

## Application Brief

### Cleaning Printed Circuit Boards With Solvent-Alternative Chemistries

Printed circuit boards with through-hole and surface mount components are used in a variety of electronic industries. Thorough cleaning of these boards after soldering always has been crucial to reliability of the finished product. Flux residue from the soldering process previously had been removed easily with the mechanical action of ultrasonics in chlorofluorocarbon-based solvent chemistries. But recent concerns with the environmental effects of the ozone-depleting CFCs and legislative measures to curb their use, have created the necessity of alternative cleaning methods.

Branson has developed methods for successfully cleaning printed circuit boards with semi-aqueous chemistry and with saponified aqueous solutions. Both methods are environmentally acceptable CFC alternatives.

Boards with surface mount components benefit from cleaning with ultrasonic energy, which efficiently removes and flushes flux residue from beneath the inherently tighter clearances of the components.

Semi-aqueous cleaners are organically-based chemistries that behave in operation more like water-based cleaners than traditional safety solvents. Semi-aqueous cleaning products can cover a wide range of characteristics: they can be water-soluble organic compounds to pure hydrocarbons with emulsifying agents. Some are naturally occurring materials, while others are chemically engineered to produce certain properties.

Saponified aqueous solutions clean by converting rosin type flux into water-soluble soaps.

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### Cleaning Through-Hole Boards With Semi-Aqueous Solutions

**Challenge:**

Remove RMA-type flux and ionic contaminants from through-hole printed circuit boards without the use of ozone-depleting solvents, while providing the same level of cleanliness experienced with solvents.

**Previous**

**Cleaning Method:**

Solvent/vapor clean with FC-113 alcohol azeotropes.

**Recommended**

**Process:**

- Immerse boards vertically for 60 seconds in full concentration semi-aqueous material heated to 140°F within a 40 kHz ultrasonic tank.
- Primary rinse with warm deionized water spray for 60 seconds.
- Final precision rinses in warm deionized water overflow for 1–2 minutes.
- Forced hot air drying.

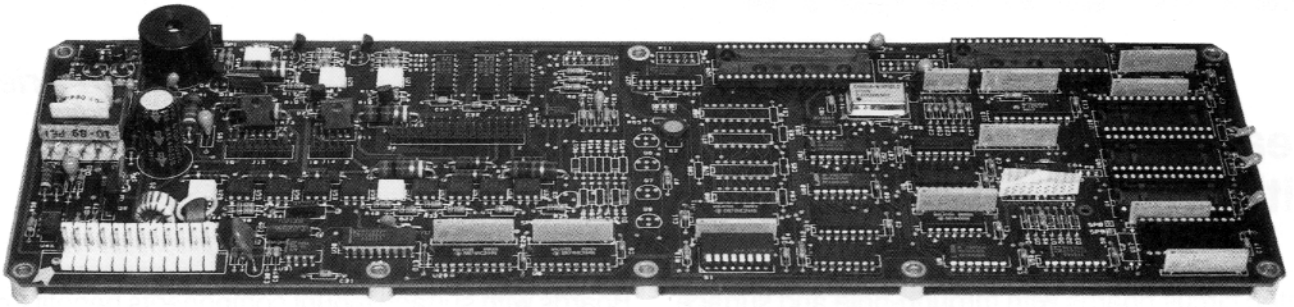
**Equipment:**

A Branson semi-aqueous batch or continuous process cleaner with dryer.

**Benefits:**

- Eliminates the need to use CFC-based solvents.
- Achieves the same cleanliness levels as CFC-based chemistries.
- Lower ionic contamination detected compared to CFC-based solvents.

Semi-aqueous solutions provide effective alternatives to CFC-based solvents. Because of their chemical properties, however, thorough rinsing in at least two separate steps must be undertaken for complete removal of the solution. As with any process involving water, drying must be included as the final step. This is important particularly with sensitive electronic components.



*Semi-aqueous and saponified aqueous solutions offer effective alternatives to cleaning printed circuit boards whether the boards are fabricated with through-hole or surface mount devices or are mixed technology. Use of ultrasonic or MicroCoustic energy in the cleaning and rinsing process make these solutions efficient alternatives to CFC-based solvents.*

## **Cleaning SMD Boards with Saponified Aqueous Solution**

This application was developed for printed circuit boards with surface mount devices. These devices generally have clearances of only 1-3 mils from the board, which often is densely populated, so effective flux removal is difficult with conventional cleaning methods. The following method employs a cleaning technology that utilizes

saponified aqueous solution as an alternative to CFC-based solvents. As with semi-aqueous materials, saponified aqueous chemistry requires thorough rinsing augmented by mechanical action such as sprays, ultrasonics, or MicroCoustic® energy. A variety of drying techniques is available for the final step in the cleaning process.

### **Challenge:**

Thoroughly and quickly remove RMA-type flux and ionic contaminants from surface mount printed circuit boards. This must be done without ozone-depleting solvents, but achieve the same level of cleanliness experienced with solvents.

### **Previous**

#### **Cleaning Method:**

Solvent/vapor clean with FC-113 alcohol azeotropes.

### **Recommended**

#### **Process:**

- Orient boards horizontally in immersion tank equipped with 40 kHz ultrasonics for 2 minutes. The saponified aqueous solution should be at 160°F with a 7% concentration by volume.
- Hot deionized water 40 kHz ultrasonic rinse for two minutes.
- Hot deionized water overflow rinse for one minute.
- High purity air knife blow-off followed by a hot air recirculating dryer.

### **Equipment:**

A Branson aqueous batch or continuous process cleaner with dryer.

### **Benefits:**

- Eliminates the need to use CFC-based solvents.
- Achieves the same cleanliness levels as CFC-based chemistries.
- Lower ionic contamination detected compared to CFC-based solvents.

*For application assistance, contact your nearest Branson office or Branson's Cleaning Applications Laboratory at (203) 796-0522.*



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