

Soldering - The "Black Art" de-mystified: Part 3

As we said in Parts 1 and 2....you can solder!

Here in Part 3, there are lots more tips, tricks ... and some surprising materials you can solder !

We'll now cover other aspects of soldering including white-metal and specialised soldering.

We'll talk about soldering irons and tips, soldering to low melting point white-metal, and how to tackle the harder metals such as spring steel and stainless steel. We'll also cover some tips and techniques for ending up with results of which you can be proud. In amongst it, we'll explain in detail about the various soldering iron tip types and when to use them. We hope you enjoy it.

White-metal and specialised metals soldering.

Soldering has gained a reputation as a "black art" to many modellers and, of all the soldering tasks, the soldering of white-metal & "hard metals" has gained more "mystery and nonsense" than any other area.

This isn't because soldering white-metal or the harder metals is all that difficult, it is just different. But like most "myths", it has been given a hard time mainly because of a poor understanding of the material, not enough preparation, wrong equipment and wrong choices in materials like solder and fluxes.

White-metal is just another modelling metal, and there are very few of the metals we use in modelling that cannot be soldered properly and quite easily, providing we use the right equipment, develop a couple of simple skills and proceed with the task methodically.

There are two factors that make a big difference to success in these metals:

Cleanliness

We are not talking simply cleaning the metals to make them dirt free, although that will help. To solder white-metal, it needs hard scrubbing until it's totally oxide free.... just before you solder parts together.

Most of the "hard to solder" materials need treating that way because they oxidize quickly or because their (often quite hard to see) oxide layers are actually very hard and act as a barrier that prevents the formation of the necessary inter-molecular bond between solder and metal layers.

Nickel bearing alloys are among the worst, and both nickel silver and stainless steel are good examples of this. Cleaning can be achieved without stress with the right cleaning tools and cleanliness at the moment of soldering is helped significantly by choosing the right flux, both of which are discussed later.

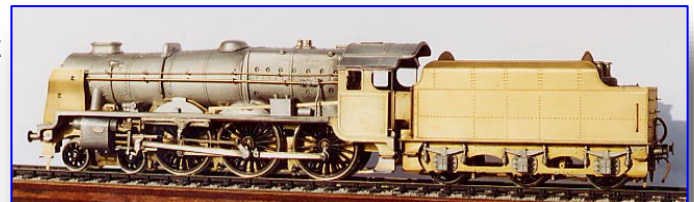
Adequate heat delivery at the right temperature

This is the key & it can be a real problem with larger metal castings if you try to use a low power or underpowered iron, which would force you to keep the iron on the white-metal too long!

Temperature and heat are not the same. It really doesn't matter how high or how low the temperature of your Iron can be set – it is the ability of the soldering iron to deliver an adequate amount heat to the joint at a rate which can both activate the flux, melt the solder and encourage the joint to form before the flux is burned off or evaporated, before the oxide layer re-forms and, most importantly, before too much of the heat applied has leached into the metal and weakened, damaged or melted adjacent parts.

In this Part 3 we are going to do our best to explain and teach you about these things.

If we can do that and also teach you a couple of simple and appropriate soldering techniques, then you really will be able to solder almost anything to anything – and therefore create almost anything you wish for your modelling.



**A classic type of kit offering a hybrid use of white-metal and etched brass.
This is easy enough to solder, if you have the right tools and advice!**

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Soldering Iron and soldering bit choices

Before we get deeper into white-metal, NS or stainless steel, lets establish a few important things.

We'll start by throwing out the rubbish. I often see advice that says a 25 Watt soldering iron is enough for soldering to rail and basic kit work. That is 100% rubbish. You need an iron that has enough power to deliver heat fast without the tip cooling, so that you don't need to hold it on the job too long and then overheat everything.

This same rule applies for everything from electronics to kit building. Never, ever less than 50 Watts. So don't even consider a smaller iron. In fact if you can afford it, go to 60 or 70 ... or even up to 80 to 100 Watts if you soldering big things or working in larger scales. A powerful iron is essential and high power doesn't mean bulky, clumsy or heavy.



The Atten 937 (LHS image) is a relatively low cost but durable temperature controlled 50 watt soldering Iron that will be a good choice for general bench work.

The Atten ST80 and ST60 (Centre above) are temperature-controlled Irons with a digital display. They can be pre-set. They are also at a very reasonable cost. We use these ST-series Irons ourselves on workbenches and they are very durable. (The number in the name indicates their power in watts)

For those with no intention of kit-building or who just want to solder the layout wiring or do a decoder installation or two, the excellent and very cost effective Atten SA50 (RHS image) is a really nice-to-use 50 watt stick-type soldering iron that also has full temperature control. It is very, very good value

All three of these top quality Atten irons are highly recommended - and we guarantee that all of them will let you do any of the things we talk about here properly. DCCconcepts also carry a wide range of Atten tips and we even hold spare parts in stock, so there is no need to compromise!

If you do, soldering will always be harder than it needs to be, and you will continue to be frustrated.

Soldering Iron tips

Not all tips are the same, and in perhaps the biggest joke that could be played on a modeller that is not confident in their soldering ability, the one that IS most commonly supplied on an iron is actually not the best type for electronics, not the best for general use and the least useful of them all to a modeller!

(Don't worry though - DCCconcepts always provide you with the proper tip as well as the standard tip with every soldering Iron)

The "Standard" B-type tip

This is the tip that's most often supplied with soldering irons. It sort of looks like what you'd expect a soldering tip to be... but it has a too-fine round tip that gives very little contact area to transfer heat, so that makes it only marginally useful for anything except basic electrical or electronics.

You'll use it rarely so regard it as the "emergency spare". There are far more useful soldering iron tips available for modelling work!

The commonly supplied but "not so useful" B-type soldering tip



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Soldering Iron and soldering bit choices

The very **useful C-type tip**.

The C type tip is in our opinion the most useful of all tips and it should be the tip that you use most of the time for all sorts of work.

This is because the fine end is fine enough for delicate work, yet the flat face is perfect for helping the iron to deliver lots of heat energy quickly to larger joint areas (see the drawing above the photographed tips to see what we mean).

The C type tip looks like a cylinder with the end cut off at an angle. It is worth owning a fine C-tip (1mm to 2mm flat tip diameter) and medium C-tip (3mm to 4mm flat tip diameter) at least.

If you only buy ONE, choose one with a face between 2 and 3mm across. (see the image here). **Highly recommended.**

The very **versatile K-type tip**

The K type tip looks like a cross between a scalpel blade and a chisel.

We were a little sceptical until we used it, and found it to be excellent for things like long seams (for example where a tender side meets a footplate or along the ends or roofline of a coach). It is very good for white-metal work too, as the large surface area of the bevelled edge gives excellent heat transfer for joining long castings together.

We were absolutely astounded to see this sort of tip being used during our DCC decoder development in the creation of hand soldered samples - the engineer used it to solder all 32 super tiny legs of a 32-pin microprocessor and the whole thing was only 5mm square!

Available in various sizes, and **Highly recommended.**

The **handy K-type tip**

While I do not use this tip much myself, I have several modelling friends that really like them, so I am happy to recommend them too.

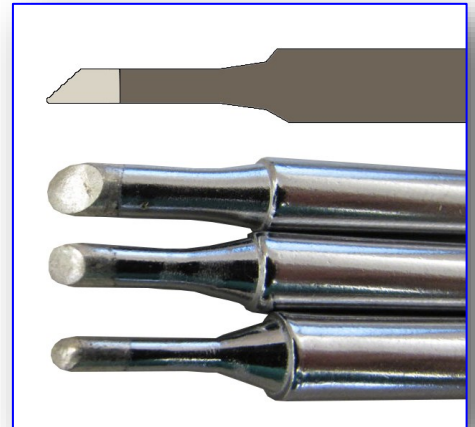
These are actually excellent for soldering droppers to the rails as the heavy end to the tip encourages heat transfer without being too large as a bigger C type tip can be, and the smaller versions are quite useful for soldering to PCBs when wiring DCC installations.

One smaller tip (about 2mm) and a larger one of about 4mm would be good choices if you wanted a long lasting and versatile set of tips to supplement your C-type tips.

Available in various sizes, and again, **Highly recommended.**

About TIP and soldering iron design

You'll notice that each tip has quite a wide "barrel". This barrel is hollow and completely surrounds the ceramic element inside the soldering iron. This means there is a really big contact area between the heating element and tip, so heat transfer is very, very efficient and tip temperature and recovery are therefore many times better than the kind of tip that is just screwed into the end, if the Iron, where only the thread area contacts the iron, and only the very end of the tip is actually close to the element!



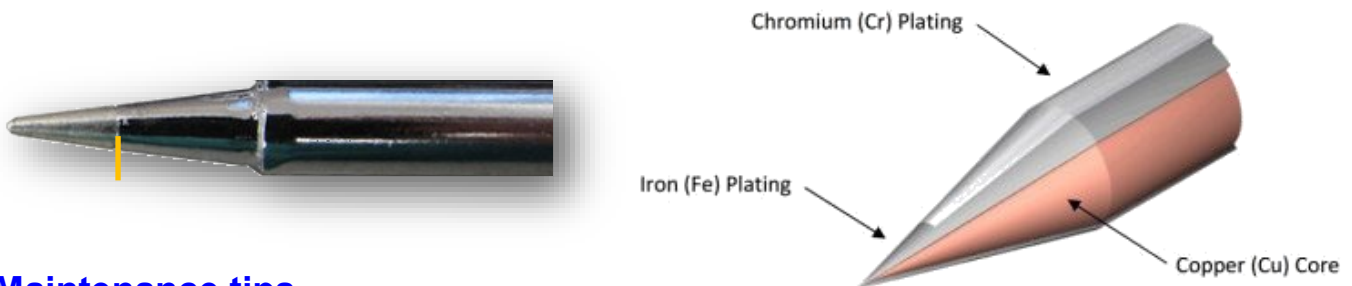
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Soldering Iron and soldering bit choices (continued)

Why you should never file or use an abrasive on a soldering iron tip!

We'll use the initial tip image again here so I can explain the structure of the tip.

Inside is the copper core. This is usually 99.9% oxygen-free copper for best thermal transfer. The rest is plating... and once that is broken or damaged, then the tip will quickly become useless.



Tip Maintenance tips

The maintenance of a soldering iron tip affects tip life much like the maintenance of any other tool and the lack of maintenance will dramatically shorten the life. Maintenance of a soldering iron tip consists of regular cleaning, inspection, and the re-tinning of the tips working surface for protection.

Proper tip maintenance will greatly extend soldering iron tip life.

A soldering iron tip should be cleaned regularly by removing any oxidized solder, flux residue and debris from the tip.

This can be done with a damp sponge or non abrasive tip cleaner such as activated brass wool (see image).

If a sponge is used, please try to use only distilled water. If distilled water isn't available or is too costly, de-ionized water can be used.

Using distilled water is best because it minimizes any mineral contamination of the surface of the tip. It's also important to regularly replace the sponge as it will collect contaminants. Changing it reduces contaminants that get to the tip when it's cleaned with the sponge.

A non-abrasive tip cleaner is an excellent alternative to a damp sponge since it minimizes the thermal shock to the tip and does not remove all the solder from the end of the tip, so it helps protect the plating of the tip from the surrounding air, which leads to oxidation of the working surface and corrosion.

During tip cleaning, the condition of the working surface of the tip should be carefully inspected for any signs of shape change, pin holes, or other physical defect.

These are indications that the tip life has been consumed and the tip should be replaced.

The final and most important part of tip maintenance is the application of solder to the tips working surface for protection, also known as tinning the tip. It is best to flood the entire working surface of the tip with solder immediately after cleaning and before putting the iron away at the end of a work session.

This process covers the working surface and protects it from reacting with the surrounding air which can lead to oxidation and corrosion. It will really extend tip life if you do this every time!

Tips are like chisels and files: delicate things and, as with any tool, they should be treated with care.

Take care not to bang or drop the tip against a hard surface or you may damage it, or even worse, you may damage the ceramic heater elements that is used in your top quality Atten soldering iron!



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Its time for us to get back to soldering...

Issue #1: Soldering common but normally incompatible metals

Sometimes, we need to solder one item to another, yet the metals are not the same and to make it more difficult, the solder needed for metal "A" will not work with metal "B".

The most common occurrence here is soldering white-metal to brass. We need to use a "low temperature" solder for the white-metal but this will unfortunately not stick to brass.

The solution:

Step #1: Tin the higher temperature metal (i.e. brass) first: Make sure your soldering iron is fitted with a C type tip (best for area tinning) and that the tip is clean and shiny all over.

We will use DCCconcepts Sapphire 145 or Sapphire 179 solder, plus a liberal dose of DCCconcepts Sapphire No-Clean flux to aid the flow.... but there's preparation work to do first!

First clean the area of the brass to be "tinned" with a fibreglass brush or other fine abrasive.

Set the soldering iron temperature control to about 380 degrees Centigrade. This is the normal temperature for soldering brass and nickel silver (the iron will work better at well above 400 degrees for steel and stainless steel).

Add lots of flux and use only a very little solder... flowing it out with the soldering iron tip until it's no more than a thin "plating" on the brass. Don't dawdle too long and always keep the tip moving.

If it is needed, clean up later with a fibreglass brush used "soft". "Soft" means with approximately 1cm of the bristles exposed. Short bristles will give a strong abrasive effect, longer bristles are less aggressive.

When it has cooled, give it a good clean again, leaving a shiny tinned surface.

Step #2: Prepare and clean the white-metal part: Use an old file (white-metal ruins good files) or perhaps abrasive emery sticks from the lady's nail care drawer to clean up the casting as needed.

Then, before you try to solder it, use Cif or a similarly old-style abrasive bathroom cleaner and an old toothbrush, vigorously scrubbing the part under warm running water.

The brush will blacken (with the oxides you are removing) as the casting starts to shine. Take your time and give it a serious clean, then rinse thoroughly and let dry.

Step #3: Making the joint: You must always lower the soldering iron temperature for white-metal use (I like it at about 200 degrees Centigrade) and before starting, clean any excess tin/lead solder off the bit.

Plan to work on the back of the joint if you can. Any errors will be hidden there!

Position the whitmetal part and add a good big brush-load of DCCconcepts Sapphire No-Clean flux so that it floods the joint area and fills the spaces between white-metal and tinned brass.

Pick up a smallish amount of DCCconcepts Sapphire 100 low melt solder on the soldering iron tip and apply the flat surface of the tip to the metal on one side of the joint.

As soon as the metal heats to a little above 100 degrees Centigrade, the solder will start to "suck in" to the joint. Move the iron slowly along the joint... do not stay in one place.

If needed, adds lots more flux and apply more solder (just enough – too much is hard to remove tidily).

Important: if it is taking time to get the flow right, work in short bursts and do not let the metal heat up too much. Re-clean the soldering iron tip and re-flux often.

Is the joint looking clean? If so, then the job is done! If the joint is still not smooth, re-flux and run a clean iron tip over the joint. Excess solder will be drawn in.

If any excess still remains, dip some solder wick into the flux and hold it on the seam. Place the iron on the wick and run it along the joint. Any excess solder will be drawn in and removed by the wick.

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Its time to get back to soldering...

What to do when the soldering session is over

Wash the model with closest attention to the joint areas. If you've used DCCconcepts Sapphire No-Clean Flux, then methylated spirits or even a good scrub with detergent and water will do.

However, use some ammonia in water or any alkaline solution (a little washing soda in water is good) to remove and neutralize the remaining flux residues if you use acid fluxes of any brand.

By the way... an old toothbrush, or, for the tool freaks among us, a dedicated battery toothbrush are both really useful cleaning tools.

Summarising the joining of brass and white-metal:

It is easy... and this technique can be used for attaching brass details to white-metal boilers of course. It can also be used when soldering most "apparently incompatible" metals to white-metal.

Copper, brass and nickel silver all tin well and can then be attached to the white-metal in the same way. A good bond will always be possible, certainly strong enough for model assembly purposes, but do be aware that it will not be as strong a structural bond as brass-to-brass etc.

But - don't do this for electrical connections to cast metal: Sometimes screw fixing really is best!

Sneaky tip: How to get a useful new kit-cleaning tool from the wife:

My wife is very used to me coming into the kitchen to clean kit parts with Jif (Ozzie for Cif), anneal brass on the gas stove etc... and several years ago, I carefully asked my wife if I could experiment with her electric toothbrush and an old worn out electric toothbrush tip as a cleaner for my brass models ...

She said OK, and it worked really well, doing a great cleaning job but remaining gentle on fine detail work.

And... to my surprise, a brand-new electric toothbrush appeared on my workbench the very next week!

I guess she thought I might try again when she wasn't looking and didn't fancy the taste of JIF.

Soldering whitemetal to whitemetal

A little more background on white-metal. Firstly, understand that it is not always the same stuff.

The name white-metal covers a very wide range of alloys from pot-metal to pewter, and the varying alloy mixes can have a melt range between 200 and about 300 degrees Centigrade.

They are generally made up of varying quantities of antimony, lead, cadmium, tin, bismuth and zinc and so are less than environmentally friendly! You should always wash your hands after building kits with whitemetal, as the trace additives are all heavy metals including arsenic and other not-nice elements.

A variant called ZAMAC also exists. This contains aluminium. ZAMAC variants are commonly used in the creation of die cast toys or ready to run locomotive chassis and it can be quite hard to solder.

Fortunately... white-metal kits are almost always a classic white-metal or pewter, easy to solder to and reasonably consistent in their melting point at 220 to 250 degrees Centigrade. That makes it much easier for us when using irons set between 190 and 200 degrees but. with perhaps only 20 to 30 degrees between a well assembled kit and a melted set of parts, we still need to be careful.

Follow the instructions for soldering tinned brass to white-metal and you will not go far wrong.

Here is a challenge and some excellent practice... it is also fun!

First, solder a few offcuts of white-metal together to get the hang of it. Then, to prove your gentle touch, make a ring out of 179 solder, and solder its ends together with 145 or 100 degree solder.

(Tip - set the iron to 160 and use lots of flux). Go on... have a go - you may surprise yourself!

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Soldering the harder metals

It is now time to take a look at how you can solder the supposedly "difficult to solder" metals.

Depending who you talk to, brass and nickel silver can be classed as easy or hard, but personally I find that with both, it's a simple task and they solder very well. You will too.

Certainly, brass or nickel silver rod, wire or rail is much easier to solder than some forms of sheet in the same material and castings of any metal are always harder than soldering processed metal such as rod, profiles or sheets.

This is because castings & sheets are generally hardened in the production process. Fortunately the brass that's used in etched kits or K&S metals shapes is usually very good to solder.

Spot Soldering brass, nickel silver, copper, steel, spring steel, and stainless steel

This includes soldering detail to larger parts, small sub assemblies and similar things.

File and tidy up any cusp left over from the etching process or remove any rough edges or other "dags" left over from cutting to size or from the fret, etc.

On castings, remove any flash and clean up mould part lines or casting sprue stubs if present.

Clean well before soldering. Wash and scrub any remaining contaminants away then thoroughly clean the areas to be soldered with either wet and dry (600 grit +), a cleaning block or a fiberglass brush.

Check the iron is set to the right temperature. This is 380° for brass or nickel silver, 400+° for steel and spring steel, maximum temperature for stainless steel. Have the appropriate bit in place.

If needed, protect any adjacent joints that are very close. I find a wad of wet tissue (or even loo paper) is a very effective heat sink and works wonders as an easy to use protection that easily conforms to all shapes and won't harm fine detail.

The water acts as a heat-sink and the protected item cannot heat past 100° until its all boiled away!

Consider tinning the mounting point if it's a tiny part. This usually lets you get away with minimum solder and gives a really tidy joint where the item is very small. It also makes the soldering time shorter.

Place the parts in position, making sure you can hold them correctly in position without burned fingers as the heat travels quickly. Don't kid yourself - tiny parts heat up fast and it hurts... ask me how I know!

Apply the flux. Use a brush and be reasonably liberal with it.

Wipe the soldering iron tip on the damp sponge to clean it then take up a small amount of S179 or S145 solder onto the tip of the soldering iron.

As always with soldering, less is more. Use as little solder as possible.

Apply the solder-loaded iron to the joint area.

Do not press down on it with the iron. Pressure does not help and will damage the soldering iron tip or the model. The solder should flow quite quickly if the parts are clean and you added flux.

If needed, work the solder smoothly into the joint by gently moving the tip along or around the joint.

Do not linger too long before you remove the iron. It is better to let it cool off then re-flux / re-work the joint again rather than stay too long on any joint.

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Soldering seams and longer joints in brass, nickel silver, copper and steel.

The process isn't so different to soldering individual items, but you may find these notes will help.

Make sure the parts fit well along the whole length of the seam with no gaps.

File or gently bend the material to accommodate any irregularities.

Check this carefully, Yes, solder is an effective filler on some occasions but it's better if it is not needed and taking real care in preparation will make a difference to the final result.

I do not always bother tinning unless it is a difficult seam such as a right angle joint in very thin material such as a lamination at the front of a Belpaire firebox. However tinning will ease the process and it can be helpful in ensuring a good strong bond first time.

So only tin the areas that will be soldered and make the tinning layer very thin .

(If you make the layer thin any excess will easily buff off with a fiberglass brush and become invisible.)

If there is space and easy access, work from the back initially for this by "spot soldering" at a few places along the joint, making sure it is true and in exactly the right place.

Once that is done, re-check the position or alignment before soldering the whole seam.

Adjust if needed.

It's time to properly flow the seam. First, re-flux generously along the whole joint.

Work from the back of the seam first if possible.

Once it's firmly in place, re-flux the front of the joint area and with little or no added solder.

Work the front so that the solder perfectly fills the joint area, leaving a thin silver line where they join with no added "fillet" or excess of solder.

Add just a little solder to the tip and (again from the back if possible) with the tip touching both bits of material, run the iron slowly, gently and steadily along the seam. Keep moving the iron and do not stop in any one place.

When solder runs out, add a little more to the tip and repeat fluxing and flowing the solder onto the joint.

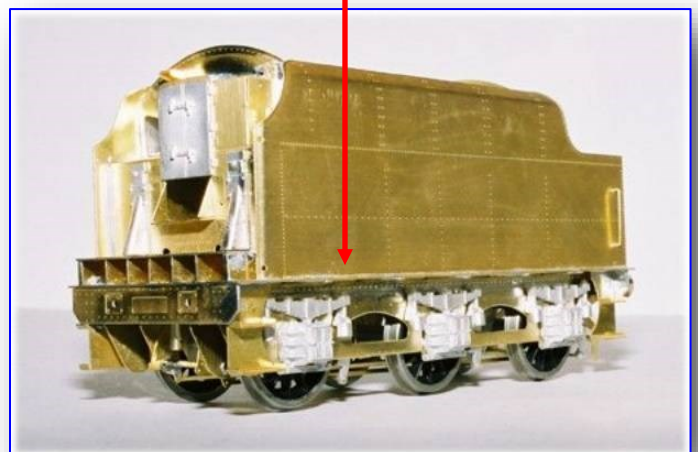
- If at any time the flux evaporates away with iron heat, add more.
- Do not linger too long in one place or overheat the brass. If it gets too hot it is much better to stop, let cool, re-flux and re-flow.
- Do not press hard with the iron at any time. This will not help and it will damage the tip!

If you have excess solder on the seams, it's time to use the de-soldering braid soaked in flux.

First dip the braid in flux then place it on the seam.

Then place the iron on it and move it along the seam with the iron and it will pick up the excess, leaving you with a nice clean sharp joint between the two parts.

Get it right and you will end up with a nice tidy seam like this one, where the tender side and the footplate edge join.



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Spring steel and Stainless steel

Techniques remain as previously mentioned for brass and nickel silver... but with some slight changes.

The most important one is... set the iron to its maximum temperature.

Stainless really does need a good strong iron... so don't even try if yours is less than 50 Watts.

Use a C type tip or a chisel tip with reasonable contact area, and a high power iron (or a gas iron of good quality with a controllable torch-type tip). We need a slightly high temperature for these metals.

Use DCCconcepts Sapphire No-Clean Flux.

Perfect cleaning of hard materials is absolutely essential.

You could use a fibreglass brush used "hard" (short bristle length) or wet and dry to make sure raw metal is exposed and no oxides remain. However, when soldering things like rod and strip I find it much quicker and easier to use a really fine file. This rips through the oxides quickly!

Remember - clean just before soldering as oxides return quickly!
Solder within an hour of cleaning.

Tinning 3 and 4 Series stainless steel or spring steel with DCCconcepts Sapphire 179 solder (containing silver) will help a good joint and, once tinned, you will be able to solder almost any solderable material to the stainless steel.

For larger jobs on stainless steel or similar metals, you should consider using a small torch-type iron to gain maximum heat delivery.

Again quality matters so don't expect a low cost discount gas iron to do a good job.

If the joint is reluctant, start again!

Persisting will only restore an oxide layer that will then never take solder properly! That means removing 100% of what is there - re-cleaning, re-fluxing and re-tinning before trying again.

Worried? Don't be... When we do soldering courses, one exercise is to solder a spring steel wire to a stainless steel plate - everyone always manages it just fine, and the joint is strong enough to "ping" the wire!

Soldering aluminium alloys and some die-cast metals containing aluminium

To be honest, this isn't at all easy ! It's hard to be specific as to what will or will not work because the metal formulations vary and we rarely know what has been used to make the specific alloy.

Soldering iron temperature, tip choice and cleaning should be as per spring and stainless steel but you will need to solder immediately after cleaning with no delay. This is because most aluminium type alloys start to oxidise immediately when they are exposed to air.

It may be helpful to pick up some "aluminium solder" and special flux from the hardware store.

However, if it's a reasonably good quality aluminium you can usually tin it with DCCconcepts Sapphire 179 solder. Once tinned, you can then solder most other solderable materials to the aluminium as the tinned coating will "take" with normal solders.

Important: Joints made to aluminium can become brittle if they are left exposed to air.

As soon as possible, clean off flux residue thoroughly, tidy up the joint as needed and apply a coat of primer to the area that has been soldered. This will "fix" the joint and it should remain strong and firm.



Stainless sheet with a piece of stainless tube soldered into it

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An overview after soldering aluminium alloys, spring steel and stainless steel

The harder metals are all alloys of one kind or another. Stainless steel contains various combinations of nickel and chromium, spring steel has additives to increase its hardness and improve its springiness, and aluminium and casting alloys are made from a huge number of differing metal combinations.

All of these "special alloys" oxidise rapidly even if, like in stainless steel, the initial oxides act positively and protect the material from further corrosion. They need to go if the metal is to be soldered!

We need a very active flux to get rid of these oxides, and we need to respect these more aggressive fluxes, because they can be corrosive or bad for health if used carelessly. ONLY DCCconcepts no clean flux is both safe to use, breath or handel and OK with most alloys! The others are corrosive!

For example, if left in place overnight an overly active or heavily acidic flux can etch or damage the metal and, if not passivated after soldering, it could also start to affect the joint, making it brittle or eating away at it! This is most common with aluminium, which oxidises very readily.

If aluminium is involved, why not first consider gluing the parts?

What you say? Heresy! ...Well, not really. Soldering aluminium tidily is not easy and there are some really top quality glues out there. The one I use most is Loctite 480.

This is a black, rubber-filled superglue with amazing strength. Because it is rubber filled, it is shock resistant and, because of the rubber filling, it is also a bit of a gap filler as well. It cleans up easily using MEK so can be used for good quality joints in difficult metals.

TIP: buy it from someone who understands and sell lots of these glues, because it really should be stored properly in a cool place so it will last. After buying, keep it in the refrigerator!

Prepare the parts and test fit before you start the job. Prepare not only the alloy parts but any of the parts that will be applied very close to the aluminium.

If aluminium is involved, solder it first, wash it, then solder other parts and dress/clean up all joints. Clean the sub-assembly very thoroughly with a neutralizing solution made with washing soda and water (or ammonia and water) followed by a detergent or scrubbing type cleaner like Cif & an old toothbrush.

Rinse very thoroughly then wash in hot water and dry with a hair dryer or fan heater.

When it is thoroughly dry, and while it is still warm to the touch, apply a spray of automotive undercoat aerosol. This is to both seal and protect the alloy joints from any further oxidization.

Any areas that still need soldering can easily be cleaned off later with a bit of MEK or other solvent. When this is done, follow the cleaning and priming routine again.

Stainless and spring steel (etc)

Irrespective of material soldered, all soldering jobs will involve a flux that should be neutralised later.

Active fluxes: Use an ammonia and water mix (or washing soda and water) in an old ice-cream tub on the workbench. If leaving the project for lunch or stopping for a short while, just drop it in and rinse off.

After finishing for the day, give it a good clean in this mix with a toothbrush followed by a thorough rinsing under warm water. Then scrub with Cif and a toothbrush to get things clean and shiny ready for the next days work.

Non-active fluxes. Use alcohol and water (meths and water or isopropyl alcohol and water) as above for the interim and post-work clean, followed by the same scrubbing and rinsing as for active fluxes.

Don't skimp on this and if you can get to the job without damaging it.

Even clean off "no-clean" fluxes if you can. Cleaning after soldering is good practice that should become a good habit, as in some cases not doing it may lead to reliability problems long term.

A clean job is a good job no matter what the soldering task is!

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More soldering tips and techniques

Soldering close to other soldered joints

I solder everything on a loco kit, from major parts through to tiny things like handrail knobs.

That means that I'm soldering parts to parts that have also already been soldered.... yet, I have almost never had a problem with heat causing one detail to drop off when I solder another to the model.

There are two easy ways to do this.

* Use a "step solder" process

This means using a couple of different solders which are designed to melt at different temperatures.

Solder major components together with a higher temperature solder.

Add the later details using lower temp solder such as DCCconcepts Sapphire 145 detailing solder

* Use heat-sinks to prevent problems

These can be anything you can find that be placed on or clipped to the work between the previously soldered parts to absorb the heat from the second joint.

For example:

- Special alloy clips designed for the purpose.
- "Dolly Grips" – older style hairdressing clips for holding rollers in hair. Easily bent and shaped (the ones referred to are made of aluminium alloy) but they may be hard to find. Persist!!
- Metal bulldog clips from the stationery shop.
- Pliers, forceps or medical clamps.
- A bit of alloy held on with a clothes peg.
- A lump of metal simply held by its own weight.

But my favourite... and most often used???

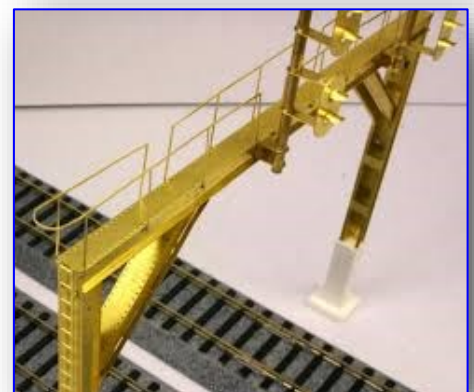
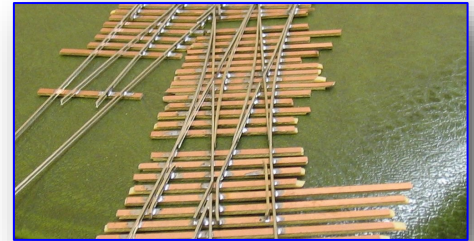
- A bit of wet loo paper, a cotton wool ball or a tissue – almost wet enough to drip but not quite.

This should be squeezed and shaped to fit and placed on the area needing protection. Hold it in place with a spare finger.

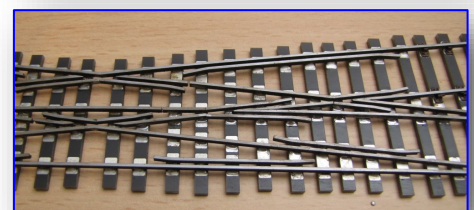
This works every time if it can be applied to the area.

You can even see it working (and if not careful, feel it) as the water boils off, showing you just how effective it is being!

Keep it wet, replace or re-wet as needed... as that area will not exceed boiling point as long as it stays wet, and that means items protected by it won't be harmed!



Once you can solder ANYTHING Becomes possible



Soldering - The "Black Art" de-mystified: Part 3

A last look at soldering tips and techniques

Cleaning up and removing excess solder

There are two parts to the clean-up: dealing with excess solder and removing active chemicals from the project at the end of every work session:

Keeping it tidy

We could of course always chip away at it, but the easiest way to get rid of excess solder is to use the right technique and never have it there in the first place. Remember that the only part of the solder that contributes to the joint strength is the bit that makes contact with the metal. All the other solder we add is really only to make us feel better, and it really just makes the job look messy and imprecise.

Keep blobs on inside seams or avoid them totally.

Tinning followed by re-fluxing and minimal solder use is always best, even if seams need to be tough.

Minimising excess solder

Tin parts with a thin coat of solder that flows really well like our Sapphire 179, clean up the tinning before assembly, removing excess or sanding smooth if too much has been applied. Then re-flux and use the absolute minimum solder on the bit (just enough to help heat transfer) to make the final joint.

Work from the rear of every joint if you can and only solder from the front where some slight gap filling may be needed. If you need to do this, if possible, add solder first to the rear, and only draw it through the work as a final finishing touch. Do this by re-fluxing and then running the iron along on the visible part of the seam to attract just enough into the joint to make the perfect joint.

Run a bit of flux-soaked de-soldering braid along joints to pick up excess and create a smooth seam.

Removing excess solder

Try not to use your new or expensive files – they will soon clog and be rendered useless.

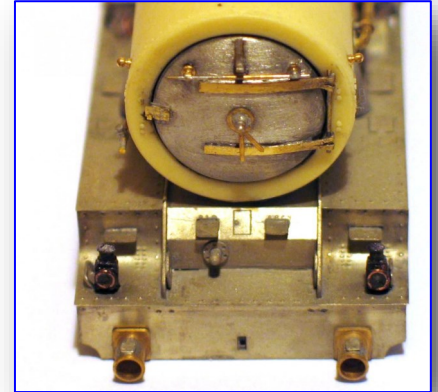
If you must use a file then either chalk it with dry chalk or dip it in a weak solution of ammonia and water first. Apparently (I've not tried it) this will reduce clogging or make it easier to get bits of solder out of the teeth.

An economical and very effective alternative that is perfect for curved seams is reasonably coarse wet and dry paper (appx 180~240 grit) glued with waterproof glue to a strip of flexible metal or plastic. Vary the width and make a few from very narrow to, say, 10mm wide. Used wet (dip it in water) this will clean off excess very well and will also follow the edge of a joint or the curve of a boiler profile beautifully without creating "facets" or flat areas anywhere.

Take your time and don't skimp on the clean-up... even during a soldering session.

Dip the loco body or wagon in a tub of water and detergent (an old ice-cream tub works well) and clean it off regularly so you can see and feel each joint properly.

The places that still need work will then stay obvious and you'll do a better job.



No excess solder here
(many, many tiny parts
and all of them soldered)



Soldering - The "Black Art" de-mystified: Part 3

Summary

The clean up

- I tend to use old files or disposable abrasives like emery boards or files made from wood strips and wet-and-dry abrasive sheets to clean up solder or white-metal. However, I have also seen it recommended to use older files dipped in ammonia/water mix or liberally coated with chalk or talcum powder to reduce clogging.
- It helps to have a scraper or two if you need to clean up awkward-to-get-to seams and spaces. I like to use a broken off scalpel blade or snapped off hacksaw blade or even an old otherwise "past its best" sharpened screwdriver to tease away excess solder. Use lots of gentle strokes to gently pare away any unsightly lumps or square up and sharpen a seam...
- Use de-soldering braid. If you have a long seam, such as between two bits of white-metal casting that are firebox and boiler (or two bits of brass that make a seam between tender side and foot-plate) running a flux soaked de-soldering braid back and forth with the iron on top will both remove any excess and give a beautifully smooth and sharp 90 degree angle between the two by removing all solder except that which comprises the bond. Make sure there is lots of flux and stop as soon as its all gone or steamed off.
- Use the fiberglass brush set to "hard" i.e. no more than about 5mm showing. It will wear away solder surprisingly fast.
- Use wet and dry paper used wet.

Preventing oxidization

Solder oxidizes and fluxes plus heat make it happen quite fast after the joint is made. The first and most important rule is to thoroughly clean the project before and after every work session – and during the session too if you are using strong active fluxes (every coffee break is a good guide) .

Before you put the soldering iron, solders and fluxes away

Soldering Iron: Clean the tip thoroughly, re-tin if needed. Add a good load of solder and turn the iron off. That added solder will cover the tip and protect it while its not being used.

Next time you use it, heat, clean that solder off and you will have a nice, clean tip ready to use.

Fluxes: Make sure the tops are on properly and store in a dark, cool place. Solvents will leach out if tops are not on tight, and direct light may affect the chemicals in the flux over time. Keeping it cool is a good idea as that will minimise any in-bottle deterioration that may happen if your flux brush has added contaminants to the flux.

Solders: Keep them in an air-tight bag, in a cool place. Solders are also alloys and they can oxidise, especially the low temperature solders. The better you look after them, the longer they will last.

Work areas: Wipe down with a wet cloth and detergent. If your fluxes were aggressive types, use a neutralising agent in the water (ammonia, washing soda, etc.) so that things you put on the bench will not corrode.

**Do you still have any other questions about soldering?
No problem – just email us and ask, we'll be happy to help!**

OK... that's all on soldering for now. But, please, don't just sit there!

I've spent many hours writing these pages and trying to help you... the least you can do is get to it and start on the path towards becoming a soldering expert ☺

You will succeed, so go on, get started! Happy soldering!