

## Modulating Vertical Boilers & Water Heaters



*Models 504 thru 2004  
Category I with vertical vent*

*Models 503 thru 2003  
Category IV Venting*

*Up to **87%** thermal efficiency!*



*The Hot Water Management Experts*

# Category I\*-up to 85% efficiency

## Category IV-87% efficiency

### Raypak's Next Generation Modulating Boiler

Time-honored technologies unite with cutting-edge advancements in Raypak's new MVB® modulating vertical boiler. Never before has a vertical boiler provided both the installer and building owner such installation flexibility, ease-of-commissioning, reliability and long-term performance. Small space, not a problem. The MVB has the smallest installed footprint of any vertical boiler, only 5.4 square feet. Raypak's MVB is built with commercial-grade components and materials. From our steel channel base to our stainless steel flue wrapper, you can tell the MVB is built to last. It's easy to handle and install, but still user friendly to service. Our compact design fits through a 30" door opening making it the perfect choice for those hard to reach retrofit projects. Now is the perfect time to take a closer look at Raypak.

### Flexibility

Small diameter vents and industry-leading vent length allowances afford greater vent location options, thus reducing wasted space. Vent versatility is further enhanced by the self-tuning combustion system which compensates for unusual chimney and vent configurations.

**Category I\*** -CSA-certified 84% boiler and up to 85% water heater models available. Our category I solution is the perfect replacement for your retro-fit applications. This reduces the installed cost by using existing category I venting or chimney. Installation couldn't be easier; all connections are on the back of the unit. Start-up is a snap, it's as close to plug-n-play as a boiler can get.

**Category IV** -CSA-certified 87% efficiency at full fire—the highest possible for non-condensing boilers (*Up to 88.4% at part load!*) When the job requires high efficiency, our category IV solution meets your needs.

At the heart of every Raypak MVB is a unique integral evaporator system - the first defense against harmful condensation. Raypak's evaporator system collects and re-evaporates condensate which may form during initial start-up or brief periods of cold-water operation, eliminating the need for a boiler condensate drain. This saves you money on installation costs as well as the headache of dealing with multiple condensate drains.

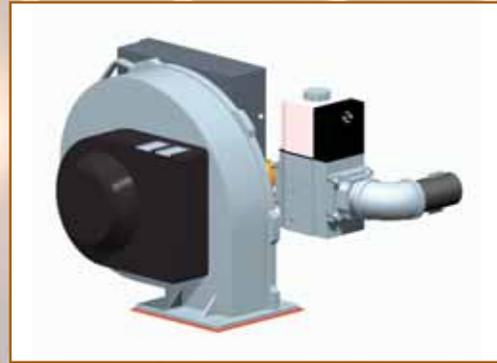
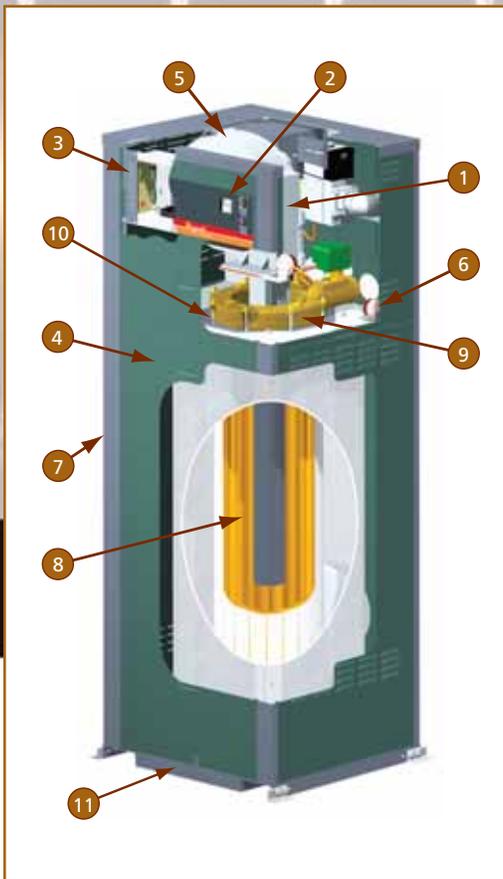
### True Modulation

Modulation is nothing new to Raypak, we have honed our gas modulation experience for over 50 years. The Raypak MVB will infinitely track the heating load precisely with its built in TempTracker Mod control, eliminating costly overshooting. Utilizing the latest European technology for the blower-gas valve package, the optimum fuel-air ratio is maintained throughout the entire range of the load-tracking operation. Our smooth 4:1 turndown (503 thru 2003) ensures efficiency is maintained through out the firing rate and actually increases during part load, right when you want it! The MVB automatically self-tunes to accommodate the widest range of gas supply pressures. The high quality integrated blower-gas valve is self-correcting and allows smooth operation with fluctuating gas supply pressures. The Raypak MVB is cutting edge technology with atmospheric simplicity.

### Key Features

- 12 models from 500,000 to 2,000,000 BTUH
- Up to 85% efficiency (Cat. I\*);
- Up to 88.4% efficiency (Cat. IV)
- No boiler condensate drain required (proprietary design)
- Lowest minimum required inlet water temperature (120F)
- Modulating gas valve and burner, up to 4:1 (503 thru 2003) turndown
- Engineered with precisely matched system components
- Smallest installed footprint (5.4 square feet) design fits tight spaces and easily replaces larger boilers
- Advanced diagnostics and easy component access make service simple
- All models indoor/outdoor certified
- Complete cabinet protects all controls and wiring
- Meets all current Low NOx regulations, including the new 2010 SCAQMD revisions
- Suitable for altitudes up to 10,000 ft. (derate above 5,000 ft.)
- With all copper and optional bronze waterways, the MVB is available in boiler and water heater configurations

\*Category I with vertical vent, category III with horizontal venting and no extractor.



State of the art European combustion technology

**1. Control Panel**

Fully enclosed controls and wiring protect against damage or vandalism. Cabinet design affords easy access to controls for installation and service.

**2. Temp-Tracker Mod Control**

This factory-mounted multi-function control delivers precise load-tracking with selectable mode displays that are easy to access and read.

**3. Universal Diagnostics Board**

12 LEDs monitor up to 22 safety circuits and store up to 256 fault codes.

**4. Weather-Proof Jacket**

Heavy gauge galvanized steel with a UV-resistant Polytuf powder coat finish is impervious to weather and corrosion.

**5. Combustion Air Fan**

Cast aluminum, non-sparking construction.

**6. Vent Pressure Switch**

Monitors vent pressure and provides safe shut down if back pressure is excessive.

**7. Minimum Clearance Requirements**

Only one inch of side clearance is required from combustible surfaces.

**8. Vertical Heat Exchanger**

Cylindrical, multi-pass heat exchanger captures all radiant energy, eliminating the need for heavy refractory.

**9. Rugged All-Bronze Headers**

The proven choice for all applications.

**10. Tube Sheet Construction**

Eliminates the repair & maintenance problems associated with rolled-tube construction. Easy, cost-effective component replacement.

**11. Viewing Port**

Allows easy burner inspection.

## Optional Equipment

### Cold Water Solutions



**Cold Water Start** – For applications that require reliable protection against harmful condensation caused by frequent, extended, cold water start-ups. Raypak's Cold Water Start protection system utilizes a proportional three-way valve to bypass water from the boiler outlet to the inlet during start-up, when the system return water temperature is below the minimum acceptable level. (See Cat. #1000.19)

system return water temperature is below the minimum acceptable level. (See Cat. #1000.19)



**Cold Water Run** – For applications requiring constant condensation protection. Raypak's Cold Water Run system utilizes a variable-speed pump to inject just the right amount of water from the main system loop into the boiler to maintain the optimum inlet temperature. This approach allows the full capacity of the boiler to be utilized to meet the system load, while at the same time continuously maintaining the optimum inlet water temperature to prevent condensation. (See Cat. #1000.19)

while at the same time continuously maintaining the optimum inlet water temperature to prevent condensation. (See Cat. #1000.19)

### Multi Boiler Solutions



**Y-200 Boiler Sequencer** – Provides additional functionality for multiple-boiler installations. Controls up to 8 MVB boilers with full PID logic. LonMark® certified interface ensures seamless compatibility with LonWorks® Building Management Systems (BMS) (See Cat. #5100.22)



**TempTracker Mod+** – Controls up to 16 Raypak MVBs with P or PID logic. Automatic or manually selectable lead-lag boiler operation. TempTracker Mod+ monitors and displays supply water temperatures on all applications including outdoor temperature when outdoor reset mode is selected. (See Cat. # 5100.22)

## Smallest Installed Footprint

The MVB's compact design allows for easy installation in the most challenging equipment rooms. It's easy to handle and install, but still user friendly to service. The MVB has the smallest installed footprint of any vertical boiler, only 5.4 square feet. The MVB contains all of its components to the inside of the cabinet, so there won't be any fans or valves hanging off the cabinet that need extra clearance. The compact design fits through a 30" door opening making it the perfect choice for those hard to reach retrofit projects.



	Model	Venting Category †	Boilers			Water Heaters			Input Min.
			Input	Output	Efficiency	Input	Output	Efficiency	
MBTUH	503	IV	500	435	87%	500	435	87%	125
	753	IV	750	653	87%	750	653	87%	188
	1003	IV	999	869	87%	999	869	87%	250
	1253	IV	1250	1088	87%	1250	1088	87%	312
	1503	IV	1500	1305	87%	1500	1305	87%	375
	1753	IV	1750	1523	87%	1750	1523	87%	438
	2003	IV	1999	1739	87%	1999	1739	87%	500
	504	I*	500	420	84%	500	420	84%	357 <sup>a</sup>
	754	I*	750	630	84%	750	630	84%	536 <sup>a</sup>
	1104	I*	1100	924	84%	1045	888	85%	786 <sup>a</sup>
	1504	I*	1500	1260	84%	1425	1211	85%	1071 <sup>a</sup>
	2004	I*	1999	1679	84%	1900	1615	85%	1428 <sup>a</sup>

\*Category I with vertical vent, category III with horizontal venting and no extractor.

†Category IV requires sealed vent with condensate drain. Category I uses conventional B vent.

<sup>a</sup>Boilers only.

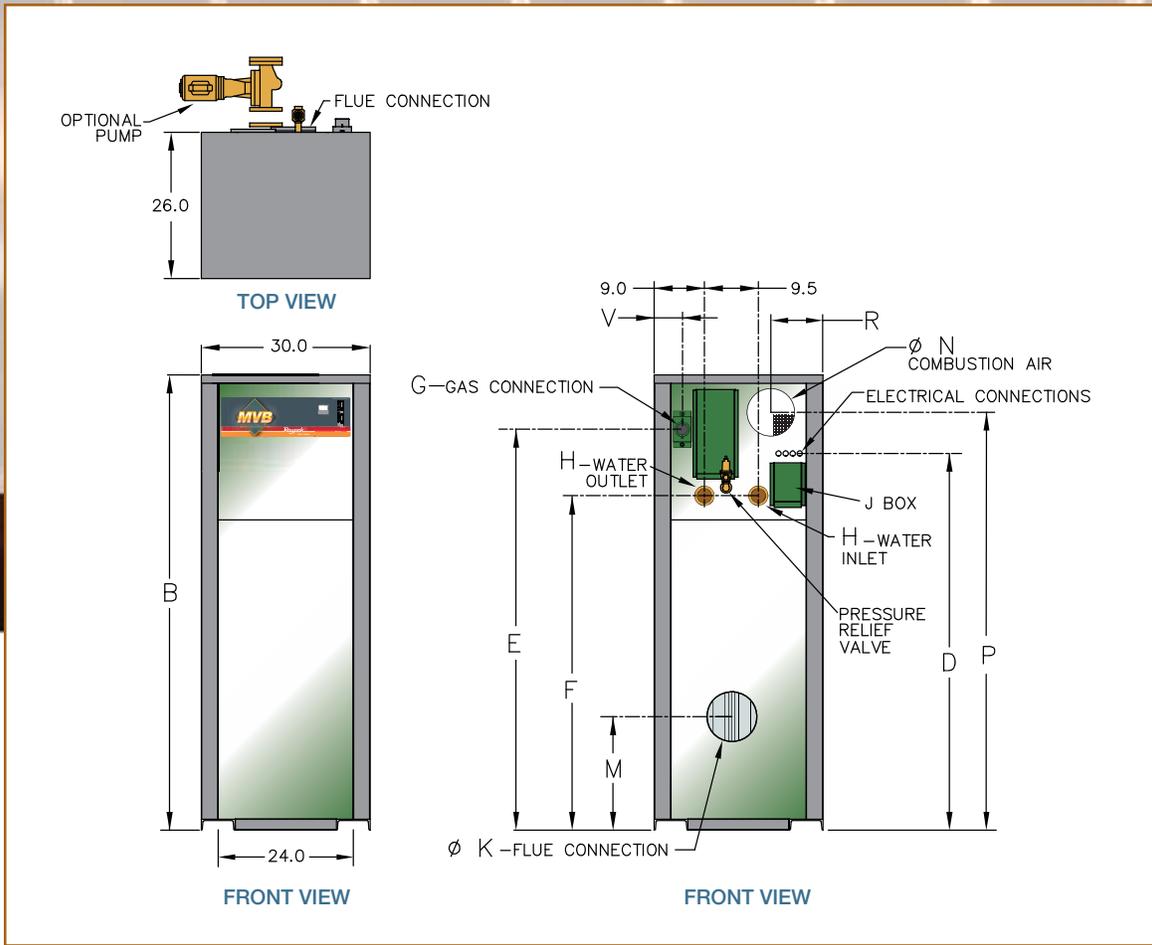
Note: Ratings are for natural or propane gas and for elevations up to 5,000 ft. above sea level. For higher elevations, consult the factory.

	Models		Dimensions (inches)													Operating Weight (lbs.)	Amps ‡	
	MVB Cat. I*	MVB Cat. IV	B Ht.	D	E	F	G † NPT	H NPT	K-Ø Cat. I*	K-Ø Cat. IV	M Cat. I*	M Cat. IV	N CA Ø	P	R			V
PHYSICAL DATA	504	503	43	32	35	23-3/4	1	2	8	6	14-1/8	14-1/2	6	35	6	2	600	12
	754	753	49	38	41	29-3/4	1	2	10	6	16	14-1/2	6	41	6	2	660	12
	1104	1003	55	44	47	35-3/4	1-1/4	2-1/2	10	6	16	14-1/2	6	47	6	2	720	12
	1504	1253	61	50	53	41-3/4	1-1/4	2-1/2	12	8	18-1/8	17-3/4	8	53	6	2	780	12
		1503	67	56	59	47-3/4	1-1/4	2-1/2		8		17-3/4	8	59	6	2	840	12
	2004	1753	75	62	65	53-3/4	2	2-1/2	14	8	20-1/8	17-3/4	8	68	9	5	940	18
		2003	81	68	71	59-3/4	2	2-1/2		8		17-3/4	8	74	9	5	1000	18

\*Category I with vertical vent, category III with horizontal venting and no extractor.

†NPT is for Natural Gas. For Propane, NPT= 1" for all water heater/boiler sizes.

‡Current draw is for heater only. (Supply breaker must have a delayed trip.)



All components are contained inside the cabinet (except PRV), no external fans or valves to deal with.

CLEARANCES	Heater Side	From Combustible Surfaces (min.)	For Service (recommended)
	Floor*	0"	0"
	Rear	12"	24"
	Right Side	1"	1"
	Left Side	1"	1"
	Top	Indoor 0" Outdoor Unobstructed	10" Unobstructed
	Front	Open	24"
	Vent Stack	Indoor 1"	1"
	Vent Cap	Outdoor 12"	12"

\*Do not install on carpeting  
Note: Local codes may require increased clearances

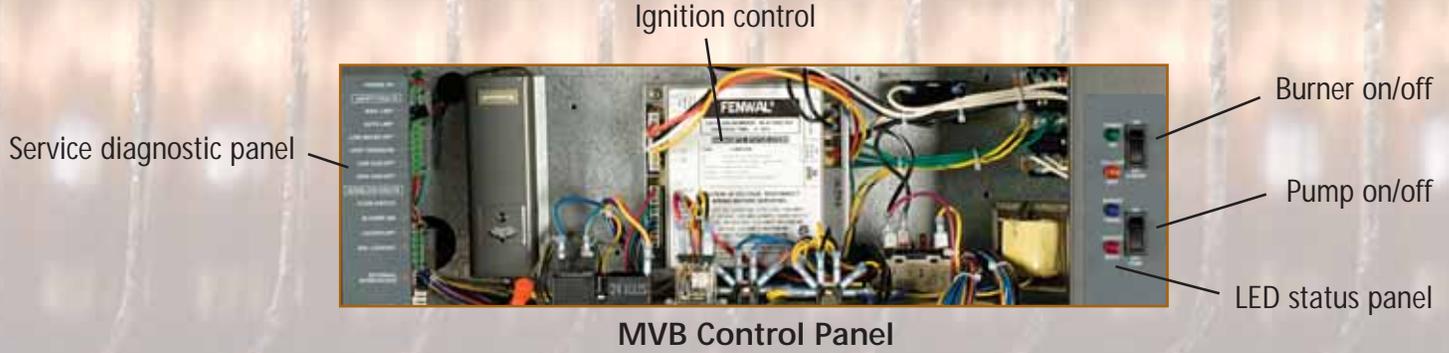
PUMP	MVB Model	Water Hardness					
		Soft		Medium		Hard	
		HP	Amps	HP	Amps	HP	Amps
	503/504	1/4	6	1/4	6	3/4	11
	753/754	1/4	6	1/2	7	3/4	11
	1003/1104	1/4	6	1/2	7	1	14
	1253	1/2	7	1	14	1	14
	1503/1504	3/4	11	1	14	1	14
	1753	1	14	1-1/2	15	1-1/2	15
	2003/2004	1	14	1-1/2	15	1-1/2	15

Note: Current draw (Amps) is for pump only

Water hardness grains per gallon  
Soft = 0-4 • Medium = 5-15 • Hard = 16-25

## Simple Serviceability

Raypak's easy-to-understand user interface, including on-board diagnostics and LED operating status lights, tells the technician all he needs to know. All service/repair components are readily accessible from the front or side for maximum installation flexibility. To enhance serviceability, the control box is completely removable allowing total access.



### CATEGORY I\* BOILERS (TYPE H)

MVB Model	Flow Rates						Pressure Drops					
	Minimum Flow			Maximum Flow			20°F		30°F		40°F	
	GPM	ΔP FT	ΔT °F	GPM	ΔP FT	ΔT °F	GPM	ΔP FT	GPM	ΔP FT	GPM	ΔP FT
504	25	1.1	34	100	11.3	8	42	2.7	28	1.4	N/A	N/A
754	32	1.7	40	100	13.8	13	63	6.0	42	2.9	32	1.7
1104	46	4.1	40	113	18.6	16	92	13.3	62	6.7	46	4.1
1504	63	8.0	40	113	22.2	22	N/A	N/A	84	13.3	63	8.0
2004	84	16.0	40	113	27.2	30	N/A	N/A	112	26.9	84	16.0

### CATEGORY I\* WATER HEATERS (TYPE WH)

MVB Model	Flow Rates						Pressure Drops			
	Minimum Flow			Maximum Flow			20°F		30°F	
	GPM	ΔP FT	ΔT °F	GPM	ΔP FT	ΔT °F	GPM	ΔP FT	GPM	ΔP FT
504	50	2.8	17	100	11.3	8	N/A	N/A	28	1.4
754	50	3.5	25	100	13.8	13	64	6.1	42	3.0
1104	60	6.3	30	113	18.6	16	90	12.6	60	6.3
1504	82	12.6	30	113	22.2	22	N/A	N/A	82	12.6
2004	109	25.5	30	113	27.2	29	N/A	N/A	109	25.5

### CATEGORY IV BOILERS & WATER HEATERS (TYPE H & WH)

MVB Model	Flow Rates						Pressure Drops					
	Minimum Flow			Maximum Flow			20°F		30°F		40°F	
	GPM	ΔP FT	ΔT °F	GPM	ΔP FT	ΔT °F	GPM	ΔP FT	GPM	ΔP FT	GPM	ΔP FT
503	25†	1.1	35	100	11.3	9	43	2.8	29	1.4	N/A	N/A
753	33†	1.9	40	100	13.8	13	65	6.4	43	3.1	33	1.9
1003	43‡	3.7	40	113	18.6	15	87	12.0	58	6.0	43	3.7
1253	54‡	6.2	40	113	22.2	19	109	20.9	73	10.2	54	6.2
1503	65‡	9.5	40	113	25.5	23	N/A	N/A	87	16.0	65	9.5
1753	76‡	13.4	40	113	27.2	27	N/A	N/A	101	22.5	76	13.4
2003	87‡	15.2	40	116	30.2	30	N/A	N/A	116	31.9	87	18.9

\*Category I with vertical vent, category III with horizontal venting and no extractor.

† Minimum flow 50GPM for WH hot water supply.

‡ Use 30° column as minimum flow for hot water supply.

Boiler Only



## TempTracker Mod

Raypak's MVB comes standard with TempTracker Mod. This control can be used for space heating and hot water supply with six application-specific modes to meet various applications, including outdoor reset for heating systems. The control monitors and displays inlet and outlet temperatures on all applications as well as monitor outdoor temperature when an outdoor reset mode is selected. Only Raypak's TempTracker Mod allows for a user definable outdoor reset slope. Boiler adjustable limits prevent over cycling, saving energy and extending the life of the boiler. Your MVB is never down with a sensor failure thanks to Raypak's exclusive TempTracker software. It can operate with as little as one functioning sensor, keeping you up and running until service arrives.

- P or PID logic
- 4-20ma output
- Building management direct control
- LCD Display
- 0-10VDC Setpoint/Direct Drive Input
  - Standard on MVB Cat. I
  - Coming soon on MVB Cat. IV

Cat. I*	MVB Input	Recovery Rates (GPH)														
		10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
84%	500	5,091	2,545	1,697	1,273	1,018	848	727	636	566	509	463	424	392	364	339
	750	7,636	3,818	2,545	1,909	1,527	1,273	1,091	955	848	764	694	636	587	545	509
	1100	11,200	5,600	3,733	2,800	2,240	1,867	1,600	1,400	1,244	1,120	1,018	933	862	800	747
	1500	15,273	7,636	5,091	3,818	3,055	2,545	2,182	1,909	1,697	1,527	1,388	1,273	1,175	1,091	1018
	1999	20,353	10,177	6,784	5,088	4,071	3,392	2,908	2,544	2,261	2,035	1,850	1,850	1,566	1,454	1,357

Cat. I*	MVB Input	Recovery Rates (GPH)														
		10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
84%	500	5,091	2,545	1,697	1,273	1,018	848	727	636	566	509	463	424	392	364	339
	750	7,636	3,818	2,545	1,909	1,527	1,273	1,091	955	848	764	694	636	587	545	509
	1045	10,640	5,320	3,547	2,660	2,128	1,773	1,520	1,330	1,182	1,064	967	887	818	760	709
	1425	14,682	7,341	4,894	3,670	2,936	2,447	2,097	1,835	1,631	1,468	1,335	1,223	1,129	1,049	979
	1900	19,576	9,788	6,525	4,894	3,915	3,263	2,797	2,447	2,175	1,958	1,780	1,631	1,506	1,398	1,305

Cat. IV	MVB Input	Recovery Rates (GPH)														
		10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
87%	500	5,273	2,636	1,758	1,318	1,055	879	753	659	586	527	479	439	406	377	352
	750	7,909	3,955	2,636	1,977	1,582	1,318	1,130	989	879	791	719	659	608	565	527
	999	10,535	5,267	3,512	2,634	2,107	1,756	1,505	1,317	1,171	1,053	958	878	810	752	702
	1250	13,182	6,591	4,394	3,295	2,636	2,197	1,883	1,648	1,465	1,318	1,198	1,098	1,014	942	879
	1500	15,818	7,909	5,273	3,955	3,164	2,636	2,260	1,977	1,758	1,582	1,438	1,318	1,217	1,130	1,055
	1750	18,455	9,227	6,152	4,614	3,691	3,076	2,636	2,307	2,051	1,845	1,678	1,538	1,420	1,318	1,230
	1999	21,080	10,540	7,027	5,270	4,216	3,513	3,011	2,635	2,342	2,108	1,916	1,757	1,622	1,506	1,405

		Water Heaters (Type WH)	Boilers (Type H)
<b>HEAT EXCHANGER</b>	ASME, National Board Registered, 160 PSI	● N/A	N/A ●
	Heat Exchanger Tubes	● ○	● ○
	Bronze Headers	●	○
	Cast Iron Headers	N/A	●
	Pressure Relief Valve	○ ● ○	● ○ ○
	Temperature & Pressure Gauge	●	●
	Pump	○	○
<b>JACKET</b>	Indoor/Outdoor Certified	●	●
	Vent Terminal	○ ○	○ ○
	Fully-Enclosed Controls	●	●
	Combustible Floor Rated	●	●
<b>OPERATING CONTROLS</b>	120V Power Supply with 120V/24V Transformer	●	●
	On/Off Switch	●	●
	Programmable Pump Time Delay, Single-Phase	●	●
	Terminal Block Connections	● ● ●	● ● ●
	12 Diagnostic Lights with 256-Event History	●	●
	Status Display Lights (4)	●	●
	Temperature Controller with 3 Water Sensors	● N/A	● ○
	Multiple Boiler Controller	○ ○	○ ○
<b>SAFETIES</b>	Hot Surface Ignition System	○ ●	○ ●
	High/Low Gas Pressure Switches	○	○
	Blocked Vent and Air Pressure Switches	●	●
	High Limit Switch	● ○ ○	● ○ ○
	Low Water Cut-Off, 24V	○	○
	Flow Switch	●	●
<b>GAS TRAIN</b>	Modulating Combination Gas Valve	●	●
	Combustion Air Blower	●	●
	TruSeal Direct-Vent Ready	●	●
	Additional Safety Valve	○ ○	○ ○
<b>OTHER</b>	CSA-Certified Efficiency	● ●	● ●
	Air Filter	○	○
	Alarm System	○	○
	CSD-1 / GE GAP Control System	○	○
	Low NOx	●	●
	Cold Water Start	○	○
	Cold Water Run	○	○

● ● = Standard    ○ ○ = Optional

