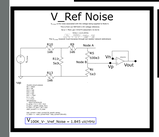
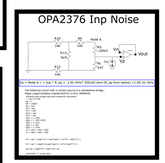
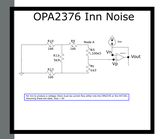
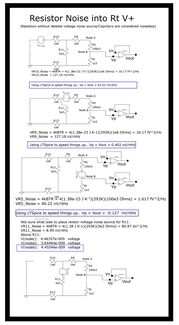
Rt Measurement Voltage Noise Section Before INA826

Rt V+ Measurement Voltage Noise Section







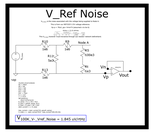


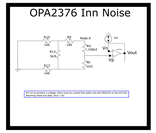
$$V_{+\,Rt\,rms} = \sqrt{(V_{ref\,noise})^2 + (e_n)^2 + (V_{inp})^2 + (V_{inn})^2 + (V_{R10\,Noise})^2 + (V_{R9\,Noise})^2 + (V_{R5\,Noise})^2 + (V_{R11\,Noise})^2}$$

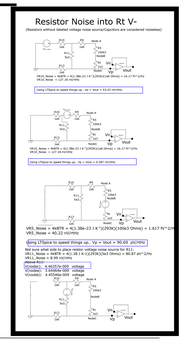
$$\sqrt{(1.845\frac{uV}{\sqrt{Hz}})^2 + (7.5\frac{nV}{\sqrt{Hz}})^2 + (1.05\frac{nV}{\sqrt{Hz}})^2 + (63.43\frac{nV}{\sqrt{Hz}})^2 + (0.402\frac{nV}{\sqrt{Hz}})^2 + (-0.127\frac{nV}{\sqrt{Hz}})^2 + (4.46\frac{nV}{\sqrt{Hz}})^2}$$

$$V_{+\,Rt} = 1.846\frac{uV}{\sqrt{Hz}}$$

Rt V- Measurement Voltage Noise Section







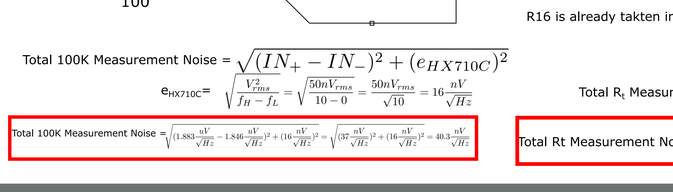
$$V_{-\,Rt\,rms} = \sqrt{(V_{ref\,noise})^2 + (e_n)^2 + (V_{inp})^2 + (V_{inn})^2 + (V_{R10\,Noise})^2 + (V_{R9\,Noise})^2 + (V_{R5\,Noise})^2 + (V_{R11\,Noise})^2}$$

$$\sqrt{(1.845\frac{uV}{\sqrt{Hz}})^2 + (7.5\frac{nV}{\sqrt{Hz}})^2 + (1.19\frac{nV}{\sqrt{Hz}})^2 + (63.43\frac{nV}{\sqrt{Hz}})^2 + (0.287\frac{nV}{\sqrt{Hz}})^2 + (90.69\frac{pV}{\sqrt{Hz}})^2 + (4.46\frac{nV}{\sqrt{Hz}})^2}$$

$$V_{-\,Rt} = 1.846\frac{uV}{\sqrt{Hz}}$$

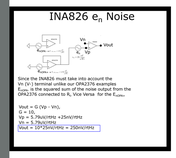
Rt Measurement Voltage Noise Section at INA826

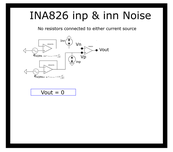
INA826:
Vout = G (Vp - Vn), G = 10
However witht he decimal places above, Vout = 0...
10*(1.846e-6 - 1.846e-6) = 0 V/rtHz



$$IN_+ = \sqrt{(250\frac{nV}{\sqrt{Hz}})^2 + (1.27\frac{nV}{\sqrt{Hz}})^2} = 250\frac{nV}{\sqrt{Hz}}$$

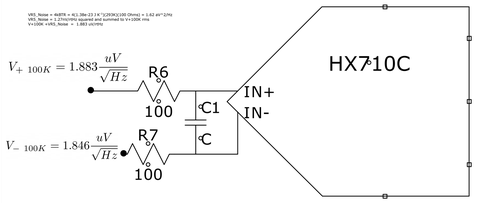
$$V_{-\,OPA333} = 1.85\frac{uV}{\sqrt{Hz}}$$





Noise at Each HX710C Inputs

Noise at 100K HX710C Inputs



$$V_{+\,100K} = 1.883\frac{uV}{\sqrt{Hz}}$$

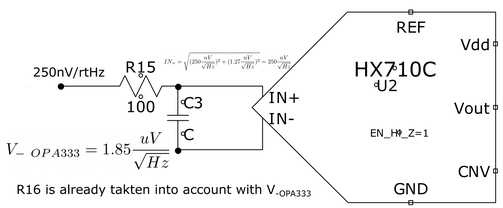
$$V_{-\,100K} = 1.846\frac{uV}{\sqrt{Hz}}$$

Total 100K Measurement Noise = $\sqrt{(IN_+ - IN_-)^2 + (e_{HX710C})^2}$

e_{HX710C}= $\sqrt{\frac{V_{rms}^2}{f_H - f_L}} = \sqrt{\frac{50nV_{rms}}{10-0}} = \frac{50nV_{rms}}{\sqrt{10}} = 16\frac{nV}{\sqrt{Hz}}$

Total 100K Measurement Noise = $\sqrt{(1.883\frac{uV}{\sqrt{Hz}} - 1.846\frac{uV}{\sqrt{Hz}})^2 + (16\frac{nV}{\sqrt{Hz}})^2} = \sqrt{(37\frac{nV}{\sqrt{Hz}})^2 + (16\frac{nV}{\sqrt{Hz}})^2} = 40.3\frac{nV}{\sqrt{Hz}}$

Noise at R_t HX710C Inputs



$$IN_+ = \sqrt{(250\frac{nV}{\sqrt{Hz}})^2 + (1.27\frac{nV}{\sqrt{Hz}})^2} = 250\frac{nV}{\sqrt{Hz}}$$

$$V_{-\,OPA333} = 1.85\frac{uV}{\sqrt{Hz}}$$

R16 is already takten into account with $V_{-OPA333}$

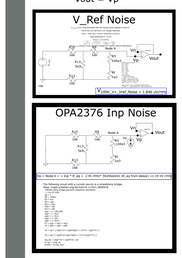
Total R_t Measurement Noise = $\sqrt{(IN_+ - IN_-)^2 + (e_{HX710C})^2}$

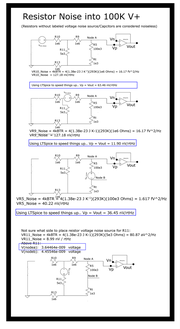
Total Rt Measurement Noise = $\sqrt{(250\frac{nV}{\sqrt{Hz}} - 1.85\frac{uV}{\sqrt{Hz}})^2 + (16\frac{nV}{\sqrt{Hz}})^2} = \sqrt{(-1.6\frac{nV}{\sqrt{Hz}})^2 + (16\frac{nV}{\sqrt{Hz}})^2} = 1.6\frac{uV}{\sqrt{Hz}}$

100K Measurement Voltage Noise Section

100K V+ Measurement Voltage Noise Section

Vout = G (Vp - Vn)
Vn = Vout since connected with only a wire
$\lim_{G\to\infty}$ Vout = (G*Vp)/(1+G)
Vout = Vp



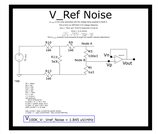


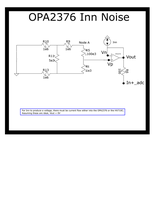
$$V_{+\,100K\,rms} = \sqrt{(V_{ref\,noise})^2 + (e_n)^2 + (V_{inp})^2 + (V_{inn})^2 + (V_{R10\,Noise})^2 + (V_{R9\,Noise})^2 + (V_{R5\,Noise})^2 + (V_{R11\,Noise})^2}$$

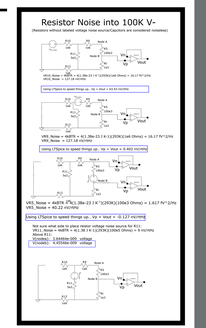
$$V_{+\,100K\,rms} = \sqrt{(1.846\frac{nV}{\sqrt{Hz}})^2 + (7.5\frac{nV}{\sqrt{Hz}})^2 + (1.19\frac{nV}{\sqrt{Hz}})^2 + (63.46\frac{nV}{\sqrt{Hz}})^2 + (11.90\frac{nV}{\sqrt{Hz}})^2 + (364.54\frac{nV}{\sqrt{Hz}})^2 + (3.64\frac{nV}{\sqrt{Hz}})^2}$$

$$V_{+\,100K} = 1.883\frac{uV}{\sqrt{Hz}}$$

100K V- Measurement Voltage Noise Section





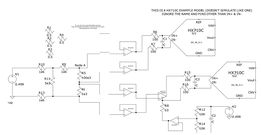


$$V_{-\,100K\,rms} = \sqrt{(V_{ref\,noise})^2 + (e_n)^2 + (V_{inp})^2 + (V_{inn})^2 + (V_{R10\,Noise})^2 + (V_{R9\,Noise})^2 + (V_{R5\,Noise})^2 + (V_{R11\,Noise})^2}$$

$$V_{-\,100K\,rms} = \sqrt{(1.845\frac{nV}{\sqrt{Hz}})^2 + (7.5\frac{nV}{\sqrt{Hz}})^2 + (1.05\frac{nV}{\sqrt{Hz}})^2 + (63.43\frac{nV}{\sqrt{Hz}})^2 + (0.402\frac{nV}{\sqrt{Hz}})^2 + (-1.27\frac{nV}{\sqrt{Hz}})^2 + (4.46\frac{nV}{\sqrt{Hz}})^2}$$

$$V_{-\,100K} = 1.846\frac{uV}{\sqrt{Hz}}$$

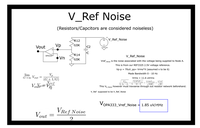
OPA2376:
Vout = G (Vp - Vn)
Vn = Vout since connected with only a wire
$\lim_{G\to\infty}$ Vout = (G*Vp)/(1+G)
Vout = Vp

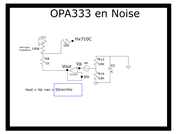


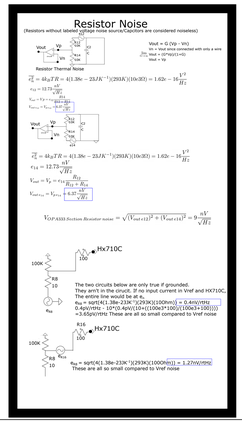
Total 100K Measurement Noise = $\sqrt{(1.883\frac{nV}{\sqrt{Hz}} - 1.846\frac{nV}{\sqrt{Hz}})^2 + (16\frac{nV}{\sqrt{Hz}})^2 + (37\frac{nV}{\sqrt{Hz}})^2 + (16\frac{nV}{\sqrt{Hz}})^2} = 40.3\frac{nV}{\sqrt{Hz}}$

Total Rt Measurement Noise = $\sqrt{(250\frac{nV}{\sqrt{Hz}} - 1.85\frac{uV}{\sqrt{Hz}})^2 + (16\frac{nV}{\sqrt{Hz}})^2} = \sqrt{(-1.6\frac{nV}{\sqrt{Hz}})^2 + (16\frac{nV}{\sqrt{Hz}})^2} = 1.6\frac{uV}{\sqrt{Hz}}$

OPA333 Voltage Noise Section at INA826







$$V_{-\,OPA333\,rms} = \sqrt{(V_{ref\,noise})^2 + (e_n)^2 + (V_{inp})^2 + (V_{inn})^2 + (V_{R12\,Noise})^2 + (V_{R14\,Noise})^2 + (V_{R8\,Noise})^2 + (V_{R16\,Noise})^2}$$

$$\sqrt{(1.85\frac{uV}{\sqrt{Hz}})^2 + (55\frac{nV}{\sqrt{Hz}})^2 + (500\frac{pV}{\sqrt{Hz}})^2 + (6.37\frac{nV}{\sqrt{Hz}})^2 + (6.37\frac{nV}{\sqrt{Hz}})^2 + (0.4\frac{nV}{\sqrt{Hz}})^2 + (1.27\frac{nV}{\sqrt{Hz}})^2}$$

$$V_{-\,OPA333} = 1.85\frac{uV}{\sqrt{Hz}}$$