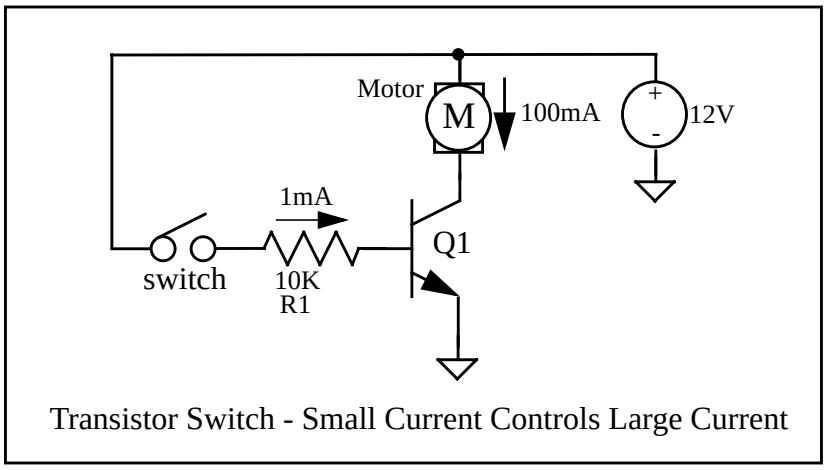

Transistor Switch - Small Current Controls Large Current

When high current motors are switched on and off, mechanical switch contacts can eventually wear out causing the switch to fail., The BJT can operate as a switch however that has no mechanism that causes it wear out. When it is saturated, the bottom terminal of the motor is essentially connected to ground. When cutoff, the bottom end of the motor is seemingly not connected to anything. Used in this manner, the switch only has to handle 1/100 of the motor current, greatly increasing its life.

The final region of operation of the BJT is the “forward active” region. It is in this region that the transistor can act as a fairly linear amplifier. In this region, we see that:

* $0.2 < Vce < Vcc$; where Vcc is the supply voltage
* $Ib > 0$ and $Ic > 0$
* $Vbe >= 0.7V$

Thus the transistor is on and the collector to emitter voltage is somewhere between the cutoff and saturated states. In this state, the transistor is able to amplify small variations in the voltage present on the base. The output is extracted at the collector. In the forward active state, the collector current is proportional to the base current by a constant multiplier called “beta”, denoted by the symbol β. Thus in the forward active region we will also observe that:

* $Ic = \beta * Ib$