

EasiChas - Chassis Kit for Hornby GER/LNER J15 0-6-0 Locomotive and Tender

For EM and P4 Gauges only

Instructions

PO Box 1137 Sutton Coldfield B76 1FU

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1. Introduction

- 1.1. The EasiChas frames for the Hornby J15 0-6-0, based on the original concept devised by John Brighton, have been specifically designed to allow easy conversion to EM or P4 gauge, which results in a fully sprung locomotive.
- 1.2. Unlike previous EasiChas kits, we have not been able to make the basic conversion of this one soldering free as it is not possible to re-use the Hornby brake hangers and blocks. However, it only requires a little more skill than previous ones and is still not difficult.
- 1.3. The J15 has 4'11" 15-spoke wheels. The nearest wheels available from Alan Gibson are 4'10" with 16 spokes, available on 1/8" axles as part number 4858. These are also available on a 2mm axle as a conversion set part number 4800/56 (for EM) 4500/56 (for P4) and if you have a set of these then the Brassmasters' hornblocks can be bushed out with Alan Gibson reducing sleeves part number 4M68. Other options include wheels from Markits for EM which would use 1/8" axles.
- 1.4. Unfortunately, it is not possible to re-use the Hornby locomotive pick-ups on this EasiChas although those on the tender can be retained. A suggested method for making pick-ups for the locomotive and the tender has been given, which has worked very successfully on the test build, although there are many other methods which the builder may prefer to use.

2. General Notes

- 2.1. There are two etches containing the parts for the locomotive and tender. Numbers shown in square brackets [] in the instructions refer to the etch. The part number appears on the etch diagrams at the end of these instructions. Certain parts, e.g. bolts, wire, springs, are not numbered.
- 2.2. Some of the parts are small and easily damaged, so do please take care. Parts should be removed from the sheets as and when needed by use of a small scalpel etc., and the tabs and etch cusp removed with a small fine-cut file.
- 2.3. Some parts (e.g. the brakes) are designed to be held as a group by part of the surrounding etch for assembly, take care where this is noted in the instructions as removing the individual parts from the etch before assembly can make assembly more difficult.
- 2.4. All folds and bends are made with the half-etched line on the inside unless otherwise stated.

3. Before you start

- 3.1. Tools Required
 - A selection of cross head and normal miniature screwdrivers
 - Small pliers
 - Small plastic bags and labels to identify parts and screws when dismantling
 - Small files
 - Soldering iron
 - A steel rule or set of bending bars to help with the long bends
 - Back to Back wheel gauge
 - For wheels without automatic quartering, e.g. Alan Gibson, the use of a GW wheel press and quartering tool is recommend.
 - A set of taper broaches to enlarge any etched holes as required
 - A variety of drill bits and a pin vice
 - Plastic solvent, superglue and epoxy resin (24 hour and 5 minute)
- 3.2. In all cases bag and label all small parts and source of screws as soon as removed (they are all different) - trust us on this one!

4. J15 prototype notes and the Hornby models

The class was long-lived and there were many changes over time. Therefore it is important to refer to photographs. 289 of the class were built, of which 123 were taken over by BR in 1948 and the last were withdrawn in 1962. Yeadon's Register volume 35 is recommended and for those of you with access online the website www.Rail-Online.co.uk has a good selection of photographs with descriptions.

Hornby have produced several models and appear to be continuing to do so. However, LNER versions are a little thin on the ground, especially those featuring the original cab roof profile which are essential for pre-1930 locomotives. None have been made with the original stovepipe chimney.

In selecting a prototype, or even before buying the Hornby model, the following notes may help, although when referring to original build information there were many 'swaps' at Stratford works.

Locomotives

Chimneys were originally all stovepipe. A NER design was fitted starting from 1930, most stovepipes being replaced by 1935. During the Second World War there were some oddballs. From 1960 Norwich shed found and fitted original stovepipe style chimneys to three engines. Alan Gibson offers lost wax stovepipe chimney ref 4M630.

Ramsbottom enclosed safety valves were originally fitted but, starting in the late 1920s, Ross Pops were fitted on the original base. Later these were fitted directly to the firebox. Hornby appear to only fit Ross Pops fitted directly to the firebox top. Alan Gibson offers lost wax replacement Ramsbottom safety valve ref 4M629.

Cab side cut-outs were deep in pre-1892 builds, shallow after that (Hornby do both but the majority of models are the shallow post-1892 cut-outs)

Raised profile metal cab roofs were fitted from 1933, eventually to all locomotives. Hornby so far (2020) have only produced one model with the original profile and wooden roof (with NER chimney), but it is an easy modification to backdate a later cab roof as this is glued (usually poorly) on the Hornby model.

The first 249 members of the class were steam brake only and all but seven of these remained so. These usually had 3-link couplings. The 43 locomotives that were vacuum or Westinghouse braked had screw couplings. Hornby models of the unfitted locomotives are not in the majority. The LNER original cab version R3230 No 7524 is one, as is the LNER later cab roof version R3380 No 7510 (both having small cab cut-outs of the post 1892 pattern and also have post-1892 tender frame types - see below). The BR liveried non-vacuum braked models all appear to have brake piping along the footplate so are incorrect.

Westinghouse pumps were only on passenger engines. Pipes were fitted (sometimes in casings) on the side of the footplate angle for vacuum (one side) and steam heat fitted engines (other side). These are cast into the Mazak footplate and therefore are difficult (i.e. near impossible) to remove from the Hornby model.

Pre-1899 engines had no balance weights on the wheels; later built ones had integral cast weights.

LT trip cocks were fitted to some engines, initially under the cab steps then adjacent to the front guard irons.

Occasionally, taper buffers were fitted.

The 19 Sharp Stewart built engines (all withdrawn before 1946) had outside brake pull rods.

Side window cabs were fitted to some engines.

Handrail knobs were perpendicular to the boiler and not parallel to the footplate as modelled by Hornby. These can be re-drilled and this makes a significant difference to the appearance of the locomotive.

Tenders

The cut-outs in the frames were D-shaped up to 1892 and parallel top and bottom thereafter. Hornby do both types, but the majority of models are the post-1892 parallel type.

Tender cabs were fitted to some locomotives.

Tarpaulin sheet support bars were fitted in World War 2 and retained thereafter on some locomotives.

There was a water gauge in the form of a dial on the left-hand side of the tender front (as fitted to Hornby models), these were removed from 1930 onwards.

Some tenders were larger at 2,640 Gallons capacity and therefore had six inch higher sides.

The last thirty engines built were matched to second-hand tenders of different patterns. Look out for equally spaced axle centres on these tenders.

The tender front handrails were of different lengths depending whether pre- or post-1892 build dates, generally to match the different cab cut-out types, but swaps occurred.

Only 16 tenders received the post-1956 BR crest as opposed to the earlier 'cycling lion' emblem.

Guide

Our website contains a guide based on these instructions where you can zoom in to see the pictures in colour and in close up.

We recommend to looking at this before you start work so you can get a feel of the steps involved in the work.

David Barham's blog

David Barham who designed the kit with us has written a blog about the design and development which is well worth reading – see

https://www.rmweb.co.uk/community/index.php?/search/&q=J15&quick=1&type=blog_entry&nodes=186

When David assembled the test etch for the chassis it ran successfully first time - see his video of this

<https://youtu.be/QbPAPw3blyQ>

It looked even better when re-united with the body - <https://youtu.be/jfFBwiH925E>

5. Dismantling the locomotive

- 5.1. Unplug the plastic plug connecting the cables from the locomotive to the tender. This cabling will be used in future so be careful not to deform it.
- 5.2. Unscrew the bolt on the locomotive which holds the locomotive to the tender drawbar. This is a special bolt with a waist so be extra careful not to lose it.
- 5.3. Unscrew the front and two middle Philips screws in the plastic keeper plate.
- 5.4. Pull the chassis block down from the front (there is a tab at the rear which holds it in place).
- 5.5. The keeper plate should come away from the main chassis block. While the wheels and coupling rods are not required, the final drive gear is needed. Remove the wire which represents the sanding gear.
- 5.6. Hold the rear axle in a pair of pliers and remove the wheels with a twisting motion, slide off the brass bushes (they can be very tight).
- 5.7. Place the axle with the centre gear in a vice so that the gear wheel is supported on the vice sides but the axle is loose, tap the axle with a small hammer or similar and the gear wheel will slide off the axle. If you do not have a vice use a pair of pliers on one side of the gear wheel, gently slide the plastic gear down and off the axle by holding the axle vertical and pressing down.
It is very important not to damage this gear.
- 5.8. You will now have a box of bits and an invalid Hornby guarantee!

6. Modifications to the Hornby chassis block

- 6.1. A little filing is now required. The metal used for the chassis block is relatively easy to file but take care to avoid getting the filings into the motor or gears. It is a good idea to wrap some Sellotape around the motor to avoid this.
- 6.2. Unless you are using the Alan Gibson conversion set with 2mm diameter axles each of the wheel bearing slots needs widening slightly to ensure that your chosen axle size will move freely. There is a slight ridge inside each of the bearing slots which retained the original brass bearing, This will need to be removed to allow an 1/8" axle bearing to slide freely.
- 6.3. There is also a little extra material to remove from the sides of the block around the rear axle slot.
- 6.4. Remove the guard irons. This is a job for a razor or piecing saw. File the cut smooth.
- 6.5. Finally, on the right-hand side of the block there is a little rectangular block ~1mm x 1.5mm which needs to be removed so that the new side frames can be easily slid on.
- 6.6. The photographs below make clear what to remove.



- 6.7. Keep the Hornby wiring intact, it can be reused along with the plate on the rear of the chassis with the two sprung plungers for the pickups.

7. Preparing the wheels

- 7.1. If you are using Alan Gibson wheels you may need to drill the crankpin holes using a 0.65mm drill. The hole must be perpendicular to the wheel. It is worth making a little jig to ensure that all the holes are drilled perpendicular and the same distance from the wheel centre. This is useful for all wheels where the crankpin holes need to be drilling and is re-usable on future projects not just EasiChas.

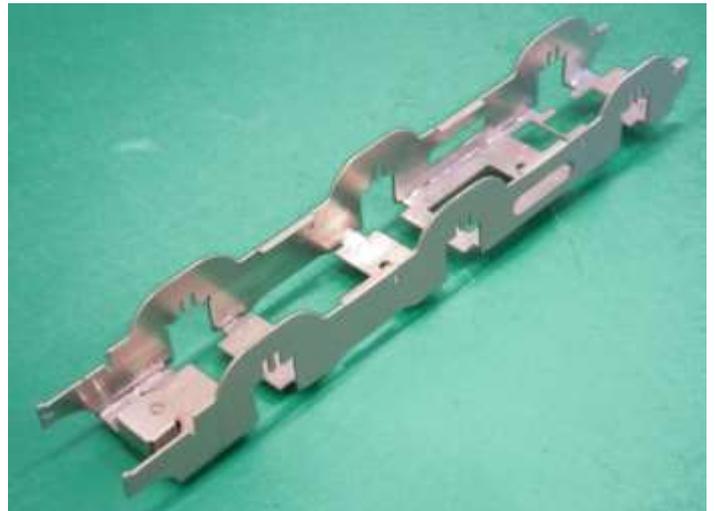


The Gibson wheels have quite a large boss on the rear which fouls the head of the crank pin bolt. Ensure that you cut away a section of this boss around the crankpin hole otherwise the countersink of the crankpin will tend to twist it 'off true' when it hits the boss.

- 7.2. The following will prevent problems with loose crankpins. Countersink the rear of the crankpin screw holes using a 3mm drill and half screw the 12BA screws home. Using 24-hour epoxy adhesive, smear the remaining thread and screw the 12BA screws home. Smear a little epoxy over the head for additional security but there should not be a big blob that will catch on wheel rotation. Leave in a warm place for 24 hours to set. This will retain the screws and stop them from rotating.

8. Basic locomotive conversion

- 8.1. Remove the main frame [L1] from the etch. Clean up the residual tabs with a small file.
- 8.2. Fold up the main frames using bending bars or a pair of steel rules to produce a U-shape. All the half etches are on the **inside** of the bend. Strengthen the bend with a bead of solder.
- 8.3. Bend the front bolt bracket, This bends back on itself and has tabs which form sides that fit into the slots on the top side. It is easiest to start with bending the two sides and then roll the part back into the slots in the main cross member of the chassis. These tabs need soldering into the frames for strength. It is deliberately a tight fit in the Hornby chassis to prevent unwanted movement and may need some filing on the sides to fit.
- 8.4. Fold inwards by 90 degrees the tops of the frames which provide spacers between the new frames and the Hornby chassis block.
- 8.5. Fold down the little hooks next to the front bolt bracket. These secure the keeper plate with the cosmetic locomotive springs which forms the lower part of the chassis. Also fold down the brake rod support at the rear. Strengthen with a bead of solder.
- 8.6. Enlarge the holes for the mounting screws slightly with a broach until the Hornby screws are a comfortable fit. It is ideal (though not vital) to keep the rear hole slightly tight so that the Hornby screw with the waist for the coupling bar holds slightly on its thread as this will mean you can use it to hold the main frame and the keeper plate together while rolling the chassis without the chassis block in place.
The finished component should look like this.



- 8.7. Check the fit of the brass bearings into the slots in the mainframes. If tight, using a smooth sharp file **lightly** file away the cusp equally on both of the edges of the slots until the bearing slides up and down with no binding. **It is very important that too much metal is not removed** resulting in a sloppy fit – no side play whatsoever is the aim, just a smooth sliding fit.

- 8.8. Remove the Chassis keeper plate [L2] from the etch. Clean up the residual tabs with a small file.
- 8.9. Fold down the cosmetic springs and strengthen the bend with a bead of solder.



- 8.10. Fold up the section of frame at the front which slots between the mainframes and strengthen the bend with a bead of solder.



- 8.11. Enlarge the mounting holes with a broach until the Hornby bolts are a comfortable fit.
- 8.12. Test fit the keeper plate into the bottom of the main frames, It should clip under the retaining hooks in the front of the frame. The waisted bolt which connected the locomotive to the tender drawbar can be used to hold these together.
- 8.13. **IMPORTANT** - Carefully examine the bearings as they are not symmetrical. It can be seen that **the flange on one side of the slot is wider than the other side**. For EM gauge, the bearings need to be mounted in

the frames with the thicker flange towards the centre of the frames. For P4 gauge, the bearings need to be mounted with the thinner flange towards the centre of the frames. Increased side-play on the middle wheels can be obtained by having the thin side of the bearings on the outside or rubbing off the circular beading round the axle hole. For EM gauge, it will be necessary to file off the raised rim on the inside face of the bearings to ensure the bearings move up and down freely. If using Gibson's conversion wheel set with 2mm axles fit the reducing sleeves into the hornblocks, file flush with the surface of the hornblocks and ideally ream the resulting bearing with a 2mm reamer.

- 8.14. Fit the mainframes to the Hornby chassis, place the bearings in the slots and check for easy movement.



- 8.15. Check your axles are a smooth fit in the bearings. If tight, ream them out to 1/8" (or 2mm if using conversion set) using a reamer or, if you do not have one, a small round file, a precision drill or a broach), then place each through the axleboxes and through the "slots" in the Hornby chassis block. If the axles catch the side of the chassis block, file away the offending part of the block.
- 8.16. If using the Alan Gibson 2mm axles you will need to 'knurl' the drive axle so that the gear wheel has something to grip on to. Place the plain axle into the chassis, measuring on the axle the overhang each side to make sure it is central. Take a permanent marker pen and mark the position of the gear on the axle. Place the axle on a cutting mat or similar. Take a small hand file, we use a 4inch second cut file, and using the file on edge, roll it with firm downward pressure over the axle where you marked the gear position. Do not stray away from this narrow area, as we do not want knurling where the axles run in the areas of the hornblocks.
- 8.17. If you are using Alan Gibson wheels you may find the axles are slightly over length for P4. They need to be approximately 22.6 mm long. You will also need to re-use the Hornby axle gear wheel. If you are using 1/8" axles then the axle hole in the Hornby gear wheel will need to be made larger. This is best done using an increasing range of broaches and/or drill bits. Take it easily and gently in small steps. The gearing meshing is quite coarse and there is a fair amount of allowance in the mesh. Fit the gear wheel onto the new axle by gentle pushing it onto the axle, ensuring that the gear wheel is offset on the axle. **It is essential that the same amount of axle should be protruding each side** of the chassis when it is fitted because clearances behind the splashers are small.
- 8.18. Take the axles and file the sharp edges off the end to a rounded profile. Use a drill bit of around 5mm diameter to chamfer the rear of each wheel axle hole. These two actions help the axle to 'centre' in the wheel when they are pressed on. Mount the bearings on all axles the correct way round, adding any spacing washers required (there will be about 0.6mm lateral movement on an axle with no washers in 18.83 gauge –so not many washers are required). For both EM and P4 we suggest one full washer on each side of the leading and trailing wheels. Finally, press the wheels on the axles. Use of a GW wheel press/quartering tool is highly recommended if you are using Gibson or other wheels which require manual quartering.
- 8.19. Press the wheels home with a back-to-back gauge between the wheels. This gauge should be an interference fit between the wheel backs with no 'slop'. Ensure this is so by turning each wheel through 90 degrees to check for wobble, and, if present, twist the wheel. Quarter the wheels with the right-hand wheel leading the left-hand wheel by 90 degrees when travelling forwards. We do this by setting the driven axle first so a wheel spoke is horizontal on one side and vertical at the other, then each other

wheelset fitted is lined up with the horizontal spoke, the chassis turned over very carefully, and the spoke on the other side lined up by eye against those on the driven axle.

- 8.20. Place the bearing springs over the tongues on the frames (a small dab of grease on the spring will keep it in place). Fit the wheelsets into the main frames and attach the keep plate. Check that the motor turns the rear wheelset with no sign of any binding by gently rotating the flywheels. You can try applying power to the motor by temporarily connecting the cable to the tender and feeding power from the tender wheels. Check the wheels spring freely with no binding and test fit to the locomotive body. Remove the etched frames from the Hornby chassis block when happy as it is easier to fit the rods and check the quartering with the frames disconnected from the motor drive.

9. Ashpan

- 9.1 The Ashpan [L19] should be folded to shape and the sides of the folds made up with solder and filed to a curve. The completed part is fitted into the slots in the keeper plate and soldered to it. The cut-out across the front of the keeper plate is to clear the connections to the Hornby pickup studs while the one half-way across the rear gives clearance for the final drive gear.



10. Coupling rods

- 10.1. Fit the Hornby coupling rods with the six bushes provided. This may require each hole to be opened up with a rat-tail round file to accept the bushes, if you are careful, these can be an interference fit. If not, the bushes have to be soldered or glued with epoxy centrally in place and if needed reamed out to take the Gibson crankpin bushes (see photo of a similar rod).



A finer scale solution is to solder up a new set of coupling rods, but this of course takes longer.

- 10.2. If you are building the replacement rods continue with this section, If not, go to 10.22.
- 10.3. The rods can be fitted with either the fluted or plain side facing outwards depending on whether your locomotive had plain or fluted rods.
- 10.4. The rods [L3-L6] are designed to be jointed in the prototypical manner, the 'tongue' and 'forks' for the joint being formed by half-etching.

One hint to aid construction is to remove the two main parts of each rod from the fret but leave the tabs in place. The rods can then be folded back on each other which means that the alignment can be set and held in place while the parts are soldered together.



- 10.5. Cut one pair of rods from the fret [L3]. Open out the crankpin holes with a 1.5 mm drill. Tin the back of each rod.
- 10.6. Fold over the two halves of the rod as above ensuring that the holes align. This is probably best done by drilling a hole using the same size drill perpendicular in a scrap piece of wood. Leave the drill in the hole in the wood.

- 10.7. Place the rod over the drill. Place a little flux along the top surface of the rod and apply heat; the solder on the soldering iron will run down between the rods and join them. The secret is to apply only a little solder at a time. Solder will fill the “cusp” and give the impression of a solid rod. Repeat for the whole length of the rod.
- 10.8. Repeat for the other three rods [L4-L6].
- 10.9. Each rod has half-etched overlays which can be fitted to the outside of the rods to make a thicker crank boss ([L7] for the leading and trailing bosses, [L8] for the centre boss). It is easiest to align these parts if the rods and overlays are placed over the 1.5 mm drill in the block of wood again, or alternatively, use a blunted end of a cocktail stick. Decide whether your loco is having fluted or plain rods before attaching the overlays, to make sure they are applied to the correct side.
- 10.10. Clean up each rod with files. Carefully blend the bosses into the front face of the rods.
- 10.11. There are two methods of forming the joint between the front and rear rods, either using a rivet or with a short length of 1.0 mm nickel silver wire. The rivet method is probably easier but results in an under-size collar on the front of the rod, the 1.0 mm wire gives the exact three inch collar.

Rivet method

- 10.12. Open out the joint holes very carefully with a broach or a tapered Swiss file to just clear the rivet.
- 10.13. To stop solder flooding the joint apply a little oil to the surfaces not to be soldered - this will prevent the solder running into the joint. Keep the rear of the rod clean.
- 10.14. Push the rivet through from the back so the head is tight up against the back of the etch.
- 10.15. Solder can then be quickly applied with a very hot iron to the back of the rod to fix the rivet in place.
- 10.16. File back the rivet at the front of the rod to leave about 0.5 mm proud.

Wire method

- 10.17. Open out the joint holes vary carefully with a broach or a tapered Swiss file to just clear the 1.0 mm wire.
- 10.18. To stop solder flooding the joint apply a little oil to the surfaces not to be soldered - this will prevent the solder running into the joint. Keep the rear of the rod clean.
- 10.19. Push the wire through from the front leaving about 0.5 mm proud.
- 10.20. Solder can then be quickly applied with a very hot iron to the back of the rod to fix the wire in place. Clean off excess solder leaving enough to keep a strong joint.
- 10.21. File back the wire at the front of the rod, again leaving about 0.5 mm proud.
- 10.22. The front and rear rods are joined with a short length of 1mm nickel silver wire pushed through from the front and then cropped back on the rear leaving about 0.5mm proud.
- 10.23. Open out the joint holes vary carefully with a broach or a tapered Swiss file to just clear the 1mm wire.
- 10.24. To stop solder flooding the joint apply a little oil to the surfaces not to be soldered - this will prevent the solder running into the joint. Keep the rear of the rod clean. Solder can then be quickly applied with a very hot iron to the back of the rod to fix the wire in place. Clean off excess solder leaving enough to keep a strong joint.
- 10.25. Open up the crankpin holes in order that the crankpin bushes will rotate in the rod. This can be done with a reamer, broach or a fine Swiss file. Check each of the crankpin holes in the rod is a good fit over your crankpin washers. At this stage it is better to err on the 'too tight' side rather than 'too loose'.
- 10.26. Fit your crank pin washers, rods and crankpin nuts to the wheels. At this stage you could also use a small piece of electrical wire sleeve in place of the nut (this does not come unscrewed unlike a proper 14BA nut!). If your wheel quartering is correct, then you should be able to roll the resulting chassis along



the bench without it binding. If it is binding, check the quartering and check each crankpin in turn to see which one is stuck. If required, then slightly open up the crankpin hole in that rod. Do this carefully and a little at a time, you can easily remove material -putting it back is a lot harder.

- 10.27. Once happy that the chassis rolls smoothly the Hornby chassis block can be reinstalled and fastened using the front and rear bolts. The gear on the rear axle should mesh with the gear train from the motor but still retain a degree of springing. At this point if you plug the unconverted tender into the locomotive using the original Hornby cabling you can power the chassis from the tender to test, though obviously the tender will still be OO so you might need to be creative with the track/rolling road.

11. Body modifications

- 11.1. Clearance for P4 wheels is tight behind the splashers on the chassis and some material will need to be removed. The casting has almost 1mm of thickness to the sides of the splashers. This work is best done with a carborundum disk in a mini-drill. Work slowly and carefully testing for clearance as you go.

12. Brakes

- 12.1. Using the original Hornby brake gear isn't an option so new brake blocks, hangers and linkage are provided on the etch. The brake components are mounted together and should be removed from the fret as a single unit. This makes folding and locating the parts together easier.

- 12.2. Locate and remove the locomotive brake components [L13] from the etch, there are eight of these, you need six; two are spares available as offerings to the carpet monster. Ensure that you can get a piece of 0.45 wire through the central holes of the brake block and hanger, also that the top hole is opened to 0.8mm, doing this while the component is still flat is easiest using either a drill or small broach. The brake assemblies are 'handed'; four are available for each side of the locomotive.



- 12.3. For each set, bend the etch in a Z-shape using the half-etch lines on the frame. Then flatten between the jaws of a small pair of pliers (use a set with smooth not serrated jaws as these could mark the metal). This will align the three components over each other for soldering. You can tweak the position if necessary.

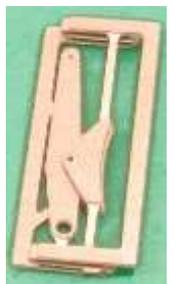
- 12.4. Thread a length of 0.45 mm wire through the hole in the brake block, this will align the components together and form the bolt detail on the brake block. Cut this roughly off so it doesn't get in the way while soldering.

- 12.5. Apply some flux and solder from the curved face of the brake block, this will run in between the components and join them securely.

- 12.6. Remove the assembled brake from the surrounding etch with a sharp scalpel. Don't worry if the diagonal tabs on the rear brake don't come off too cleanly, they are totally hidden when on the locomotive or a small file will remove them.

Lightly run a small file around the hanger to remove the cusp and use a half-round file smooth the surface of the brake block where the three thicknesses of brass are laminated. If you slightly slant the file back from the front of the brake block you can give slightly more clearance between the rear of the block and the wheel tread which will help prevent any short circuits once the brakes are mounted on the chassis.

- 12.7. Locate the brake hanger brackets [L14] on the etch. Ensure that each of the holes is opened to 0.8mm, doing this while the components are still on the main etch is easiest using either a drill or small broach. The etch contains eight of these parts, giving two spares.



- 12.8. Separate one of the brackets from the etch as photo to the right.



- 12.9. Fold each end into a U-shape, ensuring that the sides are parallel and perpendicular to the end. The distance between the short side needs to fit a thickness of etch so you could fold the part around one of the frames which surround the brake components. The larger side spaces the brake hanger from the main frame.

- 12.10. Then fold the two halves back on each other to make a W-shape.
 12.11. Apply a small quantity of solder to the part and then clean out the hole again to fit the 0.8mm wire. Feed a length of wire through the part and use this to hold it while you remove the cusps and any rough spots where the etch tabs joined.



Note that these hangers are handed, the more angled face is orientated towards the outside of the chassis.

- 12.12. Repeat this process six times until you have a complete set of brake blocks which can slide onto a 25mm length of 0.8mm rod. Ensure that you have three of each handed brake block.



- 12.13. The brake pull linkage [L16] comes with matching half-etched linkage details which need to be applied to the top and bottom of the main etch. It is easiest to tin the

parts **BEFORE removing from the main etch** and to leave the pull rod itself attached to the main etch while this work is completed.



The half-etch detail on the linkage for the rear axle has a small length which needs to be removed once they are soldered on.

- 12.14. The completed linkage should look like this photograph. The ends of the brake cross members are over-long at this stage and need to be filed down and rounded so that they can poke through the holes in the bottom of the brake assemblies. The holes in the brake hangers can also be enlarged slightly with a broach.



- 12.15. Fitting the brake assembly is probably the hardest part of the project. Be patient and take your time. You will drop parts so make space on your work bench for them to fall. In order to allow for the wheels to be removed the brake gear is designed to form a single removable unit which is 'sprung into' the holes in the frames.



With the Hornby chassis block removed from the frames, temporarily bolt the keeper plate to the chassis. Thread a 25mm length of 0.8mm rod through the hole in the frames. Thread a brake hanger and brake assembly onto each end and then thread the ends of the brake pull linkage into the lower end of the brake assembly. The completed assembly should be able to be positioned so that the brake blocks are just clear of the wheel rims. Small pieces of wire insulation can be useful to stop these parts falling off prior to soldering.

- 12.16. Solder the 0.8mm rod into the brake hanger brackets and apply solder to the ends of the brake cross members. Do not allow the solder to join the brake hanger brackets to the side frames as we want these to be removable. Avoid getting flux splashes on to the tyres of the wheels with a small strip of paper.



- 12.17. When happy with the position, cut the central section of the 0.8mm rod away between the frames leaving about 0.5mm to protrude



through the frame. This will allow the whole unit to be sprung off the chassis so that the wheels can be removed. Test fit the chassis on the footplate. The brake hangers will be hard up against the footplate, file and adjust as necessary.

13. Guard Irons and front-end details

- 13.1. Locate the guard-irons [L17], press out rivet detail with a pointed scriber or similar object. Solder these onto the frames so that tops are parallel with the tops of the frames and the bottoms are just in front of the brakes.
- 13.2. Locate the buffer beam brackets [L18], these fit horizontally between the frames and the buffer beams. Press out rivet detail with a pointed scriber or similar object. Solder these to the frames. These are horizontal to the tops of the frames and sit 2mm down from the top etc.

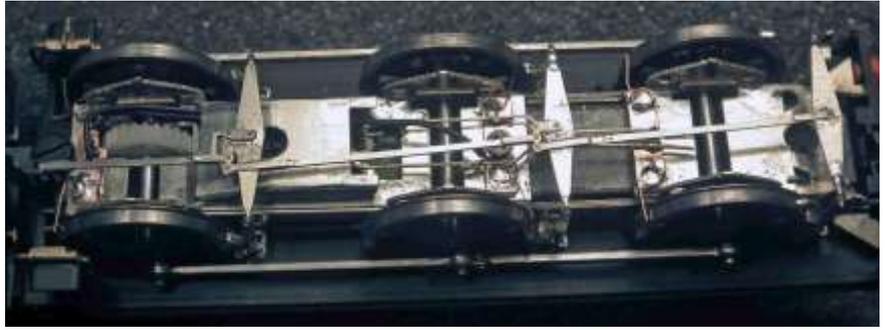


- 13.3. The J15 has sanding gear on the front axle. This needs to be represented using some 0.45mm wire. The wire should be threaded through the holes in the frames just behind the brake hanger brackets and then bent around the front brake block and then angled back in towards the rail head.



14. Pick-Ups

- 14.1. Fitting pickups on the locomotive is optional as you can get adequate pickup from the tender wheels only. However, it is relatively straight-forward to add them to the rear two axles. The recommended method is to stick a short length of copper clad paxolin (PCB) to the bottom of the etched keeper plate. Short lengths of phosphor-bronze wire can then be soldered on and bent to contact the wheels. The power can be fed into the original chassis by either soldering to or springing a wire against the original Hornby power connection plate.



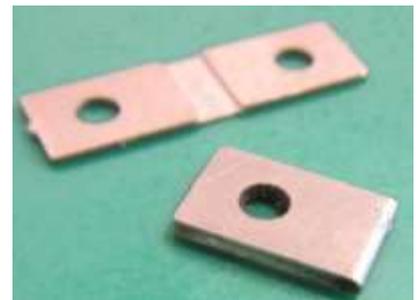
15. Modifications to Hornby tender chassis

- 15.1. Remove the four screws which hold the plastic tender keeper plate on the bottom of the tender chassis. This keeper plate will then lift out from the rear and the wheels will be free to be removed. Keep the screws to retain the new etched chassis.
- 15.2. On the main plastic chassis part are six pairs of lugs where the original axles are seated. These need to be removed completely and this is easily done with either a scalpel or a piecing saw.



16. Main tender chassis etch

- 16.1. Locate the main chassis etch [T1]. Bend the etch so that the sides fold back on each other, the half-etched line at the bottom of the horn-guides **must be on the outside of this bend**. Then fold the sides so that the central cross members are at 90 degrees as shown in the photograph. Solder the side frames together and strengthen the folds between the side members and the cross members. Gently file the sides of the horn-guides to remove the cusp on the etch so that a 2mm axle can run smoothly in the guide.
- 16.2. Bend the supports for the spring wire out by 90 degrees
- 16.3. Locate the bearing etches [T2]. There are eight of these so there are two spares available. These bearings need to be folded over and soldered. The half-etched side **must be on the inside of the bend** and the middle of the bend must be at the middle point of the half-etched section. This allows the top of the bearing to be formed of a half-etched loop through which the spring wire can pass. Ensure that the two holes in the bearing line up.
- Once folded run some solder into the joint from the non-folded end. Just use a little solder and ensure



that the folded slot at the top of the bearing remains clear of solder as the spring wire passes through this fold. Open the axle hole out to 2mm using a reamer or 2mm drill bit.

16.4. Fit the wheels through the bearings, setting the back-to-back.

16.5. Thread the spring wire through the supports on the chassis and through the bearing. There are two options for the holes in the support brackets. Use the one nearest the track level, the higher one might be useful if you are fitting a particularly heavy loudspeaker in the tender.

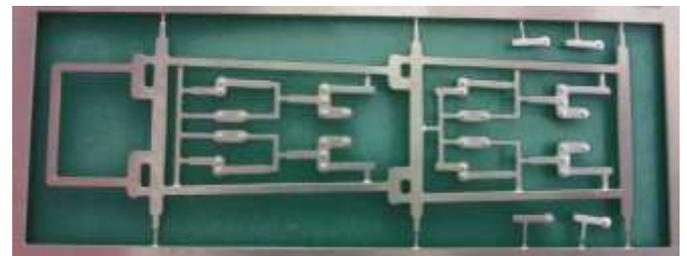


16.6. Locate the tender brake components [T3] - these fold in exactly the same way as the locomotive brakes (see section 12.2-12.6). Once again there are a couple of spares on the etch.

16.7. Feed a 25mm length of 0.8mm wire through the brake hanger holes in the tender chassis. The brake hangers need to be spaced off the sides of the tender frames by 2.5mm for P4 or 2mm for EM and this best done by inserting some short lengths of 1.5mm brass tube over the wire. Cut the tube to length by marking 2 or 2.5mm and then rolling with a heavy Stanley knife until it cuts.



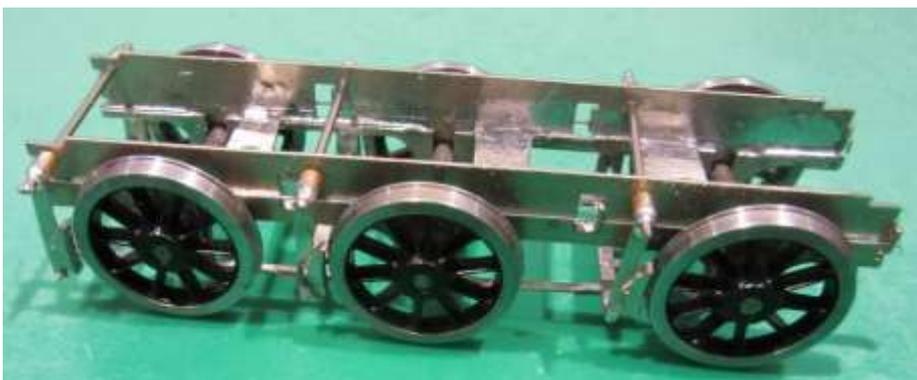
16.8. Locate the tender brake pull rod etch [T4]. The half-etch detail parts need to be soldered on either side and it is much easier to complete this while the etch is still on the fret. Tin the parts first, then attach the detail parts.



The finished component should look like the photograph.



16.9. Once the brake pull rods are complete, remove from the fret and slightly round the corners of the ends of the tie rods so that the ends will fit into



the holes in the bottom of the brake hangers. As with the locomotive springs, fitting with temporary pieces of wire insulation will help this process. Fit the rods into the brake hangers and solder the ends at the top and bottom of the brake hanger.

- 16.10. Assemble all the brake components. As with the locomotive springs, fitting with temporary pieces of wire insulation will help this process. Solder the ends of the brake hangers at the top and bottom to the 0.8mm wire and the pull rods.
- 16.11. Remove the central section of the 0.8mm wire between the frames. This will allow the brake assembly to spring off the chassis to allow the wheels to be removed.

17. Tender Pickups

- 17.1. Pickups can be arranged to spring on the rear of the wheels, and with care the original Hornby pickups can be re-used.
- 17.2. A length of copper clad paxolin (sleeper strip or similar) can be glued to the outside of the chassis to solder the pickup wires to. While this can be done on both sides it is only strictly necessary one side if you don't object to the chassis etch being live to one rail. In this case solder the pickup wires on this side to the outside of the chassis. This should not be an issue as the chassis is insulated by the plastic of the Hornby body.
- 17.3. The pickups can be made to feed the original sprung studs on the tender body either by using a sprung piece of metal or by soldering directly to the studs. A short length of phosphor-bronze strip is ideal for this, it can be bent into a rectangular shape with half of the top of the rectangle missing and soldered to paxolin strip or the frames as appropriate. The photograph shows how this fits.



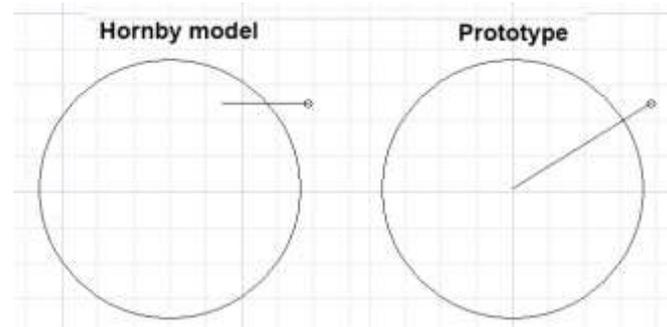
18. Reassembly

The locomotive and tender chassis can now be re-attached using the original Hornby bolts. The coupling bar [L20] fits over the bolt at the rear of the locomotive and needs to be an easily rotating fit over the larger stepped section of the bolts.



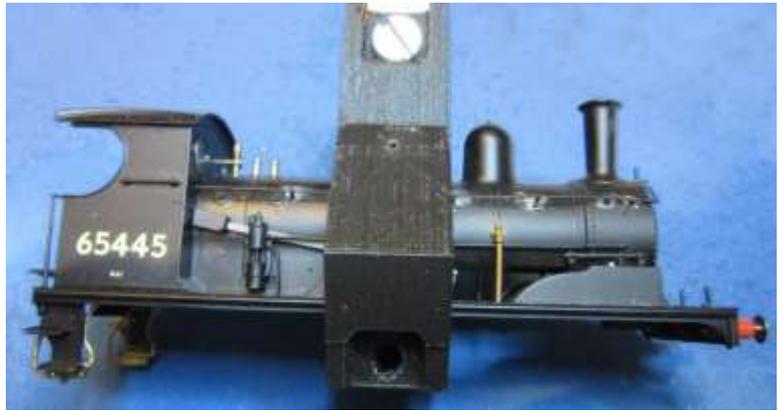
19. Locomotive handrails

- 19.1. As described in the introductory notes, the main flaw with the Hornby model is the angle of the handrail knobs around the boiler. While the actual handrail is in the right position the angle of the knobs is incorrect.
- 19.2. The handrail, together with the knobs can be eased off the body, using a small flat-bladed screwdriver or cocktail stick. Try to leave the knobs on the rail as they can be re-used.
- 19.3. The 'lumps' on the boiler where the handrail knobs fitted need to be removed with a file. This is fairly delicate work particularly around the boiler washout plugs.
- 19.4. The existing handrail knob holes in the boiler need to be filled and filed smooth, a blob of epoxy glue or putty is best. Re-drilling the holes by eye is very tricky but there is a gauge tool available to 3D print which makes the job much easier. This can be obtained for 3D printing from <https://www.thingiverse.com/thing:4214451>



This part can be clamped around the Hornby body and holds the drill at the correct angle and in the correct place for drilling the holes for the knobs.

- 19.5. Once re-drilled, the original handrail can be refitted in the new holes. The hole above the smokebox door **does not** need modifying.



Etched parts		Tender	
Locomotive		T1	Frames
L1	Main frames	T2	Bearings
L2	Keeper plate	T3	Brake components
L3 -L4	Leading coupling rods	T4	Brake pull rods
L5 – L6	Trailing coupling rods		
L7	Leading and trailing boss overlays		
L8	Centre boss overlays		
L9 – L12	not used		
L13	Brake block components		
L14	Brake hanger brackets		
L15	not used		
L16	Brake pull-rods		
L17	Guard irons		
L18	Buffer beam brackets		
Other			
	Full and half etched 1/8" washers		
	Full and half etched 2mm washers		
			Other components
			1/8" brass axleboxes (6)
			Axlebox springs (6)
			1.0 mm nickel silver wire
			0.8 mm brass wire
			0.45 mm brass wire
			1.5 mm brass tube
			0.008" spring wire
			Rivets for rods
			Bushes for Hornby rods (6)



Parts location diagram

