NER/LNER/BR Class J72 Chassis Kit

The NER/LNER/BR class J72 0-6-0T locomotives were built over a 53-year period, which made them pretty well unique in Britain. Over a similar timespan they have also been the subject of a succession of 4mm scale models, notably the old K's whitemetal kit from the 1960s and the more recent Mainline RTR model which is still available, substantially unmodified apart from the chassis, from Bachmann.

Modellers refer to them all as J72s, but their history is not quite so straightforward. The LNER had an elaborate – if inconsistently applied – system of classes and sub-classes to distinguish variations between notionally similar locomotives. It would have made life a lot simpler if this had been extended to the J72s, but it wasn't. In LNER and BR days all were identified as J72s, even though there were three distinct species within the class:

• the original 20 locos, built at Darlington in 1898-9 as North Eastern Railway class E1. Though the LNER and BR classed them as J72, these engines had shorter, shallower frames and smaller bunkers than the later locos, while the lower firebox is clearly visible between the centre and trailing wheels. The brake gear was also different, and they had steel buffer beams front and rear. Their original NER numbers, perpetuated by the LNER at the 1923 Grouping, were 462 and then, with gaps in the sequence, between 1715-63. These engines became LNER 8670-89 in the post-war renumbering scheme and, from 1948 on, BR 68670-89. A separate chassis will be available for these locomotives, which cannot be accurately modelled using the components in this kit.

• the main production batch, built from 1914 on. These are the engines catered for in this chassis kit. The original LNER numbers were 2173-92, 2303-37 and 500/12/16/24/42/66/71/4/6/81. Most were built at Darlington apart from 2313-37 which came from Armstrong Whitworth in 1922. Ten more – the ones with three-figure numbers – were built at Doncaster in 1925. They became 8690-754 under the 1946 scheme, and BR added 60000 to these numbers. These J72s had longer, deeper frames, compensated brake gear and noticeably thicker wooden buffer beams of sandwich construction but, above the running plate at least, were substantially identical in points of detail with the earlier engines apart from the larger bunkers.

From the 1930s on, however, the former E1s began to acquire wooden buffer beams at the front end only, while some of the later engines were rebuilt with the steel type at the bunker end. Roughly half were modified with vacuum-brake and steam-heating equipment – two before the war, the rest in BR days. There may well have been some swapping round of brake-gear components. As ever, dated photographs are the only accurate guide to specific variations and detail differences.

• BR then built a further batch of J72s – 69001-28 – between 1949 and 1951. Again, this particular chassis kit is correct for these locomotives. They followed the design of the main production batch but had further detail differences, such as rear sandboxes mounted externally on the frames rather than inside the cab. All had wooden 'sandwich' buffer beams and the first 20 were steam brake-only – the remainder had vacuum brakes and carriage warming equipment.

A ready-to-run J72 has been available for many years. As well as different livery options, Mainline and Bachmann have produced several bodyshell variations. As a rule the BR versions have a smokebox door dart and moulded-on numberplate; the latter is missing on LNER locos that have a smokebox door wheel instead of a door handle. Some models have a 'brass' safety valve trumpet but most have Ross pops. A few have the prominent vacuum ejector piping along the boiler on the right-hand side. All versions represent the later J72 with extended bunker, and the chassis fixing arrangements are the same throughout.

As indicated earlier, we are producing two chassis kits for this loco, specifically matched to particular batches. One kit covers the short-frame, short-bunker locomotives. The other covers the post-1914 locomotives and the BR-built examples. If you want to model one of the former E1s (BR 68670-89) but prefer not to modify the bunker, we suggest you use the early-J72 kit anyway as it has a number of

obvious visual differences compared with the later version. The slightly shorter mainframes are easily hidden.

The published wisdom on J72s – including all the endless variations in minor points of detail – can be found in two books:

Yeadon's Register of LNER locomotives Vol 43a by W.B.Yeadon (Book Law Publications)

Locomotives of the LNER part 8B, published by the Railway Correspondence and Travel Society

To complete your kit you need 4ft 11/4in 12-spoke wheels, crankpin inline. These are available from:

Alan Gibson Wheels, Unit 1, Acorn Centre, Barry Street, Oldham, Lancs. OL1 3NE
Tel. 0161 678 1607 (www.alangibsonworkshop.com)
Ref. (G4862E). The crankpins and their bushes will need to be bought separately.

Markits Ltd. PO Box 40, Watford, Hertfordshire. WD2 5TN. Tel. 01923 249711 (www.markits.com). These are self-quartering wheels available in OO and EM gauge only.

GENERAL NOTES ON CONSTRUCTION

Read the instructions carefully - preferably more than once - before starting work. Study the diagrams until you become familiar with all the parts and the assembly sequence. We have tried to make these instructions as comprehensive as possible, which may make some assembly sequences appear more complex than they actually are.

Leave the parts in the fret until they are required for use. This will protect them and makes identification simpler. Small holes can be drilled more easily while the parts are still attached. Where an accurate hole size is specified, holes are etched undersized so they can be drilled or reamed out to the correct diameter.

We want you to enjoy building your kit, but remember that even railway modelling has its risks. Frets contain sharp edges, soldering irons get very hot, adhesives may give off toxic fumes, knives and files are designed for cutting. Please be careful . . .

ASSEMBLING THE CHASSIS

The chassis can be built rigid, or with full compensation so the wheels follow the undulations of the track.

Familiarise yourself with Figure 1, and then remove the frames (1 & 2) from the fret, ensuring that they are perfectly flat and straightening them with your fingers as necessary. You'll need to decide if you're modelling one of the later engines, which had flush rivets holding the guard irons in place, or the earlier type with visible, round-headed rivets ('A' in Figure 8). For the latter type, form the rivets and then, for all types, punch out the draincock crosshaft bracket bolts (B)

Using flat-nosed pliers, fold the spring backing pieces (3 x6) through 180 degrees to make them double thickness (Fig.1) ensuring that, unlike most bending operations, the fold lines are on the ***outside*** of the bend. Make sure these parts are absolutely flat (this can be done by gently tapping them between two flat pieces of hardwood) and then solder them in place on the inside of the frames then clean off any excess solder

For a ***rigid chassis***, in all gauges, ream out ***all*** the axle bush location holes in the chassis frames and solder the circular 1/8in axle bush bearings in place.

For a ***compensated OO*** chassis, shown in Figure 5, ream out the rear axle locations only and fit axle bushes.

Compensated 'OO' locos have hornblock cutaways at the **front and middle** axles; EM and P4 chassis have hornblocks on **all axles**.

To make the hornblock cutaways, carefully make a slot up the centre lines of the axle locations, taking care not to damage the springs. Use a cutter in your minidrill, a fine fret saw, or a needle file. Now bend the sides of these cuts back and forth, until the metal snaps off to form the rough cutaway shape. Dress up the sides with a file

using the remainder of the half-etched marks as a guide. Don't file anything from the top horizontal edge of the slot - this is used to set the hornblocks at the correct height. Finally, use a 0.4mm bit to open out the datum holes (C).

For plunger pick-ups (Alan Gibson, ref. 4M62) you'll need to open out the holes 'D' so the plastic outer sleeve of the pick-up is a tight push-fit.

For those of you who model in 'OO' and wish to use our single-beam compensation system, shown in Figure 5, carefully drill out holes 'E' using the drill-starts provided, then use a reamer to ease the holes so a length of 0.8mm wire is a good fit.

For all types of chassis, punch out the bolts in the Cylinder Front Overlays (4 in Fig. 12) and then use lengths of lightly-oiled wire to locate the part on the front spacer (5) solder in place then remove the wire.

For wider EM and P4, bend up the Valve Gland (6) and, again using wire for alignment, add this and its overlay (7) to the cylinder front and solder in place. You can also solder the Piston Glands (8) in place now, or leave them until you fit the piston rods later. When you've completed the above assembly, carefully file the top edge of the gland, as shown, removing the etch cusps, so the valve gland assembly looks like one solid casting.

Select the spacers for the gauge in which you model. Open out the holes in the Motion Bracket (9) and front spacer assembly to suit the wires shown in Figure 12. For EM and P4 models, bend the crosshead mounting tag (part of the Motion Bracket '9' shown in Figure 1) though 90 degrees, Make the Right-hand Crosshead etch (10) double thickness by folding the main part through 180 degrees, and then fold the small ledge through 90 degrees. Use a short length of 0.5mm wire to position the crosshead and solder it to the Motion Bracket, as shown. Using a fine file, trim the wire very slightly proud of the detail's outer face, and flush at the rear.

For all gauges, bend up and fit the front and rear L-shaped Spacers (5 & 11), followed by the Motion Bracket (9) (detail facing forwards and then the midway spacer (12) making sure it is also facing the correct way. Add the Motion Bracket Lip (13) to the part and bend the small locator on the Spacer Strengthener (14 – EM, P4 only) through 90 degrees, then use this to locate the part on the Midway Spacer and solder in place.

Refer to the fret diagram, and to Figure 6. Open out the holes in the Side Rods (15 - 19) to suit the components shown in the diagram, and layer them up. Make the holes a tightish fit - you can always open them out a touch more later. Take the middle sections of the rods (15 x2 & 18 x2) and then add the inner and outer layers. Use the fret diagram to identify the parts, remove them from the fret in pairs and solder them to the middle layers, building one rod at a time to avoid confusion.

The rods have an articulated knuckle joint which uses a 0.8mm Valvegear Rivet as the pivot. For a smooth-running chassis, it is essential that these rivets are a good fit in their holes. When the front and rear rod sections are assembled, lightly countersink the holes at the rear of the 'forks'. Put a small amount of oil on the 'tongue' of one of the front rods and slide this into place in the 'fork' on the rear rod. Slot a rivet through the assembly and, very carefully, secure in place by soldering it to the rear rod sections only. Finally, trim the rivet almost flush at the back. Check the joints pivot freely. Do the same for both sides.

For a compensated chassis, bend up six Hornblock Etches (4 hornblocks for OO) using the separate instructions supplied. Due to space restrictions, our SpaceSavers Hornblocks must be fitted to the front axle, so it's important to study the etches so you know which is which. When all units are fitted, the horizontal tab which protrudes from their front face should be butted up against the top edge of the frame cutaways to set them at the correct height.

Position a Standard Hornblock assembly at the middle driver location, making sure you include a larger 1/8in brass hornblock bearing, which should be lightly oiled to prevent it from being soldered to the etch. Use a short length of 0.4mm wire slotted through the axlebox datum holes ('C' in Figure 1) to locate it, check it sits vertically and then solder the etch in place. Position an etch and bearing at the opposite side, slot an axle through the bearings, adjust the etch so the axle is at right angles to the frames and then solder the etch in place.

Use the coupling rods, in conjunction with axle jigs, to position the remaining pairs of hornblock assemblies (complete with lightly oiled bearings, as above) making sure you use SpaceSavers at the front axle. Then, after a final check, solder the hornblock units in place.

Trial-fitting the body

Mainline (and Bachmann) have gained the extra clearance needed for their overscale wheel flanges by raising the height at which the body sits on the chassis and by lowering the buffers to compensate. Our chassis places the footplate at the correct scale height, which means the buffers are about 0.5mm too low. You have the option of either putting packing under the body, where it sits on the chassis, or lowering the position of the buffers on

the beams. If the buffer height being a touch too low doesn't bother you, leave things as they are. It's not part of our remit to suggest improvements to the plastic body but as the moulded buffers look nothing remotely like the real thing and are in the wrong place anyway, this might help you make up your mind when choosing the best course of action.

The body will require only minimal surgery to make it fit. Working behind the front bufferbeam, make a notch at the bottom of the smaller of the two pillars, where this meets the underside of the footplate (Fig 2). Bend the Front Body Mount (20) to shape, strengthen the bends with solder then solder an M2 nut into the recess. Check the notch in the small pillar is deep enough to allow the front edge of the etch to butt up to the rear face of the beam, and that the etch sits flat on the underside of the model. Adjust as necessary, then use epoxy to glue the etch in place, making sure it is central.

Now bend the Rear Body Mount (21) to shape, forming the bends in the order specified in Figure 3, strengthen the bends with solder and add the nut, as above. Locate the protruding tabs into the square holes in the rear bufferbeam and push them to the top corners of the holes. When you're happy that the part fits well, glue it in place.

Try the chassis under the body – the front end of the body is supported by the top edges of the chassis, with the weight of the rear resting on the top of the spacer (11). Try the M2 bolts (cut to length) in place, but don't over-tighten. Note that footplate thickness can vary, so you may need to pack the body up slightly at the front and rear, where it sits on the frame tops, or above the rear spacer. When all is well, remove the body.

You'll be able to pack plenty of weight into the side tanks, bunker, and other nooks and crannies inside the bodyshell and boiler but, in order to check clearances, this is best left until after the motor/gearbox unit has been fitted. Before painting the model, you may also wish to make a styrene (Plastikard) slug for the missing piece of boiler at the front. Try and leave the boiler partially hollow so you can add weight. If you wish, you can also model the rear face of the smokebox, which should have its bottom edge level with the underside of the footplate.

The Footplate Supports (22 & 23) and Bufferbeam Braces (24 x2 & 25 x2) feature fold-over tabs to assist when fitting, and these should be folded ***after*** parts are in position. Slot the parts into their locations, then bend the tabs through 90 degrees, inside of the chassis, as you hold the outside of the part with your thumb and add solder at the tab.

Note that the Brake Spacers are slightly different, depending on gauge. Push the small front brake spacers (26 & 27 or 28 & 29) through their slots at the front of the frames, then bend the rear tab over and solder them in place (see above) making sure they the correct way up and lying vertical and square in relation to the side face of the frames. Go on to do the midway brake spacers (30 x2 or 31 x2) (also gauge specific) but this time you can bend the tabs before fitting as they can be slotted in from inside the frames – the tags should face forwards. For the rear spacers, slot in the Rear Brake Spacer Bar (32 - OO, EM or P4) and solder in place, then locate the Ashpan Sides (33 & 34) into the notches in both the bar and midway spacer, check the sides run level horizontally and parallel with the chassis' bottom edge, and solder in place.

Inside motion

The inside motion (shown in Figs. 4, 6 & 12) is highly detailed and greatly enhances the model. If you wish, you can leave it out altogether, or simplify things by fitting only the most essential parts, such as the slidebars, crossheads and lifting shaft. This may be the most sensible option for OO models, as it's difficult to see between the narrower frames.

Start by carefully removing the Slidebars (35 and 36) from the fret. Take the left hand bar and bend the crosshead and rod profile down through 90 degrees, then fold main lengths of both bars though 180 degrees to form a double thickness, making sure the bend line is on the ***outside*** of the bend (so X and X, marked on the etches, come together). Use pliers to nip the layers together as you add solder, then drill out the small holes at the front end of the bars. Add short lengths of 0.5mm wire to them, to represent the fixing bolts and file the wires so they stick up by about 0.3mm.

Fold over and fit the Left Hand Crosshead (37) to the slidebar, using wire for location, as you did for the right hand side (see above). Use a file to dress the edges of the slidebars, so they look like solid, thick pieces.

Before fitting the slidebars, use one of your unused Motion Brackets to check the small location tabs (F) will go fully home into the slots in the bars, cleaning out any solder as required. Once you're happy with this, take one of the assemblies and manoeuvre the rear end through the Motion Bracket, then push the front of the bar thought the slot in the front spacer. Invert the loco and check that the tab (F) in the Motion Bracket has located fully home in the notch (see above) in the slidebars. The tongue at the front end of the slidebar assembly should also

be correctly seated into the notch in the cylinder fronts (see exploded view), extending into front spacer slot. Once located, solder the bars in place.

Add the Crosshead Tops (38 x2) using wires to locate them, solder (or glue) in place, file the edges of the layers flush and trim the wires so they stick up by about 0.4mm. If you wish you can add the small slidebar mounting brackets (39 x2) locating them into the notches the slidebars ends and Motion Bracket, as shown.

Whilst they are still in the fret, tin the rear surfaces of the Droplink parts (40 to 45) then open out the holes to suit the wire sizes shown in Figure 12. The left and right-hand side parts are arranged together in the fret; to avoid confusion, build one side at a time. Remove parts 40 to 42 and slot them onto a short length of 0.5mm wire, using the top holes for location. Using a lightly-oiled 0.7mm wire so it can be removed or, even better, an old rusty, tapered broach, align the parts using their middle hole, and carefully apply heat to solder them together. File the top wire almost flush at both sides of the etches, and then go on to repeat the whole process for the right side (43 to 45) – again, the bottom and middle holes must be kept clear.

When the right and left hand droplink assemblies are done, fold the Valve Gear Locator (46) through 180 degrees to make it double thickness, noting that the bend line is on the ***outside*** of the bend. Push a length of 0.5mm wire through the bottom holes and then slot the droplink assemblies onto either side of the locator, and then use the middle hole (as above) to align the parts as you solder them together – again, the wire or broach must be removable from the middle holes.

Now slide a lightly-oiled length of 0.7mm wire through hole 'G' (see Fig. 1) in one side of the frames and, as you do so, add the droplink assembly, springing the locator tab on the part 46 into its location in the Motion Bracket. Continue to push the wire out through the opposite frame, check the assembly sits straight, and solder it into the bracket only (not to the wire). Carefully slide out the wire through the holes.

Open up the holes in the Lifting Arms (49) and the Lifting Arm Overlays (48 x2) and then remove them from the fret, solder the overlays in place on the arms (using some lightly oiled wire through the holes to line them up) then bend the arm assembly to shape. Push a length of 0.5mm wire through the top holes in the assembly, solder it in place and trim the ends of the wires fractionally proud of the faces of the etches.

Open out the small Lifting Shaft Journals (47 x2) then slot a length of 1mm wire through the reverser shaft location (holes 'H' in the frames) and include the journals (detail facing inwards) as you slide it through the large holes in the lifting arm assembly. Now push a 0.7mm wire back though holes 'G', picking up the bottom holes on the lifting arms and the central hole in the drop link assembly.

Make any adjustments to all the assemblies on the wires, so they are square, vertical and central in the chassis. Solder the Journals hard up to the inside faces of the frames, and then solder both wires into the chassis before trimming both wires flush at the outsides.

Lengths of 0.8mm wire, slotted through the front spacer and into the Motion Bracket, can be used for the valve spindles which you can further enhance by adding 3.5mm lengths of 1.6mm O.D. tube to represent the valve guides at the rear. Once the guides are in place, detail the Valve Oiler (50) using a short length of fuse wire (not supplied) soldered into the small groove, then carefully solder or glue the Oiler to the top of the tubes, as shown.

Finish off the valvegear by slotting in the piston rods, which can be represented using two lengths of the 1mm wire – you'll need to file a flat on the rear ends of the wires, so they locate behind the crossheads, as shown. Push the wires through the front spacer, with the ends located in the notch in the crossheads. Use wires which are slightly longer than required, which will enable you to manoeuvre them more easily. Once soldered in place, trim off the excess length so the ends are more or less flush with the front face of the spacer.

Refer back to Figure 1. Make a 30 degree bend at the top of the Railguards (51 to 54) and locate them on the chassis, as shown in Figures 1 &8, and solder in place. Once secured, form the remaining bends and then strengthen these with a small amount of solder.

Add the rivet strips (55 x2 & 56 x2) to the ends of the chassis, under the webs (Fig 1, 7 & 8).

Drill out the small holes in the ***Draincock Lever*** (57) then locate the part into the front spacer, slotting it in from the top. Slide a length of 0.4mm wire through the draincock crosshaft journal locations 'J' in the frames, and through the lever. Solder the lever in place, and the wire to the Journals then trim the outer ends almost flush.

Turn to Figure 7, which shows the underside of the chassis. Remove the retaining wires from the front and middle hornblocks at the right hand side of the chassis. Make a sharp bend in a length of 0.4mm wire, slide it through the front hornblock etch, continuing into the small hole in the leading cheek of the midway hornblock. Locate the bent at the front of this wire into the small hole in the draincock lever, solder it in place and trim almost flush at the outside. Do the same again at the rear of the loco, but this time running the wire from the rear horncheek, along the outside of the ashpan and into the small hole near the rear. Once soldered in place, trim it flush with the inside face of the ashpan.

The basic chassis can now be cleaned up, ready for another test-fit to the body. See how visible the inside motion now looks between the frames!

Compensation
If you're building a compensated chassis, the method differs depending on gauge. Study the following:

For **OO Engines** refer to Figure 5. Bend the OO Gauge Compensation Beam (58) through 180 degrees (bend lines on the outside) and solder the layers together. Cut a length of 1.6mm O.D. tube to fit between the frames, and solder this centrally in the beam, as shown. Slide a length of 0.8mm wire though the holes 'E' in the frames, locating the beam as you do so. Slide in a couple of axles and check the motion of the beam, but do not secure the wire just yet.

For the **EM/P4 Locos**, refer to Figures 1 and 4. Open out the hole in the small cantilever tab ('K' in Figure 1) in the front spacer (7) and then bend the tab up so it is vertical. Slot a 12mm length of 1mm diameter silver steel rod through the holes in the tab and spacer, so the end of the rod stops about 1mm beyond the centreline of the front hornblock - this will be the pivot for the front wheels. When soldered in place, the rod should be horizontal.

To fit the compensation beams, cut two lengths of 1.6mm O.D. tube, so they fit snugly between the frames, but without being tight. Ream out the central hole in the compensation beams (59 x2) so the tube is a good fit, and then open out the beam pivot wire hole 'L' in chassis 0.8mm diameter.

Position the beams 1mm from the edge of the tubes, and solder the tubes in place to make a handed pair. Manoeuvre the assemblies into position, so their 'feet' sit on top of the brass hornblocks - this is illustrated in the cutaway view in Figure 4 - and then slot a length of 0.8mm wire through the holes ('L' in Fig. 1) in the frames, and through the tubes. Ensure the beams pivot freely and don't catch or grind on any of the surrounding components. Check also that they clear the hornblock etches, the sides of the clearance slot in the spacer and the ashpan inner faces. The beams must sit parallel to the frame sides and it's essential that they work correctly in conjunction with the hornblocks to give a smooth, see-saw motion with no tight spots.

Setting up the chassis
Temporarily fit the driving wheels, including any washers that may be necessary to eliminate sideplay on the front and rear axles. Try pushing the chassis around your curves, to see how much sideplay you actually need - this applies to both rigid and compensated chassis. In OO and EM gauges, we've allowed for up to 0.5mm sideplay (total 1mm) on the middle axle. For P4, the sideplay should be no more than 0.3mm either side. If the chassis still won't go around your curves, allow a small amount of sideplay on the leading axle.

For a rigid chassis, the ride height and level of the chassis shouldn't really need adjusting. If you're building a compensated chassis, then you may need to make some very fine adjustments. Concentrate initially on getting the top of the chassis level, then fit the bodyshell to make a final check and, if necessary, adjust the height by packing under the ends of the body.

For Compensated **OO engines**, the height at the back is set by the fixed axle. In the unlikely event that the front end is too low, you can raise it by adding a small amount of shim material (thin brass) to either end of the compensation beam (where it touches the axle) Alternatively, you can lower the height by filing the beam at this point, but be careful.

For **EM/P4 chassis**, you can lower the back end of the loco by filing the ends of the compensation beams, or raise it by attaching a small amount of packing to the tops of the hornblock bearings. The front end of the loco can be adjusted simply by tweaking and bending the end of the silver steel pivot rod.

For **all gauges**, when the chassis sits level, and at the correct height (with the body in place), trim the compensation beam pivot wire to length (to the same overall width as the chassis) and then secure it into frames with a small amount of glue at one end only. (Make sure the glue doesn't penetrate into the tube).

Brakegear assembly

This method of assembly creates a set of brakegear that is fully removable, as well as prototypical in appearance. Do not solder anything unless the instructions specifically say so. Figures 4 and 7 show the how the completed brakegear assembly integrates with the chassis.

Use a length of wire to locate the Brake Hanger Details (60 & 61, Fig. 1) over the holes at the front of the frames, solder the etches in place and then remove the wire.

Some of the components located within the Brake Jig (shown shaded in the fret diagram) ***need to remain in place*** until the brake assembly is complete. Familiarise yourself with all parts before clipping anything from the fret (Fig 9).

If you haven't already done so, separate the jig from the main fret, making sure it remains intact. During assembly, the Brake Stretchers ***must be left in place*** in the jig in order to set them at the correct distance apart.

Identify the correct Brake Stretchers (62, 63 & 64) for the gauge you're modelling, and mark them with a coloured pen to avoid accidentally removing them. Now identify and mark the other parts you'll need for your own gauge, this time using a different colour, then proceed to clip these parts from the fret, setting them aside, then remove all the bits you won't need leaving only the stretchers in place. Note that some parts are common all gauges.

Open out the holes in the Brake Stretchers (still in the jig) the Brake Stretcher Bottoms (65 to 67) according to gauge) to the sizes shown. Tin the non-detailed faces of the Stretcher Bottoms and, using lengths of lightly-oiled wire to assist with their location, solder the Bottoms in place, under the Stretchers - their back edges line up with the edge of the Stretcher and the front is set back so the Stretchers appear thinner from normal viewing angles. Remove the wires.

Viewing the jig from above, first, bend the detail on the front stretcher up though about 90 degrees, with the bend line on the ***outside*** of the bend. To represent the pull rods, cut two pieces of 0.4mm wire to exact length, so they fit into the slots and bridge between the stretchers, as shown. Check the wires do not sit proud of the top surface of the stretchers, then solder them in place, being careful not to de-solder the Stretcher Bottoms. Bend the detail on the front stretcher the remainder of the way, so it sits flat on top of the stretcher, tap it down if necessary, and solder it in place.

Open out the holes in the Brake Adjuster (68) and slot a 16mm length of 0.4mm diameter wire into the central hole, and beyond by about 5mm, then bend the sides of the adjuster around the wire to form a crescent shape with a gap of about 0.4mm between the inner faces. Check the part for symmetry, making sure the holes at either side of the rear faces line up, and so a length 0.5mm wire can be pushed through them - the forked end should be able to accommodate a piece of full-thickness etch from the fret. Adjust as necessary and then solder the front wire in place, so it lies in line with the part, as shown.

Bend up the small tabs 'M' at the rear of the jig for your chosen gauge and then use a length of 0.5mm wire to set the angle of the adjuster assembly as you locate the front end of this assembly's wire in the notch in the rear stretcher. When you've trimmed the wire to length – it should sit fully home in the notch - solder it in place, as you did for the other stretchers.

Use wires to locate the Brake Shackle Overlays (69 & 70 for all gauges) on top of the stretchers, pushing the wires through so they protrude from the bottoms. Pay particular attention to the holes nearest the pull rods, which require short lengths of wire, taking great care in order to avoid drilling through the rods as this will severely weaken the joints. When all the wires are soldered in place, file the ends very slightly pound of the etches and carefully de-burr them using a suede brush.

The etching used to hold the Front Shackle in place can now be clipped away and the rear edge of the stretcher cleaned up, as shown in Figure 10. You can further enhance the appearance of all the rod ends by carefully filling the areas where the rods meet the shackles with solder. For an even more prototypical look, you can file a 45 degree angle on the etches to represent the change of section, from round to rectangular (Fig 11). Once you've cleaned up the rods, carefully remove the complete assembly by clipping away the location tags at the ends of the stretchers, but making absolutely sure you ***don't remove the rectangular hanger location pins*** at the very ends of the stretchers.

Turn back to Figure 1. Detail the Handbrake Lever (71) by adding the Lever Overlay (72) and Lever Offset (73), as shown, using a 0.5mm wire to locate the parts. Trim the wire slightly proud to represent the pivot pin and ease the large hole to 1mm diameter.

Open out the holes in the Steambrake Lever (74) the Actuator (75) and the Brakeshaft Journals (76 x2). Locate the handbrake assembly (above) in the rear spacer as you slide a length of 1mm wire through the frames, and through all the parts (71 & 74 to 75) as shown - the handbrake Lever locates in the notch on the rear spacer. Solder the Journals hard up against the inside of the frames, then solder the handbrake and steambrake levers to both the 1mm wire and the rear spacer – leave the actuator free for now. Trim the ends of the 1mm wire just proud of the frames.

To set the angle of the actuator, slide a lightly oiled length of 0.5mm wire through the holes in the Set-up Tabs (N) in the frames, and through the actuator. Slide the actuator along the 1mm wire, and line it up with the small marker on the rear spacer, then solder the actuator to the wire. Remove the 0.5mm set-up wire but leave the Set-up tabs in place for the time being, in case you need to adjust things.

Whilst they are still in the fret, tin the uppermost faces of the brake hanger rear layers (77 x6) and then carefully open out the top and middle holes in all the brake hanger components to suit the wires shown.

The front brake hangers Outer Layers (78 &79) have small folding tabs at the tops of the front layers which spaces them the correct distance from the frames. For narrower P4 wheels, the small pieces ('P' in Fig. 1) will need to be filed off. Bend the tops of these hangers to shape, using good pair of flat-nosed pliers to avoid distorting the etches.

After checking the bends for squareness, use a length of 0.7mm wire to locate the front and rear layers together, along with a Brake Block (80 x6) and solder the to complete the assemblies. File the wire almost flush at the front, with about 1mm protruding from the rear. Check the top hole is clear and set them aside, then go on to do the rest of the hangers (using parts 81 x2 & 82 x2), soldering the two layers together using 0.7mm wire for location, and trim them to length, as above.

Offer the brake rod assembly up to the underside of the chassis. Line up the holes at the rear end of the brake adjuster fork with those in the end of the actuator and slot a wire through.

Slide a length of 0.5mm wire into the hanger pivot 'Q' at the front wheel location - do not solder in place. Locate the tops the front pair of Brake hangers on this wire, push the hangers hard up against the frames and brake spacers, lifting the rod assembly so you can engage the small pins at the ends of the front stretcher in the holes at the bottom of the hangers.

Carefully tack-solder the hangers to the stretcher, then view the chassis to check that the whole assembly is central, with the hangers equidistant from the frames and pushed fully home. If necessary, make minor adjustments as you carefully apply heat to the joints.

Go on to fit the rest of the hangers to the stretchers, then trim all the wires at the top of the hangers, so they are very slightly proud at both sides but do not solder any of them in place. File off any protruding locators at the bottom of the hangers. To stop the wires from working loose, you can induce a slight bend along their length.

Try a wheelset in place at each axle to check the clearances between the shoes and the wheels - the geometry of the brakegear, and the fact that it’s been assembled accurately using a jig, means the hangers should be set at the correct distance from the wheels. You can remove the brakegear by pulling the wire out from the rear end of the brake adjuster and sliding out the loose wires from the tops of the hangers.

Now you can assemble the brake cylinder. If you haven’t already done so, bend the steam brake cylinder former ‘R’ on the rear spacer, down through 90 degrees. Curve the centre section of the Brake Cylinder Wrapper (83) through 180 degrees, so the bend matches the radius of the former - the half etched groove at the edge of the wrapper should be on the inside of the bend. A good way to achieve an accurate bend is to bend the wrapper over a rod, which has a slightly smaller diameter than the one you require, then press the part over a larger rod (or similar object) which has the diameter you’re aiming for. When you’re happy with the shape, locate the wrapper’s tabs in the slots in the spacer and solder in place at both ends.

Combine the two circular Cylinder End/Cover etches (84) and Inlet (85) parts, using a length of 0.4mm wire to locate them and solder them together. Grip the wire in your drill and file a small radius at the rear edge of part 84, then use the same wire to line the cover up on the end of the former as you solder the assembly in place. Now shape the wire, as shown so it runs up to the hole ‘S’ in the rear spacer.

Before fitting the sandpipes it’s best to study photographs of the prototype, as sanding arrangements could vary from loco to loco without any obvious pattern. Usually the front pipes on NER/LNER-built engines ran down behind the brake hangers, as shown in Figure 8.

On the BR-built locos the front pipes were normally routed outside and in front of the hangers. To do this, slot your wire through holes ‘T’ bridging across the chassis, as above, and shape the wire as shown in the diagram.

The rear pipes on BR-built engines ran from externally-mounted sandboxes which were situated just behind the wheels, but all other types can be fitted as per the diagram, with the wire shaped so it bridges across the frames at holes ‘T’ and then bends sharply to run down to the wheels.

Whichever type you model, check the brakegear can be removed without the pipes fouling on anything.

To finish off the chassis prior to painting, add the Gearbox Restraint (86) to its locations in the frames. It should be trimmed according to gauge (see Figure 13), with the central hole opened out to suit a length of 1.5mm wire, then it can be slotted into the chassis locations, as shown in Figure 4. For the gearbox pivot, bend a length of 1.5mm diameter wire to shape, and fit it so it bridges between the location holes. Solder the wire in place and trim the rear end flush, with about 1.5mm protruding beyond the front face of the Restraint.

Gearbox assembly

Study Figure 14. Before cutting the gearbox etch (87) from the fret, progressively drill out or ream each of the holes to accommodate the gearshaft and bushes, shown in the diagram. Components should be offered up until they are a tight push-fit in their holes. Once the gearbox is assembled, the shaft are fixed but the gears are free to revolve. Remove burrs by inserting the tip of a drill bit (of much larger diameter than the hole) and gently rotating it between your fingers.

Solder the 1/8in bushes into place with the larger-diameter shoulders on the ***same side*** of the etch as the bend lines. Using flat-nosed pliers, bend the gearbox shell to shape, as indicated - a three-sided box with all bend lines on the inside of the gearbox - and then strengthen the inside corners with generous fillets of solder. Make sure both sides of the box are parallel (use a Vernier to check this) and then brace the lower end of the box using a length of 1mm wire, soldered across holes ‘U’. Bend the Strengthening Strip ‘V’ through 180 degrees and Flood between the layers with solder.

Carefully file equal amounts from the non-shouldered face of the bushes to length, so the gearbox shell fits between the bearings in the frames. For hornblocks, be sure to allow enough clearance for the bearings to slide freely.

Using a carborundum disc in a mini-drill, cut two 2mm gearshafts, so their length equals the overall width of the gearbox. Wear effective eye protection – cutting discs can and do disintegrate if they snag. Remove any burrs with a fine file. Offer up the shafts to their location. If they’re a tight fit, you will only be able to pass them through both sides of the gearbox if it is truly square. If they won't go through, then the gearbox hasn't been folded accurately. Light finger-tweaking should put things right.

De-flux the gearbox by scrubbing with household cleaner, then rinse and allow to dry. Check that the gears themselves are free from any dust or swarf left over from manufacture. Cut a length of insulated wire into two equal lengths and solder to the motor brush tags. Insulate the terminals with tape. For testing, connect the other ends to the output leads of your controller.

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 onto the shaft in a vice. Don’t 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 motor shaft.

Fit the worm onto the motor shaft (at the mounting screw end). For 108 and 60:1 ratios, the mid-point should be about 6mm from the motor face (i.e. - so the worm lines up with the stage 1 gearshaft when the motor is fitted into the gearbox). For longer 80:1 worms, you’ll need to position the worm nearer the motor face. For all ratios, push the motor shaft fully forward to take up the end-float and check there is clearance between the front the worm and the edge of the cutaway in the gearbox.

Grind off the excess motor shaft and screw the motor onto the mounting plate. You’ll also need to remove some length from the shaft at the rear of the motor, which will depend on the length of the motor you're using.

The stage 1 double gear will be one of three types - 15/10T (60:1), 20/10T (80:1) or 27/10T (108:1) - depending on the overall reduction ratio of the gearbox. Fit the stage 1 gearshaft, double gear (according to ratio). Sight through the opening in the gearbox sides to check the mesh with the worm - there should be daylight between the gear and the worm, but avoid having too much backlash. If necessary, loosen the motor fixing screws, adjust the mesh and then lightly glue the shaft in place at both ends.

Now fit the stage 2 gearshaft and double gear (these are all 20/10T) into the gearbox and fix the shaft as above. Temporarily fit the axle, along with the brass 20T. gear into the gearbox. If the motor is not fitted, check that all the gears revolve smoothly. Now test the gearbox under power by fitting the motor and worm assembly as described above. Remove the drive axle and brass gear and the gearbox is ready to be fitted into the loco.

The gears are effectively self-lubricating but a little plastics-compatible grease will do no harm. Do not use general-purpose modelling oil, which attracts dust and grit. Metal-on-metal contact areas (motor bearings, axle bushes) should be lubricated with a tiny amount of ultra-adhesive oil, but don't use this until the final drive gear has been secured in place (see below).

Final assembly.
You'll need to restrain the motor, so it doesn't lift or drop when power is applied. Bend the Motor Anchor (88) to shape and solder it to the Motor Plate (89) – for ***all*** OO gauge engines and EM/P4 engines using a 10 series motor, the holes on the Anchor should be the lowermost ones in the plate. For EM/P4 chassis using a 12 series motor, the holes should be higher, nearest the plate. Solder the re-enforcing washer (90) over the hole at the side of the anchor which is furthest away from the motor, as shown.

Clean the motor body to get rid of any grease and oil, so you get a good bond from the adhesive. Use the rear axle to locate the motor and gearbox unit and slot the Motor Anchor assembly over the pivot wire which protrudes from the gearbox mounting bracket. Coat the motor mounting plate with Epoxy, set the motor down and adjust the position of the plate assembly, sliding it along the pin so you have about 0.4mm clearance between the anchor and bracket (see Fig. 5). When the all the wheels are on level track, the motor should be horizontal, unless you have a OO chassis with a 12 series in which case the motor will tilt back slightly to clear the wheels. Note also that motor is offset in the chassis, but the gearbox should be central between the frames.

To remove the motor only, undo the motor screws, then slide the motor forwards, off the pivot point, tilt the whole motor/gearbox assembly upwards and withdraw the motor and worm. To remove the whole power unit, you'll need to pull out the rear axle.

Refer to Figures 6, 8 and 14. Position the motor/gearbox unit, so it sits between the rear axle bushes or hornblocks. Slot the driven axle through the frames and gearbox, slipping on the final drive gear as you go but don't secure it yet. Make sure the gearbox can't move sideways between the frames or this could sandwich the gears together, causing premature wear. Washering will cure this problem. Use extra washers to eliminate all sideplay on the driven axle - aim for a running clearance only. The brass gear should run close up against the side of the gearbox, away from the side face of the stage 2 gear (Fig 14) and, when assembled, this clearance must be maintained at all times.

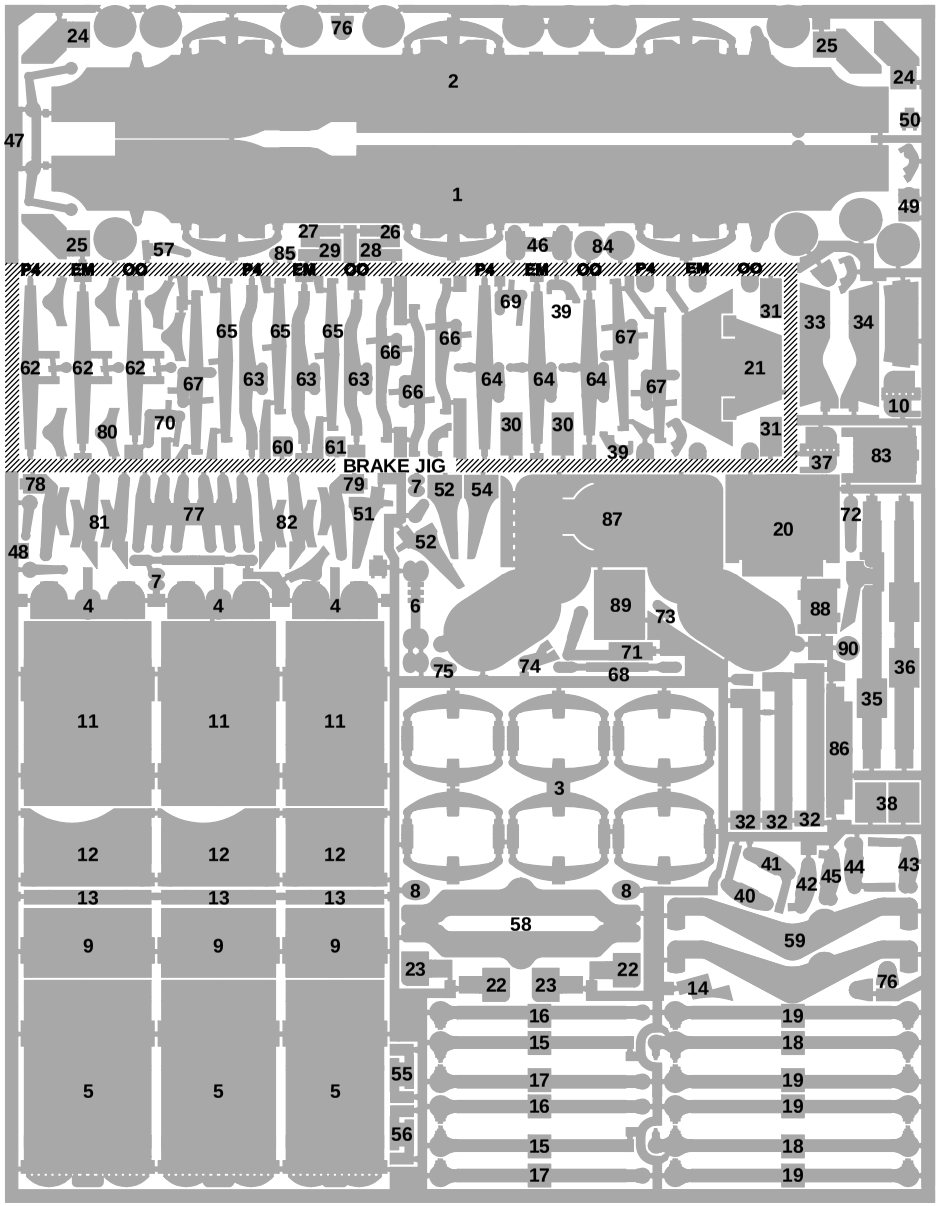
Go on to fit all the wheelsets, complete with crankpins, and quarter the wheels, - the right hand cranks lead by 90 degrees. Now add the bushes to the crankpins, followed by the coupling rods, and check for free running before fitting the securing nuts.

Push the chassis along the track - it should freewheel smoothly - then fit the body and check the rods don't catch anything. Give the motor a quick burst of power with the body fitted and then secure the final drive gear using a small amount of Loctite before testing the loco under power on your track.

Remove the body again and wire up the Pick-ups. For wiper pick-ups, you can attach short lengths of copperclad strip to the suitable mounting points, using epoxy to secure them, and then solder the pick-up wires to the strips, so they make light contact with the wheel treads. Make frequent checks as proceed, refitting the brakes to ensure wires don't short or catch. For plungers, wire up feeds from the plungers to the motor.

Give the chassis a good run on the track. If there's a tight spot, don't try winding up the controller in an attempt to blast through it, or you'll be asking for trouble! Better to investigate and, if necessary, dismantle the mechanism, working backwards through the assembly sequence, testing at each stage until you find the cause. Once the loco is running smoothly, refit the bodyshell and brakes, as described above.

CHASSIS KIT FOR J72



PARTS LIST

1. LH Frame
2. RH Frame
3. Spring Backing Pieces
4. Cylinder Front Overlays
5. Front Spacer
6. Valve Gland
7. Valve Gland Overlay
8. Piston Glands
9. Motion Bracket
10. Right Hand Crosshead
11. Rear Spacer
12. Midway Spacer
13. Motion Bracket Lip
14. Spacer Strengthener
15. Front Coupling Rod, Middle Layer (x2)
16. Front Coupling Rod, Inner Left, Outer Right x 2)
17. Front Coupling Rod, Outer Left, Inner Right x2)
18. Rear Coupling Rod, Middle Layer (x2)
19. Rear Coupling Rod, Outer Layer (x4
20. Front Body Mount
21. Rear Body Mount
22. Footplate Supports LHS
23. Footplate Supports RHS
24. Beam Brace – Front Left; Rear Right (x2)
25. Beam Brace – Front Right; Rear Left (x2)
26. Front Brake Spacer LHS OO/EM
27. Front Brake Spacer RHS OO/EM
28. Front Brake Spacer LHS P4
29. Front Brake Spacer RHS P4
30. Midway Brake Spacer OO/EM (X2)
31. Midway Brake Spacer P4 (X2)
32. Rear Brake Spacer Bar OO/EM/P4
33. Ashpan LHS
34. Ashpan RHS
35. Slidebar LHS
36. Slidebar RHS
37. LH Crosshead
38. Crosshead Tops (x2)
39. Slidebar Mounting Brackets (x2)
40. Droplink LHS Outer
41. Droplink LHS Centre
42. Droplink LHS Inner
43. Droplink RHS Outer
44. Droplink RHS Centre
45. Droplink RHS Inner
46. Valve Gear Locator
47. Lifting Arms
48. Lifting Arm Overlays
49. Lifting Shaft Journals (x2)
50. Valve Oiler
51. Railguard: Front Left
52. Railguard: Front Right
53. Railguard: Rear Left
54. Railguard: Rear Right
55. Rivet Strip: Front Left, Rear Right (x2)
56. Rivet Strip: Front Right; Rear Left (x2)
57. Draincock Lever
58. ‘OO’ Compensation Beam
59. EM/P4 Compensation Beam (x2)
60. Brake Hanger Detail LHS
61. Brake Hanger Detail RHS
62. Brake Stretcher, Front, OO/EM/ or P4
63. Brake Stretcher, Midway, OO/EM/ or P4
64. Brake Stretcher, Rear, OO/EM/ or P4
65. Stretcher Bottom, Front, OO/EM/ or P4
66. Stretcher Bottom, Midway, OO/EM/ or P4
67. Stretcher Bottom, Rear, OO/EM/ or P4
68. Brake Adjuster
69. Brake Shackle Overlay, Midway
70. Brake Shackle Overlay, Rear
71. Handbrake Lever
72. Handbrake Lever Overlay
73. Handbrake Lever Offset
74. Steambrake Lever
75. Actuator
76. Journals (x2)
77. Brake Hanger, Rear Layers (x6)
78. Leading Brake Hanger, Front layer LHS
79. Leading Brake Hanger, Front layer RHS
80. Brake Block (x6)
81. Midway/Rear Brake Hanger, Front Layer LHS
82. Midway/Rear Brake Hanger, Front Layer RHS
83. Brake Cylinder Wrapper
84. Cylinder End/Cover
85. Cylinder Inlet
86. Gearbox Restraint
87. Gearbox
88. Motor Anchor
89. Mounting Plate
90. Re-enforcing Washer

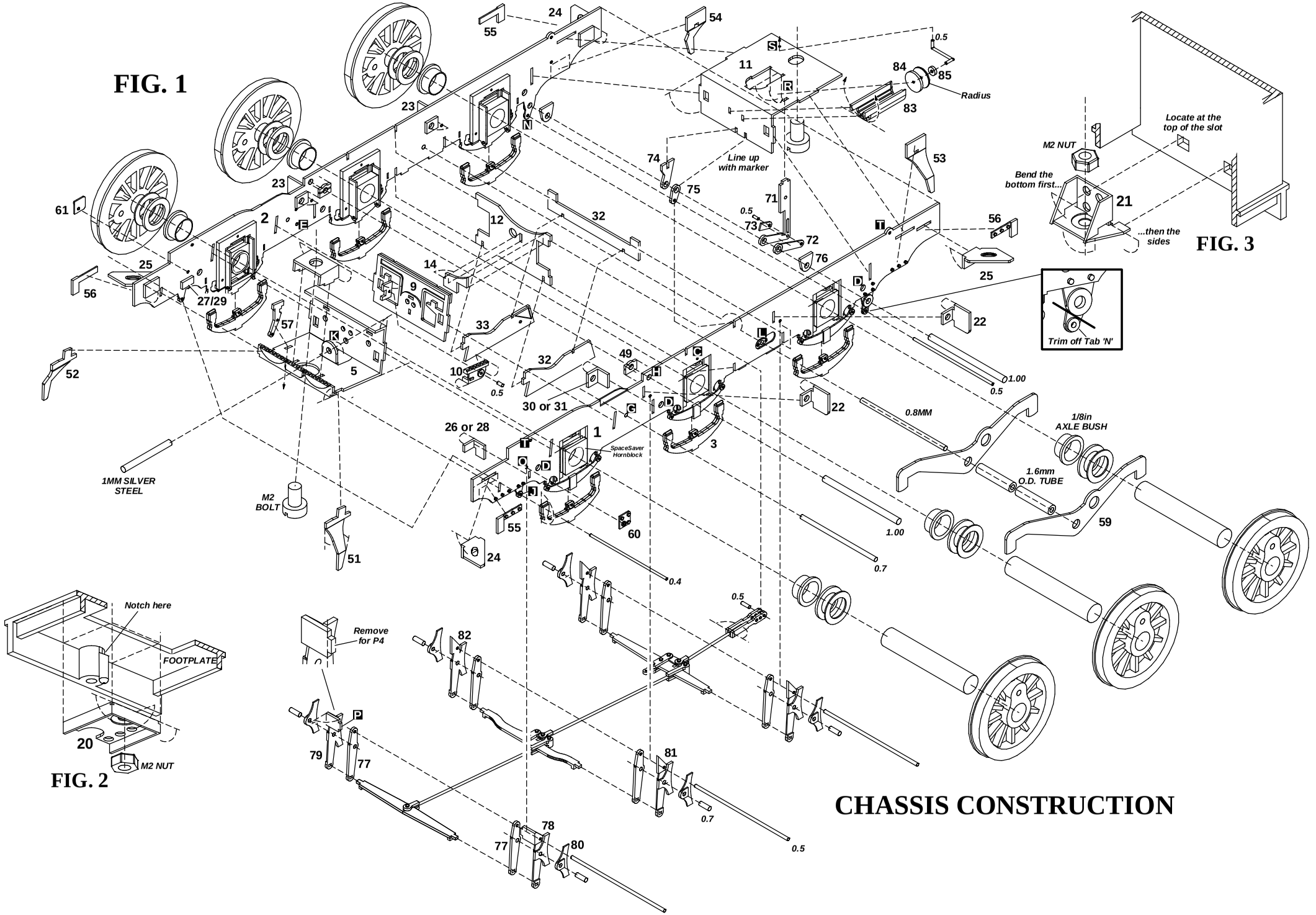


FIG. 1
Line up with marker
Radius
Locate at the top of the slot
M2 NUT
Bend the bottom first...
...then the sides
21
FIG. 3
Trim off Tab 'N'
0.8MM
1/8in AXLE BUSH
1.6mm O.D. TUBE
1MM SILVER STEEL
M2 BOLT
SpaceSaver Hornblock
Remove for P4
Notch here
FOOTPLATE
M2 NUT
FIG. 2
CHASSIS CONSTRUCTION

EM/P4 COMPENSATION SYSTEM

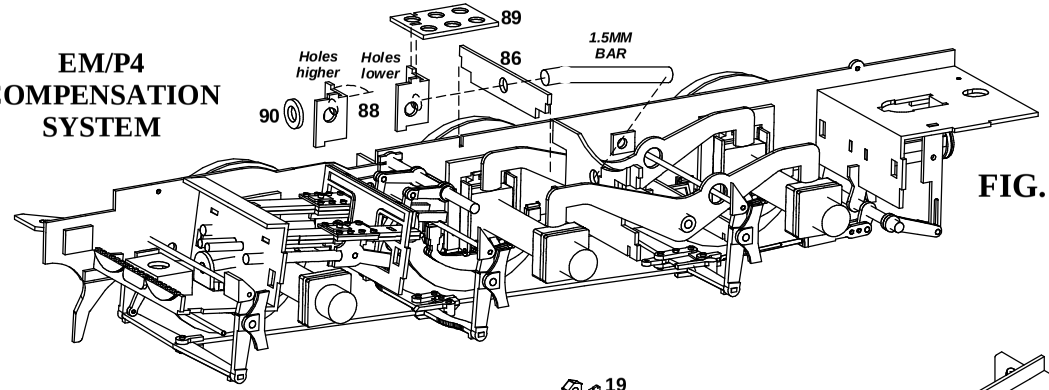


FIG. 4

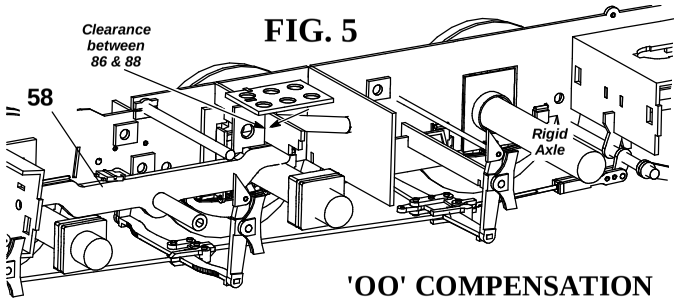


FIG. 5

'OO' COMPENSATION SYSTEM

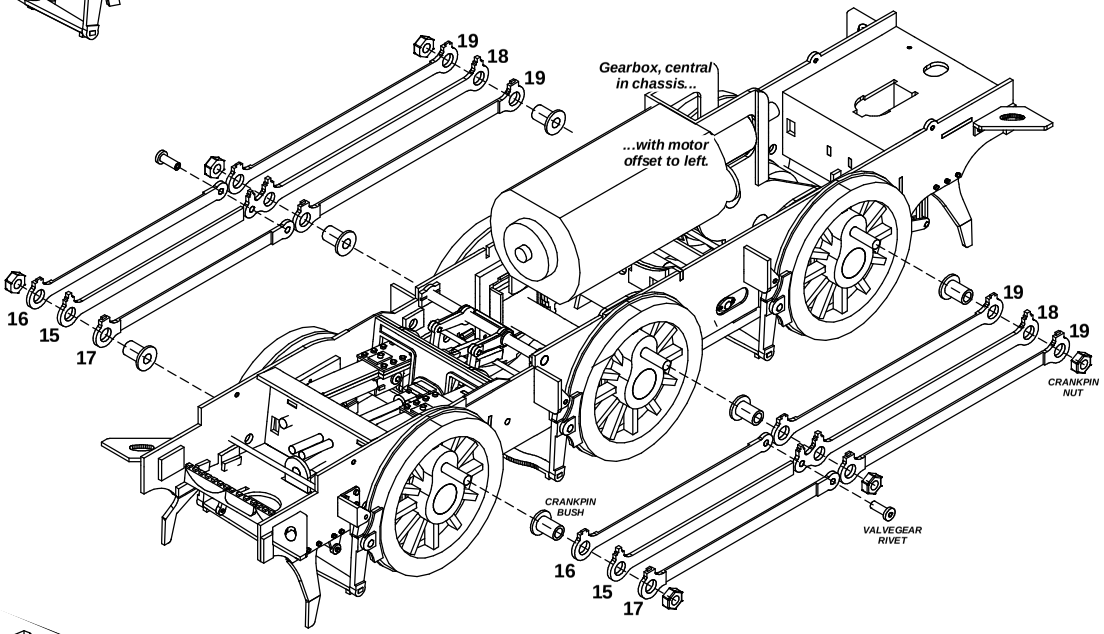
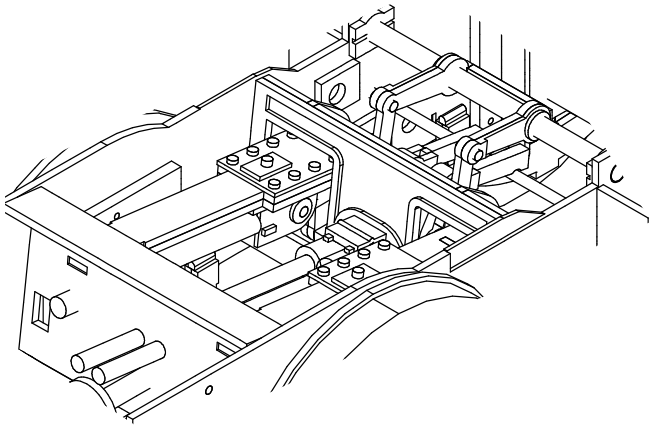


FIG. 6



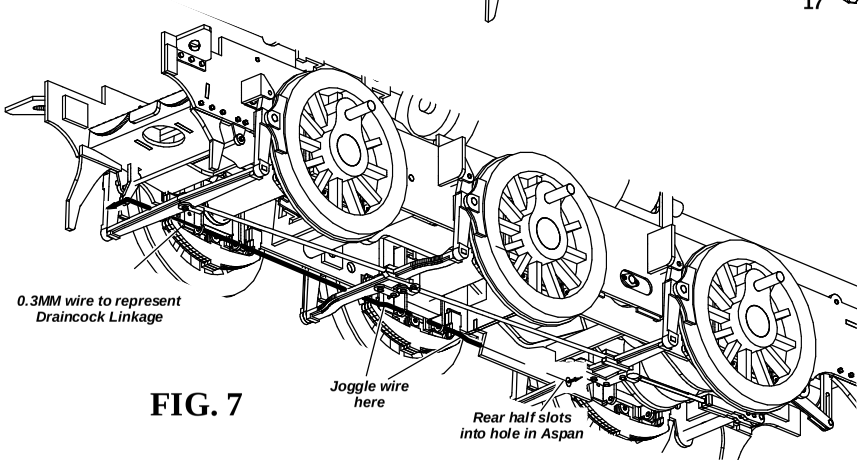
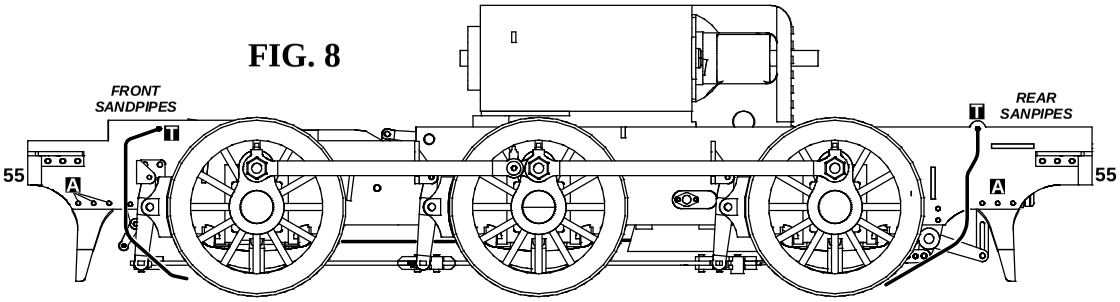
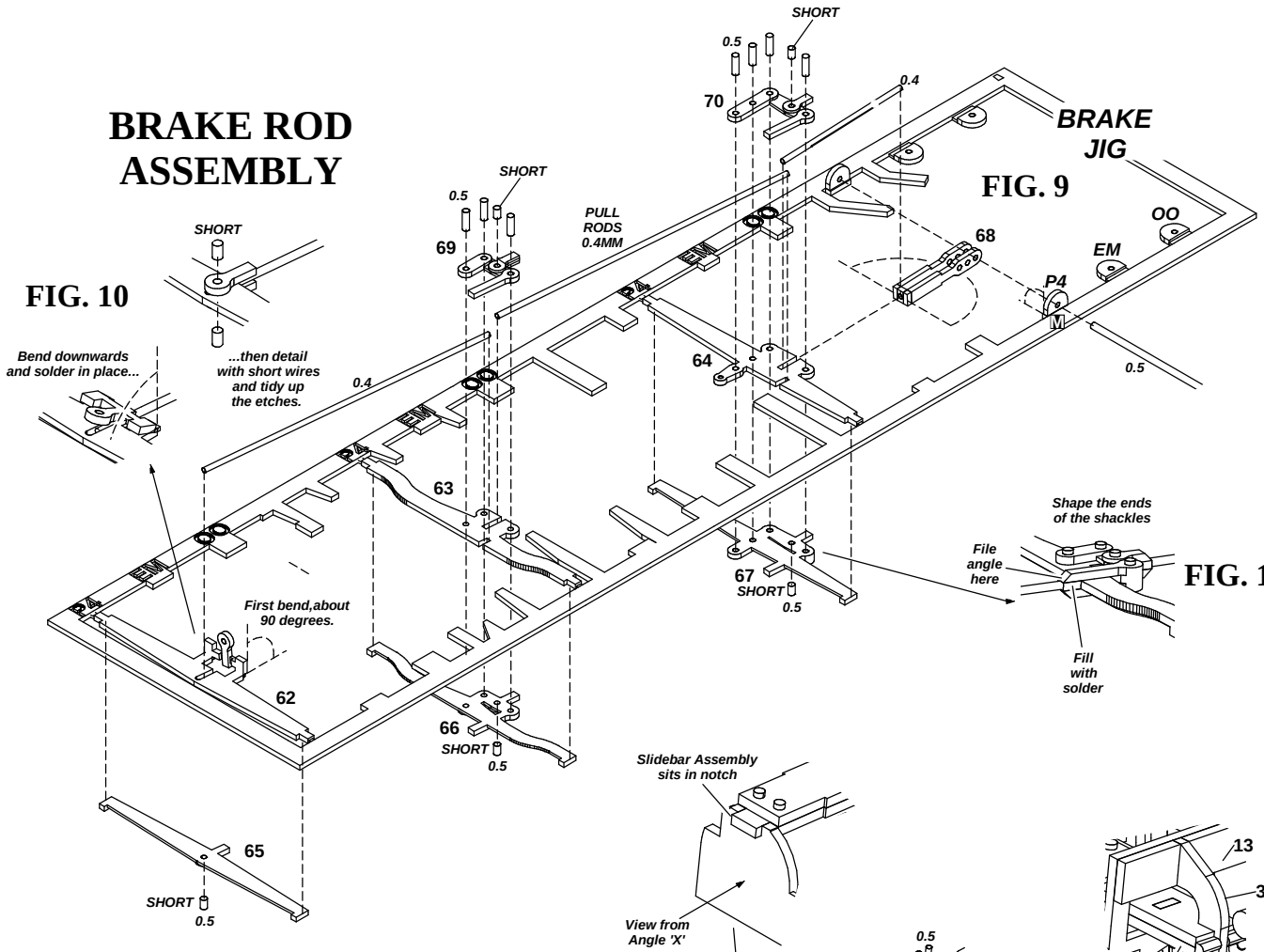


FIG. 7

FIG. 8



BRAKE ROD ASSEMBLY



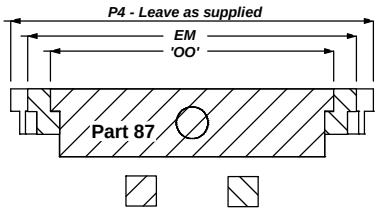
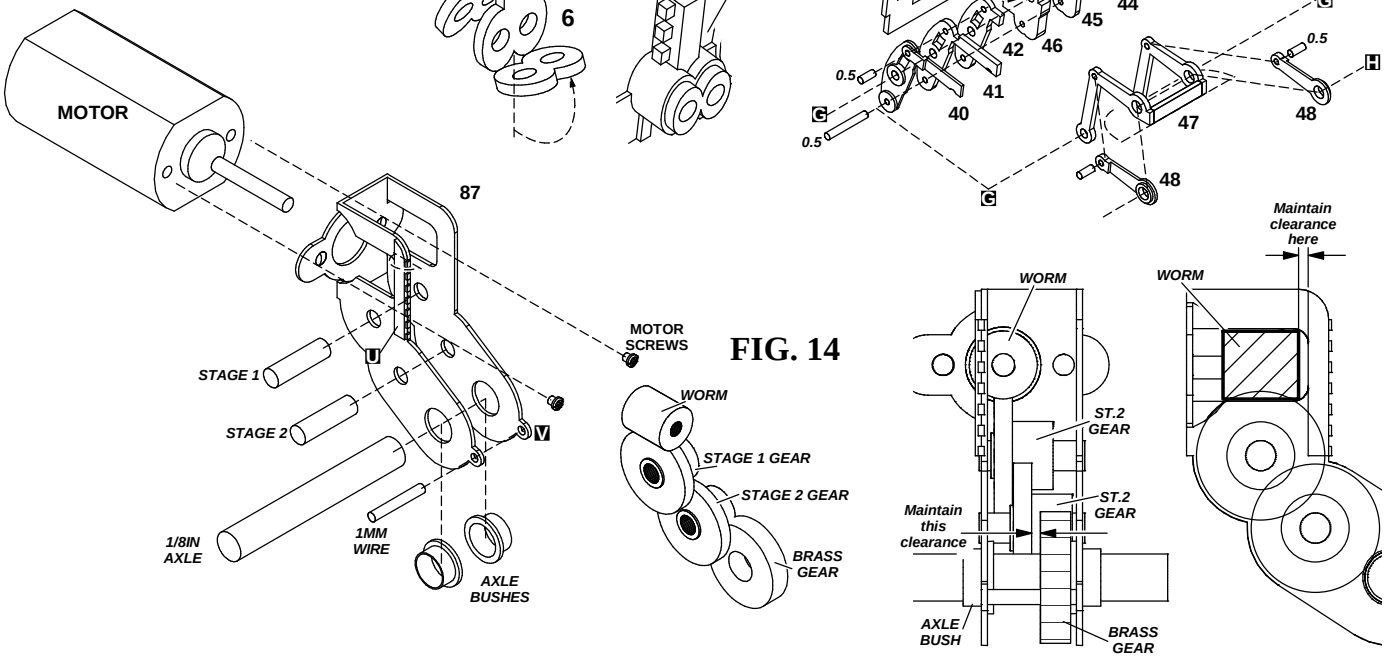
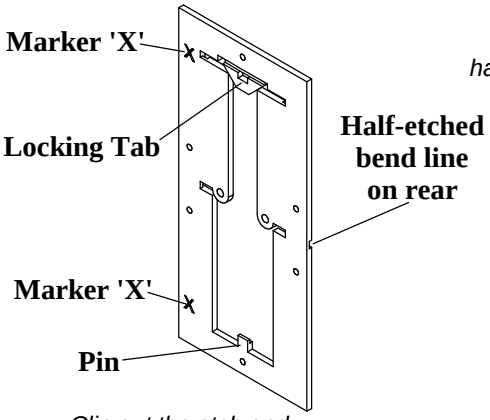


FIG. 13



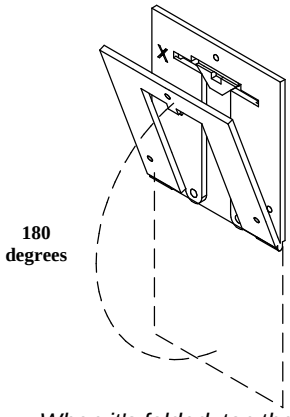
HIGH LEVEL

www.highlevelkits.co.uk



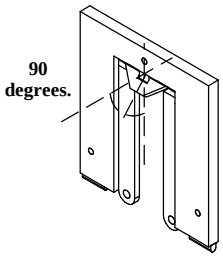
Clip out the etch and clean off any mounting tabs.

Fold the etch through 180 degrees, so the markers 'X' face each other. The half-etched line is on the outside of the fold.

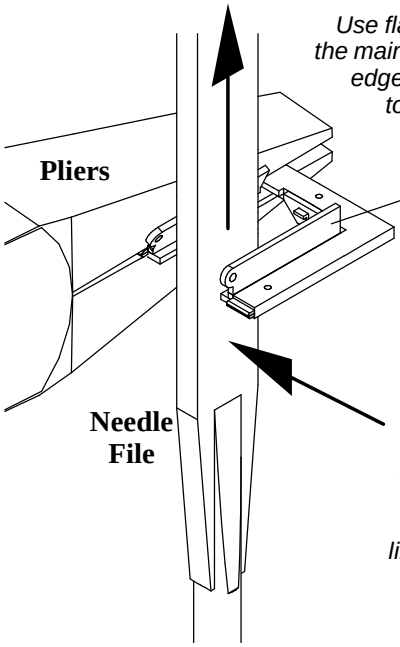


When it's folded, tap the layers between two pieces of hardwood, so they sit absolutely flat.

Hold the layers tightly together and fold the locking tab through 90 degrees, so it locates on the small pin.

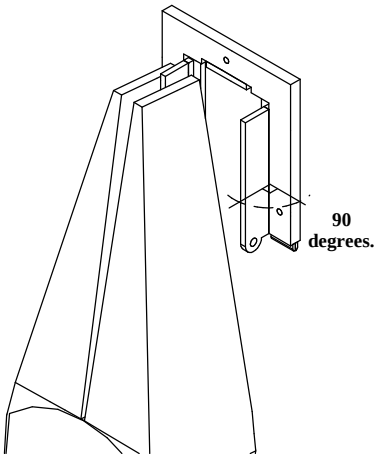


The end of a flat, pointed needle file is a good tool for this job. The tab locks the layers together, eliminating the need for solder.



Use flat nose pliers to grip the main etch,with the straight edge of the pliers close to the bend line.

Bend the horncheeks up through about 80 degrees, using a flat needle file to apply upward and sideways pressure simultaneously. In this case, the half-etched line is on the inside of the fold



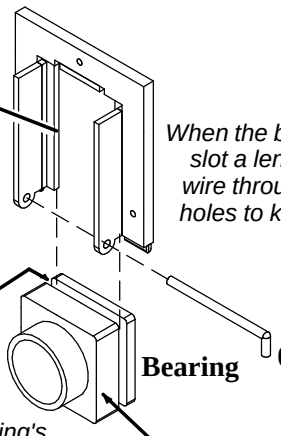
Finish off the horncheek bends so they are at 90 degrees. Check this through a magnifying glass and adjust as necessary.

Use fine emery to clean up the bearing, remove any burrs and then try it in place - the groove on the block locates on the front layer of the etches.

If the bearing's tight in the etch, check that these edges aren't 'bottoming out' in the groove...

...If they are, use a file to remove the sharp 'cusp' from the edge of the etch...

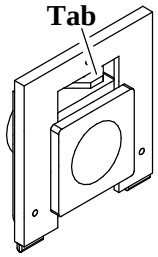
... so there is clearance in this groove...



When the bearing is fitted, slot a length of 0.4mm wire through the bottom holes to keep it in place.

...then polish the bearing's side faces until it's a smooth, sliding fit in the etch.

The completed assembly can now be soldered to the inside face of the chassis, using axle jigs. If you fit it with the bearing in place,make sure the sliding surfaces are lightly oiled, to prevent the bearing being soldered to the etch.



The top edge of the cut-outs on most loco chassis is 4mm above the axle centre. If the Standard Hornblock's tab is butted up to the top of the cut-out, the unit will sit at the correct height.

For MiniBlox, the top edge of the tab is 3mm above the axle centreline.

HIGH LEVEL, 14 TUDOR ROAD, CHESTER-LE-STREET, CO. DURHAM, DH3 3RY.
TEL. 0191 3882112.