Electronics

Rules and procedures for using the Electronics Area

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Introduction – The Basics

Please read this page before using the Electronics Area.

The Electronics Area provides tools, equipment, parts, and supplies for building, testing, and troubleshooting electronic projects.

Two workstations are available for member use. Both stations are equipped with soldering tools, and Station 1 includes a variety of electronic test equipment ready for use.

Common consumable supplies such as solder, flux, and hookup wire are stored in and around the workstations.

A mobile storage rack contains free electronic components available for member projects. These parts are donated by members and the community. If you find the parts inventory useful, please consider contributing components or making a donation to the Makerspace. Maintaining a well-stocked parts collection benefits everyone.

Safety

Electronics projects can present hazards to both people and equipment if tools and materials are used improperly. Before using this area, please read the **Warnings and Cautions** section and follow all posted safety guidelines.

Rules

Primary Rules

1. Electronics Area tools will remain in the Electronics Area. Tools moved to other areas in the Makerspace should be returned as soon as possible. Leave note if tool is to be used elsewhere for more than a few minutes. Members expect tools to be their right places when they come in to use the Electronics Area.

2. Do NOT take Electronics Area tools home or other places outside of the MakerSpace.

3. Do NOT let your device rest on the anti-static mat while soldering in such acway as to melt or damage the mat. Use one of the various clamp tools for holding your project piece while soldering. Do not let solder drip on to the mat. The anti-static mat is a tool meant to protect your MOSFET devices from static discharge.

4. Items on the rolling cart (The Little Free Radio Shack) are FREE to MEMBERS and VOLUNTEERS. Take a part, leave a part. Feel free to take them temporarily and "donate" them back later. If uncertain where an item should go, place it in any bin marked "SORT."

5. Workspace in the electronics area is currently first-come, first served. Please share.

6. **Clean up your mess!** Return ALL tools to their proper places even if you didn'tuse it. If you do not know where it should go, place it in the box designated .

7. Make sure soldering irons are turned off! (Even if you didn't turn any on!)

8. All questions should be directed to the area **Tool Champion**:

Jim Gagnon jim@bellinghammakerspace.org

Warnings and Cautions

People or equipment can be harmed by misusing the facilities.

Warnings

Your personal safety is paramount, however, it is up to you to be aware of the area's hazards. Some resources may have warning tags, but users should be aware of ALL potential risks. The MakerSpace is not responsible for your actions.

Potential hazards include, but not limited to:

Electrical shock
Fire
Burns
Lead exposure

If you identify a hazard

Contact the MakerSpace Manager or the Electronics Tool Champion if you find faulty equipment capable of harming persons.

Please place a prominent note on it indicating necessary repair. Set item aside.

Cautions

Members should be aware of the potential of their action to damage equipment. Our resources are not foolproof. Some resources will have a CAUTION tag, but lack of such a tag does not preclude damage due to improper use.

Some cautionary considerations:

Excessive voltage and/or current
Static discharge
Melting/burning from soldering irons

Electronics Tools

Tools to construct, test, or repair your electronics projects

Electronics Tools

Test Equipment

Multimeters

Portable Testers

Oscilloscopes

Power Supplies

Signal Generators

Counter - Timers

Soldering

Soldering tools, supplies, aids, and tutorials

Soldering

Soldering Irons

Weller **WESD51**

- **Temperature range** : 350F to 850F
- Digital readout
- Grounded soldering iron tip
- Zero power switching
- Anti-static design

Before turning on, inspect and determine if the tip shape and size is suitable for your task. Change tip by unscrewing sleeve.

Adjust temperature with knob: Temperature displayed is sensed by the iron. For best results and to minimize thermal damage to your circuit parts, use only enough heat that does the job.

Station will automatically shut off power to the tool and the power indicator LED after 99 minutes of inactivity of the iron.



The Weller®PES51 tools are interchangeable without the need to make any adjustments to the station "Offset" function. This is made possible by the use of a precision temperature sensor; which is positioned deep inside the tip to insure rapid response to soldering load variations.
The Weller®PES51 tool has been specifically designed for use at electrostatic free workstations and is completely free from stored static charges.

SMD / Hot Air Rework Stations

Aoyue 738H

Hot Air and Soldering Iron

Click here for 30 minute YouTube video -- Review and features

Note: ON/OFF switch is located on back, to your top left.



SparkFun 303D

Click here for 303D Tutorial

Click here for YouTube video

303D Hot-Air Rework Station has two knobs on the front of the case to control air flow as well as temperature. These knobs are labeled Low to High allowing you to adjust the 303D almost immediately.



How to Use a Hot Air Rework Station

Caution: 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.



Caution: 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.

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.

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 strait 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.

Soldering Guide

Some soldering tutorials:

Intro To Soldering

Video: **A Comprehensive Guide to Soldering: Techniques, Tools, and Tips**

WARNING: Many of the solders contain LEAD. Even if you choose a lead free solder, others have not. Consider all work surfaces and tools to be contaminated with lead. Wash hands after using the area.

Computer Workstation

A computer to aid in controlling your device or surf the internet. Windows Login to BMS User using WiFi password

Computer Workstation

A computer to aid in controlling your device or surf the internet.

Windows LogIn

Upon power up, log in to **BMS Lab User** account using WiFi password.

Feel free to add a folder for your own stuff.

> Be aware that all stored data is public and not secure. Don't expect it to be there next time!

Apps

Some apps for your convenience

Arduino IDE -- environment to edit, compile, and load programs

Visual Studio Code -

LTspice - Circuit Analysis program

TeraTerm -- Stand alone terminal emulator

ESD - Electro Static Discharge

Static Discharge

ESD - Electro Static Discharge

ESD Precautions

Many electronic components are susceptible to static electricity. MOSFETs can be permanently damaged by as little as 60 volts. You won't feel it, but your electronics will.

There are several steps you can take to protect your hardware:

Antistatic Grounding Mats

The grounding mats on the workbenches are connected to earth ground through a high resistance (1 to 10 megohm). Consider the mat as the safe place for your project.

Wrist straps

People can develop a static charge, from walking on the floor or rolling a chair.

Wear a wrist strap that is snapped into the corner of the Grounding Mat to protect your project. Insist friends also don a strap before handling your precious device as well.

Note: The high resistance to ground for mats and straps reduces currents to a low level and should not usually affect operation of your project.

Other preventive measures

Avoid bringing static producing items into the area. Do not wear clothing with a lot of static cling.

Other prevention tools such as lab coats are not provided by BMS.

When transporting your project, use a static shielding bag or other Faraday cage container.

Note: The colored antistatic bags and plastic wrap prevent static buildup but are inadequate to act as a Faraday cage. Bags with conductive metal or carbon coatings are meant for this purpose:



Lost and Found

Loose Items: Small misplaced items (e.g. electronic parts) can be found in a small bin on the shelf. If you find something, leave it in the box. If an item is larger than the box then it will be classified as an item without a parking ticket.

Where to find it

A numbering system (**GREEN numbered circles**) for drawers, shelves, cabinets, toolboxes, and storage bins and boxes is currently in process of being organized. For the time being use this abbreviated locator:

FREE PARTS

(For members only. Non-members $ 50% of online retail value, as donation)

Parts cart (click here for spreadsheet)

Solder, flux: above workbenches, extra material in plastic drawer #23

Wire: Drawer **#26, box on floor**

ELECTRONICS TOOLS

Handheld multimeter: Plastic bins behind workbenches

Bench test equipment: Shelves of workbench 1

Soldering irons: workbenches and drawer **#2**.

Crimp connectors: hanging on workbench holders, also drawer **#27**

Soldering aids: above workbenches, extra material in plastic drawer **#23**

MECHANICAL TOOLS: Drawer **#24** (left side of workbench 2)