

P4 CC03S V2 Internal sprung frame for Bachmann TTA et Al

Introduction:

These sprung suspension units will provide a relatively simple P4 conversion for the Bachmann TTA (and associated wagons with the same underframe), avoiding major surgery that would be required with replacement W irons. The Bachmann underframe is solid at lower solebar level so the suspension unit is fitted from above, beneath the tank barrel /body moulding, A jig is also provided for repositioning the brake shoes in line, and prototypically closer to, the wheel tyre. The spring suspension arrangement is behind the wheels and barely visible with the normal side view.

Should it be necessary, the guitar springs can be accessed by removing the tank barrel / body moulding; the wheels are retained by removable pins.

Safety warning.

This kit is suitable for adults only. There are small and/or sharp components. The castings and recommended solders contain lead. Observe appropriate hygiene precautions; do not eat or handle food without first washing hands. The tools and materials recommended also require the care in handling; protection for the eyes and face (dust mask) must be applied when soldering and using a mini-drill.

The components on the etched sheets are all held in position by half etched tags. The fronts of the sheets have the identifying text and should be "face up" for cutting of tags.

It is recommended that a small sharp craft knife is used to remove the components from the frets; Use a hard-base surface, such as an off-cut of chipboard or MDF, on which to perform this cutting. Ensure that the blade of the knife used for cutting the tags is regularly changed as soon as there is evidence of wear (I use a small snap-off type knife, which is quick for providing a fresh cutting edge).

Channels for the guitar wire springs in the bearing plates are created by laminates of two pieces, with the half etched areas creating a slot. It is important that these do not become blocked with solder. This can be aided by using a solder resist applied to the half-etched faces - a CD marker type pen works well. This should be applied before removal of the components from the sheet, as well as subsequently carefully controlling the quantity of flux and solder applied.

TIP: pare off small slivers of solder from the solder stick or wire; these can be selected and picked up by the tip of your soldering iron to limit the quantity that is applied.

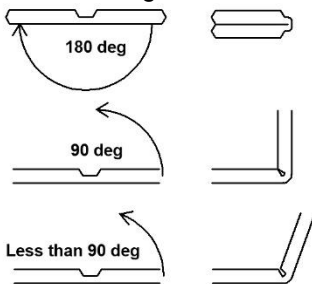


Fig 1

Cleanliness is important with solder fluxes, and it is important to "clean as you go". Any residues can cause corrosion of the steel springs in particular, as well as preventing good paint adhesion.

Folds and bends are used extensively in the kit, and these fall into two basic types:

Folds of 180° are made with the ½ etch "channel" on the outside. 90°, or less, are made with the ½ etch "channel" on the inside. All of the bends and folds can be made either with finger pressure or with smooth faced pliers. Some need a degree of support to avoid distortions. Always take care to maintain a degree of accuracy with these folds as they can influence the final alignment of the components and even the operation of the springing.

Etched sheet main components:

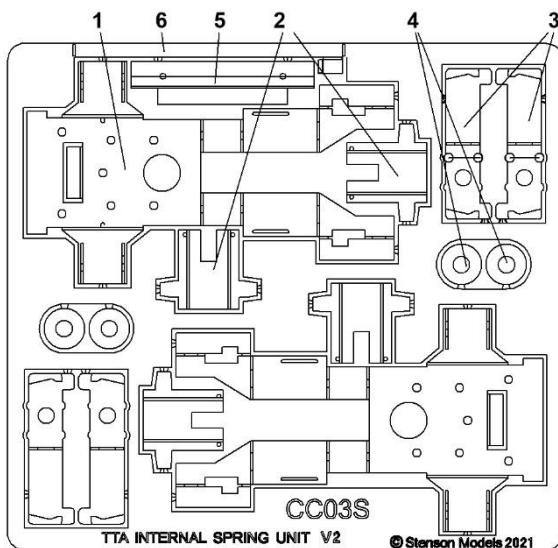


Fig 2

1. Internal frames with spring supports (2 off)

2. Axle guide supports (4 off)

3. Spring bearer plates (4 off – 2 LH, 2 RH)

4. Axle spacing washers (4 off)

5. Drill alignment jig for repositioned brake shoes

6. Spring wire installation aid (outer edge of sheet)

This component is not held in the sheet with tabs as normal, but can be snipped from the edge of the sheet when all the other items have been removed. The snipping points are identified with half etched lines.

The wheels required are 12.0 mm, or 12.5 mm diameter with a plain 2mm diameter axle flush with the outside face. (Not Pinpoint) A typical axle length is 21.9 mm. Assembly is with 2 internal spacing washers from the etched sheet (item 4).

Axle retaining pins are not provided. You can use short lengths of 0.5mm brass wire or fine 0.5mm pins (Amati Finissimi). The pins are much easier to insert.

All the folds can be performed using a small pair of smooth faced taper nosed pliers, or finger pressure. For 180° folds it is important to compress the laminate first with smooth faced pliers (Maun type with parallel jaws are preferred) and finish by placing on a smooth surface and pressing firmly (thumb pressure) with the face of a ruler or similar small flat tool.

188° solder is recommended, but not critical.

The recommended flux is “Fry’s Powerflow Flux” as this is particularly effective with laminate soldering

Slots are generated in the folding operations to locate the springs (Guitar string wire) and it is important not to flood these with solder. The use of solder resist is a simple aid; it has been found that a fine black indelible marking pen (eg the type used for marking CD’s) is an effective way to achieve this. The completed internal frame has a simple U slot in each

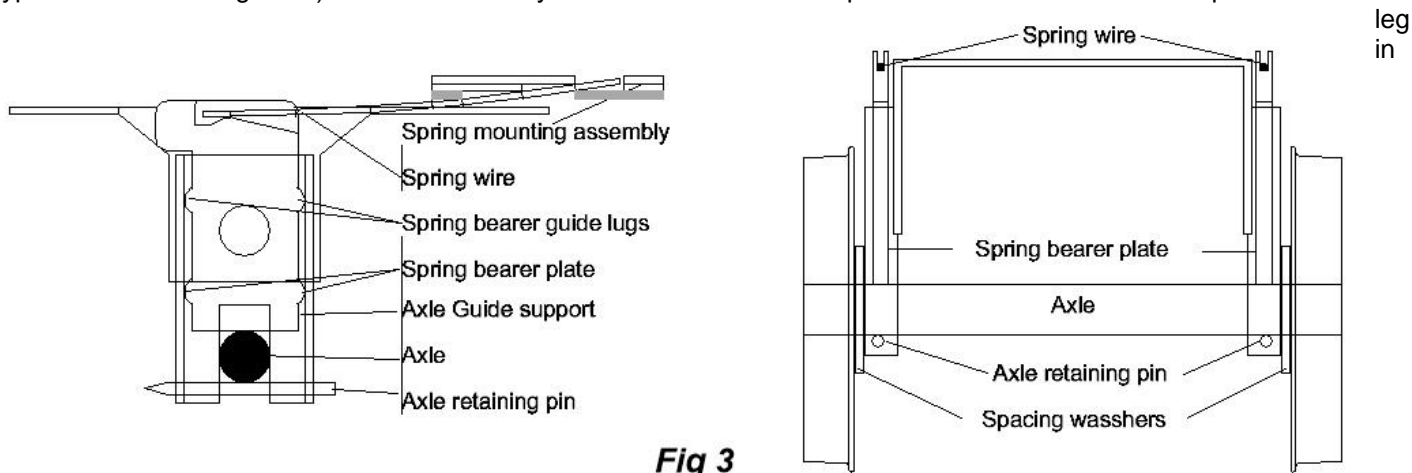


Fig 3

which the axle can move vertically; this movement is controlled by a sprung bearer plate which rests on the top of the axle. The axle is held in place by a simple pin acting as a keeper.

The spring is located on the frame, within a slot aperture and rests on the bearer plate within a slot generated by facing half-etches. The vertical movement of the bearer plate is controlled by guide pins within a slot on the frame legs.

The assembly is located on the upper part of the underframe which makes it well concealed with normal side viewing.

1. Main internal Frames:

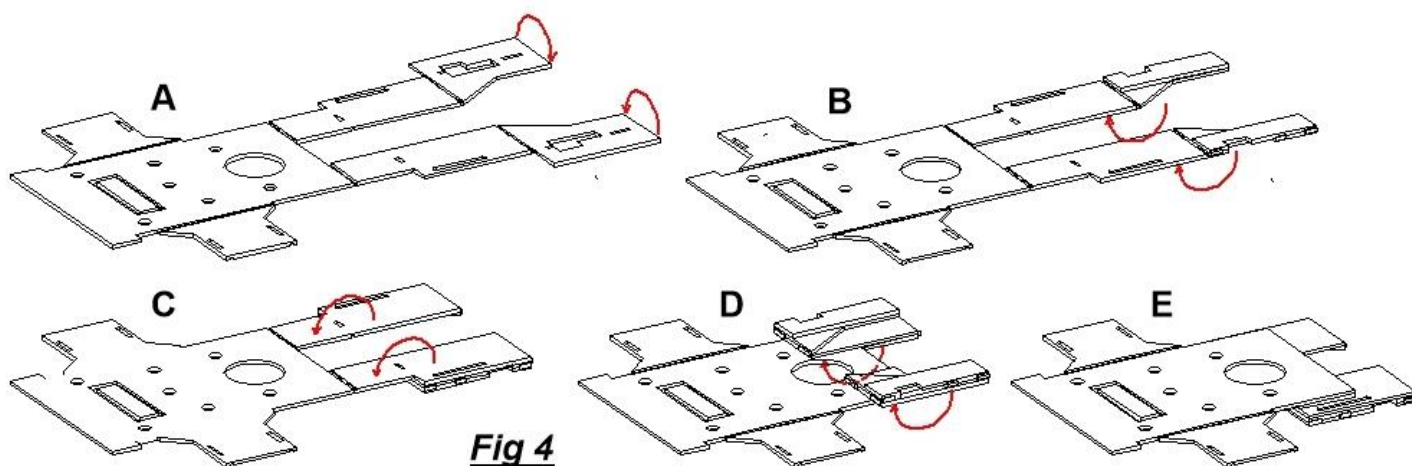


Fig 4

Remove the internal frames with spring supports (1) from the etched sheet. The drawings show this with the face up as on the original etched sheet. Carefully tidy up any tab residues with a fine flat needle file

Prepare the spring retaining laminate arrangements (*Fig 4*). All the folds are of 180° with the half-etched line on the outside; take care to ensure that these are square to the fold lines

Fold the outer two components inwards 180° (*Fig 4A, B*) with the half-etched fold line on the outside. Compress the two folds on a flat surface so that they sit truly flat. Maun pliers with parallel jaws are especially effective.

Fold these double layers back on to the underside with the half-etched fold line on the outside (*Fig 4B, C*). Compress the two folds.

Then fold these triple layers 180° on to the top with the half-etched fold line on the outside (*Fig 4C, D*). Compress the two folds.

Finally fold the quadruple layers 180° back under (*Fig 4D, E*) and compress.

There is a natural tendency for the folds to spring apart, so it is important to grip and compress each spring support laminate while soldering, to maintain the dimensional integrity. (*Fig 5A*). The frame as shown has been inverted as the soldering is performed with the spring supports on the top.

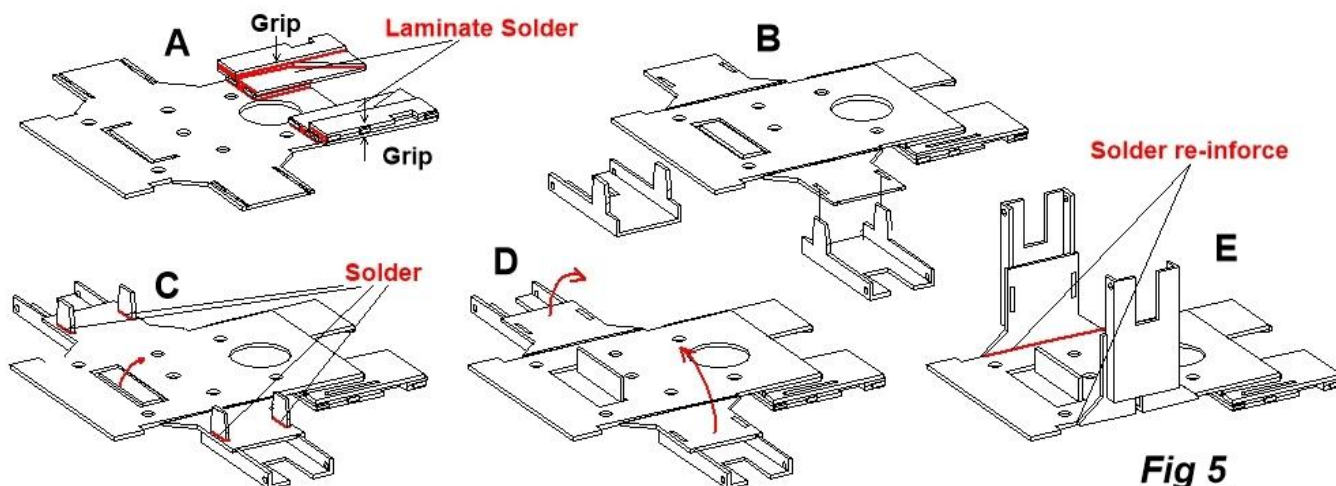


Fig 5

Apply flux and solder to laminate all 5 layers of each assembly, but take care to avoid flooding the spring retaining slot. Capillary action will draw the solder into the layers; application of solder and heat from the inner, and end faces of the support minimises the risk of blocking the spring channel. Make sure all the layers are solder laminated, A piece of 0.3mm brass wire, or one of the supplied springs can be used to check that the spring channel is free. Any unlikely solder obstruction can be removed with application of the iron with de-solder braid. It is important to check this at this stage while it is relatively easy to correct.

Remove the axle guide supports (2) from the etched sheet and tidy up any tab residues with a fine flat needle file; fold the sides 90° (*Fig 5B*) These are located in the frame from the rear face side so that they locate in the half-etched channels and the axle slot pointing outwards. Push fully home and very **gently** splay the tabs outwards to retain them. It is important not to exert too much pressure with this action as this can cause distortion.

Apply flux and solder to the tabs; capillary action will draw the solder through into the joint within the half-etched channel. Cut off the surplus tabs and tidy the surface with a sanding disc or flat file (Not critical as it is purely cosmetic and not visible). Fold up the central location Tab.

Fold up the two frame “legs” 90° (*Fig 5D, E*) and strengthen the folds with a fillet of solder,

Thoroughly wash the finished frame to remove any flux residues; an old toothbrush will help to clean the spring wire slot.

2. Spring bearer plates:

Remove the spring bearer plates (3) from the etched sheet and carefully tidy up the tag residues; **Note to avoid damaging the 4 guide lugs which will provide controlled movement of the plates within the frame slots.** The plates are made up of two layers; the half-etched areas create a slot for the spring wire when laminated. They are “handed” with 2 x LH and 2 x RH for each wagon.

It is recommended that solder resist (indelible ink marker pen) is applied to the half-etched areas (*Fig 6*) to reduce the risk of this slot becoming restricted with solder during lamination.

Fold the two parts of the plates 180° with the half-etched fold line on the outside (*Fig 6a, b*); press firmly to ensure that they are parallel, taking care not to distort the side of the spring slot.

Grip the plates and then apply flux and solder to the hole area; allow capillary action to draw the solder into the two layers by floating the tip of the iron over the area, away from the spring slot.

The face can be polished with abrasive or a fine flat needle file to remove solder. Thoroughly wash the finished plates to remove flux residues.

Check for free movement of a 2mm axle in the vertical guides; polish the guides’ inner faces with a fine flat needle file to reduce the cusp residue from the etching process if required.

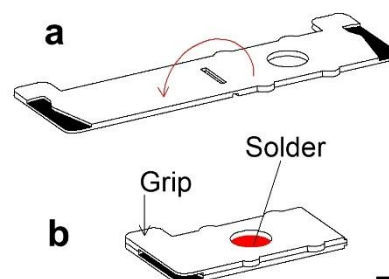


Fig 6

Insert a pair of the bearer plates into the frame slots (*Fig 7*). The guide lugs should be on the outer face so that they are clear of any solder at the at the base of the guides, and the open end of the spring slot towards the spring locators

Check that the plates are free to move within the frame guides; they should fall under gravity without any restriction.

Feed one of the supplied spring wires through from the top location slot, and use the tip of an instrument screwdriver to locate the end in the bearer plate slot and the spring support (*fig3*). Check for free springing movement.

Repeat for the other spring wire.

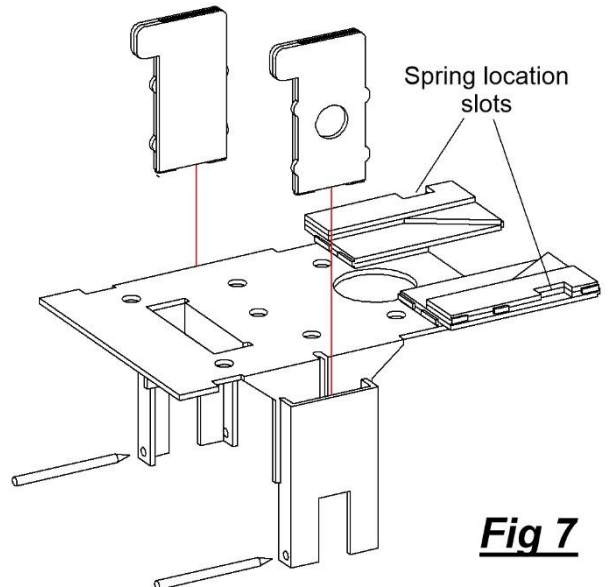


Fig 7

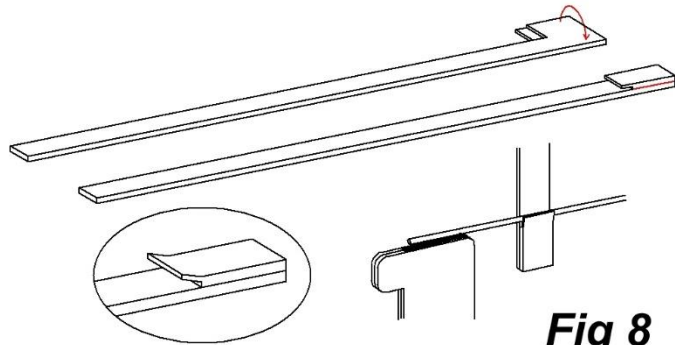


Fig 8

Access to the spring wire is more restricted when the frame is installed in the wagon underframe which in turn makes it more awkward to lift the end into the spring slot. On the edge of the main etched fret is a simple tool (item 6) which can be used to aid this task.

Carefully snip the tool from the edge of the fret and tidy up the tab residues with a fine needle file

Fold the end tab 180° with the half-etched fold line on the outside (*fig8*) and laminate solder sparingly taking care to avoid obstructing the half-etched slot

Carefully open out with the edge of a blade so that the spring wire will sit within the slot.

This tool can now be used to guide and lift the end of the spring wire into the spring slot.

Remove the spacing washers (4) from the etched sheet and clean the tab residues with a fine flat needle file, Assemble the 12mm or 12,5 mm wheelsets with 2 internal spacing washers and plain axles flush with the outer faces.

Insert a wheelset in the vertical guides with each of the spacing washers on the outer face; it may be necessary to adjust the assembly legs to achieve an optimum fit with minimum end float (*fig3*).

Check the fit of the axle retaining pins and the correct functioning of the sprung suspension. The retaining pins should be a tight fit and do not normally require any additional actions to secure.

The assembly can now be dismantled, removing the retaining pins, wheelset, spring wires and bearer plates; carefully put all the components safely aside.

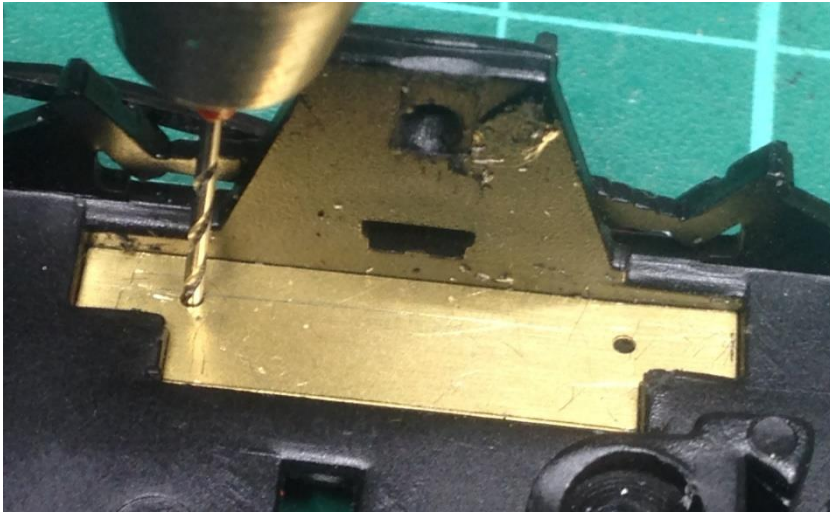
If you wish, you can blacken the lower parts of the frame, but they are not that visible from normal viewing angles; alternatively, if you have added additional detail on the underframe you will probably airbrush over this and also the lower spring frame legs (with spring plates removed).

3. Preparation of the wagon underframe.

If the wagon is a TTA disconnect the ladders from the underframe by gently pulling them away from the top of the solebar. Remove the two screws securing the tank or body, and withdraw it (along with the walkway and ladders for the TTA). Remove the 00 wheelsets.

There are two integral clips locating the ballast weight. Gently pare these back with a chisel shaped scalpel flush with the top of the solebar moulding. The steel weight is secured to the top of the solebar with a contact type of adhesive and this requires some care in removal. Gently prise one end edge of the weight with an instrument screwdriver at the same time supporting the centre of the underframe moulding to prevent excessive bending; repeat at the other end of the weight. Gentle persistence from each end will eventually result in release.





Carefully lever off the brake shoe mouldings; these were factory secured with a drop of Cyanoacrylate from the top (as with most of the underframe fittings), so usually come away easily with a small instrument screwdriver under one edge. Scrape off any adhesive on the underside where the brake shoe mouldings were located. Similarly remove the tension lock couplings if you wish to change them.

Remove the brake shoe alignment jig (Item 4) from the etched sheet and tidy up tag residues with a fine file. Locate within one of the brake shoe mounting recesses and carefully push fully into place with the tip of an instrument screwdriver or similar. Drill the two revised holes, square with the underframe, through the jig, with a 0.7mm drill in a pin chuck. Repeat for the other three recesses.

The brake shoe pairs will require to be split into two separate parts by cutting approximately 2-2.5 mm from the centre of the central bar. If you are going to fit cross shafts, or full yokes (Stenson Models SM 53D) between adjacent shoes, the required drilling is best done first for ease of handling. (refer to instructions for SM 53D with paper template replaced by alignment jig)

Modification of the underframe moulding is relatively straightforward. Pare back, with a sharp knife, the brake shoe mounting pads by approximately 1 mm by 17 mm long (*fig 9*) to allow the sprung frame to pass through from the top. This operation can also be performed as a milling technique, using a mini drill mounted in a vertical drill stand.

Due consideration should be made of other tasks while the underframe is separated from the body; the fitting of the suspension unit may restrict some later alterations. In this example the recesses behind the headstocks have been deepened by 0.5mm to allow fitting of Stenson Models sprung scale couplings; the redundant coupling bosses have also been removed.

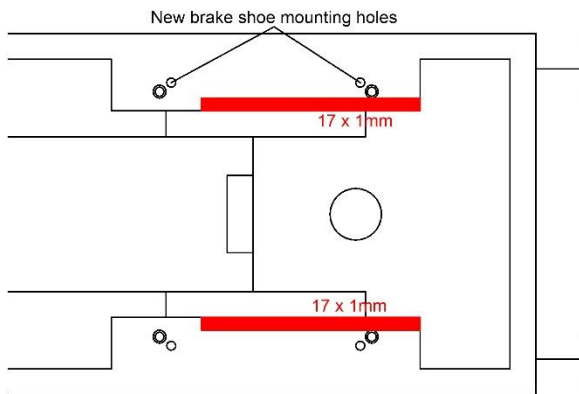


Fig 9

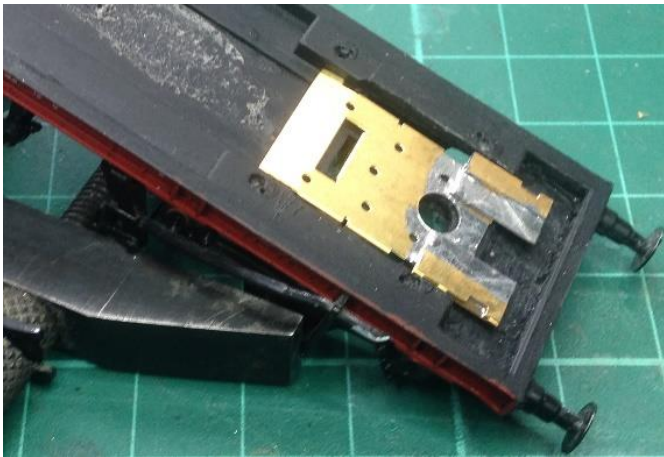


The alignment of the suspension unit in the underframe can utilise the original axle position between the W irons. This maintains the relationship of the wheels to the repositioned brake shoes when they are added later.

Insert a P4 wheelset, or bare 26mm axle in place; the fit is invariably very sloppy (one reason for the requirement of this conversion) so it is necessary to squeeze the axle boxes inwards to eliminate all this slack when locating and securing the spring frame.

This can be done with the jaws (smooth) of a small vice, one axle at a time, taking care avoid damaging the underframe detail. In particular the brake guards are proud of the axle boxes as well as the brake lever pivots.

Alternatively, a small tool makers clamp is especially suitable. This is shown here as it provides better visibility of the clamping operation.



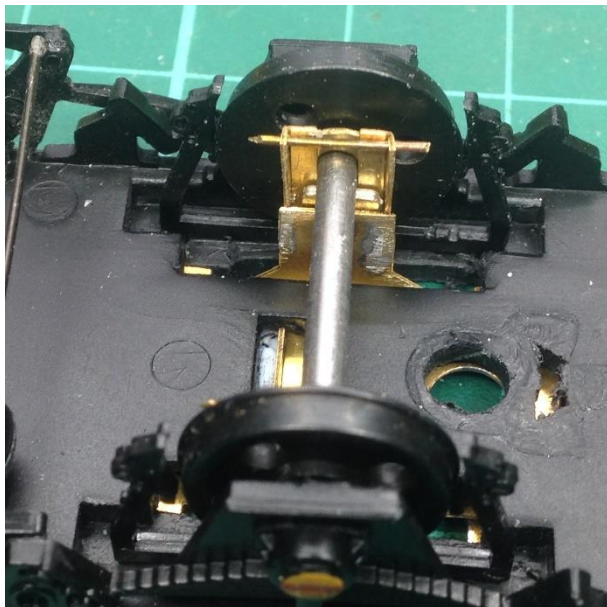
Insert one of the spring frames, locating the axle within the guide. The tabs on the inner end of the frame may require relieving with a fine needle file if they are a tight fit. The frame may appear not to sit truly flat and be able to rock slightly on the underframe moulding; this can be corrected by bending the inner top end of the frame down by approximately 0.3 mm in line with the location slot.

When you are satisfied with the position, secure with Cyanoacrylate applied through the small holes provided and around the inner location tabs. Allow the adhesive to cure before removing the axle clamp and dummy axle.

Repeat for the other frame.

Insert a spring bearer plates with the correct orientation, and check that it moves freely in the slot. Insert a spring wire through the spring retainer, and locate within the bearer slot, with assistance from the prepared tool (Item 6, [Fig 8](#)). Check that the spring bearer can be moved freely under spring tension.

Repeat for the other three bearer plates.



Insert wheel-sets into the slots with the spacing washers on the outside of the frames. Use the residues from the 0.5mm pins or 0.5mm brass wire to retain; these are a snug fit using the if using pins the pointed ends provide an alignment guide through the holes; **for safety, the pointed ends of the pins can be snipped off at final assembly**

Prepare the brake shoe mouldings by firstly drilling the brake shoes for cross shafts (optional) or if fitting yokes – Ref instructions for Stenson Models SM53D. Remove any moulding lines on the underside of the moulding and the brake shoe faces.

Cut approximately 2-2.5 mm from the centre of the link bar, splitting into two separate parts.

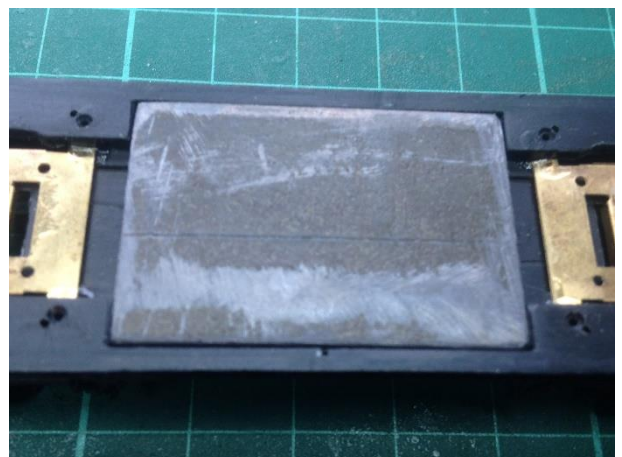
Test fit each shoe in position and ease the new alignment hole if required. Secure with cyanoacrylate, with each shoe aligned with the wheel tyre.

Don't forget to lubricate the axles where they bear on the sprung suspension before putting into service.

Weight needs to be added to the vehicle, ideally to achieve approximately 50g for a 25g axle loading.

The central recess can be neatly filled with a piece of lead 35mm x 23mm x 1.8mm** and is perfect to meet the required weight specification; there is plenty of room within the tank barrel as an alternative option.

** Code 4 lead sheet used for most building and roofing applications has a nominal thickness of 1.8mm. See your local friendly contractor for suitable off-cuts. Will require some careful flattening!



The tank barrel / wagon body locators will require shortening so that they do not protrude below the underframe. Suitable styrene washers can be made to allow the barrel to be secured to the underframe, utilising the original screws.

6. Fine tuning:

Depending on the weight of your wagon, the thickness of the spring wire (Guitar strings) should be chosen to allow at least 75% available deflection under load. If you follow the recommendations the wagon weight will be just under 50g without wheels.

The springs provided are appropriate for this weight. In the unlikely event that you wish to increase the weight further you may need to use a thicker spring wire.

The maximum wire thickness which can normally be accommodated in this frame is 0.012" (0.30mm)

The length of the spring wire at 16.3 – 16.7mm is fairly critical; if it is too long it will either not seat fully in the slots or push the bearing mounts against the guide tab and restrict free movement; if they are too short, they will not bear on the peak bearing surface in the slots.

At final assembly, apply a drop of light oil to the spring wire slots on top of the wheel bearings guides, and on to each of the axles in contact with frame and spring bearers,

Components:

1 x Etched sheet CC03S.

5 x 16.5mm long spring wires (0.25mm diameter).

Stenson Models do a range of suitable scale couplings as well as various upgrades for the walkways, ladders and underframes

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