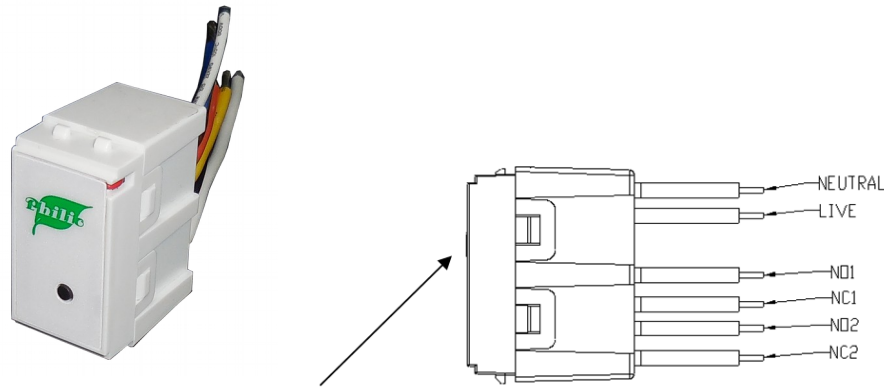


## PAN09

### TWO SPDT Switch module with meter



INCLUDE BUTTON.



## Introduction

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 (6A 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.

## Safety Precautions and Installation

- Avoid installing the unit in storming or raining weather.
- Be sure to isolate or switch off power source before installing or maintenance.
- Do ensure that the power supply circuit protected by a 16A circuit breaker or suitable equivalent fuse.

## IMPORTANT

- Installation must be performed by skilled technicians who are informed about the standards and technical requirements of the appliance and its proper installation.
- Check your local codes as they apply to your situation. If the house wiring is of aluminum, consult with an electrician about proper wiring methods.

Before proceeding with the installation, TURN OFF THE POWER TO THE LIGHTING CIRCUIT AT THE CIRCUIT BREAKER OR FUSE BOX TO AVOID ELECTRICAL SHOCK.

## Specification

Rated Voltage	100-240VAC 50Hz/60Hz 5A
Maximum Load	5A (230Vac/120Vac) (Resistive load)
Range	Minimum 40m indoor 100m outdoor line of sight

Operating Temperature	0°C to 40°C
Humidity	Up to 85% max.
Storage Temperature	-20°C to 60°C
Frequency Range	868.40MHz; 869.85MHz (EU) 908.40MHz; 916.00MHz (USA/Canada) 920.9MHz, 921.7MHz, 923.1MHz (TW/KR/Thai/SG)
RF Power	+5dBm
OTA	support
Dimensions	47.5 x 39 x16 mm
Wire	0.75mm <sup>2</sup> , 18AWG

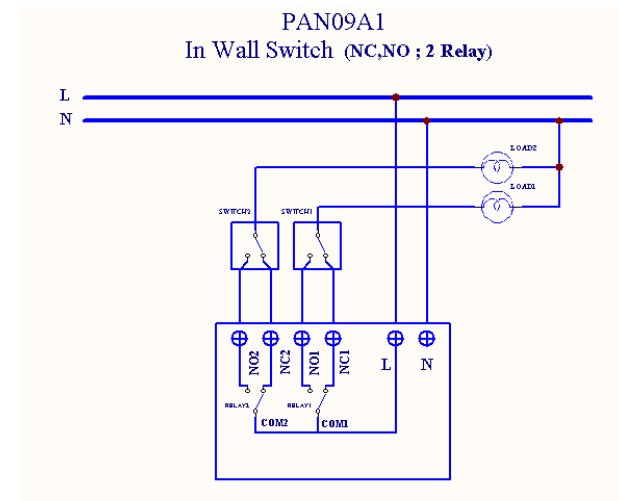
\*\* Specifications are subject to change and improvement without notice.

## Troubleshooting

Symptom	Cause of Failure	Recommendation
The Switch not working and LED off	<ol style="list-style-type: none"> <li>The Switch is not connect to the Main power</li> <li>The Switch break down</li> </ol>	<ol style="list-style-type: none"> <li>Check power connections</li> <li>Don't open up the Switch and send it for repair.</li> </ol>
The Switch LED illuminating, but cannot control the ON/OFF Switch of the <b>attached load</b>	Check if the load connect into the Switch has its own ON/OFF switch	Set the ON/OFF switch of the <b>attached load</b> to ON
The Switch LED illuminating, but the <b>detector</b> cannot control the Switch	<ol style="list-style-type: none"> <li>Not carry out association</li> <li>Same frequency interference</li> </ol>	<ol style="list-style-type: none"> <li>Carry out association</li> <li>Wait for a while to re-try</li> </ol>

LED keep flashing, but cannot control	Overload occurs	Remove the <b>attached load</b> or check max. load cannot exceed 6A(Resistive load)
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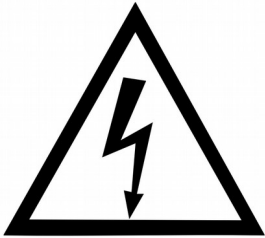
## Installation



**Fig 1. PAN09 Assembling**

For Instruction to [http:// www.philio-tech.com](http://www.philio-tech.com)





## DANGER

### Danger of electrocution!

All works on the device may be performed only by a qualified and licensed electrician. Observe national regulations.

Any works introducing changes into the configuration must be always performed with disconnected voltage.

### Choosing a Suitable Location

1. Do not locate the Module facing direct sunlight, humid or dusty place.
2. The suitable ambient temperature for the Module is 0°C~40°C.
3. Do not locate the Module where exists combustible substances or any source of heat, e.g. fires, radiators, boiler etc.
4. After putting it into use, the body of Module will become a little bit hot of which phenomenon is normal.

### Adding to Z-Wave™ Network

In the front of casing, there is an on/off button with LED indicator below which is used to toggle switch on and off or carry 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.

### 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/reset/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

Add (Inclusion)	1. Put your Z-Wave controller into inclusion mode by following the instructions provided by the controller manufacturer.	one press one flash LED
	2. Pressing INCLUDE_BUTTON three times within 2 seconds will enter inclusion mode.	
Remove (Exclusion)	1. Put your Z-Wave controller into exclusion mode by following the instructions provided by the controller manufacturer.	one press one flash LED
	2. Pressing INCLUDE_BUTTON three times within 2 seconds will enter exclusion mode.	
	3. Node ID has been excluded.	LED 0.5s On, 0.5s Off (Enter auto inclusion)
Reset	1. Pressing INCLUDE_BUTTON three times within 2 seconds will enter inclusion mode.	Use this procedure only in the event that the primary controller is lost or otherwise inoperable.
	2. Within 1 second, press On/Off button again for 5 seconds.	
	3. IDs are excluded.	LED 0.5s On, 0.5s Off (Enter auto inclusion)

Association	1. The PAN09 is an always listening Z-Wave device, so associations be added or removed by a controller at any time.  Or If your controller requires to have the PAN09 send a 'node information frame' or NIF for associations, pressing the On/Off button three times within 2 seconds will cause the PAN09 to send its NIF.	one press one flash LED
	2. There are 3 groups for the switch	
<p>✘ Adding a node ID allocated by Z-Wave Controller means inclusion. Removing a node ID allocated by Z-Wave Controller means exclusion.</p> <p>✘ Failed or success in including/excluding the node ID can be viewed from the Z-Wave Controller.</p>		

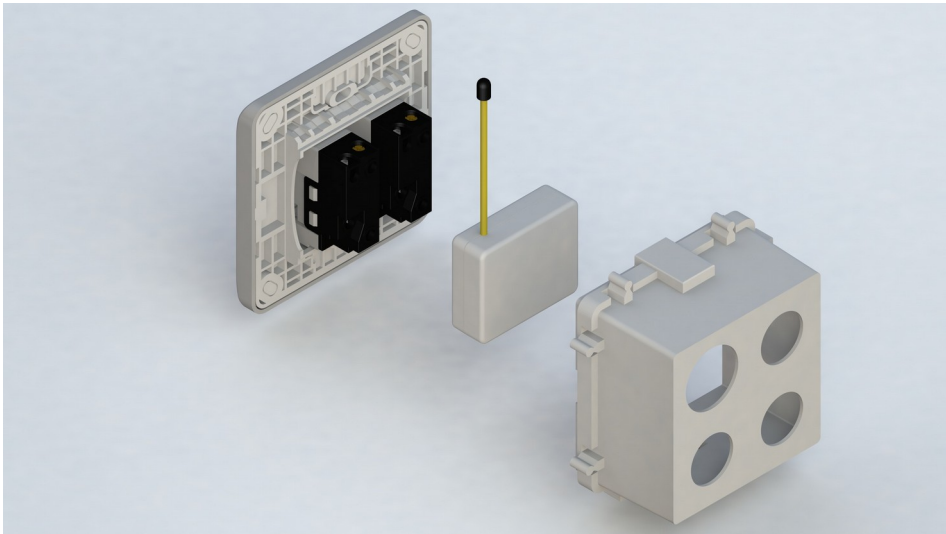
## LED Indication

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 PAN09 by 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 On/Off button, it will stop flashing temporarily.

Learning	When PAN09 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

## Installation



1. Put in wall switch into a wall box and connect the AC power wire L, N to PAN09 connector L, N.
2. Connect the wall switch to the PAN09 as Fig1.
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.

## Programming

### 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.

1-1 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(default)

Report ON when either relay 1 ON or relay 2 ON

Report OFF when both relay 1 and relay 2 OFF

Configuration parameter 3=2 Report ON when relay 1 ON  
 Report OFF when relay 1 OFF  
 Configuration parameter 3=3 Report ON when relay 2 ON  
 Report OFF when relay 2 OFF

and relay 2  
 Configuration parameter 3=2 switch ON and OFF of relay 1  
 Configuration parameter 3=3 switch ON and OFF of relay 2

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

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

Note: If the **BASIC\_GET/SWITCH\_BINARY\_GET** command follow the **switch On/Off command**, it should add **0.5s time delay before the Get command**.

#### 1-2 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(default) switch ON and OFF both relay 1

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

### 1. 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.

## 2-1 Auto report to Grouping 1 ~3(Maximum Node 1)

### 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

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

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

### 2-1-2 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) ]**

## 2-1-3 overload alarm report command

When PAN09 detect the overload, it will send Alarm Report to the correspond Group .

The content of Alarm Report

Alarm report command: [**Command\_Class\_Alarm, Alarm\_Report, Alarm Type = 0x08, Alarm Level = 0xFF**]

## 2-2 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.

### 2-2-1 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

### 2-2-2 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 (KWh)

Meter Value 1 = 0x00(KWh)

Meter Value 2 = 0x01(KWh)

Meter Value 3 = 0x38(KWh)

Meter Value 4 = 0xA3(KWh)

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

### 2-2-3 Clearing accumulated power consumption

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

Meter Reset Command: **[Command Class Meter, Meter Reset]**

### 2-2-4 AC 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)

### 2-2-5 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)

### 2-2-6 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)

### 2-3 Multi Channel Command Class Version 3

PAN09 also support Muti Channel command class (version 3), which include BINARY\_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 PAN09.

#### 2-3-1 BINARY\_SWITCH\_GET

You may get the ON/OFF state from every endpoint, when endpoint set to 1, PAN09 will reply state of Relay1.

If endpoint set to 2 and PAN09 will reply state of Relay2.

If endpoint set to 3 and PAN09 will reply ON(0xFF) either Relay 1 or Relay2 is ON, report OFF(0x00) when both Relay 1 and Relay2 OFF.

Below is an example show a source endpoint 5 send a get command to PAN09 endpoint 3.

COMMAND\_CLASS\_MULTI\_CHANNEL

MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x05	(this is the endpoint of command owner here we assume endpoint is 5 , if the owner 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 PAN09 report to last command

COMMAND_CLASS_MULTI_CHANNEL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x03	Since the endpoint is 3 so PAN09 will reply ON(0xFF) either Relay 1 or Relay2 is ON, report OFF (0x00) when both Relay 1 and Relay2 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_Reportet = 0x3)
Parameter 1 = 0xFF	(ON=0xFF , OFF=0x00)

Note: **If the Multi-Channel Encapsulated BASIC\_GET/ SWITCH\_BINARY\_GET command follow a switch On/Off command, it should add 0.5s time delay before the Get command.**

### 2-3-2 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 PAN09

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 owner doesn't support multi Channel this value will be 0)
(Bit Address+Destination End Point = 0x02)	(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)

### 2-3-3 METER\_SUPPORTED\_GET :

This command is to ask the endpoint of PAN09 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 <a href="#">inquirer</a> here we assume endpoint is 1 , if the <a href="#">inquirer</a> 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 PAN09 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)

### 2-3-4 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 owner, here we assume endpoint is 3 , if the owner 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)

**2-3-5 METER\_GET :**

Using meter get command to get the KWH, W, V, I, PF from endpoint of PAN09

2-3-5-1 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 <a href="#">inquirer</a> , here we assume endpoint is 5 , if the <a href="#">owner</a> 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 <a href="#">inquirer's</a> 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	

**2-3-5-2 Get Instant Power Consumption (Watt) from endpoint**

METER\_GET example :

COMMAND_CLASS_MULTI_CHANN EL	
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x05	(this is the endpoint of command <a href="#">inquirer</a> , here we assume endpoint is 5 , if the

	<b>inquirer</b> 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)

PAN09 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 <b>inquirer's</b> 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	

### 2-3-5-3 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 <b>inquirer</b> , here we assume endpoint is 5 , if the <b>inquirer</b> 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)

PAN09 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 owner 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	

### 2-3-5-4 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 <a href="#">inquirer</a> , here we assume endpoint is 5 , if the <a href="#">inquirer</a> doesn't support multi Channel this value will be 0)
(Bit Address+Destination End Point =	(Bit Address =0 ; Destination End Point

0x03)	range1~3)
Command Class = 0x32	( Command_Class_Meter_V3 = 0x32)
Command =0x01	(Meter_Get = 0x01)
Parameter 1 = 0x28	(Scale = A = 0x05)

PAN09 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 <a href="#">inquirer's</a> 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	

### 2-3-5-5 Get power factor PF from endpoint

Meter\_GET example:

COMMAND_CLASS_MULTI_CHANNEL	(this is the endpoint of command <a href="#">inquirer</a> , here we assume endpoint is 5, if the <a href="#">inquirer</a> does not support multi Channel this value will be 0)	
MULTI_CHANNEL_CMD_ENCAP		
Source End Point = 0x05		
(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 = 0x30	(Scale = PF = 0x06)	

PAN09 power factor report example :

COMMAND_CLASS_MULTI_CHANNEL	(Meter report = Endpoint3)
MULTI_CHANNEL_CMD_ENCAP	
Source End Point = 0x03	
(Bit Address+Destination End Point = 0x05)	(Bit Address = 0 ; Destination End Point = command <a href="#">inquirer's</a> 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

## 2. Z-Wave's Configuration

Configurat ion Parameter	Function	Size (Byte )	Value	Unit	Default	Description
1	Watt Meter Report Period	2	0x00- 0x7FFF	5s	720	0:Disable Report W 1~0x7FFF: 720*5s=3600s=1 hour
2	KWH Meter Report Period	2	0x00- 0x7FFF	10min	6	0:Disable Report KWH 1~0x7FFF: 6*10min= 1 hour
3	Slected 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	10-600	0.01A	600	600*0.01A = 6.0A
6	Threshold of KWH for Load Caution	2	1-10000	1KWh	10000	
7	Relay control mode	1	1-2		1	1 : Control relay refer to meter wattage 2 : Control relay directly
8	Restore Relay state mode	1	0-2		1	0 : All relay stay NC terminal 1 : Last relay switch state 2 : All relay stay NO terminal
9	Existence	1	1-2		1	1 : Endpoint3

	of Endpoint3					exist 2 : No Endpoint3
14	Watt differential report mode	1	0-4		1	0 : Disable 1 : 5% 2 : 10% 3 : 15% 4 : 20%
31	Select Auto Report Type	1	1-2		1	1 : Basic type 2 : MultiChannel type

### 3-1 Watt Meter Report Period:

If the setting is configured for 1hour (set value =720), the PAN09 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 ( $5s*32767/3600=45hr$ ).

### 3-2 KWH Meter Report Period:

If the setting is configured for 1hour (set value =6), the PAN09 will report its Accumulated Power Consumption (KWh) every 1 hour to the node of correspond Group. The maximum interval to report its Accumulated Power Consumption (KWh) is 227.55 days ( $10min*32767/1440=227.55$  days).

### 3-3 Selected Relay

If Controller not using Multi\_Channel command class to access the relay of PAN09, you may configure the value of relay to react the Basic Command



**3-3-1 Selecte Relay1 and Relay2 : Default select is 3**

Set command	Relay state	
Basic_Set or Binary_Switch_Set ON	Relay1 ON & Relay2 ON	
Basic_Set or Binary_Switch_Set OFF	Relay1 OFF & Relay2 OFF	

Get command	Relay state	Report to command sender
Basic_Get or Binary_Switch_Get	Relay1 ON or Relay2 ON	ON
Basic_Get or Binary_Switch_Get	Relay1 OFF & Relay2 OFF	OFF

Get command	parameter	Report to command inquirer
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	Only Relay1

**3-3-2 Selected Relay 1**

Only relay1 can be controlled and report.

**3-3-3 Selected Relay 2**

Only relay2 can be controlled and report.

**3-4 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. **But this parameter is useless to PAN09.**

3-4-1 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 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.

3-4-2 Pulse mode: this mode is suitable for the toggle type wall switch to swap the state of Relay1 or Relay2

3-4-3 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

**3-5 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 600 (6A), when the load current of Relay1 over this value, PAN09 will send current meter report to the node of correspond Group, the Range of the setting value is from 10 to 600, and the default value is 600 (6A).

**3-6 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, PAN09 will send KWh Meter Report command to the node of correspond Group, minimum value is 1KWh and default value is 10000 kWh.

### **3-7 Relay control mode**

3-7-1 Relay controlling is referred to the meter wattage: When PAN09 gets an instruction from RF command or the manual switch, to switch on or off, it will check the wattage of the load first. If the wattage value is greater than 2 watts, the switch state means ON; on the other hand, it means OFF. When the switch state is ON, only SWITCH OFF instruction will be accept; on the other hand, when the switch state is OFF, only SWITCH ON instruction will be accept.

3-7-2 Control relay directly : Whenever PAN09 get an SWITCH ON instruction, it will close the relay; on the other hand, it will open the relay.

### **3-8 Restore switch state mode**

Whenever the AC power return from lost, PAN09 will restore the relay switch state which could be All relay stay NC terminal ·Last relay switch state ·All relay stay NO terminal. The default setting is Last relay switch state.

### **3-9 Existence of Endpoint3 :**

The endpoint3 of Multi-Channel Command Class is related to relay1 and relay2. It may be redundant for the need to control relay1 or relay2 individually. When the Existence of Endpoint3 is set as 0, the endpoint3 of Multi-Channel Command Class will be disabled. The default value is 1.

### **3-10 Watt differential report mode :**

3-10-1 Disable : The function of Watt differential report will be disabled.

3-10-2 5% : When the differential value of Watt is over 5%, PAN09 will send a meter report to the associated group.

3-10-3 10% : When the differential value of Watt is over 10%, PAN09 will send a meter report to the associated group.

3-10-4 15% : When the differential value of Watt is over 15%, PAN09 will send a meter report to the associated group.

3-10-5 20% : When the differential value of Watt is over 20%, PAN09 will send a meter report to the associated group.

### **3-11 Select Auto Report type**

3-11-1 Basic type : PAN09 will send Switch\_Binary\_Report and Meter\_Report to the associated group node.

3-11-2 Multi Channel type : PAN09 will send Switch\_Binary\_Report and Meter\_Report which are encapsulated by the Multi\_Channel\_Cmd\_Encap to the associated group node.

## **4. Protection Command Classes**

PAN09 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 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.

## **5. Firmware update over the air (OTA)**

PAN09 is based on 500 series SoC and supports Firmware Update Command Class, it can receives 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.

## 6. 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

### Warning:

1.Plug out to disconnect from power supply; Do not plug in line.

2. Do not exceed the max rating

### 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.

Philio Technology Corporation

8F., No.653-2, Zhongzheng Rd., Xinzhuang Dist., New Taipei City  
24257, Taiwan(R.O.C)

[www.philio-tech.com](http://www.philio-tech.com)

### FCC Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- 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.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

#### 警語:

「取得審驗證明之低功率射頻器材，非經核准，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前述合法通信，指依電信管理法規定作業之無線電通信。低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。」