

BioMax

NextGen

Wood Gasification Boilers

Owner's Manual



Model 60



Model 40

Manufactured by:

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General Information

Problems associated with excessive wood smoke, high wood usage and frequent tending and maintenance are all addressed and solved with the BioMax gasification boiler line. Wood gasification is the proven clean, efficient and environmentally responsible way to burn wood in the 21st Century.

The purpose of this manual is to explain how the BioMax NextGen gasification boiler operates and how it works within the hydronic central heating system. **We highly recommend that every new owner read this manual completely before operating the boiler.** Failure to install or operate the boiler as described in this manual will void the warranty. BioMax boilers should be installed by a certified plumber or plumbing and heating contractor or technician. New Horizon Inc. does not take any responsibility for incorrect installation or improper boiler usage.

BioMax boilers are generally used to heat houses, garages and other buildings. The water temperature inside the boiler must never exceed 200 °F. The display on the boiler's controller will show the current operating temperature in Celsius. It is a good idea to either memorize or keep a conversion table handy when working with both Fahrenheit and Celsius measurements.

NOTE:

The BioMax boiler was designed to operate in both closed and open hydronic heating systems.

Please refer to the table below to determine the suitable BioMax boiler model for the space you are trying to heat.

BioMax Boiler Model	Btu Output (per hour)	Heated Area (square feet)
40	137 K Btu	3700 square feet
60	205 K Btu	5100 square feet

1. Fuel sources

The recommended source of fuel for the BioMax boiler is cut and split firewood that has a moisture content between 20% and 35%. Log size should be around 6 inches in diameter and about 20 inches in length for the BioMax 40 and up to 30 inches in length for the Model 60. Smaller size wood can be used as well, including briquettes, artificial logs, wood pellets and corn cobs with kernels. Additional fuel sources like dry wood chips can be added along with dry logs.

2. Boiler construction and design

The BioMax boiler's WATER JACKET is made out of ¼" boiler plate steel. The HEAT EXCHANGER is made out of multiple 3-inch diameter tubes (0.150 inch in thickness). Exhaust gases are released into a 6-inch diameter chimney outlet. Special construction of the BioMax boiler allows for a very efficient heat exchange from the boiler into the heating system. The OUTER INSULATION JACKET (made out of mineral wool) minimizes heat loss from the boiler, allowing for the maximum amount of heat transfer from the boiler into the heating system.

3. How the boiler works

During the gasification process, wood Inside the loading/burning chamber is dried and gasified. The gas (smoke) produced is drawn down through the ceramic nozzle into the ceramic-lined gasification chamber with a blower, and burned at very high temperatures. The hot, burned gas travels up through the heat exchanger tubes, out the exhaust opening and into the chimney. The heat of gasification (around 2000 °F) completely burns off virtually all smoke and particles. Gasses released from the chimney are practically invisible and do not contain unburned particles.

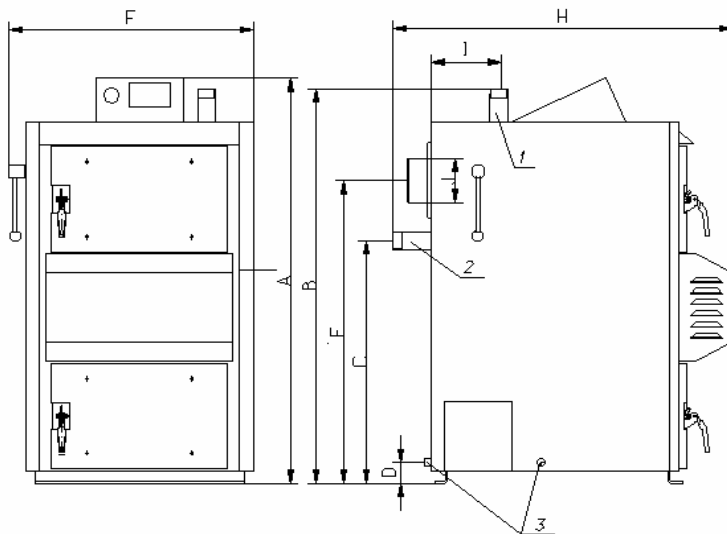
For ease of operation, the BioMax is equipped with an RK2001U regulator which is located on the top of the boiler and clearly visible and accessible from the front of the boiler. Features of the RK2001U are detailed on the next page.

- Direct connection with a heat thermostat in the building;
- Direct connection with a circulating pump;
- Direct connection to the draft blower;
- Constant temperature regulation and modulated blower speed (i.e., the blower slows down as the boiler heats up).

In case of excess water temperature (over 185°F), overheating is prevented by a safety thermostat, which cuts off electricity to the blower. This safety precaution limits the air intake and in turn slows down the burning process which lowers the water temperature and prevents overheating.

BioMax Boiler Dimensions

See page 6 for details.



1. Hot water supply
2. Cool water return
3. Drain valves

Technical Info		Models	
BioMax		40	60
Rated Power Output	BTU	140	205
European Standard EN 303-5			
Fuel Moisture Level		Cord of Wood – with a maximum of 35% moisture	
Power Range	BTU	50K – 145K BTU	60K – 215K BTU
Efficiency	%	91	91
Possible Fuels	Seasoned Wood, Corn Cobs with Kernels, 50% of Coal, Saw Dust, Wood Chips (50%), any kind of pellets		
Temperature Adjustment Range	°F	130-195	130-195
Total Weight	Lb	1212	1455
Height with Controller Housing	A in	54	54
Height of Hot Water Outlet	B in	53	53
Height of Return Water Pipe	C in	32.4	32.4
Height of Water Drain Valve	D in	2.7	2.7
Height of Flue Pipe	E in	40.5	40.5
Width with Clean-up Lever	F in	33.2	33.2
Depth	H in	38.7	54
Distance of Hot Water Outlet	I in	9.2	9.2
Flue Pipe Size	J in	6"	6"
Hot Water Outlet Pipe Size	G in	2"	2"
Water Return Pipe Size	G in	2"	2"
Drain Pipe Size	G	3/4"	3/4"

Boiler Water Capacity	gal	40	45
Flue Temperature			
-Max power output	°F	340	340
-Min power output	°F	310	310
Size of Loading Chamber			
-depth	in	20.5	30.3
-height	in	24.8	24.8
-width	in	24.8	24.8
Volume of Loading Chamber	gal	40	60
Noise Level	dB	48,7	48,7
Power Consumption	W	80	140
Voltage/Frequency	V/Hz	120ACV/60	120ACV/60

RK2001U controller operation

Before connecting the RK2001U regulator to an electrical circuit, always follow these safety precautions:

- Make sure that all the safety covers are in their appropriate place;
- Make sure that the electrical wires do not come in contact with any hot part of the boiler and the length of the wires used is sufficient;
- Confirm that the electrical outlet and the controller have the same voltage (110 V).

When these precautions have been taken, plug the regulator into the electrical outlet (110V) and then turn on the power switch. The regulator will automatically reset itself and display the current boiler temperature. The regulator should not be exposed to extreme sunlight or heat. If dust or dirt should accumulate on top of the regulator cover, the regulator can be cleaned gently with a soft cloth.

4. Boiler operation

Before firing the boiler up for the first time:

- Please read the entire owner's manual;
- Confirm that your entire hydronic heating system has enough water;
- Confirm that the boiler is connected to the correct power source;
- Confirm that the water pump is primed, fully operational and connected to the regulator;
- Confirm that the removable fireproof bricks in the bottom chamber are properly positioned underneath the nozzle and in front of the bottom door.

5. Starting the fire

When starting the fire:

- Open the bottom door slightly;
- Open the top (loading) door and fill the bottom layer of the loading chamber with easily flammable material like paper and kindling;
- Add some dry firewood;
- Keep the chimney flap open;
- Set fire to the paper and close the upper door;
- **DO NOT LEAVE THE BOILER UNATTENDED DURING THIS STAGE!!!**
- After about 15 to 20 minutes, the firewood should be burning;
- Carefully open the upper door and fill the entire loading chamber with fuel, but be careful not to jam the chimney flap, which opens into the burning chamber and must be able to close completely for gasification to begin.
- Close the upper door tightly (this will also close the chimney flap and turn on the blower)
- Close the bottom door tightly
- Set the desired water temperature on the regulator

6. Loading fuel

When loading fuel:

- Open the upper door (the blower will shut off and the chimney flap will open automatically);
- Fill up the upper/loading chamber with dry firewood;
- Close the upper door tightly (the blower will turn on and the chimney flap will open automatically).

WARNING!

When filling up the loading chamber with fuel, make sure that no fuel is obstructing the chimney flap or the door. If either one fails to close properly, the boiler can overheat and be damaged.

7. Maintaining and cleaning the boiler

For the boiler to operate most efficiently, it is vital that it be cleaned frequently. This includes removing ash as needed, as well as cleaning the heat exchanger tubes every two weeks. When using fuel with higher moisture content, excessive creosote can build up in the burning chamber. Over time, this can cause corrosion in the firebox and potential leakage.

It is therefore vital to remove the excess creosote from the walls of the burning chamber at least once a month, and keep creosote formation to a minimum by burning dry wood. When the heat exchanger tubes are cleaned by moving the lever (19), some fly ash will deposit at the bottom of the heat exchanger tubes. To remove the ash from the bottom section of the heat exchanger unscrew the access side panel (23) on the side of the boiler, and access panel (22); remove the ash by sweeping it away and close up the panels.

Removing ash from the gasification (bottom) chamber normally should be done once every 5 days, depending on the moisture content of the wood and amount of wood

burned. Wetter wood will cause more ash and creosote will accumulate, which over time will shorten the life of the boiler.

WARNING!

When cleaning out the ash from the bottom chamber, wear heat resistant gloves when removing the ceramic bricks. Ceramic pieces are HOT and should never be touched directly when the boiler has recently been used.

When using small biomass fuel like wood chips or pellets, it is very important to clean the air access vent and blower at least once a year. To clean the air vents, remove the blower cover (7) and air access covers, which will make the air intake tubes accessible. Using a shop vac, suck out the deposited chips and clear the air passage.

WARNING!

When shutting down the boiler at the end of the heating season, thoroughly clean both chambers and the chimney flap, and lubricate the seals on all doors to prevent damage by humidity and condensation. Keep the doors open when not in use to avoid condensation in the firebox and gasification chamber.

8. Additional maintenance tips

During the heating season, regularly check:

- the water level in your heating system
- for any leaks in your heating system
- the chimney flap seal
- the heat exchanger seal
- the door seals

IMPORTANT!

To maintain door seals during the heating season, once a week smear graphite oil or motor oil on the rope seals to maintain their elasticity and sealing ability in order to prevent smoke and air leakage.

To maintain a good seal on the **chimney flap** (see diagram), unscrew covers 16 and 17 whenever cleaning the heat exchanger tubes and clean the flap by gently scraping off the accumulated creosote deposits.

9. Boiler assembly and installation

BioMax Boilers are delivered fully assembled. It is the purchaser's responsibility to check that the boiler was delivered undamaged and fully equipped. It is essential that the boiler be installed on a hard surface with enough room all around to allow for easy access, cleaning and maintenance.

To connect the boiler to the chimney, use a 6-inch diameter chimney pipe, 0.12 inches thick. The chimney pipe should be pitched slightly upwards and the connection with the boiler should be carefully insulated with refractory cement to prevent smoke leakage. The diameter of the chimney should not be smaller than 6 inches, and not lower than 12 feet in height from the base. Poor chimney draft can cause smoke to linger in the boiler, cutting its efficiency and creating creosote in the firebox. Excess draft, on the other hand, can cause excessive fuel consumption, and possibly cause the boiler to overheat.

BioMax boilers can be located in an outdoor building like a shed with a roof or a garage, or in a **well ventilated** basement with a constant air supply from the outdoors.

IMPORTANT!

The BioMax boiler should be installed by a licensed or certified heating professional. The BioMax boiler should have a backup power system to prevent overheating in the event of a power outage. The simplest arrangement consists of an inverter and a marine battery connected to the boiler controller.

A properly-installed heating system should include a 3-way mixing valve to prevent low water temperature on the return

to the boiler, which can cause thermal shock. Preventing thermal shock prolongs the lifespan of the boiler.

The water pump or circulator should be directly connected to the controller, which will facilitate smooth operation of the boiler and heating system.

10. Hot water storage tank

The use of a hot water storage tank with the BioMax boiler is highly recommended. Depending on the size of the space being heated, the storage tank should be between 500 and 1,000 gallons. Storage tanks:

- Decrease fuel consumption
- Increase the lifespan of the boiler and the chimney by reducing creosote and acids
- Make the entire heating system more efficient and easier to maintain and control
- Decrease pollution

WARNING!

Final installation should conform to all local codes and other regulations.

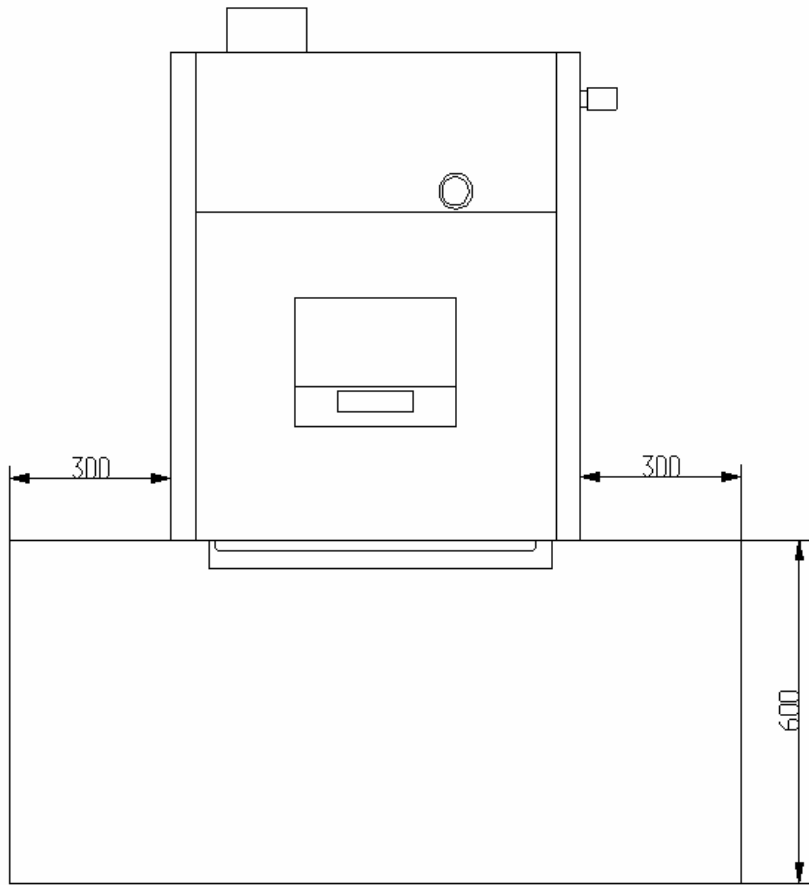
When using "PEX" (special plastic pipe) make sure it is adapted for pressurized, closed systems. It should contain an oxygen barrier.

Piping to and from the boiler should consist of at least one-inch diameter copper or PEX.

For **SAFETY** reasons, make sure that the heating system and the boiler have pressure relief valves and expansion tanks installed in the appropriate places. Check local codes.

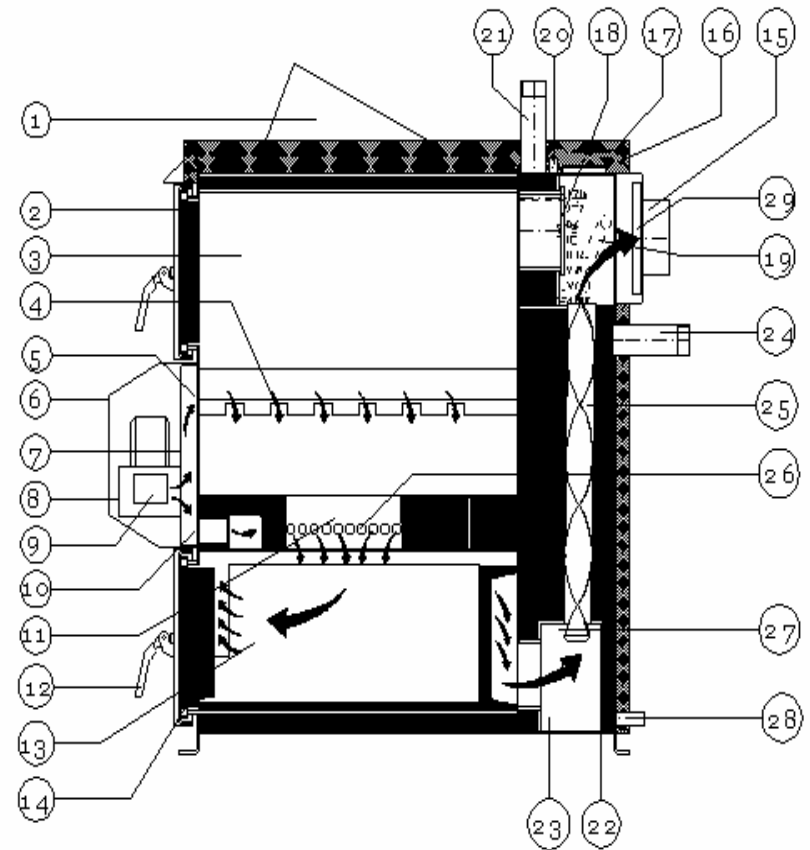
WARNING!

Always use SAFETY precautions when conducting any kind of maintenance or repair on the boiler. Repairs should be made by a licensed or certified plumbing and heating contractor or technician.



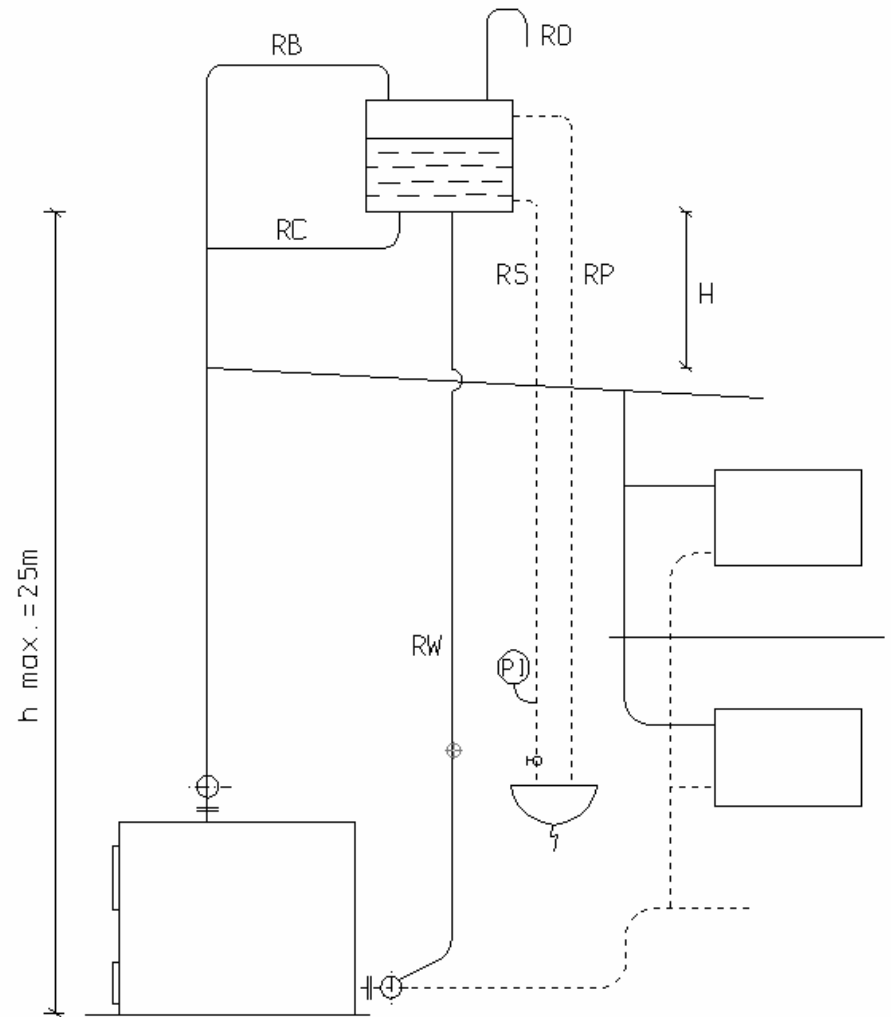
Recommended clearances

Note:
Neither New Horizon Corp. nor the manufacturer are responsible for inappropriate boiler installation or operation.



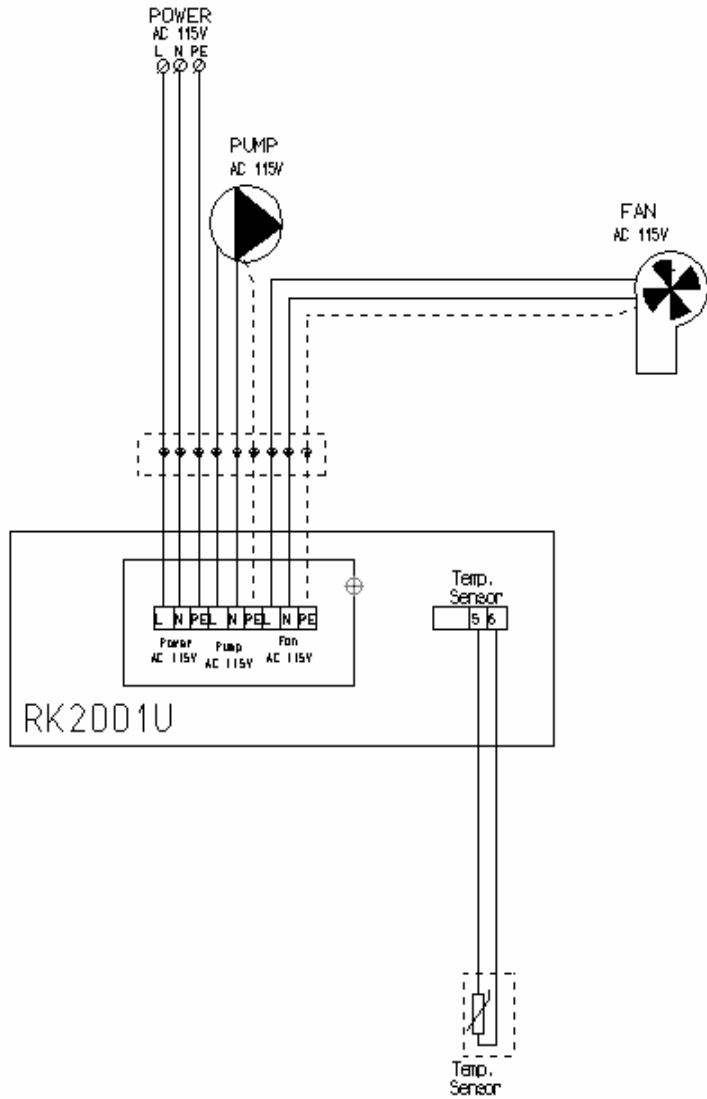
Boiler parts and features
(See page 16 for details)

- | | |
|---|-----------------------------------|
| 1. Controller RK 2001 U | 15. Flue Connection 6" |
| 2. Upper Door | 16. Clean-up Access Cover |
| 3. Loading Chamber (gassification) | 17. Clean-up Access |
| 4. Combustion Air Flow (primary) | 18. Chimney Bypass Flap |
| 5. Primary Air Adjustment | 19. Heat Exchanger Clean-up Lever |
| 6. Blower Housing | 20. Overheat Thermostat |
| 7. Air Mixing Box | 21. Hot Water Outlet |
| 8. Blower (for BioMax 60) | 22. Lower Clean-up Access Cover |
| 9. Blower Air Adjustment | 23. Lower Clean-up Access Cover |
| 10. Secondary Air Adjustment | 24. Boiler Water Return |
| 11. Refractory Nozzle | 25. Tubular Heat Exchanger |
| 12. Door Handle | 26. Secondary Air Injection |
| 13. Secondary Burning Chamber (ash pit) | 27. Flue Flow Direction |
| 14. Lower Door | 28. Drain Valve |
| | 29. Draft Blower |

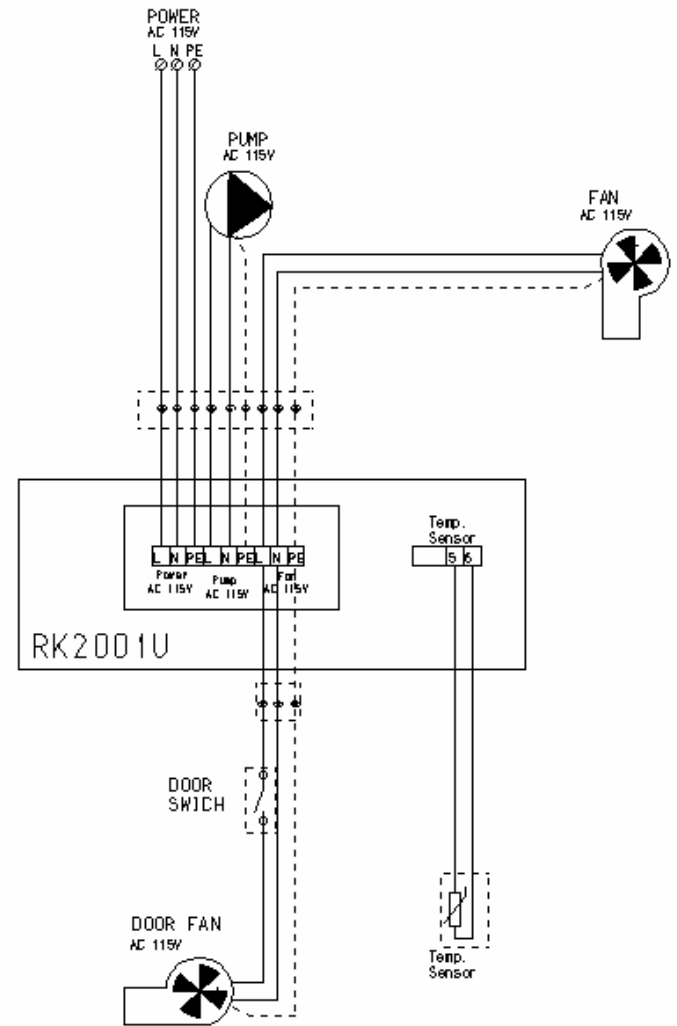


Open system setup

RB- xxxx Pipe RS-xxxx Pipe
 RW-xxxx Pipe RO-xxxx Pipe
 RP-xxxx Pipe RC-xxxx Pipe



Electrical setup for BioMax 40



Electrical setup for BioMax 60