One disappointment with the Gree (aka atmos...) rooftop air conditioner is that the inside fan is always running in cooling mode. In some conditions, this results in lots of damp air blowing around.

After reading about folks using a relay, I decided to put one in to let me sleep in peace if cooling is not called for.

The Gree has two fans, a three speed fan which circulates inside air, and a single speed outside fan.

In heat pump mode, the fan does not run all the time.

The outside fan starts before the compressor, and operates after it is powered off.

After some thought, it seems that a normally open relay put in series with the low speed fan winding wire, which is controlled by the outside fan wiring would do what I want. If constant fan is wanted, increasing the fan speed will let it run as needed. Keeping the fan mode in auto will provide the peace and quiet between cooling cycles.

Before selecting a relay it seems prudent to understand the currents involved.

One fine August day in a NY state campground, with shore power providing 122 Volts Alternating Current, I made a few measurements.

Using a clip-on AC amp meter with an inrush function hooked to the circuit breaker output wire, I recorded the following readings correlated to rooftop air conditioner operation. (Inrush current is seen for a fraction of a second when the motor is energized. Since wire current ratings are derived from the thermal performance of the insulation and installation details, the higher inrush current is not the primary driver for wire size, Compressor inrush does call for use of breakers rated for HACR.)

Inside fan only 0.3 to 0.4Amps Inrush of 2.2A
Outside fan only 0.9 to 1.5A Inrush 3.9 Amps

The compressor (with both fans running) used around 8 amps with an inrush of almost 49 Amps.

The steady operating current goes up a bit after a while as the refrigerant and system warms up.

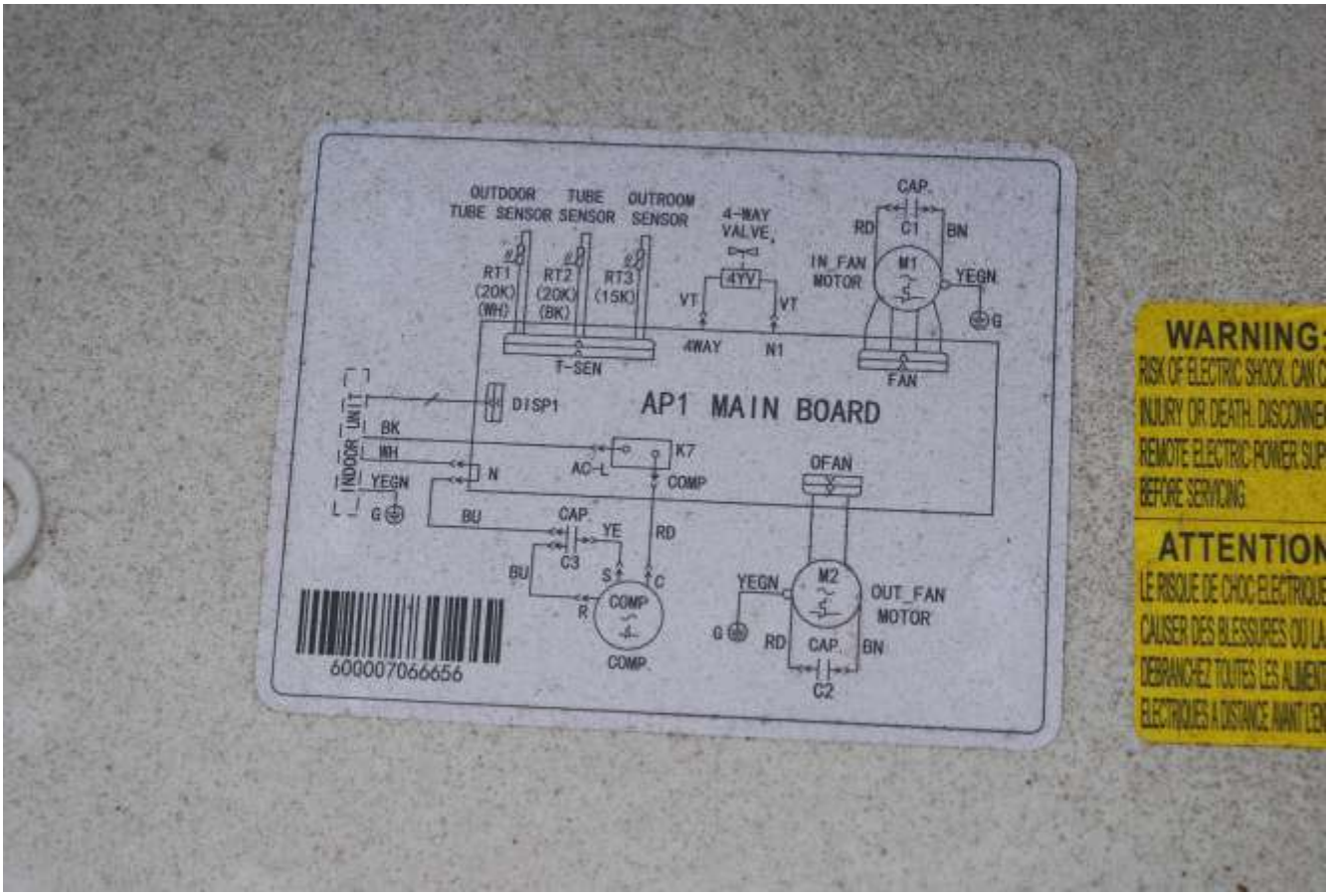
I ordered a small relay with a 120 volt coil rated for 20 amps. (googled up miniature 120 volt relay)

https://www.amazon.com/dp/B07DWCP74H

The relay coil uses about 20 miliAmps, according to my measurement on the bench. Not a lot more to ask of the outside fan circuit.

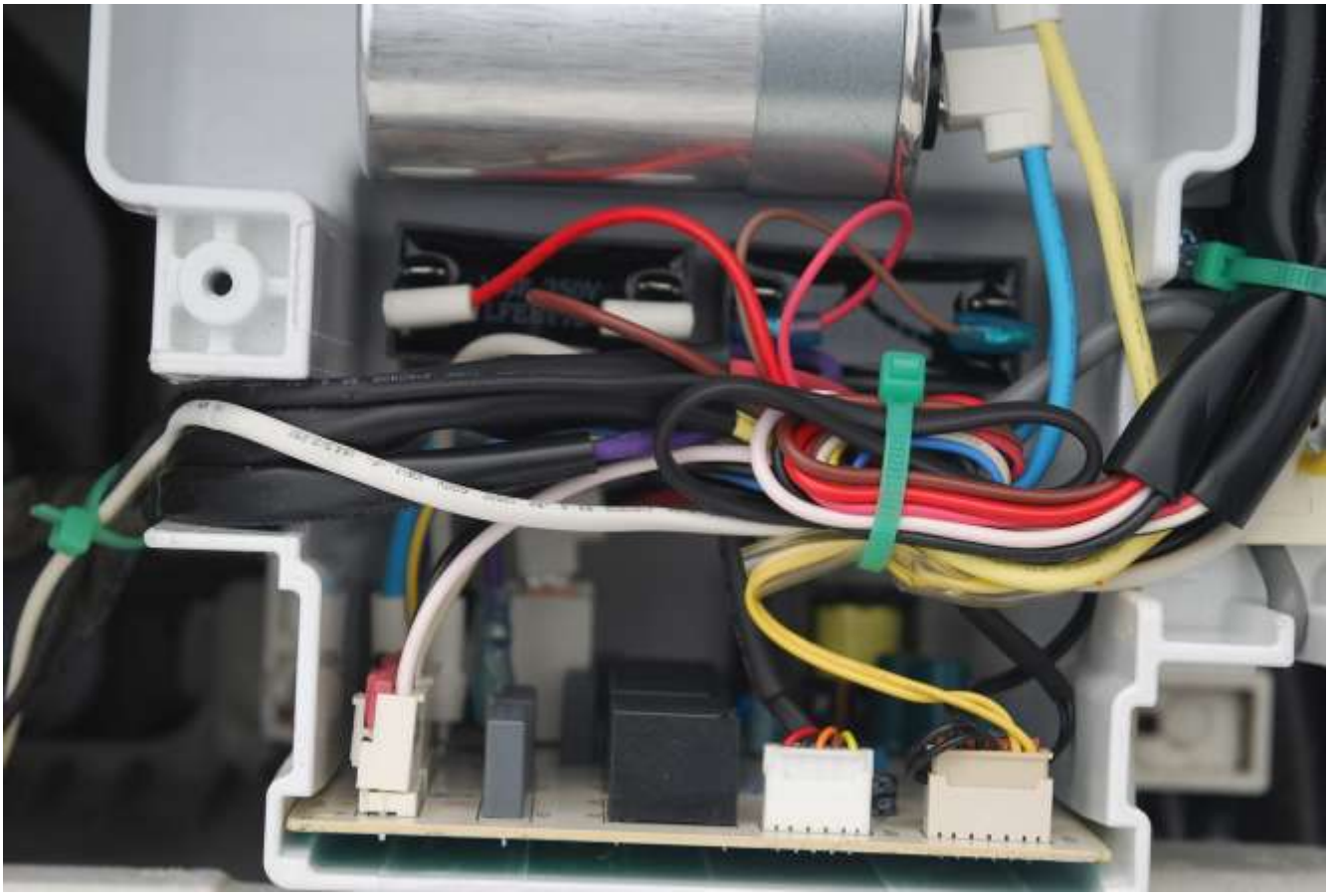
With a plan, I got on the roof and opened the cover after removing 8 Philips screws.

With the cover removed, you can see the outside fan at the top (rear of unit), compressor in the middle, and the white foam cover for the inside fan at the bottom. The small plastic box to the right of the compressor contains the main board and capacitors used to help the compressor and fans operate.



The wiring diagram is fixed to the top of its box.

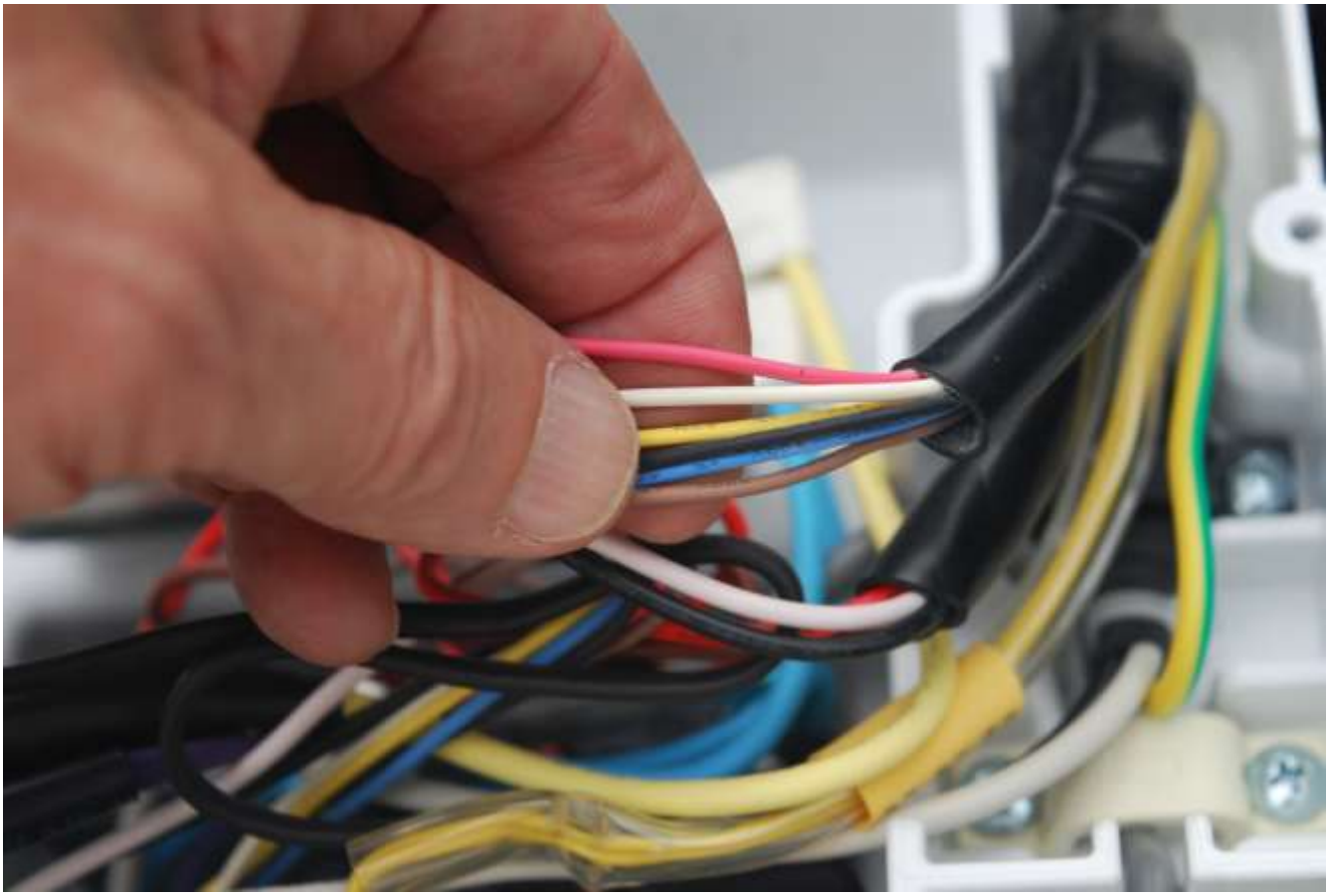
The outside fan label shows wire colors. The motor winding wires are White and Black.



With the cover removed, the main board and capacitors are visible. Looks like room for the relay to the upper left next to the compressor capacitor. The wiring for the motors seems to have a nice service loop which means enough wire length to add a few connectors.

On the left are the connectors from the main board to the outside fan and inside fan. From left to right, the outside fan white and black wires (AWG 18), and then the inside fan white, black, yellow, and blue wires (AWG 20).

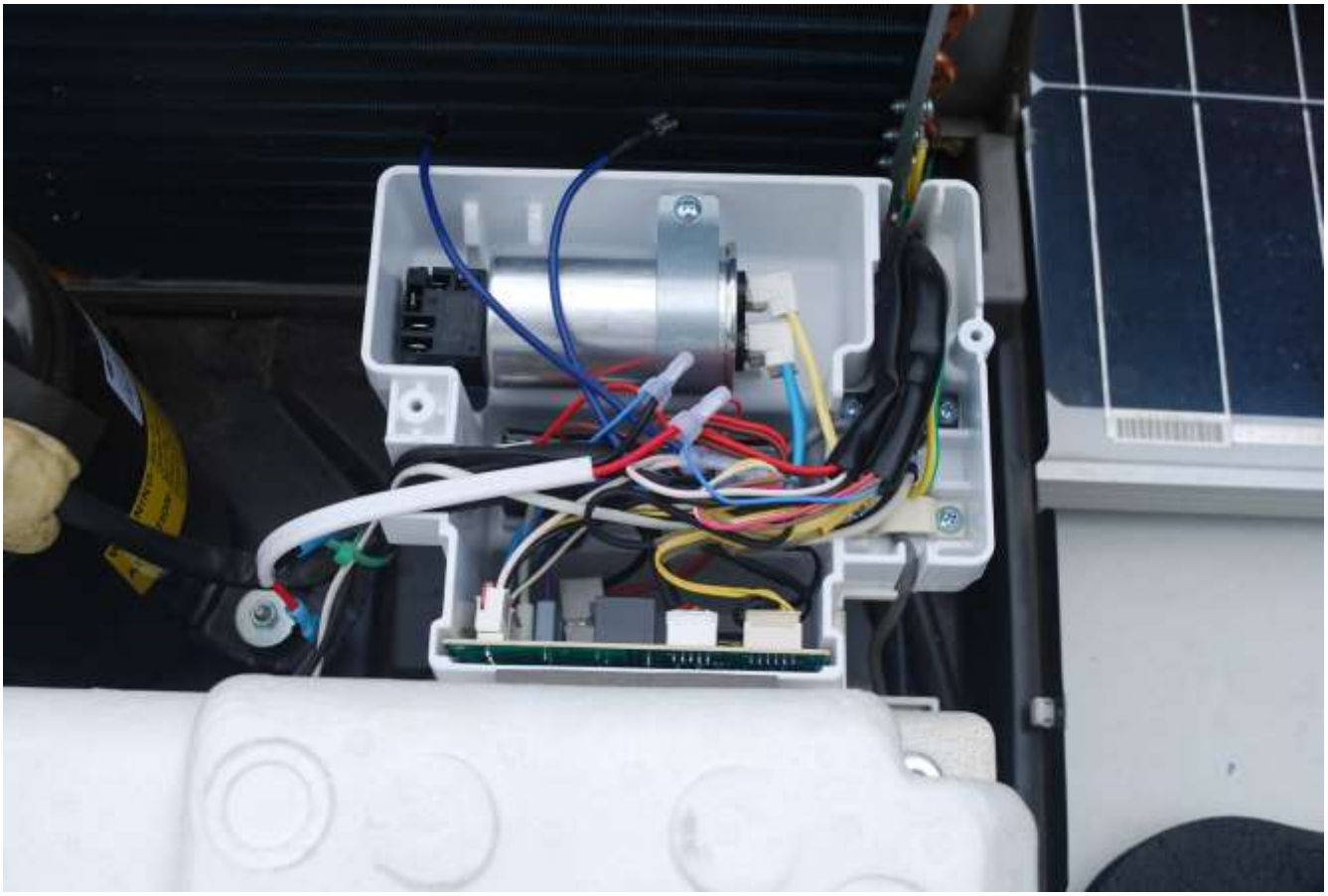
For this modification, the outside fan white and black wires will be cut and spliced to feed the relay coil. The inside fan blue wire is the low speed lead. It will be cut and extended to the relay normally open contact.



After cutting a couple tie-wraps, the wires to the fan motors are easily identified. Wires to the capacitors are in addition to the wires from the main board connectors.

I used blue awg 16 wire for the relay coil. The dark blue wires are crimped together with the cut ends of the black and white wires that feed the outside fan. At the relay end of the wires I added some heat shrink tubing over the connector to wire joint (after verifying the crimp by giving the wire a tug)

Crimp connectors shown here are for the relay contacts, I used black and white awg 16 (with a white sleeve) to extend the smaller light blue wire.

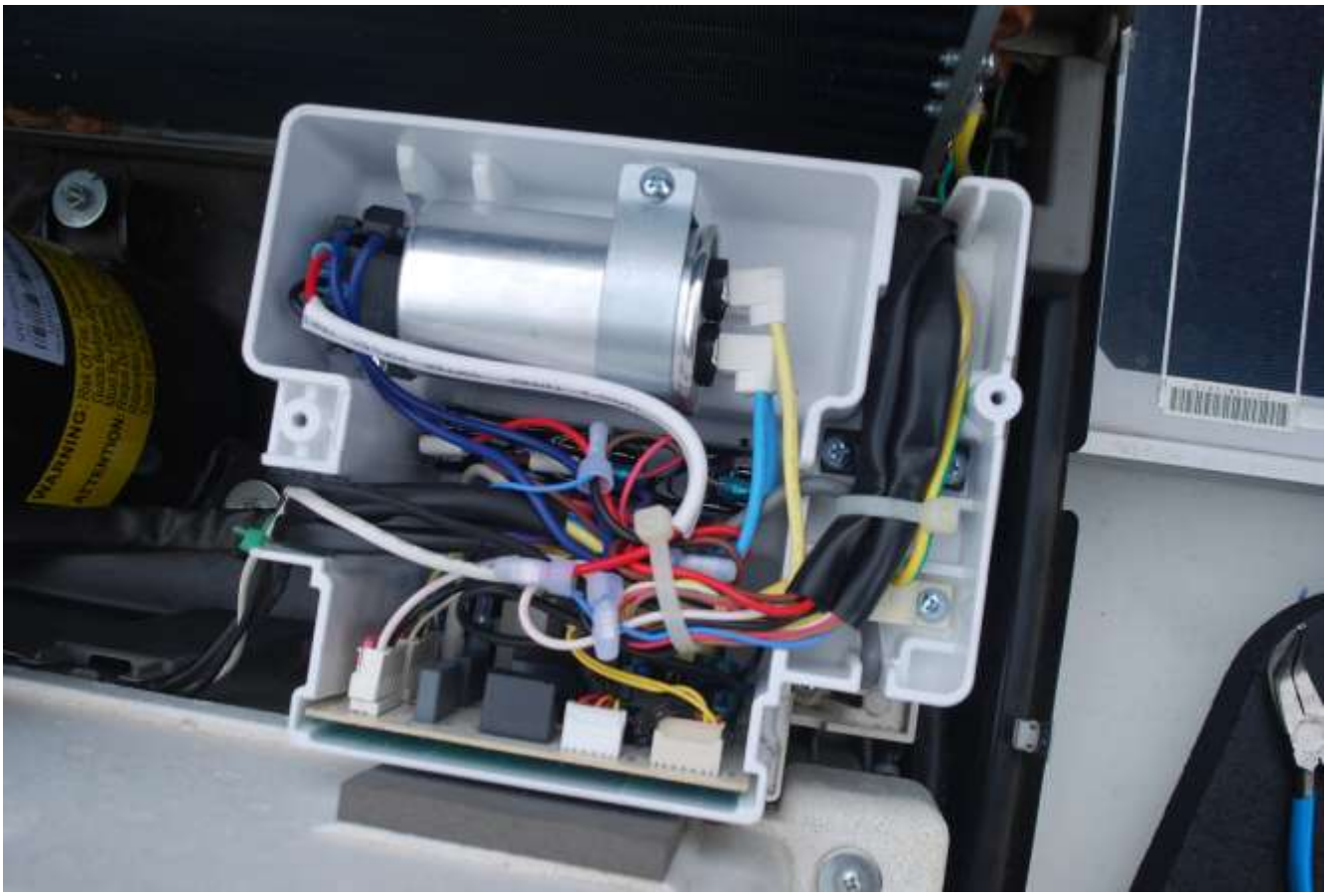


Relay sits with room to spare next to the compressor capacitor.

The individual blue wires for the relay coil are seen, as are the red and black wires in the white jacket used for the NO (normally open) relay contact.

Crimp connectors that extend the small blue low speed fan wire using the red and black jacketed awg 16 wire are at the top.

One of the splices for the relay coil feed is also visible. The cut ends of the original white wire are joined with an added dark blue awg 16 wire into a crimp connector. All crimps are verified by a tug on the wires one at a time to verify they are firmly attached.



I bedded the relay in some silicone sealant as well as one screw to hold in place. VHB tape would likely work as well. The white material the box is made of is not great at holding screw threads. New tie-wraps replace those cut to allow access to the wires. It all fits nicely under the original box cover.

I considered using WAGO connectors for this project, and they would likely work fine. I chose the crimp type because they are smaller and lighter.

Matching wire colors and diameter to those originally used would clarify this for future service work, but I went with what I had.

After the mod, it seems to work fine.

With the rooftop unit in low speed or automatic fan mode, and air conditioning mode, the inside fan turns off when the sensed temperature is less than the set point, I think this is a great improvement.

Setting the fan to a speed higher than the lowest restores original operation.