College of Engineering Laboratory Procedure

		Comment [DS1]: Highlight the title field, rt. Mouse click, select Edit Field, then overwrite				
Dept:	MSE, etc	Laboratory: Enter Lab Name		Rm: MEC	213, etc	with the title of your procedure. Then delete the (.). This will also delete this comment.
Δ	authored by:			-		comment.
D	eviewed and	Ralph Anderson, Research Assistant	Date:			
	pproved by:			-		
		Dr. Pam Innovative, PI	Date:			
	Filename;	COEN Lab Procedure 14-Sep-09.doc	Revisi	on: 1.2		Comment [DS2]: Store with filename that includes Procedure title and date. Then right mouse click this field at right and select Update Field.
Proc	edure Type		□ На	zard Class		
Brief Overview & Scope		This procedure provides general instructions on ho soldering iron in the lab environment. It does not cover use of more specialized soldering				
Potential Hazards Engr. Controls		Thermal (burns to skin), fire, inhalation of toxic vapors (solder and flux); ingestion of lead residue if hands are not washed.			Comment [DS3]: Cut and paste from master list below or add as needed: chemical, thermal, electrical, radiation, biological, fire, explosion, mechanical, pinch, physical, slip/trip/fall, pneumatic, asphyxiation, hydraulic, noise, dust, flying particles, toxic, carcinogenic, mutagen, environmental,	
		Desk fan as needed				
PPE		Safety glasses				
E	Equipment, Soldering station with soldering iron holder, de-soldering tool, ESD mat (opt.), ESD wrist strap (opt.)		ESD	biohazard, laser Comment [DS4]: Cut and paste from		
Mat'ls, Supplies:		Solder, separate flux (optional), de-soldering wick	master list below or add as needed: fume hood, local exhaust, splash shield, sharps container, building ventilation, biosafety cabinet, flammables cabinet, corrosive cabinet, radiation shielding, glove box, gas cabinet			
Add'l Training Requirements		none				
Special Requirements:						Comment [DS5]: Cut and paste from master list below or add as needed: safety
Handling & Facilities		Uncluttered work area, fire-resistant work surface.			glasses, safety goggles, face shield, gloves, gloves- nitrile, gloves- neoprene, gloves- leather, acid apron, lab coat, close-toed shoes,	
Spill & Incident n/a		n/a				steel-toed shoes, hearing protection, dust mask, respirator, leg coverings, tyvek suit, tyvek sleeves
Decontamation/ Wash hands with soap and water after some contact EH&S to dispose of lead solder.			Complete wast	e pickup forn	n and	sieeves
		REVISION HISTORY				
Rev.	Rev. Revision Description Date:		Date:			
1.0	As issued	ssued 06-25-09		06-25-09		
1.1	Adapted solo	dapted soldering iron procedure to use as template example content 09-10-09				

09-14-09

Certification of Hazard Assessment

Added revision block to track document changes.

1.2

'GENERAL SOLDERING PROCEDURE

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Comment [DS6]: Delete if you do not feel a TOC is needed

Comment [DS7]: •The Table of Contents above is included to act as a template TOC appropriate for long procedures.
•Including a TOC is optional.
•Delete TOC if procedure is not overly lengthy or not desired.

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`GENERAL SOLDERING PROCEDURE

WARNINGS:

- a. This is a general procedure for performance typical soldering or de-soldering operations. It does not apply to specialized soldering processes or equipment.
- b. This procedure is for environments where soldering is on an occasional basis by one or two people at a time. Continuous soldering operations or those involving more people may a different procedure.
- Many solders used in laboratories may contain lead. DO NOT breathe fumes generated while soldering.
- d. Beware of hot soldering irons and components. Make sure others are aware of hot tools.
- e. Be aware of the location of your soldering iron or iron while it is hot, or cooling. Make sure you place the hot iron in an appropriate holder to prevent heat or fire damage.
- f. Switch off and/or unplug soldering tools when not in use.
- g. Allow soldering tool to cool before storing.
- h. Wash your hands after using solder and soldering tools.

DESCRIPTION OF SYSTEM



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`GENERAL SOLDERING PROCEDURE

TASKS						
Hazard, EC and PPE information listed below applies to the following tasks and sub-tasks unless otherwise noted.						
Hazards	thermal, inhalation of toxic vapors (tin, lead, flux), exposure to heavy metals (tin, lead)					
Engineering Controls	desk fan as needed					
PPE	safety glasses, lab-coat, close-toed shoes					

1. Setting Up Work Area

- a. Ensure adequate ventilation. If multiple people are soldering in a concentrated area, set up a fan to gently blow fumes and vapors away from you and your co-workers.
- b. Keep area clean around workplace at all times.
- c. When working with statically sensitive components (most active devices such as ICs, FETs, transistors, etc.), be sure to use a anti-static mat to work on and wear an anti-static wrist strap to minimize risk of electrostatic discharge (ESD) damage.

2. Preparing Workpiece

- a. Clamp work securely while performing soldering or de-soldering. Use a vise or other approved clamping systems to keep your hands free to work.
- b. Use heat sinks to protect thermally-sensitive circuit components.
- c. When working with used circuit boards, make sure the areas you will be soldering or de-soldering are clean and free of dust or grease before applying heat.
- d. When soldering wire connections, make sure the wires are tightly connected. Use appropriate covering like heat shrink tubing or twist-on connectors to protect the splice. Do not use wires with melted insulation or exposed conductors.

3. Selecting A Solder and Flux

a. Solder

Solder commonly used in most laboratory environments contains tin and lead. A common alloy for non-production electronics use is the eutectic mixture of 63% tin and 37% lead due to its low melting point. This alloy melts at 361 F / 183 C.

Solder used in mass-produced items almost universally are now lead free due to the toxicity issues with lead. Lead-free solders melt at a higher temperature and require more skill to use than lead-based solders.

Be sure to understand what solder is appropriate for your task.

b. Flux

Flux is an agent that inhibits oxidation and helps the solder flow more easily. For electronics applications, rosin flux or no-clean fluxes are used.

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`GENERAL SOLDERING PROCEDURE

Rosin fluxes are available in non-activated (R), mildly activated (RMA) and activated (RA) versions. RA and RMA fluxes include an activating compound to increase solderability through oxide removal. This compound is typically an acid. The residue from RA fluxes is corrosive and must be removed after the joint is soldered. When using RMA flux, the residue is less corrosive, and cleaning is recommended but not required.

Acid fluxes are typically not needed or desired in electronics due to their corrosivity and need to thorough cleaning to avoid board and component damage.

4. Setting Up the Soldering Station

- Select the proper sized solder tip for your work. As trace and pad size decrease, soldering tip size must also decrease.
- b. Turn the soldering station ON and set the temperature appropriate to the solder composition you are using.
 - Note: higher temperatures lead to more rapid formulation of oxidation on soldering tip and will shorten tip life.
- c. Make sure the solder tip is cleaned and tinned.

5. Tinning Soldering Tip

- a. Allow the soldering iron to reach temperature.
- Apply flux to the tip first and then liberally apply solder to tip. Note: flux-core solder may not require application of flux.
- c. Wipe off excess solder on sponge.
- d. A properly tinned tip will be shiny and free of oxidation.
- e. It is normal to have to re-tin a tip from time to time as oxidation builds up on the tip.

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'GENERAL SOLDERING PROCEDURE

6. Soldering

- a. Hold the soldering iron like a pen, near the base of the handle.
- Touch the soldering iron onto the joint to be made.
 Make sure it touches both the component lead and the track. Hold the tip there for a few seconds to heat the joint.
- c. Unroll the solder and bring the end to the joint to be soldered near the soldering iron tip. The solder should melt and smoothly flow onto the components to be soldered (component lead, pcb trace, etc). Be sure to apply the solder to the joint, not the iron.
- d. Remove the solder, then the iron, while keeping the joint still.

 Allow the joint a few seconds to cool before you move the circuit board.
- e. Inspect the joint closely. Be sure that the solder joint is good, as described below.
- Solder joints may be cleaned <u>after they have cooled</u> using isopropyl alcohol and a Q-tip or similar cotton swab.

7. Solder Joint Evaluation

a. Good Solder Joints

A good solder joint:

- will be shiny and concave in nature.
- will be clean and free of dirt and voids.
- will fully cover the pad the component lead lays on or passing through.

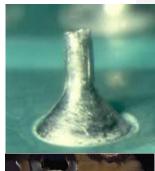
A good solder joint is shown to the right.

b. Cold Solder Joints

Joints that are dull or convex are potentially "cold" solder joints. Cold solder joints do not make a good electrical or mechanical connection.

Cold solder joints can be remedied by removing existing solder, ensuring both the soldering tip is hot and tinned and area to be resoldered is clean and free of oxidation and has ample flux. The joint then can be re-soldered.

A cold solder joint is shown to the right.





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'GENERAL SOLDERING PROCEDURE

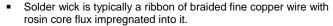
8. De-soldering

De-soldering is done to remove components that have been soldered together. Two common forms of de-soldering are done through the use of a vacuum plunger device (solder sucker) or by applying a braided wick to the joint that pulls solder away through capillary action.

a. Use of Vacuum Plunger

- To use a vacuum plunger, cock the plunger by depressing it fully until it latches.
- Bring the vacuum plunger to the location of the joint to be de-soldered.
- Heat the joint with the tip of the soldering iron.
- When the solder has melted, press the trigger of the device, which will pull the solder out of the joint.
- Two or more tries may be needed to fully remove the solder from the joint.
- On occasion, it is actually helpful to add solder to the joint to provide addition thermal mass and uniform heating to the joint. This can assist in complete melting of the solder in the joint.

b. Use of Solder Wick





- To use solder wick, lay the wick over the joint to be de-soldered.
- Apply the heated tip of the soldering iron to allow the wick to be heated and melt the solder in the joint.
- The solder will flow out of the joint and into the wick through capillary action.



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