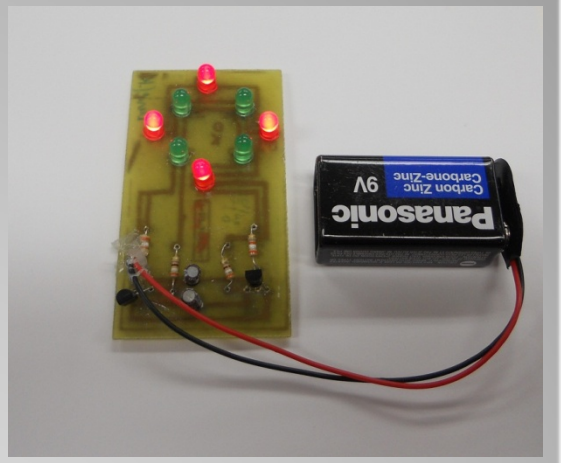
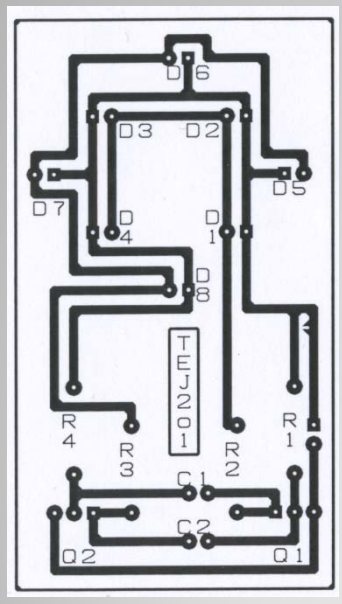




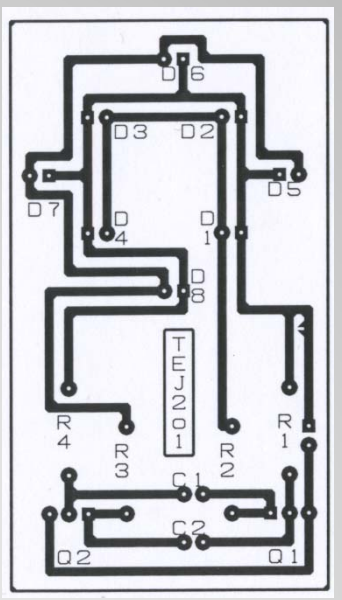
CIRCUIT PRODUCTION PROJECT

Learning Outcomes

I WILL BE ABLE TO:

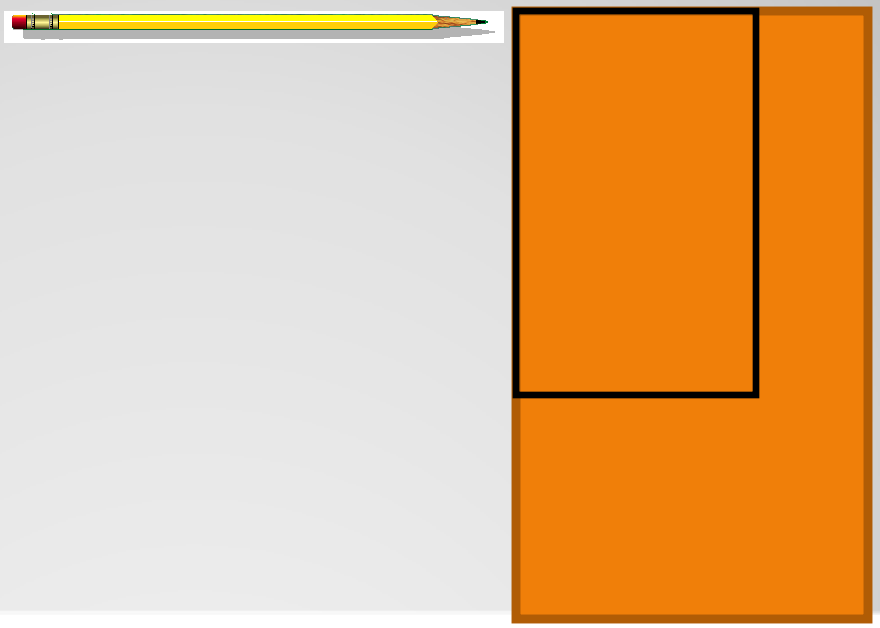
- IDENTIFY THE SCHEMATIC SYMBOLS FOR RESISTORS, CAPACITORS, TRANSISTORS AND LEDs.
- APPLY THE SOLDERING TECHIQUES USED TO CREATE ELECTRICALLY AND PHYSICALLY STRONG CONNECTIONS.
- OPERATE THE TOOLS REQUIRED TO COMPLETE THIS PROJECT IS A SAFE AND EFFECTIVE MANNER.

From your instructor obtain the transfer and cut along the thin line



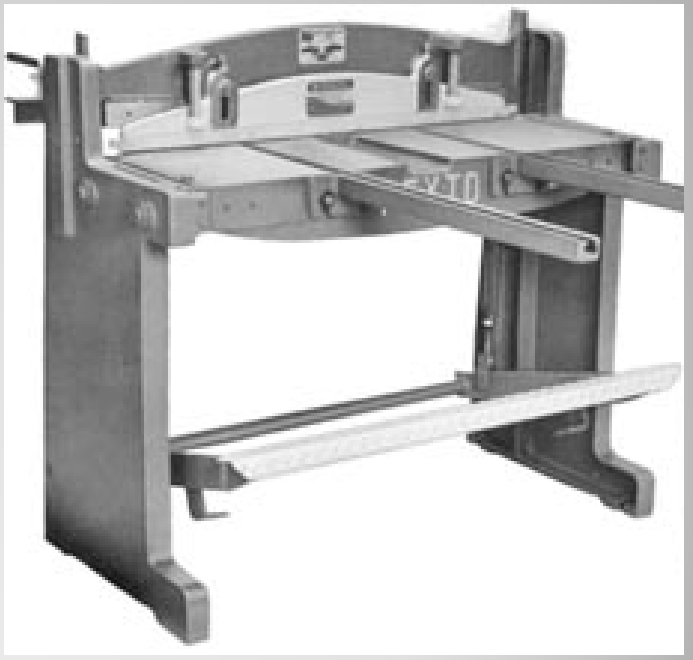
Step 1

From your instructor obtain a piece of printed circuit board. Using a pencil trace along the edge of your transfer. Make sure you efficiently use the the PC board. Do not waste.



Step 2

Use the Foot Shear to cut out the PC board. Review your notes on how to safely use the shear. Then take a copper scrub pad and scrub the board until the copper is shiny.

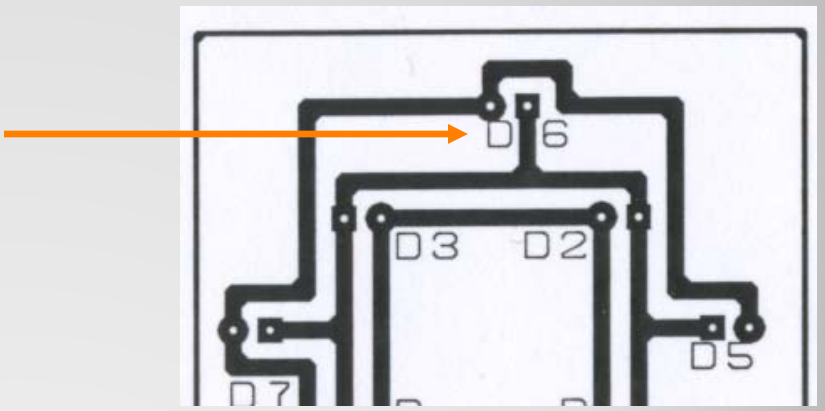


Step 3

Place a couple sheets of brown paper towel down on a piece of plywood. Then place the PC board (copper side up) on the paper towel and then cover with one more sheet. Using a clothes iron at its highest setting, heat the board for 4 minutes. Move the iron in a circular motion to provide even heat.

Step 4

Remove the top layer of paper towel and place the transfer down on the paper towel making sure you can read the letters and numbers (shiny side of transfer up). Put the paper towel back on top and heat the board with the iron for another 2 minutes. Remember to move the iron around in a circular pattern.



Step 5

Cool the board in a tray of cold tap water. After 30 seconds pull the board out and peel off the transfer making sure one end is held tight with your thumb and the other end is held tight and lifted straight up (not rolled back.

Step 6

If 80 to 90% of the image has transferred over to the copper board from the image, then you are ready for the next step. If it is less than that, use the copper scrub pad to clean the copper board and go back to step 4.

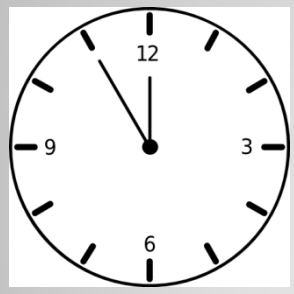
Use the permanent markers to fix up areas that did not transfer. Go over three times to make sure the marker stays on during the etching process. Also put your initials on the board.

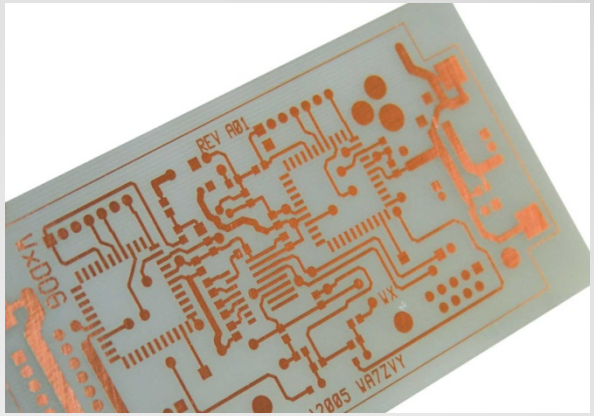
Step 7

The board is ready to be etched. It is placed *only by your instructor* into a container of ferric chloride where the a chemical reaction leaches off the copper that has not been protected by the transfer. This process takes anywhere from 20 minutes to an hour, depending on how many boards have been done before.

Step 8

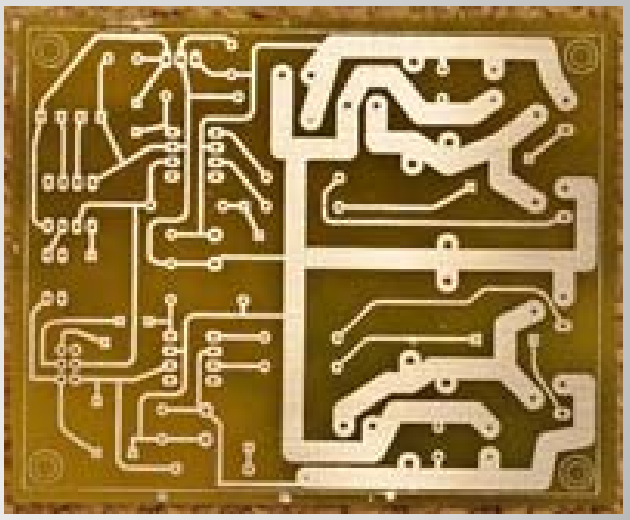
Remind your instructor to check your board every 10 to 15 minutes. The board can be over etched. Once done, your instructor will rinse off any remaining etchant. Dry the board and then scrub off the image using the copper scrub pad which will expose the copper that was left behind.





Step 9

Once all the black is off and the copper is shiny again, give the board to your instructor so that a thin layer of tin can be applied to the board. This will stop the oxidation of the copper and the tin will make it easier to solder. Remember, solder is 60% tin.



Step 10

Take a multimeter and set it up for continuity testing. On your board test all the pathways to make sure there are no breaks. There should be a beeping sound from the meter. If you do find a break, use the permanent marker to identify the spot. Later this fault can be fixed.

Then mark the centre of the pads With the permanent marker. This will help in not missing a hole drilling while drilling.

Step 11

The next step is to drill the holes in the board. A number 60 drill is used. Do not force the drill through the material or it will break. It is a *must* to wear safety glasses. Failure to do so will result is a review of shop safety procedures and a possible termination of your project.

Step 12

When populating (mounting the components) the board care must be taken the the components are close to the board with just a small gap. All leads that are bent need to be 90°. Pay particular attention to the direction because some component have to go in a certain way.

Step 13

For soldering remember the following steps:

- Clean the tip every time,
- Apply solder to the tip,
- Place tip on pad beside the lead,
- Apply solder to other side of pad,
- When solder melts feed in enough to fill hole,
- Raise solder and iron up along the lead.

Remember, solder joint should be shiny and volcano shaped. If it is ball shaped, it has not bonded to the pad. Trim the leads as you go.

REMEMBER YOUR  SAFETY GLASSES

Step 14

The final step is testing and troubleshooting. Grab a battery and attach it to the battery clip. If your project works write your name on the solder side of the project.

If the project does not work check the following:

- solder connections are good,
- pathways are not broken or shorted,
- components are in the right way,
- and finally that the components are still working.

Step 15

☹ Last Slide ☹