Published in The Rocky Mountaineer, the newsletter of the Rocky Mountain Region

Forget Sockets When Using Incandescent Lamps as Current Limiters

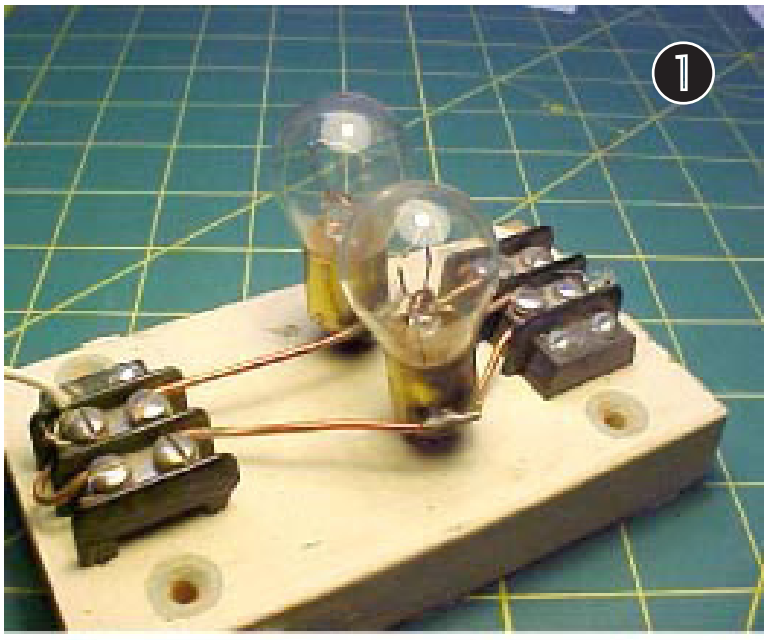
by Rex G. Beistle

Incandescent lamps have been used as track current limiters for a long time. Indeed, lamps were used before any form of Command Control and long before Digital Command Control. The late Paul Mallery described the use of incandescent lamps in his Electrical Handbook for Model Railroaders published in 1955.

Paul noted that “Lamps used for current limiters in place of circuit breakers or fuses have the drawback that they have an appreciable resistance in the range of normal operation.” He further states “Therefore, while a lamp has the advantage of simplicity, it cannot be recommended when heavy locomotives are to be run.” I presume that the late Mr. Mallery was referring to current requirements when he mentioned “heavy locomotives” in the text, the open frame motors of that time period required more current than present day can motors.

Although modern can motors do not draw as much current as the old open frame motors, several locomotives or multiple trains in a single power district may result in a noticeable and perhaps unacceptable voltage drop across the lamp and subsequent slowing of the locomotives. More, and smaller, power districts easily avoid this issue. Each power district would be equipped with its own current limiting lamp. More and smaller power districts or blocks would be a good thing, as an upset in one would not affect operations in the others.

Breaking down a layout into separate sections or blocks should not be looked at as a threatening proposition. The principle consideration is to arrive at block boundaries that only shut off power to the operator that made the operating error. If an operator runs a turnout that is lined against the direction of travel, the ideal condition would have only that operator loose power, not another operator down the track. OK, that sounds like a good idea. After considering operations and the track plan, the need for more power blocks & lots of lamps is obvious. But, catch 22, the cost of all those 1156 lamps and sockets and mounting hardware will add up quickly.



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Number 1156 lamps are expensive, sometimes more than $3.00 each. After getting past the lamp cost issue, the problem becomes how to make connections to the base of the lamp. Sockets are difficult to find and quite expensive. I paid $3.70 per socket at McGuckin hardware in Boulder CO. and that was in 2007. In times past, modelers tried to avoid the socket issue with all manner of Rube Goldberg arrangements.

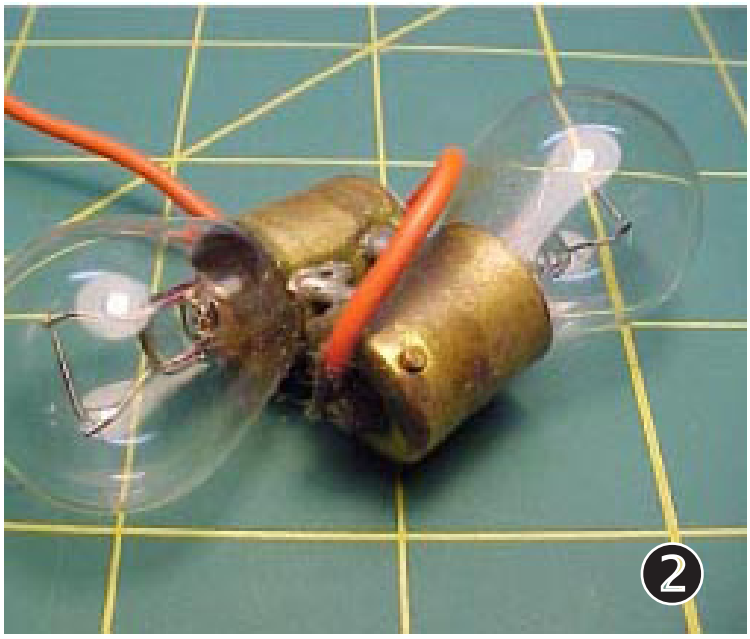


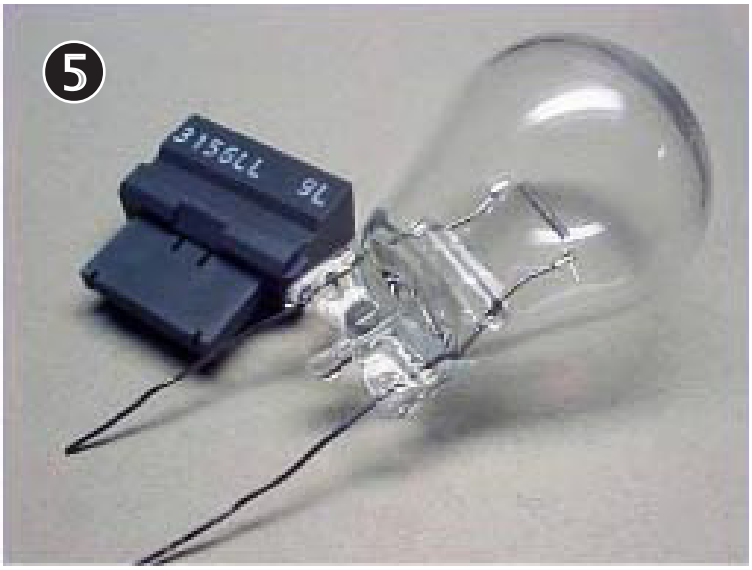
Photo Nos. 1 and 2 reveal a couple efforts to circumvent the socket. These sometimes clumsy efforts worked, but now there is an easy to use alternative solution.

The solution is to not use the expensive 1156 and similar metal based lamps and forget about sockets as well. Enter wedge base lamps, less expensive, no socket required and easily reworked to get access to their wire leads that can attach directly to terminal blocks. The automotive industry recognized the cost issue of single and dual contact bayonet base lamps such as the 1156 some years ago. Automotive and lamp industry engineers worked together to develop a lower cost alternative. Wedge base lamps forego the metal base and solder connections in the lamp assembly and greatly simplify the socket as well.

The wedge base replacement for the popular industry number 1156 lamp is number 3156. A 3156 lamp has the same electrical specifications as the venerable 1156 but costs less and can be used without an expensive socket or even thinking about a soldering iron.

Photo No. 3 shows a 3156 lamp as it comes out of the package. Photo No. 4 is the same lamp with the leads straightened out to remove the plastic base.

Photo No. 5 reveals the conveniently long lead wires, ready to connect to a terminal block with no soldering necessary! The leads are a bit shy of an inch in length. Put on your safety glasses any time the lamps are being handled, especially when removing the plastic base. Some plastic bases are a bit difficult to remove and some will just slip off.



The wire leads will fit easily in the wire barrels of a Euro-Style terminal block, such as Radio Shack stock number 274-680. These terminal blocks can be cut into smaller sections, as the need arises. Wires out the other side of the terminal block connect to the layout and, notice that no soldering is required! The venerable binding head screw barrier strip type terminal block can also be used. The barrier blocks are more expensive and many modelers are finding the Euro-Style terminal blocks to be more to their liking.

Be aware that the construction of the 3156 and similar automotive lamps is not necessarily the same for all manufacturers. The wedge base may be formed from glass with a plastic socket registration collar at the base of the envelope. The lamps with the molded plastic base are easier to use as the wire leads are longer and do not have to be reformed close to the glass base.

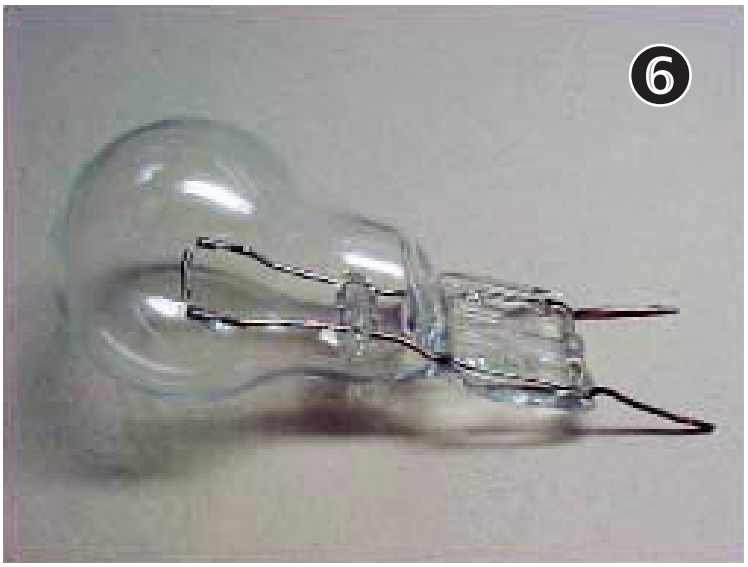
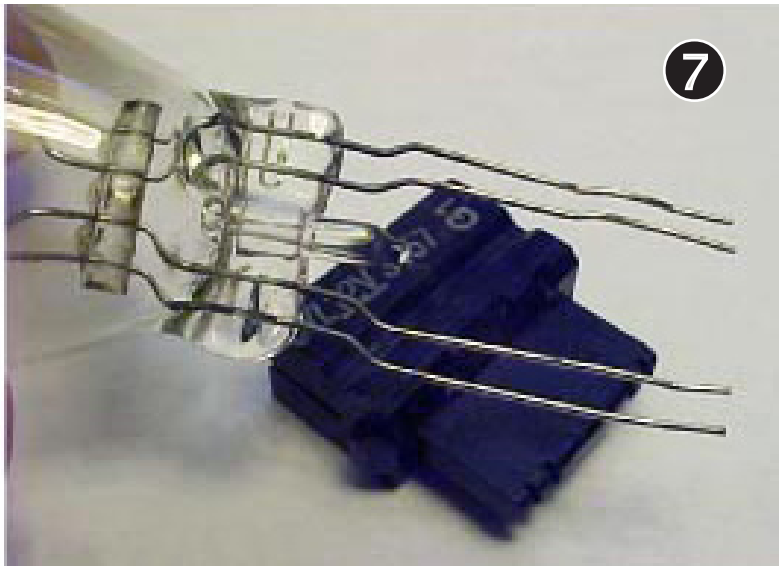


Photo No. 6 is an example of the type of lamp construction to avoid. Note that the leads on this lamp are only about a half inch long, and were reduced in cross-section during the manufacturing process. The leads are also weakened by bending near the glass. The plastic collar has been removed from this lamp.

Dual filament, stop & tail light, lamps like the 3157 can also be used. Using a 3157 with both filaments wired in parallel will give a limiter good for about 2.5 amperes versus the 2.1 amperes of a 3156. A 3157 lamp, with the base removed, is shown in Photo No. 7.



There are other lamps in addition to the 3156 that are wedge base construction and will work for model railroad current limiting applications. There are three physical sizes that could be used, and they are seen in Photo No. 8.

Large lamps like the 3156 and 3157 are S-8 lamps, spherical shape and one inch diameter. The smallest is a T-3 ¼ lamp, tubular shape and 13/32 inch in diameter. The middle sized lamp is a T-5 lamp, tubular shape and 5/8 inch in diameter. Note that the two smaller lamps can have their wire leads straightened out and that the leads are long enough to fit in the Euro-Style terminal block.

Take note especially of the reflective aluminum duct tape that is used to reflect heat away from the wood supporting the terminal block and current limiting lamp. The vast majority of the power consumed by an incandescent lamp is radiated as heat. Protecting against the heat generated by the lamps is of upmost importance. The need to assure that the heat from the lighted filament will not start a fire cannot be over emphasized. It would be wise to test the installation with long term overcurrent to assure that the heat will not cause a problem. It is be better to install the lamps so that they are not adjacent to wood at all, perhaps on a metal plate that would carry the heat away. K&S metal sheets are available in 4 by 10 inch size pieces and could be cut into plates for supporting the lamp and terminal block.

Some of the lamps may be found only at auto parts stores. A smaller selection will be in the automotive department of hardware stores & home improvement centers. The outdoor lighting department of hardware stores & home improvement centers will have an assortment of the two smaller sizes of lamps. These are used in the 12 volt outdoor lamps and are available in several wattages and typically are not identified with industry numbers.

As the January 15th 2012 deadline for this article rapidly approached, I found the T-5 size 12volt, 4, 7, 11 & 18 watt garden lamps available in packages of four for $5.63. The metal based version of the 18 watt lamp (similar to the 1156 lamp) was two per package for $7.99, a significant savings – and no socket is required!