

**EECE 690/890**  
**Digital Radio Hardware Design**

**Team 4 Assignment 4**

**Due Dates:**  
**Thurs 11/12/98 (Design Review)**  
**Monday 11/16/98 (Complete Layout)**

**Introduction**

This is the fourth in a series of assignments designed to guide you through the tasks needed to complete the audio/digital/power circuit design, layout, and mechanical engineering tasks. The object of this assignment is to complete your layout and mechanical engineering tasks.

We will hold a mini design review on or around Thursday 11/12 to go over your layouts and mechanical drawings. You should have most of your work done by this point so that we can review it for accuracy and completeness. You will then have until COB of the following Monday to make any necessary corrections/additions.

At the end of this assignment you should have a complete layout entered into the computer (ready for outputting your design as Gerber/Drill files), as well as a complete mechanical drawing ready for fabricating your front panels for the base and mobile units.

Attached to this assignment is an additional page giving a preview of future tasks. These mainly consist of creating and checking the Gerber/NC Drill files so they can be sent to APC Inc. for fabrication, and then sending them.

## EDA/Mechanical Design Engineer 1 Tasks

- ♦ Visit the comm lab (297) and study some of the PC boards there to get a feel for how layouts are done, and what density of components can be achieved. Your goal will be to produce a layout that is aesthetically pleasing, relatively compact (no larger than 5"x8" total board space), and requires little or no traces on the ground plane side.
- ♦ Sketch the footprint for 0805 (.08x.05 inch) discrete components (resistors, caps, inductors) and for the various ICs that you will be using. You can look at the footprints identified in the previous assignment by your teammate for this. This will help you as you plan your layout.
- ♦ Decide on whether you will use a 2:1 or 4:1 scale for your layout and get some gridded paper to create your layouts on.
- ♦ Do the digital circuit board layout. Do some rough drafts of this on paper first! Then enter the design in the Layout program - This will help keep you flexible and allow you to try several options and/or changes in your floorplan. Also, try to minimize the number and length of traces on the backside of the board since we want to do a "copper fill" to improve EMI performance.
- ♦ Check the layout against the schematic by printing each out and highlighting nets (one at a time) on each to be sure they match. For your layout printout, show both the component and solder side on the same page (without copper fill). ***If you don't do this step, the circuits will not work (guaranteed!).***

Your deliverables are listed below:

By the review date:

- ♦ Complete draft layout on paper or in computer.

By the final due date:

- ♦ Printouts of your complete layout consisting of three pages. Page 1 should show both component and solder side. Page 2 should be component side only (with Board Outline, SMT Assembly, and Component layers displayed). Page 3 should show the solder side only (with Board Outline, SMT Assembly, and Solder layers displayed). These three pages should not show copper fill. We will take care of that in the next assignment.
- ♦ The marked-up schematic and layout that you used for your checks.

## EDA/Mechanical Design Engineer 2 Tasks

- ♦ Enter RF layout
- ♦ Check the layout against the RF team's schematic by printing each out and highlighting nets (one at a time) on each to be sure they match.
- ♦ Finalize your mechanical drawings and provide to EE shop for fabrication. You should talk to Steve Booth in the Electronics Shop to see what is needed in the drawings. Also remember that you are doing a complete mechanical design, so you need to think through/design any and all mounting needed (such as how switches will be supported, etc.). Use your previous parts lists to get dimensions of holes, etc. needed.

### **Your deliverables are listed below:**

By the review date:

- ♦ Complete RF layout entered in computer.
- ♦ Complete draft sketches of your mechanical drawings for the panels.

By the final due date:

- ♦ Printouts of your complete layout consisting of three pages. Page 1 should show both component and solder side. Page 2 should be component side only (with Board Outline, SMT Assembly, and Component layers displayed). Page 3 should show the solder side only (with Board Outline, SMT Assembly, and Solder layers displayed). These three pages should not show copper fill. We will take care of that in the next assignment
- ♦ The marked-up schematic and layout that you used for your checks.
- ♦ Your final mechanical drawings in a form suitable for handing off for fabrication.

## **Team 4 Future Assignments**

The following gives an overview of the tasks remaining after task 4.

### **EDA/Mechanical Design Engineer 1**

- ♦ Do a final check, in conjunction with members of other teams to be sure nothing in the design has changed! Check the layout again!
- ♦ Generate Gerber and Drill files.
- ♦ Confirm that the tools called out in the generated files are acceptable to our PC board fabricator, and if not, modify them.
- ♦ View the photoplot and drill files in a third-party Gerber viewer to be sure it was generated correctly.
- ♦ Prepare the files for sending to the fabricator. (We may need to merge both the RF and digital layouts into a single design to lower fab cost, but this can be done with cut-and paste at the end).

### **EDA/Mechanical Design Engineer 2**

- ♦ Do a final check, in conjunction with members of other teams to be sure nothing in the design has changed! Check the layout again!
- ♦ Generate Gerber and Drill files.
- ♦ Confirm that the tools called out in the generated files are acceptable to our PC board fabricator, and if not, modify them.
- ♦ View the photoplot and drill files in a third-party Gerber viewer to be sure it was generated correctly.
- ♦ Prepare the files for sending to the fabricator. (We may need to merge both the RF and digital layouts into a single design to lower fab cost, but this can be done with cut-and paste at the end).