



SA-102

Smart In Wall Dual Switch

User Manual



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- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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.

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When replacing old appliances with new once, the retailer is legally obligated to take back your old appliance for disposal at least for free of charge.

## Disposal



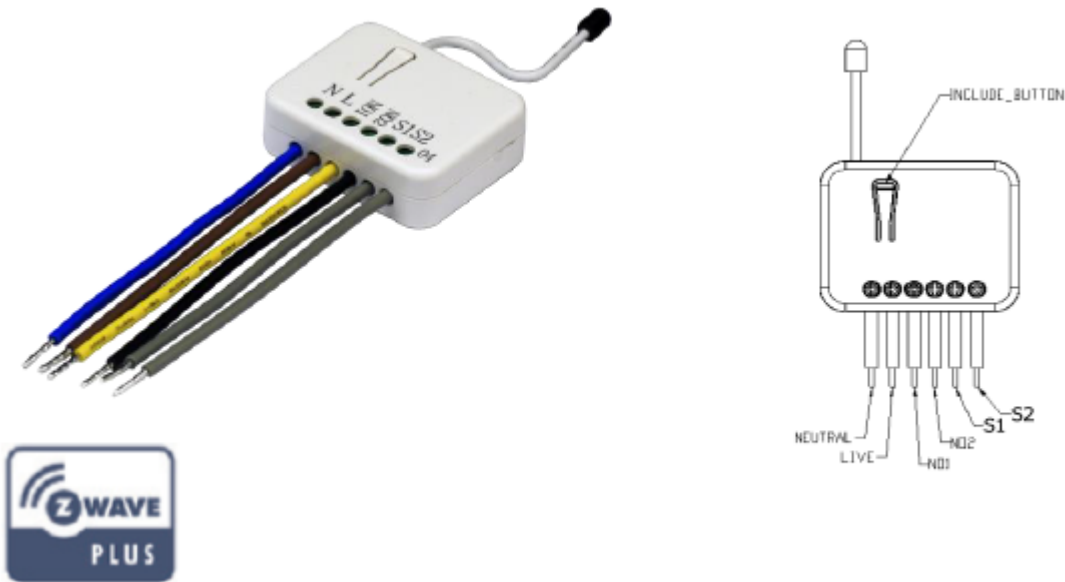
This marking indicates that this product should not be disposed with other household wastes throughout the EU. To prevent possible harm to the environment or human health from uncontrolled waste disposal, recycle it responsibly to promote the sustainable reuse of material resources. To return your used device, please use the return and collection systems or contact the retailer where the product was purchased. They can take this product for environmental safe recycling.

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# Overview



This in-wall dual relay switch module is a transceiver which is a Z-Wave Plus™ enabled device and is fully compatible with any Z-Wave™ enabled network. Mini size design let the module can easily hide itself into the wall box and that will be good for the house decoration.

There are many kind of application by using the module to switch AC power on and off, one main application is the light control. The new smart relay calibration technology can reduce the inrush current caused by the load and let the module work perfectly with many kind of light like incandescent, fluorescent and LED light.

This in-wall switch module is able to detect Instant power wattage and overload current (7.5A with resistive load) of connected light or appliances. When detecting overload state, the Module will be disabled and its On/Off button will be lockout of which LED will flash quickly. However, disconnect and re-connect the Module will reset its overload condition to normal status.

## 1.1 Adding to Z-Wave™ Network

In the front casing, there is an on/off button with LED indicator below which is used to toggle switch on and off or carries out inclusion, exclusion, reset or association. When first power is applied, its LED flashes on and off alternately and repeatedly at 0.5 second intervals. It implies that it has not been assigned a node ID and start auto inclusion.

## 1.2 Auto Inclusion

The function of auto inclusion will be executed as long as the in wall switch does not have Node ID and just connect the switch to main power.

**Note:** Auto inclusion timeout is 2 minute during which the node information of explorer frame will be emitted once every several seconds. Unlike “inclusion” function as shown in the table below, the execution of auto inclusion is free from pressing the On/Off button on the Switch.

The table below lists an operation summary of basic Z-Wave functions. Please refer to the instructions for your Z-Wave™ Certificated Primary Controller to access the Setup function, and to include/exclude/associate devices.

Function	Description	Annotation
No node ID	The Z-Wave Controller does not allocate a node ID to the Switch.	LED 2-second on, 2-second off
Inclusion	1. Put your Z-Wave controller into inclusion mode by following the instructions provided by the controller manufacturer. Pressing INCLUDE_BUTTON three times within 2 seconds will enter inclusion mode.	One press one flash LED
	Exclusion	
Reset	Pressing INCLUDE_BUTTON three times within 2 seconds will enter inclusion mode.	One press one flash LED
	Within 1 second, press On/Off button again for 5 seconds.	
	IDs are excluded.	LED 0.5s On, 0.5s Off (Enter auto inclusion)

Association	<p>The SA-102 is an always listening Z-Wave device, so associations be added or removed by a controller at any time.</p> <p>Or If your controller requires to have the SA-102 send a 'node information frame' or NIF for associations, pressing the On/Off button three times within 2 seconds will cause the SA-102 to send its NIF.</p>	LED one press one flash
	There are 3 groups for the switch	
<ul style="list-style-type: none"> <li>• Including a node ID allocated by Z-Wave Controller means inclusion. Excluding a node ID allocated by Z-Wave Controller means exclusion.</li> <li>• Failed or success in including/excluding the node ID can be viewed from the Z-Wave Controller.</li> </ul>		

Sometimes people are not easy to execute exclusion or inclusion especially when SA-102 already installed in a wall box. To solve this issue, SA-102 support a special feature that can use S1 or S2 to execute “exclusion, inclusion, Reset or Association” at the first 3 minutes when first time connect to main power.

### 1.3 LED Indication

To distinguish what mode the switch is in, view from the LED for identification.

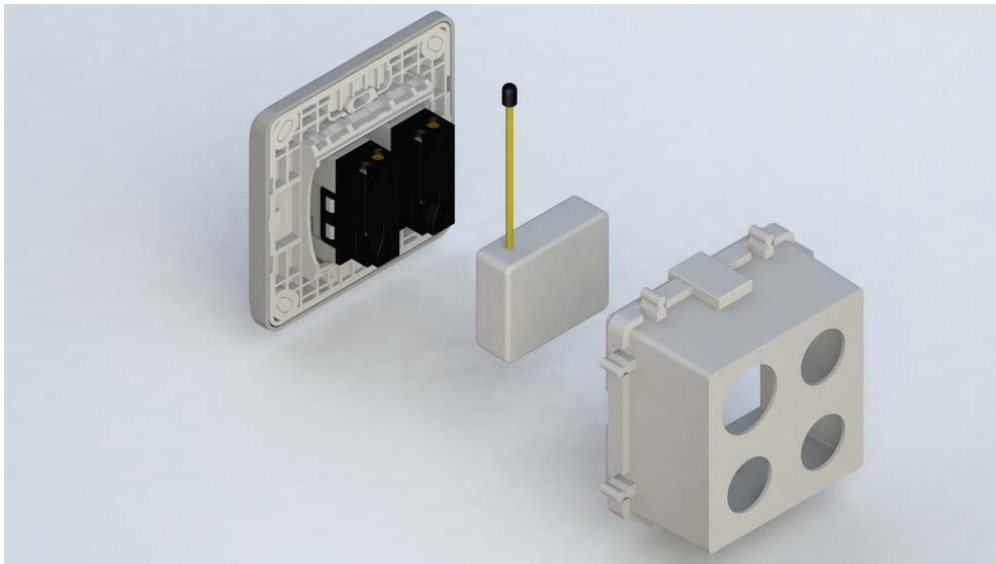
State Type	LED Indication
Normal	Whatever we switch On and off of the SA-102 by S1 S2 or On/Off button or RF command, the LED will lights up 1 second and then off.
No node ID	Under normal operation, when the Switch has not been allocated a node ID, the LED flashes on and off alternately at 2-second intervals. By pressing S1 S2 or On/Off button, it will stop flashing temporarily.
Learning	When SA-102 is in learning mode, LED flashes on and off alternately and repeatedly at 0.5 second intervals.
Overload	When overload state occurs, the Switch is disabled of which LED flashes on and off alternately at 0.2 second intervals. Overload state can be cleared by disconnect and reconnect the Switch to the main power

### 1.4 Choosing a Suitable Location

1. Do not locate the Switch facing direct sunlight, humid or dusty place.
2. The suitable ambient temperature for the Switch is 0°C~40°C.
3. Do not locate the Switch where exists combustible substances or any source of heat, e.g. fires, radiators, boiler etc.

4. After putting it into use, the body of Switch will become a little bit hot of which phenomenon is normal.

## 1.5 Installation



1. Put the in wall switch into a wall box and connect the AC power wire L, N to in wall switch connector L, N.
2. Connect the wall switch to the SA-102 as picture.
3. To manually turn ON the Switch, press and release the On/Off button. The LED will light ON for 1 second, and the load plugged into the Switch will also turn ON.
4. To manually turn OFF the Switch, simply press and release the On/Off button. The LED will light ON for 1 second and the load plugged into the Switch will turn OFF.

## 1.6 Programming

### 1.6.1. Basic Command Class / Binary Switch Command Class

The Switch will respond to BASIC and BINARY SWITCH commands that are part of the Z-Wave system.

#### 1. BASIC\_GET / BINARY\_SWITCH\_GET

Since the switch have two relay, the Switch will report its On/Off state to the Controller by setting Configuration parameter 3.

Configuration parameter 3=1	Report ON when relay 1 ON Report OFF when relay 1 OFF
-----------------------------	--

Configuration parameter 3=2	Report ON when relay 2 ON Report OFF when relay 2 OFF
-----------------------------	--



Configuration parameter 3=3 (default) Report ON when either relay 1 ON or relay 2 ON  
 Report OFF when both relay 1 and relay 2 OFF

Basic Get Command: **[Command Class Basic, Basic Get]**  
 Basic Report Command:  
 Report OFF: **[Command Class Basic, Basic Report, Value = 0(0x00)]**  
 Report ON: **[Command Class Basic, Basic Report, Value = 255(0xFF)]**

Binary Switch Get Command: **[Command Class Switch Binary, Switch Binary Get]**  
 Binary Switch Report Command:  
 Report OFF: **[Command Class Switch Binary, Switch Binary Report, Value = 0(0x00)]**  
 Report ON: **[Command Class Switch Binary, Switch Binary Report, Value = 255(0xFF)]**

## 2. BASIC\_SET / SWITCH\_BINARY\_SET

Since the switch has two relay, the load attached to the Switch will turn on or off upon receipt of the following commands from a Z-Wave Controller by setting Configuration parameter 3.

Configuration parameter 3=1 switch ON and OFF of relay 1  
 Configuration parameter 3=2 switch ON and OFF of relay 2  
 Configuration parameter 3=3 (default) switch ON and OFF both relay 1 and relay 2

**[Command Class Basic, Basic Set, Value = 1~99, 255(0xFF)]**: the load attached to the Switch turns on.  
**[Command Class Basic, Basic Set, Value = 0(0x00)]**: the load attached to the Switch turns off.  
**[Command Class Switch Binary, Switch Binary Set, Value = 1~99, 255(0xFF)]**: the load attached to the Switch turns on.  
**[Command Class Switch Binary, Switch Binary Set, Value = 0(0x00)]**: the load attached to the Switch turns off.

### 1.6.2. Z-Wave's Groups (Association Command Class Version 2)

The Switch can be set to send reports to control associated Z-Wave devices. It supports 3 association groups which every group has one node support.

Group1~Group3 support SWITCH\_BINARY\_REPORT, METER\_REPORT\_COMMAND\_V3

For group 1, the Switch will report (1) ON/OFF status of Relay1 and Relay2 (2) Instant Power Consumption (Watt) of Relay1 and Relay2 (3) Accumulated Power Consumption (KWh) of Relay1 and Relay2 to Z-Wave Controller.

For group 2, the Switch will report (1) ON/OFF status of Relay1 (2) Instant Power

Consumption (Watt) of Relay1 (3) Accumulated Power Consumption (KWh) of Relay1 to Z-Wave Controller.

For group 3, the Switch will report (1) ON/OFF status of Relay2 (2) Instant Power Consumption (Watt) of Relay2 (3) Accumulated Power Consumption (KWh) of Relay2 to Z-Wave Controller.

#### 1.6.2.1. Auto report to Grouping 1 ~3 (Maximum Node 1)

##### 1.6.2.1.1. On/Off Event Report

When “on” or “off” state has been changed, it will send Binary Switch Report to the nodes of Group1~3.

#### Binary Switch Report

<b>ON:</b> [Command Class Switch Binary, Switch Binary Report, Value=255(0xFF)] <b>OFF:</b> [Command Class Switch Binary, Switch Binary Report, Value=0(0x00)]
---

#### 1.6.2.2. Instant Power Consumption vary over 5% report

When the power consumption of load vary over 5%, it will send Meter report to the nodes of Group

#### **Meter Report Command:**

[Command Class Meter , Meter Report , Rate Type = 0x01 , Meter Type = 0x01 , Precision = 1 , Scale = 0x02 , Size = 4 , Meter Value(W) ]
---

#### 1.6.2.3. Overload alarm report command

When SA-102 detect the overload, it will send Alarm Report to the correspond Group .  
The content of Alarm Report

<b>Alarm report command:</b> [Command_Class_Alarm, Alarm_Report, Alarm Type = 0x08, Alarm Level = 0xFF]
---

### 1.6.3. Response to Meter Get Command

The Switch will report its (1) instant Power Consumption (Watt) or (2) accumulated power consumption (KWH) or (3) AC load Voltage (V) or (4) AC load current (I) (5) load power factor (PF) to Z-Wave Controller after receive the Meter Get Command from Z-Wave Controller.

#### 1.6.3.1. Instant Power Consumption (Watt) of Switch

When receiving Meter Get Command, it will report Meter Report Command to the node asked.

**Meter Get Command:** [Command Class Meter, Meter Get, Scale =0x02(W)]

**Meter Report Command:**  
[Command Class Meter , Meter Report , Rate Type = 0x01 , Meter Type = 0x01 , Precision = 1 , Scale = 0x02 , Size = 4 , Meter Value(W) ]

Example:

Meter Value 1 = 0x00 (W)

Meter Value 2 = 0x00 (W)

Meter Value 3 = 0x03 (W)

Meter Value 4 = 0xEA (W)

Meter(W) = Meter Value 3 \*256 + Meter Value 4 = 100.2W

#### 1.6.3.2. Accumulated Power Consumption (KW/h)

When receiving Meter Get Command, it will report Meter Report Command to the node asked.

**Meter Get Command:**  
[Command Class Meter, Meter Get, Scale = 0x00 KW/h)]

**Meter Report Command:**  
[Command Class Meter , Meter Report , Rate Type = 0x01 , Meter Type=0x01 , Precision = 2 , Scale = 0x00 , Size = 4 , Meter Value (KWh)]

Example:

Scale = 0x00 (KWh) Precision = 2

Size = 4 Bytes (KW/h) Meter Value 1 = 0x00(KWh) Meter Value 2 = 0x01(KWh) Meter Value 3 = 0x38(KWh) Meter Value 4 = 0xA3(KWh)

Accumulated power consumption (KW/h) = (Meter Value 2\*65536) + (Meter Value 3\*256) + (Meter Value 4) = 800.35 (KW/h)

#### 1.6.3.3. Clearing accumulated power consumption

Whenever re-start counting the accumulated power consumption is needed, you can use Meter Reset Command to clear it.

#### 1.6.3.4. Load Voltage (V)

When receiving Meter Get Command, it will report Meter Report Command to the node asked.

**Meter Get Command:** [Command Class Meter, Meter Get, Scale =0x04(V)]

**Meter Report Command:**[Command Class Meter , Meter Report , Rate Type = 0x01 , Meter Type = 0x01 , Precision = 1 , Scale = 0x04 , Size = 2 , Meter Value(V)]

Example:

Scale = 0x04 (V) Precision = 1

Size = 2 (2 Bytes of V) Meter Value 1 = 0x09(V) Meter Value 2 = 0x01(V)

AC load Voltage = (Meter Value 1\*256) +(Meter Value 2)= 230.5 (V)

#### 1.6.3.5. AC load current ( I )

When receiving Meter Get Command, it will report Meter Report Command to the node asked.

**Meter Get Command:** [Command Class Meter, Meter Get, Scale =0x05(I)]

**Meter Report Command:**

[Command Class Meter , Meter Report , Rate Type = 0x01 , Meter Type = 0x01 , Precision = 2 , Scale = 0x05 , Size = 2 , Meter Value(I)]

Example:

Scale = 0x05 (I) Precision = 2

Size = 2 (2 Bytes of I) Meter Value 1 = 0x01(I) Meter Value 2 = 0x21(I)

AC load current = (Meter Value 1\*256) +(Meter Value 2)= 2.89 (A)

#### 1.6.3.6. Load power factor (PF)

When receiving Meter Get Command, it will report Meter Report Command to the node asked.

**Meter Get Command:** [Command Class Meter, Meter Get, Scale =0x06(PF)]

**Meter Report Command:**

[Command Class Meter , Meter Report , Rate Type = 0x01 , Meter Type = 0x01 , Precision = 2 , Scale = 0x06 , Size = 1 Bytes , Meter Value(PF)]

Example:

Scale = 0x06 (PF)

Precision = 2

Size = 1 (1 Byte of PF)

Meter Value 1 = 0x63(PF) (It means that the load power factor is 0.99)

### 1.6.4. Multi Channel Command Class Version 3

SA-102 also support Muti Channel command class (version 3), which include INARY\_SWITCH\_GET, BINARY\_SWITCH\_SET, BASIC\_GET, BASIC\_SET, METER\_SUPPORTED\_GET, METER\_RESET, METER\_GET

You may control or get report from 3 endpoints of SA-102.

### 1.6.4.1. BINARY\_SWITCH\_GET

You may get the ON/OFF state from every endpoint, when endpoint set to 1, SA-102 will reply state of Relay1. If endpoint set to 2, SA-102 will reply state of Relay2. If endpoint set to 3, SA-102 will reply ON (0xFF) when either Relay 1 or Relay2 is ON, report OFF (0x00) when both Relay 1 and Relay2 are OFF. Below is an example show a source endpoint 5 send a Get command to SA-102 endpoint 3.

COMMAND_CLASS_MULTI_CHANNEL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x05	(this is the endpoint of command inquirer here we assume endpoint is 5, if the inquirer doesn't support multi Channel this value will be 0)
(Bit Address+Destination End Point = 0x03)	(Bit Address =0 ; Destination End Point range from 1~3)
Command Class = 0x25	(Command_Class_Switch_Binary = 0x25)
Command =0x02	(Switch_Binary_Get = 0x02)

Below is the example show SA-102 report to last command

COMMAND_CLASS_MULTI_CHANNEL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x03	Since the endpoint is 3 so SA-102 will reply ON(0xFF) when either Relay 1 or Relay2 is ON, report OFF (0x00) when both Relay 1 and Relay2 are OFF
(Bit Address+Destination End Point = 0x05)	(Bit Address =0 ; Destination End Point)
Command Class = 0x25	(Command_Class_Switch_Binary =0x25)
Command =0x03	(Switch_Binary_Report = 0x3)
Parameter 1 = 0xFF	(ON=0xFF , OFF=0x00)

### 1.6.4.2. BINARY\_SWITCH\_SET

By using BINARY\_SWITCH\_SET Command of Multi-Channel Command Class Encapsulation Command, you can switch Relay1 ON/OFF by setting endpoint to 1, or switch Relay2 ON/OFF by setting endpoint to 2, or switch both Relay1 and Relay2 ON/OFF by setting endpoint to 3.

The example of the command show that switch off relay1 of SA-102

COMMAND_CLASS_MULTI_CHANNEL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x01	(this is the endpoint of command inquirer here we assume endpoint is 1 , if the inquirer doesn't support multi-Channel this value will be 0)
(Bit Address+Destination End Point = 0x01)	(Bit Address =0 ; Destination End Point range1~3)
Command Class = 0x25	(Command_Class_Switch_Binary = 0x25)
Command =0x01	(Switch_Binary_Set = 0x01)
Parameter 1 = 0x00	(ON=0xFF , OFF=0x00)

#### 1.6.4.3. METER\_SUPPORTED\_GET :

This command is to ask the endpoint of SA-102 what kind of meter data can be reported. The example show how to get the meter report type

COMMAND_CLASS_MULTI_CHANNEL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x01	(this is the endpoint of command inquirer here we assume endpoint is 1 , if the inquirer doesn't support multi Channel this value will be 0)
(Bit Address+Destination End Point = 0x03)	(Bit Address =0 ; Destination End Point range1~3)
Command Class = 0x32	( Command_Class_Meter_V3 = 0x32)
Command =0x03	(Meter_Supported_Get = 0x03)

Below is the example show SA-102 report to last command

COMMAND_CLASS_MULTI_CHANNEL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x03	
(Bit Address+Destination End Point = 0x01)	
Command Class = 0x32	Command_Class_Meter_V3 = 0x32)
Command =0x04	(Meter_Supported_Report = 0x04)
Parameter 1 = 0x81	(Meter Reset =1, Meter Type=0x01)
Parameter 2 = 0x75	(Scale Supported = KWh+W+V+A+Power Factor = 0x75)

#### 1.6.4.4. METER\_RESET

This command is to reset the Accumulated Power Consumption (KWh) to 0. The example show how to reset the KWh

COMMAND_CLASS_MULTI_CHANNEL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x03	(this is the endpoint of command inquirer, here we assume endpoint is 3 , if the inquirer doesn't support multi Channel this value will be 0)
(Bit Address+Destination End Point = 0x01)	(Bit Address =0 ; Destination End Point range1~3)
Command Class = 0x32	( Command_Class_Meter_V3 = 0x32)
Command =0x05	( Meter_Reset = 0x05)

#### 1.6.4.5. METER\_GET

Using meter get command to get the KWH, W, V, I, PF from endpoint of SA-102

##### 1.6.4.5.1. Get KWH from endpoint

Meter\_GET example

COMMAND_CLASS_MULTI_CHANNEL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x05	(this is the endpoint of command inquirer, here we assume endpoint is 5 , if the inquirer doesn't support multi Channel this value will be 0)
(Bit Address+Destination End Point = 0x03)	(Bit Address =0 ; Destination End Point range1~3)
Command Class = 0x32	( Command_Class_Meter_V3 = 0x32)
Command =0x01	(Meter_Get = 0x01)
Parameter 1 = 0x00	(Scale = KWH = 0x00)

Accumulated power consumption (KWH) Report example:

COMMAND_CLASS_MULTI_CHANNEL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x03	(Meter report = Endpoint3)
(Bit Address+Destination End Point = 0x05)	(Bit Address =0 ; Destination End Point =

	command inquirer's Endpoint value)
Command Class = 0x32	(Command_Class_Meter_V3 = 0x32)
Command =0x02	(Meter_Report = 0x02)
Parameter 1 = 0x21	(Scale Bit2 = 0 , Rate Type = 0x01 , Meter Type=0x01)
Parameter 2 = 0x44	(Precision = 2 , Scale Bit1Bit0 = 0 , Size = 4)
Parameter 3 = 0x00	Accumulated Power Consumption = 0x000005FD = 15.33 KWh
Parameter 4 = 0x00	
Parameter 5 = 0x05	
Parameter 6 = 0xFD	

1.6.4.5.2. Get Instant Power Consumption (Watt) from endpoint

METER\_GET example :

COMMAND_CLASS_MULTI_CHANNEL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x05	(this is the endpoint of command inquirer, here we assume endpoint is 5 , if the inquirer doesn't support multi Channel this value will be 0)
(Bit Address+Destination End Point =0x03)	(Bit Address =0 ; Destination End Point range 1~3)
Command Class = 0x32	( Command_Class_Meter_V3 = 0x32)
Command =0x01	(Meter_Get = 0x01)
Parameter 1 = 0x10	(Scale = W = 0x02)

SA-102 Instant Power Consumption (W) Report example:

COMMAND_CLASS_MULTI_CHANNEL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x03	(Meter report = Endpoint3)
(Bit Address+Destination End Point = 0x05)	(Bit Address =0 ; Destination End Point = command inquirer's Endpoint value)
Command Class = 0x32	(Command_Class_Meter_V3 = 0x32)
Command =0x02	(Meter_Report = 0x02)
Parameter 1 = 0x21	(Scale Bit2 = 0, Rate Type = 0x01 , Meter Type=0x01)
Parameter 2 = 0x34	(Precision = 1 , Scale Bit1Bit0 = 0x02 , Size = 4)
Parameter 3 = 0x00	Instant Power Consumption = 0x000003EA = 100.2W
Parameter 4 = 0x00	
Parameter 5 = 0x03	



Parameter 6 = 0xEA	
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#### 1.6.4.5.3. Get load voltage V from endpoint

Meter\_GET example:

COMMAND_CLASS_MULTI_CHANNEL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x05	(this is the endpoint of command inquirer, here we assume endpoint is 5 , if the inquirer doesn't support multi Channel this value will be 0)
(Bit Address+Destination End Point = 0x03)	(Bit Address =0 ; Destination End Point range1~3)
Command Class = 0x32	( Command_Class_Meter_V3 = 0x32)
Command =0x01	(Meter_Get = 0x01)
Parameter 1 = 0x20	(Scale = V = 0x04)

SA-102 AC load Voltage report example :

COMMAND_CLASS_MULTI_CHANNEL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x03	(Meter report = Endpoint3)
(Bit Address+Destination End Point = 0x05)	(Bit Address =0 ; Destination End Point = command inquirer's Endpoint value)
Command Class = 0x32	(Command_Class_Meter_V3 = 0x32)
Command =0x02	(Meter_Report = 0x02)
Parameter 1 = 0xA1	(Scale Bit2 = 1, Rate Type = 0x01, Meter Type=0x01)
Parameter 2 = 0x22	(Precision = 1, Scale Bit1Bit0 = 0x00, Size = 2)
Parameter 3 = 0x09	Voltage = 0x0910 = 232.0V
Parameter 4 = 0x10	

#### 1.6.4.5.4. Get load current I from endpoint

Meter\_GET example:

COMMAND_CLASS_MULTI_CHANNEL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x05	(this is the endpoint of command inquirer, here we assume endpoint is

	5 , if the inquirer doesn't support multi Channel this value will be 0)
(Bit Address+Destination End Point = 0x03)	(Bit Address =0 ; Destination End Point range1~3)
Command Class = 0x32	( Command_Class_Meter_V3 = 0x32)
Command =0x01	(Meter_Get = 0x01)
Parameter 1 = 0x28	(Scale = A = 0x05)

#### SA-102 AC load current (I) example:

COMMAND_CLASS_MULTI_CHANNEL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x03	(Meter report = Endpoint3)
(Bit Address+Destination End Point = 0x05)	(Bit Address =0 ; Destination End Point = command inquirer's Endpoint value)
Command Class = 0x32	(Command_Class_Meter_V3 = 0x32)
Command =0x02	(Meter_Report = 0x02)
Parameter 1 = 0xA1	(Scale Bit2 = 1, Rate Type = 0x01, Meter Type=0x01)
Parameter 2 = 0x4A	(Precision = 2, Scale Bit1Bit0 = 0x01, Size = 2)
Parameter 3 = 0x00	Current = 0x002B = 0.43A
Parameter 4 = 0x2B	

#### 1.6.4.5.5. Get power factor PF from endpoint

#### Meter\_GET example:

COMMAND_CLASS_MULTI_CHANNEL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x05	(this is the endpoint of command inquirer, here we assume endpoint is 5 , if the inquirer doesn't support multi Channel this value will be 0)
(Bit Address+Destination End Point = 0x03)	(Bit Address =0 ; Destination End Point range1~3)
Command Class = 0x32	( Command_Class_Meter_V3 = 0x32)
Command =0x01	(Meter_Get = 0x01)
Parameter 1 = 0x30	(Scale = PF = 0x06)

#### SA-102 power factor report example:

COMMAND_CLASS_MULTI_CHANNEL	
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MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x03	(Meter report = Endpoint3)
(Bit Address+Destination End Point = 0x05)	(Bit Address =0 ; Destination End Point = command inquirer's Endpoint value)
Command Class = 0x32	(Command_Class_Meter_V3 = 0x32)
Command =0x02	(Meter_Report = 0x02)
Parameter 1 = 0xA1	(Scale Bit2 = 1, Rate Type = 0x01, Meter Type=0x01)
Parameter 2 = 0x51	(Precision = 2, Scale Bit1Bit0 = 0x10, Size = 1)
Parameter 3 = 0x63	Power Factor = 0x63 = 0.99

### 1.6.5. Z-Wave's Configuration

Configuration Parameter	Function	Size (Byte)	Value	Unit	Default	Description
1	Watt Meter Report Period	2	0x01-0x7FFF	5s	720	720*5s=3600s=1 hour
2	KWH Meter Report Period	2	0x01-0x7FFF	10min	6	6*10min= 1 hour
3	Selected Relay	1	1-3		3	1 : Relay1 2 : Relay2 3 : Relay1 & Relay2
4	Edge or Pulse mode or Edge-Toggle mode	1	1-3		1	1 : Edge mode 2 : Pulse mode 3 : Edge-Toggle mode
5	Threshold of current for Load Caution	2	10-750	0.01A	750	750*0.01A = 7.5A
6	Threshold of KWH for Load Caution	2	1-10000	1KWh	10000	
7	Restore switch state mode	1	0-2		1	0 : Switch off 1 : Last switch state 2 : Switch on
8	Auto off timer	2	0-0x7FFF	1s	0	0 : Disable auto off function 1-0x7FFF : 1s ~ 32767s
9	RF off command mode	1	0-3		0	0 : Switch off 1 : Ignore 2 : Switch toggle 3 : Switch on
10	Existence of Endpoint3	1	1-2		1	1 : Endpoint3 exist 2 : No Endpoint3

#### 1.6.5.1. att Meter Report Period

If the setting is configured for 1hour (set value =720), the SA-102 will report its instant power consumption every 1 hour to the node of correspond Group. The maximum interval to report its instant power consumption is 45 hours ( $5s \cdot 32767 / 3600 = 45hr$ ).

#### 1.6.5.2. KWH Meter Report Period

If the setting is configured for 1hour (set value =6), the SA-102 will report its Accumulated Power Consumption (KW/h) every 1 hour to the node of correspond Group. The maximum interval to report its Accumulated Power Consumption (KW/h) is 227.55 days ( $10min \cdot 32767 / 1440 = 227.55$  days).

#### 1.6.5.3. Selected Relay

If Controller not using Multi\_Channel command class to access the relay of SA-102, you may configure the select value to react the Basic Command Class · Binary Switch Command Class or Meter Command Class V3

##### 1.6.5.3.1. Selected Relay1

Only relay1 can be controlled and report.

##### 1.6.5.3.2. Selected Relay 2

Only relay2 can be controlled and report.

##### 1.6.5.3.3. Selected Relay1 and Relay2

Default select is 3

Both relay1 and relay2 can be controlled and report.

Set command	Relay state
Basic_Set or Binary_Switch_Set ON	Both Relay1 and Relay2 ON.
Basic_Set or Binary_Switch_Set OFF	Both Relay1 and Relay2 OFF.

Get command	Relay state	Report to command sender
Basic_Get or Binary_Switch_Get	Either relay1 ON or relay2 ON	ON
Basic_Get or Binary_Switch_Get	Both relay1 OFF and relay2 OFF	OFF

Get command	parameter	Report to command sender
Meter_Get	KWh	Relay1 KWh1 + Relay2 KWh2
Meter_Get	Watt	Relay1 W1 + Relay2 W2
Meter_Get	Voltage	Relay1 and Relay2 are the same voltage
Meter_Get	Current	Relay1 I1 + Relay2 I2
Meter_Get	Power factor PF	Relay1

#### 1.6.5.4. Edge and Pulse mode

Manual switch S1 and S2 can set to Edge mode or Pulse mode or Edge-Toggle mode, default value is Edge mode.

##### 1.6.5.4.1. Edge mode

This mode is suitable for the bi stable wall switch that has indicator point on the switch, and the same position correspond to same state of relay1 and relay2. If the SA-102 relay change the state because of receiving Z-Wave RF command, it may need two times of change (switch on to off or switch off to on) to let relay back to the correspond state.

##### 1.6.5.4.2. Pulse mode

This mode is suitable for the toggle type wall switch to swap the state of Relay1 or Relay2.

##### 1.6.5.4.3. Edge-Toggle mode

This mode is suitable for the normal bi-stable switch, every time when change the state of the wall switch will also swap the state of Relay1 or Relay2.

#### 1.6.5.5. Threshold of current for Load Caution

This is a warning when the current of load over the preset threshold value, if the setting value is 750, when the load current of Relay1 or Relay2 over this value, SA-102 will send current meter report to the node of correspond Group, the Range of the setting value is from 10 to 750, and the default value is 750.

#### 1.6.5.6. Threshold of KWh for Load Caution

This is a warning when the KWh of load over the preset threshold value, If the setting value is 10000, when the Accumulated Power Consumption of Relay1 or Relay2 over this value, SA-102 will send KWh Meter Report command to the node of correspond Group, minimum value is 1KWh and default value is 10000 kWh.

#### 1.6.5.7. Restore switch state mode

Whenever the AC power returns from lost, SA-102 will restore the switch state which could be SWITCH OFF 、 LAST SWITCH STATE 、 SWITCH ON. The default setting is LAST SWITCH STATE.

#### 1.6.5.8. Auto off timer

Whenever SA-102 switches to on, the auto off timer begin to count down. After the timer decrease to zero, it will switch off automatically. However if Auto off timer is set as 0, the auto off function will be disabled. The default setting is 0.

#### 1.6.5.9. RF off command mode

Whenever a switch off command, BASIC\_SET 、 BINARY\_SWITCH\_SET 、 SWITCH\_ALL\_OFF, is received, it could be interpreted as 4 kinds of commands.

1. Switch Off : It switches to OFF state. The default setting is Switch Off.
2. Ignore : The switch off command will be ignored.
3. Switch Toggle : It switches to the inverse of current state.
4. Switch On : It switches to ON state.

#### 1.6.5.10. Existence of Endpoint3

Multi-Channel Command is a good way to control relay1 and relay2 of SA-102 individually. The endpoint3 of SA-102 is related to both relay1 and relay2. In some condition it becomes redundant in Multi-Channel Command Class. When the Existence of Endpoint3 is set as 2, the endpoint3 will be disabled. The default value is 1.

Endpoint1 and Endpoint2 are fixed, only Endpoint3 is dynamic.

### 1.6.6. Protection Command Classes

SA-102 supports Protection Command Class version 2, it can protect the switch against unintentionally control by e.g. a child. And it can also protect the switch from being turned off by setting it in “No RF Control” state.

After being set to “Protection by sequence” state, any intentional pressing of On/Off button or S2/S2 should be hold longer than 1 second, or the switch state will not change. However, the operation of learn function does not change, because learning will not be protected.

### 1.6.7. Firmware update over the air (OTA)

SA-102 is based on 500 series SoC and supports Firmware Update Command Class, it can receive the updated firmware image sent by controller via the Z-wave RF media. It is a helpful and convenient way to improve some function if needed.

### 1.6.8. Command Classes

The Switch supports Command Classes including...

- \* COMMAND\_CLASS\_ZWAVEPLUS\_INFO
- \* COMMAND\_CLASS\_VERSION\_V2
- \* COMMAND\_CLASS\_MANUFACTURER\_SPECIFIC\_V2
- \* COMMAND\_CLASS\_DEVICE\_RESET\_LOCALLY
- \* COMMAND\_CLASS\_ASSOCIATION\_V2
- \* COMMAND\_CLASS\_ASSOCIATION\_GRP\_INFO
- \* COMMAND\_CLASS\_POWERLEVEL
- \* COMMAND\_CLASS\_SWITCH\_BINARY
- \* COMMAND\_CLASS\_BASIC
- \* COMMAND\_CLASS\_SWITCH\_ALL
- \* COMMAND\_CLASS\_ALARM
- \* COMMAND\_CLASS\_SCENE\_ACTIVATION

- \* COMMAND\_CLASS\_SCENE\_ACTUATOR\_CONF
- \* COMMAND\_CLASS\_PROTECTION
- \* COMMAND\_CLASS\_FIRMWARE\_UPDATE\_MD\_V2
- \* COMMAND\_CLASS\_MULTI\_CHANNEL\_V3
- \* COMMAND\_CLASS\_METER\_V3
- \* COMMAND\_CLASS\_CONFIGURATION

## 1.7 Troubleshooting

Symptom	Cause of Failure	Recommendation
The Switch not working and LED off	The Switch is not connect to the Main power The Switch break down	Check power connections Don't open up the Switch and send it for repair.
The Switch LED illuminating, but cannot control the ON/OFF Switch of the load attached	Check if the load connect into the Switch has its own ON/OFF switch	Set the ON/OFF switch of the load attached to ON
The Switch LED illuminating, but the Detector cannot control the Switch	Not carry out association Same frequency interference	Carry out association Wait for a while to re-try
LED keep flashing, but cannot control	Overload occurs	Remove the load attached or check max. load cannot exceed 7.5A(Resistive load)

## 1.8 Specification

Operating Voltage	100 ~240VAC /50Hz/60Hz
Maximum Load	6.5A(230Vac/120Vac) (Resistive load)
Range	Minimum 40 m in door 100m outdoor line of sight
Operating Temperature	0°C ~ 40°C
Frequency Range	SA-102-1: 868.40MHz; 869.85MHz(EU) / SA-102-2: 908.40MHz; 916.00MHz(USA/Canada) / SA-102-3: 922.5MHz/ 923.9MHz/ 926.3MHz (Taiwan/JP)

Specifications are subject to change and improvement without notice.



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