



## *LoRider motor bogie*

The LoRider4 is designed to meet the needs of OO/EM/P4 kit-builders as well as to upgrade RTR models without the need to modify the proprietary chassis in any way. Its scale 8ft 6in wheelbase suits most DMUs and EMUs as well as many BR diesel locomotives, and virtually any make or diameter of coach wheel can be used. The unit is a precise screw-fit into Hornby or Lima bogie mouldings, enabling their load-bearing and stabilising functions to be retained, and alternative parts are included to suit the different locating arrangements. With a little improvisation by the builder, these fixings can be adapted to suit most kit-built models using plastic or whitmetal sideframes.

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 and one that is too big for the LoRider). Two gear ratios are available, both giving a realistic turn of speed for 'main line' running but clearly biased towards the lower end of the scale. The 36:1 option provides a higher top speed (though nothing remotely like the 150mph of a typical RTR model) while 48:1 offers smoother, steadier low-speed control for slow-running freight and shunting. Although the bogie builds up into a self-propelled unit, we suggest you fit additional pick-ups to the trailing bogie of your model. For optimum performance, add weight to your locomotive or power car.

To remove the existing mechanism on a **Hornby** model, unclip the power leads and use a small screwdriver to lever the lugs on the motor block away from the moulding. On a **Lima** model, unscrew the motor block from the bogie moulding and cut the wire from the trailing bogie. Do what you like with the redundant motor block - local model shops are often happy to buy them as spares - but 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, you should remove the chemical blackening on the tyres. We suggest you replace the **axles** that came with your wheelsets with the silver steel rod provided. You might think a 2mm axle is a 2mm axle but most makes are slightly undersized. To compound this problem, the excessive inside diameter of many 2mm bushes gives too generous a clearance. The result is excessive slop and vibration, and this can make a substantial difference to the way a motor bogie runs. For a better 'engineering job', we recommend you use the rod cut to length as follows: OO 19.75mm; EM 21.25mm, P4 22.5mm (these are ideal dimensions but they don't need to be exact to the last thousandth of an inch). Cut the **gear shafts** to length from the same stock. They will be trimmed to the exact size after fitting, but for the time being their lengths should be 13mm for the front shaft and 12mm for the rear - whatever the gauge.

The design of the **LoRider** copies the different ways in which Hornby and Lima arrange for the motor bogie to propel the loco. Hornby use a simple push-along method, but Lima have a couple of cylindrical towers cast into the motor block which engage with a curved cut-out in the chassis moulding. You can replicate this on the LoRider in one of two ways. A basic L-shaped **rubbing plate** soldered to the mainframe works well if the existing Lima motor bogie is a smooth, sliding fit in the chassis. On many Lima models, however, production variations result in an RTR power bogie that is either too loose or so tight that its free swing is impeded. In such cases, the alternative is to use the pair of **adjustable rollers** to fine-tune the fit of the LoRider in the chassis. This method also gives smoother movement and thus minimises the danger of derailments with finescale flanges, or when heavy loads are hauled.

Before cutting any components from the fret, open out the various **holes** in the etch as indicated in Figure 1. Their size is important to the alignment of moving parts and the more care you take 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 hard work. It's 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 "X" so the gear shafts are a tight fit. Deburr the holes by twiddling them with a large drill bit. Open up holes "Y" so the axle bushes are also a close push-fit. Carefully, open out the hole in the rear motor mount "Z" until it fits tightly over the large boss on the rear of the motor. (A flat file with a tapered end is a suitable tool to do this).

Decide now whether to build rigid bogie or one with **compensation** - the latter involves very little extra work, and gives much better running. If you opt for compensation, oil the thread of the **M2 bolt** and then screw it tightly into the M2 nut on the underside of the top plate (the side with the half-etched bend lines) before soldering 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 the nut and bolt if you're building a rigid bogie.

Remove the **mainframe** (1) from the fret and clean off any tabs, being careful not to file off any tabs used for part location. For a **Hornby** model, identify the front and rear fold-up spacers on the bottom of the mainframe (these are shown shaded in Figure 1). Bend them repeatedly until they snap off, then trim off the small semi-circular protrusions (also shown shaded) on the top folding spacers. If your bogie is for a **Lima** model (Figure 3), retain the semi-circles and the two fold-up plates, and solder two 14BA clamping bolts into each of these folding spacers with their heads on the same side as the bend lines. If you are not using the adjustable rollers, fold the L-shaped **rubbing plates** (2 x 2) through 90 degrees. Locate them in the corresponding slots in the top folding spacers (on the same side as the bend lines) and solder in position, checking they are square. For **kit-built** locos, it is advisable to leave all these parts in place, keeping as many fixing options open as possible.

Now fold the mainframe into a box shape as shown in Figure 2 (all fold lines are on the inside). If Lima rubbing plates are fitted, bend the top spacers down first. The gear shafts 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 where the rear top folding spacer meets the side of the mainframe.

If you are fitting the LoRider into a **Hornby** bogie moulding, solder the **locating plates** (3 x 2) to the outer ends of the mainframe, using the lugs for location as in Figure 5. If you are retaining the proprietary coupling then fit the locating plates upside down. Use a good fillet of solder to reinforce the joints.

If you're not using the rubbing plates on your **Lima** bogie, you can now fit the **rollers** (see Figure 4). Cut two lengths of 1.6mm OD brass tube and trim so they are about 0.5mm shorter than the distance between the top and bottom folding spacers. Now cut two lengths of 0.7mm wire, approximately 20mm in length. Fit the rear roller first. Slot one of the wires through the 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 doesn't run like liquid flux) carefully solder the wire to the spacers. Remove the foil.

Locate the second wire and tube into the slots in the front spacers, but do not solder yet. Offer up the LoRider to the opening in the Lima chassis, hooking one of the retainers over its curved edge and then, with the LoRider diagonally across the opening, gently twist the mainframe so that the second retainer can be pushed into position. Take great care not to damage the curved edges of the cut-out. Centre the LoRider in the chassis and adjust the position of the roller by sliding the front pivot wire backwards and forwards in its slots. When the roller is vertical and the bogie is free to swing smoothly through its arc - so it doesn't stick anywhere, but without being particularly sloppy - solder the wire in place at the top end only, again using foil. Check that there is a small amount of play - this allows the bogie to "see-saw" as the locomotive rides over humps or dips in the track. Try the pivoting action again and, if promising, solder the bottom end of the wire. Remove the bogie from the chassis, and trim off the surplus wire.

If you've decided to build a **rigid bogie**, push the four brass bushes into their axle locations as in Figure 2 (flanges to the outside). Put an axle between them to confirm the alignment - it should be free to revolve smoothly - and then solder the bushes to the mainframe. For a **compensated bogie**, solder two bushes into the rear axle holes in the mainframe. Loosely fit the remaining two bushes into the front axle holes, push an axle temporarily in place and then screw the M2 bolt, with its lock-nut, through the nut until it just touches the axle. Tighten up the lock-nut to secure the bolt in place, and then remove the axle and bushes.

The **lateral spacers** (4 or 5) are different - the Hornby pattern is longer. Identify which one to use and slot it through the mainframe - with both arrows pointing the same way - so that an equal amount is projecting from either side (use the etched notches for alignment). When satisfied, solder it in place and then bend up the vertical side arms and reinforce the folds with a thick fillet of solder. Fold the arms on the **rear motor mount** (6) through 90 degrees and reinforce with solder. At this stage you can give the assembled bogie a scrub in household cleaner. When dry, spray it matt black and allow at least 24 hours for the paint to harden.

Thread the **front and rear gearshafts** through the mainframe and fit the double gears, spacer (7) and bushes as you do so (see Figure 6). The double gears are free to revolve on their shafts. Note that front and rear spacing arrangement is different - the front shaft (Figure 7) has a bush on either side, plus a spacer washer, whereas the rear shaft (Figure 8) has only a single bush on the outside of the larger gear. Adjust the gearshafts until they are exactly centred in the mainframe and then, at one end only, lightly superglue them in place. Now, using the alignment marks on the bottom of the bogie, position the double gears so the larger-diameter gear is exactly central on the shaft. Slide the two outer bushes into place against these gears, and

secure with a spot of cyano (the inner bush and spacer remain loose). Allow adequate time for the adhesive to set.

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 slip a full-etched washer from the fret over the end of the shaft and to file the latter down until flush with the washer. Remove the burr from the shaft ends. Now fit the **axles** through the mainframes, with the 18-tooth single gears. These are interference fit but they can be eased slightly with a reamer or tapered file so they push on more readily. Be careful when doing this – if you open them out too much they will have to be glued in place on the axle. When fitted, ensure the gear doesn't foul the pivot on the front axle - the gear is meant to be off-centre. Check the 18-Tooth gears mesh comfortably with the double gears. The position of these gears will be adjusted when the wheels are fitted.

For a compensated chassis, solder a bush into each of the **pivot beams** (8?2) and file flush at the back (the side away from the flange). Enlarge the remaining holes very slightly until a bush will just rotate in them when pushed into place on the beam. With both flanges on same the side of the beam, file this bush flush also, then deburr and clean off any swarf. Now slide the beams into place, with the fixed bushes over the axle (flanges outwards) and the loose-fitting bushes over the gearshaft, so the pivot beam is right up against the sides of the mainframe. With a tiny amount of cyano on the end of a pin, glue the flanges of these two bushes to the gearshaft, being careful not to get any glue on the beam itself. Allow the adhesive to set and then, when you're satisfied that the beams pivot easily, file off the surplus shaft.

Having removed any chemical blackening from the tyres you can now fit the **wheels**, adding washers and/or plastic tube, cut to length to eliminate sideplay on the fixed axle but allowing the rocking axle a little play so it can pivot easily. Always use an accurate gauge to determine the **back-to-back distance** – it makes no difference to the running if the axles are fractionally too long or too short but if the back-to-back measurements are out, you will have trouble. Now you can fine-tune the position of the single gear on each driven axle (Figures 7 & 8). On the front axle, allow about 1mm sideways clearance with the side face of the double gear. The rear 18-Tooth gear should run almost up against the double gear, when the latter is hard against its bush. Allow only a small amount of clearance – enough to prevent any sideplay at the rear axle from jamming gears together. Test by pushing the bogie along a flat surface - if you have been careful with the alignments of shafts in their holes, you should have a perfect mesh first time without any tight spots.

For a compensated bogie, using a carborundum cutting disc in a mini-drill, trim the front **motor shaft** to 7mm long to clear the pivot screw. This is not necessary on a rigid bogie. The **worms** provided may be either brass or nylon, according to type and gear ratio (the two are not interchangeable). With the nylon type, press them on until they are no more than 0.5mm away from the bosses on the motor casing, when the shaft end-float is taken up by pushing the motor shaft in towards the motor. Then take a scalpel and pare off a small amount at the opposite end of the front worm to make it flush with the end of the shaft.

For brass worms, push them onto the motor shaft until their distances from the bosses are 0.5mm for the front worm, and 1.5mm for the rear worm, with the end-float taken up as above. Some brass worms supplied to us are fractionally tighter than others and if they aren't 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. If necessary, secure the worms with a small drop of Loctite 601 at the outer end. Solder power leads to the motor brush tags.

Push the boss on the rear of the **motor** into the large hole (Z) in the rear mounting plate, so the label is facing upwards. Then place the motor in position on the bogie, clipping the mount over the rear gearshaft for location. Use the screws supplied with the motor to secure the front face to the front mounting plate on the mainframe. Check the **gear meshing** under power and if necessary loosen the screws and move the motor up or down slightly until satisfied - the best mesh will be when the running is quietest. Remove the rear wheels and squeeze the rear motor mount between finger and thumb. Using a 0.5mm drill bit, spot through the holes in the side brackets and through the bogie mainframe, as shown in Figure 2. Slot a length of wire through these holes - it 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 and refit the wheels.

Using wander leads from your controller, run the mechanism in for half an hour, gently at first and then gradually increasing the revs. Lubricant is not necessary on the gears but the axle and gearshaft bushes will, like the motor bearings, need a tiny drop of high-quality oil, such as Zeuthen Ultra-adhesive. 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. Now you can test the bogie on

the track - some temporary extra weight will be needed, such as a lump of lead blu-tacked 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 9. 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. Because the plastic sideframes are flexible, it is essential to check these alignments at every stage, viewing the loco from all angles. Read all of the following sections before starting work.

On a **Hornby** model, cut away the keeper plate and crosspiece at the bottom of the moulding to leave just the sides and ends. Hold the power bogie and the moulding together so everything is square and level. Use engineer's clamps, tape, blu-tack or whatever comes to hand to hold them together temporarily while you drill through one end of the moulding and into the mounting plate. Check everything is correctly aligned, secure with the nuts and bolts provided and then do the same at other end. 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. When they are correctly positioned, drill through the moulded central pillars. The hole should be countersunk so the head of the bolt doesn't protrude - and into the **stabiliser arms**, securing as before with nuts and bolts. Paint the bolt heads matt black to make them 'disappear'.

On a **Lima** model, remove the moulded bosses above the screw holes and trim them level with the top edges of the crossmembers. Sever the four ribs that join the keeper plate to the sideframes. Cut across the centre of the screw holes so that the keeper plate comes away, leaving about 3mm of plastic on the inside ends to form a pair of mounting ledges. You will need to trim off some plastic to clear the 14BA fixing bolts at either side of the ledge - note that Lima's keeper plate is moulded off-centre and so the amount of material to be removed will be different on each side. Use a square needle file to ensure that the inside corners (where the ledge joins the crossmember) are clear and that the 14BA clamping bolts can be slotted into these corners, without distorting the moulding. Now offer up the bogie to the moulding and check that the ledges don't foul the gears.

Before fitting the **clamping plates** (9 x 2), bend over the strengthening ribs on the plates, slip them over the clamping bolts and then tighten up the nuts so that the plates trap the plastic lugs. Do not over-tighten these nuts or the moulded sideframes will distort. If necessary, subtle height and level adjustments can be made by packing between the bottom spacer and the top of the crossmember. If you are using the proprietary hook and bar coupling, drill down through one of the circular lugs at the end of the LoRider, into the coupling and then fit an additional 14BA nut and bolt.

Clip the bogie into the loco and, after re-checking that the loco is sitting level, fasten the **stabiliser arms** to the central pillars, as described above. The completed motor bogie can now be clipped back into the chassis. Add extra weight, fit pick-ups on the trailing bogie, and the model is ready to run.

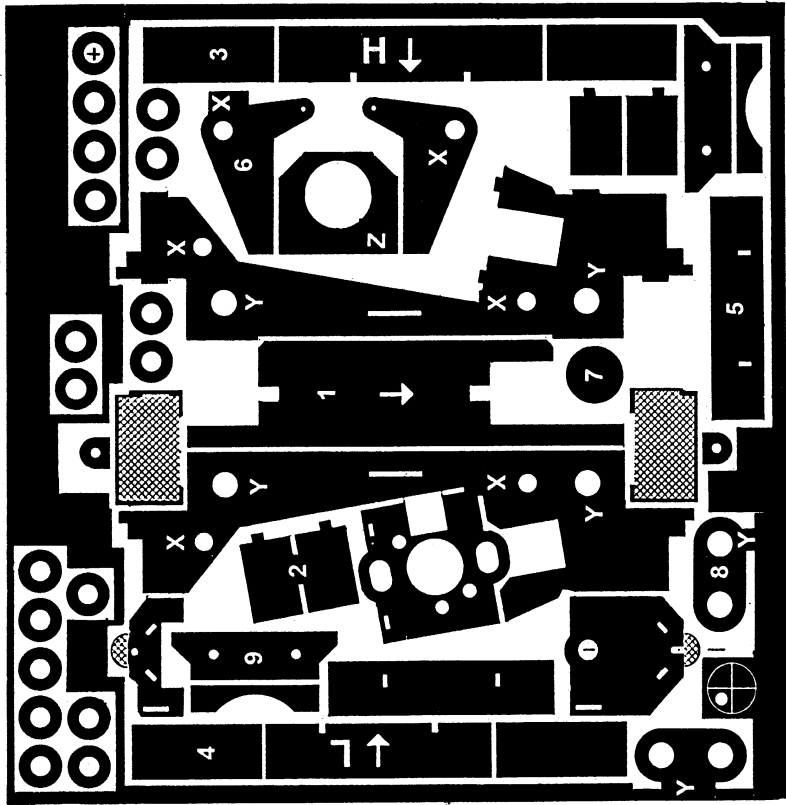


FIG. 1 ETCHED FRET

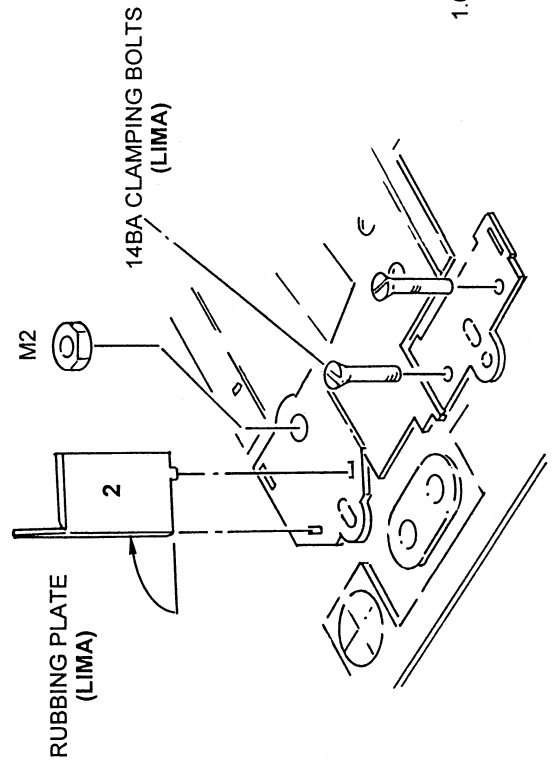


FIG. 3

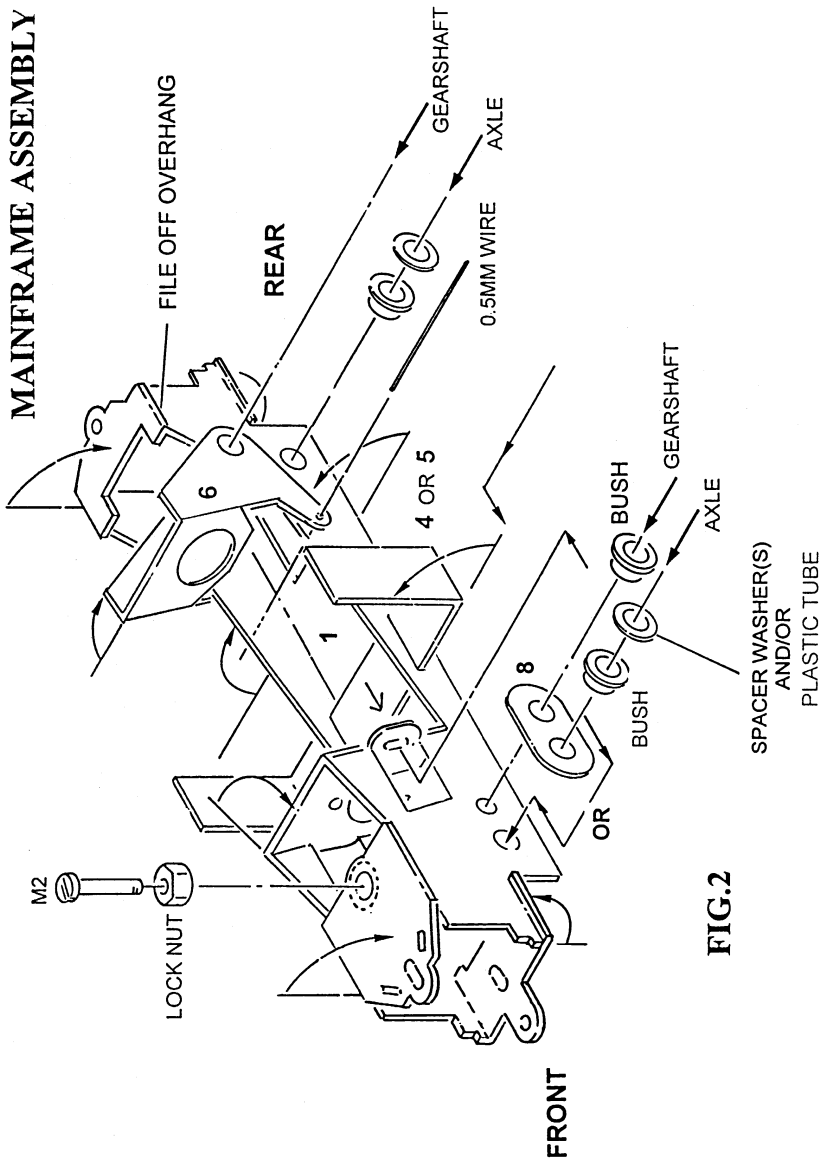


FIG. 2

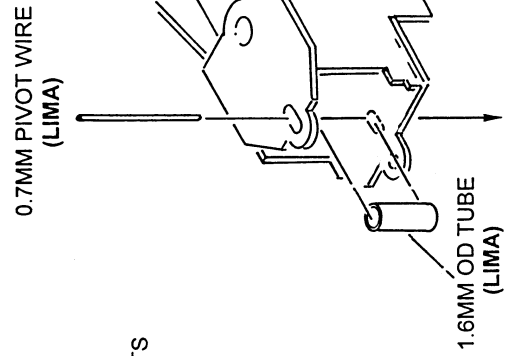


FIG. 4

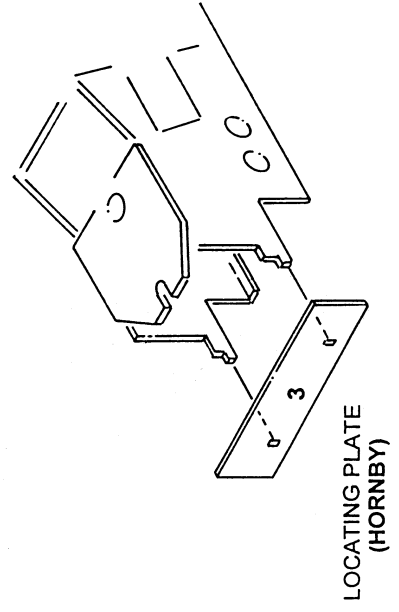


FIG. 5

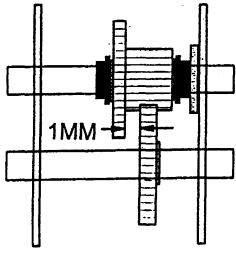


FIG. 7

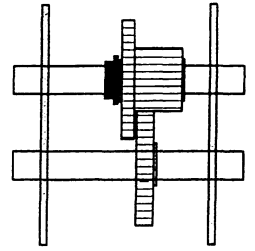


FIG. 8

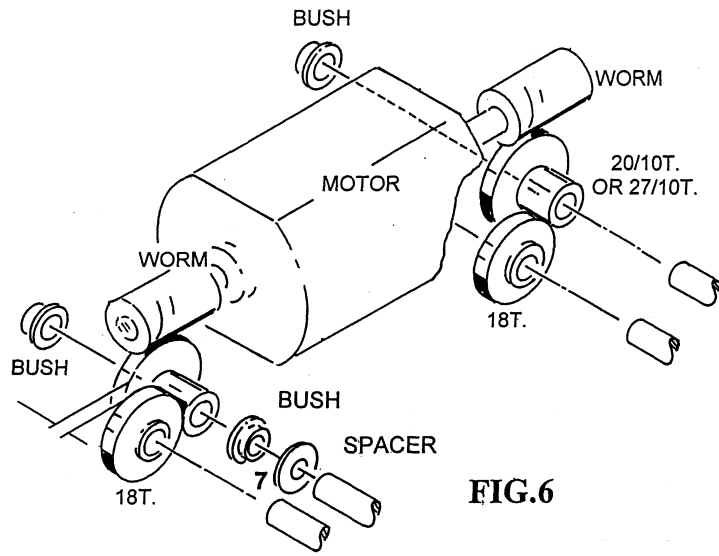


FIG. 6

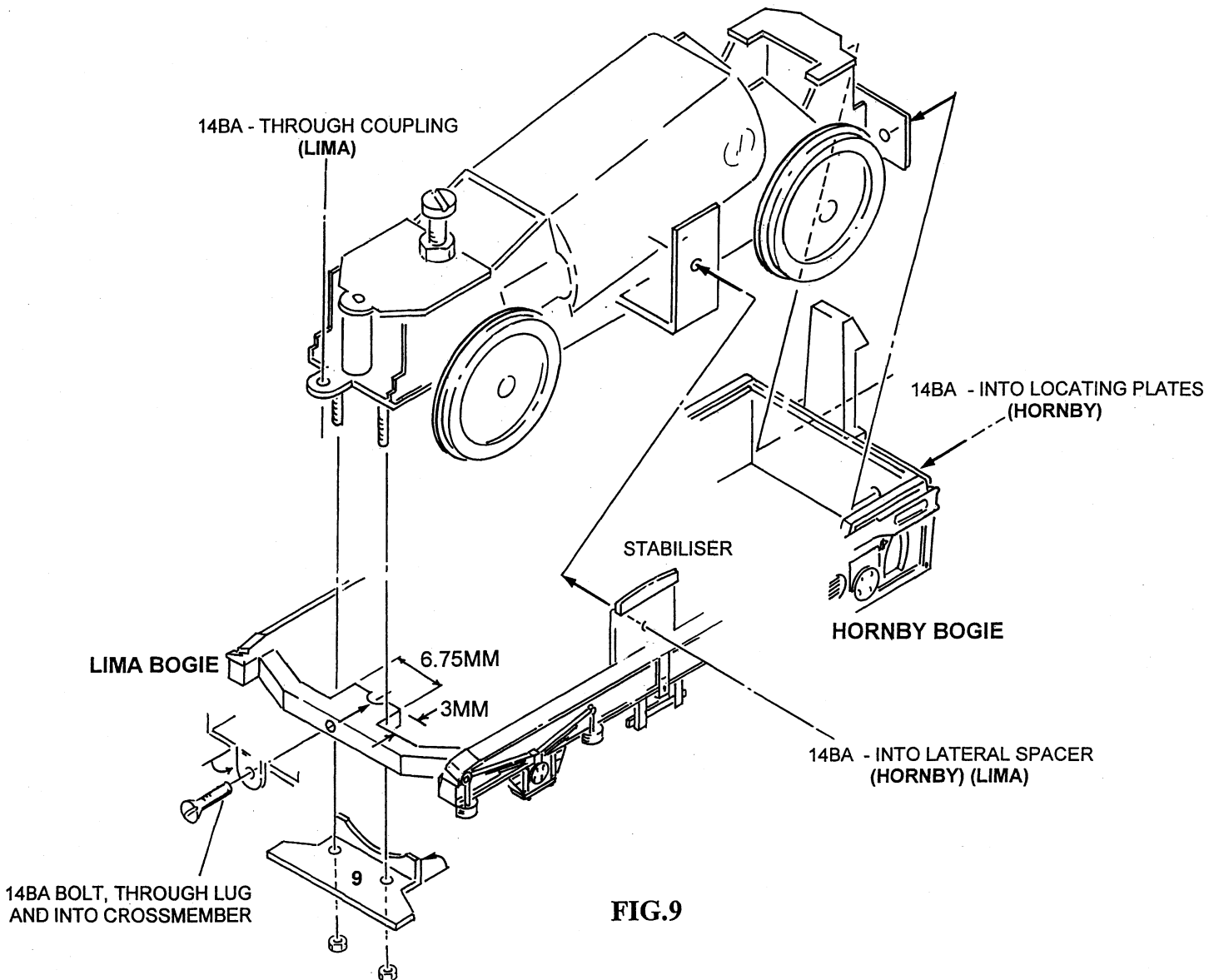


FIG. 9



**HIGH LEVEL**

# Lo Rider

*8ft 6ins wheelbase  
Compensated motor bogie,  
with four-wheel-drive.*

*27, 36 or 48:1 ratios available  
for Mashima 1420 Motor.*

*Clips into Hornby  
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