

## CMoo's T-SW & PeX-M Modules (Patented) for Smart Bulb Control from Wall Switch side

*White Paper by CMoo Systems LTD  
August 2017  
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### Overview

As was discussed in detail in the *“Lighting control technology and smart switches in the Internet of Things (IoT) era”* white paper, one of the solutions to the “No Neutral” in the wall switch was the Smart Bulb. This solution is adopted by many vendors’ products including Philips HUE bulbs, Belkin WEMO bulbs, General Electric, and many others. The approach states the following:

Since in a large majority of homes there is no NEUTRAL in the switch and hence it is impossible to control the bulb from there, put all the Smart Electronics inside the bulb and keep the mechanical switch always at ON state. This way the bulb will have constant power and the user can control it from the APP.

Basically, by always keeping the mechanical switch to ON, the LINE is delivered to the BULB and the Neutral is there anyway (Figure 1). The user can now control the lighting remotely from a smart phone.

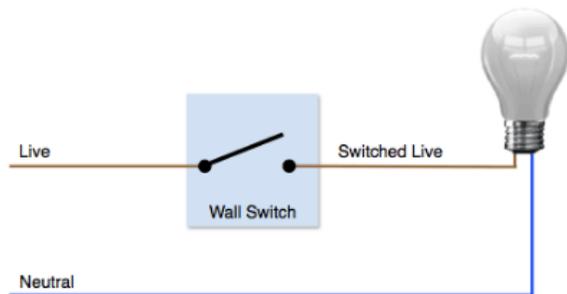


Figure 1: Typical Light Circuit

The figure above represents a light circuit in most of the world. In North America, the circuit is somewhat different but the outcome is the same.

### The problem

This approach has 1 major drawback: Keeping the switch ON at all times means that you can’t use it anymore! The user can only use his/her smart phone for control and cannot turn the light ON or OFF from the wall switch. For most users, this is not acceptable. Most people do not walk in their homes with their cell phone all the time and want a quick

way to turn the light ON or OFF from the wall switch in addition to control it smartly from the App. Also, the switch may be turned off accidentally, thus making the app impossible to connect. The App cannot replace the role of a wall switch! It complements it.

### Existing Solution on the market: Smart Bulb + remote control with battery

To overcome this problem with Smart Bulbs, vendors suggest an alternative “light switch” which is basically a remote control running on batteries. The user should “glue” it somehow over the original light switch, which can no longer be used, and then can control the Smart Bulb with the new light switch (or a smart phone). They therefore recognize that a user needs a fast way to switch ON and OFF besides using a smart phone. Philips has such a product – Philips HUE Dimmer Switch. While it may be a nice gadget for some rooms, it’s certainly not efficient for an entire home. Batteries impose a replacement and maintenance hassle. Also, sometimes the user keeps the remote around without “gluing it” and it’s easily lost.

### CMoo’s Solutions: T-Switch & PeX-M

CMoo has 2 solutions which enable control from the wall switch without batteries or Neutral wire in the switch side:

1. T-SW module for installations behind an existing wall switch.
2. PeX-M module for BULB manufacturers which have a remote control with a battery they wish to get rid of

### Highlights:

1. Both solutions do NOT require any change in the HARDWARE of the Smart Bulb!
2. Both modules allow control from the wall switch as well as from the app at the same time!
3. T-SW is a module intended to be installed behind an existing wall switch. It does not contain any RF or other type of communication.
4. PeX-M is to be used as a power supply replacing the battery within the same

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existing remote controller. Note that this is true for installations with or without the neutral wire in the wall. A new Wall Switch should be designed based on that.

## CMoo's 1<sup>st</sup> Solution: T-Switch

CMoo's T-SW was designed to simply upgrade any existing mechanical light switch to control smart bulbs from a mobile device **and / or** from the wall switch (in parallel).

Today, users must keep the switch ON to be able to use the APP. T-SW solves this constraint! The T-SW is installed behind an existing mechanical switch as shown in Figure 2 below (for illustration only)



Figure 2: T-SW installation behind a wall switch

### T-SW benefits:

1. No HW or wiring change on the bulb side.
2. Neutral wire in the switch side is not required.
3. Works with or without the Neutral
4. No battery
5. No Firmware or Radio in the switch side! The T-SW does NOT communicate with the bulb in any way so the Smart Bulb manufacturer does not need to adopt new communication protocols.
6. No change to the APP in the mobile phone.
7. Work with ANY mechanical light switch (including 3-way and multi gang switches)
8. 110 – 220 VAC support.
9. The User gets to keep its existing wall switches. No need to replace them.

### T-SW Requirement

Since the T-SW does not contain any communication method with the Smart Bulb, it is necessary to do a very minor Firmware change in the Smart Bulb. Any Smart Bulb can support T-SW as long as it has some kind of a Non-Volatile memory such as FLASH or EEPROM which most Smart Bulbs have anyway for

their firmware. CMoo will guide the bulb manufacturer on the required change upon request.

## CMoo's 2<sup>nd</sup> Solution: PeX-M

CMoo's PeX-M was designed to give an option to control a Smart Bulb from the wall switch for manufacturers of Smart Bulbs that have a remote control for this purpose. One good example is the Philips dimmer switch that controls the Philips HUE bulb. The Philips dimmer is simply a remote control operated by a battery and installed next to the real wall switch. With CMoo's PeX-M it is possible to use the same electronics of the remote control while powering it from PeX-M instead of a battery and create a true wall switch. Note that the idea behind the battery was for installations without the neutral wire in the wall.



Figure 3: PeX-M module (same size as standard PeX)

### PeX-M benefits:

1. No HW or wiring change on the bulb side.
2. No Firmware change in the bulb (as opposed to T-SW that requires a minor change).
3. Works with or without the Neutral in the wall
4. No battery
5. No change to the APP in the mobile phone.
6. 110 – 220 VAC support.
7. A new and innovative wall switch with numerous features can be designed.
8. controlled from the switch and from the app

### Summary

CMoo's T-SW is the only DIY solution that allows for a parallel ON/OFF control of a bulb through an existing wall switch or an app. The local wall switch is important for most users and the fact that they must give it up prevents many of them to move to Smart Bulbs. We believe that a Smart Bulb manufacturer that will offer T-SW or Wall Switch based on PeX-M will increase its market share dramatically.

**Note: All brand names mentioned in this paper are used as a reference, belong to their respective owners, and do not in any case reflect any endorsement on their part.**