# Soldering and Cleaning Processes

This application note is designed to provide step-by-step processing recommendations. It covers the popular SMC soldering processes currently in use and provides recommendations and cautions for each step. Since many variations of temperature, time, processes, cleaning agents and board types are found in the electronics industry, you’ll want to test and verify your own system.

The process steps, recommendations and cautions are based on Bourns Trimpot surveys of SMC users, equipment manufacturers and materials suppliers. Also, comments reflect results of Bourns’ testing. Our findings suggest the following soldering and cleaning processes:

## 1. Soldering - Forced Hot Air, Convection, IR, Vapor Phase (In-Line), Wave (Single and Dual)

## 2. Cleaning - Solvent, Aqueous, Semi-Aqueous, No-Clean

On the facing page are the common methods, materials and maximum temperature/time parameters for soldering and cleaning processes.

### Solder Paste Printing

**Reflow**

**GENERAL**

Use the optimum solder paste for the pattern, printing process, solder paste density and solder joint quality.

**RECOMMENDED**

Use solders with melting points of 215 °C or less. Solder zone profile of 245 °C for 5 seconds.

**CAUTION**

Since solder paste usually contains a high percentage of activators, you must ensure adequate cleaning to remove all residues, unless no-clean (low solids) paste is used.

### Adhesive Application

**Flow (Wave)**

**GENERAL**

The adhesive must hold the SM Component (SMC) in correct orientation upon placement and maintain correct trimmer position during physical handling before final solder processing.

**RECOMMENDED**

To assure positional stability, place a single dot of epoxy under the SMC.

**CAUTION**

Stability after placement is a direct function of the volume of adhesive used. Use enough epoxy to assure stability through the cure process.

Avoid overflow of epoxy to solder pad and terminal areas.

### SMC Placement

**GENERAL**

Use pick-and-place equipment with vacuum nozzle ID size that allows adequate suction to pick the SMC out of the embossed cavity.

**RECOMMENDED**

The nozzle inside diameter (ID) should not exceed .100 in. (2.54mm) to ensure adequate suction and part alignment.

**CAUTION**

Assure parts are placed so that all terminals are equidistant (<4 mils) from the solder pads.

Align terminals with solder belt direction of travel to avoid body shadowing effects during flow soldering.

### Adhesive Cure

**Flow (Wave)**

**GENERAL**

Use heat/time cure method with either convection oven or infrared radiation.

**RECOMMENDED**

Cure using the temperature and times recommended by the adhesive manufacturer.

**CAUTION**

Use enough cure time to assure complete adhesive transition from fluid to solid.

### Flux Application

**Flow (Wave)**

**GENERAL**

Use the correct flux to remove surface oxides, prevent reoxidation and promote wetting.

**RECOMMENDED**

• RMA
• No-clean SRB (Synthetic resin based)
• OA (Organic Acid) (See caution)

**CAUTION**

Avoid highly activated fluxes. Consult factory before using OA.
For technical assistance call the Trimmer Products number on the back cover.

## Soldering And Cleaning Processes

### SOLDERING/CLEANING METHODS

<table>
<thead>
<tr>
<th>Process Step</th>
<th>Reflow</th>
<th>Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Solder Paste Printing</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2. Adhesive Application</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3. Component Placement</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>4. Adhesive Cure</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>5. Flux Application</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>6. Solder (Reflow)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>7. Solder (Flow)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>8. Wash (Solvent)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>9. Wash (Semi-Aqueous)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>10. Wash (Aqueous)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>11. No-Wash</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

### Solder

**Reflow: Hot Air, IR and Vapor Phase**

- **General:** Preheat sufficiently using both time and temperature to vaporize all solder paste solvents and moisture, leaving only solder and flux as component enters solder reflow phase.
- **Recommended:** Solder profile of 230°C for 20 seconds.
- **Caution:** Do not exceed time and temperature reflow profile of 235°C for 45 ± 5 seconds for hot air/IR reflow and 215°C for 3 minutes for vapor phase reflow. Use 215°C as minimum reflow temperature.
- **Minimize thermal shock by limiting temperature rise rate to 3°C/sec and by stabilizing board and components temperature during preheating.**

### Wash

**Solvent**

- **General:** Use solvent cleaning primarily for nonpolar contaminants such as rosin-based flux residues.
- **Recommended:** Use any suitable washing solvents that meet ODC requirements.
- **Caution:** Limit excessive direct spray pressure to 60 psi or below for optimum reliability.

**Semi-Aqueous**

- **General:** Use semi-aqueous for nonpolar contaminants such as rosin-based flux residues.
- **Recommended:** Use terpene or hydrocarbon based for prewash. Use water for final wash.
- **Caution:** Limit excessive direct spray pressure to 60 psi or below for optimum reliability.

**Aqueous**

- **General:** Use aqueous cleaning primarily for polar contaminants such as organic flux residues.
- **Recommended:** Use any of these aqueous wash materials: Deionized water Surfactants Saponifiers
- **Caution:** Limit excessive direct spray pressure to 60 psi or below for optimum reliability. Ultrasonics may cause component damage or failure.

### Board Rework Technique

**General:** Hot air reflow technique is preferred.

**Caution:** Avoid use of a soldering iron or wave soldering as a rework technique.