SERVICE AND APPLICATION NOTES

C-14-04
August 22, 2014
Revised December 11, 2014

iComfort® Max Defrost Operations

AFFECTED MODELS:

XP17 and XP21 with iComfort® Outdoor Control 103369-03 or -04

OVERVIEW:

Lennox has developed an improved defrost control algorithm for use on our XP17 and XP21 Heat Pumps Models to address applications where the outdoor fan assembly is subjected to ice bridging. The Intellifrost* Defrost Control has been designed to alleviate the icing issues associated with these units for applications primarily in Northern markets. The upgraded defrost controls were implemented into production beginning with October 2013 serial number units.

J1 - DEFROST TERMINATION TEMPERATURE

1. The **J1** jumper is factory-set to **50°F** (10°C). This jumper can be repositioned to terminate defrost at **70°F**, **90°F** or **MAX** (21°C, 32°C and MAX). If there is no jumper on **J1**, the default termination temperature is **90°F**(325C).

NOTE - *Colder climates may require a higher defrost termination temperature to maintain a clear coil.*

2. If the **J1** jumper is set to **MAX**, defrost will run **maximum defrost sequence**.

J 3 - DEFROST AUTO

1. **Defrost Auto** can be set to either **ON** or **OFF**. Factory setting is **OFF**.
   NOTE - *If the jumper is missing the default is **OFF**.*
2. **Defrost Auto** is set to **OFF**, the defrost cycle will run and terminate based on **J1** setting.
3. **Defrost Auto** is set to **ON**, the defrost termination will be determined based on the following rules:
   A. The first defrost after the unit is powered up, or the first defrost after cooling call , will terminate based on the J1 setting.
   B. The accumulated heating run-time between defrost cycles:
      - ***If the heating run time between defrost cycles is less than 50 minutes,*** the defrost termination temperature will be increased for the next defrost cycle based on the current termination setting. If the current termination setting is **50°F** or **70°F,** then the next defrost termination will be **90°F**. If J1 is set at **90°F** or **MAX,** the next defrost cycle will terminate at the **MAX** setting.
      - ***If the heating run time between defrosts is longer than 1 hour for 2 consecutive heating cycles*** and the termination temperature is set at 50ºF, 70ºF, or 90ºF, then the defrost control will follow the **JI** jumper setting during the next defrost cycle. If the **J1** jumper is set to **MAX**, then the next defrost termination temperature will be decreased to **90ºF**.

   C. If **J1** is set to **MAX**, the system will always run at **MAX** when accumulated compressor **OFF** time is longer than **30 minutes and ambient temperature is less than 35°F**.
   D. When the ambient sensor temperature is **higher than 40ºF** and **J1** is set to **MAX**, defrost termination will be **90ºF**. If **J1** is **50ºF**, **70ºF**, **or 90ºF**, defrost termination will follow the **J1** setting.

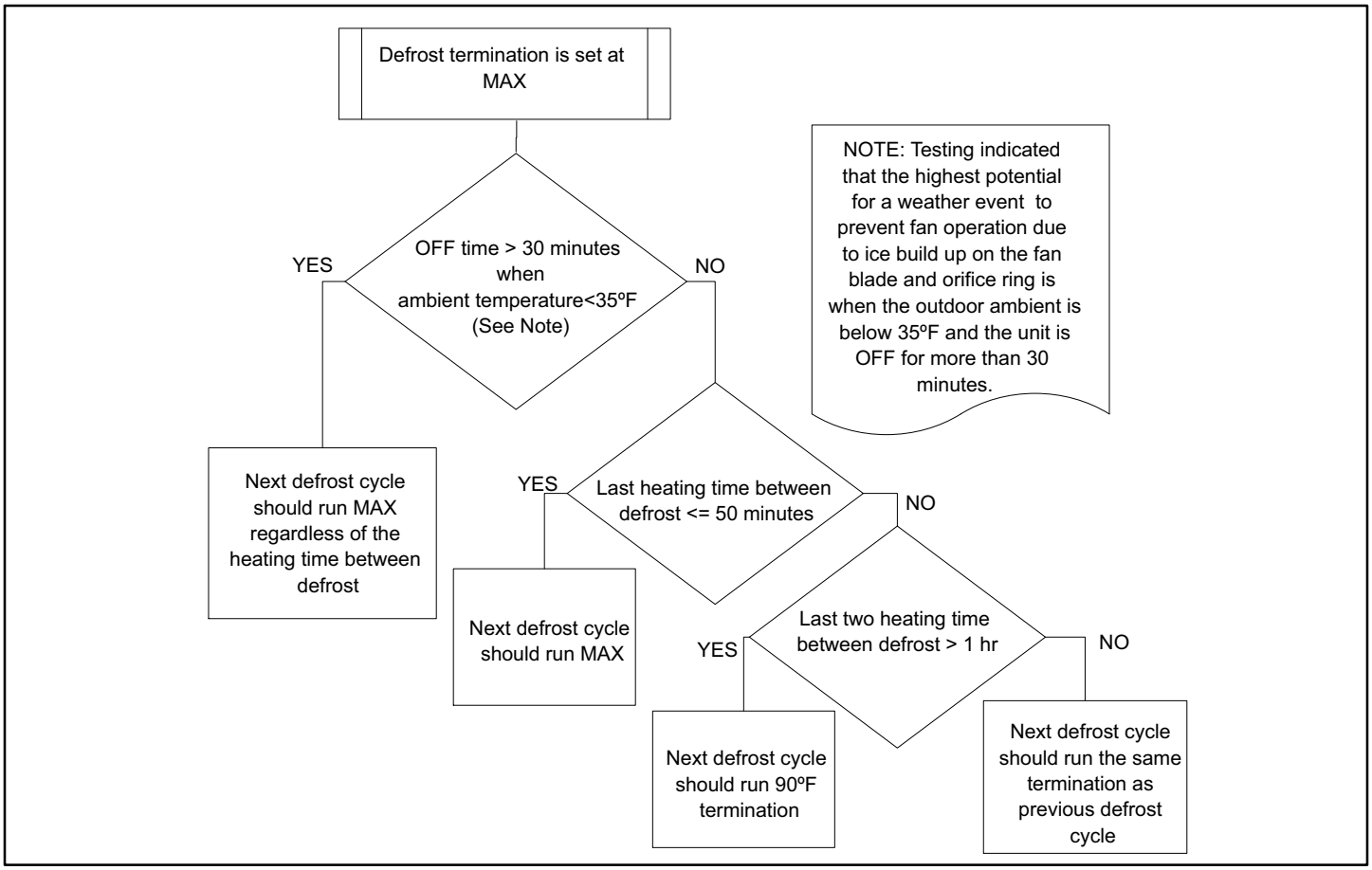


Figure 1. Auto Defrost Rule

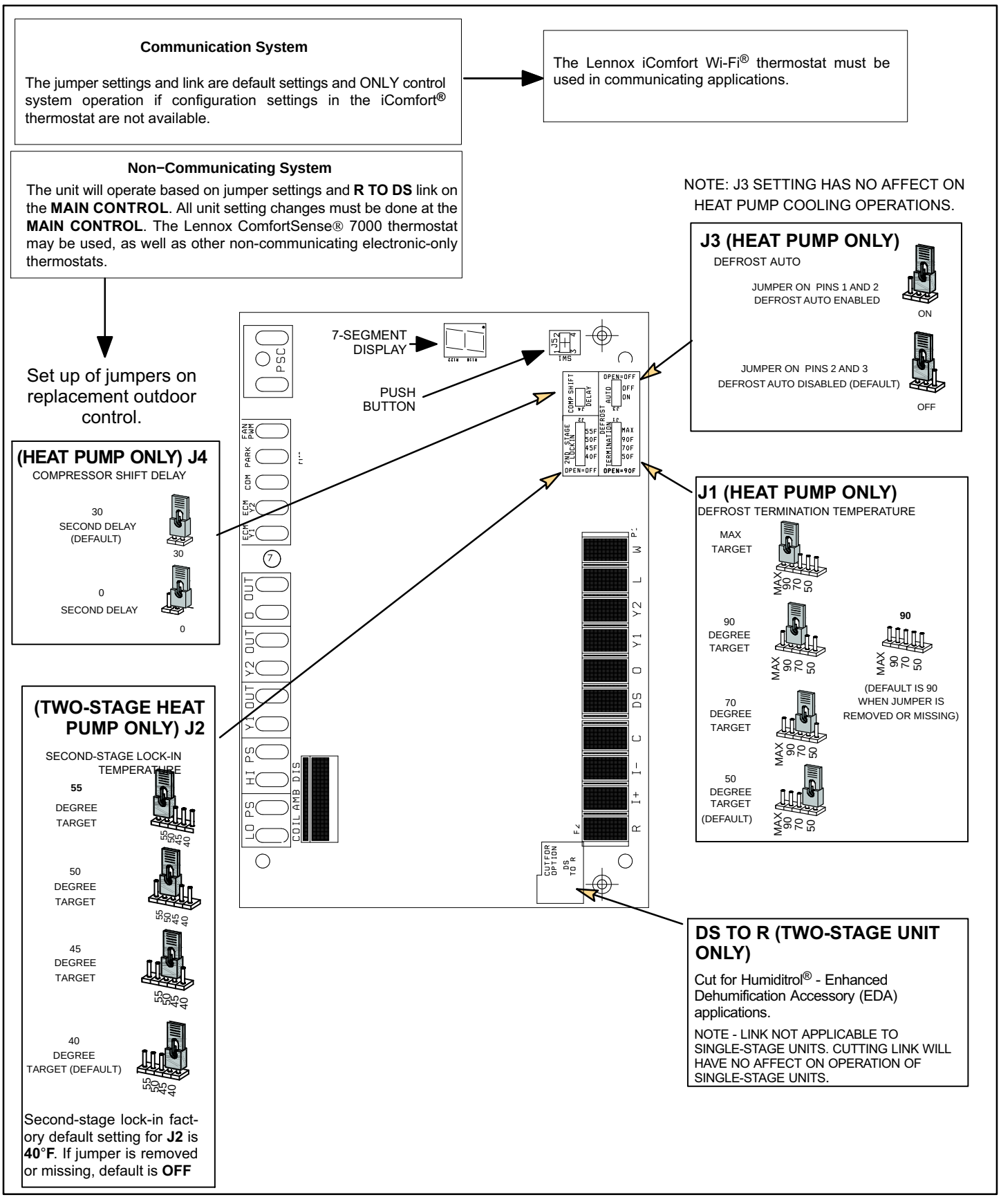


FIGURE 2. Jumper and Link Settings

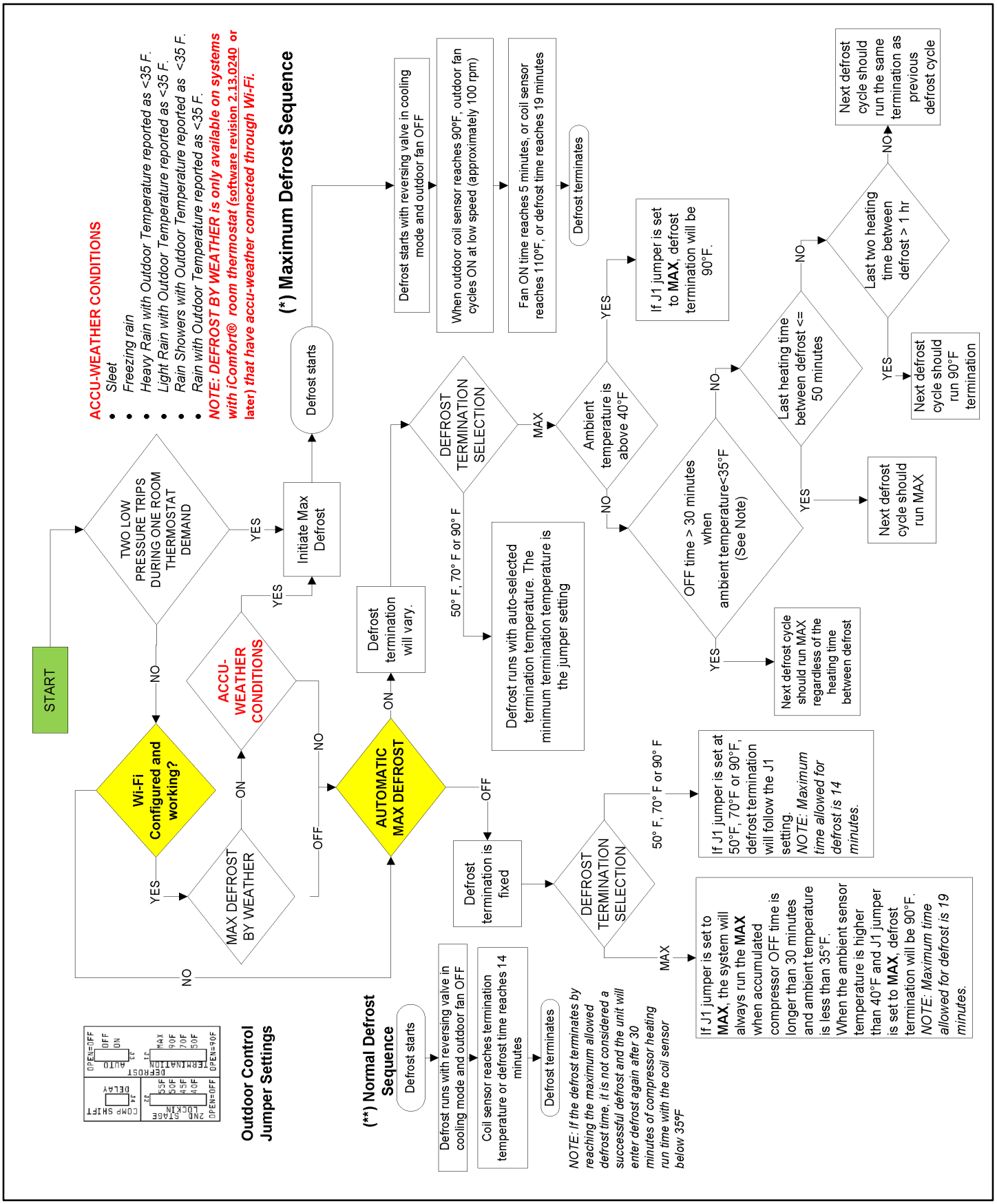


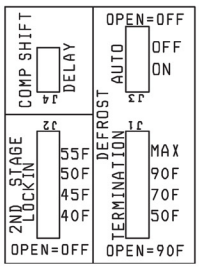
Figure 3. Defrost Auto Selection and Max Defrost Sequence of Operations

Heat pump control monitors mode of operation through outdoor ambient / coil temperatures and compressor run-time to determine when a defrost cycle is required.
Note: No system alert codes can be active for defrost calibration to be achieved.

Defrost Calibration
Coil sensor detects temperatures below 35°F (2°C) during any of the following:
- Initial power-up
- After loss of power
- After cooling mode

A sacrificial defrost will be used to ensure there is a clear coil before attempting calibration.

Notes:
When the HP enters defrost, the thermostat will run auxiliary heat with the HP, stopping the auxiliary heat when defrost ends.



Outdoor Control Jumper Settings

Coil sensor below 35°F (2°C)
No → No attempt to calibrate
Yes

Accumulated compressor run-time while outdoor coil temperature sensor input is below 35°F (2°C). If temperature rises above 35°F before the 30 to 35 minutes, accumulated run-time will clear.

30-35 minutes compressor accumulated run-time has occurred.
No → Continue to accumulate run-time
Yes

Demand Defrost
After the initial calibration, the heat pump control disables the defrost mode for 30-35 minutes in order to avoid unnecessary defrosts. Beyond this timing period, both the ambient and coil sensors are continuously monitored. If the coil temperature is below 35°F (2°C) and the calibration delta is reached or accumulated compressor run-time is more than six (6) hours, a defrost is to initiated.

Defrost Mode
Initiate a defrost (turn off outdoor fan, energize reversing valve and increase compressor to 100% capacity). Monitor coil temperature sensor input and accumulated defrost time.

How did defrost terminate?

- **Termination temperature set on outdoor control is 50ºF, 70ºF, 90ºF**: Coil temperature sensor input reached the specified defrost termination temperature in ***less than 14 minutes***.
- **Termination temperature set on outdoor control is MAX**: Defrost ***less than 19 minutes*** with the outdoor fan ON at low speed for 5 minutes.

- **Termination temperature set on outdoor control is 50ºF, 70ºF, 90ºF**: Defrost for ***14 minute maximum*** without the coil temperature sensor input reaching termination temperature.
- **Termination temperature set on outdoor control is MAX:** Defrost for ***19 minute maximum*** or coil temperature sensor reached 110ºF.

No

Yes

Calibration attempted
(unit running in heat mode)

Calibration

Figure 4. Demand Defrost - Defrost Calibration

iComfort Wi-Fi® Thermostat (Firmware Version 2.13.xxxx)

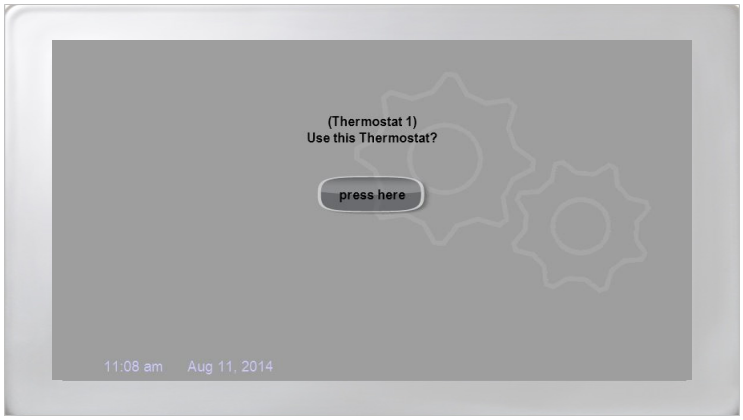
Setting Defrost Parameters

This procedure is for setting the thermostat's defrost parameters. This is for only fully communicating systems both indoor and outdoor units. Applicable outdoor units are XP17, XP21 and XP25 series units.

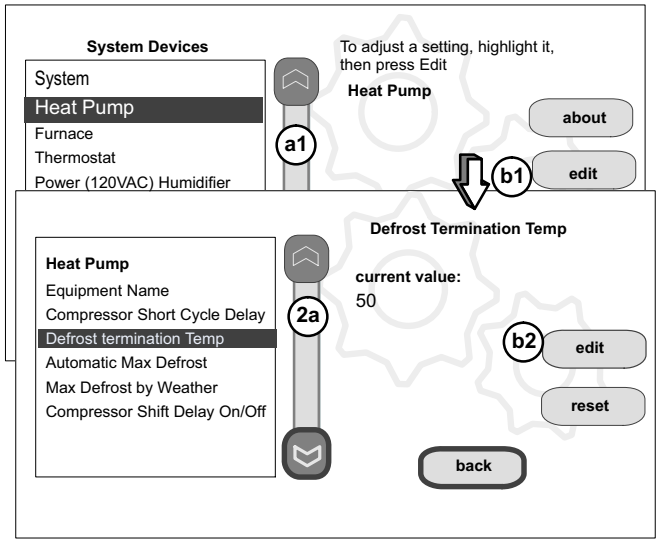
1. During initial thermostat start-up the following screen will appear. This indicates that the thermostat is active and booting up.

2. During initial thermostat start-up if the following screen appears, this will indicate that the thermostat has been incorrectly wired or has shorted wires. Turn power off to the system and verify that all wiring is correct.

3. Power up the system and then select the **press here** button to allow system discovery.



4. Progress through the setup screens until the **System Devices** screen appears.

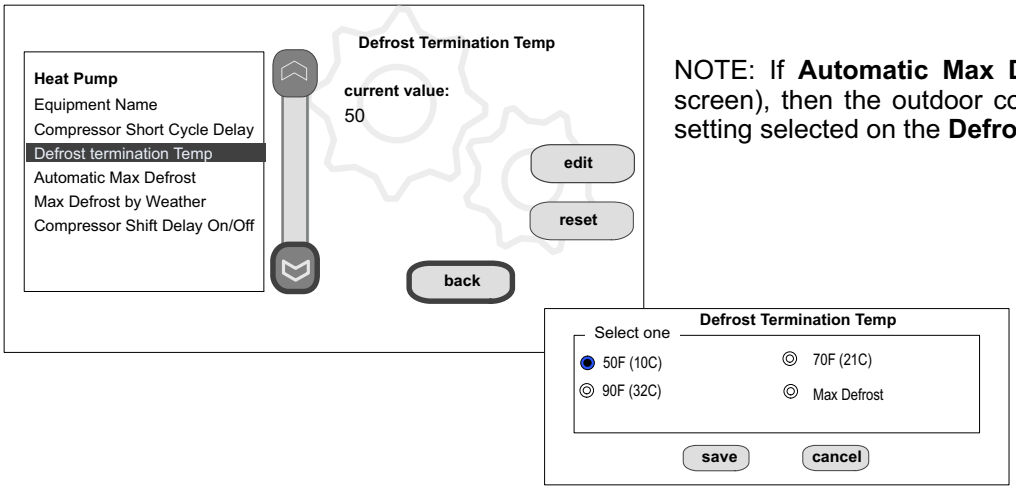


Configure the device as follows:

A. In the *system devices* list, use the arrows (**a1**) to highlight ***Heat Pump***. Press **edit** (**b1**).

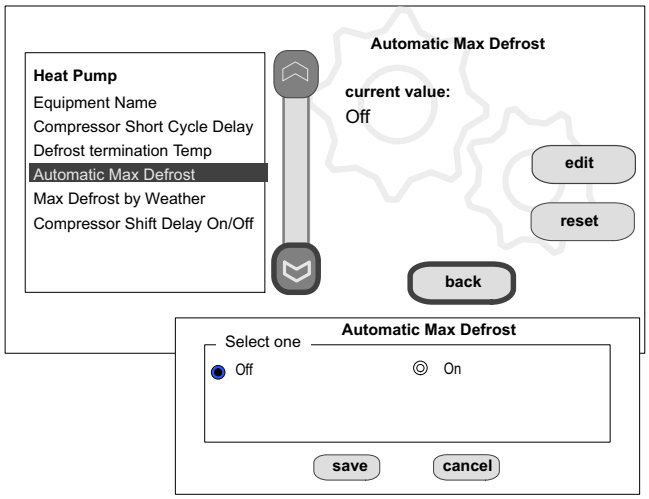
B. In the Heat Pump list, use the arrows (**a2**) to highlight ***Defrost Termination Temp*** *option***.** Press **edit** (**b2**).

5. Select the **Defrost Termination Temperature** setting.



NOTE: If **Automatic Max Defrost** is set to OFF (see next screen), then the outdoor control will terminate defrost at the setting selected on the **Defrost Termination Temp** screen.

6. Select the **Automatic Max Defrost** setting.



If Automatic Max Defrost is set to On, then defrost termination will be base on the following rules:

A. The first defrost after the unit is powered up, or the first defrost after a cooling call – the defrost control will terminate defrost based on the selected setting in the Defrost Termination Temperature screen (the prior screen).

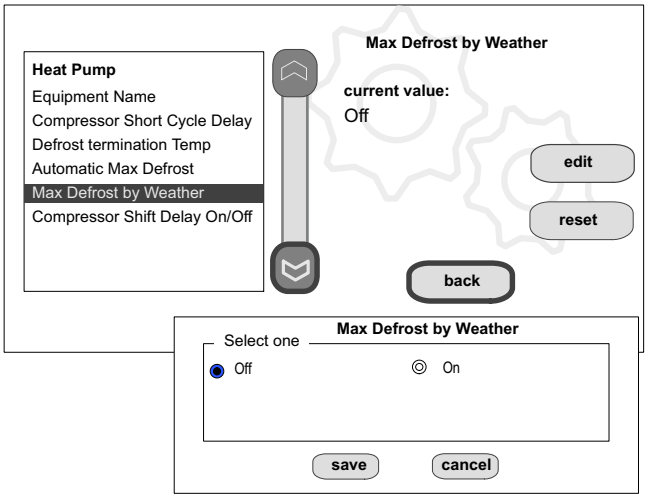
B. Accumulated heating run-time between defrost cycles: If the heating run time between defrost cycles is less that 50 minutes, the defrost termination temperature will be increased for the next defrost cycle based on the current termination setting. If the current termination setting is 50 F or 70 F, then the next defrost termination will be 90 F. If the current termination setting is 90 F or MAX, then the next defrost cycle will be terminated at the MAX setting.

C. If the heating run time between defrost cycles is greater than 60 minutes for 2 consecutive heating cycles, and the termination setting is 50 F, 70 F, or 90 F, then the defrost control will follow the current termination setting during the next defrost cycle. If the current termination setting is MAX, then the next defrost termination temperature will be decreased to 90 F.

D. If the current termination setting is MAX, the system will run the MAX defrost termination routine, when the compressor OFF time has been longer than 30 minutes, and the ambient temperature is less than 35 F.

E. When the ambient temperature is greater than 40 F, and the current termination setting is MAX, then defrost termination will be at 90 F. When the ambient temperature is greater than 40 F, and the current termination setting is 50 F, 70 F, or 90 F, then the defrost termination will follow the current termination setting.

7. Select the **Max Defrost by Weather** setting.



If **Max Defrost by Weather** is set to On, then the outdoor control will operate as follows regardless of time of day or current defrost termination temperature setting (on a fully communicating system that has been registered by the homeowner and therefore is able to receive the Accu-Weather feed):

If the Accu-Weather Conditions are:

- Sleet
- Freezing Rain
- Heavy Rain with OD Temperature reported as <35 F
- Light Rain with OD Temperature reported as <35 F
- Rain Showers with OD Temperature reported as <35 F
- Rain with OD Temperature reported as <35 F

Then the iComfort Wi-Fi® thermostat will inform the outdoor control to operate in **MAX Defrost Mode** for the duration of the weather event.