10 YEARS ANNIVERSARY

Serving the USA Market
With Air To Water Heat Pumps
Since 2015

OFFICIALLY CERTIFIED #1 EFFICIENCY WORLD'S RECORD

Chiltrix

Air To Water Heat Pumps

(a/k/a Reverse Cycle Chillers or
Hydronic Heat Pumps)

AHRI CERTIFIED®

"World's Most Efficient"

ENERGY STAR 2019
Emerging Technology Award

Updated 4-2-2026

Welcome to Chiltrix!

The #1 Ultra-Efficiency Solution to "All Electric Home" HVAC systems and Net Zero energy.

Why all-electric? Because there are no panels you can install on the roof that make gas or oil.

Get Chiltrix Advanced Technology, Features & Worlds Record Setting Performance. All With No refrigerant Inside The Building Envelope. Ever.

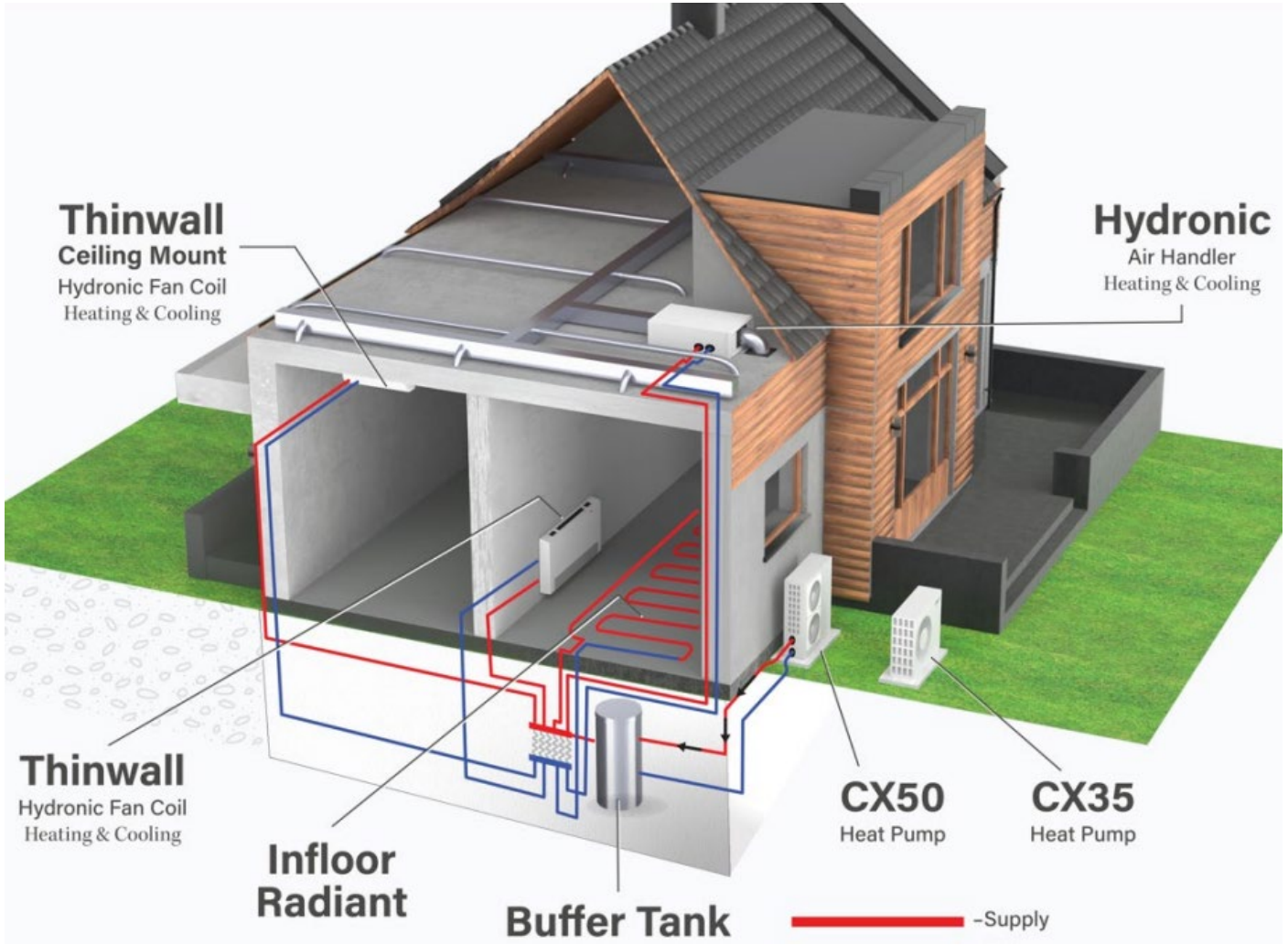
ENERGY STAR 2019 Emerging Technology Award

The Chiltrix ultra-high efficiency air-to-water heat pump CX34 has been awarded the EPA **ENERGY STAR 2019/2020 Emerging Technology Award**

Chiltrix Air-To-Water Heat Pumps

"World's Most Efficient"

Basic System Overview - Functions



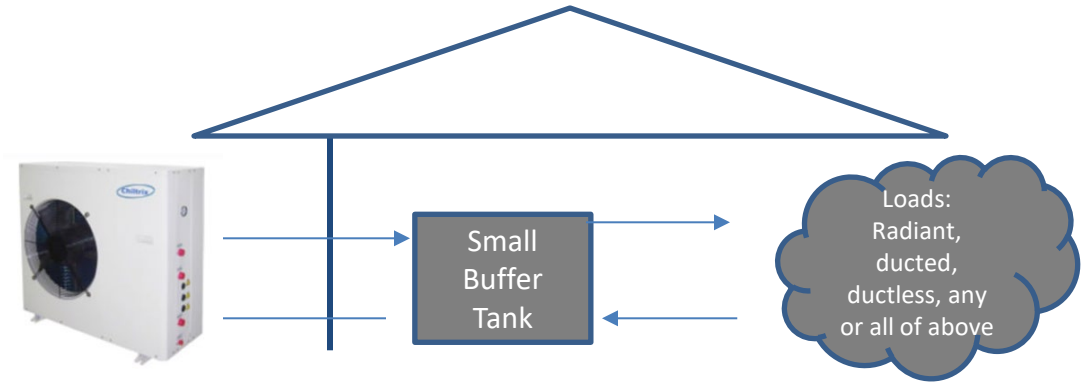
Chiltrix Air-To-Water Heat Pumps

Basic System Overview – High Level

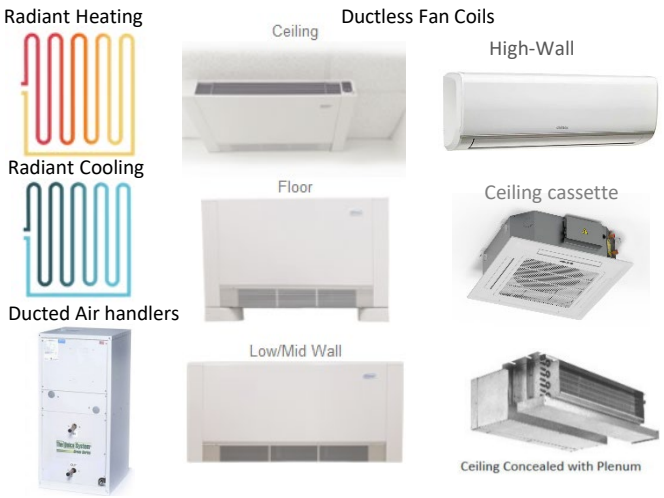
"World's Most Efficient"

- Chiltrix air to water heat pumps use the proven "monoblock" design, meaning that all refrigerant and associated components such as compressor, evaporator, condenser etc. are all self-contained and sealed in the outdoor unit.
- The outdoor unit connects to indoor equipment via insulated water lines (water or water/glycol). Water lines are usually PEX.
- No refrigerant is ever inside the building envelope.

Simplified typical example (Domestic Water Heating Not Shown)



Can be used for radiant heating or cooling, ductless fan coil units, ducted air handlers, or a combination using any or all of these can be used in a single installation.



Chiltrix Air-To-Water Heat Pumps

Basic System Overview - Functions

"World's Most Efficient"

Suitable For Any Combination of:

- Cooling
- Heating
- Domestic Hot Water (DHW)

Install With Any Combination of:

- Radiant System (Heating and/or Cooling)
- Ductless Room Fan Coil Units (Up to 16 or more per system)
  (High-Wall, Ultra Thin Low Wall, Ceiling Cassette)
- Ducted Air Handlers
- Concealed Ceiling Fan Coil Units
- Indirect Water Heater Tank
- Solar Thermal Integration

Chiltrix Air-To-Water Heat Pumps

"World's Most Efficient"

Basic System Overview - Features

- Ultra-High Efficiency up to IPLV EER 23 / COP 4.9
- World's Record Efficiency
  (Highest Among All Certified Air To Water Heat Pumps)
- CX35 2 Tons Cooling, 3.4 Tons Heating
  CX50 3.5 Tons Cooling, 4.75 Tons Heating
  CX65 EVI 3,75 Tons Cooling, 5.5 Tons heating
- Modular for "Stacking" up to Three Heat Pumps
- All-DC Inverter Variable Speed – Compressor, Fan, Pump
- Best of Breed Components
- Dynamic Humidity Control
- Dynamic Backup Heat
- Dynamic Outdoor Reset
- Dynamic Dew-Point Control For Radiant Cooling

Chiltrix Air-To-Water Heat Pumps

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"World's Most Efficient"

Chiltrix Heat Pump Outdoor Units

CX35

CX50

CX65

Chiltrix Air-To-Water Heat Pumps

"World's Most Efficient"

Basic System Overview - Equipment

1. Best-Of-Breed Component Selection – All Key Components are OTS (Off The Shelf). But only from the absolute "TOP" shelf.

2. Compressor: Variable Speed Mitsubishi DC Inverter
   Outdoor Fan: Variable Speed Panasonic DC Inverter
   Air Coil: MULTISTACK
   Water Coil: SWEP BPHE
   Valves: Emerson/Danfoss
   Pump: Variable Speed WILO/Grundfos

3. AHRI-Certified / CEC-Certified Title 24 / UL 60335-1-40 / UL 60335-2-40 / CSA 22.2 / TUV EN 14825

4. All Chiltrix Tanks are Certified to UL 174/CSA 22.2. Chiltrix Domestic Hot Water Tanks are also certified by the U.S. Department of Energy where they have the highest efficiency rating ever achieved by a certified water heater, up to UEF 4.95.

Compare to Geothermal (Ground Source Heat Pumps)

"World's Most Efficient"

- Chiltrix Air to Water Heat Pumps and ground source heat pumps usually have highly similar Seasonal Average Cooling Efficiency.
- In heating climates, Ground Source Heat Pumps generally save some energy cost during the heating season, around $200 per year per ton.
- Air to Water systems have much lower hardware and installation costs, often $10,000 - $20,000 less cost per ton.
- Even after incentives, the energy cost savings of a ground source system usually takes 30-50 years or longer to repay the extra installed cost difference.
- Ground Source systems often have negative ROI compared to Air To Water systems, as the payback time of the extra installed cost often exceeds the system life expectancy.
- No Refrigerant Inside The Building Envelope w/ Air To Water Heat Pumps.

Air-To-Water Heat Pumps & IPLV & SEER

"World's Most Efficient"

There is no "SEER" rating for Air To Water heat Pumps, the rating is called IPLV which is more accurate and can be deconstructed and used for modeling. IPLV, like SEER, is an effort to rate a Seasonal Average Efficiency. IPLV uses a weighted average of EER at each of these conditions. Below is the AHRI formula for IPLV:

- IPLV = 0.01*A+0.42*B+0.45*C+0.12*D @ 44 °F LWT*
  (NPLV uses the same formula, at 54 °F LWT*)

  Where:
  A = COP or EER @ 100% Load
  (About 1% of the time the unit needs to run at around 100% capacity).
  B = COP or EER @ 75% Load
  (About 42% of the time the unit needs to run at around 75% capacity).
  C = COP or EER @ 50% Load
  (About 45% of the time the unit needs to run at around 50% capacity).
  D = COP or EER @ 25% Load
  (About 12% of the time the unit needs to run at around 25% capacity).

*LWT=Leaving Water Temperature (Supply temp, leaving the heat pump)

Air-To-Water Heat Pumps & COP, SCOP & HSPF

"World's Most Efficient"

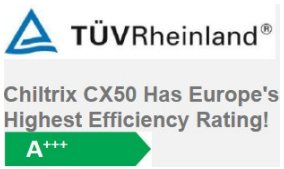
As with SEER, there is no such thing as an HSPF for air to water heat pumps. AHRI 550/590 does provide a heating test standard for full speed heating, but not for seasonal average COP which is far more important.

Chiltrix sent it's CX35 and CX50 heat pumps to the European lab TUV Rheinland for officially certified part load heating performance, called SCOP, tested to IEC EN14825. This standard has highly similar test conditions as Climate Zone 4 HSPF. CX35/CX50 are certified for use in Europe with A+++ rating.

SCOP (Seasonal Average COP) can be converted to its HSPF equivalent by multiplication using a factor of 3.412.

CX35 SCOP = 4.69 = HSPF 16
CX50 SCOP = 4.55 = HSPF 15.5
CX65 SCOP = 5.36 = HSPF 18.3

What does it all mean?
SEER = Seasonal Energy Efficiency Ratio
HSPF = Heating Seasonal Performance Factor
SCOP = Seasonal Coefficient of Performance
EER = Energy Efficiency Ratio (BTU/Watt-hour)
COP= Coefficient of Performance (W/W)
1Wh = 3.412 BTU
1 BTU = .2931 Wh
Wh is energy = 1 Watt of power for 1 Hour
BTU is energy = 1 BTU/h for 1 hour



Note – SCOP is not HSPF and air to water heat pumps cannot have an official HSPF rating. While ASHRAE has the same definition for both HSPF and SCOP, i.e., "the total heating output of a heat pump during its normal annual usage period for heating, divided by the total electric energy input during the same period", the standards are not identical. SCOP is calculated as Watt-hours/Watt-hours and HSPF is calculated as BTU/Watt-hours. There are 3.412 BTU per watt-hour. Therefore, SCOP and HSPF can be used for performance modeling with the conversion factor of 3.412.

Prüfbericht - Produkte
Test Report - Products

TÜVRheinland®

Prüfbericht-Nr.: *Test report no.:*	CN22ULR3 002	**Auftrags-Nr.:** *Order no.:*	**170311612**	Seite 1 von 13 *Page 1 of 13*
Kunden-Referenz-Nr.: *Client reference no.:*	CX35	**Auftragsdatum:** *Order date:*	2022.06.24	

SCOPon	4.74	SCOPnet	4.77
SCOP	4.69		
η_s	185		

Prüfbericht - Produkte
Test Report - Products

TÜVRheinland®

Prüfbericht-Nr.: *Test report no.:*	CN22ULR3 001	**Auftrags-Nr.:** *Order no.:*	**170311612**	Seite 1 von 13 *Page 1 of 13*
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	CX50			

SCOPon	4.57	SCOPnet	4.60
SCOP	4.55		
η_s	179		

Chiltrix Air-To-Water Heat Pumps

"World's Most Efficient"

SGS

Chiltrix Inc.
CX65

Information of efficiency class according to (EU) No 811/2013 for space heating		
Item	Measured value	Verdict
Average (mandatory)		
Declared temperature application	Medium-temperature	—
SCOP	3,881	—
seasonal space heating energy efficiency η_s; %	152,2	A+++
Annual energy consumption Q_{HE};(KWh)	8974	—
Average (mandatory)		
Declared temperature application	Low-temperature	—
SCOP	5,360	—
seasonal space heating energy efficiency η_s; %	211,4	A+++
Annual energy consumption Q_{HE};(KWh)	7380	—

Chiltrix

Chiltrix Capacity Control Patented

AHRI CERTIFIED®
"World's Most Efficient"

1. Manages capacity (compressor & pump speed) to match load based on ΔT between LWT (Leaving Water Temperature) and EWT (Entering Water Temperature) and GPM.

2. System targets ~2.4 - 2.8 GPM per ton and a ~9-10 °F ΔT

3. Real-Time BTU Calculation / BTU = 500 x GPM x ΔT

4. Does not "chase and overshoot" a set point.

5. 500 is the WF (Water Factor) of pure water:
   8.33 (lbs. per gallon) x 60 (minutes per hour) x 1.0 (specific heat of water) x 1.0 (specific gravity of water) = 499.8 (500)

   <u>WF Adjustment for Propylene Glycol Mix</u>:

10% Glycol, WF=494	40% Glycol, WF=463
20% Glycol, WF=488	50% Glycol, WF=442
30% Glycol, WF=480	60% Glycol, WF=421

Chiltrix

Dynamic Humidity Control
Patented Exclusive

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Chiltrix offers its exclusive Dynamic Humidity Control (DHC) as an included feature.

- DHC Manages Dehumidification (Latent Heat Rejection) & Disables Dehumidification When It's Not Needed.
- Can Provide >42% Additional Energy Savings Above The Official IPLV Rating When Dehumidification is Disabled. Chiltrix Official IPLV is > EER 22 . When DHC is Active, NPLV is > EER 30.7 and up to EER 40+
- Prevents Over-Drying the air during cooling operation.
- DHC Function Onboard, No Extra Controller Needed (As of Q1 2025). And indoor humidity sensor is added.
- Extra efficiency is obtained via reduced Carnot lift (negative lift).
- Also perfect for server room cooling operation.

- In a standard AC/cooling system, the unit has no control over the coil temperature - "it is what it is". Only Chiltrix patented DHC technology can proactively and dynamically control the coil temperature.

- When indoor humidity is in the "good" range (user defined), the Chiltrix w/ DHC runs at ~NPLV saving a large amount of energy, well above it's record-setting IPLV EER rating.

- If humidity enters the space (from a door opening, shower, etc.) the DHC controller immediately sees the increase in humidity and drops the coil temperature to its IPLV settings, well below the dew point, to get rid of the humidity.

- Changing the temperature of the supply water to a less-cold temperature reduces the Carnot lift, resulting in a large gain in efficiency (as well as capacity).

$$W = \frac{Q_1}{COP_p} = \frac{Q_1(T_1 - T_2)}{\eta_{mech} T_1}$$

- Prevents unwanted dehumidification and overly dry air which can cause skin, sinus or respiratory problems, and increased static electricity.

Psychrologix™ & DHC Controller

"World's Most Efficient"

Below, the top chart shows IPLV, the bottom chart shows NPLV. Both are results from the same official CX34 AHRI lab test and are based on identical ambient conditions.

The difference – IPLV shows cooling EER at loop (coil) temperature 44.6 °F (7 °C) w/ Strong Dehumidification Active. NPLV shows cooling EER at coil temperature 55 °F (13 °C) w/ Dehumidification Reduced or Disabled. Properly sized FCUs can still manage the sensible cooling load at NPLV (Dynamic Humidity Control Active) Conditions.

As you can see, running the loop 10 °F (6 °C) warmer has a profound effect on EER, increasing the rating from EER 22.21 to EER 30.72. A few more °F difference can raise it to EER 35-42+.

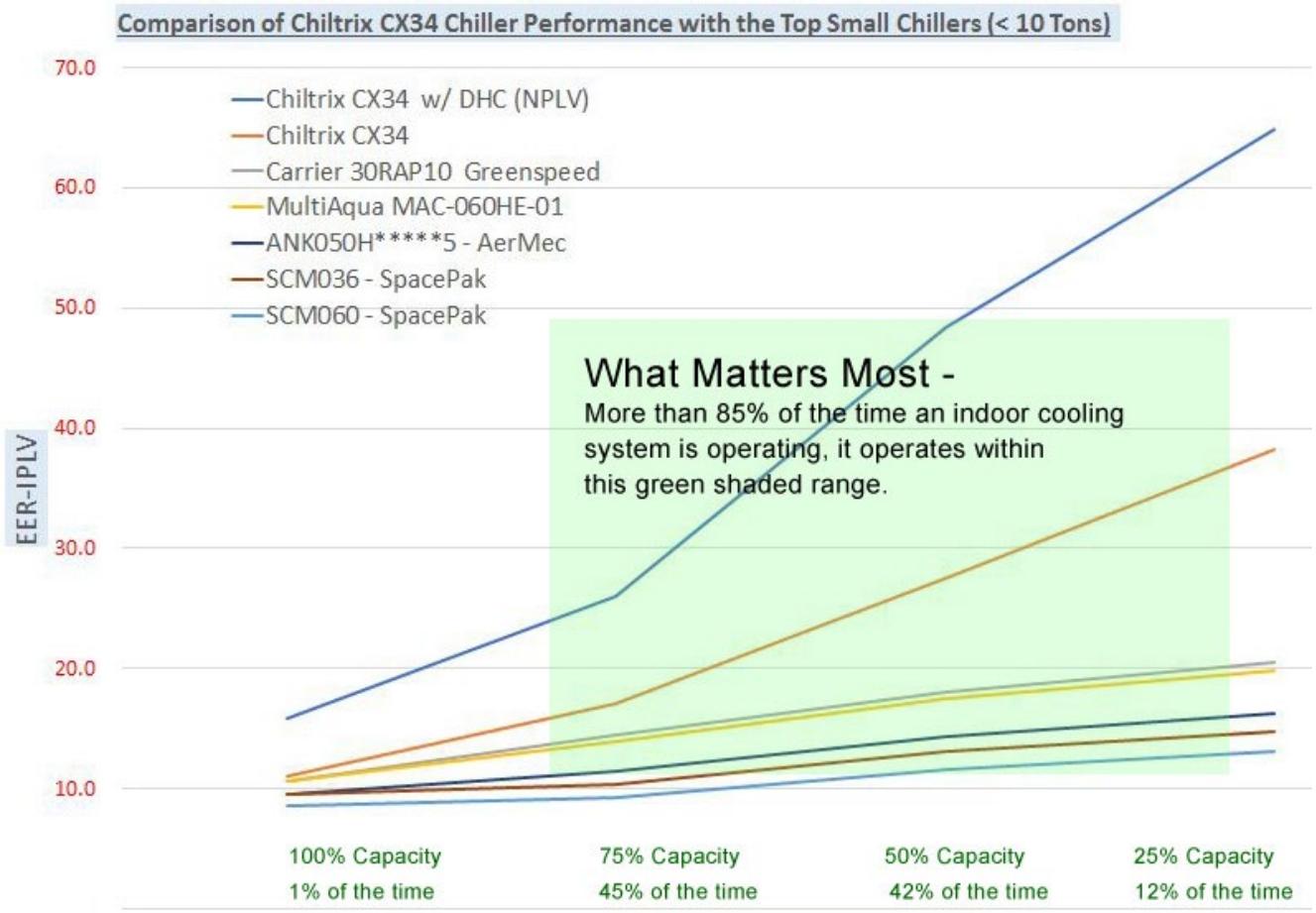
Published Performance	Evaporator Leaving Water Temperature, °C	Condenser Entering Air Dry Bulb, °C and % Load			
		35, 100%	27, 75%	19, 50%	13, 25%
Capacity, kW	7.00	7.500	5.625	3.750	1.875
Total Power, kW		2.381	1.187	0.5054	0.1959
Efficiency, COP (W/W)		3.150	4.740	7.420	9.570
	IPLV.SI	6.510 kW/kW	**EER 22.21**		

Published Performance	Evaporator Leaving Water Temperature, °C	Condenser Entering Air Dry Bulb, °C and % Load			
		35, 100%	27, 75%	19, 50%	13, 25%
Capacity, kW	13.00	8.807	6.605	4.404	2.202
Total Power, kW		2.455	1.138	0.4085	0.1613
Efficiency, COP (W/W)		3.587	5.804	10.78	13.65
	NPLV.SI	8.963 kW/kW	**EER 30.58**		

Compare Air-To-Water Heat Pumps

"World's Most Efficient"

The cart below shows Chiltrix CX34 EER (Both IPLV and NPLV) compared to the top competitors.



The top blue line shows Chiltrix running w/ DHC at NPLV.

The orange line shows Chiltrix running at it's official IPLV.

These other lines show various competitors running at their official IPLV.

Only Chiltrix can dynamically shift between IPLV and NPLV.

For the same reason (reduced Carnot Lift) that our patented DHC/Dynamic Humidity Control saves a lot of energy, radiant cooling, which also uses a less-cold supply temperature for cooling, also saves a lot of energy.

Average seasonal efficiency can be as high as EER 42 with EER 32-35 being typical.

In spite of the huge gain in efficiency, and load reduction, the main attraction of radiant cooling is improved thermal comfort. The human body is simply more comfortable with radiant than with forced-air. And like with radiant heating, radiant cooling also results in improved indoor air quality.

Dew Point: In most climates a radiant controller (Dew Point Controller) is needed to prevent condensation problems.

Humidity: In most climates a dehumidifier is needed. However, modern high-efficiency buildings require a de-coupling of sensible and latent heat removal anyhow, due to reduced sensible cooling loads, so adding a dedicated dehumidification system is usually a requirement regardless of the system type.

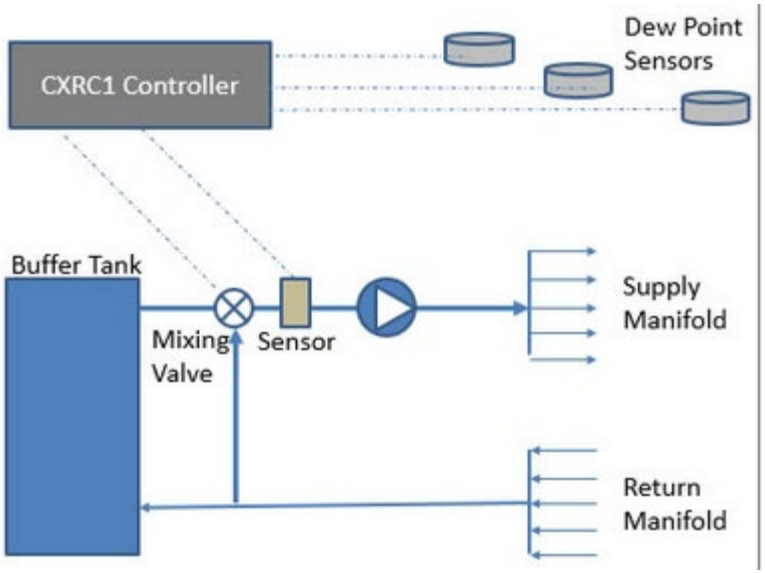
Evaluation required: Radiant heating and cooling temperatures and capacity can be modeled using a load report and a Stephan-Boltzmann calculation.

CXRC Radiant Cooling Controller Prevents Unwanted Condensation

"World's Most Efficient"

Siemens Mixing Valve & Actuator

Dew Point Sensors



Dew point sensor rules:
1 per floor, up to 1600 ft^2

IMPORTANT:
Let Chiltrix evaluate the application!

Advanced calculators available see https://www.chiltrix.com/radiant-cooling/

Heating Operation

1. Heating control: As with cooling mode, capacity is controlled based on ΔT and GPM flow rate. Compressor and pump speed vary to match the load.

2. Typical running temperature of an air to water heat pump for radiant is 95 °F. Fan coil units should be sized for 104 °F entering water temp. Combo FCU-radiant design should be designed for 104 °F. Note that Chiltrix Fan Coil Units and Ducted Air Handlers are rated for 104 °F entering fluid temperature.

3. Radiant heating always requires a buffer tank. Fan coil-only installations can run without a buffer tank with 15-20 gallons minimum loop volume. A buffer tank Is always best, regardless.

4. Optional integrated V18 dynamically variable power backup heater targets an exact match to any heating shortfall and keeps the compressor at full speed.

5. Onboard dynamic outdoor reset with user-customizable curve.

Chiltrix

Heating Operation
Proper Low-Temp Heating Design

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"World's Most Efficient"

1. With All Heat Pumps, "Lift" Drives the COP. (Same as IPLV Vs.NPLV)

2. Lift = ΔT between Ambient and Supply Temp.

1. Carnot Efficiency: $W = \frac{Q_1}{COP_p} = \frac{Q_1(T_1 - T_2)}{\eta_{mech} T_1}$

2. Always Design For The Lowest Possible Heating Supply Temperature.

3. Example: at 0 ^{o}F outdoor temperature, an air to water heat pump such as the CX35 will have >20% higher capacity when used with an operating supply temperature of 95 ^{o}F compared to operating at 122 ^{o}F. And COP at 95 ^{o}F will be >30% higher at 95 ^{o}F than at 122 ^{o}F.

4. Help Your Customer Get The Highest COP: Use Closer PEX Spacing, Larger FCU coils, add PEX in Walls, Ceiling if Needed.

Heating Operation
Low Temp Supply Design

"World's Most Efficient"

$$W = \frac{Q_1}{COP_p} = \frac{Q_1(T_1 - T_2)}{\eta_{mech} T_1}$$

Carnot efficiency equation for a heat pump.

<u>Radiant</u>
Always design PEX (or panels etc.) for lowest operating temp, typically 95-104F.

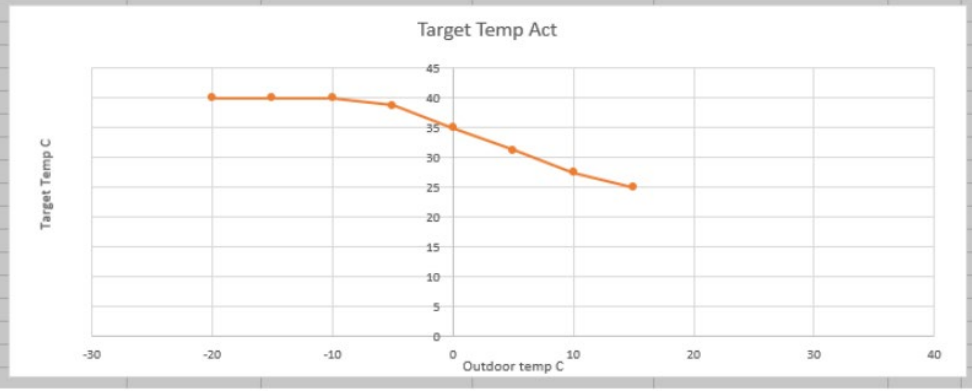
<u>AHU or Fan Coil Units</u>
Size fan coils or air handlers for 104F.

Always design indoor-side equipment for the lowest temperature possible.

See Heating Data on next slide.

Dynamic Outdoor Reset Control

	Offset	Max Temp	Start targ temp	Start Au Outdoor temp	Ramp Curve
Enter Value	-5	40	25	18	4
Range:	-10 to 10	35-50	20-45	-10 to 20	1 to 5
P Value	P49	P48	P25	P24	P26



Design the indoor side of the system to handle the peak load at the lowest possible operating temperature, **then let the system automatically reset to an even lower and more efficient temperature at times when weather is milder!**

See reset curve development tool to create a custom curve

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Heating Operation

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Capacity and COP of a heat pump varies as a function of both outdoor ambient temperature and leaving water temperature. See Chiltrix CX35 heating performance map below.

CX35 Outlet Water Temp										
Temperature °F		-4	5	14	17(15)	23	32	47(43)	59	77
86	Capacity	16,730	20,439	24,165	26,103	29,037	32,518	42,038	48,589	58,348
	Power Input	1.90	1.96	2.01	2.02	2.04	2.13	2.08	2.09	2.10
	COP	2.580	3.050	3.520	3.780	4.180	4.470	5.930	6.810	8.130
95	Capacity	16,139	19,893	23,646	25,113	27,365	31,119	40,468	46,815	56,300
	Power Input	2.07	2.17	2.24	2.27	2.30	2.35	2.42	2.35	2.28
	COP	2.285	2.687	3.094	3.242	3.487	3.881	4.901	5.839	7.237
104	Capacity	15,580	19,142	22,725	24,158	26,683	30,880	39,513	45,416	54,253
	Power Input	2.30	2.38	2.44	2.46	2.50	2.56	2.67	2.59	2.51
	COP	1.990	2.357	2.730	2.878	3.128	3.535	4.337	5.139	6.335
113	Capacity		18,613	22,315	23,817	26,035	29,754	38,182	43,812	52,206
	Power Input		2.59	2.63	2.64	2.66	2.68	2.76	2.79	2.81
	COP		2.107	2.487	2.644	2.869	3.254	4.055	4.602	5.445
122	Capacity			20,541	22,145	24,567	28,628	37,226	42,413	50,158
	Power Input			2.89	2.91	2.93	2.96	3.30	3.26	3.23
	COP			2.083	2.230	2.457	2.835	3.306	3.813	4.551
131	Capacity			18,767	20,507	23,134	27,502	35,793	40,741	48,111
	Power Input			3.3	3.3	3.32	3.34	3.66	3.75	3.86
	COP			1.67	1.82	2.04	2.41	2.87	3.18	3.65

"World's Most Efficient"

Capacity and COP of a heat pump varies as a function of both outdoor ambient temperature and leaving water temperature. See Chiltrix CX50 heating performance map below.

Outlet water temp		Full Speed @ Outdoor Air Temperature dB (wB)								
Temperature °F		-4	5	17(15)	23	32	47(43)	59	68	77
86	Capacity	26,956	31,426	38,489	42,447	47,565	59,917	68,755	75,306	81,891
	Power Input	3.26	3.32	3.39	3.41	3.47	3.46	3.48	3.49	3.50
	COP	2.423	2.774	3.328	3.648	4.017	5.075	5.790	6.324	6.857
95	Capacity	26,069	30,880	37,636	40,536	45,347	56,983	65,752	72,269	78,820
	Power Input	3.43	3.48	3.54	3.56	3.58	3.61	3.66	3.70	3.73
	COP	2.227	2.601	3.116	3.337	3.712	4.626	5.265	5.725	6.193
104	Capacity	25,182	29,413	35,350	38,898	44,767	55,413	63,568	69,642	75,750
	Power Input	3.63	3.65	3.68	3.76	3.86	3.93	3.97	3.99	4.01
	COP	2.033	2.362	2.815	3.032	3.399	4.132	4.693	5.116	5.536
113	Capacity		28,423	34,954	38,625	43,710	54,219	61,623	67,151	72,679
	Power Input		3.99	4.10	4.13	4.19	4.28	4.32	4.35	4.37
	COP		2.088	2.490	2.741	3.057	3.713	4.181	4.524	4.874
122	Capacity			34,409	36,715	42,174	53,809	60,156	64,865	69,608
	Power Input			4.58	4.56	4.54	4.76	4.80	4.82	4.85
	COP			2.202	2.360	2.723	3.313	3.673	3.944	4.206
131	Capacity			33,900	35,710	41,321	50,704	57,051	61,794	66,537
	Power Input			5.20	5.13	5.02	5.23	5.36	5.42	5.50
	COP			1.910	2.129	2.412	2.841	3.120	3.341	3.546

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Heating Operation

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Capacity and COP of a heat pump varies as a function of both outdoor ambient temperature and leaving water temperature. See Chiltrix CX65 heating performance map below.

LWT °F	Outdoor Ambient °F	-22	-15	-9	-4	0	5	10	17	23	32	39	45	47	50	60
86	Heating Capacity(KBTU/H)	41.524	45.789	48.962	52.169	54.285	57.424	59.778	61.825	62.815	64.248	65.408	66.773	68.308	70.560	78.169
86	INPUT POWER(KW/H)	5.94	6.07	6.13	6.24	6.24	6.24	6.38	5.96	5.2	4.37	3.9	3.69	3.69	3.7	3.73
86	COP (KW/KW)	2.05	2.21	2.34	2.45	2.55	2.7	2.75	3.04	3.54	4.31	4.92	5.3	5.43	5.59	6.14
95	Heating Capacity(KBTU/H)	38.556	42.650	45.721	48.792	50.805	53.841	56.742	59.301	60.495	62.303	63.770	65.135	66.363	68.206	74.416
95	INPUT POWER(KW/H)	6.04	6.1	6.15	6.24	6.2	6.241	6.38	6.08	5.44	4.72	4.3	4.04	4.02	3.99	3.92
95	COP (KW/KW)	1.87	2.05	2.18	2.31	2.4	2.53	2.61	2.86	3.26	3.87	4.35	4.73	4.84	5.01	5.57
105	Heating Capacity(KBTU/H)	35.280	39.170	42.138	45.038	46.983	49.883	53.398	56.503	57.970	60.154	61.928	63.293	64.214	65.613	70.253
105	INPUT POWER(KW/H)	6.08	6.14	6.17	6.24	6.23	6.24	6.38	6.16	5.66	5.08	4.71	4.43	4.39	4.31	4.13
105	COP (KW/KW)	1.7	1.87	2	2.12	2.21	2.34	2.45	2.69	3	3.47	3.85	4.19	4.29	4.46	4.99
120	Heating Capacity(KBTU/H)	30.299	33.915	36.645	39.374	41.149	43.844	48.314	52.238	54.080	56.912	59.164	60.529	60.972	61.655	63.907
120	INPUT POWER(KW/H)	6.12	6.17	6.21	6.23	6.25	6.24	6.38	6.3	5.98	5.6	5.35	5.03	4.94	4.81	4.45
120	COP (KW/KW)	1.45	1.61	1.73	1.85	1.93	2.06	2.22	2.43	2.65	2.98	3.24	3.53	3.62	3.76	4.21
131	Heating Capacity(KBTU/H)			32.755	35.314	37.020	39.579	44.697	49.133	51.180	54.217	56.673	58.550	58.652	58.823	59.403
131	INPUT POWER(KW/H)			6.23	6.23	6.24	6.24	6.38	6.34	6.1	5.8	5.61	5.45	5.34	5.16	4.67
131	COP (KW/KW)			1.54	1.66	1.74	1.86	2.05	2.27	2.46	2.74	2.96	3.15	3.22	3.34	3.73
140	Heating Capacity(KBTU/H)						26.307	30.572	35.826	40.569	47.700	53.398	57.663	57.663	57.697	57.765
140	INPUT POWER(KW/H)						6.27	6.22	6.18	6.16	6.13	6.11	6.08	5.93	5.71	5.11
140	COP (KW/KW)						1.23	1.44	1.7	1.93	2.28	2.56	2.78	2.85	2.96	3.31
149	Heating Capacity(KBTU/H)						13.034	16.446	22.519	29.957	41.183	50.122	56.776	56.673	56.571	56.127
149	INPUT POWER(KW/H)						6.3	6.06	6.02	6.22	6.46	6.61	6.71	6.52	6.26	5.55
149	COP (KW/KW)						0.61	0.8	1.1	1.41	1.87	2.22	2.48	2.55	2.65	2.96

Dynamically Variable V18 Backup Heater

Patented Exclusive

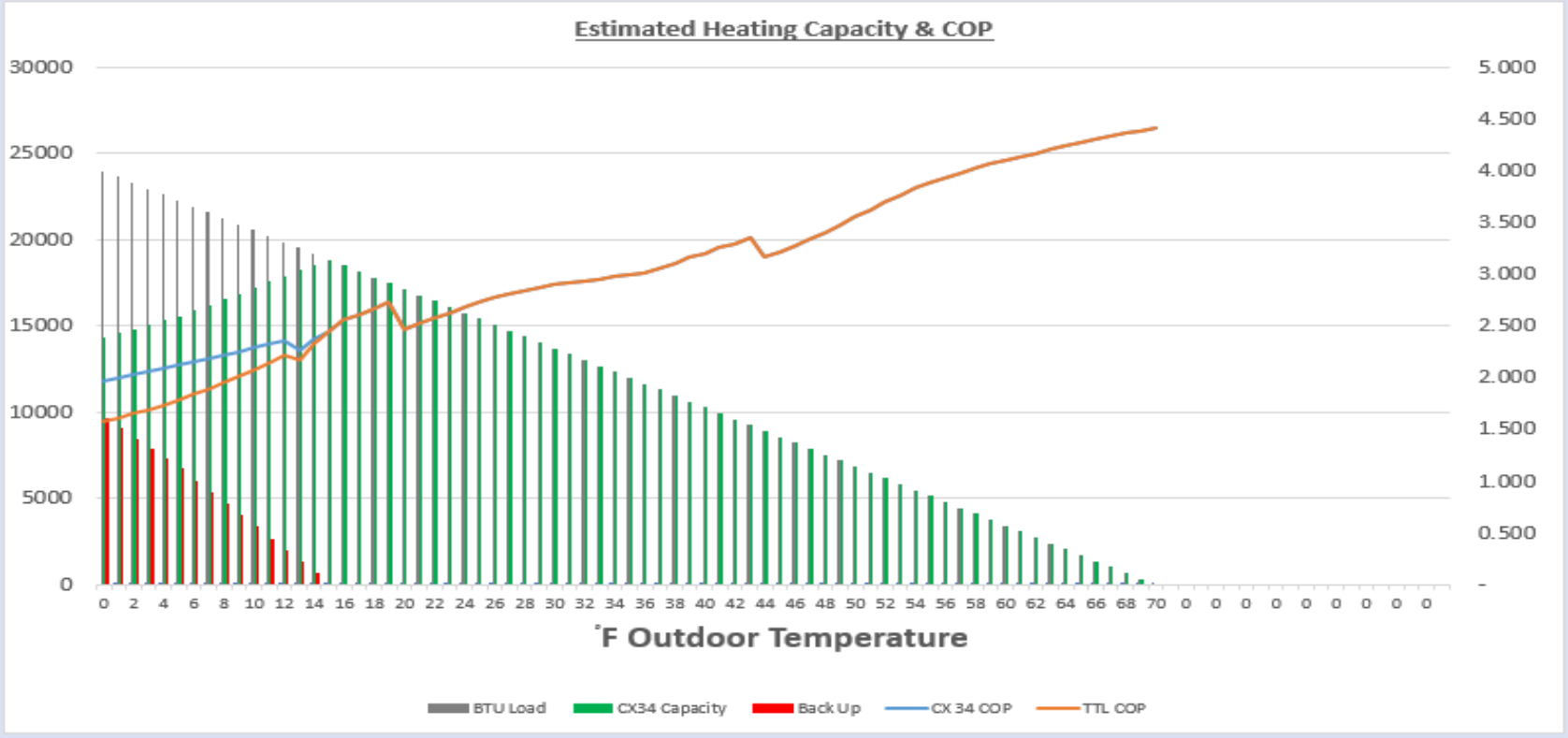
"World's Most Efficient"

- Typical ATW heat pump backup is a water heater tank installed on the supply side of the loop.
- Typical tank backup element runs at full power to chase and overshoot a set point, stops, and a few moments later, repeats. This results in temperature swings and wasted energy. Compressor may slow or stop.
- The V18 is instead controlled by the Chiltrix heat Pump to target a BTU shortfall, dynamically matching its variable output to match any heating capacity shortfall.
- V18 backup heat output is continuously adjusted in 1% increments to avoid over-providing backup heat, allowing the compressor to always produce the highest possible % of total heat. Compressor stays at full speed.
- 0-18,7660 BTU (Variable) Per V18. Use up to three per heat pump. Uses SSR Technology with 100 Power Level Steps, 0-100% Dynamic Variable Power

Heating Performance Modeling

"World's Most Efficient"

Chiltrix is able to provide heating performance projections that can help understand the estimated COP, annual energy costs, and backup heat requirements to help w/ system design & modeling, etc. Below, see example COP & Capacity Chart showing 1x CX34, Windsor, Ontario, Canada WMO 712980 w/ Manual J Heating Load 24,000 BTU @ Outdoor Design 0 °F / Radiant LWT105 / Per AHRI 550/590 Heating Test Data



Vertical grey lines are the load, vertical green lines are heat provided by compressor, vertical red lines are heat provided by backup. BTU load is down the left side, COP is down the right side, and across the chart the orange line is TTL COP (net including backup heat at COP 1), blue line is compressor-only COP, outdoor temps are across the bottom.

Chiltrix Fan Coil Units (FCU)

"World's Most Efficient"

4 Sizes: 5.1" Thin Euro-Style Fan Coil Units
¼ ton, ½ ton, ¾ ton, 1 ton
DC Inverter Fan Motors – Nearly Silent
Universal Mounting – Wall, Floor, Ceiling

Sizing Considerations:
Select based on the higher of heating or cooling load.
Capacity Rating depends on entering water temperature.
Designed for "wild coil" operation without valve.
WiFi Option Available.

For cooling, all fan coil units including CXI series are typically rated at 44 ^{o}F entering Water temperature. Rated for heating w/ 104F entering water temperature.

Use the Chiltrix CXI sizing guide for heating capacity.

Ducted System Air Handler Options
Extended Performance Data of VMB Variable Speed VMB Series

Cooling NPLV LWT54F AHRI 550/590 80/67																
Model	8VMB	8VMB	8VMB	8VMB	12VMB	12VMB	12VMB	12VMB	16VMB	16VMB	16VMB	16VMB	20VMB	20VMB	20VMB	20VMB
CFM	800	700	600	500	1200	1050	900	750	1600	1400	1200	1100	1825	1700	1600	1400
(ESP)IWC	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
BTU	13,600	12,100	10,600	9,000	20,200	18,000	15,800	13,400	27,700	24,700	21,500	19,900	31,000	29,200	27,700	24,700
Cooling IPLV LWT44F AHRI 550/590 80/67																
Model	8VMB	8VMB	8VMB	8VMB	12VMB	12VMB	12VMB	12VMB	16VMB	16VMB	16VMB	16VMB	20VMB	20VMB	20VMB	20VMB
CFM	800	700	600	500	1200	1050	900	750	1600	1400	1200	1100	1825	1700	1600	1400
(ESP)IWC	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
BTU	18,600	16,800	15,000	13,100	27,900	25,100	22,500	19,600	39,100	35,500	31,900	27,900	43,100	41,000	39,300	35,500
Heating LWT 105F AHRI/68 EAT																
Model	8VMB	8VMB	8VMB	8VMB	12VMB	12VMB	12VMB	12VMB	16VMB	16VMB	16VMB	16VMB	20VMB	20VMB	20VMB	20VMB
CFM	800	700	600	500	1200	1050	900	750	1600	1400	1200	1100	1825	1700	1600	1400
BTU	21,600	19,400	17,100	14,700	32,200	28,800	25,400	21,900	44,400	39,800	35,000	32,500	49,500	47,200	44,400	39,800

Customers can use ducted, ductless, or radiant and can use all of these in the same application if desired.

For example, an open area (living/dining/kit) might be served by a ducted system, while bedrooms, office, den, may be served by room fan coils, and bathrooms (or even the entire home) may have radiant heating.

Other brands of AHUs used will require the extended performance data from the manufacturer in order to properly size for the Chiltrix standard water temperatures.

Chiltrix Air-To-Water Heat Pumps

"World's Most Efficient"

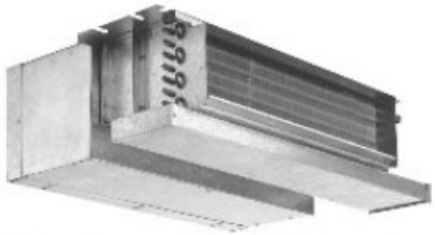
Concealed Ceiling Air Handler Options
Variable Speed "X" DC Inverter Motor Series

In addition to or in combination with Radiant, Central Ducted or Room Fan Coil Units ("FCU" CXI-series models) customers can use Concealed Ceiling Fan Coil Units.

Chiltrix can provide the BTU ratings for each model after we know how you will operate them. Or use the sizing guide. Note, these units must be professionally specified by the customers HVAC contractor as Chiltrix does not offer duct design or calculations for static pressure or CFM.

Cooling Range up to 36,000 BTU / Heating Range up to 32,000 BTU.

Ceiling Recessed

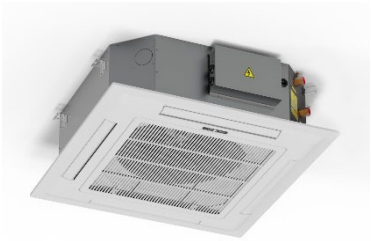


Ceiling Concealed with Plenum

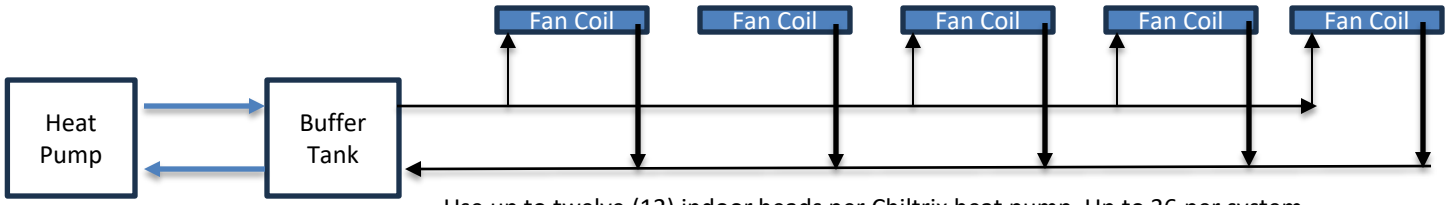
Ceiling Concealed (Un-Cased)

High Wall & Cassette Fan Coil Units (FCU)

"World's Most Efficient"



Symphony™ Compatible



Use up to twelve (12) indoor heads per Chiltrix heat pump. Up to 36 per system.

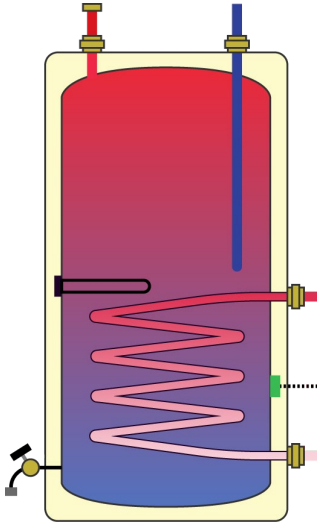
- As with all Chiltrix systems, 100% of the refrigerant stays outdoors.
- Safer and more efficient that multi-head minisplits/ VRF. Avoids complex code issues related to having the new flammable refrigerants R454B and R32 inside the building envelope.
- Patent-protected **Symphony Controls** manage supply water temperature, mitigate cycling, and accurately enforce ΔT and flow rate simultaneously.

Model	BTU (Cooling)	BTU (Heating1)	HBTU (Heating2)	BTU (Heating3)	CFM H/L	Height	Width	Depth	SPL dBA	GPM	Power V/A
HW98	9895	11942	9553	7233	253/130	11.46"	33.47"	7.99	32	2.2	120v /10.8a
HW160	16378	19560	16377	12180	500/264	11.89	38.27"	8.82"	47	3.6	120v/.31a
Heating EAT 68F, Heating1@ EWT 122F, Heating2@EWT113F, Heating3 EWT 104F, SPL dBA @1M (per ISO 7779)											
Model	BTU (Cooling)	BTU (Heating1)	BTU (Heating2)	BTU (Heating3)	CFM H	Height	Width	Depth	SPL dBA	GPM	Power V/A
CXI34	3379	4520	3967	3194	94	26.4"	27.6"	5.4"	30	1.2	120v/.12a
CXI65	6451	8500	7083	5667	188	26.4"	35.4"	5.4"	32	1.3	120v/.15a
CXI85	8670	11400	9500	7600	270	26.4"	43.3"	5.4"	37	1.8	120v/ .175a
CXI120	11873	14600	12167	9733	340	26.4"	51.2"	5.4"	39	2.5	120v/.18a
Heating EAT 68F, Heating1@ EWT 122F, Heating2@EWT113F, Heating3 EWT 104F, SPL dBA @1M (per ISO 7779)											

Domestic Hot Water

"World's Most Efficient"

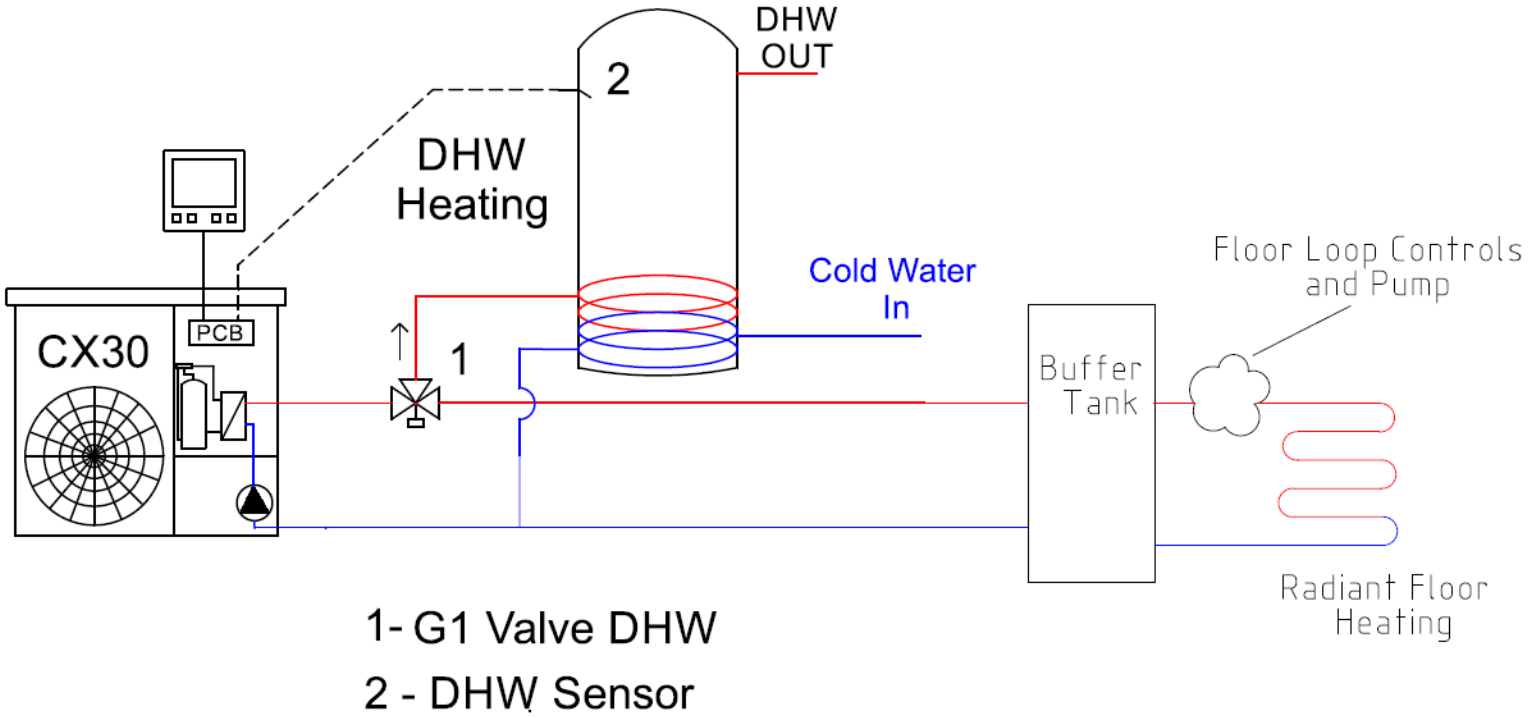
- DHW Function requires a heat exchanger tank (indirect coil or solar type tank).
- Requires a G1 (DN25 for CX35, DN32 for CX50) 3-way valve, controlled by heat pump.
- When the DHW tank needs heat, the heat pump switches to DHW mode (Full Speed Heating) and switches a 3-way valve to the tank. Space heating/cooling are paused temporarily.
- Generally, the 3-way valve/tank should be close to the heat pump. A booster pump may be needed depending on the pressure drop of the coil and piping design to the tank.
- Always Use Chiltrix Tank or Chiltrix Approved Tank (Coil Size)
- Exceptional Off-The-Charts Efficiency, beats every heat pump water heater in the market.
- Managed tank set point is 120 °F (Except when anti-legionella function is active).
- Automatic Anti-Legionella Function.
- Highest Rated Water Heater in the USA.



#1 Highest UEF rating among all US DOE certified water heaters of any size or type.

Chiltrix Air-To-Water Heat Pump
(Shown w/ DHW & Radiant System)

"World's Most Efficient"



Simplified concept drawing – not all components shown

DHW Tanks
Domestic Hot Water

"World's Most Efficient"

DHW80
71 Gallons Net / Well Insulated Poly 50mm
GIANT Coil: 72 ft. x 1.25" Convoluted Coil 32 ft^2 Surface Area
Inner Tank & Coil: Duplex 2205 Stainless Steel
Outer Tank: 304 Stainless Steel

DHW105
99 Gallons Net / Well Insulated Poly 50mm
GIANT Coil: 196 ft. x 1.25" Convoluted Coil 98 ft^2 Surface Area
Inner Tank & Coil: Duplex 2205 Stainless Steel
Outer Tank: 304 Stainless Steel

The DHW105 99 Gallon Reverse-Return Configuration holds a **World's-Record** UEF Rating among all U.S. Department of Energy Certified Water Heaters with the Highest Uniform Efficiency Factor **(UEF 4.95)** of any certified tank. And it holds a **World's Record First-Hour Rating of 101 Gallons**, the highest of any certified heat pump tank under 119 Gallons.

Chiltrix

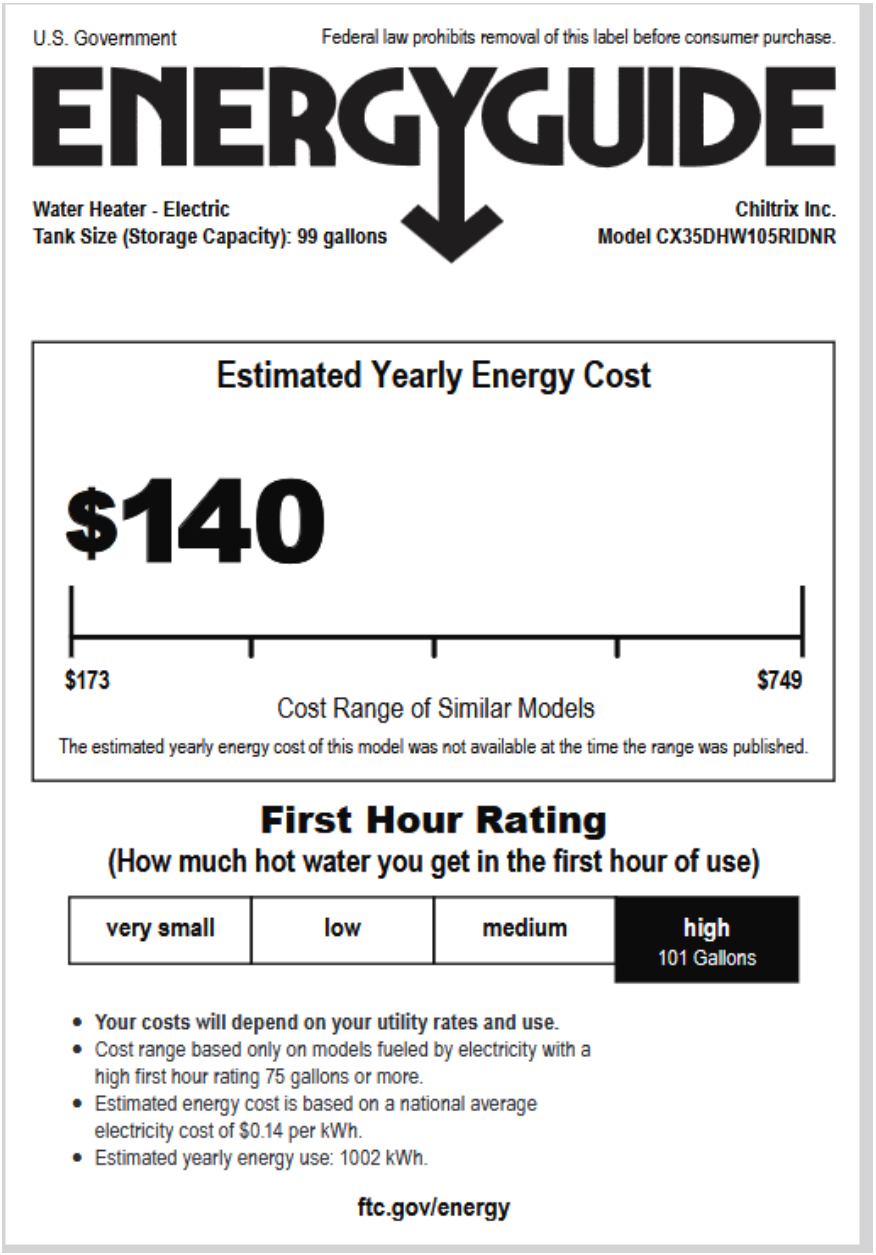
AHRI CERTIFIED®

"World's Most Efficient"

When we say "off the charts" performance, we mean it.

Literally.

See the Energy Guide label, where we broke the current version of the U.S. Dept. of Energy Label format by $33 per year.



U.S. Government

Federal law prohibits removal of this label before consumer purchase.

ENERGYGUIDE

Water Heater - Electric
Tank Size (Storage Capacity): 99 gallons

Chiltrix Inc.
Model CX35DHW105RIDNR

Estimated Yearly Energy Cost

$140

$173 — $749

Cost Range of Similar Models

The estimated yearly energy cost of this model was not available at the time the range was published.

First Hour Rating

(How much hot water you get in the first hour of use)

very small	low	medium	high 101 Gallons

- **Your costs will depend on your utility rates and use.**
- Cost range based only on models fueled by electricity with a high first hour rating 75 gallons or more.
- Estimated energy cost is based on a national average electricity cost of $0.14 per kWh.
- Estimated yearly energy use: 1002 kWh.

ftc.gov/energy

Buffer Tanks

"World's Most Efficient"

VCT19 Buffer Tank: 304 Stainless Steel
19 Gallons Net / Well Insulated Poly 50mm
2x 1" NPT Ports Supply Side
2x 1" NPT Ports Load Side
Element-Ready For Emergency Heat

VCT37 Buffer Tank: 304 Stainless Steel
37 Gallons Net / Well Insulated Poly 50mm
6x 1" NPT Ports Side 1
4x 1.5" NPT Ports Side 2
Element-Ready For Emergency Heat
Designed For Either Vertical or Horizontal Installation

VCT60 Buffer Tank: 304 Stainless Steel
58 Gallons Net / Well Insulated Poly 50mm
6x 1.25" NPT Ports Side 1
4x 1.25" NPT Ports Side 2
Element-Ready For Emergency Heat

All Chiltrix Buffer Tanks include magnesium anode and can be ordered with ICCP Powered Anode to avoid magnesium anode & electronically protect the tank.

Use a VCT37 or VCT60 when combining 2 or 3 Heat Pumps

IMPORTANT: Read the DHW & Buffer Tank Manual:
https://www.chiltrix.com/heat-exchanger-tanks/chiltrix-tank-manual.pdf

Chiltrix

Chiltrix Air-To-Water Heat Pump (Shown 2x CX Heat Pumps w/ 2x V18s, Buffer Tank, Radiant & Fan Coils)

AHRI CERTIFIED®

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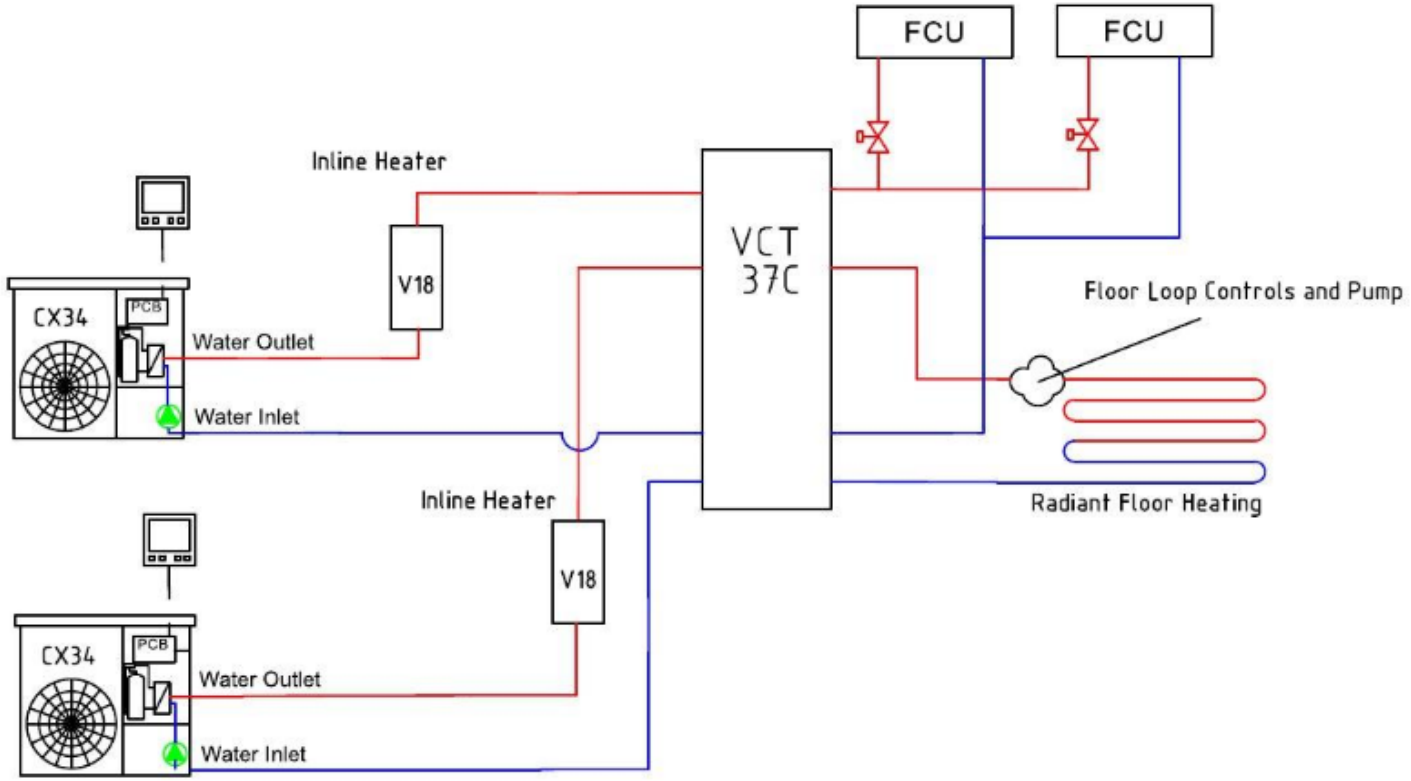


Simplified concept drawing – not all components shown

Hundreds or even thousands of designs are possible.

Chiltrix

Design & Installation Notes

AHRI CERTIFIED®
"World's Most Efficient"

Compared to boiler powered systems, design is very similar but there are a few differences and some new things you will need to know. Chiltrix engineers are available to assist with designs & more. Please review the following items with Chiltrix in advance, as needed. We want to help! Let us be involved in your pre-sales, design, and commissioning!

A good design always starts with a Manual J or other heating & cooling load report.
IF YOU DO THE DESIGN YOURSELF. PLEASE SEND THE load REPORT & PIPING DESIGN FOR REVIEW.

- When a Buffer or Volume Tank is Needed
  1. Any time there is radiant.
  2. When the system will have less than 15-20 gallons of total fluid volume.
  3. When there are lots of annual hours at low loads (below 7kbtu heating/5kbtu cooling).
  4. Generally, it's always more efficient to use a buffer tank.

- Backup vs. Emergency Heat – What is the difference and how to use:
  1. Backup heat using V18 is applied "before" any loads and before the buffer tank.
  2. Emergency heat (elements in a buffer tank) may be manually activated in a case where the heat pump is unavailable.
  3. A boiler can be integrated by connecting directly to the buffer tank, Chiltrix can control the boiler. Let us help with the design.

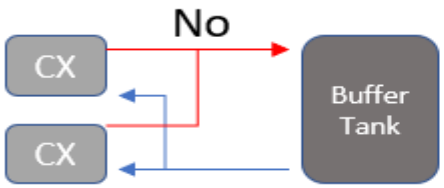
Design & Installation Notes (continued)

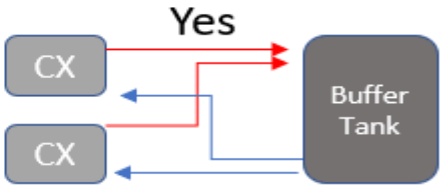
"World's Most Efficient"

- Operating Temperature vs. Capacity/Efficiency
  1. Always design for the lowest heating operating temperature.
  2. Generally, space the PEX as close as possible.
  3. Flow rates should be designed for low delta (9-10F) between supply and return.

- Using & Sizing Fan Coils/Air Handlers
  1. Chiltrix fan coils and air handlers are designed for 104F entering water temp.
  2. All manufacturers can provide a 104F rating if requested, this temp should be used when sizing any fan coil or air handling units.
  3. If using DHC control, any cooling units should be sized to meet the sensible load at 54 °F entering temp (See SHR from Load Report).
  4. Options: Wild coil, or valves and/or pump may be controlled by the fan coil unit.

- Don't Use Primary/Secondary or Closely Spaced Tees on the supply side to combine multiple outdoor units. Use a Chiltrix multiport buffer tank (VCT37 or VCT60).





There are other options. If it is not possible to connect all outdoor units to the tank, contact us for design help.

- Insulate all piping, taking special care for applications that will use cooling.

Chiltrix Air-To-Water Heat Pumps

"World's Most Efficient"

Thank You!

John Williams
Chiltrix Inc.

More Questions? Please call or email:
john@chiltrix.com / 757-410-8640 Ext. 152

And please visit https://www.chiltrix.com/

ENERGY STAR 2019
Emerging Technology Award

10 YEARS ANNIVERSARY

Serving the USA Market
With Air To Water Heat Pumps
Since 2015

OFFICIALLY CERTIFIED #1 EFFICIENCY WORLD'S RECORD

Chiltrix holds the record for the Highest Seasonal Average COP (SCOP) and the Highest Seasonal Average EER (IPLV) among all air to water heat pumps, and for water heating, the Highest US DOE UEF.