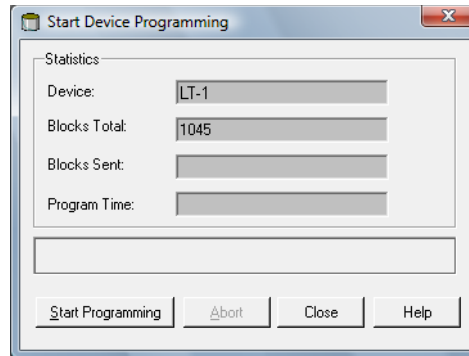


7. Click the **Browse** button to locate the flash program file. File extension *.cry are used for these files.
8. Click the **Start Programming** button. Now the *Start Device Programming* window appears.

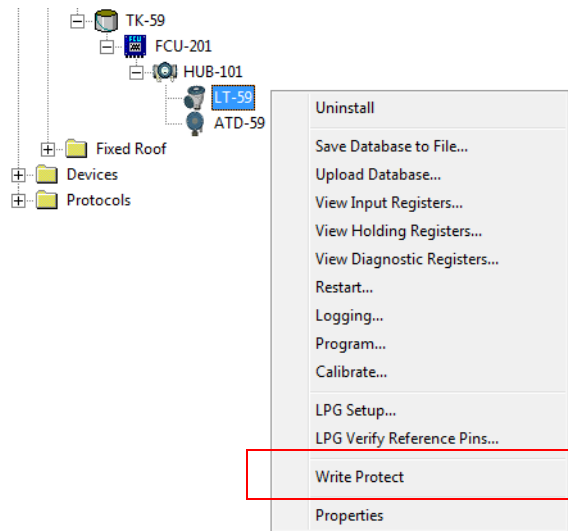


9. Click the **Start Programming** button to activate device programming. If a 2160 Field Communication Unit (FCU) is used, a maximum of 25 devices can be programmed. If there are more devices the programming must be divided in two steps.
10. Update the TankMaster installation by adding the new *.ini files for the 5900 gauge to the TankMaster installation folder. For the 5900 two *.ini files are used, RLG.ini and RLG0xx.ini, where xx is the identification code of the 5900 gauge application software. The RLG.ini file is copied to the *C:\Program Files\Rosemount\Server folder*. The RLG0xx.ini file is copied to the *C:\Program Files\Rosemount\Shared folder*.

6.2.6 Write Protection

A Rosemount 5900 can be write protected to avoid unintentional configuration changes.

1. Start the *TankMaster WinSetup* program.
2. In the *WinSetup* workspace select the *Logical View* tab.
3. Click the right mouse button on the 5900 icon.



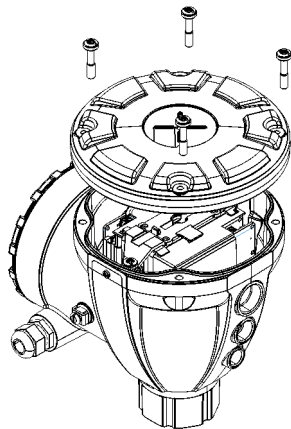
4. Choose the **Write Protect** option to open the *Write Protect* window.



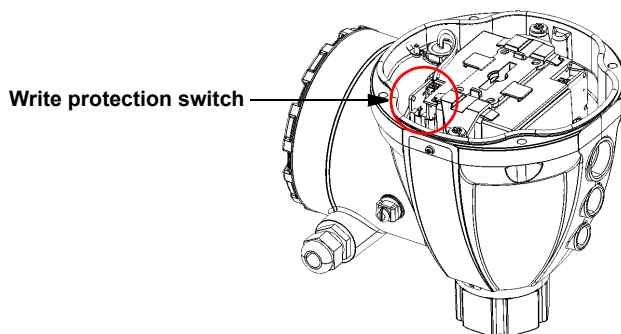
5. Ensure that **New State** is set to **Protected**.
6. Click the OK button to save the new state and close the *Write Protect* window.

6.2.7 Write Protection Switch

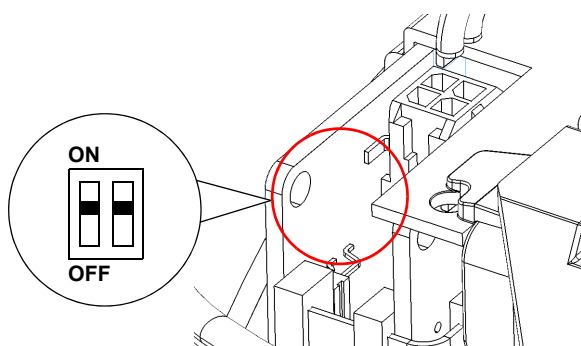
A switch can be used to prevent unauthorized changes in the Rosemount 5900 database. To write protect the 5900 do the following:



1. Check if there is any screw that is sealed. Contact Emerson Process Management/Rosemount Tank Gauging before breaking the seal if warranty is still valid. Completely remove the seal so that it does not damage the threads.
2. Loosen the screws and remove the cover.



3. Locate the write protection switch.

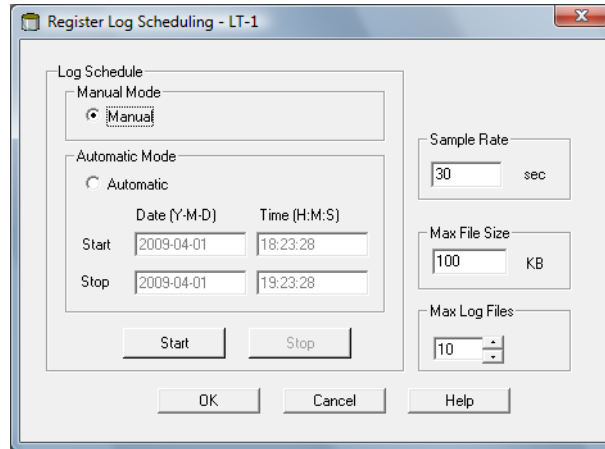


4. To write protect the 5900 move the left-hand switch to the **ON** position.
5. Check that contact surfaces on the transmitter housing and cover are clean. Replace the cover and tighten the screws.

6.2.8 Logging Measurement Data

The Rosemount 5900 supports logging of diagnostic registers. This function is useful for verifying that the gauge works properly. The logging function can be accessed by using the *TankMaster WinSetup* program. To start logging do the following:

1. Start the *TankMaster WinSetup* program.
2. Select the 5900 gauge icon in the *WinSetup* workspace.
3. Click the right mouse button and choose **Logging**.



4. The Manual mode lets you start logging at any time. In Automatic mode you have to specify a Start and Stop time.
5. The resulting log file will not exceed the size specified by the Max File Size parameter.
In automatic mode logging will proceed until the stop date and time is reached.
In manual mode logging will proceed until it is stopped by clicking the Stop button.
Logging will stop automatically when the number of log files is equal to the number given by the Max Log Files parameter.
6. The log file is stored as a plain text file and can be viewed in any word processing program. The log file is stored in the following folder: **C:\Rosemount\Tankmaster\Setup\Log**, where C is the disk drive where the TankMaster software is installed.
The log file contains the same input registers as the *View Diagnostic Registers* window, see "Diagnostics" on page 6-7.
You can change which input registers to be included in the log file by configuring the *View Diagnostic Registers* window, see the *Raptor System Configuration Manual (Document No. 300510EN)* for more information.

Date	Time	IR1002	IR1004	IR1000	IR4002	IR4012	IR5112	IR1420	IR0	IR4	IR54	IR4006	IR2
2009-02-05	16:54:58	0	0	0	0	85536	2392.43	8	1	96521	9652	9652	9,65209
2009-02-05	16:55:08	0	0	0	0	85536	2392.7	8	1	96521	9652	9652	9,6521
2009-02-05	16:55:18	0	0	0	0	85536	2395.7	8	1	96521	9652	9652	9,65215
2009-02-05	16:55:28	0	0	0	0	85536	2392.06	8	1	96522	9652	9652	9,65213
2009-02-05	16:56:14	0	0	0	0	85536	2393.5	8	1	96522	9652	9652	9,6522
2009-02-05	16:56:24	0	0	0	0	85536	2388.86	8	1	96522	9652	9652	9,65217

**6.2.9 Exchanging
Gauge
Electronics**

Jämför SIL; krav på att redogöra för reparation och underhåll av vissa delar, t.ex. Electronic Deposit Box (EDB).

6.2.10 Calibration Using the WinSetup Calibrate function

The **Calibrate** function is a tool that lets you adjust a Rosemount 5900 level gauge in order to minimize the offset between actual (hand dipped) product levels and the values measured by the level gauge. By using the Calibrate function you can optimize measurement performance over the whole measurement range from the top to the bottom of the tank.

The Calibration function calculates a new Calibration Distance based on fitting a straight line to the deviations between hand dipped levels and levels measured by the transmitter.

For the Rosemount 5900 still pipe gauge the calibration function is specially suitable since a minor adjustment of the Scale Factor is often necessary. The radar propagation velocity is dependent on the inner diameter of the still pipe, and the Scale Factor parameter is used to adjust the transmitter to take this effect into account. Since the average diameter is often difficult to determine accurately a calibration is often needed.

Procedure

The adjustment process includes the following steps:

1. Recording the hand dipped ullage values and the corresponding level gauge values.
2. Entering the hand dipped levels and the level gauge values into WinSetup.
3. Inspect the resulting calibration graph and, if necessary, exclude measurement points which should not be used in the adjustment calculation.

Required information

Make sure that the following information is available when you intend to use the **RTG Adjustment** function in TankMaster WinSetup:

- A list of hand dipped ullage values.
- A list of RTG level values corresponding to the hand dipped ullage/level values.

Hand dipping

Staff

Only one person should perform the manual ullage measurements in order to guarantee good repeatability between measurements.

Hand dip tape

Use only one tape for the calibration. The tape should be made of steel and calibrated by an approved testing institute. It must also be free from bends and kinks. The thermal expansion factor and calibration temperature shall also be provided.

Dip hatch

A dip hatch should be available close to the level gauge. If the dip hatch is far away from the level gauge, differences in roof movements may result in large errors.

Procedure

Follow these instructions when you make hand dip measurements:

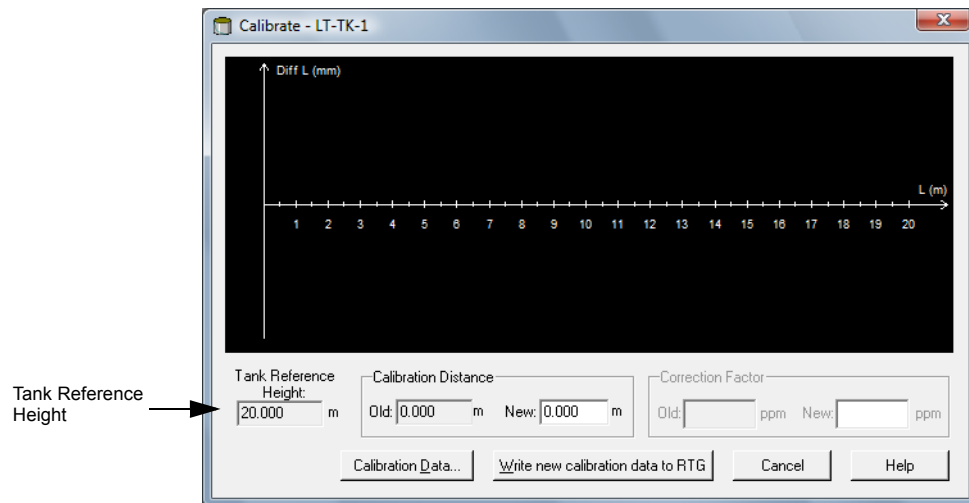
- hand dip until you obtain three consecutive readings within 1 mm
- correct the tape according to the calibration record
- note the hand dipped ullage and the RTG level reading simultaneously.

Do not calibrate when

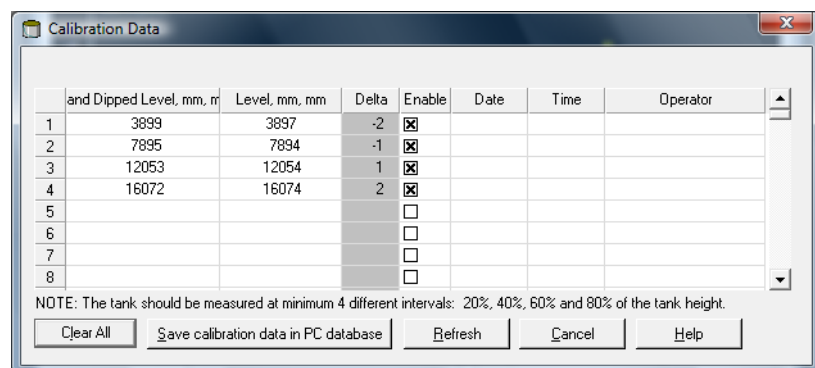
- the tank is emptying or filling
- agitators are running
- when there are windy conditions
- when there is foam on the surface.

To enter calibration data

1. Select the transmitter to be calibrated in the workspace window, click the right mouse button and choose **Calibrate**, or choose **Calibrate** from the **Service/Devices** menu.



2. Before any data is entered, the *Calibrate* window is empty. Make sure that the **Tank Reference Height**, displayed in the lower left corner, is correct. To adjust the Tank Reference Height, select the transmitter icon in the WinSetup workspace, click the right mouse button and choose the **Properties/Tank Distances** option.
3. Click the **Calibration Data** button.

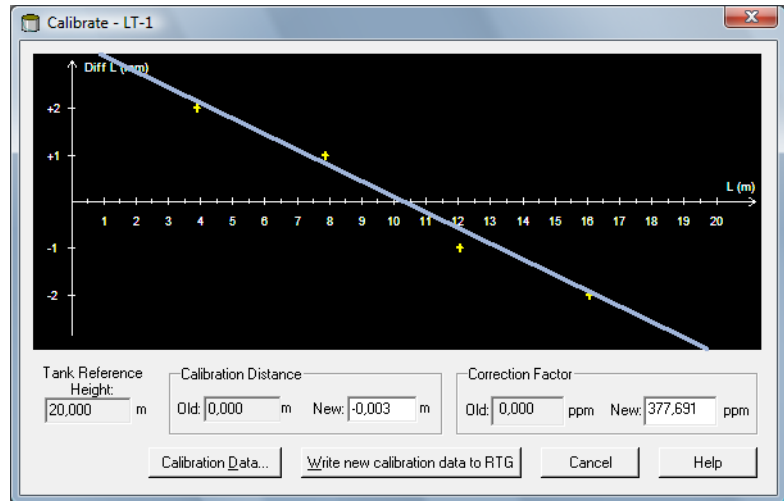


4. Enter hand dipped level values and the corresponding levels measured by the transmitter. It is recommended that the hand dipped levels are based on the average value of three consecutive measurements within 1 mm. For further information see "Hand dipping" on page 6-14.

NOTE!

Measurement unit mm is used in the *Calibration Data* window.

5. Click the **Refresh** button. Now WinSetup calculates the deviations between hand dipped and measured levels.
6. Click the **Save Calibration Data in PC Database** button in order to save the entered values and return to the *Calibrate* window.

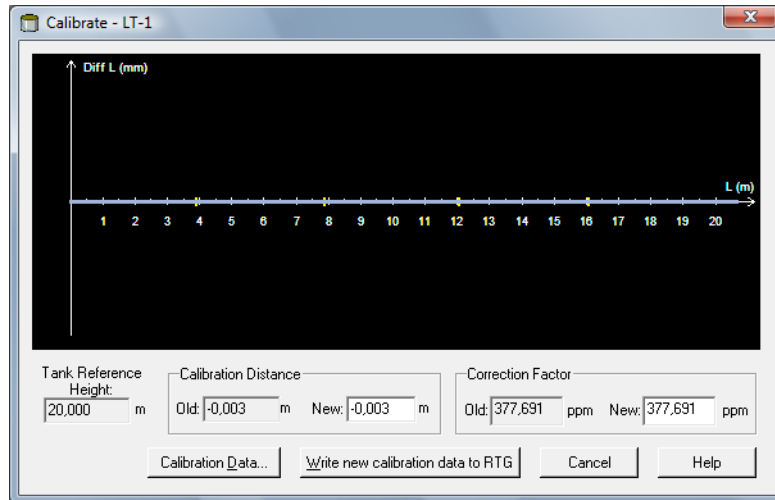


7. The *Calibrate* window displays a straight line fitted through measurement points representing the difference between hand dipped level values, and values measured by the RTG. For still pipe antennas a sloping line is displayed, otherwise the line is horizontal. The slope is due to the linear impact from the still pipe on the microwave velocity of propagation.
8. Check that the line fits well to the measurement points. If a point deviates significantly from the line, it can be excluded from the calculations by opening the *Calibration Data* window (click the **Calibration Data** button) and deselecting the corresponding check box in the **Enable** column.
9. Click the **Write new calibration data to RTG** button in order to save the current calibration data.

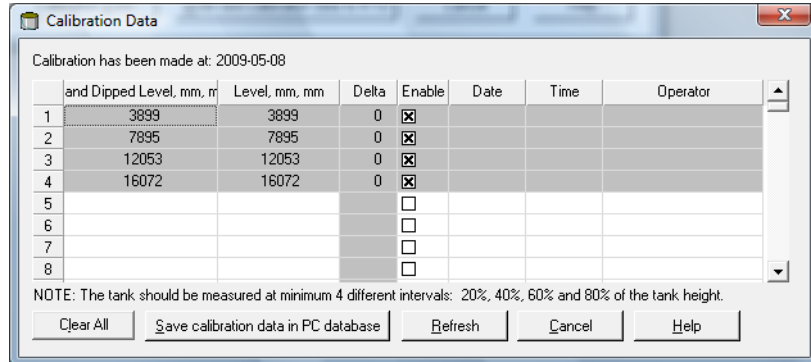
NOTE!

By clicking the **Write new calibration data to RTG** button, the Level values in the *Calibration Data* window are recalculated and the old Calibration Data is replaced.

Now you can check the calibration result by opening the *Calibration* window again:



Note that all measured values are adjusted according to the calculated Calibration Distance and Correction Factor. In the *Calibration Data* window you can also see that the level values measured by the transmitter are adjusted. Of course, the hand dipped levels are unaltered.



6.2.11 Loading the Default Database

The **Default Database** is the original factory settings of the holding register database.

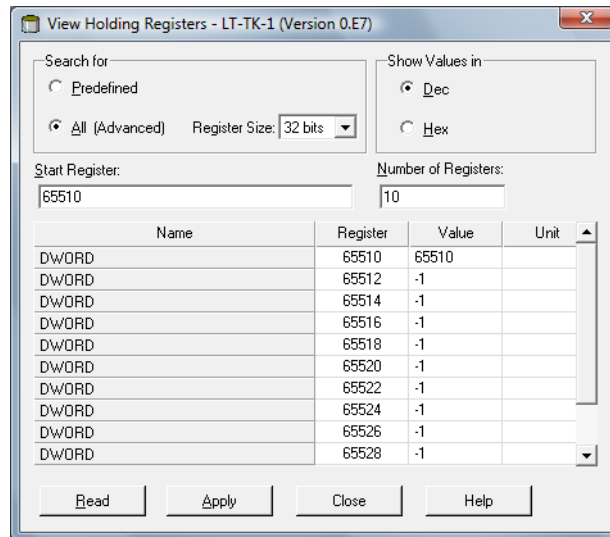
TankMaster WinSetup offers the option to load the **Default Database**. This can be useful if, for example, you want to try new database settings and then want to reload the original factory settings, or when tank conditions have been altered. If error messages appear or other problems occur concerning the Database a troubleshooting is recommended before loading the **Default Database**.

NOTE!

The device address remains unaltered when the default database is loaded.

To load the default database:

1. Select the desired device icon in the *TankMaster WinSetup* workspace window.
2. Click the right mouse button and choose the **View Holding Register** option.
3. Choose the **All** option and type **65510** in the **Start Register** input field. Type the desired number of registers to be displayed in the **Number of Registers** field and click the Read button.



4. Type 65510 in the **Value** input field.
5. Click the **Apply** button.

6.3 TROUBLESHOOTING

Table 6-1. Troubleshooting chart for the 5900 level gauge

Symptom	Possible cause	Action
No level reading	<ul style="list-style-type: none"> • Communication on the tank bus does not work • Data communication cables disconnected • The level gauge is not configured 	<ul style="list-style-type: none"> • Check cable connections • Check the 5900 Modbus communication address, see "Communication failure" • Check configuration of the 2410 Tank Database
Incorrect level reading	<ul style="list-style-type: none"> • Configuration error • Disturbing objects in the tank 	<ul style="list-style-type: none"> • Check configuration of tank geometry and antenna parameters: <ul style="list-style-type: none"> - Tank Reference Height (R) - Gauge Reference Distance (G) - Calibration Distance - Antenna Type - Antenna size (Still pipe Array) See the <i>Raptor System Configuration Manual</i> (Document no. 300510EN) for more information on how to use TankMaster Winsetup for configuration of tank geometry and antenna parameters. • Use the Tank Scan function in TankMaster Winsetup to analyze the measurement signal: <ul style="list-style-type: none"> - Check if there are any disturbing echoes from obstacles in the tank. - Check if there is a strong echo at the bottom of the tank; use deflection plate at the end of still pipe. See the <i>Raptor System Configuration Manual</i> for more information on how to use the Tank Scan function. • Verify that the mechanical installation of the 5900 fulfills installation requirements. Check for example: <ul style="list-style-type: none"> - nozzle height and diameter - obstacles in the vicinity of the nozzle - distance to tank wall - inclination - total slot/hole are in still pipe See chapter 3.2 "Installation Considerations". • Check configuration of Environment parameters such as <i>Foam</i>, <i>Turbulent Surface</i> etc. and other advanced configuration options. Winsetup: 5900 Properties/Environment, 5900 Properties/Advanced Configuration. • Check status and diagnostics information, see "Diagnostics" on page 6-7. • Check that the 5900 has not locked on an interfering object in the tank.
The level gauge configuration can not be saved	The gauge is write protected	<ul style="list-style-type: none"> • Check position of the write protection switch and make sure that it is in the OFF position, see "Write Protection Switch" on page 6-11. • Check write protection setting in TankMaster WinSetup, see "Write Protection" on page 6-10.

Symptom	Possible cause	Action
Communication failure	<ul style="list-style-type: none"> • Incorrect or faulty cable connections. • Bad cable quality. • Unshielded wires. • Multiple shield grounding points. • Incorrect Tankbus connection. • Hardware failure. • Incorrect Tankbus termination. • Incorrect connection to the Tankbus. • Multiple shield grounding points. • Water in conduits. • Too many devices on the Tankbus. • Wrong Modbus address. • FISCO fuse broken. • Incorrect configuration of the 2160 Field Communication Unit (FCU) slave database. • Incorrect configuration of tank database in the 2410 Tank Hub. The 5900 Modbus address does not match address in the 2160 FCU Slave Database. • The primary bus on the 2410 tank hub is connected to the wrong field bus port on the 2160 FCU. • The Field Bus Modem is connected to the wrong communication port on the control room PC. • The Field Bus Modem is connected to the wrong Group Bus port on the 2160 FCU. • The 2410 tank hub is connected to the wrong communication port on the control room PC (if no FCU is used). • Faulty Field Bus Modem. • Faulty 2160 FCU. • Faulty communication port on the control room PC. 	<ul style="list-style-type: none"> • Check wiring and cable connections. • Check that the Field Bus Modem, or the Rosemount 2410 tank hub, is connected to the right communication port on the control room PC. • Check the Error LED on the Rosemount 2410 display. • Use shielded twisted pair wiring. • In TankMaster WinSetup open the <i>FCU Properties/Slave Database</i> window and check configuration of Modbus addresses. See the <i>Raptor System Configuration Manual</i> (Document no. 300510EN) for more information on how to configure the slave database of the 2160 FCU. • Check configuration of Modbus communication addresses in the tank database of the 2410 Tank Hub. See the <i>Raptor System Configuration Manual</i> (Document no. 300510EN) for more information on how to configure the Rosemount 2410 tank database. • Check diagnostics information, see "Diagnostics" on page 6-7. • Check Device Status input register, see "Device Status" on page 6-22. • Check communication port LED:s inside the 2160 Field Communication Unit (FCU). • Restart all devices by disconnecting and connecting the power supply to the 2410 tank hub • Check the communication port on the control room PC. • Contact Emerson Process Management/Rosemount TankGauging service department. <p>Tankbus</p> <ul style="list-style-type: none"> • Ensure that there are two terminations on the Tankbus, see "The Raptor Tankbus" on page 3-41 • Ensure that terminations are placed at both ends of the Tankbus • Check that the built-in termination in the 2410 tank communication unit is enabled • Ensure that the cable shield is grounded at the power supply end (2410) only • Ensure that the cable shield is continuous throughout the Tankbus network • Ensure that the shield inside the instrument housing does not come into contact with the housing • Connect wiring with drip loops

6.3.1 Device Status

Device Status messages that may appear on the display of the Rosemount 2410 tank hub, in the Rosemount Tankmaster program, or on a Rosemount 2230 display, are shown in Table 6-2. Device Status can be found in Input register 4000. See “Viewing Input and Holding Registers” on page 6-2 for more information on how to view Input registers.

Table 6-2. Device status messages

Message	Description	Action
Running Boot Software	<ul style="list-style-type: none"> • The application software could not be started. • The application SW is not loaded in the flash memory • The previous upload of the flash SW failed 	Reprogram the gauge with new software. Contact Emerson Process Management/Rosemount TankGauging service department.
Device Warning	A device warning is active.	See “Warning Messages” on page 6-23 for details.
Device Error	A device error is active.	See “Error Messages” on page 6-25 for details.
Level correction error	The LPG module is enabled but the module is either incorrectly configured, or there is no sensor input data for pressure or temperature.	See Input register 4702 <i>LPGIregArea-LPG_Corr_Error</i> for more information.
Invalid Measurement	The level gauge indicates that measurement is invalid. This may be caused by an actual measurement problem or some other error indication.	Check Error Messages, Warning Messages and Measurement Status for details.
User Register Area Write Protected	The configuration registers are write protected.	Do one of the following: 1. Use the Lock/Unlock function to turn off the software write protection. 2. Change position of the Write Protection switch to OFF.
Default Database	All configuration registers are set to default values.	Ensure that device calibration is valid.
Simulation Active	The 2410 tank hub is in simulation mode	The 2410 is in simulation mode for a specified period of time. It can also be manually stopped at any time. See section 6.2.9 “Simulation Mode” in the Rosemount 2410 Tank Hub reference manual (document no. 300530EN).
RM Reprogramming In Progress	New software is downloaded to the 5900 level gauge	Verify 5900 operation when reprogramming is finished

6.3.2 Warning Messages

Table 6-3 shows a list of Warning messages that may appear on the Display of the Rosemount 2410 tank hub. Warnings may also appear in the Rosemount Tankmaster program or on a Rosemount 2230 display. Warnings are less serious than errors.

For each warning message that may appear, detailed information can be found in Input registers 6100 to 6130 as shown in Table 6-3.

Table 6-3. Warning messages

Message	Description	Action
RAM warning	Input register no. 6100. Bit 8: DSP Stack Bit 12: DSP RAM low	Contact Emerson Process Management/Rosemount TankGauging service department.
FPROM warning	Input register no. 6102.	Contact Emerson Process Management/Rosemount TankGauging service department.
HREG warning	Input register no. 6104. Bit 4: DSP Factory holding registers	Load default database and restart the 5900. Contact Emerson Process Management/Rosemount TankGauging service department if the problem persists.
Other memory warning	Input register no. 6106.	Contact Emerson Process Management/Rosemount TankGauging service department
MWM warning	Input register no. 6108. Bit 1: Version mismatch between PM and RM	Contact Emerson Process Management/Rosemount TankGauging service department
RM warning	Input register no. 6110 Bit 1: SW config Bit 5: FPROM Checksum Bit 6: FPROM Version Bit 9: HREG Checksum Bit 10: HREG Limit Bit 11: HREG Write Bit 12: HREG Read Bit 13: HREG Version Bit 14: MWM Invalid Id Bit 30: SW Serious Warning	Contact Emerson Process Management/Rosemount TankGauging service department
Modem warning	Input register no. 6112.	Contact Emerson Process Management/Rosemount TankGauging service department
Other hardware warning	Input register no. 6122.	Contact Emerson Process Management/Rosemount TankGauging service department

Message	Description	Action
Configuration warning	Input register no. 6128. Bit 0: Super Test Active Bit 1: ATP Table Invalid Bit 2: Special Correction Table Invalid Bit 3: Near Zone Correction Table Invalid Bit 5: Config LPG Pins Visible Bit 6: Config LPG Error Bit 7: Simulation Mode Used Bit 8: Default Sweep Mode Used Bit 9: Test Sweep used Bit 10: ACT Table Invalid Bit 11: UCT Table Invalid Bit 12: Simple Simulation Mode Warning Bit 13: Ramp Simulation Mode Warning Bit 14: TSM Filter Too Narrow	<ul style="list-style-type: none"> • Load the default database and restart the level gauge, see "Loading the Default Database" on page 6-19. • Configure the level gauge or load a backup configuration file (see "To Recover a Backup Configuration Database" on page 6-6). • Contact Rosemount TankGauging service department if the problem persists.
SW warning	Input register no. 6130. Bit 8: DSP Undefined software warning	Contact Emerson Process Management/Rosemount TankGauging service department

6.3.3 Error Messages

Table 6-4 shows a list of error messages that may appear on the display of the Rosemount 2410 tank hub, in the Rosemount Tankmaster program, or on a Rosemount 2230 display.

For each error message that may appear, detailed information can be found in Input registers 6000 to 6030 as shown in Table 6-4.

Table 6-4. Error messages for the Rosemount 5900

Message	Description	Action
RAM error	Input register no. 6000. A gauge data memory (RAM) error has been detected during the startup tests. Note: this automatically resets the gauge. Serious RAM problem: Bit 8: DSP RAM Bit 10: DSP stack Bit 11: DSP RAM checksum Bit 12: DSP RAM low	Contact Emerson Process Management/Rosemount TankGauging service department.
FEPROM error	Input register no. 6002. An error in the gauge program memory (FEPROM) has been detected during the startup tests. Note: this automatically resets the gauge. Serious FEPROM problem: Bit 4: DSP Boot checksum Bit 5: DSP Boot version Bit 6: DSP Application checksum Bit 7: DSP Application version Bit 8: DSP Application memory limitation Bit 12: FEPROM device Bit 13: FEPROM erase Bit 14: FEPROM write	Contact Emerson Process Management/Rosemount TankGauging service department.
Database (Hreg) error	Input register no. 6004. An error in the transmitter configuration memory (EEPROM) has been detected. The error is either a checksum error that can be solved by loading the default database or a hardware error. NOTE: the default values are used until the problem is solved. The following bits indicate a serious Holding register problem: Bit 4: DSP checksum Bit 5: DSP limit Bit 6: DSP version Bit 14: Write error	Load default database and restart the 5900. Contact Emerson Process Management/Rosemount TankGauging service department if the problem persists.
Other Memory error	Input register no. 6006.	Contact Emerson Process Management/Rosemount TankGauging service department.
RSU error	Input register no. 6008. Bit 0: Config Data Error Bit 1: Database communication Bit 2: Sweep regulation frequency Bit 3: Sweep regulation frequency Bit 4: Sweep start frequency Bit 5: Controllrq	Contact Emerson Process Management/Rosemount TankGauging service department.

Message	Description	Action
Microwave Module error	An error in the microwave module.	Contact Emerson Process Management/Rosemount TankGauging service department.
Modem error	Input register no. 6012. An error in the modem used for digital communication has been detected.	Contact Rosemount TankGauging service department.
Other hardware error	Input register no. 6022. An unspecified hardware error has been detected. Bit 0: HW NumError Bit 10: Internal Temp Out of Range Bit 12: External Sensor UART Error	Contact Emerson Process Management/Rosemount TankGauging service department.
Configuration error	Input register no. 6028. At least one configuration parameter is outside allowed range. NOTE: the default values are used until the problem is solved.	<ul style="list-style-type: none"> • Load the default database and restart the level gauge, see "Loading the Default Database" on page 6-19. • Configure the level gauge or load a backup configuration file (see "To Recover a Backup Configuration Database" on page 6-6). • Contact Rosemount TankGauging service department if the problem persists.
Software error	Input register no. 6030. An error has been detected in the 5900 gauge software. Bit 8: DSP Undefined SW Error Bit 9: DSP Task Not Running	Contact Rosemount TankGauging service department.

6.3.4 Measurement Status

Measurement Status information can be found by viewing Input register 4002. Table 6-5 presents the various status bits that may appear:

Table 6-5. Measurement status for the Rosemount 5900

Message	Description	Action
Full tank	The level measurement is in Full Tank state. The transmitter waits for the surface echo to be detected at the top of the tank.	The transmitter leaves the Full Tank state when the product surface gets below the Full Tank Detection Area.
Empty tank	The level measurement is in Empty Tank state. The transmitter waits for the surface echo to be detected at the bottom of the tank.	The transmitter leaves the Empty Tank state when the product surface gets above the Empty Tank Detection Area. See "Empty Tank Handling" on page C-5.
Dirty antenna	The antenna is so contaminated that the level measurement might be affected.	Clean the antenna.
Sweep linearization warning	The sweep is not correctly linearized.	Check Warning messages. If MWM Warning is active this might indicate a transmitter error. Contact Emerson Process Management/Rosemount TankGauging service department.
Tank signal clip warning	The last Tank Signal was clipped.	Check Warning Messages. If MWM Warning is active this might indicate a transmitter error. Contact Emerson Process Management/Rosemount TankGauging service department.
No surface echo	The Surface Echo Pulse can not be detected.	Check if the configuration can be changed so that the surface echo can be tracked in this current region.
Predicted level	The presented level is predicted. The surface echo could not be detected.	See <i>No surface echo</i> above.
Sampling failed	The sampling of the last tank signal failed.	Check Warning Messages.
Invalid Table		
Invalid volume value	The given volume value is invalid.	Check Volume Status for details.
Simulation Mode	The simulation mode is active. The presented measurement values are simulated.	No action needed.
Advanced Simulation Mode	The advanced simulation mode is active. The given measurements are simulated.	To turn off the Advanced Simulation mode set Holding Register 3600=0 (see "Viewing Input and Holding Registers" on page 6-2).
Tracking Extra Echo	The transmitter is in the empty tank state tracking an extra echo.	
Bottom Projection Active	The bottom projection function is active.	
Pipe Measurement Enabled	Pipe Measurement is active.	No action needed.
Surface close to registered false echo.	Close to a registered false echo measurement accuracy may be slightly reduced.	By using the Register False Echo function the transmitter can track the product surface in the vicinity of disturbing objects.
Sudden level jump detected.	This may result from various measurement problems.	Check interior of the tank to find out what causes the problem tracking the surface.

Preliminary

Reference Manual

300520EN, Rev AA

November 2009

Rosemount 5900 Series

Appendix A Reference Data

A.1	Specifications	page A-1
A.2	Dimensional drawings	page A-4
A.3	Ordering Information	page A-8

A.1 SPECIFICATIONS

General	
Product	Rosemount 5900S series radar level gauge
Measurement principle	FMCW (Frequency Modulated Continuous Wave)
Antennas	Horn antenna, parabolic antenna, still-pipe array antenna, LPG/LNG antenna
Instrument accuracy	± 0.5 mm (0.020 in.)
Reference conditions	According to OIML R 85. Temperature: 20 ± 5 °C (68 ± 9 °C). Pressure: 1013 ± 20 mbar (14.7 ± 0.3 PSI). Relative humidity: 60 ± 15%. Measurement with a parabolic antenna
Field bus (standard)	Foundation™ fieldbus FISCO (Tankbus)
Start-up time	30 s
Update time	New measurement every 0.3 s
Repeatability	0.2 mm (0.008 in.) under reference conditions for any distance between 1 to 30 m (3 to 98 ft)
Maximum level rate	Up to 200 mm/s (50 mm/s with default setting)
Hazardous location certifications and IS parameters	ATEX, FM-C, FM-US, and IECEx. For details, see Section B: Product Certifications
CE-mark	93/68/EEC: complies with applicable EU directives (EMC, ATEX, LVD, and R&TTE)
Communication / Display / Configuration	
Output variables and units	Level, free water level, and ullage: meter, centimeter, millimeter, feet, or inch Level rate: meter/second, meter/hour, feet/second, feet/hour, inch/minute Temperature: °F, °C, or °K. Signal strength: mV Extended set of variables and units are available in Rosemount 2410 and TankMaster
Analog inputs	In separate unit, Rosemount 2410 tank hub
Relay outputs	In separate unit, Rosemount 2410 tank hub
Temperature inputs	Connection of temperature sensors to Rosemount 2240S multi-input temperature transmitter or Rosemount 644 temperature transmitter for further connection to Rosemount 2410 tank hub
Field data display	In separate unit, Rosemount 2230 field display
Configuration tools	Rosemount TankMaster WinSetup, 375 field communicator
Electric	
Power supply	Powered by Rosemount 2410 tank hub
Internal power consumption	Typical 300 mW
Quiescent current draw	50 mA
Microwave output power	< 1 mW

Mechanical	
Housing material	Polyurethane-coated die-cast aluminum
Cable entry (connection/glands)	<p>½ - 14 NPT for cable glands or conduits.</p> <p>Optional:</p> <ul style="list-style-type: none"> • M20 x 1.5 conduit / cable adapter • Metallic cable glands • 4-pin male Eurofast® connector or A size Mini 4-pin male Minifast® connector
Tankbus cabling	AWG 16-22 (1.3-0.3 mm ²), shielded twisted pairs
Built-in Tankbus termination	Yes (to be connected if required)
Total weight	<p>Värden för Rex...5900S with horn antenna: Appr. 20 kg (44 lbs),</p> <p>5900S with parabolic antenna: Appr. 25 kg (55 lbs),</p> <p>5900S with still-pipe array antenna: 21.5-32 kg (47.4-70.5 lbs)</p> <p>5900S with LPG/LNG antenna: 38 kg (84 lbs) for 6-in. 150 psi, and 48 kg (106 lbs) for 6-in. 300 psi</p>
Environment	
Ambient operating temperature	-40 to +70 °C (-40 to +158 °F). Minimum start-up temperature -50 °C (-58 °F)
Storage temperature	-50 to +85 °C (-58 to +185 °F)
Temperature drift	According to OIML R 85 requirements; ± 1 mm within the specified ambient operating temperature range
Humidity	0-100% relative humidity
Ingress protection	IP 66 and 67 (Nema 4X)
Metrology certification	OIML R 85, and national certifications such as PTB, NMI etc
Metrology sealing possibility	Yes
Vibration resistance	IEC 60770-1 level 1 and IACS UR E10 test 7
Telecommunication (FCC and R&TTE)	<p>Compliance with:</p> <ul style="list-style-type: none"> • FCC 15B Class A, and 15C • R&TTE (EU directive 1999/5/EC) • ETSI (EN 302 372-1 V.1.1.1) • IC (RSS210-5)
Electromagnetic compatibility	<ul style="list-style-type: none"> • EMC directive 2004/108/EC, and EN61326-3-1 • OIML R 85 XXXX
Transient / built-in lightning protection	According to IEC 61000-4-4-5, level 2 kV to ground. Complies with IEEE 587 Category B transient protection and IEEE 472 surge protection
Pressure Equipment Directive (PED)	97/23/EC
Ordinary location certification	Complies with FM 3810:2005 and CSA C22.2 No. 142-M1987
Rosemount 5900S with horn antenna	
Operating temperature in tank	Max. +230 °C (+445 °F)
Measuring range (standard)	0.8 to 20 m (2.6 to 65 ft) below flange
Measuring range (option)	0.3 to 30 m (1 to 100 ft) below flange with reduced accuracy
Pressure	-0.2 to 2 bar (-2.9 to 29 psig)
Material exposed to tank atmosphere	<p>Antenna: Acid proof steel type EN 1.4436 (AISI 316)</p> <p>Sealing: PTFE</p> <p>O-ring: FPM (Viton®)</p>
Antenna dimension	175 mm (7 in.)
Nozzle diameter	Minimum 200 mm (8 in.)
Mounting flange	8-in. ANSI B 16.5 150 lbs/DN 200 PN 10 DIN 2632/SS2032 (other flanges available on request). The flange can be horizontal or 4° inclined for mounting close to tank wall

Rosemount 5900S with parabolic antenna	
Operating temperature in tank	Max. +230 °C (+445 °F)
Measuring range	0.8 to 40 m (2.6 to 130 ft) below flange. For longer measuring range, please consult your Emerson Process Management / Rosemount Tank Gauging representative
Pressure	Clamped: -0.2 to 0.2 bar (-2.9 to 2.9 psig) Welded: -0.2 to 10 bar (-2.9 to 145 psig)
Material exposed to tank atmosphere	Antenna: Acid proof steel type EN 1.4436 (AISI 316) Sealing: PTFE O-ring: FPM (Viton®)
Antenna dimension	440 mm (17 in.)
Manway size	Min. 20-in
Tank connection	Gauge is clamped in a 96 mm (3.78 in.) diameter hole, or welded in a 117 mm (4.61 in.) diameter hole
Rosemount 5900S with still-pipe array antenna	
Operating temperature in tank	-40 to 120 °C (-40 to 248 °F)
Measuring range	0.8 to 40 m (2.6 to 130 ft) from antenna end. For longer measuring range, please consult your Emerson Process Management / Rosemount Tank Gauging representative
Pressure	-0.2 to 2 bar (-2.9 to 29 psig) at 20 °C
Measuring range	0.8 to 40 m (2.6 to 130 ft) from antenna end. For longer measuring range, please consult your Emerson Process Management / Rosemount Tank Gauging representative
Pressure	-0.2 to 2 bar (-2.9 to 29 psig) at 20 °C
Material exposed to tank atmosphere	Antenna: Polyphenylsulfid (PPS) Sealing: PTFE O-ring: Fluorosilicone Flange: Acid Proof Steel EN 1.4404 (AISI 316L)
Still-pipe dimensions	5-, 6-, 8-, 10- or 12 in.
Rosemount 5900S with LPG/LNG antenna	
Operating temperature at ball valve	-55 to 90 °C (-67 to 194 °F)
Operating temperature in tank	-170 to 90 °C (-274 to 194 °F)
Measuring range	0.5 m to 60 m (1.6 ft to 200 ft) from cone end. For longer measuring range, please consult your Emerson Process Management / Rosemount Tank Gauging representative
Maximum pressure	Up to 25 bar (365 psig). (Note! Flanges may have higher pressure rating than 25 bar, but maximum tank pressure is still 25 bar)
Pressure rating	10 bar/150 psi 20 bar/300 psi 40 bar/600 psi
Pressure sensor (option)	Rosemount 2051
Flange	6-in.
Still-pipe dimension alternatives	4-in. sch. 10 or sch 40 100 mm (99 mm inner diameter)
Material exposed to tank atmosphere	Antenna: Acid proof steel type EN 1.4436 (AISI 316) Sealing: Quartz and PTFE
Ball valve sealing	20 bar or 60 bar (290 psi or 870 psi), the higher pressure for 600 psi flange only

A.2 DIMENSIONAL DRAWINGS

Figure A-1. Dimensions of Rosemount 5900 with Horn antenna

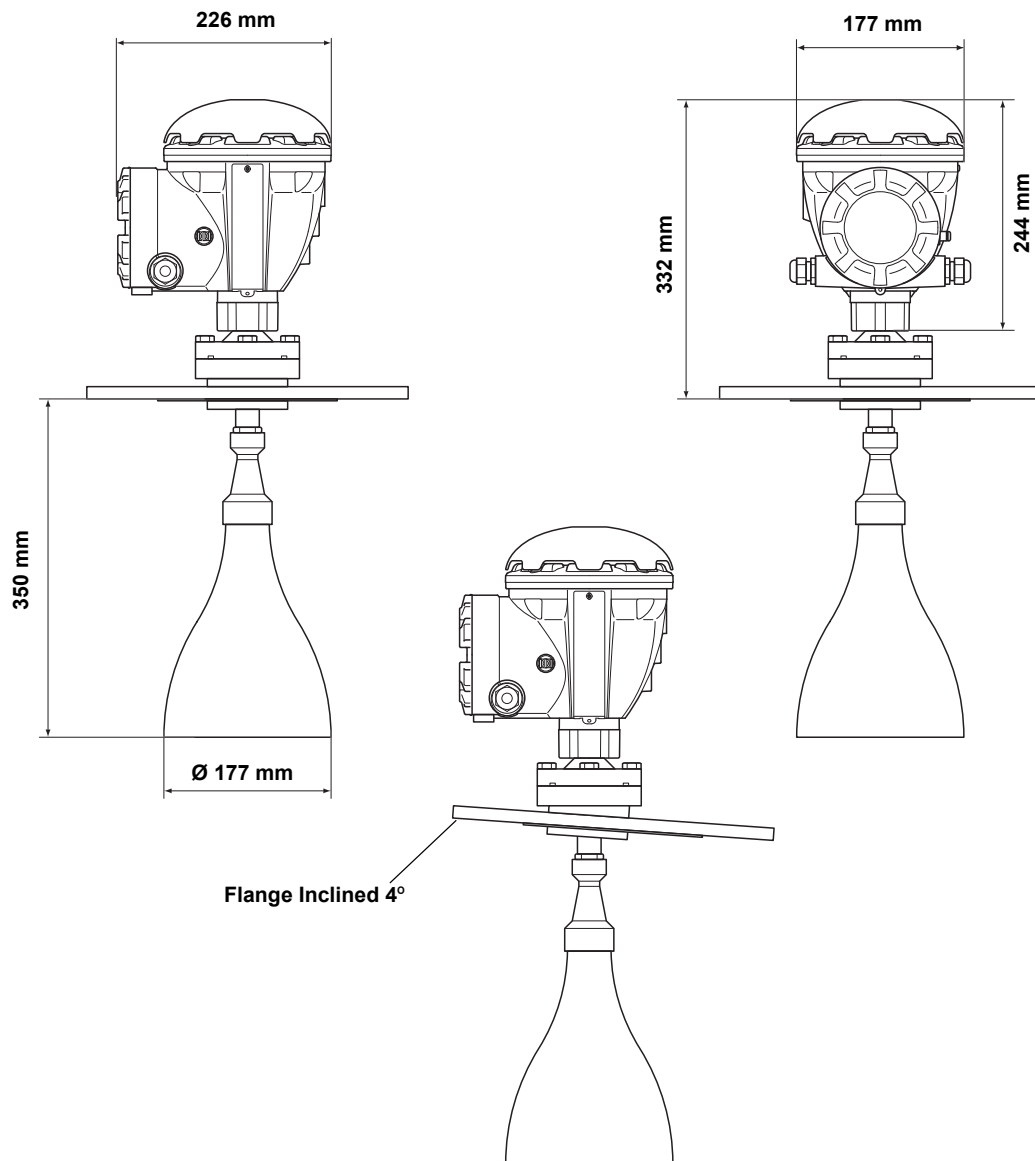
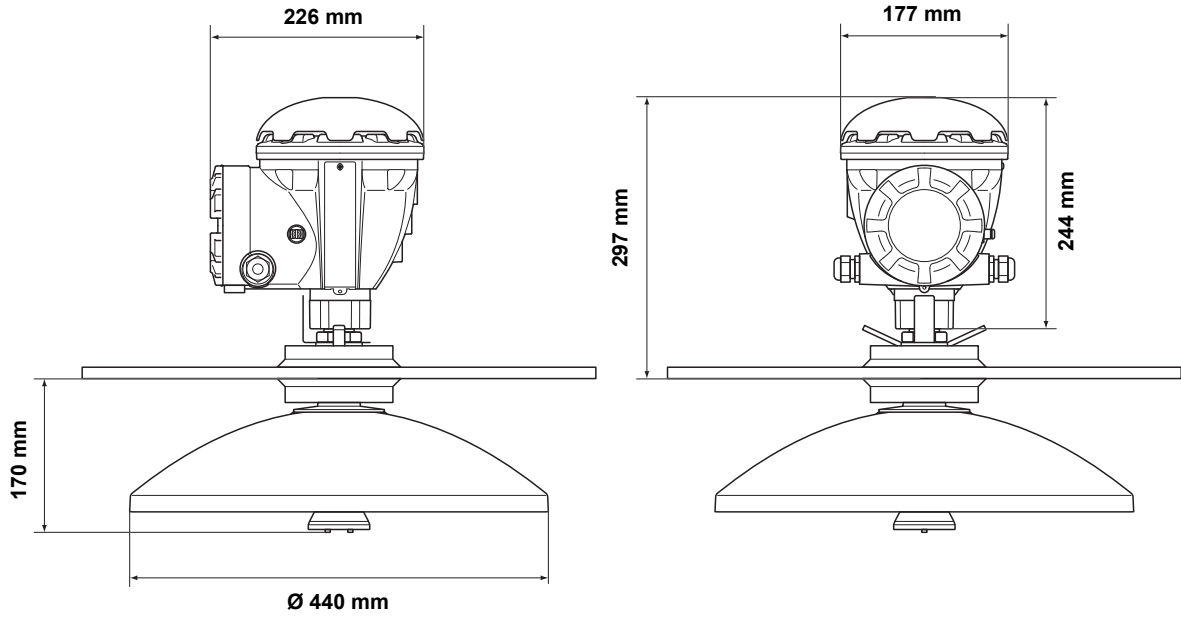


Figure A-2. Dimensions of
Rosemount 5900 with Parabolic
antenna



Rosemount 5900 Series

Figure A-3. Dimensions of
Rosemount 5900 with Still-Pipe
Array antenna

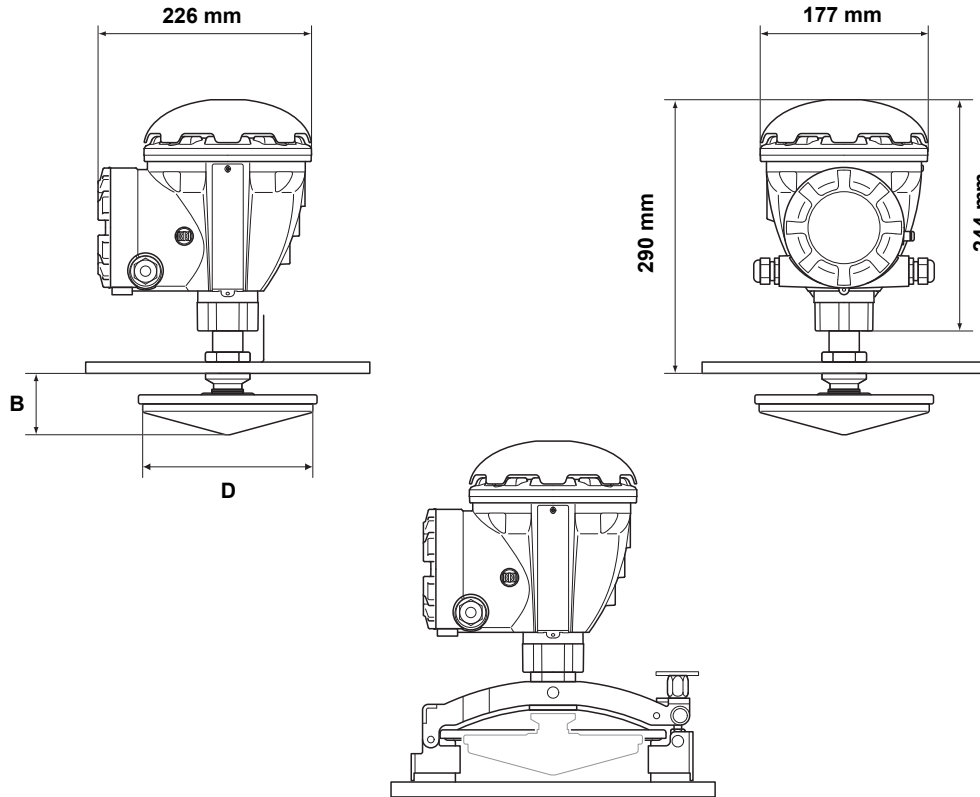


Table A-1. Available sizes for
Still-Pipe Array Antenna

Antenna diameter (D)	B (mm)
5 in. / DN125 (Ø 120 mm)	56
6 in. / DN150 (Ø 145 mm)	59
8 in. / DN150 (Ø 145 mm)	65
10 in. / DN150 (Ø 145 mm)	73
12 in. / DN150 (Ø 145 mm)	79

Figure A-4. Dimensions of Rosemount 5900 with LPG/LNG Still-Pipe antenna

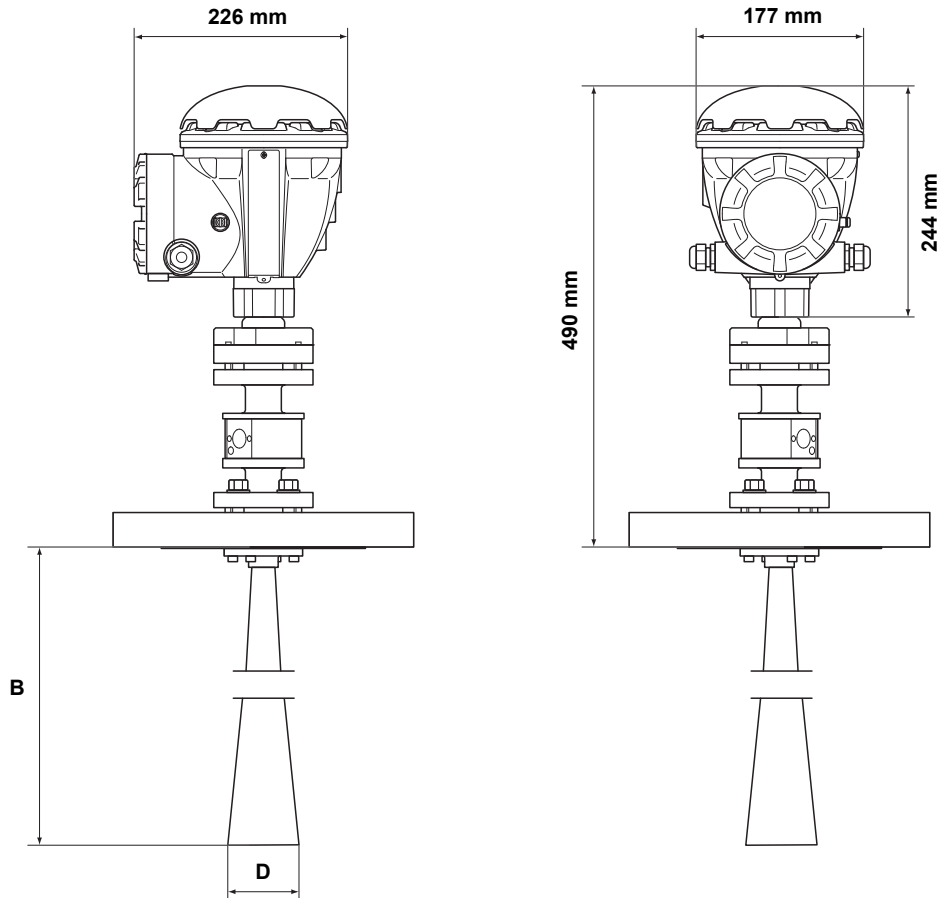


Table A-2. Available sizes for LPG/LNG Still-Pipe antenna

Antenna diameter (D)	B (mm)
4 in. Sch10 (Ø 107 mm)	752
4 in. Sch40 (Ø 101 mm)	534
DN100 (Ø 99 mm)	502

Rosemount 5900 Series
A.3 ORDERING INFORMATION
A.3.1 Transmitter Head (TH)

Model (Pos 1)	Product Description	Note
5900S	Radar Level Gauge	
Code (Pos 2)	Performance Class	Note
P	Premium: ±0.5 mm (0.020 in.) instrument accuracy	
Code (Pos 3)	Safety Certification (SIS)	Note
3	SIL3-certification as per IEC 61508 ⁽¹⁾	Requires Rosemount 2410 with Relay Output (SIS/SIL), code 3
2	SIL2-certification as per IEC 61508	Requires Rosemount 2410 with Relay Output (SIS/SIL), code 2
F	None. Ready for upgrade of safety certification (SIS)	
0	None	
Code (Pos 4)	Redundancy	Note
2	2-in-1; Independent radar level gauge electronics	The secondary radar level gauge unit has ± 3 mm (0.12 in.) instrument accuracy
F	None. Ready for upgrade to 2-in-1	
1	None. Single radar level gauge electronics	
Code (Pos 5)	Tankbus: Power and Communication	Note
F	Bus powered 2-wire FOUNDATION™ fieldbus (IEC 61158)	
Code (Pos 6)	Hazardous Location Certification	Note
I1	ATEX Intrinsic Safety	
I5	FM-US Intrinsic Safety	
I6	FM-Canada Intrinsic Safety	
I7	IECEX Intrinsic Safety	
NA	None	
Code (Pos 7)	Custody Transfer Type Approval	Note
R	OIML R85 E performance certification	Requires Rosemount 2410 Tank Hub with OIML R85 E custody transfer type approval
0	None	
Code (Pos 8)	Radar Measurement Method	Note
1	10 GHz FMCW radar technology	
Code (Pos 9)	Housing	Note
A	Standard enclosure	Polyurethane-covered aluminium. IP 66/67
Code (Pos 10)	Cable / Conduit Connections	Note
1	½ - 14 NPT (standard)	Female thread. 1 plug included
2	M20 x 1.5 adapters	Female thread. 2 adapters and 1 plug included
G	Metal cable glands	Rated increased safety (Exe). 2 glands and 1 plug included
E	Eurofast® male connectors	1 plug included
M	Minifast® male connectors	1 plug included

(1) Requires Pos 4 "Redundancy" code 2 (2-in-1).

A.3.2 Horn Antenna

Code (Pos 11)	Antenna	Note
1H	Horn antenna	
Code (Pos 12)	Antenna Size	Note
8	8 in. / DN 200, Ø=175 mm (6.9 in.)	
Code (Pos 13)	Antenna Material	Note
S	Stainless steel (material type corresponding to AISI 316/316L and EN 1.4401 /1.4404)	
Code (Pos 14)	Tank Seal	Note
PV	PTFE with Viton® fluoroelastomer o-ring	
Code (Pos 15)	Tank Connection	Note
ANSI Flanges (SST AISI 316 / 316 L)		
8A	8 in. Class 150	
8Z	8 in. Class 150, 4° inclined	
EN Flanges (SST EN 1.4401 / 1.4404)		
LA	DN 200 / PN 10	
LZ	DN 200 / PN 10, 4° inclined	
Code (Pos 16)	Special	Note
0	None	

A.3.3 Parabolic Antenna

Code (Pos 11)	Antenna	Note
1P	Parabolic antenna	
Code (Pos 12)	Antenna Size	Note
F	20 in. / DN 500, Ø=440 mm (17.3 in.)	
Code (Pos 13)	Antenna Material	Note
S	Stainless steel (material type corresponding to AISI 316/316L and EN 1.4401 /1.4404)	
Code (Pos 14)	Tank Seal	Note
PF	PTFE with FEP fluoropolymer o-ring	
Code (Pos 15)	Tank Connection	Note
WE	Welded installation	Flange not included
CL	Clamped/threaded installation	Flange not included
Code (Pos 16)	Special	Note
0	None	

A.3.4 Still-pipe Array Antenna

Code (Pos 11)	Antenna	Note
1A	Still-pipe array antenna	
Code (Pos 12)	Antenna Size	Note
5	5 in. / DN 125, Ø=120 mm (4.7 in.)	
6	6 in. / DN 150, Ø=145 mm (5.7 in.)	
8	8 in. / DN 200, Ø=189 mm (7.4 in.)	
A	10 in. / DN 250, Ø=243 mm (9.8 in.)	
B	12 in. / DN 300, Ø=293 mm (11.8 in.)	
Code (Pos 13)	Antenna Material	Note
S	Stainless steel (AISI 316L / EN 1.4404) and PPS (Polyphenylene sulfide)	
Code (Pos 14)	Tank Seal	Note
FF	Fixed flange installation with fluorosilicone o-ring	
HH	Integrated hatch installation with fluorosilicone o-ring	
Code (Pos 15)	Tank Connection	Note
ANSI Flanges (SST AISI 316 L)		
5A	5 in. Class 150	
6A	6 in. Class 150	
8A	8 in. Class 150	
AA	10 in. Class 150	
BA	12 in. Class 150	
EN Flanges (SST EN 1.4404)		
KA	DN 150 PN 16	
LA	DN 200 PN 10	
MB	DN 250 PN 16	
Code (Pos 16)	Special	Note
0	None	
C	Clamp flange in galvanized steel (for still-pipes without a flange)	Same size as tank connection

A.3.5 LPG/LNG Antenna

Code (Pos 11)	Antenna	Note
G1	LNG still-pipe antenna	
G2	LPG still-pipe antenna	
Code (Pos 12)	Antenna Size	Note
A	4 in. Schedule 10, Ø=107 mm (4.2 in.)	
B	4 in. Schedule 40, Ø=101 mm (4.0 in.)	
D	DN 100, Ø=99 mm (3.9 in.)	
Code (Pos 13)	Antenna Material	Note
S	Stainless steel (material type corresponding to AISI 316/316L and EN 1.4401 /1.4404)	
Code (Pos 14)	Tank Seal	Note
QA	Quartz sealing	
Code (Pos 15)	Tank Connection	Note
4A	4 in. Class 150	
4B	4 in. Class 300	
4C	4 in. Class 600	
6A	6 in. Class 150	
6B	6 in. Class 300	
6C	6 in. Class 600	
8A	8 in. Class 150	
8B	8 in. Class 300	
Code (Pos 16)	Special	Note
V	Measurement verification kit	Includes one verification pin and a pipe-end deflector kit

A.3.6 5900S Radar Level Gauge Options

Code (Pos 17)	Options – multiple selections are possible	Note
QT	IEC 61508 certificate and FMEDA-data ⁽¹⁾	
Q4	Calibration certificate	
S4	Witnessed calibration certificate	Calibration certificate witnessed by factory selected third part metrology certified institute
Q8	Antenna material traceability certification per EN 10204 3.1 ⁽²⁾	
ST	Engraved SST tag plate	
P1	Antenna hydrostatic pressure testing	

(1) Requires Pos 3 "Safety Certification (SIS)" code 2 or 3 (SIL3 or SIL2).

(2) Certificate includes all pressure retaining wetted parts.

Model code example, Rosemount 5900S with still-pipe array antenna

5900S - P 3 2 F I1 R 1 A 1 - 1A 8 S HH 8A 0 - QT Q4

Preliminary

Reference Manual

300520EN, Rev AA

November 2009

Rosemount 5900 Series

Appendix B Product Certifications

B.1	Safety Messages	page B-1
B.2	EU Conformity	page B-2
B.3	Hazardous Locations Certifications	page B-3
B.4	Approval Drawings	page B-7

B.1 SAFETY MESSAGES

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

⚠ WARNING

Explosions could result in death or serious injury:

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

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

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

⚠ WARNING

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

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

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

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

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

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

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

Avoid contact with leads and terminals.

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

Antennas with non-conducting surfaces may generate an ignition-capable level of electrostatic charge under certain extreme conditions. Therefore, when the antenna is used in a potentially explosive atmosphere, appropriate measures must be taken to prevent electrostatic discharge.

B.2 EU CONFORMITY

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount Tank Gauging website at www.rosemount-tg.com. A hard copy may be obtained by contacting our local sales representative.

B.3 HAZARDOUS LOCATIONS CERTIFICATIONS

B.3.1 Factory Mutual US Approvals

Figure B-1. Factory Mutual Intrinsic Safety US Approval Label



The Rosemount 5900 Series level gauges that have the following labels attached have been certified to comply with the requirements of the approval agencies noted.

Project ID: 3035466.

I5

FISCO Field Device

Intrinsically Safe for Class I, Division 1, Groups A, B, C and D
 $U_i=17.5V$, $I_i=380mA$, $P_i=5.32W$, $C_i=1.1nF$, $L_i=1.5\mu H$

Entity

Intrinsically Safe for Class I, Division 1, Groups A, B, C and D
 $U_i=30V$, $I_i=300mA$, $P_i=1.3W$, $C_i=1.1nF$, $L_i=1.5\mu H$

Dust Ignition Proof for Class II/III, Division 1, Groups E, F and G
Temperature Code T4

Install per Control Drawing 9240040-917

Ambient Temperature Limits: -50°C to +80°C

Special Conditions of Use

1. Parabolic and Array antennas with plastic surfaces and the surface of the painted housing may, under certain extreme conditions, generate an ignition-capable level of electrostatic. Appropriate measures must be taken to prevent electrostatic discharge.

B.3.2 Factory Mutual Canadian Approvals

Project ID: 3035466.

Figure B-2. Factory Mutual Intrinsic Safety Canadian Approval Label



I6

FISCO Field Device

Intrinsically Safe for Class I, Division 1, Groups A, B, C and D

For each channel: $U_i=17.5V$, $I_i=380mA$, $P_i=5.32W$, $C_i=1.1nF$, $L_i=1.5\mu H$

Entity

Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D.

Intrinsically Safe for Class I, Division 1, Groups A, B, C and D

For each channel: $U_i=30V$, $I_i=300mA$, $P_i=1.3W$, $C_i=1.1nF$, $L_i=1.5\mu H$

Dust Ignition Proof for Class II/III, Division 1, Groups E, F and G

Temperature Code T4

Install per Control Drawing 9240040-917

Ambient Temperature Limits: $-50^{\circ}C$ to $+80^{\circ}C$

B.3.3 European ATEX Directive Information

The Rosemount 5900 Series Level Gauge that has the following label attached has been certified to comply with Directive 94/9/EC of the European Parliament and the Council as published in the Official Journal of the European Communities No. L 100/1 on 19-April-1994.

Figure B-3. ATEX Intrinsic Safety Approval Label



I1 The following information is provided as part of the label of the transmitter:

- Name and address of the manufacturer (Rosemount)
- CE Conformity Marking



- Model number
- Serial number of the device
- Year of construction
- ATEX EC-Type Examination Certificate Number FM 09ATEX0057X
- Install per Control Drawing 9240040-917

FISCO Field Device



- Ex ia IIC T4 (-50 °C <Ta< +80 °C)
- For each channel: Ui=17.5V, li=380mA, Pi=5.32W, Ci=1.1nF, Li=1.5µH

Entity



- Ex ia IIC T4 (-50 °C <Ta< +80 °C)
- For each channel: Ui=30V, li=300mA, Pi=1.3W, Ci=1.1nF, Li=1.5µH

Special Conditions for Safe Use (X)

1. The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.
2. Parabolic and Array antennas with plastic surfaces and the painted surface of the enclosure may, under certain extreme conditions, generate an ignition-capable level of electrostatic charge for IIC applications. Therefore, when these antennas are used in Category 1G, Group IIC, appropriate measures must be taken to prevent electrostatic discharge.

B.3.4 IECEx Approval

- 17 The following information is provided as part of the label of the transmitter:
- Name and address of the manufacturer (Rosemount)
 - Model number
 - Serial number of the device
 - IECEx Certificate of Conformity Number IECEx FMG 09.0009X
 - Install per Control Drawing 9240040-917

Figure B-4. IECEx Intrinsic Safety Approval Label



FISCO Field Device

- Ex ia IIC T4 Ga/Gb (-50°C<Ta<+80°C)
- For each channel: Ui=17.5V, Ii=380mA, Pi=5.32W, Ci=1.1nF, Li=1.5µH

Entity

- Ex ia IIC T4 Ga (-50°C<Ta<+80°C)
- For each channel: Ui=30V, Ii=300mA, Pi=1.3W, Ci=1.1nF, Li=1.5µH

Special Conditions of Certification (X):

1. The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.
2. Parabolic and Array antennas with plastic surfaces and the painted surface of the enclosure may, under certain extreme conditions, generate an ignition-capable level of electrostatic charge for IIC applications. Therefore, when these antennas are used in Category EPL Ga, Group IIC, appropriate measures must be taken to prevent electrostatic discharge.

B.4 APPROVAL DRAWINGS

This section contains Factory Mutual system control drawings. You must follow the installation guidelines presented in order to maintain certified ratings for installed transmitters.

The following drawings are included:

System Control Drawing for hazardous location installation of intrinsically safe FM ATEX, FM IECEx, FM-US, and FM-C approved apparatus.

Figure B-5. Sheet 1 of System Control Drawing: FISCO Single Radar Level Gauge.

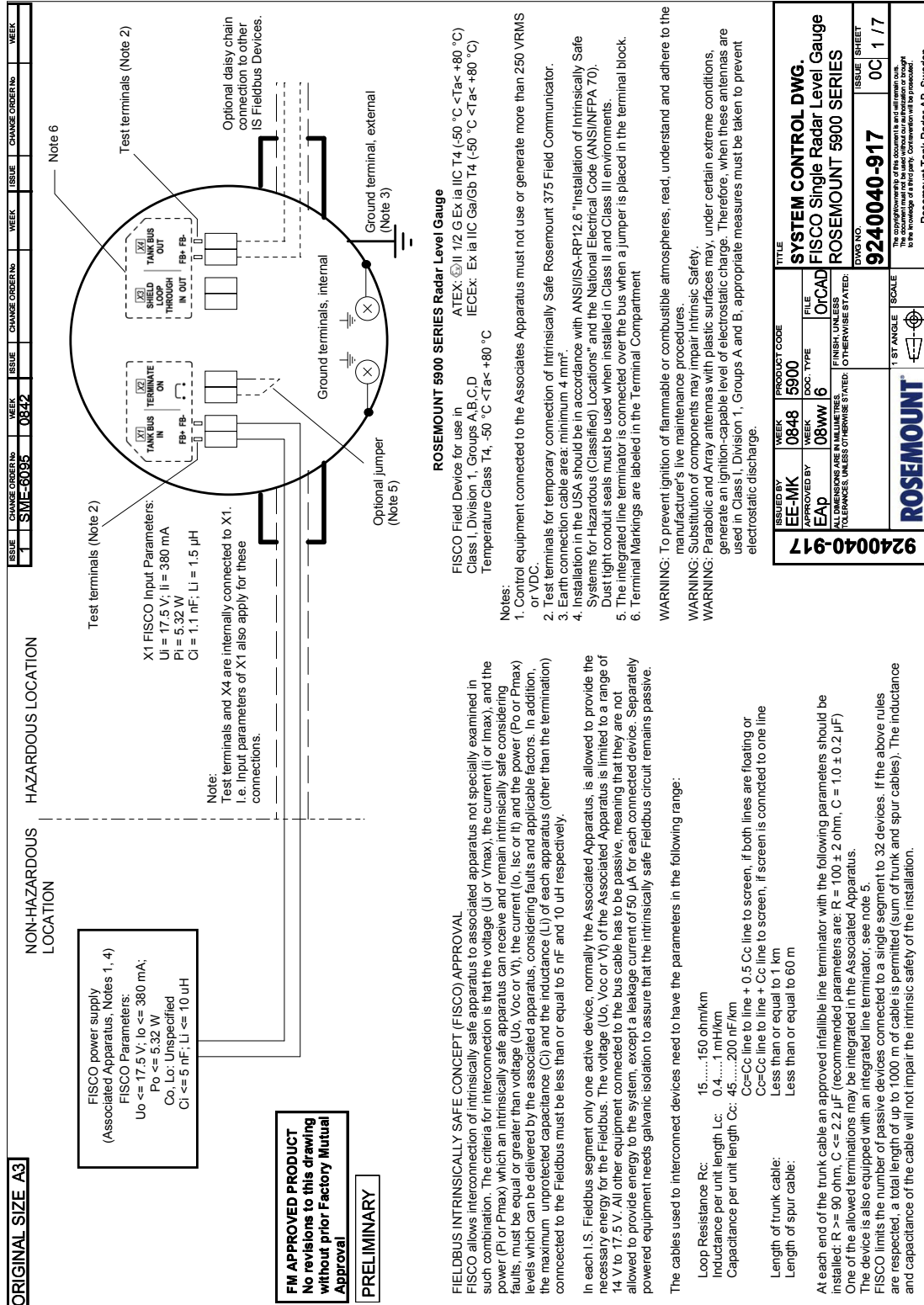


Figure B-6. Sheet 2 of System Control Drawing: FISCO 2-in-1 single bus.

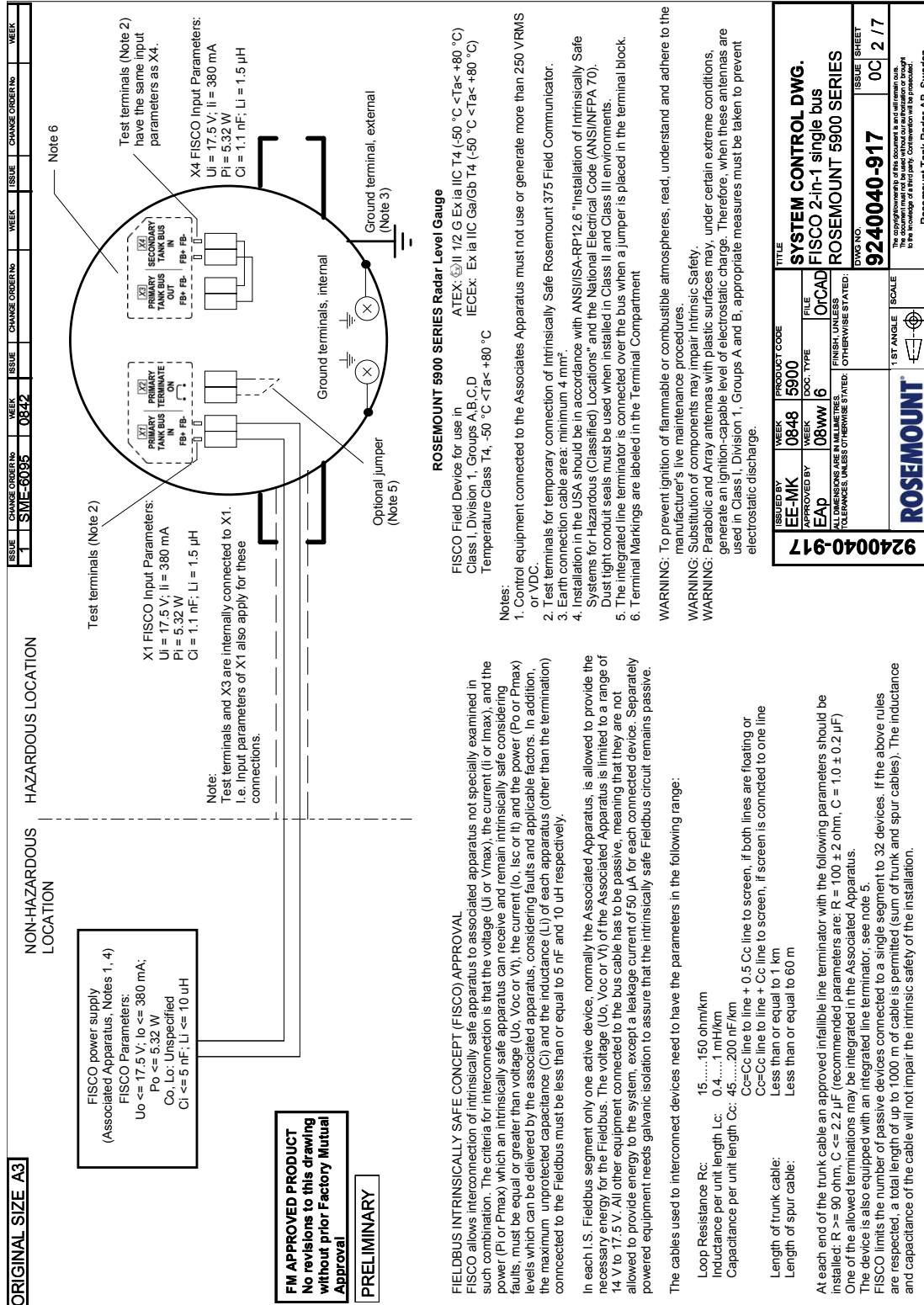


Figure B-7. Sheet 3 of System Control Drawing: FISCO 2-in-1 two buses.

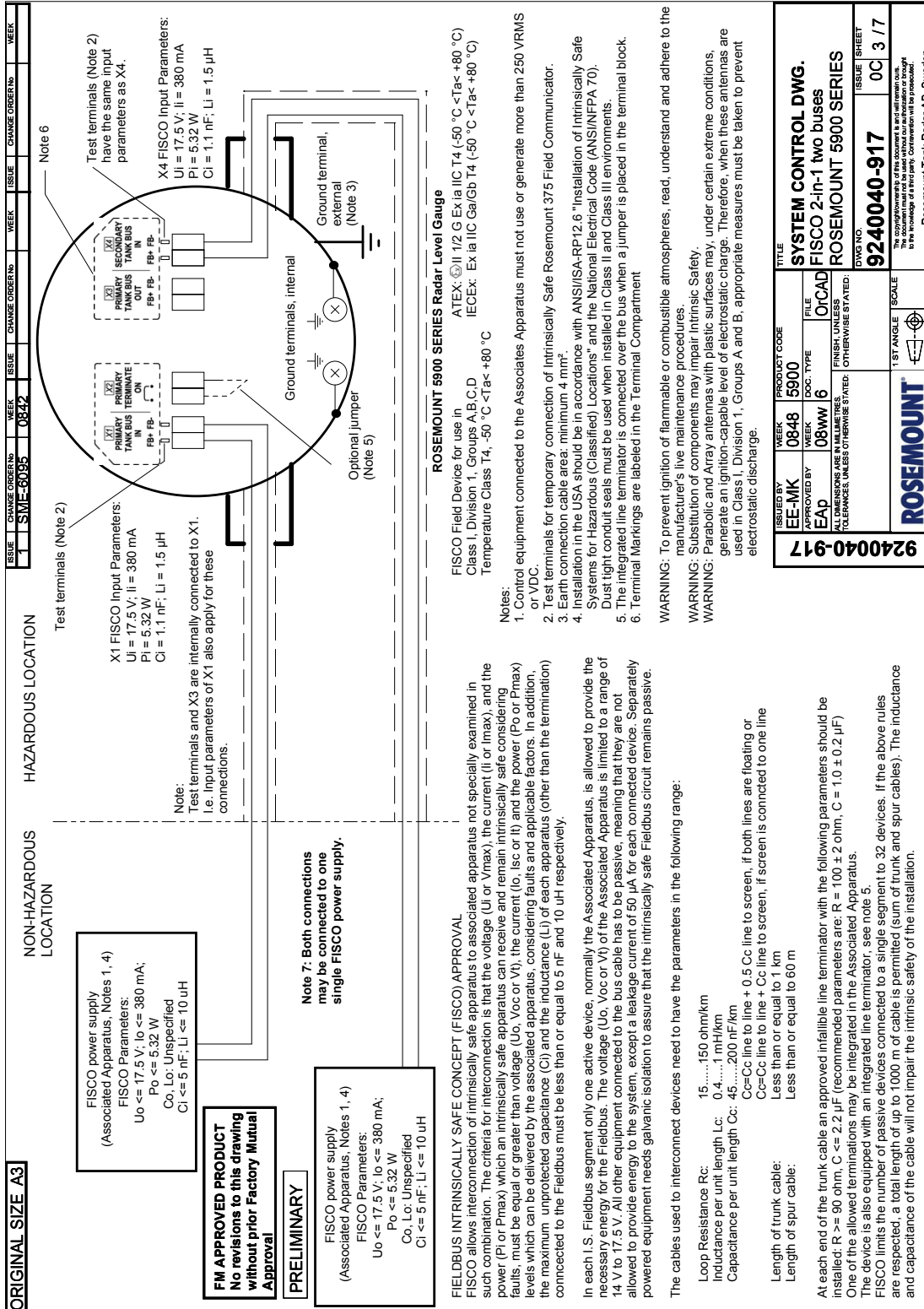
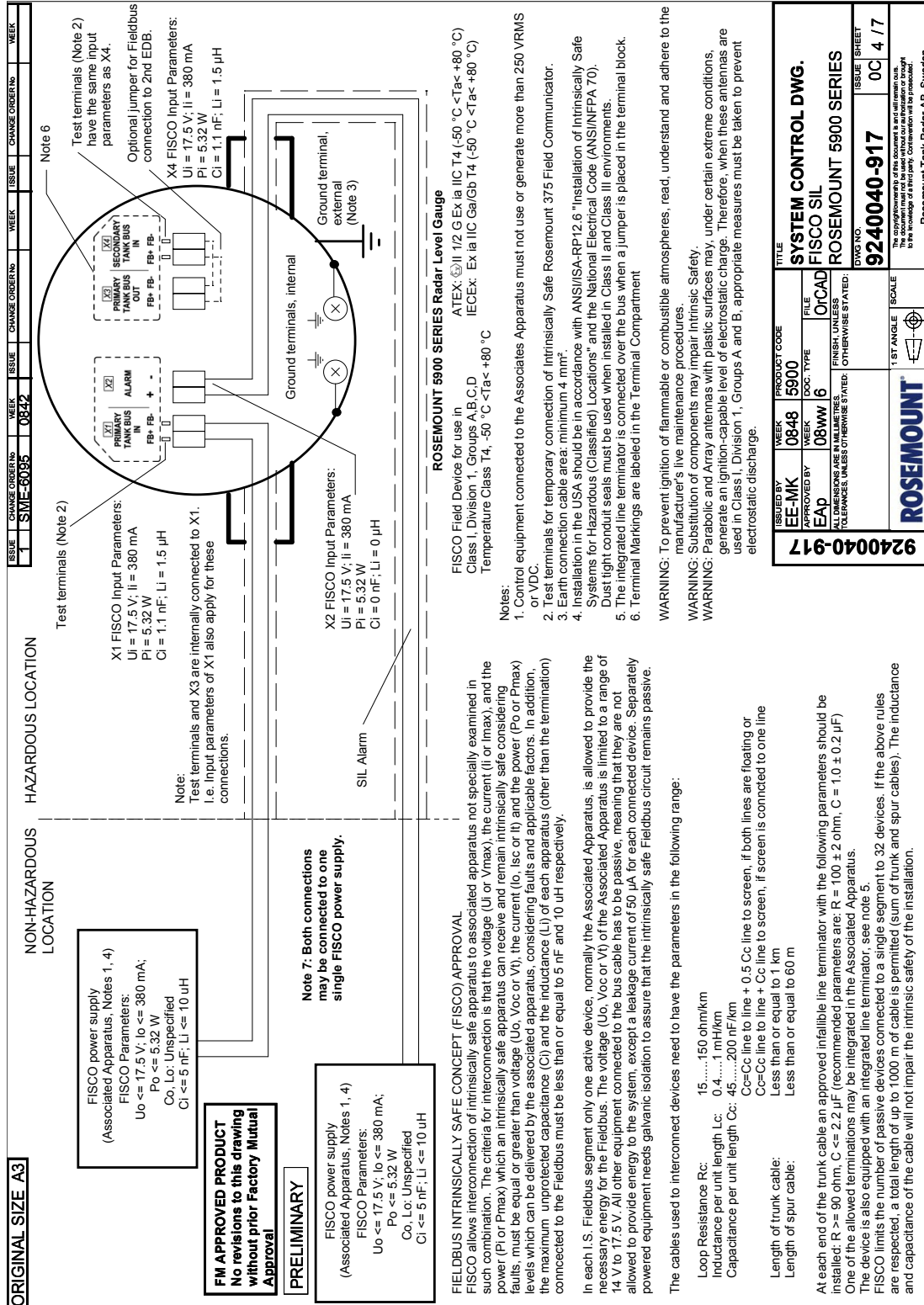


Figure B-8. Sheet 4 of System Control Drawing: FISCO SIL.



Rosemount 5900 Series

Figure B-9. Sheet 5 of System Control Drawing: Entity Single Radar Level Gauge.

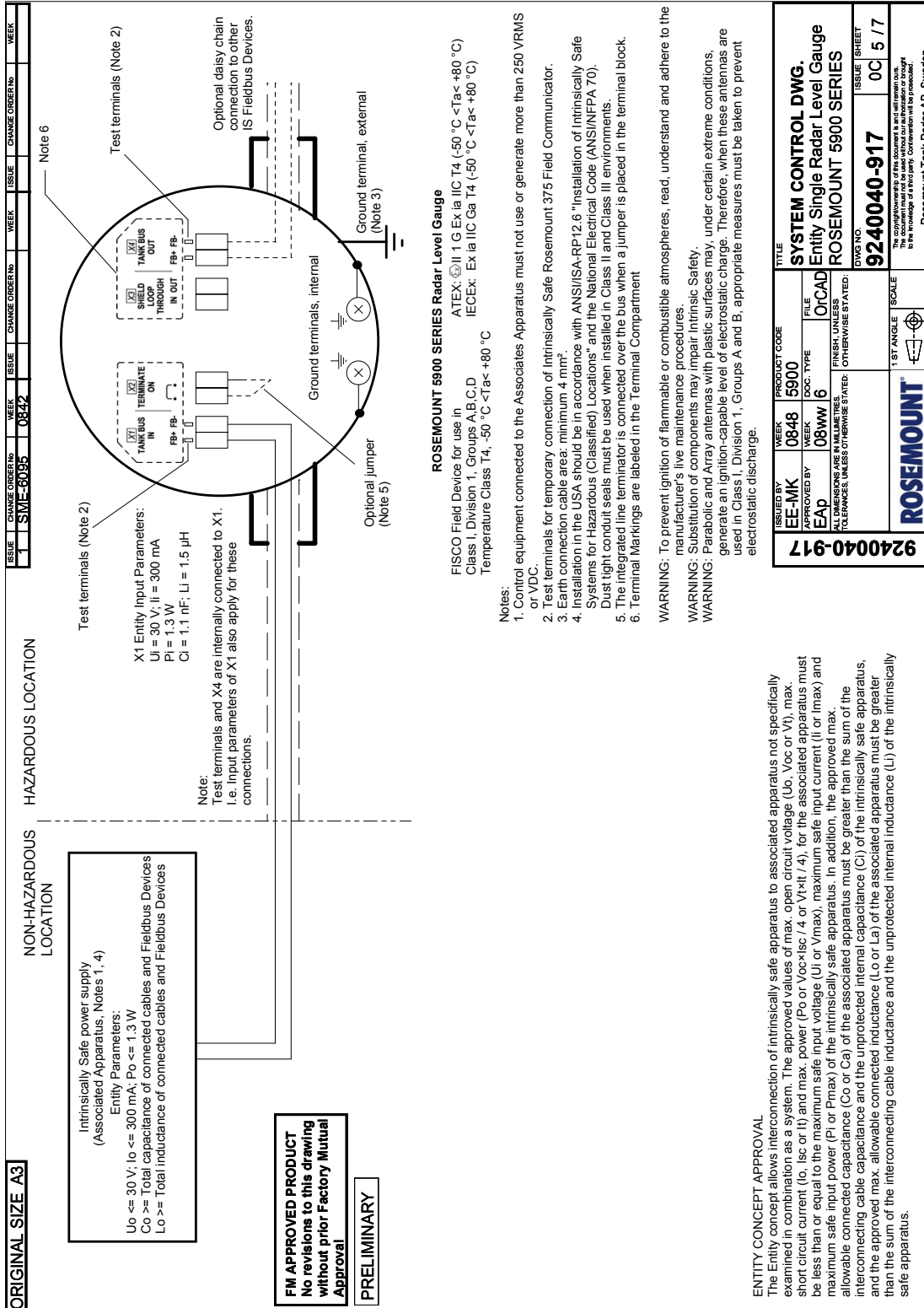
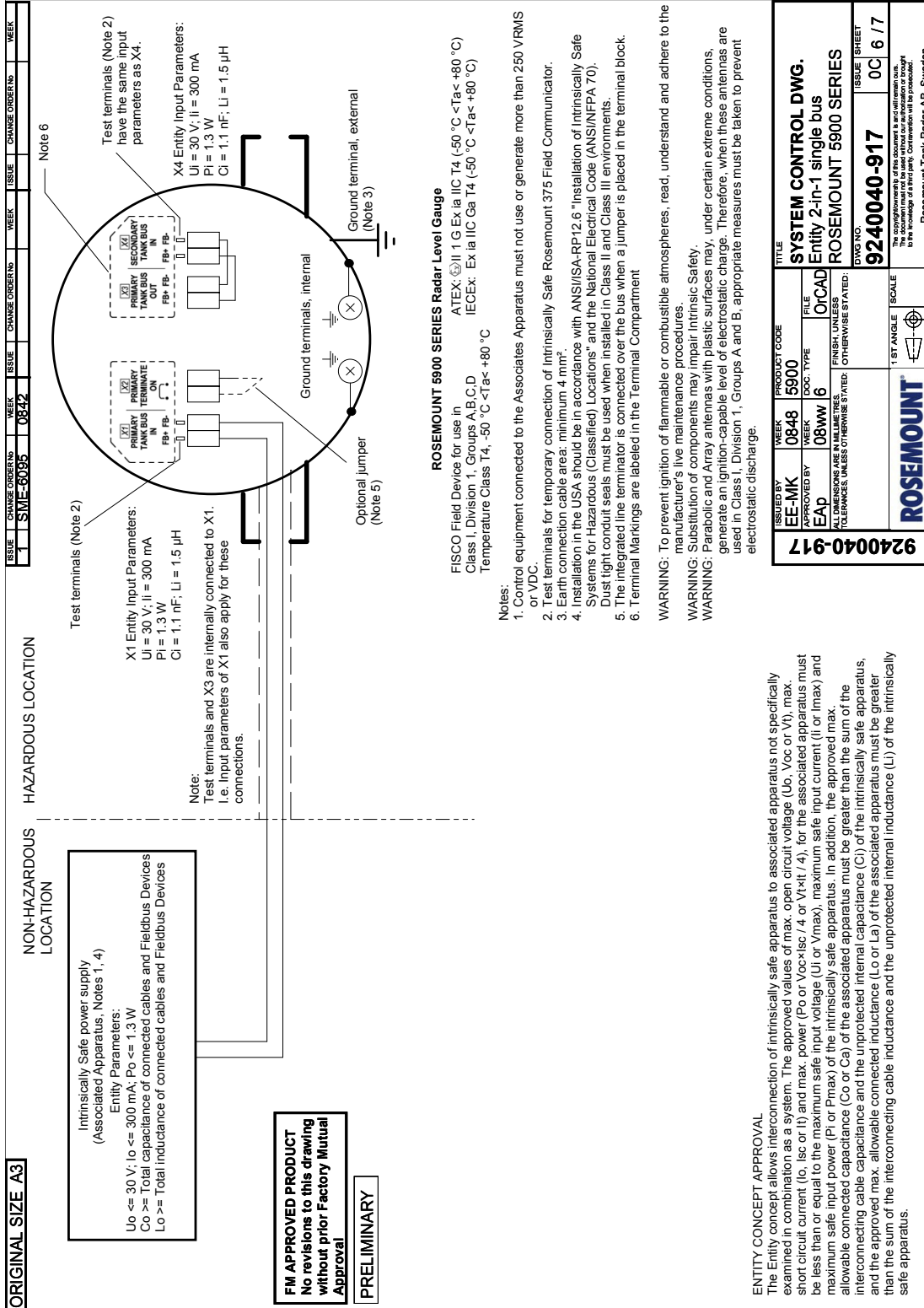
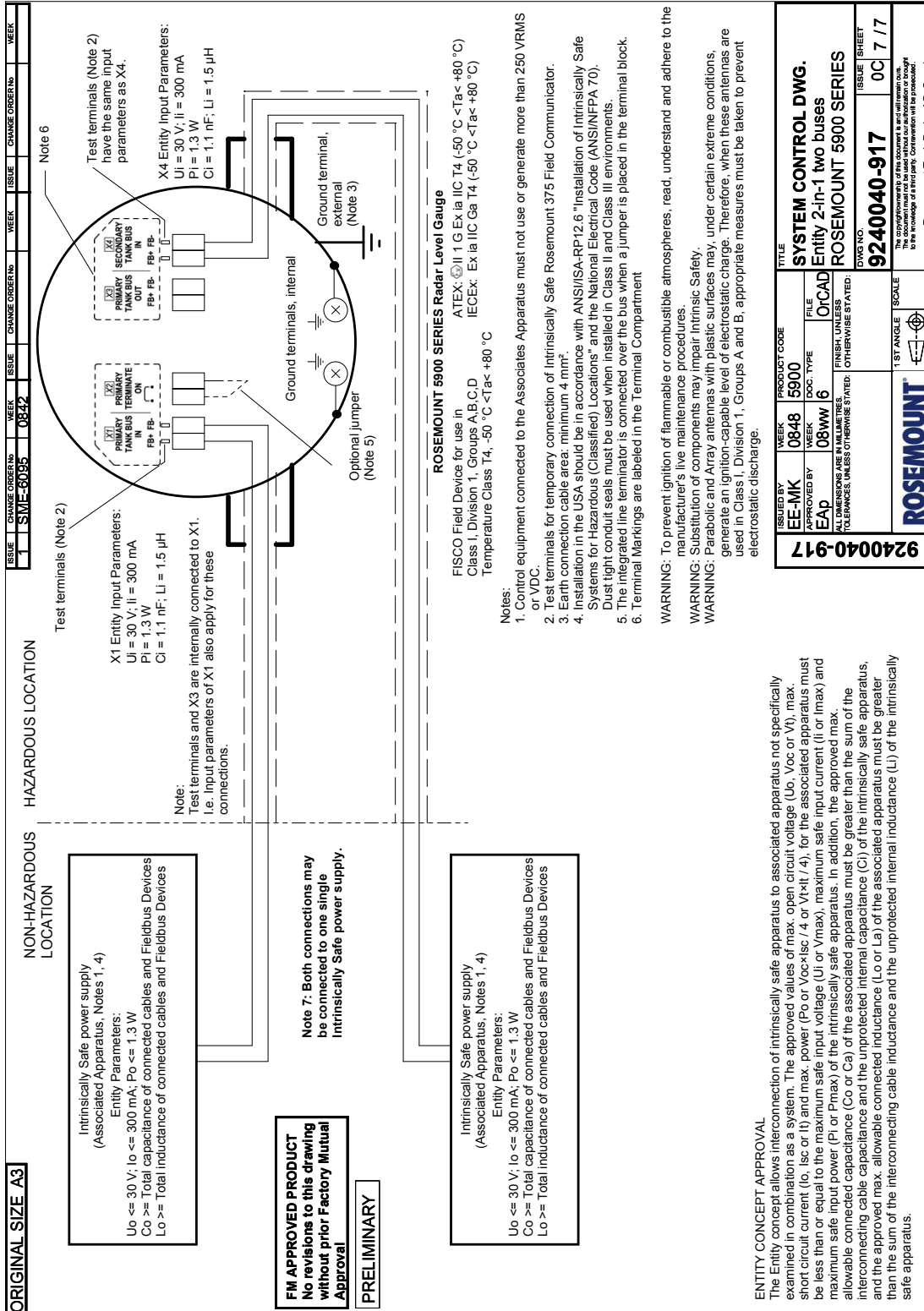


Figure B-10. Sheet 6 of System Control Drawing: Entity 2-in-1 single bus.



Rosemount 5900 Series

Figure B-11. Sheet 7 of System Control Drawing: Entity 2-in-1 two buses.



Appendix C Advanced Configuration

C.1	Safety messages	page C-1
C.2	Winsetup Advanced Configuration	page C-3
C.3	Tank Scan	page C-4
C.4	Empty Tank Handling	page C-5
C.5	Surface Echo Tracking	page C-9
C.6	Filter Setting	page C-11

C.1 SAFETY MESSAGES

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

⚠ WARNING

Explosions could result in death or serious injury:

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

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

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

⚠ WARNING

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

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

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

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

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

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

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

Avoid contact with leads and terminals.

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

Probes covered with plastic and/or with plastic discs may generate an ignition-capable level of electrostatic charge under certain extreme conditions. Therefore, when the probe is used in a potentially explosive atmosphere, appropriate measures must be taken to prevent electrostatic discharge.

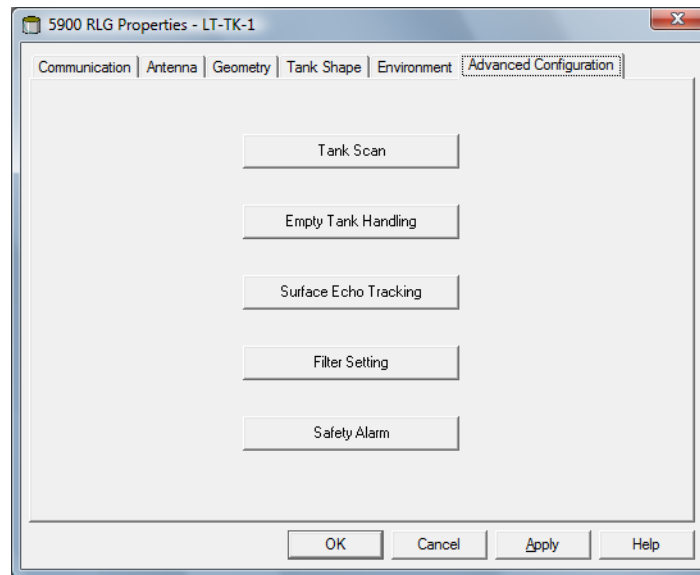
C.2 WINSETUP ADVANCED CONFIGURATION

There are a number of advanced configuration options for the Rosemount 5900 gauge which are not included in the Installation Wizard. These options are available via the *Properties* window.

To access the advanced options for the 5900 do the following:

1. In the TankMaster WinSetup workspace, click the right mouse button on the icon that represents the desired 5900 radar level gauge.
2. Choose the **Properties** option. The *RLG Properties* window appears.

Figure C-1. The *RLG Properties* window includes tabs for basic and advanced configuration.



3. Select the *Advanced Configuration* tab.

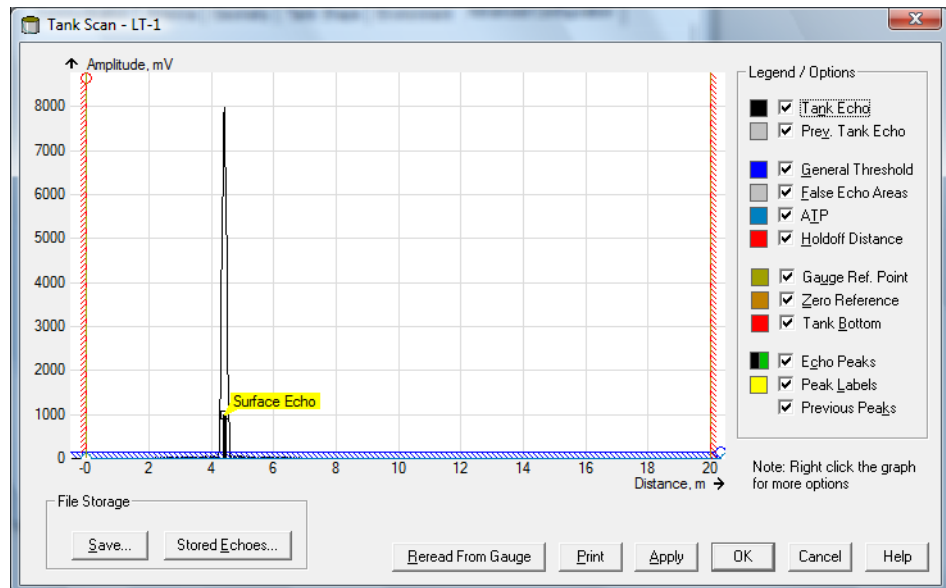
C.3 TANK SCAN

The *Tank Scan* window is a useful tool for analyzing the Rosemount 5900 measurement signal. It allows you to view tank echoes and setup the most important parameters to enable the gauge to distinguish between the surface echo and disturbing echoes and noise.

To open the *Tank Scan* window:

1. Start the TankMaster *WinSetup* program.
2. In the *TankMaster WinSetup* workspace, click the right mouse button on the icon that represents the 5900 radar level gauge.
3. From the popup menu choose the **Properties** option. The *RLG Properties* window appears.
4. In the *RLG Properties* window, select the *Advanced Configuration* tab.
5. Click the **Tank Scan** button to open the *Tank Scan* window:

Figure C-2. The WinSetup Tank Scan window



6. The *Tank Scan* window contains the Graph Area, Legend/Options area, File Storage buttons, and various action buttons.

When the *Tank Scan* window is opened, the system starts reading tank data from the gauge (indicated by a progress bar in the lower right-hand corner).

The **Tank Echo** curve shows the measurement signal in graphical form. Apart from the surface echo there might be echoes from obstacles in the tank.

In the graph area you can configure the gauge to filter out echoes that originate from obstacles in the tank in order to facilitate tracking of the product surface echo.

The tank echo and echo peaks can be refreshed at any time with the **Reread From Gauge** button. The new echo curve will be shown as a black line and the previous curve as a grey line. The graph may show up to two old echo curves. An old echo peak will be marked by a small cross. This can be used to compare the existing tank signal with previous signals.

See the *Raptor System Configuration* manual (Document No. 300510EN) for more information on how to use the Tank Scan function in *TankMaster WinSetup*.

C.4 EMPTY TANK HANDLING

The Rosemount 5900 **Empty Tank Handling** function handles situations when the surface echo is close to the tank bottom. It has the ability to:

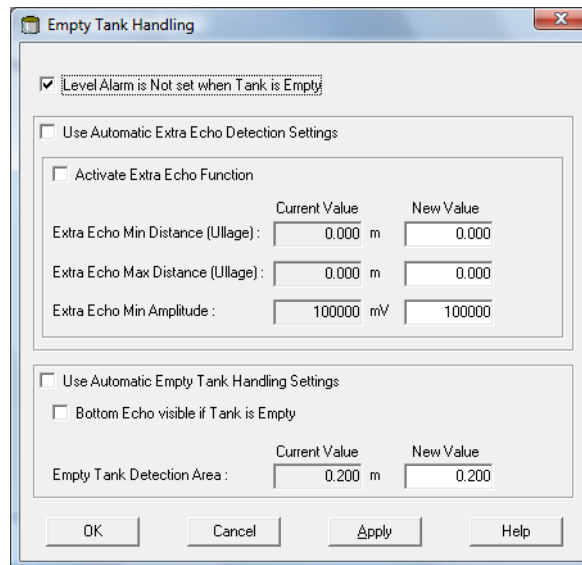
- track weak product echoes
- handle lost echoes

If the surface echo is lost this function makes the 5900 present a zero-level measurement, and an alarm is activated unless the alarm has been blocked.

To open the *Empty Tank Handling* window:

1. In the *TankMaster WinSetup* workspace, click the right mouse button on the icon that represents the desired 5900 radar level gauge.
2. From the popup menu choose the **Properties** option. The *RLG Properties* window appears.
3. In the *RLG Properties* window, select the *Advanced Configuration* tab.
4. Click the **Empty Tank Handling** button:

Figure C-3. The WinSetup Empty Tank Handling window



Level Alarm is not set when Tank is Empty

If the echo from the product is lost in an area close to the tank bottom (Empty Tank Detection Area), the device will enter empty tank state and an alarm is triggered. Two types of alarms are triggered:

- Invalid Level (can be seen in the Diagnostics window).
- The Analog Output enters Alarm Mode.

Enable this checkbox if you don't want the alarm to be triggered when the gauge enters empty tank state.

Activate Extra Echo Function

The **Extra Echo Detection** function is used for tanks with domed or conical bottom shapes, and when the tank bottom does not produce a strong echo when the tank is empty. The function will make measurements near the tank bottom more robust.

For these tank types an echo beneath the actual tank bottom sometimes appears when the tank is empty. If the device is not able to detect the tank bottom this function can be used to ensure that the device stays in empty tank state as long as an extra echo is present.

You can verify that such an echo exists by using the Tank Scan function when the tank is empty. Make sure you scan a distance that exceeds below the tank bottom. In the tank spectrum you can also find suitable values for **Extra Echo Min Distance**, **Extra Echo Max Distance** and **Extra Echo Min Amplitude**. When an echo within the Min and Max Distance with an amplitude above the specified limit appears the tank is considered empty.

Extra Echo Min Distance

Defines the minimum distance to the extra echo. This parameter should be greater than the Tank Height.

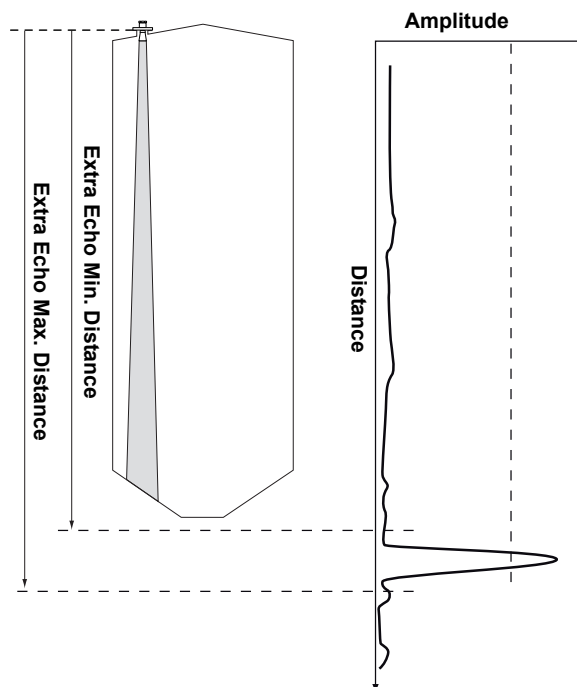
Extra Echo Max Distance

Defines the maximum distance to the extra echo. This parameter should be greater than the Extra Echo Min Distance.

Extra Echo Min Amplitude

Defines the minimum signal strength of the extra echo. If the signal strength of the extra echo exceeds this value and is found in the window between Min and Max Distance the device is forced to stay in empty tank state and to present Level=0.

Figure C-4. Extra Echo Function



Bottom Echo Visible if Tank is Empty

Only set this parameter if the bottom echo is visible. By setting this parameter the bottom echo will be treated as a disturbance echo to facilitate tracking of weak surface echoes close to the tank bottom.

Check if the gauge detects the tank bottom when the tank is empty before activating this function.

This setting defines how the device should act when the tank is empty. A bottom echo is visible if you have a strong echo from the tank bottom when the tank is empty. You can use the spectrum to verify if such an echo exists when the tank is empty.

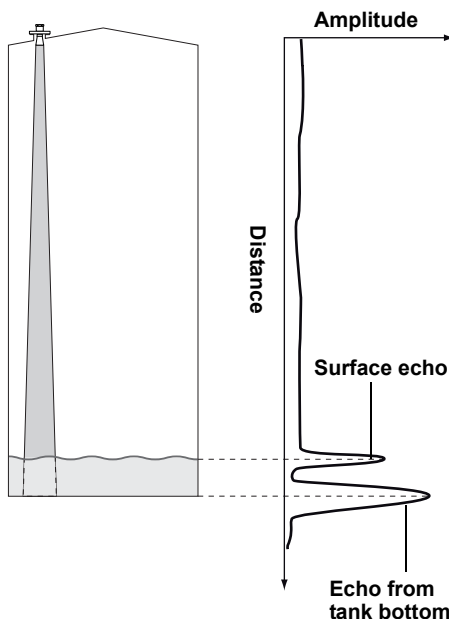
Note! If you have a bottom echo this checkbox should be enabled.

By setting this parameter the bottom echo will be treated as a disturbance echo to facilitate tracking of weak surface echoes close to the tank bottom. If this parameter is not enabled, searching for a lost surface echo is restricted to a region close to the tank bottom (Empty Tank Detection Area).

If the checkbox for Use Automatic Empty Tank Handling is enabled, the Bottom Echo Visible if Tank is Empty function is automatically controlled by the gauge.

If the checkbox is not enabled you can manually activate the Bottom Echo Visible if Tank is Empty function is enabled this overrides the automatic setting.

Figure C-5. Bottom Echo Visible



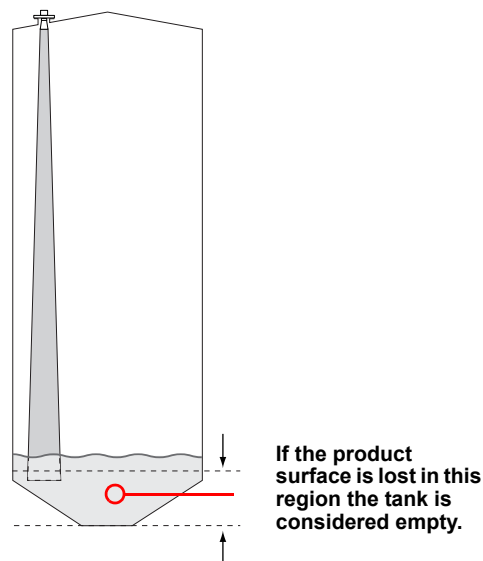
Empty Tank Detection Area

The Empty Tank Detection Area defines a range within a lower limit of 400 mm (16 in.) and a higher limit of 1000 mm (39 in.) above the tank bottom. If the surface echo is lost in this region, the tank is considered empty (the device enters Empty Tank State) and the transmitter presents a zero level reading.

If the tank is empty the transmitter searches for the product surface in a region 2 x Empty Tank Detection Area. When a new echo is found it is considered to be the product surface. It is important that there are no disturbances in this area. If there are disturbances they may need to be filtered out.

This parameter is only used if there is no bottom echo visible. The *Bottom Echo Visible if Tank is Empty* function shall be disabled.

Figure C-6. Empty Tank Detection Area.



C.5 SURFACE ECHO TRACKING

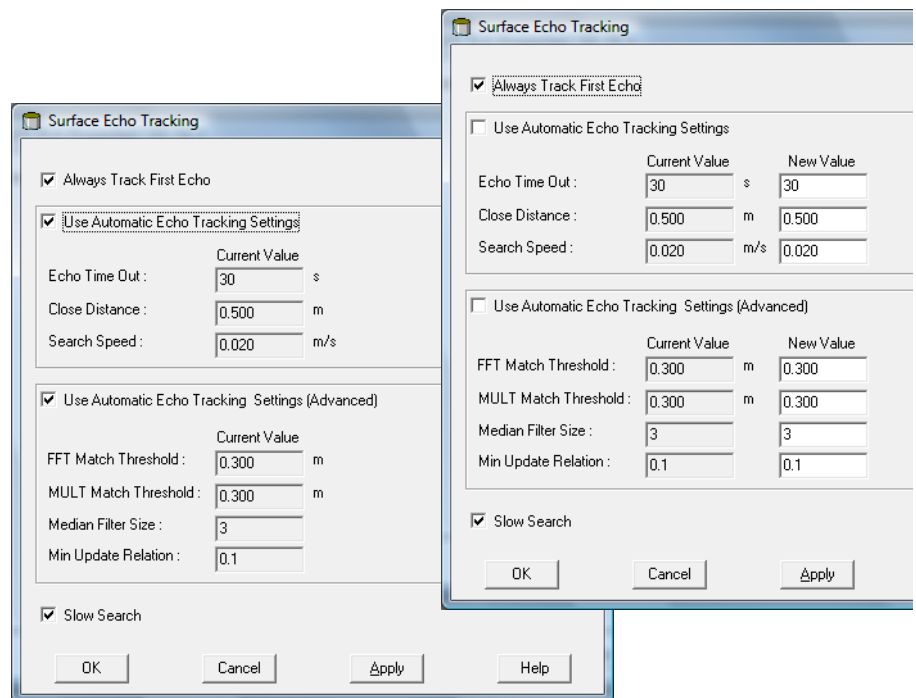
The Surface Echo Tracking function can be used to eliminate problems with certain types of ghost echoes below the product surface. This may, for example, occur in Still-pipes because of multiple reflections between the pipe wall, flange and antenna. In the tank spectrum these echoes appear as amplitude peaks at various distances below the product surface.

To activate this function select the *Always Track First Echo* check box. Make sure that there are no disturbing echoes above the product surface when this function is activated.

To open the *Surface Echo Tracking* window:

1. In the *TankMaster WinSetup* workspace, click the right mouse button on the desired 5900 radar level gauge icon.
2. From the popup menu choose the **Properties** option.
3. In the *RLG Properties* window, select the *Advanced Configuration* tab.
4. Click the **Surface Echo Tracking** button:

Figure C-7. The WinSetup Surface Echo Tracking window



Echo Timeout

Use Echo Timeout to define the time in seconds before the transmitter will start to search for a surface echo after it has been lost. After an echo has been lost, the transmitter will not start searching, or trigger any alarms, until this time has elapsed.

Close Distance

This parameter defines a window centered at the current surface position in which new surface echo candidates can be selected. The size of the window is \pm CloseDist. Echoes outside this window will not be considered as surface echoes. The transmitter will without delay jump to the strongest echo inside this window. If there are rapid level changes in the tank, the value of the Close Distance Window could be increased to prevent the transmitter from missing level changes. On the other hand, a too large value might cause the transmitter to select an invalid echo as the surface echo.

Search Speed

This parameter indicates how quickly the search region (Slow Search window) is expanded when the *Slow Search* function is active.

C.6 FILTER SETTING

Damping Value

The Damping Value parameter determines how quickly the transmitter responds to level changes and how robust the measurement signal is against noise. Technically, a damping value of 10 means that in 10 seconds the output from the transmitter is about 63% of the new level value. Consequently, when there are rapid level changes in the tank, it may be necessary to decrease the Damping value for the transmitter to be able to track the surface. On the other hand, in noisy environments, and if level rates are low, it may be better to increase the damping value to have a stable output signal.

Distance Filter Factor

This parameter defines the amount of product level filtering (1 = 100%).

A low Filter Factor means that a new level value is calculated by adding a small fraction (for instance 1%) of the level change to the last known level value. It makes the level value steady but the device reacts slowly to level changes in the tank.

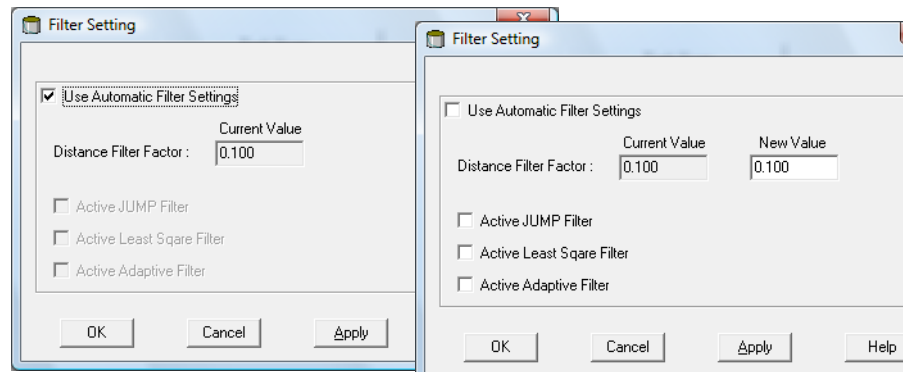
A high Filter Factor means that a larger fraction of the level change is added to the current level value. This setting makes the device react quickly to level changes but the presented level value can be somewhat jumpy.

Jump Filter

The Jump Filter is typically used for applications with turbulent surface and makes the echo tracking work smoother as the level passes, for example, an agitator. If the surface echo is lost and a new surface echo is found, the Jump Filter makes the transmitter wait some time before it jumps to the new echo. During that time the new echo has to be considered a valid echo.

The Jump Filter does not use the Distance Filter Factor and can be used at the same time as the Least Square or the Adaptive Filter.

Figure C-8. The WinSetup Filter Setting window



Least Square Filter

The Least Square filter gives increased accuracy for slow filling or emptying of the tank. The level value follows the surface with high accuracy and without delay as the level changes. The Least Square filter can not be used at the same time as the Adaptive Filter.

Adaptive Filter

The Adaptive Filter automatically adapts to the movement of the surface level.

Preliminary

Reference Manual

300520EN, Rev AA

November 2009

Rosemount 5900 Series

Index

A

Always Track First Echo C-9
Antenna Feeder 3-23
Antenna feeder 3-29
Asphalt 2-7, 3-6
ATEX B-5

B

Bitumen 2-7, 3-6

C

Calibration data 6-16
Calibration Distance 4-5, 6-18
C-distance 4-5
CE Marking 1-2
Close Distance Window C-10
Config Pins button 4-12
Configure reference pins 4-12

D

Damping C-11
Default Database 6-19
Diagnostic Registers 6-7
Dipping Datum Plate 4-5
Dipping Datum Point 4-5
Distance Filter Factor C-11

E

Echo Timeout C-9
Empty Tank Detection Area C-8
Environment 4-6
External Cabling 1-2

F

Flange Ball 3-6
Flange Ball T30 3-6
Flange Ball T38-W 3-6, 3-7
FM symbol 1-2
Foam 4-6
Free space 3-12
Horn Antenna 3-5
Parabolic Antenna 3-9

G

Gauge Reference Point 4-4

H

Hand dipping 6-14
Hold Off Distance 4-4, 4-5
Holding Registers
Viewing 6-2
Horn Antenna Gauge
flanges 3-5
radar beam 3-4
transmitter head 3-19

I

Inclination 3-27
RTG 3930 3-6
ini files 6-9
Inner diameter
Still Pipe 3-10
Input Registers 6-2

J

Jump Filter C-11

L

Log Setup button 6-7
Low-loss radar mode 2-7
LPG Configuration
Calibrate 4-11
Calibration Distance 4-11
Choose correction method 4-15
configure pins 4-12
reference pins 4-12
Vapor Pressure Source 4-11
vapor temperature 4-12
verify 4-14
LPG/LNG Gauge
Still Pipe 3-13

M

Minimum Level Distance (C) ... 4-5

O

Obstacles 3-4

P

Parabolic Antenna
free space 3-9

Parabolic antenna
flange requirements 3-6
Parabolic Antenna Gauge
inclination 3-6, 3-27
Parabolic Reflector 3-23
Pipe Diameter 4-6
Pipe Inner Diameter 3-10
Pipe schedule 3-10
Predefined 6-3
Product Certificates B-1
Product Dielectric Range 4-6

R

Radar beam
Horn Antenna Gauge 3-4
Parabolic Antenna Gauge 3-8,
3-9
Rapid Level Changes 4-6
Reference Pins 3-36
Reference pins 4-12
threshold value 4-13
RTG Reference Distance (G) .. 4-5
RTG Reference Point 4-5

S

Slot area 3-11
Socket Requirements
Parabolic Antenna Gauge 3-8
Start Programming 6-9
Still Pipe
LPG/LNG Gauge 3-13
slot area 3-11
Still pipe 3-13
Still pipe array antenna 2-7
Still Pipe Gauge 2-7
Flange Requirements 3-11
pipe diameter 3-10
Recommended Installation 3-11
Still Pipe inner diameter 3-10
Still Pipe Requirements 3-10
Surface Echo Tracking C-9
Symbols 1-2

T

T30 3-6
T38-W 3-7

Preliminary

Reference Manual

300520EN, Rev AA

November 2009

Rosemount 5900 Series

Tank Distances

Minimum Level Distance (C)	4-5
Tank Reference Height (R)	4-5
Tank Ref Point	4-5
Tank Reference Height (R)	4-5
Tank Reference Point	4-5
Turbulent Surface	4-6

V

Vapor Pressure Source	4-11
Vapor temperature	4-12
View Diagnostic Registers	6-7
Viewing Input and Holding Registers predefined	6-3

W

WinSetup	2-5
----------	-----

Z

Zero level	4-4, 4-5
Zero Reference	4-4

Preliminary

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