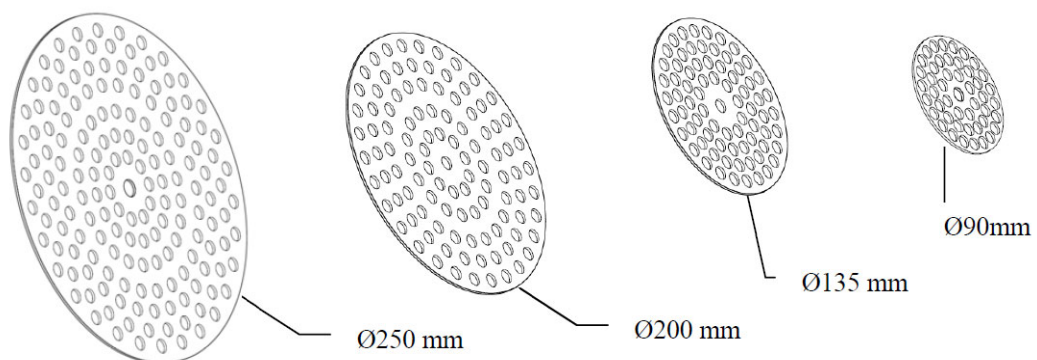
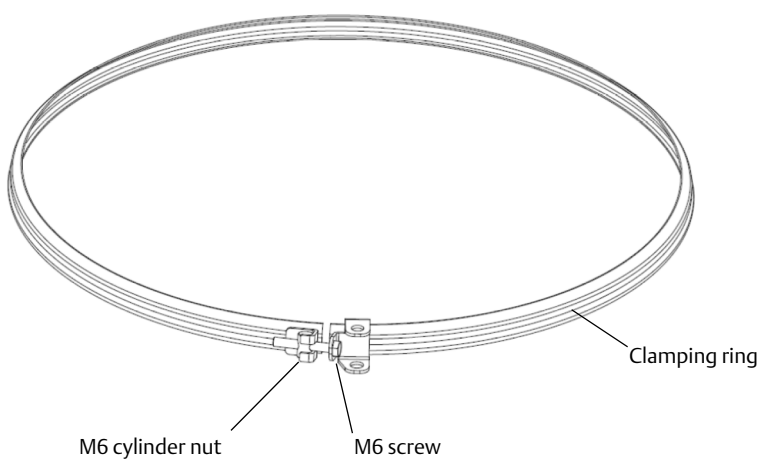
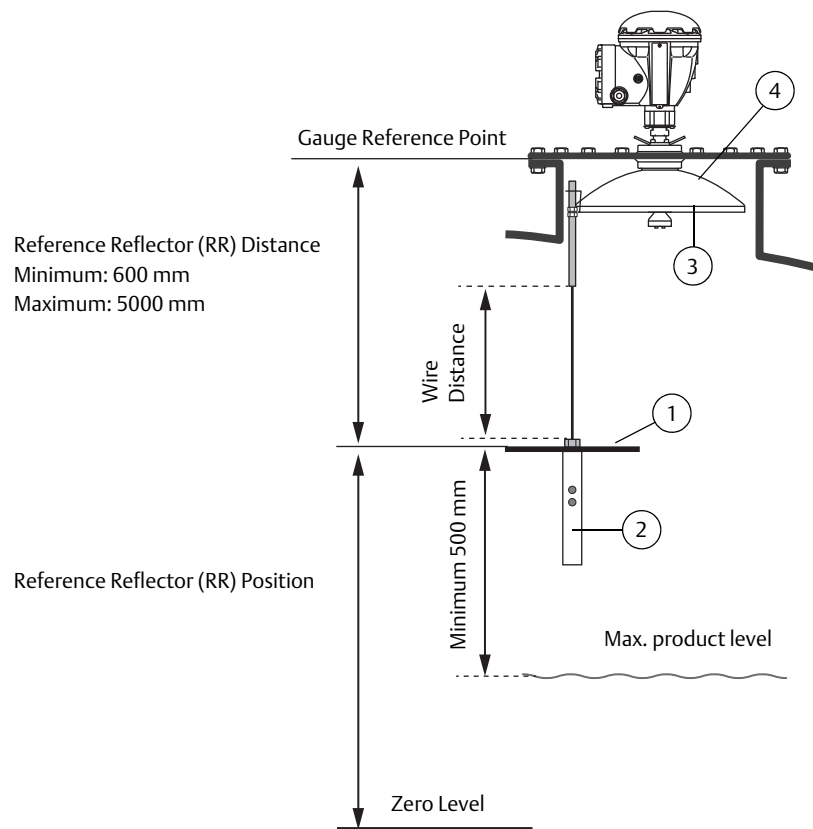


Figure 2-3. Clamping Ring



## 2.4.2 Tank Geometry - Parabolic Antenna

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



1. Reference Reflector (RR). Maximum inclination 2.5°.
2. Weight
3. Clamping ring
4. Parabolic antenna

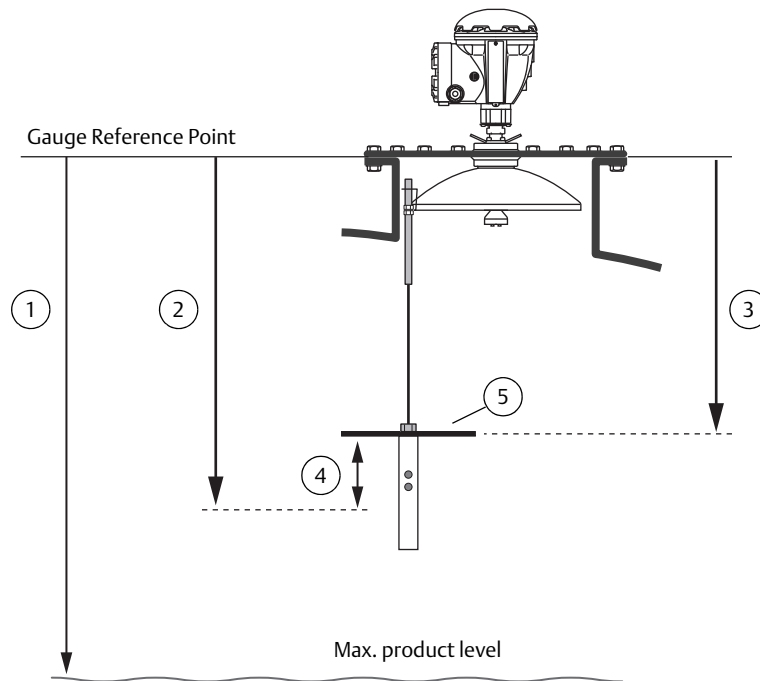
**Note**

See “Safety Instrumented System (SIS)” on page 10 for installation requirements in Safety Instrumented Systems (SIS).

## Safety Instrumented System<sup>(1)</sup> (SIS)

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 RR - Gauge Reference Point: 600 to 5000 mm.
  - c. Minimum 500 mm to maximum product level.

**Figure 2-5. Tank geometry for Rosemount 5900 with Parabolic Antenna and Proof Test Reference Reflector in Safety Instrumented System (SIS).**



1. SIL Surface Distance
2. SIL High Alarm Limit
3. Distance RR - Gauge Reference Point: 600 to 5000 mm
4. Minimum distance RR - SIL High Alarm = 500 mm
5. Reference Reflector (RR)

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

## 2.4.3 Installing the Reference Reflector

The length of the wire 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

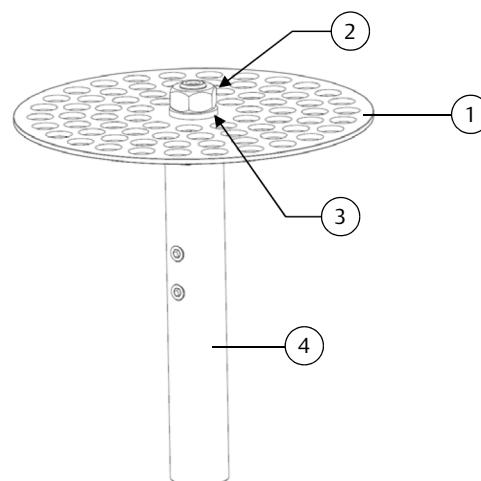
Handle the wire and assembly with care to avoid permanent bends.

1. Specify the position of the Reference Reflector (RR) and calculate the Reference Reflector Distance (see [Figure 2-4 on page 9](#)).
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 for Various Distances**

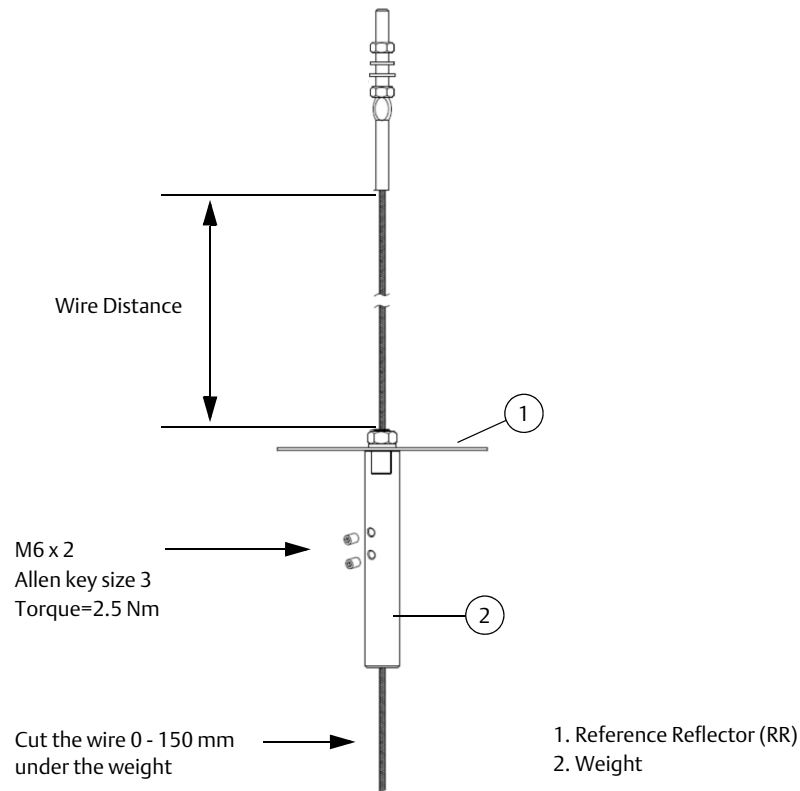
Reference Reflector Distance (mm)	Diameter (mm)
$600 \leq \text{RR Distance} < 2000$	250
$2000 \leq \text{RR Distance} < 3000$	200
$3000 \leq \text{RR Distance} < 4000$	135
$4000 \leq \text{RR Distance} < 5000$	90

3. Mount the appropriate Reference Reflector on the weight.
4. Tighten the M12 nut to a torque value of 18 Nm.



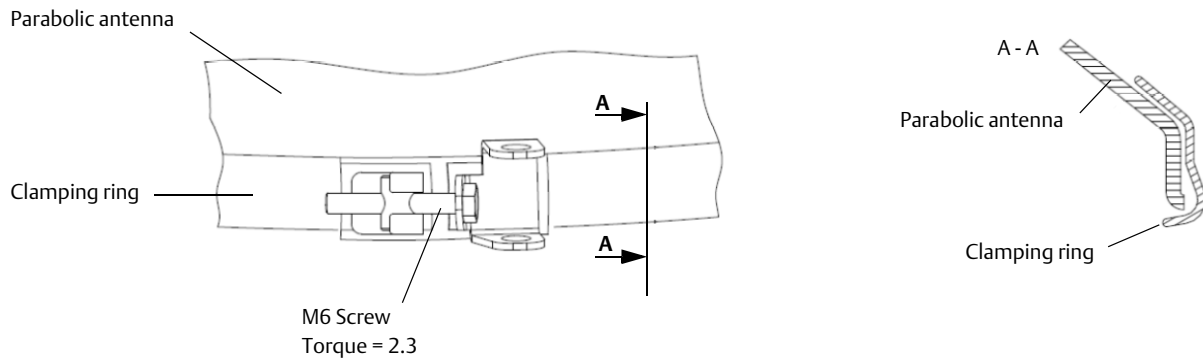
1. Reference Reflector (RR)
2. M12 Nut. Torque=18 Nm
3. Spring washer
4. Weight

5. Calculate the required Wire Distance. See “Wire Distance calculation” on page 15.
6. Feed the wire through the weight and the Reference Reflector (RR).

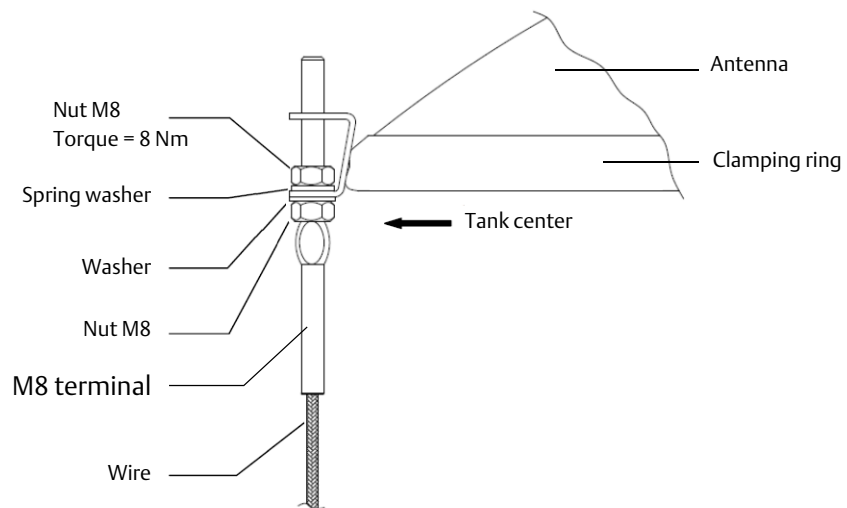


7. Position the weight so the calculated Wire Distance is obtained.
8. Tighten the two screws (size M6) to a torque value of 2.5 Nm.
9. Cut the wire. You may leave 0 to 150 mm of the wire below the weight.

10. Mount the clamping ring (see Figure 2-3 on page 8) on the Parabolic Antenna. Ensure that the Reference Reflector is directed towards the center of the tank as illustrated in Figure 2-4 on page 9.

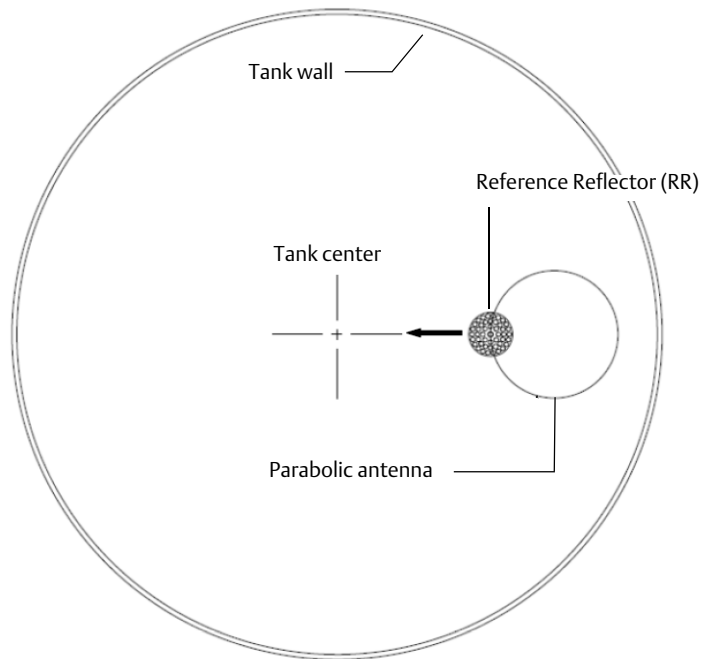


11. Mount the M8 terminal (which holds the weight and Reference Reflector) on the clamping ring.
12. Tighten the M8 nut to the specified torque of 8 Nm.



13. Ensure that:
  - the Reference Reflector is correctly aligned towards the center of the tank
  - inclination of Reference Reflector is less than  $2.5^{\circ}$ .

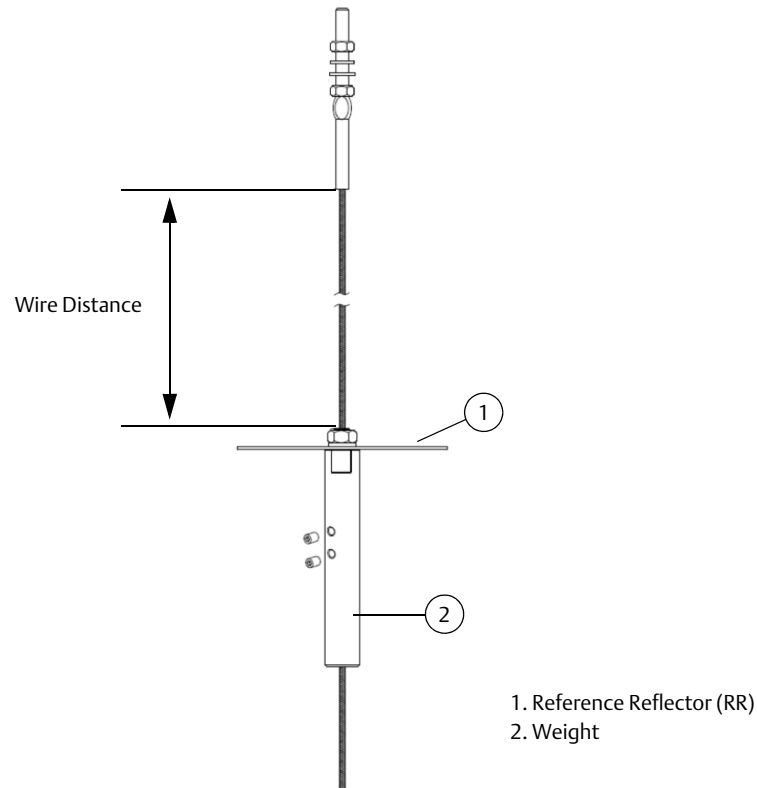
**Figure 2-6. Align the Reference Reflector**



## 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



## Welded tank connection

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

$$\text{Wire Distance} = \text{RR} + \text{Ga} - \text{W} - 194 \text{ (mm)}$$

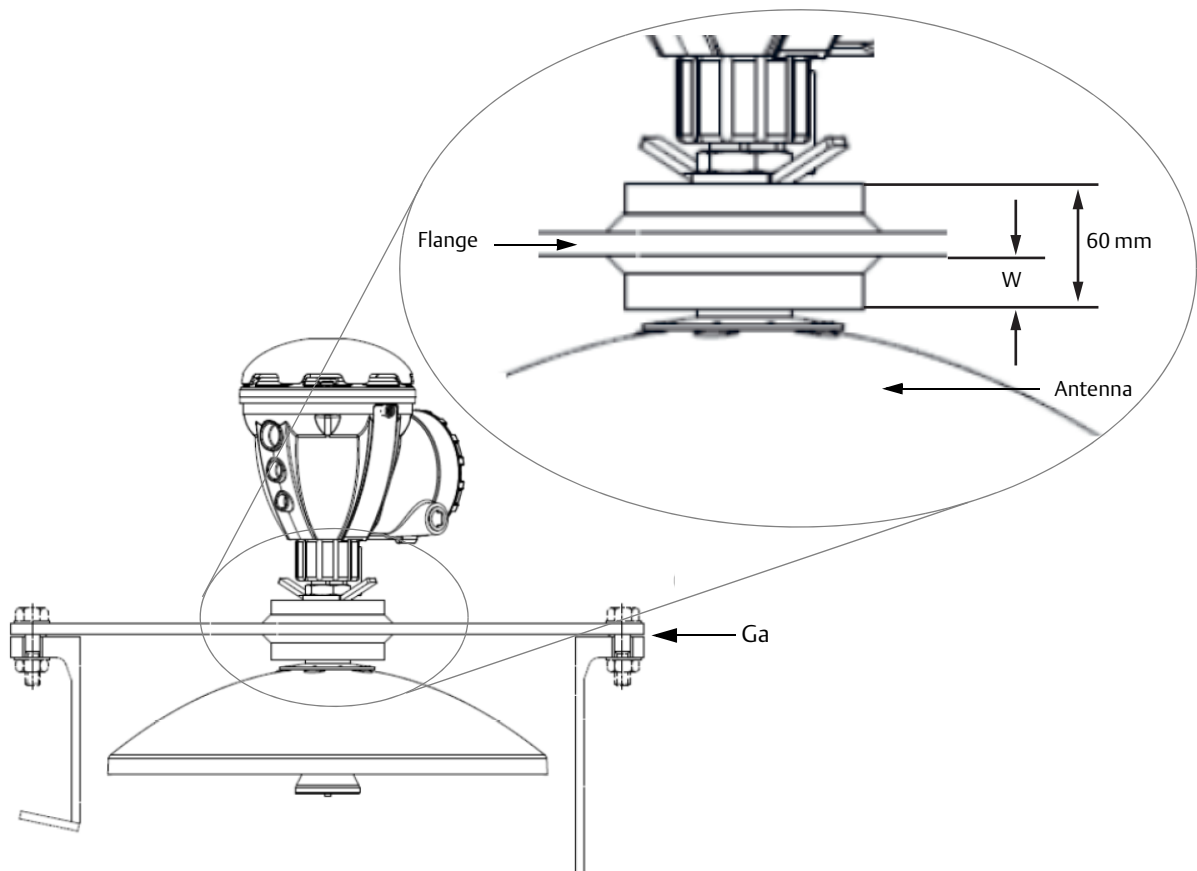
where

W= see [Figure 2-8 on page 16](#)

Ga= thickness of the flange gasket (see [Figure 2-8 on page 16](#))

RR= Reference Reflector Distance (see [Figure 2-4 on page 9](#))

**Figure 2-8. Welded Connection**



## Clamped tank connection

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

$$\text{Wire Distance} = \text{RR} + \text{Ga} + \text{T} - 243 \text{ (mm)}$$

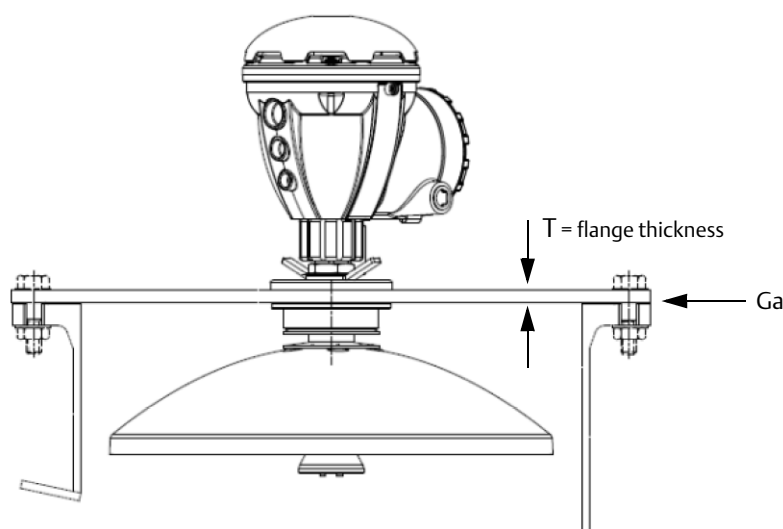
where

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 on page 9](#))

**Figure 2-9. Clamped Connection**



## 2.5 Installing the Reference Reflector for Array Antenna

### 2.5.1 Reference Reflector Kit

The 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

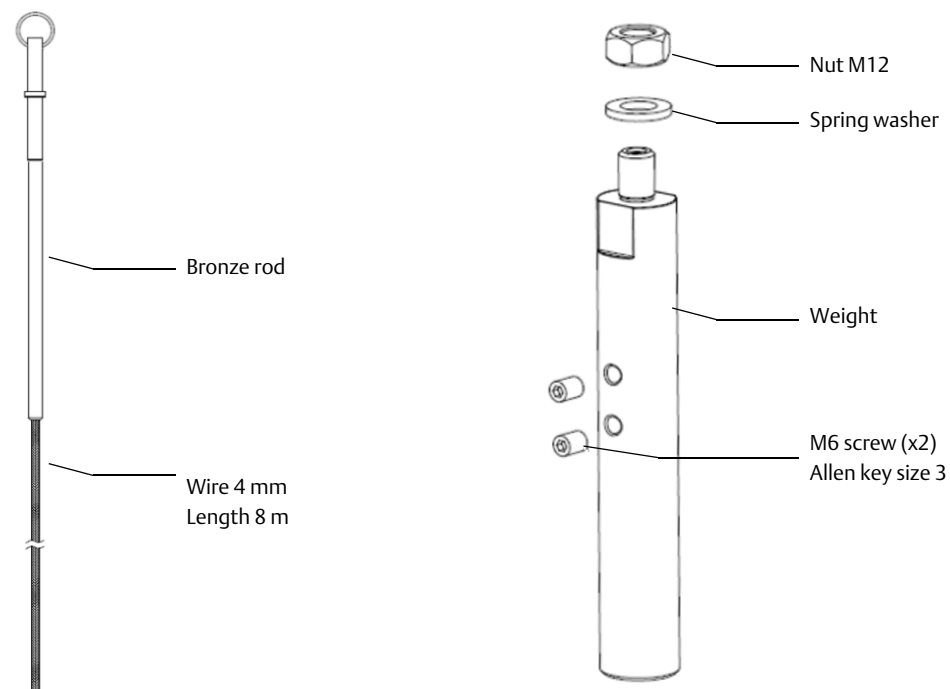
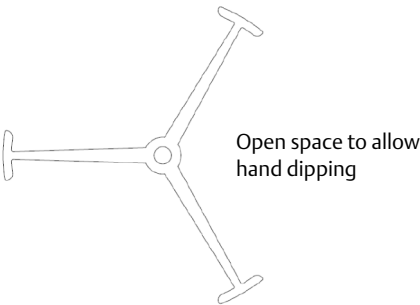


Figure 2-11. Reference Reflector



Note!  
The reflector may need to be removed for product sampling through the pipe.

Figure 2-12. Safety Wire

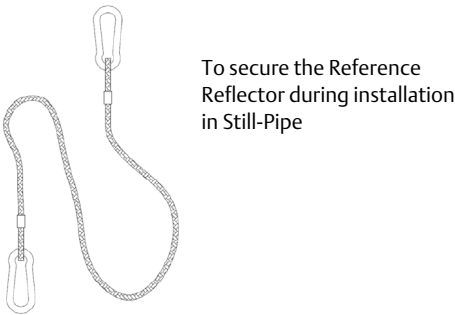
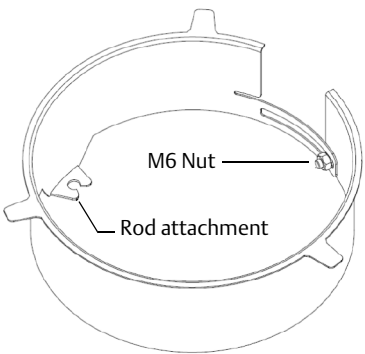


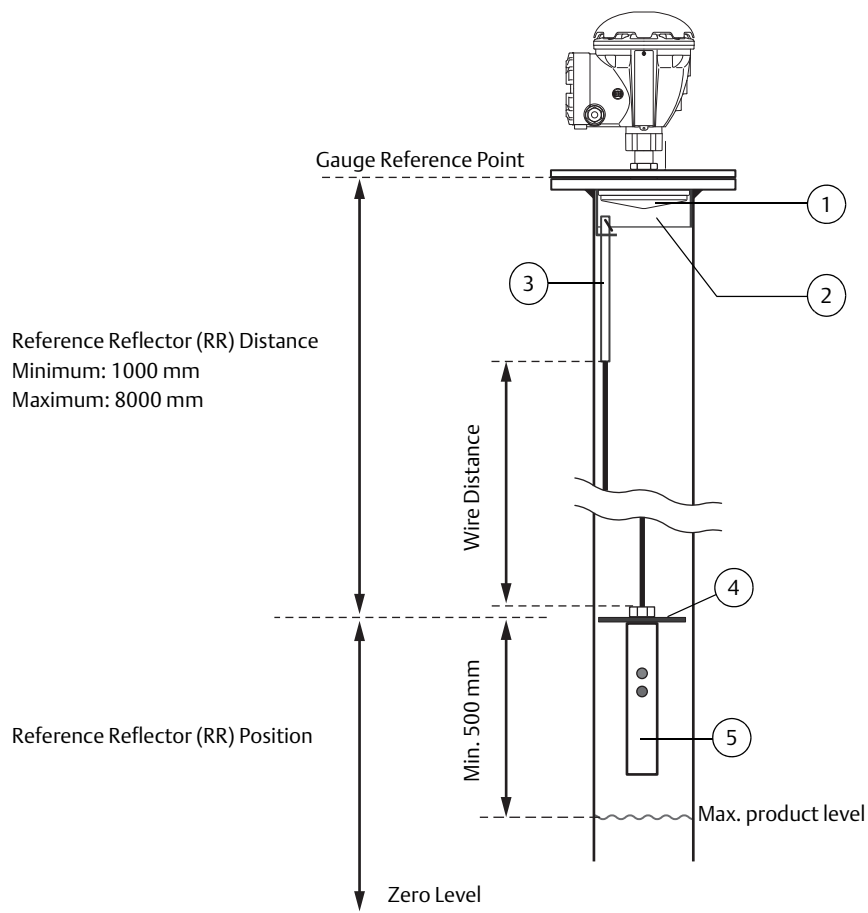
Figure 2-13. Flexible Ring



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

## 2.5.2 Tank Geometry - Array Antenna

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

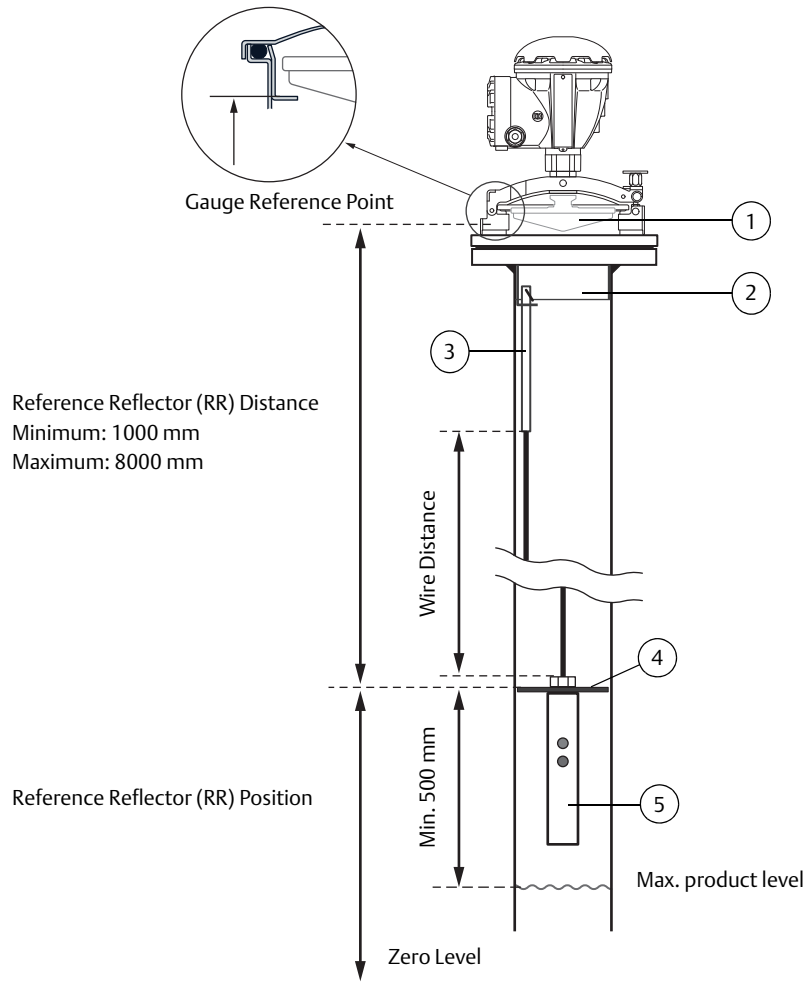


1. Array antenna
2. Flexible Ring
3. Bronze Rod
4. Reference Reflector (RR). Maximum inclination 2.5°.
5. Weight

**Note!**

See “Safety Instrumented System (SIS)” on page 22 for installation requirements in Safety Instrumented Systems (SIS).

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



1. Array antenna
2. Flexible Ring
3. Bronze Rod
4. Reference Reflector (RR). Maximum inclination 2.5°.
5. Weight

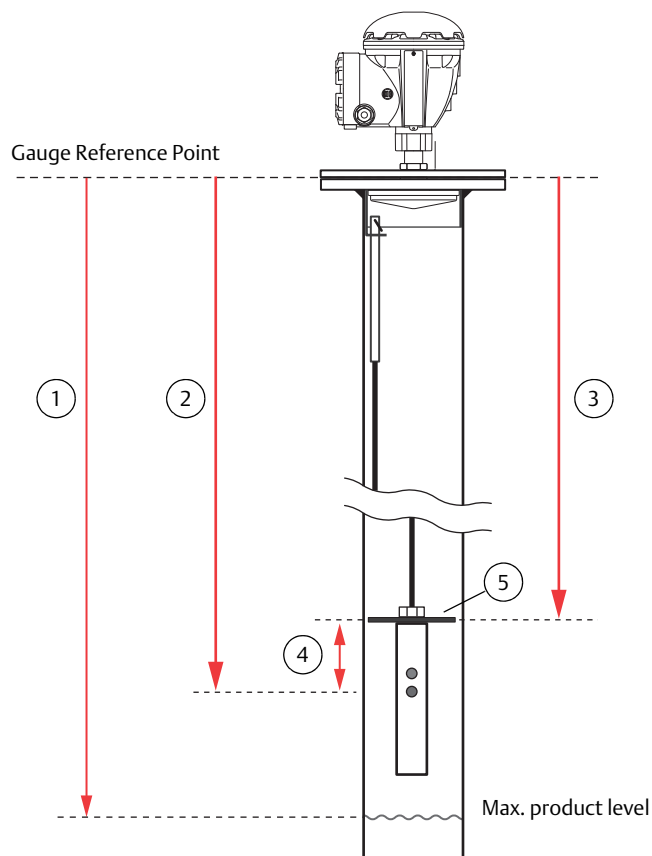
**Note!**

See “[Safety Instrumented System \(SIS\)](#)” on page 22 for installation requirements in Safety Instrumented Systems (SIS).

## Safety Instrumented System<sup>(1)</sup> (SIS)

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 RR - Gauge Reference Point: see Figure 2-16 and 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 SIS System (SIL).**



**Table 2-2. Tank Geometry Parameters for Array Antenna in Safety Instrumented Systems**

Item	Description	Item	Description
1	SIL Surface Distance	4	Minimum distance RR - SIL High Alarm Limit: 500 mm
2	SIL High Alarm Limit	5	Reference Reflector (RR)
3	Distance RR - Gauge Reference Point. Array antenna 6 inch: 1100 to 8000 mm Array antenna 8 inch: 1400 to 8000 mm Array antenna 10 inch: 1800 to 8000 mm Array antenna 12 inch: 2000 to 8000 mm	<b>Note!</b> These requirements are applicable for both the fixed and hatched versions of the Array antenna.	

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

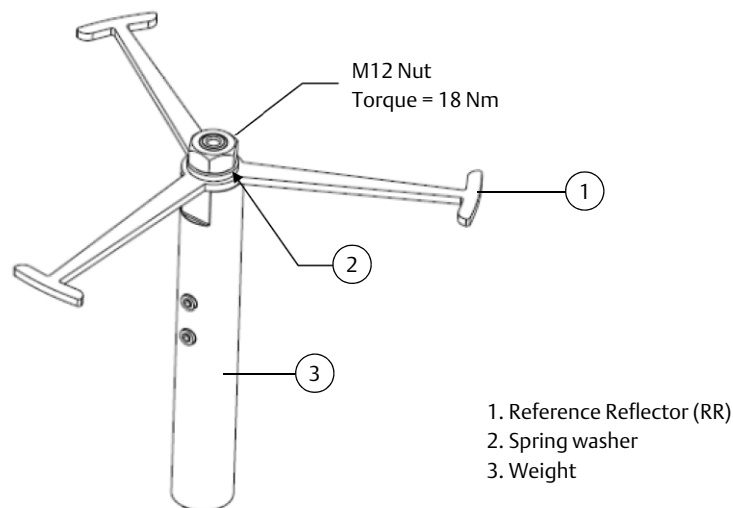
## 2.5.3 Installing the Reference Reflector

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.

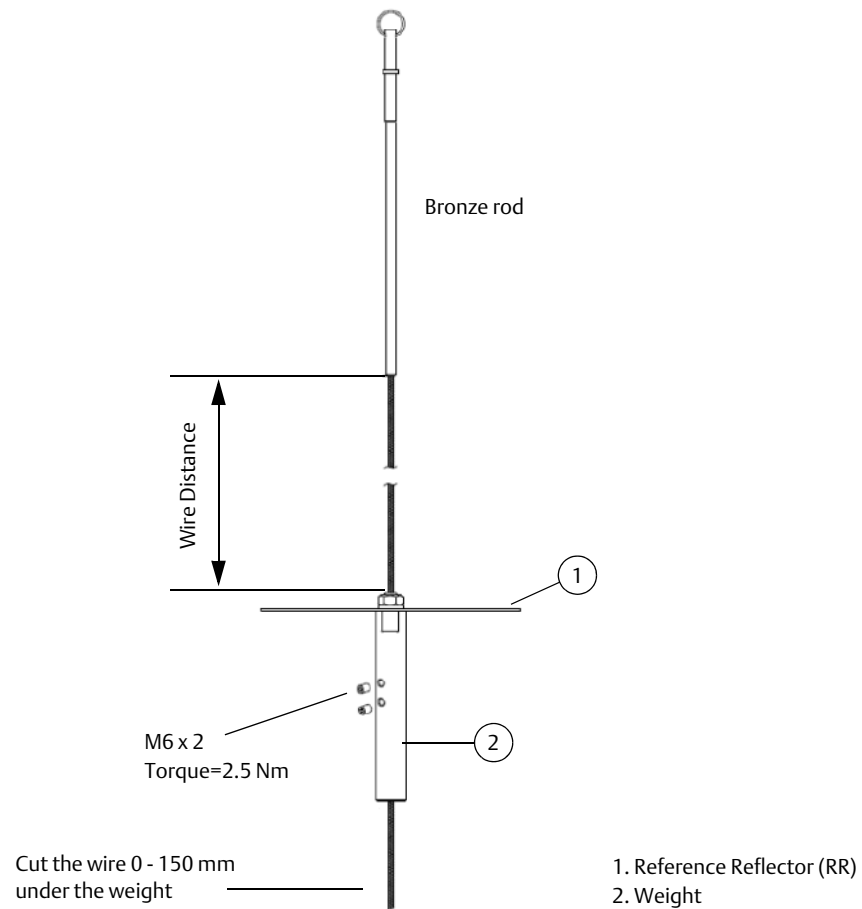
### ⚠ CAUTION

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

1. Specify the position of the Reference Reflector (RR).
2. Calculate the Reference Reflector Distance. This is the distance from the Gauge Reference Point to the Reference Reflector as illustrated in [Figure 2-14 on page 20](#) and [Figure 2-15 on page 21](#).
3. Mount the Reference Reflector on the weight.
4. Tighten the M12 nut to a torque value of 18 Nm.



5. Calculate the Wire Distance as described in “Wire Distance calculation” on page 27.
6. Feed the wire through the weight and Reference Reflector (RR).



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.

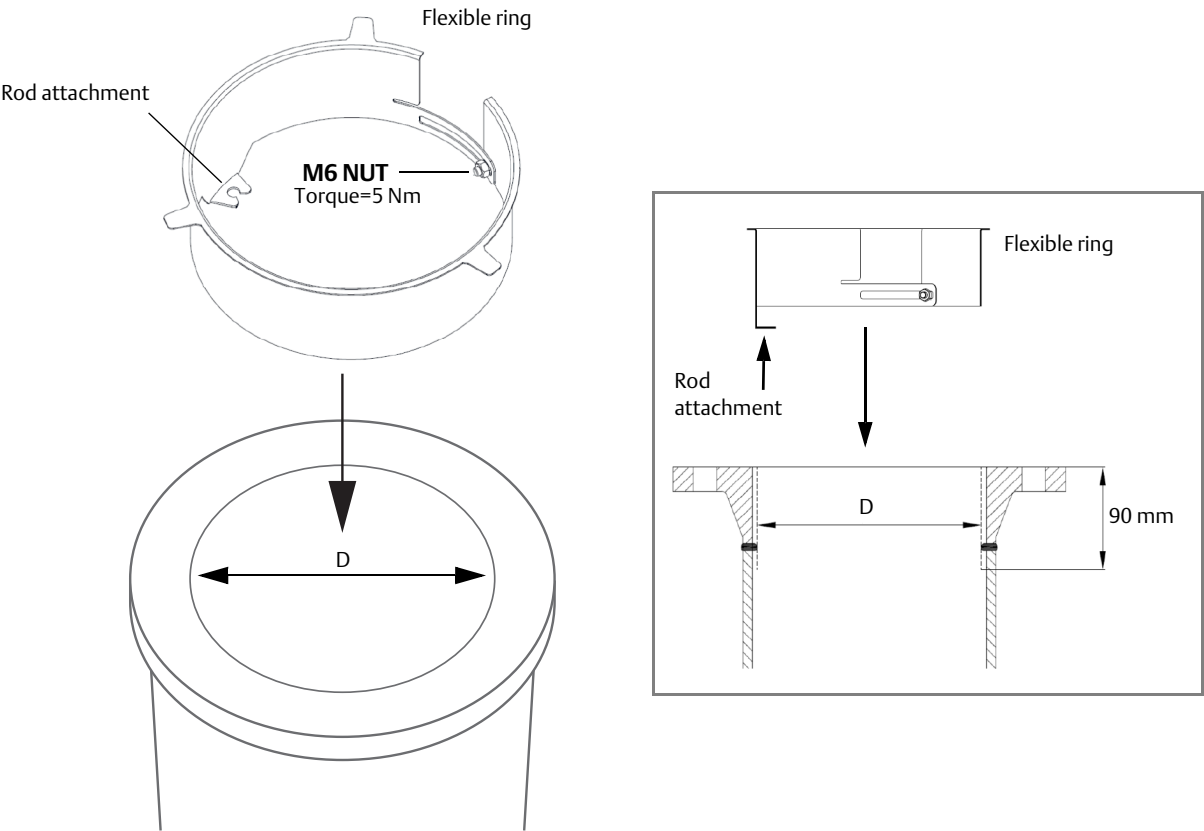
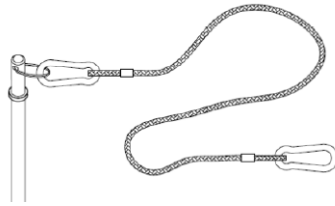


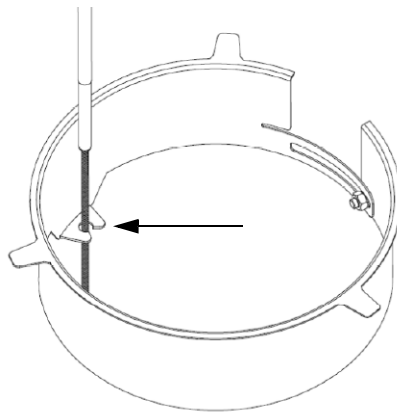
Table 2-3. The Flexible Ring Fits a Wide Range of Still-pipe Inner Diameters

Inner diameter (D)			
6 inch pipe	8 inch pipe	10 inch pipe	12 inch pipe
152 - 164 mm	195.5 - 210.2 mm	254.5 - 268 mm	298.4 - 318.1

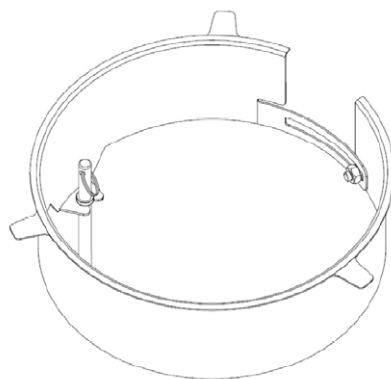
13. Fasten one end of the Safety Wire to the Bronze Rod and the other end to the tank.



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 formulas to calculate the required Wire Distance.

Array Antenna hatch version:

$$\text{Wire Distance} = \text{RR} - \text{Ga} - 362 \text{ (mm)}$$

Array Antenna fix version:

$$\text{Wire Distance} = \text{RR} - 324 \text{ (mm)}$$

where

Ga= thickness of the flange gasket

RR= Reference Reflector Distance (see [Figure 2-14 on page 20](#) and [Figure 2-15 on page 21](#))



# Section 3 Configuration of Reference Reflector

Overview .....	page 29
Safety messages .....	page 29
Configuration using TankMaster WinSetup .....	page 30

## 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 Safety messages

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

**⚠ WARNING**

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

Make sure 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.

**Physical access**

Unauthorized personnel may potentially cause significant damage to and/or misconfiguration of end user’s 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 user’s assets. This is true for all systems used within the facility.

## 3.3 Configuration using TankMaster WinSetup

### 3.3.1 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 software to configure a Rosemount Tank Gauging system.

---

#### Note

The Proof Test function requires gauge firmware version 1.B9 or higher and Rosemount TankMaster 6.E1 or higher .

---

### Proof test features

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

- Configure proof test
- Perform proof test
- View proof test history
- Schedule proof tests

### 3.3.2 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")

### 3.3.3 Configuration procedure

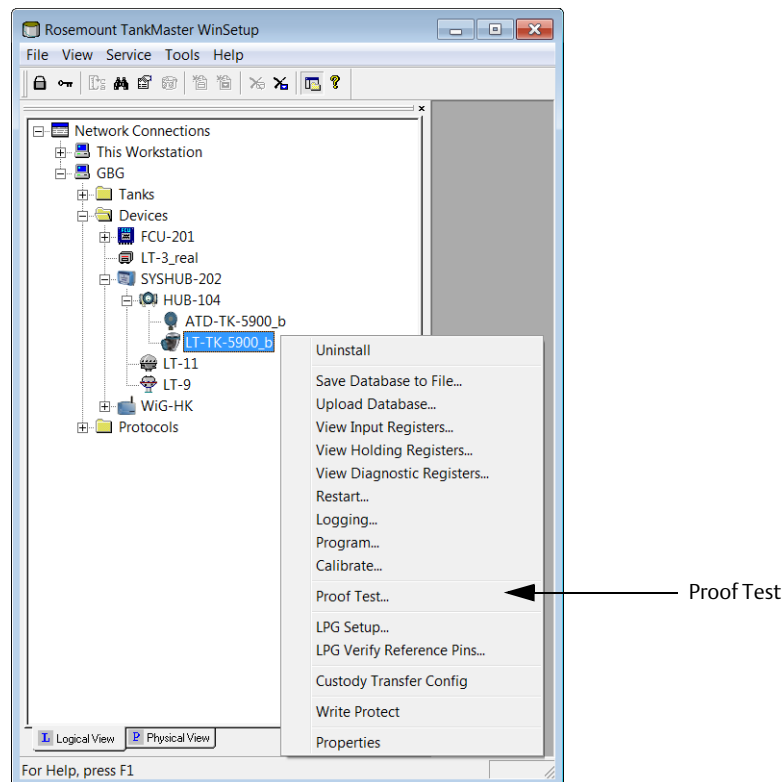
The Proof Test function needs to be configured prior to any proof test can be performed. This means calibrating the reference reflector by specifying the actual position of the reflector and the nominal amplitude of the reflected radar signal.

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

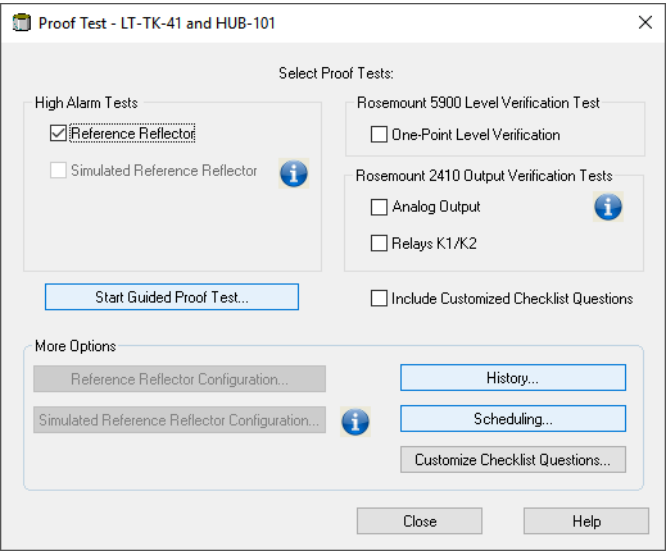
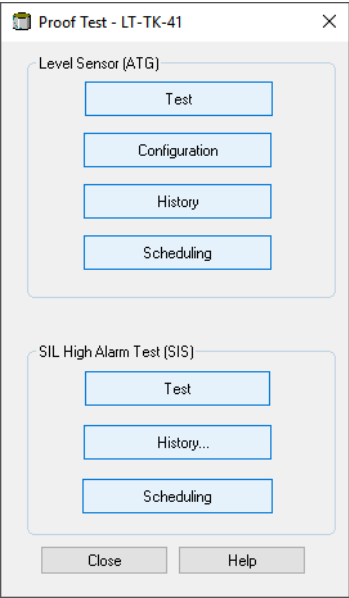
Ensure that a standard configuration of the Rosemount 5900 is performed prior to the proof test configuration.

To configure a Rosemount 5900 with Reference Reflector for Proof Test applications do the following:

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.



- 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
<b>SIL2 Model Code S and non-SIL</b>	
<b>SIL3</b>	

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

The image shows a software window titled "Reference Reflector Configuration - LT-TK-MI1". The window is divided into several sections for configuring the reference reflector.

**Calibrate Reference Reflector**

RR Distance: 1.500 m [Calibrate... Reset...]

Distance Tolerance: 0.300 m

Calibration Status: ⚠ Not Calibrated

**Reference Reflector Settings**

Min Amplitude Factor: 0.25 Tolerance: 0.060 m

Max Amplitude Factor: 2.50

**Reference Reflector Measurement**

Echo Distance: 1.727 m Calibrated Distance: 1.727 m

Echo Amplitude: 475 mV Calibrated Amplitude: 478 mV

Reference Reflector Status: ⚠ Not Calibrated

**Test Time**

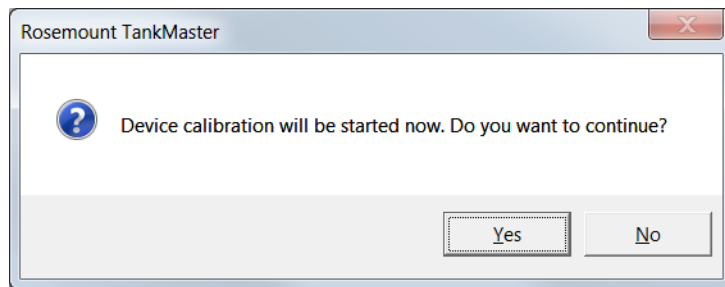
Default Proof Test Time: 30 s

[OK] [Close] [Apply] [Help]

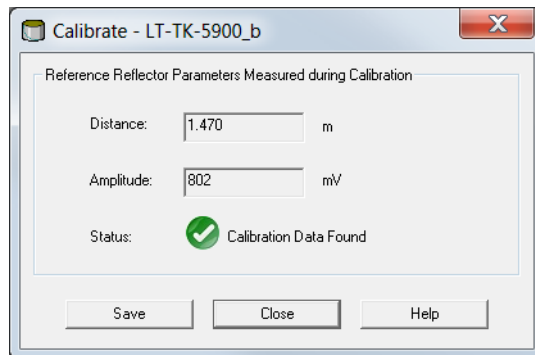
**Diagram:** A schematic diagram of the reference reflector setup. It shows a tank with a liquid level labeled "Max Product Level". A reflector is positioned above the liquid. A vertical double-headed arrow indicates the "Ref Reflector Distance" from the tank top to the reflector. Another vertical double-headed arrow indicates the "Min Distance See Manual" from the "Max Product Level" to the reflector.

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 be displayed.
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. See [Section 2: Installation](#) for more information.
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 3-1 on page 38](#)). The default value is 0.3 m.
9. Click the **Calibrate** button.

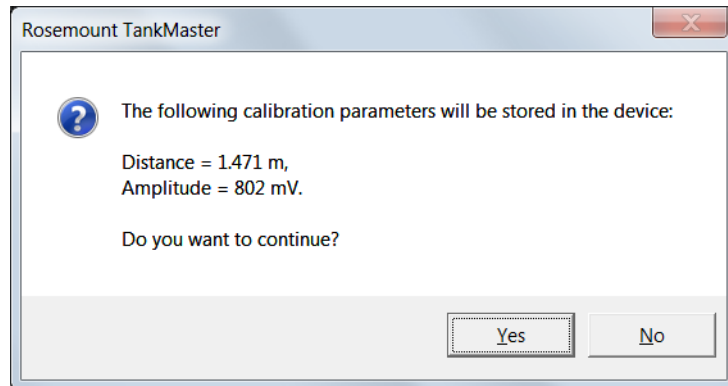


10. Click **Yes**. Now the level gauge starts searching for the Reference Reflector. When the search is finished, the *Calibrate* window appears showing the distance to the Reference Reflector and the amplitude of the reflected radar signal.



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 (SIL) 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.

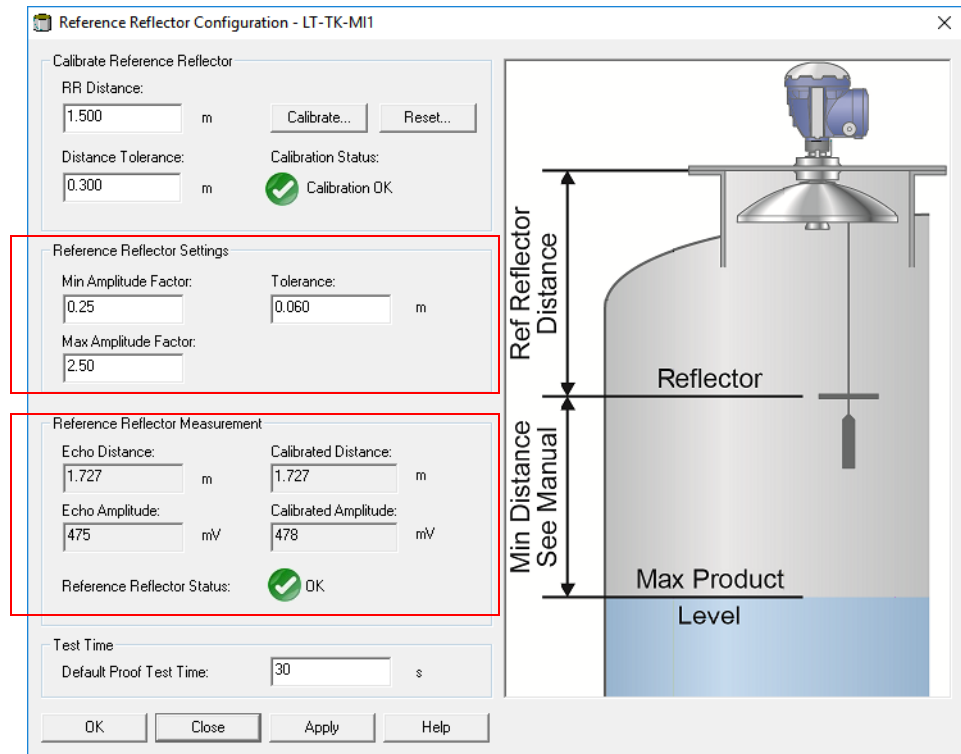


14. In case the product surface is too close to the Reference Reflector during the calibration, a warning message will appear allowing you to choose whether to cancel or to save the calibration data.

See [Section 2: Installation](#) for information on requirements for minimum distance between Reference Reflector and product surface.

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 (see ["Tank Geometry - Parabolic Antenna"](#) on page 9).
  - Verify that there are no disturbing objects near the reference reflector that may interfere.

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



17. 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, these settings can be changed.
18. Verify that Reference Reflector Status is OK. RR Status will be OK as long as the actual distance (Echo Distance) and amplitude (Echo Amplitude) are within the specified tolerances as specified in the Reference Reflector Settings pane. Click the **Apply** button to store the parameters.
19. 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.
20. 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.

## Example

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

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 3-1 on page 38.

**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

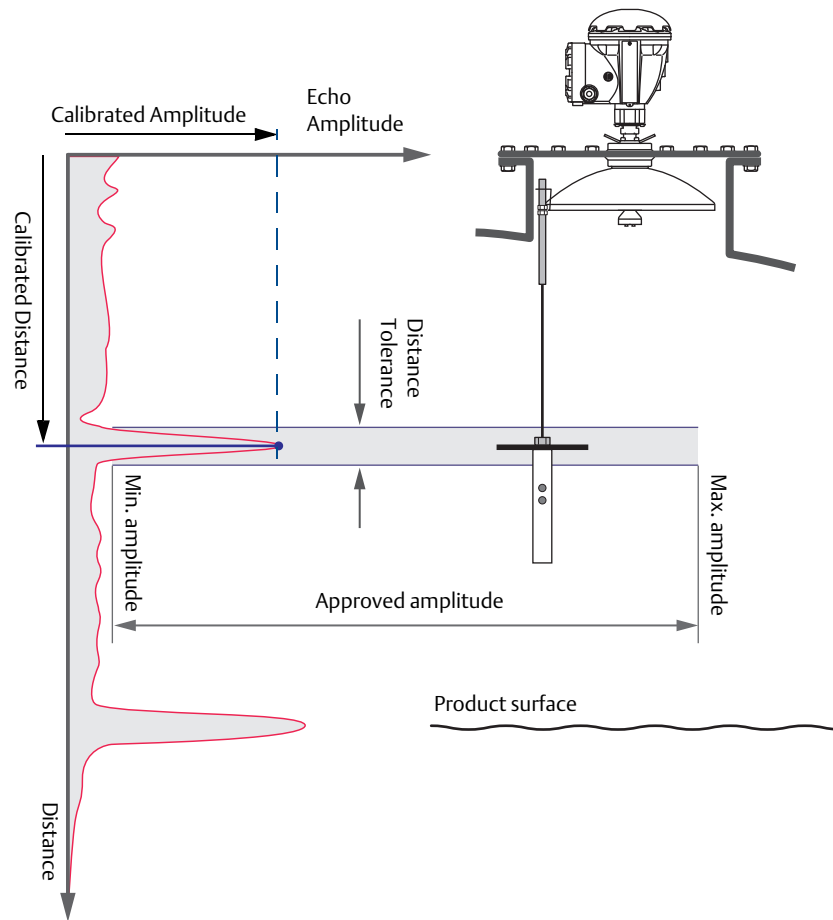
---

### Note

For **Safety Instrumented Systems** (SIL) 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 3-1. Proof Test Calibration**



**Table 3-3. Configuration Parameters for a Proof Test Setup**

Parameter	Description
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.
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).

# Section 4      Operation

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## 4.1      Overview

This section contains information on the Light Emitting Diodes (LED) on the front of the Rosemount 2460 System Hub.

## 4.2      Safety messages

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

⚠ WARNING

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

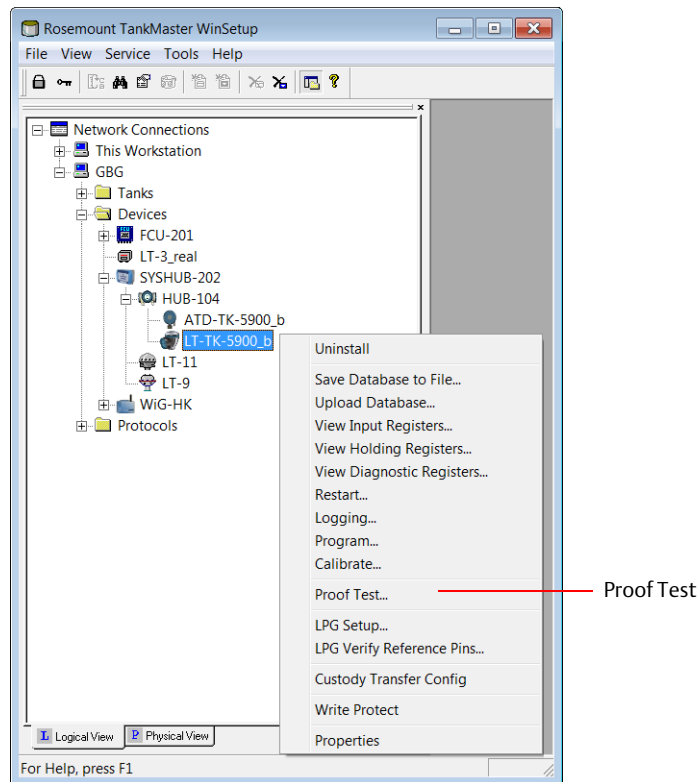
- Make sure only qualified personnel perform the installation.
- Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.
- Do not perform any service other than those contained in this manual unless you are qualified.

## 4.3 Proof Test operation

Prior to running a Proof Test you will have to ensure that the Proof Test function is properly calibrated and configured as described in [Section 3: Configuration of Reference Reflector](#).

To run a proof test for a Rosemount™ 5900 with Reference Reflector do the following:

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 choose 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

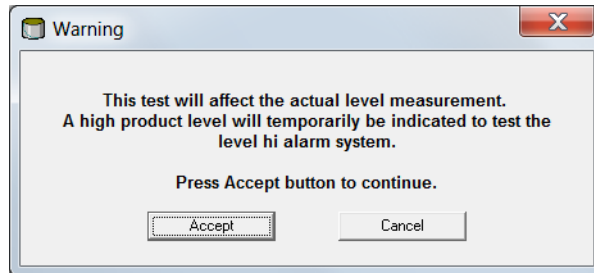
### SIL3

4. To perform a 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 you will have to make a calibration of the Reference Reflector first. See [Section 3: Configuration of Reference Reflector](#) for more information.

6. The following measurement data is presented:

Parameter	Description
Level	Distance from the <b>Zero Reference Point</b> to the product surface or the Reference Reflector, respectively
Ullage	Distance from the <b>Gauge Reference Point</b> to the product surface
Distance	Distance from the <b>Gauge Reference Point</b> 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 on page 4-43](#).
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. When the proof test is finished you will have to fill in a proof test form in order to create a report (see [“Proof Test Report” on page 49](#)). A report in PDF format will be created automatically and will be available from the *Proof Test History* window. See [“Viewing a report” on page 48](#).

## 4.3.1 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

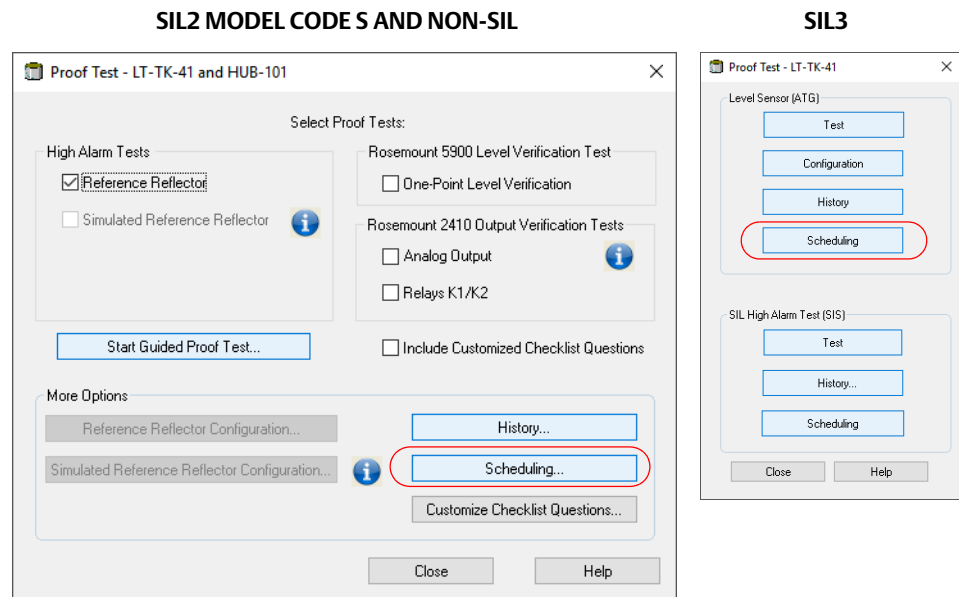
## 4.4 Scheduling

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:

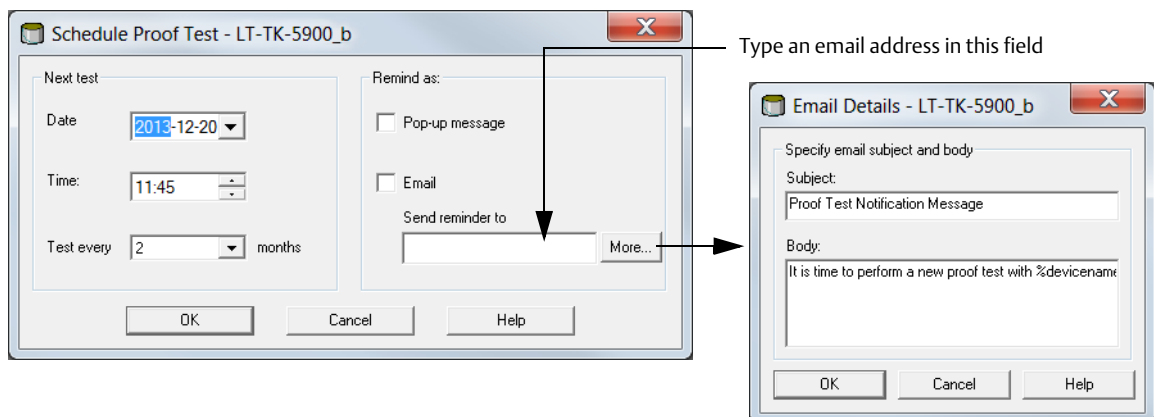
- e-mail
- pop-up window

To specify scheduling options and reminder settings:

1. Open the *Proof Test* window.



2. Click the **Scheduling** button.

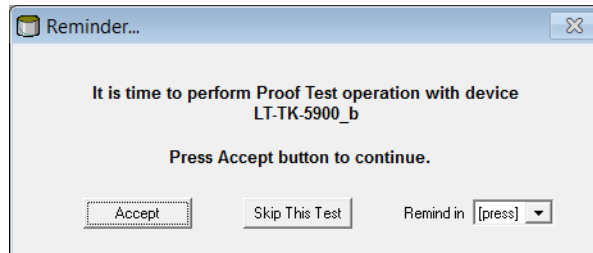


3. Enter the desired date, time, and scheduling interval.
4. Choose one or both of the reminder options; **Pop-up Message** and/or **E-mail**. The **More** button opens the *Email Details* window which lets you type a subject line and a message text for the email reminder.

## 4.4.1 Pop-up message

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

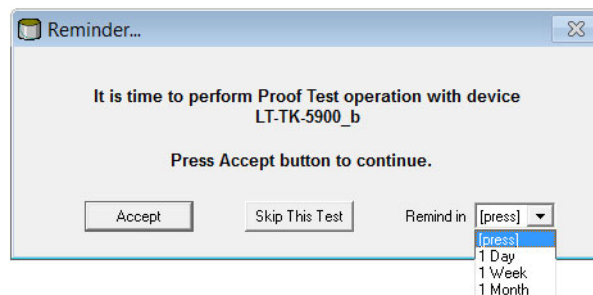
**Figure 4-1. Pop-up Message with Reminder to Perform Proof Test**



In case you choose to accept, you will be directed to the *Proof Test* window in order to start the Proof Test procedure as described in [Section 4: Proof Test operation](#) "Proof Test operation" on [page 40](#).

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.

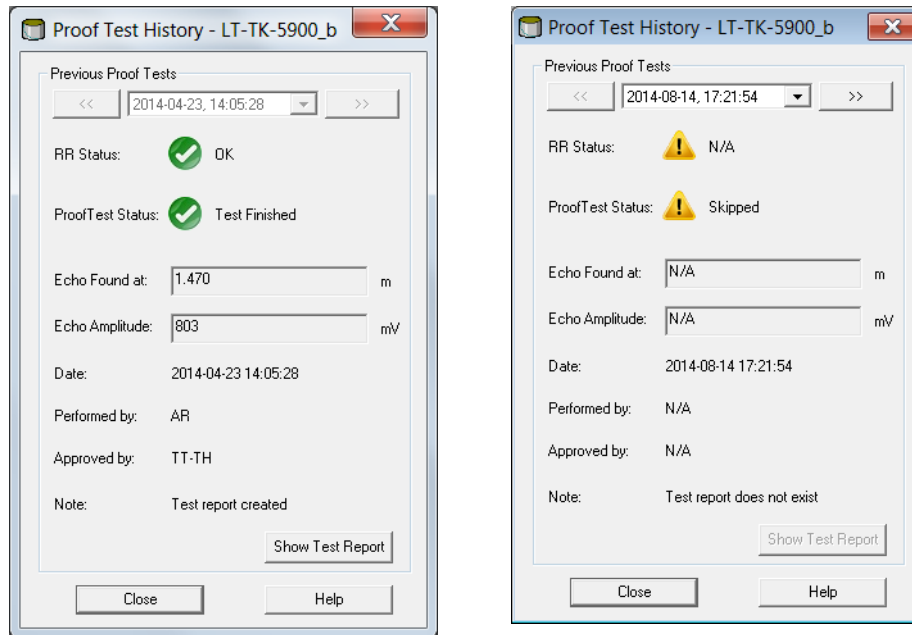
**Figure 4-2. If Proof Test Is Skipped You May Choose To Be Reminded Later**



## 4.5 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, see “Viewing a report” on page 48.

## 4.6 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.

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

**SIL2 MODEL CODE S AND NON-SIL**

Level Sensor Report - LT-TK-12

### Proof Test Report

---

#### LT-TK-12

Device Information				
Device	Device type	Antenna Type	Device ID	SW version
LT-TK-12	R5900	Still-Pipe Array Fixed	9190	1F0

#### HUB-110

Device Information					
Device	Device type	Analog Output	Relay Support	Device ID	SW version
HUB-110	R2410	Supported	K1 & K2	23009	1D0

#### Simulated Reference Reflector Verification

Test Status	Sim RR Level, m	Sim RR Distance, m	Sim RR Amplitude, mV
Success	28.442	1.558	2356

#### One-Point Level Verification

Test Status	Level, m	Measured Level, m	Deviation, m
Success	26.525	26.523	-0.002

#### Analog Output Verification

Current Value Test Status	Analog Output Current, mA	Measured AO current value, mA	Deviation, mA
Success	18.147	18.15	0.003

Print Save and Close Help

**SIL3**

### Proof Test Report

#### SIL High Alarm Test Report, LT-TK-1

2015-09-18, 08:30:44

Device Information			
Device	Device type	Antenna Type	SIL SW version
LT-TK-1	R5900	Parabolic	1.B3

SIL High Alarm Test Result	
Safety Status	OK
Safety Mode	Approved
Change Status	OK
Device ID	10325
SIL Surface Distance	2972 mm
SIL Test Surface Distance	813 mm
SIL Valid Surface Distance	Yes
SIL Surface Amplitude	3215 mV
SIL Test Surface Amplitude	892 mV
SIL Measurement Status	0 Hex
SIL Test Measurement Status	1 Hex
SIL High Alarm Limit	1400 mm
SIL Ref. Ref./LPG Pin Distance	815 mm
SIL Ref. Ref./LPG Pin Max Amplitude	2700 mV

Test time: 60 sec

Did the alarms sound? \* Yes ☐ No ☐

Did the emergency shutdown work? \* Yes ☐ No ☐

Did the pump stop? \* Yes ☐ No ☐

Did you find the whole Proof Test successful? \* Yes ☐ No ☐

Hereby I confirm that the customer system function as expected \* Yes ☐ No ☐

Additional comment (only four rows will be saved):

Test performed by: JAR

Test approved by: JTN

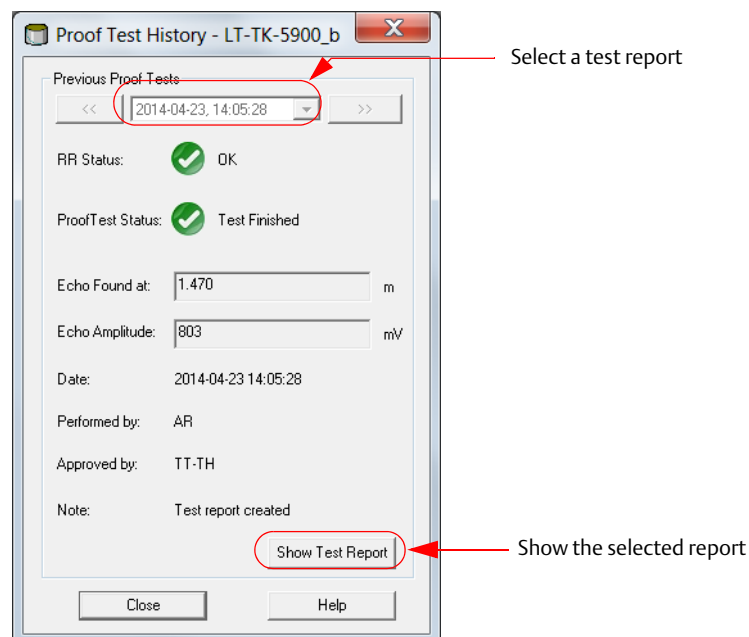
2. Click the **Save** button to store the proof test form.
3. A report in PDF format will be created automatically. It will be available from the *Proof Test History* window. See “[Viewing a report](#)” on page 48.

## 4.6.1 Viewing a report

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

To view a report:

1. In TankMaster WinSetup, click the Rosemount 5900 icon and select the **Proof Test** option to open the *Proof Test* window.
2. In the *Level Sensor (ATG)* pane, 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.

Figure 4-4. Proof Test Report

**SIL2 MODEL CODE "S" AND NON-SIL**

Level Sensor Report - LT-TK-12

### Proof Test Report

---

#### LT-TK-12

Device Information				
Device	Device type	Antenna Type	Device ID	SW version
LT-TK-12	R5900	Still-Pipe Array Fixed	9190	1F0

#### HUB-110

Device Information					
Device	Device type	Analog Output	Relay Support	Device ID	SW version
HUB-110	R2410	Supported	K1 & K2	23009	1D0

#### Simulated Reference Reflector Verification

Test Status	Sim RR Level, m	Sim RR Distance, m	Sim RR Amplitude, mV
Success	28.442	1.558	2356

#### One-Point Level Verification

Test Status	Level, m	Measured Level, m	Deviation, m
Success	26.525	26.523	-0.002

#### Analog Output Verification

Current Value Test Status	Analog Output Current, mA	Measured AO current value, mA	Deviation, mA
Success	18.147	18.15	0.003

**SIL3**

### Proof Test Report

#### SIL High Alarm Test Report, LT-TK-1

2015-09-18, 08:30:44

Device Information			
Device	Device type	Antenna Type	SIL SW version
LT-TK-1	R5900	Parabolic	1B3

SIL High Alarm Test Result	
Safety Status	OK
Safety Mode	Approved
Change Status	OK
Device ID	10325
SIL Surface Distance	2972 mm
SIL Test Surface Distance	813 mm
SIL Valid Surface Distance	Yes
SIL Surface Amplitude	3215 mV
SIL Test Surface Amplitude	892 mV
SIL Measurement Status	0 Hex
SIL Test Measurement Status	1 Hex
SIL High Alarm Limit	1400 mm
SIL Ref. Refl. LPG Pin Distance	815 mm
SIL Ref. Refl. LPG Pin Max Amplitude	2700 mV

Test time: 60 sec

Did the alarms sound?	Yes
Did the emergency shutdown work?	Yes
Did the pump stop?	Yes
Did you find the whole Proof Test successful?	Yes

Hereby I confirm that the customer system function as expected Yes

Additional comment (only four rows will be saved):

Test performed by:

JAR

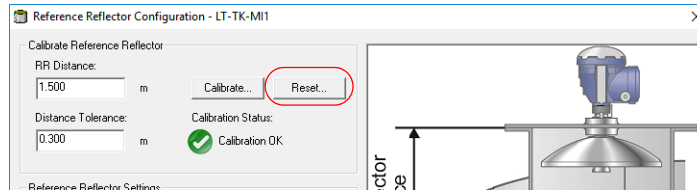
Test approved by:

TN

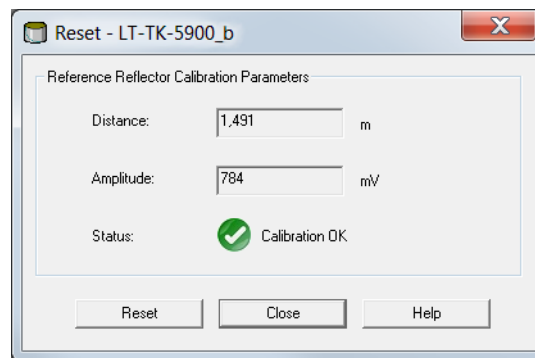
## 4.7 Removing a Reference Reflector

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.

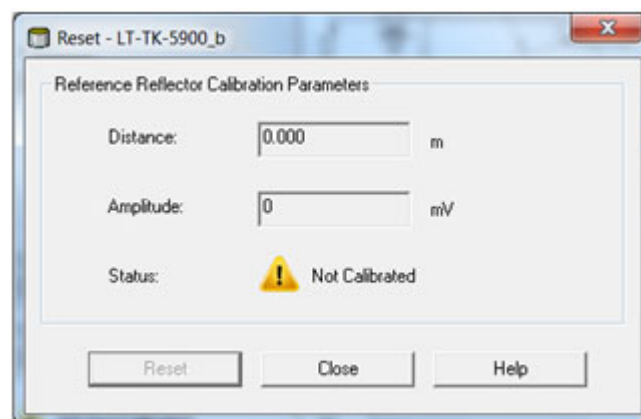
1. Open the *Proof Test* window and click the **Configuration** button.



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



3. The *Reset* window shows the current Reference Reflector calibration data for the Rosemount 5900 Radar Level Gauge.
4. Click the **Reset** button to clear all calibration data. Status will be changed to **Not Calibrated**.



# Section 5      Service and Troubleshooting

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## 5.1      Safety messages

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). 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:**

- Make sure 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.

**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 2410 Tank Hub is off and the lines to any other external power source are disconnected or not powered while wiring the 2460.

## 5.2 Troubleshooting

Table 5-1 provides summarized troubleshooting suggestions for the most common operating problems.

**Table 5-1. Troubleshooting Chart**

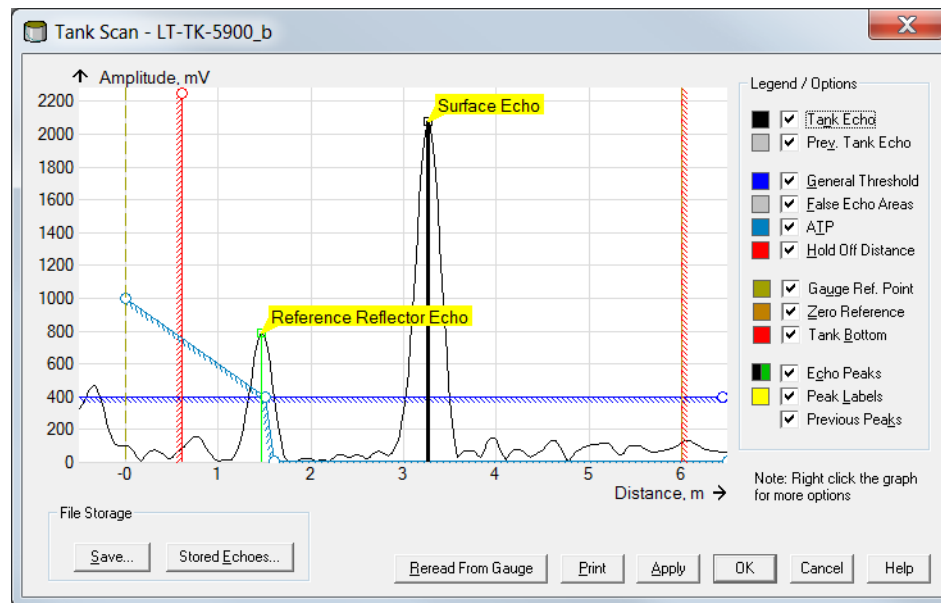
Symptom	Possible cause	Action
Reference Reflector (RR) not found	Incorrect configuration	<ul style="list-style-type: none"> <li>■ Check RR Distance</li> <li>■ Check Distance Tolerance</li> </ul>
	RR inclination too high	Adjust the RR and make sure that the RR is horizontal within specified limit see <a href="#">Section 2: Installation</a> .
	The Reference Reflector is within the Hold Off region	Check that the reflector is installed according to the instructions in <a href="#">Section 2: Installation</a> . Ensure that it is installed according to the requirements for minimum Reference Reflector Distance.
	Wrong search window due to using incorrect reference system	Ensure that distances are measured in the correct reference system as described in “ <a href="#">Tank Geometry - Parabolic Antenna</a> ” on page 9 and “ <a href="#">Tank Geometry - Array Antenna</a> ” on page 20. Note for example, that the Gauge Reference Point is located at the flange of the tank nozzle.
	RR Calibration could not be performed	See “RR calibration could not be performed”.
Proof Test could not be started	Product surface too close to the RR	Make sure that the product surface is below the maximum level that is allowed for RR calibration, see <a href="#">Section 2: Installation</a> .
Proof Test was aborted unexpectedly		
RR calibration could not be performed	Write protection is enabled	Disable write protection
Reference Reflector does not appear in the Tank Scan <sup>(1)</sup> window	Tank Signal Mean (TSM) function (near-zone improvement) filters away the Reference Reflector	Enable Peak Labels by checking the box

(1) See “[Tank spectrum](#)” on page 53

## 5.3 Tank spectrum

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.**

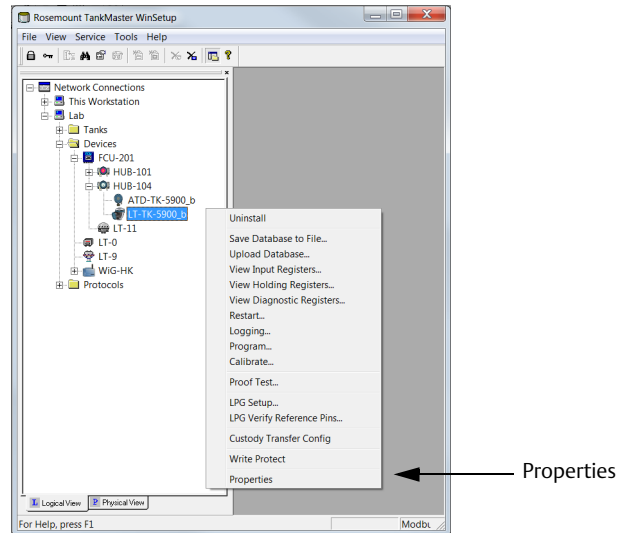


### Note

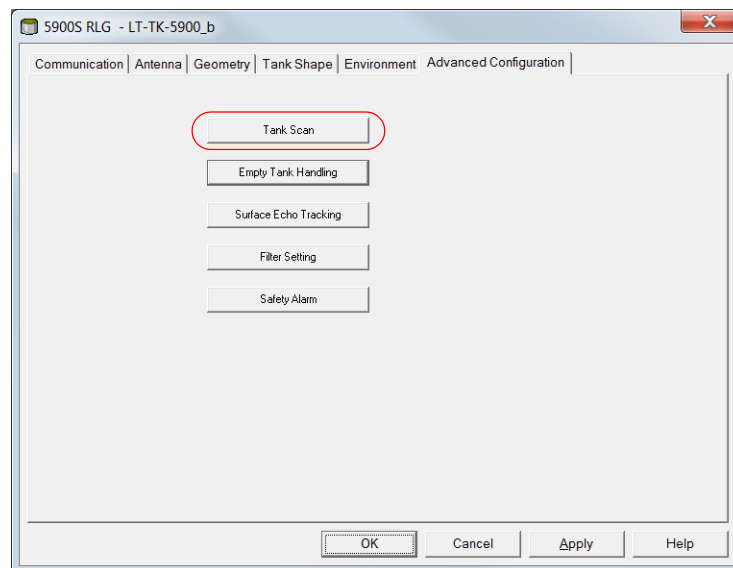
Simulated reference reflector will not be shown in tank scan.

To open the *Tank Scan* window:

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



2. Choose the **Properties** option.



3. Select the *Advanced* tab and click the **Tank Scan** button.

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