

Centeron™ Gauge Monitor Instruction Manual

Model: GM Series

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List of Acronyms

Acronym

Defined

ANSI	American National Standards Institute
FCC	Federal Communications Commission
GPS	Global Positioning System
Hz	Hertz
MHz	Megahertz
NEMA	National Electric Manufacturers Association
NPT	National Pipe Thread
PSI	Pounds per Square Inch
PSIG	Pounds per Square Inch, Gauge
RF	Radio Frequency
UL	Underwriters Laboratories
UV	Ultraviolet
V	Volts

1.0 Introduction

This manual describes how to install, test, and service the Centeron™ Gauge Monitor. The Centeron™ Gauge Monitor is part of the Centeron™ Level Monitoring System that includes the Data Collection System and Controller(s).

This guide does not include how to install, test, maintain or troubleshoot the Controller(s) or Data Collection System. Refer to these products' respective instruction manuals.

The description herein is based on a standard installation.

2.0 Product Overview

2.1 Description

The Centeron™ Gauge Monitor is a member of Robertshaw's Spread Spectrum Radio Frequency (RF) family of products. This Monitor detects level, temperature, low battery, and system status and broadcasts this data to the system's Controller.

The Monitor is pre-programmed at the factory with the Transmitter ID, Property Code, and Transmission Frequency. No field programming of the Monitor is required.

2.1.1 Product Markings

Included on the housing of the Monitor are labels that contain important information about the product.

Figure 1. Centeron™ Monitor Label Product Markings



2.1.1.1 Product and Customer Identification Field

This field is used to identify the product or customer depending on application.

2.1.1.2 Serial Number Field

This field displays the seven character alphanumeric I.D. that uniquely identifies the Monitor (and tank) to the Centeron™ system. This number is programmed into the unit at the factory and remains resident in the EEROM of the device even if the battery is removed. This number can only be re-programmed at the factory. The serial number is also bar coded in standard 128 Autoswitching Format for easy reading with bar code devices.

2.1.1.3 Model Number Field

This field displays the current model number and revision of the device. Please be sure to identify this number when contacting service or technical support personnel.

2.1.1.4 FCC I.D., Logo, and Text Field

The FCC requires certification information and identification to appear on product labels. See Section 2.4.1 for more information on FCC certification.

2.1.1.5 Product Safety Markings and Text Field

The commercial and industrial markets require products to meet certain safety requirements and to be marked appropriately. See Section 2.4.2 for more information on safety certifications.

2.1.1.6 Manufacturing Location and Patent Listing Field

This field identifies the location of manufacturing and all patents that apply to the product.

2.1.1.7 Warning Label

This label provides important information concerning Intrinsic Safety and battery replacement. Refer to Section 5.1 for specific battery replacement instructions.

2.2 Operation

The Centeron™ Gauge Monitor consists of sealed Polypropylene housing with a large mounting magnet in the base for attaching the Monitor to a steel tank. The Gauge Monitor assembly includes a voltage dividing potentiometer that replaces the standard external level indicator on a tank and magnetically couples with the float mechanism inside the tank. By comparing the potentiometer input and output voltages the Monitor is able to determine the percent volume of liquid inside the tank. This level information is transmitted to the Controller at pre-programmed intervals using a spread spectrum radio signal in the 902–928 MHz bandwidth.

The Monitor is powered by a replaceable 3-Volt battery that is designed to provide at least two (2) years life in normal service.

2.3 Environmental Specifications

The following environmental specifications should be observed when installing the Monitor:

- Operating Temperature Range: -40°C to +80°C (-40°F to +176°F)
- The sealed housing is designed to meet or exceed NEMA 3.
- UV life: 10 years exposure to direct sunlight.
- Shock: The unit will withstand a one meter drop test per UL 913.
- Chemical Exposure: The unit is sealed with O-rings and designed for outdoor service. The housing material of the Monitor is Polypropylene, which has very good chemical resistance to most fuels, oils, and acids.

2.4 Certifications

2.4.1 FCC Notice—Radio Frequency Communications

The Monitor generates and uses radio frequency energy. If not installed and used in accordance with the manufacturer's instructions, it may cause interference to radio and television reception. The Monitor has been tested and found to comply with the specifications in Part 15 of Radiators and FCC Rules for Class B Computing Devices.

CAUTION: Robertshaw Industrial Products Division does not support field changes or modifications to any of the Centeron™ Level Monitoring System equipment unless they are specifically covered in this manual. All adjustments must be made at the factory under the specific guidelines set forth in our manufacturing processes. Any modification to the equipment will void the manufacturer's warranty and could void the user's authority to operate the equipment and render the equipment in violation of FCC Part 15, Subpart C, 15.247.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.4.2 Safety and Regulatory

The Monitor is designed to comply with UL Standards for Intrinsically Safe Apparatus for use in Class I, Division 1, Group D locations. The Monitor conforms to UL 913 and has been certified to CAN/CSA Standard C22.2 No. 157 and Standard C22.2 No. 94.

WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.

AVERTISSEMENT: LA SUBSTITUTION DE COMPOSANTS PEUT COMPROMETTRE LA SÉCURITÉ INTRINSÈQUE.

3.0 Installation

A Quick Installation Guide, which provides an overview of the Gauge Monitor installation procedure, was included with this product.

The following sections of this manual explain in detail the site selection and installation process:

3.1 RF Site Guidelines

The Centeron™ Gauge Monitor contains sensitive measurement circuitry and a radio transmitter. Large metal objects such as buildings and vehicles may affect the transmission of radio signals. Electrical equipment may produce electronic noise that could adversely affect signal quality.

- Direct line of sight between the Centeron™ Monitor and Controller will provide optimum radio reception.
- The Centeron™ Monitor and Controller can communicate at distances up to one mile under optimum line-of-sight conditions.
- When obstructions such as walls, buildings, and vehicles exist between the Centeron™ Monitor and Controller the distance between these units should be limited to less than 500 feet.
- Multiple obstructions (such as two or more walls or a tank and a wall) between the Monitor and Controller should be avoided, if possible.
- Electrically conductive objects such as metal buildings, concrete reinforcement rods, tanks, silos, and vehicles reflect radio signals. This reflection can be either an advantage or disadvantage to good radio reception at a particular installation site:
 1. Metal objects between the Monitor and Controller may reflect and scatter RF energy and reduce radio signal strength at the Controller.

2. Metal objects behind the Monitor or Controller may increase the radio signal strength at the Controller by reflecting radio signals toward the Controller.
- Even small metal objects such as tank vents or toolboxes between the Monitor and Controller can significantly reduce radio signal strength if they are within a few feet of the Monitor or Controller. These objects can reflect radio signals and cause a RF “shadow” which may prevent radio signals from reaching the Controller.
 - Objects which are not electrically conductive such as wooden or fiberglass buildings, non-reinforced masonry, trees, plastic, and glass have less effect on radio signals than metal objects.
 - Windows and wooden doors can provide radio signals access into otherwise closed metal buildings. However, “low-E” window glass may have a thin metallic coating that can reflect radio signals.
 - Strong electromagnetic fields such as those found in close proximity to power lines, large electric motors, generators, electric fences, and transmitter antennas may interfere with the radio signals received by the Centeron™ Controller.
 - The Centeron™ Controller should be mounted as high as is reasonably possible to improve its ability to receive radio signals. For example, placing the Controller on a high shelf would be preferable to setting the unit on a floor near ground level. Installing the Controller on the second floor of a two-story structure would be more desirable than installing it on the ground floor. Installing the Controller in an underground basement should be avoided.

Warning: For maximum Monitor reception, mount the Monitor within 500 feet of the Controller, avoid mounting Monitor or Controller inside a fully closed metal building or enclosure, and avoid close proximity to large electrical equipment. Do not paint the Centeron™ Monitor or Controller housings.

3.2 Handling Guidelines

The Centeron™ Gauge Monitor is designed to provide many years of reliable service in demanding outdoor environments. However, the Monitor contains sensitive measurement circuitry and should be handled carefully. Do not throw or drop the Monitor. Do not attempt to disassemble the Monitor except as described in section 5.1 (Battery Replacement).

3.3 Mounting

After the Controller has been successfully setup, the Monitor can be mounted to the tank by following these instructions:

Warning: *Tanks may contain flammable liquid or vapor, extinguish all flames and smoking material before performing the Monitor installation procedure*

- Remove the Monitor and gauge from their protective packaging. Along with the gauge, there will be two stainless steel #6-32 screws and a nylon wire tie.
- Remove the existing level indicator dial from the tank by removing its two mounting screws. Verify that the new indicator dial is designed to fit the existing gauge mounting base.

Warning: *Remove only the level indicator dial. Do not attempt to remove the indicator mounting base or float assembly - severe injury could result.*

- Install the Centeron level indicator dial on the tank using the two supplied #6-32 screws. Verify that the level indicator dial fits correctly on the mounting base. Tighten the dial mounting screws to 5 inch-pounds torque.
- Compare the new dial reading with the estimated tank contents. If the new dial reading is not correct, remove the dial and rotate the pointer to approximate the expected dial reading (using a magnet near the back of the dial). Reinstall the dial. If the reading still seems incorrect, the indicator dial may be the wrong type.

Warning: *Improper dial selection or application may result in inaccurate gauge reading. Release of tank contents as well as damage to equipment and safety hazard may result if the tank is overfilled. Fuel exhaustion may occur if the tank contents are less than indicated. The Centeron Level Monitoring System is not a substitute for a fixed liquid level gauge or weight measurement device which can be required for filling.*

Note: For maximum accuracy, adjust the tank so that it is level to within +/- 5 degrees. A bubble level may be used for this task (see Figure 2).

Figure 2. Adjusting Tank using Bubble Level



- If the Centeron level indicator dial is located under the tank dome, use the supplied nylon wire tie to secure the wire to the feed tube or other object in order to prevent the dome lid from damaging the wire harness when it is closed (reference Figure 6).
- Carefully attach the Centeron Gauge Monitor to the top of the tank outside of the dome lid. A large magnet in the base will hold the Monitor in place on a smooth area of the tank. Rotate the monitor slightly to position it in the most stable orientation on the tank.

Repeat these steps for additional Monitors. Figure 7 in Appendix B shows a monitor installed on a propane tank.

Warning: For maximum Monitor reception, mount the Monitor within 500 feet of the Controller, avoid mounting the Monitor or Controller inside a fully closed metal building or in a metal enclosure, and avoid close proximity to large electrical equipment.

3.4 Activation

After Monitor mounting, follow these steps to activate the unit(s):

- To activate the Monitor, pull the external slide magnet completely out of the top of the Monitor housing. This will activate the Monitor to make measurements and radio transmissions on a factory programmed interval.

Note: The installer can limit the number of Controller calls during multiple Monitor installations by removing each additional Monitor magnet within 30 seconds of the last one.

Note: Do not discard the slide magnet completely-keep it accessible for future use if needed. Do not store the magnet in the monitor upper housing slot since this will deactivate the monitor.

- Once the external slide magnet (see Figure 8) is removed from the Monitor, the Controller should flicker one green light to indicate that it successfully received a Monitor transmission.

Note: A second installer could verify this by watching the Controller during Monitor activation.

- The Controller will then wait 30 seconds to receive additional Monitors before calling the Data Collection System.

To activate additional Monitors, repeat these steps.

3.5 Site Survey

Appendix D contains a Site Survey Form, which should be filled out by the installer.

Supply the following information:

- Contact Name
- Contact Address
- Contact Telephone Number
- GPS Location (latitude/longitude)
- Product Name
- Product ID
- Tank Orientation (horizontal/vertical cylinder, oblong, etc.)
- Tank Geometry (diameter, length, width, etc.)
- Tank Contents (propane, etc.)

Figure 3 shows an example of a completed Site Survey form.

Figure 3. Example Completed Site Survey Form

Robertshaw Centeron™ Level Monitoring System Gauge Monitor Site Survey Form	
Contact Name:	John Smith
Contact Address:	12345 Elm Street Anywhere, USA 12345
Contact Telephone Number:	(123) 456-7890
GPS Location (latitude/longitude):	35° 57' 12" North - 83° 56' 44" West
Product Name:	Centeron™ Gauge Monitor
Product ID:	GAG0001
Tank Orientation (horizontal/vertical cylinder, oblong, etc.):	Horizontal cylinder
Tank Geometry (diameter, length):	36" outside diameter X 63" outside length
Tank Contents:	Propane

4.0 Troubleshooting and Testing

This section contains procedures for testing the Centeron™ Gauge Monitor and provides information troubleshooting the monitor installation.

If the Monitor is not operating properly, try to locate the solution below:

Question

Has the Monitor ever reported into the Data Collection System?

Solution

If Never:

Verify that the Controller is properly installed. Refer to the Controller Instruction Manual for installation verification.

Perform the Monitor test in Section 4.1 with the Monitor installed. If this test is unsuccessful, perform the same test with the Monitor near the Controller installation

Question

Solution

location. If successful only at bench testing, re-evaluate the installation site for RF interference problems and refer to Section 5.5 for technical support. If not successful at either test, continue with troubleshooting.

Replace the 3 VDC 2/3A LiMnO2 battery by following Section 5.1 and repeat the above tests. If still having problems, refer to Section 5.5 for technical support.

Does the Monitor occasionally miss scheduled report times (i.e., The Controller reports “lost Monitor” to the Data Collection System)?

If Yes:

The most likely cause is RF interference problems. Re-evaluate the installation site per Section 3.1 for RF interference problems and refer to Section 5.5 for technical support.

Does the Monitor ever report a low battery status?

If Yes:

Replace the 3 VDC 2/3A LiMnO2 battery by following Section 5.1 and repeat the above tests. If still having problems, refer to Section 5.5 for technical support.

Does the Monitor ever report error codes?

If Yes, find the error code below:

Code EG01: Indicates that the Monitor is reading a level above 100% volume. Inspect the potentiometer and wiring harness for damage. Unplug the potentiometer wiring harness from the Monitor and force the unit to transmit, refer to Section 4.1. If the Monitor still reports EG01 the problem is internal and the Monitor must be replaced. If the Monitor no longer reports EG01 replace the potentiometer and wiring harness assembly.

Question**Solution**

	Other Error Codes: Other error codes and combinations of error codes may be reported by the monitor. Record the code number that is reported and refer to Section 5.5 for technical support.
Does the Monitor always report a level of approximately 80% regardless of the fuel level in the tank?	If Yes, verify that the level indicator wiring harness is connected to the Monitor and that the wiring harness is not damaged.

4.1 Monitor Test

The Monitor is designed to wake up, take a measurement, and transmit RF data every time the power is cycled by inserting and then removing the disable magnet used for shipping. At the same time that the Monitor transmits its RF data, the Controller will acknowledge the receipt of the transmission by blinking the top right green LED light. If the Controller has never received data from this particular Monitor (this is the case during initial install or after the Controller has been reset), it will then initiate a call (within 30 seconds) to the Data Collection System to report a “new Monitor” and request set-up data. With this in mind, use the following steps to verify installation and troubleshoot system communication problems.

1. Re-set the Controller by following the guidelines under the Controller test section of the Controller instruction manual. Proceed to the next step only if the above is successful.
2. Insert the disable magnet into the slot of the Monitor’s upper housing until snug.
3. If testing with the Monitor at the tank site, it will be necessary to have one person activate the Monitor while another watches for a response at the Controller. If bench testing, the same person can locate the Monitor close to the Controller in order to watch for a response. Activate the Monitor by completely removing the disable magnet from the upper housing.
4. Verify that the Controller received the RF data transmission by watching the top right green led light turn off and on.
5. Verify that the Controller initiates a phone call after 30 seconds and returns to ready mode (see Controller Instruction Manual on how to recognize Ready mode).

Repeat the above test as necessary, using the guidance of Section 4.0 to determine the cause of communication problems.

5.0 Servicing

5.1 Battery Replacement

If it becomes necessary to replace the battery in the Monitor, follow these steps:

WARNING: TO PREVENT IGNITION OF A HAZARDOUS ATMOSPHERE, THE BATTERY MUST ONLY BE CHANGED IN AN AREA KNOWN TO BE NONHAZARDOUS.

AVERTISSEMENT: AFIN DE PRÉVENIR L'INFLAMMATION D'ATMOSPHÈRES DANGEREUSES, NE CHANGER LE BATTERIE QUE DANS DES EMPLACEMENTS DÉSIGNÉS NON-DANGEREUX.

Warning: Use Duracell Ultra DL123A Lithium Manganese Dioxide 3 volt battery only.

Warning: If the tank contains flammable liquid or vapor, extinguish all flames and smoking material before performing the battery replacement procedure.

1. Remove monitor from the tank and transport it out of the hazardous area.
2. Ground yourself by either wearing an anti-static wrist strap or by touching a grounded metal object (such as a copper water pipe).
3. Remove the Monitor's upper housing by removing the 3 Phillips head screws and carefully lifting the upper housing off of the lower housing.
4. Cut and discard the tie wrap that secures the old battery (see Figure 4).

Figure 4. Gauge Monitor without Cover (Replacing the Battery)



5. Remove the old battery.
6. Insert the new battery (observing polarity markings molded into the battery holder).
7. Carefully install a new zip tie through the circuit board slots and secure it around the battery.
8. Ensure that the upper housing O-ring is properly positioned on the lower housing O-ring shelf.
9. Firmly reinstall the Monitor's upper housing.

Note: The mounting screws are not evenly spaced around the upper housing in order to insure that the housing will only fit in the proper orientation.

10. Using a Phillips screwdriver, gently tighten the 3 screws on the Gauge Monitor housing to 10+/- 2 inch pounds. Do not over tighten.
11. Re-install the monitor on the tank.
12. Follow the battery manufacturers' safety and disposal guidelines.

5.2 Warranty

Seller warrants title and that products sold to Buyer shall be free from defects in material and workmanship and shall conform to specifications for a period of one (1) year from purchase for complete units and parts and subassemblies. Warranties on goods sold but not manufactured by the seller are expressly limited to the terms of warranties of the manufacturer of such goods.

Seller makes no representation or warranty of any kind, express or implied, as to merchantability, fitness for particular purpose or any other matter. Upon receipt of definite shipping instructions, Buyer shall return, transportation prepaid, all defective material, or material not conforming to specifications, to Seller, after inspection by Seller, or at Seller's election, subject to inspection by Seller. Material returned by Buyer must be returned in same condition as when received by Buyer. Defective material, or material not conforming to specifications, so returned shall be replaced or repaired by Seller and returned, freight prepaid, without any additional charge, or in lieu of such replacement or repair, Seller, may, at Seller's option, refund the purchase price applicable to such material. Seller agrees to pay return freight charges not exceeding the lowest rail or truck rate which would apply from the original destination on all defective material, or material not meeting specifications. However, Seller shall not be obligated for such charges when material returned proves to be free from defect and to meet specifications. Material that proves to be free from defect and to meet specifications shall be held by Seller for shipping instructions and Buyer shall furnish such instructions promptly upon request. Seller's liability shall be limited solely to the replacement or repair or to refunding the purchase price applicable to the defective material or material not meeting specifications. Seller shall not be liable for any consequential damages nor any loss, damages or expenses directly or indirectly arising from the use of the material.

5.3 Unit Disposal

The U.S. Environmental Protection Agency regulates the disposal of waste products in the United States. The EPA Regulations are listed in the "Code of Federal Regulations," CFR40, entitled "Protection of Environment." Individual states and local communities also may establish regulations covering the disposal of waste products. These may be more stringent than the federal regulations and may cover the disposal of household waste, which is not included in the federal regulation. Thus, state and local agencies should be contacted for their disposal guidelines.

The plastic parts of the external housing unit are marked for recycling purposes. An approved battery recycling center must dispose of the battery.

5.4 Service Parts List

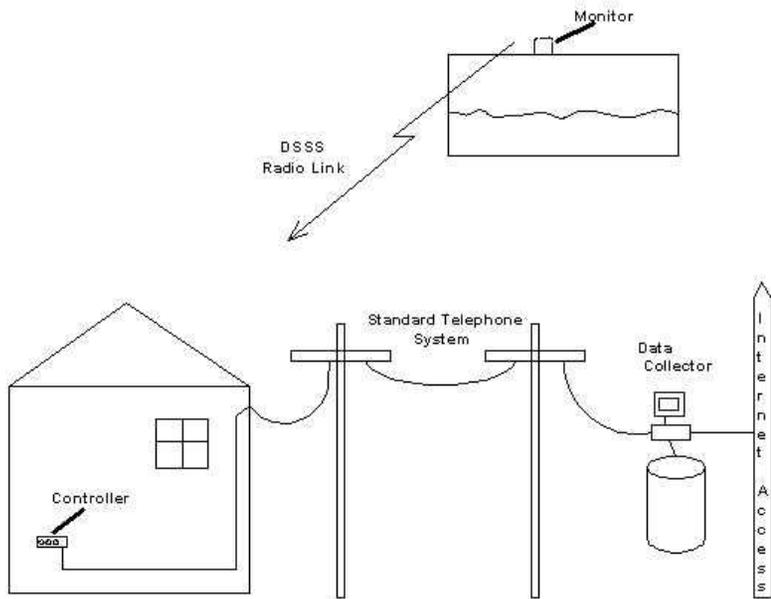
Robertshaw Part Number	Description	Quantity
039912A0001	Upper Housing Screws	3
039911A0001	Battery	1
039898A0001	Tie Wrap (For Battery)	1
039931A0001	Releasable Tie Wrap (For Wiring Harness)	1
086607A0001	Magnet Assembly	1
036240N0039	Upper Housing O-ring	1
039945A0001	Instruction Manual	1
039944A0001	Quick Installation Leaflet	1
086625A0001	Potentiometer Wiring Harness	1
039958A0001	Potentiometer Mounting Screw	2

5.5 Service and Technical Support

For service and technical support, contact Robertshaw Industrial Products Service Center at (865) 981-3103

Appendix A: Monitoring System

Figure 5. Centeron™ Level Monitoring System



Appendix B: Monitor Installed on Tank

Figure 6. Wiring Harness Attached To Feed Tube



Figure 7. Monitor Installed on Tank



Appendix C: Product Drawings

Figure 8. Monitor Drawing

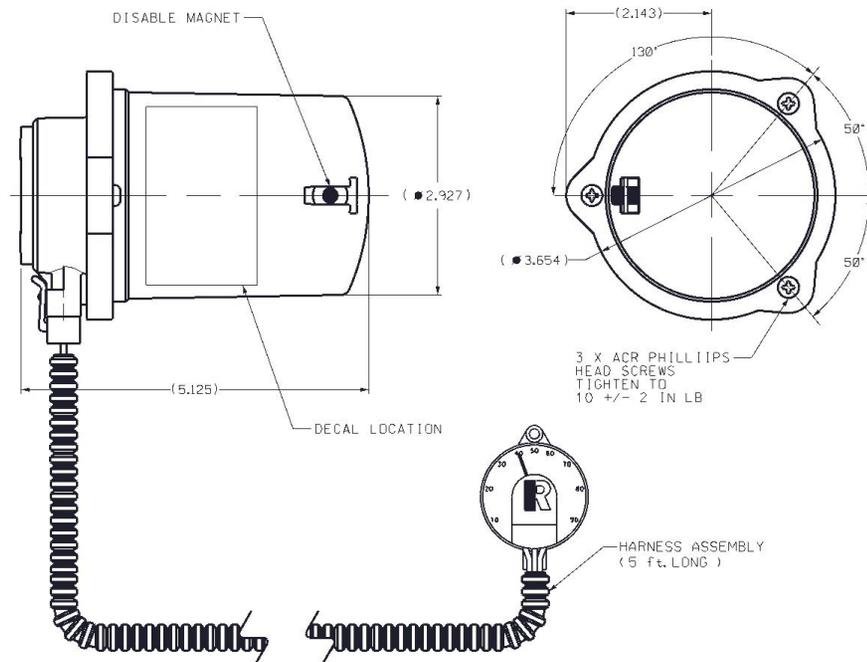
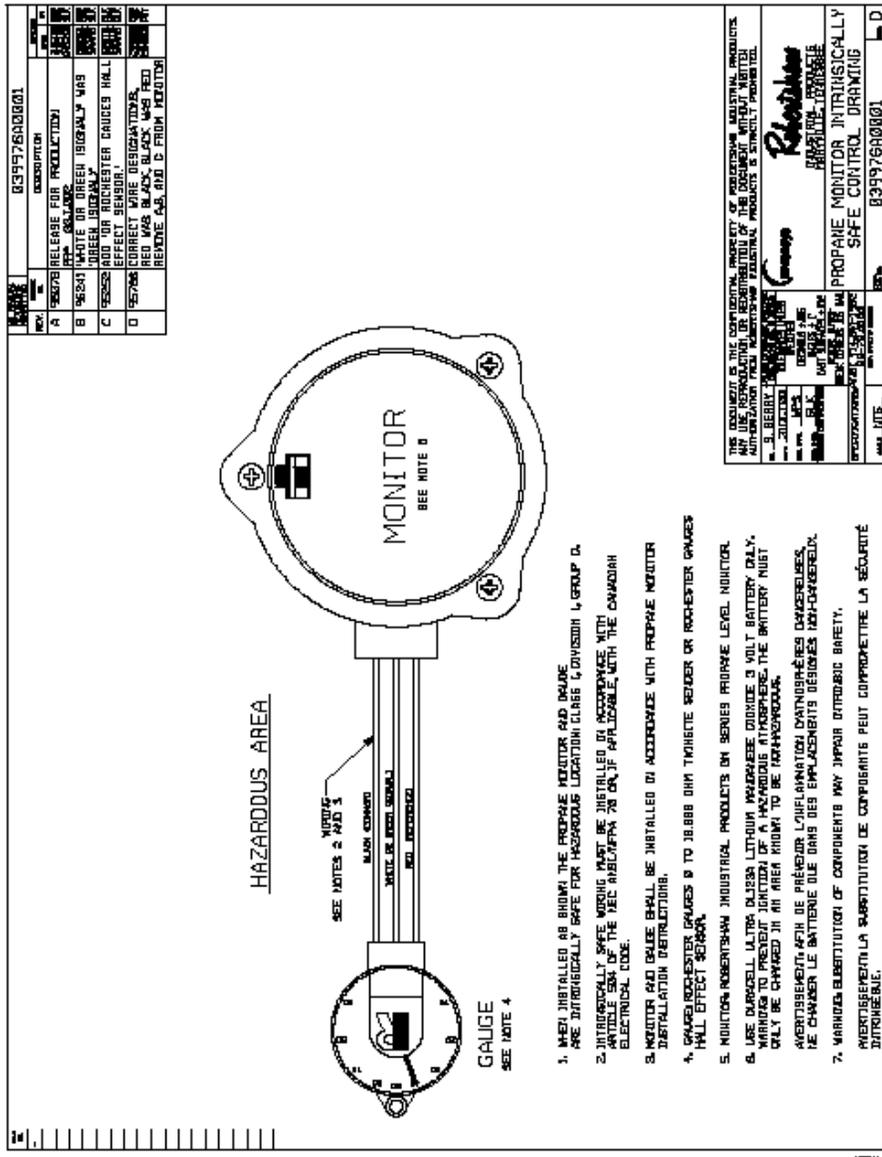


Figure 9. Gauge Monitor Control Drawing



Appendix D: Site Survey Form

Figure 10. Site Survey Form

Robertshaw Centeron™ Level Monitoring System Gauge Monitor Site Survey Form	
Contact Name:	
Contact Address:	
Contact Telephone Number:	
GPS Location (latitude/longitude):	
Product Name:	
Product ID:	
Tank Orientation (horizontal/vertical cylinder, oblong, etc.):	
Tank Geometry (diameter, length):	
Tank Contents:	



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