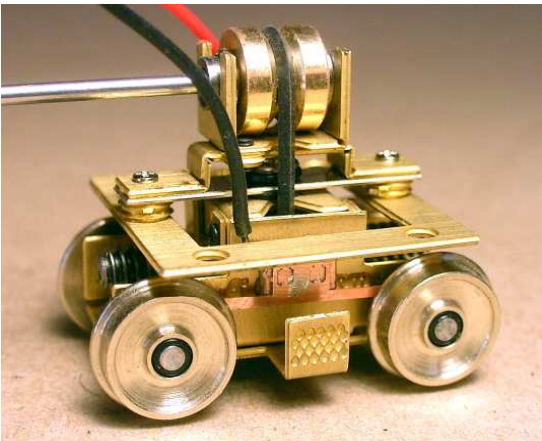




Please read these instructions fully before attempting to assemble the Diablo kit.

The Diablo kit contains all the parts needed to assemble a fully working drive unit. No soldering is necessary, all screws are provided and the holes pre-tapped. Even if you find a hole we missed out on tapping, driving one of the steel screws into the hole will make the thread anyway.

This photograph shows a completed Diablo. This Diablo is fitted with the optional additional pickup, just visible behind the wheels:



For the purposes of this set of instructions, all diagrams are prepared using 3D drawings of the Diablo in order to make the assembly sequence clearer. If you wish, a full color copy of these instructions can be downloaded from the Hollywood Foundry web site as a PDF file. With the PDF file, you are able to zoom in to see the drawings in a larger size than the printed version.

The PDF is available from:
<http://www.hollywoodfoundry.com/translations.shtm>

Tools

You will need a small number of tools:

- Heavy Duty Box Cutter (to cut parts from fret) or a Xuron Photo-etch Scissor # 9180ET
- Small flat and round files
- Small cross-head or Phillips Screwdriver, such as the Wiha Phillips #00.
- Pair long nose pliers, smooth jaw.

Cutting Items Free From The Fret

Some of the parts are attached to a fret or frame. It is best to leave them attached to the fret until they are needed. Cutting

them out of the fret can be done with a heavy duty box cutting knife. Place the fret on a hard cutting surface, noting that the items are attached by small tapered tabs. The fret should be placed so the half-etched side of the tabs are down. Cut close to the part, or at the narrow end of the tapered tab.

You can use other methods of cutting the parts free, but take care not to distort the parts themselves by the method you use. Using a pair Xuron Photo-etch Scissors is an excellent way of cutting the parts free, and much easier to do. When free from the fret, carefully file away any remainder of the securing tabs.

Making Folds

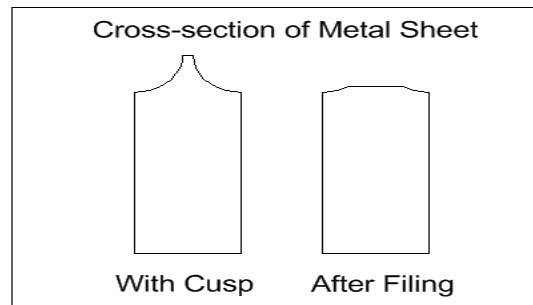
Although it is possible to use a tool like a Hold N' Fold for folding the parts, it is not really necessary. Perfect folds can be made simply using a pair of long-nose pliers and your fingers.

Wherever a fold is required, there is a half-etch fold line in the part. There is one simple rule about folds, the metal is always folded towards the fold line, or such that the fold line is on the inside, never on the outside.

Filing of Parts

The Diablo is designed very precisely with careful tolerances, but there is an unfortunate effect of metal etching called 'cussing', where there is a jagged edge along the sides of the etched part. This is called the cusp, and is more pronounced with the Diablo because we use a thicker, heavier grade of brass for extra strength.

In a small number of places it will be necessary to file away some of this cusp to make items fit properly. When filing, always remove as little material as possible, do not be tempted to file heavily.



The idea is to gently file away the raised cusp until the edge is almost flat. Often this may only require a couple of strokes of the file to accomplish.

Small Hardware & Spares

Many of the screws and other items of hardware used for assembling the Diablo are very tiny. For this reason, we have put in one spare for many of the items in case you lose them. There are spares for many, but not necessary all, items. If you lose more than is required to assemble the kit, contact us for extras. Alternately, all screws used are obtainable from North West Short Line in their Metric screw range.

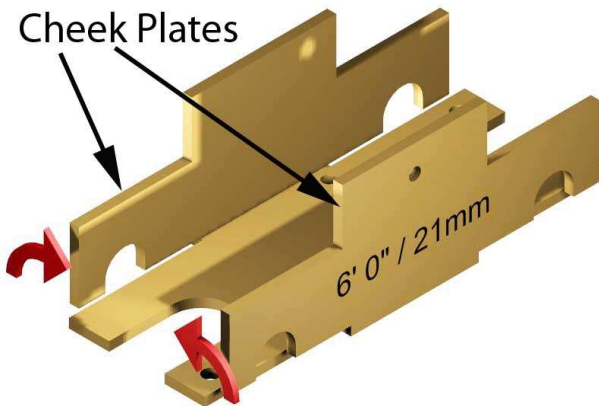
There is also a spare drive belt supplied with every kit We do not include this spare belt because we believe that you will need it, but as a courtesy to those who are nervous about belt drives. So you get an extra belt to keep you happy.

Identifying parts

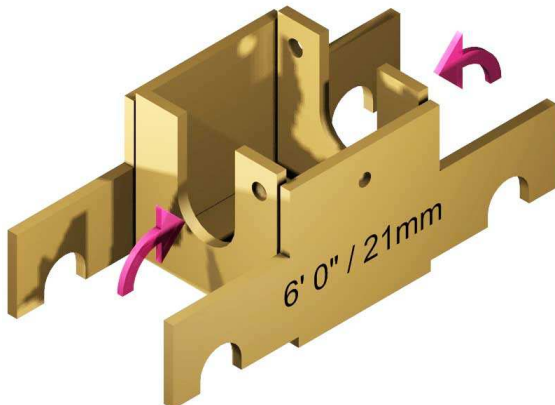
All parts have a 2 or three letter identifying code etched into the part. And the code means something. For example, the main frame is coded MF, for Main Frame. These instructions will refer to those codes.

Assembly

Locate the Main Frame (marked MF) and clean up. Using a pair of pliers, bend the long cheek plates up at right angles to the base, in fact it is best to go a little past the right angle point.



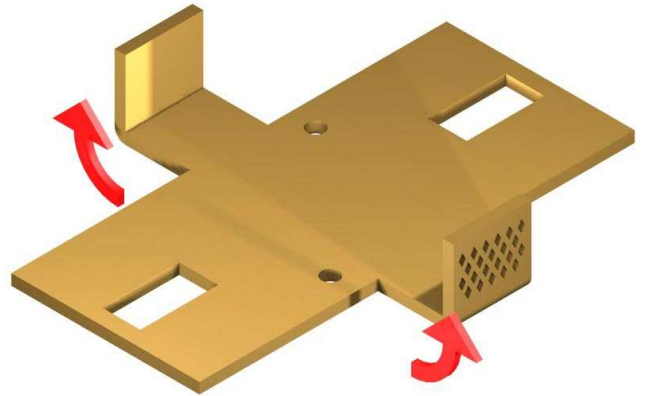
Then bend the end panels up between the cheek plates, also at right angles, so that they force the side panels apart and fit snugly:



Locate the small nickel silver solder tag and attach it to the Main Frame using one of the small black screws, as shown below:



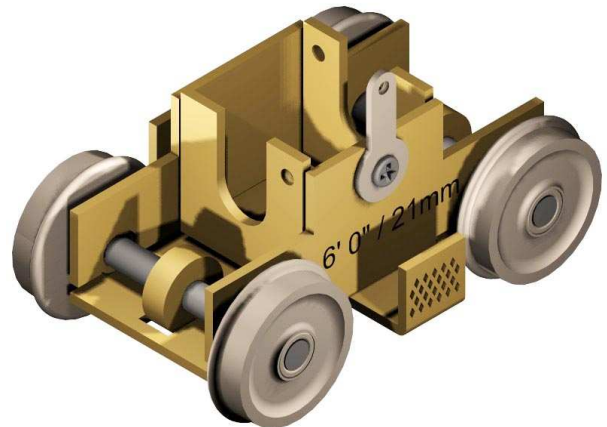
Next locate the Keeper Plate (marked KP) and clean up. Bend the two side panels up at right angles so that the diamond etched pattern is on the outside, as shown:



The diamond pattern is to provide 'keying' for adhesive when you attach cosmetic side frames to the Diablo.

Fit the wheel and axle assemblies into the slots in the Main frame, making sure that the axle bearings are located outside of the Main Frame cheek plates. Each axle contains one insulated and one non-insulated wheel. The insulated wheel is identified by the black plastic insulation in the wheel hub. Make sure both insulated wheels are on the same side of the Diablo. By convention, the insulated wheel goes on the opposite side to the solder tag.

Attach the Keeper Plate to the bottom of the Main Frame using two of the small black screws:



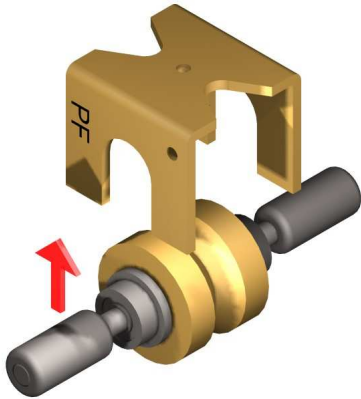
The wheels should be able to spin quite freely. Test the wheels by holding the ends of the wheels between the thumb and forefinger, letting the rest of the mechanism hang below. It should swing freely back and forth.

It is important to get the wheels rolling free before continuing with the Diablo assembly. If the wheels are binding, a possible reason may be that the cheek plate of the Main Frame is pushing out against the wheel bearings. Using a pair of long nose pliers, bend the cheek plate inwards at the outer ends by a tiny amount.

It is also possible that the wheels may be a little sloppy in their fit, in which case, bending the cheek plate outwards may help.

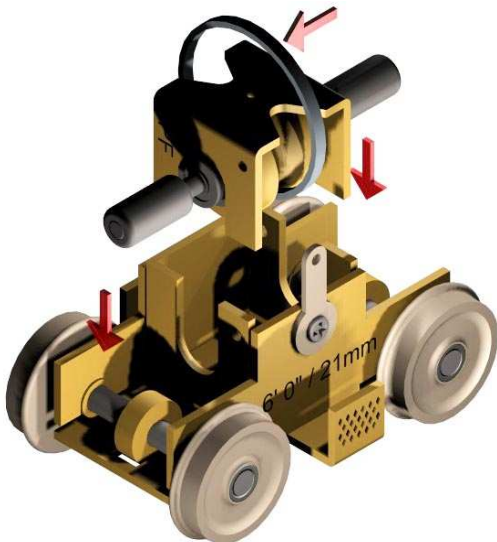
Locate the Pulley Frame (marked PF), which is on the fret containing most of the brass etched parts. Clean up and bend the sides towards the fold line to an angle of 90 degrees. Fit the Layshaft assembly, comprising brass pulley, two ball bearings and two worms, into the inverted Pulley

Frame, making sure the ball bearings are inside the Pulley Frame:

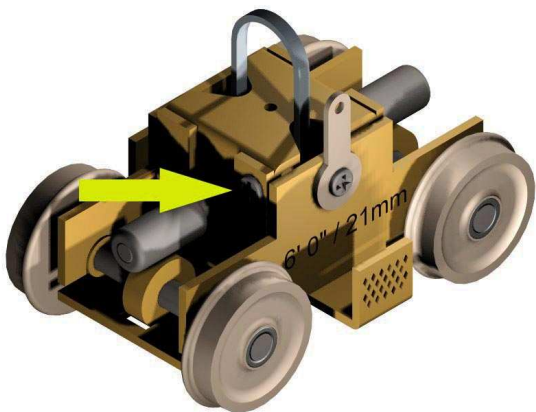


The Layshaft can go either way around, it is symmetrical. Place the synthetic rubber drive belt around the Pulley and Pulley Frame as shown below. The belt is indicated by the top arrow in the following diagram.

Insert the Pulley Frame and Layshaft into the Main Frame, as shown:



Push the Pulley Frame fully into the Main Frame, and attach using two small black screws into the end panels of the Main Frame, as indicated by the arrow below.:

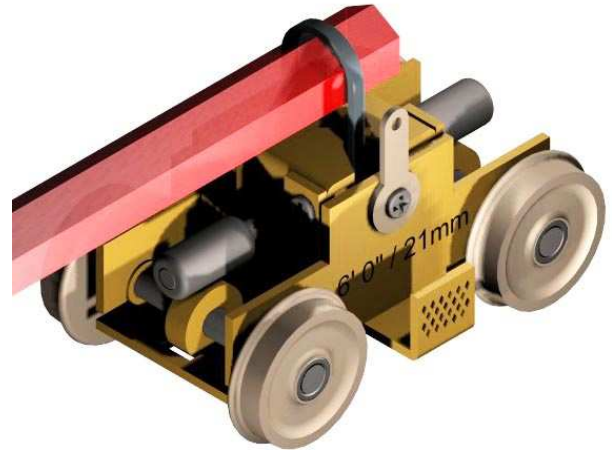


Check that the steel worm on the layshaft is engaged properly with the brass worm gear on the axle. It should not

be possible to rotate the wheels any longer, they should be stopped by the worm.

Check that the ball bearing is not able to move up and down to any great degree in the main frame. If it does, loosen the two black screws, push the Pulley Frame down firmly and re-tighten the screws.

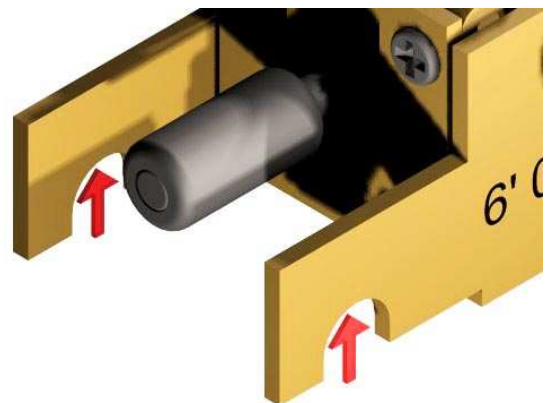
In order to test that the drive works properly, insert a pencil through the drive belt as shown below:



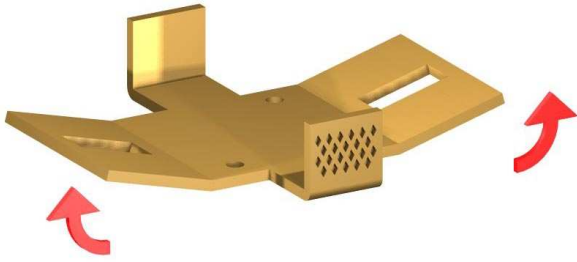
By rotating the pencil, the drive system should run freely. In fact, it should be possible to suspend the Diablo from the pencil and then by rotating the pencil, the Diablo wheels should turn.

If the wheels are not turning freely, then look to see that the worm and worm gear are not binding against each other. This will be the most likely area for binding. You may need to loosen the Pulley Frame screws and lift it slightly to provide greater clearance between the worm and worm gear.

On the other hand, the mesh between the worm and the axle worm gear may not be close enough. This requires bringing the axle closer to the worm gear. Remove the bottom Keeper Plate and the wheel assemblies. Using a small round jeweller's file, file a little off the top of the arches where the Axle bearings sit, as indicated by the arrows in the drawing:



Please file only a little at a time. It will then be necessary to bend the bottom Keeper Plate up slight near the ends to hold the wheel bearings tightly against the top of the arches. This bend is shown in an exaggerated form in the following drawing. It should not be necessary to bend the plate this far.



Re-fit the wheels and attach the Keeper Plate to the bottom of the Main Frame. Check the mesh of the worm and worm wheel, and repeat this procedure if necessary until you are satisfied with the mesh.

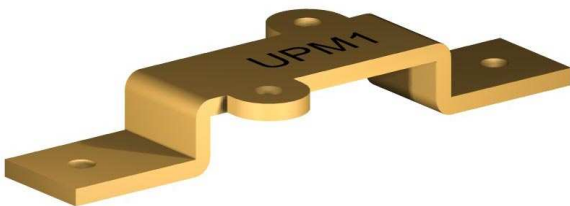
In most cases, the clearance will be correct, but due to the vagaries of metal etching, some units may require these adjustments. Nevertheless, it is important to make sure the mechanism works properly before continuing with assembly.

The next part requires a decision on your part, how much freedom of movement you want in the truck mounting? There are two Truck Mounts (marked TM) supplied, one in brass, attached to the main fret, and another loose in the packet made from a thinner nickel silver material. For normal use, the Diablo has a moderate amount of rock & roll in the mounting, so we recommend using the brass TM part. If you have sharp transitions from flat to grade in your track, you may need the truck to be able to tilt fore and aft more, so you should consider the thinner nickel silver TM.

Locate one of the black Delrin plastic shoulder washers, and place it with the shoulder side uppermost, in the centre of the Pulley Frame, over the central hole. Next, place your choice of Truck Mount over the shoulder washer, then another shoulder washer on top, with the shoulder side facing down. Place the nickel silver plain washer on top of this, then insert one of the 4mm long silver screws into the hole in the assembly, and tighten. The sequence is shown in the following drawing:

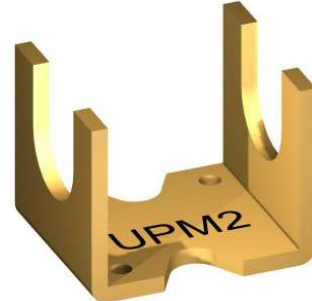


Locate the Upper Mount One (marked UPM1) on the main fret, clean up and bend into the 'top hat' shape shown:

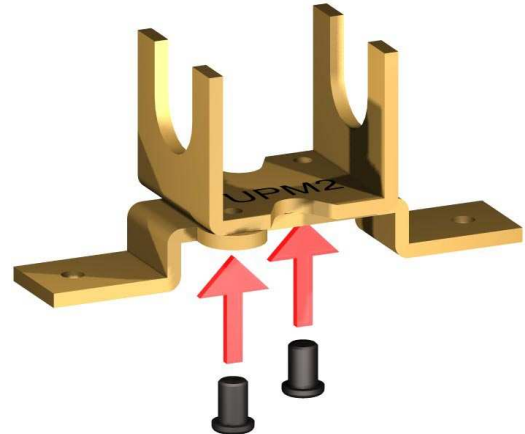


Because of the small spacing between the parts, you will find it perhaps easier to bend the two inside folds first, then the two outside folds. This folding operation can be a bit fiddly, so take your time with it.

Locate the Upper Mount Two (marked UPM2) on the main fret and clean up. Bend the two sides up at right angles as shown:

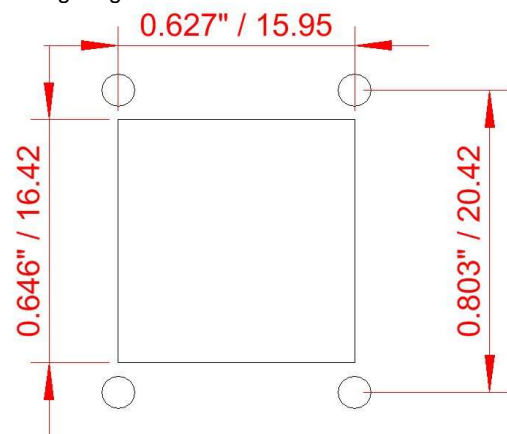


The UPM1 and UPM2 can now be fastened together using two of the small black screws. The UPM2 sits on the top, and the screws are inserted from the bottom of the UPM1 part. The following diagram shows the method:

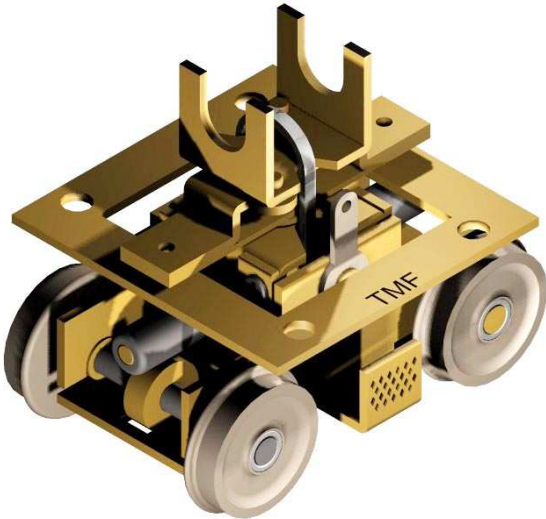


At this point you need to decide whether to use the Truck Mount Flange (marked TMF), the square brass etched part with a square hole in it, or if the model has already been designed to accept a Diablo, it may have an aperture of the correct size designed into the model.

If you are using the TMF, clean it up and use it as a template to mark the main rectangular hole in the floor of the model, and the positions of the 4 x 2mm screws and nuts provided for attaching the Diablo to the model floor. Alternatively, use the following diagram:



Now place the TMF on top of the Diablo, underneath the TM part, and insert the assembled Upper Mount through the drive belt as shown:



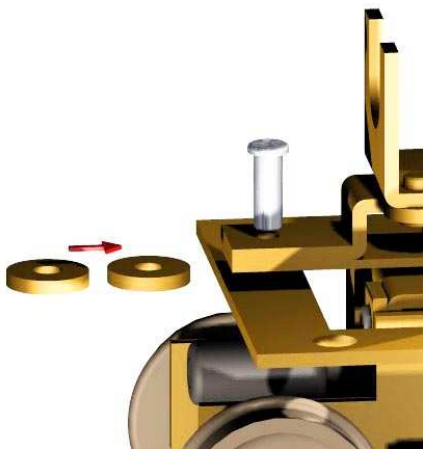
When placing the Upper Mount through the drive belt, do this carefully so as not to nick the surface of the drive belt.

When fitted to the model, the Truck Mount Frame is intended to be attached to the top, or inside surface of the model's floor. However, provision has been made in the design to adjust the ride height of the truck with respect to the model's floor. There are 6 brass washers attached to a sub-fret inside the TMF part, and these are used as packing pieces.

The washers are inserted between the Flange and the Upper mount assembled, and screwed into position using 2 x 4mm length silver screws.

Each washer inserted into this position raises the Diablo by 0.7mm or about .027". Leaving the washers out means the model will ride higher on its trucks, whereas inserting the washers causes the truck to ride lower. The supplied 4mm length screw will permit up to 2 washers to be inserted into the Diablo. If you wish to insert more spacers, then a longer screw will be required.

Longer screws are available from NWSL, such as a 6mm version, NWSL part # 21145-5.

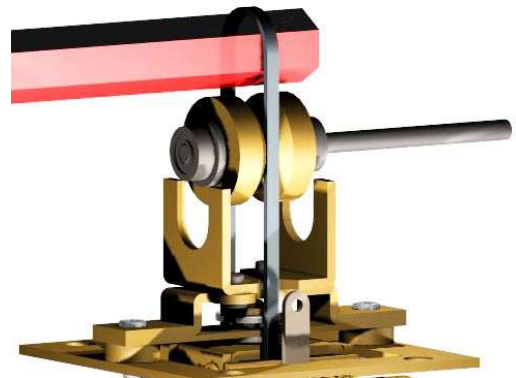


Assemble the parts of the Top Pulley, note that there are 2 phosphor bronze washers placed between the brass pulley and the ball bearings:



The phosphor bronze washers are the small copper-colored ones.

Place a pencil through the drive belt as before, and gently stretch it enough to insert the Top Pulley assembly into the UPM2 frame. **WARNING: Do not stretch the drive belt any further than is necessary to fit the pulley in place.**



The Top Pulley is not fastened into the UPM2 frame in any way, it is simply held in place by the tension of the drive belt. This is quite intentional.

This completes the main assembly of the Diablo, it should now look like this:



Four sets of 2mm screws and nuts are provided in the kit for attaching the Diablo to your model, via the Truck Mounting Frame.

Lubrication

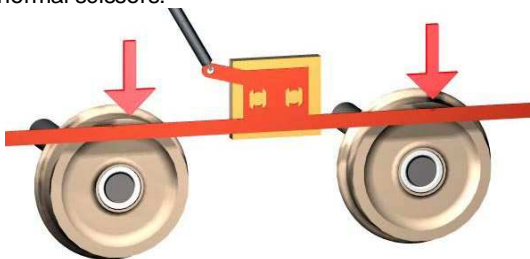
The recommended oil is LaBelle #108. Place a single drop on the axle just inboard of each brass axle bearing. Place a drop on top of each worm, and also against the end cage of each ball bearing. As usual, lubricate when necessary, but avoid over-oiling.

Electrical Connections

Solder one end of the supplied red wire to the solder tag attached to the frame of the Diablo. The Diablo, in its standard form, collects power from one track only. The wheels on the opposite side are insulated at the wheel hub for compatibility with two-rail systems.

For two-rail, or overhead trolley pole operation, this arrangement will work satisfactorily, and has been the normal method employed by most brass trolley models, with the trailing truck at the other end of the model rotated such that its insulated wheels are on the opposite track to the driving truck.

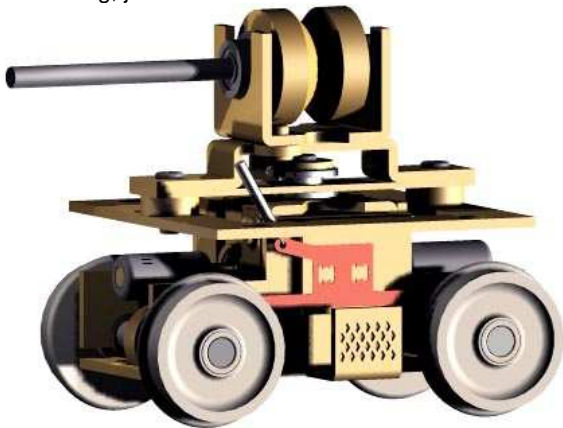
However, an optional extra pickup is provided for you to fit if you wish to collect power from both tracks. The pickup consists of a phosphor bronze strip soldered to a tiny piece of printed circuit board to act as an electrically insulated mount. It has a black wire attached. Hold the pickup against the wheels and cut off the excess wiper that extends past the centre of the wheels, as indicated by the arrows, it can be cut with normal scissors:



Bend the ends out very slightly, away from the printed circuit board so they will press on the back of the wheels. Slide the whole assembly in between the backs of the wheels and the main frame on the opposite side to the frame solder tag. It should hold in place by pressure of the wipers.

This will be on the same side as the insulated wheels. Carefully position the pickup assembly, then apply a **SMALL** drop of superglue, using a pin to regulate the amount. Place the glue at the join between the back of the printed circuit board and the Diablo Main Frame.

The diagram shows the pickup fitted to the opposite side to the solder tag, just visible behind the wheels:



Truck Side Frames

Cosmetic side frames can be attached to the tab on the bottom Keeper Plate. If the side frames are brass, then the best method is to solder them to the brass Keeper Plate.

However, it is not strictly necessary, as the diamond pattern etched into the tab has been designed to provide 'keying' of a cement or glue.

The most effective glue is a high strength two-part epoxy, one that has high strength, not the type that cures in 5 minutes. It is best to remove the Keeper Plate from the Diablo and set up a small jig to hold the plate and side frame in the correct position. Clean the two surfaces with a little alcohol to remove grease, then apply the cement, and place the two items in position.

Another method is to position the two parts, then carefully place a small drop of superglue to the joint. Then do the same with the other side frame, and when dry, apply the two-part high-strength epoxy adhesive liberally over the joint to bond it strongly. Only use a tiny amount of superglue, it is only there to keep the parts in proper alignment while the epoxy dries.

Belt Replacement

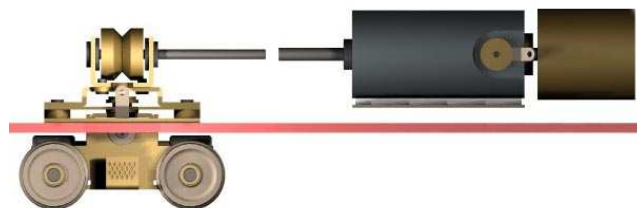
While those who have replaced a spring belt will testify as to how difficult it is, replacing the drive belt on a Diablo is not quite as hard. Begin by lifting the drive belt and removing the Top Pulley from the UPM2 mount. It can stay connected to the motor by silicone tubing if you like.

Remove the two 4mm silver screws that fasten the Truck Mount to the Truck Mount Frame, or the model if the frame is not used. Lift the Diablo out of the model. Remove the two small black screws that secure the Pulley Frame to the Main Frame. Withdraw the entire Layshaft and Pulley Frame upwards to enable the belt to be changed.

Reverse the above procedure to re-assemble.

Motor Mounting

The motor should be positioned so that there is a gap between the motor shaft and the Diablo drive shaft of around 2mm or 3/16". In addition, the motor must be positioned vertically and horizontally to line up with the Diablo shaft. It may be necessary to raise the motor on a piece of packing to line up with the Diablo shaft. Pieces of Evergreen are ideal for this purpose. It is not possible to provide a universal packing piece, as the height will vary according to the ride height of the truck that you set earlier.



The piece of supplied black silicone tubing will join together shafts of between 1.5mm and 2.0mm diameter. Slide the silicone tubing onto the Diablo shaft first, fix the motor down and then slide the tubing Back over the motor shaft.

Assembly is complete. We hope your Diablo gives you many years of trouble-free performance.

