Design Project: Test Plan and Program for OP07D Op-Amp

Preliminary Test Plan Due: Tues, Oct. 28th (Tues of 8th week)

Initial Tests Completed: Fri, Nov 7th (Fri of 9th week)

Repeatability/Reproducibility Study Due: Nov. 14th (Fri of 10th week)

Final Test Plan and Report Due: Nov. 19th, Tues of Finals week

This design project will involve the development of a production level test plan and test program for the OP07D general purpose op-amp (datasheet on Moodle). ALL production level tests MUST be performed in this test plan and program. If you are unsure how to perform a production test, talk to your professor. This op-amp can be used with the DIB that we are using in class. Follow the format for the test plans provided in class and lab. In the test plan, be sure to indicate for each test a schematic with DIB component values and voltages labeled, calculations to obtain these component values, calculations for each datasheet limit, relays to be closed or opened, and expected instrument ranging. Feel free to reuse code from the labs when possible. The OP07D op-amp chips can be purchased in the instrument room. I will let you know when the chips are in.

The program should be verified by showing that all tests pass with two chips. (Note: Ib may not pass due to DIB leakage, but I'd like to see it written anyway.) Show the instructor that the test works and record your overall test time and your test time for each function.

Once your test seems complete, perform a repeatability study by repeating your test 25 times and recording the results. The results for each test should be placed in a histogram with the mean, standard deviation, and datasheet limits labeled on the histogram. (This can be done in excel on the data you have recorded from the ATE. See note below.). Calculate the GRR value for each test. If the GRR values are not <10%, you may need to adjust your measurement accuracy (be sure to rerecord your new test time if the program is modified). If this is unobtainable, discuss why in your report.

Once the repeatability study has been completed, a reproducibility study should be performed on 5 units (3 provided by me) showing the variation of each unit for each measurement due to different sites and different boards. There are two DIBs, but one DIB has a broken nulling amp on site 2. Therefore, your reproducibility study should include 3 measurements for each test for each chip. Be sure to correlate which chip you are measuring on which site. You may number your chips in pencil to keep track if you wish. My chips will be 3, 4, and 5. Show the result using line charts (e.g. show the results for all 5 chips on 1 site on 1 line, show the results for all 5 chips on another site with another line. Be sure that chip 1 aligns vertically for all sites, chip 2 aligns vertically for all sites, etc. An example is placed on Moodle). Place all the data for a given test (all sites and all chips) into 1 histogram and label the mean, standard deviation, and datasheet limits. Keep in mind that this data contains process variation, board variation, and measurement variation. Calculate the GRR value for each test. If the GRR values are not <20%, discuss why in your report.

*Note! There are 2 matlab programs on Moodle that will help you with your repeatability and reproducibility data management (thanks to Joe Wanstrath and Justin Swadling). The **repeatability** matlab program receives your repeatability log file and plots the historgram with the data sheet limits placed on the histogram in red, a black line showing the mean, and error bars showing the standard deviation. It also calculates the mean, standard deviation, and GRR. The **reproducibility** program receives 3 log files (1 for each test condition - e.g. site1 DIB1; site2 DIB1; site 1 DIB2), where each log file contains the data from the 5 chips. This program will then plot the line charts. Feel free to use these programs!*

Please email me a copy of your excel spreadsheet containing your data and analysis by the "Repeatability/Reproducibility Study" due date. We will present the final results in class on the last day of class. Please turn in your final test plan, the final ETS code necessary to implement this test plan, your data analysis, and your final test time by the "Final Test Plan and Report" due date. Your final report should describe your set of tests briefly, justify your design decisions, and explain your data analysis. In the conclusion, determine if you feel that your program is "production ready" or if further modification/optimizations should be considered.