

**APPENDIX**  
**EXPERIMENTAL MEASUREMENTS**

## 1. GATE POWER SUPPLY

### 1.1 Voltage Calibration

One of the first measurements was to calibrate the HP6209B<sup>1</sup> gate power supply using the HP59501B<sup>2</sup> power supply programmer. The calibration was done after setting the zero mark. The input voltage for the HP59501B<sup>2</sup> was set using Labview 6.0i<sup>3</sup> and the output voltage from the HP6209B<sup>1</sup> was measured using a Keithley 2700 multimeter<sup>4</sup>, which was calibrated by measuring the voltage from a 9V Battery. The graph shown below, gives us the required relation between the input and output voltage

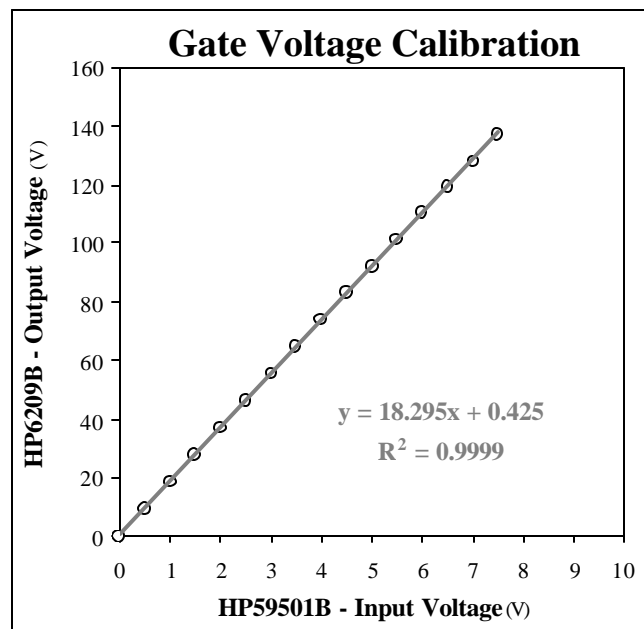


Figure 1. Graph showing voltage calibration for the gate power supply

The relation between the input voltage and the output gate voltage is as follows:

$$V_{\text{out}} = 18.295 \cdot V_{\text{in}} + 0.425 \quad (1)$$

The above equation can also be re-written to yield  $V_{\text{in}}$  as a function  $V_{\text{out}}$ , which is :

$$V_{\text{in}} = 0.0547 \cdot V_{\text{out}} - 0.0232 \quad (2)$$



## 2.2 DC Mode - Anode Current Measurement

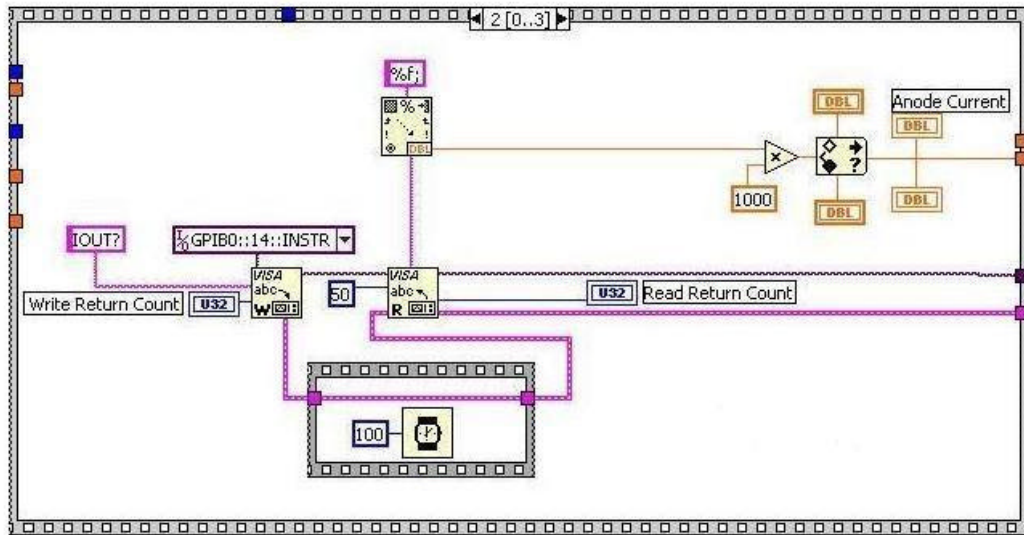


Figure 3 Measuring the anode current using the SRS350<sup>5</sup> power supply.

## 2.3 Exposure Dose

The dose was calculated by integrating (numerically) the area under the P-t curve.

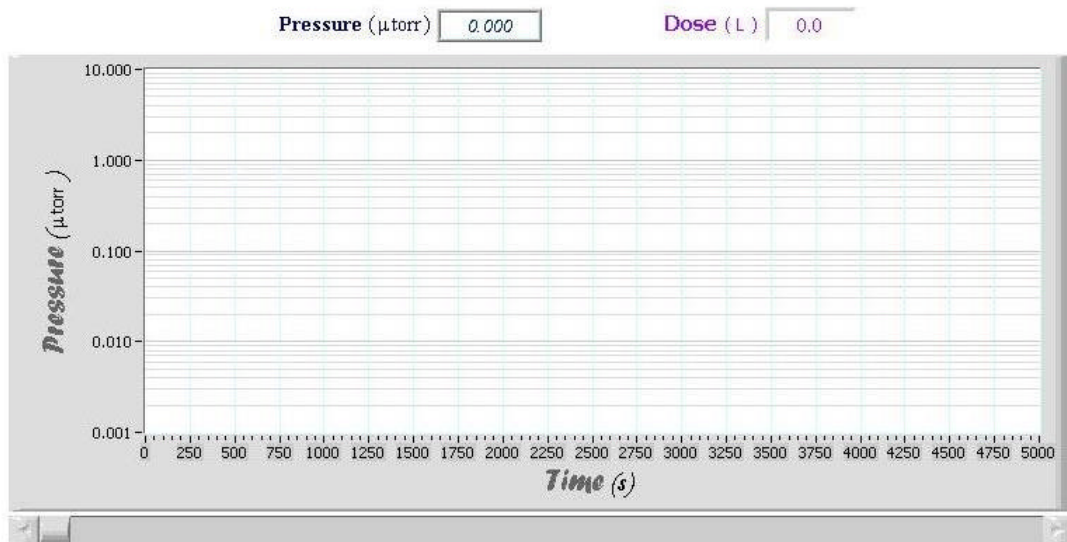


Figure 4 Front panel for the dose calculation from the pressure reading.

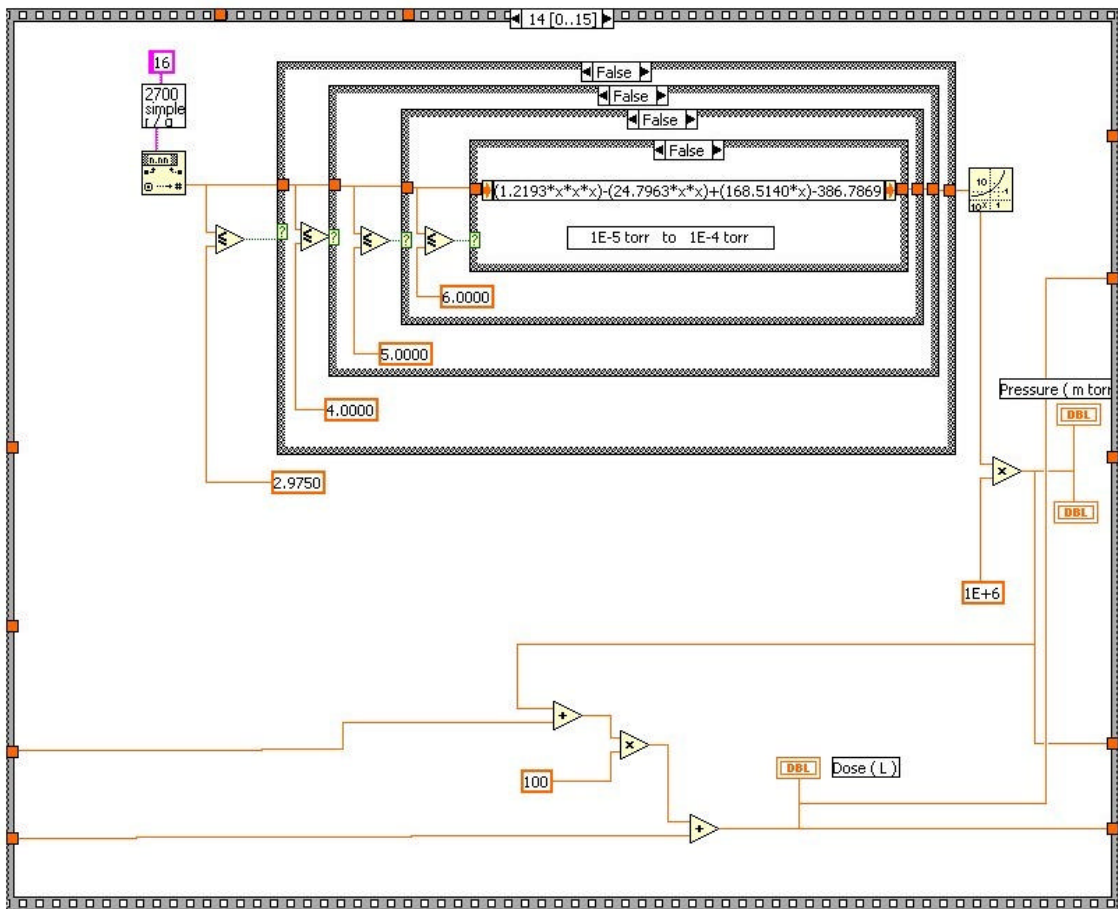


Figure 5 Block diagram showing the voltage read out from the Keithley 2700 multimeter<sup>4</sup> Depending on the range of the output voltage, the pressure is calculated using different case structures for different output voltages.

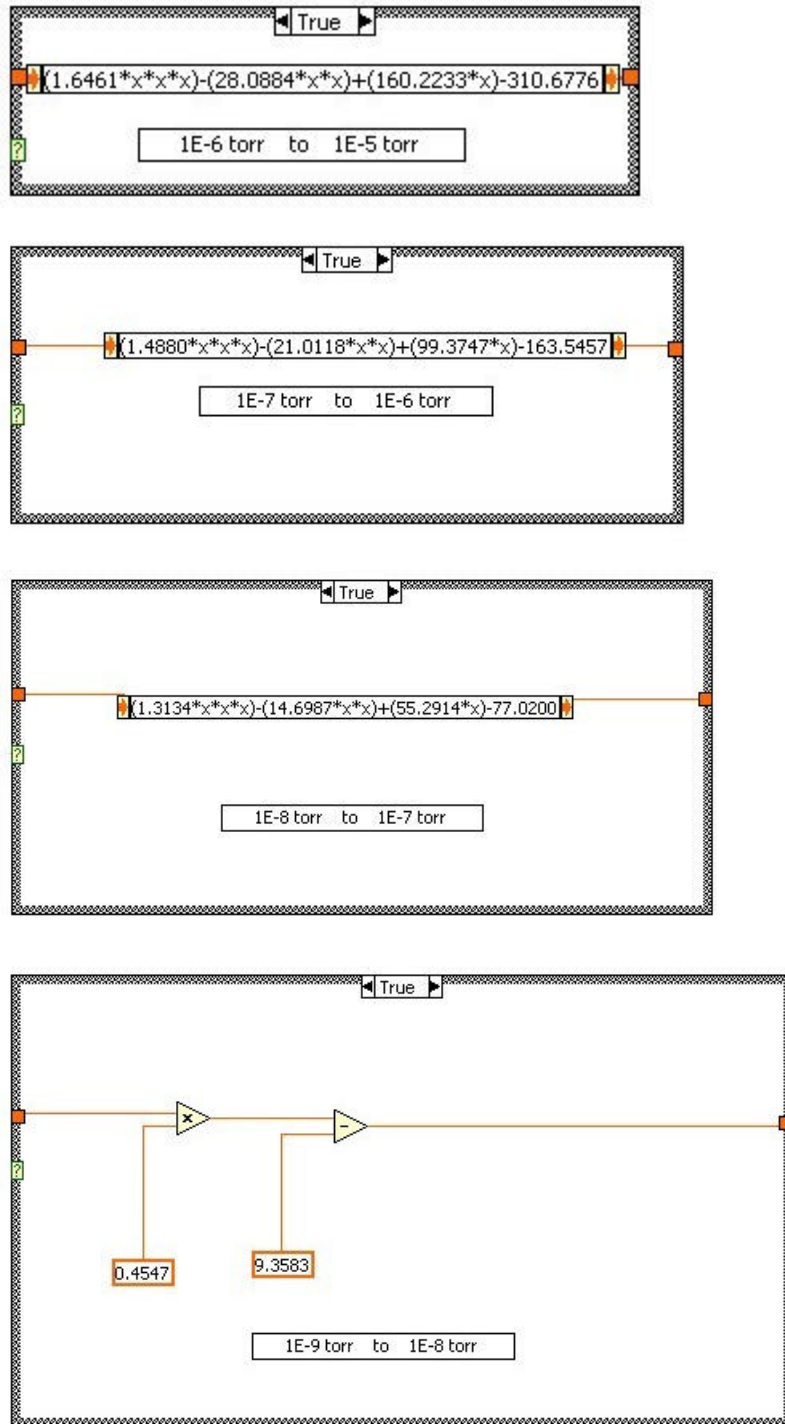


Figure 6 Different case structures for different pressure range conversions.



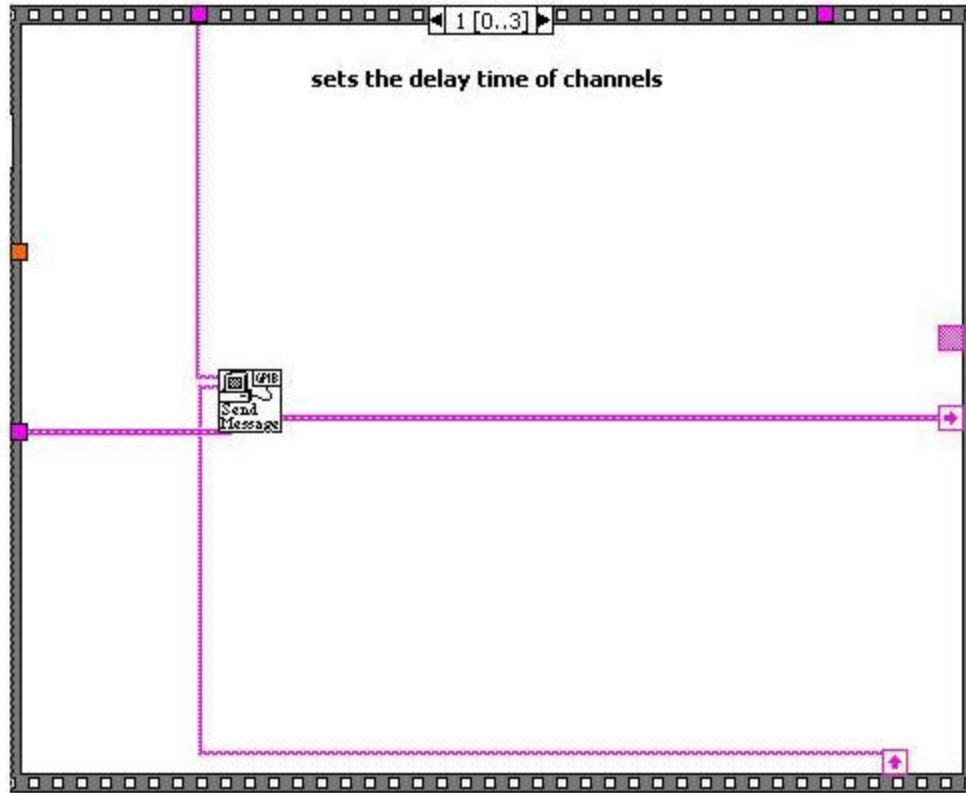


Figure 8 Block diagram for setting the “ON” duty cycle – Sequence 2



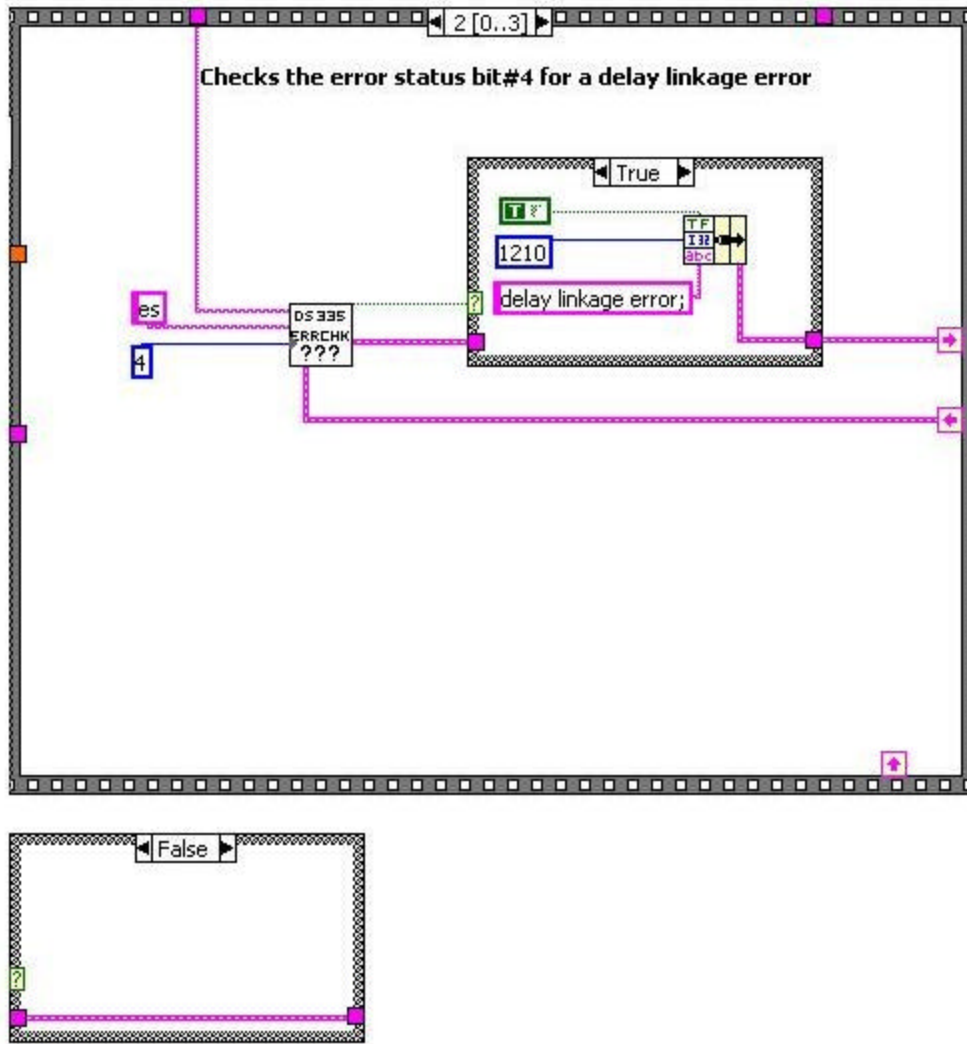


Figure 9 Block diagram for setting the “ON” duty cycle – Sequence 3

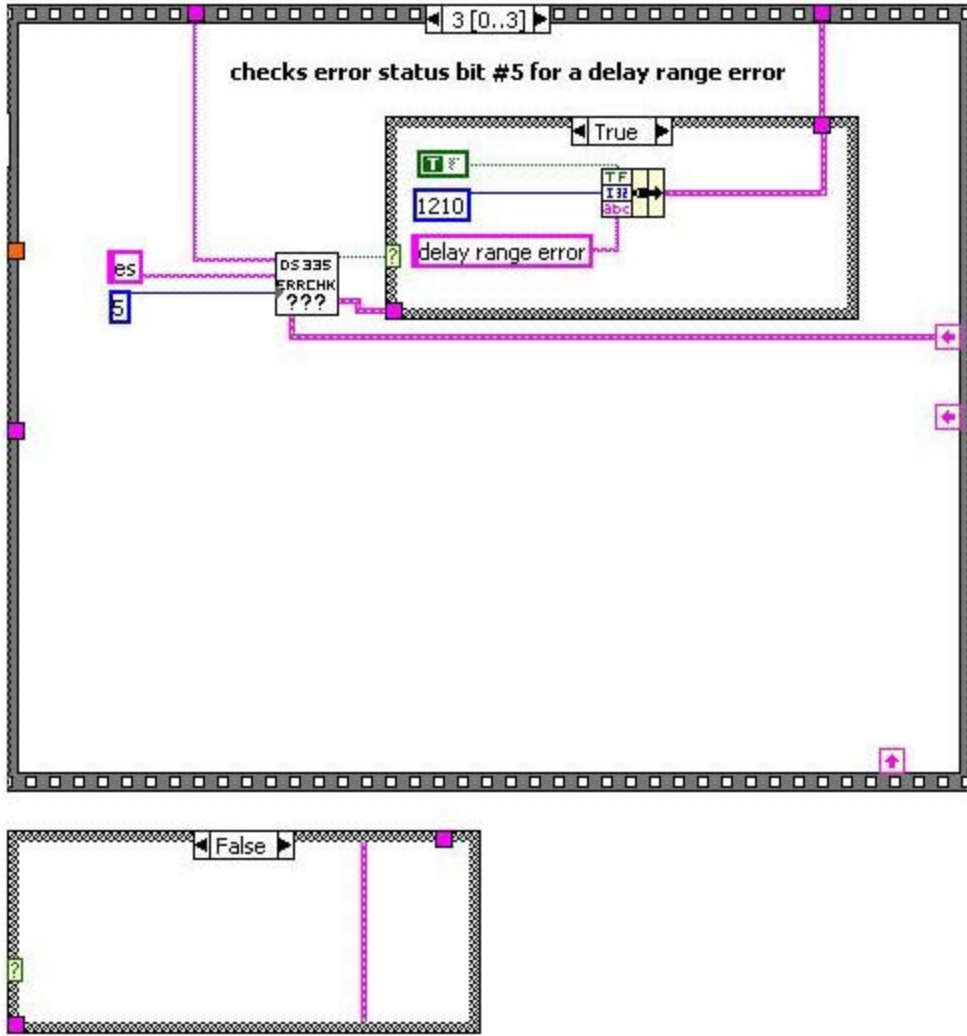


Figure 10 Block diagram for setting the “ON” duty cycle – Sequence 4

## 2.5 Pulsed Mode – Anode Current Measurement

The pulsed mode anode current measurements were made using a Lecroy 9310<sup>6</sup> digital oscilloscope. By measuring the voltage drop across the 3300 resistor, we were able to calculate the anode current. Figures 11 – 15 show the various sequences for measuring the anode current for each of the 2 halves of the FEA.

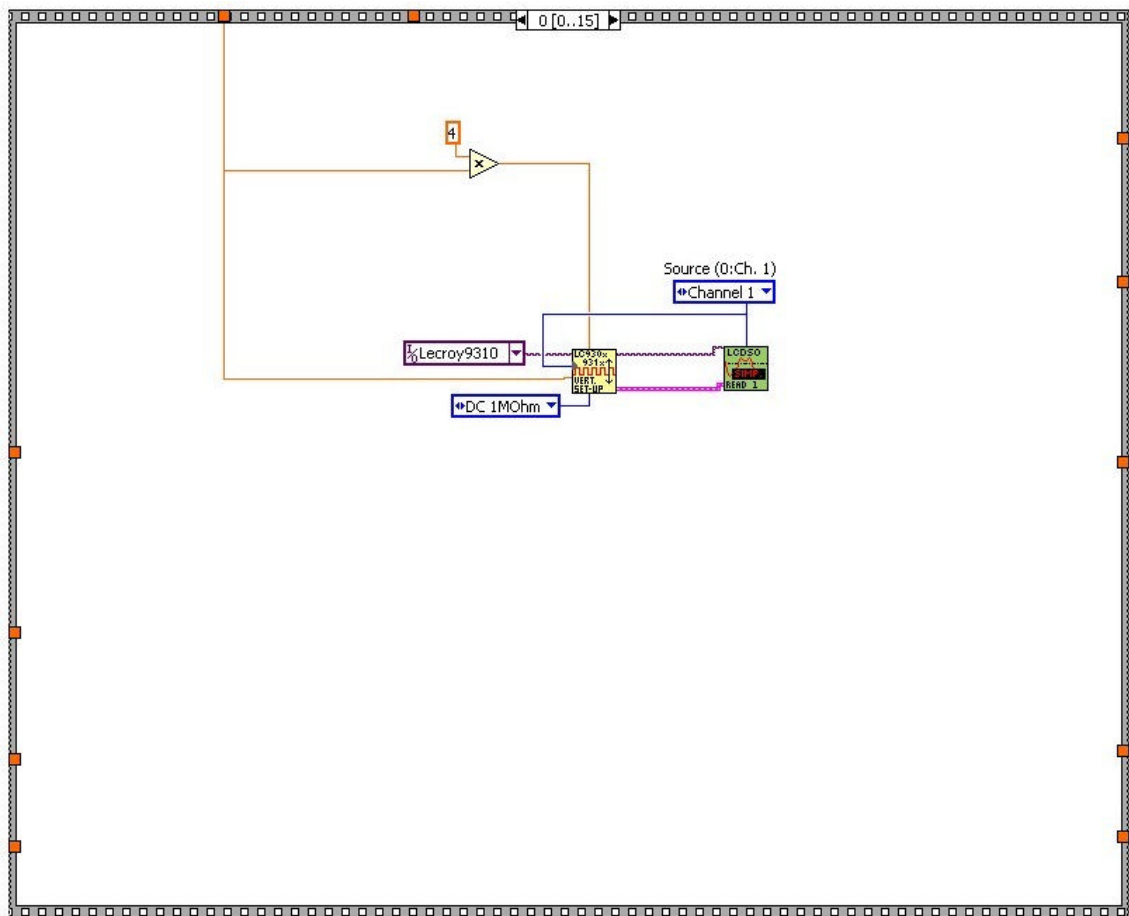


Figure 11 Block diagram 1 - Oscilloscope settings for channel 1 (trigger)

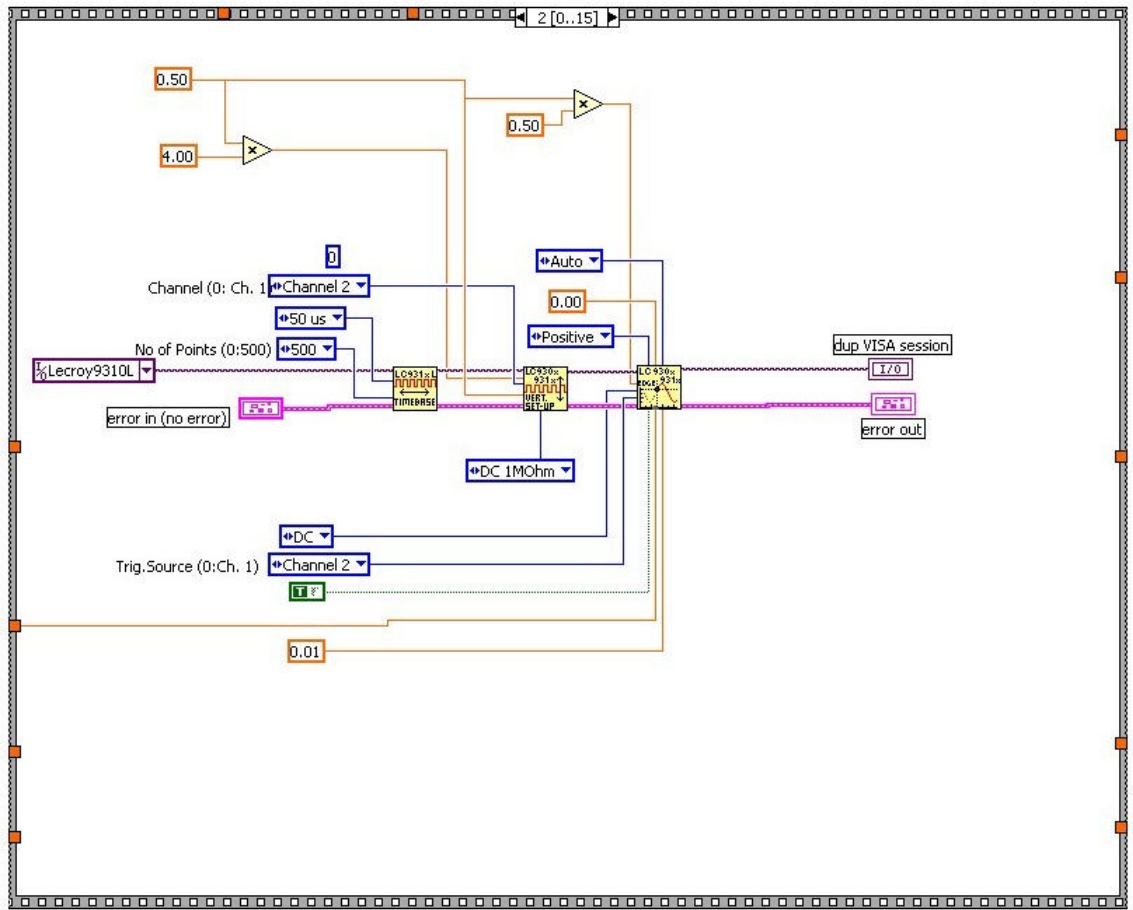


Figure 12 Block diagram 2 - Oscilloscope settings for the 1<sup>st</sup> half of the FEA (uncoated).

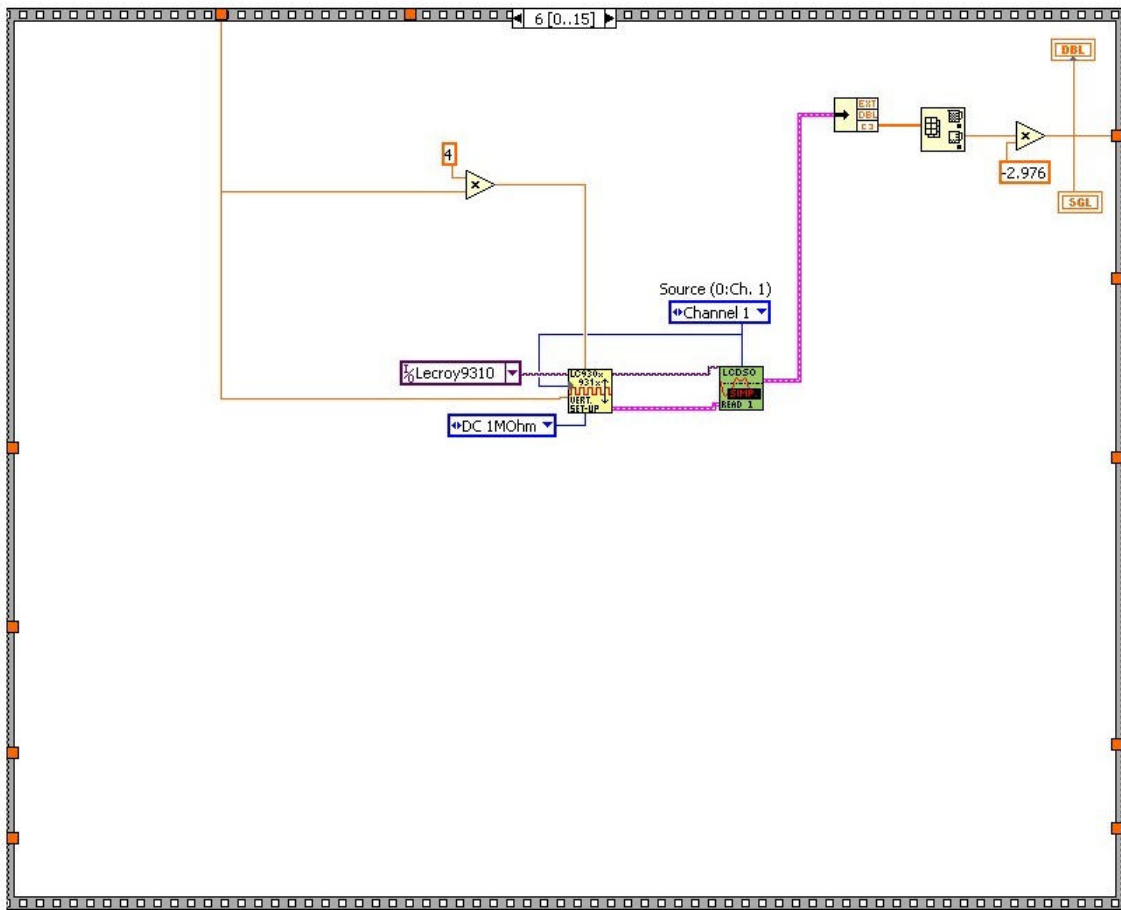


Figure 13 Block diagram 3 – Anode current from the 1<sup>st</sup> half of the FEA (uncoated).

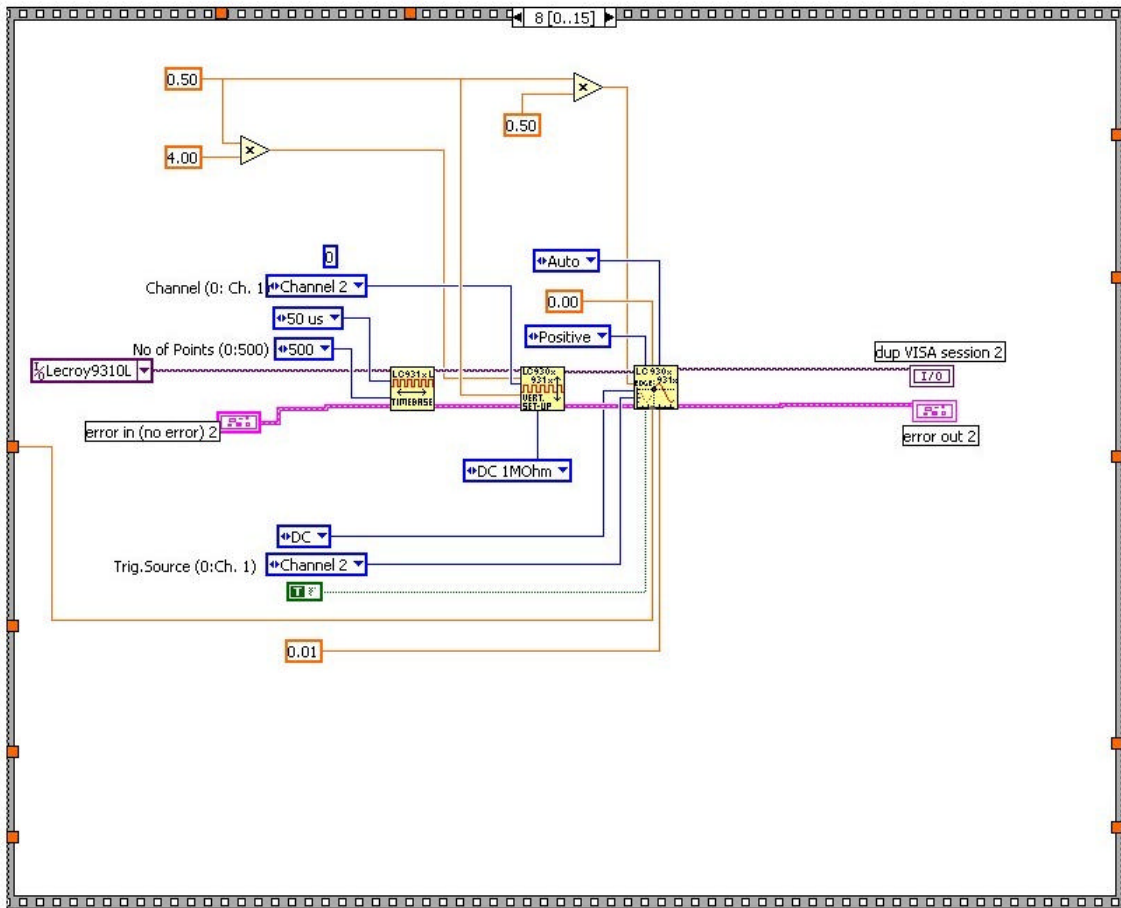


Figure 14 Block diagram 4 - Oscilloscope settings for the 2<sup>nd</sup> half of the FEA (Au coated).

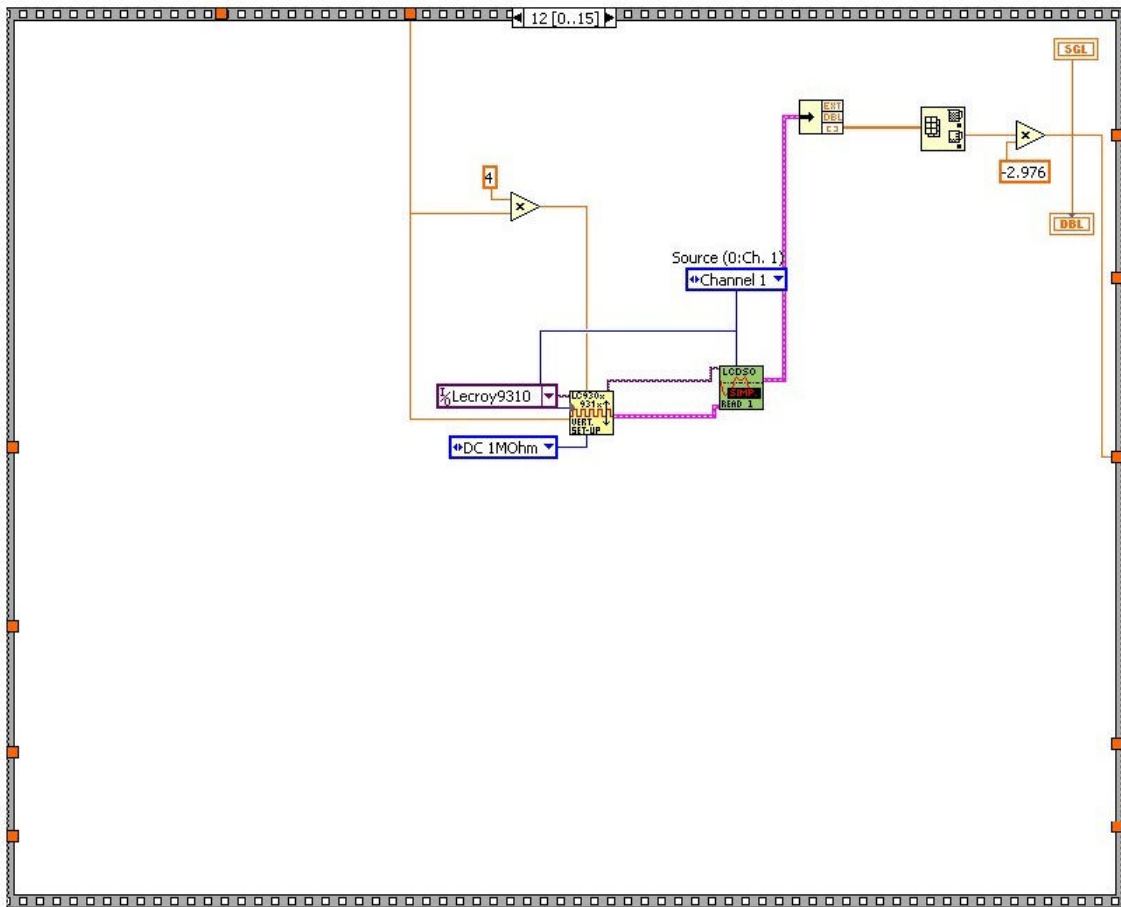


Figure 15 Block diagram 5 – Anode current from the 2<sup>nd</sup> half of the FEA (Au coated).

# *I - D Plot for Coated Arrays with Variable ON Cycle ( 0.5 - 10% )*

This Application allows us to vary the ON Cycle (Pulse Settings) and it monitors the Anode Current and Dose every 200 s for 20000s, both for the Uncoated & Coated half of the Array.

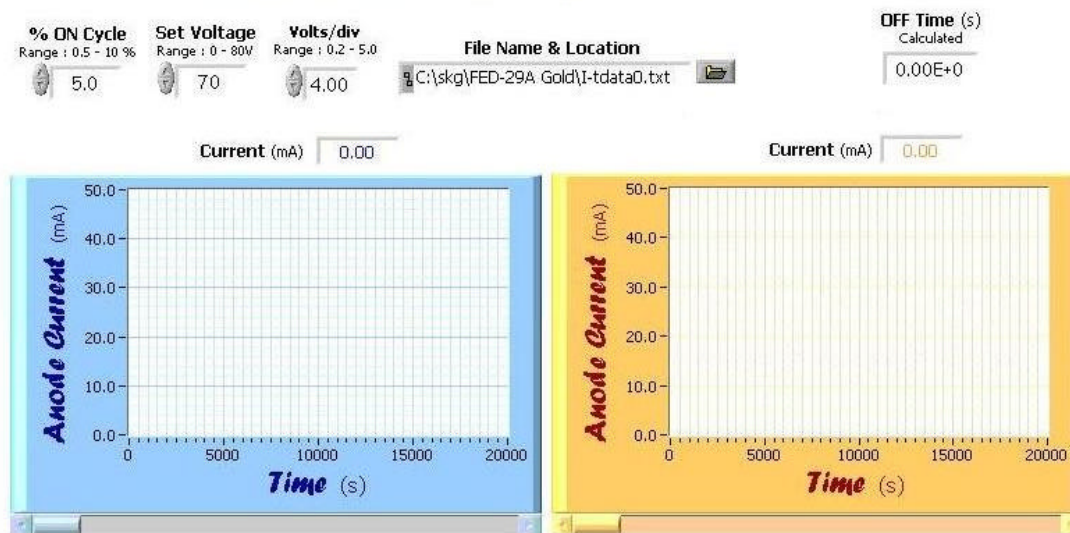


Figure 16 Front panel of the application for measuring the pulsed mode anode current from the uncoated half and the Au coated half of the FEA.



## REFERENCES

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<sup>1</sup> HP6209B DC Power Supply Manual.

<sup>2</sup> HP59501B Power Supply Programmer Manual.

<sup>3</sup> Labview<sup>TM</sup> 6.0i is a registered trademark of National Instruments Inc., Austin, Texas (2000).

<sup>4</sup> Keithley 2700 Multimeter and Programmer Manual.

<sup>5</sup> Stanford Research Systems, Inc., 1290-D Reamwood Avenue, Sunnyvale, CA 94089.

<sup>6</sup> LeCroy 9310, 300 MHz dual channeled Oscilloscope Manual.