Re: Effect of the supply internal resistance

Source: http://sci.tech−archive.net/Archive/sci.electronics.basics/2009−02/msg00186.html

- *From*: "Greg Neill" <gneillRE@xxxxxxxxxxxxxxx>
- *Date*: Sun, 8 Feb 2009 09:07:30 −0500

Rich wrote:

> "Greg Neill" <gneillRE@xxxxxxxxxxxxxxx> wrote in message
> news:498edc3d$0$22977$9a6e19ea@xxxxxxxxxxxxxxxxxxxxxxx
>
> > Rich wrote:
> >
> > > "Greg Neill" <gneillRE@xxxxxxxxxxxxxxx> wrote in
> > > message
> > > news:498ed579$0$22975$9a6e19ea@xxxxxxxxxxxxxxxxxxxxxxx
> > >
> > > > Rich wrote:
> > > >
> > > > +−−−−−−−−−+−−E2
> > > > = 0.1V
> > > > | |
> > > > [10R] R2 |
> > > > | |
> > > > +−−−E1
> > > > | |
> > > > [90R] R1 |
> > > > | [1R]
> > > > +−−Ebat |
> > > > |+ |
> > > > [BAT] |
> > > > | |
> > > > | |
> > > > | |
> > > > +−−−−−−−−−+
> > > >
> > > > BAT is suppossed to be a
> > > > device with zero resistance.
> > > > So, you can
> > > > erroniously conclude there
> > > > is 10V across 1R, thinking

one part of 1R

is

at
ground.

No, you can't, because BAT is a device that
is *defined* to have
a voltage potential difference across it of
10.1V . You cannot
arbitrarily choose to recognize and disregard
this on a whim when
you analyze the circuit.

The voltage stated is a
voltage *reference to
ground*. One end of 1R
is + 10V above ground or
the negative terminal that's
for sure. But in

fact

the other side of 1R is *not*
connected to ground at all
through a

zero

resistance, so there is not +
10V across R1. This shows
how careful

one must

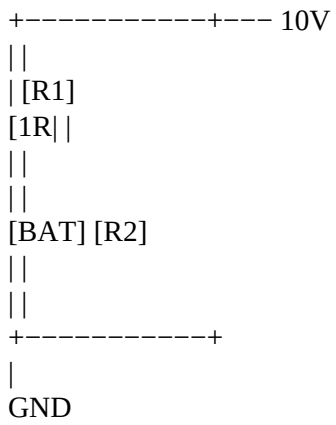
be when associating a zero
resaistance value to some
ideal component.

I must

be careful in doing that.

What's to be careful about? The circuit
plainly shows the 1R resistor
connected to the battery + terminal at one
end, and R1 at the other.

> Nowhere in sight is there a hint of a direct
> connection of the 1R
> resistor to ground (which by common
> convention is taken to be the
> negative terminal of the battery for a simple
> circuit like this).



> But, when I drew the circuit, BAT and 1R is an equivalent
> circuit for a
> battery. Consisting of a perfect battery (BAT) and an internal

resistance

> (1R).
>
> Face value you want to say, hey if BAT is a perfect battery
> with zero
> resistance, there's 10V across 1R.

> No, because then the 1R would be in parallel with BAT, not in
> series as is drawn. You don't get to arbitrarily assign the
> stated potential of the voltage source to another passive
> component (the internal resistance).

Really, the issue has been what to make of that fact that in the circuit

as

drawn, R1 is at a potential of + 10v and it's other side is "seemingly*
connected through BAT to GND.

That can cause you to wonder how to explain why there is not really a 10V

potential across R1. Not that one is unable to calculate the actual

voltage

across R1, which I can.

There is no ambuiguity. One *end* of the 1R resistor is fixed at
a potential of Vbat with respect to ground (taking the battery
negative as ground). This says nothing about the other end of
the 1R resistor until you look at the rest of the circuit and
hence the current flowing through the 1R resistor.

If the circuit happens to be open (no path to ground via the other
end of the 1R resistor), then *both* ends of the 1R will be fixed
at Vbat above ground; there will still not be a potential of Vbat
across the 1R.

> Of course that is not true. It's just one
> of these issues you get when dealing with perfect
> components in series

with

> resistance.

> Sorry, but it's not a common problem. You seem to have your own
> unique set of confusions that lead to such inferences.

> Not really, just trying to see where the error would be in thinking there
> was 10V across R1. That I don't think would be an uncommon thing to do.

The error is in assigning the properties of a voltage source
(battery) to a resistor. This is not a 'legal' operation.
An ideal resistor is a passive component that contains no
sources.

A resistor presents across its terminals a voltage that
depends upon the amount of current flowing through it:

v(I) = I*R.

Without a current there is no voltage across the resistor.

An ideal voltage source presents the same voltage across
its terminals irrespective of the current flowing through it:

v(I) = V

> 10v is just a statement that that point is 10V above a refrence point. And there really is not a zero resistance across BAT. It's mixing
> a
> fiction with reality. The equivalent circuit of a batttery is a fiction.

> For all intents and purposes the BAT component has no resistance associated with it. The resistance of the "real" battery is lumped into the 1R resistor. Any circuit analysis that is performed on this circuit *must* consider the potential difference across the battery.
>
> Note also that when you eventually come to analyse AC circuits that also have DC sources in them, the DC sources *can* look like short circuits (zero resistance) to the AC signal components. The +Vcc voltage supply in an audio amplifier circuit, for example, will "look" like a ground every bit as much as the actual DC ground does to the audio signal.

Yes, I've noticed that in my ham radio experience.

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