

# Gauge Monitor Instruction Manual

Model: G4GM Series

Document # 039945B0001

Revision # B

Dated 10/06/2014



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## 1.0 Introduction

This manual describes how to install, test, and service the Gauge Monitor. The Gauge Monitor is part of a Level Monitoring System that includes the Gateway and Data Collection system. This guide does not include how to install, test, maintain or troubleshoot the Gateway or Data Collection system. Refer to the Gateway Instruction Manual and Data Collection system help screens.

The description herein is based on a standard installation.

## 2.0 Product Overview

### 2.1 Description

This Monitor detects level, temperature, low battery, and system status and broadcasts this information to the system's Gateway. The Monitor is pre-programmed at the factory with the Transmitter ID and Transmission Frequency. No field programming of the Monitor is required. Many of the performance features, such as transmission frequency and alarm settings, can be set from the Data Collection website.

### 2.2 Operation

The Gauge Monitor consists of sealed housing with a large mounting magnet in the base for attaching the Monitor to a steel tank. The Gauge Monitor connects to a sensor that detects the position of the pointer in a level indicator dial on the tank. By comparing the sensor 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 Gateway.

The Monitor is powered by two replaceable batteries. Battery life depends on the reporting frequency and operating temperature.

### 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 4X/6P.
- 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:** The Manufacturer does not support field changes or modifications to any of the 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 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 Monitor and Gateway will provide optimum radio reception.
- The Monitor and Gateway 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 Gateway the distance between these units should be minimized.
- Multiple obstructions (such as two or more walls or a tank and a wall) between the Monitor and Gateway 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 Gateway may reflect and scatter RF energy and reduce radio signal strength at the Gateway.
  2. Metal objects behind the Monitor or Gateway may increase the radio signal strength at the Gateway by reflecting radio signals toward the Gateway.
- Even small metal objects such as tank vents or toolboxes between the Monitor and Gateway can significantly reduce radio signal strength if they are within a few feet of the Monitor or Gateway. These objects can reflect radio signals and cause a RF “shadow” which may prevent radio signals from reaching the Gateway.
- 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, transformers, generators, electric fences, and transmitter antennas may interfere with the radio signals received by the Gateway.
- The Gateway should be mounted as high as is reasonably possible to improve its ability to receive radio signals. For example, placing the Gateway on a high shelf would be preferable to setting the unit on a floor near ground level. Installing the Gateway on the second floor of a two-story structure would be more desirable than installing it on the ground floor. Installing the Gateway in an underground basement should be avoided.

*Warning: For maximum Monitor reception, mount the Monitor as close as possible to the Gateway, avoid mounting Monitor or Gateway inside a fully closed metal building or enclosure, and avoid close proximity to large electrical equipment. Do not paint the Monitor or Gateway housings.*

### 3.2 Handling Guidelines

The 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 Gateway 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 sensor from their protective packaging.
- Install the Gauge Monitor sensor on the tank level indicator dial. Most new tanks have a Remote Ready dial with a small black plastic tab on its face. Remove this tab by lifting the outer edge and sliding it away from the center of the dial. Slide the Gauge Monitor sensor module into the slot where the tab was removed and snap it securely into position.
- If the tank is NOT equipped with a Remote Ready dial then replace the existing level indicator dial with the appropriate Remote Ready dial. Install the Gauge Monitor sensor on the new Remote Ready dial as described in the previous step.

**Warning:** *If a level indicator dial must be replaced, remove only the small plastic dial. Do not attempt to remove the dial mounting base or float assembly - severe injury could result.*

- 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 Level Monitoring System is not a substitute for a fixed liquid level gauge or weight measurement device, which may be required for filling.*

- If the level indicator dial is located under the tank dome, use the supplied nylon wire tie to secure the sensor wire to the feed tube or other object in order to prevent the dome lid from damaging the wire when it is closed (reference Figure 1).
- Apply the supplied dielectric grease as deep as possible into the Monitor housing socket. Insert the sensor wiring harness connector into the Monitor housing socket and snap it firmly into position.
- Carefully attach the 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.

*Note: For maximum accuracy, adjust the tank so that it is level to within +/- 5 degrees.*

Repeat these steps for additional Monitors Figure 2 shows a Monitor installed on a propane tank.

**Warning:** *For maximum Monitor reception, position the Monitor within 500 feet of the Gateway, avoid mounting the Monitor or Gateway inside a fully closed metal building or in a metal enclosure, and avoid close proximity to large electrical equipment. Do not install the Monitor under a metal dome lid.*

### 3.4 Activation

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

- To activate the Monitor, pull the small 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: 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.*

- When the disable magnet is removed from the upper housing slot the Monitor will immediately make a level measurement and transmit this information. The Monitor then waits for three minutes and then transmits every twenty seconds for the next four minutes. The Gateway will flicker the green "Monitor" LED each time it successfully receives a Monitor transmission. After this initial activation routine the Monitor reverts to its factory programmed transmission interval.

*Note: The installer can verify radio reception at the Gateway by watching the "Monitor" LED during the Monitor activation sequence.*

To activate additional Monitors, repeat these steps.

## 4.0 Troubleshooting and Testing

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

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

### Concern

Monitor has NEVER reported to Data Collection system

### Solution

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

Perform the Monitor test in Section **Error! Reference source not found.** with the Monitor installed. If this test is unsuccessful, perform the same test with the Monitor within a few feet of the Gateway. If only successful at close range then re-evaluate the installation site for RF interference or obstruction problems. If not successful at close range then replace the battery by following Section 5.1 and repeat the above tests. If still having

Concern	Solution
	problems, refer to Section 5.5 for technical support.
Monitor occasionally misses scheduled reporting times	The most likely causes are obstructions or radio interference. Re-evaluate the installation site for RF issues per Section 3.1. If the condition persists then refer to Section 5.5 for technical support.
Monitor reports a low battery	Replace both batteries by following Section 5.1.
Monitor reports an Error Code	Code 01 – Microprocessor error. Refer to Section 5.5 for technical support.  Code 02 – Open gauge circuit. Verify that the sensor wiring harness is not damaged and that it is securely plugged into the Monitor.  Code 03, 04, or 05 – Shorted gauge circuit. Verify that the sensor and wiring harness are not damaged. Unplug the wiring harness from the Monitor and force the unit to transmit (refer to Section 3.4). If the Monitor continues to report the same error code without a wiring harness connected then the problem is internal and the Monitor must be replaced. If the Monitor reports Code 02 with no wiring harness connected but reverts to the original error code when the wiring harness is re-connected then replace the sensor and wiring harness assembly.  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.

Concern	Solution
Monitor always reports a level of approximately 50% regardless of the fuel level in the tank	Verify that the Gauge Monitor sensor is connected to the indicator dial and that the sensor is not damaged.

## 5.0 Servicing

### 5.1 Battery Replacement

If it becomes necessary to replace the batteries 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 DL123A (quantity 2) batteries only.*

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

1. Unplug the sensor wiring harness. 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. Avoid contact with circuit board components, if possible. Hands should be clean and dry. Handle circuit board only by the edges.
5. Cut and discard the tie wrap that secures the old batteries.
6. Remove **BOTH** old batteries.

7. Insert a new battery in the BT2 holder (observing polarity markings molded into the battery holder).
8. Insert a new battery in the BT1 holder (observing polarity markings molded into the battery holder).
9. Carefully install a new zip tie through the circuit board slots and secure it around the batteries.
10. Lightly lubricate the housing O-ring with dielectric grease, silicone grease, or petroleum jelly. Ensure that the O-ring is properly positioned on the lower housing O-ring shelf.

NOTE: For a good seal, the O-ring must be intact and properly placed, and the lid must be fully sealed.

11. 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.*

12. Using a Phillips screwdriver, gently tighten the 3 screws on the Gauge Monitor housing to 10+/- 2 inch pounds. Do not over tighten.
13. Re-connect the sensor wiring harness and re-install the Monitor on the tank.
14. Follow the battery manufacturer's safety and disposal guidelines.

## 5.2 Warranty

Please see the Warranty section of the General Terms and Conditions of Sale provided with the order confirmation.

## 5.3 Unit Disposal

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

## 5.4 Service Parts List

Part Number	Description	Quantity
039912A0001	Upper Housing Screws	3
039931A0001	Releasable Tie Wrap (For Wiring Harness)	1
039911A0001	Battery	2
496KA003-04	Tie Wrap (For Batteries)	1
086607A0001	Magnet Assembly	1
036240N0039	Upper Housing O-ring	1

## 5.5 Service and Technical Support

If you experience trouble with this equipment, please contact the company that sold you the monitor.

## Appendix A: Monitor Installed on Tank

Figure 1. Wiring Harness Attached To Feed Tube



Figure 2. Monitor Installed on Tank



## Appendix B: Control Drawing

Figure 3. Gauge Monitor Control Drawing

