



## HIGH-EFFICIENCY CONDENSING GAS-FIRED SEPARATED COMBUSTION UNIT HEATERS





At 93% thermal efficiency for all model sizes, Modine's Effinity<sup>93®</sup> condensing unit heater features the highest efficiency available in North America for gas-fired unit heaters. This industry leading efficiency is a result of the coupling of our Conservicore<sup>®</sup> secondary heat exchanger technology with our robust tubular primary heat exchanger design. The Conservicore<sup>®</sup> technology features a secondary recuperative heat exchanger fabricated from AL29-4C<sup>®</sup> stainless steel. This material is superior to other lower grades of stainless steel and aluminum, resulting in outstanding ability to withstand the corrosive environment of condensing gas fired equipment.

Available in ten model sizes with input ranges from 55,000 to 310,000 Btu/Hr, Modine offers application flexibility unmatched in the industry. The separated combustion units draw combustion air from outside to ensure that the unit will always have plenty of fresh, clean air for combustion while increasing the overall heating efficiency. Venting material to be used is PVC, an extremely cost effective vent system.

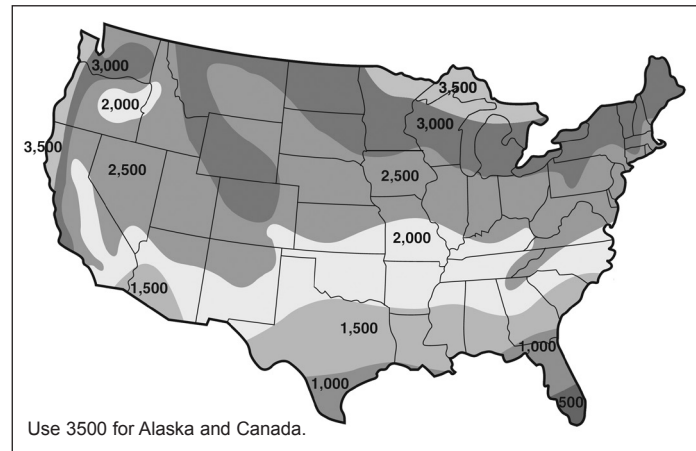
This catalog describes the design benefits, construction features, performance data, unit selection procedure, and the optional and accessory devices available for the Modine Effinity<sup>93®</sup> Condensing Unit Heater, Models PTC & BTC.

**Table 2.1 - Estimated Annual Fuel Cost Savings Using the Effinity<sup>93®</sup> Condensing Unit Heater**

		Estimated Annual Savings Against Other Equipment ① ②			
		Gravity Vented		Power Vented	
Design Heat Load (Btu/Hr):		120,000	280,000	120,000	280,000
Annual Heat Load Hours (Refer to Figure 2.1)	500	\$306	\$713	\$136	\$318
	1000	\$611	\$1,427	\$273	\$637
	1500	\$917	\$2,140	\$409	\$955
	2000	\$1,223	\$2,853	\$546	\$1,274
	2500	\$1,529	\$3,567	\$682	\$1,592
	3000	\$1,834	\$4,280	\$819	\$1,911
	3500	\$2,140	\$4,993	\$955	\$2,229

① Based on a natural gas rate of \$1.10/Therm. Actual realized savings can vary significantly based on a number of changing factors including, but not limited to, fuel prices, climate, building use or construction, etc.  
 ② Compares 93% efficient against 65% seasonal efficient gravity vented and 78% seasonal efficient power vented.

**Figure 2.1 - U.S. Average Heat Load Hours Map**



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**! WARNING**

1. Do not locate ANY gas-fired unit in areas where chlorinated, halogenated, or acidic vapors are present in the atmosphere.
2. Appliances must not be installed where they may be exposed to a potentially explosive or flammable atmosphere.

**! CAUTION**

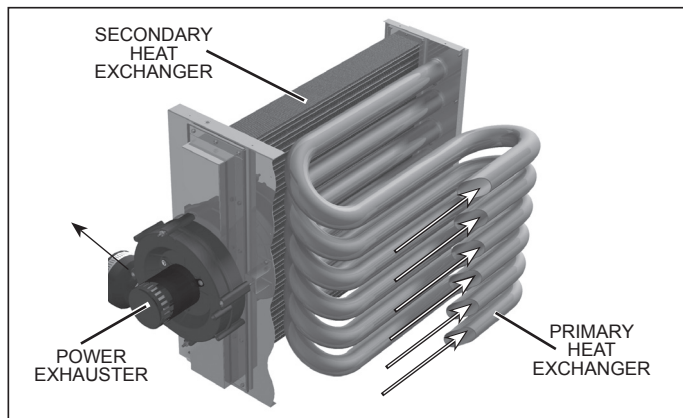
Heaters are designed for use in heating applications with ambient temperatures between 40°F and 80°F. Heaters should not be used in applications where the heated space temperature is below 40°F. The combination of low space and combustion air temperatures may result in condensate freezing in the secondary heat exchanger and/or condensate drain.

As Modine Manufacturing Company has a continuous product improvement program, it reserves the right to change design and specifications without notice.  
 ® AL29-4C is a Registered Trademark of Allegheny Ludlum Corporation.  
 ® Effinity<sup>93®</sup>, Conservicore<sup>®</sup>, and any combination of these names either together or with other words is a registered trademark of Modine Manufacturing Co.

**Figure 3.1 - Effinity<sup>93</sup>® Model PTC/BTC (PTC Shown)**



**Figure 3.2 - Modine Conservicore® Heat Exchanger**



**Table 3.1 - Standard Features and Factory Options ①**

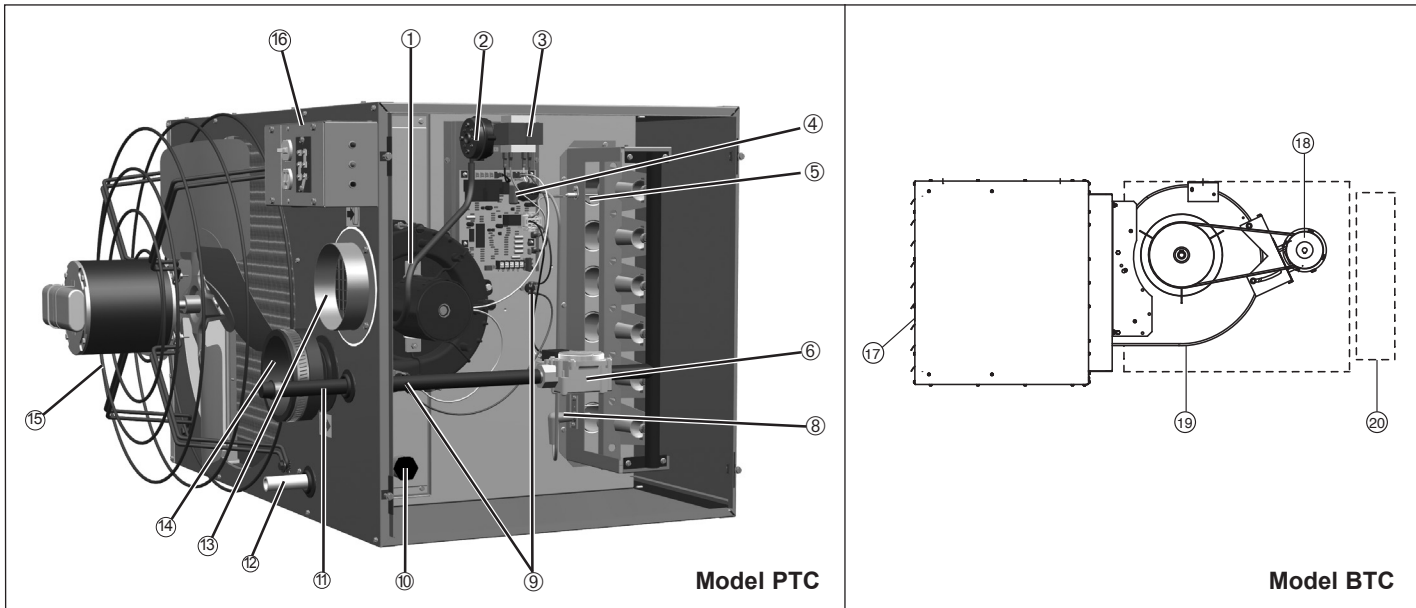
	Feature	PTC	BTC
Cabinet and Air Mover	Aluminized steel cabinet (gauge indicated)	20 ga.	20 ga.
	Baked-on polyester powder paint for durability and corrosion resistance	•	•
	Adjustable air-deflector blades	•	•
	Fans engineered for quiet operation	•	•
	Totally enclosed fan motors for maximum durability	•	•
	Fingerproof fan guard (standard on sizes 110 and smaller)	Opt	
	Adjustable motor sheaves, certified to 0.7" W.C. external static pressure		•
Heat Exchanger and Burner	93% thermally efficient	•	•
	Aluminized steel primary heat exchanger (409 stainless steel optional)	•	•
	Tubular heat exchanger for superior durability	•	•
	In-shot burner on each heat exchanger tube for reliable performance, ease of serviceability and low sound level on flame ignition/extinction	•	•
	Modine Conservicore® technology on secondary recuperative heat exchanger with AL29-4C® stainless steel material as standard	•	•
Controls	ETL certification for residential (size 110 and smaller only), commercial, and industrial use in the US and Canada	•	
	Factory-installed power exhauster	•	•
	Controls for natural gas (propane optional)	•	•
	Single stage gas controls	•	•
	Flame roll-out safety switch (model sizes 110 and smaller)	•	
	High limit safety controls for both the heated air and flue gas temperature	•	•
	Condensate drain overflow switch to verify proper condensate drainage	•	•
	Differential pressure switch for proof of venting	•	•
	Direct spark ignition with continuous retry control system	•	•
	Contractor Convenience Package featuring a condensate pump convenience outlet, unit on/off switch, heater function status indicator lights, and external terminals for thermostat wiring	•	•
	Gas control step down transformer with 24V gas controls	•	•
	Fan delay timer	•	•

① • = See page 11 for Field Installed Accessories.



The Modine Breeze® AccuSpec is the fastest way to generate performance data based on actual job conditions. The Breeze® AccuSpec program is a web-based sizing and selection program. The program provides a series of step-by-step questions that allow for the easy configuration of Modine products. After a model has been configured, the program can generate Submittal Schedules, Submittal Data (including performance and dimensional drawings), and Specifications.

Figure 4.1 - Factory Mounted Standard Features



**① Power Exhauster**

All units are supplied with a round vent pipe and combustion air inlet pipe connections.

**② Pressure Switch**

An automatic reset vent pressure switch is supplied on all units and is designed to prevent operation of the main burner in the event there is restricted venting of flue products. This restriction may occur due to an improper vent diameter, long vent runs, un-approved vent terminal, high winds, high negative pressure within space, etc. After the cause of the restriction has been corrected, the pressure switch will reset automatically.

**③ Control Step Down Transformer**

The control step down transformer is located in the electrical junction box. The transformer is used to step down from 115V to 24V for the gas controls, fan delay relay, field supplied motor starter, etc. An additional field installed transformer is required if the supply voltage is 208V, 230V, 460V, or 575V. To determine the control transformer supplied as well as any required accessory transformers, refer to Table 10.1.

**④ Integrated Direct Spark Control Board**

The integrated direct spark ignition control combines all furnace control functions. The integrated board provides digital control of the air mover, inducer, ignition, gas valve and flame sense as well as monitoring the safety circuit at all times. The board includes LED diagnostics for trouble shooting and a fused power supply. Ignition control is 100% shut-off with continuous retry.

**⑤ Flame Sensor**

Remote flame sensor verifies ignition of all burners, monitors the flame signal and communicates with the integrated circuit board.

**⑥ Single Stage Gas Valve**

The main gas valve is factory installed on the unit heater gas train. The main gas valve provides regulator, main gas, and manual shutoff functions. The valve is redundant and provides 100% shut off.

**⑦ Flame Roll Out Switch (size 110 and smaller only) (hidden)**

Flame roll out switches are mounted near the burners and will shut off the gas supply in the event of an unsafe flame roll out condition.

**⑧ Direct Spark Igniter**

Provides spark for direct ignition of the burners.

**⑨ High Limit Switches**

One limit control is mounted in the air stream and will shut off the gas supply in the event of overheating. The other limit control is mounted on the power exhauster housing and will shut off the gas supply in the event of overheating flue gas temperatures.

**⑩ Condensate Drain Overflow Switch**

Shuts down gas controls if condensate is not properly draining from the unit.

**⑪ Gas Pipe Connection**

Easy access to factory installed gas pipe connection stubbed to outside of unit casing.

**⑫ Condensate Drain Connection**

Easy access to factory installed condensate drain pipe connection stubbed to outside of unit casing.

**⑬ Combustion Air Inlet Pipe Connection**

Simple connection for combustion air inlet piping.

**⑭ Vent Pipe Connection**

Simple Fernco® rubber boot connection for PVC vent system.

**⑮ Fan Guard (Standard for PTC Models)**

Propeller units may be equipped with an optional finger proof fan guard (standard on size 110 and smaller) for added protection. If ordered, the finger proof fan guard is installed at the factory in place of the standard fan guard.

**⑯ Contractor Convenience Package**

External junction box features simple connection of supply power wiring internally, thermostat wiring to terminals externally, an On/Off switch, a single 115V outlet for connection of an external condensate pump, and status indicator lights to display the operational state of the unit.

**⑰ Horizontal Air Deflector Blades**

Factory mounted on the discharge of the unit, the blades can be adjusted to provide horizontal (up and down) delivery control of the heated air. Vertical deflector blades are available as a field installed accessory.

**⑱ Blower Motor (Standard for BTC Models)**

Blower motors smaller than 3 HP are factory installed on the blower housing. Motors 3 HP and above ship loose for field installation to prevent damage during shipment. The blower motor is supplied with an adjustable sheave that can be used to increase/decrease the blower RPM, and the blower motor can be provided in a variety of supply voltages and motor horsepower.

**⑲ Blower Enclosure (OPT for BTC Models)**

**⑳ Filter Rack (OPT for BTC Models)**

Provides filtration of air to be heated. Must include Blower Enclosure accessory.



Table 5.1 - Propeller Unit Heater Model PTC General Performance Data

	Model PTC Sizes									
	55	65	85	110	135	156	180	215	260	310
<b>Btu/Hr Input</b> ①	55,000	65,000	85,000	110,000	135,000	155,000	180,000	215,000	260,000	310,000
<b>Btu/Hr Output</b> ①	51,150	60,450	79,050	102,300	125,500	144,150	167,400	199,950	241,800	288,300
<b>Condensate Production (Gal./Hr.)</b>	0.3	0.4	0.5	0.7	1.0	1.1	1.3	1.6	1.9	2.3
<b>Entering Airflow (CFM) @ 70°F</b> ②	1097	1141	1650	1750	2160	2600	3020	3865	4585	5400
<b>Outlet Velocity (FPM)</b> ②	618	650	619	668	719	862	676	699	831	765
<b>Air Temp. Rise (°F)</b>	43	49	44	54	54	51	51	48	49	49
<b>Max. Mounting Height (Ft.)</b> ②	12	12	13	13	14	18	15	17	20	19
<b>Heat Throw (Ft.) @ Max. Mtg Ht</b>	43	43	48	46	51	62	53	60	70	67
<b>Motor Type</b> ③	PSC	PSC	PSC	PSC	PSC	PSC	PSC	PSC	PSC	PSC
<b>Motor HP</b>	1/8	1/8	1/8	1/3	1/3	1/3	1/3	1/2	3/4	3/4
<b>Motor RPM</b>	1440	1440	1550	1075	1075	1075	1075	1075	1125	1125

① Ratings shown are for elevations up to 2,000 ft. For elevations above 2,000 feet, ratings should be reduced at the rate of 4% for each 1,000 feet above sea level (in Canada see rating plate). Reduction of ratings requires use of a high altitude kit.

② Data taken at 65°F ambient and unit fired at full-rated input. Mounting height as measured from bottom of unit, and without deflector hoods.

③ All motors used are produced, rated and tested by reputable manufacturers in accordance with NEMA standards and carry the standard warranty of both the motor manufacturer and Modine. All motors are totally enclosed and all single phase motors have built-in thermal overload protection.

Table 5.2 - Model PTC Operating Electrical Data ⑤

Supply Voltage	Power Code		Model PTC Sizes									
			55	65	85	110	135	156	180	215	260	310
115V 1 Phase	01 (115V)	<b>Motor Amps</b>	2.20	2.20	2.20	4.60	4.60	4.60	4.60	7.00	8.80	8.80
		<b>Total Amps</b>	4.35	4.35	4.35	6.75	6.75	6.75	6.75	9.15	10.95	9.85
		<b>Transformer kVA</b>	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
208V 1 or 3 Phase	01 (115V) with Transformer	<b>Transformer kVA</b>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	1.50	1.50
		<b>208V Total Amps</b>	2.41	2.41	2.41	3.73	3.73	3.73	3.73	5.06	6.05	5.45
230V 1 or 3 Phase	01 (115V) with Transformer	<b>Transformer kVA</b>	0.75	0.75	0.75	1.00	1.00	1.00	1.00	1.50	1.50	1.50
		<b>230V Total Amps</b>	2.18	2.18	2.18	3.38	3.38	3.38	3.38	4.58	5.48	4.93
460V 3 Phase	01 (115V) with Transformer	<b>Transformer kVA</b>	0.75	0.75	0.75	1.00	1.00	1.00	1.00	1.50	1.50	1.50
		<b>460V Total Amps</b>	1.09	1.09	1.09	1.69	1.69	1.69	1.69	2.29	2.74	2.46
575V 3 Phase	01 (115V) with Transformer	<b>Transformer kVA</b>	0.75	0.75	0.75	1.00	1.00	1.00	1.00	1.50	1.50	1.50
		<b>575V Total Amps</b>	0.87	0.87	0.87	1.35	1.35	1.35	1.35	1.83	2.19	1.97

⑤ Amp draw data shown is operating amp draw at incoming power. For units that use a field installed accessory step-down transformer as noted, the amp draw shown is the primary side operating amp draw. For sizing of circuit protection for equipment with transformers, please refer to the National Electric Code.



Table 6.1 - Blower Unit Heater Model BTC General Performance Data

	Model BTC Sizes		
	215	260	310
Btu/Hr Input ①	215,000	260,000	310,000
Btu/Hr Output ①	199,950	241,800	288,300
Condensate Production (Gal./Hr.)	1.6	1.9	2.3
Entering Airflow Range (CFM)	2645-4628	3198-5597	3813-6674
Outlet Velocity (FPM) ②	497-826	601-999	559-930
Air Temp. Rise (°F)	40-70	40-70	40-70
Max. Mounting Height (Ft.) ②	9-22	11-26	11-26
Heat Throw (Ft.) @ Max. Mtg Ht	33-77	40-94	39-91
Motor Type ③	TE	TE	TE
Motor HP	See Table 7.1		
Motor RPM	1725	1725	1725

Table 6.2 - Blower Model BTC Motor Amp Draw ④ ⑤

Motor HP	Supply Voltage					
	115V/1ph	230V/1ph	208V/3ph	230V/3ph	460V/3ph	575V/3ph
1	14.00	7.00	3.20	3.20	1.60	1.30
1-1/2	15.00	7.50	4.60	4.80	2.40	1.90
2	-	-	6.00	5.80	2.90	2.30
3	-	-	8.40	7.80	3.90	3.20
5	-	-	13.60	12.30	6.20	5.10

Table 6.3 - Blower Model BTC Control Circuit Amp Draw ④ ⑤

Model Size	Supply Voltage					
	115V/1ph	230V/1ph	208V/3ph	230V/3ph	460V/3ph	575V/3ph
215-260	2.15	1.08	1.19	1.08	0.54	0.43
310	1.05	0.53	0.58	0.53	0.26	0.21

Table 6.4 - Blower Model BTC Accessory Transformer Size (kVA) ⑥

Model Size	Supply Voltage			
	208V/3ph	230V/1 or 3ph	460V/3ph	575V/3ph
215-260	0.50	0.50	0.50	0.50
310	0.50	0.25	0.25	0.25

① Ratings shown are for elevations up to 2,000 ft. For elevations above 2,000 feet, ratings should be reduced at the rate of 4% for each 1,000 feet above sea level (in Canada see rating plate). Reduction of ratings requires use of a high altitude kit.

② Data taken at 65°F ambient and unit fired at full-rated input. Mounting height as measured from bottom of unit, and without deflector hoods.

③ All motors used are produced, rated and tested by reputable manufacturers in accordance with NEMA standards and carry the standard warranty of both the motor manufacturer and Modine. All motors are totally enclosed and all single phase motors have built-in thermal overload protection.

④ Amp draw data shown is operating amp draw at incoming power. For units that use a field installed accessory step-down transformer as noted, the amp draw shown is the primary side operating amp draw. For sizing of circuit protection for equipment with transformers, please refer to the National Electric Code.

⑤ For BTC models, add the Motor Amp Draw and Control Circuit Amp Draw to get the Total Unit Amp Draw.

⑥ Transformers for blower models are typically smaller than those used for propeller models, as the transformer is not needed for the blower motor. Size 310 uses a PSC power exhaustor motor, further reducing the required transformer size.



# BLOWER PERFORMANCE DATA - MODEL BTC



**Table 7.1 - Power Code Description - Blower Model BTC ①**

Power Code	Voltage	Phase	BTC215		BTC260		BTC310	
			HP	Drive	HP	Drive	HP	Drive
02	115/230	1	1	270	1-1/2	261	1-1/2	261
08	208-230/460	3	1	269	2	268	3	260
11	575	3	1	269	2	268	3	260
13	115/230	1	1-1/2	270	1-1/2	263	1-1/2	263
19	208-230/460	3	1-1/2	269	3	260	5	260
22	575	3	1-1/2	269	3	260	5	260
24	115/230	1	1	272	1-1/2	266	1-1/2	266
30	208-230/460	3	2	269	5	260	1-1/2	262
33	575	3	2	269	5	260	1-1/2	262
35	115/230	1	1-1/2	272	-	-	-	-
41	208-230/460	3	3	271	1-1/2	262	2	262
44	575	3	3	271	1-1/2	262	2	262
46	115/230	1	1	274	-	-	-	-
52	208-230/460	3	1	273	2	262	3	278
55	575	3	1	273	2	262	3	278
57	115/230	1	1	277	-	-	-	-
63	208-230/460	3	1-1/2	273	3	278	1-1/2	264
66	575	3	1-1/2	273	3	278	1-1/2	264
74	208-230/460	3	2	273	1-1/2	264	2	264
77	575	3	2	273	1-1/2	264	2	264
80	575	3	1	275	2	264	3	265
83	575	3	1	276	1-1/2	267	1-1/2	267
84	208-230/460	3	1	275	2	264	3	265
85	208-230/460	3	1	276	1-1/2	267	1-1/2	267

① For selection of correct Power Code, refer to the tables on page 9.

**Table 7.2 - Filter Static Pressure Drop ②**

	BTC215	BTC260	BTC310
Filter Static ("W.C.)	0.1	0.1	0.1

② Calculated at 55°F ATR, for blower units with enclosure and filter, add filter static to external static pressure

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# BLOWER PERFORMANCE DATA - MODEL BTC



**Table 9.1 - Blower Model BTC215-310** ①②③

Model Size	ATR	CFM	HP	External Static Pressure ("W.C.)																							
				0.0			0.1			0.2			0.3			0.4			0.5			0.58			HP		
				RPM	Drive	Turns	RPM	Drive	Turns	RPM	Drive	Turns	RPM	Drive	Turns	RPM	Drive	Turns	RPM	Drive	Turns	RPM	Drive	Turns			
215	40	4628	2	618	269	5.0	647	269	4.0	676	269	3.5	703	269	2.5	730	269	2.0	757	-	-	777	-	-	2		
			3	618	273	0.5	647	-	-	676	-	-	703	-	-	730	-	-	757	271	1.0	777	271	0.5	3		
	45	4114	1-1/2	552	-	-	586	-	-	617	269	5.0	648	269	4.0	677	269	3.5	706	-	-	727	-	-	1-1/2		
			2	552	273	3.0	586	273	1.5	617	273	0.5	648	-	-	677	-	-	706	269	2.5	727	269	2.0	2		
	50	3703	1	500	273	4.5	534	273	3.5	569	273	2.0	602	-	-	634	-	-	665	-	-	690	-	-	1		
			1-1/2	500	275	1.5	534	275	0.5	569	-	-	602	-	-	634	269	4.5	665	269	3.5	690	269	3.0	1-1/2		
	55	3366	1	457	275	3.5	497	275	2.0	534	275	0.5	570	-	-	604	-	-	636	-	-	685	-	-	1		
			1-1/2	457	276	1.0	497	-	-	534	-	-	570	-	-	604	273	1.0	636	269	4.5	685	269	3.0	1-1/2		
	60	3086	1	422	-	-	463	-	-	504	273	4.5	541	273	3.0	578	273	2.0	612	269	5.0	640	269	4.5	1		
			1	422	275	5.0	463	275	3.0	504	275	1.5	541	275	0.0	578	-	-	612	273	0.5	640	-	-	1		
	65	2848	1	392	-	-	439	-	-	481	-	-	521	273	4.0	559	273	2.5	596	273	1.5	624	269	5.0	1		
			1	392	276	4.0	439	276	1.5	481	275	2.5	521	275	1.0	559	-	-	596	-	-	624	273	0.5	1		
70	2645	1	368	-	-	419	-	-	464	-	-	506	273	4.5	546	273	3.0	584	273	1.5	614	269	5.0	1			
		1	368	276	5.0	419	276	2.5	464	275	3.0	506	275	1.5	546	275	0.0	584	-	-	614	273	0.5	1			
260	40	5597	3	797	260	3.5	821	260	3.0	843	-	-	866	-	-	888	-	-	910	-	-	927	-	-	3		
			5	797	278	0.0	821	-	-	843	-	-	866	260	2.0	888	260	1.5	910	260	1.0	927	260	0.5	5		
	45	4975	3	713	-	-	739	260	5.0	764	260	4.5	789	260	3.5	813	260	3.0	837	260	2.5	856	260	2.0	3		
			3	713	278	2.5	739	278	1.5	764	278	1.0	789	278	0.5	813	-	-	837	-	-	856	-	-	3		
	50	4478	2	646	262	4.0	674	262	3.5	702	262	2.5	729	268	5.0	755	268	4.5	781	-	-	801	-	-	2		
			3	646	264	1.5	674	264	0.5	702	262	2.0	729	262	2.0	755	262	2.0	781	260	4.0	801	260	3.5	3		
	55	4071	1-1/2	590	-	-	622	262	5.0	653	262	4.0	682	262	3.0	710	-	-	738	-	-	760	-	-	1-1/2		
			2	590	264	3.0	622	264	2.0	653	264	1.0	682	264	0.0	710	-	-	738	268	5.0	760	268	4.5	2		
	60	3731	1-1/2	543	264	4.5	576	264	3.5	609	264	2.5	641	262	4.5	671	262	3.5	701	262	2.5	724	262	2.0	1-1/2		
			1-1/2	543	267	1.5	576	267	0.5	609	264	2.5	641	264	1.5	671	264	0.5	701	262	2.5	724	262	2.0	1-1/2		
	65	3444	1-1/2	503	-	-	540	264	5.0	575	264	3.5	609	264	2.5	641	262	4.5	672	262	3.5	697	262	3.0	1-1/2		
			1-1/2	503	267	3.0	540	267	1.5	575	264	3.5	609	264	2.5	641	264	1.5	672	264	0.5	697	-	-	1-1/2		
70	3198	1-1/2	469	-	-	507	-	-	544	264	4.5	580	264	3.5	614	262	5.0	647	262	4.0	673	262	3.5	1-1/2			
		1-1/2	469	267	4.5	507	267	3.0	544	264	1.5	580	264	2.5	614	264	2.5	647	264	1.5	673	264	0.5	1-1/2			
310	40	6674	5	809	260	3.0	827	260	3.0	847	2.5	2.5	866	260	2.0	886	260	1.5	906	260	1.0	922	260	0.5	5		
			3	722	-	-	743	260	5.0	765	260	4.5	788	-	-	810	-	-	833	-	-	850	-	-	3		
	45	5932	5	722	278	2.0	743	278	1.5	765	278	1.0	788	278	0.5	810	260	3.0	833	260	2.5	850	260	2.5	5		
			5	722	-	-	743	-	-	765	-	-	788	260	3.5	810	260	3.0	833	260	2.5	850	260	2.5	5		
	50	5339	3	652	-	-	677	-	-	701	-	-	726	260	5.0	751	260	4.5	776	260	4.0	795	260	3.5	3		
			3	652	278	4.0	677	278	3.5	701	278	2.5	726	278	2.0	751	278	1.5	776	278	0.5	795	278	0.0	3		
	55	4854	2	595	-	-	621	262	5.0	648	262	4.0	676	262	3.5	703	262	2.5	729	-	-	750	-	-	2		
			3	595	264	3.0	621	264	2.0	648	264	1.5	676	264	0.5	703	-	-	729	260	5.0	750	260	4.5	3		
	60	4449	1-1/2	547	264	4.5	575	264	3.5	605	264	2.5	635	-	-	664	-	-	692	-	-	714	-	-	1-1/2		
			2	547	267	1.5	575	267	0.5	605	-	-	635	262	4.5	664	262	3.5	692	262	3.0	714	262	2.5	2		
	65	4107	1-1/2	506	-	-	537	264	5.0	569	264	4.0	601	264	3.0	632	264	2.0	662	262	3.5	686	-	-	1-1/2		
			2	506	267	3.0	537	267	2.0	569	267	0.5	601	-	-	632	-	-	662	264	1.0	686	262	3.0	2		
70	3813	1-1/2	471	-	-	507	-	-	541	-	-	575	-	-	608	262	4.5	640	262	4.5	663	262	3.5	1-1/2			
		1-1/2	471	267	4.0	507	267	3.0	541	264	4.5	575	264	3.5	608	264	2.5	640	264	1.5	663	264	1.0	1-1/2			

**Table 9.2 - Alternate Drives for 115/230V 1 Ph, 1 HP Motors**

Model	1 HP Drive Listed	1 HP Drive for 115/230V
BTC215	269	= 270
	273	= 272
	275	= 274
	276	= 277

**Table 9.3 - Alternate Drives for 115/230V 1 Ph, 1-1/2 HP Motors**

Model	1-1/2 HP Drive Listed	1-1/2 HP Drive for 115/230V
BTC215	269	= 270
	273	= 272
BTC260	262	= 261
	264	= 263
BTC310	262	= 261
	264	= 263

① Outputs shown are for elevations up to 2000'. For elevations over 2000', output needs to be reduced 4% for each 1000' above sea level. (Does not apply in Canada - see rating plate).

② Sheave turns open are approximate. For proper operation, check blower rpm.

③ For 115/230V (1 HP and 1-1/2 HP) selections, see Tables 9.2 & 3 for the corrected Drive Number.

# ELECTRICAL SELECTION DETAILS - ALL MODELS



**Table 10.1 - Electrical Selection Details - All Models**

Model	Supply Voltage	Phase	Motor Voltage	Required Accessory Transformer ①	Power & Gas Control Circuit Transformer Voltages	Factory Installed Transformer	Motor Starter Coil Voltage
PTC	115	1 or 3	115V/1ph	none	115V/1ph	115 to 24V	none
	208			208V to 115V			
	230			230V to 115V			
	460	3		460V to 115V			
	575			575V to 115V			
BTC	115	1	115V/1ph	none	115V/1ph	115 to 24V	none
	208	1	208V/1ph	208V to 115V			115V
	230		230V/1ph	230V to 115V			
	208	3	208V/3ph	208V to 115V			
	230		230V/3ph	230V to 115V			
	460	3	460V/3ph	460V to 115V			
	575		575V/3ph	575V to 115V			

① For accessory transformer sizing, refer to Table 5.2 for model PTC and Table 6.4 for model BTC.

**Table 10.2 - Gas Controls – All Models ①**

Model Size	Control System Description	Gas Type	Control Code	Control Voltage
55-310	<b>Single-Stage, Direct Spark Ignition</b> Utilizes a single-stage combination gas control and an ignition control. Gas is automatically lit with the direct spark igniter on call for heat.	Natural	11	24V
		Propane	21	

① All ignition controls are 100% Shut-Off with Continuous Retry.

Table 11.1 - Field Installed Accessories

	Feature	Model	
		PTC	BTC
Cabinet and Air Mover	<b>Vertical Deflector Blades</b> - Allows directional discharge air control in the left and right directions.	•	•
	<b>Downward Air Deflector Hoods</b> - Available in 30°, 60°, and 90° configurations these deflector hoods provide more focused air flow control. Refer to page 12 for further details.	•	•
	<b>Two-Point Suspension Kits</b> - Converts from 4-point suspension to 2-point suspension.	•	
	<b>Fingerproof Fan Guard</b> - Ships installed on unit in place of standard guard (standard on size 110 and smaller).	•	
	<b>Pipe Hanger Adapter Kits</b> - Allows the unit to be suspended by 3/4" pipe from the standard 3/8" holes found in the top of the unit.	•	•
	<b>Discharge Transition for Polytube</b> - Allows for the connection of polytube (not included) to the discharge of the unit.		•
	<b>Blower Enclosure with or without Filter Rack</b> - Totally encases the motor and blower assembly. Optional filters provide filtering of the air prior to entering the heater.		•
	<b>Belt Guard</b> - Provides protection for building occupants as well as service people from the drive belt and sheaves.		•
Controls	<b>Natural Gas to Propane Gas Conversion Kit</b> - All required parts to convert a natural gas unit to propane gas.	•	•
	<b>Energy Saver Thermostats</b> - Mounted high and independent of the room stat, this control turns on the unit heater fan if high temperatures are sensed, forcing the heated air down, reducing stratification and potentially gas usage. SPDT switch, 30°-100° range. 16 amp @ 120V. Honeywell T631A1113.	•	•
	<b>Single-Stage Room Thermostats</b> - See Table 11.2 for details.	•	•
	<b>Stepdown Transformers</b> - Used to operate units on 208V, 230V, 460V, or 575V supply voltage. Refer to Table 10.1 for further selection details.	•	•
Condensate Handling	<b>Condensate Pump</b> - Used for high lift applications of up to 22' - DiversiTech CP-22	•	•
	<b>Condensate Pump Suspension Kit</b> - Used to suspend/support pump (DiversiTech CP-22) from heater.	•	•
	<b>Condensate Treatment</b> - Controls slime growth in pump (DiversiTech CP-22) and downstream drain.	•	•
	<b>Condensate pH Neutralizing Kit</b> - Reduces acidity of condensate.	•	•
	<b>Recharge Kit for pH Neutralizing Kit</b> - Aggregate material to recharge the pH Neutralizing kit (once per year or every 2000 hours).	•	•
Venting	<b>Horizontal Concentric Vent Kit</b> - Enables horizontal concentric venting. Kit consists of one concentric adaptor, one vent termination screen, and one inlet guard assembly (See Figure 11.1).	•	•
	<b>Vertical Concentric Vent Kit</b> - Enables vertical concentric venting. Kit consists of one concentric adaptor, one combustion air inlet cap, and two vent pipe terminal screens (See Figure 11.2).	•	•
	<b>Termination screens for horizontal or vertical, 2-pipe system terminals.</b> Terminals are by others.	•	•

Figure 11.1 - Horizontal Concentric Vent Kit

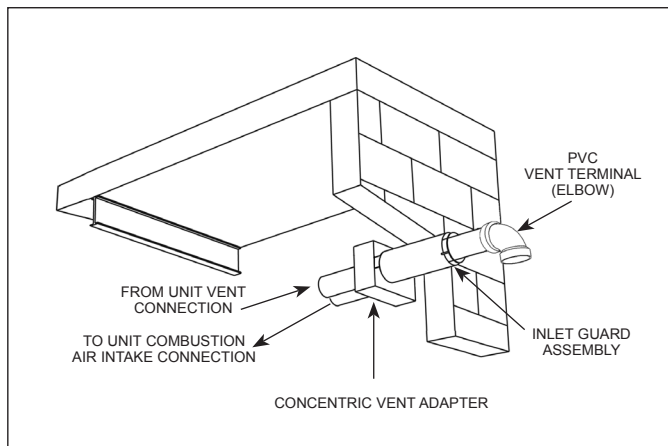


Figure 11.2 - Vertical Concentric Vent Kit

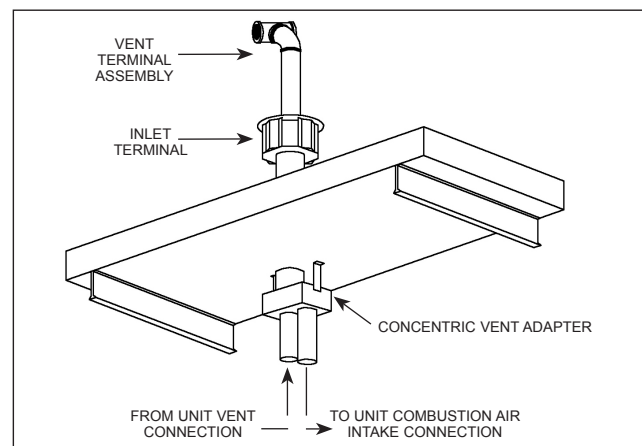


Table 11.2 - Field Installed Thermostats

	Description
Single-Stage Room Thermostats	WHITE-RODGERS 1C20-101 - 1.2 amps @30VAC, 50° -90°F temperature range, 0.15 to 1.2 amps adjustable heat anticipator
	WHITE-RODGERS 1C26-101 - Same as 1C20-101 above except adds Heat/Off/Cool and Fan On/Auto switches
	HONEYWELL TH5220D1029 digital non-programmable room stat with switching - range 40-90°F
Duct Thermostats (BTC Only)	JOHNSON CONTROLS A350 Electronic Temp Control with Sensor and S350 Stage Adder
	HONEYWELL T678A1015 20 foot capillary tube



Figure 12.1 - 30°, 60°, & 90° Deflector Hoods

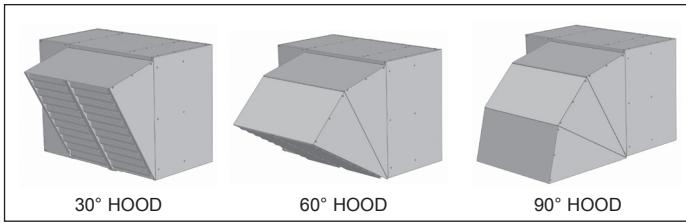


Figure 12.2 - 30° & 60° Hood Throw/Floor Coverage

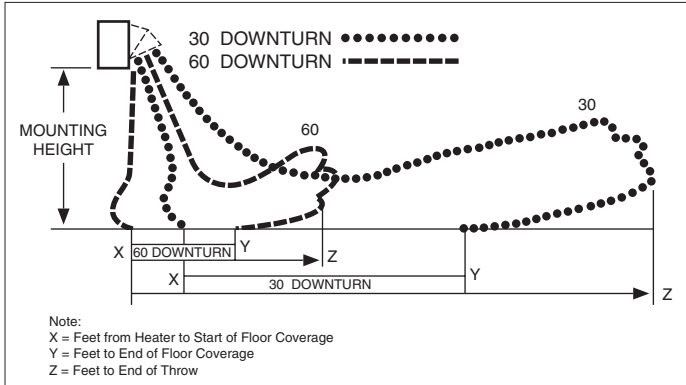


Figure 12.3 - 90° Hood Throw/Floor Coverage

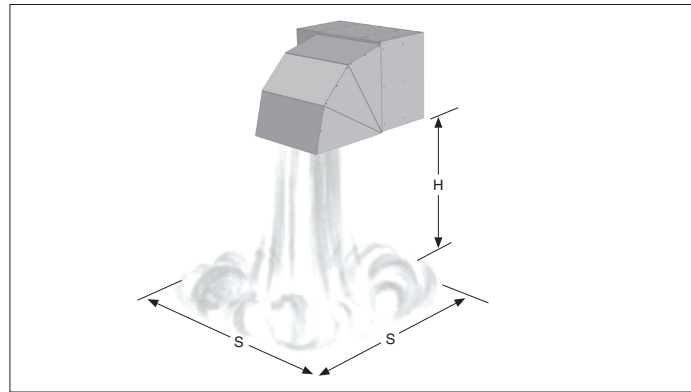


Table 12.2 - Deflector Hood General Performance Data - Model PTC

Model Size	Airflow (CFM)	Temp Rise (°F)	Mounting Height (ft)	Blade Angle (°)	30° Hood			60° Hood			90° Hood
					X (ft)	Y (ft)	Z (ft)	X (ft)	Y (ft)	Z (ft)	S (ft)
55	1097	43	8	55	12	27	37	0	28	39	19
			10	44	11	25	35	0	26	35	17
			12	31	9	23	32	0	22	30	15
65	1141	49	8	54	12	26	36	0	27	38	18
			10	43	10	24	34	0	25	34	16
			12	29	8	21	30	0	20	28	15
85	1650	44	8	59	14	30	41	0	32	43	17
			10	49	12	29	39	0	29	40	16
			12	39	11	26	37	0	26	36	14
			13	32	10	25	35	0	24	33	14
110	1750	54	8	57	13	29	39	0	30	41	16
			10	47	11	27	37	0	28	38	15
			12	35	10	25	34	0	24	33	13
135	2160	53	13	28	9	23	32	0	22	30	13
			8	60	15	32	44	0	34	47	24
			10	52	13	31	42	0	32	44	21
			12	42	12	29	40	0	29	40	19
156	2600	51	14	30	10	26	36	0	25	34	18
			8	60	19	41	56	0	43	60	26
			10	51	18	40	55	0	42	57	23
			12	41	17	38	53	0	40	55	21
180	3020	51	14	29	15	37	51	0	37	51	20
			16	8	14	34	48	0	34	47	18
			8	63	16	35	48	0	37	51	26
			10	55	15	34	46	0	35	48	23
215	3865	48	12	46	13	32	44	0	32	45	21
			14	36	12	29	41	0	29	40	20
			8	66	19	41	56	0	43	59	32
			10	60	18	40	54	0	42	57	29
260	4585	49	12	53	17	38	53	0	40	54	26
			14	46	15	36	50	0	37	51	24
			16	37	14	34	47	0	33	46	23
			8	69	22	45	62	0	48	66	37
			10	63	21	44	61	0	47	64	33
			12	57	19	43	59	0	45	62	30
310	5400	49	14	51	18	42	57	0	43	59	28
			16	44	17	40	55	0	40	55	26
			18	35	15	37	52	0	36	50	25
			20	25	13	33	47	0	31	43	24
			8	68	20	43	58	0	45	62	34
			10	61	19	42	57	0	44	60	31
310	5400	49	12	55	18	40	55	0	42	58	28
			14	48	17	39	53	0	40	54	26
			16	40	15	37	51	0	36	50	24
			18	31	13	34	47	0	32	44	23

Table 12.1 - Deflector Hood General Performance Data - Model BTC

Model Size	Airflow (CFM)	Temp Rise (°F)	Mounting Height (ft)	Blade Angle (°)	30° Hood			60° Hood			90° Hood
					X (ft)	Y (ft)	Z (ft)	X (ft)	Y (ft)	Z (ft)	S (ft)
215	3366	55	8	59	14	31	42	27	32	44	22
			10	50	13	29	40	36	30	41	20
			12	40	11	27	37	40	27	37	18
			14	27	9	24	33	35	22	31	17
			15	17	7	21	30	28	18	25	16
260	4071	55	8	65	18	38	52	34	40	55	29
			10	58	17	37	50	48	39	53	26
			12	51	15	35	49	59	36	50	24
			14	42	14	33	46	64	33	46	22
			16	33	12	30	42	61	29	40	21
			18	18	9	26	37	42	23	32	19
310	4854	55	19	2	6	20	30	52	23	32	19
			8	64	17	37	51	33	39	54	28
			10	57	16	36	49	47	37	51	21
			12	50	15	34	47	56	35	48	16
			14	41	13	32	44	61	32	44	13
			16	30	11	29	41	56	27	38	11
310	4854	55	18	14	8	23	33	30	20	28	9

Note: Refer to Figures 12.1 through 12.3.

Note: Refer to Figures 12.1 through 12.3.



## Selection Procedure

In order to properly select a unit heater it is necessary to have the following basic information.

### 1. Heating output capacity

Model size output is to be matched against the heat loss to be replaced.

### 2. External static pressure (blower units only)

The external static pressure (E.S.P.) is determined using the ASHRAE Guide for duct losses or provided by the design engineer.

### 3. Accessory internal static pressure (transitions, filters, etc.) (blower units only)

The critical accessories are those that add internal static pressure (I.S.P.) to the unit. Once these items are determined, the total pressure drop can be determined (if applicable).

### 4. Heat exchanger material

The heat exchanger type is determined by the application. The standard heat exchanger material is aluminized steel. A 409 stainless steel heat exchanger is recommended when the combined entering/return air to the unit is below 40°F or in high humidity applications.

### 5. Type of fuel

Either natural or propane gas determined by the design engineer.

### 6. Gas controls

Single stage, as determined by the design engineer.

### 7. Main power supply voltage to unit

## Selection Example (Propeller Unit)

### Selection Example Conditions (Propeller Unit)

Select a unit heater to meet the following conditions:

1. Heating output capacity = 166,000 Btu/Hr per design engineer
2. External static pressure = 0.0
3. Internal static pressure = 0.0. No static producing accessories are required.
4. Heat exchanger = 409 Stainless Steel
5. Gas Type = Natural
6. Gas Controls = Single Stage
7. Supply Voltage: 460V/60Hz/3Ph

With the information listed above, the basic model, using the information in this catalog and the Model Nomenclature shown on page 19, can be selected as shown:

### 1. Determine the Model and Input Rating (MBH):

Using the Heating output capacity, the Furnace Input Rating is determined from Table 5.1. The closest model to 166,000 Btu/Hr output has an Btu/Hr Input rating of 180,000 Btu/Hr so the Furnace Input Rating = 180. The corresponding model for a 180 size, propeller, separated combustion unit heater is PTC. The model and size are a PTC180.

### 2. Determination of Heat Exchanger Material:

From item #4 in the example, the Heat Exchanger required is 409 Stainless Steel. Thus, the Heat Exchanger Material = S from the Model Nomenclature on page 19.

### 3. Determine the Ignition Type:

The Ignition Type = S from the Model Nomenclature on page 19.

### 4. Determine Power Code Required:

Referring to Table 5.2, it can be seen that the supply voltage from the example conditions is not available (460V). A transformer kit selected later in this example must be used. In this instance, from Table 5.2 select the 115V/60Hz/1Ph power code (PC) = 01 unit.

### 5. Determine the control type:

From items #4 and #5 in the example conditions, the gas type is Natural Gas and controls are Single Stage. From Table 10.2, we are directed to use Control Code (CC) 11.

### 6. Determine the fan guard type:

No specific type of fan guard was specified, so select Fan Guard = S from the Model Nomenclature on page 23.

**At this point we have a full model number of PTC180SS0111SBAN**

### 7. Determination of transformer:

To operate a 115V/60Hz/1Ph unit on 460V/60Hz/3Ph supply power a unit step down transformer must be selected. By referring to Table 10.1 we see that a 460V to 115V step down transformer is required. As noted in the footnote for Table 10.1, the size can be determined to be 1.0kVA from Table 5.2.



## Selection Example (Blower Unit)

### Selection Example Conditions (Blower Unit)

Select a unit heater to meet the following conditions:

1. Heating output capacity = 195,000 Btu/Hr per design engineer
2. External Static Pressure = 0.2.
3. Internal Static Pressure = 0.0. No static producing accessories are required at this point, but filters may be added later.
4. Heat exchanger = Aluminized Steel
5. Gas Type = Propane
6. Gas Controls = Single-Stage
7. Supply Voltage: 230V/60Hz/3Ph
8. CFM = 2,600

At this point we have a full model number of **BTC215AS8421NBAN**

### 6. Determination of Transformer:

To operate the BTC215AS8421NBAN on 230V/60Hz/3ph supply voltage, we need to review Table 10.1 to determine if any field installed transformers are required. The table indicates that we need a 230V to 115V step down transformer for the power exhaust and gas control circuit voltage. As indicated in the footnote for that table, Table 6.4 directs us to the correct size for this model, which is 0.5kVA. Transformers for blower models are typically smaller than those used for propeller models, as the transformer is not needed for the blower motor.

With the information listed above, the basic model, using the information in this catalog and the Model Nomenclature shown on page 19, can be selected as shown:

### 1. Determine the Model and Input Rating (MBH):

Using the Heating output capacity, the Furnace Input Rating is determined from Table 6.1. The closest model to 195,000 Btu/Hr output has an Btu/Hr Input rating of 215,000 Btu/Hr so the Furnace Input Rating = 215. The corresponding model for a 215 size, blower, separated combustion unit heater is BTC. The model and size are a BTC215.

### 2. Determination of Heat Exchanger Material:

From item #4 in the example, the Heat Exchanger required is aluminized steel. Thus, the Heat Exchanger Material = A from the Model Nomenclature on page 19.

### 3. Determine the Ignition Type:

The Ignition Type = S from the Model Nomenclature on page 19.

### 4. Determine Power Code Required:

From page 9 we see that a unit requiring a static of 0.2 and a cfm of 2600 requires a 1 horsepower motor with a -275 drive that is turned open 3 turns. Referring to Table 7.1 it can be determined that for a BTC215 with a 1HP motor and a -275 drive operating on 230V/60Hz/3Ph that it will have a power code = 84. However, note that if filters are added later, that drive/motor combination will not be sufficient. One alternate drive selection could have been made with a 1HP motor with a -276 drive. The power code would be 85.

### 5. Determine the control type:

From items #5 and #6 in the example, the gas type is Propane Gas and controls are Single-Stage. From note ⑥ on page 4, we are directed to use Control Code (CC) = 21.

# DIMENSIONAL DATA - MODEL PTC



Figure 15.1 - Dimensional Drawings - Model PTC

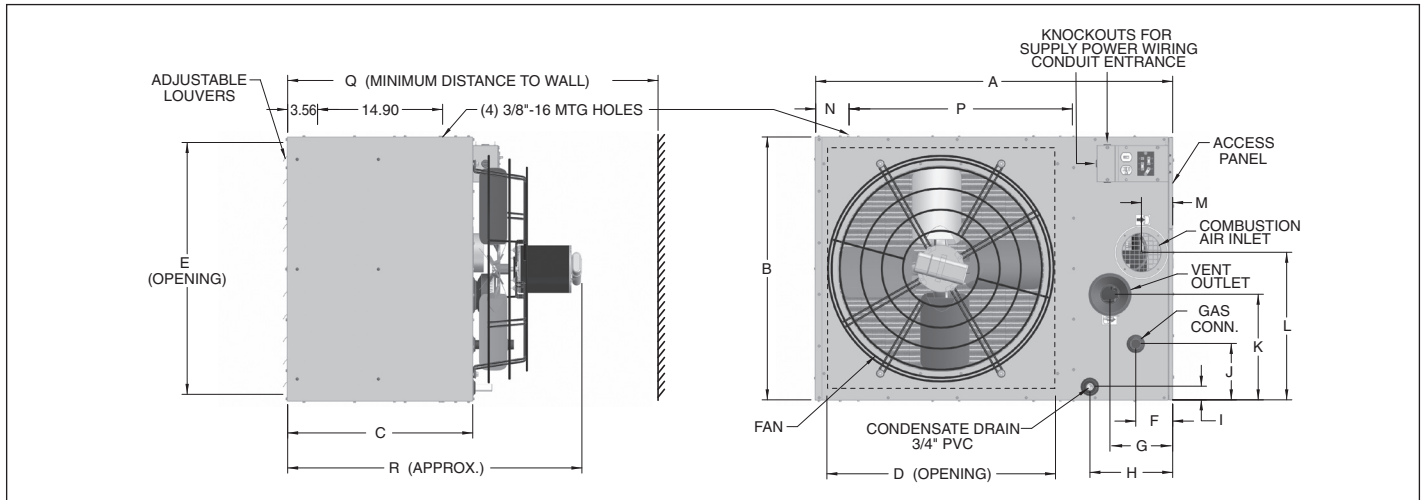


Table 15.1 - Dimensions (inches)

Models	PTC 55	PTC 65	PTC 85	PTC110	PTC135	PTC156	PTC180	PTC 215	PTC260	PTC310
A	29.80	29.80	35.53	35.53	35.53	35.53	42.53	42.53	42.53	42.53
B	18.13	18.13	20.31	20.31	23.06	23.06	25.81	31.31	31.31	39.56
C	19.03	19.03	22.05	22.05	22.05	22.05	22.05	22.05	22.05	22.05
D	17.00	17.00	22.52	22.52	22.52	22.52	29.52	29.52	29.52	29.52
E	16.24	16.24	18.42	18.42	21.18	21.18	23.93	29.43	29.43	37.68
F	4.71	4.71	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
G	7.19	7.19	7.98	7.98	7.98	7.98	7.98	7.47	7.47	8.12
H	10.22	10.22	10.27	10.27	10.18	10.18	10.36	9.86	9.86	9.79
I	3.10	3.10	1.32	1.32	2.15	2.15	1.73	1.63	1.63	1.88
J	12.81	12.81	6.73	6.73	8.09	8.09	9.47	6.72	6.72	10.84
K	6.00	6.00	8.74	8.74	8.45	8.45	9.82	12.58	12.58	16.19
L	9.07	9.07	12.13	12.13	12.95	13.45	14.92	17.58	17.58	22.19
M	3.30	3.30	3.86	3.86	3.48	3.98	3.98	3.72	3.72	4.62
N	1.90	1.90	1.54	1.54	1.54	1.54	3.97	3.97	3.97	3.97
P	16.00	16.00	22.03	22.03	22.03	22.03	26.60	26.60	26.60	26.60
Q	40.19	40.19	45.83	45.83	45.83	45.83	45.83	45.83	46.83	46.83
R	28.19	28.19	30.69	34.23	33.83	33.83	33.83	33.83	34.83	34.83
Combustion Air Inlet Pipe	3	3	3	3	3	4	4	4	4	6
Vent Outlet Pipe	3	3	3	3	3	4	4	4	4	4
Gas Connection	1/2	1/2	1/2	1/2	1/2	1/2	1/2	3/4	3/4	3/4
Fan Diameter	14	14	18	18	20	20	22	24	24	26
Approx. Shipping Weight (lbs.)	93	103	125	128	165	165	215	265	265	310

Table 15.2 - Clearances - Sizes 110 and Below

Unit Side	Clearance To Combustible Materials	Recommended Service Clearance
Top and Bottom	1"	18"
Access Side	1"	18"
Non-Access Side	1"	18"
Rear	18"	18"
Vent Connector	6"	18"

Table 15.3 - Clearances - Sizes 135-310

Unit Side	Clearance To Combustible Materials	Recommended Service Clearance
Top and Bottom	6"	18"
Access Side	6"	18"
Non-Access Side	6"	18"
Rear	18"	18"
Vent Connector	6"	18"



# DIMENSIONAL DATA - MODEL BTC



Figure 16.1 - Dimensional Drawings - Model BTC

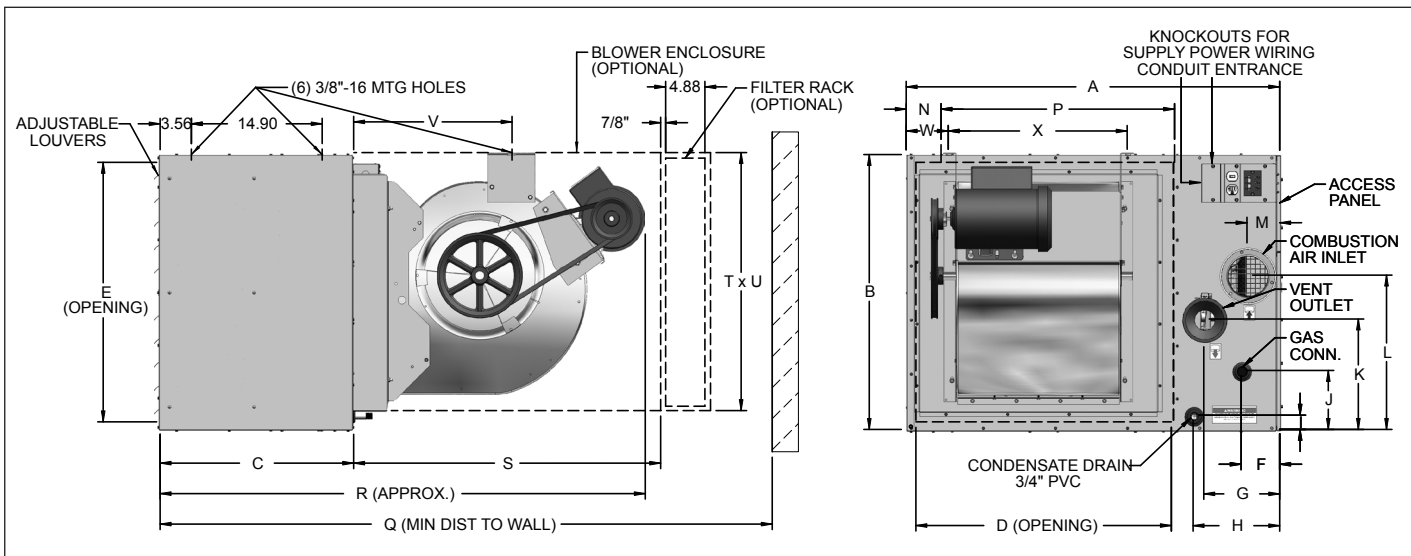


Table 16.1 - Dimensions (inches) - BTC

Models	BTC 215	BTC260	BTC310
A	42.53	42.53	42.53
B	31.31	31.31	39.56
C	22.05	22.05	22.05
D	29.52	29.52	29.52
E	29.43	29.43	37.68
F	4.50	4.50	4.50
G	7.47	7.47	8.12
H	9.86	9.86	9.79
I	1.63	1.63	1.88
J	6.72	6.72	10.84
K	12.58	12.58	16.19
L	17.58	17.58	22.19
M	3.72	3.72	4.62
N	3.97	3.97	3.97
P	26.60	26.60	26.60
Q (w/Blower Encl & Filter Rack)	79.68	79.68	79.68
Q (w/o Blower Encl & Filter Rack)	70.88	70.88	70.88
R ①	58.88	58.88	58.88
S	39.88	39.88	39.88
T	28.57	28.57	28.57
U	28.28	28.28	28.28
V	18.00	18.00	18.00
W	5.45	5.45	6.45
X	20.59	20.59	21.59
Combustion Air Inlet Pipe	4	4	6
Vent Outlet Pipe	4	4	4
Gas Connection	3/4	3/4	3/4
Blower	15-15	15-15	15-15
Approx. Shipping Weight (lbs.)	340	350	395

① This is an approximate dimension for standard motors, allow 3" for sheave and optional motors.

# SPECIFICATIONS - ALL MODELS



Note: Specifications below are extracted from a master gas-fired unit heater specification and therefore certain numbered sections have been intentionally omitted.

## General

### A. Standards

All unit(s) shall include:

- A.2. ETL design certification for use in both the US and Canada to the ANSI Z83.8 - latest revision, standard for "Gas Unit Heater and Gas-Fired Duct Furnaces" for safe operation, construction, and performance.

### B. Mechanical Configuration

- B.3. Condensing furnace section with 93% minimum efficiency provided by an indirect-fired tubular heat exchanger with individually fired tubes coupled to a secondary recuperative heat exchanger for maximum heat recovery.

### C. Venting/Combustion Air Arrangement

- C.4. The unit shall be separated combustion. The venting shall be a power exhausted arrangement with a separate combustion air intake pipe connection to allow for fresh combustion air from outside the conditioned space. The unit shall be tested to insure proper ignition when the unit is subjected to 40 mile per hour wind velocities. The unit shall also include a factory mounted differential pressure switch designed to prevent main burner ignition until positive venting has been proven.

Venting shall be Schedule 40 PVC. For Canadian installations, all vent pipe and components must be approved to ULC S636.

### D. Unit Casing

- D.1. The unit heater(s) casing shall be constructed of not less than 20 gauge aluminized steel with minimization of exposed fasteners.
- D.2. All exterior casing parts shall be cleaned of all oils and a phosphate coating applied prior to painting. The exterior casing parts shall then be painted with an electrostatically applied baked-on gray-green polyester powder paint (7-mil thickness) for corrosion resistance.
- D.3. The unit shall be furnished with horizontal air deflectors. The deflectors are adjustable to provide for horizontal directional airflow control (up or down).

### E. Furnace Section

- E.1.e. The primary heat exchanger(s) shall be made of 18 gauge aluminized steel (opt 409 stainless steel) tubes and headers. Each heat exchanger tube shall be individually and directly flame-fired. The heat exchanger tube shall be crimped to allow for thermal expansion and contraction. The flue collector box shall be made of 20 gauge AL29-4C stainless steel.  
The thermal efficiency of the unit(s) shall be a minimum of 93% efficient for all air flow ranges through the use of a secondary recuperative heat exchanger. The secondary heat exchanger shall be constructed of AL29-4C stainless steel to withstand the corrosive environment of condensing gas fired equipment.
- E.2. The heat exchanger(s) seams and duct connections shall be certified to withstand 0.9" W.C. external static pressure without burner flame disturbance.
- E.3.a. The burner(s) shall be in-shot type, directly firing each heat exchanger tube individually and are designed for good lighting characteristics without noise of extinction for both natural and propane gas.

- E.5. The ignition controller(s) shall be 100% shut-off with continuous retry.
- E.6. The gas pressure shall be between 6-7" W.C for natural gas (opt). The gas pressure shall be 11-14" W.C. for propane gas.
- E.7.a. The solid state ignition system shall directly light the gas by means of a direct spark igniter each time the thermostat calls for heat.
- E.8. The unit gas controls shall be provided with the following:
  - E.8.d. Single-stage gas controls with a single-stage combination gas control, an ignition control, and a single-stage low voltage thermostat. The unit fires at 100% full fire based on a call for heat from a room thermostat.
- E.9. An automatic reset high limit switch mounted in the air stream to shut off the gas supply in the event of overheating.
  - E.9.a. An automatic reset high limit switch mounted on the power exhauster housing to shut off the gas supply in the event of overheating flue gas temperatures.
  - E.9.b. A condensate drain line overflow switch that senses if the condensate line is clogged and shuts the unit heater down.
- E.10. A time delay relay that delays the start of the air mover to allow the heat exchanger a warm-up period after a call for heat. The time delay relay shall also continue the air mover operation after the thermostat has been satisfied to remove any residual heat on the heat exchanger.
- E.11. The unit shall be orificed for up to 2000' elevation above sea level (opt the unit shall be orificed for \_\_\_\_\_ elevation above sea level).

### F. Electrical

- F.1. All electrical components shall carry UL, ETL, or CSA listing.
- F.2. Low voltage terminal board.
- F.3. A single 115V to 24V step down transformer shall be provided for all unit controls.

### G. Air Mover

- G.1. The motor horsepower shall be \_\_\_\_.
- G.2. The motor shall be factory wired (PTC Models).
- G.3. The motor shall be controlled by a time delay relay.
- G.4. Propeller models shall meet the following requirements:
  - G.4.a. The motor type shall be Single-speed, totally enclosed (TE)
  - G.4.b. The motor shall be rated for: (a) 115V/60Hz/1Ph
- G.5. Blower models shall meet the following requirements:
  - G.5.a. The motor type shall be single-speed, totally enclosed (TE)
  - G.5.b. The motor shall be rated for:
    - (a) 115V/60Hz/1Ph
    - (b) 208V/60Hz/1Ph (BTC model)
    - (c) 230V/60Hz/1Ph (BTC model)
    - (d) 208V/60Hz/3Ph (BTC model)
    - (e) 230V/60Hz/3Ph (BTC model)
    - (f) 460V/60Hz/3Ph (BTC model)
    - (g) 575V/60Hz/3Ph (BTC model)

- G.5.c. The motor shall be provided with an adjustable motor sheave to allow for minor adjustment of the blower rpm at the job site. (BTC models)
- G.5.d. The blower shall be a double width, double inlet (DWDI), forward curved, belt driven, assembly with spider ball bearings. (BTC models)

## H. Mounting

- H.1. The unit shall be equipped with tapped holes to accept 3/8"-16 threaded rod for suspension.
- H.1.a. The unit shall be equipped with mounting brackets to allow for threaded rod suspension or to be bolted directly to the ceiling support structure allowing 1" of top clearance. (PTC models - opt on sizes 55-110)
- H.3. Propeller unit to have 4 suspension points.
- H.4. Blower unit to have 6 suspension points.

## J. Accessories

The following field installed accessory control devices shall be provided with the unit:

- J.1. A 1/2-50 psi gas pressure regulator to reduce the inlet gas pressure for the operating controls.
- J.2. A clear plastic thermostat guard with two keys for room thermostats.
- J.4. Pipe Hanger Adapter Kit to facilitate threaded pipe suspension.
- J.7. Vertical Deflector Kit to enables side distribution of airflow.
- J.8. A blower enclosure fully encloses blower to enable the attachment of filter racks and/or duct.
- J.9. A combination filter rack/duct connector containing a 1" thick, cleanable filter.
- J.11. A belt guard enclosing the belts and sheaves (pulleys) on a blower type unit heater. (BTC models)
- J.12. Propane conversion kit for converting natural gas units to propane gas.
- J.17. Discharge transition from unit to polytube. (BTC models)
- J.18. 30° non-velocity generating downward air deflector hood constructed of 20 ga. cold rolled steel with baked-on gray-green polyester powder paint.
- J.19. 60° non-velocity generating downward air deflector hood constructed of 20 ga. cold rolled steel with baked-on gray-green polyester powder paint.
- J.20. 90° non-velocity generating downward air deflector hood constructed of 20 ga. cold rolled steel with baked-on gray-green polyester powder paint.
- J.21. A 208V to 115V step down shall be provided for operation of the 115V unit. (PTC models)
- J.22. A 230V to 115V step down shall be provided for operation of the 115V unit. (PTC models)
- J.23. A 460V to 115V step down shall be provided for operation of the 115V unit. (PTC models)
- J.24. A 575V to 115V step down shall be provided for operation of the 115V unit. (PTC models)
- J.25. A 208V to 115V step down shall be provided for operation of the 115V power exhaustor and control circuit. (BTC models)
- J.26. A 230V to 115V step down shall be provided for operation of the 115V power exhaustor and control circuit. (BTC models)
- J.27. A 460V to 115V step down shall be provided for operation of the 115V power exhaustor and control circuit. (BTC models)
- J.28. A 575V to 115V step down shall be provided for operation of the 115V power exhaustor and control circuit. (BTC models)
- J.29. A horizontal concentric vent kit shall be provided to allow the vent outlet and combustion air inlet pipes to penetrate the building wall through one opening.
- J.30. A vertical concentric vent kit shall be provided to allow the vent outlet and combustion air inlet pipes to penetrate the building roof through one opening.
- J.31. A 2-point suspension kit to convert the unit from 4-point mounting to 2-point mounting.
- J.32. An Energy Saver Thermostat to be mounted high and independent of the room stat to turn on the unit heater fan if high temperatures are sensed, forcing the heated air down to reduce stratification and gas usage.
- J.33. A condensate pump for high lift applications of up to 22'. Pump shall include indicator lights to show pump status, internal vibration isolation, a check valve, condensate treatment tablet dispenser, and alarm contacts to shut the unit heater down if the pump becomes inoperable.
- J.34. A condensate pump suspension kit to suspend/support the pump (DiversiTech CP-22) from the unit heater.
- J.35. Condensate treatment tablets to controls slime growth in pump (DiversiTech CP-22) and downstream drain.
- J.36. A condensate pH neutralizing kit to reduce the acidity of condensate. Includes barbed inlet and outlet fittings, mounting brackets and an initial charge of neutralizing aggregate.
- J.37. A recharge kit for pH neutralizing kit. Includes sufficient aggregate for a complete recharge of the neutralizing kit.

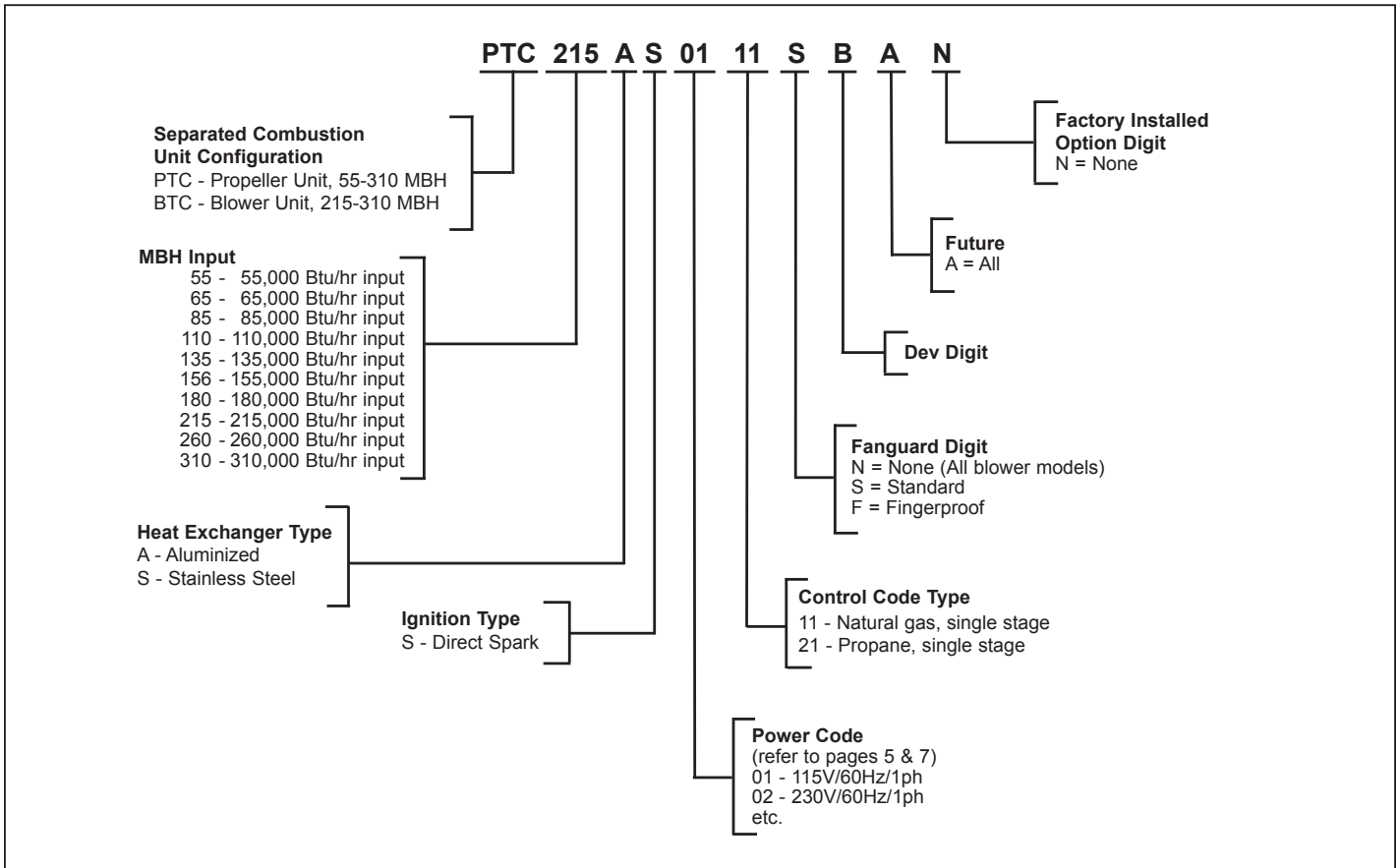
## K. Thermostats

The unit shall be provided with the following thermostat:

- K.2. A single stage room thermostat with a 50°-90°F range.
- K.3. A single stage room thermostat with a 50°-90°F range with Heat/Off/Cool and Fan On/Auto switching.
- K.4. Honeywell TH5220D1029 digital non-programmable room stat with switching - range 40-90°F.
- K.5. A field installed two-stage duct thermostat with a 0°-100°F range and 20-foot capillary.
- K.6. A two-stage electronic duct thermostat with field installed temperature sensor, temperature selector and one stage adder.

**Figure 19.1 -Model Number Designations**

(Remove access cover to locate)



Products from Modine are designed to provide indoor air-comfort and ventilation solutions for residential, commercial, institutional and industrial applications. Whatever your heating, ventilating and air conditioning requirements, Modine has the product to satisfy your needs, including:

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