



EDM Models

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Introduction

Thanks for buying this kit. This small range of tender kits started life as aids to scratch building modified tenders to go with Bachmann Moguls and other engines. They aren't modelled on any specific prototype but have one common feature, they are shorter than the standard mogul tender as the standard Mogul doesn't fit on the turntable of our club layout.

As these notes are written there are two tenders in the range a large tender and a medium tender. The chassis is common to both kits. The both bodies look good with the Mogul whilst the smaller one was conceived to accompany the Backwoods Miniatures Select A Kit loco's.

I have both On3 and On30 models so I have tried to make these kits suitable for both gauges and have done this by providing San Juan On3 trucks and NWSL wheels for either On3 or On30 on a standard axle.

I am going to make the bold, and probably foolish, assumption that you are reading these words **before** you get started on building the kit.

What You Get

Large Sized Tender

Chassis Etch	Tender Top	Water Filler	1/4" long 8 BA screws[4]
Body Etch	Bunker Sides	Back Up Light	8 BA full nuts [10]
Spare Step etch	Bunker Base	Oil Filler	1/2" long 8 BA csk screws [2]
	Oil Tank	Water Valves [2]	1/2" long 8BA cheesed screws [2]
	Tender front base	Re-Railers [2]	0.45 mm Brass Wire
	Tender front detail		NWSL wheels [4 axles]
	Styrene Floor		San Juan Trucks [2]

Medium Tender

Chassis Etch	Tender Top	Back Up Light	1/4" long 8 BA screws[4]
Body Etch	Bunker Sides	Oil Filler	8 BA full nuts [6]
Spare Step etch	Bunker Base	Water Valves [2]	8 BA Half Nuts [4]
	Tender front base	Re-Railers [2]	1/2" long 8 BA csk screws [2]
	Tender front detail	NWSL wheels [4 axles]	1/2" long 8BA cheesed screws [2]
	Styrene Floor	San Juan Trucks [2]	0.45 mm Brass Wire

Tools Required

The tools required are those that most modellers would have in their tool kits already. Nothing fancy is required.

Must Have		Nice to Have	
Small Files	Fibre Glass brush	Small Pliers	Gravers
Small Screw Drivers	Soldering Iron	Cocktail Stick	Taper Broaches
Round file	Small Side Cutters	Small Block of Wood	Solder Wick
Tooth brush			

Taper Broaches: The taper broaches are a luxury item used to ease out the holes in the tender chassis to clear the screws. As there are only four of these don't rush out and buy broaches just to build this model. If you don't have any taper broaches use a rat tail needle file - that is the tapering round file found in most needle file sets. If you don't have any taper broaches then seriously consider getting some for all of your modelling, once you have them you will wonder how you managed without and save a fortune in small drill purchase as with a set of broaches you can drill to the nearest hole undersize that you have and ease the hole out with one of the broaches.

Gravers: Until about six months ago I had never heard of these items, now I wouldn't be without them. They are lengths of square tool steel with the end ground at an angle to give a sharp cutting edge. They are ideal for paring away and surplus solder, it being softer than the brass it shaves away easily. A set of these will last you a life time and can be kept sharp with an oil stone. In the UK a set of three of these are available from Eileen's Emporium.

Block of Wood: This high tech device is just a bit of softwood I have lying about on the bench. My bit happens to be 70 x36 x 16 mm but I don't think the size is too important. What it will allow you to do is press pieces into place with an even flat force whilst you solder them and also keep your fingers away from the hot bit.

Solder Wick: No matter how careful you are you will probably get some solder where you didn't want it. To get it off you have two options, soak it up or scrape it off. The gravers will handle the scraping it off but to soak it up you need a wick. I used to have a commercial product that did this but when I needed some more I couldn't find any so I made my own. All you need is some multi-strand copper wire like the stuff your layout is wired with and the same flux you are doing the soldering with. Strip some insulation of the wire and loosely twist the strands of wire together and cover it with the paste flux. To use it lay it on the blob of solder you want to remove and then apply the soldering iron. As the solder melts and the flux on the wire sizzles away the solder is soaked up into the braid you made. Remove the wire and the braid from the model at the same time and you will find that most of the solder has been sucked up. You can then finish the clean up with files, gravers and the fibreglass brush.

Bits you need to supply

Many of these items will be on your bench any way but here is the list of items I use. Your actual choice will probably be governed by your own personal preferences.

- Solder
- Cream Cleaner [CIF or similar]
- Flux
- Cyano-acrylate glue
- Filler
- Paint

Sound Installation

Whilst these tenders haven't been designed to take a specific sound layout of speaker A, decoder B etc I do fit sound to my models and the biggest pain I find in doing that is making holes in the tender base to let the sound out. As a result the tender frame has holes etched in it to form a speaker grille. If anything there are too many holes and it might be necessary to block up the ones not covered by your choice of speaker.

Confession time

Ok, so this is the bit where I confess to mistakes I made with the etches. Thankfully they are small and relatively easy to cope with. The stage by stage instructions will detail how to get round the problems but I will list them here so you are forewarned. The problem is in the same area on each kit but each has a different variation on the mistake.

Medium Tender Body: When you fold the frame for the tender body up there is a hole in the two halves for which the plan was you would put a bolt through the hole it would line the two bits up. I got a length wrong so it doesn't line up as it should.

Large Tender body: This has a problem in the same area except this time whilst it does line up the hole didn't etch right through in one half and etched it all away in the other half.

Soldering

“I can't solder!” Don't believe you, have you tried?

I have heard many people say they can't solder and then when interrogated it's hardly a surprise their efforts went horribly wrong as they ignored most of the written advice, used the wrong materials and tools.

The truth is that with the right stuff, a little patience and practice soldering is easy and a delight to do. I regularly run clinics on how to solder and actually sit people down and make them have a go and they go away transformed in to confirmed solderers.

Here are the regular mistakes: -

Wrong Solder: If their efforts came out all blotchy and lumpy and they claimed they couldn't get the solder to flow it's a fair bet that they were using electrical solder usually bought from the DIY shop and often with the flux cored into it. Solder is a cocktail of metals and the constituents of that cocktail are messed with to tailor the solder for purpose. Electrical solder is designed to melt at a high temperature so it doesn't melt when the appliance gets hot; it's designed to have a low electrical resistance and it's designed on the assumption that it will be joining copper or tinned components. Also the flux included in the solder is designed to help the joint make but, more importantly, it is passive so if it's not cleaned off it won't damage the solder. Get the right stuff for the job.

Wrong Soldering iron: Usually having started with the wrong solder and concluded that it's not getting hot enough out come the blow torch or the induction heat gun. These are a no no and a disaster. Get the right iron.

Wrong Flux: As mentioned in the solder section electrical solder has to be passive. It has to be so as not to affect the electrical components but by being passive it is restricted in the help it can give to making the join. We don't have that restriction we can use something a bit more powerful.

So having told you how wrong you can be lets get you the right stuff.

Solder: – 145 degree melting point model solder. These are available in the UK from Carr's, Duncan Models or from me at EDM models. There are others like a 188 degree version you may add to your repertoire as your skill increases.

Soldering Iron: An iron in the 25 – 30 watt range with a fine tip is all you need. You will also need a stand and a cleaning sponge. These are often all sold as a set.

Flux: Frys Powerflow flux is my preferred flux. It's the same stuff plumbers use and comes in little yellow pots. You can buy it in B&Q [Home Depot in the USA] or from me. It's a white cream best applied with a cocktail stick.

That's all you need to get started. Over time and with experience you will add solders, fluxes and methods of heating to your collection. I have several varieties of solder, three or four fluxes, two irons and a resistance soldering station but the truth is that for 95% of the soldering I do I use the items listed above. The pilot tender models were all built with the listed items.

Getting Started

A few things you need to remember before you get started.

1. Soldering involves the application of heat. The iron and the work piece will get hot.
2. The flux is slightly corrosive and it will give off fumes when heated and are best not breathed in. You don't need to dress up like a spaceman, just be careful, don't bend right over the work whilst soldering.

I think that is enough stating the blindingly obvious before we get to "don't do anything", "everything is dangerous," so lets get started. There are four stages to making a soldered joint.

- Clean the surfaces
- Flux the surfaces
- Apply the solder
- Clean up afterwards

Clean the surfaces. What we are about to do is join to bits of brass together by applying molten solder. The solder actually penetrates the surface of the brass so the brass needs to be clean for this to happen. The easiest way to clean the brass is to rub it with a fibreglass eraser. The one I use is called a PoliRod and has the advantage that it doesn't drop little bits of fibres everywhere to stick in you. A few wipes with this the brass is shiny and ready to solder. [I'm probably not supposed to admit this but with new etches that have just come out of the box little if any cleaning is needed]

Apply some flux: It doesn't take much, just smear a small amount on both of the parts to be joined.

Set up the join. Bring the two parts together and get them lined up how you want them to be and hold them in place. Remember they are going to get hot so use pliers or the block of wood to hold them in place.

Pick up a small amount of solder on the tip of the iron and apply it to the join. There should be a great fizzing of flux followed by the solder running in to the join. Remove the iron and leave it to cool.

Clean up: Here's a ideal you'll never live up to, clean up each join after you have made it. The idea is that you clean and scrape any excess solder off each join just after you have made it. The theory is that you'll miss it if you leave it until later and also you will probably fasten another component in the way of the clean up. I set out to do this but usually lapse into bad habits.

Wash Up. The flux you have been using should be washed off at the end of each session. Don't think I'll leave it until tomorrow, you will regret it. The PowerFlow flux is designed to be acidic and active at the time of soldering but is then supposed to make itself inactive over time – it has to or your central heating would fall to bits. If you wash it off at the end of the session it will wash off with hot water, the cream cleaner [chemical theory interlude – flux is acid, cream cleaner is alkali and they cancel each other out] and a tooth brush it comes off easily. Leave it until tomorrow and it will have formed a hard crust and you will be chipping it off with a chisel – you have been warned.

If this is to be your first ever soldered joint cut some of the scrap material from the etch fret up and have a practice before doing the real thing. Right that's enough lecturing, now let's build the kit

A word on Etch Frets

In case this is your first kit its worth a few notes on how the etch is produced and what it means to us when it comes to building the kit. Etching, also sometimes know as chemical milling, is the process of removing some of the metal using a strong acid solution. Material is removed from both sides of the sheet at the same time and is only stopped from removing metal by a resistant coating. The coating is put in place from the artwork sent to the etch company. The coating on the two sides of the sheet don't have to be the same so you can half etch through from on side to get details and bend lines or etch through from both sides to get a hole. Generally this is very precise but it does have an impact for us. The acid attacks from the outside surface and works its way in so the outer face is exposed to the acid for longer this means the edge of a sheet or a hole through the sheet won't be parallel. On the edge of a sheet it means there is a small cusp to remove and holes are usually etched just a little undersize and need opening out. A few wipes with a sharp fine file removes the edge cusp and the round file or broach sorts the holes out. The etching process has the advantage of being able to etch half way through where a bend is required. In all such cases the half-etch goes on the inside of the bend.



Chassis Pt 1

The first bit to build is the first part of the tender chassis. At this stage we don't add the detail parts as we use the chassis to assist in assembling the body etches and they get in the way.

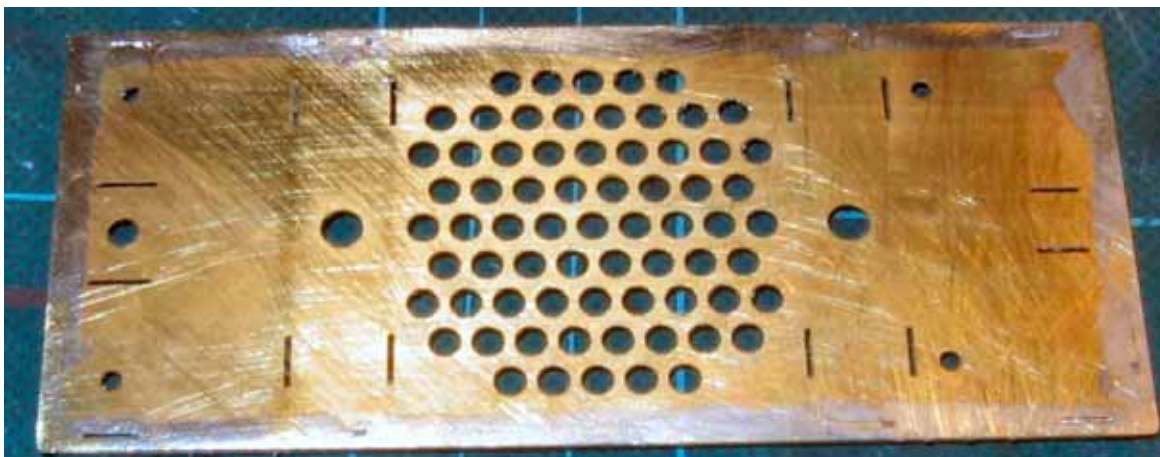
First job is to make sure all the components in the chassis etch fret are clean. If there are any bits that are tarnished now is the time to give them a polish whilst the etch is flat. Next cut the base and the chassis frames from the etch and file off any bits of the tabs that held them to the fret. Clean off the cusp from the edge [assume you do that all the time so I don't keep repeating myself]. Bend the first of the frame pieces to 90' at the half etch and place it into the half etch groove on the base with the tabs poking through the holes. Check that it sits in the groove, you may have to just trim the ends slightly, no more than a few strokes with a file. Apply some flux to the tabs and apply just a spot of solder to the tab from above. At this stage you are just tacking it in place so be in and out quickly. Prepare the second frame piece, this time you may have to file a bit more off



the ends so that they mate squarely at the corners. Tack this piece at the tabs as well.

Check the corners are OK and tack solder them as well. After a final check all is where you want it its time to solder it all in solidly, this is really easy to do and one of the clever things solder will do. Smear flux all around the inside of the joint between the side frames and the base, turn the base over and lay it flat on a surface that will stand some heat. You are going to do all the soldering from above whilst pressing down lightly to hold it all in place. Apply a smear of flux around the top surface of the base above the side frames. Pick up some solder on the iron and apply it to one of the tabs and base. You will see the solder will flow from the tab along the joint, believe me it does, turn it over and look once it's cooled. If you repeat this at all the tabs and through the unused slots drawing the iron right around the top of the base above the joint and the solder will run right around the entire joint,

That's enough soldering for now, its time for a clean up. File all the tabs off and smooth the top of the frame so it's flat and clean. Give the whole thing a wash in hot water with the cream cleaner and a bit of a scrub with the toothbrush. Take a break.



Body

Next up is building the shell of the body using the chassis already built as a jig to aid assembly. In brief we are going to do this in four stages.



1. Build the box frame
2. Solder the first side into place
3. Solder the second side into place
4. Add the finish detail

Cut the box frame and the side cross plates out of the fret. Cut the ladder etches out of the centre and clean all the tabs and the etch cusp off. It is important that you fully remove the cusp in the recesses on the box frame where the cross plates will sit.

Make the first bend at the rear ensuring the bend is at right angles. Once you are happy its 90° apply a tack of solder to the inside of the bend to reinforce the joint.

Make the second bend again ensuring it is 90 degrees. An additional check is to measure the distance between the top and bottom frames close to the bend and at the other end. The measurement should be the same. Once again re-

enforce the joint with solder. At this stage don't bend the front sections down as we'll do that last and avoid the errors in the etch.



The next thing we have to add are the cross frame side plates. Rest the tender frame on your block of wood and hold one of the side frames against the main frame and tack solder one end as shown in the picture. Check the cross frame is in the right place and flush with the top of the tender [either face could be the top until this moment, once you have made this joint the flush face is the top].

If the edge is all in place and flush with the top add a tack at the other end, check again and add a tack in the middle of the cross frame

Now repeat this process with the other side cross frame. Make sure you make the same edge the flush edge [guess why I am warning you of this mistake?]

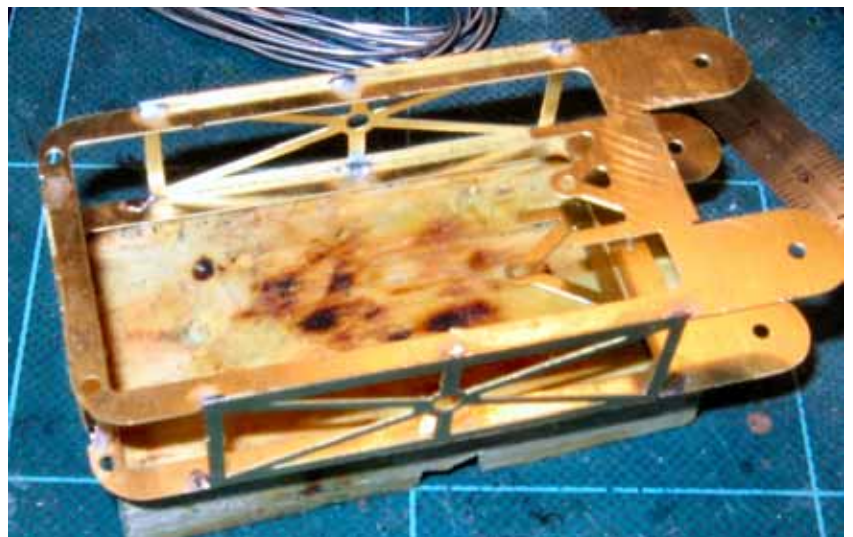
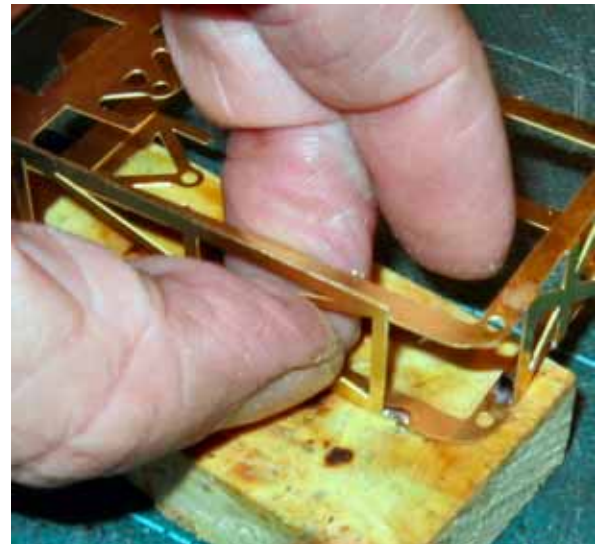
You should now have the folded tender top, bottom and end with the two side cross plates soldered to the top edge with the joints flush. The bottom face should still be free to move and the cross plates should overlap the bottom face by a couple of millimetres or so.

The next job is to tack solder the bottom face to the cross plates. This time they

don't go flush, the aim now is to tack the bottom plate parallel to the top plate. How do you get it parallel? Measure the gap between the top and bottom plate front and back whilst holding the joint in your fingers and when you're happy add a single tack. Check again and add further tacks. A visual clue should be that you will see the side cross frame overlap by a constant amount.

You should end up with a rigid box with the cross plates soldered on flush with the top face and overlapping at the bottom. With it tacked like this you can check its all OK and, if necessary get any one joint undone by apply the iron and easing a small screwdriver or knife blade into the joint.

Once you are happy with it the joints can be completely soldered. What were aiming to do here is to get the solder to run along the joint but only ever melting one of the tacks at a time. Smear the flux down the joint and applying the iron to one of the tacks, as the solder melts move the iron along the joint towards the next tack. You should see the

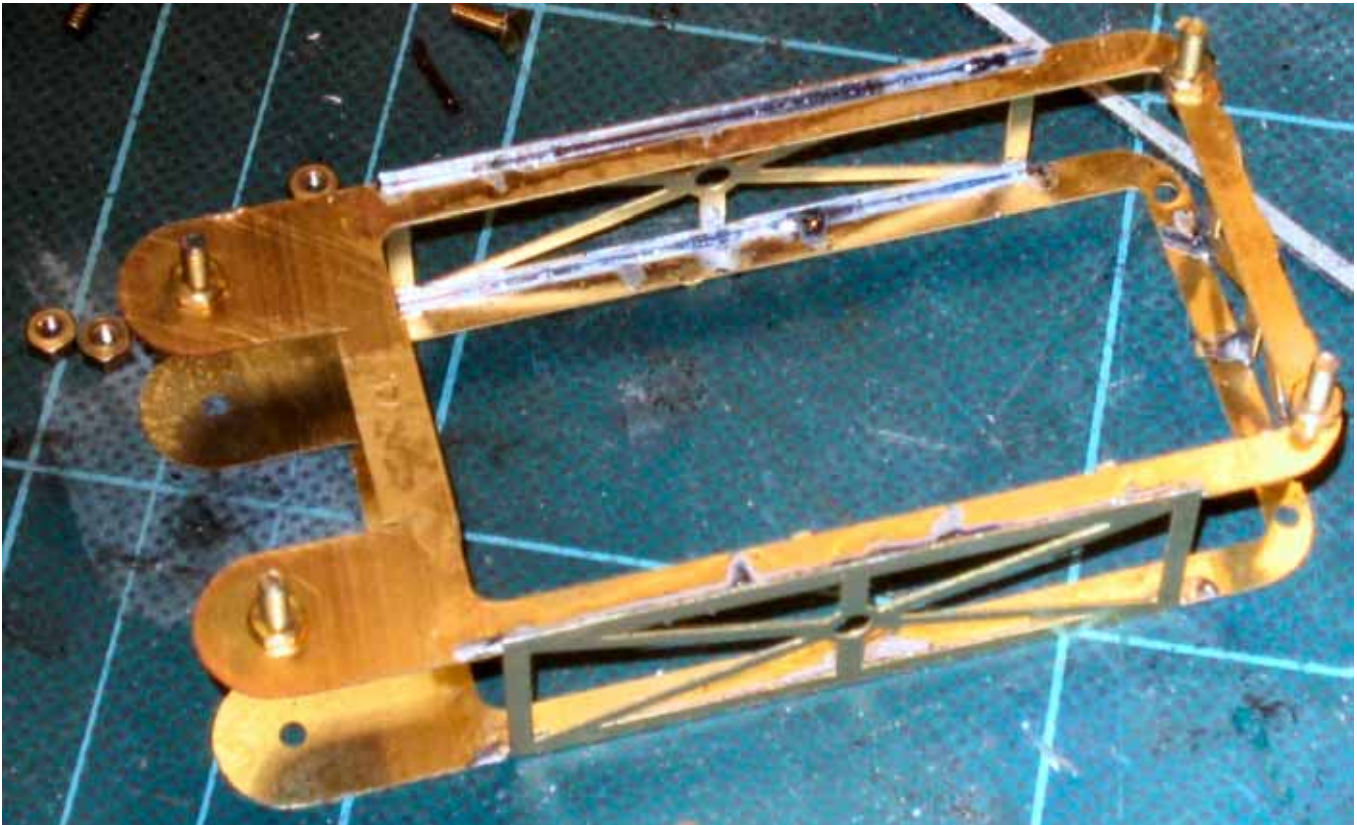


solder run along the join; don't add any more solder initially. When it stops following the iron along the join remove the iron, let the job cool then do the same with the next tack and repeat on all the joins. When I did this I didn't need to add any more solder but that will depend on how big your tacks were. If there are gaps in the solder along the join add more flux and solder.

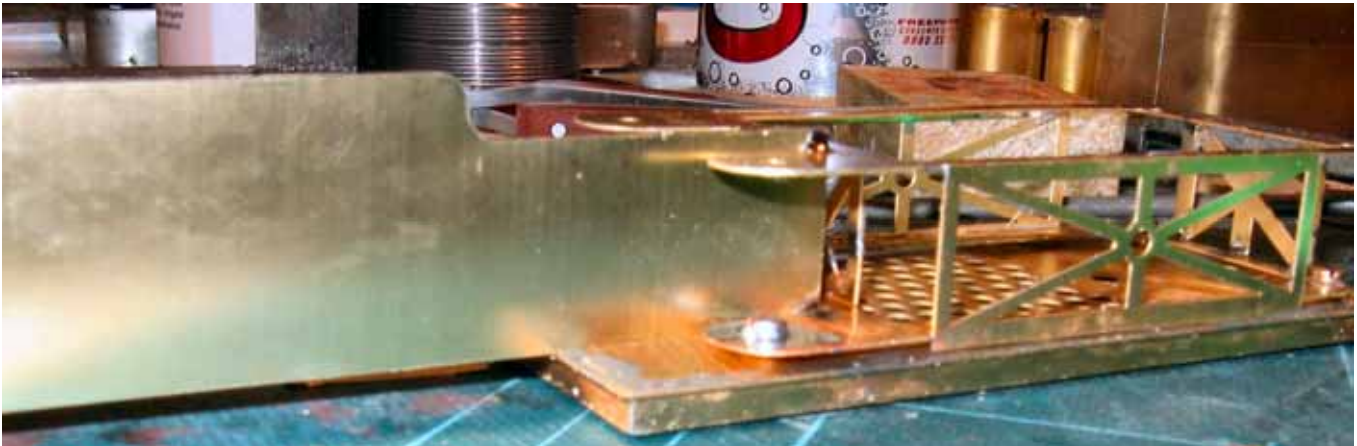
The final job is to bend down the front sections so they will overlap and then solder them. Don't worry about the holes lining up as they aren't needed for alignment anymore. *[With the frame assembled in the order described the front sections could be dispensed with by bending back and forth a time or two until the half etch fails]*

The final task in this section is to clean the four corner holes out and insert four of the 1/4" long 8BA screws through the holes facing down. On the medium tender use the four half thickness nuts for this. On the large tender normal nuts are used. Once they are done up tight, add some flux to the heads and solder them to the bottom face to ensure they can't turn.

Time for a break? Have a clean up with hot water, cream cleaner and a tooth brush. Reward yourself with a coffee break and admire your soldering.



Next we are going to add the wrappers and this is going to take longer to describe than it takes to do. Here it is in pictures with few words:



First job is to fit the box frame on to the chassis you made earlier and add another set of nuts to hold it in place. The side cross frames should just touch the chassis; you might just have to give them a couple of wipes with a file.

Take a wrapper that you have cleaned the cusp and tags off and insert it's in to the slots in the top and bottom plates. Ensure that the wrapper is flat on the deck as shown above. Add a solder tack top and bottom.



An Afterthought moment – make sure you get the wrapper the right way round! The row of sloping rivets etched on the wrapper should slope down to the front

Next use your block of wood to roll the wrapper around the front legs of the tender tank. Add tacks at the beginning of the straight side at the top and bottom of the frame. Press the wrapper into place with the block of wood.

The wrapper will roll round the ends easily if you use the block to apply even pressure as you do it and keep it tight against the frame.

Check the wrapper is still pressed down against chassis. If it isn't ease the tacks with the iron whilst pressing it down to the frame.

Once you are happy move the block along to the rear and add some more tacks along the vertical edge of the rear end of the side cross frame whilst pressing the wrapper into place.



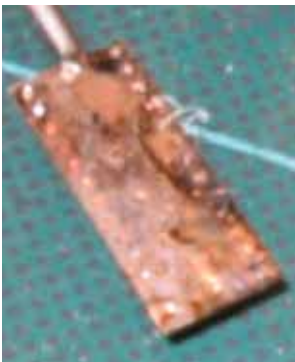
The final move with this wrapper is to roll it around the end. Use the block of wood to press the wrapper in and solder it to the rear frame. Just add a couple of tacks initially.

Now is the time to check, check and double check that it is aligned as you want it as you can get the tacks undone at the moment.



Repeat the process for the other side only tacking it at the moment.

Once you are happy with the tacked assembly you can remove it from the chassis and complete the soldering. Add plenty of flux, use the block to press it into place and run the solder along the joins top and bottom. Be careful not to undo too many of the tacks at once.



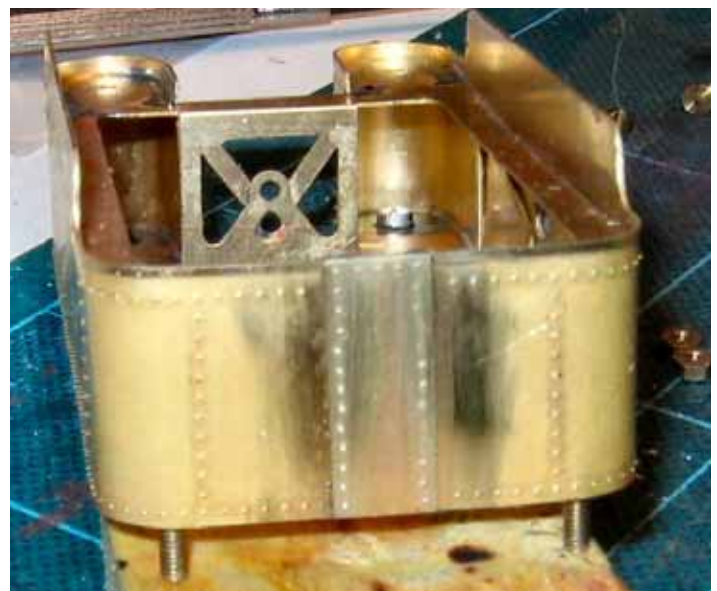
The last job for this section is to add the rear blanking plate. In the large tender this is a half etched plate and is ready to use. In the medium tender body it has half etched holes which need pressing out into rivet heads. The best way to do this is with a riveting tool but a simple way is to insert a panel pin in to the half etched hole and then tap the pin. The point will then emboss a rivet head on the other side of the plate. The trick with this method is to keep the blows the same to give even rivet heads.

The best way to solder the plate on is to apply a thin smear of solder across the rear of the plate. Add flux to the rear of the tender and check its alignment. When happy add a small tack top and bottom. Check again for alignment and then stand the tender on you block of wood so the tender body is pressing the plate down onto the wood and apply the iron to the inside of the tender and melt the solder. The solder on the other side will melt and run right across the joint. Let it cool down and give it a clean and it looks like this.

Clean up time again. Give it all a good scrub with the cream cleaner and hot water and have a break.

Final task on this bit is to spend a bit of time with file, scraper and graver [if you have them] cleaning any excess solder off the joins.

I managed to get a blob of solder on the outside of the



wrapper, here's how I removed it. 1) Use some home made solder wick to soak up most of the blob, 2) scrape away the rest with files and a knife blade. [The best tool for this was the graver but they aren't that common] 3) polish it with the fibreglass brush.

Chassis Pt 2

Part two of the chassis construction is to add the details to the chassis that would have been in the way whilst we were doing the body.

First job is to tin the back of the overlay components. This is easiest with them on the fret.



Next add the side overlays to the chassis. These are designed to be slightly overlength. Centre them on the side and hold with a clamp or tweezers. Run some solder in to the joint near the clamp and then work your way in a series of tacks to the ends.

Do this in brief dabs with the iron so as not to build up too much heat as the overlays will distort if they get too hot. Make sure the ends are well soldered and

then file them flush with the ends.

Add the end details. The end with the sloping bits and coupler cut out goes at the rear.

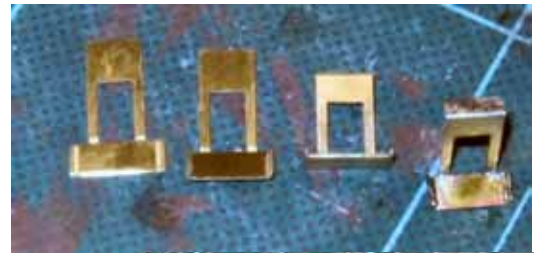
Next up are the steps.

Cut from the fret and clean off the tabs and cusp

1. With pliers fold the step sides up.
2. Fold the step to 90° with the back
3. Fold the top over
4. Apply flux and run a small amount of solder in to the joints
5. Solder the steps to the chassis at each corner.

Re-railers

Solder the re-railer castings to the frame. The tinning technique works well here. You may want to shorten the supports on the castings to give greater ground clearance.



Ladder

Now we are brilliant at soldering there is one last task for us to do and that is to build the ladder for the rear of the tender.

1. With the ladder still supported in the etch open out the holes to clear the wire with either a small drill or a reamer. Also clean off as much of the cusp as you can.
2. Remove the ladder from the etch and bend the two sides up to right angles. This is easiest with a folding tool such as the "hold & fold" range.
3. Thread lengths of the wire through the holes and apply flux. Apply a small amount of solder to the joint. This is best done by applying the iron to the wire away from the ladder and then move the iron towards the ladder until the solder runs. What you **don't** want is solder to run into the half etch lines
4. Solder the other side and trim the wires with cutters and file smooth.
5. **Tricky Bit – Remove the brass joins.** This isn't actually that hard. File across the join at 45° until you see a line appear. Do the same the other side and the centre bit will tear out with tweezers. Do both of them and then clean up in the usual way.



That's all the soldering done. Wasn't that hard was it?



Resin Details

Trim the tender top casting to fit inside the brass assembly. It is possible that the top is a little bit too thick so that it stands proud of the brass at the front. If this is the case thin it by rubbing it on sand paper being careful to keep even pressure on both sides.



Assemble the bunker sides as shown in the picture. This is best glued with a superglue type glue.

Glue the bunker top into the top of the tender. Apply one lot of superglue to hold it in place. Further runs of glue into the joint will act as filler into the joint.

Glue the bunker front packing piece and the bunker front into place. On the medium tender body these two items

will need trimming as the same bits are supplied in both kits. The packer goes into the tender with the steps facing inwards to fill the gap in the front of the etch. The bunker front then glues to this.



Add the cast details to the bunker top. The water filler is a brass casting in the large tender and resin casting in the medium tender.

In the large tender a packing block is needed to raise the back up light so it shines over the edge of the tender.

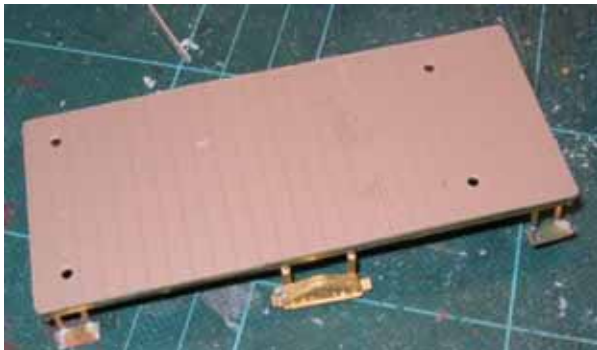
As a test to see if you read these instructions before building anything a handy tip is to use the etch for the tender body frame as a guide to drill a couple of holes for the water valves



On the tender chassis we need to add some resin details as well.

Clean up the casting that form the spine of the frame and glue into place.

The smaller block goes to the rear with the 1/4" 8BA CSK screw glued in to support a kadee coupling. The height should be right for on30.



At the front the 1/2" 8BA cask screw is fitted and the block glued on to provide a pin for the engine coupling.



Last job is to glue the embossed styrene deck on and drill through the fixing holes. If your styrene came in two pieces join it along one of the plank lines.

Trucks

The trucks are 3'6" wheelbase trucks provided by San Juan. If you are building them to 0n3 then they are built as per the San Juan instructions. If they are being built for 0n30 the brake rigging needs to be altered. The simplest alteration is to cut it off and have an un-braked tender. I have tried too other options with varying success.

Option 1: File the supports that hold the brake beams so they clear the back of the wheels. This is quick and not that difficult but it still leaves the brake shoes out of line with the wheels.

Option 2: Snip the brake rigging off at the bolster. Snip the brake beam in the middle and remove a small amount of material so the brake shoes are the right distance apart for the 0n30 wheels. Glue the brake beam back together with a solvent glue and add a styrene splice on the inside or underneath to strengthen the joint. Allow to set fully. Glue the rigging back to the bolster and reinforce the joint with some small pieces of styrene.



Finishing

You now have a tender body that is just waiting for you to customise it to make it your very own tender. The sky is the limit from just adding some coal or pipework, air reservoirs and so on. The large tender has a bonus of an optional oil tank with filler that just drops into place.



I hope you enjoyed building this kit. We have plans for many others over the coming years and are already working on our first loco kit. We would love to hear how you got on with this kit and see some pictures of your models

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