

### Introduction

As its name implies, wave soldering is used to combine PCBs and parts through a liquid “wave” formed as the result of motor agitation. The liquid is actually dissolved tin. It is carried out in a wave soldering machine (Figure 2).

The wave soldering process is composed of four steps: **flux spraying, preheating, wave soldering, and cooling.**

Source: <https://www.techbriefs.com/component/content/article/tb/features/articles/28337>

### 1. Flux Spraying

Cleanliness of metal surfaces is the basic element ensuring soldering performance, depending on functions of solder flux. Solder flux plays a crucial role in smooth implementation of soldering. Primary functions of solder flux include eliminating oxide from the metal surface of boards and component pins; protecting circuit boards from secondary oxidation during the thermal process; reducing surface tension of solder paste; and transmitting heat.

### 2. Pre-Heating

In a pallet along a chain similar to a conveyor belt, circuit boards travel through a heat tunnel to carry out preheating and activate flux.

### 3. Wave Soldering

As temperature constantly rises, solder paste becomes liquid with a wave formed from the edge boards that travel above. Components can be solidly bonded on boards.

### 4. Cooling. Wave

Cooling. Wave soldering profile conforms to a temperature curve. As temperature reaches the peak in the wave soldering stage, it is reduced, which is called a cooling zone. After being cooled to room temperature, the board will be successfully assembled.

### Wave flow Soldering

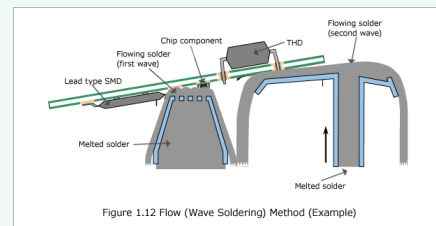


Figure 1.12 Flow (Wave Soldering) Method (Example)

### Process

As circuit boards are placed on a pallet ready to go through wave soldering, time and temperature are closely associated with soldering performance. As far as time and temperature are concerned, a professional wave soldering machine is necessary, while the PCB assembler's expertise and experience are seldom easy to obtain since they depend on application of up-to-date technologies and business focus.

If temperature is set too low, flux won't be melted properly, reducing the ability to react and dissolve oxide and dirt on the surface of the metal. In addition, the alloy won't be generated by flux and metal if the temperature is not sufficiently high. Other factors such as speed of the band carrier, wave contact time, etc. should be taken into consideration.

Generally speaking, even though the same wave soldering equipment is used, different assemblers offer differing manufacturing efficiency due to operation methods and the extent of knowledge about how to operate the machine.

### Reflow vs Soldering

Figure illustrates the difference between soldering process steps. The essential difference between wave soldering and reflow soldering lies in flux spraying — wave soldering contains this step, while reflow soldering does not. Flux enables dioxide elimination and surface tension reduction in the material to be soldered. Flux works only when it's activated, which requires rigorous adherence to temperature and time control. Since flux is contained in solder paste in reflow soldering, flux content has to be appropriately arranged and achieved..