Soldering - The "Black Art" de-mystified

Before I start this series of three articles on soldering, it's important to know one thing.

You <u>can</u> solder! All you need to become as good as anyone else are the right tools & materials and a little guidance. Take it one step at a time, and don't rush at it. You'll soon be an expert!

Part 1: The right stuff!

First: a little about soldering, soldering tools & solderable metals.

WHAT IS soldering?

Here are a couple of ex web definitions.

Both are accurate, but they really describe only the "what", and tell you little about the "how" of soldering.

- A technique used in making or repairing items whereby two pieces of metal are joined by applying a molten metal which has a lower melting point than the two metals being joined.
- A process used to bond similar or dissimilar materials by melting a filler metal or alloy that's placed between the components being joined. (Solders are generally filler metals or alloys that melt at temperatures below 450 degrees C. (Above this temperature, the process is termed brazing and can use different materials and tools)

HOW DOES Soldering work?

Soldering is a process by which two metals or alloys are joined together with a third metal or alloy.

The third metal or alloy is the solder. It has a much lower melting point compared to the first two metals.

Soldering is different from adhesive joining. Adhesives bond by mechanical attraction having to do with the mechanical surface properties of the material relative to the adhesive.

In the case of solder, there is a chemical reaction in addition to physical reaction. Soldering is primarily used to provide a convenient reasonable strength joint, to ensure electrical contact or to seal against leakage.

Solders typically do not provide overly high mechanical strength, given the soft nature of popular solder materials. Soldering is used extensively in the electronics industry printed circuit boards.

It is also used in joining metals in hobbies and in industries such as cutlery, tools, metal box making etc, where its strength is more than adequate.

The soldering process bonds by creating what is called an inter-metallic layer.

In order to have a good soldering joint, one must form the thinnest possible inter-metallic layers between the solder material and the base metal.

Otherwise, the solder simply solidifies over the base metal without forming any bond (The dry joint is a problem that's familiar to anyone working in electronics manufacturing).

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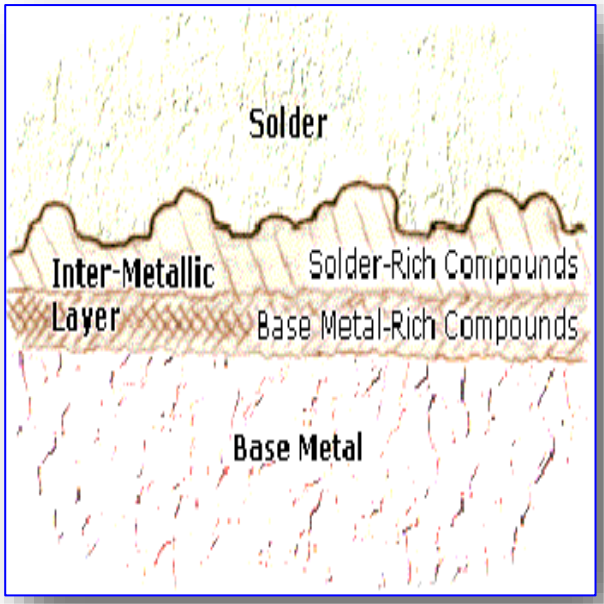
Within each inter-metallic layer, there are actually a number of different compounds formed by the solder materials and the base metal. These compounds are typically quite brittle and will adversely affect the integrity of the solder joint.



As the joint is subject to stress, thermal cycles, vibration, or shock, the inter-metallic layers are usually where it fails.

Why should you consider soldering?

- Mechanically, soldering is usually fast, strong, water-proof & shock-resistant compared to glues as well as being generally impervious to most solvents.
- Because it utilizes materials of a similar surface texture to those it joins, it can form a contiguous surface that is easy to finish invisibly and paint well. In other words, it is neat and tidy!
- Of course, if we're talking electrical/electronic products soldering is the only way to reliably connect items to a PCB or circuit automatically and at low cost.

However there are a few other VERY important reasons for the modeller to solder:

- Because it is the only way to achieve some forms of joint in scale modelling (try fixing rungs to a scale sized ladder with glue, invisibly fixing fine detail to a brass loco, building signals using scale materials or a loco chassis or trackwork or perhaps a series of fine fences).
- Because once simple skills are learned, it is much easier and far stronger to use solder rather than glue for most hobby applications.
- Because it is faster, more permanent and much more refined than making models with glue.
- Because working with metal and solder allows for second attempts, it is very forgiving. Soldering makes errors more easily corrected than glue or any other form of fixing ever can.

This is "British Legion"

It is a 4mm scale, OO Gauge English prototype Royal Scot locomotive, and it was soldered together from brass and nickel silver components.

Even the connecting rods are made from three parts, inner, centre & outer, in order to reproduce a scale thickness and shape that is totally correct.

Advanced work, yes, and we agree that it is not a task to tackle before a bit of practice….but it is something that every single one of you could do if you read these pages carefully, make sure you have the right tools, take your time & follow instructions carefully!

To see a temperature controlled soldering iron that was used to make this locomotive - and the several other soldering irons that we recommend very highly, CLICK HERE

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Soldering tools and their uses:

Basic soldering requires only a few tools.

For once most of them except for a good soldering iron are quite inexpensive but if the modeller wishes to do a good job they must be the correct choices for the job. Get in the habit of using them with every task (in particular the simple ones like a damp sponge) and you will soon be routinely making the perfect solder joint!

#1 - A good quality soldering iron with adequate power:

A good quality soldering iron of a size that can be handled precisely *and* with adequate power to heat the job rapidly *plus* a tip of the appropriate size/shape to deliver the power where its needed and only where its needed. High quality does not necessarily mean expensive - in this context it just means well designed and with a power rating that can do the job properly!

When choosing an iron, it is important to understand the difference between heat & temperature.

It is a complete misunderstanding of the soldering process to think that a smaller or lower power iron is needed for smaller tasks or for lower temperature soldering jobs. The temperature to which the bit can be heated is only an indication of the potential level of the iron's output. What is important is the ability to deliver right amount of heat at the right place as quickly as possible.

The measure of that is the power of the iron, expressed in watts. The right iron will deliver the right amount of power (heat energy) instantly when needed. This will ensure that fluxes can do their work properly, that solder can flow and bond properly and will result in a quick joint - and a quick joint ensures that the smallest possible area of the item being soldered becomes hot.

The result? A better quality joint, with minimum possibility of heat damage to the parts being soldered *plus* the lowest possibility of damaging other parts or materials or (dislodging adjacent parts).

Simplest example for railway modellers: soldering to rails. Modellers have trouble soldering to rail because among other things, their soldering iron can't transfer heat fast enough because either they use an old iron with a bad tip (or the wrong tip), listened to bad advice and bought a lower-power iron...or tried to save money by going "too cheap" and the iron has been poorly designed.

When soldering anything to rails in plastic track we want a fast, unobtrusive joint with no heating of sleepers or rail fastenings as this causes very ugly damage, changes gauge & weakens the track.

Fast means exactly that: Even when taking your time, using the right iron & doing it the right way means the soldering iron will not actually be in contact with rail for more than two seconds…. and while that is enough for a good joint, it's not long enough to cause any damage by excess heating of rail!

The perfect iron is one that's powerful enough to do any soldering job and small enough to be handled precisely. Ideally it will:

- Have excellent temperature regulation.
- Have rapid heat delivery.
- Allow the operating temperature range to be adjusted.
- Allow the tip to be changed quickly and easily.

The ability to change tips really does matter. The tip area also controls the rate of heat transfer.

More surface area = faster & more energy!

In the end, its most important that you buy the RIGHT gear to do the job - equipment that will be flexible enough for many tasks. We'll define the right choices in soldering tools next.

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PLEASE pay close attention here, because whether you're an expert or an average modeller… nobody can produce a good result with the wrong soldering iron and related equipment.

So what kind of soldering iron do you need?

Base station plus iron or "Stick-type iron" with power lead directly attached? This is up to you…. we like to use a base station iron like the Atten models shown here for kit work and electronics, but we find that it can be really inconvenient when wiring track. For trackwork we prefer a stick iron that also has temperature control such as the excellent Atten SA50, which is the best stick available right now!

Bear in mind that a good soldering iron and related tools will last a lifetime and do not skimp!

- Definitely not less than 50 watts power.
- Preferably temperature adjustable 200 ~ 500 degrees Centigrade (400 to 900 degrees Fahrenheit)
- An iron whose tips have a hollow sleeve to surround the element for best heat transfer.
- You should have two tips. A 2 to 3mm T-2 type sloped chisel tip for brass and kit soldering, soldering wiring and soldering to rails, and perhaps a fine conical tip for electronics.
  (DCCconcepts always supply the correct tip types with every soldering iron: a standard small conical tip for finer wiring on PCBs and a very versatile T2 type tip which has an excellent profile for track use, wiring and all other general hobby soldering).

Our recommendation? These are the irons we currently use every day.

Best Stick Iron Atten SA50

80 Watt Base Station Atten ST80

50 Watt Base Station Atten ATT 937

Many parts stores sell irons, and low cost irons that look good can be found on the net too…but you'll be disappointed when it comes to spare parts and replacement tips, because often they just don't bother.

DCCconcepts always stock spare parts for every soldering iron they sell, so whether it's a new element, handpiece, a new tip or any other part, your soldering iron can always be kept in top condition.

These are the also soldering irons that we use daily so we know they work perfectly!

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You will also need a soldering iron stand...

You have to put it down sometimes and it needs to be somewhere safe. If you've ever wrecked a model by accidentally letting the iron get close when you put it down for a moment or leaned on a hot iron with your bare arm, you'll understand why in no uncertain terms.

A good soldering iron stand will have a heavy solid base for stability, as well as a soldering iron holder that will hold the iron properly and shield the hot tip. It should also have a sponge holder in the base to hold a damp sponge for tip wiping before every joint!

If you'd like to see what one looks like, or need one for your workbench, then please CLICK HERE

Please note: High quality soldering irons, especially temperature controlled irons, will often come with their own stand included in the box so if you are purchasing a new iron, check before you spend more than you need by buying one separately. (The Atten Base Stations all include an excellent stand).

A damp sponge and an activated brass wool tip cleaner.

The sponge will keep the tip shiny and clean while it is turned on between solder tasks.

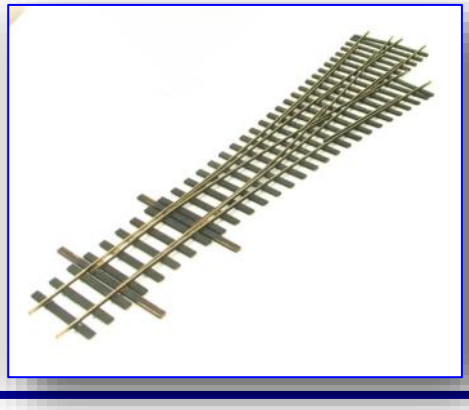
Ideally it should be a natural sea sponge but these can be very expensive! In reality, you can just use a normal kitchen sponge as long as its kept damp. Just place it on a saucer or similar!

By the way - "damp" means wet enough so that if you held it by the corner, it will slowly drip… not too much more or less please!

What's it all for? It literally steam cleans the tip! A quick wipe of the soldering iron tip on the sponge just before every use of the iron will ensure best results for each joint as the tip will stay clean and shiny for best heat transfer speed.

The activated brass wool cleaner: This helps in removing hard build-ups of oxides from the tip and will not harm the tip. Brass is chosen because its gentle - **never** use a file , wet and dry sandpaper or blade to make a tip clean… You **will** damage it, and once the tip plating is damaged, it will not last long.

Once you can solder, a new world opens up in which anything you can imagine becomes possible.
The chassis and coal rails of this 0-6-0 were all soldered together, as was the 3-way turnout… and the front footplate of the loco at the right (Turbomotive) was soldered together from bits of scrap brass!



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Plus a fiberglass pen or abrasive cleaner

Cleanliness is at the core of good soldering and that means removing hard oxides, muck or surface treatments to allow the heat to flow quickly between the soldering iron tip and the item being soldered ...and to let the solder flow smoothly for a good joint.

Fluxes are powerful cleaners but some times flux alone cannot do this on some materials which have hard or deep oxide layers and dirt build-up.

A fiberglass brush is the easy way to do the initial cleaning quickly and cleanly on many jobs.

Generally available at reasonable cost they do wear. However, here at DCCconcepts we always stock of replacement brush inserts so it is a one-off reasonable cost with a low ongoing maintenance cost.

De-soldering wick or braid

This is the simple and effective way to remove excess solder.

A de-soldering wick is made with an activated pure copper braid in many widths. To use it, dip the end in flux then place it on the joint. Place the soldering iron firmly (but not too hard) on top of it and move it as needed over the area of excess solder.

It will suck up all excess solder leaving a thin tinned surface needing almost no other clean up in most cases. It is therefore perfect way to clean up a PCB or clean off any excess solder on a brass model.

Dipped in flux, it is an excellent way of cleaning up accessible surfaces that have accidentally received too much solder. Used with care its also a good way to clean up seams in white-metal models, but do be careful about overall temperature when doing that!

When the job is done clip off and discard the solder-filled part ready for next use. DCCconcepts always have de-soldering wick ex stock. Click on the images to find them on our website.

Soldering Iron Tip Conditioner

This is a small tin of specially fluxed solder that is used to revitalise the soldering iron tip. Use on the tip before trying to solder with a new tip, or to revitalise a tip if you accidentally left it on too long or the tip has blackened / is no longer clean and shiny and other cleaning methods no longer work.

How to use? Take the lid off. Turn the iron on and, as it starts to heat, gently roll the tip in the tinning/cleaning compound. It will soon start to melt and should evenly coat the tip with a bright, shiny new flux layer. Wipe off excess and repeat until you have a tip that is "good as new". (If your tip does not respond to the tip conditioner, then it has lost its coating and it really does need replacing to restore the performance of your soldering iron!)

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We are nearly there - the rest of the items that you will find helpful are quite likely to be in your toolbox right now - or can be obtained easily at low or no cost.

You are going to need a clean, flat soldering surface:

Soldering can be harder than it needs to be if you cant see what you are doing, and if you can't hold items in the correct relationship to each other, so a good practical work surface to solder on is just as important as it is for any other form of modelling task.

We are fortunate in that a very common material makes the perfect soldering surface.

This is - melamine covered MDF/chipboard. This is the white coated chipboard or MDF usually used for common kitchen cupboards. It is usually available as off-cuts from any kitchen makers premises (free if you ask nicely) and is often also available at a good price from Steptoe type yards.

Use a good thickness (usually 12mm~15mm). White is usually best.

Its easily marked out with squared lines and the melamine, although very thin is smooth and very good at handling chemicals and heat. It is the perfect hobby bench surface really.

Its cheap so don't be afraid to drill it or tack on bits of timber to give a guide or work-fence to solder against. Clean it regularly with anything that will remove residues and chemicals.

Melamine coatings are very tolerant and anything from a bathroom cleaner to MEK will do it well.

And a "scrawker", scriber or scraper.

It is a tool that is used to get into tight corners or right angles to remove any excess solder and give a neat result - for example, usually where there's a tad too much solder where cab-side meets footplate. Our high quality tungsten carbide scriber is shown here.

Plus… some tweezers & pliers of various shapes.

Holding metal that needs to be soldered without pain is important. Heat travels quickly through some metals and you'll inevitably find that you run out of pain tolerance just before the solder hardens quite often if you do not have some means of holding things other than your fingers.

Actually any sort of plated tweezers will do, but avoid untreated mild steel or brass as it's quite likely to end up soldered to the job in hand.

We also find a selection of bamboo skewers or Satay sticks and wood scraps helpful here and there's also the best of them all ...a fingernail. This can be a real gift to those that solder fine work as a finger tip/ nail is very sensitive to positioning things properly so it can be super accurate!

And… fingernails do not transfer heat quickly plus it is constantly growing and ready to use!

(Which is useful, as solder heat + fluxes makes them brittle …. guess how I know that)

*** In these well groomed days I don't expect you to grow talons, but sharp fingernails were once very useful cutting and marking out tools for the older trades ...

I once knew an old saddler that sharpened his thumbnails like a blade and used them to cut leather/hide into long spirals to make the most beautiful plaited reins & whips!

Other ideas:

There are lots of options here, but avoid plastics for obvious reasons. We have added a few that we find useful at the top of the next page.

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Disposable: "Holders": Balsa Glue (dries almost instantly, and spotted in place can hold two bits of metal long enough to solder them) * Blue-tack * double sided Sellotape * wooden clothes pegs (they are still out there if you search Amazon etc... and can be carved to shape to fit your current need).

Long life and re-usable holders: * Dolly grips - these are the long straight aluminium hair clips that ladies used to use to hold rollers in their hair when they had a "permanent wave" (young modellers may need to look that up on Google). Perfect as customisable clamps (they are bendable) and really good as heat sinks clamped on close to a joint to absorb heat and stop previously made joints coming unstuck. * Low cost mini-clamps from the dime, pound ~ dollar shop * bulldog clips from the stationers. (Bulldog clips also make great mini-clamps)

Solders and fluxes:

Please do pay attention here… the right solder and flux choice will make all the difference in the world, and can make you an expert overnight in combination with the right tools and equipment!

A short story:

I once spent hours creating some notes on soldering to present at a local club meeting. One attendee scanned them and blustered "I got a soldering kit from my daughter for my birthday and I can do anything I need with that why are we wasting time on this"

The same deaf-to-improvement person told me not long after that he was replacing his flex-track with set-track because its impossible to make even curves… and he still seems to find it hard to open the boxes his trains are sold to him in as well.

All in all a genuine shame as that same man loves his hobby and would enjoy it so much more with much less frustration if he'd only listen to others and accept a few simple things.

(As it is, as far as I know, he still hasn't used the soldering iron, of course..)

I mention this story only because I'm often told by dyed in the wool modellers (that coincidentally are all not good at soldering) that 60/40 standard solder, or perhaps the solder roll that granddad gave you is just fine and there's no need for any other…. but that is simply not the case! Solders do have a use-by date, and using wrong or out-of-date solder will not give the best result, no matter how hard you try!

Choosing your solder and flux:

The problem is that the same solder will not do the job in all cases, and some fluxes that might look useful will actually damage the thing you are trying to do! (Bakers flux is an example… a favourite for years, its acid nature means that wiring soldered with Bakers flux will rot and corrode quickly, leading to layout problems and great frustration).

Solder choices have been made a little more of a problem by the advent of "lead free solder", something introduced for production electronics as a "green effort" but has trickled down to hobby soldering, too!

In the next steps, we will talk about solder and fluxes, and how to select them.

We need to consider the metal that will be soldered, the conditions it will be used under, the need for strength and the need for flow. Only then can we choose the right solder and flux!

The good news is, however, that because we have really focussed on creating both solders and fluxes specially for modellers and modelling materials, all of your soldering resource needs can now be 100% covered with just two fluxes and three different solders.

Even better, we are very aware of the health of our clients and want a clean, green planet on which our families can grow up, so while we do recommend treating them with respect, none of them are even nearly as bad for the environment, dangerous to human respiration or chemically dangerous as many of the solders and fluxes used in industry, or those still sold by others!

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Flux: What is it and why should you use it – how does it help?

First, lets talk about the various fluxes…… There are several definitions of what flux is - not all even relate to our subject of soldering metals, but all are correct for the purposes to which they refer.

Each kind of flux is different and its creation depends on the job it has to do... in a nutshell, fluxes are used to provide active cleaning, especially when heat is applied.

They improve heat transfer, encourage solders to flow and they also aid formation of the very important inter-metallic layer when used with solders. It is important to use the right flux for the right job.

Definitions:

- A substance that aids, induces, or actively participates in fusing or flowing.
- A substance applied to a surface to be joined by welding, soldering, or brazing to clean the surface and "wet" the surface in order to facilitate the flowing of solder and prevent formation of oxides.
- A mineral added to the metals in a furnace to promote fusing or to prevent the formation of oxides.
- An additive that improves the flow of plastics during fabrication.
- A readily fusible glass or enamel used as a base in ceramic work.

The KEY words for us in all of the above are: Flowing, Clean, Wet, Prevention of Oxides.

To put it very simply, soldering needs clean surfaces so base metal is properly exposed to the solder.

During any soldering operation, fluxes do the following:

They remove the oxide films that always exist on the base metal and momentarily prevent the formation of oxide films during the soldering process. They also very effectively lower the surface tension of the solder to promote wetting. This allows the solder to flow properly and to evenly coat the surfaces.

The actual range of fluxes available is quite wide as they will vary depending on the materials to be joined and the circumstances in which the joined materials will be used.

(Variance is in toxicity, aggressiveness and efficiency under specific heat ranges or soldering conditions).

The three types in common use are "Activated fluxes" which include resin based flux and organic fluxes, "Chemical fluxes" which include corrosive acid based fluxes and "Reaction fluxes" which are stable until they react with the base metal and only have any reaction when the appropriate degree of heat is applied.

Most fluxes sold for hobby use are based around corrosive acids or resins, both of which unfortunately emit harmful fumes and definitely need careful neutralisation after use.

Mindful of technical advances created by the needs of high volume soldering of consumer electronics and very conscious of customer health, DCCconcepts have developed their own flux range.

DCCconcepts flux is highly effective but it is much safer to use than traditional fluxes made using dangerous chemicals!

While there are only three fluxes within this range, each is "best in class" and they will allow you to solder almost all modelling metals except aluminium in any circumstance you are likely to encounter.

This image shows the front end of "British Legion".

The smoke-box front and front footplate consist of more than 20 bits of brass and Nickel silver, all soldered using our own DCCconcepts solders and fluxes.

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The DCCconcepts flux range

Sapphire No-Clean Flux

DCCconcepts Sapphire No-Clean flux was created with the soldering of wire to rail without the need for follow-up cleaning, but has become much more than that...

It is a truly universal flux and is an ideal soldering companion that will make it possible for you to make perfect joints easily every time in electronics, soldering wires to track, installing decoders, working on (or maybe re-working) brass, white-metal or nickel silver kits. In fact anywhere that any cleaning later on might be a bit difficult to do!

It is also effective on some grades of stainless steel, including our Legacy trackwork and the grade that is used for Marklin rail.

This flux is now used by many professionals who cannot believe how well solder flows when using it!

No Clean flux does not stain, so the only time you may want to clean this flux off post-soldering is if you wish to paint the area you have soldered. In that case, a simple wipe over with cloth or cotton bud dipped in Isopropyl Alcohol, or even methylated spirits, is all that is needed.

If you want to buy only one flux, buy this one!

Available as a liquid in 30 or 50 ml bottles.

Apply with a brush or a cotton bud.

The No-Clean Flux Pen

Sometimes its is easier or more convenient to use a simple pen rather than a cotton bud and flux bottle - for example when soldering fine electronics or adding detail to a brass models. With care you can remove the nib holder and re-fill with DCCconcepts No-Clean Flux.

On the next couple of pages, we'll discuss solder types and their characteristics.

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General 60:40 Solders:

60:40 is the standard solder that used to be sold in hardware stores.... but now they probably only have "Lead-free". It's usually a 1~2mm wire that is flux cored and when **new** it is quite a good general solder.

It is composed of 60% tin ~ 40% lead. It melts @ appx 190°C / 374°F, but it doesn't become completely solid again until it cools to 180° / 361°F. This means it has a "pasty range" of 7° to 13°. Too wide!

The liquid temperature and narrow "soft or paste-like range" can make it easy to form and maintain consistent high, rounded, beaded joints, such as on electrical work. However, its long hardening time also means that if you don't hold it perfectly still for some time after making a joint, a dry joint will result.

Eutectic Solders:

63:37 is a better choice for most standard work electronic work though (sometimes this is called Eutectic solder). It has two properties that are better than 60:40.

It makes a stronger joint and, more importantly, it goes from solid to liquid and back again over a much narrower temperature range. This means it can make a much faster joint that is much more likely to be reliable. It is therefore good for electrics/electronics although it still has poor flow characteristics for tasks other than simple electrical/mechanical joints.

Other common solders:

50:50 lead-tin mix is the better choice if you want to have the solder flow smoothly, as when making a seam or tinning two bits of material ready to join them with solder.

It melts (depending on additives) between 182° and 188°.

Which solder to choose for electrical, electronics, soldering to rails and soldering brass?

There is now one best choice for electronics or wiring that need excellent wetting and flow plus a fast, narrow "melt range" and brass work that needs the same, plus added strength.

We call it "Sapphire 179 solder".

DCCconcepts have created a solder that really can do it all and do it well. We added a little pure silver plus some secret stuff... and so creating the DCCconcepts favourite, our S179 Sapphire solder!

It has all the best properties of the above and none of their vices. It is stronger than 60:40, and it is also slightly better as a conductor so it is perfect for electronics & electrics. It has quite a low melting point of 179° and it has a **very fast** melt transition of only **one** degree. Perfect!

It also flows beautifully, largely because of the added silver.

In testing, it consistently works well with pretty well anything! (Many of our clients also love using it on their brass kits, as the smooth flow means a fine, strong joint. It works beautifully on all the harder alloys such as copper, brass and nickel silver.)

In combination with our own flux, it will also very easily solder spring steel or piano wire... and if you turn the soldering iron up to its maximum temperature, when used with DCCconcepts Sapphire No-Clean flux, it will even solder Austenitic (3 Series onwards) stainless steel!

Most important to most of our readers.. DCCconcepts S179 Solder is certainly the BEST solder for soldering nickel silver or attaching wire to rails, bar none! CLICK on the image for more...

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More DCCconcepts specialist solders:

While I do find myself using our DCCconcepts 179 solder for many kit building tasks, there is NO doubt that there are tasks that really do need the correct specific solder for the job, as only the right solder will work best… so with our success in creating Sapphire 179, we went a little further and created two more excellent solder products.

DCCconcepts Sapphire 145 solder .

While developing our 179, we also talked to our manufacturer about the importance of thin and smooth flow with kit-building and the need for a fine solder wire to aid precision, and they came up with another winner. We have called it DCCconcepts Sapphire 145.

It has a slightly different formulation to other 145 solders that improves flow significantly. In addition to this, the very thin 0.6mm solder wire means that its much easier to control the amount of solder used, making this a really excellent way to achieve clean, tidy joints.

We are delighted to say that DCCconcepts Sapphire 145 has the best performance of any solder we have ever used in kit-building. The difference in flow and its ability to go where its wanted with zero wicking or peaking has been noticed by the experts, In fact, it is now used exclusively by a couple of the UK's better professional loco builders despite the fact that, in bulk, it's more than twice the price of its nearest competitor!

For more information on our DCCconcepts Sapphire 145 solder, click HERE or on the solder Image.

DCCconcepts Sapphire 100 low melting point white-metal solder

Having had some very good success with the more conventional solders, we thought we'd also take a look at another important solder type - low melt solders.

This one was more difficult and it did take a while to get right, but our DCCconcepts S100 low melting point white-metal solder has some really nice characteristics.

Unlike conventional low-melt solder, it does not combine with the white-metal to produce a weak layer of sludge as they do. This makes it possible to remove excess solder with a solder wick or braid, and you can rework joints in a way you just cannot do with standard 70° low-melt solder.

While the difference takes a little getting used to (it needs lots of flux and a little more working into the joint) the iron is set to the same temperature for both types and it flows really well when used with our Sapphire flux. (Note: soldering iron temperature for white-metal is 200°, not 70° as some imagine)

DCCconcepts S100 low melting point white-metal solder has a melting point of 100°.

While I admit I do still tend to tin the two parts (old habits do die hard) our S100 can, if you prefer, be applied directly to brass to attach white-metal parts with no real need for pre-tinning with normal solder!

Presentation is a bit different - with two fine-wire solders in the range, making another would add confusion… so because S100 will usually be used on larger quantities per joint anyway, we present it in a way that will never see it confused with other solders.

We hope you like it! Click on the image to learn more.

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DCCconcepts Specialised solders:

DCCconcepts Solder Cream 179 degree

(Ideal for resistance soldering, also excellent with conventional irons for super-fine work)

While we tend to like and keep using wire-type solder, for some modellers, the introduction of this 179 degree cream has somewhat changed the way they approach the construction of etched brass kits.

This is a really excellent product for those who use resistance soldering in particular. Quality-wise, it is good. The particle size and shape is right and while the resin flux needs cleaning off before painting, it is the best resin flux we've used. It is supplied in a syringe, together with a micro nozzle. This allows you to apply it precisely. (Note: The cream is not always in stock, sorry)

Consequently, the work can be very neat and cleaning up is quick.

"Occasional solderers" should note the following carefully!

Solder creams are VERY expensive compared to solder and flux and they also have a relatively short shelf life.

Consider carefully before purchasing them unless you will use them up within a short time. Once opened they will start to deteriorate as the solvents will slowly leach out.

Keep it in an air-tight bag & store in the refrigerator to give solder paste a reasonable shelf life.

The "LEAD FREE SOLDER MYTH":

Because of the problems created for the environment in the recycling of millions of tons of redundant electronics, global legislation has made it illegal to use lead bearing solders in most products. In general this applies to consumer products where assembly is via a production line or factory process.

(While lead isn't good for you this was done mostly for environmental, not health and safety reasons).

However, hobby applications (as well as industrial electronics, most medical and all military products) are excluded from this onerous change which is a good thing as, to be frank, it is far harder for the average person to solder well with the current generation of lead-free solders!

So, there is no need to even think about this issue. However, we do wish to make the point that with leaded solders now being produced in far lower volumes, lead bearing solders can expect to see price increases over the next decade plus inevitable shortages in the lower temperature solders that are very, very specialised. (Already we need to buy ever greater batches and pay much more, because the manufacturers are finding it less profitable).

SOLDERING ON FACTORY MADE LEAD-FREE PCBs

Every now and again, you may find that you need to fix something that's made with lead free solder.

Lead free solder does **not** mix well with leaded solder, and if you are repairing or adding to a PCB made in the last few years it is likely to have been created with lead-free solder.

If you do not want to buy lead free solder just for this job that is OK. but before re-soldering a new part in place with a leaded solder, thoroughly clean off the solder pad with de-soldering braid or a solder sucker plus a fiberglass burnishing brush and make sure there is not enough lead-free solder left that will compromise the leaded solder you are about to use.

After its all done, remove any excess solder from the iron tip and re-tin the tip with our S179 or S145 solders before returning to your modelling jobs!

Soldering - The "Black Art" de-mystified

We've talked about what soldering is, tools you may need and things you solder with… solder and flux.

Before we close part 1 of the black art de-mystified, a quick oversight on "what can be soldered"….

Solderable Materials.

Things you can solder given the right technique, solders, tools and fluxes:

Despite the fear of soldering and the denial of many modellers that it can be done, basically almost all of the commonly available modelling metals can be soldered by the average modeller using average tools, providing he uses the right techniques, the correct soldering iron, the correct flux and the correct solder.

Easiest of all to solder:

- Tin
- Copper
- Steel
- Brass
- Nickel silver
- Steel alloys

A wee bit harder but still relatively easy for the average modeller:

- Stainless Steel (Clean carefully, needs over 450 degrees C, S179 solder, No Clean Flux)
- English white-metal (S100 Solder, around 200 degrees C at the tip, No Clean Flux)
- Lead (S100 to S179 solder, No clean flux, careful with tip temperature)
- Pewter (As per Lead, but S179 solder is best)
- Spring steel. (Standard tip temperature appx 380 degrees C, S179 solder & No Clean Flux)

Difficult without special techniques and often nasty fluxes but not impossible:

- Iron
- Aluminium & its alloys
- Pot metal and its derivatives.

There is a lot more to come.

Please also read Parts 2 and 3 to continue to learn about soldering.

In Part 2: Using flux and how to solder. Tips and techniques. Building in Brass.

In Part 3: Soldering the "harder to solder stuff". More tips and tricks, and how to clean up after soldering to make the neatest possible job.