Fold–up motor/gearbox mounts.

These units should provide a simple answer to the problems of motor mounting with a free running gear system. It seems that in spite of their simplicity difficulties still arise. The steps described below illustrate the processes that I go through to obtain a free running assembly.

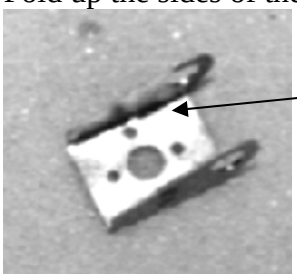
There are several sources of etched motor mounts some provided within kits, others from a variety of manufacturers. I believe they are a more than adequate drive for the smaller locomotive. The one used to illustrate this is from the Branchlines stable.

Stage 1.

Clean up etched edges as you would for a kit component removing any fret tabs that may remain. If necessary, using a taper reamer, open up the holes that receive the axle bearings. I would be looking for a "free" fit of the bearing in the hole. Remove any burrs generated.
Ensure the bearing boss on the motor fits the hole in the etch. Allow a few thou up and down movement. See later.
Ensure that the axle passes through the bearings without any binding. The final machining can create a burr that closes off the bore. A deburring tool can be usefully employed to break the corners of the bore.
Check the gearwheel for burrs left after machining the teeth. To remove them use a steel wire brush and brush vigorously along the teeth. This also has the advantage of imparting a slight polish to the flanks of the teeth.

Stage 2.

Fold up the sides of the mount and apply a generous fillet of solder to reinforce the corner.



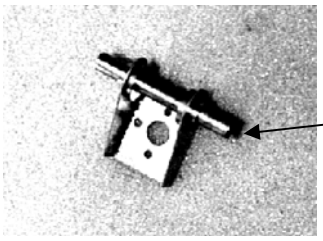
Solder fillet along both folds.

The surface tension of the solder can pull the sides inwards to less than 90°. Check after soldering and correct if this is the case by re-melting the solder and bending the side gently back. Do not worry too much if the angle is very small, the axle bearings can compensate.

Stage 3.

Fit the axle bearings. Check the mount in your chassis before soldering the bearings in place. It may be necessary to reduce the length of the bearings in order to get the mount to fit between the chassis bearings. The mount bearings, those in the chassis or both may need shortening.
An easy way to reduce the length of a bearing is grip a piece of silver steel of axle diameter vertically in a vice. Slip the bearing over it. Adjust the steel rod so that it is recessed within the bearing by the amount you need to remove. File the bearing down until the file just strikes the steel and it should be close to the desired length. Remove any burrs again.

Always use an axle or jury axle to locate the bearings whilst soldering them in place.



Jury axle locating the bearings. Keep it place whilst soldering the bearings. It will get hot! Ensure that it spins freely after soldering.

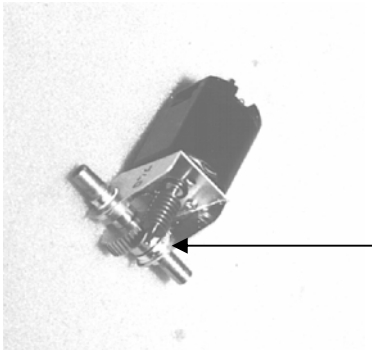
The jury axle should spin freely after soldering. If it doesn't then examine the bearings with the axle in place. Check for an uneven dark line showing around the axle where it enters/exits the bearing. This shows that the bearing had cockled a little. Hold the jury axle vertical in a vice with the mount on the axle, offending bearing uppermost and re-solder the bearing allowing enough heating to melt all the solder that fixes the bearing. It should then float into position. Allow to cool and recheck for free running. If still a little tight repeat for the second bearing

Stage 4.

Locate the motor in the mount. Some mounts allow the worm to pass through the large hole in the etching. In this case the Delrin™ worm (my favourite for this type of gearbox – see later) could be fitted to the motor out of the mount and then the assembly introduced to the mount. Fit the two tiny screws that attach the motor. Take care not to loose them.
If you are unfortunate enough to do so bite the bullet and acquire replacements. It is unwise to try and substitute an alternate as you are very likely to get the length wrong and the end of the screw will rip the armature windings! Even more expensive than a screw!
Do not fully tighten the screws until the gearwheel is fitted to the axle.

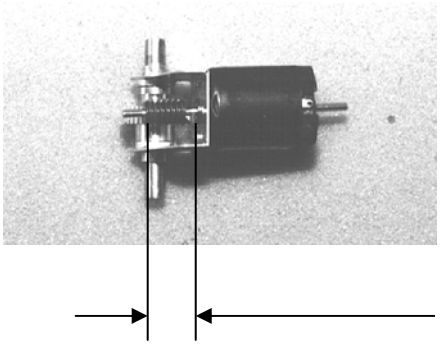
Stage 5.

Again using the jury axle fit the gearwheel. In the example of the Branchlines unit shown a third bearing is provided to space the gearwheel to centralise it – a good idea. If one is not provided then acquire one or use an equivalent length of brass tube that fits over the axle to do the same. A pack of washers is not recommended as they fall out too readily when trying to assemble the axle to the mount!



Spacer alongside the gearwheel to keep it central under the worm.

With gearwheel temporarily located check the position of the worm relative to the gear. Slide it along the motor shaft so that it is equally disposed about the gear.

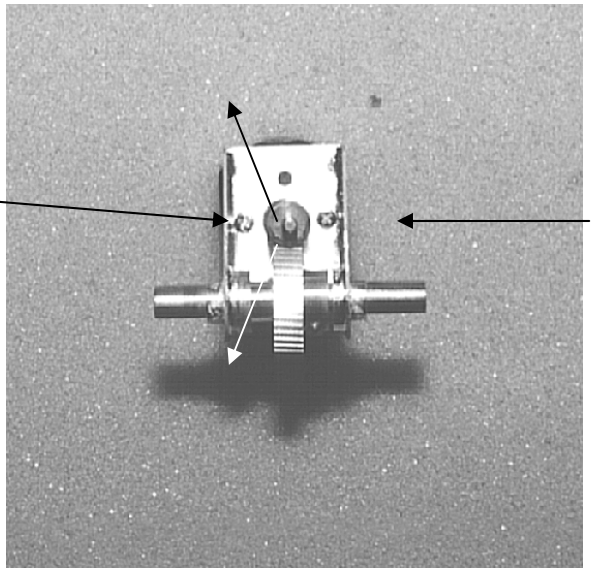


Equalise the position of the worm over the gearwheel.

Stage 6.

Obtaining the correct mesh is a little subjective. Too tight is obvious as the motor will not spin freely; too loose and the worm will jump out of mesh under load. This only shows up later unless you can run the motor applying a load to the jury axle.
To adjust the mesh tighten one of the mounting screws until it just grips the mount. This now forms a pivot about which the motor can be rotated lifting the worm in and out of mesh.

Tighten this screw to grip the mount



Rotate the motor about the "tight" screw to lift the worm in and out of mesh.
When satisfied lock up this one and fully tighten the other.

If necessary remove the motor and carefully elongate one screw hole to increase the amount of movement on the motor. The same may be true of the hole that bearing bush on the motor fits into.

Reassemble and adjust again.

The gearwheel should have a very small clearance in the worm. Hold the worm so that the motor shaft does not move and rotate the gear. It should just, only just, rotate in the mesh. Fully tighten both screws and check again.

Check by applying some power. The motor should run freely on the lowest voltage. There may be a little noise. This should largely diminish with some lubrication on the axle bearings.

Stage 7.

You now have a unit that can be fitted into the chassis and will run freely. If it doesn't then the error now lies in the chassis!

To complete the installation it is my practice to fix two lengths of copperclad sleeper to the motor with double-sided tape. A wire from each motor terminal is soldered to each. The wires from the pickups can then be soldered to the copperclad with no fear of damaging the motor terminals, as these can be a little fragile.

The final fitting of the assembly into the chassis will probably require some means of restraining it from rotating about the axle. If you have fitted suspension the restraint will have to flexible. If the motor lies close to a frame spacer it can be attached with a blob of silicone bath sealer. This sticks well and is flexible. If the axle is fixed the bath sealer will do too or a loop fitted over the motor and fixed to the chassis will do. It would be advisable to make this removable for future maintenance.

On Delrin ™ Worms.

I particularly favour these gears for the following reasons:

1. They are a push fit on the motor shaft and remain concentric with the shaft.
Metal worms often get displaced eccentric to the shaft by the tightening of the fixing grub screw. Oddly this does not seem to be feature on the gearwheel or the effect is negligible.

2. They always run quieter than an all-metal gear set.

3. No lubrication is needed, though a little helps.