



High Efficiency Hot Water Supply Boiler

Boiler Manual

- *Installation*
- *Operation*
- *Maintenance*

NOTICE

When installing Models manufactured after July 7th, 2008, you will notice additional selections on the Installer Menu of the Control that will not apply to this unit. DO NOT CHANGE THESE FACTORY SETTINGS. Refer to the Control Program Reference Chart within this manual for selections that apply to this model.



Heat Exchanger Bears the "ASME" Stamp

⚠ WARNING

This manual must only be used by a qualified heating installer / service technician. Failure to comply could result in severe personal injury, death or substantial property damage. It is also important to keep these Instructions with the appliance.

SAFETY WARNINGS

FOR YOUR SAFETY READ BEFORE OPERATING

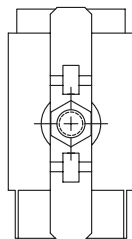
WARNING: If you do not follow these instructions exactly, a fire or explosion may result, causing property damage, personal injury or loss of life.

- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B. **BEFORE OPERATING** smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
- WHAT TO DO IF YOU SMELL GAS**
- Do not try to light any appliance
 - Do not touch any electric switch; do not use any phone in your building
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas suppliers' instructions.
- If you cannot reach your gas supplier, call the fire department.
- C. Use only your hand to turn the gas control knob. Never use tools. If the handle will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

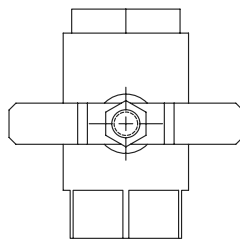
OPERATING INSTRUCTIONS

1. STOP! Read the safety information above.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Remove front cover.
6. Turn gas shutoff valve to "off". Handle will be across the piping, do not force.
7. Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to next step.
8. Turn gas shutoff valve to "on". Handle will be in line with piping.
9. Install Front Cover.
10. Turn on all electric power to appliance.
11. Set thermostat to desired setting.
12. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

GAS VALVE
ON



GAS VALVE
OFF



TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove Front Cover.
4. Turn gas shutoff valve to "off". Handle will be across the piping. Do not force.
5. Install Front Cover.

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USING THIS MANUAL

WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch: do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department. Installation and service must be performed by a qualified installer, service agency or the gas supplier.
- Installation and service must be performed by a qualified installer, service agency or gas supplier.

WARNINGS

- THIS UNIT IS FOR CATEGORY IV VENTING - 2 PIPE ONLY. THIS IS A SEALED COMBUSTION APPLIANCE.
- THIS HEATER INSTALLATION MUST CONFORM TO THE LATEST EDITION OF THE "NATIONAL FUEL GAS CODE" ANSI Z223.1 NEPA 54 AND OR CAN/CGA B149 INSTALLATION CODES. STATE AND LOCAL CODES MIGHT ALSO APPLY TO INSTALLATION.
- WHERE REQUIRED BY THE AUTHORITY HAVING JURISDICTION, THE INSTALLATION MUST CONFORM TO THE STANDARDS FOR CONTROLS AND SAFETY DEVICES FOR AUTOMATICALLY FIRED HEATERS, ANSI/ASME HEATER AND PRESSURE VESSEL CODE, Section IV, ALONG WITH CSD1.
- THE HEATER, GAS PIPING, WATER PIPING, VENTING AND ELECTRICAL MUST BE INSTALLED BY TRAINED & QUALIFIED PERSONNEL FAMILIAR WITH INSTALLATION PRACTICES, LOCAL CODE, LICENSING REQUIREMENTS.
- IF THE INFORMATION IN THESE INSTRUCTIONS ARE NOT FOLLOWED EXACTLY, A FIRE OR EXPLOSION MAY RESULT; CAUSING PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH.
- DO NOT STORE OR USE GASOLINE OR OTHER FLAMMABLE VAPORS AND LIQUIDS IN THE VICINITY OF THIS OR ANY OTHER APPLIANCE;
- THE USE OF A LOW WATER CUT-OFF DEVICE MAY BE REQUIRED BY STATE OR LOCAL CODES IF THE MUNCHKIN IS INSTALLED ABOVE RADIATION LEVELS.

TABLE OF CONTENTS

PART 15 thru 9

GENERAL INFORMATION

- A How It Operates5
- B Munchkin Ratings and Dimensions . .6–7
- C Pre-installation Requirements8
- D Pressure Relief Valve9

PART 29 thru 10

ELECTRICAL

- A Electrical Connection9

PART 310 thru 11

GAS CONNECTION

- A Gas Connection10
- B Gas Piping11
- C Gas Table11
- D Gas Valve Conversion11

PART 412 thru 18

VENTING

- A General12
- B Approved Venting Materials for Exhaust Vent and Intake Air Pipe . . .12
- C Exhaust/Vent / Air Intake Pipe Location12
- D Exhaust Vent and Intake Air Pipe Sizing15
- E Exhaust Vent and Air Intake Pipe Installation15
- F Heater Removal from a Common Vent System16
- G Condensate Removal16

PART 519 thru 29

PIPING

- A Expansion Tank19
- B High Velocity Circulator Pump19
- C Circulator Sizing20

PART 630 thru 34

START UP PROCEDURES

- A Sequence of Operation30
- B Items to be Checked Before Lighting the Munchkin31
- C Lighting Instructions31
- D Operating Instructions31
- E Adjusting the Operating Set Points of the Munchkin VWH Display32
- F Status Menu32
- G Test Mode33
- H To Turn Off Gas to Appliance33

PART 735 thru 37

TROUBLESHOOTING

- A Munchkin Error Code35
- B Boiler Error35
- C Boiler Fault35

PART 838 thru 45

MAINTENANCE

- A Maintenance Procedures38
- B Annual Maintenance38
- C Condensate Cleaning Instructions . . .38
- D Combustion Chamber Coil Cleaning Instructions39
- E Munchkin Controllers41

PART 1. GENERAL INFORMATION

A. HOW IT OPERATES

The Munchkin VWH is a hot water supply boiler designed to operate in conjunction with a hot water storage tank. Each Munchkin VWH is equipped with a high velocity pump to keep the unit running efficiently for many years of service. A flow switch monitors the water flow through the heat exchanger to make sure that the unit has an adequate flow rate during operation. The Munchkin VWH Controller accurately monitors the return and supply temperature that controls the output range of the Munchkin

When the system has sensed a temperature drop below the set point and minus the differential set point, The Munchkin VWH will activate the blower motor for a pre-purge of 5 seconds before going into operation. Once in operation, the Munchkin controller will now start to modulate the pre-mix burner based on analyzing the return, supply, differential and operating set point temperatures. By compiling this information, the controller utilizes an algorithm to fully adjust the firing rate while maintaining the desired output temperature. The pre-mix burner fan has direct drive current, low-voltage motor with pulse relay counting. This system allows precise control over the fan speed and combustion air volumes. Coupled with the fuel and air mixing system which are set to provide a one to one ratio of precisely measured volumes of fuel to air, an accurate and instant burner output is achieved. This keeps the Munchkin VWH running at the highest efficiency.

SPECIAL ATTENTION BOXES

Throughout this manual you will see these special attention boxes similar to this one, which are intended to supplement the instructions and make special notice of potential hazards. These categories mean, in the judgement of Heat Transfer Products, Inc.:

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

RECOMMENDED SERVICE CLEARANCES

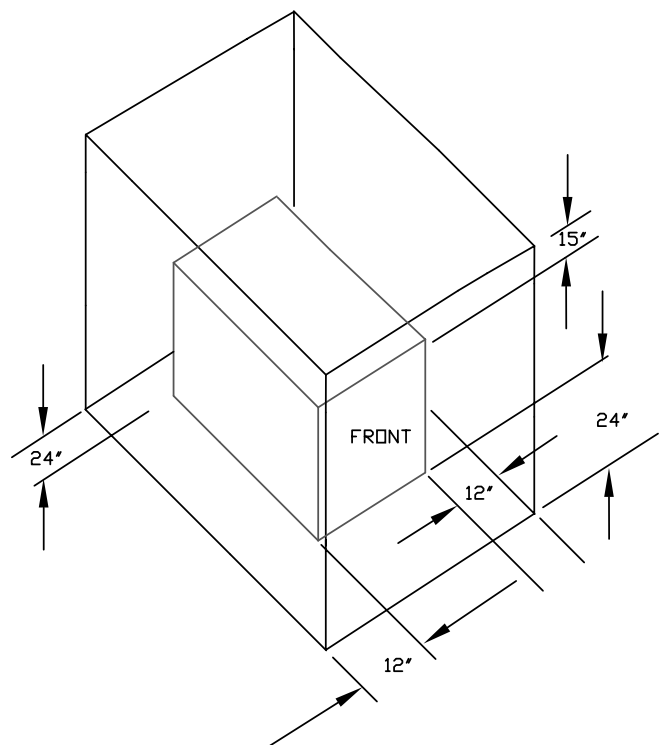


Figure 1-1

B. MUNCHKIN RATINGS AND DIMENSIONS

MUNCHKIN VWH RESIDENTIAL BOILER											
Model Number	Input Modulation BTU / hr	DOE Heating BTU / hr	Net I=B=R Ratings BTU / hr	DOE AFUE %	Boiler Water	Water Connections	Gas Connections	Vent Size	Fan Speeds		Ship. Wt.
									High	Low	
199VWH	66,000–199,000	183,000	159,000	95.1	1.8 gal	1-1/4" NPT	3/4"	3"	4800	1550	126 lbs.

MUNCHKIN VWH COMMERCIAL BOILER												
Model Number	Input Modulation BTU / hr	Gross Output BTU / hr	Net I=B=R Ratings BTU / hr	Combustion Efficiency%	Thermal Efficiency%	Boiler Water	Water Connections	Gas Connections	Vent Size	Fan Speeds		Ship. Wt.
										High	Low	
399VWH	100,000–399,000	379,000	330,000	95.1	93.4	4.2 gal	2" NPT	1-1/4"	4"	7700	1900	252 lbs.

MODEL	INLET	OUTLET	RECOVERY RATE	FIRST HOUR RATING W/ 80 GAL. STORAGE TANK	FIRST HOUR RATING W/ 119 GAL. STORAGE TANK
199 VWH	40°	80°	573 GPH	626 GAL	652 GAL
199 VWH	40°	90°	458 GPH	511 GAL	537 GAL
199 VWH	40°	100°	382 GPH	435 GAL	461 GAL
199 VWH	40°	110°	327 GPH	380 GAL	406 GAL
199 VWH	40°	120°	287 GPH	340 GAL	366 GAL
199 VWH	40°	130°	255 GPH	308 GAL	334 GAL
199 VWH	40°	140°	229 GPH	282 GAL	308 GAL
199 VWH	40°	150°	208 GPH	261 GAL	287 GAL
199 VWH	40°	160°	191 GPH	244 GAL	270 GAL
199 VWH	40°	170°	176 GPH	229 GAL	255 GAL
199 VWH	40°	180°	163 GPH	216 GAL	242 GAL

*Example recovery rate for 199VWH @ 90° rise: 400 gal. tank ÷ 255 GPH @ 90° rise = 1.56 x 60 min. = 93.6 min.

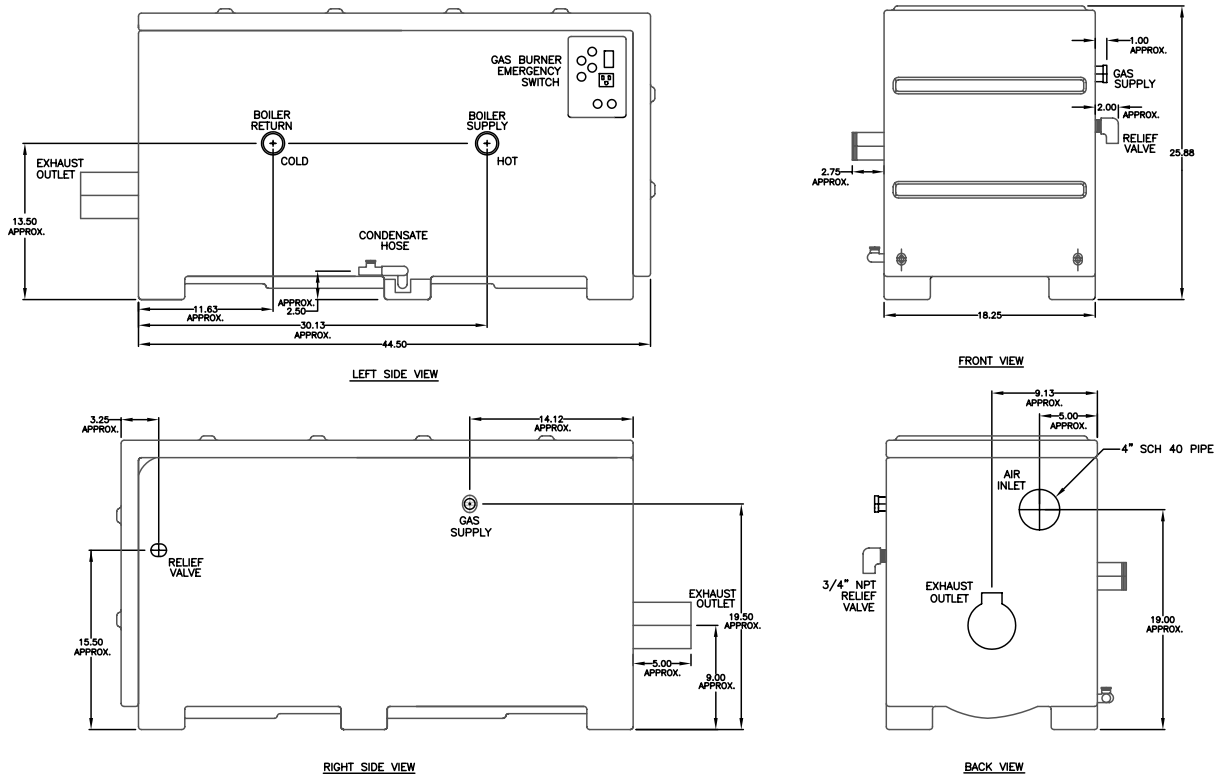
399 VWH	40°	80°	1149 GPH	1202 GAL	1228 GAL
399 VWH	40°	90°	919 GPH	972 GAL	998 GAL
399 VWH	40°	100°	766 GPH	819 GAL	845 GAL
399 VWH	40°	110°	657 GPH	710 GAL	736 GAL
399 VWH	40°	120°	575 GPH	628 GAL	654 GAL
399 VWH	40°	130°	510 GPH	563 GAL	589 GAL
399 VWH	40°	140°	460 GPH	513 GAL	539 GAL
399 VWH	40°	150°	418 GPH	471 GAL	497 GAL
399 VWH	40°	160°	383 GPH	436 GAL	462 GAL
399 VWH	40°	170°	354 GPH	407 GAL	433 GAL
399 VWH	40°	180°	328 GPH	381 GAL	407 GAL

*Example recovery rate for 399VWH @ 90° rise: 400 gal. tank ÷ 510 GPH @ 90° rise = .78 x 60 min. = 46.8 min.

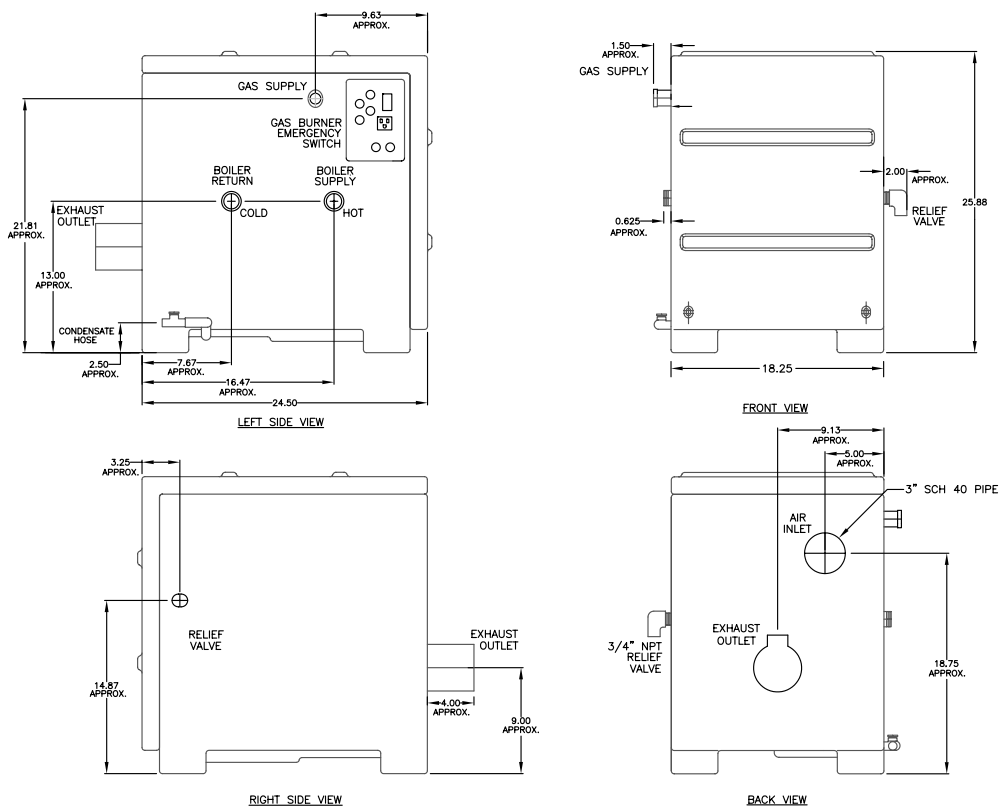
199 VWH at 20GPM					
Pressure Drop for Tube Length of 1¼" Copper (10) 90° Elbows and (2) Tees (Side Outlet) with Munchkin 199 VWH					
1¼" Tube Length	20'	30'	40'	50'	60'
20 GPM	21.65	22.62	23.6	24.56	25.53

399 VWH at 40GPM					
Pressure Drop for Tube Length of 2" Copper (10) 90° Elbows and (2) Tees (Side Outlet) with Munchkin 399 VWH					
2" Tube Length	20'	30'	40'	50'	60'
40 GPM	24	24.37	24.74	25.11	25.48

DIMENSIONS



399VWH



199VWH

Figure 1-2

C. PRE-INSTALLATION REQUIREMENTS**GENERAL**

1. Munchkin VWH is supplied completely assembled as a packaged boiler. The package should be inspected for damage upon receipt and any damage to the unit should be reported to the shipping company and wholesaler. This boiler should be stored in a clean, dry area.
2. Carefully read these instructions and be sure to understand the function of all connections prior to beginning installation. Contact your Heat Transfer Products, Inc. Representative or the Heat Transfer Products, Inc. Customer Service Department for help in answering questions.
3. This boiler must be installed by a qualified contractor. The boiler warranty may be voided if the boiler is not installed correctly.
4. This boiler needs to be installed on a level floor. This will assure the proper flow to the condensate drain in the bottom of the boiler.

CODES & REGULATIONS

Installation and repairs are to be performed in strict accordance with the requirements of state and local regulating agencies and codes dealing with boiler and gas appliance installation.

⚠ WARNING

Liquefied Petroleum (LP) Gas or Propane is heavier than air and, in the event of a leak, may collect in low areas such as basements or floor drains. The gas may then ignite resulting in a fire or explosion.

ACCESSIBILITY CLEARANCES

1. The Munchkin VWH is certified for closet installations with zero clearance to combustible construction. In addition, it is design certified for use on combustible floors.
2. Refer to Figure 1.1 for the recommended clearance to allow for reasonable access to the boiler. Local codes or special conditions may require greater clearances.

CAUTION

Do not install this boiler on carpeting.

COMBUSTION AND VENTILATION AIR

1. The Munchkin VWH is designed only for operation with combustion air piped from outside (sealed combustion). PVC pipe must be supplied between the air inlet connection at the

rear of the boiler through an outside wall.

2. No additional combustion or ventilation air is required for this appliance.
3. Refer to Section 4 of this manual, Venting, for specific instructions for piping combustion air.

PLANNING THE LAYOUT

1. Prepare sketches and notes showing the layout of the boiler installation to minimize the possibility of interferences with new or existing equipment, piping, venting and wiring.
2. The following sections of this manual should be reviewed for consideration of limitations with respect to:
 - a. Electrical Wiring: Part 2
 - b. Gas Connection: Part 3
 - c. Venting: Part 4
 - f. Piping the Munchkin VWH to the Storage Tank: Part 5

⚠ WARNING

The Munchkin is certified as an indoor appliance. Do not install the Munchkin outdoors or locate where it will be exposed to freezing temperature. This includes all related piping and components. If the Munchkin is subjected to flood water or submersed in water, the Munchkin must be replaced.

⚠ NOTICE**Service clearance of the Munchkin**

1. **The front of the appliance needs 24" of clearance for service minimum. It may have a non-rated or combustible door or access panel and must have a minimum of 24" clearance.**
2. **The left side of the heater is 12" clearance**
3. **The right side of the heater is 12" clearance**
4. **The top of the heater is 15" clearance.**

If the Munchkin is set up for liquefied petroleum (LP) gas, some geographic areas follow the Uniform Mechanical Code, section 304.6, "Liquefied petroleum gas burning appliances shall not be installed in a pit, basement or similar location where heavier-than-air gas might collect. Appliances so fueled, shall not be installed in a below grade under-floor space or basement unless such location is provided with an approved means for removal of unburned gas."

NOTICE

Condensation removal: This is a condensing, high efficiency appliance, therefore condensation removal must be addressed to avoid damage to surrounding area or appliance. See Part (4) for Condensate Requirements.

D. PRESSURE RELIEF VALVE

A pressure relief valve is installed into the right front side of the manifold. It is required that it meets the requirements of ANSI/ASME Boiler and Pressure Vessel Code, Section IV or CSA B51: Boiler Pressure Vessel and Piping Code as applicable for heating boilers. A 3/4" pipe connected to the pressure relief valve must be directed to a floor drain or suitable location within 6" of a drain or floor. To protect the valve from freezing, do not plug or cap the pressure relief valve.

DANGER

Serious explosion causing property damage and/or loss of life could result. Under no circumstances should the relief valve be eliminated, capped or plugged.

PART 2. ELECTRICAL

A. ELECTRICAL CONNECTION

The electrical connection for the Munchkin is on the left hand side of the unit. There is a 1/2" knockout location for an electrical connection for both the incoming power and the circulator connection. All electrical wiring must be performed by a qualified licensed electrician in accordance with National Electrical Code ANSI/NEPA to and/or the Canadian Electrical Code, Part 1 CSA C22.1, or to the applicable codes and standards. For your convenience, we have labeled all the wires that need to be connected to operate the Munchkin.

The electrical requirements are for standard 120 volts, 60 Hz 15 Amp service. This unit is wired with #18 awg and fused for no more than 15 Amps.

DANGER

IT IS EXTREMELY IMPORTANT THAT THIS UNIT BE PROPERLY GROUNDED!

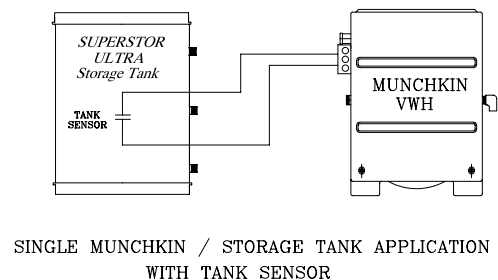
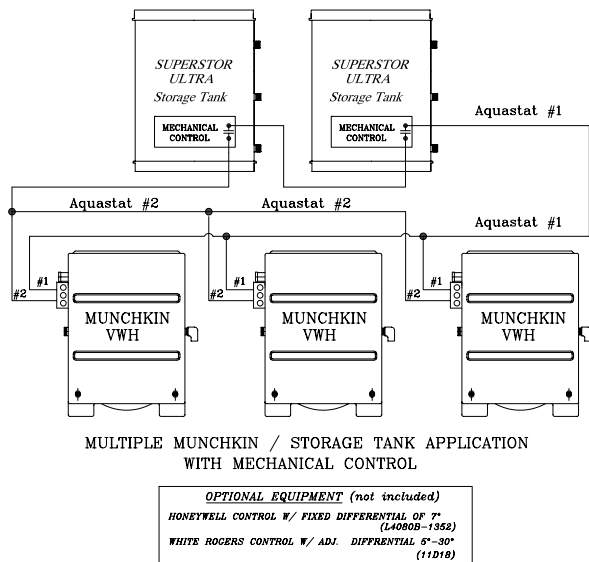
DANGER

IT IS VERY IMPORTANT THAT THE BUILDING GROUND IS INSPECTED BY A QUALIFIED ELECTRICIAN PRIOR TO MAKING THIS CONNECTION!

There are two ground points in the electrical compartment that must be connected to the building ground system. Connect the building ground to the green ground screw and the green ground wire inside electrical box provided.

The Incoming power supply is connected to the Black (Hot) and the White (Neutral). The Munchkin Control board is polarity sensitive. If the polarity is reversed, the Munchkin control will not sense a flame and lock out the system.

It is important that the electrical power is not turned on at this time. Double check all connections and then turn the power on. The display that is provided with the Munchkin should now be reading the outlet temperature. Note: see Part 6/Startup Procedure section in the manual to change the temperature setting or run the heater.



OPTIONAL EQUIPMENT (not included)
INDIRECT TANK SENSOR (Single Tank Only) 7250P-325

*NOTE: The tank sensor is used only on single Munchkin, single tank applications. For multiple applications, a mechanical control must be used.

PART 3. GAS CONNECTION

A. GAS CONNECTION

⚠ WARNING

Failure to follow all precautions could result in fire, explosion or death!

The gas supply shall have a maximum inlet pressure of less than 14" water column (350 mm), ½ pound pressure (3.5 kPa), and a minimum of 3.5" water column. The entire piping system, gas meter and regulator must be sized properly to prevent pressure drop greater than 0.5" as stated in the National Fuel Gas Code. This information is listed on the rating plate. **It is very important that you are connected to the type of gas as noted on the rating plate.** "LP" for liquefied petroleum, propane gas or, "Nat" natural or city gas. All gas connections must be approved by the local gas supplier, or utility in addition to the governing authority, prior to turning the gas supply on. The nipple provided for the 399VWH is 1¼" with a mandatory 1 x 1¼ reducing coupling (provided). Threaded into the branch of a 1¼" tee and a drip leg fabricated as per the national fuel gas code. The 199VWH has a ¾" gas supply nipple with a ½ x ¾ reducing coupling (provided) which is to be threaded into the branch of a ¾" tee. **You must ensure that the entire gas line to the connection at the Munchkin is no smaller than 1¼" for the 399VWH and ¾" for the 199VWH.** Once all the inspections have been performed, the piping must be leak tested. If the leak test requirement is a higher test pressure than the maximum inlet pressure, you must isolate the Munchkin from the gas line. In order to do this, you must shut the gas off using factory and field-installed gas cocks (following the lighting instructions in Part 6 Section B.) This will prevent high pressure. Failure to do so may damage the gas valve. In the event the gas valve is exposed to a pressure greater than ½ PSI, 14" water column, the gas valve must be replaced. **Never use an open flame (match, lighter, etc.) to check gas connections.**

B. GAS PIPING

1. Run the gas supply line in accordance with all applicable codes.
2. Locate and install manual shutoff valves in accordance with state and local requirements.

C. GAS TABLE

Refer to Table (1) to size the supply piping to minimize pressure drop between meter or regulator and unit.

Maximum Capacity of Pipe in Cubic Feet of Gas per Hour for Gas Pressures of 0.5 psi or Less and a Pressure Drop of 0.3 Inch water Column

(TABLE 1) (Based on a 0.60 Specific Gravity Gas)

Nominal Iron Pipe Size (inches)	Internal Diameter (inches)	Length of Pipe (Feet)															
		10	20	30	40	50	60	70	80	90	100	125	150	175	200.		
3/4	.824	278	190	152	130	115	105	96	90	84	79	72	64	59	55}	BTU'S	
1	1.049	520	350	285	245	215	195	180	170	160	150	130	120	110	100}	PER	
1 1/4	1.380	1,050	730	590	500	440	400	370	350	320	305	275	250	225	210}	HOUR	
1 1/2	1.610	1,600	1,100	890	760	670	610	560	530	490	460	410	380	350	320}	X 1,000	

It is recommended that a soapy solution be used to detect leaks. Bubbles will appear on the pipe to indicate a leak is present. The gas piping must be sized for the proper flow and length of pipe, to avoid pressure drop. Both the gas meter and the gas regulator must be properly sized for the total gas load. If you experience a pressure drop greater than 1" WC, the meter, regulator or gas line is undersized or in need of service. You can attach a manometer to the incoming gas drip leg, by removing the cap and installing the manometer. The gas pressure must remain between 3.5" and 14" during stand-by (static) mode and while in operating (dynamic) mode. **If an in-line regulator is used, it must be a minimum of 10 feet from the Munchkin. It is very important that the gas line is properly purged by the gas supplier or utility. Failure to properly purge the lines or improper line sizing, will result in ignition failure.** This problem is especially noticeable in NEW LP installations and also in empty tank situations. This can also occur when a utility company shuts off service to an area to provide maintenance to their lines. This gas valve must not be replaced with a conventional gas valve under any circumstances. As an additional safety feature, this gas valve has a flanged connection to the Venturi and blower.

⚠ WARNING

Failure to follow all precautions could result in fire, explosion or death!

D. GAS VALVE CONVERSION

⚠ DANGER

ONLY AN HTP, U.L. APPROVED GAS VALVE CONVERSION KIT SHOULD BE USED TO DO A GAS CONVERSION ON THIS UNIT. UNDER NO CIRCUMSTANCES SHOULD ANYONE OTHER THAN A LICENCED CONTRACTOR PERFORM THIS GAS VALVE CONVERSION.

FAILURE TO HEED THIS PRECAUTION WILL RESULT IN SERIOUS INJURY OR DEATH!

Gas conversion kits may be ordered through your local Heat Transfer Products Inc. Distributor.

PART 4. VENTING

A. GENERAL

1. Install the boiler venting system in accordance with these instructions and with the National Fuel Gas Code, ANSI Z223.1/NFPA 54, CAN/CGA B149, and/or applicable provisions of local building codes.
2. This boiler is a direct vent appliance and is listed as a Category IV appliance with Underwriters Laboratories, Inc. VENT AND INTAKE AIR PIPE

WARNING

This vent system will operate with a positive pressure in the pipe. Do not connect vent connectors serving appliances vented by natural draft into any portion of mechanical draft systems operating under positive pressure.

WARNING

Follow these venting instructions carefully. Failure to do so may result in severe personal injury, death, or substantial property damage.

B. APPROVED MATERIALS FOR EXHAUST VENT AND INTAKE AIR PIPE

1. Use only Non Foam Core venting material. The following materials are approved for use as vent pipe for this boiler:

NOTICE

Use materials approved by the authority having jurisdiction. In the absence of other authority, PVC and CPVC pipe must comply with ASTM. When installing a condensate pump, select one approved for use with condensing boilers and furnaces. The pump should have an overflow switch to prevent property damage from condensate spillage. Condensate from the Munchkin VWH Boiler will be slightly acidic (typically with a pH from 3.2 to 4.5). Install a neutralizing filter if required by local codes.

APPROVED VENTING MATERIAL

Item	Material	Standards for Installation in:	
		United States	Canada
Vent or air pipe and fittings	PVC schedule 40/80	ANSI/ASTM D1785	CPVC and PVC venting must be ULC-S636 Certified. IPEX is an approved manufacturer in Canada supplying vent material listed to ULC-S636
	PVC-DWV	ANSI/ASTM D2665	
	CPVC schedule 40/80	ANSI/ASTM F441	
Pipe cement/primer	PVC	ANSI/ASTM D2564	IPEX System 636 Cements & Primers
	CPVC	ANSI/ASTM F493	

WARNING

Do not use Foam Core Pipe in any portion of the exhaust piping from this boiler. Use of Foam Core Pipe may result in severe personal injury, death, or substantial property damage.

2. Cellular foam core piping may be used on air inlet piping only. Never use cellular foam core material for exhaust piping.

C. EXHAUST/VENT / AIR INTAKE PIPE LOCATION

1. Determine exhaust vent location:
 - a. The vent piping for this boiler is approved for zero clearance to combustible construction.
 - b. See Figure 4.1 for an illustration of clearances for location of exit terminals of direct-vent venting systems.
 - c. This boiler vent system shall terminate at least 3 feet (0.9 m) above any forced air intake located within 10 ft (3 m). Note: this does not apply to the combustion air intake of a direct-vent appliance.
 - d. Provide a minimum of 1 foot distance from any door, operable window, or gravity intake into any building.
 - e. Provide a minimum of 1 foot clearance from the bottom of the exit terminal above the expected snow accumulation level. Snow removal may be necessary to maintain clearance.
 - f. Provide 4 feet horizontal clearance from electrical meters, gas meters, gas regulators, and relief equipment. In no case shall the exit terminal be above or below the aforementioned equipment unless the 4 foot horizontal distance is maintained.
 - g. Do not locate the exit terminal over public

- walkways where condensate could drip and/or freeze and create a nuisance or hazard.
- h. When adjacent to a public walkway, locate exit terminal at least 7 feet above grade.
 - i. Do not locate the exit termination directly under roof overhangs to prevent icicles from forming.
 - j. Provide 3 feet clearance from the inside corner of adjacent walls.
2. Determine air intake pipe location.
 - a. Provide 1 foot clearance from the bottom of the air inlet pipe and the level of maximum snow accumulation. Snow removal may be necessary to maintain clearances.
 - b. Do not locate air intake pipe in a parking area where machinery may damage the pipe.
 - c. When venting with a two pipe system, maximum distance between air intake and exhaust vent is 6 feet (1.8 m). Minimum distance between exhaust vent and air intake on single boiler is 8" (0.2 m) center-to-center. Minimum distance between vents and intakes on multiple boilers is 8" (0.2 m) center-to-center. See Figure 4.2.

Location of exit terminals of mechanical draft and direct-vent venting systems.

(Reference: National Fuel Gas Code ANSI Z223.1/NFPA 54 2002).

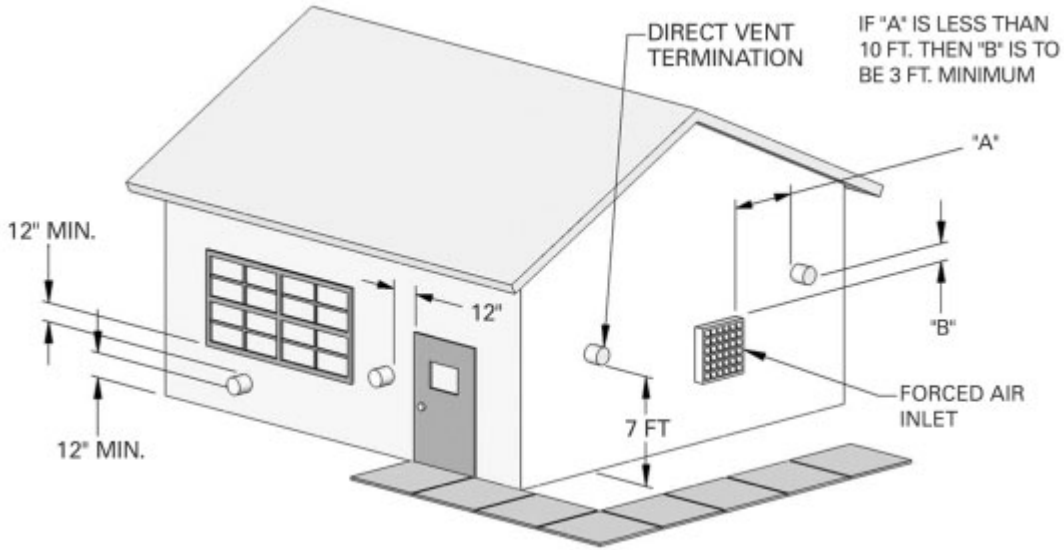


Fig. 4-1

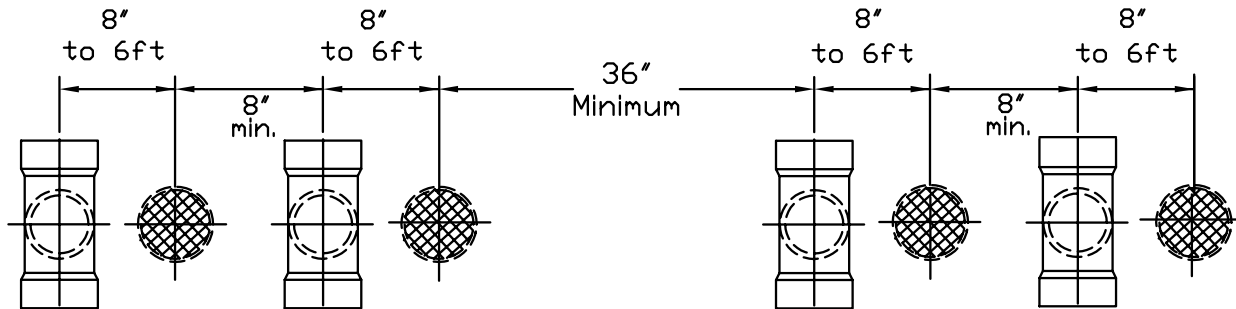


Fig. 4-2 Multiple Vent Spacing*

*Note: Exhaust must extend out 1 foot. There should be no more than 2 vents and 2 intakes then a space of 36" to the next set of vents.

*Note: There must be a minimum of 36" spacing between every 2 kit grouping.

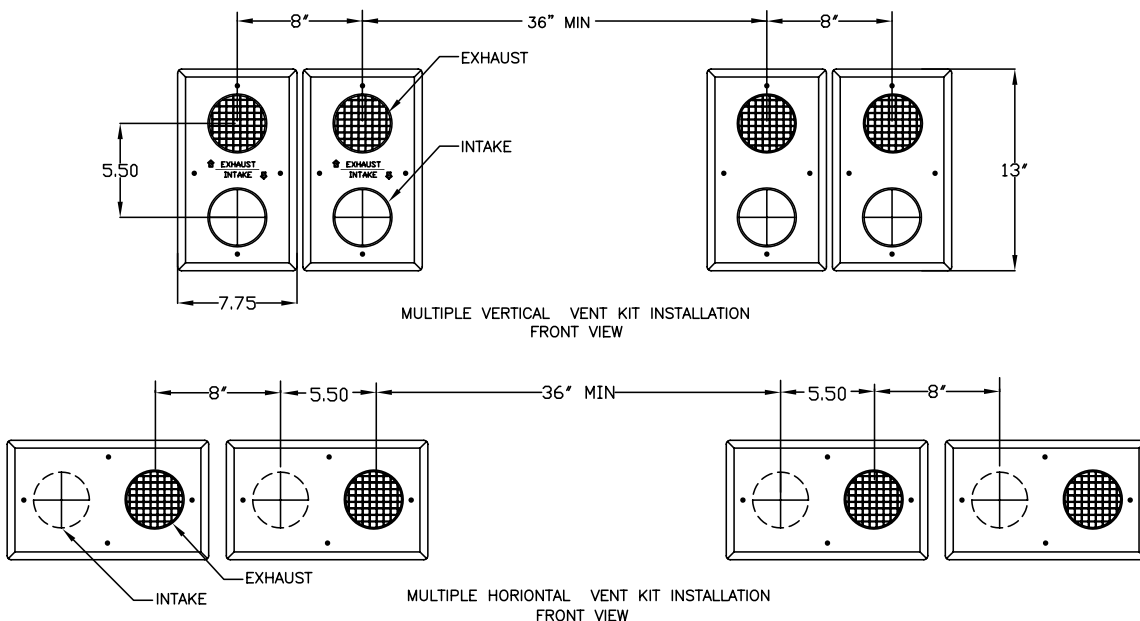


Fig. 4-3 Multiple Stainless Steel Horizontal Vent Kit Installation – Front View

D. EXHAUST VENT AND INTAKE AIR PIPE SIZING

1. For the 399VWH the exhaust vent and air intake pipes should be 4" and 3" for the 199VWH.
2. The total combined equivalent length of exhaust vent and intake air pipe should not exceed 85 feet.
 - a. The equivalent length of elbows, tees, and other fittings are listed in the Friction Loss Table 4.1.

Table 4.1

FRICTION LOSS EQUIVALENT IN PIPING AND FITTINGS			
FITTINGS OR PIPING	EQUIVALENT FEET		
	3"	4"	6"
90 DEGREE ELBOW	5'	3'	1'
45 DEGREE ELBOW	3'	1'	1'
COUPLING	0'	0'	0'
AIR INLET TEE	0'	0'	0'
STRAIGHT PIPE	1'	1'	0.5'
V1000 4" VENT KIT	1'	1'	N/A
V2000 4" VENT KIT	N/A	1'	1'
CONCENTRIC VENT KIT	3'	N/A	N/A

*Friction loss for long elbow is 1 foot less.

- b. For example: If the exhaust vent has two 90° elbows and 10 feet of PVC pipe we will calculate:

Exhaust Vent Pipe Equivalent Length = $(2 \times 5) + 10 = 20$ feet
 Further, if the intake air pipe has two 90° elbows, one 45° elbow and 10 feet of PVC pipe, the following calculation applies:

Air Intake Pipe Equivalent Length = $(2 \times 5) + 3 + 10 = 23$ feet
 Finally, if a concentric vent kit is used we find:

Total Combined Equivalent Length = $20 + 23 + 3 = 46$ feet
 Therefore, the total combined equivalent length is 46 feet which is well below the maximum of 85 feet.

- c. The intake air pipe and the exhaust vent are intended to penetrate the same wall or roof of the building.
 - d. Effort should be made to keep a minimum difference in equivalent length between the air intake pipe and the exhaust vent.
4. The minimum combined equivalent length is 16 equivalent feet.
5. The maximum combined equivalent length can be extended by increasing the diameter of the vent pipe. However, the transitions should begin a minimum of 15 equivalent feet from the boiler.
 - a. Transitions should always be made in vertical sections of pipe to prevent the condensate from pooling in the vent pipe.

- b. Use a 6" x 4" reducing coupling to transition from the 399VWH boiler connections to 6" vent.
 - c. The maximum equivalent length for the increased diameter vent pipes is 125 feet.
 - d. If the transition occurs at a distance greater than 15 equivalent feet from the boiler, the maximum equivalent length will be reduced. See Table 4.2. Standard Vent Pipe is 4" and Oversized Vent Pipe is 6" for the 399VWH.

Table 4.2: Vent Termination Kits

Transition Point (ft from boiler)	TEL of Standard 3" Vent Pipe (ft)	TEL of Oversized 3" or 4" Vent Pipe (ft)	Maximum TEL of all Vent Pipe (ft)
15	30	95	125
20	40	77-1/2	117-1/2
25	50	60-1/2	110-1/2
30	60	43	103
35	70	26	96
40	80	8-1/2	88-1/2
None	85	0	85

TEL = Total Equivalent Length

E. EXHAUST VENT AND AIR INTAKE PIPE INSTALLATION

1. On the 399VWH Boiler the 4" exhaust vent connection is located at the rear of the boiler and the air intake is higher and toward the left side when the boiler is viewed from the front. The air intake connection is intended for a slip fit. No sealant or adhesive is required.
2. See Approved Venting Materials, page 11.

⚠ WARNING

All joints of positive pressure vent systems must be sealed completely to prevent leakage of flue products into the living space.

3. Horizontal lengths of exhaust vent must slope back towards the boiler not less than 1/4" per foot to allow condensate to drain from the vent pipe. If the vent pipe must be piped around an obstacle that causes a low point in the pipe, a drain pipe must be connected to allow condensate to drain.
4. All piping must be fully supported. Use pipe hangers at a minimum of 4 foot intervals to prevent sagging of the pipe where condensate may form.
5. Do not use the boiler to support any piping.
6. A screened straight coupling is provided with the boiler for use as an outside exhaust termination.

6. A screened inlet air tee is provided with the boiler to be used as an outside intake termination.
7. The following is an optional intake air/exhaust vent termination available from Heat Transfer Products, Inc. for the 399M: 4" Stainless Steel Vent Termination Kit – V2000.

DANGER

The Munchkin is not intended to be common vented with any other existing appliance!

F. HEATER REMOVAL FROM A COMMON VENT SYSTEM

At the time of removal of an existing heater, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to common venting system are not operating.

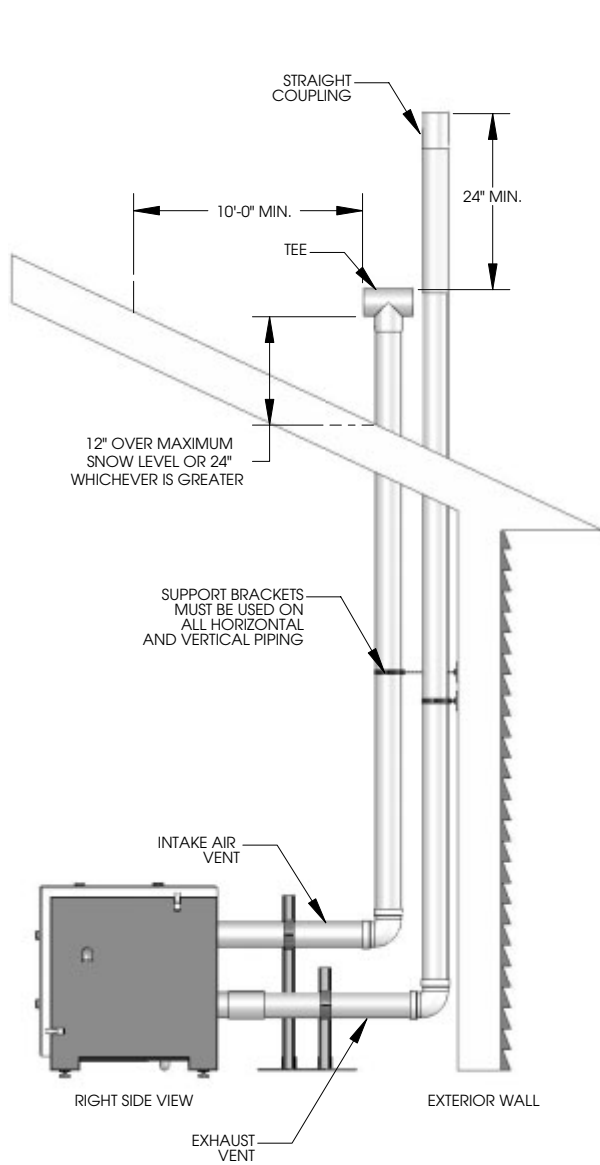
1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch to determine if there is blockage, leakage, corrosion or other deficiencies that could cause an unsafe condition.
3. If practical, close all building doors, windows and all doors between the space in which the appliance remains connected to the common venting system located and other spaces in the building. Turn on clothes dryers and any appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, at maximum speed. Do not operate a summer exhaust fan. Close all fireplace dampers.
4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust the thermostat so the appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle or smoke from a cigarette.
6. After it has been determined that each appliance remaining connected to common venting system properly vents when tested as outlined, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their previous condition of use.
7. Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Appendix G in the National Fuel Gas Code, ANSI Z 223.1

G. CONDENSATE REMOVAL

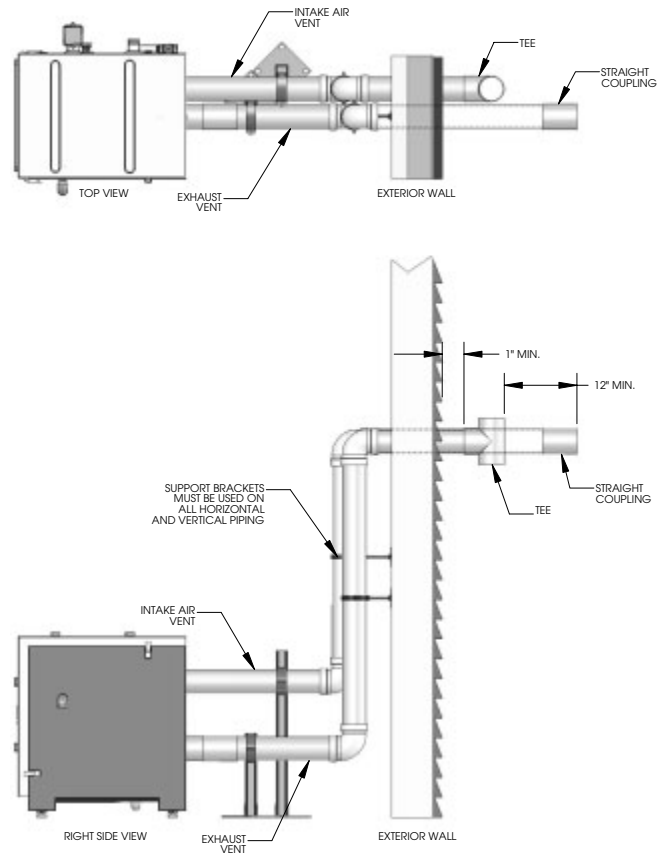
This is a condensing high efficiency appliance, therefore this unit has a condensate removal system. Condensate is nothing more than water vapor, derived from the combustion products, similar to an automobile when it is initially started. It is very important that the condensate line is sloped away from and down to a suitable inside drain, if the condensate outlet on the Munchkin is lower than the drain, you must use a condensate removal pump (kit available from Heat Transfer Products, Inc.) A condensate filter, if required by local authorities, can be made up of lime crystals, marble or phosphate chips will neutralize the condensate. This can be done in the field by the installer or you may purchase one from Heat Transfer Products, Inc. It is also very important that the condensate line is not exposed to freezing temperatures, or any other type of blockage. Plastic tubing should be the only material used for the condensate line. Steel, brass, copper or others will be subject to corrosion or deterioration. A second vent may be necessary to prevent condensate line vacuum lock if a long horizontal run is used. An increase to 1" tubing may be necessary.

DIAGRAMS FOR SIDEWALL VENTING

**ROOF VENT WITH TEE (INTAKE)
AND COUPLING (EXHAUST)**

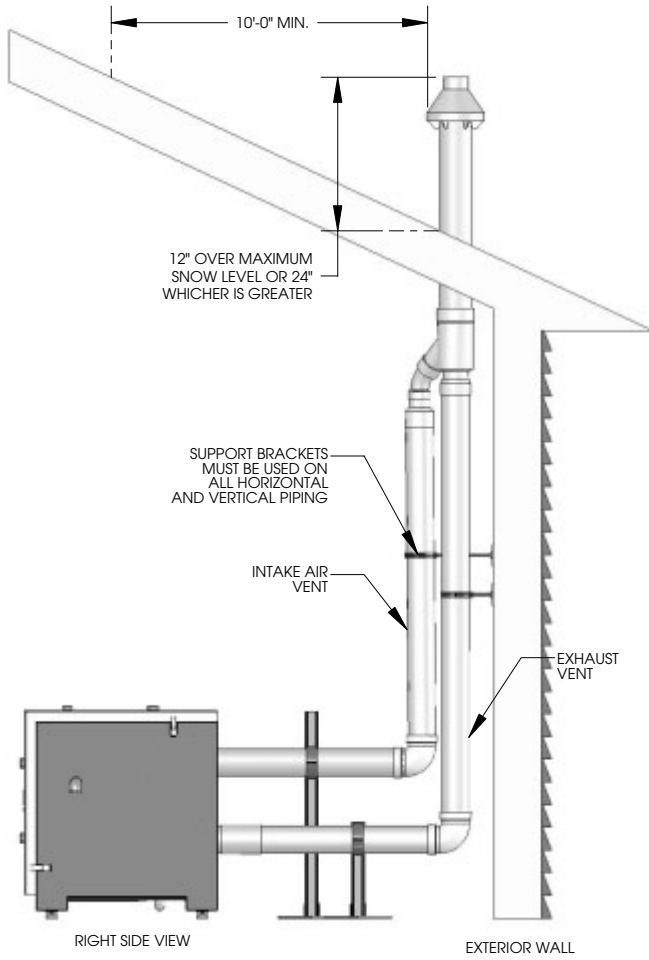


**SIDEWALL VENTING WITH TEE (INTAKE)
AND COUPLING (EXHAUST)**

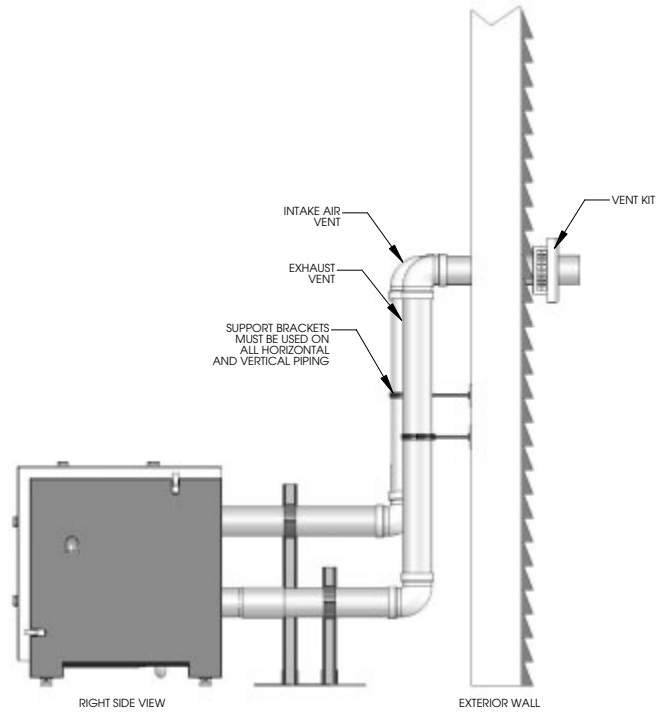


DIAGRAMS FOR SIDEWALL VENTING

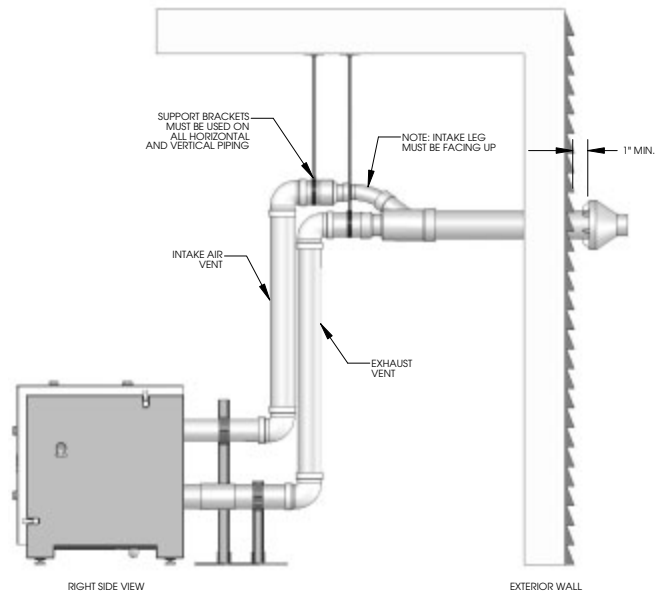
ROOF VENT WITH CONCENTRIC VENT KIT



SIDEWALL VENTING WITH KIT



SIDEWALL VENTING WITH CONCENTRIC VENT KIT



PART 5. PIPING THE MUNCHKIN VWH TO THE STORAGE TANK

WARNING

When raising tank temperature, you increase the risk of scalding – Please use a water tempering or mixing valve and extreme caution. Consult codes for conformance.

WARNING

Plumbing of this product should only be done by a qualified, licensed plumber in accordance with all local plumbing codes.

The Munchkin is designed to be connected to a storage tank to supply domestic hot water. Heat Transfer Products has available storage tanks that are 80/119 gallon size storage tanks constructed in either Stainless Steel or Glass lined construction. These storage tanks will be directly connected to the Munchkin VWH supply and return connection. Connect the cold water supply to both the storage bottom port and the supply side of the Munchkin VWH (shown in Piping details, this section) It is important that you install a flow check on the supply line of Munchkin VWH before you connect feed line to the storage. This will allow the cold feed to flow through the storage tank first and not the Munchkin VWH. It is recommended that you install shut off valves on the cold feed line for ease of future service. If there is a back flow preventer, or any type of no return valve in the system, then you must install an additional tee for a suitable potable hot water expansion tank. Connect the Storage tank return line to the return connection located on the Munchkin VWH (shown in Piping details, this section). Then connect your hot water outlet located on the storage tank to your hot water plumbing lines.

WARNING

NEVER USE DIELECTRIC UNIONS OR GALVANIZED STEEL FITTINGS WHEN CONNECTING TO A STAINLESS STEEL STORAGE TANK.

A. EXPANSION TANK

A potable hot water expansion tank may be required to offset the water expansion as the water is heated. In most city plumbing systems, the water meter has a no return or back flow device built into the system to prevent a back flow of water back into city mains. Some states require back flow preventers on all incoming water supplies. Under these circumstances, you will need a hot water expansion tank listed for potable water use. The expansion tank should be located on the cold inlet piping close to the water heater. It is important that you follow the expansion tank manufacturer's installation guidelines when installing any expansion tank.

See the piping illustrations included in this section, Figs. 5-2 to 5-9 for suggested guidelines in piping the Munchkin heater with either zone valves or circulator pumps.

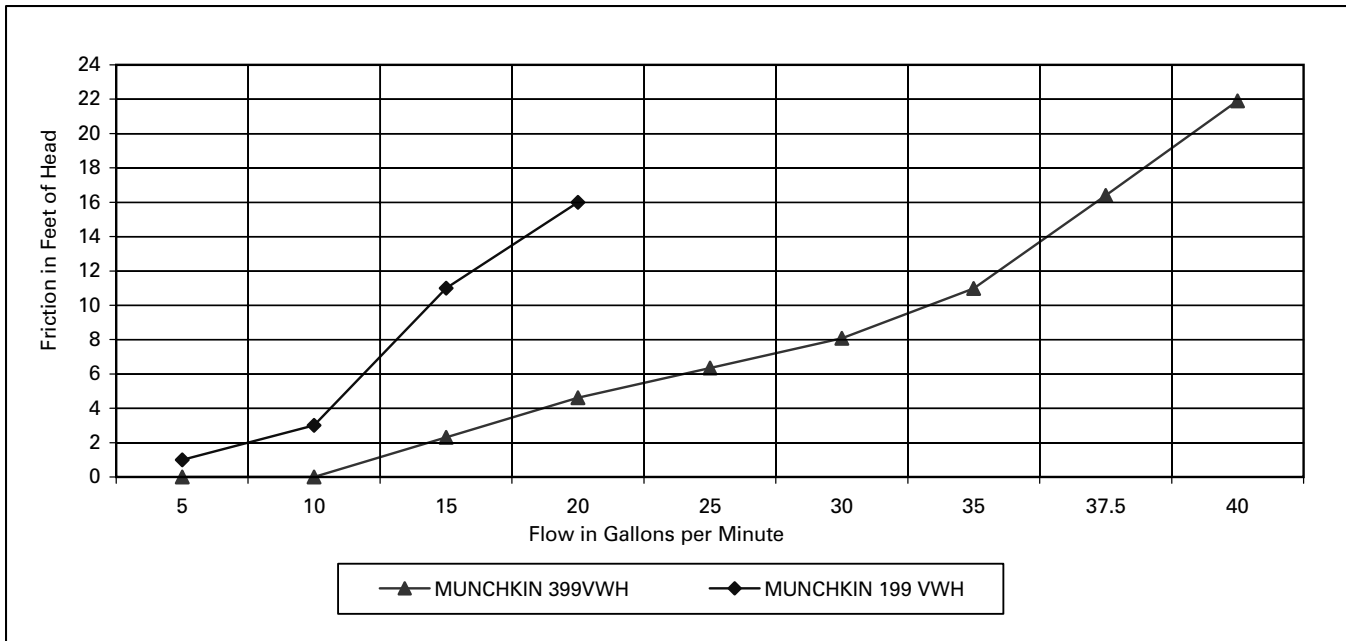
**Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment and detailing required by local codes.*

B. HIGH VELOCITY CIRCULATOR PUMP

Every Munchkin VWH is shipped with a high velocity circulating pump to assure the correct amount of continuous flow through the all stainless steel heat exchanger at all times. If a replacement of the high velocity circulator pump is needed, it must match the performance of the pump provided with the Munchkin VWH package. NOTE: The circulator must be designed for potable water systems.

C. CIRCULATOR SIZING

The Munchkin VWH Heat Exchanger has a pressure drop which must be considered in your system design. Refer to the graph below for pressure drop through the Munchkin VWH Heat Exchanger.

















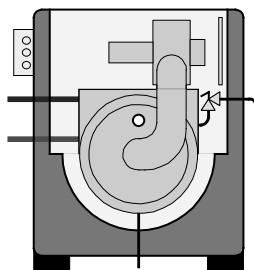
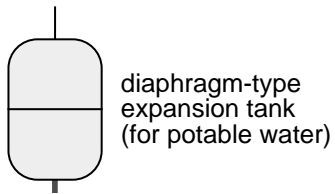
*The recommended circulators are based on 1 gpm per 10,000 BTU/hr w/20

Circulator Sizing Chart			
BOILER	TACO P/N	GRUNDFOS P/N	Bell & Gossett
199M	1400-20B	26-96	PL-36
399M	1400-50B	UPS 32-160	PL-55

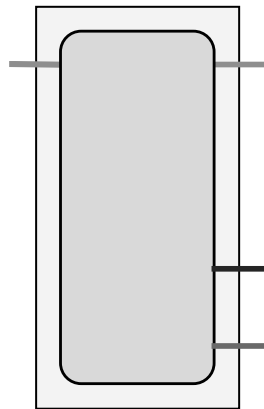
PIPING ILLUSTRATIONS

Piping Symbol Legend

- | | | | |
|--|--|---|--|
|  | circulator (open loop)
(w/ isolation flanges) |  | anti-scald rated
mixing valve |
|  | flow switch |  | pressure gauge |
|  | gate valve |  | pressure relief valve
(or P&T relief valve) |
|  | globe valve |  | temperature /
pressure gauge |
|  | ball valve |  | union |
|  | swing-check valve |  | vacuum breaker |
|  | spring-loaded check valve | | |
|  | hose bib / boiler drain | | |



Munchkin heater

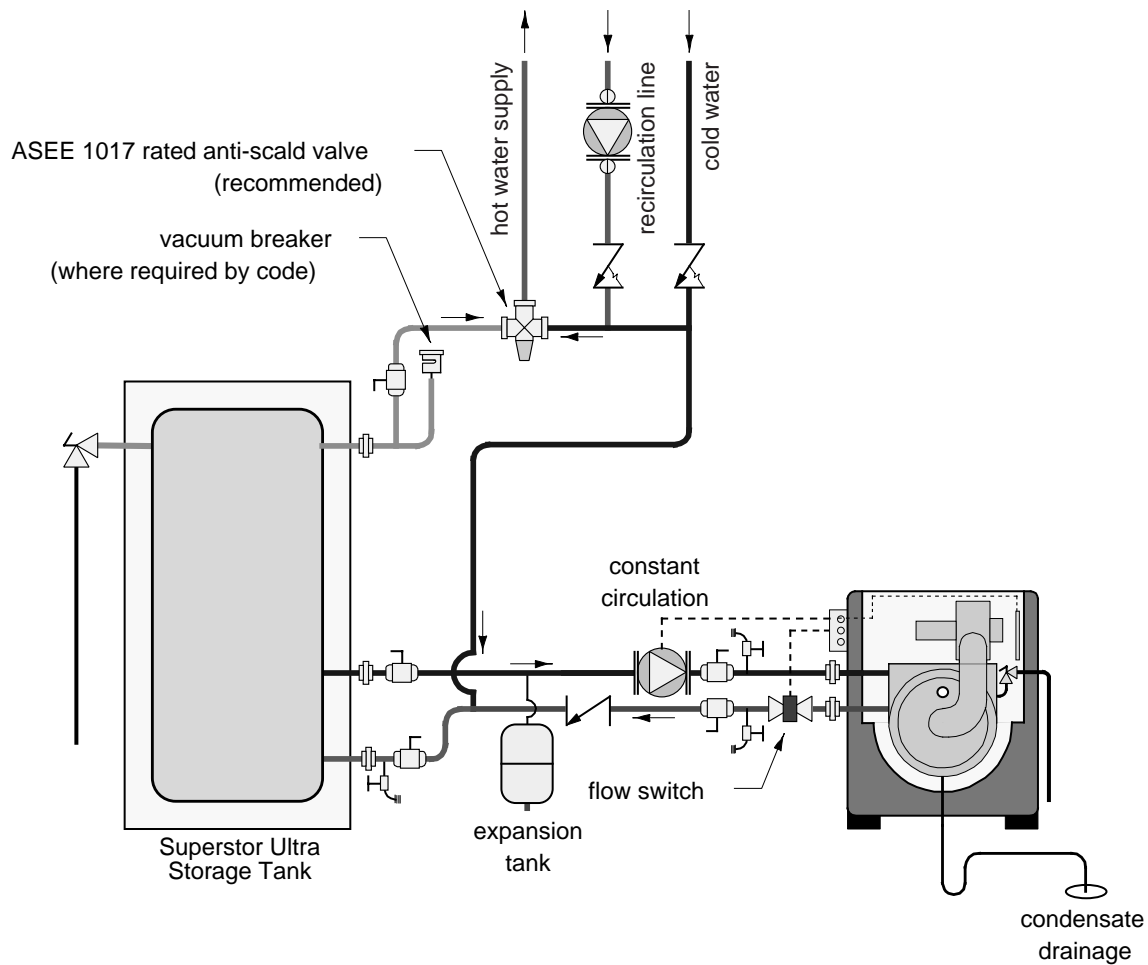


Superstor Ultra
Storage Tank

Fig. 5-1

Volume Water Heating using Munchkin boiler (1 boiler supplying one storage tank)

Drawing VWH 1/1



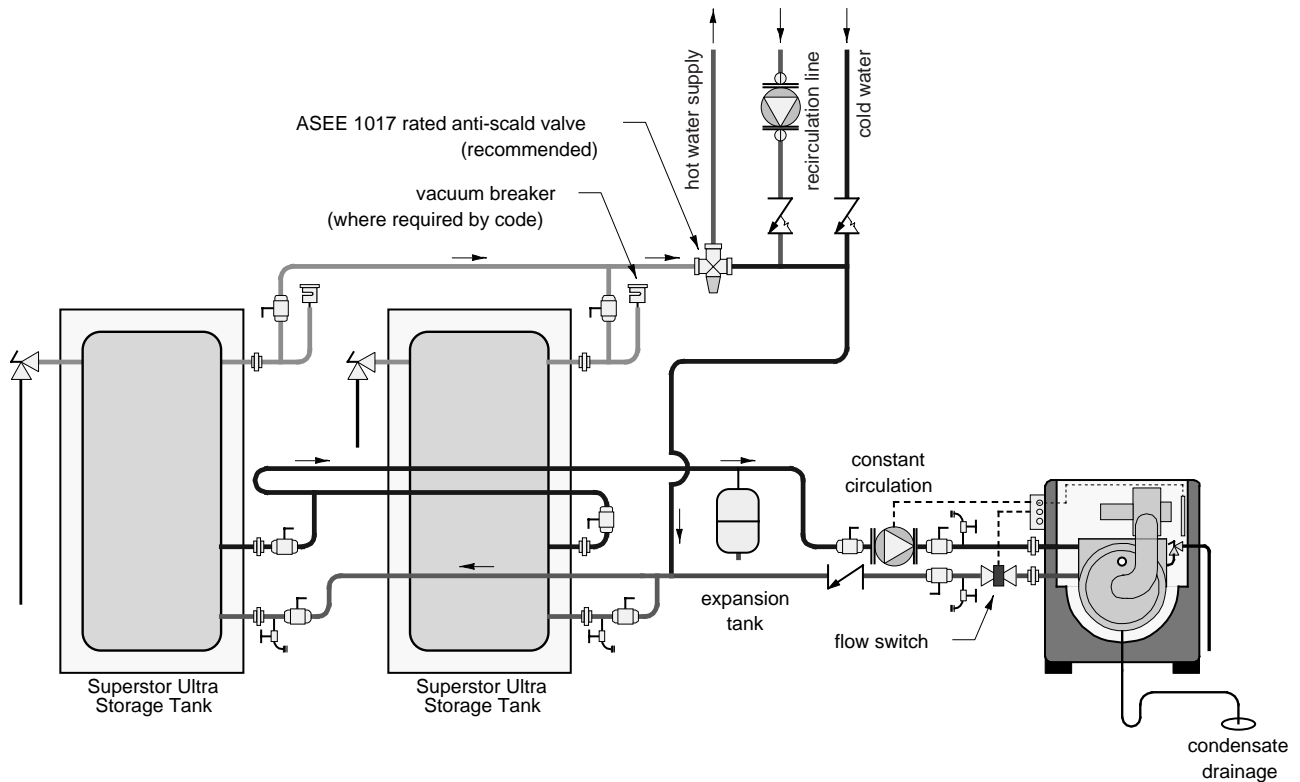
NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. Boiler circulator must be rated for open loop application. Do not use cast-iron circulators
3. Boiler circulator(s) operate continuously
4. The minimum pipe size for connecting to a water storage tank is 1.25 inch for 199 VWH and 2 inches for 399 VWH
5. The minimum pipe size for connecting a Munchkin boiler is 1.25 inches for 199 VWH, and 2-inches for 399 VWH
6. All pumps are shown with isolation flanges or full port ball valves for isolation. The alternative is standard flanges with full port ball valves and a separate flow check valve.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators and check valves.
8. Install vacuum relief valve in accordance with local code requirements
9. All multiple boilers and multiple storage tanks shall be installed with reverse return piping as shown
10. Anti-scald rated mixing valve is recommended on all tanks if the leaving hot water temperature from tank is above 119 °F.
11. Expansion tank must be rated for use with potable water

Fig. 5-2

Volume Water Heating using Munchkin boiler (1 boiler supplying two storage tanks)

Drawing VWH 1/2



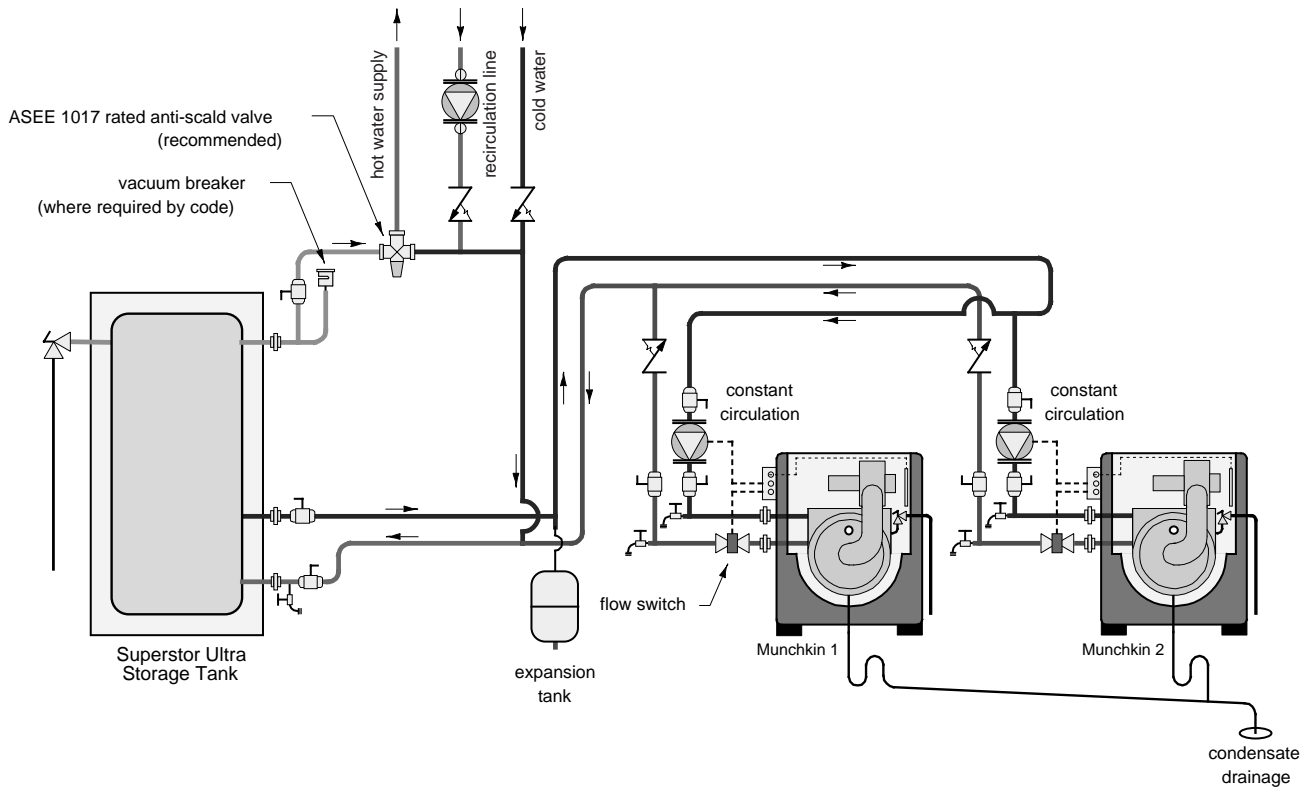
NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. Boiler circulator must be rated for open loop application. Do not use cast-iron circulators
3. Boiler circulator(s) operate continuously
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5. The minimum pipe size for connecting a Munchkin boiler is 1.25 inches for 199 VWH, and 2-inches for 399 VWH
6. All pumps are shown with isolation flanges or full port ball valves for isolation. The alternative is standard flanges with full port ball valves and a separate flow check valve.
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8. Install vacuum relief valve in accordance with local code requirements
9. All multiple boilers and multiple storage tanks shall be installed with reverse return piping as shown
10. Anti-scald rated mixing valve is recommended on all tanks if the leaving hot water temperature from tank is above 119 °F.
11. Expansion tank must be rated for use with potable water

Fig. 5-3

Volume Water Heating using Munchkin boiler (2 boilers supplying one storage tank)

Drawing VWH 2/1 H



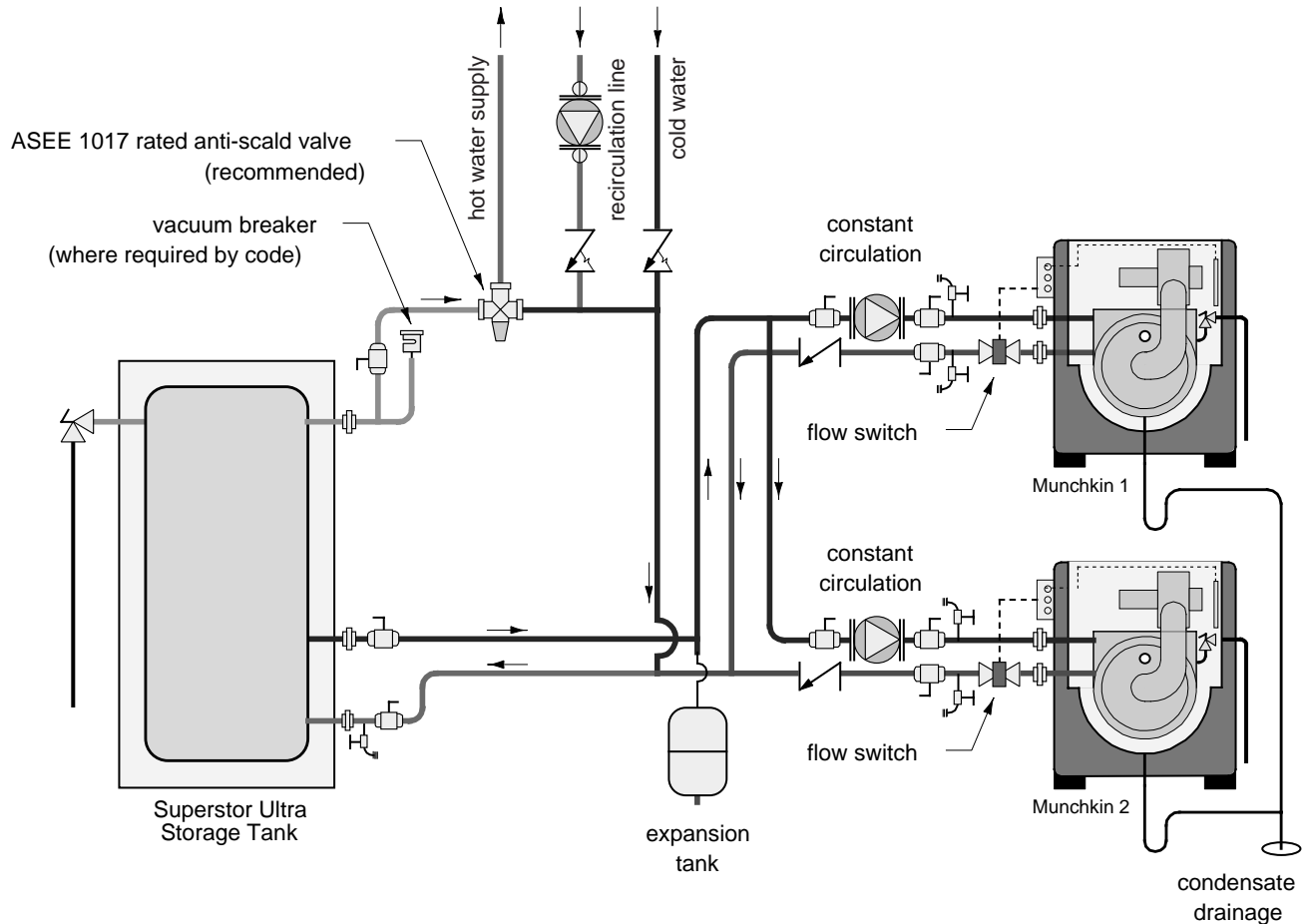
NOTES:

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3. Boiler circulator(s) operate continuously
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5. The minimum pipe size for connecting a Munchkin boiler is 1.25 inches for 199 VWH, and 2-inches for 399 VWH
6. All pumps are shown with isolation flanges or full port ball valves for isolation. The alternative is standard flanges with full port ball valves and a separate flow check valve.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators and check valves.
8. Install vacuum relief valve in accordance with local code requirements
9. All multiple boilers and multiple storage tanks shall be installed with reverse return piping as shown
10. Anti-scald rated mixing valve is recommended on all tanks if the leaving hot water temperature from tank is above 119 °F.
11. Expansion tank must be rated for use with potable water

Fig. 5-4

Volume Water Heating using Munchkin boiler (2 boilers supplying one storage tank)

Drawing VWH 2/1 V



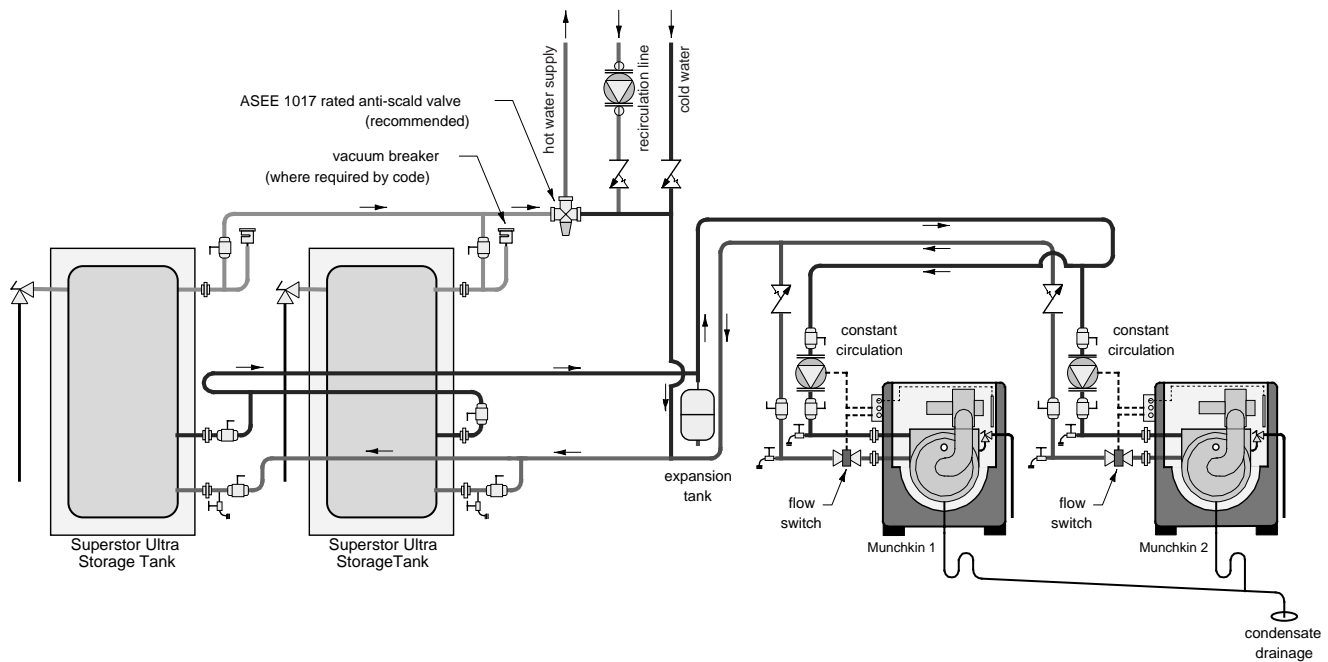
NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. Boiler circulator must be rated for open loop application. Do not use cast-iron circulators
3. Boiler circulator(s) operate continuously
4. The minimum pipe size for connecting to a water storage tank is 1.25 inch for 199 VWH and 2 inches for 399 VWH
5. The minimum pipe size for connecting a Munchkin boiler is 1.25 inches for 199 VWH, and 2-inches for 399 VWH
6. All pumps are shown with isolation flanges or full port ball valves for isolation. The alternative is standard flanges with full port ball valves and a separate flow check valve.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators and check valves.
8. Install vacuum relief valve in accordance with local code requirements
9. All multiple boilers and multiple storage tanks shall be installed with reverse return piping as shown
10. Anti-scald rated mixing valve is recommended on all tanks if the leaving hot water temperature from tank is above 119 °F.
11. Expansion tank must be rated for use with potable water

Fig. 5-5

Volume Water Heating using Munchkin boilers (2 boilers supplying two storage tanks)

Drawing VWH2/2 H



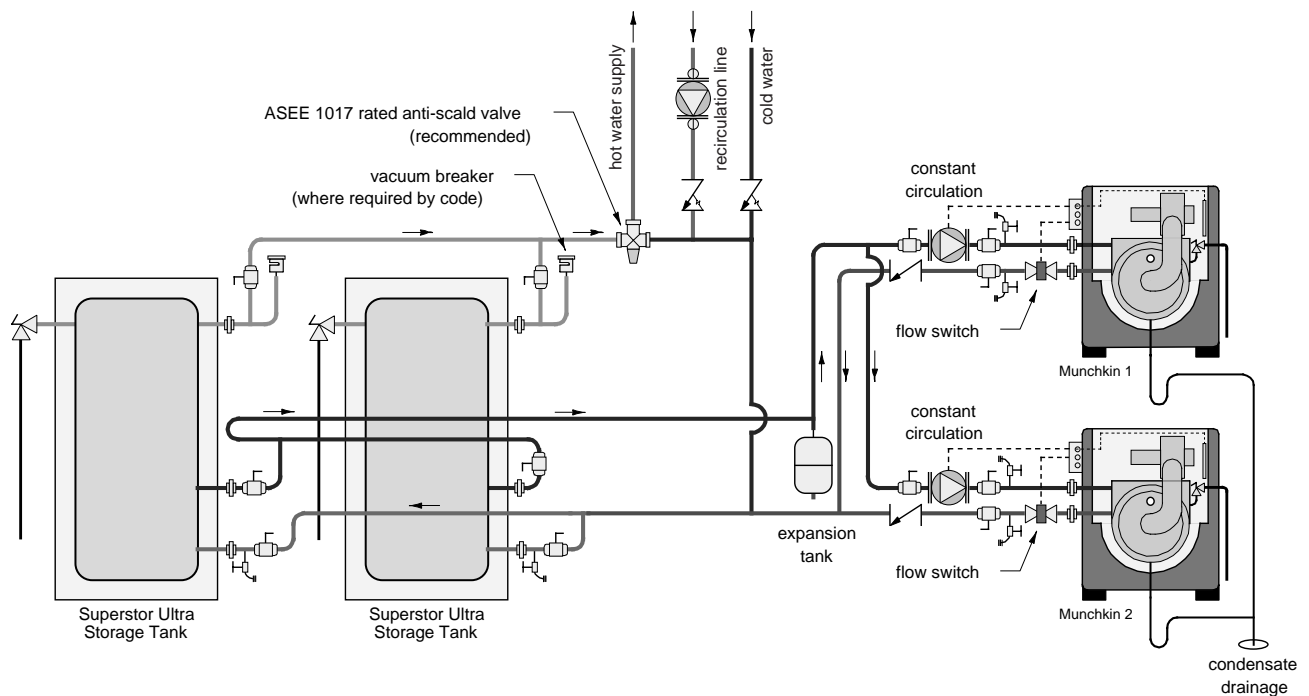
NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. Boiler circulator must be rated for open loop application. Do not use cast-iron circulators
3. Boiler circulator(s) operate continuously
4. The minimum pipe size for connecting to a water storage tank is 1.25 inch for 199 VWH and 2 inches for 399 VWH
5. The minimum pipe size for connecting a Munchkin boiler is 1.25 inches for 199 VWH, and 2-inches for 399 VWH
6. All pumps are shown with isolation flanges or full port ball valves for isolation. The alternative is standard flanges with full port ball valves and a separate flow check valve.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators and check valves.
8. Install vacuum relief valve in accordance with local code requirements
9. All multiple boilers and multiple storage tanks shall be installed with reverse return piping as shown
10. Anti-scald rated mixing valve is recommended on all tanks if the leaving hot water temperature from tank is above 119 °F.
11. Expansion tank must be rated for use with potable water

Fig. 5-6

Volume Water Heating using Munchkin boilers (2 boilers supplying two storage tanks)

Drawing VWH2/2 V



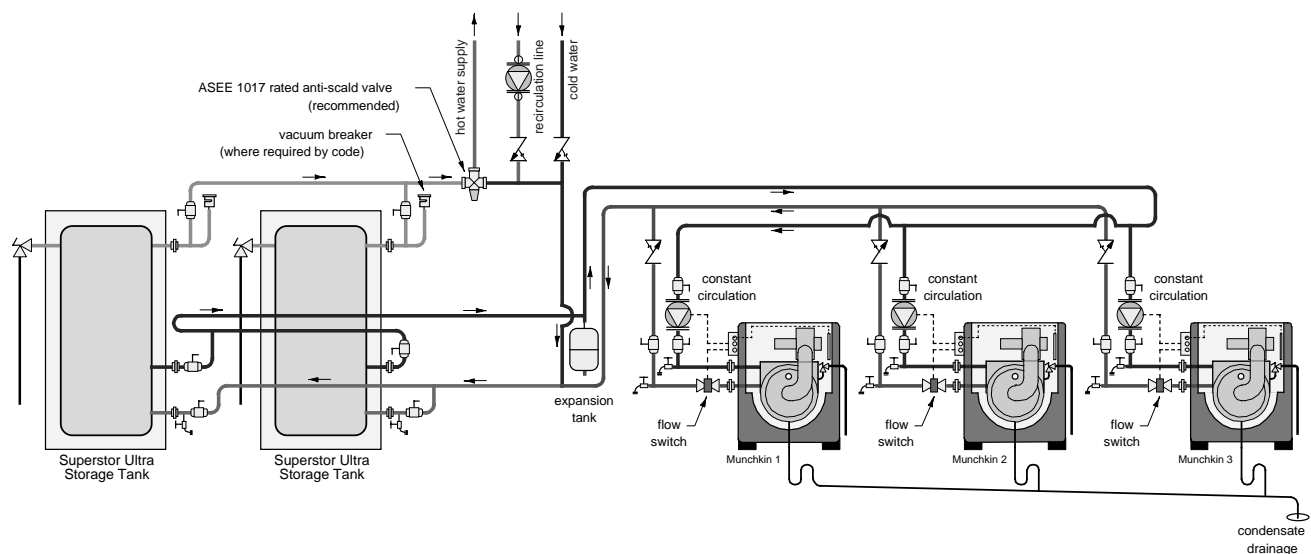
NOTES:

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2. Boiler circulator must be rated for open loop application. Do not use cast-iron circulators
3. Boiler circulator(s) operate continuously
4. The minimum pipe size for connecting to a water storage tank is 1.25 inch for 199 VWH and 2 inches for 399 VWH
5. The minimum pipe size for connecting a Munchkin boiler is 1.25 inches for 199 VWH, and 2-inches for 399 VWH
6. All pumps are shown with isolation flanges or full port ball valves for isolation. The alternative is standard flanges with full port ball valves and a separate flow check valve.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators and check valves.
8. Install vacuum relief valve in accordance with local code requirements
9. All multiple boilers and multiple storage tanks shall be installed with reverse return piping as shown
10. Anti-scald rated mixing valve is recommended on all tanks if the leaving hot water temperature from tank is above 119 °F.
11. Expansion tank must be rated for use with potable water

Fig. 5-7

Volume Water Heating using Munchkin boiler (3 boilers supplying two storage tanks)

Drawing VWH 3/2 H



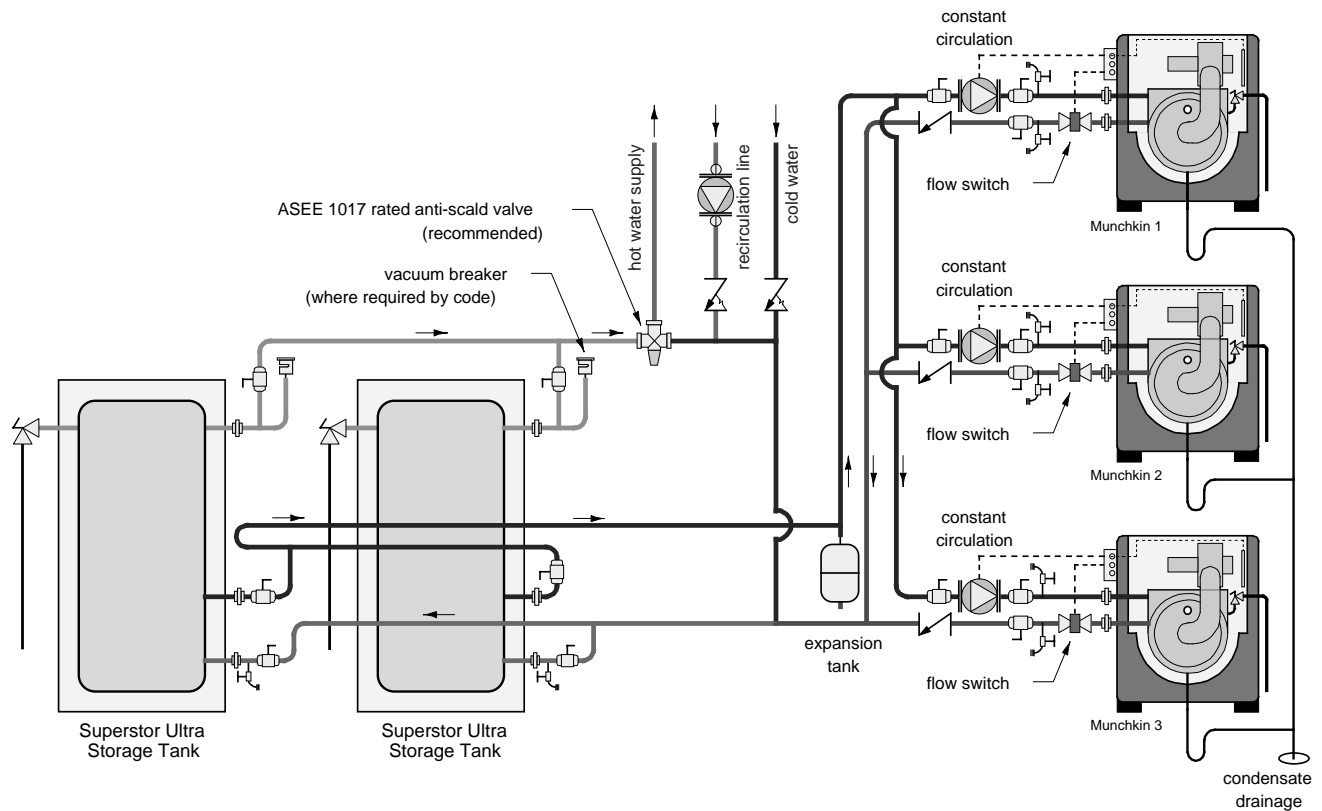
NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. Boiler circulator must be rated for open loop application. Do not use cast-iron circulators
3. Boiler circulator(s) operate continuously
4. The minimum pipe size for connecting to a water storage tank is 1.25 inch for 199 VWH and 2 inches for 399 VWH
5. The minimum pipe size for connecting a Munchkin boiler is 1.25 inches for 199 VWH, and 2-inches for 399 VWH
6. All pumps are shown with isolation flanges or full port ball valves for isolation. The alternative is standard flanges with full port ball valves and a separate flow check valve.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators and check valves.
8. Install vacuum relief valve in accordance with local code requirements
9. All multiple boilers and multiple storage tanks shall be installed with reverse return piping as shown
10. Anti-scald rated mixing valve is recommended on all tanks if the leaving hot water temperature from tank is above 119 °F.
11. Expansion tank must be rated for use with potable water

Fig. 5-8

Volume Water Heating using Munchkin boiler (3 boilers supplying two storage tanks)

Drawing VWH 3/2 V



NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. Boiler circulator must be rated for open loop application. Do not use cast-iron circulators
3. Boiler circulator(s) operate continuously
4. The minimum pipe size for connecting to a water storage tank is 1.25 inch for 199 VWH and 2 inches for 399 VWH
5. The minimum pipe size for connecting a Munchkin boiler is 1.25 inches for 199 VWH, and 2-inches for 399 VWH
6. All pumps are shown with isolation flanges or full port ball valves for isolation. The alternative is standard flanges with full port ball valves and a separate flow check valve.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators and check valves.
8. Install vacuum relief valve in accordance with local code requirements
9. All multiple boilers and multiple storage tanks shall be installed with reverse return piping as shown
10. Anti-scald rated mixing valve is recommended on all tanks if the leaving hot water temperature from tank is above 119 °F.
11. Expansion tank must be rated for use with potable water

Fig. 5-9

PART 6. START-UP PROCEDURES

A. SEQUENCE OF OPERATION

The VWH boilers are shipped with light blue wires connected using a wire nut, which controls storage tank temperature through the supply manifold sensor located on the heater. The light blue wires can also be connected to allow the user to control the storage tank temperature directly using a Mechanical Aquastat Control (Not included in package) or Tank Sensor which would be mounted directly on the storage tank. All VWH boilers should be set up to run the pump continuously to assure long service life and accurate temperature measurement.

1. When power is first applied to the control, the control display will read the outlet temperature. The control will initially run through a self-diagnostic routine and then go into its operating mode. If there is no call for heat, the System will go into an idle state. The circulator must be wired to incoming power to operate continuously. If there is a code **FL** in the display window, then either the circulator is not operating or there is a restriction in the piping system, rendering an inadequate flow.
2. The control then performs selected system diagnostic checks. If all checks are successfully passed, a pre-purge cycle is initiated (the blower will be on maximum speed).
3. When the actual temperature is below a set-point, minus the switching differential, the burner will operate and modulate to heat the system. If using a mechanical control on the storage tank, the burner will not activate until the control calls for heat. This will activate the burner and modulate the heater off the programmed set-point value on your Munchkin VWH unit. It is recommended that the VWH control set-point is 5° higher than the set-point on the mechanical control.
4. When the pre-purge period is complete, power is applied to the spark ignitor for approximately 6 seconds. Approximately 2 seconds later, we verify flame. If a flame is not verified during the trial-for-ignition, the gas valve is immediately closed and the control will return to step 2. After three trials, if a flame is not verified, the control will go into a lockout mode. If a flame is confirmed, the control enters the heating mode. The fire rate will be based on the proprietary algorithm.
5. When water temperature reaches the temperature set point, the gas valve is closed and the control enters a post-purge state (the blower will be on maximum speed).
6. When the post-purge is complete, the control enters an idle state while continuing to monitor temperature and the state of other system devices. If a call-for-heat is received, the control will automatically return to step 2 in sequence and repeat the entire operating cycle.

CHECK/CONTROL WATER CHEMISTRY

Water pH between 6.0 and 8.0

1. Maintain boiler water pH between 6.0 and 8.0. Check with litmus paper or have chemically analyzed by water treatment company.
2. If pH differs from above, consult local water treatment company for treatment needed.

Hardness less than 7 grains.

1. Consult local water treatment companies for unusually hard water areas (above 7 grains hardness).

Chlorine concentration less than 200 ppm

1. Filling with chlorinated fresh water should be acceptable since drinking water chlorine levels are typically less than 5 ppm.
2. Do not use the boiler to directly heat swimming pool or spa water.
3. Do not fill boiler or operate with water containing chlorine in excess of 200 ppm.

B. ITEMS TO BE CHECKED BEFORE LIGHTING THE MUNCHKIN

It is recommended that you read the General Information Section (Part 1) to get a better understanding how the Munchkin operates before you start the unit.

1. Make sure that you follow the Lighting instruction before running the Munchkin.
2. Check to see if all the electrical connections are on securely.
3. Make sure that the Gas is turned on inside the cabinet and outside of the Munchkin.
4. Double check the temperature setting (Note: The Munchkin is factory set at 119 degrees)
5. Make sure the unit is properly grounded and the electrical wiring meets the requirements of the electrical section (Part 2).
6. Turn on the power to the Munchkin. The Temperature of the Munchkin Outlet will appear in the display provided. If a fault code appears, correct the fault before operating. Make sure that the flow switch is connected and adjust the setpoint for the desired water temperature. The Munchkin will now run its pre-purge cycle, then begin running, which will be indicated by the Green light illuminating under "Flame On" in your display.

⚠ WARNING

If you do not follow these instructions exactly, a fire or explosion may result, causing property damage, personal injury or loss of life.

C. LIGHTING INSTRUCTIONS**FOR YOUR OWN SAFETY READ BEFORE OPERATING**

1. This appliance does not have pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
2. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
 - Do not touch any electric switch; do not use any phone in your building.
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas suppliers' instructions.
 - If you cannot reach your gas supplier, call the fire department.
3. Turn on gas shutoff valve (located inside of the Heater) so that the handle is aligned with the gas pipe. If the handle will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
 4. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.
 5. The Munchkin Heater shall be installed so the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (circulator replacement, condensate trap, control replacement, etc.)

D. OPERATING INSTRUCTIONS

1. STOP! Read the safety information in Part 6.
2. Turn off all electric power to the appliance.
3. This appliance is equipped with an ignition device which automatically lights the burner. Do

not try to light the burner by hand.

4. Remove front cover.
5. Turn gas shutoff valve to “off” position.
6. Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow Part 6, Section B/Lighting Instructions in the safety information. If you don't smell gas, go to the next step.
7. Turn the gas shutoff valve to “on” position.
8. Replace the Front Cover.
9. Turn on all electric power to appliance.
10. Set the temperature to the desired setting.
11. If the appliance will not operate, follow the instructions “To Turn Off Gas To Appliance” Section E and call your service technician or gas supplier.

E. ADJUSTING THE OPERATING SET POINTS OF THE MUNCHKIN VWH DISPLAY


To adjust the temperature set point value of the Munchkin VWH Boiler, press the **S3/Program** key for three seconds until you see Sh then an alternating value of 7°F. This is the default setting for the unit differential setting which operates off of the supply sensor. To advance to the next function, press the **S3/Program** key to advance to the next setting. Any function may be changed by pressing either the **S1/-** key or **S2/-** key on the display to either increase or decrease the setting. After the settings have been established, the user will advance through the functions pressing the **S3/Program** key until the display shows the outlet temperature of the unit. The system settings are now programmed into the control. Listed below are the set points that can be programmed into the control.

Set Point Adjustment			
Function	Display	Default Setting	Range of Adjustment
Supply Sensor Differential	sh	29° F	5–30° F
Temperature Set Point	dd	119° F	95° F/185° F
Tank Sensor Differential Set Point	dh	7° F	1–18° F
Temp. Measurement	t	Fahrenheit to Celcius	F or C

Note: When using a mechanical control on the storage tank, it is recommend that the temperature set-point on the Munchkin VWH boiler is set 5°F above the setting of the mechanical control located on the storage tank .The Munchkin VWH will modulate its firing rated based on the supply temperature sensor until the mechanical control temperature set point is reached.


⚠ DANGER

⚠ DANGER



Water temperature over 125 degrees F. can cause severe burns instantly, or death from scalds. Children, disabled, and elderly are at highest risk of being scalded. See instruction manual before setting temperature at water heater. Feel water before bathing or showering! Temperature limiting valves are available.

⚠ DANGER



F. STATUS MENU

Installers are also able to check the current status of the Munchkin parameters by pressing **S4/Reset** key for 3 seconds. Once activated, the display will show **d1** alternating value of the actual outlet temperature. Actual values are displayed for each function. To view the next value simply press the **S/4** key to go to the next displayed value. Listed below are the values which can be displayed. These values cannot be changed. To exit this menu, simply press **S3/Program** key to resume normal operation.

Function Value

- d1/ Actual Temperature from outlet sensor
- d2/ Actual Temperature from inlet sensor
- d3/ If using a standard mechanical control, the control will display **0** for closed and **1** for open. If the tank sensor is connected to the SuperStor storage tank, it will measure the actual temperature
- d4/ 307 (Not used)
- d5/ NC (Not used)
- d6/ Actual Fan speed multiplied by 10 (example: If fan speed displayed is 410 RPM x 10 = 4100 actual fan speed)
- d7/ Actual Ionization current read from Flame Rectification probe
- d8/ 0 (Not used)
- d9/ **0** or **1** (Not used)
- d10/ NC (Not used)
- d11/ 32 (Not used)
- d12/ Power on in thousands (display will not read until 100 hrs.)
Example : Display x 1000 = Power on Hours
- d13/ NA
- d14/ Total running hours in thousands
(display will not read until 100 hrs)
- d15/ Passed ignition attempts in thousands (display will not read until 100 ignition attempts)
Example: Display x 1000 = Ignition attempts
12.3 x 1000 = 12300 Ignition attempts

G. TEST MODE

This function is intended to simplify the gas valve adjustment if needed. Listed below are the recommended limits on each Munchkin Heater and the Combustion Settings. Automatic modulation does not take place when the controller is in Test mode, only temperature limitation based on the Munchkin Central Heating set point. The user will be allowed to increase or decrease the fan speed by pressing in either the **S1/-** or **S2/+** keys.

To activate the test mode, press and hold the **S2/+** and the **S3/Program** Key simultaneously. The display will show the control alternating between **Ser** and the fan speed (shown in a multiple of 10). The measurement of the combustion level should always be taken at the highest fan speed and the lowest fan speed. Press and hold **S2** until it reaches the maximum fan speed and take your measurement. Then press and hold **S1** until it reaches minimum fan speed and take your measurement. The control will automatically exit test mode in several minutes, if you wish to exit test mode sooner, press **S1/-** and **S2/+** simultaneously for 1 second.

COMBUSTION SETTINGS — 199 VHW / 399VWH				
HIGH FIRING RATES and LOW FIRING RATES ON ALL MODELS				
	Natural Gas		Propane LP	
	low	high	low	high
Carbon CO ppm Monoxide	0–20 ppm	70 ppm–135 ppm	0–20 ppm	80–150 ppm
Carbon CO ₂ % Dioxide	8-1/2% – 9-1/2%	8-1/2% – 9-1/2%	9-1/2% – 10-1/2%	9-1/2% – 10-1/2%

Fig. 6-1

MUNCHKIN VWH FAN SPEEDS			
BOILER	HIGH	LOW	IGNITION
199M	4800	1550	2765
399M	7700	1900	3000

Fig. 6-2

H. TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove the front cover.
4. Turn gas shutoff valve to "off".
5. Install front cover.

MUNCHKIN GAS VALVE

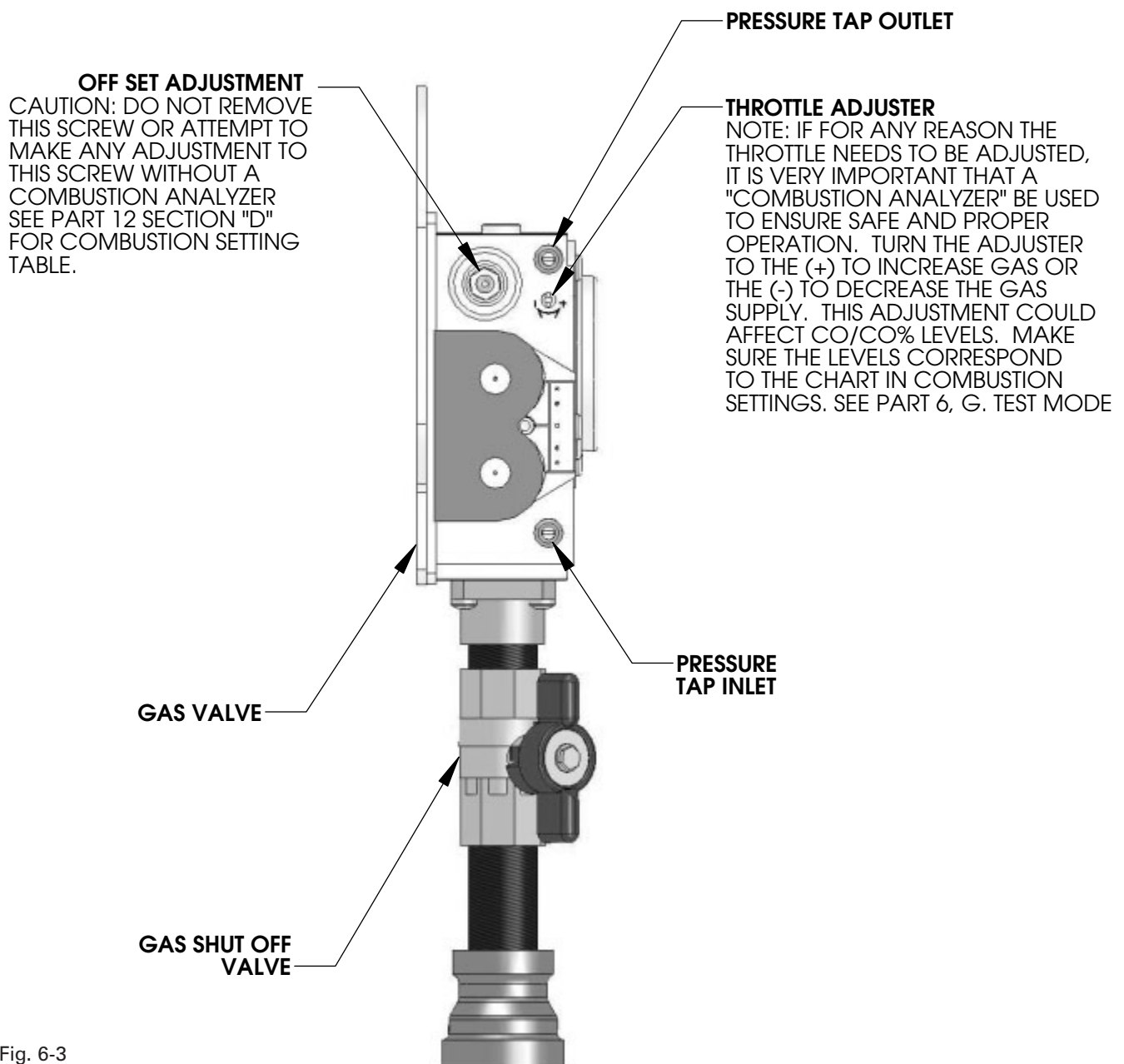


Fig. 6-3

PART 7. TROUBLESHOOTING

A. MUNCHKIN ERROR CODE

An error code may occur in the installation of the Munchkin VWH. This condition may lead to a lock out condition of the controller, which will need to be manually reset through the S4/Reset button. These temporary codes will help the installer correct the problem before going into a lock out condition, which will require a manual reset.

B. BOILER ERROR

1. When an error condition occurs the controller will display an error code on the display module.
2. These error codes and several suggested corrective actions are included in Table 7.1.
3. In the case of E00, E13, and E14 this error, if uncorrected, will go into a fault condition as described in Paragraph C (Boiler Fault).

C. BOILER FAULT

1. When a fault condition occurs the controller will illuminate the red "fault" indication light and display a fault code in the format (Example: **F00**) on the display module.
2. Note the fault code and refer to Table 7.2 for an explanation of the fault code along with several suggestions for corrective actions.
3. Press the reset key to clear the fault and resume operation. Be sure to observe the operation of the unit to prevent a recurrence of the fault.

WARNING

When servicing or replacing any components of this boiler be certain that:

- The gas is off.
- All electrical power is disconnected

DANGER

When servicing or replacing that are in direct contact with the boiler water, be certain that:

- There is no pressure in the boiler. (Pull the release on the relief valve. Do not depend on the pressure gauge reading).
- The boiler water is not hot
- The electrical power is off

WARNING

Do not use this appliance if any part has been under water. Improper or dangerous operation may result. Contact a qualified service technician immediately to inspect the boiler and to repair or replace any part of the boiler which has been under water.

CAUTION

This appliance has wire function labels on all internal wiring. Observe the position of each wire before removing it. Wiring errors may cause improper and dangerous operation. Verify proper operation after servicing.

CAUTION

If overheating occurs or the gas supply fails to shut off, do not turn off electrical power to the circulating pump. This may aggravate the problem and increase the likelihood of boiler damage. Instead, shut off the gas supply to the boiler at the gas service valve.

Table 7-1: 925 Control Board Error Codes

Code	Description	Duration	Corrective Action
E00	High Limit Exceeded	50 Sec.	<ol style="list-style-type: none"> 1. Check circulation pump operation. 2. Assure that there is adequate flow through the boiler by accessing the status menu and assuring that there is less than a 50°F rise from the return thermister to the supply thermister. 3. Replace switch if faulty.
E13	Combustion Fan Speed Low. The boiler combustion air fan speed less than 70% of expected.	60 Sec.	<ol style="list-style-type: none"> 1. Check the combustion air fan wiring. 2. Replace the combustion air fan. 3. Replace the control board.
E14	Combustion Fan Speed High. The boiler combustion air fan speed is more than 130% of expected.	60 Sec.	<ol style="list-style-type: none"> 1. Check the combustion air fan wiring. 2. Replace the combustion air fan. 3. Replace the control board.
FLO	Flow Switch Open	Until Corrected	<ol style="list-style-type: none"> 1. Assure that high velocity pump is operational. 2. Check pump impeller. 3. Check flow switch and paddle wheel.
FLU	Blocked Vent Pressure Switch	Until Corrected	<ol style="list-style-type: none"> 1. Assure that the vent is not blocked 2. Check the switch operation by applying a jumper. (If the switch is not functioning properly, replace.)

Table 7-2: 925 Control Board FAULT Codes

Code	Description	Remedy
F00	High Limit Exceeded.	<ol style="list-style-type: none"> 1. Check circulation pump operation 2. Assure that there is adequate flow through the boiler by accessing the status menu and assuring that there is less than a 50°F rise from the return thermister to the supply thermister. 3. Check thermister reading on supply thermister. Replace switch if faulty.
F01	Vent Temperature Limit Exceeded.	<ol style="list-style-type: none"> 1. Push the red reset button on the switch. 2. Check the flue temperature during operation using a combustion analyzer. 3. Replace the switch if faulty.
F02	Interrupted or Shorted Supply (Outlet) Thermister.	<ol style="list-style-type: none"> 1. Check the electrical connection to the thermister on the outlet manifold. 2. Replace thermister if necessary.
F03	Interrupted or Shorted Return (Inlet) Thermister.	<ol style="list-style-type: none"> 1. Check the electrical connection to the thermister on the inlet manifold. 2. Replace thermister if necessary.
F05	Supply (Outlet) Temperature exceeds 230°F	<ol style="list-style-type: none"> 1. Check circulation pump operation. 2. Assure that there is adequate flow through the boiler by accessing the status menu and assuring that there is less than a 50°F rise from the return thermister to the supply thermister.
F06	Return (Inlet) Temperature Exceeded 230°F.	<ol style="list-style-type: none"> 1. Check circulation pump operation. 2. Assure that there is adequate flow through the boiler by accessing the status menu and assuring that there is less than a 50°F rise from the return thermister to the supply thermister.
F09	No flame detected – The boiler will make three attempts at ignition before the control goes into this lockout condition.	<ol style="list-style-type: none"> 1. Watch the igniter through the observation window provided. 2. If there is no spark, check the spark electrode for the proper ¼" gap. 3. Remove any corrosion from the spark electrode and flame rectifier probe. 4. If there is a spark but no flame, check the gas supply to the boiler. 5. If there is a flame, check the flame sensor. 6. Check any flue blockage or condensate blocks.
F10	Loss of Flame Signal – The boiler will relight 4 times before the control goes into this lockout condition.	<ol style="list-style-type: none"> 1. Monitor the gas pressure to the unit while in operation. 2. Assure that the flame is stable when lit. 3. Check to see if the green light on the display module is out while the boiler is running. 4. If the green light doesn't come on or goes off during operation check the flame signal on the status menu. 5. If the signal reads less than 1 microampere, clean the flame rectifier probe. 6. If the flame rectifier probe continues to read low, replace it.
F11	False Flame Signal – The boiler will lock out if it senses a flame signal when there should be none present.	<ol style="list-style-type: none"> 1. Turn the gas off to the unit at the service valve. 2. If the flame signal is still present replace the igniter. 3. If the flame signal is not present after turning off the gas supply, check the gas valve electrical connection. 4. If there is no power to the gas valve, remove the valve and check for obstruction in the valve seat or replace the gas valve. 5. Turn the gas on at the service valve after corrective action is taken.
F13	Combustion Fan Speed Low – The boiler will lock out if it senses that the fan speed is less than 70% of expected rate for more than 60 seconds.	<ol style="list-style-type: none"> 1. Check the combustion air fan wiring. 2. Replace the combustion air fan. 3. Replace the control board.
F14	Combustion Fan Speed High – The boiler will lock out if the fan speed is more than 130% of expected rate for more than 60 seconds.	<ol style="list-style-type: none"> 1. Check the combustion air fan wiring. 2. Replace the combustion air fan. 3. Replace the control board.
F18	Gas Valve Error	<ol style="list-style-type: none"> 1. Make sure the connector is correctly connected to the gas valve. 2. Check the electrical wiring from the valve to the control board. 3. Replace the low voltage wiring harness assembly. 4. Replace control board.
F30	Watchdog	Call factory for further assistance.
F31	Parameter Memory	Call factory for further assistance.
F32	Parameter Memory Write Error	Call factory for further assistance.
F33	Programming Error	Call factory for further assistance.

RESISTANCE TABLES

Boiler	Resistance (ohms)
32	32550
41	25340
50	19870
59	15700
68	12490
77	10000
86	8059
95	6535
104	5330
113	4372
122	3605
131	2989
140	2490
149	2084
158	1753
167	1481
176	1256
185	1070
194	915
203	786
212	667

PART 8. MAINTENANCE

A. MAINTENANCE PROCEDURES

Periodic maintenance should be performed once a year by a qualified service technician to assure that all the equipment is in safe efficient operation. The owner can make necessary arrangements with a qualified heating contractor for periodic maintenance of the heater. Installer must also inform the owner that the lack of proper care and maintenance of the heater may result in a hazardous condition. The installer should discuss the contents of the User's Information Manual with the owner.

B. ANNUAL MAINTENANCE

A trained and qualified service technician should perform the inspections listed below at least once a year.

- **Heater** – check the heater for dust or foreign materials, which may have been drawn in from the air intake of the heater. Simply blow out or wipe down with a dry rag.
- **Vent Termination** – check to remove any obstructions, such as leaves, bushes, or other sources which may interfere with the units ability to draw fresh air on the air intake or exhaust flue gas from the exhaust outlet.
- **Vent Piping** – make sure that all vent piping is in good condition. Check Joints for possible leaks.
- **Condensate** – check the Condensate trap by simply starting the unit and observing the flow of Condensate which should not be restricted in any fashion. (See instructions below.)
- **Heat Exchanger** – in the unlikely event the heater flue passage is becoming blocked, service must be performed only by an authorized Heat Transfer Products Representative or Certified Installing Contractor. (See coil cleaning instructions Section D)
- **Burner** – check burner for deterioration. If deterioration is observed, replace burner.
- **System Water / Pressure** – check pressure regulator and system pressure. Check system for air which will create noise. Open air vents or purge system to bleed air then close once air is fully purged from the system.
- **Water Piping** – check for and repair any leaks.
- **Gas Piping** – check for and repair any leaks.

C. CONDENSATE CLEANING INSTRUCTIONS

1. Turn down the temperature setpoint **dd** so the Munchkin will not cycle and then follow the steps below.
 - a. Close gas valve
 - b. Disconnect the condensate hose from the **outside** connection (**not from the Munchkin**) so flow can be observed.
 - c. Block the air flow in the exhaust by temporarily plugging the exhaust from the outside vent.
 - d. Turn up the temperature set point **dd** so the Munchkin VWH will begin to cycle. This will cause the fan to run at 100% which will then blow out any sediment that has accumulated in the condensate line. This process should only take a few minutes.
 - e. The unit should now be ready to re-start.
2. Before re-starting the Munchkin follow the steps below:
 - a. Reconnect the Molex connection and un-block the vent (**IMPORTANT: MAKE SURE EXHAUST VENT IS NO LONGER BLOCKED!**)
 - b. Open the gas valve.
 - c. Hit System Reset and increase the temperature to assure that the VWH will operate.
 - d. Observe the boiler function to make sure you see a condensate flow.
 - e. If you do not observe a condensate flow, repeat the above procedure.
3. If the problem is not corrected at this point, it is possible you have a material deposit problem,

in which case, a qualified plumber will need to be contacted to follow the Coil Cleaning Instructions (Section D) included in this section to dissolve deposit and clean condensate line.

⚠ DANGER

IT IS EXTREMELY IMPORTANT TO MAKE SURE THE EXHAUST VENT IS NO LONGER BLOCKED. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH.

D. COMBUSTION CHAMBER COIL CLEANING INSTRUCTIONS*

⚠ WARNING

The combustion chamber insulation in this product contains ceramic fiber material. Ceramic fibers can be converted to cristobalite in very high temperature applications. The International Agency for Research on Cancer (IARC) has concluded, "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group1).":

- Avoid breathing dust and contact with skin and eyes.
 - Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for cristobalite at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH website at <http://www.cdc.gov/niosh/homepage.html>. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this website.
 - Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
 - Apply enough water to the combustion chamber lining to prevent dust
 - Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.
- NIOSH stated First Aid.**
- Eye: Irrigate immediately
 - Breathing: Fresh air.

*Before beginning this procedure, you must have on hand the following items:

- a nylon, stainless or brass brush (not steel)
- "Rydylyme" (recommended for best results) (available on line www.rydylyme.com) or "CLR" (available at most hardware stores)
- Gloves, eye protection

1. Shut down the Munchkin by using the following steps:
 - a. Close the gas valve, shut down the unit and wait for the unit to be cool to the touch
 - b. Disconnect the condensate hose from the **outside** connection, (**not from the Munchkin side**), so the flow can be observed.
 - c. Remove screws and loosen bracket holding gas valve in place.
 - d. Pull connector to the venturi by sliding gas valve to left, remembering to disconnect both Molex connectors.
 - e. Remove the (6) 10MM nuts from the burner plate assembly to access the coils.
 - f. Pull the entire burner plate assembly towards you, while removing or pushing aside any wiring to allow the removal of the assembly.
2. Using a spray bottle filled with the recommended product "RYDLYME" or "CLR", spray liberally on the coils, making sure the solution penetrates and funnels down through the condensate hose. If the condensate hose is blocked, let the chemical penetrate for at least 15 minutes or until it drains.
3. Use the nylon, stainless or brass brush (do not use steel) and scrub coils to remove any buildup, then vacuum the debris from the coils.. **WARNING: Follow precautions above.**
4. Spray the coils with clear water, making sure to confine the spray to the area being cleaned (Try to avoid getting the back ceramic wall of the unit wet). Flush the combustion chamber with fresh water. At this point, the Munchkin should be ready to power back up.

Before powering up the Munchkin follow the steps below

- a. Re-install the burner assembly
- b. Replace the (6) 10MM nuts to the burner plate
- c. Re-connect the Molex connectors

- d. Re-connect gas valve, air-gas mixer and replace bracket. (**IMPORTANT: CHECK FOR GAS LEAKS**)
- e. Re-set thermostats (**IMPORTANT: MAKE SURE EXHAUST VENT IS NO LONGER BLOCKED!**)
- f. Turn the Munchkin back on** and observe condensate flow.
- g. Re-connect the condensate hose to the outside connection.

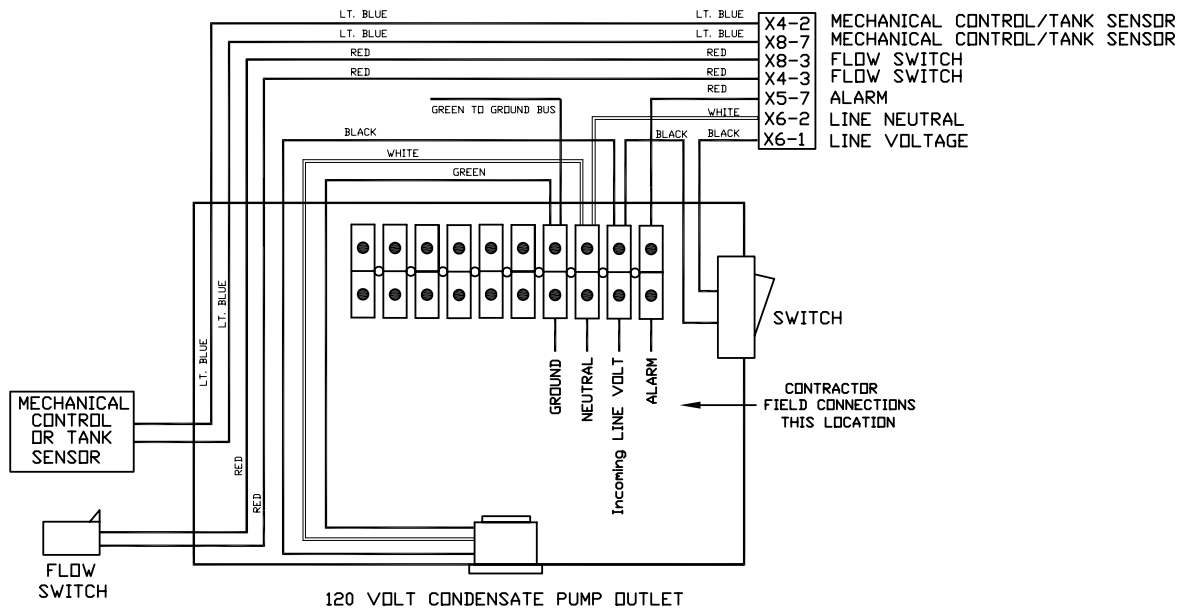
⚠ DANGER

IT IS EXTREMELY IMPORTANT THAT YOU CHECK FOR LEAKS WHEN RECONNECTING THE GAS VALVE AND MAKING SURE THE EXHAUST VENT IS NO LONGER BLOCKED. FAILURE TO DO SO MAY RESULT IN SEVERE PERSONAL INJURY OR DEATH.

****NOTE: When firing up the boiler for the first few times you may experience some fluttering of the gas burner that may result in a flame lockout. This is normal and will require you to re-cycle the unit until this clears up. This is caused by water still present in the combustion chamber.**

E. MUNCHKIN CONTROLLERS

Munchkin VWH
Field Wiring Diagram



Munchkin VWH
Internal Wiring Diagram

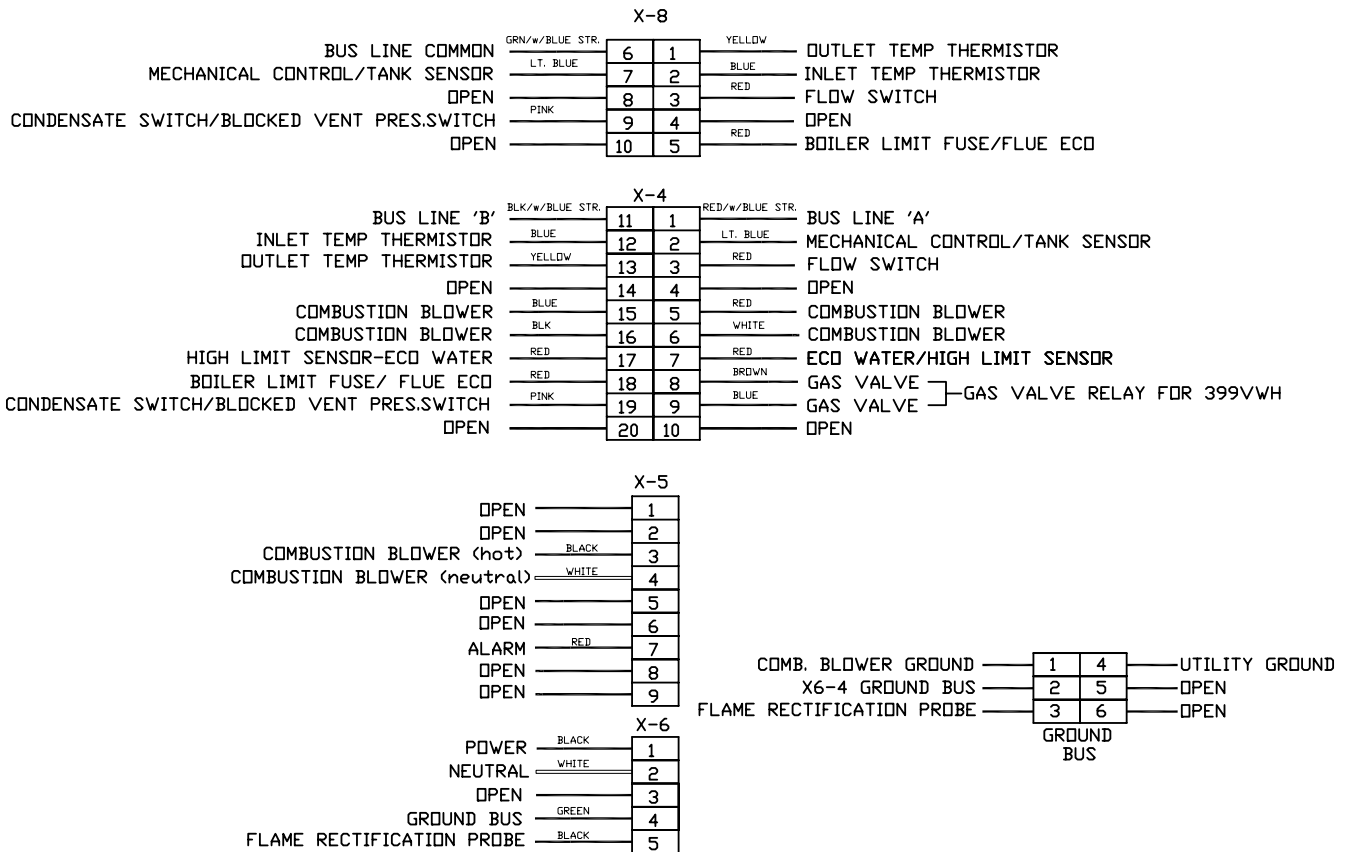
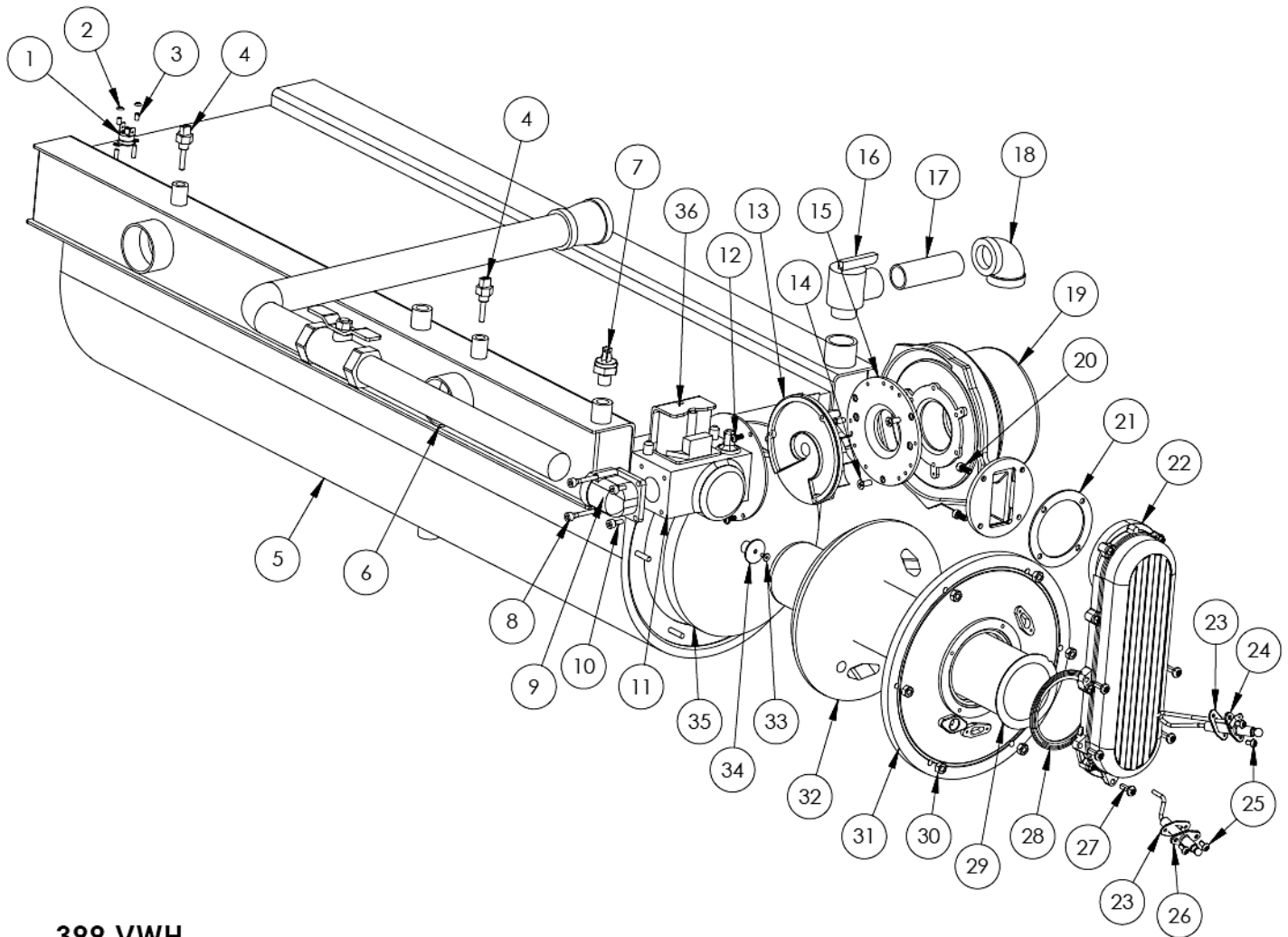
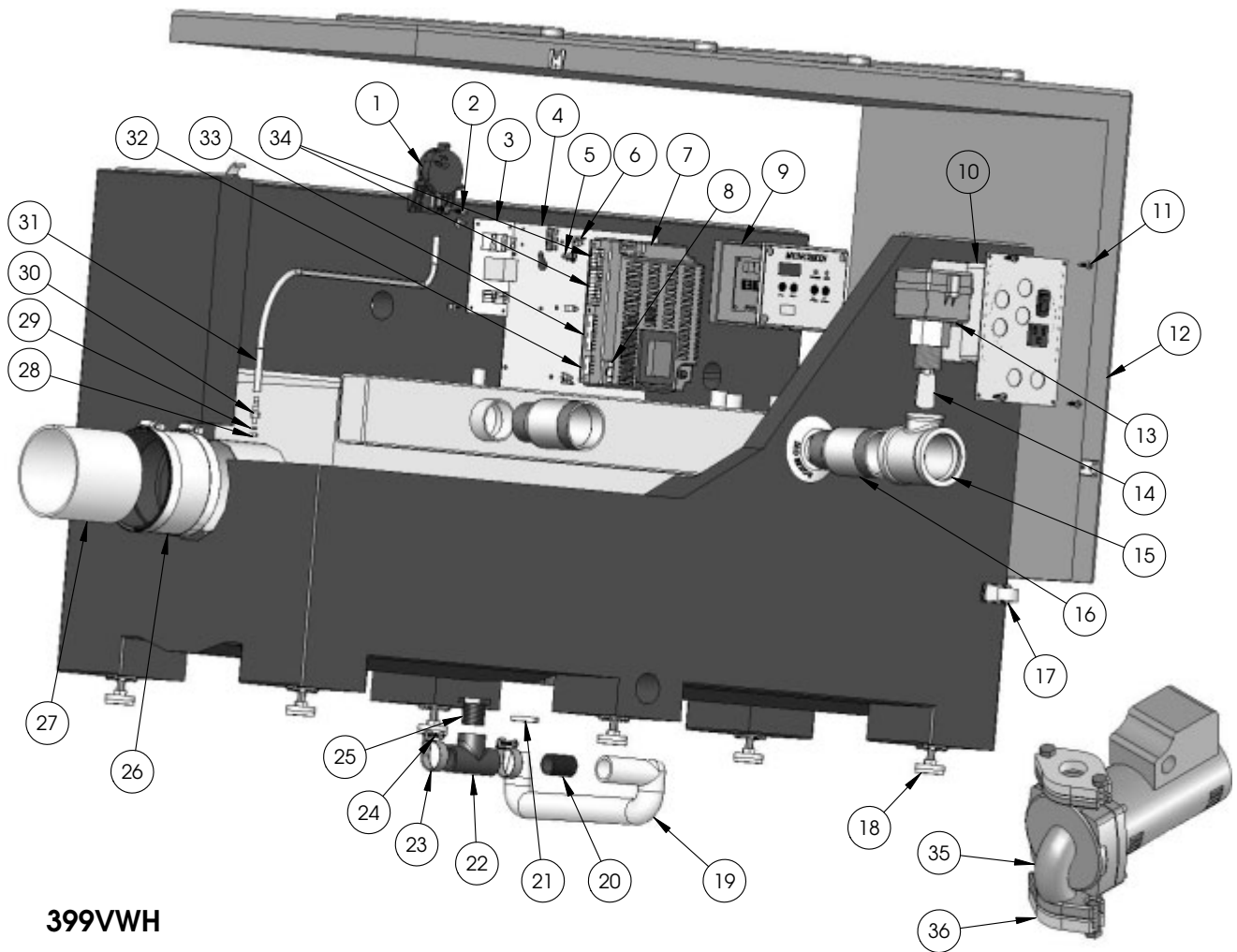


Fig. 8-1



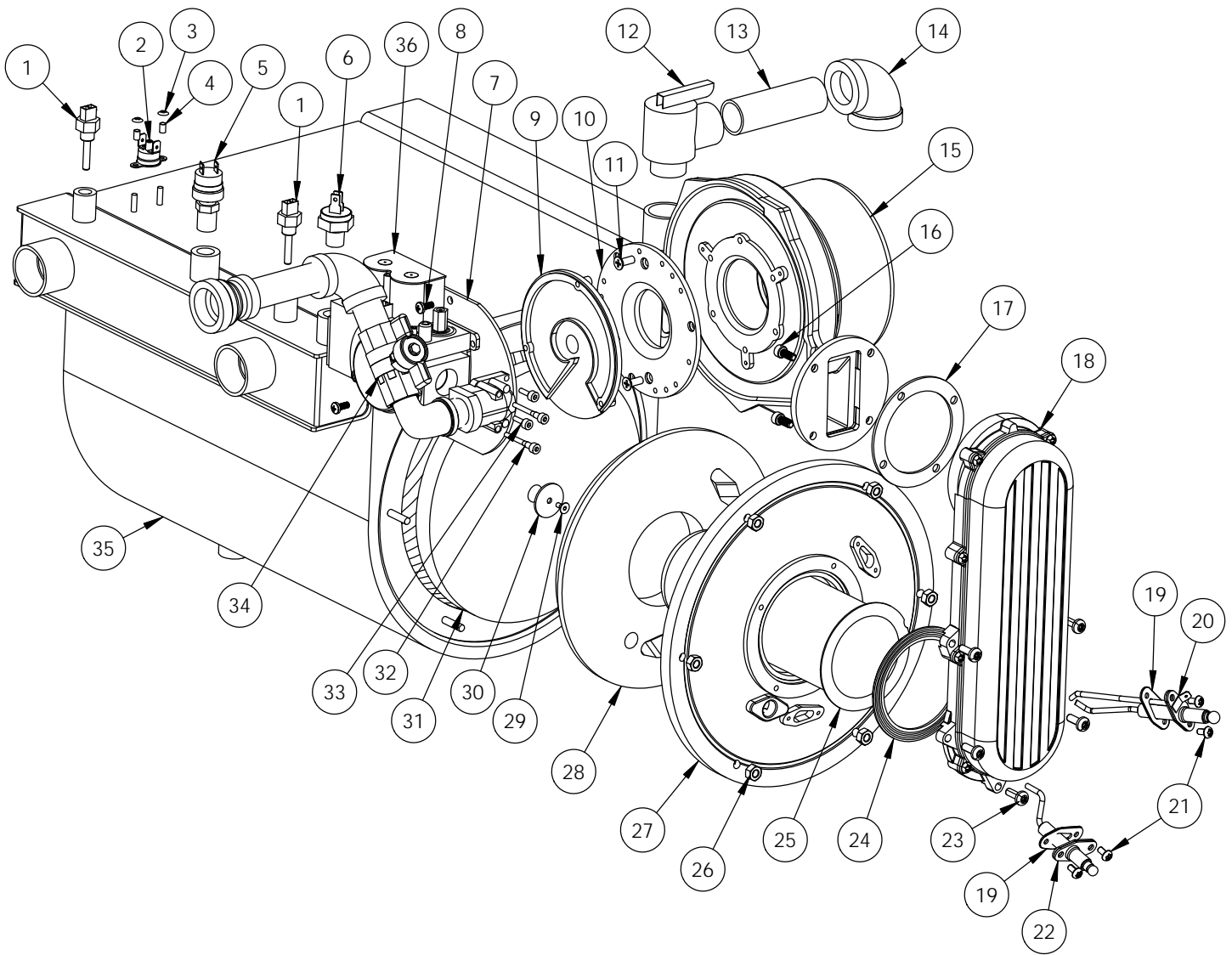
399 VWH

REPLACEMENT PARTS					
Item #	Description	Part #	Item #	Description	Part #
1	Thermodisc Flue ECO 210°F	7250P-089	18	Brass 90° Elbow - 3/4" NPT	7250P-313
2	Steel Push Retainer (Thermodisc Flue ECO)	7250P-151	19	Combustion Blower (w/Gasket)	7250P-518
3	PVC Black Tubing 1/8 ID (Thermodisc Flue ECO)	7250P-311	20	Screws M5 x 12MM (Combustion Blower)	7250P-478
4	Thermistor	7250P-667	21	Gasket (Air/Gas Channel to Combustion Blower)	7500P-075
5	Welded Module	7250P-623	22	Air/Gas Channel	7250P-687
6	Gas Valve Piping Assembly	7250P-706	23	Gasket (Flame Rec./Spark Electrode)	7250P-005
7	Eco/High Limit Sensor	7250P-019	24	Spark Electrode (w/Gasket)	7350P-020
8	Screws M4 x 30MM Allen Head	N/A	25	Screws M4 x 8MM (Probe/Electrode)	7250P-069
9	Right Angle Connector	7250P-723	26	Flame Rectification Probe (w/Gasket)	7250P-049
10	Screws M4 x 12MM Allen Head	N/A	27	Screws Torx M5 x 22MM (Air/Gas Channel to Burner Door)	7250P-206
11	Dungs Gas Valve Assembly	7250P-710	28	Gasket (Air/Gas Channel to Burner)	7500P-074
12	Screws M4 x 30MM Round Head (Gas Valve)	7250P-670	29	NIT Burner	7250P-703
13	Swirl Plate - Blk	7250P-712	30	Nuts M6 (Burner Door)	7500P-067
14	Screws M5 x 12MM Flat Head (Adapter Plate)	7500P-105	31	Burner Door	7250P-684
15	Gas Valve Adapter Plate	7250P-711	32	Burner Door Ceramic Refractory	7250P-702
16	Relief Valve	7250P-576	33	Screw M4 x 8MM (Ceramic Target Wall)	7250P-704
17	Brass Nipple - 3/4 NPT x 3"	SN1018	34	Washer M4 (Ceramic Target Wall)	7500P-109
			35	Ceramic Target Wall	7250P-160
			36	24VAC GAS VALVE COIL ONLY - GREY	7350P-623



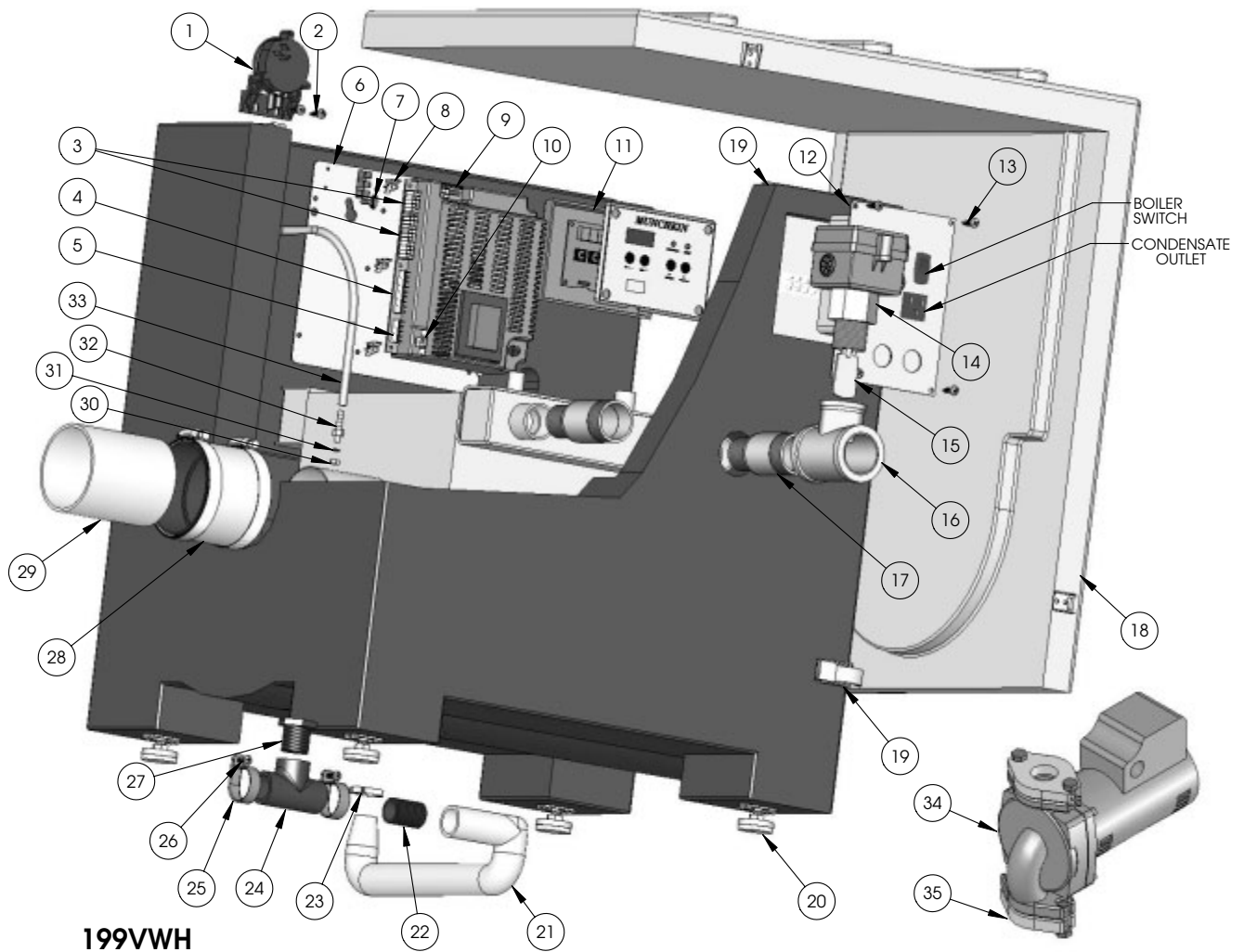
399VWH

REPLACEMENT PARTS					
Item #	Description	Part #	Item #	Description	Part #
1	Blocked Vent Pressure Switch	7250P-150	19	Condensate Hose Assy	7250P-724
2	Screws # 8 x 1/2" Self Tapping (Blocked Vent Pressure Switch)	7250P-133	20	PVC Nipple Sch. 80 3/4 NPT (Condensate Assembly)	7250P-648
3	Relay Board	7250P-580	21	Hose Clamp (Condensate Assembly)	7250P-210
4	Control Board Mounting Panel (w/Screws)	7250P-651	22	PVC Tee Sch. 30 3/4 NPT (Condensate Assembly)	7250P-646
5	Screw 1/4-20 x 1/2" (Control Board Mounting Panel)	7250P-184	23	Cable Clamp (Condensate Assembly)	7250P-649
6	Control Board Hold Down Clips	7250P-352	24	Screw # 8 x 1/2" Self Tapping (Condensate Assembly)	7250P-133
7	Control Board (w/Fuse)	7250P-317	25	Poly Plug 3/4 NPT (Condensate Assembly)	7250P-647
8	Fuse (Control Board)	7250P-378	26	Band Clamp (Exhaust Assembly)	7250P-549
9	Control Board Display (w/Ribbon Cable)	7250P-332	27	PVC Pipe Sch. 40 4" (Exhaust Assembly)	7250P-524
10	Electrical Box (w/Screws)	7250P-707	28	S.S. Hex Nut 10-32 (Blocked Vent Pressure Switch)	7250P-153
11	Screws # 8 x 1/2" Self Tapping (Electrical Box)	7250P-133	29	O-Ring 007 (Blocked Vent Pressure Switch)	7250P-152
12	Cabinet Cover	7250P-501	30	S.S. Hose Barb 1/4 x 10-32 (Blocked Vent Pressure Switch)	7250P-154
13	Flow Switch (w/Paddle)	7250P-612	31	Plastic Tubing 3/16" ID (Blocked Vent Pressure Switch)	7000P-805
14	Flow Switch Paddle	7250P-613	32	5 Pin Wiring Harness (location)	7250P-721
15	Brass Tee 2" x 2" x 1" (Flow Switch)	7250P-588	33	9 Pin Wiring Harness (location)	7250P-602
16	Brass Nipple 1-1/2 x 2 x 3-3/4"	7250P-514	34	Low Voltage Wiring Harness (location)	7250P-720
17	Cabinet Latch and Gasket Kit (w/Screws)	7250P-671	35	Circulator Pump - 1-1/2"	7250P-592
18	Leveling Foot	7250P-673	36	Mounting Flanges - 1-1/2"	7250P-595



199VWH

REPLACEMENT PARTS					
Item #	Description	Part #	Item #	Description	Part #
1	Thermistor	7250P-667	18	Air/Gas Channel	7250P-687
2	Thermodisc Flue ECO 210 °F	7250P-089	19	Gasket (Flame Rec./Spark Electrode)	7250P-005
3	Steel Push Retainer (Thermistor)	7250P-151	20	Spark Electrode (w/Gasket)	7350P-020
4	PVC Black Tubing 1/8 ID (Thermistor)	7250P-311	21	Screws M4 x 8MM (Probe/Electrode)	7250P-069
5	Water Pressure Switch	7250P-096	22	Flame Rectification Probe (w/Gasket)	7500P-039
6	Eco/High Limit Sensor	7250P-019	23	Screws Torx M5 x 22M (Air/Gas Channel to Burner Door)	7250P-206
7	Gas Valve	7250P-452	24	Gasket (Air/Gas Channel to Burner)	7500P-074
8	Screws M4 x 25MM (Gas Valve)	7250P-718	25	NIT Burner	7250P-117
9	Swirl Plate	7500P-093	26	Nut M6 (Burner Door)	7500P-067
10	Gas Valve Adapter Plate (w/Screws)	7250P-644	27	Burner Door	7250P-684
11	Screws M5 x 12MM (Gas Valve Adapter Plate)	7250P-484	28	Burner Door Ceramic Refractory	7250P-702
12	Relief Valve	7250P-219	29	Screw M4 x 8MM (Ceramic Target Wall)	7250P-704
13	Brass Nipple 3/4 NPT x 3"	SN1018	30	Washer M4 (Ceramic Target Wall)	7500P-109
14	Brass 90° Elbow - 3/4 NPT	7250P-313	31	Ceramic Target Wall	7250P-160
15	Combustion Blower (w/Gasket)	7250P-087	32	Screws M4 x 30MM Allen Head (Gas Piping Assy)	N/A
16	Screws M5 x 14MM (Combustion Blower)	7250P-478	33	Screws M4 x 12MM Allen Head (Gas Piping Assy)	N/A
17	Gasket (Air/Gas Channel to Combustion Blower)	7500P-075	34	Gas Piping Assembly (w/Shut-off Valve, Screws)	7250P-705
			35	Welded Module	7250P-300
			36	24VAC Gas Valve Coil Only - Grey	7350P-624



199VWH

REPLACEMENT PARTS

Item #	Description	Part #	Item #	Description	Part #
1	Blocked Vent Pressure Switch	7250P-150	19	Cabinet Latch and Gasket Kit (w/Screws)	7250P-671
2	Screws # 8 x 1/2" (Blocked Vent Pressure Switch)	7250P-133	20	Leveling Foot	7250P-673
3	Low Voltage Wiring Harness (location)	7250P-720	21	Condensate Hose Assy	7250P-724
4	9 Pin Wiring Harness (location)	7250P-602	22	PVC Nipple Sch. 80 3/4 NPT (Condensate Assy)	7250P-648
5	5 Pin Wiring Harness (location)	7250P-721	23	Hose Clamp (Condensate Assy)	7250P-210
6	Control Board Mounting Panel (w/Screws)	7250P-651	24	PVC Tee Sch. 40 3/4 NPT (Condensate Assy)	7250P-646
7	Screw 1/4-20 x 1/2" (Control Board Mounting Panel)	7250P-184	25	Cable Clamp (Condensate Assy)	7250P-649
8	Control Board Hold Down Clips	7250P-352	26	Screw # 8 x 1/2 Self Tapping (Condensate Assy)	7250P-133
9	Control Board (w/Fuse)	7250P-317	27	Poly Plug 3/4 NPT (Condensate Assy)	7250P-647
10	Fuse (Control Board)	7250P-378	28	Band Clamp (Exhaust Assy)	CA2000
11	Control Board Display (w/Ribbon Cable)	7250P-332	29	PVC Pipe Sch. 40 3" (Exhaust Assy)	7250P-242
12	Electrical Box (w/Screws)	7250P-707	30	S.S. Hex Nut 10-32 (Blocked Vent Pressure Switch)	7250P-153
13	Screws # 8 x 1/2" Self Tapping (Electrical Box)	7250P-133	31	O-Ring 007 (Blocked Vent Pressure Switch)	7250P-152
14	Flow Switch (w/Paddle)	7250P-612	32	Hose Barb 1/4 x 10-32 (Blocked Vent Pressure Switch)	7250P-154
15	Flow Switch Paddle	7250P-593	33	Plastic Tubing 3/16" ID (Blocked Vent Pressure Switch)	7000P-805
16	Brass Tee 1-1/4" x 1-1/4" x 1" (Flow Switch)	7250P-589	34	Circulator Pump - 1-1-4"	7250P-591
17	Brass Nipple 1 x 1-1/4 x 3-3/4"	7250P-221	35	Mounting Flanges - 1-1/4" (set of 2)	7250P-594
18	Cabinet Cover	7250P-231			

ADDITIONAL INSTALLATION REQUIREMENTS FOR THE COMMONWEALTH OF MASSACHUSETTS

In the Commonwealth of Massachusetts, the installer or service agent shall be a plumber or gas fitter licensed by the Commonwealth.

When installed in the Commonwealth of Massachusetts or where applicable state codes may apply; the unit shall be installed with a CO detector per the requirements listed below.

5.08: Modifications to NFPA-54, Chapter 10

(1) Revise NFPA-54 section 10.5.4.2 by adding a second exception as follows:

Existing chimneys shall be permitted to have their use continued when a gas conversion burner is installed, and shall be equipped with a manually reset device that will automatically shut off the gas to the burner in the event of a sustained back-draft.

(2) Revise 10.8.3 by adding the following additional requirements:

(a) For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. **INSTALLATION OF CARBON MONOXIDE DETECTORS.** At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the service of qualified licensed professionals for the installation of hard wired carbon monoxide detectors

a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.

b. In the event that the requirements of this subdivision cannot be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

2. **APPROVED CARBON MONOXIDE DETECTORS.** Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3. SIGNAGE. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "GAS VENT DIRECTLY BELOW, KEEP CLEAR OF ALL OBSTRUCTIONS".

4. INSPECTION. The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08 (2)(a) 1 through 4.

(b) EXEMPTIONS: the following equipment is exempt from 248 CMR 5.08 (2)(a) 1 through 4:

1. The equipment listed in Chapter 10 entitled "Equipment Not Required to be Vented" in the most current edition of NFPA 54 as adopted by the Board; and
2. Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

(c) MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM PROVIDED. When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

1. Detailed instructions for the installation of the venting system design or the venting system components; and
2. A complete parts list for the venting system design or venting system.

(d) MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED. When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies "special venting systems", the following requirements shall be satisfied by the manufacturer:

1. The referenced "special venting system" instructions shall be included with the appliance or equipment installation instructions; and
2. The "special venting systems" shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

(e) A copy of all installation instructions for all Product Approval side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

