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Screen Temperature Display

You will probably notice as the Infinity / Evolution control is working that the room temperature display does not change very often. This is by design. The actual display you see is a number that has been rounded toward the set point. The actual temperature the control uses in its electronics is broken down into sixteenths of a degree.

So at times you will notice that equipment is operating, yet the display matches the set point. For example, a display of 70ºF could actually be 69.1 thru 70.9. This is the way all of our thermostats display temperature, and has been this way since the beginning.

Staging Algorithm and Anticipator

The control will continually calculate a demand using a built in Proportional/ Integral algorithm. This means that both time and temperature are taken into account before a decision to stage up or down is made. The anticipator setting is the third variable used to determine demand. The –B model user interface uses the anticipator for cooling operation only.

It is not possible in the field to determine staging demand at a particular point in time. This process is done in the background, and there is no access to the algorithm output other than pushing the right side button for three seconds. This will display the current equipment status which shows the current equipment stage (ON, OFF, HIGH, LOW, etc.)

As a rule of thumb, when the space temperature is ½ degree from set point, there is enough demand to turn on the equipment, and it generally will not over-condition by more than ½ degree on a normal cooling or heating mode. When dehumidifying, overcooling may be allowed, see dehumidification section.

When raising the anticipator setting, the equipment will turn on and stage up more slowly. It will also cycle off sooner. Raise the anticipator if the customer wants the equipment to cycle off sooner.

For the –B model user interface, if the system is overshooting/undershooting in heating mode, then adjust the Cycles Per Hour up to a value of 6. This will cause the system to use shorter, faster cycles.

Cooling Only Operation

When the staging algorithm determines the cooling demand is sufficient to cycle on the equipment (approximately ½ degree), the outdoor unit and blower will turn on. On 2-stage systems, the unit will always start the cycle in low speed (unless high speed latching is active, initial power up of a Bristol system, or 12 hours off time on a Bristol system), and run a minimum of 10 minutes before staging up to high stage. Increasing the set point 5 degrees or more will **not** override this timer (this is true for software versions 3, 5, 6, 8, 10, 12 but beginning with (-B) models, a 5 degree demand **will** override staging timers. If after 10 minutes there is sufficient demand, the system will stage up to high. If the demand is stabilizing (not increasing), the system will remain in low stage beyond the 10 minute timer. There is no maximum run time in low stage. If the demand exactly matches the building load, the unit could run for extended periods in low stage. Extended run times are not a problem for the unit, and actually are desired to help control humidity and avoid the wear and tear of stop-start cycles.

The system may stage back and forth between high and low, and will cycle off when the demand is satisfied.

Cooling airflow is dependant on the size and type of outdoor unit installed, and the AC Airflow selection in the AC Set up menu. The available settings are:

-B Infinity / Evolution Cooling airflows			
Comfort	**Efficiency**	**Max**	
		Low Stage	High / Single Stage
350 cfm/ton x Comfort airflow multiplier plus or minus dehumidify adjustments	350 cfm/ton x Efficiency airflow multiplier	400 cfm/ton x airflow multiplier	400 cfm/ton

Airflow Multipliers for (-B) Infinity / Evolution Controls						
Model	Compressor	Tonnage	Low Stage		High Stage	
			Comfort	Efficiency	Comfort	Efficiency
All Single Stage	All	All	n/a	n/a	1.00	1.00
38TDB, YDB 598B, 698B	Bristol TS	all	0.63	0.63	1.05	1.05
24ANA7 187A	Bristol TS	2	0.60	0.70	0.98	1.00
		3	0.56	0.70	0.96	1.00
		4	0.50	0.63	0.97	1.00
		5	0.61	.070	0.98	1.00
25HNA6 286A	Bristol TS	2	0.60	0.70	0.98	1.00
		3	0.55	0.70	0.94	1.00
		4	0.49	0.63	0.95	1.00
		5	0.60	0.70	0.98	1.00
24ANA1 180A	Copeland Ultra Tech	2	0.77	1.15	1.06	1.15
		3	0.73	0.88	1.03	1.15
		4	0.72	0.80	0.98	1.00
		5	0.70	0.80	0.96	1.00
25HNA9 288A	Copeland Ultra Tech	2	0.78	0.95	1.08	1.15
		3	0.70	0.88	0.98	1.15
		4	0.70	0.80	0.95	1.00
		5	0.69	0.80	0.94	1.00

Airflow Multipliers for (-A) Infinity / Evolution Controls				
All Single Stage	All	All	n/a	1.00
Model	Compressor	Tonnage	Low Stage	High Stage
38TDB, YDB 598B, 698B	Bristol TS	all	0.63	1.05
24ANA7 25HNA6 187A 286A	Bristol TS	2	0.70	1.00
		3	0.70	1.00
		4	0.63	1.00
		5	0.7	1.00
24ANA1 25HNA9 180A 288A	Copeland Ultra Tech	2	1.15	1.15
		3	0.88	1.15
		4	0.80	1.00
		5	0.80	1.00

Infinity / Evolution Dehumidify Function

This system dehumidifies based on inputs from both the room temperature, and the sensed humidity. The control uses these 2 variables to determine airflow level, and compressor stage. Below is a description of dehumidify operation:

There are 3 options for dehumidification,

1. Dehumidify (factory default)

   Also known as “Cool to dehumidify”, this option enables the full dehumidification algorithm. The equipment will operate on either a cooling call, or a dehumidify call without a cooling call as described in the charts below, depending on whether it’s a 2-speed or single speed unit. Overcooling up to 3 ºF is allowed at room temperatures of 75ºF and higher. As the room temperature is conditioned toward 70ºF, less over conditioning is allowed. Overcooling is not allowed below 70º F room temperature. Beginning with (-A) models, “DEHUMIDIFYING” is displayed in the Status screen (right side button push for 3 seconds) when the system is overcooling (new feature for version 10 software). Starting with –B controls (V13 & V14), with dehumidify turned on and cooling airflow set to Efficiency or Maximum, airflow adjustments will not be used. However, overcooling may be allowed to satisfy the dehumidify demand. When using continuous fan a 5 minute coil drain timer will force the blower off at the end of the cycle regardless of airflow setting (efficiency or maximum).

2. Dehumidify only with a call for cooling

   If the Dehumidify feature is turned off in the Cooling Humidity screen, and AC airflow is set to Comfort, the equipment will only come on with a call for cooling, but will run reduced airflow to dehumidify during the cooling call if necessary. To access the Dehumidify option:

   Press and release Advanced button
   Press NEXT until the COOLING HUMIDITY screen appears
   Press SCROLL button down until DEHUMIDIFY is highlighted
   Press TEMPERATURE UP/DOWN button to turn DEHUMIDIFY off

3. Dehumidify features turned off
   If the AC airflow is changed from Comfort to Efficiency or Max, the system will not run reduced airflows to dehumidify and will work only to satisfy the cooling demand.

(Dehumidify function cntd.)
When all dehumidify options are enabled, there are 4 potential airflow stages.

Airflow Stage 1: Occurs from system off to Dehumidify only demand. Or when cooling demand is satisfied and dehumidify demand still exists. Potential for this stage lasts only 10 minutes. After 10 minutes of run time, the system will not stage down to this stage.

Airflow Stage 2 (2-stage outdoor units only): Occurs after 10 minutes of stage 1 with only a dehumidification demand, or when low speed cooling demand exists and dehumidification demands exist.

Airflow Stage 3: Occurs with high speed cooling demand with or without dehumidification demand

Airflow Stage 4: Occurs with greater high speed cooling demand-not much airflow reduction with dehumidification demand

5 minute continuous fan off delay: if dehum demand existed at any time during the competed cycle, this will occur

Airflow for new platform 2-Stage Units using (–A) User Interface
24ANA7, 25HNA6, 24ANA1, 25HNA9 and 187A, 180A, 286A, 288A models

Cooling CFM/Ton for Two Stage ODU (=350 CFM/ton x % x Multiplier)

		Airflow Stage 1	Airflow Stage 2	Airflow Stage 3	Airflow Stage 4
		Dehumidify demand, no cooling demand **Lo Stage compressor only (high) = dehum airflow set to high in Furnace or Fan coil set up**	Dehumidify demand and / or Lo stage cooling demand	Hi Stage Cooling with or without Dehumidify demand	Greater Hi Stage cooling demand with or without dehumidify demand
A	**Dehumidify demand greater than 5%**	**52% (high=85%)** ***10 min -→***	**72%(high=85%)**	**93%**	**105%**
B	**Dehumidify demand 0 to +5%**	**72% (high=85%)** ***10 min -→***	**78% (high=85%)**	**100%**	**110%**
C	**Dehumidify demand satisfied by 0-5%**	**Cannot exist**	**85%**	**100%**	**110%**
D	**Dehumidify demand satisfied by more than 5%**	**Cannot exist**	**100%**	**100%**	**110%**

(Dehumidify function cntd.)

Cooling CFM/Ton for Two Stage Outdoor Unit (38TDB, YDB, 598B, 698B) ONLY

	Airflow Stage 1	Airflow Stage 2	Airflow Stage 3	Airflow Stage 4
	Dehumidify demand, no cooling demand **Lo Speed compressor only (high) = dehum airflow set to high in Furnace or Fan coil set up**	Dehumidify demand and / or Lo speed cooling demand	Hi Speed Cooling with or without Dehumidify demand	Greater Hi Speed cooling demand with or without dehumidify demand
Dehumidify demand greater than 5%	**126 (high=205*) 10 min**	**173 (high=205)**	**325**	**375**
Dehumidify demand 0 to +5%	**173 (high=205) 10 min,**	**189 (high=205)**	**350**	**400**
Dehumidify demand satisfied by 0-5%	**Cannot exist**	**205**	**350**	**400**
Dehumidify demand satisfied by more than 5%	**Cannot exist**	**220**	**350**	**400**

Cooling CFM/Ton for all Single Stage Outdoor Units

	Airflow Stage 1	Airflow Stage 3	Airflow Stage 4
	Dehumidify demand only, no cooling demand **(high) = dehum airflow set to high in Furnace or Fan coil set up**	Dehumidify and /or Cooling Demand	Dehumidify and/or Greater Cooling Demand
Dehumidify demand greater than 5%	**200 (high=325) *10 min***	**275 (high=325)**	**375**
Dehumidify demand 0 to +5%	**275 (high=325) *10 min***	**325**	**400**
Dehumidify demand satisfied by 0-5%	**Cannot exist**	**350**	**400**
Dehumidify demand satisfied by more than 5%	**Cannot exist**	**350**	**400**

Coil Freeze Detection (new feature beginning with (–A) models version 10 software)

This algorithm will attempt to detect a freezing coil while cooling is active. It will do this by periodically measuring the static pressure of the system, and comparing the restriction to the initial restriction on the system at the start of cooling. If the restriction has increased by a certain amount, then a *possible* freezing coil will be declared. The system will turn off cooling and immediately perform a filter check. If this new filter static pressure measurement has increased by a 0.2" over the last "official" filter measurement (performed at 1pm, or mode change from OFF), then the coil will be declared as frozen. The system will continue to run the fan at the filter measurement speed with cooling off while taking restriction measurements every five minutes. A System Malfunction will be displayed and logged in the Last 10 Events. If the restriction measurement is reduced to a certain amount, or one hour has passed, then cooling will resume, if demand still exists.

On zoned systems, additional calculations will be performed to determine how much the fixed static pressure of the system has increased (due to a restricted coil). This will remove the affect damper movements have on total system static pressure.

On (-B) models, the frozen coil detection will be ignored during blower cutback.

Heat pump / Electric Strip Heating

In heat pump heating, there are 3 possible air flow settings. The AC airflow setting is used to determine the HP airflow setting (Comfort Efficiency or MAX). There is no separate heat pump air flow setting.

On a call for heating, the system will begin with the heat pump. If after 15 minutes the demand has not stabilized or decreased, the system will begin staging in electric heat. With self-identifying electric heaters, the system will stage through the heater stages with a 10 minute minimum run time per stage. If the demand stabilizes it will remain in its current stage, or if the demand is reduced, it will stage down to a lower stage. Ideally, the system will operate the minimum stage of heat necessary to begin reducing the demand.

With non-self identifying heaters, all the electric heat will come on with a call for auxiliary heat.

An auxiliary heat lock out setting is available to prohibit the heaters from coming on until the outdoor temperature is below the setting. During defrost, the auxiliary heat will come on and the lockout will be ignored. The amount of heat in defrost is dependant on the heat pump size and equipment stage. The control calculates the minimum amount of heat

required to eliminate cold blow, and turns on the appropriate number of heater banks.
If a System Malfunction error is generated by the outdoor unit, the electric heat will operate and the lockout will be ignored. There is no heat pump lock out setting available with this system configuration.

Electric heat airflows are factory programmed depending on the heat pump / heater combination, and are not adjustable. Heat pump only heating airflows are as follows:

(-A & -B) Infinity / Evolution Heat Pump Heating Airflows

Comfort			**Efficiency**	**Max**	
Between 12 and 61 outdoor	**Above 61 Outdoor**	**Below 12 Outdoor**	**All Times**	**Low Stage**	**High / Single Stage**
HP_Size((3.5*OAT)+137)*Airflow Multiplier	350 CFM/Ton x airflow multiplier	Use 12 deg for comfort calculation. May be higher depending on unit combination	350 CFM/Ton x airflow multiplier	400CFM/Ton x multiplier	400 CFM/Ton

Airflow Multipliers for (-A) Infinity / Evolution Controls				
All Single Stage	All	All	n/a	1.00
Model	Compressor	Tonnage	Low Stage	High Stage
38TDB, YDB 598B, 698B	Bristol TS	all	0.63	1.05
24ANA7 25HNA6 187A 286A	Bristol TS	2	0.70	1.00
		3	0.70	1.00
		4	0.63	1.00
		5	0.7	1.00
24ANA1 25HNA9 180A 288A	Copeland Ultra Tech	2	1.15	1.15
		3	0.88	1.15
		4	0.80	1.00
		5	0.80	1.00

Airflow Multipliers for (-B) Infinity / Evolution Controls						
Model	Compressor	Tonnage	Low Stage		High Stage	
			Comfort	Efficiency	Comfort	Efficiency
All Single Stage	All	All	n/a	n/a	1.00	1.00
38TDB, YDB 598B, 698B	Bristol TS	all	0.63	0.63	1.05	1.05
24ANA7 187A	Bristol TS	2	0.60	0.70	0.98	1.00
		3	0.56	0.70	0.96	1.00
		4	0.50	0.63	0.97	1.00
		5	0.61	.070	0.98	1.00
25HNA6 286A	Bristol TS	2	0.60	0.70	0.98	1.00
		3	0.55	0.70	0.94	1.00
		4	0.49	0.63	0.95	1.00
		5	0.60	0.70	0.98	1.00
24ANA1 180A	Copeland Ultra Tech	2	0.77	1.15	1.06	1.15
		3	0.73	0.88	1.03	1.15
		4	0.72	0.80	0.98	1.00
		5	0.70	0.80	0.96	1.00
25HNA9 288A	Copeland Ultra Tech	2	0.78	0.95	1.08	1.15
		3	0.70	0.88	0.98	1.15
		4	0.70	0.80	0.95	1.00
		5	0.69	0.80	0.94	1.00

Strip Heat Only Heating

Electric strip heat may be used as primary heat source. If using a self-identifying heater, the system will stage on the heat using the proportional / integral algorithm used for heat pump heating. There will be a minimum of 10 minutes of run time before the system will stage up.

If a non-self identifying heater is used, you will need to select the heater during the learning process. It will then bring on all the heat any time there is a call for heating. It will not stage in the banks if the heater is non-self identifying. Approximate airflows will be as follows:

FE4002			
kW	**Stage 1**	**Stage 2**	**Stage 3**
5	406	469	625
8	406	469	625
9	406	469	625
10	439	506	675
15	504	581	775
18	618	713	950
20	618	713	950

FE4 003			
kW	**Stage 1**	**Stage 2**	**Stage 3**
5	439	506	675
8	455	525	700
9	455	525	700
10	504	581	775
15	553	638	850
18	683	788	1050
20	683	788	1050

FE4005			
kW	**Stage 1**	**Stage 2**	**Stage 3**
5	439	506	675
8	455	525	700
9	455	525	700
10	504	581	775
15	553	638	850
18	683	788	1050
20	683	788	1050
24	910	1050	1400
30	926	1069	1425

FE4006			
kW	**Stage 1**	**Stage 2**	**Stage 3**
5	683	788	1050
8	683	788	1050
9	683	788	1050
10	683	788	1050
15	683	788	1050
18	731	844	1125
20	731	844	1125
24	1138	1313	1750
30	1138	1313	1750

FE5 004			
kW	**Stage 1**	**Stage 2**	**Stage 3**
5	439	506	675
8	504	581	775
9	504	581	775
10	504	581	775
15	585	675	900
18	731	844	1125
20	731	844	1125

Furnace Only Heating

When using a gas furnace for heating, a heating cycle will begin based on the staging selection in the Furnace Setup menu. The following are the available selections:

System (factory default): The UI will control furnace staging. It will always begin in low stage, regardless of the demand, and will run a minimum of 10 minutes in low before staging up to high. If the demand is stabilizing or increasing after 10 minutes in low, the system will stage up to high. It will then stage back and forth between high and low, or stage to low and turn off depending on the demand condition.

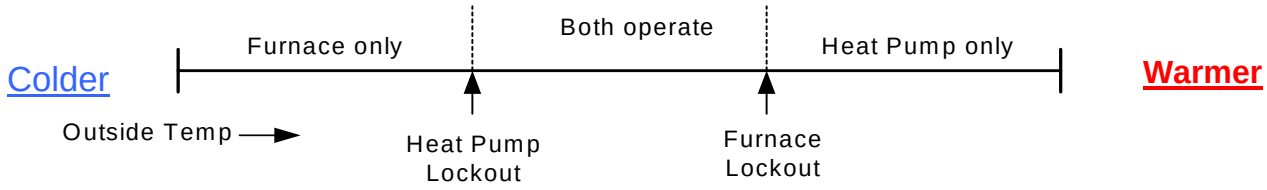
High: high stage only
Low: Low stage only
Furnace: (available in non-zoned only) Furnace board controls heat staging

See furnace literature for low and high stage airflows

Hybrid Heat (Original, (-A) & (-B) models)
When a Hybrid Heat system is installed and commissioned, there are 2 equipment lock out settings available. A setting is provided to lock out the furnace, and a second setting is provided to lock out the heat pump. The heat pump and furnace are not allowed to run together unless the heat pump is in the defrost mode.

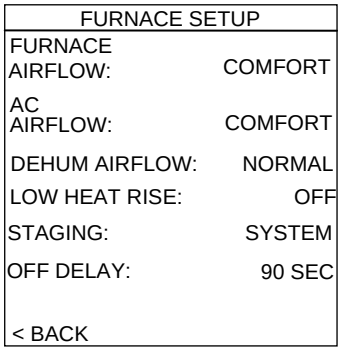
The furnace lockout setting selects an outdoor temperature above which the furnace will not operate (except defrost or emergency heat). The heat pump lock out setting (balance point) selects an outdoor temperature below which the heat pump will not operate. When no lockouts are set, the heat pump will always start the heating cycle, and staging between units is controlled by system demand and staging timers (described below).

On (-A) and earlier models, the heat pump lock out setting is located in the Heat Pump Setup screen and the Furnace Lockout setting is located in the Furnace Setup screen (see figures below). On (-B) models, there is a separate setup area dedicated to Hybrid Heat. The outdoor temperature is read continuously during the heating cycle. If lockouts are set, the outdoor temperature at the start of the cycle determines whether the heat pump or furnace begin the heating cycle. The diagram below shows how the lockout temperatures affect system operation.

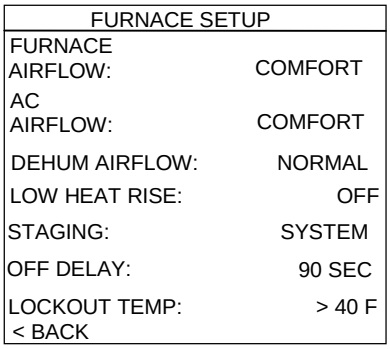


The Infinity/Evolution setup screens will self-configure to show the equipment installed. The Furnace Setup screens below reflect all the available setup options. In a Hybrid Heat system, the LOCKOUT TEMP setting will appear. This setting allows for the setup of a temperature between **NONE, or 5° to 55°** Factory Default is **NONE.** The furnace will not operate above this outdoor temperature, except for defrost or emergency heat. In defrost, the furnace will come on regardless of lock out settings and the call will be completed with the furnace on original and (–A) version 10. With (-A) version 12 and (-B) models, the system can revert back to heat pump after a 2 minute delay. On (-B), there are additional setup options available. The user can select no furnace operation during defrost if desired, and also select longer heat pump run time before staging up to furnace.

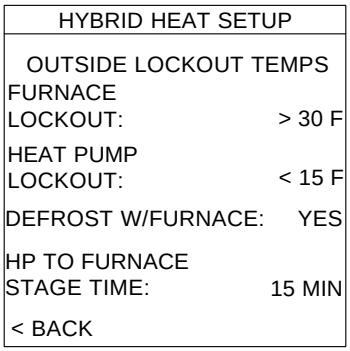
Non-Hybrid Heat



Hybrid Heat (-A) and earlier



Hybrid Heat (-B) Model



(Hybrid Heat cntd)

With original and (-A) models, the Heat Pump Lockout will be displayed in the Heat Pump Setup screen. With (-B) models, a separate setup screen is used. The available settings are **NONE**, or **5° to 55°.** Factory Default is **NONE.** The temperature displayed is the outdoor temperature below which the heat pump will not operate.

Non - Hybrid Heat

HEAT PUMP SETUP	
COOLING LOCKOUT:	NONE
ENTERED SIZE:	36 KBTU
DEFROST INTERVAL:	90 MIN
HIGH COOL LATCH:	NON
< BACK	

Hybrid Heat (-A) and earlier

HEAT PUMP SETUP	
COOLING LOCKOUT:	NONE
ENTERED SIZE:	36 KBTU
DEFROST INTERVAL:	90 MIN
LOCKOUT TEMP:	< 15 F
HIGH COOL LATCH:	NONE
< BACK	

Hybrid Heat (-B) Model

HYBRID HEAT SETUP	
OUTSIDE LOCKOUT TEMPS	
FURNACE LOCKOUT:	> 30 F
HEAT PUMP LOCKOUT:	< 15 F
DEFROST W/FURNACE:	YES
HP TO FURNACE STAGE TIME:	15 MIN
< BACK	

In original models, the Infinity/Evolution control has a built in five-degree dead band between the furnace and the heat pump lockout setting. The lockout settings cannot be set at the same temperature. In (-A and -B) models, the lockout settings may be set to the same temperature.

If the system needs to stage down during normal heating mode, (because room temp is approaching the set temp), the system will stage from furnace back down to heat pump. There will be a two-minute delay between stages in order to cool down the coil. If the furnace is on due to defrost, it will stage down with (–A) version 12 and (–B) models. With Original models and (-A) version 10, the cycle will be finished with the furnace. Again, during defrost, the furnace will come on regardless of lockout settings.

<u>Hybrid Heat Sequence of Operation; from satisfied to full heating:</u>

1. First Stage heat pump
   Ten-minute staging timer if 2-stage heat pump
   Fifteen-minute timer if single stage heat pump
2. Second Stage heat pump (if a 2-stage heat pump)
   Fifteen-minute different fuel time (Electric to Gas). Can be increased with (-B) models.
3. First Stage GAS (Heat pump off unless defrost)
   Ten-minute staging timer
4. Second, stage GAS

Notes: With (-A) and earlier controls, heat stages are not shortened due to a 5-degree or higher demand. All stages are utilized for the full-allotted time described above. With (-B) models, a 5 degree demand will override the staging timers and higher stages will operate sooner. Pressing the FAN and TEMPERATURE UP buttons simultaneously defeats cycle timers.

(Hybrid Heat cntd)

With a Hybrid Heat System, What happens if:

- The outdoor sensor fails – The system will always start a heating cycle with the heat pump and stage up and down as if no lockouts were set.

- The heat pump fails (fully communicating system) - if the heat pump control generates a SYSTEM MALFUNCTION fault, the system will stage up to the furnace after staging timers expire. The furnace lock is ignored during this process.

- The heat pump fails (non-communicating heat pump with NIM)- The system will not know if the heat pump is running, but it will naturally stage up to gas furnace once the staging timers have elapsed.

- The furnace fails to ignite, blower is OK (**original models)** - the system **will not** revert back to heat pump operation. It will continue to try and run the furnace to satisfy the demand.

- The furnace fails to ignite, blower is OK (**-A, -B models**) - Once an ignition fault code is set by the furnace, the system **will** revert back to heat pump operation, and continue to run as long as a call exists The heat pump lock out is ignored.

    - **NOTE: if the ignition fault occurs during a defrost cycle, the system may not revert back to the heat pump. With –B models, the system will revert to heat pump if the fault occurs during defrost.**

- No gas is available, but the heat pump is powered (**original models**) – Depending on lock out settings, the heat pump will operate until a defrost demand exists. It will then attempt to bring on the furnace during defrost. Since the furnace is used to complete the call when a defrost cycle occurs, the system will continue to attempt to run the furnace and **not** revert back to heat pump heating.

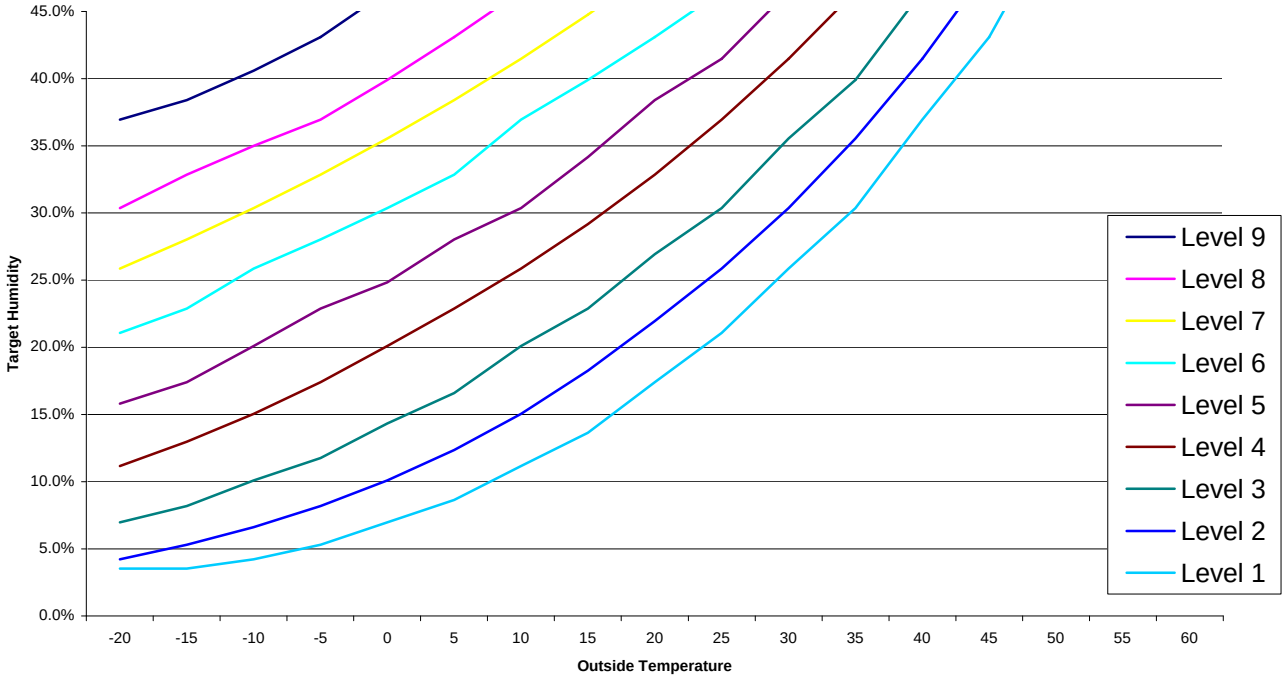
- No gas is available, but the heat pump is powered (**- A, -B models**) - Once the furnace sets an ignition fault code, the system **will** revert back to heat pump operation, and continue to run as long as a call exists. The heat pump lock out setting is ignored, and the system will defrost normally.

Heating Humidification

The customer can select either Auto humidification or Manual. With Manual humidification, the user will select a fixed humidity target from 5% to 45%. With Auto selected, the user will select a relative level from 1 to 9, which represents the insulation level of their windows. When in Auto, the target humidity will be at 45% until the outdoor temperature triggers the system to begin following one of the curves below. **To view current target vs. humidity readings, press and hold the right side button for 3 seconds to access System Status**

For example, if an Auto Humidity setting is on Level 1(aqua line on chart) the humidity target will be at 45% until the outdoor temperature reaches around 47ºF. The target humidity will then follow the Level 1 curve as the outdoor temperature decreases. At 28 ºF, the target humidity will be at around 22%. If the Auto Humidity setting is on level 7 (gold arrows), the target humidity will be at 45% until the outdoor temperature reaches around 16ºF. It will then follow its curve as the outdoor temperature decreases. At around 6ºF, the target humidity will adjust to 38%.

The better the window, the higher the level the customer should select. Each of these levels corresponds to a psychrometric curve where the humidity target is selected based on indoor and outdoor temperature.



If the customer is experiencing condensation on their windows, then a lower level should be selected. Conversely, if no condensation appears, and higher humidity levels are desired, then select a higher level.
On the –A models, the Humidity with Fan selection will bring on the fan with a call for humidity without a call for heat. On original models, continuous can was required for this feature.

Ventilator Function

The ventilator has four settings in heating mode and three settings in cooling mode:

Heating - AUTO – the ventilator runs continuously and selects the ventilator fan speed based on indoor humidity and outdoor temp. It may cycle on/off every 30 minutes depending on humidity and outside temp (see chart below).

LOW – low speed all of the time.
HIGH – high speed all of the time.
DEHUM – will only turn on if indoor humidity is 3% over the set point. The speed is determined by indoor humidity and outdoor temp.

Cooling - AUTO – the ventilator fan speed is selected based on indoor humidity and outdoor temp. High speed may cycle on/off every 30 minutes depending on humidity and outside temp (see chart below). This is referred to as medium speed in the chart.
LOW – low speed all of the time.
HIGH – high speed all of the time.

If the fan coil or furnace fan speed is set to Auto and the ventilator wants to run, the fan speed will run at High continuous speed on original UI controls. Beginning with the –A model UI, it will run in low speed. Otherwise indoor unit fan will stay at the chosen continuous fan speed.

Ventilator Speeds (-A & -B) Models

Outdoor Temp	RH Above Target	RH Below Target
-20	Low	Off
-15	Low	Off
-10	Low	Off
-5	Low	Off
0	Med	Low
5	Med	Med
10	Med	Med
15	High	Med
20	High	Med
25	High	Med
30	High	High
35	High	High
40	High	High
45	High	High
50	High	High
55	Med	High
60	Med	High
65	Med	High
70	Med	High
75	Med	High
80	Low	Med
85	Low	Med
90	Low	Med
95	Low	Med
100	Low	Med
105	Off	Low
110	Off	Low
115	Off	Low
120	Off	Low

True Sense Dirty Filter Detection for (-A & -B) User Interface

At 1:00 PM each day, or when the user switched the system from OFF to any operating mode, the fan will run at either 233 CFM/ton of cooling capacity or (90% High Heat Airflow/1.5), whichever is higher for one minute after heating/cooling is turned off (A heating or cooling call will be interrupted if in progress at 1:00 PM). If the furnace staging is set to LOW, then use the low furnace airflow/1.5 or cooling airflow (233 CFM/ton), whichever is highest. Blower RPM measurements are then taken and a static pressure is calculated.

If the blower has not run in the past 24 hours, the measurement will not be made. If the system is off and the fan is off (or Auto), the current measurement will not be performed.

Zoning Continuous Fan Operation

With the Infinity/Evolution system, one can select a different fan speed for each zone. Using the known relative size of each zone, a High, Medium, and Low fan speed can be calculated for each zone. High speed is the highest heating or cooling airflow (whichever is greater) multiplied by the zone size. For example, if the high cooling airflow is 2000 CFM, and a zone's size is 25%, High fan speed for that zone is 500 CFM (2000 x 25%). Medium speed is 75% of High speed, Low speed is 50% of High speed.

Each zone's desired CFM is calculated and summed together. The indoor unit blower is then driven to that summed speed. If all of the zones are demanding the same speed (High, Medium or Low) then the dampers are all positioned fully open (position 15). If a zone is requesting a lower speed than others, then its damper will close to a fixed position (10 for medium, 8 for low).

If one zone is calling for a continuous fan speed, and the other zones are all set to Auto, then a problem may arise. The minimum indoor unit blower speed may be greater than the CFM demanded from the zone. In these cases, the user interface will open the Auto zones to dump the air down to the required level demanded by the demanding zone. For example, a zone that wants continuous fan has a max airflow of 600 CFM; so Low speed continuous fan setting is 300 CFM (50%). So the system opens that zone to position 15 and delivers 300 CFM to that zone, but the indoor unit's minimum is 680 CFM, so the system has to find some place to dump the other 380 CFM. It opens the Auto zones enough to dump the 380, divided equally between them.

Now the fan setting is raised to High. The calling zone now wants 600 CFM. The indoor unit's minimum is still 680, so the calling zone stays wide open (15) and gets 600 CFM, the Auto zones now need to dump 80 CFM between them, so they do not need to open as much as before.

Zoning Duct Assessment

With (-A) and earlier models, the system will perform a duct assessment every 24 hours at 1 PM in order to determine the relative size of every zone. The time is not adjustable. With (-B) models, the duct assessment time is selectable to any hour of the day or night. The duct assessment will take approximately 1-½ minutes per zone to complete. The system will first open all zones and drive the blower to 175 CFM/ton of cooling (or the minimum indoor unit's airflow, whichever is greater). It will then take a static pressure measurement. The system will then close all zones and open one zone at a time, taking a static pressure measurement for each zone. The system will then close all zones and take a pressure measurement, getting a value for the duct leakage up to and through the dampers. With these static pressure measurements, the system will calculate the relative size of each zone as well as the percent leakage through the dampers.

Blower Cutback

Blower cutback is a feature in the User Interface that is designed to protect the indoor unit from extremely high static pressure situations. The process begins when the indoor blower motor sets a cutback “flag” which tells the UI the RPM is at the maximum allowed by the motor. This is typically around 1300 RPM.

Zoned System Cutback – when the motor sets a cutback flag, the requested CFM begins to back down in 50 CFM increments. This will be seen in the Furnace or Fan Coil Status screens. The CFM request is reduced until either the indoor motor removes the Cutback flag (RPM is sufficiently reduced), or the airflow request is at the minimum allowed. If minimum airflow is requested before the cutback flag is removed, the system will attempt to dump air using the same method as Airflow Limiting (stage down, dump to unoccupied zones, adjust set points etc.). If the cutback flag is still active after dumping, the system will shut down and set an ECXESS STATIC PRESSURE fault in the Last 10 System Events. The system will start again when more zones call for conditioning, and airflow restrictions no longer exist.

During Cutback on Original and (-A) models, the Static Pressure displayed in the Service Screens is not valid since the unit cannot deliver the requested airflow. With (-B) models, UNKNOWN will be displayed for Static Pressure while blower cutback is active.

Non-Zoned Cutback – when non-zoned systems are in blower cutback, the process is identical to zoned systems, except there are no provisions for airflow dumping, and the system will not shut down when the EXCESS STATIC PRESSURE fault is set.

Zoned System Staging – Normal Operation

Each zone's temperature is continually measured to within 1/16 degree. When any zone's demand is greater than 0.8 degree or the average of all zone demands is greater than 0.5 degree, the equipment is turned on or staged up one stage if it is already on. When the average demand of all zones is zero, the equipment turns off or stages down. This provides temperature control in all controlled zones within less than one degree of set point. Note that when a damper is closed, its zone is satisfied. If other zones still have demands, the equipment will continue to run and this closed zone may become overconditioned due to air crossing over from other zones. Under these conditions, it cannot be controlled.

Zoning Airflow Limits and Equipment Protection

The maximum airflow allowed into a zone is based on the relative size of the zone determined by the duct assessment, and the airflow limits selected for each zone. Airflow limits are set to high as factory default. This means that 200% of the assessed air flow is allowed into the zone. Example: if a zone size is determined to be 25% of the entire system, and the maximum airflow (heating or cooling) is 2000 cfm, the maximum airflow into this zone is 2000 x 25% x 200% = 1000cfm.

This airflow limit multiplier can be adjusted to reduce or increase allowable noise levels; Low = 100%, Med = 150%, Max = 210% (will not cause stage down when reached).

If the system determines that with the selected airflow limit, the allowable airflow into a zone is not sufficient for the equipment to operate correctly, and that zone has a call for conditioning, the system will take the following 4 steps:

1. Reduce airflow if possible
   a. Minimum of 275 CFM per ton minimum in high stage cooling (325 if Dehum airflow set to High). 175 CFM per ton in low stage cooling
   b. Comfort Heat airflow is minimum for heat pump heating (3.5 x outdoor temp + 137) cfm /ton
   c. Use heat pump comfort airflow as minimum if AC Airflow is Efficiency or MAX
   c. No adjustment for furnace heating
2. Dump air to zones set to Unoccupied
   a. Unoccupied zones can be conditioned up to the most conditioned set point
3. Dump air to zones with less conditioned set points
   a. Zones with less conditioned set points may be conditioned to within 3 deg of the most conditioned set point.
   b. Increase or decrease all zones an additional 0.75 deg
4. Stage down equipment
   a. Equipment will stage down or shut off if necessary
   b. Last 10 System Events will record an AIRFLOW LIMITED event
   c. If shut down occurs, other zones need to call before equipment will resume operation

Minimum Equipment Airflows in Zoned Systems

When airflow limits are set to MAX, the maximum airflow allowed into a particular zone is 210% of the assessed airflow for that zone. Example: if a zone size is determined to be 25% of the entire system, and the maximum airflow (heating or cooling) is 2000 cfm, the maximum airflow into this zone is 2000 x 25% x 210% = 1050cfm. If this is the only zone calling for conditioning, it may not be sufficient airflow for the system to operate reliably. The zoning system uses the chart below to determine the minimum airflow that must be achievable before the system will turn on or continue to run.

Using the previous example, in cooling, a 2-stage 5 ton system's minimum airflow per the chart is 275 cfm/ton (1375 cfm). The maximum airflow allowed into a zone set to MAX airflow limit is 1050cfm. The system will not turn on in high stage because this is below the minimum airflow required for high stage. The minimum airflow for low stage is 175 cfm/ton (875 cfm). The system will turn on in low stage and attempt to run full low stage airflow. This will depend on the type of outdoor unit installed and the current humidity demand. A typical 2-stage Bristol compressor system will run about 220 cfm/ton when set to efficiency low stage airflow which is 1100 cfm for a 5 ton. This is slightly higher than maximum allowed into the zone, but well above the minimum for reliable operation. The system will turn on in low stage and reduce the airflow to 1050cfm which is the maximum airflow allowed into that zone set at MAX airflow limit.

If the zone is very restrictive the system will attempt to dump air into other zones per the steps shown in the Airflow Limits and Equipment Protection section above (beginning with step 2 since this is already the minimum airflow). If all steps are unsuccessful, the system will shut down and register an EXCESS STATIC PRESSURE event in the last 10 system events.

Application	**Minimum Air Flow per zone to keep System Running**		
	Cooling		**Heating**
	High Stage/ Single Stage	Low Stage	
Furnace + Air conditioner	275 / 325 cfm/ton	--	Low Stage Furnace Airflow
Hybrid Heat	275 / 325 cfm/ton	175 / 225 cfm/ton	Above Heat Pump Lockout: Comfort Heat Pump Heating Airflow. Below Heat Pump Lockout: Low Stage Furnace Airflow.
Heat Pump + Fan Coil + Electric Heat	275 / 325 cfm/ton	175 / 225 cfm/ton	Comfort Heat Pump Heating Airflow or Efficiency Heat pump airflow depending on airflow setting.
Furnace only	--	--	Low Stage Furnace Airflow
Heat Pump + Fan Coil + Hot Water Coil	275 / 325 cfm/ton	175 / 225 cfm/ton	Comfort Heat Pump Heating Airflow or Efficiency Heat pump airflow depending on airflow setting.
Fan Coil + Hot Water Coil	275 / 325 cfm/ton	175 / 225 cfm/ton	Hot Water heating selected airflow

- **Airflows listed are for Normal / High Dehumidify settings respectively**

Hydronic Heating

The –B model of the Infinity / Evolution control has an added capability of Hydronic Heating. This capability is limited to FE fan coil only. In order for this to work properly, the following are required:

- (-B) User Interface
- Fan coil with control board HK38EA011 or newer (model FE4ANF00x0000ABAA or FE5ANF00x0000ABAA)
- Hydronic Heat Kit for FE fan coil KFAIF0101HWC

The Hydronic Heat kit contains a plug that is installed in the FE fan coil where an electric heater would otherwise be installed. This plug contains a resistor that identifies it as a Hydronic Heat application. The (-B) UI then provides set up options in a separate Setup screen. See figure below.

Older fan coils can be upgraded to use the hydronic application by replacing the control board with the HK38EA012.

The system will treat hot water heat as auxiliary heat or the primary heat source if a heat pump is not installed.

HYDRONIC HEAT SETUP	
HOT WATER LOCKOUT::	> 30 F
HEAT PUMP LOCKOUT:	< 45 F
DEFROST W/WATER:	YES
AIRFLOW:	800 CFM
BLOWER ON DELAY:	30 SEC
BLOWER OFF DELAY:	30 SEC
< BACK	

G Terminal Fan Operation

The G Terminal may be used to energize the fan from an external input. For a wiring diagram, see the UI installation instructions. When the G Terminal is configured to run the blower, the blower will run at the fan speed that has been selected at the UI under the G Terminal setup. The heating or cooling fan speed overrides any G input during the call. A G input will override any continuous fan that has been set at the UI main screen.

G Terminal System Shutdown

The G Terminal can be configured to shut down the system in the event that a float switch or other device makes or breaks the R-G connection at the furnace/fan coil board. This is not intended for fire safety shutdown. Any blower off delays will still operate when required by the indoor unit and the operating mode. See UI installation instructions for G terminal wiring and configuration settings.

G Terminal System Malfunction message

A G Terminal input can be used to alert a home owner with an external device. This will produce a System Malfunction pop-up message to alert the home owner. See UI installation instructions for G terminal wiring and configuration settings.