

2mm Finescale Chassis Kit for GEM

L & Y Saddle tank:

Construction Notes

1. Introduction

This kit has been designed to fit a GEM L & Y saddle tank loco body and includes all parts for the loco chassis.

Parts required to complete are: -

GEM L & Y Saddle Tank kit	1
Driving wheels	6 x 9mm
Crankpins (flanged recommended)	6
Crankpin cap washers	6
Frame bushes	minimum 8
Wheel muffs	minimum 2
Gear muffs	one plain metric, one stepped metric
Gears	1 x 30:1 gear set and one Mod 0.3 14:1 and 25:1 spur gear
Axle steel	1"
Motor	Nigel Lawton 10mm mini motor or Faulhaber 1016
Thin double-sided PCB (0.25mm thick)	2 sq. inches should suffice
Nickel silver rod 0.31mm	4"
Screws and nuts 10BA cheesehead	1
Screws and nuts 12BA cheesehead	2
Screws and nuts 14BA cheesehead	1

Tools required include: -

Soldering iron and solder, flux
Needle files – flat, round
Modelling knife
Broaches
Wet and dry paper, glass fibre brush
Set of jewellers screwdrivers
Chassis frame assembly jig
Tweezers
Flat-nosed pliers
10 BA tap
12 BA tap
Minidrill and burrs
0.3mm diameter drill bit

I recommend you read and understand these instructions before you begin assembly. There are a number of small and delicate parts on the etch. It's best to leave parts on the etch until actually required. All folds are made with the half-etched line inside the fold unless otherwise stated. Traces of tabs holding parts in the etch should be removed with a needle file prior to assembly. It is recommended that work done is cleaned periodically to remove all traces of flux.

2. Locomotive chassis

Frames

(See supplementary drawing for extra guidance)

2.1 Start by removing the loco frames and open out axle holes with a round file until frame bearings just fit. Solder bearings in each hole on the inside of the frames. If you want to use 'Simpson' springing for the chassis, it's best to drill the extra 0.3 mm holes referred to in paragraph 2.7 now. An article describing 'Simpson' springing appeared in the 2mm Magazine for Aug/Sept 2008, and a copy is available in the Yahoo 2mm group files area, entitled Simpson springs.pdf.

2.2 Open out each bearing until a driving wheel axle can be inserted and spun freely with minimum play, especially the middle axle that carries the worm wheel.

2.3 Remove loco frame spacers (3 in total) and bend to right angles along the fold lines.

2.4 Cut two pieces of double-sided PCB for each spacer, slightly larger than the spacer in question, and solder them to the frames, in the positions, and to the shapes, shown in the drawing. Note the clearance needed for the front spacer, positioned below the brake hanger attachment holes.

2.5 Solder spacers onto the PCB pads of one frame as shown in the drawing. Ensure the rear spacer is also clear of the rear brake hanger holes. Check that each spacer is square to the frame horizontally and vertically.

2.6 Solder the frames together using a loco frame assembly jig. Check after soldering that the frames are electrically isolated from each other, and that they are square to each other. This can be done using lengths of axle steel through the outer axle holes or temporarily fitting driving wheels and checking that the chassis doesn't wobble when set on true track or a sheet of glass.

2.7 If you want to employ 'Simpson' springing, I recommend you drill extra 0.3mm diameter holes in the frames for springing of the middle and rear axles. The holes need to be in front of the middle axle, and behind the rear axle, level with and about 5mm from, the centre of the axle holes. There are already holes half etched for the front springing and these also need to be opened out to 0.3mm diameter. Open out the axle holes to 1.6mm diameter, bend 9mm lengths of thin (c. 0.1mm) phosphor bronze wire into 'L' shapes, with the longer leg about 7.5mm long. Insert the short leg into the hole in the frame, hold the long leg over the middle of the wheel bearing, and solder the short leg to the frame.

2.8 Solder lengths of 0.31mm nickel silver rod into the three sets of holes along the top of the frames so that about 2mm protrudes either side of the frames.

2.9 Solder crankpins in their holes in driving wheels, then solder or glue the wheel balance weights to four wheels. The weights are positioned across three spokes opposite the crankpins. These wheels are for the front and rear axles, and no weights are on the middle axle wheels.

2.10 Solder the four guard irons into the recesses at the front and back of the frames with the straighter edges of the guard irons towards the rear of the chassis. Bend the guard irons outwards just below the frames then back in to a vertical alignment about 2mm further down.

2.11 Solder pairs of coupling rods together, the fluted side uppermost.

2.10 You can now paint the chassis, coupling rods and wheels if you want.

2.11 Fold up the motor mount (the spacer like part with the curved ends), add a fillet of solder along each bend, and solder 12 BA nuts over the two holes. Then epoxy the motor to the motor mount.

2.12 Drill 1mm holes right through the three plain (wheel) muffs 2mm either side of the centre.

2.13. Reduce the diameter of the rim on the rimmed gear muff until the outer edge of the rim is below the bottom of the teeth of the 14:1 spur gear. Drill a 1mm hole right through the muff 2mm off centre.

2.14 Ream the three wheel muffs until the wheel axles are a firm push fit into them. Ream the rimmed muff so that 1.5mm axle steel is a firm push fit.

2.15 Mount a 30:1 worm wheel centrally on the rimmed muff and a 14:1 spur gear the other side of the step. Cut two 4mm

lengths of axle steel, then fill the axle hole in the muff with a small amount of epoxy at either end. Then hold the muff between the frames in line with the holes in the frame above and between the rear and middle driving wheel holes. Insert the pieces of axle steel until about flush with the frames and check the gear muff rotates freely and that no epoxy has escaped between the frames and the muff. Leave to dry and then re-check for free rotation.

2.16 Glue the 25:1 spur gear on one of the wheel muffs, checking the gear lines up with the 14:1 spur gear.

2.17 Hold the 25:1 spur gear and muff between the frames and fit the non-balance weight driving wheels into the muff.

2.18 Fit the remaining four wheels into their muffs inside the frames, then set the back to backs of all three axles. Check the wheels and the worm wheel spin freely.

2.19 Quarter the drivers one pair at a time, ensuring the chassis can run smoothly down a gentle slope with the coupling rods fitted and held in place with rings of wire insulation material. When satisfied, re-check the back to back and glue the axles in the muffs with drops of superglue in the previously drilled 1mm holes. You can also test the worm gear meshing at this stage by screwing the motor to the rear spacer. You will probably need to cut a piece of shim from some scrap sheet nickel silver or brass (say 0.25mm thick) to fit under the motor mount to get the meshing just right. Run the motor and check that the meshing is satisfactory, and that the wheels rotate smoothly.

2.20 Now attach the coupling rods. First put one of the larger diameter half etched washers on each crankpin on one side of the chassis, then the coupling rod, then a piece of greaseproof paper on one of the crankpins, and finally one of the larger diameter full-thickness washers. Hold the washer down firmly and solder it to the crankpin. Check the coupling rod rotates on the pin, and do the other two crankpins. Then repeat this for the other side of the chassis. Rinse and clean up the joints, then trim the crankpins until about 0.5mm protrudes above the washers, and check the wheels rotate freely.

2.21 You can solder the leads from the motor to the frames using the tags just above the rear driving wheels, or soldered against the sides of the frames just above the worm wheel axle holes. It will not be possible to run the loco until the cross rodding for the brake gear has been removed, as described in step 2.24 below.

Brake gear

2.22 The brake gear can now be attached. Solder brake shoes onto the brake hangers, noting that the hangers are handed with the backing section for the brake shoes set just above centre. Open the holes in the brake hangers to take the 0.31mm rod. Place a brake assembly on the rod protruding from the frame, and the hanger lined up just inside the outer face of the adjacent driving wheel, then solder in place. Repeat for the other brake hangers, and check the wheels rotate freely.

2.23 Thread three lengths of 0.31mm rod through the lower brake hanger holes, mount the two pull rods on the rods, then thread the rods through the holes in the brake hangers on the opposite side of the chassis. Solder the rods to the brake hangers, line up the pull rods approximately in line with the bottom of the frames and solder the pull rods to the rods. Check the driving wheels still rotate freely.

2.24 Rinse the soldered joints, clean up any excess solder and trim the rods through the brake hangers almost flush with the brake hangers. Finally remove the central sections of the nickel silver rod to maintain electrical isolation by carefully cutting the rod just inside the top and bottom of each brake hanger.

3. Finishing Off

3.1 Once the loco chassis work is complete, if current is now applied to the motor, the loco should run. Possible uneven running may be due to: -

- 1 Lack of weight on the drivers – for test running purposes blue tack a lump of lead over the gearbox.
- 2 Poor gear meshing – inspect and adjust as necessary.
- 3 Dirty wheels/ track – it's important these are spotless.
- 4 Lack of oil – a spot of oil on all axles and crankpin/ coupling rod joints is advisable.

4. Painting etc

4.1 The stage at which you paint the chassis is up to you. If you've followed the instructions above, you can paint everything after assembly is complete. Alternatively the chassis and driving wheels can be painted before the driving wheels are permanently fitted. You will then need to paint the brake gear after it has been assembled. This approach is easier in some ways, as it's hard to paint behind the driving wheels once they are attached to the chassis.

5. Fitting Body

5.1 Before I assembled the body kit, I drilled a hole for a 10BA screw in the footplate 7.5mm behind the rear of the front buffer beam, and attached a 10BA nut above the hole. I had to slightly elongate the hole in the front spacer to line up with the nut on the footplate, and adjust the position of the chassis relative to the loco body to get the location correct. This single attachment point seemed to work for me, but you could attach a metal plate at the rear of the footplate, and use the plate to fashion a rear fixing point. Note that there is not much room between the rear end of the motor and the rear of the footplate, so finding room for a screw might be a problem unless you opted to use a 14BA screw.

5.2 I glued thin strips of 0.125mm plasticard on the underside of the footplate, front and rear, between the buffers to electrically isolate the chassis and frames. Thin strips of greaseproof paper could be used instead.

References

- 1 Lancashire and Yorkshire Locomotives, Barry Lane
2. An Illustrated History of LMS Locomotives Vol. 3, Essery and Jenkinson

