Centeron®

Loop Monitor
Instruction Manual

Model: PMN Series Non-Intrinsically Safe

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Revision B

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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™ Loop Monitor. The Centeron™ Loop Monitor is part of the Centeron™ 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® Loop Monitor is a member of Robertshaw's Spread Spectrum Radio Frequency (RF) family of products. This Monitor detects any sensor with 4 to 20mA output current signal, temperature, low battery, and system status and broadcasts this data to the system's Controller.

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

2.2 Operation

The Loop Monitor consists of a NEMA 4X Approved housing. The housing protects the Monitor's electronic circuitry and permits connection of the sensor. The Loop Monitor measures 4 to 20mA loop current by detecting changes on the sensor. This information is calculated and transmitted to the Controller in hundredths of a percentage of the Full Scale of Sensor Measurement Range .

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 Housing is designed to meet or exceed NEMA 4X.
- UV life: 10 years exposure to direct sunlight.

- Chemical Exposure: The unit is designed for outdoor service. The housing material of the Monitor is either ABS or Polycarbonate, which have 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® 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 not intrinsically safe when configured to use an external supply.

3.0 Installation

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

3.1 RF Site Guidelines

The Centeron® Loop 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 Monitor and Controller will provide optimum radio reception.

- The 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 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, which 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 Controller.

- The 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 RF reception, mount the Monitor within 500 feet of the Controller, avoid mounting Monitor inside a fully closed metal building, and avoid close proximity to large electrical equipment.

3.2 Handling Guidelines

The Loop 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 0 (Battery Replacement) and section 3.3 (Connection and Mounting).

3.3 Connection and Mounting

After the Controller has been successfully setup, make wire connection and mount monitor by following these instructions:

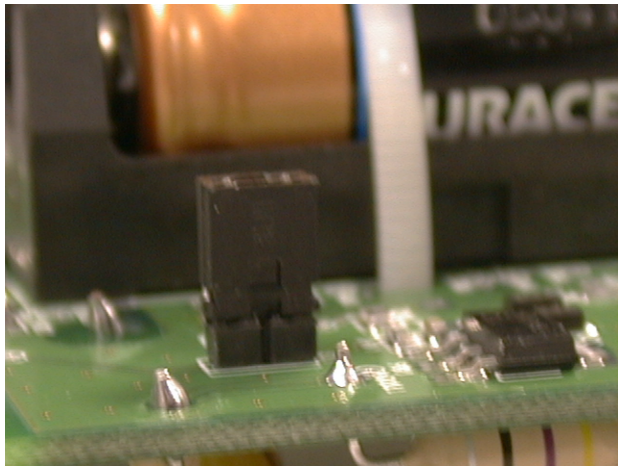
- Open the cover of the Loop Monitor Housing, discard Shipping Cap Plug.
- To maintain NEMA 4 rating of enclosure, install NEMA 4 Cable Seal at Access Hole.
- Connect: See Section 6 for details of wiring connections.
- Following RF guidelines in section 3.1, securely mount the Loop Monitor with proper orientation.

3.4 Activation

- To activate the Monitor: 1.Pull the Disable Jumper (See Figure 2) completely out of the PCA of the Monitor. This will activate the Monitor to make measurements and burst transmissions on a factory programmed interval.

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

Figure 1. Disable Jumper in disable position



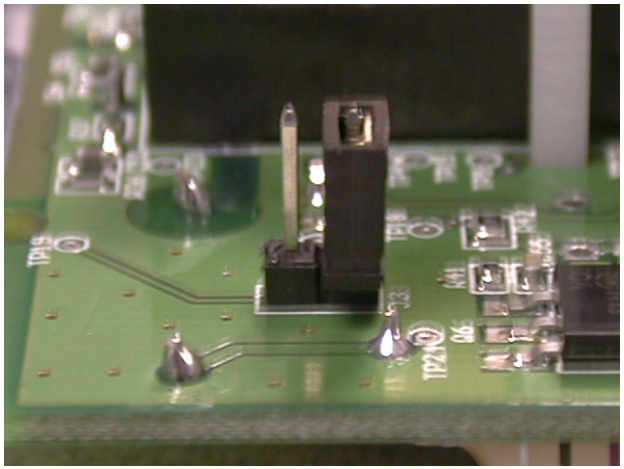
- Once the Disable Jumper is removed from the PCA of the Monitor, the Controller should flicker LED light to indicate that it successfully received a Monitor transmission.

  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.

Note: Store the Disable Jumper by turning the Jumper 90° from original position and place it on one pin of two positions header for future use if needed. (See Figure 2)

Figure 2. Disable Jumper in enable position



To activate multiple Monitors, repeat above steps.

Note: After activation, secure the cover of the Loop Monitor Housing.

3.5 Site Survey

Supply the following information:

- Contact Name
- Contact Address
- Contact Telephone Number
- GPS Location (latitude/longitude)
- Product Name
- Product ID

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

Figure 3. Example Completed Site Survey Form

Robertshaw Centeron® Level Monitoring System Loop 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™ LoopMonitor
Product ID:	P000001

4.0 Troubleshooting and Testing

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

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

Question	Solution
Has the Monitor ever reported into the Data Collection System?	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 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

Question	Solution
	troubleshooting. Replace the 3 VDC 2/3A LiMnO2 Battery by following Section 0 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 0 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 ED01 or ED05: Indicates that the Sensor is shorted or is installed in improperly application. (Smaller measurement range sensor is installed in larger range application) Code ED03: Indicates that the loop is open or disconnected, Check the connection of the terminal block connector in the Monitor Housing. Code ED06: Indicates that the Sensor output is close to 4mA. Code ED07: Indicates that the sensor is close to 20mA.

Question	Solution
	Other Error Codes: Many other error codes and combinations of error codes can be reported by the monitor or controller. Record the code number that is reported and refer to Section 5.5 for technical support.

4.1 Monitor Test

The Monitor is designed to wake up, take a measurement, and transmit RF data on a preprogrammed schedule or every time when the power is cycled by inserting and removing the Disable Jumper used for shipping. When the Monitor transmits its RF data, the Controller will acknowledge the receipt of the transmission by blinking the 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. Reset 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. Use the disable Jumper to short two positions header on the PCA of the Monitor until snug.

3. If testing with the Monitor at the location 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 Jumper from the PCB of the Monitor.

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 Housing, follow these steps:

1. Remove the Monitor's Cover by removing the 4 Phillips head screws (See Figure2).

2. Use the disable Jumper to short two positions header on the PCB of the Monitor to disable Loop Monitor (See Figure3).

Caution: When performing next procedures be extremely careful the Monitor is disabled.

3. Disconnect two wires from Terminal Block Connector (See Figure 6).

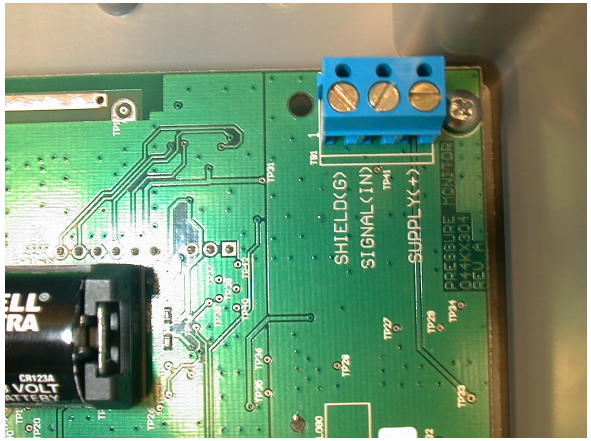
4. Cut and discard the Tie Wrap that secures the old battery.

5. Remove the old Battery.

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

7. Install Tie Wrap that secures the new battery. Trim tie wrap free end leaving at least ¼ inch untrimmed material.

Figure 4. Terminal Block Connection



8. Re-install the Monitor.

9. Reconnect wires to Terminal Block Connector.

10. Remove the Disable Jumper to activate Loop Monitor.

    Note: Store the disable Jumper by turning the Jumper 90° from original position and place it on one pin of two positions header for future use if needed

11. Close the cover of the Monitor Housing.

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. Seller shall hold material that proves to be free from defect and to meet specifications 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. An approved battery-recycling center must dispose of the battery.

5.4 Service Parts List

Robertshaw Part Number	Description	Quantity
040037C001	Instruction Manual	1
039911A0001	Battery	1
039898A0001	Tie Wrap	1

5.5 Service and Technical Support

For service and technical support, contact Robertshaw Industrial Products Service Center at (865) 981-3118.

6.0 Wiring Connections

For all wiring connections, refer to drawing 040018B0001. Figure 5 should be used when connecting to a self-powered sensor. Figure 6 should be used when the Loop Monitor is placed into a loop with a power supply and a sensor.

Figure 5. Connections For Self-Powered (4-wire) Sensor

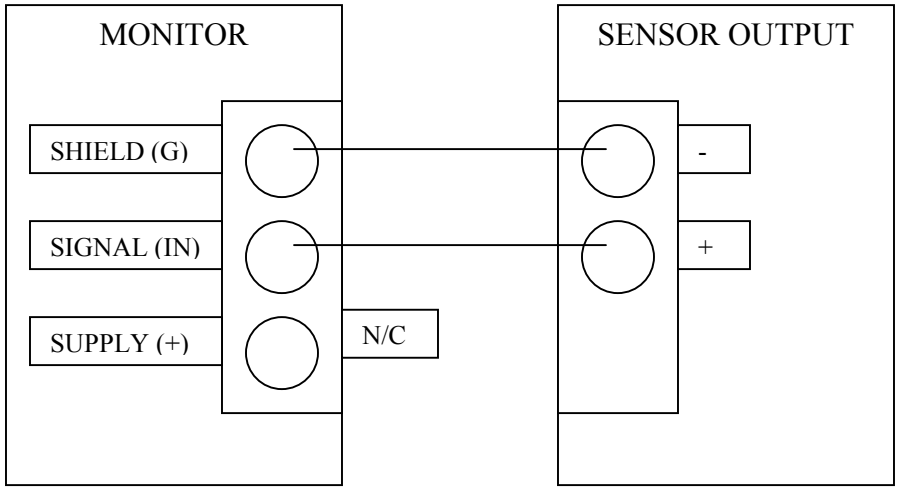
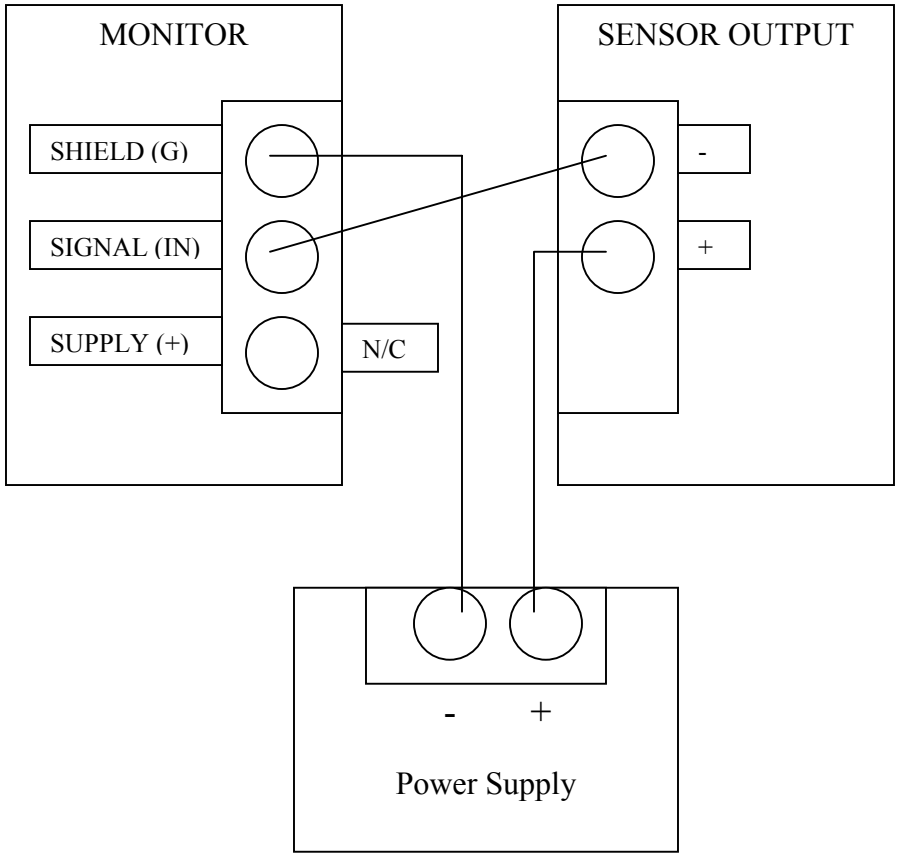


Figure 6. Connections With Power Supply In Loop



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