LongRider motor bogie

The LongRider is designed to fit straight into Lima class 26/27 and 33 models, which share a common chassis using 40mm wheelbase bogies. It can also be adapted to fit the Lima or Mainline ‘Warship’ and even the Hornby ‘Hymek’, although these particular conversions are not covered in these instructions.

The bogie is designed around the Mashima 1420 flat-can motor. (Be careful when ordering. Some retailers call this an MH1620, inviting confusion with the round-can M1620, a different motor entirely.)

Three gear ratios are available:
- 27:1 gives a realistic turn of speed for ‘main line’ running (though nothing remotely like the 150mph of a typical RTR model).
- The 36:1 option represents a good general compromise, combined with smoother performance at the lower end of the scale, while:
- 48:1 offers superb low-speed control for slow-running freight and shunting operations.

On Lima models, the trailing bogie has a single phosphor bronze pick-up, which acts as a crude form of springing. This means that any extra body weight may affect the ride height of the loco. Instead of trying to slot out plastic-centred wheels, it is advised to fit twin pick-ups (one either side) to both bogies. Note that the Lima model uses non-scale diameter wheels on a 2.5mm axle. If the modeller intends to use the correct scale 14mm diameter wheels on 2mm axles, they will need to use some tube to bush the 2mm axles, so they fit into the bogie without slopping.

To remove the existing mechanism on the Lima model, unscrew the motor block from the bogie moulding and cut the wire from the trailing bogie. Retain the circlip which holds the trailing bogie in place, but the redundant motor block can be discarded. (It has been suggested that local model shops are often happy to buy them as spares). Do not, at this stage, make any alterations to the sideframe moulding.

Any make or diameter of coach wheels on a 2mm axle can be used with this bogie but, for good current collection, the chemical blackening on the tyres should be removed and the treads polished until they are free from grooves or scratches. The axles, that were supplied with the wheelsets can also be replaced with the silver steel rod provided in the kit. It should be noted that there can be a slight variation in size of a 2mm axle and some makes are slightly undersized. This can result in excessive slop and vibration, which makes a substantial difference to the way a motor bogie performs. For a better ‘engineering job’, it is recommended that the rod supplied should be cut to length as follows: 00 19.75mm; EM 21.25mm, P4 22.5mm (these are recommended dimensions and they do not need to be exact to the last thousandth of an inch).

The LongRider has refined the method used by Lima for the motor bogie to propel the loco. The Lima bogie has a couple of cylindrical towers cast into the motor block, which engage with a cut-out in the chassis moulding. On the LongRider, the top level must, however, be congratulated on clear, concise and comprehensive material. The publication of this material, however, in no way implies a recommendation to use High Level products in preference to other manufacturers who may or may not produce similar items. High Level also produce a range of traction packs, motor bogies and locomotive kits.

Before cutting any components from the fret, open out the various holes in the etches (1 to 3) as indicated in Figure 1. Their size is important to the alignment of moving parts and the more care that is taken to get a perfect fit, the better the bogie will run. Sloppy, over-large or off-centre holes may cause poor running and correction is difficult. It is much better to get things right first time, even if it calls for a little extra effort. Use a reamer to open out all holes marked ‘A’ so the gearshafts are a tight fit. It is very important to deburr all holes by twiddling them with a large drill bit, particularly those on the legs of the rear motor mount. Open up holes ‘B’ so the axle bushes are also a close push-fit. Use a 0.7mm drill bit to open out the 4 holes ‘C’ and then open up the holes ‘D’ until the screws supplied with the motor are a good fit.

Carefully, open out the large hole ‘E’ in the rear motor mount, until it fits tightly over the large boss on the rear of the motor. A flat file with a tapered end is an example of a suitable tool to do this. Whichever tool is used, take it slowly and be careful it does not ‘snatch’ as this could cause the hole to wander off-centre, which would effect the mesh of the worm.

The modeller must now decide upon whether to build a rigid bogie or one with compensation - the latter involves very little extra work, and gives much better running. If compensation is opted for, oil the thread of an M2 bolt and then screw it through hole ‘F’ and into an M2 nut on the mainframe etch (1) on the opposite side of the etch to the LongRider logo). Solder the nut in place - the oil will keep the thread free of solder. Remove the bolt - later, it will form the pivot for the rocking front axle. Omit this nut if building a rigid bogie. For the rigid bogie, push the four brass bushes into their axle locations in the mainframes (the flanges on the bushes should be on the same side of the etch as the ‘LongRider’ logo) and then solder them into the mainframe.

For a compensated bogie, solder two bushes into the rear axle holes in the mainframe. The other two can be soldered into their holes in the compensation beams (2 x 2) and the non-shouldered side of these bushes filed flush with the etch.

Remove the mainframe (1) from the fret and clean off any tabs, being careful not to file off any tabs used for part location. Now fold the etch into a box shape as shown in Figure 2 (all the lines are on the inside). The gearshafts should be a comfortable fit across the bogie. Solder the mainframe along the joints, using a piece of wood to push
the folding spacers and the front motor mount hard up against their locators. File off the overhang ‘G’ at the rear end only. For OO models it may be also necessary to file off some of the overhang (H) where the rear bottom folding spacer meets the side of the mainframe, in order to provide clearance behind the wheels.

Fold the arms on the rear motor mount (3) through 90° and reinforce with solder. When the 90° corners have been completed, put a slight inward curve into the legs of the mount, as shown in Figure 3.

If the Lima hook-and-bar coupling is being cut off and discarded (to replace it with working screw couplings) then bend down pieces ‘J’ at both ends. If, however, it is being retained then bend down the rear-end only.

Cut two M2 bolts to 7mm long, file a flat onto the heads and slot them into their locations at the ends of the bogie. Line the flats up, as shown in Figure 2, and then solder the bolts into the etch. Now the rollers can be fitted. Cut two lengths of 1.6mm OD brass tube and trim them so they are fractionally shorter than the distance between the top and bottom folding spacers. Now cut two lengths of 0.7mm wire, approximately 20mm in length. Slot one of the 0.7mm wires through their holes and locate one of the tubes as you do so. To stop solder clogging the roller, trap two small pieces of kitchen foil at top and bottom between the tube and the spacer so they are pierced by the wire. Using a paste flux if possible (it does not run like liquid flux) carefully solder the wire to the spacers. Remove the foil.

Do the same at both ends and trim the wire flush.

Clip the assembly into the loco floor, in exactly the same way as the Lima block would be fitted. It helps if the floor is separated from the body, so the opening is able to elongate slightly as the bogie is fitted. When it is fitted, the LongRider should be free to swing smoothly through its arc without sticking. Check there is a small amount of play fore and aft, to allow the bogie to rock as the locomotive rides over humps or dips in the track. Remove the bogie from the body.

Slot the lateral spacer (4) through the main-frame - the arrow points to the compensated (front) end of the bogie - so that an equal amount is projecting from either side. Push the stabiliser forward, so the notches locate, solder it in place, bend up the vertical side arms and then finally reinforce the folds with a thick fillet of solder.

At this stage the assembled bogie can be given a scrub in household cleaner. When dry, spray it matt black and allow at least 24 hours for the paint to harden. It is advised to leave the inside faces of the motor mount unpainted, to ease assembly.

Cut the gearshafts to length - for the front shaft this should equal the width of the bogie. The rear motor mount locates on the rear gearshaft, which should first be trimmed so that no more than 0.5mm protrudes from the mainframe on either side - the simplest way to do this is to fit the shaft into its location, slip a full-etched (full thickness) washer from the fret over the ends of the shaft and to file the latter down until flush with the washers. Remove the burrs from both shaft ends, chamfer the ends very slightly and then put them to one side.

Study Figures 4 to 7. Identify the short and long brass spacer collars. Check both axes will pass easily through their bushed holes and ease the holes if necessary. Insert the stage 1 gearshaft and double gear at the front end of the motor bogie. As this is done, include the two collars, along with either the compensation beams (shoulders on the axle bushes facing inwards) or two 2mm spacer washers (6 X4) in place of the beams. The larger diameter part of the stage 1 gear should be exactly centred on the shaft, directly under where the worm will run. Use a tiny amount of adhesive to glue the shaft to the etch at one end.

Before fitting the 18T final drive gears, it may be desirable to ease the holes very slightly with a reamer - they are interference fit on the axle, and may be too tight for comfort. If not already done so, remove the chemical blackening from the tyres of the wheels using fine wet-and-dry paper. Remove both wheels from the axle and file off the pin-point ends and file a small chamfer on the axle ends as this will make it easier to push through the gear. Alternatively, the silver steel supplied with the kit can be used (see above).

Push an axle through the right hand side of the motor bogie, through the bush in the right hand compensation beam and into the 18T gear, which should be held in place between your fingers. This gear meshes with the double gear and the thicker boss should be on the left. Hold the bogie over a firm flat surface, left side up, and, looking down through the axle holes, line up the axle end (now ‘started’ in the 18T gear) with the holes in the left-hand compensation beam and the hole in the motor bogie side. Position your thumbs as close as possible to the axle hole (to prevent the bogie side from buckling) and apply downward pressure to the bogie, forcing the axle up through the gear, and then through the left-hand beam and sideframe. Do this a bit at a time, constantly checking the position of the gear as you proceed. Note - make sure the compensation beams do not wander too far away from the bogie sides as you push the shaft through (if they do, they will ‘lock’ onto the shaft which could cause them to bend).

When there are equal amounts of the axle visible at either side of the motor bogie, and the 18T gear is meshed at the end of the 10-tooth portion of the stage 2 gear (see Figure 6) then the axle and gear are in the correct position. Make sure the 18T gear does not touch the compensation pivot and check that an M2 nut can be fitted to the bogie fixing bolt without catching.

Fit the rear stage 1 gearshaft, along with the remaining double gear with collars, as before, and with two spacer washers (5). When fitted, the shaft must be exactly central, with equal amounts protruding at either side. Secure the shaft with a small amount of glue. Now fit the drive axle and 18T gear - this time there are no compensation beams to worry about - and check the position of the gear, as described for the forward end. Finally, ensure there is no excess adhesive or paint anywhere near the ends of the rear gearshaft, as this will cause problems when fitting the motor mount.

Add an appropriate number of washers or plastic tube (cut to length) to eliminate all sideplay and fit the wheels at both ends of the motor bogie. For a compensated bogie, cut an M2 bolt to about 15mm long, and file the end to shape as shown in Figure 2. Screw the bolt, with its lock-nut, through the top pivot nut, until the bogie sits level on the track, when viewed from the side. Make final adjustments so the axis of the ‘blade’ is at right angles to the axle. Check the axle is able to rock about 0.7mm without binding on the inside edges of the holes in the sideframes, and then tighten up the lock-nut to secure the bolt in place.

Test the motor bogie by pushing it along the track - it should freewheel without sticking. Under no circumstance should the 18T gears at the front of the bogie be able to rub against either the M2 pivot bolt or the fixing nut - if they do then they are either wrongly positioned, or there is too much sideplay on the axes.
MOTOR BOGIE - High Level cont.

For a compensated bogie it may be necessary to trim the front motor shaft so it clears the pivot bolt (this will depend on the length of the motor shaft) using a carborundum cutting disc in a mini-drill. Wear eye protection when doing this.

The worms provided may be either brass or nylon, according to type and gear ratio (the two are not interchangeable). Some brass worms supplied to us are fractionally tighter than others and if they are not an easy push-fit, they can be gently forced on to the shaft in a vice. Use a piece of brass tube of suitable inside diameter to push the worm past the outer edge of the shaft - do not use excessive force or the shaft may bend. Instead, use a broach to ease the fit of the worm and then, if necessary, secure the brass worm with a small drop of Loctite 601 at the outer end of the shaft. Nylon worms should be a push-fit on the shaft.

Push the worms onto the motor shaft so the centre of the worms are positioned as shown in Figure 7. On compensated bogies, it may be necessary to pare off a small amount of the nylon worm in order to make it flush with the end of the shaft. Solder the power leads to the motor brush tags. Some motors have a ‘plus’ (+) sign moulded onto the rear face. This can be easily removed using a scalpel.

Although the motor can be fitted (and removed) with the rear wheels in place, it may be easier if you remove them, particularly in OO gauge where space is limited.

Push the boss on the rear of the motor into the large hole (E) in the rear mounting plate, so the label is facing upwards. Push the front worm though the hole in the front motor mount and then swing the back of the motor down into position in the bogie, clipping the rear mount over the rear gearshaft as you do so. Use the screws supplied with the motor to secure the front face to the front mounting plate on the mainframe.

Slot a length of 0.7mm wire through the small holes (‘C’ in Figure1), as shown in Figure 5 - the wire will hold itself in place by tension but can readily be pulled out if you need to take the motor off. Bend down the ends of the wire making sure they cannot short on the wheels. In OO gauge, ensure that the legs of the motor mount do not bend outwards and short on the backs of the wheels.

Using wander leads from a controller, run the mechanism in for half an hour, gently at first and then gradually increasing the revs. The gears can be lubricated using a plastic-friendly product, such as RS Multi-purpose Grease. The metal-on-metal components, such as the axle bushes and motor bearings will benefit from a tiny drop of high-quality oil such as Seuthé 113.

Use epoxy to fit two small pads of copperclad strip (not supplied) to the underside of the lateral spacer. When set, shorten the motor leads and solder them to the pads, then solder pick-up wires of 0.4mm wire in place and bend them so they make contact with the back or tread of the wheel as preferred. It will be found that longer pick-up wires give more flexibility making them easier to adjust, as well as allowing them to ‘ride’ up and down with the movement of wheels.

Now the bogie can be tested on the track - some temporary extra weight will be needed, such as a piece of lead attached with ‘blu-tack’ to the motor. Check that each pick-up is working and tweak as necessary. All that remains is to fix the motor bogie into the dummy sideframes, as illustrated in Figure 5. Read all of the following sections before starting work.

Take the Lima bogie moulding and, using a sharp blade, sever the four ribs that join the keeper plate to the sideframes. Now cut across the ends, just inward of the screw hole centres, and the keeper plate should come away. Leave sufficient material at the ends, to form a pair of mounting ledges (dimensions shown in Figure 5). Make sure the surfaces of the bogie ends are flat and smooth and then, without distorting the moulding, offer up the moulding to the bogie. If the Lima hook and bar couplings are being retained, the LongRider should be fitted so the folded down end section at the rear of the LongRider is at the opposite end to the coupling. Check that the ledges at the ends do not foul the gears and then fix the ends of the bogie sideframe in place using the M2 bolts provided (watch you do not catch the gears).

The power bogie should be seated square and level in the moulding - the latter carries the weight of the model and dictates the way it sits on the track - and the wheel centres should align with the axleboxes. If necessary, subtle height and level adjustments can be made using the packing pieces (6 X 4) which fit between the bottom spacer and the top of the cross member. Because the plastic sideframes are flexible, it is essential to check these alignments at every stage, viewing the loco from all angles.

If the hook and bar couplings are to be retained then, at the coupling end of the bogie, drill down through the hole in the etch and fit an additional 14BA nut and bolt into the hole. This will transfer the load from the coupling directly to the LongRider and will prevent the sideframe from distorting when hauling heavy trains.

Clip the bogie into the loco and check the loco body sits level - at this stage, the stabilisers on the flexible moulded sideframes are still free to move up and down, which can cause the loco to lean or sit at the wrong height. The top edge of the bogie sides should be straight. When they are correctly positioned, drill through the moulded central pillars - the hole should be countersunk so the head of the bolt does not protrude - and into the stabiliser arms (Fig 5).

Finally, remove the bogie from the loco and fasten the stabiliser arms to the central pillars using 14BA nuts and bolts. Paint the bolt heads matt black to make them ‘disappear’. The completed motor bogie can now be clipped back into the chassis and the model is ready to run.
MOTOR BOGIE - High Level cont.

ETCHED PARTS
1. Mainframe
2. Compensation beams (x2)
3. Rear motor mount
4. Lateral spacer.
5. Gearshaft spacer washers (x4)
6. Packing pieces (x4)

ADITIONAL PARTS
2mm steel shaft
2mm bore plastic tube
Short brass collar (x2)
Long brass collar (x2)
Worm (x2)
Double gear (x2)
18T. gear (x2)
M2 bolt (x3)
M2 nut (x4)
14B.A. brass c/sunk bolt (x3)
14B.A. brass nut (x3)
0.4mm wire
0.7mm wire

FIGURE 1

FIGURE 2

FIGURE 3
MOTOR BOGIE - High Level cont.

FITTING THE GEARS

FIGURE 7

FITTING THE LONGRIDER INTO THE LIMA SIDEFRAMES