DuoTherm Air Conditioner Relay Box and Thermostat Info

My aging roof air conditioners have had a couple of problems in the past two years. The rear unit had the relay that controls the compressor short out, causing the compressor to run constantly, regardless of thermostat setting, including “OFF”. Obviously, this was inconvenient because to only way to use the AC was to set the thermostat to “COOL” and 60°F to ensure the fan kept running, then flip the circuit breaker on at the main panel. Once things got cold enough to hang meat, you had to get up and turn the circuit breaker back off. The Dometic AIR CONDITIONER & HEAT PUMP SERVICE MANUAL that Jim Exler posted in the file section included little information on the relay control box, other than saying that the components in the box were not customer serviceable.

In the spring this year, my front unit quit cooling. Inspection revealed refrigerant oil residue on the high pressure tubing coming out of the compressor. I decided that a replacement unit would be a better investment than repairing the old, 19 year old unit.

I ended up selecting a 13,500 btu DuoTherm Brisk Air II, primarily because it was $250 less than a low profile unit matching my old unit. I will tell you right now, I also purchased a $75 LCD thermostat and relay box, and a $75 Ducted air return, both on the advice of the retailer who told me that my old hardware would not work with the new unit. This is not true! The connector and pin out on the old relay box is identical to the new box. I don’t begrudge that purchase, because it solved my rear air problem by freeing up the front relay box for reuse in back, and the LCD capacitive touch thermostat is a nice upgrade. As for the Ducted air return, my old return would have worked fine, and yours will too.

When the hardware arrived, I was surprised and somewhat miffed that no documentation came packaged with the hardware, other than one sheet of paper in the box with the air conditioner, stating that it had a 2 year warranty. The thermostat had a sheet of operating instructions. (If you can’t operate a thermostat, you should probably be living in a group home). The Ducted air return had a mystery piece of sheet aluminum which was anything but obvious as to where it should go, and no instruction sheet. After going down several rabbit holes, I did manage to download installation and operating instructions from Dometic’s less than stellar website. I have uploaded a copy to the files area of this group, The only useful information in the manual was located on page 9 of 15: “Tighten all four (4) mounting bolts **EVENLY**
with in 40 to 50 inch pounds. See (FIG. 15).”

So, let’s talk about the new relay box and thermostat. The only readily obvious installation information was (were?) the tags on all but one of the wires of the low voltage wiring harness. Prying off the cover of the thermostat (blind faith again, no indication of how to get the thermostat open.) I’ll just tell you, it has snap tabs at the top and bottom of the cover. Hold the cover top and bottom with one hand while pressing down on the top of the base with two fingers of the same hand and pulling outward on the bottom end of the base with your other hand. If you only have one arm, get help.

Once inside you will find a terminal block with three termination points: +12v, -12v, and an unlabeled terminal between the two. Let's hope it is the communication wire to the thermostat. Finally after wasting a good bit of time trying to track down a schematic for the new relay box, I gave up and took the cover off the box. Hmmm, THAT'S where they put it. Unlike the old relay box, the schematic is on the inside of the cover instead of the outside. I guess one could argue that I am the one who belongs in the group home. Examining the schematic confirmed that the untagged orange wire on the harness goes to the thermostat.

At any rate, the installation is fairly straight forward. First and foremost, begin by turning off the circuit breaker AND locating (and removing) the fuse in your house fuse panel that protects the 12v D.C. going to your air conditioners. I'd recommending checking at the relay box with a meter to verify that you located the correct fuse. Granted, you can be a cowboy and do the change out without pulling the fuse, but if you blow it, it's nice to know where the fuse is located beforehand so you can replace it.

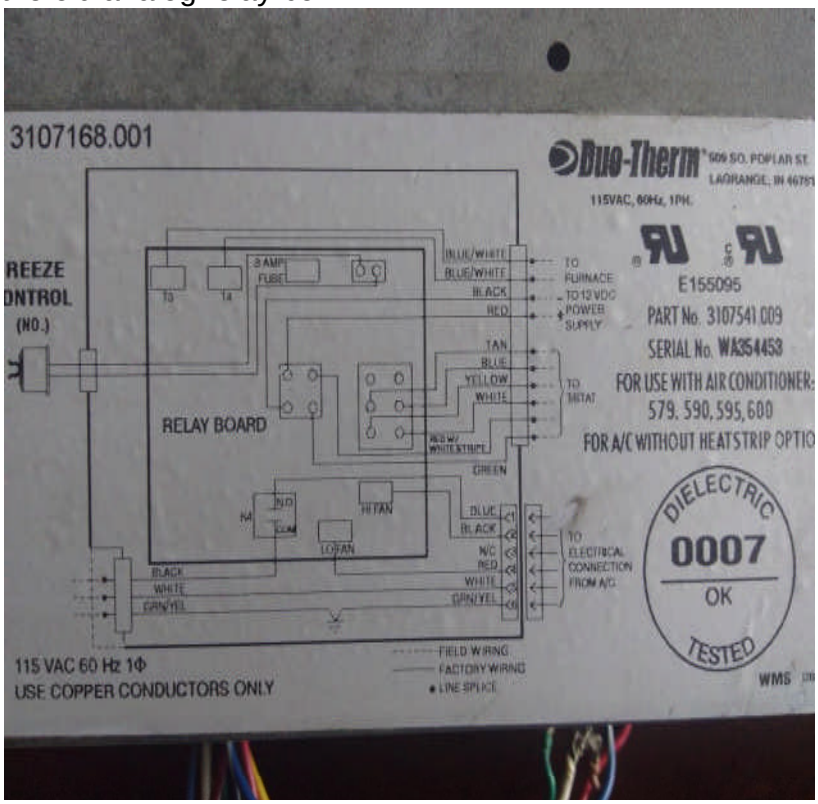
With power removed, remove the ducted air return. Next remove the rear two mounting bolts and the aluminum plate that was trapped under the rear bolts. With the plate off, you will spot the old relay box in a cavity between the ceiling and roof, on the passenger side of thee coach. You may have a galvanized sheet metal plate holding the box from sliding out. Bend the lip of the plate out and pull the relay box out. If the box seems to hang on something, push it back in and lift up and try again; it's probably hanging up on the back edge of the galvanized plate. You will also encounter resistance from the 12-2 romex 120 VAC supply) doubled up behind the box. Use the schematic off the old relay box to identify and label the wires for the furnace and 12 volt supply and ground. You can reuse any three of the old thermostat wires to run power and data to the new thermostat. I would suggest Red, Black, and Orange. Install the new thermostat using the same three wires, and you are ready for the heavy lifting.

To replace the actual AC roof unit, remove the remaining front two mounting bolts from below and free up the main harness from the old roof unit and unplug the frost sensor (there's usually an inline connector.) The main harness passes through a hole in the wood header separating the supply and return sides of the plenum and it may be gobbed in by a stiff glob of caulk. Have fun with that.

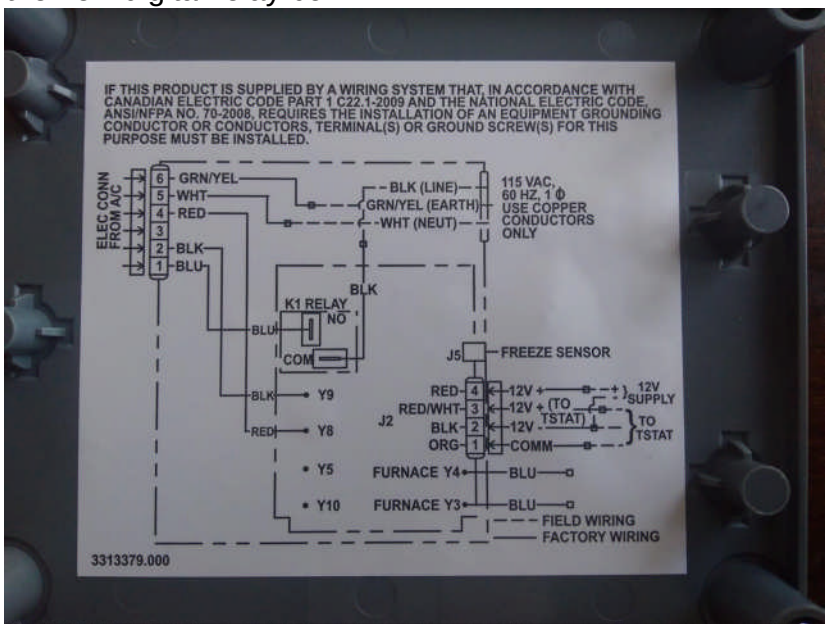
On the roof side, lift the old unit and set it aside. Clean and inspect the mounting surface and make any repairs that are needed. Inspect the bottom of the new unit and ensure that the new roof seal is in place and undamaged. It is important to lift the new unit and set it in place without sliding it to avoid damaging the seal. From inside, if the unit is not aligned perfectly with the hole in the roof, lift up through the hole, support the weight of the unit and adjust alignment as needed. Install the frost sensor supplied with the new relay box in the evaporator coil as detailed on the hang tag attached to the sensor. Pass the main harness back through the Hole in the wood header and plug the harness into the relay box. Before caulking around the harness, I'd bolt the unit down remember, 40 to 50 INCH pounds), then apply power and verify everything works before installing the Ducted air return. When installing the back two bolts, reuse the

aluminum plate that was previously removed. Once you are satisfied that everything is operating properly, install the Ducted air return,

Schematic for the old analog relay box



Schematic for the new digital relay box



Relay Information

The relays in both the old and new relay boxes are readily available through a number of sources. The large power relay that switches the compressor was available online for $6 or less at the time of writing (2019), while the smaller relays for fan high, fan low, and furnace were $3 or less.

A word of caution: All relays are pin in hole mounted to the circuit board. If you are proficient with a soldering pencil and solder wick, proceed on. If not, find a friend with these capabilities or find an old scrap board to practice on.

Also be advised, the new digital relay board is double sided with surface mount components, including integrated circuits on the back side. Antistatic precautions must be taken (antistatic mat and wrist band) to be sure you don't zap something on the board. If these words a greek to you, again, find a friend with the requisite skills.

Part Numbers

New Box

Compressor Potter & Brumfield T9a51d22-12 or HF105F-5

Fan low, fan high, furnace HF3FF

Old Relay Box

Compressor Potter & Brumfield T9a51d22-12 or HF105F-5

Low Fan, Furnace JS1A-12

High Fan T7CV5D-12

The old relay box also has a 3 amp blade fuse in it, protecting the 12vdc in.

Bob
2001 Zanzibar
July 27, 2019