Re: Could someone please explain how this works?

Source: http://sci.tech−archive.net/Archive/sci.electronics.basics/2007−06/msg00907.html

- *From*: John Fields <jfields@xxxxxxxxxxxxxxxxxxxxx>
- *Date*: Mon, 25 Jun 2007 16:15:29 −0500

On Sun, 24 Jun 2007 13:54:17 −0700, Eric R Snow <etpm@xxxxxxxxxxx>
wrote:

> Greetings All,
> This link:
> http://www.vellemanusa.com/downloads/0/manual_mk138.pdf
> is the schematic for a thermostat kit I built. Even though it works I
> don't understand how it works. The high temperature limit is too low
> for what I want to use it for. But I think that using less resistance
> for R5 will raise the upper temperature limit. Am I right?

−−−
Yes.
−−−

> And if I am, why?
> Thank You,
> Eric

−−−
Why...?

IC1 is an LM324, which is four low power operational amplifiers, one of which (IC1C) is being used as a non−inverting buffer for the 5.1V reference being generated by ZD1 and R1, and another (IC1D) as a voltage comparator. IC1B and IC1C aren't being used and are wired to force all inputs and outputs to zero volts.

SK1 is used to connect the DC supply to the circuit, and D2 is used to provide protection in case the supply is connected backwards, in which case D2 will be reverse biased, cutting off the supply of current to the circuit and preventing IC1 from being destroyed.

C4 is used as a reservoir capacitor and serves to help remove ripple

from the input DC.

The LM324 draws about 2mA, worst case, per opamp, for a total of 8mA.

The relay has a 360 ohm coil so, subtracting the drop across D2 and VCE(sat) of T1 from the 12V supply it draws about:

E 12V − (0.7V + 0.1V)
I = −−− = −−−−−−−−−−−−−−−−−−− ~ 31mA
R 360R

D1 draws:

(+V) − Vzk 11.3V − 5.1V
I = −−−−−−−−−−−− = −−−−−−−−−−−− ~ 6mA
R1 1000R

Finally, IC1D supplies about:

(+V) − 2V 11.3V − 2V
I = −−−−−−−−−−− = −−−−−−−−−−−− ~ 1mA
R3 10kR

The total current needed, then, would be about 46mA with the relay closed and the ripple across C4 would be:

I dt 4.6E−2A * 8.3E−3s
V = −−−−−− = −−−−−−−−−−−−−−−−−− ~ 3.82 volts
C 1.0E−4F

That's assuming a 12V peak, 60Hz full−wave rectified sine wave into D2, so a previously filtered 12VDC supply would make the rippl