



# HOSHIZAKI AMERICA, INC.

## SERVICE BULLETIN

**SB05-0002**

**July 7, 2005**

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### **Subject: -AAC THERMISTOR AND CONTROLLER TROUBLESHOOTING**

This Service Bulletin will aid in the troubleshooting of the –AAC controller and thermistor assembly. It is important to distinguish between a defective controller and a defective thermistor. In order to troubleshoot the controller/thermistor assembly first the operation of the controller should be understood. See pages 3-5 for Refrigerator operation and pages 6-9 for freezer operation.

#### **Troubleshooting Thermistors:**

First determine what temperature the thermistors are reading and how it corresponds to the actual temperature where the thermistor is located. This is done by the following.

**Cabinet Thermistor:** This temperature reading can be noted simply by looking at the temperature shown on the display. However, in some cases the display may be reading “dEF”. In this case turn the unit to the “OFF” position. Next press the  $\wedge$  button while turning the unit “ON” with the toggle switch. This will by-pass the initial defrost cycle and allows the display to show the cabinet thermistor reading. This temperature should correspond closely with the actual cabinet temperature. If it does not, see “Ohming the thermistors”.

**Defrost Thermistor:** This temperature reading must be checked by entering the set up menu for the controller. To access this menu press the  $\vee$  arrow and the  $^{\circ}\text{F}$  button at the same time and release, the display should now show “dIF”. Press  $^{\circ}\text{F}$  24 times for freezer and 18 times for refrigerators until “SEN” is displayed. Press the  $^{\circ}\text{F}$  one more time and this reading should be the evaporator coil temperature. Note: this thermistor is mounted in the evaporator therefore when the machine is in the freeze cycle you will see temperatures that would correspond to actual evaporator temperature.

See SB03-0007R1 for detailed information concerning this set up menu.

**Ohming the thermistor:** If either thermistor does not show the proper temperature check the resistance readings of the thermistors.

1. Determine the actual temperature where the sensing end of the thermistor is located.
2. Using a small “precision” type screwdriver remove the thermistor leads from the rear of the controller.
3. Using an ohm meter check the resistance of each thermistor.
4. Compare the resistance to the following chart.

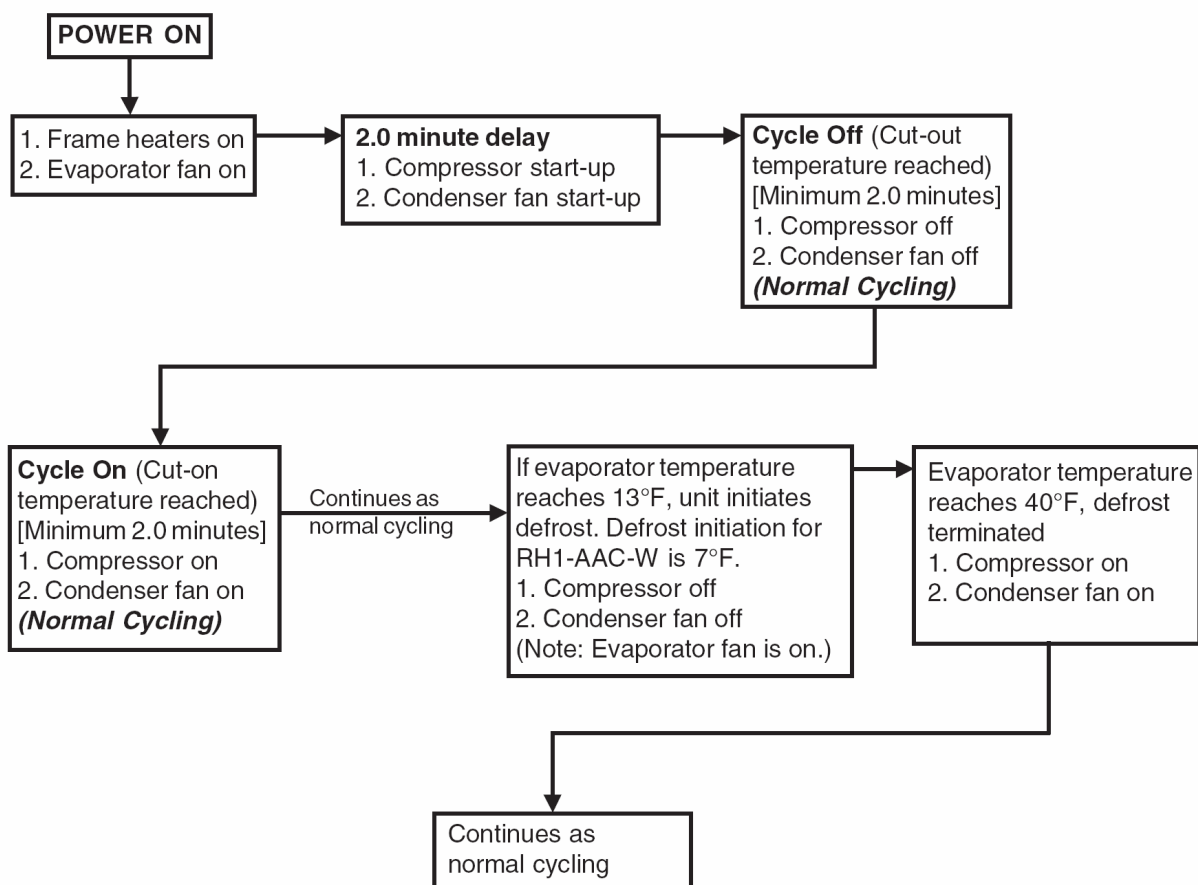
If you find readings that do not correspond to this chart, the problem is likely due to a defective thermistor.

Temperature °F	Temperature °C	Resistance (Ω)
0	-17.8	704
10	-12.2	713
32	0	812
50	10	880
70	21.1	961
90	32.2	1046

## **Controller Diagnosis**

Before diagnosing problems with the controller it is important to understand the sequence of operation. Attached you will find Sequence of operation, flow charts, timing charts and a detailed explanation of the operation of the controller. If after reviewing this information you have any questions please contact the Technical Support Department at 1-800-233-1940.

## Normal Electronic Control Process Flow Operation for Refrigerator



## Note:

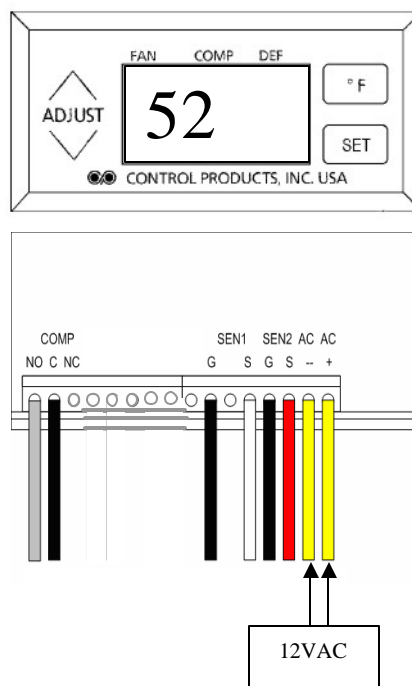
- Cut on / cut off / and cabinet temperature are read by the same sensor, called the “cabinet thermistor.”
- The defrost thermistor reads evaporator temperature and is mounted in the evaporator coil.
- This unit has a -5° differential, therefore cut on temperature will be equal to the set point temperature and cut off will be 5°F below set point temperature.

## -AAC REFRIGERATOR SEQUENCE

### START UP

When the unit is powered “ON” the evaporator fan will energize and run continuously. The FAN LED will not energize since the evaporator fan is not controlled through the controller.

If no display is shown when the unit is turned on check the power supply to the controller at AC- and AC+. This voltage should be 12.0VAC.

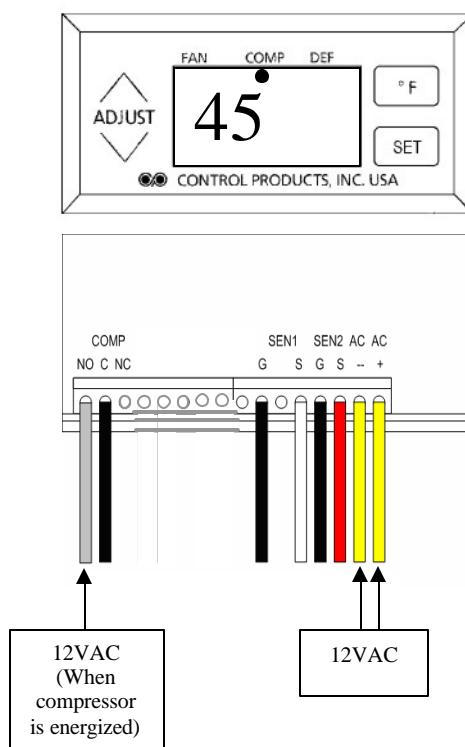


### NORMAL OPERATION

After a 2 minute delay the compressor, condenser fan motor and compressor LED will energize and begin to pull the cabinet temperature down.

The temperature will drop to 5 degrees below the set point before the compressor and condenser fan cycles off. When the temperature warms to the set point temperature the compressor and condenser fan will re-energize.

Note: The evaporator fan continues to operate in the off cycle.



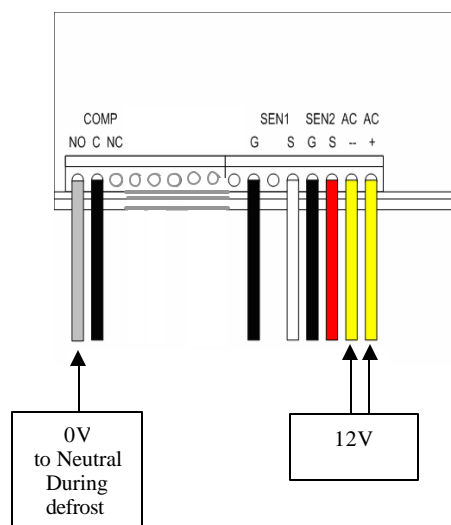
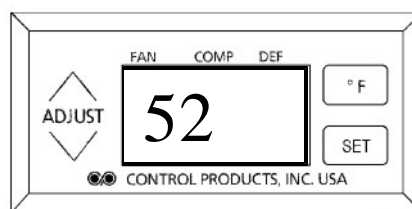
## DEFROST PERIOD

The refrigerator uses an off-cycle defrost. If additional defrost is needed, a temperature initiated / temperature terminated back up defrost will occur.

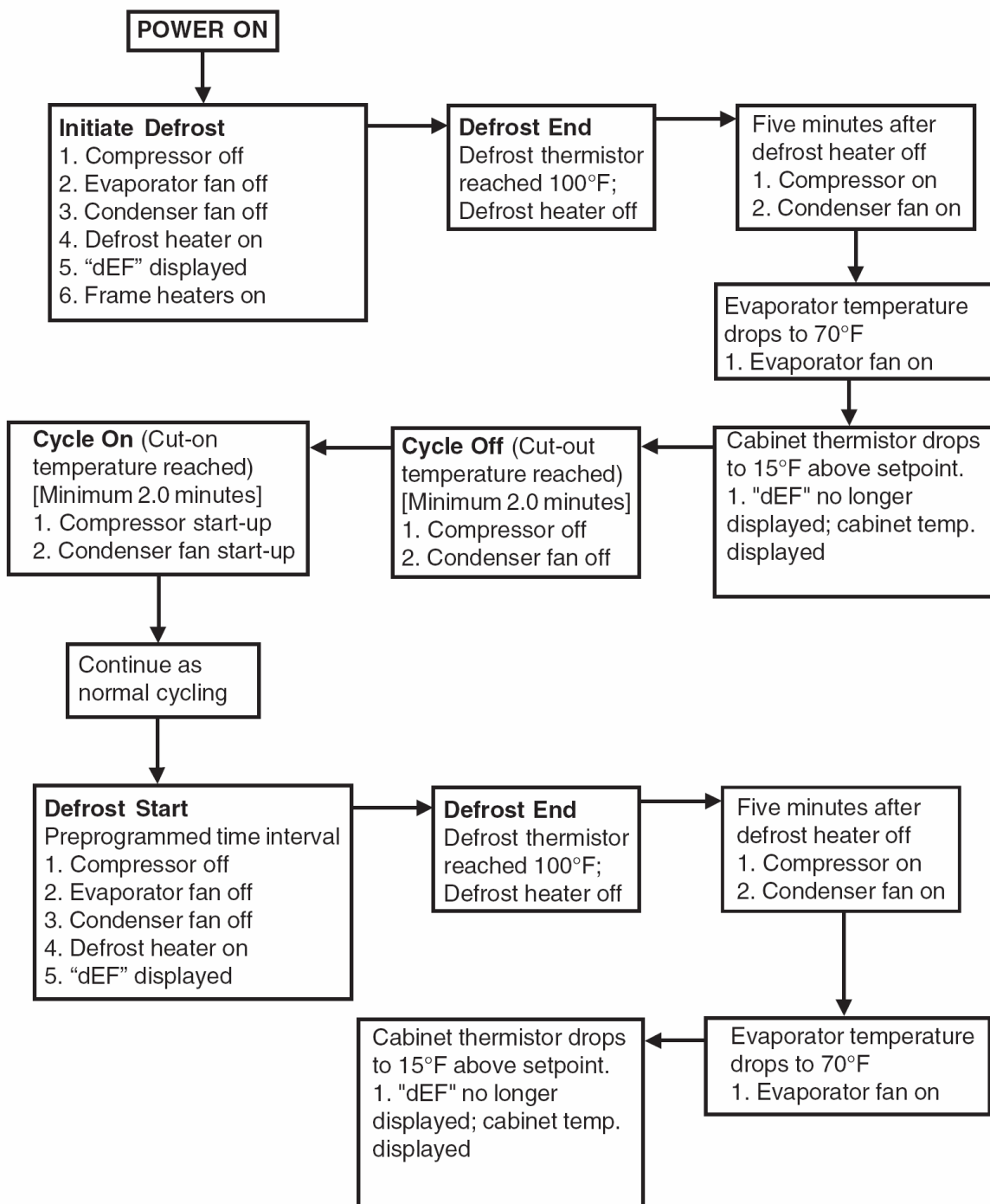
This additional defrost will only occur if the evaporator temperature sensor reaches 13°F (7°F on RH1-AAC-W). During this defrost the compressor and condenser fan will de-energize. The evaporator fan will continue to run.

After the evaporator temperature reaches 40°F the compressor and condenser fan will re-energize and continue normal operation.

Note: The DEF LED will not energize during this defrost nor will the display show “dEF”.



## Normal Electronic Control Process Flow Operation for Freezer



## Note:

- Cut on / cut out / and cabinet temperature are read by the same sensor, called the "cabinet thermistor."
- The defrost thermistor reads evaporator temperature and is mounted in the evaporator coil.
- This unit has a -6° differential, therefore cut on temperature will be equal to the set point temperature and cut off will be 6°F below set point temperature.

## -AAC FREEZER SEQUENCE

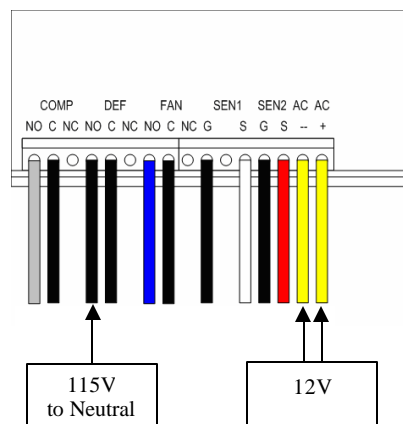
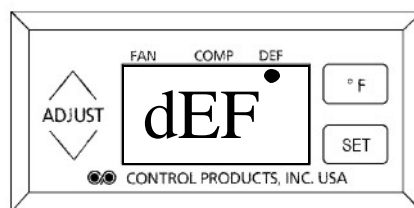
### START UP

When the unit is powered “ON” it starts in the defrost cycle. The display will show dEF and the DEF LED will be lit.

115VAC will be supplied to the DEF “NO” connection on the back of the controller

If no display is shown when the unit is turned on check the power supply to the controller at AC- and AC+. This voltage should be 12.0VAC.

Note: This initial defrost cycle can be by-passes by moving the control switch to “ON” while the  $\wedge$  is pressed.

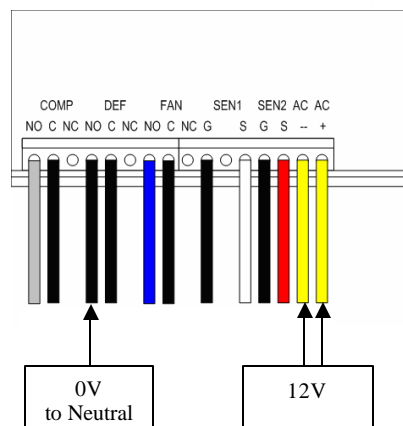
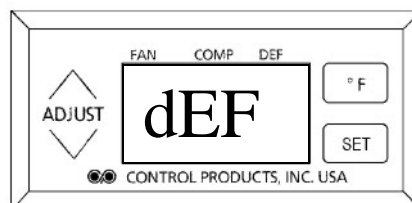


### DEFROST TERMINATION

The defrost cycle is terminated once the evaporator sensor temperature reaches 100°F.

The DEF LED will go out and 115VAC will no longer be supplied to DEF “NO” connection the back of the controller.

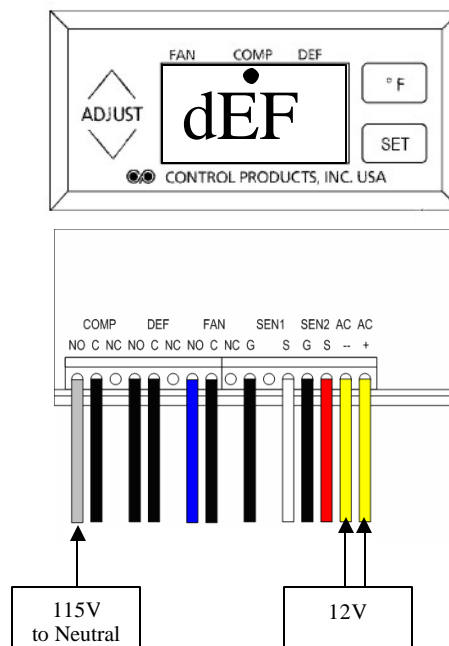
dEF will continue to be displayed throughout the Recovery period. (see below)



## RECOVERY PERIOD

5 Minutes after the defrost heater de-energizes the compressor, condenser fan and COMP LED will energize.

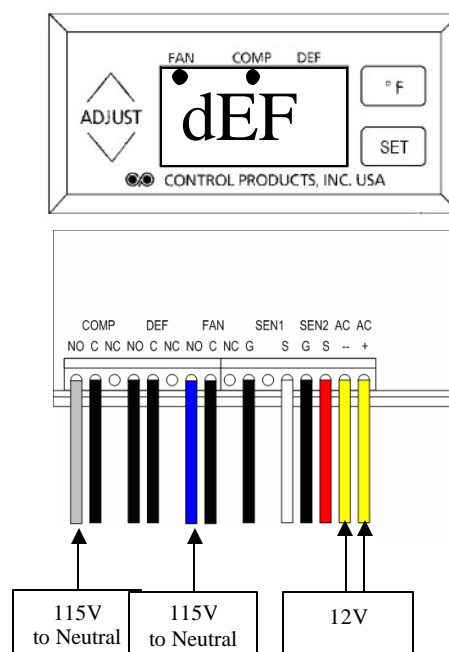
115VAC will also be supplied to the Comp “NO” connection.



When the evaporator reaches 0°F or 70°F (Depending on model configuration) the evaporator FAN LED and Evaporator fan will energize.

115VAC will also be supplied to FAN “NO” connection on the back of the controller and 115VAC will continue to be supplied to the compressor.

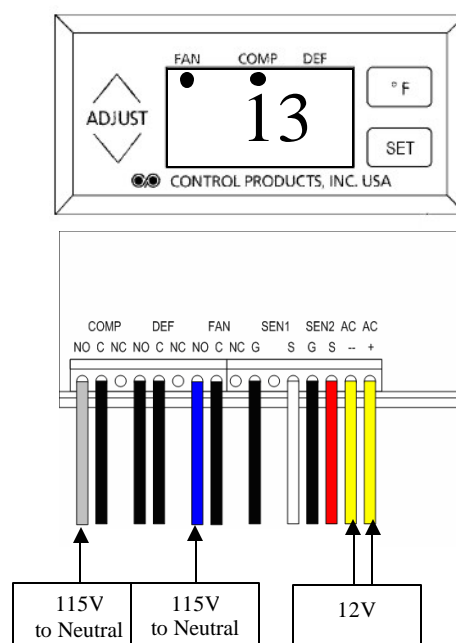
Note: The evaporator fan will remain energized unless the door is open, the unit is in defrost or the unit is turned “OFF”.





When the cabinet temperature reaches 15°F above the set point the display will begin showing actual cabinet temperature.

Voltage supply will not change on the rear of the controller.



## NORMAL OPERATION

**Cycle OFF:** The cabinet temperature will continue to pull down until the cabinet reaches 6°F below the set point. The compressor and condenser fan will cycle off. The evaporator fan remains energized.

**Cycle ON:** The compressor and condenser fan will cycle on when the cabinet temperature reaches set point.

**Note:** There is a 2 minute minimum off and on time.

