

***EECE 690/890***  
***Active Learning Assignment #2***  
***and***  
***Homework Assignment #6***

Due Thursday, Dec 3, 1998

***Objectives***

The goal of this assignment is to map out the remaining tasks for the semester. These tasks consist of:

- Testing our designs and demonstrating that they work, and
- Documenting the project.

In the “active learning” assignment, you will work with your teammates and company to plan your testing and documentation, and to assign circuit construction and testing responsibilities to individual people.

In the “homework” assignment, you will develop a written plan together with circuit diagrams, etc. that will be needed in running your tests, and will work with the graduate students in your company to provide them what they need to assemble the final company report.

***Test Planning***

In many product development activities, testing is just as important as initial design. In fact, developing a test plan should be an integral part of the design project.

For a design as complex as ours, it is not reasonable to assume that the product will work when we turn it on. There will be (hopefully small) errors in every portion of the design, and it is important to track these down and fix them before attempting full integration of the components. Thus, we will perform initial “stand-alone” testing of each team’s designs in this assignment. If all goes well with each part, we will put the complete product together before the end of the semester.

Since we have very little of the semester remaining, we will work on the premise that “some testing is better than none”. Each team should plan a sequence of tests ranging from seeing if anything works at all, to full coverage of all parts of the design. Due to our time constraints, our motto in developing and conducting our tests will be “Keep It Simple!”. Some suggestions for how you might test your designs are given below for each team. You should work with your teammates to:

- Expand the test outline into a complete test plan, and
- Assign duties to each team member to complete the tests before the end of the semester.

### Team 1:

- ❖ Work with your instructor to make sure that we get everything on order this week.
- ❖ Work with Team 4 to make sure that your board is fabricated in time for testing.
- ❖ Designate one or more of your team to do construction of the circuits (“board stuffing”).
- ❖ Designate the other member(s) to create a test board to allow I/O pins to be manipulated during testing.
- ❖ Plan your tests. For example, these could consist of:
  - Applying power slowly to the board with a current-limited supply.
  - Checking the DC current in various modes.
  - Confirming that the oscillators are oscillating.
  - Confirming that other circuits work (list what you will check and how).
  - Testing the synthesizers (how can you do this?).
  - Performing a complete “loop-back” test with the TX signal fed back to the RX input with an appropriate frequency conversion and with attenuators inserted to lower the signal level (how could you do the frequency conversion?).

### Team 2

- ❖ Work with Team 4 to make sure that you have the latest pin assignments.
- ❖ Designate one or more members of your team to configure an Altera board to input an appropriate clock and allow I/O pins to be manipulated during testing.
- ❖ Plan your tests. For example, these could consist of:
  - Confirming that the TX PLD generates the proper clock frequency (96 kb/s). You may want to add a “test” output for checking this.
  - Confirming that the TX PLD will take in data on the uC lines and then output that data at the appropriate rate and with the appropriate guard time when “send” is active.
  - Confirming that the RX PLD generates a “recovered clock” appropriately. You may want to add a “test” output for checking this.
  - Other tests (what will you test and how?)
  - Performing complete “loop-back” tests with the TX data signal fed back to the RX data pin.

### Team 3

- ❖ Decide who will integrate your team’s code.
- ❖ Add a “debug” flag to your code to allow it to run up to a certain point, stop and display where it is on the LCD, and then wait for an external action (such as off-hook, PLD rx data ready, etc.). You may also want to have it jump over certain code (such as PLD reading).
- ❖ Designate one or more of your team to do construction of a test board with switches that can be manually operated to mimic PLD actions, etc.
- ❖ Plan your tests. For example, these could consist of:
  - Confirming that the circuit alternates between sleep and wake with proper timing.

- Confirming that reasonable activity shows on the synthesizer pins at each wake.
- Confirming that code responds to Hook signal
- Confirming that other responses and output signals occur as expected (what will you test and how?)

#### Team 4

- ❖ Work with your instructor to make sure that we get everything on order this week and that your board is fabricated in time for testing.
- ❖ Designate one or more of your team to do construction of the circuits (“board stuffing”).
- ❖ Designate one or more of your team to complete construction of the product packaging.
- ❖ Plan your tests. For example, these could consist of:
  - Applying power slowly to the board with a current-limited supply.
  - Checking the DC current in various modes.
  - Confirming that the switches apply the appropriate signals to the uC pins.
  - Confirming that the audio circuits work.
  - Confirming that other circuits work (list what you will check and how).
  - Performing a complete “loop-back” test with the TX data signal fed back to the RX data input and the PLD set to voice mode.

#### ***Documentation***

Work with your company’s graduate students to plan what will be included in the documentation and what you will need to supply to them.

#### ***Deliverables***

Your deliverables for this assignment consist of:

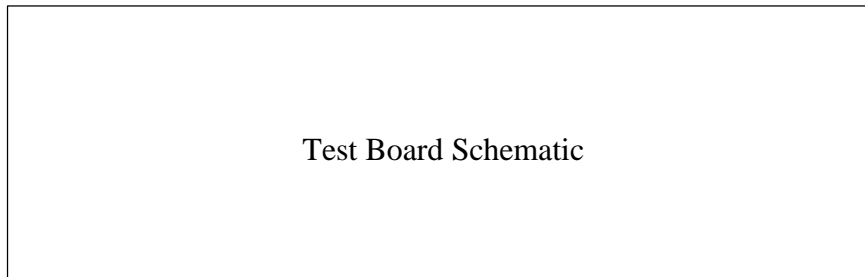
- A list of who will be doing construction, etc.
- Your team’s test plan. This must be significantly more detailed than the lists above. It should be in the form of a step-by-step procedure.
- A list of what each person will supply to help out in the documentation task.

Example Test Plan:

The following functions of the transceiver board will be tested:

- Power supply current in sleep mode
- Power supply current in receive-only mode.
- ...

Refer to the test-board schematic shown in Figure X for signals called out within the test procedure.



### **Power Supply Current in Sleep Mode**

- On test board, set sleep switch to high, and transmit switch to low.
  - Apply power slowly beginning at zero volts and increasing to 5 volts, monitoring current and output voltage of on-board 3 V regulator.
  - Check that each IC / subcircuit has proper supply voltage.
  - Record current.
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### **Supply Current in Receive Only Mode**

- Switch sleep to low.
  - Record current.
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### **Supply Current in Transmit Mode**

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