**Procedure similar to sec. 3.6 of Melissinos & Napolitano but measure noise power using VI instead of \( e_n^2 \) using oscilloscope.**

Johnson noise measurement block diagram:

Also measure \( |H(f)| \) for system using signal generator, voltage divider, and oscilloscope (or use oscilloscope VI). See Figs. 3.25 and 3.26. The voltage divider should give a factor of \( \pm 1000:1 \) (use 10kΩ and 10kΩ, for example).

\[
\begin{align*}
R_1 &= 100\,\Omega \\
R_2 &= 1000\,\Omega \\
R_3 &= 2.2\,k\,\Omega \\
\text{all metal film 1%}
\end{align*}
\]

Use short leads, build near supply rails, pass \( \pm 5\,V \) to ground nearby with \( \pm 0.1\,\mu F \).

Some care may be necessary in connecting the carper to the BNC connector to avoid interference and ground loops.

**Spectrum analyser:** Get one-sided spectral density by summing positive and negative frequencies with 1024 samples, 100 kHz sample rate, channels 0-512 correspond to 0-50 kHz (f<sub>c</sub>). Sum channels of interest, take mean of 5 iterations (0±20) to find power within BW.