Conduction Rework Techniques for Fine Pitch and 0201 Components

With the size of the PCBs for the PCMCIA cards, pagers, and cell phones getting smaller and smaller, micro components have become a favorite solution for many manufactures worldwide. It’s easy to see why they have become so popular; they offer increased functionality and optimize PCB real estate.

Reworking micro components can be challenging and time consuming for all rework operators. However, in terms of cost savings to the manufacture, it’s more than justifiable to rework these expensive boards, even with the additional cost of training the operators and the extended rework time.

Reworking micro components can take two approaches: conduction and convection. This Application Note will focus primarily on conduction rework.
METCAL CONDUCTION APPROACH

The conduction approach uses the Metcal line of Micro-fine Rework Tips with either a MX500 or SP200 system, and the aide of a microscope. In addition, a fixture to stabilize the tip while reworking may be necessary, especially when removing the components with the “topside” approach.

This Application Note focuses on the “top-side” removal process, where the tip touches only the top of the component allowing solder surface tension to lift the component out of the way. A traditional slot tip approach and a tweezer tip approach were considered, but rejected due to design and component spacing issues. Since the 0201 component is often placed between sensitive plastic connectors, these ideas were considered too difficult to use. The “top-side” approach is more appropriate because component spacing isn’t a factor in determining the final tip design.

This Application Note also describes, in detail, rework techniques used all of the micro solder tips. The “Hook” tip can also be used for point-to-point soldering and fine pitch component touch-up.

MICRO REWORK TIP KIT

<table>
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<th>Tip Geometry</th>
<th>Description</th>
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<tr>
<td>SMTC-X171</td>
<td>Designed to remove 0201 and 0402 components from a “topside” angle. This design allows the operator to view the component when reworking/removing components.</td>
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<tr>
<td>SMTC-X172</td>
<td>Designed for fine drag soldering and point-to-point soldering. This tip allows for lead-to-lead or solder bridging clean up.</td>
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SMTC-X174

Long reach micro hoof tip designed with a smaller surface area than the mini hoof for optimal drag soldering components in tight spots.

SMTC-X175

Micro hoof tip designed with a smaller surface area than the mini hoof for drag soldering of small/micro leaded components.

STTC-X90

Micro fine tip designed for soldering and touch up of micro components such as 0201 and 0402.

REWORK PROCESS

0402/0201 Component Removal

1. First, insert the SMTC removal tip into the Metcal hand-piece, turn the system on and allow the tip to heat up.
2. When the tip is hot, tin the flat side surface of the tip. This will aid in heat transfer and helps to pick up the component.

Caution: Do not apply too much solder to the tip as it may reflow adjacent components.

3. Place the Micro tip directly over the top of the component so that the flat side of the tip is in direct contact with top of the component (see pictures below).
4. Lift the tip upward and away from the board after about 1 to 2 seconds. The solder surface tension should help keep the component on the tip as you lift up. If you did not apply enough solder to the tip, it may not pick up the component on the first try. In that case, simply clean the tip, reapply solder and repeat the step.

Placement

1. Re-apply a small amount of flux to the pads.

2. Using a tweezer tool to pick up a 0402/0201 component, align the component to the pad. A microscope is required for viewing this process.

3. While holding the component with the tweezer, use the STTC-190 tip to touch one side of the pad to allow for the component to reflow. Touch up the other side to finish.
Special Application Considerations

Note 1: If the component has epoxy underneath it, it may take a little longer to remove. Additional time may be required to allow the component to heat up in order to loosen the epoxy and allow for surface tension to lift the component off of the board.

Note 2: The SMTC-X174 and SMTC-X175 tips can also be used in the same manner as the SMTC-X171 tip to remove the 0402/0201 components.

Note 3: The pads may need to be leveled using fine copper braid, and tinned before placing the 0402/0201 component. This is due to excess solder that may be left behind when the component is removed.

Drag Soldering Fine Pitch Components with Metcal Micro Tip Cartridges

1. Align the component to the pads on the board. If you do not feel comfortable with the steadiness of your hands, you may need to purchase a fixturing product to help you to accomplish this.

2. Ensure the pin orientation to the PCB is correct; center the leads onto the lands.

3. Hold the component steady with one hand or the aid of a pick up tool; flux the opposing corner leads of the part.

4. Tin approximately 1/3 of the tip with solder, keeping the solder towards the “toe” of the tip (see pictures below).

Apply a small amount of solder on contact area of tip only.
5. Bring the tip down onto the fluxed component area and tin the pad. The purpose is to tack the part down, not to make a good connection.

6. Re-tin 1/3 of the tip with solder. The amount of the solder will depend on the number of leads you have to solder.

7. Flux an entire row of leads. Work with the rows of leads going from left to right. If you are left-handed, work with rows of leads from right to left.

8. Hold the tip so the toe runs parallel along the row of leads.

9. Bring the tip in on a flat landing onto the first lead and run the tip down the row of leads drawing a straight line, pausing ½ second on each lead. When you reach the end of the row, wipe the tip down the lead towards you. To avoid bridging, do not stop and restart in the middle of a pass.

10. Repeat the process for the other rows of leads.

Note: Clean the tip and make sure that it is shiny and wettable. Re-tin the tip.
Micro Component Soldering with the SMTC-X172 “Hook” Cartridge Tip

1. Align the component to the pads on the board. If you do not feel comfortable with the steadiness of your hands, you may need to purchase a fixture to help you accomplish this.

2. Ensure the pin orientation to the PCB is correct; center the leads onto the lands.

3. Hold the component steady with one hand or the aid of a pick up tool; flux the opposing corner leads of the part.

4. Place a small amount of solder onto the tip so that it covers the entire end, keep the solder down towards the “end” of the tip.

5. Bring the tip down onto the fluxed component area and tin the pad. The purpose is to tack the part down, not to make a good connection. Therefore a cold solder joint is allowed to hold the component (see Note below).

6. Flux an entire row of leads. Work with the rows of leads going from left to right. If you are left-handed, work with rows of leads from right to left.

7. Hold the tip so that it runs parallel along the row of leads.

8. Bring the tip in on a flat landing onto the first lead. Immediately begin running the tip down the row of leads, drawing a straight line. Pause ½ second on each lead. When you reach the end of the row, wipe the tip down the lead towards you. To avoid bridging, do not stop and restart in the middle of a pass.
9. Repeat the process for the other rows of leads.

Note: Clean the tip and make sure that it is shiny and wettable. Re-tin the tip.
Removing Solder Bridges and Point-to-Point Soldering with the “Hook” Cartridge Tip

1. Apply flux to the bridged leads.

2. Wipe all excess solder from the tip and make sure it is shiny and wettable.

3. Bring the tip in as you would in drag soldering, making contact with the solder bridge. Wipe the leads towards you and away from the components.

4. The excess solder will flow towards the heat source, i.e. the tip. You should see excess solder on the tip.

5. Wipe the excess solder from the tip and repeat the process if necessary.

6. If the bridge is large, solder braid may be required to remove the excess solder.

Note: Clean the tip and make sure that it is shiny and wettable. Re-tin the tip.

If you have any questions about these techniques or about tip selection, please contact your local Metcal distributor or representative.