

Components recommended to construct a complete chassis:

6 Markits 5'2" driving wheels (WH205)  
3 axles 6 crankpins and washers (RM2)  
Mashima MHK1015 motor and GB4/15 gearbox

This etch contains sideframes, coupling rods, brake shoes, brake pull rods and balance weights to produce a basic chassis of the correct scale dimensions and appearance which can be used as a substitute for a kit or RTR chassis. A separate fret of 00 spacers is included, which can be exchanged for EM (LS10) or P4 (LS60) by returning them to us in a stamped, self-addressed envelope.

We recommend the Mashima MHK1015 motor with our gearbox GB4 for this model and can supply the gearbox together with Markits driving wheels if required.

As supplied the frames are suitable for the Hornby/Mainline bodies.

Please note that all bends should be made with the half-etch to the inside and reinforced with a fillet of solder.

#### Assembly Instructions

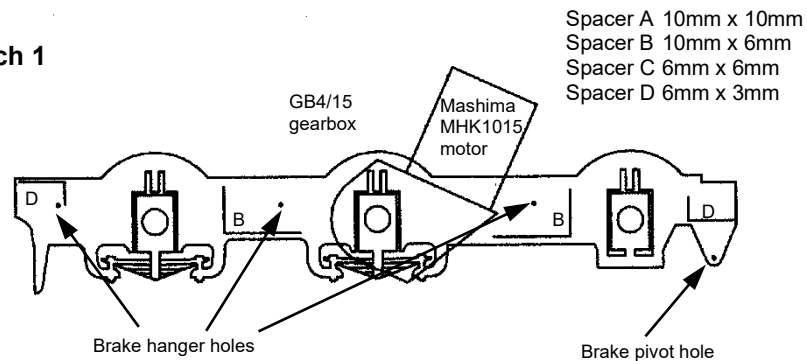
1. The frames may be assembled rigid, or with sprung axles using our hornblocks and springs code LS55. If you wish to spring the chassis cut through the spring hangers using a piercing saw and remove them together with the centre portion of etch within the hornway. The sides of the hornways are etched at approximately 5.85mm so as to ensure that any slight variations in the width of the machined grooves in the hornblocks do not result in any one of them having a loose fit within the hornway. Each hornway must be carefully dressed with a file to achieve a good sliding fit to each hornblock, which should then be marked up or placed into a labelled bag to ensure it is assembled only into the hornway to which it has been precisely matched. Take time and care over this stage, removing material slowly and from each face equally. The hornblock must drop in freely under gravity but must not show any fore and aft play which might cause the coupling rods to bind. This might sound daunting, but the patient builder will be rewarded with a chassis having superior ride, track holding and traction compared to an unsprung chassis.
2. For rigid axle assembly, carefully open out the axle bearing holes in the frames until the bearings are a close fit, ensuring the bearing flanges fit snugly against the frames. This is best done using a five sided broach. If you are using our chassis jigs (see below), DO NOT solder the bearings in place at this stage. Open out the holes for the brake cross-shafts to 0.75mm.
3. Select the appropriate frame spacers - the size and position of them will depend on the siting of the body fixings and your preferred motor/gearbox and pick-up arrangements. A suitable layout of spacers is shown (sketch 1) to suit fitting the chassis to the Hornby/Mainline body and with our gearbox GB4 and Mashima MHK1015 motor. This will allow the rear screw fixing to be utilised, and a tongue and slot system fabricated at the front. The T shaped item on the fret should be fixed to the underside of the rear of the body to ensure that it sits horizontally on the chassis (sketch 2).
4. If you are springing the chassis, drill out the holes at each side of the hornways and those in the separate spring etches to 0.5mm as shown in sketch 3. The frame spacers fold to right angles on the half-etched line. Solder your chosen ones to one of the frames, then assemble by clamping the other side frame to the first using the wheelsets to check alignment before soldering the second side frame. This crucial stage of the assembly can be achieved more easily and with greater accuracy by using our frame assembly jigs (code LS16 for 00, LS17 for EM and LS61 for P4). Full instructions are provided with them. If you are springing the chassis using our hornblocks please note that you will need a set of four turnings code LS59 which are intended to locate in the hornway during this stage of assembly.
5. For a sprung chassis, insert the spring and hornblock, ensuring that they are placed into their correct hornways only. Note that the grooves in the hornblock are not on the centre line. This allows you to choose a greater or lesser amount of sideplay on each axle. Use 0.45mm wire to locate the spring detail and solder in place using a minimum of flux. This captures the hornblock and the protruding centre shackle should ensure that the bottom of the hornblock is slightly above the bottom edge of the chassis giving approximately 1.0mm of movement only. Do not be tempted to file too much material from the top of the centre shackle. Greater travel should not be necessary and there is then a risk that

the spring could become dislodged if there is too much downward travel.

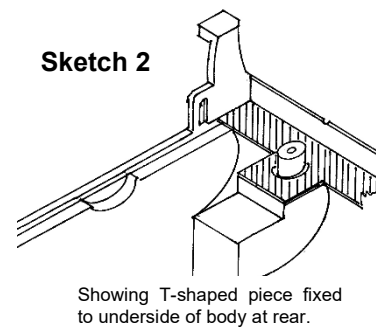
6. Solder lengths of 0.7mm wire through the brake hanger holes. Solder the brake overlays to the brake rear etches (sketch 4) then thread them on and solder in place. Alignment is made easier if something of suitable thickness is used to space out the brake shoe from the frame, with a wheelset fitted to ensure correct spacing relative to the wheel treads.
7. The coupling rods can be articulated if desired by cutting the full length backing rod as shown in sketch 5 before soldering on the overlays. Whether you articulate the rods or not, this operation is simplified if the crankpin holes are first drilled, (1.2mm for Markits crankpins) and the backing rod tinned along its length. Both the backing rod and the overlay can now be threaded onto the drill which will keep one end in alignment whilst the other is squared up and the rods soldered together. Note that on this loco the half-etched surface of the coupling rods should face outwards.
8. The chassis can now be washed to remove flux residues, but before painting we suggest that you fit the wheels and check the fit of the body. You may find some slight filing is required to obtain a perfect fit. If using Markits wheels you will need to use a paper washer between the coupling rod and the crankpin washer to prevent the rods being soldered to the crankpins
9. With the wheelsets and drivetrain fitted, the brake pull rods can now be fitted outside the wheels. Make sure that you leave sufficient clearance to allow for any axle sideplay.

Our preference is for wiper pick-ups made from 26 swg phosphor bronze wire as shown in sketch 6. The wire is soldered to PCB strip which is bolted to a frame spacer. We recommend that, if possible, you arrange the pick-up to be "bolt on" since this allows for easy removal and adjustment of the wire wipers. Pack LS23 provides all the parts.

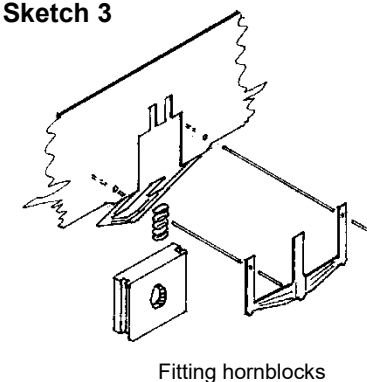
**Sketch 1**



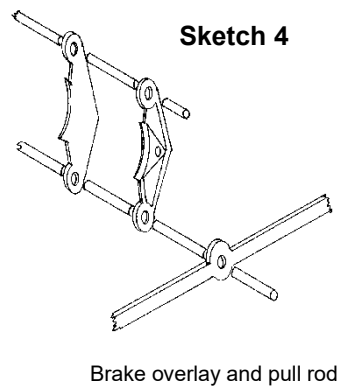
**Sketch 2**



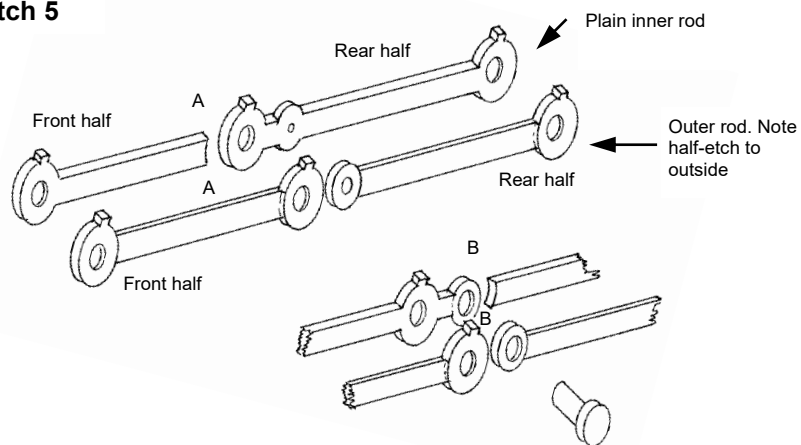
**Sketch 3**



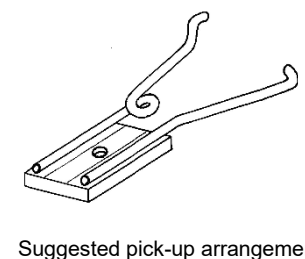
**Sketch 4**



**Sketch 5**



**Sketch 6**



To split the rods over the centre crankpin, cut the backing rod at A-A, solder to the corresponding halves of the outer rods and connect both halves at the centre crankpin.

To split the rods on the knuckle joint, first drill through the half-etched centres on the knuckle and cut the backing rod at B-B. Solder the inner and outer halves together then join the front and back halves of the rods using a pin or rivet (not supplied) so that the rods are articulated behind the centre crankpin.