



Circlotron - Thevenin vs. Norton circuit from post #2 and #6 about
<http://www.diyaudio.com/forums/solid-state/175466-biasing-schemes-bipolar-transistor-circlotrons.html>

Basically you first have to understand how the circlotron works.

You have two options: let's call them Thevenin and Norton.

In the Thevenin case, you have an auxiliary supply referenced to the emitter of the top transistor, feeding the base through a bias resistor.

The lower transistor simply has a resistor between base and emitter.

The driver transistor is connected between the bases, and diverts a controlled fraction of the bias current from the top transistor to the bottom one.

Normally, under quiescent conditions, exactly half of the bias current is passed through the driver.

In the Norton circuit, both transistors have identical E to B resistors, and a CCS supplies twice the bias current to the top transistor, and as in the previous case, half of this current is taken by the driver to the base of the bottom transistor.

Both approaches are equivalent from a theoretical standpoint, but I find the Norton version much easier to apply practically.

Here is a practical example:

<http://www.diyaudio.com/forums/attach...-unigabuff.gif>

It is a bit unusual, because it is implemented as a unity gain buffer, but if you make Q4 NPN, it becomes the standard circuit.

The current source is Q3, and it has to compensate thermally the output transistors via D1 or D2, the other serving as a self compensation.

In addition, this circuit has a servo-controlled I_q via Q5 and Q6, but conventional emitter degeneration is also usable.

Part of the current provided by Q3 will go into R4, and the rest will be diverted by Q4 to R5.

When the circuit is properly adjusted, the voltages across R4 and R5 will be equal and just sufficient to reach the V_{be} of the output transistors.

The quiescent current will be set by the common current generator Q3, which is why it has to be thermally coupled to the output transistors.

Q4 manages the way the total current is shared between the output devices: if it conducts less, Q2 will be completely and the excess current will flow into the base of Q1 (the value $V_{be}/R4$ is constant), making it conduct more.

It also works in the opposite direction.