

## Developing LED tail lamps for the 1955 Ford

We always liked the look of the LED tail lamps on the new cars. The benefits of LED lights have been known for a while, they come on very fast, they draw very little current, and they seem have a more intense light. We thought it would be great if we could offer the TBird hobby LED tail lamps. So we began to investigate what it would take to bring these to our customers. First we looked at the direct replacement led clusters that replace the filament bulbs. They weren't even as good as the filament bulbs. They just aren't as bright and they are situated behind the reflector. Next we bought some assemblies with 6 LEDs precariously mounted on an "open-air circuit board". There were multiple problems with this arrangement: It didn't plug into the original socket, the 6 LEDs don't have near enough output, and what came in the box left us asking, "Really they get \$80 for this?"

So we looked to some tail lamp manufacturers to come up with our own assembly. We had these simple criteria: First and foremost the assembly must perform as good or better than the original configuration with a filament bulb. Second the unit must be easy to install and plug directly into the original bulb socket. And finally the assembly should look like it belongs on a classic car not on some kiddy ride at the local fair.

We learned that the original lens employs optics on the back side of the lens which expects all of the light to be coming from a single point ie a single glowing filament. The optics are referred to as Fresnel (pronounced Fray-nell) optics. This technology was invented by Augustine Fresnel in 1822. Fast forward to 2005, the LEDs have their own focusing lens on the front of each LED. Since many LEDs are needed to be as bright as a filament bulb, the light can't come from a single source. When the LEDs are spread out in a large pattern, and a stock lens is used, the Fresnel optics spread the light out so much it is not useable. Simply plugging in an LED array and slapping the stock lens back on won't work and may actually be not as safe as the regular filament bulb. So we had to plan on offering our assembly with no Fresnel optics.

In order to know if our LED assembly worked better than the original filament bulb, we had photometric tests done on a stock lens with filament bulb to know where we were starting. What we discovered was although the brightness was probably sufficient for the standards used in the 50's, the original fails current DOT safety requirements for stop lamp. This reinforced our desire to bring a DOT compliant LED assembly to the hobby. Here is the Reader's Digest version of the test results: Passed side and parking but Failed 8 of 19 points in Stop resulting in failure in 3 of 5 zones specifically the three center zones.

We also tested the LED array with stock lens. It PASSED side and parking but FAILED 7 of 19 points in stop resulting in failure of 3 of 5 zones again the three center zones.

The next challenge was to find a manufacturer of LED printed circuit boards that was willing to configure the LEDs to work not only with 6 volts but 6 volt positive ground. LEDs being diodes only work when current is flowing in the correct direction.

When we started this project we were interested because the LEDs look neat. Now, nine months later, we are excited to finally have the prototypes that look neat but are also much safer than the original filament bulb counterparts. Our assembly uses 24 LEDs, is DOT compliant, uses an easy to install pigtail that plugs into the original bulb socket, and is very attractive.

## LED Tail Lamps for 1955 Thunderbird

