

Before (Unchanged Board) After Card 3 Grounded Input Noise Mean: -32.779 Std Dev: 8.5007 Card 3 Grounded Input Noise Mean: -47.818 Std Dev: 3.0427 Register ADC Register U13 1000 1000 Sample Card 3 Grounded Input Noise Min: -65 Max: -11 Sample Card 3 Grounded Input Noise Min: -58 Max: -37 50 AS193-73LF Count 50 Count **REMOVED** 0 └ -70 -60 -60 -20 -10 -35 ADC Register Card 3 Grounded Input Noise RMS: 8.4965 ADC Register Card 3 Grounded Input Noise RMS: 3.0412 Magnitude .0 .5 Magnitude ADC0_INn 1.5 $\times 10^5$ Frequency Frequency $\times 10^5$ Card 3 Grounded Input Noise Mean: -42.241 Std Dev: 5.3482 Card 3 Grounded Input Noise Mean: -66.225 Std Dev: 2.7637 ADC Register Register U19 C159 200 400 600 800 1000 200 800 1000 Sample Card 3 Grounded Input Noise Min: -57 Max: -25 Sample Card 3 Grounded Input Noise Min: -75 Max: -58 AS193-73LF Count 20 00 th 00 50

A/Ds Disconnected from Analog Front End.

GND

-40

ADC Register
Card 3 Grounded Input Noise RMS: 5.3456

Frequency

Magnitude

-35

1.5

-25

-20

Ch1

 $\times 10^5$

REMOVED

-75

Magnitude .0 -65

ADC Register
Card 3 Grounded Input Noise RMS: 2.7623

Frequency

-55

 $\times 10^5$

Before (After on A/D Disconnect) After Card 3 Grounded Input Noise Mean: -47.818 Std Dev: 3.0427 Card 3 Grounded Input Noise Mean: -23.716 Std Dev: 2.7001 ADC Register 200 800 1000 1000 Sample Card 3 Grounded Input Noise Min: -32 Max: -15 Sample Card 3 Grounded Input Noise Min: -58 Max: -37 200 AS193-73LF Count 50 Count 100 **REMOVED** -15 -30 ADC Register Card 3 Grounded Input Noise RMS: 3.0412 ADC Register Card 3 Grounded Input Noise RMS: 2.6988 Magnitude 200 Frequency $\times 10^5$ Frequency $\times 10^5$ Card 3 Grounded Input Noise Mean: -66.225 Std Dev: 2.7637 Card 3 Grounded Input Noise Mean: -35.533 Std Dev: 2.6264 ADC Register ADC Register 200 800 1000 1000 Sample Card 3 Grounded Input Noise Min: -75 Max: -58 Sample Card 3 Grounded Input Noise Min: -44 Max: -27 Count 50 Count 100 0 L -80 -75 -65 -25 ADC Register Card 3 Grounded Input Noise RMS: 2.7623 ADC Register Card 3 Grounded Input Noise RMS: 2.6251 Magnitude

Amplifiers disconnected from Analog Switches which are reconnected to A/Ds

0.5

Frequency

1.5

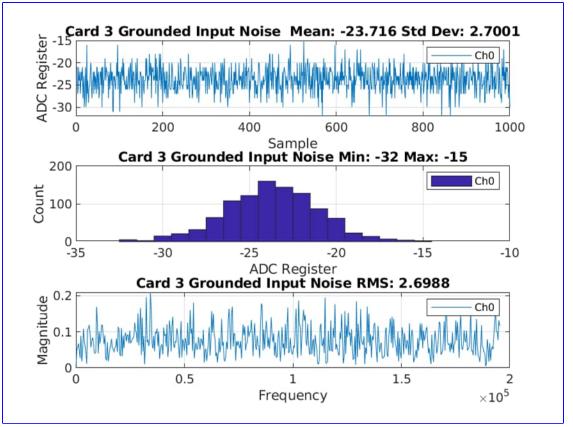
 $\times 10^5$

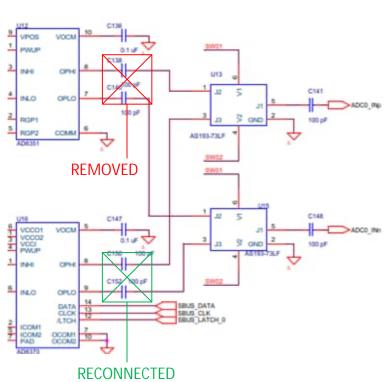
1.5

 $\times 10^5$

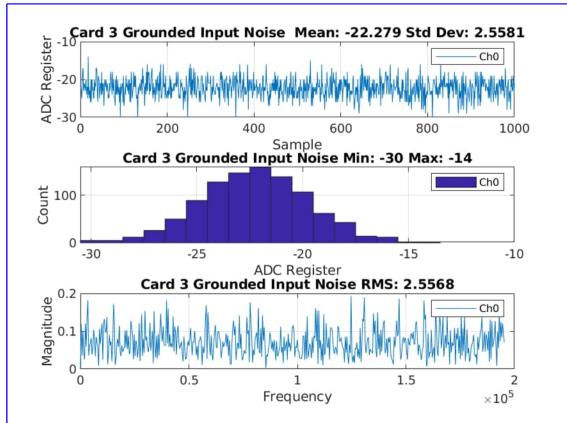
Frequency

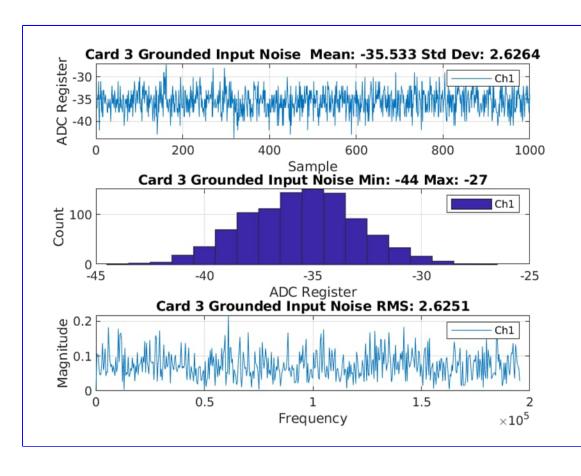
Before (Variable Amp reconnect)

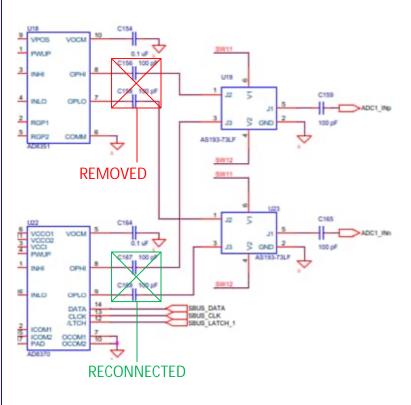


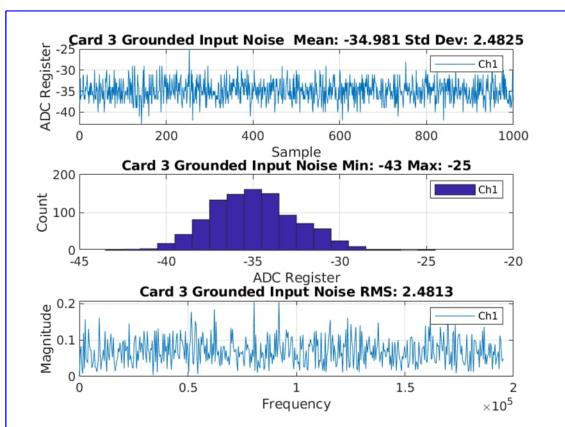


After (Variable Amp reconnect)



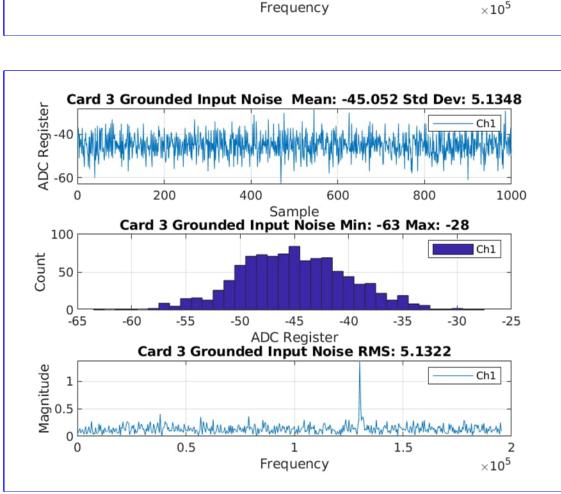






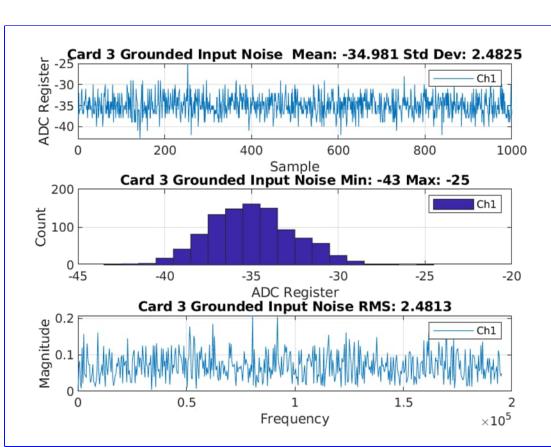
Fixed Amp disconnected/Variable Amp reconnected to Analog Switches which are reconnected to A/Ds

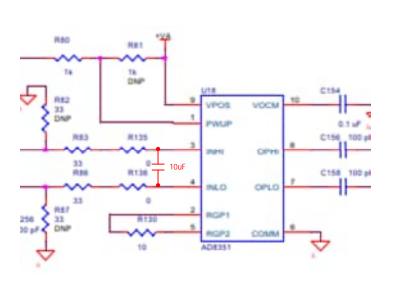
Before (After Variable Amp reconnect) After (Fixed Amp Input Shorted) Card 3 Grounded Input Noise Mean: -22.279 Std Dev: 2.5581 Card 3 Grounded Input Noise Mean: -18.927 Std Dev: 4.9792 ADC Register ADC Register 1000 Sample Card 3 Grounded Input Noise Min: -30 Max: -14 Sample Card 3 Grounded Input Noise Min: -34 Max: -3 100 Count 100 Count 50 0 -35 -30 -15 -10 ADC Register Card 3 Grounded Input Noise RMS: 2.5568 ADC Register Card 3 Grounded Input Noise RMS: 4.9767 Magnitude 0.1 Magnitude control cont $\times 10^5$ Frequency



-15

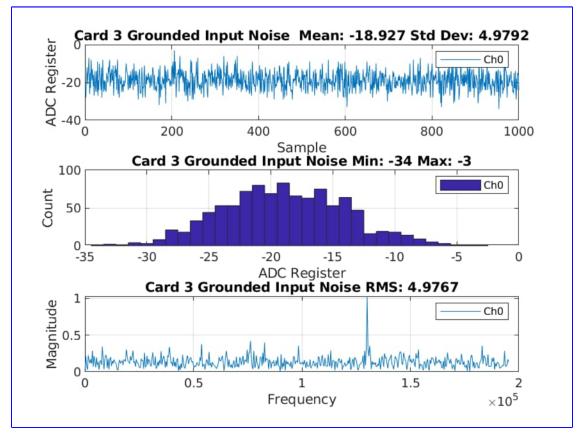
1000

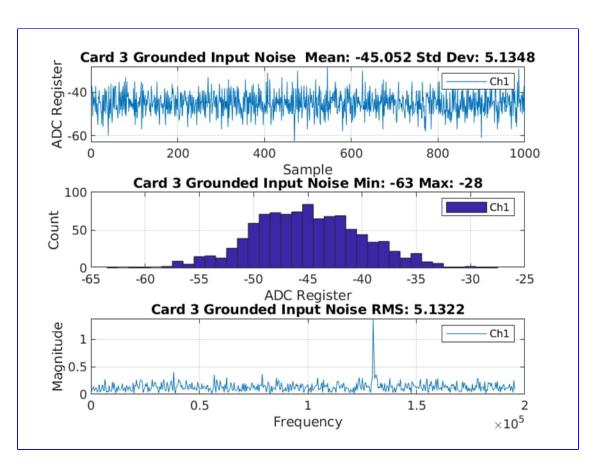




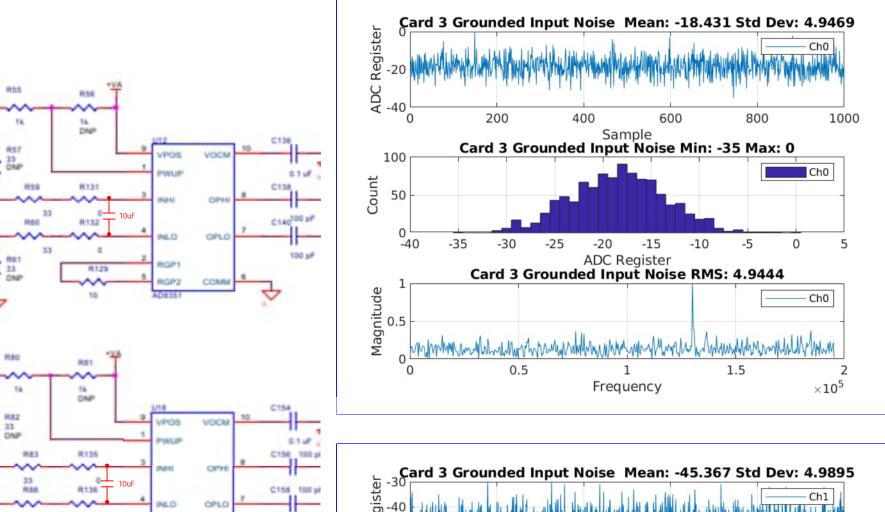
Fixed Amp Input Shorted: Both Amps reconnected to Analog Switches which are reconnected to A/Ds

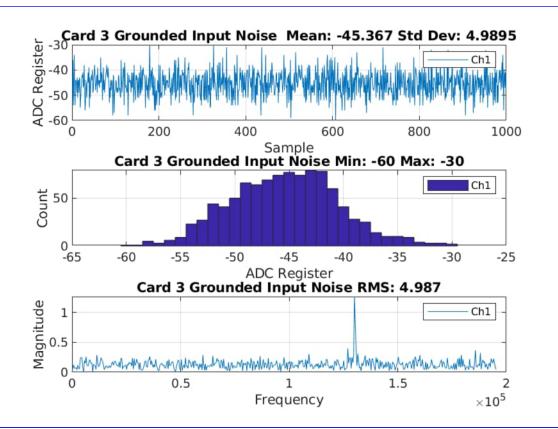
Before (Fixed Amp Input Shorted)





After (Fixed Amp Input Shorted & C122 to .3uF)



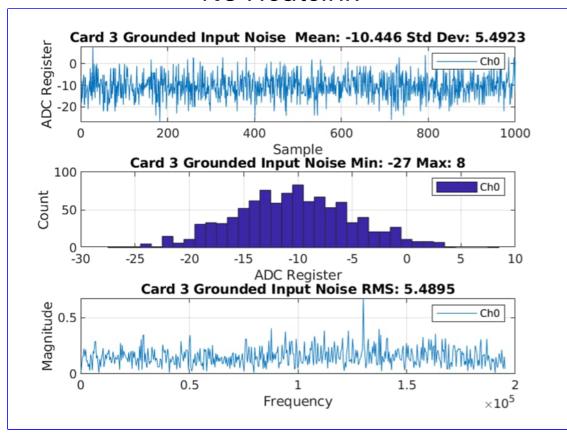


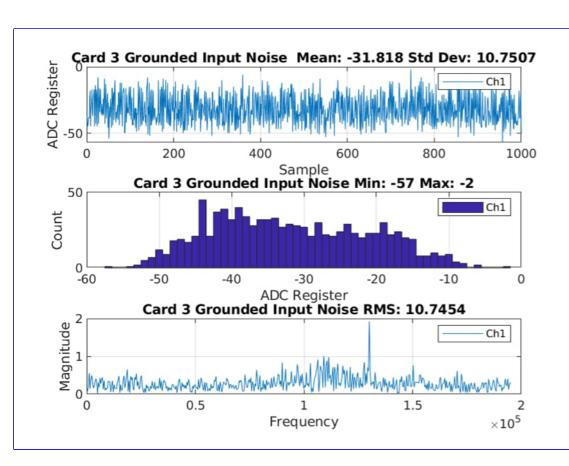
Fixed Amp Input Shorted And C122 (+Va) increased to .3uF, was 15pF

And

ANALOG POWER

No Heatsink

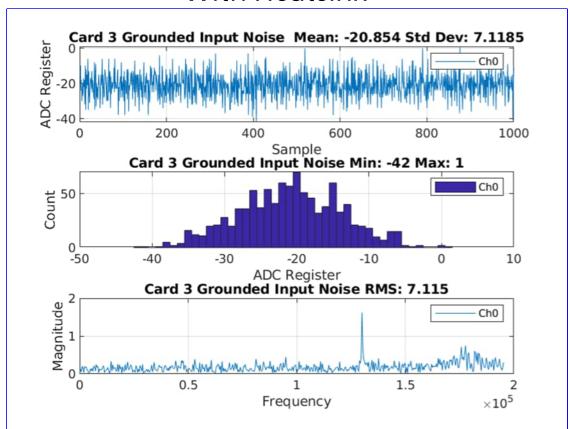


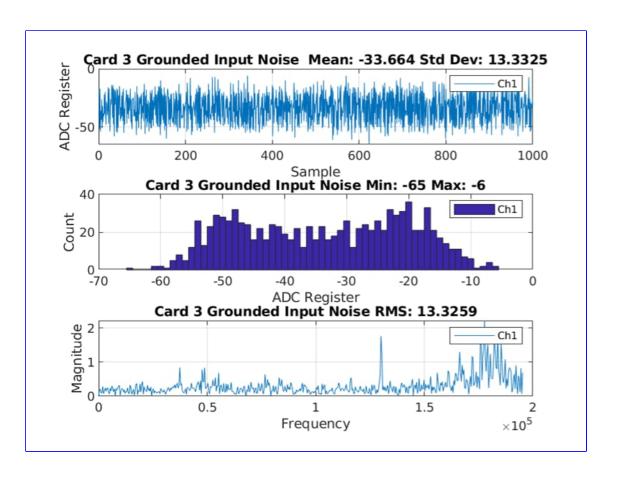


After restoring the Analog signal path I performed a noise test without the Heatsink and noticed the noise went up from the original measurement. Thinking the heatsink would act as a shield the noise went up. Grounding the Heatsink reduced the noise slightly.

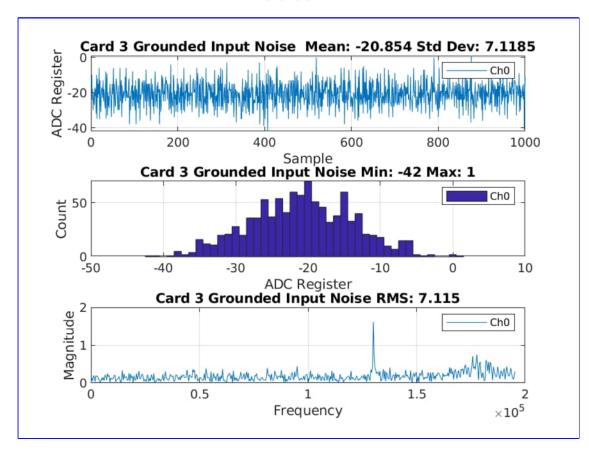
Using a Homemade RF sniffing probe, Minicircuits LZF-500+ Amplifier (.05 – 500MHz) and an Oscilloscope, the A/D converter was the noise source.

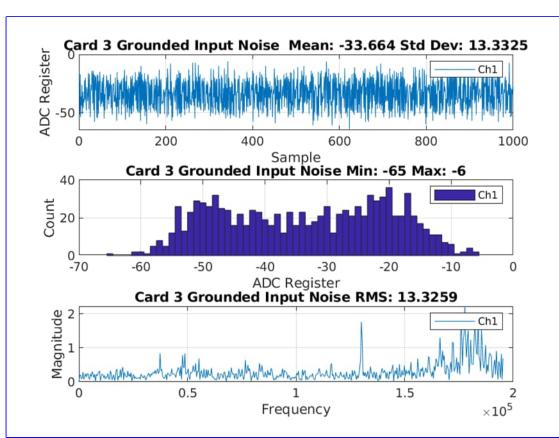
With Heatsink





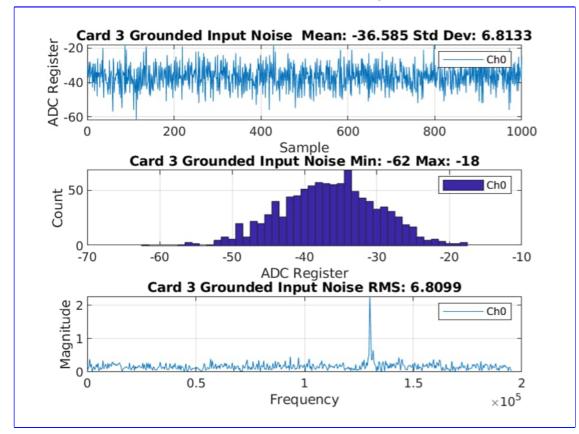
Heatsink

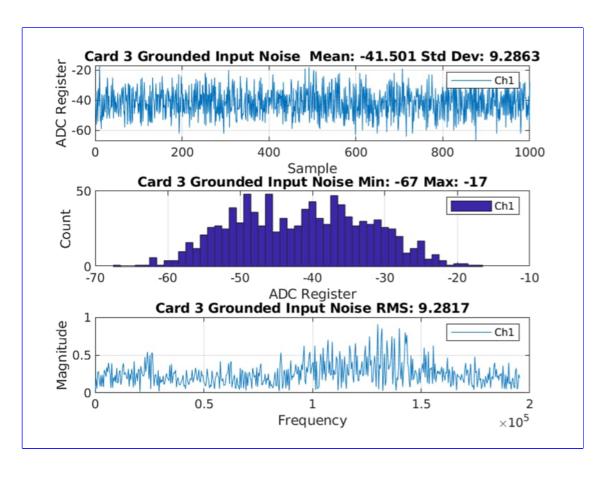




Cutting a strip of Metalized Mylar from an anti-static bag and placing it between the transformers and Heatsink reduced the noise.

Heatsink and Metalized Mylar Shield





Analog path restored, Heatsink (GND'ed) vs Heatsink (GND'ed) with Metalized Mylar Shield by Transformers