

Arctica Tips and Oddities – #1-#12

by Jim Pearce for *Appliance Service News*

Arctica Tips and Oddities #1

Assume odd behaviors are normal until they “feel” normal

WHILE becoming familiar with the GE Arctica Refrigerator, assume everything you see, hear, or touch is normal (i.e., evaporator fan motor could run “jerkily” or smoothly at strange intervals). Until you learn more, assume everything is normal and concentrate on what your customer has told you. Otherwise, there may be an overwhelmingly strong urge to change a vital component when the customer has complained, say, only of door alignment. After a while you will instinctively know what “Arctica Normal” really is! Order GE Publication #31-9072 to learn more.

Arctica Tips and Oddities #2

Fans will run at odd times — the Liner Protection Mode is king

SINCE the Arctica sports a fashionable plastic interior liner ensemble, GE engineers realized early on that liner damage could become a leading cause of product returns (swap-outs). With this in mind, the Liner Protection Mode was created. It consists of a few overriding functions, and these could easily get an unsuspecting technician into trouble. The Liner Protection Mode can be responsible for some of the following odd but “normal” behaviors:

1) The fan (evaporator or fresh food) comes on after three minutes of door-open time. This function protects the liner from the heat of the light bulbs.

2) The fan motor may modulate (shift speeds) or it may not during this period.

3) As part of the liner protection system, after three minutes of door-open time, on side-by-side models the refrigerator damper will automatically close when the fan starts. On top-mounts, no damper is used in the air channel at all. Therefore, only the fan will run within this same three-minute door opening scenario.

4) The damper, used only in the Arctica side-by-sides, is either open or closed. No middle ground here. If the damper is stuck somewhere in the middle with voltage present, replace the assembly! (see the note at Arctica Tips and Oddities #5)

5) For a no-cool complaint in the refrigerator section, if the damper is closed, check the door switch before suspecting the damper. If the light goes off as the door closes, the switch is good.

6) The evaporator fan could run during the defrost cycle. Three minutes after opening the freezer door, the evaporator fan will come on — again, to protect the liner from light bulb heat.

Arctica Tips and Oddities #3

DC components are abundant

APPROX. voltage inputs to DC components in the Arctica are as follows:

- 1) Evaporator fan motor (12, 8, or 4 VDC depending on fan speed)
 - 2) Condenser fan motor (12 VDC)
 - 3) Fresh food fan motor (some models) (12 VDC)
 - 4) Thermistor (up to five) (5 VDC)
 - 5) Damper motor (some models) (6VDC operating; 2 VDC standing)
- See Arctica Tips and Oddities #5 and #6

Arctica Tips and Oddities #4

A fatal attraction debunked at the control board

THE Arctic's main control board monitors all DC components for potential short circuits. If it detects a (near) short in any DC circuit, the control board simply shuts down the complete system. This could lead to some fairly erratic behavior. For instance, if the evaporator thermistor were shorted due to moisture, the whole system could shut down. If later, the moisture evaporated from within the thermistor, the refrigerator could start running again. In the rare cases when the troublesome thermistor cannot be pinpointed, it is recommended all thermistors in the system be replaced.

If a fan or damper motor happens to short, the control board could shut down the complete system until the shorted motor component is removed from the circuit. This becomes a fairly easy process of elimination by simply unplugging each DC motor component until the refrigerator (compressor) starts running again. DC motors cannot be reliably checked for continuity or for shorts with a meter. (See Arctica Tips and Oddities #8.)

Arctica Tips and Oddities #5

Here's how to check

the Arctica DC motors

FAN motors: Each DC motor has four leads: red (12 volts to power the tachometer and PC board on motor), white (common), blue (monitor or sensing), and yellow (12 VDC drive voltage at high speed, 8 VDC at medium speed, and 4 VDC at low speed — with 4 VDC low-speed input voltage found only on top-mount models).

Note: 12 VDC is present at all times at all DC motors in this system — between the red and white leads. The blue wire only monitors the fan speed for the board. The yellow wire is the “active” lead, which provides power to the fan motor from the main board.

About the damper motor: The damper motor is powered by 6 VDC in its operating mode — when it actually moves. In its standing mode — when it's inactive — 2 VDC normally is read.

Arctica Tips and Oddities #6

Thermistors aren't workhorses

IT'S important to realize that the thermistors do not actually “control” anything. They simply monitor temperatures for the main control board. The main control board (located at the back-side) controls components based on what each related thermistor “reads,” or by programs such as the Adaptive Defrost Mode and, of course, the ever-vigilant Liner Protection Mode. The refrigerator thermistors “tell” the control board when it's time to open or close the damper. The freezer thermistor monitors the freezer temperatures and “tells” the control board, which “decides” when to start or to stop the compressor based on these and other variables. The freezer thermistor is generally recognized as the primary thermistor sensed by the control board that determines when the compressor is cycled. The evaporator thermistor is appropriately located on the evaporator coil and should not be confused with the freezer thermistor. Its primary function is to monitor the temperatures of the evaporator and to “signal” the board to terminate the defrost cycle when approx. 60-70°F is sensed depending on model. The actual termination is done at the control board as power is removed from the defrost relay.

Arctica Tips and Oddities #7

All Arctica thermistors are created equal

ANY thermistor can be used in any thermistor application in the Arctica. Actually all of these “sensitive” brothers share exactly the same “family” values although originally different part numbers were assigned to each. Remember, 5 VDC from the control board feeds them all. It’s important to realize that thermistors could deviate from their nominal values of resistance at any given temperature, which could result in either a “too-cold” or a “too-warm” complaint. Note: Thermistors should be checked first. However, don’t overlook the possibility of a broken damper. And remember, as a DCV component, a shorted thermistor would shut down the whole control system.

See: Arctica Tips and Oddities #4.

Arctica Tips and Oddities #9

Why force the Arctica to defrost if it don’t wanna?

DON’T bother using the self-diagnostics function to force a defrost cycle. On some models (with control knobs, which technically are not Arctica models) servicers would have to invest in a “test” control panel, complete with touch pads and digital displays, to achieve this function. Instead, save time and money by following this helpful Arctica tip: If a frosted evaporator — or a “frost block” — is already apparent, initiating a defrost cycle may not reveal anything helpful anyway. First disconnect from power and simply check the resistance across the defrost heater and bimetal circuit at the main board located on the backside. The two associated wires at the main board are almost always blue and orange. The heater/bimetal circuit should read roughly 30 ohms. Next, check the evaporator thermistor at the main board between thermistor input terminals J1-4 (blue/white) and J1-5 (blue) to determine that its resistance is greater than 1.2k ohms but not more than 166.8k ohms depending on ambient temperature. If the thermistor resistance falls within this range according to temperature (approx. 6k ohms at 70°F; 16.3k ohms at 32°F; 51k ohms at 0°F) and the heater/bimetal circuit is diagnosed as good, then replace the board. Note: Always check the tech sheet per specific model to verify wire colors and terminal locations.

Arctica Tips and Oddities #10

The only traditional function that stayed exactly the same

IT’S really strange. GE didn’t mess with the synchronized operations of the condenser fan motor and the compressor. The compressor and condenser fan still run at the same time. Although I seem to remember the two lights in the refrigerator coming on each time the door opens, I can’t be dead sure if they ever went off together!

Arctica Tips and Oddities #11

Here’s some more not-so-normal normal stuff

THE list: 1) On top-mount models, the evaporator fan could run at any of three levels of speed or not at all — whether the compressor is running or not. (Only two speeds are used in side-by-side models.)

2) The evaporator fan and the fresh-food fan run at the same time (side-by-side models).

3) The evaporator fan will run for a solid 48-hour period in the Quick Ice Mode.

4) It’s possible that the compressor and all fans would run for eight continuous hours.

5) The evaporator fan shuts off when the door is opened — on some models.

6) Max. time between defrosts is 60 hours plus pre-chill time (two hours) with four possible tries (if door is opened, pre-chill will start over), which makes it possible to go almost 68 hours between defrosts.

7) The main control board monitors the door switches to count the seconds that the door is open, then factors this and other information “sensed” or “remembered” into an algorithm to continually compute future defrost requirements.

8) The evaporator thermistor is monitored by the control board to “read” approx. 60-70°F before the main board (defrost relay) will terminate the defrost cycle. If a 70°F reading is not “seen” by the board, it will terminate the defrost cycle after 45 minutes and “remember” to activate another defrost cycle after eight hours. Check tech sheet per model for specific temperature limits.

9) The bimetal thermostat located on the evaporator is used only as a safety measure. Preset to open at 140°F and to close at 110°F, it likely will never cycle unless the defrost relay contacts on the main board stick.

Arctica Tips and Oddities #12

A subtle difference in liner protection

WHEN the main board senses that either door is open — on side-by-side models — it will start timing out three full minutes before starting the evaporator fan motor — no matter what else is occurring within the system. And precisely at that time the damper will close to isolate compartment temperatures..

However, top-mount models have no damper!

So, instead of isolating compartment temperatures by opening and closing a damper, the main board simply adjusts its output to the evaporator fan as needed to safeguard compartment temperatures.

The complete opposite of this occurs during the Pre-Chill Mode — just prior to the defrost cycle — when the compressor attempts to run two straight hours without door interruptions. On side-by-sides, the damper will close in this very cold mode where freezer temperatures could approach -20°F. However, the refrigerator thermistor is monitored by the main board, which controls the damper as needed to maintain appropriate fresh-food temperatures throughout the pre-chill operation. On top-mounts, in this scenario, the evaporator fan speed is simply lowered or raised as needed to maintain proper fresh-food temperature.

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