Soldering Basics

Rod making applications

Manufacture of reel seat hardware and ferrules

Repair. Old hardware on rod restorations can many times be repaired if broken

Basic tools and materials needed

Torch with flexible hose

Small torch tip along with flex hose is available at Lowe's or Home Depot

Propane cylinder

Map Gas Cylinder with attached tip

Butane lighters for when, not if, the self lighting function fails on torch tip

Solder (solid core. NOT acid or flux core. These are for electronic apps.)

70/30 Tin/lead solder. Hard to find. Available at musical instrument repair outlets

60/40 Available more readily on line. Not as strong as 70/30 but is adequate for most rod making processes.

Lead free solder available at most plumbing or Home Depot type stores

Silver Solder. Online through most jewelry making outlets

Flux (liquid)

3fl.oz. Alpha Liquid Soldering Flux. (Non Electric Apps.) Available at Ace Hardware

Ultra Flux for Silver Brazing.

Englehard
Route 152
Plainville, MA. 02762

Solid Bench type vise

Scrapers

Large Tri, small tri and hook

Small glass bottle with glass eye dropper

Water spray bottle

Sand paper 50-500 grit

Steel wool

Denatured Alcohol

Wire brushes, round. Available at Harbor Freight

Plastic brushes, round. Also Harbor Freight

Q-tips

Painters Rags

Soldering basics

Things to remember:
1. Clean!Clean!Clean!
2. Flux is your FRIEND
3. Control your heat

1. Cleaning.
Prep all surfaces that are to be joined by soldering.

lightly sand or rough up internal surface with sand paper. Solder works better for me on a bright surface. Be careful NOT to mar any visible surface while doing this as you will need to polish scratches out before finish. I use wire brushes on the inside of tubing. They do a good job of removing oxidation and roughing the inner surface.

wash thoroughly with soap and water. I use the round plastic brushes with Lava soap on the inner surfaces.

wipe all surfaces with denatured alcohol, inside with Q- tips outside with paper towels until there is no more black residue on rags or Q tips. On tubing, clean well above and below the solder joint. Oil, dirt and corrosion mix with flux, flow into solder joint and will hinder solder flow. CLEAN!

2. Flatten small piece solder. Using a small hammer, pound about a two inch section of solder until it is quite thin and flat. Thin solder melts quicker, is easier to control in small areas and is less likely to leave a blob of solder on the outside that will need to be cleaned later. I use the anvil section of my vise to pound solder.

3. First Fluxing

During the soldering process, you will need to flux the pieces being joined at least once and usually two to three times

Use ONLY liquid solder flux. Paste flux is very hard to control. Assemble pieces to be soldered with a drop of liquid flux. Move pieces around to ensure a good coating on all surfaces. Flux does two things. Being an acid based product, it will clean the parts slightly and the glycerin in it helps the solder to flow.
IMPORTANT!! Use only in a well ventilated area. Lead fumes are toxic and the boiling acid in the flux will make you cough. Best to not breathe any of this in. I always turn on my vent fan and open the window, weather permitting.

Secure pieces in a solid vise. Make sure the pieces can't move around or you will have very hot parts falling on your floor or feet. Always scary if you have bamboo shavings on the floor. Good to make sure that you clean your area BEFORE soldering. No fires please.

Light torch.
Heat pieces to be soldered from all directions. Keep the flame moving. This is where a flexible hose really helps. Controlling heat is vital to good solder flow. You should start to see the first fluxing begin to bubble off here. If the flux coming out is black or off color, cool parts with your squirt bottle, disassemble and clean again. Dirt and oil will not allow solder to flow. If you try to solder dirty parts, you will end up with blobs of solder on the outside with no solder where it is supposed to go. Clean up of solder on the outside of a part is not easy. Lead does not blue

and on parts that are to be left bright, the solder spots will show as blemishes as the part begins to age.
If flux comes out clean, you are ready to solder.

4. Second fluxing

As soon as the first fluxing is boiled off, add another small drop of flux to target area and continue to heat.

5. Solder.

When the second drop of flux begins to boil, CAREFULLY touch the flattened piece of solder to the area that you want to solder. It most likely won't melt yet but keep touching it to the area being heated until the solder melts. Try to not touch the solder anywhere you don't want it as it will make a mess and have to be cleaned later. Keep your flame moving. Try to use the section of the flame where light blue turns dark. The tip here is the hottest part. Melted solder wants to run/ flow so be careful where you put it. It will follow heat and flux. If you have flux dripping everywhere, the melted solder will most likely follow it all over the part being soldered. Once the first small piece of solder melts, I try to paint the melted metal using the torch. Many times, the small drop is enough for the project. If it doesn't flow completely around, I will add another small drop of solder, flux again and try to paint it the rest of the way around.

6. Clean up.

No matter how careful you are, there will usually be small amounts of solder in places you don't want it. To remove unwanted solder, first cool the soldered part thoroughly.
By cooling the part, you are minimizing the risk that you will unsolder what you just soldered. Take one of your Q-tips or a painters rag and begin heating the blob of solder that you want to remove. When the solder begins to melt, it will start to turn color. Quickly and lightly, wipe the solder drop. Be careful here that you move your flame away or you will light the rag on fire. Not good. Repeat the procedure until the solder is gone. Melted solder will leave a stain, so don't try to remove it with heat. You will over heat the part and cause lots of problems. You can remove the stain with steel wool, 3 M scratch pads on light grit sandpaper. I find it works well to chuck the finished part in the lathe or my bench motor and use steel wool to clean.

Soldering internal Parts, i.e. moisture barriers inside ferrules etc.

All steps for internal soldering are the same as external soldering with the exception of solder application. Cleaning and fluxing are the same but trying to guide a long piece of solder into a small, hot ferrule, will leave a lot of melted solder in places you don't want it.

Measure placement of plug and insert something to hold the moisture plug in place. You can use many different things to do this. I have used the back ends of drill bits, bamboo chop sticks and aluminum rod. I like aluminum rod as solder doesn't stick to it and it doesn't burn. Soot leaves a residue which inhibits solder from flowing. If your moisture plug moves too easily, it is hard to keep it in place. The flux bubbling often times moves it away from your target area. If it is loose, you can take a small hammer and lightly peen the plug until it fits snug.

Turn ferrule upside down, with the ferrule tabs facing up. Make sure the plug is in the right place, heat and drop one drop of flux onto the plug. Cut a very small square of flattened solder (usually less than 1/8" square) and drop it into the barrel of the ferrule on top of the plug. Add another drop of flux and heat until the solder melts. By soldering from the bottom, you lessen the chance that you will get solder in the female slide. Blobs of solder really mess up how a

ferrule works. Cool and wash with brushes, soap and water. I like to remove residual flux quickly as it is acid based.

Silver Solder

Silver soldering/brazing is some what different than lead/ soft soldering. Silver solder is very strong and generally used in applications where you don't want the part in question to break i.e. stripping guides, hook keeper rings, broken clarinet keys etc.
Since far more heat is required to braze than to solder, I like to use a more aggressive torch. Map gas works well for brazing. It gets hotter and heats parts faster. It can be used for soft solder applications, but I don't like it for this as it is easy to let the heat get away from you.
Just like in soft soldering, cleaning is VERY important.
Clean the part to be soldered thoroughly with both soap and hot water and then with denatured alcohol. I don't use Acetone as it is quite toxic and leaves a residue that alcohol doesn't.
Secure the part to be soldered very securely and begin heating. When the part is hot, add a small drop of brazing flux to the area to be soldered. Continue heating until the part you want soldered turns red hot. Unlike Tin/lead solders, silver solder will not melt until the part is red hot. As the part starts to get near the target temperature, the flux will melt. When this happens, start touching the Silver solder to the part until it melts. Be careful not to get too much as the excess will need to be filed or sanded off. No wiping off here.

Last thoughts

Securing parts.

Holding parts securely while soldering is very important. You need to be able to wipe solder off without the part falling on the floor, you need to be able to apply solder and not have the part moving around and you need to be accurate. You can use a bench vise for this, but a bench vise by itself has several draw backs. First, the bench vise is meant to hold large pieces securely and the parts we usually solder in rod making are small and easily crushed. Secondly, a bench vise is a very large chunk of steel that does a very good job of absorbing heat. When the vise absorbs heat, the part we are soldering takes a lot longer to come up to target temperature. It is hard to tell when it gets there and it is very easy to over heat the part or make a huge mess with solder. If a part gets too hot, the solder bounces off and falls on the floor instead of going where you want it. Lastly, the jaws on a bench vise are usually serrated very aggressively and will scar the parts you are working on. I have tried many ways to fix these problems. Using an old pair of large hemostats to hold the part works ok but an aluminum jig seems to work better. Aluminum doesn't scar parts, heats quite a bit faster than steel and doesn't retain the heat as long. Be creative.

Safety is very important.

Solder in well ventilated areas
Wear protective clothing
Wear eye protection. Flux spatters and acid will hurt and worse if it gets in your eyes
Always be aware where your flame is. Best not to light things in your shop on fire
Clean the area around where you plan to solder and remove all flammable objects
Have a fire extinguisher handy in case, and lastly,
Remember not to pick up hot parts with bare hands (ask me how I know this)

Remember, Cleanliness ensures solder flow, and Flux is your friend!
Good Soldering!