



# RFI: Buck Converter versus Series Capacitor LED Bulbs

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## All bulbs are not made the same!

Not all LED bulbs are made the same! There are two ways to convert mains high-voltage AC to low voltage DC energy required to power light emitting diode (LED) bulbs.

- One way to lower the mains voltage is to employ a **step-down buck converter**. Without any capacitor ripple filter present at the load side, this type of LED bulb **causes an illegal amount of radio frequency interference (RFI)**. Once the LED bulb opened and exposed, a buck converter can be easily recognised by its **yellow transformer** (Figure 1; front).
- A **high-voltage series capacitor in combination with a series resistor** is another way to tap a low voltage from the mains. If moreover a full wave rectifier is employed, this type of LED bulb will not cause any RFI. The high-voltage series capacitor is easily recognisable (Figure 1; back)

At times, it is hard to tell both types apart without opening the packaging. A white neck casing is more indicative of a buck converter, but this is not always the case. **LEDs with a GX53 socket are almost always using a series capacitor**. Even if a buck converter LED bulb complies with EMC regulations, it will still emit some noise.

When shopping for LED bulbs, **buy always a single unit for testing first, before committing to more**.



**Figure 1:** *Front:* EMI dirty LED bulb with unfiltered buck converter, recognisable by its yellow transoformer;  
*Back:* EMI clean LED bulb with a big, red-coloured series high-voltage capacitor.

## LED database

The German radio society DARC maintains a [LED bulb EMI database](#). In lack of proper governmental EMC policing, this initiative should be applauded! Consult this database prior to spending your hard-earned money on some noisy LED bulbs.

## Policing

The vast, underpopulated land masses of Australia, render HF radio an essential survival tool. Undoubtedly, this is the very reason why [LED bulb policing](#) is stricter there than anywhere else in the world. Good job!



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