

Text and images by Ian Morgan. Based on a build of 2-399, it contains information which may be of use for any of the Association's freight bogie range.

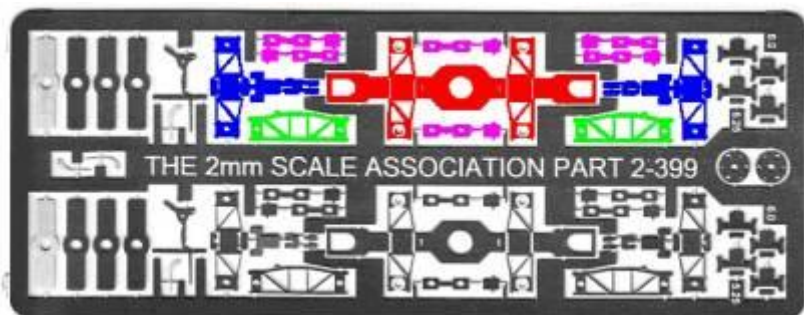
Parts Required

- 2-399 LMS Diamond Bogie etch
- 3-112 brass bearing (should be included with etch)
- 2-041 top hat bearings (four per bogie)
- 12BA brass screws and nuts for fitting to wagon
- fine wire (brass or p/b) required if bogie mounted brake wheels are to be used
- wheels on 12.25mm axles, either 6mm or 5.25mm diameter, as required. Spoked or 3 hole disc can be used, dependent on the prototype. If 5.25mm diameter wheels are used, they are only available as plain disc type, but these are two drilling templates on the etch that can be used to drill the wheels to produce 3 hole disc wheels. If the bogie is to have brake handles fitted, it will have to have 5.25mm wheels to clear the mechanism.
- piece of wood (ply or MDF) with a 1.5mm hole drilled near one edge, 3 or 4mm deep

Tools Required

- Soldering iron (small tip, medium powered)
- Solder
- Liquid flux
- Small reamers or broaches
- Small round and flat files
- Tweezers
- Flat bladed pliers
- Sharp knife
- Small drills and pin vice (1.5mm, 0.3mm diameter)
- Epoxy Resin glue (for fitting to a wagon)

Etch Parts



(Red) Main Bogie Etch

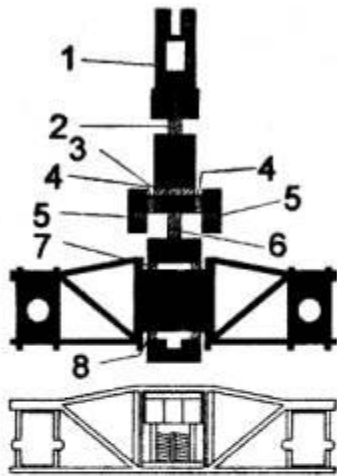
(Blue) Spring Pockets

(Green) Bogie Side Layer

(Purple) Axleboxes

Parts should be removed from the etch, when required, by laying the etch flat on a piece of hard wood (ply or MDF) and using a sharp knife to cut through the half etched joining tabs around the edge of the piece. The remains of these tabs should be removed by holding the item in a smooth jawed vice, or holding it tightly in the flat bladed pliers, with just the remains of the tab showing, and filing the edge flat.

Spring Pocket Etch Fold Table



LMS DIAMOND FRAME

FOLD NO.	I or O	ANGLE
1	I	180
2	O	180
3	I	90
4	I	90
5	I	90
6	I	180
7	I	90
8	I	90

These fold numbers should be used in conjunction with the assembly instructions and photos below.

'Fold No' is the number of the fold, and its position is shown on the diagram to the left.

'I or O' indicates whether the half etched fold line will be on the inside or the outside of the fold. This is very important to get right.

'Angle' is the angle in degrees of the completed fold (90 = right angle, 180 = fold back on itself)

Assembly Instructions

1. Remove one of the main bogie etches from the fret (shown in red above). Keep this item flat for now - it will be one of the last parts to be folded.

2. stand a top hat bearing on your workbench, largest diameter part downwards. Gently ream one of the bearing holes in the etch until it just fits on to the top hat. Insert the top hat so the brim sits in the half etched indent. The photo also shows the hole drilled in the wood that the protruding end of the bearing will sit in for the next step.



3. Turn the etch over, insert the top hat bearing and push it into the 1.5mm hole drilled in the piece of wood, so that the etch is flat on the wood. Fix the bearing to the etch with a minimum amount of solder, pressing downward in the centre of the bearing with a pin to hold it in place while soldering.



4. Repeat for the other 3 top hat bearings.

5. Remove a spring pocket etch from the fret (shown in blue above). Make folds 1 and 2, using the pliers or tweezers. Squeeze flat and check for squareness. Squeeze the sticking out bit of fold 2 flat. This will be used later to locate into an etched hole. Solder the folded bits together, using the minimum amount of flux and solder in from one side.



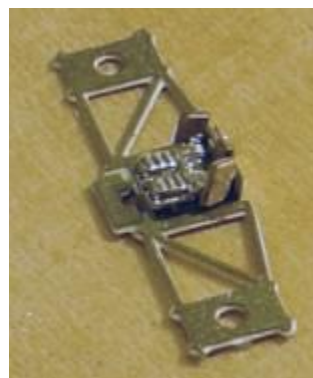
6. Make the 90 degree fold 3, and fold up the sides 4. Leave folds 5 for a bit later.



7. Check everything is square and make fold 6, which is quite tricky. Again check everything is square and the folds are all tight. Note the etch has been turned over from the previous photo.



8. Now make fold 7, which is really tricky



9. With everything neat and square, make fold 8. You may need to cut down the sides of this piece before being able to make the fold as the etch might not have broken through here completely. The flattened fold 2 should locate in the hole in fold line 8 if everything went right. Check everything is square and neat again. Apply some flux and solder in this hole and it will run into the hole and behind the springs and hold everything in place.



10. Finally fold down the flaps 5 nice and square. If you do not like the etched representation of the springs, it should be possible to replace them with some 14BA screw thread.

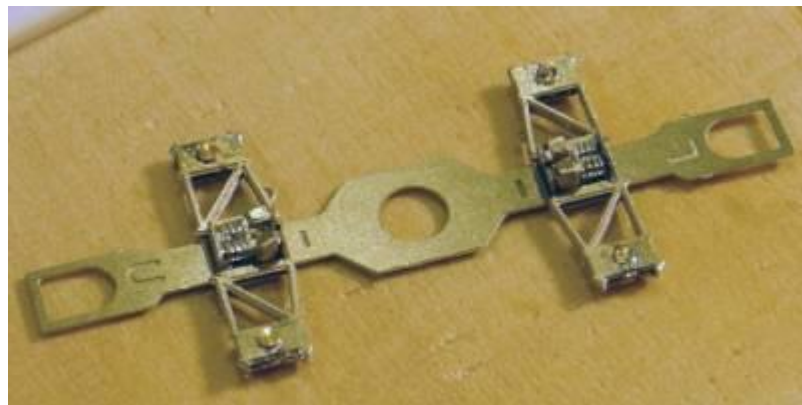


11. Repeat for the second spring pocket etch.

12. Remove one of the final bogie side etches from the fret (shown in green above). This is supposed to fit over the spring pocket, but I have been unable to get it to fit, so instead I use it as a middle layer. Ream out the holes so that it fits over the bearing ends. Do the same with the holes on the spring pocket assembly, and then fit all the layers together. Holding all the layers firmly together, apply a little solder to the end so it runs between the layers. Do the same at the other end of the bogie side, and it will then have plenty of strength just tacked at each end like this.



13. Repeat with the second bogie side. Note that if you will be fitting brake handles, make sure that the location spiggots both end up at the same end of the bogie. Drill the holes out in the spiggots to take the thin wire (0.3mm) If you do not intend to fit the brake handles, file the spiggots off after soldering the bogies frames together. Tidy up the ends of the bogie sides with a file.



14. Remove an axlebox etch from the fret (shown in purple above). Fold one of the parts with a hole in over the middle part. Pass a reamer through the holes to help line them up and squeeze them together.



15. Remove the reamer, apply some flux and solder one edge. Now ream the hole until it fits over the end of an axle bearing. File off the fold hinge. Fold the axlebox front over the other two layers and line it up carefully. Position the complete axlebox over the bearing, square it up, and ensure the side lugs are towards what will be the bottom of the bogie. Flux and apply some solder to the side while pressing down on the axlebox front. Cut or file the remaining fold hinge from the top of the axlebox front.



16. Repeat for the other three axleboxes.

17. Gently file the bogie centre hole with a small round file, until one of the large brass bearings just fits.



18. Fold up one bogie side so that it is at right angles to the top bogie stretcher. Add a little solder to the inside of the fold for strength.



19. Add the brake shoe etch. Choose the ones marked 5.25 or 6.0, depending on the wheel diameter you will be using. These have a tab that fits into the etched slot and a fold over tab that rests against the inside of the bogie side. Make sure the cut edges are cleanly filed, as they will both butt up against the bogie etch. Solder in place as shown.



20. Fold up the second side and solder the bend. Add the second brake shoe assembly.

21. Fold over the half of the bottom stretcher with the letter 'U' on it. Fold over the other half, with the letter 'L' on it. Add two sets of wheels and adjust the bogie folds so that the wheels run freely, but do not drop out. Add some solder to one edge only of the join between the two halves of the lower stretcher. This will allow for later dismantling or adjustment to take place. If both edges are soldered, it will be almost impossible to dismantle or adjust.



22. The bogie is now ready for cleaning, painting and fitting. There is still enough give and spring in the bogie to remove the wheelsets

23. Now put together the second bogie.



Adding brake handles

If you are going to add brake handles to the bogies, as opposed to brake wheels on the actual wagon, you need to use 5.25mm dia wheels. Each bogie will have one brake handle assembly on one side only, and the end of the handle will end up pointing towards the nearest buffer beam.

1. Remove the wheels from the bogie. Cut a length of thin straight wire a little wider than the bogie. Thread the wire through the drilled and reamed holes in the spiggots.



2. Cut out the two parts of the handle assembly. The larger piece has three fold etch lines, which will be inside the fold. Fold all three to 90 degrees. Drill and ream out the holes half etched in the parts



3. Fit the larger piece on to the end of the wire and slide into position, with each of the three folded arms gripping the bogie frame. Add a little solder to each of these joints.



4. Fit the smaller piece onto the wire and slide into position, and fix with a small touch of solder. Trim the wire on both sides of the bogie.



Mounting bogies to a wagon

These bogies can be used under a variety of wagons, so the method of fixing the bogies to a wagon will vary. Here, I describe how I fixed the bogies to the Parkwood Warflat wagon. The bogie etch includes a set of packing pieces that may be used for bogie attachment. One is half etched to a thickness of 0.12mm, whereas the others are full thickness of 0.25mm

1. File off the plastic bogie mountings from the underside of the wagon floor. The outline can still be seen, which is useful for lining up the new mounts, later. Next the wagon solebars and buffer beams can be glued in place.



2. Take one of the full thickness packing pieces from the etch, and fold up the last few millimeters at each end to 90 degrees.



3. Pass a 12BA bolt through the bent piece, and a second flat packing piece, and solder them all together. Ensure the bolt is perpendicular to the bottom plate, and that not too much solder comes down the thread.



4. File the ends of the folded legs gently until the overall measurement from the end of the folded bit to the bottom of the lower plate is 2.4mm for both legs. Ensure the filed ends are flat, and parallel with the bottom plate. Apply some epoxy resin glue to each of the legs, and glue in place centrally over the outline of the former plastic bogie mount. Check that the bolt is perpendicular to the wagon floor. Leave for the glue to harden.



5. Using a round file, open up the odd shaped hole in the bottom of the bogie, made by the two overlapping layers, until a 12BA nut will just rotate freely in the hole. Holding a bogie upside down, slide a large brass bearing between the top and bottom plates of the bogie and jiggle it around until it drops into place in the large hole in the bogie top face. Thread the bearing over the mounting bolt.



6. Add a 12BA nut and tighten, making sure the bogie does not get trapped between the large brass bearing and the mounting plate. Make sure the bogie rotates freely.

