

# Wheelset Resistor Installation

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Rev B 9/06/2005

(Photos and Drawings by the Author)



*The basic list of supplies needed to make your rolling stock detectable.*

## Required Materials

Each car should have a minimum of two resistors, one axle per truck. I install them on the inboard axle, so as to make them more discrete, but it is up to you. Optimum resistor values are [10,000 ohms \(10K\) 1/8th watt](#) or [10,000 ohm \(10K\) 1/10th watt](#). Bear in mind that the 1/8 watt resistors are plenty small, but the 1/10th watt resistors are really, really small (approximately the size of a Kadee knuckle coupler spring). Both wattage values will work equally as well. Resistors cost around 1 cent each, but can be even cheaper if they are purchased in lots of 5000 or more.

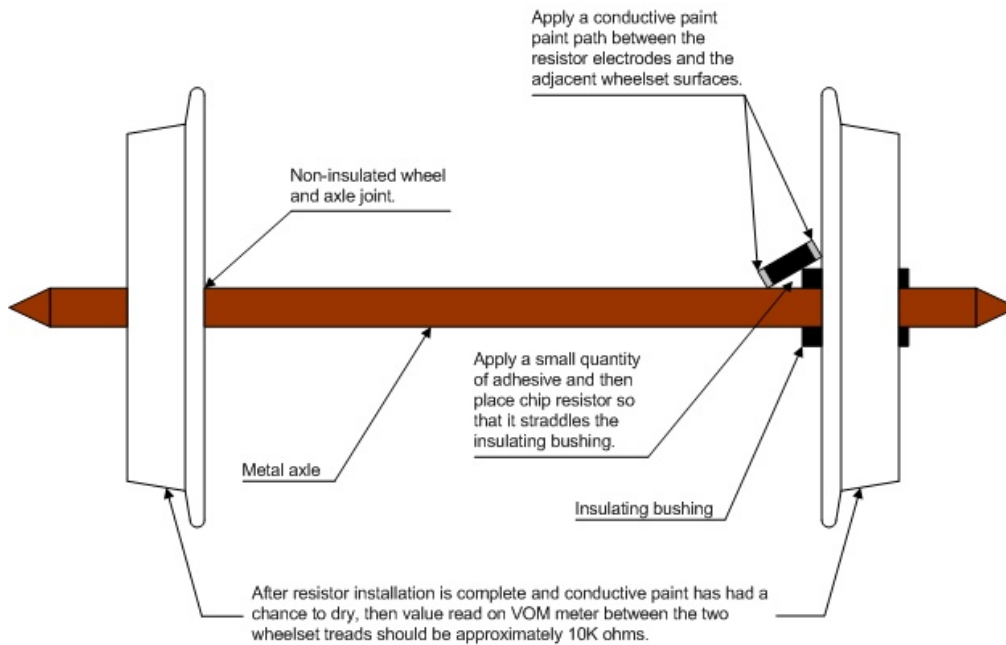
Most chip resistors that have been done to date have been attached using 5-minute epoxy, which is mixed up in small amounts to do about 3 or 4 axles at a time. However, an alternative method being used is [IC-2000 Rubberized CA Adhesive](#) (it is the fourth one down on the page) by BSI (Bob Smith Industries). It is a good adhesive for attaching resistors to wheelsets since it is a CA type adhesive so it sets up fast, but not too fast, and it retains its elasticity (shock resistant) after it dries, unlike conventional CA that can become brittle once it

cures. Rubberized CA is used frequently by the R/C car guys to attach rubber tires to the hubs, therefore Larry's Hobbies is a good local supplier. A 1 oz. bottle of IC-2000 runs around \$8.00. I understand it is also possible to purchase BSI IC-2000 at outdoor sporting goods centers, since it can also be used for patching rubber boots, rafts, etc. The IC-2000 makes the job go much faster and is ready for the silver paint in about 5-minutes after application.

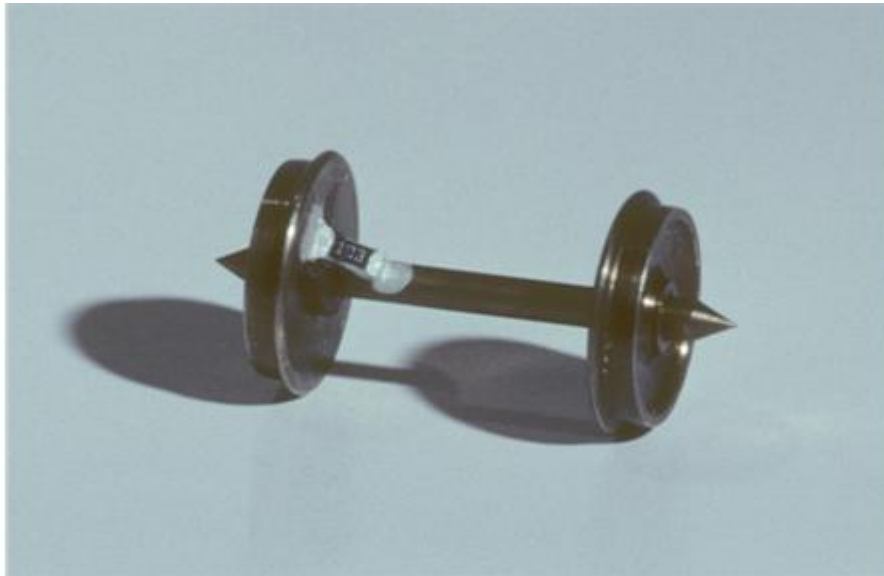
As for the silver print circuit board repair paint, it is available in a small pen-like applicator and in 1/2 oz. bottles. The pen costs about \$16 by CircuitWorks, which I've heard both good and bad things about. I've heard that the pen has a tendency to clog, but others swear by it, since it can make the process move along quicker than using a brush. It's up to you as I've never used it myself. I think the pen can be purchased locally from Fry's Electronics over on I45 near West Rd. or you can get it mail order [CircuitWorks Conductive Paint Filled Pen](#) (scroll down to where it says "CircuitWorks Conductive Paint Filled Pen"). I have no idea which tip size would be better.

The [Silver Print](#) (scroll down to p/n GC-22-023) by GC Electronics is available via mail-order for around \$25 for 1/2 ounce, which will do thousands of wheelsets. The silver print is also available in a 1 oz. bottle for those that might want to go in together to split a larger bottle, since it costs less (about \$42 for 1 oz. bottle). The bottle that the silver print comes in is actually a liquid nail polish bottle and it has the typical nail polish type brush attached to the cap. This brush, however, is way oversized for our needs, so I apply it with a Floquil #5/0 red-sable brush. In addition, if you go the route of the silver print, I recommend you put a few BBs (pre-cleaned in lacquer thinner, so you don't contaminate the contents with the light oil that comes on the BBs) in the bottle. The silver print is made with real silver powder in a lacquer solution and the pigment is very heavy and likes to settle to the bottom of the bottle, especially when it sits for long periods of time between uses. In order to get the best results, you really need to shake it well and BBs help to break up the heavy pigment and make a nice rattle noise when it is ready for use. Use straight lacquer thinner to clean brushes.

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Rev: A	Date: 03-15-2005	Initials: SJK
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*A completed wheelset with the resistor installed and the conductive paint applied.*



*To test the resistor installation, the wheelset is hooked up to the test leads of the VOM. The VOM selector switch is set to read resistance (ohms) and the value being measured between the wheel tread surfaces is 10.03K (10,030) ohms. Due to the tolerance rating applied to resistors, the value you read may vary from this example.*

### **Other Sources for Resistance Wheelsets**

As for pre-resistor wheelsets, I know of two sources:

- [Jay-Bee Wheelsets](#) are available through Walthers and, therefore, available through most hobby shops. However, you most likely need to special order them. Please note Jay-Bee wheelsets have slightly oversized axles to accommodate the resistors inside the axle. I personally have not used them, but I have heard some bad things about the quality control on Jay-Bee Wheelsets on various MRR newsgroups in the past in regards to the wheelsets not being in gauge or the resistors not making contact. When you try to re-gauge them by twisting the wheelset you end up breaking the continuity between the wheels and you just end up with a plain old expensive fat-axle wheelset. They may have gotten a little better with their QA recently, so it's up to you whether or not you want to give them a try. Walthers lists them for about \$2 per axle (sold in packages of 10).
- [Logic Rail Technologies](#) from the Houston, TX area. Logic Rail Technologies supplies standard [NWSL detectable wheelsets](#) with 15K chip resistors glued on, much like you would do yourself. 15K is a little on the high-side for a resistor value, but they will work, just may not be as reliable as the 10K value. However, with 2 detectable axles per car, it shouldn't be a problem. Also, if you order a substantial amount, Logic Rail

Technologies may be willing to change the resistor value to whatever you request. Logic Rail Technologies price list shows they cost around \$9 per 4 axles (approx. \$2.25 each).

## **Final Thoughts**

A common misconception by some modelers is that they just plan to change out one axle per truck and leave the existing axles installed. Technically, this will work as long as the wheels are the same diameter; however, the aesthetics of the car can be compromised. By compromise, I mean HO wheelset profiles are like snow flakes and differ from manufacturer-to-manufacturer; the new resistor installed wheelset profiles will most likely not match the existing wheelsets leaving the wheels on trucks looking funny because the wheelset faces will be different. The obvious solution is to change out all the wheelsets with wheelsets from the same manufacturer to assure that the wheel-face profiles are all the same. Since the manufacturers that make resistor equipped wheelsets also make standard wheelsets, you only have to purchase one resistor wheelset per truck and then use that same manufacturer's non-resistor wheelsets for the remaining axles. The next obvious - and least expensive - solution is to just add resistors to your existing wheelsets (as long as your current wheelsets have metal wheels). Adding resistors to your existing metal wheelsets solves both the unsightly "snow flake" wheel face profile issue and gives you detectable axles on each truck for a fraction of the cost.

In closing, you can make your car detectable for mere pennies per axle, but they are available commercially if you wish to go out and purchase them pre-made. In addition, you are free to paint the wheelsets after you apply the resistors and silver print if you like, however, it is recommended that you mask the wheelset tread before painting or clean it thoroughly after painting since the paint will severely inhibit the "detectability" of the wheelset.