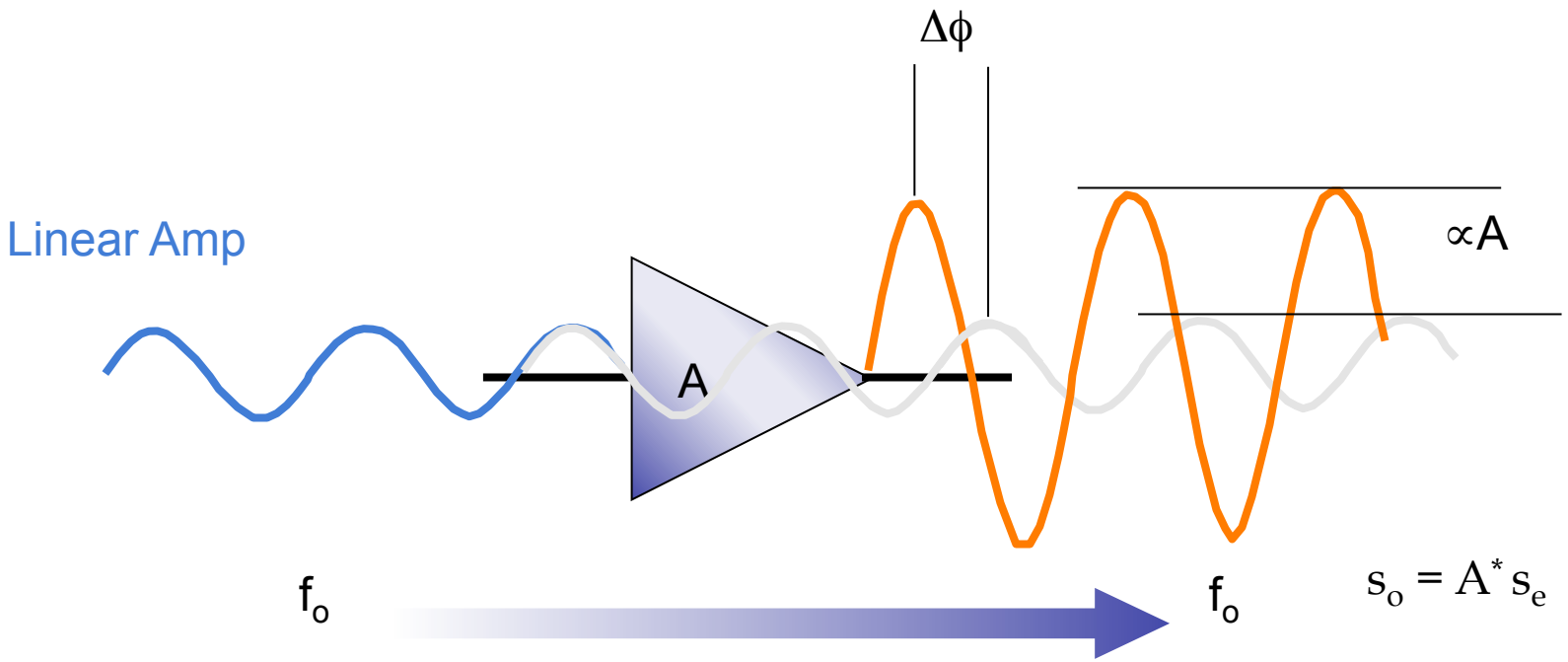
Electronic Amplifier

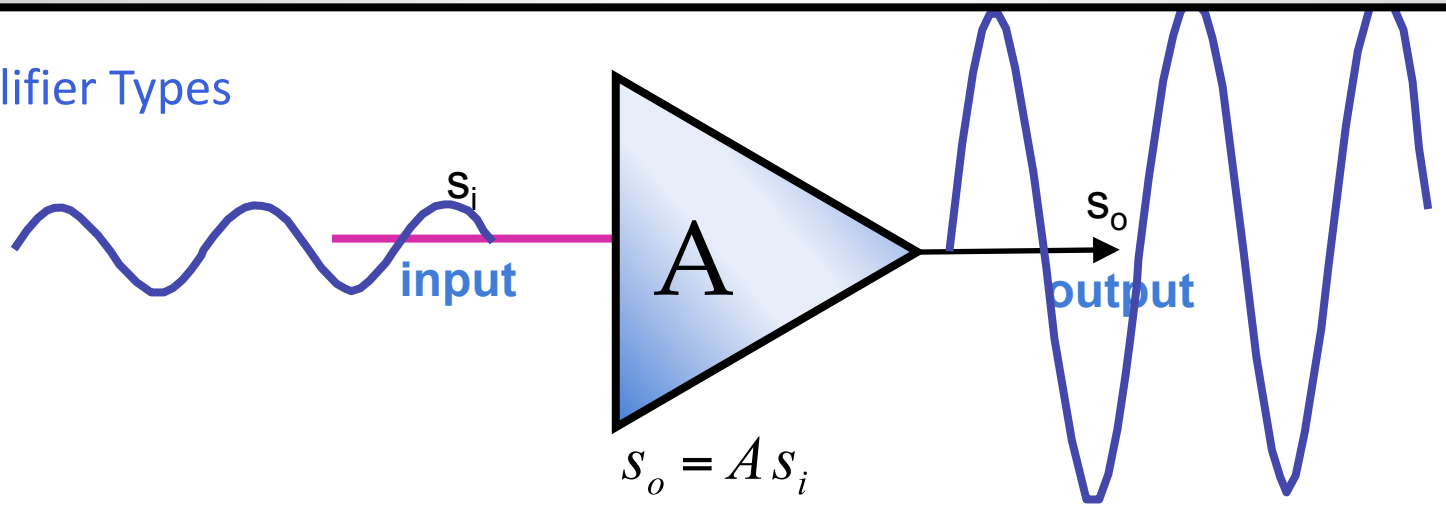
Concept of Gain Amplitude and Phase



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

Electronic Amplifier

Amplifier Types

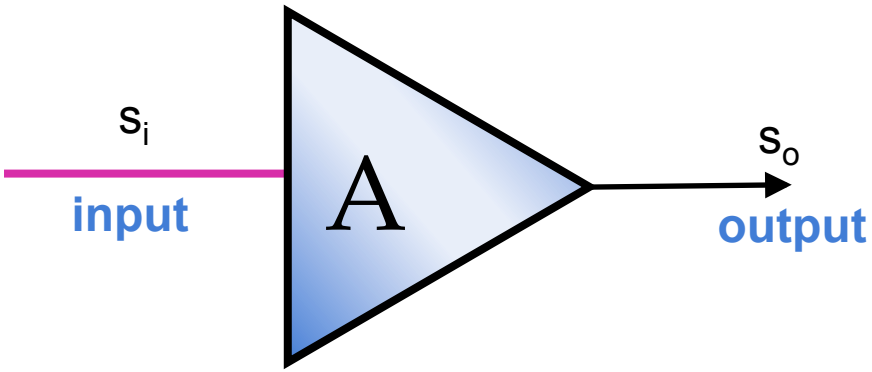


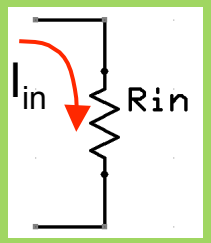
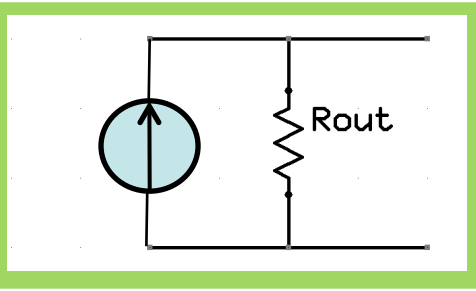
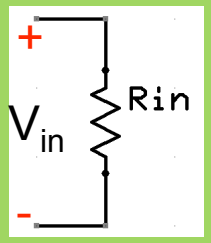
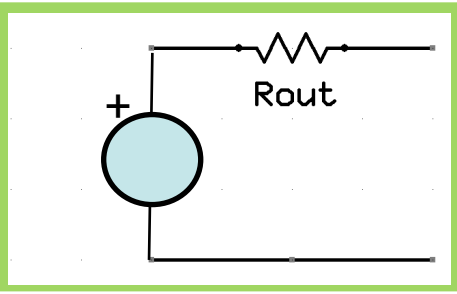
Input and Output magnitudes define the type of amplifier:

s_o / s_i	I	V
I	Current Amplifier $A = Io / Ii$	TransImpedance Amplifier $A = Vo / Ii$
V	TransImpedance Admitance $A = Io / Vi$	Voltage Amplifier $A = Vo / Vi$

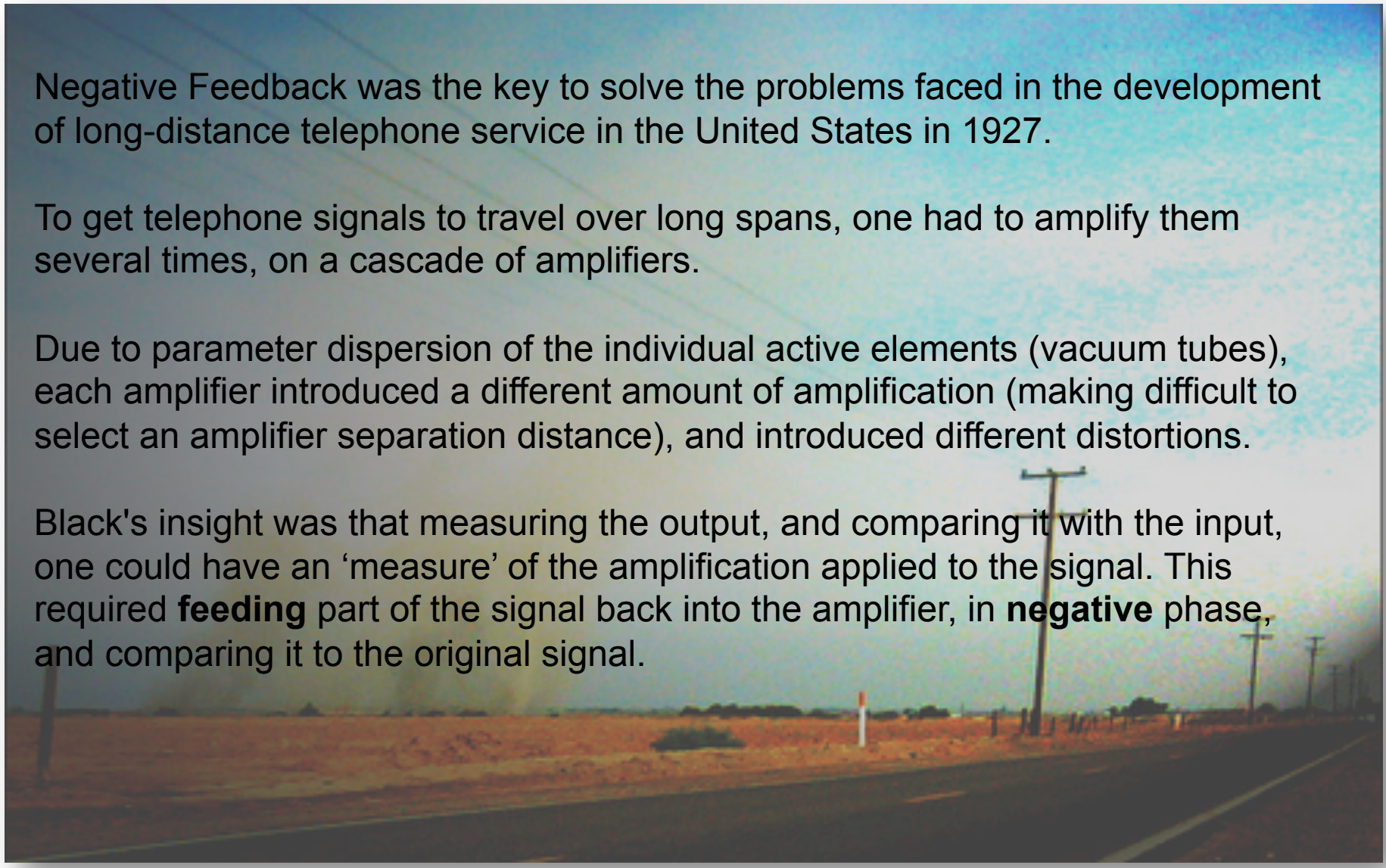
Electronic Amplifier

Electric Equivalent



	Input Equivalent	Output Equivalent	
I			Norton Eq.
V			Thevening Eq.

Feedback on an Electronic Amplifier



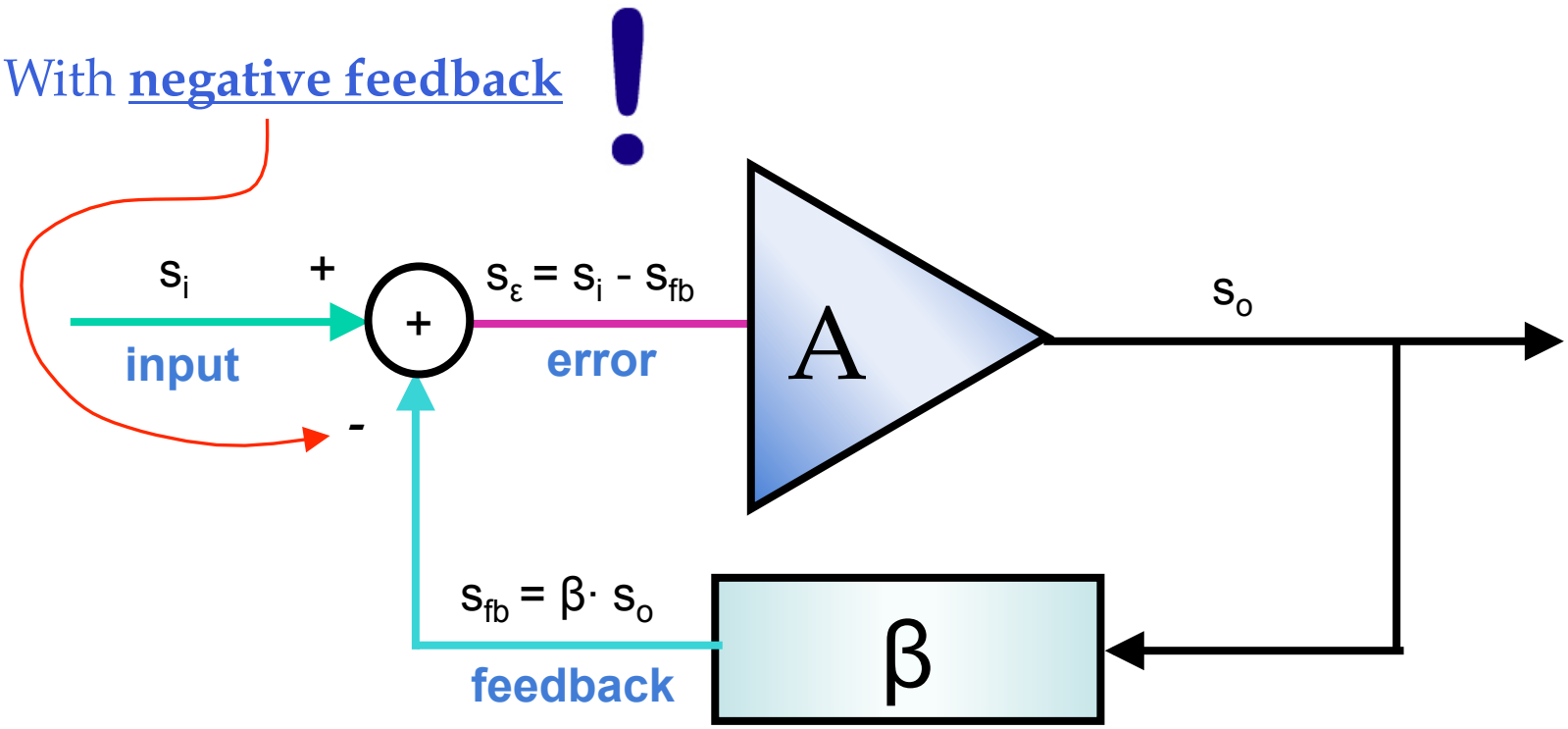
Negative Feedback was the key to solve the problems faced in the development of long-distance telephone service in the United States in 1927.

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.

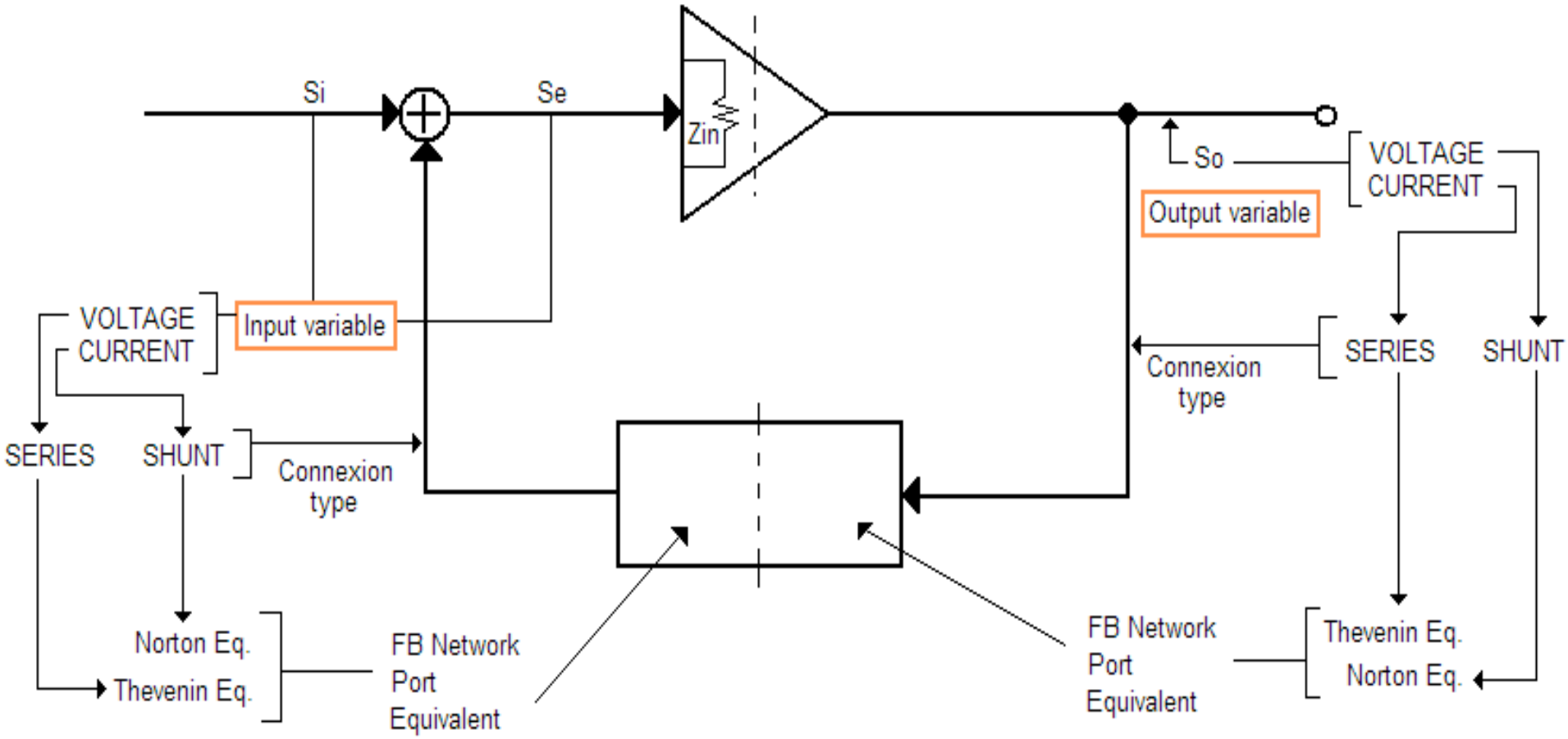
Black's insight was that measuring the output, and comparing it with the input, one could have an ‘measure’ of the amplification applied to the signal. This required **feeding** part of the signal back into the amplifier, in **negative** phase, and comparing it to the original signal.

Ideal configuration of a feedback amplifier



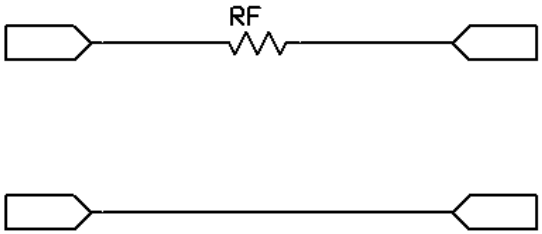
$$A = \frac{a}{1 + a\,f}$$

Equivalent circuit of a feedback amplifier

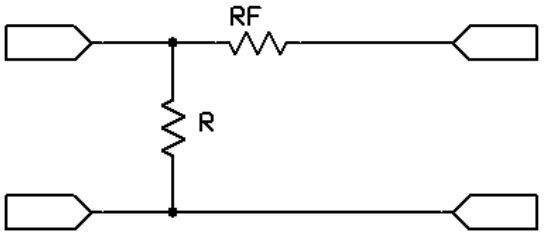


Typical Feedback Networks

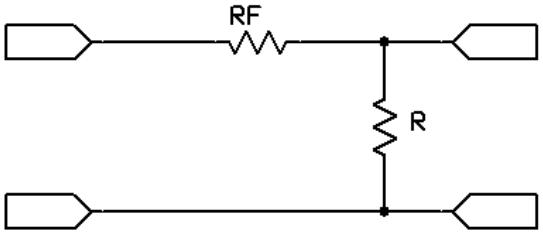
SHUNT - SHUNT



SERIES - SHUNT



SHUNT - SERIES



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