Gateway To Space

ASEN 1400 / ASTR 2500

Class #07

Colorado Space Grant Consortium
Today:

- Announcements
- Next Time
- Soldering 101
Announcements:

- Everyone submits HW 4 and 5 via email but it is a team HW

- Bring everything built and done in HW 4/HW 5 to class 9/24
Announcements:

- Before you leave class today, each team will take two of the following:
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Announcements:

- DO NOT TRIM THE LEADS
Before you leave class today, each team will take two of the following:

- [Image of components]
Next Time...

**Arduinos**
Please be early to help setup

**ITLL 1B50**
Bring hardware and Laptops (2 per team)
HW 03, 04, and 05 DUE

Colorado Space Grant Consortium
Soldering 101

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Soldering:
Caution:

- *Soldering is dangerous if not respected*

- *Be mindful of where you are and where the soldering iron is*

- *Eyes and liquid solder*

- *Everyone is expected to solder*

- *If you get burned…*

- *Stay together, don’t work ahead*
Soldering

Circuit Board

Top View

Side View

Resistor

Solder Pads
Soldering Iron

Iron is only there for heat – to heat the board and part
Move soldering iron until tip is touching wire & solder pad

Iron is only there for heat – to heat the board and part
Move solder to touch edge of tip.

Iron is only there for heat – to heat the board and part.
Hold until solder melts on tip by wire

Solder

Iron is only there for heat – to heat the board and part
Move solder back to touch wire only

Iron is only there for heat – to heat the board and part
Move solder in to form a small pocket

Iron is only there for heat – to heat the board and part
Move soldering iron tip up. This will drag solder up with it.

Iron is only there for heat – to heat the board and part.
Look for shinny fillets
TIPS:

- Use caution when clipping leads to avoid flinging metal across the room.

- All soldering must achieve a good solder filet on the pad as shown for circuit reliability.

- Also clip the leads in this fashion.

- Bend resistors and diodes using your plastic tool as shown.
Hands-on: Soldering
Tinned Copper Traces
Soldered bridge shorting two traces - bad, bad, bad

But, can be fixed by reheating or using solder sucker
Soldering Tips

1. Make sure tip is hot
2. Clean & tin tip
3. Keep tip clean by using wet sponge and cloth
4. Heat until the parts are hot enough to melt solder
5. Hold until solder flashes around pad
6. Do not put too much solder on
Prep Step 4: Tinning the iron (close-up)

- Tin the tip of the soldering iron by melting an inch or so of solder on the tip.

- The iron will now look shiny on the tip.

- Then wipe any excess solder on the golden sponge.

- Now place the iron back into the holder. Tinning your soldering iron in this manner will aid in future soldering.
Prep Step 4: Tinning the iron (close-up)
Prep Step 1: Tool Layout

- Prepare tools for the construction process.
- Put on your safety glasses.
Voltmeter is very useful
This is the set up typically used.
Use this setting to check resistor values.
Use this setting to check DC voltage
Use this setting to check continuity.
Pre-Bending:

Pre-Bending 101:

- Pre-bending is a technique that allows components to be easily inserted into a PCB.

- Pre-bending also allows components to lay more flush with the board.

- Bending components to the correct bend radius takes practice, but mastering the technique will reap rewarding benefits!
Pre-Bending:

Pre-Bending 101:

- Start with the bending and prodding tool in the position shown in the top picture.

- Choose a location along the length of the tool that will yield the appropriate bend radius.

- Use your thumb to bend the lead such that the component and lead are orthogonal.
**Hands-on: Soldering**

- Get into your teams

- Each person on the team will solder their own circuit

- You and your team will have 50 minutes

- Turn your soldering irons on

- Don’t work ahead…
Board Safety:

Caution:

Many of the components used in this workshop are sensitive to electrostatic discharge (ESD). Please ensure that you are wearing your protective wrist strap at all times. There will be a warning slide when components are ESD and heat sensitive.

Clipping leads can sometimes cause them to separate in a rapid manner that could cause injury. Please take caution when clipping leads. Wear your safety glasses at ALL TIMES!
Prep Step 2: Grounding

- Put on a static strap to remain grounded. Also make sure the strap is tight across your wrist.

- This will protect any parts from electro-static discharge (ESD) and its harmful effects.
Hands-on: Soldering

Step 1: Distribute solder kits among team

You will have to share the soldering stations

Help each other learn the techniques

Throw out instructions
Hands-on: Soldering

Step 2: Layout kit (Socket not shown)
Hands-on: Soldering

Step 3: Look at board, find reference point
Hands-on: Soldering

Step 3: Look at board, find reference point

Solder Side
Hands-on: Soldering

Step 4: Flip board over and solder 8 pin socket
Hands-on: Soldering

Step 6: Flip board over and bend chip leads out
DO NOT SOLDER AT THIS TIME
Hands-on: Soldering

What is a resistor?

In the event that your resistors get mixed, please refer to the chart at the left to classify your resistors, or use your multimeter.

If you are unsure, don’t hesitate to raise your hand and ask for assistance.
Hands-on: Soldering

Step 7: Install 120 kΩ resistor (Brown, Red, Yellow)
Hands-on: Soldering

Step 8: Install 33 kΩ resistor (Orange, Orange, Orange)
Hands-on: Soldering

Step 9: Verify resistors

120 kΩ
Brown, Red, Yellow

33 kΩ
Orange, Orange, Orange
Hands-on: Soldering

Step 10: Flip board over

Step 11: Solder Resistors

120 kΩ
Brown, Red, Yellow

33 kΩ
Orange, Orange, Orange
Hands-on: Soldering

Step 12: Inspect solder joints and trim leads
Hands-on: Soldering

Step 13: Flip board over and install capacitor

Gray strip indicates “negative” lead

“-” Lead
Hands-on: Soldering

Step 14: Verify capacitor is installed correctly

“-” Lead
Hands-on: Soldering

Step 15: Flip over board and solder capacitor

“-” Lead
Step 16: Verify solder joint and clip leads
Hands-on: Soldering

Step 17: Install RED LED over 120 kΩ Resistor
Negative side is facing edge of board
Hands-on: Soldering

Step 18: Install GREEN or YELLOW LED over 33 kΩ Resistor. Negative side is facing edge of chip.
Hands-on: Soldering

Step 19:  Flip board over and solder LED leads
Hands-on: Soldering

Step 20: Solder socket to board. Go slow

Verify solder joints and check for solder bridges
**Hands-on: Soldering**

**Step 21: Install the chip**

Small circle placed over pin hole “1”
**Hands-on: Soldering**

**Step 22:** Install 9V battery clip to board
Step 23: Flip board over and solder battery leads
Hands-on: Soldering

Step 24: Attach test battery and watch what you made

NOTE: If it doesn’t work, detach battery immediately and have it inspected
Hands-on: Soldering

When completed, please wait for further instruction