

Date: 8/16/2023

Region: 4C

CSS No.: 88808

FAC ID: WV020

Maximo WO No.: 12035

Asset #: NA

Priority: Routine



**Original Work Request:**

Labor and material to a.) to install a.) (4) LOCHINVAR KHB285N KNIGHT SS HEAT EXCHANGER HEATING BOILER PER DIRECTION RECIEVED WHILE ONSITE b.) Install BOILERS LOCHINVAR STACK FRAME KH55-285 #100163409 c.) TEKMAR #275 TN4 FOUR MODULATING BOILER CONTROLS d.) use 1 ¼ " COPPER PIPE AND 1 ¼" COPPER PRESS FITTINGS FOR INSTALL OF NEW BOILERS  
PLEASE NOTE: THIS ESTIMATE ACCOUNTS FOR THE DRAWING/DESIGN

**Description of Repairs Needed:**

Labor and material to a.) to install a.) (4) LOCHINVAR KHB285N KNIGHT SS HEAT EXCHANGER HEATING BOILER PER DIRECTION RECIEVED WHILE ONSITE b.) Install BOILERS LOCHINVAR STACK FRAME KH55-285 #100163409 c.) TEKMAR #275 TN4 FOUR MODULATING BOILER CONTROLS d.) use 1 ¼ " COPPER PIPE AND 1 ¼" COPPER PRESS FITTINGS FOR INSTALL OF NEW BOILERS  
PLEASE NOTE: THIS ESTIMATE ACCOUNTS FOR THE DRAWING/DESIGN  
Our contractor recommended to replace all 4 boilers, facility liked the recommendation and agreed.  
Lead time for materials is 2-3 weeks

Labor:	Labor Hrs	Labor Rate	Total
Technician 2 Men	32	\$ 150.00	\$ 4,800.00
Tidewater Technician	8	\$ 100.00	\$ 800.00

Material List:	Quantity	Cost	Total
LOCHINVAR KHB285N HEATING BOILER	4	\$ 10,875.00	\$ 43,500.00
LOCHINVAR STACK FRAME KH55-285 #100163409	1	\$ 3,400.00	\$ 3,400.00
TEKMAR #275 TN4 FOUR MODULATING BOILER CONTROLS	1	\$ 2,800.00	\$ 2,800.00
1 ¼ " COPPER PIPE AND 1 ¼" COPPER PRESS FITTINGS	1	\$ 4,200.00	\$ 4,200.00
GASLINE PIPE AND FITTINGS ¾"	1	\$ 850.00	\$ 850.00
PVC AND FITTINGS FOR DRAINS AND VENTING	1	\$ 550.00	\$ 550.00
LOW WATER CONTROLS AND CUTOFF	1	\$ 450.00	\$ 450.00
DRAWING AND DESIGN	1	\$ 700.00	\$ 700.00

Equipment List:	Quantity	Cost	Total
			\$ -
			\$ -
			\$ -

**PM WO History:**

NA
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**Estimate Summary:**

Labor	Material	Equipment
\$ 5,600.00	\$ 56,450.00	\$0.00

Sub Total	G&A 12%	Fee 6%	Total Estimate
\$62,050.00	\$7,446.00	\$3,723.00	\$73,219.00

# TOTAL COMFORT HEATING AND COOLING

2302 Hamill ave  
Clarksburg wv 26301  
304-629-7192

US ARMY RESERVE  
7605 US HWY 19 N  
JANE LEW WV 26378

8/8/23

## INSTALL THE FOLLOWING

- 1.) LOCHINVAR KHB285N KNIGHT SS HEAT EXCHANGER HEATING  
BOILER (4) BOILERS  
TOTAL \$43,500.00
- 2.) LOCHINVAR STACK FRAME KH55-285 #100163409  
TOTAL \$3,400.00
- 3.) TEKMAR #275 TN4 FOUR MODULATING BOILER CONTROLS  
TOTAL \$2,800.00
- 4.) 1 1/4 " COPPER PIPE AND 1 1/4" COPPER PRESS FITTINGS FOR  
INSTALL OF NEW BOILERS  
TOTAL \$4,200.00
- 5.) LABOR (2) GUYS @ \$150 HR 4 DAYS AT 32HRS  
TOTAL \$4,800.00
- 6.) GASLINE PIPE AND FITTINGS 3/4"  
TOTAL \$850.00
- 7.) PVC AND FITTINGS FOR DRAINS AND VENTING  
TOTAL \$550.00
- 8.) LOW WATER CONTROLS AND CUTOFF  
TOTAL \$450.00
- 9.) DRAWING AT THE END OF THE DESIGN TOTAL \$700.00

JOB TOTAL \$61,250.00



**HIGH EFFICIENCY  
CONDENSING BOILERS**



FIFTEEN YEAR HEAT EXCHANGER  
(15/5)  
FIVE YEAR PARTS WARRANTY

# THE BEST KNIGHT EVER

**95% AFUE Efficiency**

**SMART SYSTEM™**

**CON-X US®**  
Capable

DESIGNED ★ ENGINEERED ★ ASSEMBLED

**USA**

 **Lochinvar®**

## THE LOCHINVAR DIFFERENCE



**BROADEST LINE OF  
WATER HEATING SOLUTIONS  
IN THE INDUSTRY**



**INDUSTRY-LEADING TRAINING  
ON CAMPUS AND  
ONLINE AT [LOCHINVARU.COM](http://LOCHINVARU.COM)**



**A WORLD-CLASS RESEARCH &  
DEVELOPMENT DEPARTMENT THAT  
CONTINUOUSLY INTRODUCES NEW  
AND INNOVATIVE TECHNOLOGY**



**A COMMITMENT TO IN-DEPTH  
SERVICE BEFORE, DURING AND  
AFTER EVERY SALE**

# NO ONE BRINGS IT ALL TOGETHER **LIKE** **LOCHINVAR**

Lochinvar is the industry leader that other leading companies call upon for the most advanced and efficient water heating products in the world. For that reason, Lochinvar is trusted to go beyond the call of duty to find a solution for every project, no matter the size. You will not find a water heating company that works harder or cares more.

That's why no one brings it all together quite like Lochinvar.

## A HISTORY OF **INNOVATION**

For over 80 years, Lochinvar, an American company, has been a leader of innovation and high-efficiency water heating. Through Lochinvar's pride in leadership and commitment to excellence, the company has continually improved year after year.

Today, Lochinvar touts the broadest line of high-efficiency water heating solutions, a world-class research & development department, comprehensive service with every sale and industry-leading training through Lochinvar University.



AN INDUSTRY LEADER IN THE MAKING, 1954.

DESIGNED ★ ENGINEERED ★ ASSEMBLED  
**USA**

# ALWAYS LEADING **THE CHARGE**

Introduced in 2005, the KNIGHT® boiler was a major step forward for Lochinvar. Designed for both new construction and replacement applications, the KNIGHT quickly became recognized by the industry as the gold standard for installation flexibility and ease of serviceability.

In 2008, the KNIGHT boiler line was broadened to reach up to 800,000 BTU/hr with the introduction of the KNIGHT XL residential and light commercial boiler, and in 2010 a new and innovative SMART SYSTEM™ control was added to both the KNIGHT and KNIGHT XL boiler products to enhance their feature set.

The SMART SYSTEM control makes the setup and operation of KNIGHT boilers easier through its large display, color-coded screens, soft keys and navigation dial used for transitioning from screen to screen quickly.

With over 100,000 units sold to date, the KNIGHT boiler line has continued to benefit from Lochinvar's commitment to perpetual innovation with four model generations and a host of design, efficiency and installation enhancements.

## KNIGHT **PRODUCT TIMELINE**



**2005**

KBN INTRODUCED LOCHINVAR'S  
COMMERCIAL TECHNOLOGY  
TO THE RESIDENTIAL MARKET



**2010**

2ND GENERATION KBN/WBN  
UPDATED SMART SYSTEM  
AND NEW USER INTERFACE



**2016**

KHN INTRODUCED A FIRE TUBE IN A FLOOR  
STANDING PRODUCT WITH 3RD GENERATION  
SMART SYSTEM & 10:1 TURNDOWN



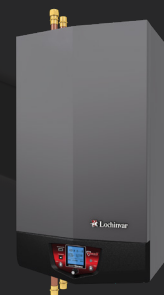
**2007**

WBN WALL MOUNT  
INTRODUCED TO THE LINEUP



**2010**

WHN WALL MOUNT FIRE  
TUBE INTRODUCED



**2017**

WHN WITH 10:1 TURNDOWN 3RD  
GENERATION SMART SYSTEM WITH TOP  
AND BOTTOM WATER CONNECTIONS





**KHB**

**KNIGHT FLOOR MOUNT**

# THE BEST KNIGHT EVER

Lochinvar is proud to introduce the new, improved KNIGHT fire tube boiler—delivering ultimate ease of installation, unmatched operational reliability and serviceability.

Recent upgrades keep KNIGHT at the head of the class, allowing it to continue to lead the charge as the industry-leading high-efficiency residential boiler. With more adjustable parameters than any other competitor, KNIGHT is the most flexible residential boiler you can install.

Today, the new KNIGHT boiler family is available in 13 model options—six floor mounts and seven wall mounts. It also offers a broader range of heating capacity from 55,000 to 399,000 BTU/hr—while continuing to work at 95% AFUE efficiency.

## INDUSTRY-LEADING FEATURES

KNIGHT boilers now feature a universal vent connector, making installation easier than ever. It comes with many standard features that allows PVC, CPVC, polypropylene or stainless steel connections directly to the boiler.

We've added a variable speed ECM pump as standard equipment, helping to push day-to-day operational efficiency even further. We've also redesigned the trap height for the condensate pump to make installation a snap.

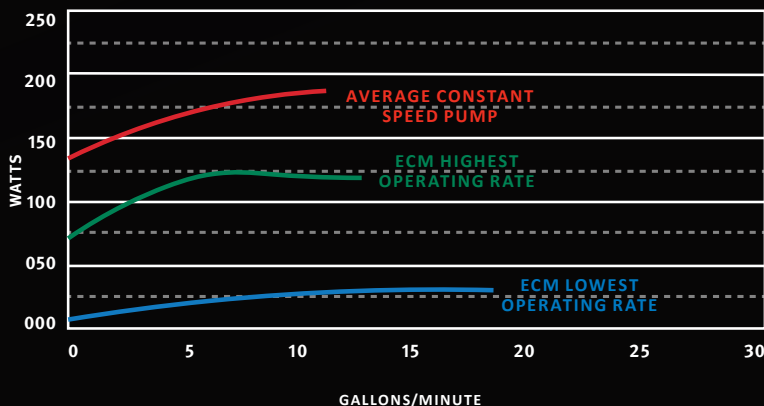
Every KNIGHT boiler comes with a built-in 110V convenience outlet. Use this handy standard feature to power your lighting or installation equipment—or for powering the condensate pump.

As in past generations, Lochinvar's KNIGHT boiler continues to raise the bar for installation flexibility. With our latest product enhancements, we've pushed the KNIGHT boiler's capabilities and value to levels the industry has never seen before.

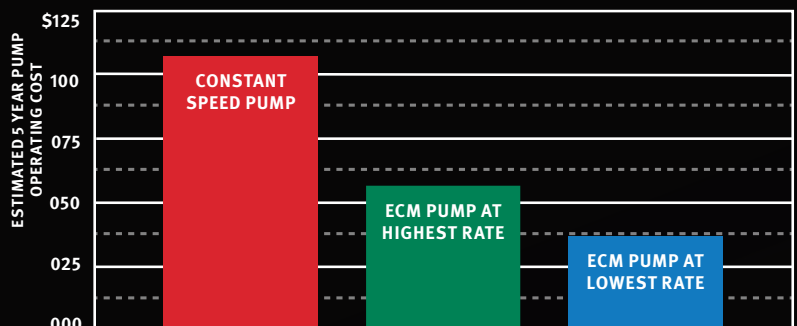
## ECM PUMP STANDARD EQUIPMENT

ECM pump technology saves electricity & lowers operating costs. Lochinvar now includes this money saving technology as standard equipment on all WHB & KHB boilers. Using the Smart System to continuously match the target Delta T at all modulation rates this technology makes variable speed pump integration simple and easy. Push your savings further by taking advantage of local rebate programs for ECM variable speed pumps. Check with your local utilities company for details.

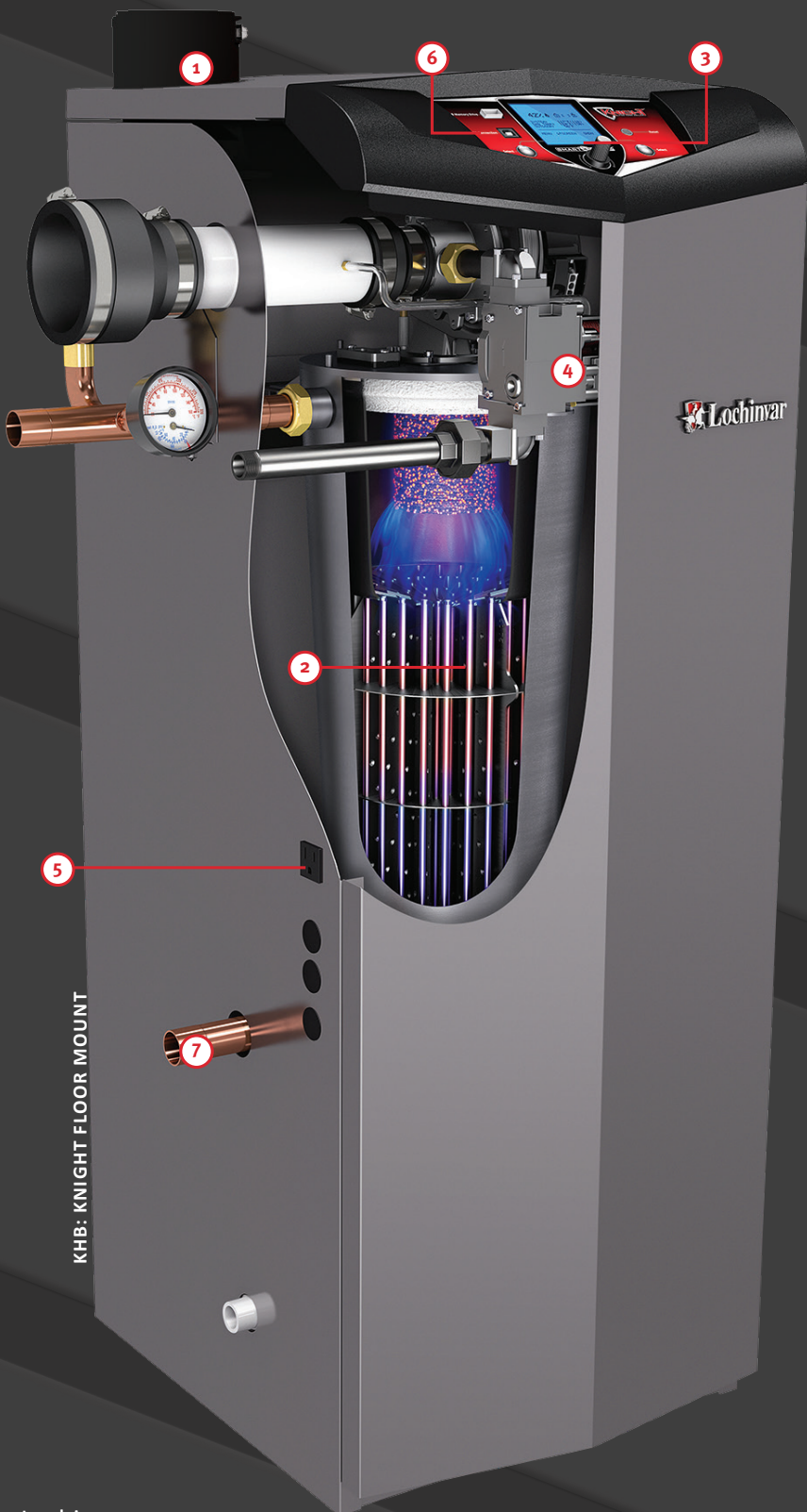
PUMP ENERGY USAGE



OPERATING COST



OPERATING COST: 120 DAYS/YEAR, 10 HOURS/DAY, \$0.12/KWH



KHB: KNIGHT FLOOR MOUNT



WHB: KNIGHT WALL MOUNT

## KNIGHT FEATURES

### 1 UNIVERSAL VENT CONNECTOR

Allows for easy installation of multiple vent materials.

### 2 FIRE-TUBE HEAT EXCHANGER

Low pressure drop saves on pump operation costs and provides installation flexibility, while stainless steel fights off corrosion.

### 3 SMART SYSTEM USER INTERFACE

A plain English, code free interface with multicolor diagnostic display.

### 4 10:1 MODULATION TURNDOWN

Saves money on fuel cost.

### 5 ELECTRICAL OUTLET (not shown on WHB)

Plug available for work light or condensate pump.

### 6 LOCH-N-LINK® USB PROGRAMMING

Allows for saving of parameters onto a USB drive for use at a different job site.

### 7 INSTALLATION FLEXIBILITY

Top and bottom water connection for the WHB. Left side utility connections for the KHB for easy retro-fitting, such as a cast iron efficiency upgrade.





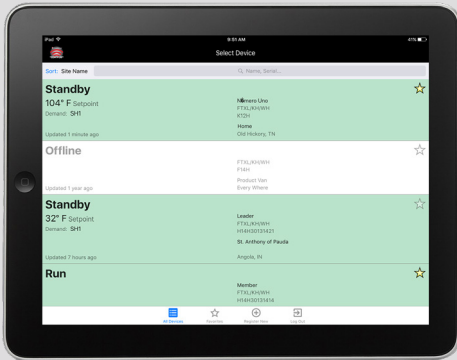
## BOILER CONTROL FROM ANYWHERE

The industry's most advanced boiler control system now includes the CON-X-US® Remote Connect option and Loch-N-Link® USB drive programming feature. See next page for a complete list of SMART SYSTEM™ functions and features.

From wherever you are, the CON-X-US option lets you use any internet-capable device to link up with the SMART SYSTEM on an unlimited number of KNIGHT boilers. With CON-X-US, you're always in touch and in control. Optional CON-X-US control board is sold separately.



- » DO REGULAR CON-X-US CHECKS FOR ALL YOUR KNIGHT CUSTOMERS, AND LET THEM KNOW YOU'RE MONITORING THEIR BOILER'S PERFORMANCE.
- » ADJUST SETPOINTS, DOMESTIC HOT WATER, RESET CURVES, PUMP DELAYS AND MORE, USING THE CON-X-US INTERACTIVE DISPLAY.
- » STATUS ALERTS VIA TEXT OR E-MAIL LET YOU KNOW WHEN A KNIGHT BOILER NEEDS ATTENTION.



## THE ULTIMATE IN BOILER CONTROL AND MONITORING

The backlit, user-friendly LCD display provides diagnostic information and system status in real words, not codes including:

### SET-UP WIZARD

For fast and easy programming.

### RAMP DELAY

Six steps of modulation to extend runtime and reduce cycling.

### LOCH-N-LINK

Save parameters on a USB drive and take them with you for future use.

### VACATION MODE

Tell your boiler when you are out of town to save energy.

### OUTDOOR RESET WITH BOOST

Automatically change the set-point according to weather conditions.

### MODULATION FACTOR

Fine tune boiler performance to be more or less aggressive depending on the application.

### VARIABLE SPEED BOILER PUMP CONTROL

Keep the same Delta T at all firing rates to save electricity and increase performance.



# THE BEST JUST GOT BETTER

New features include:

SET-UP WIZARD

VARIABLE SPEED ECM PUMP

UNIVERSAL VENT CONNECTOR WITH ANALYZER PORT

110V CONVENIENCE OUTLET

PARTS COMPATIBILITY BETWEEN FLOOR AND WALL MODELS

AUTOMATIC PARAMETER RESTORATION WHEN CONTROL IS REPLACED



**WHB**

**KNIGHT WALL MOUNT**

## SMART SYSTEM<sup>TM</sup> FUNCTIONS AND FEATURES

### SMART SYSTEM<sup>TM</sup> FEATURES

- » **Smart System Digital Operating Control**  
Multi-Color Graphic LCD Display w/Navigation Dial,  
Soft Keys and Loch-N-Link® USB programming
- » **Three Boiler Setpoint Temperature Inputs**  
Plus Domestic Hot Water Prioritization
- » **Built-in Cascading Sequencer for up to 8 Boilers,  
with Cascade Redundancy**  
Multiple Size Boiler Cascade  
Lead Lag  
Efficiency Optimization  
Front End Loading Capability
- » **Outdoor Reset Control with Outdoor Air Sensor**  
Programmable for Three Reset Temperature Inputs
- » **Programmable System Efficiency Optimizers**  
Space Heat Night Setback  
Domestic Hot Water Night Setback  
Anti-Cycling  
Outdoor Air Reset Curve  
Ramp Delay  
Modulation Factor Control  
Boost Temperature & Time
- » **Four Pump Control**  
System Pump with Parameter for Continuous Operation  
Boiler Pump with Variable Speed Control  
Domestic Hot Water Pump  
Domestic Hot Water Recirculation
- » **Domestic Hot Water Prioritization**  
DHW tank piped with priority in the boiler loop  
DHW tank piped as a zone in the system with the pumps  
controlled by the SMART SYSTEM  
DHW Modulation Limiting  
Separately Adjustable Space Heat/DHW Switching Times
- » **Building Management System Integration**  
0-10 VDC Input to Control Modulation or Setpoint  
0-10 VDC Modulation Rate Output  
0-10 VDC Input to Enable/Disable Call for Heat
- » **Access to BMS Settings through Graphic LCD Display**
- » **High-Voltage Terminal Strip**  
120 VAC / 60 Hertz / 1 Phase Power Supply  
Three Sets of Pump Contacts

- » **Low-Voltage Terminal Strip**  
Domestic Hot Water Recirculation Pump Start/Stop  
24 VAC Device Relay  
Configurable Proving Contacts  
Flow Switch Contacts  
Alarm on Any Failure Contacts  
Runtime Contacts  
DHW Thermostat Contacts  
3 Space Heat Thermostat Contacts  
System Sensor Contacts  
Domestic Hot Water Tank Sensor Contacts  
Outdoor Air Sensor Contacts  
Cascade Contacts  
0-10 VDC BMS External Control Contact  
0-10 VDC Boiler Rate Output Contacts  
0-10 VDC Variable Speed System Pump Signal Input  
0-10 VDC Signal to Control Variable Speed Boiler Pump  
Modbus Contacts

#### » Time Clock

#### » Data Logging

- Hours Running, Space Heating
- Hours Running, Domestic Hot Water
- Ignition Attempts
- Last 10 Lockouts

#### » Maintenance Reminder

- Custom Maintenance Reminder with  
Contractor Contact Information
- Installer Ability to De-activate Service Reminder

#### » Low-Water Flow Safety Control & Indication

#### » Password Security

#### » Customizable Freeze Protection Parameters

### STANDARD FEATURES

- » **ENERGY STAR Most Efficient Product**
- » **95% DOE AFUE Efficiency (WHB 55-285)**
- » **Modulating Burner with up to 10:1 Turndown**  
Direct Spark Ignition  
Low NOx Operation
- » **ASME Stainless Steel Heat Exchanger**  
30 PSI ASME Relief Valve
- » **MNPT Top and Bottom Water Connections**  
(WHB 55-285 only)

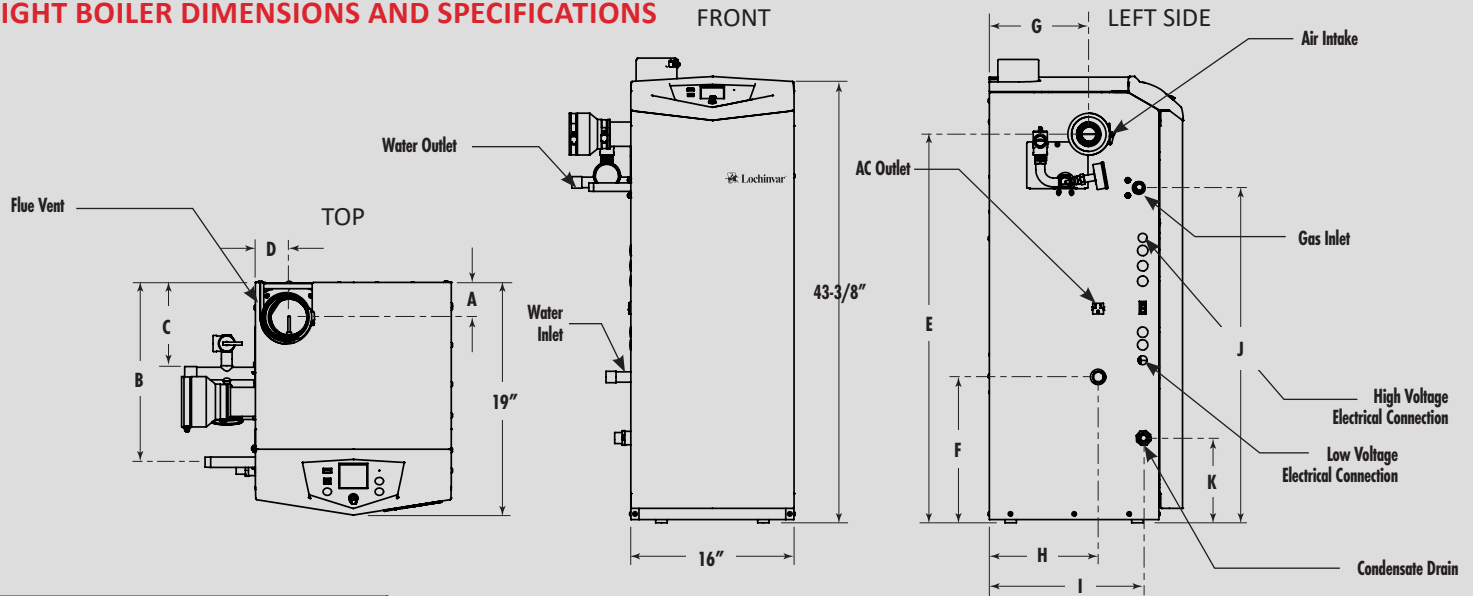
- » **Vertical & Horizontal Direct Vent**  
PVC, CPVC, Polypropylene or SS Venting up to 100 feet
- » **Universal Vent Adapter**  
Built-in Combustion Analyzer Port
- » **Smart System Control**
- » **Condensate Trap**
- » **ECM Variable Speed Boiler Circulating Pump**
- » **110V Convenience Outlet**
- » **High Altitude Models Available**
- » **Other Features**  
Automatic Reset High Limit  
Adjustable High Limit w/Manual Reset  
Boiler Circulating Pump  
Zero Clearances to Combustible Materials  
15-Year Limited Warranty (See Warranty for Details)  
5-Year Limited Parts Warranty
- » **Firing Codes**  
M9 Standard Construction  
M7 California Code

### OPTIONAL EQUIPMENT

- CON-X-US® Remote Connectivity
- Modbus Communication
- BACnet MSTP
- Flow Switch
- Low-Water Cutoff w/Manual Reset & Test
- Alarm Bell
- Concentric Vent Kit
- SMART SYSTEM™ PC Software
- Condensate Neutralization Kit
- BMS Gateway to LON or BACnet IP
- Sidewall Vent Termination
- Wireless Outdoor Sensor
- LP Conversion Kit

# KNIGHT BOILER DIMENSIONS AND SPECIFICATIONS

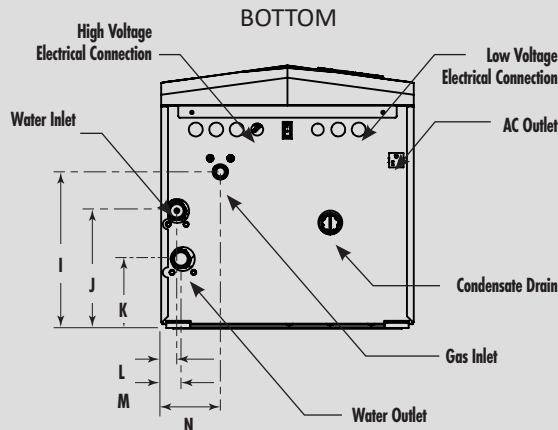
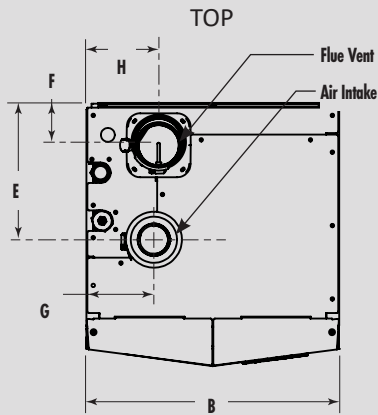
FRONT



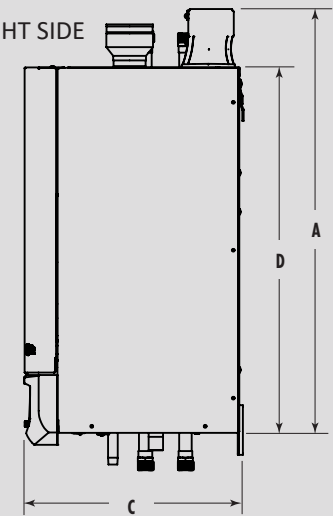
## FLOOR MOUNT



Model Number	Input MBH		Heating Capacity MBH	Net AHRI Rating Water, MBH	AFUE, %	A	B	C	D	E	F	G	H	I	J	K	Gas Conn.	Water Conn.	Air Inlet	Vent Size	Shipping Wt. (lbs.)
	Min	Max																			
KHB055N	8.3	55	51	44	95.0	3 1/2	13 1/4	6	2 3/4	37 2/3	13 1/2	8 1/3	10 1/2	15	32 1/2	8 1/3	1/2	1	2	2	160
KHB085N	8.5	85	79	69	95.0	3 1/2	13 1/4	6	2 3/4	37 2/3	13 1/2	8 1/3	10 1/2	15	32 1/2	8 1/3	1/2	1	2	2	165
KHB110N	11	110	102	89	95.0	2 3/4	14 3/4	7 1/2	2 3/4	38	14 1/3	9 3/4	10 1/2	15	33	8 1/3	1/2	1	3	3	170
KHB155N	15.5	155	143	124	95.0	2 3/4	14 3/4	7 1/2	2 1/2	38	14 1/3	9 3/4	10 1/2	15	33	8 1/3	1/2	1	3	3	175
KHB199N	19.9	199	184	160	95.0	3	15 1/2	7 1/2	2 1/2	38 1/3	14 1/3	10 1/2	11 1/2	15	33	8 1/3	1/2	1 1/4	3	3	195
KHB285N	28.5	285	264	230	95.0	3	15 1/2	7 1/2	2 1/2	38 1/3	14 1/3	10 1/2	11 1/2	15	33	8 1/3	1/2	1 1/4	3	3	205



RIGHT SIDE



## WALL MOUNT



Model Number	Input MBH		*Output MBH	Net AHRI Rating, Water, MBH	AFUE, %	Combustion Efficiency, %	Thermal Efficiency, %	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Gas Conn.	Water Conn.	Air Inlet	Vent Size	Ship Wt. (lbs.)
	Min	Max																								
WHB055N	8.3	55	51	44	95.0	-	-	40"	18-3/4"	16"	31-1/8"	8-1/2"	3-3/4"	4-1/2"	6-1/2"	7-1/4"	8-7/8"	3-1/2"	1-1/2"	1-1/2"	6"	1/2"	1"	2"	2"	139
WHB085N	8.5	85	79	69	95.0	-	-	39-3/4"	18-3/4"	16"	31-1/8"	8-1/2"	3-3/4"	4-1/2"	6-1/2"	7-1/4"	8-7/8"	3-1/2"	1-1/2"	1-1/2"	6"	1/2"	1"	2"	2"	142
WHB110N	11	110	102	89	95.0	-	-	41-1/4"	18-3/4"	19"	31-1/8"	10"	2-3/4"	5"	5-1/4"	11-1/2"	8-1/2"	5"	1"	1"	4-1/2"	1/2"	1"	3"	3"	159
WHB155N	15.5	155	144	125	95.0	-	-	41-1/4"	18-3/4"	19-1/8"	31-1/8"	10"	2-3/4"	5"	5-1/4"	11-1/2"	8-1/2"	5"	1"	1"	4-1/2"	1/2"	1"	3"	3"	166
WHB199N	19.9	199	184	160	95.0	-	-	41-1/4"	18-3/4"	19-1/8"	31-1/8"	10-1/2"	3"	5-1/4"	6"	11"	9-1/2"	6-1/4"	1-1/2"	1-1/2"	4-1/2"	1/2"	1-1/4"	3"	3"	175
WHB285N	28.5	285	264	230	95.0	-	-	41-3/4"	18-3/4"	21-1/8"	31-1/8"	15"	3"	3-3/4"	5-1/4"	12-1/4"	11"	6-1/4"	1-1/2"	1-1/2"	6-1/2"	1/2"	1-1/4"	3"	3"	184
WHB399N	39.9	399	377	328	-	96.0	94.4	43-5/8"	25-1/4"	21-7/8"	34-3/8"	3-1/8"	4-1/4"	23"	3-7/8"	8-3/4"	12-1/2"	9-1/4"	2"	2"	23"	3/4"	1-1/2"	4"	4"	213

Information subject to change without notice.

Dimensions shown are approximate and should not be used for construction purposes.

\*"Output" is "Heating Capacity" for units with inputs <300 MBH and "Gross Output" for units ≥300 MBH.

Change "N" to "L" for LP gas models.

The Net AHRI Water Ratings shown are based on a piping and pickup allowance of 1.15.

Lochinvar should be consulted before selecting a boiler for installations having unusual piping and pickup requirements, such as intermittent system operation, extensive piping systems, etc.

The ratings have been determined under the provisions governing forced draft burners.

For technical information call 800-722-2101. Lochinvar, LLC reserves the right to make product changes or improvements without prior notice.



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Lebanon, Tennessee 37090  
P: 615.889.8900 / F: 615.547.1000  
[www.lochinvar.com](https://www.lochinvar.com)

