This article is taken from the Winnebago Rialta Owners web site with the permission of the site owner. It has been modified to remove motorhome-oriented terminology, and insert TrailManor-oriented terminology. The original article is located at http://www.rialtainfo.com/model_info/modifications/refrigerator.htm

Modifying the Norcold Thermostat for Operation on 12 VDC

Most owners of Norcold N300.3 refrigerators don't realize that when their refrigerator is switched to 12 VDC (battery) operation, there is no thermostatic control. In fact, the unit runs "full cold" and if you are not careful, it will ultimately freeze most of the contents if you drive all day. To deal with this, the owner can make a reversible wiring change to add thermostat control. Just follow these instructions.

The Norcold refrigerator has a number of annoying features. One of them is the fact that the 12 VDC operation is open-loop. That is, it runs continuously with no thermostatic control. Mine would get well below freezing after driving all day on the 12V setting. Also, having the refrigerator running constantly makes it harder for the alternator to charge the trailer battery while driving. This modification helps both of those problems.

Caution - You should attempt this modification only if you're reasonably comfortable with electrical things. You'll notice I don't provide really detailed descriptions of what color wires are where, and what the various parts look like. If you aren't confident that you can figure this out from the schematic, you probably shouldn't try this. In any case, it will void the Norcold warranty, so I wouldn't do it to a new unit. As usual, I take no responsibility for your actions.

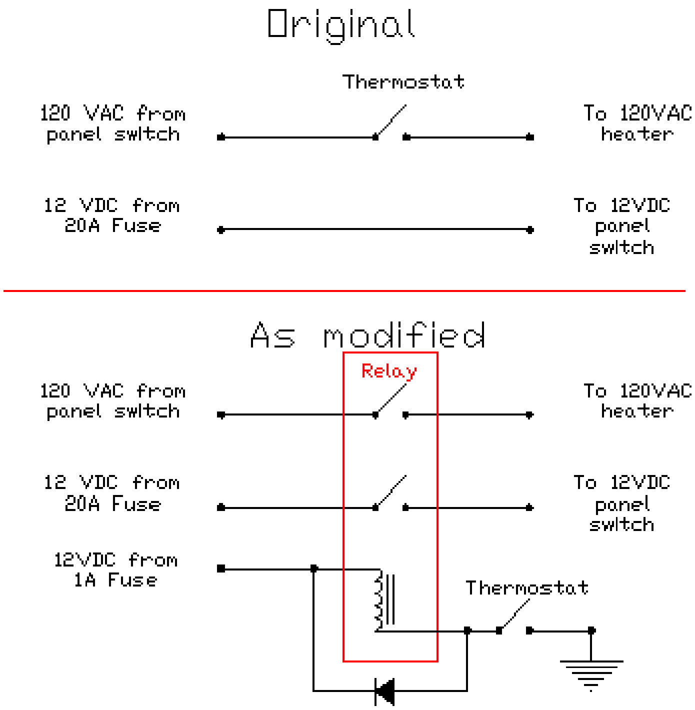
As shipped, the thermostat has a single set of electrical contacts which close when the temperature is too warm, and open when the desired temperature is reached. These contacts are used to switch the 120VAC heater. My modification was the addition of a DPST relay. I use the thermostat contacts to switch the relay, and then I use one side of the relay to switch the 120VAC heater, as before. I use the other side of the relay to switch the 12VDC heater.

The first step was to find a suitably rated double-pole relay. It needs to be able to switch 120VAC at 3 amps, and 12VDC at 20 amps (these are the fuse ratings, not necessarily the actual current draw). It also needs to have a 12V coil. Digi-key sells an appropriate relay, part no. PB298-ND, for $10.49 in their 2010 catalog. This relay is easy to mount, and uses standard .25" quick-connect terminals, just like the rest of the electrical items on the fridge, so the wiring job is easy.

I went down to the hardware store, and got a couple of feet of 10-AWG marine grade wire (overkill, but better that than underrated wire), a box of 25 fully insulated female quick-connect connectors (I used about half of them), and a box of 5 double male-to-female adapters (also Digi-Key, p/n A27890-ND, $3.10 for 10). These double male to female adapters are handy: they slip over an existing male terminal, and effectively turn it into two male terminals. Using this type of wiring and connectors, I was able to make the wiring job completely reversible. In other words, if I ever decide to undo my modification, I can. I didn't cut any existing wiring or insulation, and I didn't use a soldering iron anywhere in the process.

The final part I used was a silicon diode, Radio Shack cat no 276-1101A (or Digi-Key, p/n 1N4001GOS-ND, 34 cents each or 10 for $2.35), type 1N4001. The precise type isn't critical, it just needs to be rated to handle the coil current (0.2A is enough). The reason for the diode is to eliminate "inductive kick" when switching the relay off. Since the relay coil is an inductor, once it starts conducting current, it will go to great effort to continue conducting. Without the diode, when the thermostat contacts opened, the relay coil would generate a high voltage and arc across the contacts. Instead, we let the diode provide a safe path for the coil to send its current when the thermostat switches off, saving the thermostat contacts and prolonging their life. Note the polarity of the diode: it should NOT conduct electricity when the relay is turned on.

Here's a partial schematic, showing only the parts of the refrigerator's circuitry that I changed.



I mounted the relay to the top of the refrigerator using two screws. I put it to the left of the terminal block where the AC and DC power come in. I typed up a schematic and instructions on how to restore the refrigerator to its original configuration, and taped this near the relay. This might minimize the amount of grief I cause future technicians.

After this modification is done, there's still one nagging problem. The relay coil is energized anytime the refrigerator is warmer than its set temperature, *even if the refrigerator is switched off!* Also, the relay goes on and off when the refrigerator is on propane, even though the relay isn't useful during propane operation. Ideally, I would like the relay to draw power only when the fridge is running on 120VAC or 12VDC, but there's no source of power in the refrigerator circuitry that is energized under these conditions only.

The relay coil draws about 130 milliamps of current when it's energized. This load, by itself, is enough to drain a fully charged, perfectly conditioned coach battery in 42 days. It's similar to the load the propane detector places on the battery. I considered putting a cutoff switch on the relay, and/or putting an LED in the refrigerator panel to indicate when the relay is energized, but I decided against these, because they would permanently modify the refrigerator in a way that couldn't easily be restored. I decided I could live with the situation as-is. I'll just train myself to turn the thermostat to its "Start" position (fully counterclockwise) every time I turn the refrigerator off. When the thermostat is fully counterclockwise, the relay never energizes and doesn't draw any current.