ICP Inverter Heat Pump Application Guideline

The ICP Inverter variable speed heat pump provides a flexible alternative to high-priced variable speed systems on the market today, as well as a competitive option compared to 2-stage products currently being offered. Its highly efficient, smaller and lighter design offers many benefits to dealers and homeowners alike. This document outlines the recommended application guidelines and differences from other products.

Overview

The ICP inverter is an inverter-driven variable speed heat pump designed for the ducted residential market. Its size and weight advantage makes it easier for dealers to handle and stock, and allows for high-efficiency installations in tighter spaces than previously possible. It is designed to complement the dealer's product offering by adding a variable speed option to compete in this expanding market.

Benefits of Variable Speed

Variable speed systems provide several benefits to the homeowner. The wide capacity range of the system allows it to more closely match the home's needs as conditions change. This increases indoor comfort by running longer comfort cycles at lower speeds thus eliminating up and down temperature swings. Longer cycles at lower speeds also translate into higher efficiency, and lower overall sound levels both indoors and outside. The wide capacity range also improves zoning and dehumidification capability compared to 2-stage and 1 stage systems.

Comparison to 16 SEER 2-stage systems

This new model offers several benefits compared to two-stage systems. Below is a comparison of the new ICP inverter variable speed model compared to the 16 SEER two-stage model:

The chart below shows the major differences between ICP heat pump lines

	ICP Inverter with Observer® Wall Control	**16 SEER 2-sage**
SEER	Up to 19	Up to 17.5
EER	Up to 13	Up to 13.5
HSPF	Up to 11	Up to 9.5
Compressor Type	Variable speed Rotary	2-stage Scroll
Compressor Stages	5 stages as low as 25%	2 stages as low as 70%
Line length	Up to 100ft. equivalent length	Up to 250ft equivalent length
Fan motor	Compact ECM(Brushless DC) No module attached Inverter driven	Standard PSC
Ambient range	Cool: 40º-115ºF communicating (4.4º-46.1ºC) Cool: 55º-115ºF non-communicating (12.8-46.1ºC) Heat: 10 - 66ºF(-12.2-18.9 ºC) Not initially qualified for Low ambient cooling	Cool: 55º-125ºF (12.8º-51.7C) Heat: -20 - 66 ºF(-28.9º-18.9C) Low ambient cooling capable with kit
Sound	56dBA-73 dBA	67dBA – 71 dBA
Basepan sizes	24, 25 and 36 sizes - 23”x23” 37, 48 and 60 sizes - 31.25” x 31.25”	35”x35” all sizes
AHRI Ratings with	Observer communicating indoor for full 5-stage functionality with Touch Control	Observer Communicating indoor 2-stage functionality with Touch Control
	2-stage indoor for 2-stage functionality with non-communicating 2-stage thermostat	2-stage indoor for 2-stage functionality with non-communicating 2-stage thermostat

ICP Inverter System Matching

This heat pump unit provides the most customer benefit and highest efficiency **when installed as a complete Observer® Communicating system** including Observer Control. Acceptable system combinations will be listed in the AHRI directory and in the online ratings database, accessible through the Go websites.

For increased system flexibility, and increased replacement opportunities, this outdoor unit is also designed to work with standard non-communicating thermostat inputs. Combination ratings are available with some non-communicating 2-stage indoor units such as the FVM4 fan coil. When utilizing this type of indoor unit, a standard 2-stage thermostat is required, and the system will operate with 2-stage functionality.

Compatibility with existing indoor equipment (also see attached flowchart)

Because this unit is designed to work with communicating or standard thermostat inputs, it opens up opportunities for replacement applications. However, the indoor components must be of suitable size and configuration.

Existing Observer® communicating indoor equipment

The ICP Inverter products are backward compatible with all Observer communicating indoor equipment. However, the non-WiFi® Observer wall control is not compatible with the inverter unit in communicating mode. The software in the non-WiFi Observer will not recognize the outdoor unit, and cannot be upgraded in the field.

A software update to the WiFi Observer control to version 5.0 is planned for August 2015 to add inverter unit functionality. WiFi Observer controls built before this date may be upgraded in the field to version 5.0 software or newer in order to be use with an inverter outdoor unit.

For full system capability with older indoor Observer-capable equipment, the wall control must be upgraded to the Observer control with appropriate software.

Observer Model	Compatible with Inverter	Upgradable in the Field
TSTAT0201CW	Yes, with software version 5.0 or newer	Yes
TSTAT0101SC	No – replace with current version	No

Check ratings for system matches with FCM4 fan coil. These ratings can be applied to old and new FCM4 fan coils units.

NOTE: The 2 and 3 ton ICP inverter models are **NOT** compatible with the FCM4X60 fan coil due to the large size of the indoor coil.

For dual fuel systems, the furnace must have a suitable blower size. Indoor coils built in 2006 or newer may be straight matched to the outdoor unit tonnage or one size larger*. An R410A refrigerant TXV is required on the indoor coil. Indoor coils built between 2005 and 1992 must be one or two tonnage sizes larger than the outdoor unit tonnage*. An R410A TXV must be added to the indoor coil.

Existing 2-stage indoor equipment

The ICP inverter is capable of operating with a standard 2-stage thermostat and non-communicating 2-stage indoor equipment. In this case, the outdoor unit will be wired as a 2-stage system, and will operate as a 2-stage system. Combination ratings will be available with FVM4 fan coils and some furnace/coil combinations. These ratings will apply to both new and existing equipment of like model numbers.

NOTE: In replacement situations, the 24, 25, and 36 size ICP inverter models are **NOT** compatible with the FEM4X60, or FVM4X60.

For existing dual fuel systems, the furnace must have a suitable blower size and staging capability. Indoor coils built in 2006 or newer may be straight matched to the outdoor unit tonnage or one size larger*. A R410A TXV is required on the indoor coil. Furnace coils built between 2005 and 1992 must be one or two tonnage sizes larger than the outdoor unit tonnage*, and a R410A TXV must be added to the suitable indoor coil.

Set furnace high stage airflow at 350-400 cfm/ton
Set furnace low stage airflow at 70-80% of high stage

* Examples

- Straight matched to outdoor unit tonnage- 3-ton ICP inverter unit with 3-ton furnace or fan coil
- One size larger indoor – 3-ton ICP inverter with 3.5 ton furnace or fan coil
- 2 sizes larger indoor – 3-ton ICP inverter with older 4 ton furnace coil

Existing 1-stage indoor equipment

The ICP inverter will work with a 1-stage thermostat as a 1-stage system with suitable indoor coil and fan until the indoor components can be upgraded to provide full variable speed functionality.

Fan coil application – if the fan coil was built in 2006 or after, it may be straight matched or one size larger than the outdoor unit tonnage*. If built between 2005 and 1992, the fan coil must be one size larger than the outdoor unit tonnage*. An R410A TXV is required on the indoor coil.

Furnace coil application – if the furnace coil was built in 2006 or after, it may be straight matched or one size larger than the outdoor unit tonnage*. If built between 2005 and 1992, the furnace coil must be one or two sizes larger than the outdoor unit tonnage*. An R410A TXV is required on the indoor coil.

Set airflow at 350-400 cfm/ton

Line set limitations

The ICP inverter is qualified for line sets up to 100ft equivalent length.

Lift limitations:

Outdoor above indoor: 100 ft.

Outdoor below indoor:

2 ton	3 ton	4 ton	5 ton
80ft	80ft	70ft	60ft

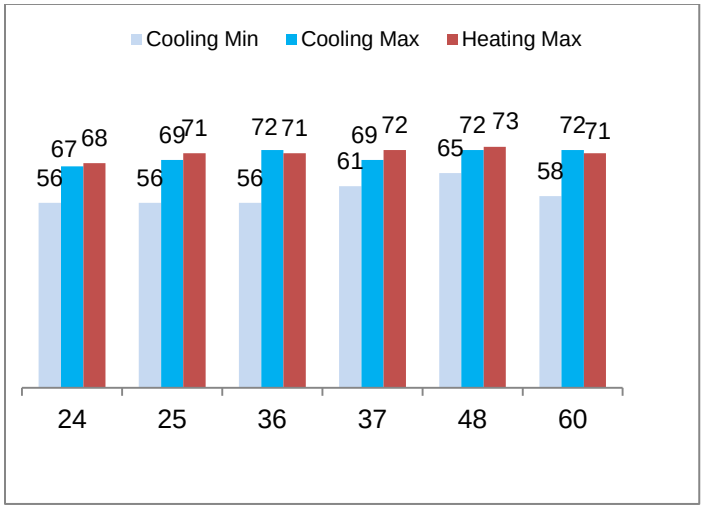
See Product Data for line set diameter requirements

* Examples

- Straight matched to outdoor unit tonnage- 3-ton ICP inverter with 3-ton furnace or fan coil
- One size larger indoor – 3-ton ICP Inverter with 3.5 ton furnace or fan coil
- 2 sizes larger indoor – 3-ton ICP inverter with older 4 ton furnace coil

Sound

The ICP inverter variable speed heat pump adjusts its operating speed through 5 available stages. The operating stage will depend on the load demand of the home as well as outdoor temperature. The operating sound can vary significantly between cooling to heating modes; from as low as 56 dBA in minimum cooling stage to 73 dBA in maximum heating stage. The unit will operate at low stages the majority of the time and increases to maximum speed only at cold outdoor temperatures. See chart below for sound ranges.



ICP Inverter Sound (dBA)

The ICP inverter heat pump will operate extremely quietly in cooling mode and will likely receive only complements from customers regarding its sound. In heating mode, the unit will operate at higher compressor RPM's at cold outdoor temperatures and the sound may be noticed by the customer while it was totally inconspicuous during the summer. Make the customer aware of these sound differences and let them know that the higher speed in heating mode helps the system deliver high efficient and comfortable heating.

Another sound that may be heard by customers is the equalization of pressures during the off-cycle. This unit contains a pressure equalizer valve that is designed to allow easier starting of the rotary compressor (see Figure 1 below). It will energize in the off-cycle to equalize pressure across the compressor. A hissing sound may be heard during this process. This sound is normal, but the customer should be made aware to avoid nuisance callbacks.

Figure 1. Pressure Equalizer Valve

To avoid sound complaints, the following guidelines should always be followed:

Sound DO's

1. Explain the sound range to the customer so that they understand the differences they will hear throughout the year. The higher speeds in heating, while happening for minimal time periods, help produce comfortable and efficient heating during times of more extreme cold.
2. Explain the defrost cycle to customers. The ICP inverter heat pump has a defrost cycle like any heat pump and the sound may be noticeable during winter months. Explain that this is normal for heat pump and required for efficient operation
3. Explain the equalization sound described above to customers to avoid nuisance callbacks.

Sound Don'ts

1. Do not install this heat pump, or any other heat pump, outside bedroom windows. The defrost cycle will likely be heard through the window during winter and my cause customer complaints
2. Due to the wide operating range of this unit in heating mode, it is particularly important to follow published installation guidelines regarding refrigerant lines. ***Do not*** attach refrigerant piping to structural joists or beams in the home. This can transmit vibration and sound into the home which can cause customer complaints. If the lineset is hard mounted to structural members, an accessory vapor line muffler is recommended to minimize transmitted sound. See Product Data for muffler part number.

EER Rating vs. Equipment payback

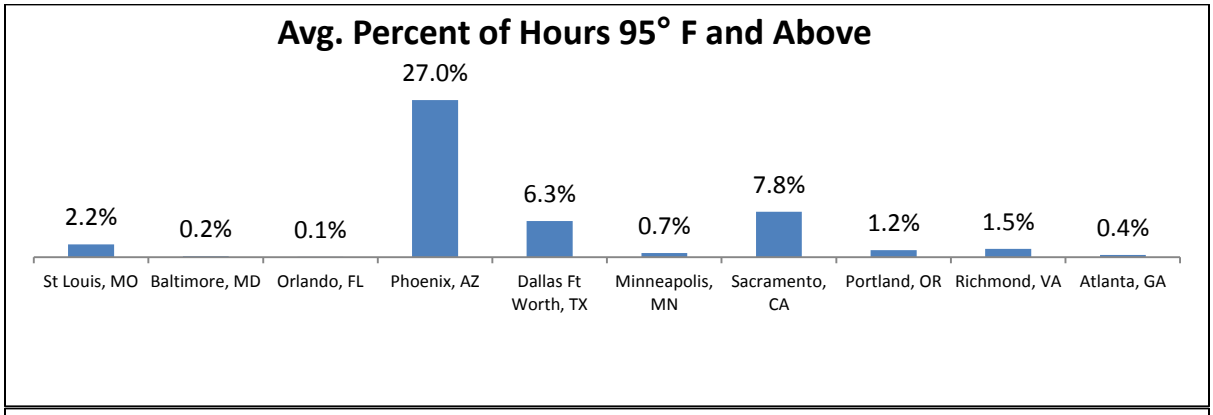
The published EER rating represents efficiency of cooling products at peak load, or 95ºF (35ºC). This rating is driven by utility companies that are concerned with power consumption at peak demand periods. In most locations, peak load is experienced for a very short time during a year (see charts below). The even-size ICP inverter units are designed for high efficiency at lower load conditions, which represents the vast majority of the cooling season. This is why the SEER ratings are high, but the EER is not as high as other high-efficiency products. Some local incentives and rebates require higher EER ratings, however many regions do not require a higher EER rating. The even-model sizes focus on high SEER ratings which allows for smaller unit design and competitive price. For markets requiring higher EER ratings, the odd-size units will be available for these applications.

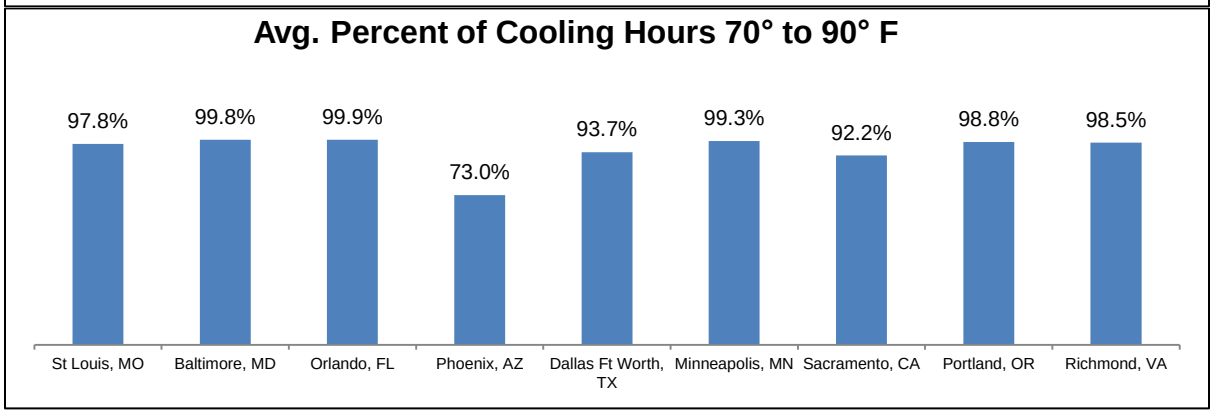
A cost analysis should be done to compare benefit of a rebate with higher EER models vs. the cost of the lower EER models. Things to consider regarding rebates containing EER requirements:

(Cost of qualifying EER equipment) – (rebate amount) = _____

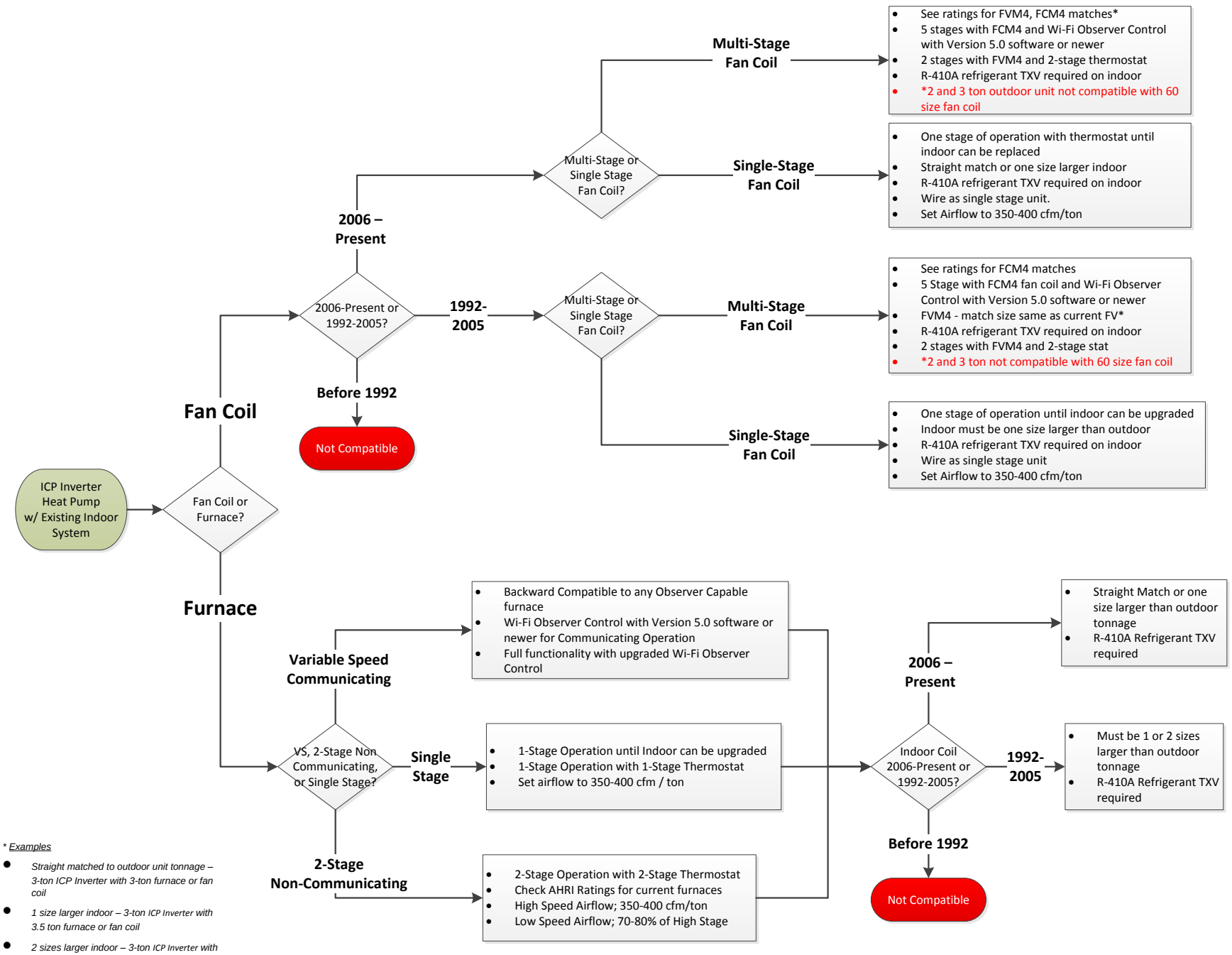
Cost of ICP inverter equipment = _____

In many cases, the cost of the even-size ICP inverter product may be less than a competitive product less the rebate.





ICP Inverter Heat Pump System Matching with Existing Indoor Equipment



* *Examples*

- *Straight matched to outdoor unit tonnage – 3-ton ICP Inverter with 3-ton furnace or fan coil*
- *1 size larger indoor – 3-ton ICP Inverter with 3.5 ton furnace or fan coil*
- *2 sizes larger indoor – 3-ton ICP Inverter with older 4 ton furnace coil*