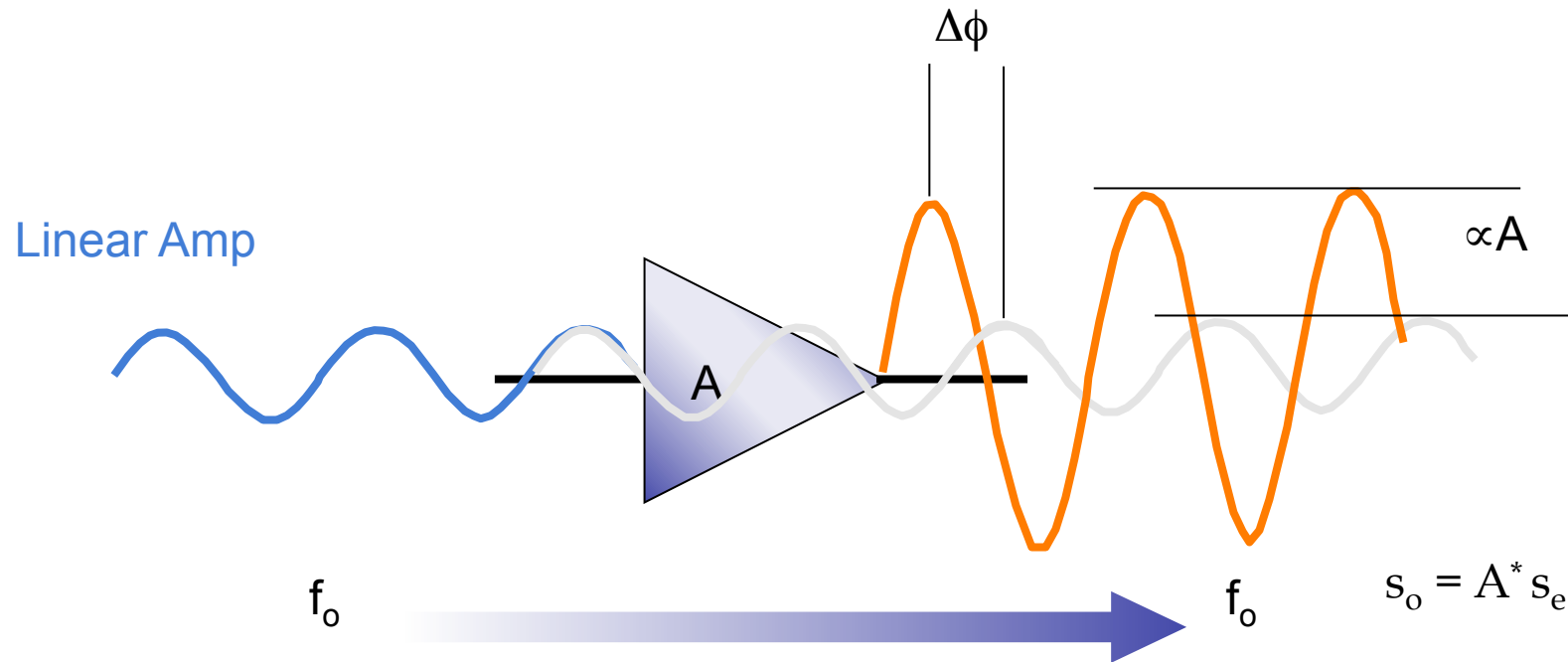


Electronic Amplifier

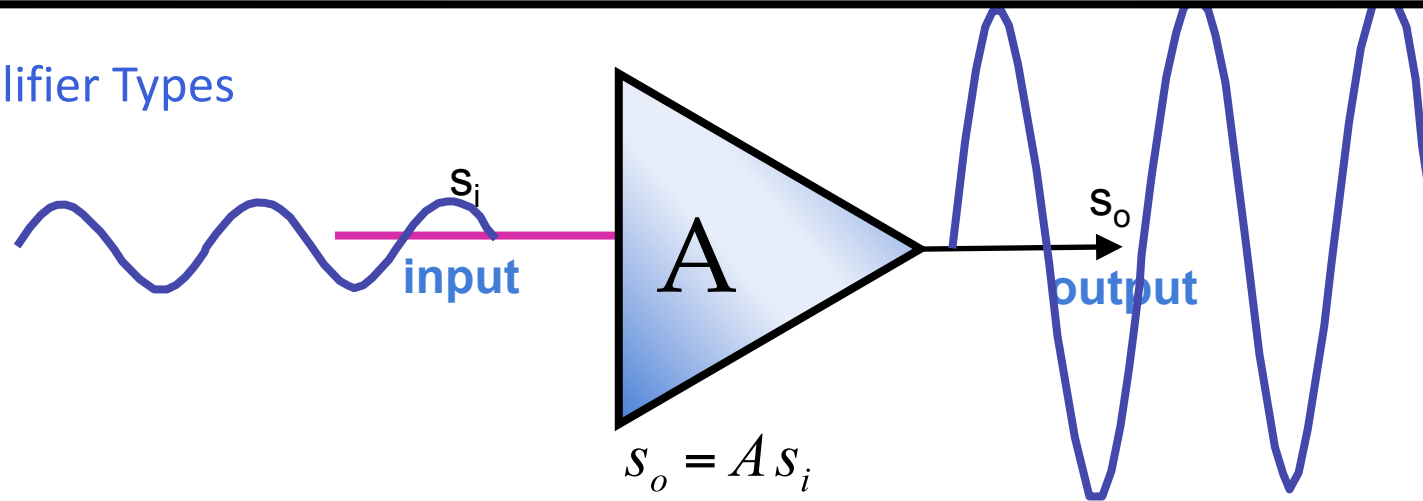
Concept of Gain Amplitude and Phase



Gain (as a complex magnitude) produces a change in amplitude and phase, not in frequency!

Electronic Amplifier

Amplifier Types

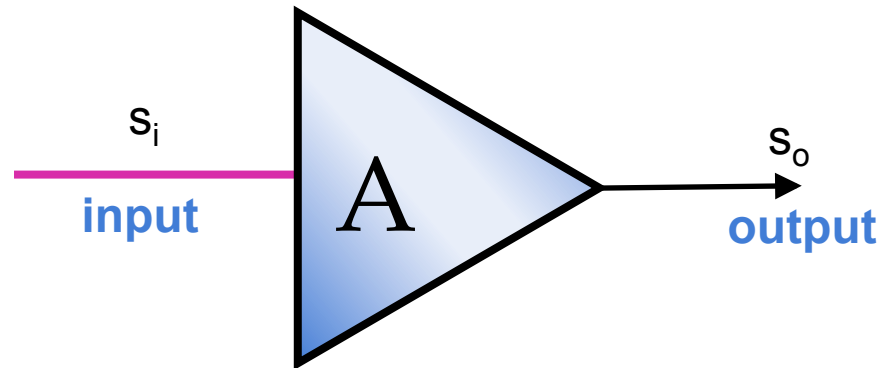


Input and Output magnitudes define the type of amplifier:

s_i	s_o	I	V
I	I	Current Amplifier $A = I_o / I_i$	TransImpedance Amplifier $A = V_o / I_i$
V	V	TransImpedance Admittance $A = I_o / V_i$	Voltage Amplifier $A = V_o / V_i$

Electronic Amplifier

Electric Equivalent



	Input Equivalent	Output Equivalent	
I	<p>A circuit diagram showing a current source labeled I_{in} in parallel with a resistor labeled R_{in}. A red arrow indicates the current entering the node.</p>	<p>A circuit diagram showing a current source (represented by a circle with an upward arrow) in parallel with a resistor labeled R_{out}.</p>	Norton Eq.
V	<p>A circuit diagram showing a voltage source labeled V_{in} in series with a resistor labeled R_{in}. The voltage source has a '+' sign at the top and a '-' sign at the bottom.</p>	<p>A circuit diagram showing a voltage source (represented by a circle with a '+' sign) in series with a resistor labeled R_{out}.</p>	Thevening Eq.

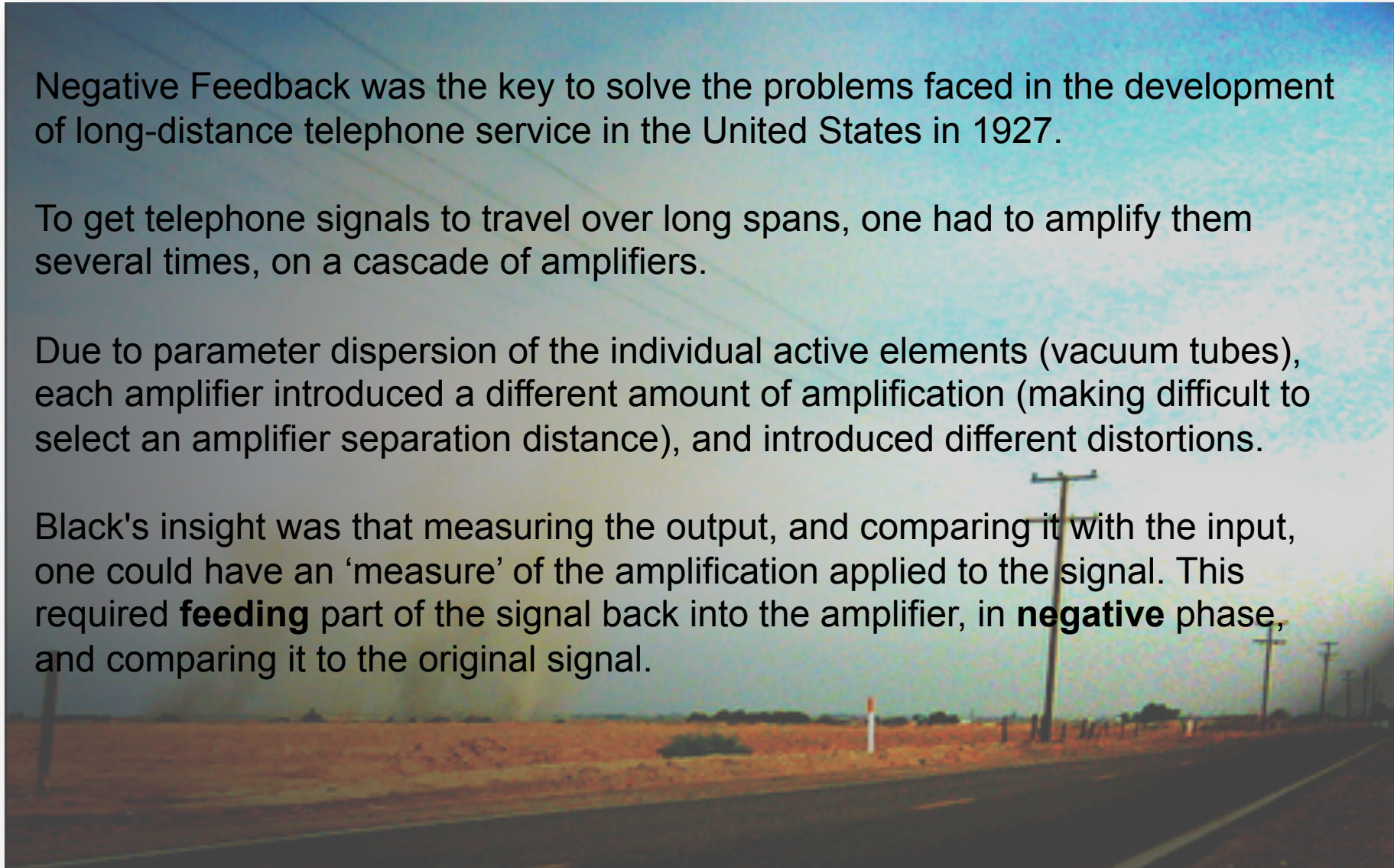
Feedback on an Electronic Amplifier

Negative Feedback was the key to solve the problems faced in the development of long-distance telephone service in the United States in 1927.

To get telephone signals to travel over long spans, one had to amplify them several times, on a cascade of amplifiers.

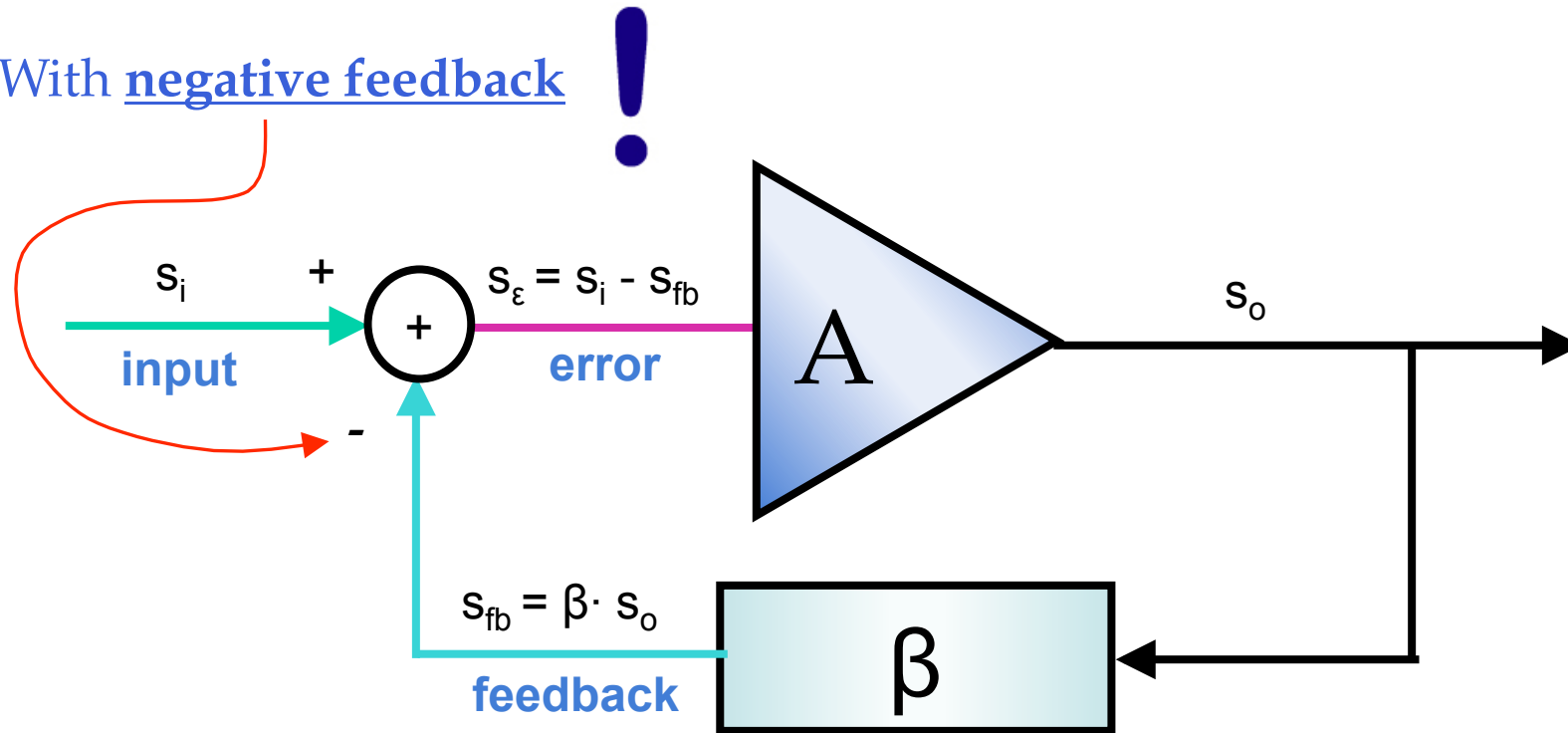
Due to parameter dispersion of the individual active elements (vacuum tubes), each amplifier introduced a different amount of amplification (making difficult to select an amplifier separation distance), and introduced different distortions.

Black's insight was that measuring the output, and comparing it with the input, one could have an 'measure' of the amplification applied to the signal. This required **feeding** part of the signal back into the amplifier, in **negative** phase, and comparing it to the original signal.



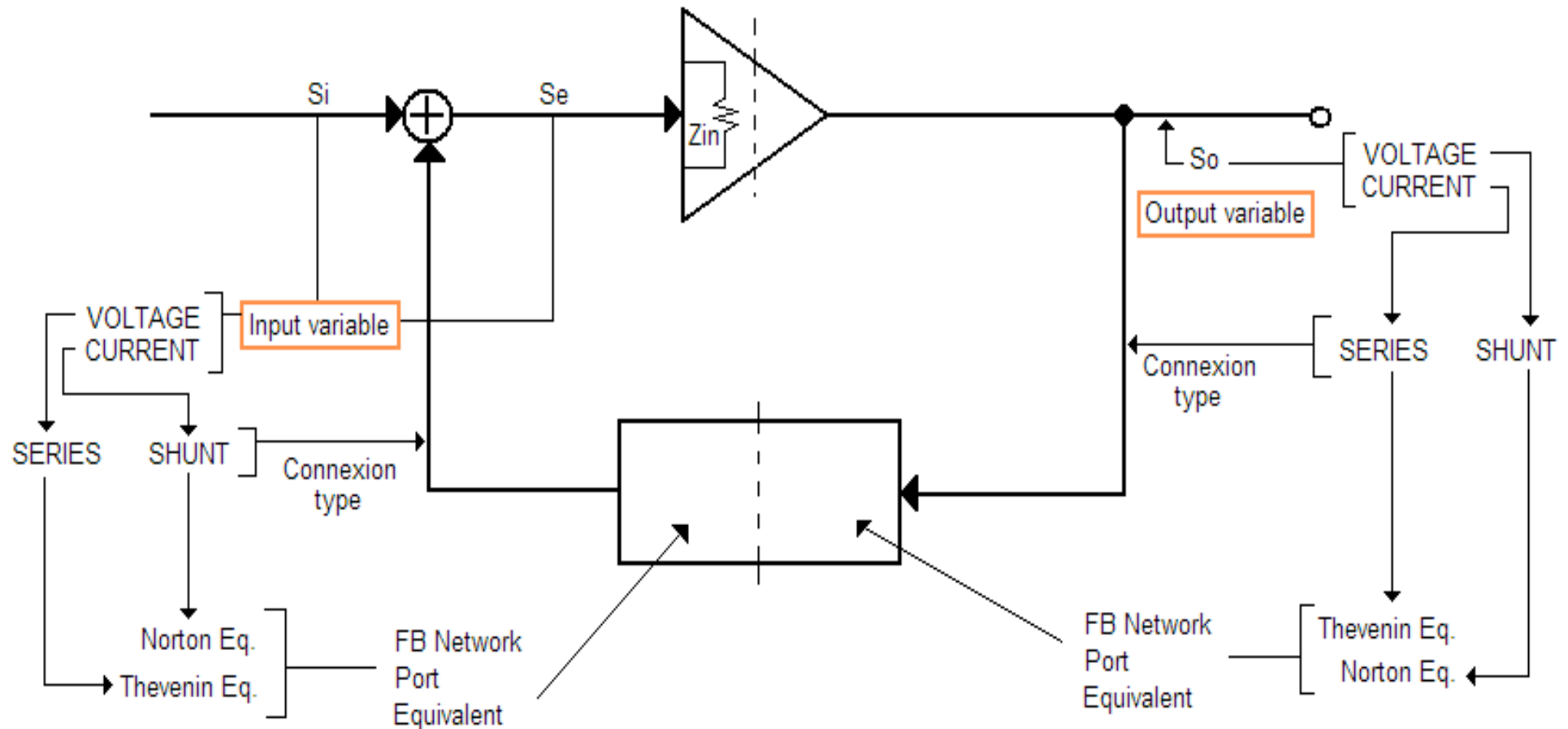
Ideal configuration of a feedback amplifier

With negative feedback !



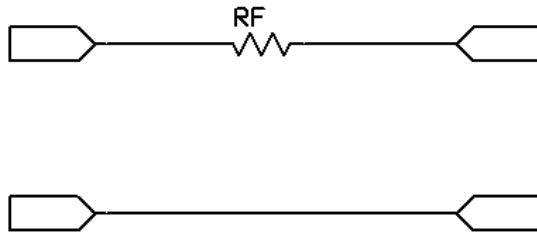
$$A = \frac{a}{1 + a f}$$

Equivalent circuit of a feedback amplifier

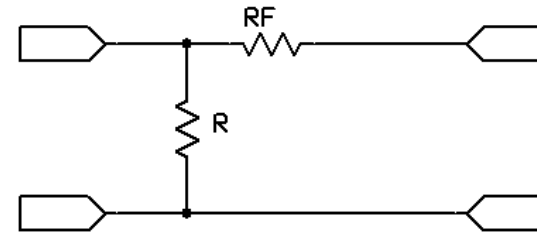


Typical Feedback Networks

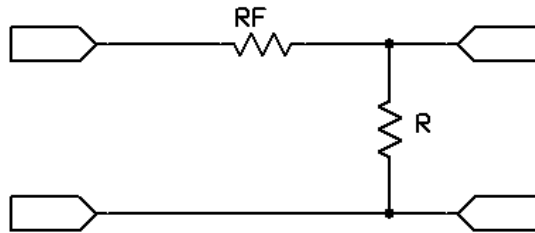
SHUNT - SHUNT



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