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Pulse Transformer Fired Dimmer (PTFD)

What is it and why would I need it?

This article is dedicated to explaining the term 'Pulse Tranformer Fired Dimmer' (hereafter refered to as PTFD). This is a tried and proven piece of technology that has been almost completely replaced by modern semiconductor circuitry. Unfortunately as you will find out, the change is not neccessarliy for the better.

It is also one of the major reasons that the LSC ePRO, iPRO, e24, TDS, TEKO and EKO dimmers are so popular and well liked by lighting crew all over the world.

What is it?

Back in the dim, dark past (sorry for the bad pun) lighting dimmers used a small 'pulse transformer' to control the power device, usually a triac or an SCR. (We will use the generic term 'triac' throughout this document to keep things simple). The 'triac' is the part of the dimmer that actually controls the voltage coming out of the dimmer to the lights.

A 12 channel dimmer needed 12 transformers, one per channel. The transformer was used to provide isolation between the high voltage (100-240v) mains output and the low voltage (~12v) of the dimmer electronics. A pulsed signal was fed into the input of the transformer, and the output was connected to the input of the 'triac'.

The result was a dimmer that could control virtually any type of connected load. This included inductive loads (eg. Anything with a transformer in it, such as pinspots, 12v EVL dichroic lamp systems, etc) and reactive loads (discharge lamps and fluorescent lamps).

Then in the 1980's a new integrated circuit device became available known as an "opto-isolator" (also known as; opto-coupler, MOC). This device uses an LED and a photo-transistor to provide the same level of high-low voltage isolation as a pulse transformer, at a FAR LOWER COST.

Due to the lower cost, and the fact that an IC is easier to work with than a transformer in manufacturing, the vast majority of dimmer manufacturers switched to this great new device.

So what is the problem with an opto-isolated dimmer?

As always in life, you don't get anything for free. The opto-isolators have one major disadvantage.

They do NOT provide power to drive the 'triac' !

Instead the dimmer circuitry uses the connected load to provide the power, so;

The opto-isolated dimmer's performance is dependent on the load connected to it.

In the case of a simple high power load (e.g. a 1000w Par64) this is not usually a problem. The circuitry actually works quite well.

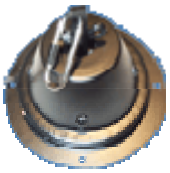
In this scenario the LSC ePAK and iPAK dimmers are an ideal choice.

The problems occur when you get into any of the following situations.

- Very low power circuits (eg. a 15w festoon lamp)
- Inductive loads, such as;
  - Pinspots

  - ELV 12v dichroic lamp systems

  - Transformers such as gobo rotator power supplies
- Motors, such as mirror ball rotators



- Motorised Disco Effects (these often contain a motor and a transformer)

- Reactive loads such as Intelligent lights, Discharge lamps and Fluorescent lamps

If the load is very small (e.g. 15w) there is just not enough power to fire 'triac'. The result is that most opto-isolated dimmers require a minimum load of 100w in order to work.

If the load is inductive or reactive then there is a problem with the voltage and current getting out of phase with each other (due to the laws of physics) which can cause a false trigger of the 'triac', which causes the lights to flicker or flash.

If the load is both of the above (e.g. a small transformer driving a gobo rotator or a 35w dichroic) then some opto-isolated dimmers will simply never turn off the 'triac', so your light or gobo rotator keeps working at full power, even with the dimmer control at zero!

A PTFD dimmer rack does NOT have any of these problems. It simply dims the light as the operation of the 'triac' is <u>completely independent of the load</u> !

<u>Customers usually learn this critical piece information too late.</u>

In many instances the first the customers knows of this "compromise" is after a new dimmer installation is finished.

They decided to 'upgrade' their 20 year old analogue dimmers that were transformer fired, to new digital opto-isolated dimmers. However, once installed the new dimmers *<u>DON'T WORK AS WELL AS THE OLD ONES</u>*, due to the issues outlined above. So having spent many 1,000's of dollars they are actually worse off than before!

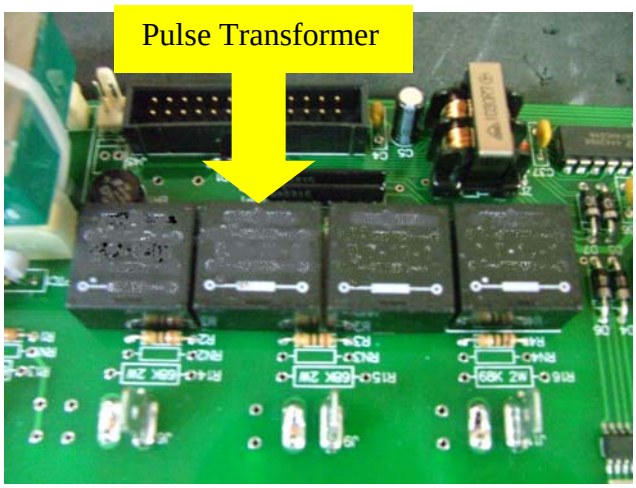
The solution to this dilemma is to make sure that the end user FULLY understands the difference between a **Pulse Transformer Fired dimmer** and an **Opto-isolated dimmer**

<u>BEFORE THEY MAKE THE PURCHASE !</u>

Only a **Pulse Transformer Fired dimmer** offers the superior performance.

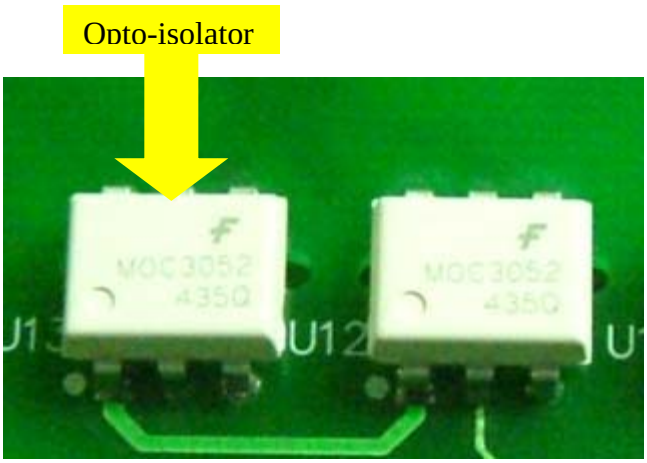
So how do I tell the difference?

Here is a photo of an LSC ePRO dimmer firing card. You can see 4 large black 'cubes' on the PCB, these are the pulse transformers.



The following LSC dimmers are all Pulse Transformer Fired:

- ePRO
- iPRO
- e24
- TDS
- EKO
- TEKO



Here is a photo of an opto-isolated dimmer firing card. You can clearly see the White 6pin IC device. The labelling says it is a MOC3052. Various manufacturers use slightly different devices, but they will usually be a 6pin Dual InLine (DIL) IC package.

The following LSC dimmers are all Opto Fired:

- Redback
- ePAK
- iPAK
- monoPAK

Hard Firing

Some manufacturers try to get around this with what is called Hard Firing. This involves sending a string of small pulses to the opto-isolator (just like we do with our PTFD's), so that if/when the 'triac' misfires, or turns off from a lack of power, it will automatically re-trigger.
Whilst this can help the situation it is a bit like trying to cure cancer with a band-aid. The solution only helps hide the problem, the dimmer still cannot control certain loads.
Some sales jargon will try to convince the end user that Hard Firing solves all the problems with opto-isolation.
It does not!

The Proof

The best way to prove this is to demonstrate the problem. LSC staff carry a Pinspot, a 12v desk lamp with transformer and a mirror ball motor with them when they do demonstrations. The LSC PTFD dimmers can control all of these devices without any problem.

Almost all opto-isolated dimmers fail this demonstration completely. The mirror ball motor does not start, or if it does it never stops. The Pinspot flickers at low levels and the 12v desk light cannot be dimmed; it simply stays on at full brightness as the dimmer channel is dimmed up and down.

The Cost

LSC Pulse Transformer Fired dimmers are more expensive than opto-isolated dimmers. However a 5 tonne truck is also more expensive than a family car. You would never consider trying to carry 5 tonne of lighting equipment in your family car; it is the wrong vehicle for the task. The truck, whilst more expensive is the easiest method to carry the gear. The upfront cost is greater, but over the longer term the truck is actually far more cost effective.

The same goes for a PTFD. Of course it is more expensive to buy. This is because it is more expensive to build. However the long term cost effectiveness cannot be denied. It will simply do the job that is required, no matter the situation.

Most end users will agree that it is worth spending a little more for a PTFD once they have the technical information required to make an informed decision.

END

This document is one of a number of FAQ documents that can be found on the LSC website at www.lsclighting.com