

ASSEMBLING ELECTRONICS GUIDE

This guideline applies to electronics with voltages of less than 60V DC or 30V AC at any time. According to CSA Z462, the safety controls required above these voltages increase substantially and work above these voltages should never be completed in the laboratory without additional processes in place and supervision by an electronics technologist or similar specialist.

Equipment with lower voltages can still be hazardous. It takes as little as 60mA DC or 15mA AC (at 60 Hz) to cause severe pain and difficulty breathing in a person. As a result, always follow electrical safety processes to minimize risk.

Consult Your Supervisor

No student should complete any electronics design, testing, or maintenance tasks without first receiving practical training and instruction from their supervisor.

Design

Properly designing electronics is imperative to control risk and ensure your device can achieve the necessary [ESA certifications](#). During the design phase and prior to purchasing any components, ensure that:

- All components and power supplies are ESA certified, and the components can be mounted in a way that the certification is visible.
- All AC power supplies are three-pronged to allow for grounding.
- A fuse with the correct rating and type (AC or DC) should be installed in-line with the power supply's input.
- The gage and colour of the wire as well as all connections are appropriate for the nominal voltage and current of the system (confirmed through calculations).
- A stepwise testing system is developed which allows the system to be tested one channel at a time and review it with your department electronics technologist or equivalent. A stepwise testing process helps with troubleshooting as it gradually increases the complexity of the circuit.
- The cooling system is properly designed according to the power being supplied. Make sure to use calculations, guidelines and best practices, especially when working with high-current switching.

Prior to Assembling the Device

- Clear the area of any sources of sparks, friction or static discharge.
- Inspect all components for signs of damage.

Assembling the Device

- **Any assembling or servicing should always be completed with the power disconnected and the system discharged.**
- When soldering, use a fume extractor to reduce exposure to hazardous fumes.
- Ground any AC power supplies immediately upon entry to the chassis.
- Always use fire retarding chassis such as metal. If metal cannot be used, plastic must be certified as fire retardant or painted with fire retardant paint. Openings on the chassis may not exceed the size of a pencil on the top and sides of the chassis. The bottom of the chassis may not have holes greater than 1/32 inch in diameter.

Testing

- Testing is the most dangerous part of working with electronics. Always use a buddy system during testing to ensure that an extra set of hands are available as needed and an individual is accessible in case of emergency.
- Wear safety glasses.
- If the design generates a large amount of heat, the cooling system should be tested with a nominal load and using a laser thermometer or a thermocouple to measure the temperature in the hotspots until thermal stability is reached.
- Complete your stepwise testing as per the plan reviewed by the departmental technologist.