Soldering for Model Railroaders

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Soldering Clinic - Introduction

• Introduction - Why bother with solder?
• Safety First!
• Tools and Equipment
• Characteristics of a good Solder Joint
• Soldering 101 (Let’s do it!)
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Introduction - Why bother with solder?

- A properly soldered joint has a lower resistance, and is a more reliable electrical connection than almost any other method.
- Best for permanent, non-moving joints.
- Once you get the hang of it, soldering is fun! (A good solder joint is a work of art!)
Soldering Clinic - Safety

• Safety First!
  – Rule #1: Protect your eyes! Use safety glasses!
  – Molten solder is HOT! (>250 degrees C)
    • Solder “splash” will burn your eyes and skin.
    • The hot soldering iron will burn your flesh too.
    • Don’t change tips while the iron is hot!
  – Solder away from combustibles
    • Gas cans, loose paper, heaps of oily rags, leaky natural gas appliances, etc.
Soldering Clinic - Tools and Equipment

• Tools and Equipment
  – Soldering Iron or Soldering Gun
    • Radio Shack - Y.G.W.Y.P.F! ($20)
    • Weller – good quality, very popular ($30-$100)
    • Metcal – best quality ($250+)
  – Solder
    • 60/40 tin/lead general purpose (e.g. Kester)
    • RMA flux core is good. Never use acid core!
  – Flux
    • Paste or liquid, it cleans the hot wires. (Kester)
    • Use “electronic” flux, never acid-based plumbing flux. (It will keep on eating the cold joint.)
Tools and Equipment

Sources of Supply

- Digikey (www.digikey.com) Great catalog!
- Newark (www.newark.com)
- Allied Electronics (www.alliedelec.com)
- Radio Shack - “Huh? You want a what?”
• Characteristics of a good solder joint
  – Shiny (not dull and cracked)
  – Wicked into tight spaces (not balled up – no blobs, drips, fingers, stringers, spider webs, etc.)
  – Clean and free of foreign material, such as insulation, melted tie plastic, burned flesh, etc.
Soldering Clinic – Soldering 101

• Soldering 101 (Let’s do it!)
  – Everything MUST BE CLEAN!
    • Soldering iron tip, wires, rails, joiners, etc.
    • Use a damp solder sponge to clean the iron.
    • Use sandpaper, brite-boy, Scotch-Brite pad or similar to clean the wires, rails, etc.
    • UNCLEAN parts are the #1 cause of BAD solder joints and EXTREME FRUSTRATION!
  – Establish a good mechanical joint first.
    • Wrap the wires tightly, if possible.
    • Solder by itself is a very soft alloy and is NOT very strong.
Soldering Clinic – Soldering 101 (Cont’d.)

- Add a drop of flux to the connection.
- Clean the hot soldering iron tip by wiping it on a damp sponge. Do this for every joint! The tip should be bright and shiny.
- “Tin” the hot soldering iron by melting some fresh solder on the tip. (Sometimes it is best to “tin” the pieces too.)
- Heat up the joint by touching the molten solder on the tip to BOTH pieces to be joined. The molten solder conducts heat into the joint much better than a “dry” tip.
- After a second or two when the joint is hot, run a small amount of fresh solder into the joint, NOT onto the soldering iron!
- The solder should wick its way into the joint and form fillets, NOT solder balls! If the solder beads up the joint is not clean - Start over!
Soldering Clinic – Soldering Applications

• What can be easily soldered?
  – Copper wire, brass, silver (with special solder).
  – Most electrical wiring that does not move or flex. (If it moves use crimp terminals.) Track power, DCC, signaling wires, accessories, lighting. Circuit boards.
  – Nickel silver rail joints and joiners. (A good practice for track laying.)
  – Brass tubing and structural shapes for signals, signal bridges, etched metal kits, handrails, expensive locomotives, etc.

• What can’t be easily soldered?
  – Tin, aluminum, steel, iron. Screws, rivets, washers and other metal fasteners are generally not solderable unless they are brass.