



## Leak Gopher Z-Wave Water Sensor

Model: LGZWWS

Rev 1.10

### Features

- ☞ Water Sensor
  - Built-in water sensing pins
  - RJ11 jack for external sensor
- ☞ Wireless detection using many available Home Automation platforms and security panels
- ☞ Observe via Internet or Smart Phone
- ☞ Prevent expensive water damage even when you're not home
- ☞ Z-Wave Wireless connectivity ○ Advanced Mesh Network
  - 5<sup>th</sup> Generation Technology
  - 300' Radio Range
  - Over-The-Air firmware update
- ☞ Security S2 AES-128 encryption optional
- ☞ Wall powered or battery powered
  - Battery backed up
- ☞ Z-Wave Plus Certified

### Overview

The Leak Gopher Z-Wave Water Sensor is a critical component to protect your home from costly damage due to a water leak. A burst pipe can result in many thousands of dollars of repair costs. The Leak Gopher Z-Wave Water Sensor can notify your Smart Home hub that a water leak has been detected then it can use the Leak Gopher Z-Wave Valve Controller to shut off the water.

Compatible with many security panels and most Home Automation systems, you can observe the Water Sensor from your Smart Phone or computer from anywhere in the world via the Internet.

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



### Ordering Information

LGZWWS

UPC: 857254005486





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## Introduction

The Leak Gopher Z-Wave Water Sensor (LGZWWS) works with Z-Wave enabled security alarm systems and most Home Automation platforms to protect your home or business from water leaks. The Leak Gopher Z-Wave Water Sensor is designed to sense a water leak using either the gold pins on the bottom of the Leak Gopher Z-Wave Water Sensor or an external sensor connected to the RJ11 jack. When the device detects water, the Water Sensor sends a message to a Home Automation system which can be programmed to tell a Leak Gopher Z-Wave Water Valve Controller to automatically turn the water off, protecting your home or business. The Leak Gopher Z-Wave Water Sensor is Z-Wave Plus certified to support the latest Z-Wave Controller capabilities. The optional Security S2 feature provides banking level encryption using AES-128 to ensure secure operation.

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](http://www.z-wavealliance.com)) provides a list of manufacturers of Z-Wave compliant devices. Z-Wave was created by [Sigma Designs](http://www.sigma-designs.com) and more details on the technology can be found at [www.z-wave.com](http://www.z-wave.com).

## Installation

Watch the Leak Intelligence videos on You Tube for detailed installation instructions. Search for “Leak Gopher” on <http://www.youtube.com> to find the latest videos.



### How to install the Leak Gopher Water Sensor

1. Decide where you want to install your Leak Gopher Z-Wave Water Sensor.
2. If the location where you want to install your Leak Gopher Water Sensor has a 110VAC power outlet, we suggest you power your Leak Gopher with the included power adapter. If you power the Leak Gopher with the power adapter, the battery is for battery backup only.
3. If you power the Leak Gopher with the battery as the only power source the Z-Wave capabilities are different than if it is powered by the power adapter. Please see the section Wall powered vs. Battery powered below for more information.
4. If you are using the power adapter, Plug the 5VDC power adapter (included) into the side of the Leak Gopher.
5. Remove the battery cover and install the 3VDC CR123A battery.



6. Place the Leak Gopher where you want the gold pins on the bottom of the Leak Gopher to monitor for a water leak.
7. Include the Leak Gopher into your Z-Wave network (see below).

Depending on your Z-Wave controller, and its capabilities, the Leak Gopher Z-Wave Water Sensor 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 Water Sensor to your Z-Wave Controller

- Plug the wall cube power adapter (included) into the receptacle on the bottom of the Leak Gopher Z-Wave Valve Control marked "5 VDC". Plug the wall cube into a 110 VAC outlet. This provides power to the Leak Gopher Z-Wave Water Sensor.
- 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 and release the Z-Wave button on the front of the Leak Gopher Z-Wave Water Sensor.
- The Z-Wave Controller will acknowledge that the Leak Gopher Z-Wave Water Sensor has been added to the Z-Wave network.
- Your Leak Gopher Z-Wave Water Sensor is ready to use.

## Inclusion without Security

If your home automation hub does not support the Z-Wave Security Command class, tap the Z-Wave button two times. Tapping the button twice will send a simpler message to the hub which will not include the security command classes.

## Inclusion Legacy Mode

If your home automation hub does not support the Z-Wave Notification Command Class, the Leak Gopher Z-Wave Water Sensor can substitute the simpler Binary Switch command class. To enable Legacy Mode, tap the Z-Wave button three times during inclusion. Virtually all hubs support the Binary Switch command class.

## Z-Wave Exclusion

How to Remove the Leak Gopher Z-Wave Water Sensor from your Z-Wave Controller

- Plug the wall cube power adapter (included) into the receptacle on the bottom of the Leak Gopher Z-Wave Water Sensor marked "5 VDC". Plug the wall cube into a 110 VAC outlet. This provides power to the Leak Gopher Z-Wave Water Sensor.



- 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 and release the Z-Wave button on the Leak Gopher Z-Wave Water Sensor.
- The Z-Wave Controller will acknowledge that the Leak Gopher Z-Wave Water Sensor has been excluded from the Z-Wave network.
- Your Leak Gopher Z-Wave Water Sensor is excluded from this controller.
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## Reset to Factory Defaults

### How to reset the Leak Gopher Z-Wave Water Sensor

- If the exclusion process above is not working or the Z-Wave controller was 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 Z-Wave Water Sensor Z-Wave radio and routing tables, press and HOLD the Z-Wave button for 15 seconds. The LED will blink very quickly while holding the Z-Wave button down. Once the LED turns off, release the Z-Wave button.

## LED Indicator

The blue LED on the face of the Leak Gopher Z-Wave Valve Control indicates the current mode of the LGZWWS.

LED	Description
DARK	Power is off or running on batteries
BLINKS slowly once every other second	Not joined to a Z-Wave network - Press the Z-Wave button to join LED will go out after 4 minutes if operating on battery power.
BLINKS quickly twice per second after pressing the Z-Wave button	Attempting to either Include or Exclude from a Z-Wave network. Expires after about 10 seconds.
BLINKs very quickly	A water leak has been detected!
BLINKs ON briefly every 2 seconds	If the LED is OFF most of the time and briefly “winks” ON every 2 seconds, then the LGZWWS is awake, connected to the Z-Wave network and operating normally

## Wall powered vs. Battery powered

The Leak Gopher Z-Wave Water Sensor can be powered exclusively using the CR123A battery or it can use both the battery and the included 110VAC wall adaptor. If a wall outlet is within reach of the desired water leak detection location, it is recommended to use 110VAC wall power. When wall powered, the Leak Gopher Z-Wave Water Sensor improves the Z-Wave mesh network and provides another Z-Wave repeater in the network. When battery powered, the Leak Gopher Z-Wave Water



Sensor will use the Z-Wave mesh network but cannot act as a Z-Wave repeater. Battery life of the LGZWWSS is approximately one (1) year under typical conditions. The battery back-up feature however only provides about one day of battery backup in the event of a power loss.

Whichever method of powering the Leak Gopher Z-Wave Water Sensor is chosen, it is critical that the proper method be used when joining the Z-Wave network. When the Leak Gopher Z-Wave Water Sensor is included into the Z-Wave network the low-power mode is enabled if battery powered.

Do NOT include the Leak Gopher Z-Wave Water Sensor into the Z-Wave network with the power adaptor plugged in if you intend to use the Leak Gopher Z-Wave Water Sensor powered by battery. In this case the battery will only last about one day. However, the reverse is acceptable. If you intend to power the Leak Gopher Z-Wave Water Sensor with a battery and include it into the Z-Wave network while battery powered, you can then power it with the wall adaptor and then only draw on the battery when there is a power outage. This method will make the battery last a very long time in a power outage. However, the Leak Gopher Z-Wave Water Sensor will not improve the Z-Wave mesh network in this mode. When the Leak Gopher Z-Wave Water Sensor is wall powered, the battery reading is always 100% (with firmware revision 1.10 or later).

#### Recommendations:

1. If wall power is not readily available, join the Leak Gopher Z-Wave Water Sensor using just the battery for power.
  - a. Typical battery life is over 1 year in normal operation.
2. If wall power is available, join the Leak Gopher Z-Wave Water Sensor while using the wall power.
  - a. If battery backup of 1 day is enough, insert a battery. The battery will last for many years as the backup but can only be read when running on battery power.
  - b. If battery backup is not needed, then do not install a battery. Remember that the other parts of the Z-Wave network will also need back-up power, especially the Z-Wave hub which may also require access to the internet even during a power outage.
3. If more than 1 day of backup power is needed (ex: you often have 2+ day long power outages), then join the Leak Gopher Z-Wave Water Sensor using ONLY the battery. Once joined, then plug the power supply in.

The **power mode** is selected based on the power used when joining the Leak Gopher Z-Wave Water Sensor to the Z-Wave network. If Wall Powered when joined, the device will use power constantly and use up a battery in a little over 1 day. If Battery Powered when joined, the device will sleep most of the time and use very little power but will wake up as soon as water is detected. To change power modes, exclude then use the proper power method and re-include to the Z-Wave network.



When joined using Wall Power, the Z-Wave Battery Command Class is not included and thus typically the Hub will not display a battery value. That is how you know if you are in wall or battery mode.



### Software Developer Technical Information

This section is intended for home control software developers to support Leak Gopher Z-Wave Water Sensor in their home control software. Users of Leak Gopher Z-Wave Water Sensor 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 [SiLabs.com](http://SiLabs.com). Specific details of how each command class is used by the LGZWWS are described below.





## Z-Wave Command Classes

Command Class	Purpose	Version
NOTIFICATION	Notification Command Class Type of Water Alarm (0x05) with an event of Water Leak Unknown Location (0x02) is sent when water is detected and an Event of 0x00 when dry.	8
ZWAVEPLUS_INFO	Provides the Z-Wave Role Type, Node Type and Icon	2
VERSION	Provides the firmware version, SDK version and version of each command class	2
MANUFACTURER_SPECIFIC	Provides the Manufacturer ID, Product ID and Product type ID to uniquely identify the LGZWWS.	2
DEVICE_RESET_LOCALLY	When the LGZWWS is reset locally, a notification is sent to the controller to inform that the LGZWWS has been reset to the factory defaults and is no longer part of the Z-Wave network.	1
ASSOCIATION	Assigns the destination for changes in the state of the moisture	2
ASSOCIATION_GRP_INFO	Details on the LifeLine association Group	1
POWERLEVEL	Can be used to measure the quality of the radio link	1
WAKEUP <sup>1</sup>	Set the interval between battery reports	2
BATTERY <sup>2</sup>	Reports the status of the battery level	1
BASIC	BASIC GET will return a BASIC REPORT of the state of water detection - 0x00=Dry, 0xFF=Wet	1
FIRMWARE_UPDATE_MD	Firmware in the LGZWWS can be updated via this class	4
SECURITY	If joined as a Secure device, all Z-Wave transfers are AES-128 encrypted. S0 is not recommended in battery powered mode as it will shorten the battery life. Recommendation is to use Security S2 or normal mode. Double tap when joining to not use Security.	1
SECURITY_2	Security S2 UnAuthenticated level is supported. No PIN codes are necessary to join. All transfers are AES-128 encrypted with minimal delays or battery drain.	1
SUPERVISION	Part of the Security_2 framework	1
TRANSPORT_SERVICE	Part of the Security_2 framework	2
BINARY_SWITCH	If joined using Legacy Mode, BINARY_SWITCH replaces Notification Command Class.	1

The Z-Wave command class version supported by the firmware in the LGZWWS can be obtained via the VERSION\_COMMAND\_CLASS\_GET command. Note that the firmware may support a later version than what is documented here.

<sup>1</sup> WAKEUP command class is not present in the Node Information Frame if the device is wall powered during Inclusion

<sup>2</sup> BATTERY command class is not present in the Node Information Frame if the device is wall powered during Inclusion



## Association and Association Group Info

The LGZWWS has a single Association Group, Group 1 also known as the “Lifeline” group as required for Z-Wave Plus certification. Typically the Z-Wave system controller or Hub will automatically assign itself to Group 1. A single NodeID can be assigned to Group 1 which is typically the Hub.

When the water leak is detected a Notification Command Class command is sent to the NodeID in Group 1. Thus, it is critical that the Z-Wave system controller configure Association Group 1 with its NodeID when the LGZWWS is joined to a Z-Wave network.

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 LGZWWS.

## Notification

When a water leak is detected a NOTIFICATION\_REPORT with a Notification Type of WATER\_ALARM (0x05) and an Event of 0x02 (Water Leak Detected, Unknown Location) will be sent to the nodeID in Association group 1. The Z-Wave system controller should then inform the user that a water leak has been detected and the water valve should be closed to prevent damage to the home. A Notification Event of Event Inactive (0x00) is sent when the water leak is no longer present. The state of the water leak can also be polled if the LD is awake. When running on battery, the detection of the leak no longer being present typically takes four (4) minutes.

Version 1 of the Alarm command class is supported but not recommended. The state of the water detection can be obtained with an Alarm Get which will return a Type of 0x05 and a Level of 0 for dry conditions and 0x02 if a water is detected. The Notification command class replaced the Alarm command class version 1 and 2.

## Basic

The BASIC command class can be used to determine the state of the water leak. The BASIC\_SET command is ignored. A BASIC\_GET will return a BASIC\_REPORT with either 0x00 (No water leak) or 0xFF(water leak detected!).

## Z-Wave Plus Info

When wall powered, the LGLD identifies itself as an SLAVE\_ALWAYS\_ON with an Icon type of SENSOR\_NOTIFICATION\_WATER\_SENSOR. When battery powered it is a SLEEPING\_REPORTING\_SLAVE.



## Battery Powered Only

Wakeup and Battery command classes are present in the NodeInformationFrame (NIF) upon joining the Z-Wave network if the LGZWWS is operating on battery power alone. If the LGZWWS is wall powered during the joining process, then these two command classes are not included in the NIF.

## Wakeup

The Wakeup Command Class is used to set the interval between battery readings. A WakeUpNotification is also sent to the hub and the LGZWWS remains awake for a few seconds so the hub can communicate with it if desired. The default interval is 12 hours. Note that setting the default to small values will shorten battery life.

## Battery

The Battery Command Class reports the status of the battery in percentage when powered with the battery. When wall powered, the battery reading is always 100%. To get a battery reading the wall power must be removed while the battery is installed. A low-battery report is sent when the battery level crosses below the 20% level. When the battery reaches 0% it will go into a deep low-power mode and will no longer communicate until a new battery is installed. Note that the CR123A Lithium battery reading falls off quickly as the battery approaches the end of life. Thus, the battery percentage will tend to fall very slowly at first and then drop quickly at the end of its service life. Battery reports are ONLY sent if joined as a battery powered device. If joined as a wall powered device, the state of the battery is not reported even if the battery is used as a backup-battery.

## Firmware Update

The LGZWWS 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 firmware for the LGZWWS. 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 LGZWWS within a few feet of the system controller. 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. Operating the LGZWWS using the 110VAC power adaptor is also recommended during firmware update. It is also recommended to include LGZWWS using the non-secure mode (tap 2 times during inclusion) as the security overhead will make the firmware update take much longer.

Often after a firmware update the LGZWWS may forget the HomeID and NodeID it was assigned. It will have reverted to the factory defaults and will need to be re-included. Use the Replace Node method of inclusion if supported by your hub.



## Legacy Mode

Some automation hubs do not support the Notification Command Class. Legacy mode simplifies the software interface for the automation hubs by informing the hub that the simple Binary Switch command class is supported instead of the Notification Command Class. Nearly all automation hubs support Binary Switch command class.

Legacy mode is enabled when the LGZWWS is included in the Z-Wave network. To enable Legacy mode, tap the Z-Wave button three (3) times.

## Binary Switch

When Legacy mode is enabled, a Binary Switch Report is sent instead of the Notification command class. A value of 0xFF (Switch is ON) indicates water has been detected, a value of 0x00 (Switch is OFF) indicates water is not present. Sending a Binary Switch SET command is ignored. The state of the water detected is always returned on a Binary Switch GET. Note that the Binary Switch Report will be automatically sent to the Lifeline NodeID when water is detected or when it is no longer detected.



## Troubleshooting

Problem	Solution
Not Powering on - No LED lights	<p>Check outlet for voltage:                      If there is no voltage check the fuse panel for thrown breaker.                      If voltage but no power, replace the power supply.</p>
Unable to join to a Z-Wave network	<p>Perform a Z-Wave Exclusion on the device first, then try re-including. If that fails, do a full Reset to Factory Defaults.                      Bring the LGZWWS close to the Z-Wave system controller (3 feet or less).</p>
Battery life is only a few hours or a few days	<p>Exclude the LGZWWS from the Z-Wave network                      Remove the wall adaptor from the LGZWWS plug                      Insert a new CR123A battery                      Include the LGZWWS into the Z-Wave network                      If the LGZWWS is wall powered when joined to a Z-Wave network, it assumes the battery is only for battery backup purposes and that it does not need to go into the low power sleep mode and thus will drain the battery in a few hours.</p>
Hub is unable to complete Inclusion	<p>If a home automation hub is unable to complete “pairing” or inclusion, try excluding the LGZWWS, then instead of just pressing the Z-Wave button once, press it twice quickly. A double-tap of the Z-Wave button removes the Z-Wave Security command classes which some hubs do not support.</p>
Hub is doesn't show a water leak detection	<p>If your home automation hub does not support the Z-Wave Notification command class it will not understand the commands the LGZWWS is sending. Exclude the LGZWWS from the hub, then tap the Z-Wave button three times. This will send a message to the hub replacing the complex Notification command class with the simple Binary Switch command class which virtually all hubs support. The water detector will then show up as a simple switch which is ON when water is detected and OFF when it is not.</p>
No battery reports but I am running on batteries	<p>Sometimes the measurement of the battery level thinks the device is running on wall power when in fact it is running on batteries. In this case, exclude and then re-include. Since the device has been running on batteries for a few minutes the battery voltage will have dropped enough for the battery measurement to be accurate.</p>



Problem	Solution
Z-Wave button does not turn the LED on	Make sure the LGZWW5 water sensor is dry. If the sensor is detecting water then it cannot detect the Z-Wave button has been pressed. Remove power, dry the water detector, restore power and the Z-Wave button should work properly.
Any other questions	Call our helpline at 855-828-2811
Other sources of technical help	<a href="http://www.z-wavealliance.org">www.z-wavealliance.org</a> <a href="http://www.z-wave.com">www.z-wave.com</a>

## Technical Specifications

Operating Temperature Range: 5°C to 80°C

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: 5VDC or 3VDC CR123A Battery

Dimensions: 2.5" X 5 3/8" X 1"

Weight: Less than 1lb



## Z-Wave Plus Certification

Certificate number: [ZC10-17055593](#)

This product can be included and operated in any Z-Wave network with other Z-Wave 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

Leak Intelligence, LLC will repair or replace, at its option, any part of the device, which proves to be defective in workmanship or material under normal use, in the USA except in the states of Alaska or Hawaii, for a period of three years from the date the device is purchased. During the warranty period, Leak Intelligence, LLC will repair and provide all parts necessary to correct such defects, free of charge, provided the device has been operated in accordance with the manufacturer's guidelines. The Customer will return the device to Leak Intelligence, LLC for testing and 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 as stated herein, Leak Intelligence, LLC shall not be liable for any incidental or consequential damage caused by failure of the Leak Gopher 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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Leak Intelligence, LLC does not guarantee the leak notification service in regards to notification of leaks. Leak Intelligence, LLC is not responsible for any value of water loss, commercial loss or any property damage, or for any other loss or damage caused or incurred as a result of the failure of the device and/or failure of the notification service.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state. To know what your legal rights are in your state, consult your local or state consumer affairs office or your state's Attorney General.

Your state laws or local ordinances may require that a licensed plumber perform installation of this device. The manufacturer is not responsible for enforcement of your states law or local ordinances.

Damage limitation warning; In no event shall manufacture be liable for any incidental or consequential damages including water damage, damage to other property by water, loss of use of the product, loss of time, inconvenience, travel expense, lodging expenses, lost by damage to personal property, loss of income, profits or revenues.

## Document History

The Revision of this document tracks the version of the firmware as reported using the Version command class. Note that revisions will increment by more than 0.01 to allow for branches if needed.

Revision	Date	Comments
1.10	8/10/2018	Improved battery measurements. When on wall power the battery level is reported to be 100%. When on battery power the report is 99% or lower. Previously the battery level might read in the 90s when on wall power and a new battery often read only 60%.
1.06	5/9/2017	Minor corrections related to security S0 support
1.04	5/1/2017	Z-Wave Certification release – SDK 6.71.01