

Flow Meter

Technical User Manual



INTRODUCTION

Flow Meter is a Z-WavePlus™ enabled device that measures water flow. Detects, measures, and monitors your water utility and it will send alerts on your Z-Wave™ network. The FMI is compatible with other Z-Wave™ and Z-WavePlus™ certified products. *For the latest User Manual, go to www.fortrezz.com*

SPECIFICATIONS for FMI (Z-WavePlus™ enabled device)

Power:	5 volts (nominal) DC from regulated Power supply @~ 500mA capability with optional AA alkaline battery (2) backup
Battery Life (without AC Mains):	40 hours depending on battery capacity/quality and no alarms and default Z-Wave network settings. The FMI typically is not powered by the AA batteries. The batteries are optional; they will keep the FMI functional during short power outages and will maintain continuity of the water usage data for customers who prefer to have historical usage data. The battery life while running on AC main power is generally the normal shelf life.
Frequency Range:	908.4MHz (US); 868.4MHz (EU)
Distance Range:	Max 100ft line of sight in unobstructed environment
Enclosure Size (LxWxD):	3" (76 mm) x 2.1" (53mm) x 1.1" (30mm)
Weight:	0.25 lb (110 g)
Operating Temperature:	-10°C (14F) to +70°C (158F)
Input Signal 1 (SIG1):	Digital Input 0 to 16V DC, minimum 32 ms high or low time.



SPECIFICATIONS for Flow Meter Body

Maximum Pressure:	150 psi
Maximum Temperature:	122°F
Accuracy:	Normal Flow: ± 1.5% / Low Flow: ± 3%
Minimum Flow Rate (GPM):	0.25 (3/4") / 0.75 (1")
Maximum Flow Rate (GPM):	20 (3/4") / 50 (1")
Materials:	Body & Coupling – EcoBrass; Internals – Engineered thermoplastic; Magnet – Alnico
Pulse Output Cable:	Micro USB cable ~5 ft.
Pulse Rate:	10 pulses / gallon
Weight (lbs.)	¾": 4.25 lbs. / 1": 6.5 lbs.

WARNINGS AND PRECAUTIONS

- **Do not store highly flammable items such as oily rags or other combustibles near your FMI.**
- **Do not apply electrical power to the unit unless the unit is fully assembled to avoid shock.**
- **Install unit in accordance with electrical & plumbing codes and regulations. In case you are unsure about any part(s) of these instructions consult a licensed electrician, plumber and/or professional Z-Wave™ home automation specialist.**
- **Functionality is based on wireless radio frequency (RF) transmissions. Any wireless transmission can be subject to RF interference or loss of communication. This interference or loss of communication may cause the unit to not operate as intended. You are responsible for ensuring that the FMI functionality and installation meets your desired requirements.**
- **WARNING: The FMI must not be used in life support and/or safety applications.**
- **Do not place FMI on or near large metal objects. This decreases the range and/or blocks the wireless transmissions.**
- **Information provide in this manual is for your convenience and may be superseded by updates. This manual is subject to change without notice.**
- **WARNING: It is against the Law to remove or tamper with an existing city meter!**
- **WARNING: Do not abruptly open water supply after meter install. The sudden pressure may damage the meter!**



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Using the Flow Meter in a Z-Wave™ Network

Program Switch for Inclusion or Exclusion The switch is used for including or excluding the FMI in a Z-wave™ network. Refer to your controller's User Manual for specific details on network inclusion, exclusion, and association.

- **Inclusion** in (adding to) a network: 1) Set up the inclusion mode at the controller; 2) Press the switch once and the controller will indicate the unit has been included in the network. Also, the LED will blink when the inclusion completes. *Inclusion and exclusion are always done at normal transmit power mode. 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.*
- **Exclusion** from (removing from) a network: 1) Set up the exclusion mode at the controller; 2) Briefly press the switch once and then release. The controller will indicate the unit has been removed from the network. The LED will blink when the exclusion completes.

Associations: Once in a network, a controller can be used to associate the FMI with other devices in the Z-Wave™ network, such as a light or a remote audible alarm. Refer to your controller's documentation on how to associate FMI with another device in your network. The FMI supports four association groups (including the controller Lifeline) with a maximum of five devices in each group. Refer to the Association section below for details on the FMI association groups.

Node Info / Keep-Alive: The FMI will send the Z-Wave™ Node information frame when the switch is briefly pressed. This is primarily used for inclusion as described above; however, status information is also sent after a button press.

Status Indications The FMI provides a status light to indicate various situations. As shown in the table below, the light blinks a variable number of times, fast or slow, periodically or only once.

Fast Blinks	Slow Blinks	Periodic?	Description
1			Button has been pressed
	1	Yes	Network-Wide Inclusion (NWI) mode (automatically entered at power-up when not 'in-network')
2			FMI is 'in-network' (indication after inclusion and after power up)
	2		Main Power (+5V adapter) has dropped out
4		Yes	FMI is 'out-of-network' (indication after button is pressed during NWI mode without inclusion or after 30 second timeout from NWI mode)
	3		Waiting for Over-The-Air firmware update (initiated by pressing the button quickly three times in a row; exit by another button press)
30 (approx.)			After a device reset has been completed (initiated by holding the button and then releasing after 15 or more seconds)

During an alarm

If flow is detected or over/under-temperature or power low conditions are detected, the unit will send an alert message(s) to the Z-Wave™ network (if included in the network). The type of alert message depends on how the FMI is configured. If associations are configured, Basic Set messages will be sent for water flow as described below under *Associations*. If Heat or Power Alarms have been configured (via the Notification Command Class), then the FMI will send alert messages to the Lifeline group (Association Group 1). Association alert messages and Alarm alert messages may both be configured and sent. If an over/under temperature Alarm occurred and the temperature alarm conditions are no longer present, an 'alarm clear' message is also sent.

Also, depending on your Z-Wave™ controller, it is possible to receive a remote alert from the FMI. For example, with some gateway controllers, you can receive an email or cell phone text message when an alarm is activated. Depending on your specific controller's capabilities you will be able to remotely check the status of any FMI in your network.

Low Power & Battery

The FMI will send an alert on the Z-Wave™ network at regular intervals when it detects a low power condition on the main adapter. (See the Lifeline description in the Association section below.) These messages will be 'AC Mains Disconnected' notifications. Two AA batteries may also be installed for back-up in case of AC main power loss. If these batteries are new or fully charged they should provide enough power under normal power loss conditions to avoid resetting the device and losing the meter count. Do not rely on these batteries for more than 40 hours (less if the batteries are old). New batteries should be installed (while keeping the device powered with the main adapter) after lengthy power dropouts, or when the low battery indication is given. Do not install batteries that appear damaged or unsealed.

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Configuring the Flow Meter via Z-wave™

Refer to your controllers' manual on how to send configuration commands.

Temperature Alarms:

- The high and low temperature set points can be configured via Z-wave™. The low setpoint must always be set at least 2 degrees C below the high setpoint. The low setpoint cannot be less than -10 deg C, and the high setpoint cannot be higher than 70 deg C.

Meter Count Reset:

- The meter count can be reset back to "0" via Z-wave™ configuration parameter 3 (see below table)

Report Interval:

- The time interval between meter reports while water is flowing can be set in increments of 10 seconds. Default is 1 minute (60 seconds)

Flow Threshold Alarms:

- Water Flow threshold is set by default to 5 gallons / minute. Flow above 5 gallons / minute will display "High flow". This can be configured to a different value.

Water Flow - Notification Commands Vs Multi-Level Sensor Report:

- While water is flowing, the meter can be configured to send a Notification report or a Multilevel Sensor report to the Lifeline. The Notification report is for Water (Type 5) with a water flow event type (6) and event parameters below threshold (2) or above threshold (3). The Multilevel Sensor report is similar. A General Purpose Sensor report is sent with value of 0 for inactive, 128 below threshold and 255 above threshold.
- Use this configuration command to toggle between Notification and Multi-Level Sensor. By default, Notification command class is used.

CONFIGURATION Parameters Table

PARAMETER	DESCRIPTION	DEFAULT VALUE	SIZE (bytes)	POSSIBLE VALUES
1	Temperature Low threshold	4°C	1	-10°C thru 69°C
2	Temperature High threshold	70°C	1	-9°C thru 70°C
3	Meter Count (tenths of gallons)	0	1,2,4	0 – 99,999,999 <small>(count rolls over at 99,999,999)</small>
4	Meter Report Interval, <u>while</u> liquid flow is detected <ul style="list-style-type: none"> If 0 is set, then no continuous reporting during liquid flow <i>Note: Report is sent every 10 hours whether or not flow is detected.</i>	6 <small>(60 seconds)</small>	1	0 to 255
5	Meter Leak Threshold. Set the threshold count for reporting Flow vs High Flow. Default set to 50 (5 gallons) <ul style="list-style-type: none"> Flow above 5 gallons/min sends (Above Threshold / 255) Flow below 5 gallons / min sends (Below Threshold / 128) <i>Note: If MLS enabled, Value of 0 = No flow detected (during interval)</i>	50 <small>(5 gallons) (10 = 1 Gallon)</small>	1,2 <small>(max)</small>	0 to 65535
6	NOTIFICATION Commands vs. Multi-Level Sensor Toggle <i>Notifications set as default – Value "0"</i> <i>To enable MLS – Value set to any number except 0</i>	0	1	0 (disabled), Non-zero (enabled)

ASSOCIATIONS

Once in a network, your controller can be used to associate the FMI inputs with other devices in the Z-Wave™ network, such as a light or remote audible alarm. For example, when an unexpected flow is detected, the FMI can be set up to automatically send a command to turn on a device(s) associated with that condition, such as a flashing light. *Refer to your controller's documentation on how to associate the FMI with another device in your network.* The FMI supports four association groups with a maximum of 5 associated devices in each group. The association groups and functionality are listed in the table below. The Lifeline association should be automatically set up by your controller if it is Z-Wave™ Plus compatible.

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Note that Association Group 1 (Lifeline) allows the temperature to be sent to an associated device (such as the controller). The FMI sends the temperature when it changes but no more often than 30 seconds. If the temperature is toggling between two consecutive numbers the FMI performs filtering to avoid continually sending reports.

Association Group (Name)	Max. Associations per Group	Supported Events (Command Classes)
1 (Lifeline – the controller should automatically set up this association)	5	<ul style="list-style-type: none"> • Device Reset Locally (via 3 quick presses of the program switch) • Multilevel Sensor Temperature Report • Meter Pulse Report (flow count) • Notifications <ul style="list-style-type: none"> ▪ Under temperature detected ▪ Over temperature detected ▪ Power (Voltage Drop/Droop)
2	5	Basic Set Command with value = 0xFF is sent to the associated nodes to indicate that a Temperature High condition has been detected. When the temperature is back in the normal range, one additional report with value = 0x00 is sent.
3	5	Basic Set Command with value = 0xFF is sent to the associated nodes to indicate that a Temperature Low condition has been detected. When the temperature is back in the normal range, one additional report with value = 0x00 is sent.
4	5	Basic Set Command with value = 0xFF is sent when the meter count is incremented (i.e., flow has started). Do not set associations for this group if water flow is expected. When flow is not expected (for example, at a vacant vacation home), this association group can be set to perform various tasks such as commanding a water valve to open in order to stop the flow of water and/or commanding a siren/strobe unit to activate. Since the Basic Set Command (value 0xFF) is sent every 30 seconds while the water is flowing; this commanding should be turned off by removing the associations in this group if water flow is normally expected. Note that no command is ever sent with a value of 0x00 because the FMI cannot know if or when conditions have returned to normal.

FMI Reset & Firmware Update

The program button can be pressed once to include or exclude the FMI from a network by sending a Node Information Frame. The single button press will put the unit into Network Wide Inclusion (NWI) mode or will take it out of NWI mode. The following button press sequences can also be performed.

- **Device Reset to Factory Defaults** – Press and hold the button for 15 or more seconds and then release. This can be done while the device is either in or out of a network, but not while in NWI mode. **CAUTION – When a reset is done in-network, the device will no longer be in the network. All configurations and associations will be set to default.**
- **Enter Over-the-Air (OTA) Firmware Update mode** – Quickly press the program button three times while in-network. **Warning – This should not be done unless a firmware update will be immediately started at the controller. Do not allow the OTA mode to continue indefinitely without starting the firmware update at your controller; otherwise, the potential for your FMI to be hacked is increased.** Refer to your controller’s manual for update procedures. Press the button once to exit the OTA mode.

MORE RESOURCES

For more troubleshooting help, online resources, and more, please visit our website or contact us.

www.fortrezz.com

Contact US

Main office: (248) 481-7092

Hours: (M-F 9am-5pm EST) *

Sales & Product Inquiries: sales@fortrezz.com

Tech Support / Warranty Inquiries: support@fortrezz.com



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TECHNICAL APPENDIX

Z-Wave™ INFORMATION

Node Information Frame (NIF): Always listening flag set, Optional functionality flag set
Manufacturer ID 0x0084
Product Type ID 0x0473 (US) 0x0471 (EU)
Product ID varies

Device Type / Supported Command Classes

Generic Device Type: GENERIC_TYPE_SENSOR_MULTILEVEL
 Specific Device Type: SPECIFIC_TYPE_ROUTING_SENSOR_MULTILEVEL

COMMAND_CLASS_ZWAVEPLUS_INFO_V2
 COMMAND_CLASS_VERSION_V2
 COMMAND_CLASS_MANUFACTURER_SPECIFIC_V2
 COMMAND_CLASS_DEVICE_RESET_LOCALLY_V1
 COMMAND_CLASS_ASSOCIATION_GRP_INFO_V1 (Info about Root Associations)
 COMMAND_CLASS_NOTIFICATION_V7 (Power Management, Water Flow, and Heat alarm handling)
 COMMAND_CLASS_ASSOCIATION_V2 (Refer to Association Section)
 COMMAND_CLASS_POWERLEVEL_V1
 COMMAND_CLASS_BASIC_V1 (for controlling associated nodes during/Heat alarms; received Basic Set commands are ignored)
 COMMAND_CLASS_METER_V2 (Default scale: Gallons with precision 1 = tenths of gallons)
 COMMAND_CLASS_SENSOR_MULTILEVEL_V8 (Temperature sensor and General Purpose sensor types)
 COMMAND_CLASS_CONFIGURATION_V1
 COMMAND_CLASS_FIRMWARE_UPDATE_MD_V2
 COMMAND_CLASS_BATTERY_V1

Status Indications

Fast Blinks	Slow Blinks	Periodic?	Description
1			Button has been pressed
	1	Yes	Network-Wide Inclusion (NWI) mode (automatically entered at power-up when not 'in-network')
2			FMI is 'in-network' (indication after inclusion and after power up)
	2		Main Power (+5V adapter) has dropped out
4		Yes	FMI is 'out-of-network' (indication after button is pressed during NWI mode without inclusion or after 30 second timeout from NWI mode)
	3		Waiting for Over-The-Air firmware update (initiated by pressing the button quickly three times in a row; exit by another button press)
30 (approx.)			After a device reset has been completed (initiated by holding the button and then releasing after 15 or more seconds)

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COMMAND CLASS CONFIGURATION Parameters

PARAMETER	DESCRIPTION	DEFAULT VALUE	SIZE (bytes)	POSSIBLE VALUES
1	Temperature Low threshold	4°C 0x04	1	-10°C thru 69°C 0xF6 thru 0x45
2	Temperature High threshold	70°C 0x46	1	-9°C thru 70°C 0xF7 thru 0x46
3	Meter Count (tenths of gallons)	0	1,2,4	0 – 99,999,999 0 – 0x7FFFFFFF <small>(count rolls over at 99,999,999)</small>
4	Meter Report Interval, <u>while</u> liquid flow is detected <ul style="list-style-type: none"> If 0 is set, then no continuous reporting during liquid flow <i>Note: Report is still sent every 10 hours whether or not flow is detected.</i>	6 (60 seconds)	1	0 to 255 0 to 0xFF
5	Meter Leak Threshold. Set the threshold count for reporting Flow vs High Flow. Default set to 50 (5 gallons) <ul style="list-style-type: none"> Flow above 5 gallons/min sends (Above Threshold / 255) Flow below 5 gallons / min sends (Below Threshold / 128) <i>Note: If MLS enabled, Value of 0 = No flow detected (during interval)</i>	50 (5 gallons) <small>(10 = 1 Gallon)</small>	1,2 (max)	0 to 65535 0 to 0xFFFF
6	NOTIFICATION Commands vs. Multi-Level Sensor Toggle <i>Notifications set as default – Value “0”</i> <i>To enable MLS – Value set to any number except 0</i>	0	1	0 (Notification) Non-zero (MLS)

Associations

Association Group (Name)	Max. Associations per Group	Supported Events (Command Classes)
1 (Lifeline – the controller should automatically set up this association)	5	<ul style="list-style-type: none"> Device Reset Locally (via 3 quick presses of the program switch) Multilevel Sensor Temperature Report Meter Pulse Report (flow count) Notifications <ul style="list-style-type: none"> Under temperature detected Over temperature detected Power (Voltage Drop/Droop)
2	5	Basic Set Command with value = 0xFF is sent to the associated nodes to indicate that a Temperature High condition has been detected. When the temperature is back in the normal range, one additional report with value = 0x00 is sent.
3	5	Basic Set Command with value = 0xFF is sent to the associated nodes to indicate that a Temperature Low condition has been detected. When the temperature is back in the normal range, one additional report with value = 0x00 is sent.
4	5	Basic Set Command with value = 0xFF is sent when the meter count is incremented (i.e., flow has started). Do not set associations for this group if water flow is expected. When flow is not expected (for example, at a vacant vacation home), this association group can be set to perform various tasks such as commanding a water valve to open in order to stop the flow of water and/or commanding a siren/strobe unit to activate. Since the Basic Set Command (value 0xFF) is sent every 30 seconds while the water is flowing; this commanding should be turned off by removing the associations in this group if water flow is normally expected. Note that no command is ever sent with a value of 0x00 because the FMI cannot know if or when conditions have returned to normal.

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