Centeron™

Digital Two Channel Monitor
Instruction Manual

Model:

SM 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® Digital Two Channel Monitor. The Digital Two Channel Monitor is part of the Centeron® Level Monitoring System that includes the High Level Alarm Console or a Controller used with a Data Collection System. Throughout this manual, the High Level Alarm Console or Controller will be referred to generically as the Receiver. This guide does not include how to install, test, maintain or troubleshoot the Receiver(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 Digital Two Channel Monitor is a member of Robertshaw's Spread Spectrum Radio Frequency (RF) product family. This Monitor detects alarm status, temperature, low battery, and system status and broadcasts these data to the system's Receiver. 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: 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 Receiver. This number is programmed into the unit at the factory and remains resident in the EEPROM 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 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 Digital Two Channel Monitor consists of a sealed Polypropylene housing with a large mounting magnet in the base for attaching the Monitor to a steel surface. The Digital Two Channel Monitor assembly can be connected to any one or two simple passive apparatus to detect alarms (changes in the state of the apparatus). This alarm status information will be transmitted to the Receiver using a spread spectrum radio signal in the 902–928 MHz bandwidth.

A replaceable 3-Volt battery that is designed to provide at least two (2) years life in normal service powers the Monitor.

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 Digital Two Channel Monitor installation procedure, is 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 Digital Two Channel Monitor contains sensitive alarm trigger 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 Monitor and Receiver will provide optimum radio reception.

- The Monitor and Receiver 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 Monitor and Receiver 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 Receiver 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:

    a. Metal objects between the Monitor and Receiver may reflect and scatter RF energy and reduce radio signal strength at the Receiver.

    b. Metal objects behind the Monitor or Receiver may increase the radio signal strength at the Receiver by reflecting radio signals toward the Receiver.

- Even small metal objects such as tank vents or toolboxes between the Monitor and Receiver can significantly reduce radio signal strength if they are within a few feet of the Monitor or Receiver. These objects can reflect radio signals and cause a RF “shadow” which may prevent radio signals from reaching the Receiver.

- 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 and bulletproof 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 Receiver.

- The Receiver should be mounted as high as is reasonably possible to improve its ability to receive radio signals. For example, placing the Receiver on a high shelf would be preferable to setting the unit on a floor near ground level. Installing the Receiver on the second floor of a two-story structure would be more desirable than installing it on the ground floor. Installing the Receiver in an underground basement should be avoided.

3.2 Handling Guidelines

The Digital Two Channel Monitor is designed to provide many years of reliable service in demanding outdoor environments. However, the Monitor contains sensitive 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 High Level Alarm Console or Controller has been successfully setup, the Float Switch Assembly and Digital Two Channel Monitor can be mounted on 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

Step 1.
Select a mounting bung on the top of the tank that will keep the Float Switch Assembly vertical and allow free travel of the float mechanism. Verify that there is adequate clearance to prevent the float mechanism from contacting obstructions such as walls, baffles, reinforcements, and other measurement equipment inside the tank. Remove all materials from the desired bung.

Step 2.

Install a thread-thread bushing in the bung to allow mounting of the Float Switch Assembly (if required).

Step 3.
Carefully insert the Float Switch Assembly into the tank and tighten it.

Step 4.
Connect the Float Switch Assembly wiring harness to the Digital Two Channel Monitor using the supplied grease packet. Place the Monitor on top of the tank. A large magnet in the base will hold the Monitor securely on a steel tank. Repeat Steps 1–4 for additional Monitors.

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

3.4 Activation

Following Monitor mounting, the unit(s) can be activated.

Step 5.
To activate the Monitor, pull the external slide magnet completely out of the top of the Monitor housing. This will activate the Monitor to report switch transitions and to make supervisory radio transmissions on a pre-programmed interval.

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

- When the external slide magnet is removed from the Monitor, the High Level Alarm Panel or Controller lights should indicate that it is receiving a Monitor transmission.

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

Step 6.
To activate additional Monitors, repeat Step 5.

3.5 Site Survey

Appendix B 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 Contents (diesel fuel, etc.)
- Description of Use (overfill protection, sump level monitoring, etc.)

Figure 2: Example Completed Site Survey Form

Robertshaw Centeron® Level Monitoring System High Level Alarm 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:	Digital Two Channel Monitor
Product ID:	S000001
Tank Contents:	Gasoline
Description of Use (overfill protection, sump level monitoring, etc.)	Overfill protection

4.0 Troubleshooting and Testing

4.1 Troubleshooting

This section contains procedures for testing the Digital Two Channel Monitor and provides information troubleshooting the Monitor installation.

If the Monitor is not operating properly, try to locate the solution in the following chart.

Fault Condition	Corrective Action
Monitor never reported to the High Level Alarm Console	Verify that this Monitor's ID is properly stored in the High Level Alarm Console. Refer to the High Level Alarm Console's Instruction Manual for details. Perform the Monitor test in Section 4.2 with the Monitor installed. If this test is unsuccessful, perform the same test with the Monitor near the Console installation 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 battery by following Section 5.1 and repeat the above tests. If still having problems, refer to Section 5.5 for technical support.
Monitor never reported into the Data Collection System (This only applies to installations using the Controller and Data Collection System.)	Verify that the Controller is properly installed. Refer to the Controller Instruction Manual for installation verification. Perform the RF tests listed under the previous question.
Monitor occasionally misses scheduled report times (i.e., the Receiver reports "Lost Monitor")	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.
Monitor does not immediately report alarm condition when communicating with a Controller	There is a delay in the modem communication between the Controller and the Data Collector. Check Monitor setting on the internet and refer to Section 5.5 for technical support.

Fault Condition	Corrective Action
Monitor reports a low battery status	Replace the battery by following Section 5.1 and repeat the above tests. If still having problems, refer to Section 5.5 for technical support.
Monitor reports a level of 11.1% (using a Controller) or is the Tank Status LED indicating an invalid state (using High Level Alarm Console)	Verify that the switch assembly is wired correctly.

4.2 Monitor Test

The Monitor is designed to wake up and transmit RF data every time an alarm is triggered or when the power is cycled by inserting and then removing the disable magnet.

4.2.1 Controller Reception of Monitor Data

The Controller will acknowledge the receipt of the transmission by blinking its Test light green. 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.

4.2.2 High Level Alarm Console Reception of Monitor Data

If the Monitor's ID has been set up in the High Level Alarm Console, the corresponding Tank Status light will flash green when the Monitor has been struck by its magnet.

NOTE: If the Monitor's ID is NOT set up in the High Level Alarm Console, the Console will never indicate that it received the Monitor's transmission.

With this in mind, use the following steps to verify installation and troubleshoot system communication problems.

- 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. For the High Level Alarm Console, assure that the Monitor's ID is stored in the Console's monitor database.

- Insert the magnet into the slot of the Monitor's upper housing until snug.

- 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 Receiver. If bench testing, the same person can locate the Monitor close to the Receiver in order to

watch for a response. Activate the Monitor by completely removing the magnet from the upper housing.

- Verify that the Receiver received the RF data transmission by watching the light blink green ("test" light on Controller, appropriate Tank Status LED on Console).

- Verify that the Controller initiates a phone call and returns to ready mode (see Controller Instruction Manual on how to recognize Ready mode). No further checks are needed for the High Level Alarm Console.

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.

- Remove monitor from the tank and transport it out of the hazardous area.

- Ground yourself by either wearing an anti-static wrist strap or by touching a grounded metal object (such as a copper water pipe).

- Remove the Monitor's upper housing by removing the 3 Phillips head screws and carefully lifting the upper housing off of the lower housing.

- Cut and discard the tie wrap that secures the old battery.

- Remove the old battery.

- Insert the new battery (observing polarity markings molded into the battery holder).

- Carefully install a new tie wrap through the circuit board slots and secure it around the battery. **Trim the tie wrap, leaving a minimum of ¼" untrimmed material.**

- Ensure that the upper housing O-ring is properly positioned on the lower housing O-ring shelf.

- 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.

- Using a Phillips screwdriver, gently tighten the 3 screws on the Gauge Monitor housing to 10+/- 2 inch pounds. Do not over tighten.

- Re-install the monitor on the tank.

- 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

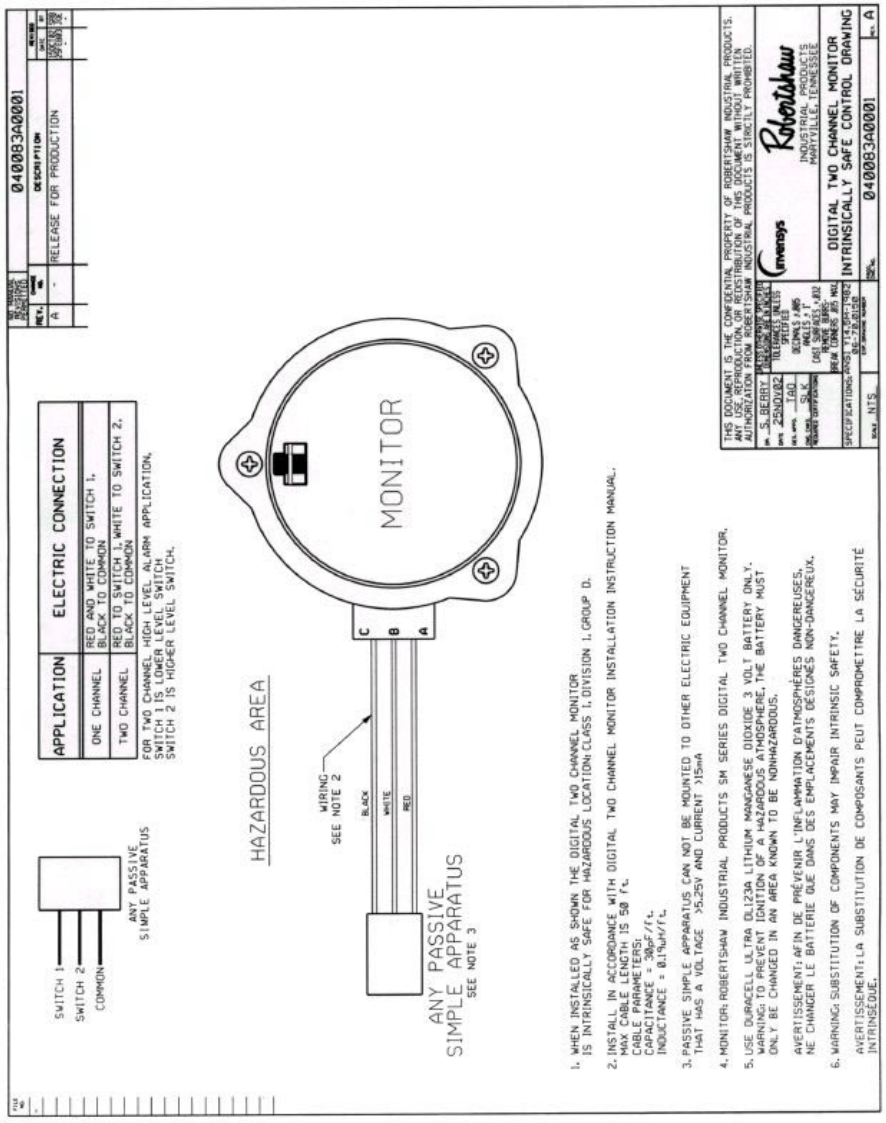
Robertshaw Part Number	Description	Quantity
039912A0001	Upper Housing Screws	3
039911A0001	Battery	1
039898A0001	Tie Wrap (For Battery)	1
039931A0001	Releasable Tie Wrap (For Wiring Harness)	1
086607A0001	Magnet Assembly	1
036240N0039	Upper Housing O-ring	1
040084A0001	Instruction Manual	1
040085A0001	Quick Installation Leaflet	1

5.5 Service and Technical Support

For service and technical support, contact Robertshaw Industrial Products Service Center at (865) 981-3100.

Appendix A: Product Drawings

Figure 3: Digital Two Channel Monitor Control Drawing



Appendix B: Site Survey Form

Figure 4: Site Survey Form

Robertshaw Centeron® Level Monitoring System Digital Two Channel Monitor Site Survey Form	
Contact Name:	
Contact Address:	
Contact Telephone Number:	
GPS Location (latitude/longitude):	
Product Name:	
Product ID:	
Tank Contents:	
Description of Use (overfill protection, sump level monitoring, etc.)	

Robertshaw
INDUSTRIAL PRODUCTS DIVISION
AN INVENSYS COMPANY

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U.S.A. – Robertshaw Industrial Products Division, 1602 Mustang Drive, Maryville, Tennessee 37801
865-981-3100 • Fax: 865-981-3168
www.Centeron.net