

# HOW TO CONVERT A “TOY” TO A MODEL - AND DO IT ON A BUDGET (A *Makin’ Tracks!* Tutorial)

At some point, most modelers look at the cars in their rosters and wish they could look and work a little better. Many such cars were acquired early in the hobby experience, or perhaps received as a gift, or maybe as a “bargain” on an Internet auction site.

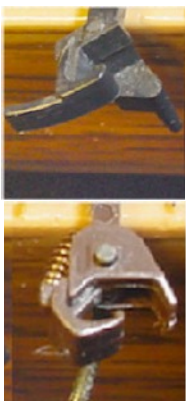
Regardless of their origin, we eventually realize some of the important shortcomings of the cars in terms of appearance, performance and compatibility with the very impressive models available today. If only there were a reliable way to upgrade the old toys at a reasonable cost.

In point of fact, *some* of the old standbys look realistic, sometimes convincingly so. It would be worthwhile if you could make them into top performers that will be compatible with and operate well with new newer models -and, at a reasonable cost. And even the ones that look a bit like candy can be repainted, so they, too are candidates for conversion.

This article will show our budget friendly methods of converting the “toy” cars into top performers. Applying our methods will allow you to perform fleet upgrades that preserve your existing investment. So, before you toss them aside, read the following material to learn what can be done with what you already have. You might be very pleasantly surprised.

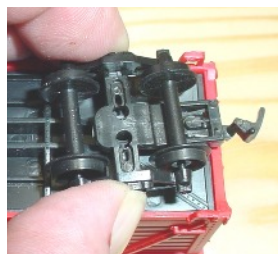
There are basically three performance challenges with the old toy type cars; couplers, trucks and wheels.

**1. The couplers:** Old style horn and hook couplers (above left) are rarely used anymore, having been replaced by the more realistic and better performing knuckle style (below left). The horn and



hook, being made of plastic, can only be uncoupled manually, or with a special track section with a channel that traps the downward facing pin and forces the coupler open. This means that cars moving through this uncoupler tracks will always come apart, so your choice of locations for them is limited. But the knuckle coupler has a metal pin, fashioned to look like a brake line hose. Thus magnets may be used to open the knuckle. Remotely operated electromagnets may be placed in many locations but will have no effect until you activate them from the panel.

**2. The trucks:** The toy cars were, typically, fitted with “talgo” trucks. This style of truck has the mount for the coupler built in to it, as shown at right. Because the mount was made for just one of several horn and hook coupler styles, finding replacements was difficult, and knuckle couplers would either fit poorly, or not at all. The truck



was attached to the car body in one of 3 ways:

1. A split stem at the top of the truck which popped into a hole in the car body (most common).
2. A mounting pin which went through a hole in the truck and then fit by compression into a hole in the car body (less common)
3. A screw which went through the truck and into a hole in the car body (rare).

If your rolling stock was purchased from multiple manufacturers, you quickly learned that that the three types were incompatible with one another. You had to keep separate replacement parts on hand for repair.

Despite this inconvenience and potential added cost, talgo trucks do have *one* advantage over conventional trucks, which do not have an integrated coupler. A coupler mounted to a truck will swing with the truck as it rotates to follow curves in the track. Therefore the couplers stay centered on one another in curves. And that means talgo trucks will perform better when negotiating a tight radius.

The body mounted couplers stay in the same position, at a right angle to the end of the car. Consequently, they engage each other at an angle when the train moves through curved track sections. This is not normally a problem until either the radius of the curve is very sharp, or the cars are very long, or both. And that is why many long cars (such as passenger cars) still use talgo trucks, or otherwise some mechanism to make a body mounted coupler swing from side to side.

But this single advantage *only* works for cars being *pulled*. If they are being pushed (train backing up) then the talgo trucks work against you; the shape of the engaged surfaces of the couplers work to make derailment more likely.

The main disadvantage of the talgo truck is that most all use plastic parts to attach the truck to the car body, which tends to create friction and wear. The split stem in particular constantly bounces around in the mounting hole while the train moves. Dust, grime, hair or fibres and other matter contribute to rough operation. By contrast, the conventional truck is mounted with a metal screw whose threads bite into the plastic hole in the bottom of the car body. This assures stability, plus smooth rotation of the truck around the screw.

Bottom line: conventional trucks perform better than talgo trucks in most all situations.

**3. The wheels:** Most “toys” use plastic. Metal is better. The surface is more highly polished, so metal wheels accumulate less dirt and crud than plastic. They roll more freely than plastic. They are heavier, so they lower the car’s center of gravity and make for more reliable operation. They are easier to clean when they do get dirty, and can’t be damaged by aggressive cleaning. And darn they sure **SOUND** good.

A *total* car conversion is therefore a 3 step process: trucks, couplers, and wheels.

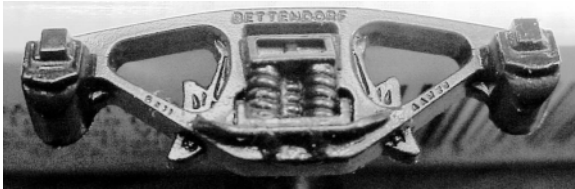
**Supplies, materials and tools:** Before we jump in, let's begin with a list of what you'll probably need, with some in-depth explanations of the available alternatives. For those who are new to the hobby, and bewildered by the many options and choices, this section may be especially helpful.

- **Trucks.** If you have some conventional trucks harvested from various models, they can probably be used. Otherwise, you will need to procure some trucks, with or without wheels. The least cost solution is to use trucks with NO wheels, and then purchase metal wheels to fit them. For example, Accurail trucks and Intermountain metal wheels.

And this brings us to the question of what kinds of trucks were used by the railroads. There were many competing brands, types and variants. But in general, as cars were designed to carry heavier and bigger loads, trucks became more substantial, included more suspension and incorporated roller bearings to reduce friction.



Pictured above is a modern truck, with 3 visible coil suspension springs, and generically known as a "roller bearing" truck, often sold under the "Barber" brand. The end of the axle was separated from the bearing surface by 3 rolling bearings. This would be appropriate for the 1960's and forward era.



The predecessor truck was the "Bettendorf" which included 2 visible springs in front and "hot boxes" in which the axle rested and rotated in a simple hole. Appropriate for the early to mid 20th century, this was known as a "friction bearing" truck.



Prior to that was the "Andrews" truck which was similar to Bettendorf, but not as substantial.

We stock all three kinds of trucks.

- **Metal wheels.** Intermountain metal wheels appear to be the standard, which is why we use them for our own upgrades, and recommend them to others. Made of highly polished brass, and incorporating needle point axle ends, they are adaptable to most any (but not all) trucks.

- **Coupler box.** Also known as a "draft gear box," this is the shallow, lidded box with a bearing stem which passes through a hole in the shank of the coupler to keep it in place. The Kadee #242 is exceptionally easy to use; the lid is a snap fit into the box, requiring no glue or hardware. And, it is dirt cheap.



- **Knuckle Couplers.** The Kadee #5 pictured at right is regarded by many as the industry standard, because it is made of metal and is quite sturdy. Note that the #5 uses a separate "centering spring" being the copper foil part which keeps the coupler at a right angle to the end of the car. Walthers makes a "Proto-Max" knock off, a basic clone of the Kadee, which was manufactured when Kadee's patent on the famed #5 expired. It includes the centering spring.



Otherwise, there are competing brands made of plastic, including the popular McHenry brand, which is also produced under license by Bachmann, and sold as the E-Z Mate Mark II coupler. What all of these hold in common is a coil spring which keeps the knuckle in a closed position, and a metal "trip pin" which will respond to magnetic force to open the coupler. This feature has the appearance of an air brake hose. There are variants which rely instead on a tongue to do the same job as the coil spring. Accurail offers a split coupler (top and bottom) which when assembled resembles a pair of scissors. Each half of the scissor has a thin section of flexible plastic which is trapped in the coupler box, to keep the scissor closed until forced open by impact from a coupler on another car.

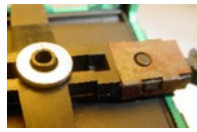


We have standardized on the Kadee because of its universal acceptance and proven operation and reliability. That brings us to two choices. The #5, with a separate spring inside the coupler box, and the #48 "whisker," (left) which relies on a thin flexible wire integrated into the coupler itself.

- **Hardware.** Most commonly, 2/56 machine screws are used to attach trucks to car bodies. Typically, the threads of the screw bite into the plastic of the hole; the hole is normally not threaded itself. However, because you will be converting



cars that probably have a much larger hole for the talgo trucks you will be replacing, you will also need some 2/56 nuts. These will be pressed into the existing hole and will provide a solid, threaded path for the 2/56 screws.



Otherwise, you will most likely need some small metal washers to adjust the height of the car over the trucks. The coupler, which is attached to the car, will likewise be adjusted to the correct height, IF it would be too low without the washer adjustment. Most of the time, the couplers will be too low, so the washer fix is commonly used and is easy to apply. But if the coupler is too HIGH, you'll need to add some shims between the coupler box and car, to move the coupler down.

Be aware that most washers are made by punching them out from a sheet of metal. Consequently, one side will often have a somewhat jagged, rough edge. This is the edge that should face the bottom of the car, so the truck bolster can rotate freely on the smooth side. Sometimes, you'll need 2 washers to get the right lift. In that case, the rough edge should be filed away, which normally only takes a few passes with an ordinary small shop file.

Small washers are readily available from home improvement stores, but the 2/56 screws and nuts are comparatively rare and tend to be expensive when found. Consequently, we stock several lengths of the screws, plus nuts and washers at reasonable prices.

- Scrap pieces of thin plastic sheet goods, balsa or cardboard. These will allow you to make shims, when necessary, to place between the coupler box and car body.
- Tools:
  - Small screw drivers
  - 13/64 drill bit
  - A small, flat "mill bastard" file. (Ours is about 10 inches long, flat on one side).
  - Small straight edge (like a metal ruler)

The above tools are easily obtained if you don't already have them handy. See the Needs List" at the end of this article for a compact summary of the above.

**Selecting Cars to Convert:** You may want to use some really ugly old cars for practice, but otherwise select the cars that are already pretty good looking, or which you can weather or paint to make them look good. Often, gondolas are realistically painted and decorated. But just as often certain box cars and hoppers appear to be made of candy or otherwise are simply not very convincing models. Are you supposed to eat them? Or run them on the layout?

If you're good with airbrushing, many of these can be salvaged. But if you are not, then focus on the cars whose appearance looks best to you just as they are.

**The Basic Procedure:** In summary, here are the five basic stages of a conversion.

1. Remove the old trucks, ream out the hole with the 13/64 bit (by hand) insert a 2/56 nut, and carefully apply CA glue to secure the nut.
2. Assemble coupler boxes with couplers installed; set aside.
3. Prepare underbody of rail car for placement of the coupler box, apply CA to prepared surface, and affix the coupler box with coupler.
4. Insert metal wheels in the new trucks if necessary, screw truck to car, using the 2/56 nut previously mounted.
5. Compare coupler height to a known good car, or to a coupler height gauge; adjust height of car body over truck as necessary. To raise coupler, insert washer (s) between truck and underbody; to lower, remove material from car body.

Done. After doing a few cars, you should be able to finish a job in ten minutes or less. Now let's take a more detailed look at what to do.

**Preparing for the new trucks:** Most old talgo trucks can be pulled out of their sockets with a little effort, to expose the mounting hole. There is a market for the talgos, so keep them for swap meets, to sell online, etc.

We suggest using a cradle of some kind to hold the car still during various phases of the operation. We use an empty cardboard box with a cloth in it to secure the car - but you use whatever does the same basic job.

We use a 13/64th's bit to ream out the mounting socket, for a press fit of a 2/56 nut. You may use a smaller bit, then continue with a sharp hobby blade to scrape away more material. The important thing is to not make the hole too big, so the nut drops right through it. For this work, you will probably find it easier simply to hold the car with one hand, while you work with the other.

With some finger tip force, you should be able to push the nut into the hole, although it may be noticeably tilted as shown at right. Now you can drive it the rest of the way home with a flat straight edge, so that the nut is firmly seated, flat, and even with the surrounding plastic.

If the top of the nut is slightly above or below the surrounding material, you can file away some the nut or plastic to make them even.





To test the nut for correct orientation, turn in a 3/4" or longer 2/56 screw. Use it as a "joystick" to tilt the nut so that the screw is in a true vertical position when observed from every angle. Once you've got it right, very gently turn out the screw, so as to avoid tilting the nut as you do so.

But what if the hole is simply too big? All is not lost. Turn to your scrap pieces and cut some small slivers to bind the nut in place. As a last resort, fill the hole entirely with epoxy or similar material which you can later drill and tap for a 2/56 screw - and forget about using the nut.



The next step is to secure the nut with some CA adhesive, such as our Makin' Tracks! Gap Filling Insta-Cure. This particular product is fluid enough to fill gaps, but will also puddle up somewhat instead of running freely. This step is CRITICAL, because you want to apply the glue ONLY between the faces of the nut and the plastic around it. This is why the gap filling property is important. At the same time you want to AVOID letting any glue get inside the nut itself, where it will fill the threads and make turning in a screw impossible.



We suggest squeezing out a small drop on the tip of a toothpick, then very carefully touching the tip of the pick

over the voids between the faces of the nut and the plastic surrounding plastic collar in which the nut is embedded.

Give the glue a few moments to set, then carefully turn in a 2/56 screw to be sure no glue has migrated to the threads of the nut. If this *has* happened, continue to turn the screw in as far as you can, then pull out the screw, to bring the nut along with it. Start with a new nut.

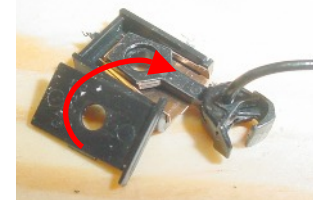
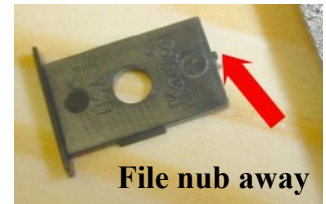
Assuming all is now well, apply the same procedure to the other end of the car, and this phase will be complete.

There are alternative methods which may be used to mount the nuts. You can, for example, start with a nut that is screwed onto the end of a long 2/56 screw. Then, coat the inside of the hole with some CA, and push in the nut, using the screw as a handle, at the same time adjusting the orientation to keep the screw straight. It is *very important* NOT to apply too much CA, or it will flow into the threads from the underside of the nut.

Another alternative is make a tiny puddle of CA and allow it to flatten out. Then, using the screw as a handle, coat the outside of the nut by lightly dipping the outside edge of the nut. Here again, avoid an excessive coating, or the CA will wick around into the threads of the nut.

**Couplers:** Use whatever brand of coupler you want. Install them

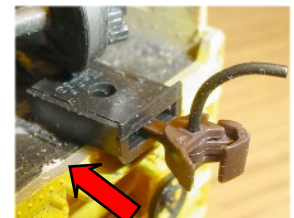
into a Kadee #242 "universal black box" coupler box. These boxes use a snap-fit lid which does not require a screw to hold the lid in place. When you detach the lid from the sprue, file away the bit of sprue on the end of the lid, to assure an exact fit of the lid into the box. The top of the lid has the word "Kadee" on it, and should be facing up to you when you snap the lid into the box. If the lid is upside down, it won't fit. The lid is secured when you hear it, or feel it, seat itself. As



indicated by the pictures, the curved trip wire of the coupler should face toward you when you assemble the couplers. It is the closed side of the coupler box that is affixed to the car body, so the lid is in view when you pick up the car and hold it upside down.

**Installation of Couplers on Cars:** Depending on the type and construction of the car, you may, or may not, need to prepare it for affixing the coupler. In the ideal situation, the bottom edge of the end wall of the car body will exactly match the bottom of the floor of the car. You're home free; just glue the coupler assembly to the underside of the bottom of the car, and you're done. By assembling the box and coupler first, you've made complete unit with a little "handle" -being the coupler itself- to make handling and placement very easy.

If the underbody of the car is slightly inset below the edge of the end wall of the car body, then the exposed lip will prevent mounting the coupler box flat to the underbody. It must either be shaved away, or you'll need to add some shims to the underbody to provide a surface that is even with the lip.



The easiest adjustment is simply to shave away material from the lip of the end wall to make it level with the bottom of the car. This is pictured at right.

This correction might, however, come at the cost of making the coupler too high over the tracks. If that's what actually happens, then you'll need to pop off the coupler box, add a shim (or several) to the underbody, and reset the box over the shims. More often than not, the box can be pried up without damaging it, because the glue is not yet fully cured. But before affixing it to the the shims, sand away any residual glue from the bottom of the box. Worst case: you do spoil the box, but the cost is minimal.



The other fix is simply to use shims from the get-go. It is a bit more time consuming but not at all complex. Simply add enough to make a platform for the coupler box, that is even with the lower edge of the end wall, as shown at left.

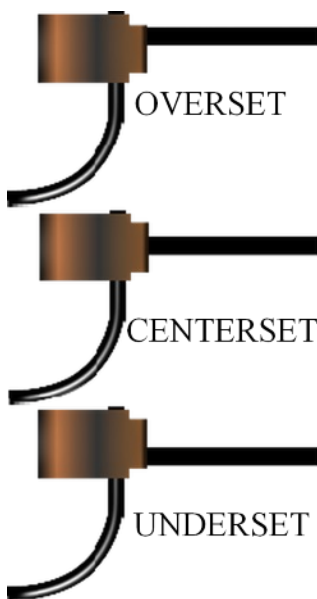
Whether using the shave or shim method, it is essential to center the coupler box with respect to the left and right sides of the car, and be certain it is at a 90 degree angle with respect to the end of the car (you can be more relaxed as to placement of the shims). If you see an error, pop off the box promptly, and try again.

You should now have a car with couplers attached, and mounting holes ready to receive the trucks.

You may wonder how to make sure the coupler, when installed, will be at the correct height from the tracks. It is possible to estimate this with a number of tedious measurements, but we recommend you not even try. Instead, install the coupler, and THEN check it for height against a coupler gage or another car whose couplers are known to be correct. It is far easier and faster to make any necessary corrections than it is to attempt a perfect placement from the outset, which will probably require additional adjustments later, anyway.

That said, the preferred situation is to have couplers which end up being too low, for this is easily corrected by adding a washer or two between the truck and the car body. Less preferred, but by no means hopeless, is couplers that are too high. In such cases, the correction is accomplished by popping off the coupler box, adding a shim or two to the car body, then affixing the coupler box to the shim. Either way, you'll know from direct observation exactly what amount of correction is necessary.

#### **But what about underset, or overset coupler shanks?**



Most knuckle coupler manufacturers make couplers to meet these odd sounding specifications. The idea is that the shank (the "neck") of the coupler is attached near the top or bottom of the head (the knuckle), as opposed to the center, which is the normal practice. This has the effect of raising or lowering the knuckle, as illustrated at left.

We suggest you do NOT go with this option, for several reasons. First of all, while selecting the appropriate coupler may get you CLOSE to what you want, there is no assurance it will get you all the way. You'll still need an additional remedy. Second, purchasing these couplers is an added expense, especially when you can't know how many of any of them you'll need ahead of time. Finally, the offset of either the over or underset coupler introduces additional torque effects in a moving train.

Perhaps the only time to use couplers with offset heads is on

locomotives, where it might be impossible raise or lower coupler height any other way. Otherwise, we'd prefer to see all couplers with center set shanks, which is the normal and most widely used configuration, and has the added benefit of using just one kind of coupler in all situations.

**Finish and Install Trucks:** Install metal wheels in trucks, if this has not been done previously.

Use a small shop file to dress the tops of the nuts and surrounding plastic to assure they are dead flat and at the same height with respect to one another.

Mount the trucks to the body with a 2/56 screw turned into the nut. The screws should be turned in to allow free pivot of the trucks, but permit as little car rocking motion as possible. One good way is to tighten the screw so the truck does not turn, then slightly turn the screw back out - just enough to allow the free rotation of the truck.

Use the longest 2/56 screw that can be turned fully into the nut. On some cars, the screw will simply appear in a hollow interior. But in others, there may be a metal weight or some other obstacle below the mounting nut. Occasionally, you'll need to cut a screw to the appropriate length. Do so with a pair of side cutters or a cut off wheel. Gently file away any burrs at the start of the threads, so the screw will engage the threads of the nut easily.

**Final Adjustments:** Turn the car upright and sit it on the bench to compare the height of the couplers to a car you already use, or to a coupler gauge such as the Kadee #205.

On any given layout, couplers should be at the *same* height. This need *not* be the same as the Kadee gage, as long as all couplers are at a uniform height. Be sure the curved metal wire under the coupler (the "trip wire" or "glad hand") is high enough to avoid contact with rails along a curved track section, or in a turnout. Trip wires may be bent up if they are too low. But this should only be done if the coupler heads are already evenly matched, and the trip wire is barely making contact with the rail.

On the other hand, if you will be using your cars on a club layout, all members will need to observe the same height, so all cars may be freely interchanged. Most of the time, the Kadee height gauge is accepted as the standard to be observed by all.

Ideally, no height adjustment at all will be necessary. Otherwise you'll need to raise or lower the coupler a little bit.

**Coupler too low:** To raise the coupler, raise the entire car slightly above the trucks, using a small washer placed between the the truck and the car body. It is helpful to have 2 or 3 different small washer sizes available to make a precise adjustment. Buy packets of the smallest standard washers from a hardware or home improvement store. Sometimes, you may need to use a stack of two washers to make the adjustment, but this should be avoided if possible. If necessary, make a shim from your scrap pile, drill or punch a hole in it to allow the screw to pass through, and affix it with CA to the underbody of the car, centered over the screw hole. Then add a washer between the shim and the



truck.

You'll note that washers often are smooth on one side, but have a bit of flash around the edge on the other. A few passes with a file will remove this material. Otherwise, let the jagged edge face toward the car underbody - smooth side toward the truck.

Washers may be secured with a tiny bit of CA, but we don't recommend doing so unless it is crucial to stability and performance of the car. Use just a tiny dab, so the washer may be popped free later, if necessary. Aside from raising the car, the washers also provide a bit more shoulder to support the truck when it rotates to follow curves - a performance enhancement.

**Coupler too high:** The situation becomes slightly more difficult if couplers are too high. The most effective solution is to add a shim (or shims) beneath the coupler box, to make the coupler lower. Pop off the box, affix the shim, and replace box as previously described.

**Final Test:** Mount car on the tracks and give it a shove to move it along. If it moves smoothly with no discernible tilt or wobble, you're done.

But there might be a discernible tilt to one side or the other. This usually indicates one or more of the following problems:

1. The underbody of the car is not properly seated in the shell of the car; it is slightly cocked to one side or the other.

Seat the underbody (car floor) properly.

2. A weight in the car has shifted; inspect and correct.
3. The top of the nut and any surrounding material are not dead flat and level. Correct it by filing away enough material to make the top of the nut and surrounding plastic dead flat and parallel to the underbody of the car.
4. If you have used washers, the jagged edge may be either facing the truck, or slightly raising the washer on one side. Correct by filing away the flash or flipping the washer over (or both).

Assuming all has been corrected and your car runs well, you now have successfully converted a former "toy" into a credible model. Spray on some dull coat, add a bit of weathering, and you have one dandy, good looking, nicely performing piece of rolling stock at a much lower cost than purchasing a new kit or ready to run equipment. After you've done two or three cars, you'll be converting cars quickly, easily and reliably with no need to consult these instructions.

We maintain a substantial inventory of parts you might need to perform these upgrades. See our website, at:

[www.makemytracks.com](http://www.makemytracks.com)



On the following page, you'll find a compact list of parts you might need to convert your cars.

Below is a compact parts list, and at right is one we've filled out as an example. Suppose you have 10 cars to upgrade. You want 2 equipped with roller bearing trucks, 3 with Bettendorf, and 5 with Andrews. Enter these values under "# of Cars", and multiply by the factor under the "X" column to calculate your "Total Parts."

You want 3 cars to ride on 33 inch wheels, 7 with 36 inch. The multiplier is 4, because you'll need 4 axles for each car.

Because all 10 cars will take coupler boxes, you'll order 10 pairs of those.

2/56 washers are normally NOT available in retail stores, but you'll probably get by with the more common smaller sizes that are. You can even forget the specific numbers - you just want several sizes of small washers.

At our web site, Makin' Tracks! Offers trucks, wheels, coupler boxes, couplers, screws, nuts and CA Glue, all at budget friendly prices. The web site address is:

[www.ezbizwebsite.com](http://www.ezbizwebsite.com)

Follow the "Quick Pick" link found under the Model Market heading.

Description	# of Cars	X	Total Parts
Trucks, roller bearing, pair	2	1	2
Trucks, Bettendorf, pair	3	1	3
Trucks, Andrew, pair	5	1	5
Metal Wheels, 33" axles	3	4	12
Metal Wheels, 36" axles	7	4	28
Kadee #242 coupler boxes, pair	10	1	10
Kadee #5 couplers, pair	10	1	10
Kadee #48 couplers, pair		1	
EZ Mate Mark II Couplers, pair		1	
CA Glue - Instaset, Gap Filling			1 bottle
2/56 X 1/4" screws, pair	10	1	10
2/56 nuts, pair	10	1	10
2/56 washers, pair		1	
#8 washers, package		1	1
#6 washers, package		1	1
Scrap Material for shims, etc.	<b>Check Shop</b>		

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Description	# of cars	X	Total Parts
Trucks, roller bearing, pair		1	
Trucks, Bettendorf, pair		1	
Trucks, Andrew, pair		1	
Metal Wheels, 33" axles		4	
Metal Wheels, 36" axles		4	
Kadee #242 coupler boxes, pair		1	
Kadee #5 couplers, pair		1	
Kadee #48 couplers, pair		1	
EZ Mate Mark II Couplers, pair		1	
CA Glue - Instaset, Gap Filling			1 bottle
2/56 X 1/4" screws, pair		1	
2/56 nuts, pair		1	
2/56 washers, pair		1	
#8 washers, package		1	
#6 washers, package		1	
Scrap Material for shims, etc.			