TECHNICAL INFORMATION COMMUNICATION

Quality and Continuous Improvement

Number: TIC2021-0005 **Date:** 2/17/2021

Title: 26/24 Seer Variable Speed Operation

Product Category: Residential Inverter Splits Products

Operation:

The Infinity®/Evolution Extreme® 26 & 24 Condensing Units use several different settings, values, and components to adjust the speed of the indoor and outdoor units to provide cooling or heating to the space.

The system uses the System Control (Thermostat/ User Interface and any remote sensors (if there is a zoning system)) to reference 8 different tables (shown in Figure 2) to tell each component what speed to switch to for proper operation. Each table has a nominal value for the component to operate towards, to provide cooling or heating (Figure 1). The System Control will determine what table to select based on the current airflow setting, type of conditioning it is in (heating or cooling) and outdoor ambient temperature.

The System Control, through a PI (control algorithm) loop, is constantly evaluating and anticipating the next change in the space to adjust a component's speed or position as needed to keep up with the different demands of the space. Example: Your 6-year-old son leaves the back door open when he runs to get his dog in the back yard because he is stuck in the snow. The system was already running at a slower speed, but the System Control sees the temperature drop and starts speeding up the compressor to help deliver more heat to the space.

The System Control shows an Equipment Operating Status in a percentage when the outdoor unit is operating. This value is based on the demand and available capacity of the operating range per the tables mentioned above. A 40% displayed indicates it is operating at a 40% value of that operating range and not a 40% capacity of the overall nominal total system capacity. An operating status of 40% will have a different heating or cooling system output from table to table.

System Protection:

Just as the System Control is evaluating and anticipating the next system change for temperature it is also making sure the system is protecting itself from damage. It is evaluating temperature readings, airflows, system pressures, fan, and compressor speed to make sure the system is in a good operating zone. The system will speed up and slow down the compressor speed based on pressures, temperatures and what the PI loop is anticipating. Each Table (8 tables referenced above) has another Compressor Envelope Table that it references in the background to keep the compressor in a safe operating zone. Figure 3 is a very simple example of the Compressor Operating Envelope we use to reference speed and pressures to keep the operation inside of the rectangle. The envelope is created to ensure system oil and refrigerant return to assure the compressor will be lubricated and cooled for system operation and reliability.

System's Adjustments:

The factory default settings allow the system to operate from a nominal system capacity from a minimum (25%) and up to the maximum (100%) based on ambient conditions and heat or cooling load demands. The System Control software has the ability to set limits on the capacity of the outdoor unit.

Although we have created this feature, we still recommend allowing the system to adjust the operation itself to meet the demands seen by the equipment instead of limiting it by the setup feature.

System capacity limits can be applied in the dealer advance setup screens under: Service; Setup; AC/Heat Pump Setup; Capacity Limiting Cooling Heating. The ranges are adjustable by 10's from 10% to 100%. The adjustment settings from 10% to 100% adjust the operating range between minimum and maximum operation. The equipment uses a complex set of tables to select minimum and maximum compressor operating speeds based on outdoor temperature, operating mode (heating vs. cooling) and several other factors. If a capacity limit is selected, then an operating limit below the maximum capacity will be used. For example, consider a system with operating conditions where the minimum compressor speed is 900rpm and the maximum compressor speed is 3660rpm. If a capacity limit of 50% is selected, the compressor speed will be limited to the mid-point between minimum and maximum speed, or 2280rpm in this example.

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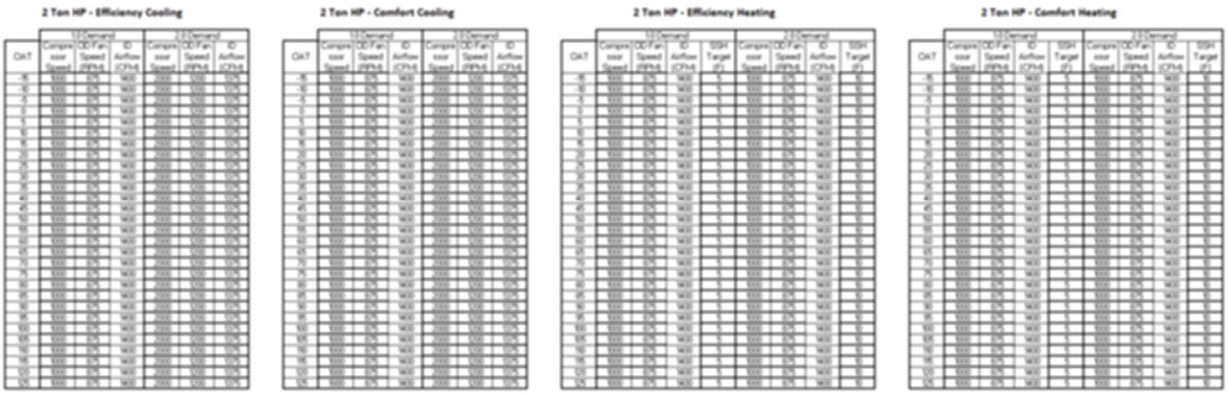
Minimum Heating Table	
Compressor Speed	900 RPM
Condenser Fan Speed	300 RPM
Indoor Unit Airflow	400 CFM
Electronic Expansion Valve Position	30%
Suction Superheat (Heating only)	4 deg F

Values scaled for demand between tables

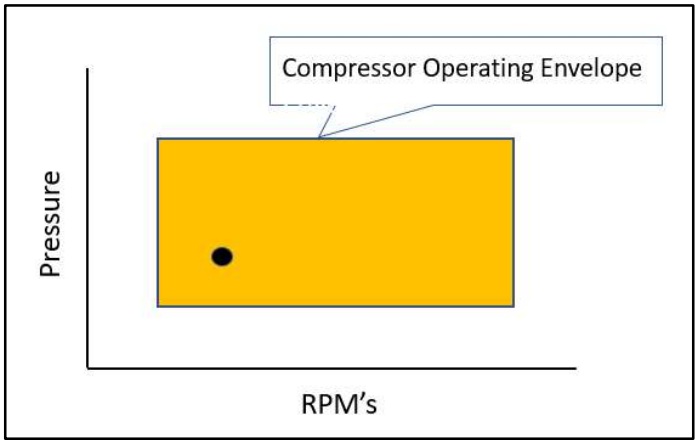
Maximum Heating Table	
Compressor Speed	3660 RPM
Condenser Fan Speed	800 RPM
Indoor Unit Airflow	1200 CFM
Electronic Expansion Valve Position	75%
Suction Superheat (Heating only)	9 deg F

*Table values are for example only

(Figure 1)



(Figure 2)



(Figure 3)

Only trained and qualified personnel should design, install, repair and service HVAC systems and equipment. All national standards and safety codes must be followed when designing, installing, repairing and servicing HVAC systems and equipment. It is the responsibility of the Dealer to ensure local codes, standards, and ordinances are met.