# Leak Gopher Z-Wave Meter Reader

Model: LGMR
Rev 1.02

## Features

- ☙ Attaches to any meter device with a pulse output
- ☙ Wireless readings using many available Home Automation platforms and security panels
- ☙ Monitor via Internet or Smart Phone
- ☙ Prevent expensive water damage even when you're not home
- ☙ Z-Wave Wireless connectivity o Advanced Mesh Network
    - o 5th Generation Technology
    - o 300' Radio Range
    - o Over-The-Air firmware update
- ☙ Z-Wave Plus Certified

## Overview

The Leak Gopher Meter Reader is a critical component to protect your home from costly damage due to a water leak. A burst pipe can result many thousands of dollars in repair costs and the Leak Gopher Meter Reader can inform you of the leak in time to prevent damage.

Compatible with many security panels and most Home Automation systems, you can monitor the Leak Gopher Meter Reader from your Smart Phone or computer from anywhere in the world via the Internet. Automation systems can automatically turn off the water if a leak is detected and a text message can be sent to you informing you of the alert.

Z-Wave wireless connectivity ensures reliable operation and compatibility with other Z-Wave products from many manufacturers and software providers.

The Leak Gopher Meter Reader is easily installed by a homeowner with the help of our YouTube videos. Professional installation is recommended.

## Ordering Information

LGMR- 1 with 3/4" water meter

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## Introduction

The Leak Gopher Z-Wave Meter Reader (LGMR) works with Z-Wave enabled security alarm systems to protect your home or business from water leaks. When the Leak Gopher Meter Reader detects a sudden increase in water usage, the Z-Wave Controller can be programmed to tell a companion Leak Gopher Valve Controller to automatically turn the water off, protecting your home or business. The Leak Gopher Meter Reader is Z-Wave Plus certified to support the latest Z-Wave Controller capabilities.

Z-Wave is a wireless mesh-networking protocol for reliable, intelligent home control of all Z-Wave compatible devices. Z-Wave devices can act as repeaters to create a mesh-network to ensure reliable communication regardless of the manufacturer or type of device. This product can be included and operated in any Z-Wave network with other Z-Wave certified devices from any other manufacturer. Z-Wave devices such as lamp modules, fan controllers, thermostats, dimmer switches and many other types of home control devices are available from a wide range of manufacturers The Z-Wave Alliance (www.z-wavealliance.com) provides a list of manufacturers of Z-Wave compliant devices. Z-Wave was created by Sigma Designs and more details on the technology can be found at www.z-wave.com.

## Installation

Watch the Leak Intelligence videos at http://www.Leakintel.com or You Tube for detailed installation instructions. Search for "Leak Gopher Meter Reader" on http://www.youtube.com to find the latest videos.

Locate and install the water meter and connect it to the Leak Gopher Meter Reader using the two screw terminals on the Leak Gopher Meter Reader circuit board.

**How to install the Leak Gopher Z-Wave Meter Reader**
1. Determine where you want to mount the Leak Gopher Meter Reader and secure it to the wall using the mounting holes located in the top and bottom of the device.
2. Plug the 12VDC power adapter (included) into the bottom of the Leak Gopher Meter Reader.
3. Install the Water Meter

**How to install the Leak Gopher Electronic Water Meter**

The plumbing in every building is different. Determining where to locate the Leak Gopher Water Meter is an important part of the installation process. While outside the scope of these instructions, the optimum place to locate the Meter is where it can measure all of the water entering the premises. In a

residential setting this is typically on the main water line coming into the house. Variations in plumbing make it impossible to provide detailed installation instructions for your installation. Your situation may require rerouting the water line, or other changes to your plumbing. It is your responsibility to check with your local codes department to determine if a licensed plumber is required to install the Water Meter. The Leak Gopher Water Meter should be installed indoors.

Depending on your Z-Wave controller, and its capabilities, the Leak Gopher Meter Reader can be added to the controller as a Z-Wave device, operated directly from the controller, or incorporated into scenes, etc.

## Z-Wave Inclusion

How to Add the Leak Gopher Meter Reader to your Z-Wave Controller
- Plug the wall cube power adapter (included) into the receptacle on the bottom of the Leak Gopher marked "12 VDC". Plug the wall cube into a 110 VAC outlet.
  This provides power to the Leak Gopher.
- Configure the Z-Wave Controller to Include/Add a device.
- When the Z-Wave Controller is ready to include/add a device, it will display a message like "waiting to add device". Press Include/Add button on the front of the device.
- The Include/Exclude button is the Z-Wave logo located on the front of the Leak Gopher Meter Reader.
- Press the Include/Remove button. Depending on your controller you may have to press the button 3 times.
- The Z-Wave Controller will acknowledge that the Leak Gopher Meter Reader has been added to the Z-Wave network.
- Your Leak Gopher Meter Reader is ready to use.

## Z-Wave Exclusion

How to Remove the Leak Gopher Meter Reader from your Z-Wave Controller
- Plug the wall cube power adapter (included) into the receptacle on the bottom of the Leak Gopher Meter Reader marked "12 VDC". Plug the wall cube into a 110 VAC outlet.
  This provides power to the Leak Gopher Meter Reader.
- Configure the Z-Wave Controller to Exclude a device.
- When the Z-Wave Controller is ready to exclude a device, it will display a message like "waiting to exclude device. Press exclude button on the device"
- The Include/Exclude button is the Z-Wave logo located on the front of the Leak Gopher Meter Reader.
- Press the Include/Remove button. Depending on your controller you may have to press the button 3 times.

- The Z-Wave Controller will acknowledge that the Leak Gopher Meter Reader has been excluded from the Z-Wave network.
- Your Leak Gopher Meter Reader is excluded from this controller.


### Reset to Factory Defaults

How to reset the Leak Gopher Meter Reader
- If the exclusion process above is not working or the Z-Wave controller that was originally joined to is lost or not available, the following process can be used to factory reset the device to the same state it has when shipped new.
- To reset the Leak Gopher Meter Reader Z-Wave radio and routing tables, press and hold the Include/Exclude button located on the front of the Leak Gopher Meter Reader for 15 seconds.


## LED Indicator

The blue LED on the face of the Leak Gopher Meter Reader indicates the current mode of the Leak Gopher Meter Reader.

| LED | Description |
|---|---|
| DARK | Power is off |
| BLINKS slowly 0.5Hz | Not joined to a Z-Wave network - Press the Z-Wave button to join |
| BLINKS quickly 5Hz after pressing the Z-Wave button | Sent a Z-Wave Node Info and attempting to either Include or Exclude from a Z-Wave network. Expires after about 10 seconds if not joined |
| WINKs OFF | Every time a pulse from the meter is detected, the LED will wink off briefly. |


## Configuration Parameters

The Leak Gopher Meter Reader has three configuration parameters that enable different features.


### 1 - Debounce

Valid Values: 1-255, default=10

DEBOUNCE applies a filter the meter pulse to ensure the meter count is incremented only once with each pulse. The default should work for most meters. If the meter pulses are more than 100/second, then a lower DEBOUNCE value should be used. If the pulse count is incrementing by more than 1 with each pulse, then the DEBOUNCE parameter should be increased. Note that increasing the DEBOUNCE value lowers the maximum pulse rate that can be accumulated. For example, a

DEBOUNCE of 100 means any pulse of less than 100ms (1/10th of second) will be filtered out an not counted so the maximum pulse rate that can be accumulated is 5 pulses/sec.

### 2 - Rate Count
Valid Values: 0-255, default=10, 0=disables this mode

Pulse counts are automatically sent to the Association Group 1 NodeID every time the pulse count is incremented by value of this parameter. The maximum rate of reports is once per minute so the pulse count can increment by more than this number. A Pulse Rate of 0 turns off the automatic reporting feature and the system controller has to poll to get the current pulse count.

### 3 - Rate Time
Valid Values:0-255, default=0, 0=disables this mode, Units 1/10ths of an hour

Pulse counts are automatically sent to the Association Group 1 NodeID every 1/10th of an hour times this parameter. A value of 0 turns off the automatic reporting feature and the system controller has to poll to get the current pulse count.

Pulse counts are reported via the Z-Wave Meter Command Class and are sent to the NodeID configured in Association group 1. If BOTH Rate Count and Rate Time are zero, the home automation system has to poll the meter value using a METER_GET command. If either Rate Count or Rate Time are non-zero, then METER_REPORTs are automatically sent when either condition triggers. Rate Count is ideal to quickly determine if there was a sudden increase in water flow for example if a pipe has burst. As soon as the pulse count has incremented by the Rate Count value, a meter report will be sent to the Lifeline. The Rate Time parameter is ideal for determining if there is a slow leak in the system where the rate count is slowly incrementing 24 hours per day. Note that small leaks are limited by the minimum flow rate of the water meter. Typically Rate Time is set to 20 so that a report is sent every two hours at a minimum if this feature is desired. Note that the default for Rate Time is 0 which disables this mode.

## Software Developer Technical Information

This section is intended for home control software developers to support Leak Gopher Meter Reader (LGMR) in their home control software. Users of Leak Gopher Meter Reader do not need this information but it is provided here for serious DIYers who want to understand how the device works under the hood.

All Z-Wave communication uses standard Z-Wave Command Classes. Each command class is fully described in the Z-Wave specification documents available at SigmaDesigns.com. Specific details of how each command class is used by the LGMR are described below.

No device specific coding is required for the LGMR. By properly interrogating the device and its command classes you can fully support the device using common code for any device with the supporting command class. The LGMR works out-of-the-box with no configuration required. Meter Command Class reports will be automatically sent to the Lifeline Association (Group 1) NodeID.

Interrogation process:
1) Upon inclusion and receipt of the NodeInfo Frame NIF, note that the Z-Wave Plus command class is first in the NIF. The Hub therefore knows that the device has passed Z-Wave Plus certification and the device will report all of its capabilities without requiring custom coding. A deeper interrogation of the command classes, their versions and specific reports from applicable command classes can then be performed.
2) Assign the Lifeline Association Group 1 with the Hub Z-Wave NodeID (usually 0x01). THIS STEP IS CRITICAL! All Z-Wave Plus devices expect to have a Lifeline NodeID assigned. The Lifeline Node is how the LGMR know where to send the automatic Meter Reports.
3) Get the Z-Wave Plus Icon Type which identifies the LGMR as a water meter. Use this to build the GUI representation of LGMR.
4) Get the Manufacturer Command Class which identifies the manufacturer as Leak Intelligence.
5) Get the Meter Command Class METER_SUPPORTED report which identifies the scale and precision of the Meter. A Meter GET to get the current value should also be done at this time so the user is presented with the current value. A method to zero the meter value should be available to the user.
6) Get the Configuration Command Class Configuration Properties report and optionally the other data for the configuration parameters. Present this information to the user perhaps under an "Advanced" tab.
7) Have the user position the LGMR in the final location.
8) Once the LGMR has been placed in its final location, be sure to update neighbors (3 times) and assign return routes to ensure the LGMR is able to route back to the Hub with the Meter reports.
9) The LGMR will now AUTOMATICALLY send Meter Report commands each time the meter has detected Parameter 2 number of pulses and optionally every Parameter 3 1/10ths of an hour.
   a. There is NO NEED TO POLL LGMR to get the meter report as long as the lifeline Association Group 1 NodeID has been assigned.

## Z-Wave Command Classes

| Command Class | Purpose | Version |
|---|---|---|
| **METER** | **Meter reports are sent automatically to Association Group 1 (lifeline) NodeID based on configuration settings** Use this command class to monitor the meter via Z-Wave. | V4 |
| CRC_16_ENCAP | Meter CC requires the support of CRC_16_ENCAP to ensure the integrity of the meter value. Use of this command class is optional. | V1 |
| ZWAVEPLUS_INFO | Provides the Z-Wave Role Type, Node Type and Icon | V2 |
| ASSOCIATION | Assigns the destination for changes in the meter reading | V2 |
| ASSOCIATION_GRP_INFO | Details on the LifeLine association Group | V1 |
| CONFIGURATION | Used to identify, document, set and report the three configuration parameters | V3 |
| VERSION | Provides the firmware version, SDK version and version of each command class | V2 |
| MANUFACTURER_SPECIFIC | Provides the Manufacturer ID, Product ID and Product type ID to uniquely identify the LGMR. | V2 |
| DEVICE_RESET_LOCALLY | When the LGMR is reset locally, a notification is sent to the controller to inform that the LGMR has been reset to the factory defaults and is no longer part of the Z-Wave network. | V1 |
| POWERLEVEL | Can be used to measure the quality of the radio link | V1 |
| FIRMWARE_UPDATE_MD | Firmware in the LGMR can be updated via this class | V2 |
| BASIC | Used to test radio communications. Sets the state of the LED for 2 seconds | V2 |

The Z-Wave command class version supported by the firmware in the Leak Gopher Meter Reader can be obtained via the VERSION_COMMAND_CLASS_GET command. Note that the firmware may support a later version than is documented here. Use the version reported by the firmware which is always more up-to-date than this manual.

## Association and Association Group Info
The Leak Gopher Meter Reader has a single Association Group, Group 1 also known as the "Lifeline" group as required for Z-Wave Plus certification. One (1) NodeID can be SET into Group 1. Typically the Z-Wave system controller or Hub will be the only member of Group 1.

The Association Group Info command class can be used to obtain the name of group 1 "Lifeline" and other information about the commands that can be received from LGMR.

## Basic
The BASIC command class can be used to temporarily set the state of the LED. A BASIC_GET will return a BASIC_REPORT with the state of the LED (0=off, 0xFF=on). A BASIC_SET will turn the LED off (0) or on (non-zero) for 2 seconds. After 2 seconds, the LED will return to the normal operating mode. This functionality is provided to help debug communication issues with the LGMR.

## Meter

The Meter Command Class is the primary class that reports the current "pulse count" of the water meter. Each water meter has a different quantity of water per "pulse" but typically is one gallon per pulse. Version 4 of the Meter command class is supported so the meter type and scales are reported by sending a METER_SUPPORTED_GET command. The type and scale define the meter as a water meter with a scale of Pulse Count. The pulse count is an accumulated value that is retained even if power is lost. Pulses that occur while power is off are NOT included. To avoid wearing out the electronics, the current pulse count is stored once per hour so if power is lost just before the LGMR was going to store the pulse count, then all the pulse counts in the past hour will be lost.

The pulse count is a 32 bit number. If the maximum value is reached, the pulse count will remain at the maximum count.

The pulse count is cleared to zero with a METER_RESET command. The pulse count stored in non-volatile memory is also immediately zeroed.

CRC_16_ENCAP command class is supported which can be used to ensure the meter reading is accurate and that no corruption of the data has occurred during the transfer over the radio. If a METER_GET is encapsulated in a CRC16 frame, then the METER_REPORT is returned also encapsulated in a CRC16 frame.

## Firmware Update

The Leak Gopher Meter Reader firmware can be updated in the field using the Firmware Update Command Class. Contact Leak Intelligence for the latest Intel Hex file of the Over-The-Air (OTA) firmware. The Z-Wave system controller must support the Firmware Update command class in order to update the firmware. Refer to the Z-Wave system controller documentation to initiate a firmware update.

It is strongly recommended to bring Leak Gopher Meter Reader within a few feet of the system controller during firmware update. This ensures reliable radio transfer of the firmware and minimizes the duration of the process. The firmware update takes about five minutes of continuous radio traffic so the update should only be done when the rest of the system is not required to be operational.

## Configuration

Version 3 of the Configuration Command Class is supported by the Leak Gopher Meter Reader. Version 3 provides information about the three configuration parameters by interrogating the device itself. Use a CONFIGURATION_NAME_GET command to get a string of ASCII characters that are the name of each parameter. Note that the parameter number field for the CONFIGURATION_NAME_GET command is TWO (2) bytes long instead of just one byte for V1&V2

commands. The name of each parameter is short enough to fit in a single Z-Wave CONFIGURATION_NAME_REPORT frame.

The number of bytes for each configuration parameter, value format, minimum, maximum and default values can be obtained using the CONFIGURATION_PROPERTIES_GET command. The NextParameterNumber field indicates the next parameter to interrogate. The last parameter will have a zero for NextParameterNumber. Note that the parameter number field is again two bytes instead of just a single byte.

A short description of the purpose of each parameter can be obtained via the CONFIGURATION_INFO_GET command. This command will return a series of CONFIGURATION_INFO_REPORT frames. These frames make up a string of English ASCII characters that can be presented to the user to help them determine the desired value for their situation. The proper order of the frames can be determined using the ReportsToFollow field.

## Troubleshooting

| Problem | Solution |
|---|---|
| Not Powering on - No LED lights | Check outlet for power:<br> If there is no voltage check the fuse panel for thrown breaker.<br> If voltage but no power, replace the power supply. |
| Unable to join to a Z-Wave network | Perform a Z-Wave Exclusion on the device first, then try re-including.<br>If that fails, press and hold the Z-Wave button for 30 seconds to do a full Reset to Factory Defaults.<br>Bring the Leak Gopher Meter Reader close to the Z-Wave system controller (3 feet or less). |
| Any other questions | Call our helpline at 855-828-2811 |
| Other sources of technical help | www.z-wavealliance.org www.z-wave.com |

## Technical Specifications

Operating Temperature Range: 5ºC to 80ºC

RF Range: 300 feet minimum line of sight

RF Data Rate: 9.6Kbps, 40Kbps, 100Kbps

RF Frequency: 908/916MHz (US)

RF Interface: ZM5202

Power Supply: 12vdc-1A

Dimensions: 4in X 5 ½in X 2in

Weight: Less than 1lb

## Z-Wave Plus Certification

Certificate number: TBD

This product can be included and operated in any Z-Wave network with other ZWave certified devices from other manufacturers and/or other applications. All non-battery operated nodes within the network will act as repeaters regardless of vendor to increase reliability of the network.

Z-Wave is a registered trademark of Sigma Designs and/or its subsidiaries.

## Limited Warranty & Disclaimer

repair or replacement. Should you need service, during warranty period or beyond, call 855-828-2811 to obtain return authorization before shipping your device to Leak Intelligence, LLC.

Except for the obligation to repair or replace the Leak Gopher Meter Reader as stated herein, Leak Intelligence, LLC shall not be liable for any incidental or consequential damage caused by failure of the Leak Gopher Meter Reader to function as advertised or expected.

Leak Intelligence, LLC technicians, will provide all warranty service and this warranty is void if the device has been opened or serviced by anyone other than a Leak Intelligence, LLC technician.

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