George Mason University **Physics 311**

Data Acquisition 2

Assignment 1: Getting to know the equipment

1. Examine the front panel of the SR 560. Make a sketch of the front panel into your lab notebook. Also, check out the rear panel. Make sure you write down what everything does.

2. Using the SR-560, create a 1-kHz low pass filter with a gain of 10. Measure the signal with the oscilloscope. Record it with open choice desktop and determine the 3 dB break off point.

3. Simulate your low pass filter in Multisim and create a bode plot. What is the difference in results for simulated data and actual measurement?

Assignment 2: Capacitively- coupled Interference

4. Using an adapter, connect an unshielded length of wire to your amplifier's A input, and connect the 50 Ω output of your amp to your scope. Plug the other end of the unshielded wire into your breadboard, but don't make any other connection to it. Don't get near the wire when you make your measurement, or else your body will act as an antenna and affect the measurement. Make sure the amplifier's input switches are set appropriately, and adjust the gain to obtain the best possible display without overloading. **Measure** the peak-to peak voltage of the 60 Hz interference.

5. Now use your breadboard to connect the loose end of the wire to ground through a 10 MΩ resistor. **Measure** the peak-to peak voltage of the 60 Hz interference. **Predict** the amplitude of the 60 Hz interference you will measure when you replace the 10 MΩ resistor first with a 1 MΩ and then with a 100 kΩ resistor. **Check your prediction experimentally.** This experiment should convince you that reducing the impedance to ground of the signal source reduces capacitively-coupled interference. Next, you will replace the resistor with a capacitor. Predict what value of capacitance will produce the same reduction of the 60 Hz

interference as the 100k resistor did. Check your prediction experimentally. Would this capacitor or the 100k resistor be more effective at suppressing interference at 20 kHz? Why?

6. Now connect a coax cable to the input of your amp, instead of the unshielded wire / clip lead assembly, and leave the other end of the coax unconnected. This is just the same configuration as in part 6, except now the inner conductor is shielded. The outer conductor is connected to the amplifier's common point when you make the connection to the amplifier. **Measure** the amplitude of the 60 Hz interference. This should convince you that using a shield connected to the amplifier's common point is a very effective way to reduce capacitively-coupled interference!