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How to Use a Hot Air Rework Station

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Introduction

Hot-air stations or heat guns are very useful tools and are essential for any electronics workbench. When working with or building printed circuit boards, there is a lot of room for errors to be made. Whether you're relying on machines to do the building for you or building by hand, solder can often have a mind of its own. Sometimes the person doing the building (or the person programming the machine that does the building) can make a mistake. Other times, the solder or components on the PCB can react in ways that are not desirable during reflow. Have no fear though, there are ways to remedy this! The SparkFun hot-air rework station - 303D is one such solution.



Hot-Air Rework Station - 303D

© TOL-14557

\$114.95

★★★★☆ 10

Tools

Besides a hot-air rework station, you'll need a few tools to rework a surface mount components on a board. The tweezer type will depend on the job and personal preference. Flux can also help reflow solder joints.



SparkFun Third Hand Kit

☉ TOL-11784

\$34.95

★★★★☆ 53



Insulated Silicone Soldering Mat

☉ TOL-14672

\$9.95

★★★★☆ 3



Tweezers - Curved (ESD Safe)

☉ TOL-10602

\$3.95

★★★★☆ 5



Tweezers - Straight (ESD Safe)

☉ TOL-10603

\$3.95

★★★★☆ 3



Chip Quik No-Clean Flux Pen - 10mL

☉ TOL-14579

\$7.95

★★★★★ 2



Panavise Jr. - Vacuum Base

☉ TOL-10410

\$32.95



Tweezers - Straight (Cross-Lock, ESD Safe)

☉ TOL-12573



Tweezers - Curved (cross-lock, ESD Safe)

☉ TOL-12572

\$3.95**\$3.95**

★ ★ ☆ ☆ ☆ 1

Additional Tools

To protect your table's finish, we recommend using a heat resistant material.

- Heat Resistant Material
 - Piece of Medium Density Fiberboard (MDF)
 - Silicone Mat

If this is the first time that you have reworked a board, try reworking a scrap board from our ding and dent before reworking an expensive PCB!



Scrap Boards

● DD-08477

\$0.25

★ ★ ☆ ☆ ☆ 4



Pick and Place Spare Parts Grab Bag

○ DD-10351

Hardware Overview

Let's take a look at the features starting on the upper right side of the 303D hot air rework station.



Power Switch -- The 303D uses a **standard North American plug/outlet (~110VAC)**. Hopefully the power on/off switch is self-explanatory. Move the switch to "ON" to turn the hot-air rework station on, move the switch to "OFF" to turn the hot-air rework station off. Easy peasy.

Please Note! The device will not power off immediately after turning the switch to the "OFF" position. It will continue to blow air until the air temperature is below 100°C.

LED Digital Output -- The LED digital output lists both your temperature range as well as your air flow. The display will change as you turn either the air or temperature knobs.

Note: Temperature scale (Celsius vs Fahrenheit) is set during the manufacturing stage. By default, the display will show your current temperature in degrees **Celsius**.

Air Flow Grade -- Air flow grades range from **A25 ~ A99**. You can adjust the air flow by turning the air setting knob. The LED output will display the setting air flow grade for 2 seconds and then return to the current air temperature of the nozzle.

Temperature Range -- Output temperatures range from **100° ~ 480° Celsius**. You can adjust the working temperature by turning the temperature setting knob. The LED output will display the setting temperature for 3 seconds and then return to the actual air temperature of the nozzle. The indicator in the temperature box will twinkle when the desired temperature is reached.

Nozzles -- The 303D comes with 2x changeable hot-air nozzles. The smaller nozzle is good for focusing the hot air on smaller components. The bigger nozzle is great if you are trying to focus hot air around a big area on the board.



Wand Holder -- The unit comes with a wand holder for the hot air gun. It can be attached on either side of the hot air rework station.



Wand Holder Attached to the Right Side While Powered

What's It Good For?

Hot-air rework stations can be very handy. As mentioned above, they are a crucial tool when it comes to reworking a board. The term rework just means you are refinishing or repairing an already reflowed board, and it is a term commonly used in the electronics world. Just think of it as doing any work to the board that wasn't involved in the actual production process. Here are some common rework scenarios:

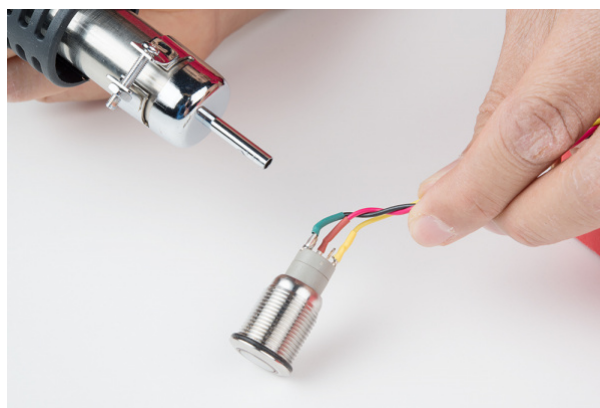
- **Polarized Components** - Parts that have been placed incorrectly (backwards, shifted x degrees off). These include ICs, diodes, some capacitors, connectors, etc.
- **Tombstone Parts** - This is when a part (usually a resistor or capacitor) reflows only on one side. The part usually sticks straight up resembling a tombstone.
- **Cold Joints** - This is similar to a tombstone except the parts might not be sticking straight up, making it harder to see the connection that is not being made.
- **Removing Defective Parts** - Sometimes, during the IC manufacturing process, errors can arise and go unnoticed. These ICs are then placed on perfectly good PCBs. Hot-air is great for replacing these bad parts.
- **Missing Components** - The smaller the component, the easier it is for it to disappear. This can happen before or during reflow, resulting in a spot where something should be, but isn't. Hot-airing a new part in its place is a snap with this rework station.
- **Unintentional Solder Jumpers** - If too much solder or solder paste is used, the result can be jumpers on one or more of your surface mount IC's legs. Hot-air can sometimes be used in conjunction with a flux pen to remove these pesky buggers.

Other Uses

Rework isn't the only thing a hot-air rework station is good for. Other uses include:

- Salvaging electronic components from old PCBs.
- Reflowing solder paste applied with a stencil between SMD components and a PCB.
- Shrinking heat-shrink to secure wire connections.

- Heating up and bending certain plastics (with the correct settings).
- Heating up hot glue to remove or reposition items that were glued incorrectly.



How to Use a Hot Air Rework Station

Warning: Do not use hot-air on surfaces you don't want ruined. Having a piece of scrap wood or something similar to work with hot-air on is highly recommended.

Third hands or other vice grips help tremendously. Remember, metal heat sinks and PCBs with ground planes can make reworking take a lot longer.

Choose Your Nozzle

Choose the appropriate tip for the job. Attach the nozzles to the wand and tighten the screw using a screw driver to hold it in place.

Plug the 303D's North American standard plug into your very favorite US outlet (~110VAC). The heating element and blower will remain off until you flip the power switch to ON.

Power On

Flip said power switch to ON. The heating element will fire up and the air will get very hot, very quickly so aim the nozzle accordingly. The red LED next to the "SET TEMP" will pulse, indicating that "Hey, I'm ready to melt some stuff." Wait for the hot-air station to warm up before using it.

Note: It's possible that little whimsical puffs of white smoke will emit from the nozzle. Those are just magical solder clouds and are normal. They will go away, so enjoy them while they last.

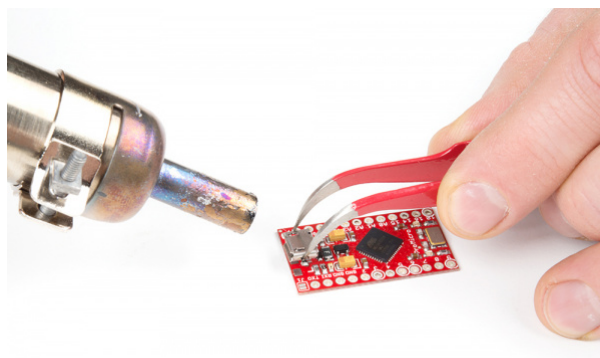
Adjust Air and Temperature

There are two control knobs – one for airflow and one for temperature. Adjust them to suit your needs.

Note: Set the temp and air-flow to the appropriate settings (slightly higher than the melting point of the solder, and not too much air to blow your parts away). We recommend setting the air flow and temperature knobs to the middle and then test reflow on a small component.

Rework

When you've got your settings honed in, carefully aim the nozzle at the area you are working on. Saying the magic spell (meltum, meltum, meltum), move the nozzle back and forth until the solder begins to flow (the solder should appear shiny and molten). Then carefully remove/reposition the part you want to rework using tweezers by nudging or grabbing the part. Keep in mind that hot-air is, well, hot.



A micro-B connector being removed from a Pro Micro for a Tech Prank. Be sure to rework the board on a heat resistant material!

Warning: Make sure to keep the hot-air gun moving to prevent any damage to the component or the PCB from burning. Aiming the heat gun at the same point can melt the board after a certain period of time. Certain components may be heat sensitive. Make sure to check the datasheet on the IC. The black plastic on male and female headers can melt while surface mount buttons can become discolored. Be sure to aim the hot air at a component carefully!

If you also see smoke, warping, or black goo coming from your board, remove the heat and turn your heat setting down.

Cool Down

When you are done, flip the power switch to OFF to allow the station to cool down when finished. The self-cooling will kick on and last for a few minutes.

Clean

Wash your board when you're finished to remove any water soluble flux left on the board, which can cause corrosion over time.

Demo Video

Below is a demo video from our pal Dave Stillman showing us how to use our SparkFun Hot-air Rework Station properly!

SparkFun Hot Air Rework with David Stillman





Replacement Parts

Nozzles



Hot-air Rework Nozzles - Y1126

☉ TOL-07925

\$14.95

Heating Elements

Heads up! If you decide to replace the heating element, the following directions listed further below are for TOL-10706. When replacing the heating element in the wand for TOL-14557, there will be some epoxy/glue in the handle that seals it shut. After removing the screws, you may need to force it open which may damage the handle! We recommend replacing the heating element at your own risk for TOL-14557.

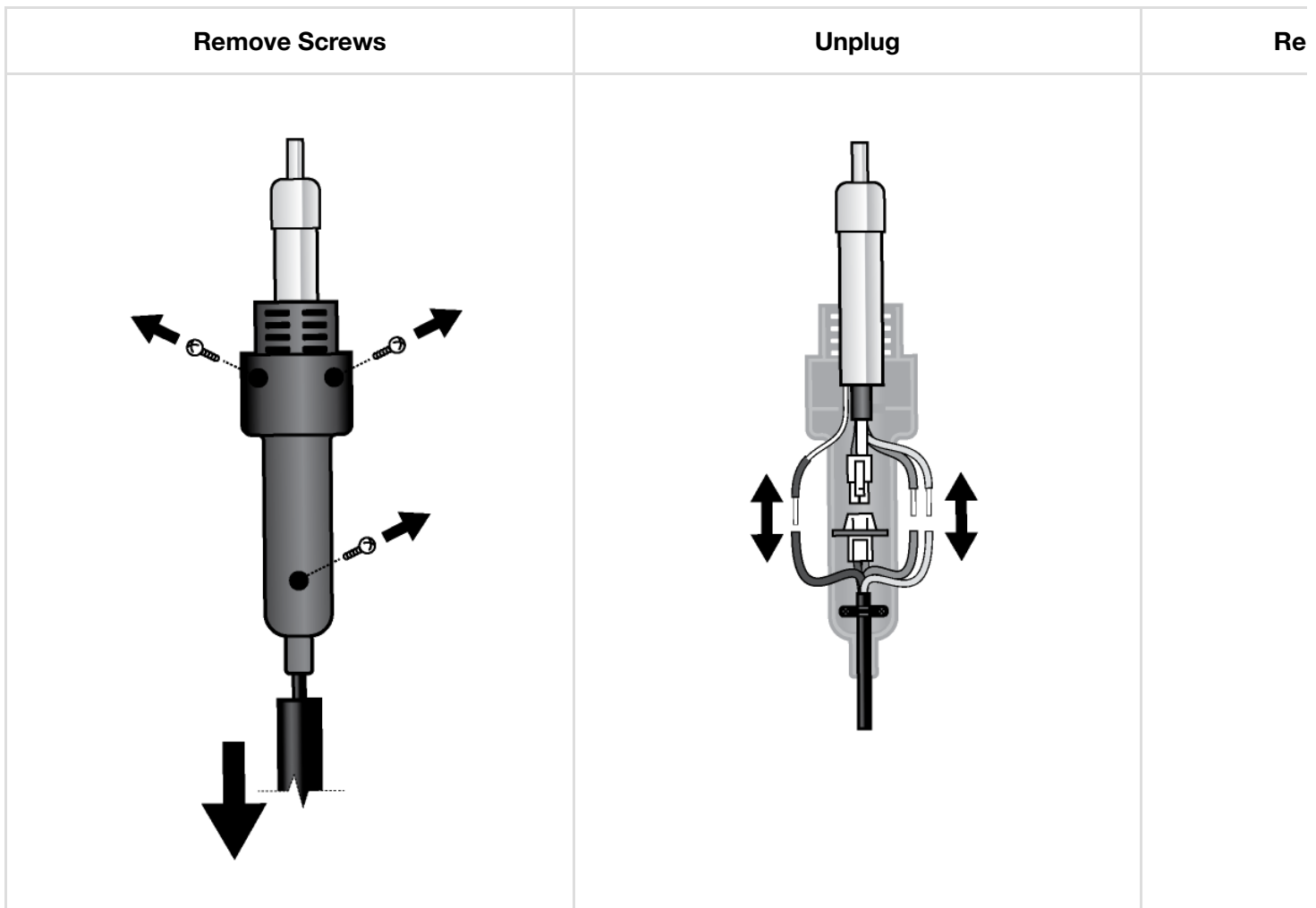


Hot-air Rework Replacement Element - Temp Controlled

☉ TOL-11130

\$19.95

Replacing the Heating Element:



Troubleshooting

Low Airflow when "Air" Dial is Turned Up

If you are getting low airflow when the "Air" Dial is turned up, make sure that you have the nozzle securely attached. With the nozzle, you will get more air flowing through the hot-air rework station's handle.

S-E Error

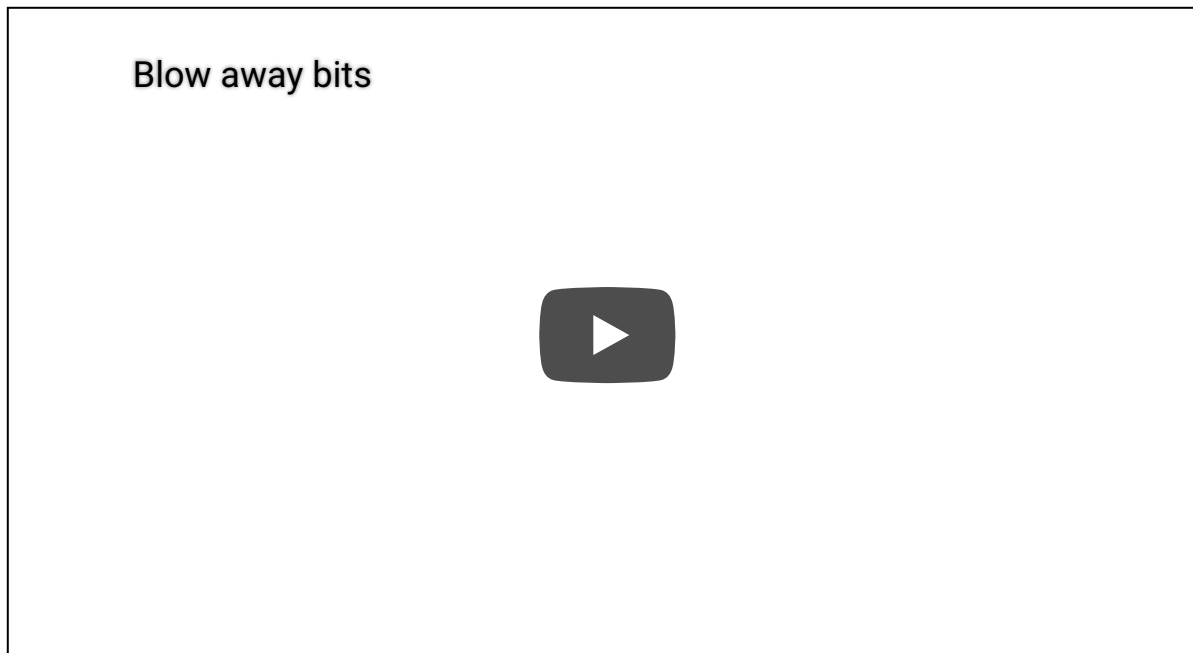
"S-E" usually means Sensor Error. It's a common error. Sometimes it goes away after messing with the dial and the temperature will display properly again. Other times it indicates that the heat sensor is failing. The rework station might be able to be revived by removing and re-attaching the heater. Another tech support rep thinks it's oxide building up on the connections. This results in fooling the controller into thinking the heater has failed.

H-E Error

Units displaying the "H-E" usually means there is a heating error. It might be that there is something with the heating element failing or not connected properly. Try checking the connections to see if the heating element needs to be re-seated. Last resort is getting a replacement heating element. A last resort is getting a replacement heating element.

Air Turned Too High

If your air flow is turned up too high, it is quite possible that you will start seeing small projectiles shooting away from your board. Those are your parts. We recommend starting at a lower air flow and moving up as your needs require.



Destroying a PCB

If you sit too long on a given spot on a PCB while working with hot-air, the glue that holds the copper layer to the FR4 laminate underneath lets go and comes out as black goo. The green soldermask on the top side also begins to come off. Because we don't have Smell-a-vision yet, we can try to describe the smell - it's horrendous. It smells like burning electronics (surprise) but the smell seems to cling to your skin and clothes. Not cool. So practice and don't be surprised if you smell bad things with your first couple re-work attempts.



Pulled Pads

When checking to see if a part is ready to move, we recommend nudging the part gently. If you push too hard, you can pull the pad.

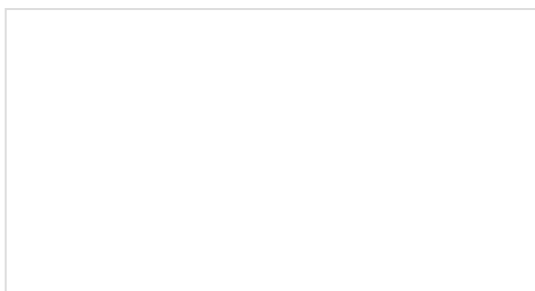
Resources and Going Further

If you have any questions or comments, please feel free to drop them in the comments box below. Happy reworking!

For more information about the hot-air rework station, check out the resources below:

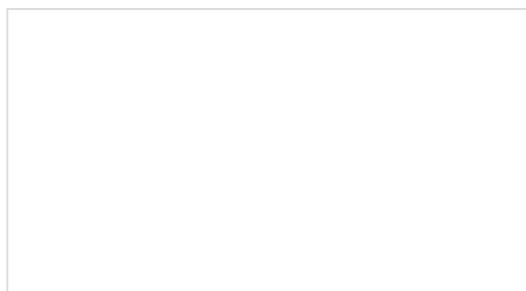
- 303D Manual
- SMD How To - 4: Rework with hot-air = Good
- SMD How To - 8: How does hot air rework actually work?

Check out these other great tutorials from Sparkfun to level up your skills!



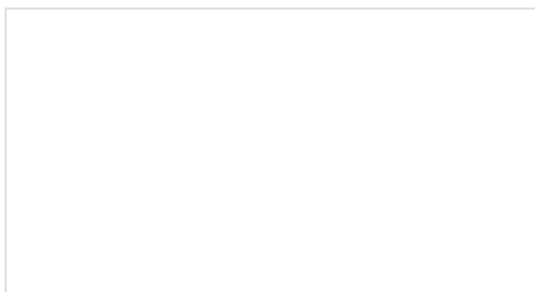
Installing an Arduino Bootloader

This tutorial will teach you what a bootloader is and why you would need to install or reinstall it. We will also go over the process of burning a bootloader by flashing a hex file to an Arduino microcontroller.



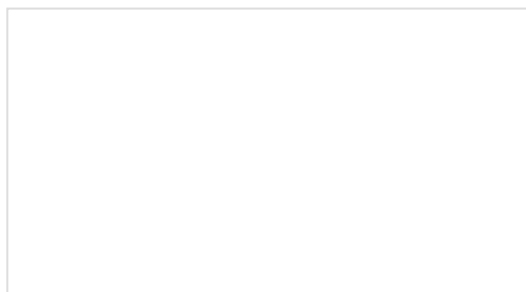
Working with Wire

How to strip, crimp, and work with wire.



How to Solder: Castellated Mounting Holes

Tutorial showing how to solder castellated holes (or castellations). This might come in handy if you need to solder a module or PCB to another PCB. These castellations are becoming popular with integrated WiFi and Bluetooth modules.



MicroPython Programming Tutorial: Getting Started with the ESP32 Thing

MicroPython is an implementation and subset of the Python 3 programming language that can be used on microcontrollers. This guide will walk you through writing MicroPython programs for the ESP32 Thing development board.