

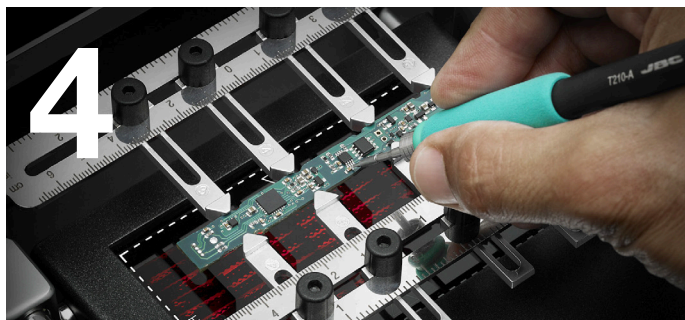
# **SUCCESSFUL SOLDERING AND REWORKING FOR CLASS 3 AND 3A APPLICATIONS**

Introducing JBC's  
range of specialist  
soldering and rework  
stations for military,  
aerospace and  
medical applications

# Contents

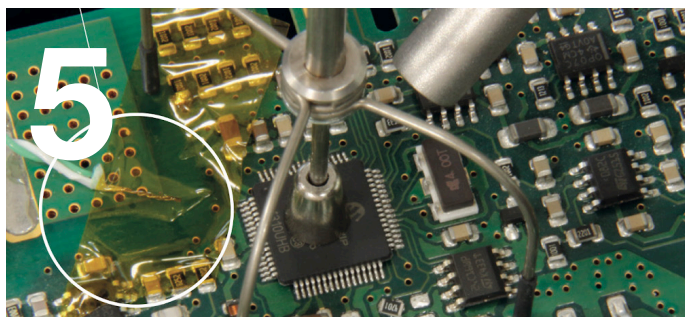


## The need for precision



## The challenge of reworking PCB assemblies

- 4 Ensure quality
- 4 Preventing errors



## Manufacturing

- 6 Precision hot air stations for reworking
- 8 Preheating PCBs



## Soldering and rework

- 11 The need to optimize thermal efficiency
- 13 DDU 2-Tool Control Unit
- 14 WSS Precision High-Temperature Wire Stripper Station



# The need for precision

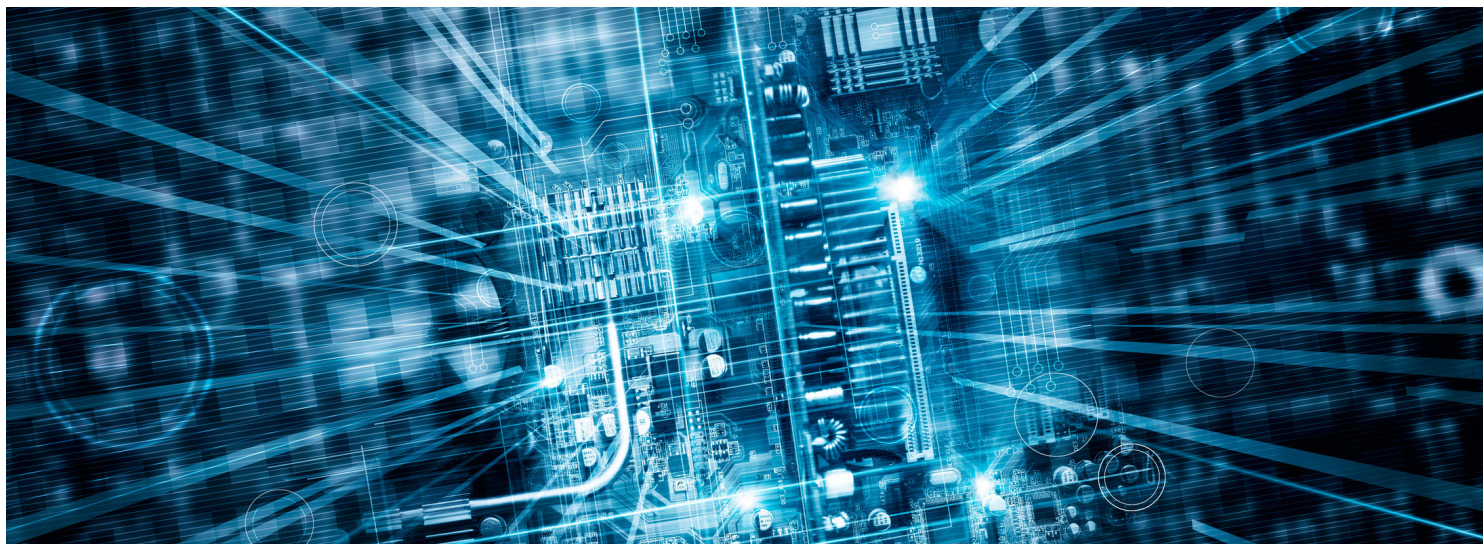
**IPC Class 3 and 3A printed circuit boards (PCBs) increasingly depend on electronics. PCBs are the core component in almost every device for military, aerospace and medical applications because they mechanically fix and electrically connect all electronic components.**

By necessity, PCBs for such applications have to be highly-reliable. That means the quality of the solder joints that attach each and every component and reworked device to the board are fundamental to the performance of the board.

JBC manufactures quality soldering and rework stations for demanding applications. JBC is based in Barcelona, Spain, with over 90 years of experience serving clients worldwide.

It offers a wide range of innovative, efficient and reliable soldering solutions developed to satisfy the most demanding of customers' requirements.

This document outlines how JBC's soldering and rework stations can be used for the rapid placement, precision hand soldering, and easy reworking of components onto the surface of an IPC Class 3 and 3A PCB for high and ultrahigh reliability military, aerospace and medical applications.



# The challenge of reworking PCB assemblies

The range of devices and applications that use IPC Class 3 and 3A PCBs is reflected in the diverse range of components that can be attached to a PCB. These include: Through-Hole (THT) Devices, Surface Mount Devices (SMDs), as well as Ball Grid Arrays (BGAs), Quad Flat Packs (QFP) and, increasingly, Micro-Quad Flat No Lead (QFN) devices.

While the diversity of components used is increasing, the size of individual components is decreasing. With smaller-sized components, devices can be placed closer together on the PCB, which makes the task of soldering and reworking individual components far more

demanding if collateral damage to adjacent devices or to the board is to be avoided.

The task of soldering and reworking is made all the more challenging because the increased functionality demanded for PCBs in these sectors means that many boards are constructed in multiple layers. These thicker boards require more heat to be reworked, which further increases the threat of thermal stress both to components and to the PCB.

## Ensure quality

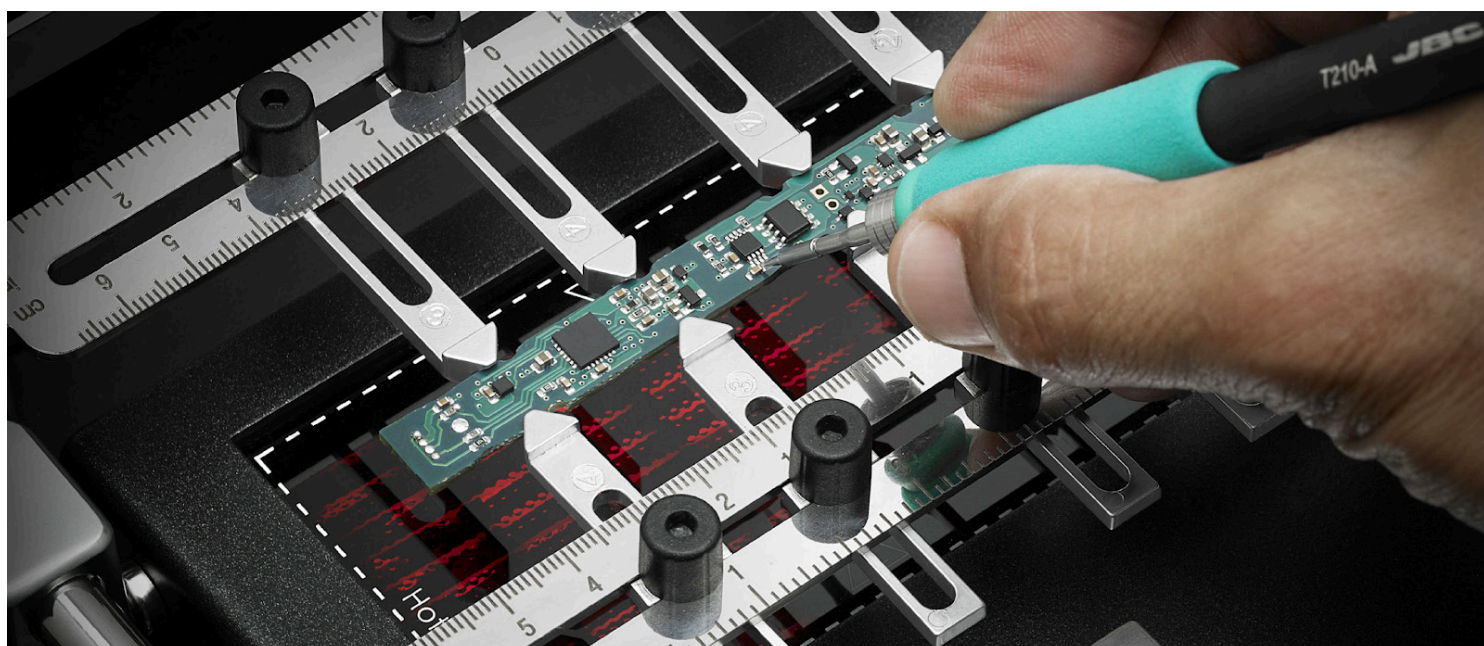
Preheating the board, particularly if it is a multi-layered board, is key

to avoid thermal shock to components and improving quality during solder and rework operations.

Preheating the board minimizes the temperature differential between the board and the soldering and reflow temperature, reducing the likelihood of damage.

## Preventing errors

To avoid thermal shock during the rework process, JBC Hot Air Station include fully-configurable soldering temperature and air flow rate profiles for up to twenty-five profiles. Each profile can include a precise pre-heat time, ramp-up-time to peak temperature for reflow, and a cool-down rate.





# Manufacturing

**The process of reworking a PCB assembly usually involves desoldering and removal of a defective component and re-soldering a replacement.**

JBC's innovative range of stations are designed to improve quality and increase production efficiency by enabling the rapid placement, precision hand soldering and easy reworking SMT components onto the surface of a PCB.

A hot air station is ideal for this type of work because it allows reproducible soldering profiles and ensures even heating of the working area. It uses a special nozzle to focus a stream of hot air to heat a particular component to melt the solder joints that attach it to the PCB so that it can be removed. A range of accessories are available to ensure the heated airstream is concentrated only on the component being reworked and the heated component is carefully extracted. These accessories include protectors, extractors and tripods. Once the pad array on the circuit board has been cleaned, a replacement device is soldered to the board.

Components are generally worked on one by one and care must be taken to avoid damage to the



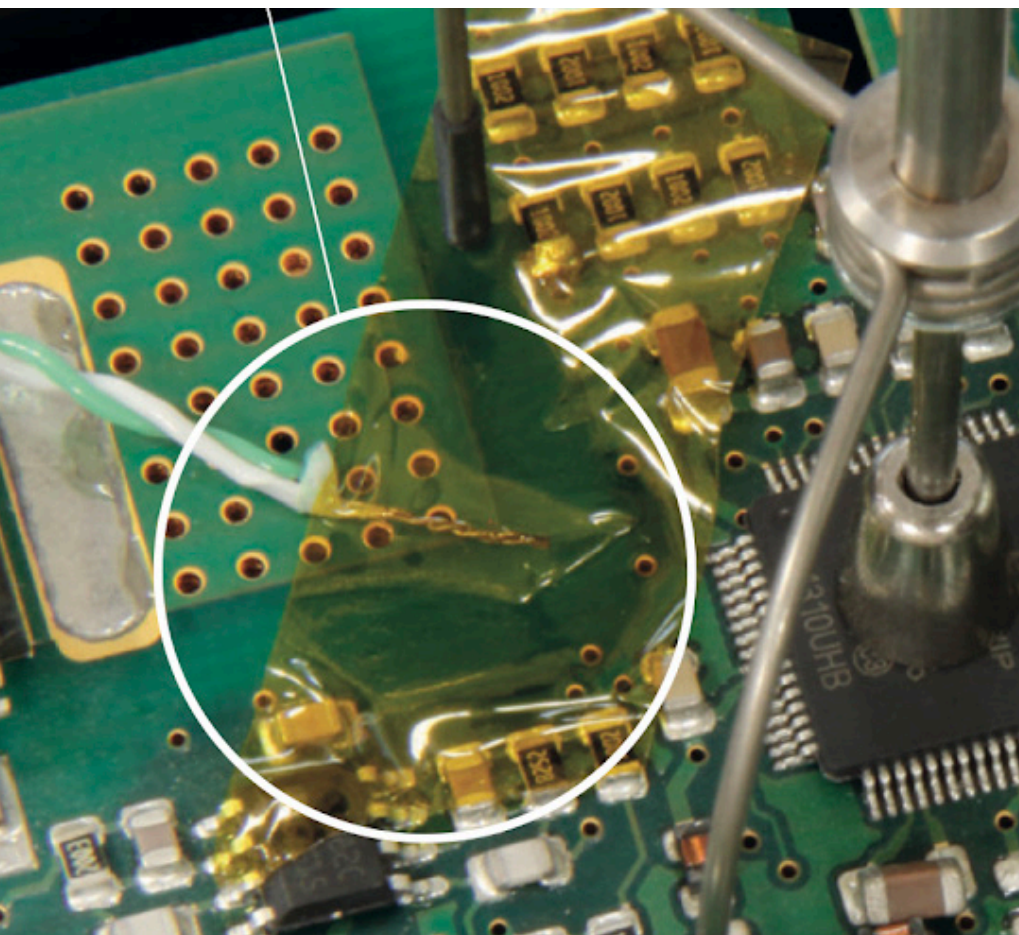
surrounding components or to the PCB itself, often through the use of thermocouples and protective surrounds.

JBC manufactures high-powered hot air stations to rework all types of SMDs. TE, JT and JNA stations are ideal for Class 3 or Class 3A applications.

## Hot air stations for reworking

In addition to the temperature profile feature, TE Precision and JT Standard Hot Air Stations also have the facility to limit the working temperature using JBC's Type K thermocouple.

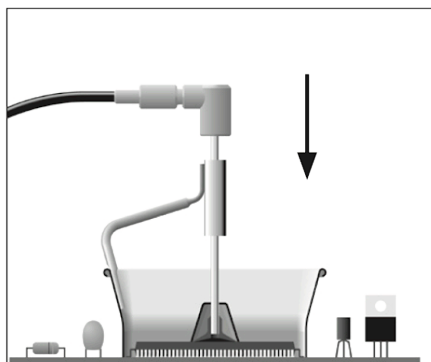
- In **regulation mode**, the thermocouple is connected to the component being worked on so that the station regulates the air temperature automatically to maintain the external thermocouple at a set temperature.
- In **protection mode**, the thermocouple is attached to an adjacent component to protect it from heat damage. As soon as the thermocouple senses the component has reached the maximum set temperature, the rework station cuts off the supply of air.



A range of accessories are available to ensure heat is concentrated only on the component being reworked and the heated component is carefully extracted. These accessories include protectors, extractors and tripods. To desolder with JBC Hot Air Station:

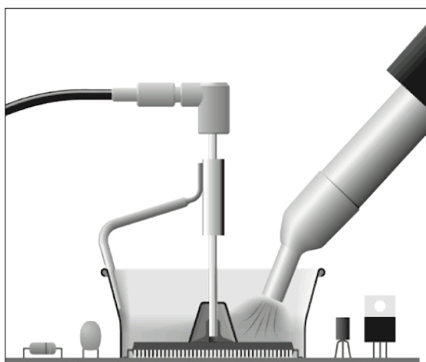
- **Place.** Choose the extractor, or protector and tripod which best fits the component.
- **Heat.** Apply the heat to the component, while the surrounding elements are protected.
- **Extract.** The desoldered component will automatically be withdrawn.

### 1. Placing



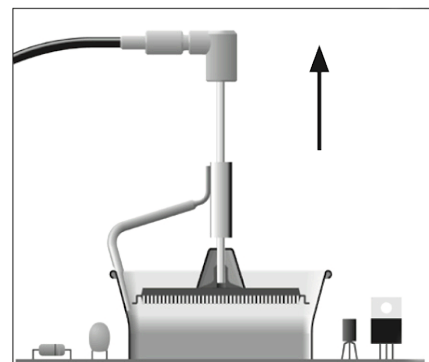
Position the extractor with the appropriate suction cup and press the suction button.

### 2. Heating



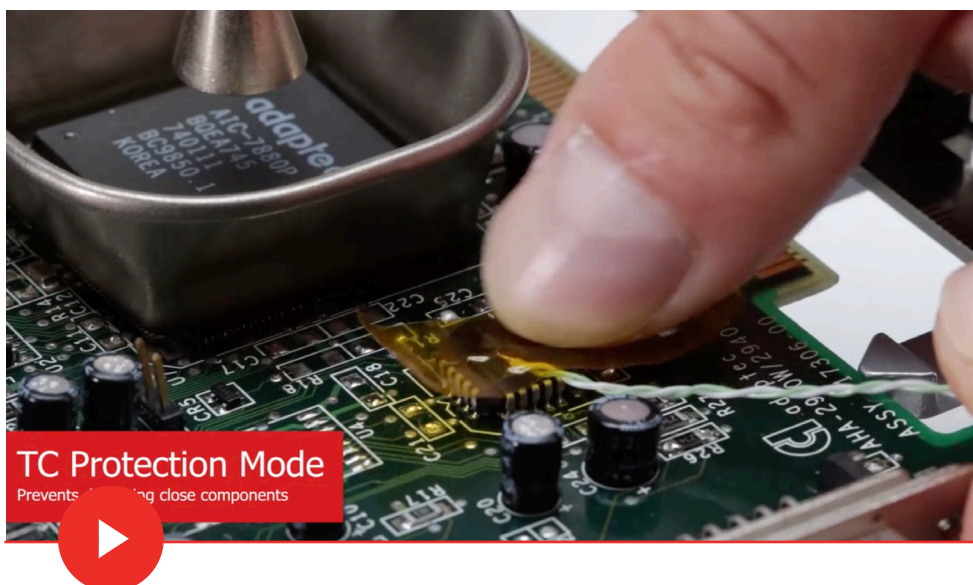
Heat the component.

### 3. Extracting



The component lifts off automatically when the solder melts.

In addition, a pick-and-place tool can be attached to the integral vacuum pump to place and remove SMDs of any size.



## Preheating PCBs

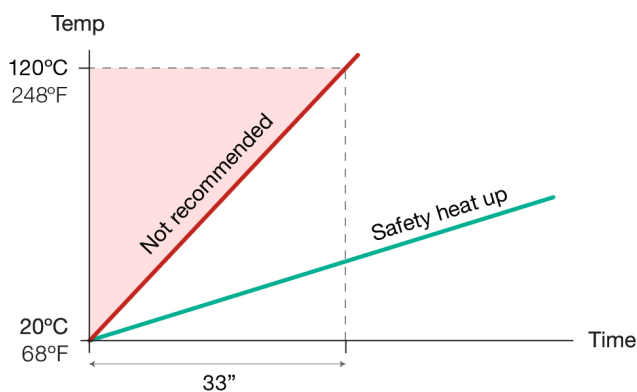
Preheating the PCB is essential when reworking multi-layered boards and/or large ground planes in order to avoid thermal shock to both the board and components and to facilitate soldering and desoldering processes. Preheating also allows work to be undertaken faster and at lower temperature, which reduces the risk of thermal stress on PCBs and components.

JBC manufactures four preheater models, the largest of which is suitable for PCBs measuring up to 20 x 24 in (510 x 610 mm).

All preheaters use thermal convection to gradually and uniformly heat the entire working area. The rate at which the PCB and its components are preheated should be in line with the recommended temperature profiles and limit values for each application. Up to eight thermocouples can be connected to the preheater to precisely control the rate of preheating temperatures.

To optimize the preheating process, JBC's Preheaters feature temperature profiles which can be customized according to need to

enable the operator to work within the temperature ramp-up rate of less than 5 - 7°F per second (3 - 4°C per second) recommended by the Institute for Printed Circuits in order to minimise the risk of thermal stress.



Within the temperature ramp-up rate of less than 5 - 7°F per second (3 - 4°C per second) recommended by the Institute for Printed Circuits the risk of thermal stress is minimised.



With JBC Software, Preheaters can be synchronized with other JBC Hot Air Stations, Soldering Stations as well as Fume Extractor equipment to optimize the rework process.

Preheaters are operated easily and conveniently from a separate console, which includes a 2.8" colour screen and an intuitive user interface to ensure quick and easy access to the station's operating parameters.

Profile Mode allows the heating rate of the PCBA to be controlled without exceeding the recommended temperature limit for each application, using the control and protection thermocouple. The station features 22 customizable temperature profiles. In this mode, the heater unit regulates the temperature according to the selected profile as measured by Thermo-

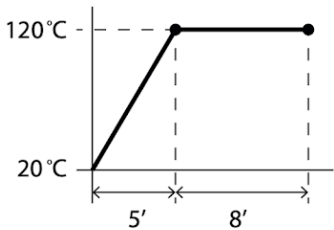


couple 1 as long as the temperature at the other thermocouples remains below the protection temperature limit.

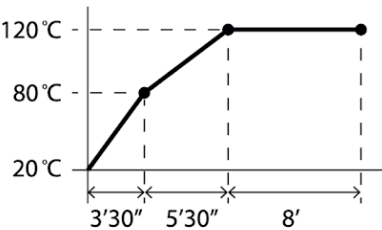
In addition, there are three JBC predefined profiles: A, B and C, each with an increased number of preheating steps. The thicker a PCB and the more layers it contains, the more steps are needed

to warm it gradually. These profiles are not modifiable but can be used as a template to create custom profiles.

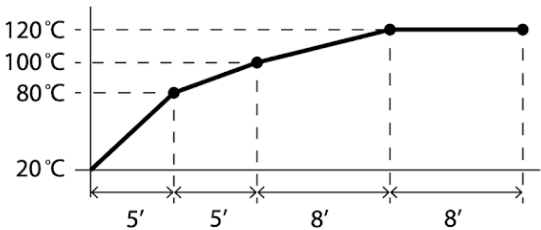
**JBC-A**  
2 steps



**JBC-B**  
3 steps



**JBC-C**  
4 steps

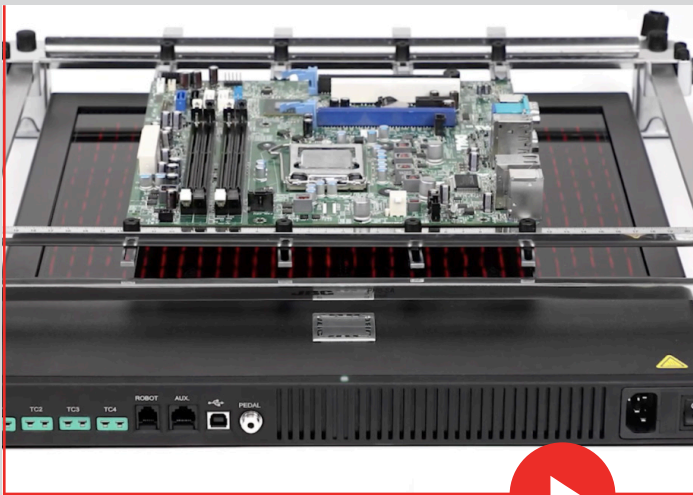
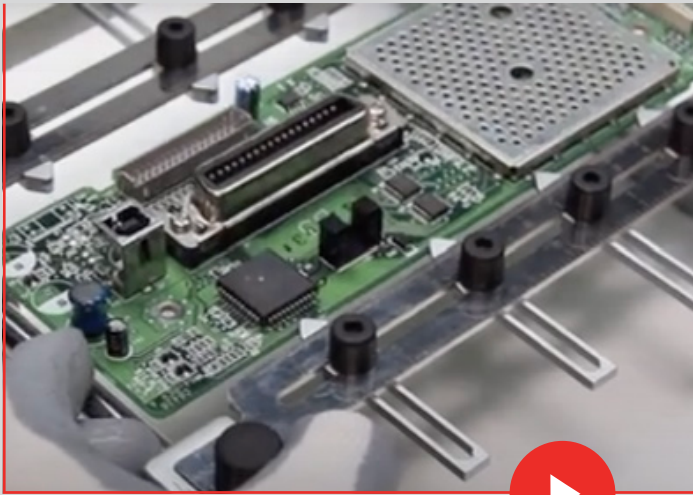


**PCB Reference Specifications:** FR4 1,6mm thick and 2 layers.

FR4 1,6mm thick and 6 layers.

FR4 2,2mm thick and 6 layers.

To hold the PCBA in place precisely above the Preheaters, JBC manufactures a range of height-adjustable support frames.



# Soldering and rework

**Hand soldering involves bonding electronic components to PCBs by melting and placing a low-temperature alloy solder to form an electronically conductive joint.**

## The need to optimize thermal efficiency

The most essential part of a soldering iron is its tip. JBC has developed the most advanced solder technology to extend tip life and to optimize production time based on:

- Excellent heat transfer
- Instantaneous heat-up
- Great durability

When selecting a tip, it is important to have the correct geometry for the application, to ensure the tip fits the joint correctly. The bigger the tip surface in contact with the application, the higher the rate of thermal transfer, the lower the time needed, and the better the result.

JBC has over 500 models of cartridges of different sizes and shapes for every application, from precision work to high power applications. Tip types suitable for

the Long-Life Cartridge Range for T245 Handles, for example, are available in many shapes and sizes, including:

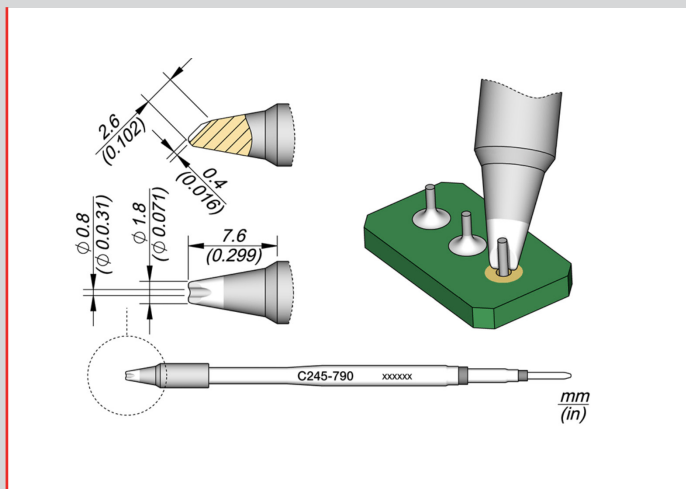
- **Chisel:** A flat, straight end. The size is usually specified as the length of the flat area and thickness of the tip, for example C245731 cartridge chisel has a tip 0.024 x 0.011" (0.6 x 0.3 mm).
- **Bevel:** A beveled tip has a flat oval end set at an angle. The size is specified by the diameter of the shaft. C245951 Cartridge Bevel has a diameter of 0.149" (3.8 mm).
- **Conical:** The end of the soldering tip comes to a point. The size is specified by the diameter of the end, for example C245030 has a diameter of 0.012" (0.3 mm). These tips are

generally used when pin-point accuracy is needed. The ends of the tips may also be bent for difficult-to-access areas.

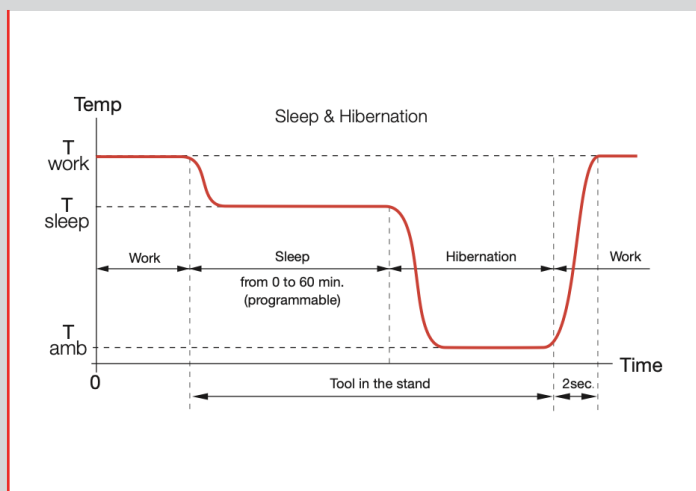
- **Barrel:** Where the tip is shaped to fit around a pin or cable to improve the rate of heat transfer. These are appropriate for connector soldering purposes and they are perfect for both THT and SMD cable soldering or for applications with high power requirements such as ground plane soldering.



In addition, if a specific tip is needed for a particular application, JBC can work with you to design and manufacture a bespoke tip. JBC prototype developers are constantly creating special cartridge shapes according to the requests of customers. You can contact them at [customtips@jbc-tools.com](mailto:customtips@jbc-tools.com).



C245790  
Cartridge Barrel  
Ø 0.8



**Tool Temperature.** When the tool is placed in the stand, it automatically puts the tool into Sleep & Hibernation Mode. **Sleep Mode** lowers tip temperature below solder melting point, preventing tip iron dissolving into solder. **Hibernation Mode** cuts off power, allowing the tip to cool to room temperature thus preventing oxidation and saving energy. Sleep and Hibernation set point temperatures can be adjusted for both, the type of work and the specific device, to ensure optimum solder quality for all Class 3 components.



The keypad ensures the station is fast and easy to configure, including setting the temperature to deliver optimal performance. Operators can set a maximum and minimum working temperature; by default, these are set at 750°F (400°C) and 392°F (200°C) respectively.

Operators can also fix one temperature value within the temperature range 190 - 840°F (90 - 450°C), which is ideal when soldering more than one component at a specific temperature. The station will reject any attempt to change the temperature. Alternatively, the user can set up to three temperatures to enable a quick change between components.

CDB Station works with C245 Cartridges and T245 Handles, which is the perfect soldering tool for general electronic applications with high power requirements. To enable an operator to change C245 Cartridges safely without having to switch the station off, CDB Soldering Station incorporates JBC Quick Cartridge Extractor.



## DDU 2-Tool Control Unit

DDU Control Unit can operate two 150W tools simultaneously. It is suitable for both, soldering and desoldering applications, and is fully compatible with ten different JBC tools.

The station features JBC Exclusive Heating System and Intelligent Sleep and Hibernation Modes to lower the soldering tip temperature when the tool rests in the stand, in order to avoid oxidation and to help extend tip life.



## WSS Precision High-Temperature Wire Stripper Station

WSS Station is designed to strip high-temperature wire insulation made of thermostable materials such as Teflon®, Kapton®, silicone rubber and others from 14 to 40 AWG (0.0031 to 0.0642" / 0.08 to 1.63 mm) at temperatures of up to 1470°F (800°C).

WSS incorporates predetermined power levels for each type of material and a customized working mode.

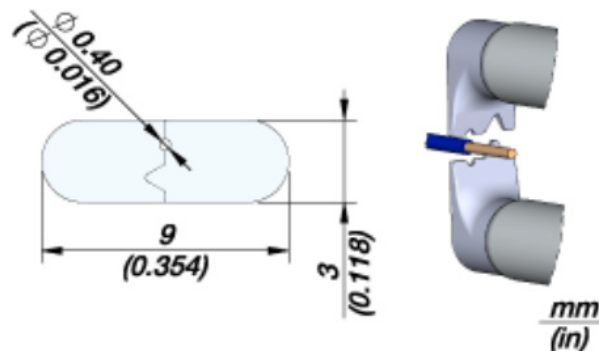
The station comes with the comfortable, ergonomic WS140 Precision High-Temperature Wire Stripper Tweezers which are designed for safe operation at very high temperatures. The tweezers feature an adjustable opening and an adjustable cable length selector for optimum precision.





WS140 Tweezers are compatible with W140 Blade Cartridge Range. The blade's self-centering design ensures perfect tip alignment, ensuring insulation is removed from the wire without damage to the conductor. Customized cartridges can also be supplied for special applications.

### W14026G



# **JBC**

The Soldering Co.



[www.jbctools.com](http://www.jbctools.com)