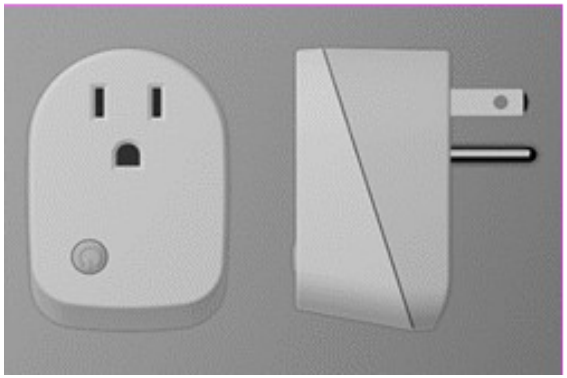
Smart Energy Plug PAN44



This plug-in ON/OFF switch PAN44 is a devices displaying the Z-Wave Plus™ logo can also be used security enabled wireless switch, based on Z-Wave Plus technology. Z-Wave Plus™ enabled with it regardless of the manufacturer, and can also be used in other manufacturer's Z-Wave™ enabled networks. Remote On/Off control of the connected load is possible with another manufacturer's wireless Controller. Each switch is designed to act as a repeater. Repeaters will re-transmit the RF signal to ensure that the signal is received by its intended destination by routing the signal around obstacles and radio dead spots. Because PAN44 supports Security Command Class, it can learn with Secured controller. Its functionality and supported command classes are identical when included as a secure and non-secure device.

This plug-in ON/OFF switch is able to detect instance wattage (1560W/UL/TW/JP) and overload current (14.5A with resistive load) of connected lights or appliances. When detecting overload state, the Switch will be disabled and it's On/Off button will be lockout of which LED will flash quickly. However, unplug and reconnect the switch will reset its overload condition to normal status.

Specification

Operating Voltage	100V-240V~ 50Hz~60Hz
Maximum Load (Ampere)	13A (Resistive load) PAN44-1; PAN44-2
Range	Minimum 40 m in door 100m outdoor line of sight
Operating Temperature	0°C ~ 40°C
Frequency Range	908.4MHz & 916.0MHz/ USA (PAN44-1); 920~927MHz/ Taiwan/ Japan (PAN44-2)
RF Maximum Power	+10dBm (Peak), -10dBm (Average)

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

Troubleshooting

Symptom	Cause of Failure	Recommendation
The Switch not working and LED off	1.The Switch is not plugged into the electrical outlet properly 2.The Switch break down	1. Check power connections 2. Don't open up the Switch and send it for repair.
The Switch LED illuminating, but cannot control the Switch of the load attached	1.Check if the load plugged into the Switch has its own ON/OFF switch 2. The switch is protected	1. Set the ON/OFF switch of the load attached to ON 2. Unprotected the switch or follow the instruction of protection.
The Switch LED illuminating, but the Detector cannot control the Switch	1. Not carry out association 2. Same frequency interference	1. Carry out association 2. Wait for a while to retry
LED keep flashing, but cannot control	Overload occurs	Remove the load attached or check max. load cannot exceed 13A (Resistive load)

For Instruction to 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 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 2 second intervals. It implies that it has not been assigned a node ID.

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 devices

Warning:

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

2. Do not exceed the max rating.

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	1.Have Z-Wave Controller entered inclusion mode.	One press one flash ※ To support handling of the device when already installed the external switch can be used for inclusion or exclusion for 3 minutes after power up.
	2.Pressing On/Off button three times within 2 seconds will enter inclusion mode.	

Smart start	1.To initiate the SmartSart process, please type in the first five digits of DSK string or scan the QR code. The QR Code can be found on PAN44 or in the box. Ex: DSK: 18112-24021-58001-62259-57092- 27453-08187-47408 2.PAN44 is supported with Smart-Start, it can be added to Z-Wave™ network by scanning the Z-Wave™ QR code on the product. 3.Without further actions, PAN44 will be automatically included in a certified Z-Wave™ Controller with SmartStart inclusion ability in 10 minutes after it turned on.	
Remove	1.Put your Z-Wave controller into exclusion mode by following the instructions provided by the controller manufacturer.	
	2.Pressing On/Off button three times within 2 seconds will enter exclusion mode.	
	3.Node ID has been excluded.	LED 2s On, 2s Off
Reset	1.Pressing On/Off 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 2s On, 2s Off (Enter auto inclusion)
Association	1.The PAN44 is an always listening Z-Wave device, so associations may be added or removed by a controller at any time. Or If your controller requires to have the PAN44 send a node information frame or NIF for associations, then pressing the On/Off button three times within 2 seconds will cause the PAN44 to send its NIF.	
	2.There is only one group for the switch	
※Including a node ID allocated by Z-Wave Controller means inclusion. Excluding a node ID allocated by Z-Wave Controller means exclusion. ※Failed or success in including/excluding the node ID can be viewed from the Z-Wave Controller.		

LED Indication

To distinguish what mode the switch is in, view from the LED for identification. The color of LED could be blue、cyan、green、orange、pink or red, it represents the power consumption from light to heavy.

State Type	**LED Indication**
Normal	Under normal operation, toggle On/Off button between On and Off. When pressing On, LED lights up, whereas Off, LED is 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 PAN44 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 unplugging and reconnecting the Switch to the wall outlet.

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.

Installation

1. Plug this On/Off Switch into a wall outlet near the load to be controlled.
2. Plug the load into the Switch. Make sure the load to be controlled cannot exceed 13A.
3. Press the button or switch on the load to the ON position.
4. To manually turn ON the Switch, press and release the On/Off button. The LED will turn ON, and the load plugged into the Switch will also turn ON.
5. To manually turn OFF the Switch, simply press and release the On/Off button. The LED will turn OFF and the load plugged into the Switch will also turn OFF.

Programming

1. Basic Command Class / Binary Switch Command Class

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

1-1 BASIC_GET / BINARY_SWITCH_GET

Upon receipt of the following commands from a Z-Wave Controller, the Switch will report its On/Off state to the node asked.

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)]**

1-2 BASIC_SET / SWITCH_BINARY_SET

Upon receipt of the following commands from a Z-Wave Controller, the load attached to the Switch will turn on or off.

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

The Switch can be set to send reports to associated Z-Wave devices. It supports one association group with one node support for Grouping 1. For group 1, the Switch will report its latest status to Z-Wave Controller. Grouping 1 includes, SWITCH_BINARY_REPORT, METER_REPORT, ALARM_REPORT.

2-1 Auto report to Grouping 1 (Maximum Node 5)

2-1-1 On/Off Event Report

When "on" or "off" state has been changed, it will send Binary Switch Report to the node of Grouping 1.

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 varies over 5%, it will send Meter report to the nodes of Grouping 1.

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

When PAN44 detects the current is more than 14.5A, it will send Alarm Report to Group 1 node.

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.

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 (KWh)

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

Meter Get Command: **[Command Class Meter, Meter Get, Scale = 0x00 KWh)]**
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.

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.

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.

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)

3. Z-Wave's Configuration

Configuration Parameter	Function	Size (Byte)	Value	Unit	Default	Description
1	Watt Meter Report Period	2	0x0000 - 0x7FFF	5s	720	0: Disable Watt Report 1~32767: 5s~ 45h
2	KWH Meter Report Period	2	0x0000 - 0x7FFF	10min	6	0: Disable KWh Report 1~32767: 10min~ 227days
3	Threshold of current for Load caution	2	10-1300	0.01A	1300	1300*0.01A = 13A
4	Threshold of KWh for Load caution	2	1-10000	1KWh	10000	10000*1KWh = 10000 KWh
5	Restore switch state mode	1	0-2		1	0: Switch off 1: Last switch state 2: Switch on
6	Mode of Switch Off function	1	0-1		1	0: Disable 1: Enable
7	LED indication mode	1	1-3		1	1: Show switch state 2: Show night mode 3: One flash mode
8	Watt differential mode	1	0-1		1	0 : Disable 1 : 5% 2: 10% 3: 15% 4: 10%
9	Switch status report mode	1	0-1		1	0: Disable 1:Enable

3-1 Watt Meter Report Period:

If the setting is configured for 1hour (set value =720), PAN44 will report its instant power consumption to Group1 node every 1 hour. The maximum interval to report its instant power consumption is 45 hours (5s*32767/3600=45hr). When the setting is 0, PAN44 will disable Watt auto report function. The default value is 720.

3-2 KWH Meter Report Period:

If the setting is configured for 1hour (set value =6), PAN44 will report its Accumulated Power Consumption (KWh) to Group1 node every 1 hour. The maximum interval to report its Accumulated Power Consumption (KWh) is 227.55 days (10min*32767/1440=227.55 days). When the setting is 0, PAN44 will disable KWH auto report function. The default value is 6.

3-3 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 1300, when the load current of Relay1 over this value, PAN44 will send current meter report to warn the Group1 node, the range of the setting value is from 10 to 1300, and the default value is 1300.

3-4 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 over this value, PAN44 will send KWH meter report to warn the Group1 node, minimum value is 1KWh and default value is 10000 kWh.

3-5 Restore switch state mode:

Whenever the AC power return from lost, PAN44 will restore the switch state

which could be SWITCH OFF、LAST SWITCH STATE、SWITCH ON. The default setting is LAST SWITCH STATE.

3-6 Mode of switch off function:

When the mode of switch On/Off is set to 0, any command of switch off will be disabled and the On/Off function of include button will be disabled. The default setting is enable mode. When manual On/Off function is disabled, the RF command can only switch On but not Off. This is useful function for keeping the device in switch on state.

3-7 LED indication mode: The default setting is Show Switch State.

3-7-1 Show Switch State：When switch is on, LED is on. When switch is off, LED is off.

3-7-2 Show Night mode：When switch is on, LED is off. When switch is off, LED is on.

3-7-3 One Flash mode：When the state of switch changes, LED will be on only one second, then LED keeps off.

3-8 Watt differential mode：The default setting is 1 (= 5%).

Whenever Watt value of PAN44 changes over 5% of last reading value, it will send Meter report to the group 1 nodes. However, if Watt differential mode as 0, the unsolicited report will be disabled.

3-9 Switch status report mode: The default setting is 1(Enable)

Whenever PAN44 manually switch on or off, it will send BINARY_SWITCH_REPORT to the node of group1.

1. Firmware update over the air (OTA)

PAN44 is based on 700 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.

2. The Switch supports Command Classes including

Command Class	Version	Required Security Class
Z-Wave Plus Info	2	None
Security 0	1	None
Security 2	1	None
Supervision	1	None
Transport Service	2	None
Association	2	Highest granted Security Class
Association Group Information	3	Highest granted Security Class
Basic	2	Highest granted Security Class
Binary Switch	2	Highest granted Security Class
Configuration	4	Highest granted Security Class
Device Reset Locally	1	Highest granted Security Class
Firmware Update Meta Data	5	Highest granted Security Class
Indicator	3	Highest granted Security Class
Manufacturer Specific	2	Highest granted Security Class
Meter	5	Highest granted Security Class
Multi Channel Association	3	Highest granted Security Class
Notification	8	Highest granted Security Class
Powerlevel	1	Highest granted Security Class
Version	3	Highest granted Security Class

Note: Please make sure that the intensity of the plug of the electrical device must be 16A and have same head as the enclosed plug before inserting to the socket.

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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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.

(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.