Plumbing schematics for single and multiple Rinnai water heaters in use with domestic systems, recirculation, and storage tanks.
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**Condensing Water Heaters**

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<thead>
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<th>Description</th>
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<tr>
<td>CWH1</td>
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**Non-condensing Water Heaters**

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**Generic Units (Condensing/Non Condensing)**

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**Hybrid Units**

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**Maintenance Procedure**

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<td>WH1-F</td>
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**Legend**

| WH1      | 1   | Flush Procedure       |
| WH2      | 2   | Demand Circulation   |
| WH3      | 3   | Demand Circulation Return Line |
| WH4      | 4   | Circ Logic            |
| WH5      | 5   | Generic Air Handler   |
| WH6      | 6   | Combination System    |
| WH7      | 7   | Combination System with HX |
| WH8      | 8   | Solar Backup Option 1 |
| WH9      | 9   | Solar Backup Option 2 |
### MSB Kits for Connecting Multiple Water Heaters

Each bank is controlled by an MSB-M control board. These boards are connected to each other with MSB-C2 cables. One MSB-M is the controlling or master MSB-M for the entire system.

- **M** MSB-M control board
- **A** Connector cable A (part of MSB-M kit; replace with MSB-C3 cables for V Series)
- **C1** MSB-C1 cable for connecting water heaters within a banked system (up to 5), (use MSB-C3 cables for V Series)
- **C2** MSB-C2 cable for connecting MSB-M control boards (up to 5)

#### Number of Kits Required

<table>
<thead>
<tr>
<th>No. of water heaters</th>
<th>No. of water heaters for each bank</th>
<th>MSB-M</th>
<th>MSB-C1</th>
<th>MSB-C2</th>
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<td>19</td>
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<td>5</td>
<td>15</td>
<td>4</td>
<td>20</td>
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</table>

#### MSB Kits - Parts Needed

Use the table to determine the type and number of kits necessary for your system.

Up to 5 water heaters can be connected together using the MSB-M and MSB-C1 kits. When over 5 water heaters are connected together, MSB-M control boards are connected using MSB-C2 kits.

If multiple MSB-M control boards are used, then at least three water heaters should be connected to each MSB-M. Example: With 7 water heaters, one MSB-M should control 4 water heaters and the other MSB-M should control 3 water heaters.

Detailed installation instructions are provided with each of the kits.

* V Series models use the MSB-M, MSB-C2, and MSB-C3 cables. V Series models must use the MSB-C3 cables instead of the MSB-C1 cables and the Cable A in the MSB-M.
A complete water analysis and an understanding of system requirements are needed to protect the Rinnai tankless water heaters and water heating systems from scale. Water analysis shows whether water is hard or soft. Hard water, unless treated, will cause scaling or liming of the Rinnai heat exchanger.

The rate of scaling increases with temperature and usage because calcium carbonate and other scaling compounds lose solubility (fall out of solution) at higher temperatures. For example, for every 20°F over 140°F, the rate of scale increases by a factor of 2 (See figure below). Reference target water quality levels below and treat the water if these levels are exceeded.

Consideration of care for your water heater should include evaluation of water quality. The water must be potable, free of corrosive chemicals, sand, dirt, or other contaminates. It is up to the installer to ensure the water does not contain corrosive chemicals, or elements that can affect or damage the heat exchanger. Water that contains chemicals exceeding the levels below affect and damage the heat exchanger. Replacement of the heat exchanger due to water quality damage is not covered by the warranty. If you install this water heater in an area that is known to have hard water or that causes scale build-up the water must be treated and may require more frequent heat exchanger flushing schedule.

When scale build-up in the heat exchanger begins to affect the performance of the water heater, a diagnostic code “LC#” will display. Flush the heat exchanger to prevent damage to it. Scale build up is caused by hard water and can be accelerated if the unit is set at a high temperature.

<table>
<thead>
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<th>Maximum Level</th>
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<tr>
<td><strong>Total Hardness</strong></td>
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<tr>
<td><strong>Aluminum</strong> *</td>
</tr>
<tr>
<td><strong>Chlorides</strong> *</td>
</tr>
<tr>
<td><strong>Copper</strong> *</td>
</tr>
<tr>
<td><strong>Dissolved Carbon Dioxide (CO2)</strong></td>
</tr>
<tr>
<td><strong>Iron</strong> *</td>
</tr>
<tr>
<td><strong>Manganese</strong> *</td>
</tr>
<tr>
<td><strong>pH</strong> *</td>
</tr>
<tr>
<td><strong>TDS (Total Dissolved Solids)</strong> *</td>
</tr>
<tr>
<td><strong>Zinc</strong> *</td>
</tr>
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* Source: Part 143 National Secondary Drinking Water Regulations
1. Use the chart below or one appropriate for your conditions to determine the heat loss in the length of the hot water supply and return piping. For example, 100 ft of 1-1/2 in bare copper tubing results in a heat loss of 5300 Btu/h.

### Approximate Heat Loss from Piping at 140 ºF Inlet, 70 ºF Ambient *

<table>
<thead>
<tr>
<th>Nominal Size, in.</th>
<th>Bare Copper Tubing, Btu/h-ft</th>
<th>1/2 in. Glass Fiber Insulated Copper Tubing, Btu/h-ft</th>
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<td>3/4</td>
<td>30</td>
<td>17.7</td>
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<tr>
<td>1</td>
<td>38</td>
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<td>1-1/4</td>
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<tr>
<td>1-1/2</td>
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<td>25.4</td>
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<td>66</td>
<td>29.6</td>
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<tr>
<td>4</td>
<td>120</td>
<td>48.4</td>
</tr>
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</table>

* Source: 2015 ASHRAE Handbook HVAC Applications

2. Determine the acceptable temperature drop at the last fixture in the loop. For example, if the supply temperature from the water heater is 120 ºF (49 ºC) and an acceptable temperature at the last fixture is 100 ºF (38 ºC) then the acceptable temperature drop is 20 ºF (7 ºC).

3. Calculate the required pump flow rate using the following formula:

\[
\text{FLOW RATE (gpm)} = \frac{\text{HEAT LOSS (BTU / h)}}{500 \times \text{ACCEPTABLE TEMPERATURE DROP (ºF )}}
\]

4. Based on the above calculations select a pump for the type of circulation system you will be utilizing:

   **B). Circulation system** - Reference pump manufacturers flow vs. pressure specifications to select a pump that can provide 3 gpm of flow or the flow rate calculated above, whichever is greater, while overcoming the pressure loss through:
   - Rinnai tankless water heater (reference flow vs. pressure curve of the Rinnai model being used)
   - All building supply and return plumbing in the circulation loop (reference local plumbing codes, standards, or practices)

**NOTE:** Only use pumps of brass, bronze, or stainless steel construction. Do not use pumps of iron construction as they will oxidize and clog the inlet filter on the appliance. The pump should be controlled by an aquastat, timer, or combination of the two. A demand control (motion sensor, push button, or door contact) may also be used.
**Additional Guidelines**

**Rinnai water heaters not recovering a storage tank:** In applications involving a commercial dishwasher, a hot water circulation loop feeding the dishwasher is required.

**Rinnai water heater recovering a storage tank:** In applications involving a commercial dishwasher, a hot water circulation loop feeding the dishwasher may be required depending on the distance between the dishwasher and the storage tank. Refer to local codes when determining the need for circulation loops to dishwashers.

When using a Rinnai product as the heat source for a circulation loop, the piping systems should be designed with a hot water circulation loop having a minimum circulating flow rate of 3 gpm. You must also review pressure drop curves for the Rinnai when sizing circulators.

Rinnai water heaters cannot be used in applications requiring 180°-195° F water at a DISHWASHER, unless a booster heater capable of producing 180°-195° F water is provided at the dishwasher. The Rinnai water heater is not to be used as a booster water heater in these applications.

For beauty salon applications, a hot water circulation loop feeding the head wash stations is highly recommended. This provides instant hot water to the head wash stations and reduces the possibility of cold bursts at the stations. (Refer to the piping schematics in this manual.) Insulation of circulation piping is also recommended for heat retention.

Exhaust gases from beauty salon applications and fume hoods of commercial dish washers with chemical sanitizers can be highly corrosive and may cause premature failure of water heater components. Care must be taken to ensure that the water heater and vent termination are installed away from that area. An uncontaminated supply of combustible air must be maintained for optimum performance of the water heater.

If the intended installation is located in hard water area, a softener or similar water treatment system must be used. Always remember to perform routine maintenance.

Some models may require the use of the MCC-91-2 temperature controller (purchased separately) for applications requiring temperatures above 140° F. For further information refer to the tankless water heater installation and operation manual.

All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances. Condensate must be disposed of according to local codes.
The following applies when using Rinnai tankless water heaters to recover a storage tank. Drawing WH1-BC is an example.

Rinnai Tankless water heaters have a pressure loss which must be considered in the system design. Reference the pressure loss curve for the Rinnai model being used to determine the pump size for the desired recovery rate.

For recommended pump sizes use the table below. Additional pressure losses in plumbing between the Rinnai(s) and the storage tank must also be taken into consideration.

The specified pump size is to provide maximum recovery of the storage tank. A smaller pump size may be used, but could result in longer recovery time of the tank. Please contact the engineering department with any questions on pump sizing.

NOTE: Only use pumps of brass, bronze, or stainless steel construction. Do not use pumps of iron construction as they will oxidize and clog the inlet filter on the appliance. RUR series units are not to be used when recovering storage.

### Pump Flow Requirements

<table>
<thead>
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<th>Number of Rinnai Water Heaters</th>
<th>RL94i/e, RLX94i, RUC98i, RUC90i, RU90e, RU98e, RUC80i, RU80e, C199i/e</th>
<th>RL754i/e, V755i/e, V53e, V65i/e</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>5 gpm @ 30' head</td>
<td>5 gpm @ 25' head</td>
</tr>
<tr>
<td>2</td>
<td>10 gpm @ 30' head</td>
<td>10 gpm @ 25' head</td>
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<tr>
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<td>15 gpm @ 30' head</td>
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</tr>
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<tr>
<td>15</td>
<td>75 gpm @ 30' head</td>
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Pressure Loss (psi) vs Water Flow (gpm)

- V65i/e, V75i/e, RL75i/e, V94i/e, V94Xi, RL94i/e, RLX94i

Pressure Drop Curves - Non Condensing Models
Pressure Drop Curves-Condensing Models

Pressure Loss (ft head)

Pressure Loss (psi)

RUC80i, RUC90i, RUC98i, RU80e, RU90e, RU98e, C199i/e

R-TRWH-E-02 Rev E
Condensing Tankless
Single Unit

Note:

All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances. Condensate must be disposed of according to local codes.
Condensing Tankless
Two Units

Note:

All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances. Condensate must be disposed of according to local codes.
Condensing Tankless
Three Units

Note:
All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances. Condensate must be disposed of according to local codes.
Condensing Tankless
Single Unit Circulation

Note:

All condensate must drain and be disposed of according to local codes.
Use only corrosion resistant materials for the condensate drain lines
such as PVC pipe or plastic hose. The condensate drain pipe (along its
entire length) must be at least the same diameter as the drain line, (1/2
inch NPT).

Where the drain pipes from more than one unit are manifolded together
for condensate drainage, the pipe or tubing shall be sized in accordance
with an approved method as dictated by local codes. The end of the
condensate drain pipe should be open to the atmosphere. The end
should not be under water or other substances. Condensate must be
disposed of according to local codes.

Pump should be controlled by an Aquastat, Timer or Combination
Aquastat and Timer.

Pump should be sized to maintain circulation loop temperature.

The pump should be sized to overcome the pressure loss through the
tankless water heater, supply, and return plumbing. Reference the

Pump should be of bronze or stainless construction.
Condensing Tankless Two Unit Circulation

Note:

All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances. Condensate must be disposed of according to local codes.

Pump should be controlled by an Aquastat, Timer or Combination Aquastat and Timer.

Pump should be sized to maintain circulation loop temperature.

The pump should be sized to overcome the pressure loss through the tankless water heater, supply, and return plumbing. Reference the Rinnai Hot Water System Design Manual, Pump Sizing for Circulation.

Pump should be of bronze or stainless construction.
Condensing Tankless
Three Unit Circulation

Note:

All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain line such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

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Pump should be controlled by an Aquastat, Timer or Combination Aquastat and Timer.

Pump should be sized to maintain circulation loop temperature.

The pump should be sized to overcome the pressure loss through the tankless water heater, supply, and return plumbing. Reference the Rinnai Hot Water System Design Manual, Pump Sizing for Circulation.

Pump should be of bronze or stainless construction.
Condensing Tankless
Six Unit Circulation

Note:
All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should open to the atmosphere. The end should not be under water or other substances. Condensate must be disposed of according to local codes.

Pump should be controlled by an Aquastat, Timer or Combination Aquastat and Timer.

Pump should be sized to maintain circulation loop temperature.

The pump should be sized to overcome the pressure loss through the tankless water heater, supply, and return plumbing. Reference the Rinnai Hot Water System Design Manual, Pump Sizing for Circulation.

Pump should be of bronze or stainless construction.
Condensing Tankless
Single Unit with Backup Storage

Note:
All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances. Condensate must be disposed of according to local codes.

Do not use manifold electronic controls with storage tank applications.
Condensing Tankless
Two Units with Backup Storage

Note:
All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, 1/2 inch NPT.

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances. Condensate must be disposed of according to local codes.

Do not use manifold electronic controls with storage tank applications.

Set water heaters @ 20F above storage tank Aquastat

Reference the section on Pump Sizing for Storage Tank Application.

Building Hot Water Supply Line

Storage Tank
(No Burner or Heating Element)

Submersible
Aquastat
(set @ 20F below Rinnai Temperature Setting)

Normally Closed Ball Valve

Condensate Drain Line

Hot Water Supply Line

Pump / Aquastat Control Wire

Building Circulation Pump

Pump / Aquastat Control Wire

(R-TRWH-E-02 Rev E)
Note:
All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances. Condensate must be disposed of according to local codes.

Do not use manifold electronic controls with storage tank applications.
Condensing Tankless
Six Units with Backup Storage

Note:
All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances. Condensate must be disposed of according to local codes.

Do not use electronic manifold controls with storage tank applications.

Building Hot Water Supply Line

Set water heaters @ 20°F above storage tank Aquastat

Storage Tank
(No Burner or Heating Element)

Submersible
Aquastat
(set @ 20°F below Rinnai Temperature Setting)

Hot Water Supply Line

Gas Supply

Optional Pump Bypass

Cold Water Supply Line

Reference the section on Pump Sizing for Storage Tank Applications.

Rinnai America Corporation
103 International Drive
Buford, GA, 30519
1-800-621-5419

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Note:

All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances. Condensate must be disposed of according to local codes.


Maximum Pipe Length (Hot and Cold Water Supply Lines)
3/4" - 400ft
1/2" - 100ft

Rinnai America Corporation
103 International Drive
Pickensville, Oh, CA 30216
1-800-621-6419
Condensing Tankless
RUR Crossover Circulation

Note:
All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances. Condensate must be disposed of according to local codes.


Maximum Pipe Length (Hot and Cold Water Supply Lines)
3/4" - 4000ft
1/2" - 100ft
Condensing Tankless
Two Units RUR Circulation

Note:
All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substance. Condensate must be disposed of according to local codes.


Maximum Pipe Length (Hot and Cold Water Supply Lines)
3/4" - 400ft
1/2" - 100ft

Rinnai Equipment List
Rinnai Condensing Water Heaters
Rinnai RUR Condensing Water Heater
PVA Valves
Condensing Tankless
Two Units RUR Circulation

Note:

All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances. Condensate must be disposed of according to local codes.


Maximum Pipe Length (Hot and Cold Water Supply Lines)
3/4" = 400ft
1/2" = 100ft
Condensing Tankless
Three Units RUR Circulation

Note:

All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances. Condensate must be disposed of according to local codes.


Maximum Pipe Length (Hot and Cold Water Supply Lines)
3/4" - 400ft
1/2" - 100ft
Condensing Tankless
Four Units RUR Circulation

Note:

All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances. Condensate must be disposed of according to local codes.


Maximum Pipe Length (Hot and Cold Water Supply Lines)
3/4" - 400ft
1/2" - 100ft

Gas Supply

Cold Water Supply Line

Hot Water Supply Line

Building Return Line

PVA

Condensate Drain Line
Condensing Tankless
Five Units RUR Circulation

**Note:**

All condensate must drain and be disposed of according to local codes. Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose. The condensate drain pipe (along its entire length) must be at least the same diameter as the drain line, (1/2 inch NPT).

Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method as dictated by local codes. The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances. Condensate must be disposed of according to local codes.


*Maximum Pipe Length (Hot and Cold Water Supply Lines)*

- 3/4" = 400ft
- 1/2" = 100ft

**Rinnai Equipment List**

- Rinnai Condensing Water Heaters: 4
- Rinnai RUR Condensing Water Heater: 1
- PVA Valves: 1

*Electronic Connection*

*Refer to Rinnai Accessories and Model Applicability for electronic connection details.*
Non-Condensing Tankless
Three Units

Rinnai Equipment List
QTY
Rinnai Non-Condensing Water Heaters 3

Electronic Connection*

*Refer to Rinnai Accessories and Model Applicability for electronic connection details

Hot Water Supply Line

Cold Water Supply Line

Gas Supply

Rinnai America Corporation
103 International Drive
Pittsburgh, OH, USA 43268
1-800-621-5419
Non-Condensing Tankless
Single Unit Circulation

Note:

The pump should be controlled by an Aquastat, Timer or Combination Aquastat and Timer. The pump should be sized to maintain circulation loop temperature. The pump should be sized to overcome the pressure loss through the tankless water heater and supply and return plumbing in the circulation loop. Reference the section Pump Sizing for Circulation. Pump should be of bronze or stainless construction. Reference warranty section of Installation Manual for this configuration.
Non-Condensing Tankless
Two Unit Circulation

Note:

Pump should be controlled by an Aquastat, Timer or Combination Aquastat and Timer. Pump should be sized to maintain circulation loop temperature. The pump should be sized to overcome the pressure loss through the tankless water heater and supply and return plumbing in the circulation loop. Reference the section Pump Sizing for Circulation. Pump should be of bronze or stainless construction. Reference warranty section of Installation Manual for this configuration.
Non-Condensing Tankless
Three Unit Circulation

Note:
Pump should be controlled by an Aquastat, Timer or Combination Aquastat and Timer.
Pump should be sized to maintain circulation loop temperature.
The pump should be sized to overcome the pressure loss through the tankless water heater and supply and return plumbing in the circulation loop.
Reference the section Pump Sizing for Circulation.
Pump should be of bronze or stainless construction.
Reference warranty section of Installation Manual for this configuration.
Non-Condensing Tankless
Six Unit Circulation

Note:

Pump should be controlled by an Aquastat, Timer or Combination Aquastat and Timer. Pump should be sized to maintain circulation loop temperature. The pump should be sized to overcome the pressure loss through the tankless water heater and supply and return plumbing in the circulation loop. Reference the section Pump Sizing for Circulation. Pump should be of bronze or stainless construction. Reference warranty section of Installation Manual for this configuration.
Notice:

Warranty does not cover damage due to freezing. The unit may be drained manually. However, Rinnai highly recommends that drain down solenoid valves be installed that will automatically drain the unit if power is lost. Rinnai also recommends the installation of a surge protector with terminals that attaches to the PC board in the unit and allows the solenoid valves to operate if the unit is disabled due to an error code. When the electrical power to the water heater fails, the normally closed solenoid valve closes (stopping the flow of water into the heater) and the normally open solenoid valve opens (allowing the water heater and associated piping to drain). Ensure that you run the drain for the solenoids to the outside environment to prevent discharging water inside the building causing water damage.

NOTE:

Heat trace ALL water pipe and fittings located outside home (attic, crawl space) or building structure. (ALL water pipe and fittings shown above the dashed line in the drawing.)

NOTE:

ALL pipe and fittings shown below dashed line should be located inside home or building structure. The vacuum breaker line should be located inside the building structure.
Non-Condensing Tankless
Two Unit Freeze Protection

Notice:

Warranty does not cover damage due to freezing.
The unit may be drained manually. However, Rinnai
highly recommends that drain down solenoid valves
be installed that will automatically drain the unit if
power is lost. Rinnai also recommends the installation
of a surge protector with terminals that attaches to the
PC board in the unit and allows the solenoid valves to
operate if the unit is disabled due to an error code.
When the electrical power to the water heater fails, the
normally closed solenoid valve closes (stopping the
flow of water into the heater) and the normally open
solenoid valve opens (allowing the water heater and
associated piping to drain). Ensure that you run the
drain for the solenoids to the outside environment
to prevent discharging water inside the building causing
water damage.

NOTE:
Heat trace ALL water pipe and fittings
located outside home (attic, crawl space)
or building structure. (ALL water pipe
and fittings shown above the dashed line
in the drawing.)

NOTE:
ALL pipe and fittings shown below dashed line
should be located inside home or building
structure.
The vacuum breaker line should be located
inside the building structure.

Rinnai Equipment List

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<th>QTY</th>
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Electronic Connection*

*Refer to Rinnai Accessories and
Model Applicability for electronic
collection details

Rinnai America Corporation
103 International Drive
Pittsburgh, OH, 43068
1-800-621-8419

Reference: F54
xxxxx=1020
xxxxx=10015
xxxxx=00005

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Rinnai

Non-Condensing Tankless
Two Units Freeze Protection

MFG: 0011

02/2015

Drawn by: RM
Approval by: JS

Page 1 of 1
Non-Condensing Tankless
Three Unit Freeze Protection

Notice:
Warranty does not cover damage due to freezing.
The unit may be drained manually. However, Rinnai highly recommends that drain down solenoid valves be installed that will automatically drain the unit if power is lost. Rinnai also recommends the installation of a surge protector with terminals that attaches to the PC board in the unit and allows the solenoid valves to operate if the unit is disabled due to an error code.
When the electrical power to the water heater fails, the normally closed solenoid valve closes (stopping the flow of water into the heater) and the normally open solenoid valve opens (allowing the water heater and associated piping to drain. Ensure that you run the drain for the solenoids to the outside environment to prevent discharging water inside the building causing water damage.

NOTE:
Heat trace ALL water pipe and fittings located outside home (attic, crawl space) or building structure. (ALL water pipe and fittings shown above the dashed line in the drawing.)

NOTE:
ALL pipe and fittings shown below dashed line should be located inside home or building structure.
The vacuum breaker line should be located inside the building structure.
Non-Condensing Tankless
Six Unit Freeze Protection

Notice:
Warranty does not cover damage due to freezing.
The unit may be drained manually. However, Rinnai highly recommends that drain down solenoid valves be installed that will automatically drain the unit if power is lost. Rinnai also recommends the installation of a surge protector with terminals that attaches to the PC board in the unit and allows the solenoid valves to operate if the unit is disabled due to an error code.
When the electrical power to the water heater fails, the normally closed solenoid valve closes (stopping the flow of water into the heater) and the normally open solenoid valve opens (allowing the water heater and associated piping to drain). Ensure that you run the drain for the solenoids to the outside environment to prevent discharging water inside the building causing water damage.

NOTE: Heat trace ALL water pipe and fittings located outside home (attic, crawl space) or building structure. (ALL water pipe and fittings shown above the dashed line in the drawing.)

NOTE: ALL pipe and fittings shown below dashed line should be located inside home or building structure.
The vacuum breaker line should be located inside the building structure.
For this application:
Do not use electronic manifold controls with storage tank applications.

Set water heaters @ 20F above storage tank Aquastat

Option Tank Bypass

Storage Tank
(No Burner or Heating Element)

Submersible Aquastat (set @ 20F below Rinnai Temperature Setting)

Gas Supply

Hot Water Supply Line

Tank Bypass (optional)

Normally Closed Ball Valve

Reference the section on Pump Sizing for Storage Tank Application.

Cold Water Supply Line

Pump / Aquastat Control Wire

Building Hot Water Return Line (Optional)

Building Circulation Pump

Rinnai Non-Condensing Water Heaters

Rinnai Equipment List

QTY

Rinnai America Corporation
103 International Drive
Pleasanton, CA 94566
1-800-621-8419

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Reference: PEGE020

Rinnai

Non-Condensing Tankless
Single Unit with Backup Storage

For this drawing, it is intended only as a guide and not as a replacement for professional engineering project drawings. This drawing is not intended to describe a complete system. It is up to the contractor or engineer to determine the necessary components and configuration of the particular system to be installed. The drawing does not imply compliance with local building code requirements. It is the responsibility of the engineer or contractor to ensure that the installation is in accordance with all local building codes. Consult with local building authorities before installation.
For this application:

Do not use manifold electronic controls with storage tank applications.

Non-Condensing Tankless
Two Units with Backup Storage

Building Hot Water Supply Line

Set water heaters @ 20F above storage tank Aquastat

Storage Tank
(No Burner or Heating Element)

Submersible Aquastat
(set @ 20F below Rinnai Temperature Setting)

Tank Bypass (optional)

Hot Water Supply Line

Reference the section on Pump Sizing for Storage Tank Application.

Pump / Aquastat Control Wire

Pump / Aquastat Control Wire

Building Hot Water Return Line (Optional)

Building Circulation Pump

Rinnai America Corporation
103 International Drive
Reseda, CA 91335
1-800-621-5419

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Rinnai Equipment List
QTY
Rinnai Non-Condensing Water Heaters 2

Non-Condensing Tankless
Two Units with Backup Storage

Reference: \[\text{xxxx} \times \text{xxx} + 0020 \times \text{xxx} + 0015 \times \text{xxx} + 0005\]
For this application:

Do not use manifold electronic controls with storage tank applications.

Non-Condensing Tankless
Six Units with Backup Storage

Rinnai Equipment List

Rinnai Non-Condensing Water Heaters 6

Rinnai America Corporation
103 International Drive
P.O. Box 2968
Fairfax, CA 97028
1-800-627-8419

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Rinnai Tankless
Single Unit D'MAND Circulation

Note:
Demand Circulator should be controlled by push button, motion sensor
or door contacts. Demands Circulators should be designed
specifically for tankless waters.

Ensure Demand Circulator is sized for desired flow rate and pressure
drop of circulation loop.

Contact Demand Circulator manufacturer for assistance with circulating
sizing.

Pump should be of bronze or stainless steel construction

The use of Demand Circulators will maintain full warranty of Rinnai
water heaters.
Rinnai Tankless
Single Unit Demand Dedicated Return

Note:
Demand Circulator should be controlled by push button, motion sensor or door contacts.
Demands Circulators should be designed specifically for tankless waters.

Ensure Demand Circulator is sized for desired flow rate and pressure drop of circulation loop.

Contact Demand Circulator manufacturer for assistance with circulator sizing.

Pump should be of bronze or stainless steel construction

The use of Demand Circulators will maintain full warrantee of all Rinnai water heaters.
For this application:


Pump should be of bronze or stainless steel construction
Rinnai Tankless
Three Units Circ Logic

For this application:
Pump should be of bronze or stainless steel construction
PVA to remain at factory default setting.
Circulation unit should not be connected electronically to MSB Controller or EZ Connect Cord.

Circulation Unit

Condensate Drain Line As Appropriate

3/4" Return Line
Minimum Recommended

Rinnai Circ Logic Connection

Gas Supply
Cold Water Supply Line

Rinnai Equipment List
QTY
Rinnai Tankless Water Heaters 3
PVA Valves 1
Electronic Connection*

*Refer to Rinnai Accessories and Model Applicability for electronic connection details
For this application:


Pump should be of bronze or stainless steel construction

PVA to remain at factory default setting. Circulation unit should not be connected electronically to MSB Controller or EZ Connect Cord.

Condensate Drain Line As Appropriate

3/4" Return Line Minimum Recommended

Rinnai Circ Logic Connection

Rinnai Tankless
Four Units Circ Logic

Rinnai Equipment List
QTY
Rinnai Tankless Water Heaters 4
PVA Valves 1
Electronic Connection*

*Refer to Rinnai Accessories and Model Applicability for electronic connection details
Rinnai Tankless
Generic Air Handler

**Primary Pump**
Pump must be sized for the flow rate of the heating system. Pump must also be sized to overcome pressure loss through the system at the desired flow rate. Refer to the Operation and Installation Manual for the model's pressure loss curve. To be of bronze or stainless construction.

Rinnai Domestic Priority Control Switch
Part Number: 10300037

**Condensate Drain Line As Appropriate**

**Cold Water Supply**

**Hot Water Supply**

**Building Hot Water Supply**

**Gas Supply**

**Primary Pump**

**Rinnai Equipment List**

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<th>Rinnai Tankless Water Heaters</th>
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Rinnai America Corporation
103 International Drive
Pickens, SC 29671
1-800-821-8419

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---

Reference: 1030015

Rinnai Tankless
Generic Air Handler

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Rinnai Tankless
Hydronic Heating

Primary Pump
Pump must be sized for the flow rate of the heating system. Pump must also be sized to overcome pressure loss through the system at the desired flow rate. Refer to the Operation and Installation Manual for the model's pressure loss curve. To be of bronze or stainless construction.

Gas Supply
Primary Pump

Condensate Drain Line As Appropriate

Cold Water Supply

Hot Water Supply

Pressure Reducing Valve (as required)

Building Hot Water Supply

This is not an engineering drawing; it is intended only as a guide and not as a replacement for professional engineering project drawings. This drawing is not intended to describe a complete system. It is up to the contractor or engineer to determine the necessary components and configuration of the particular system to be installed. The drawing does not imply compliance with local building code requirements. It is the responsibility of the engineer or contractor to ensure that the installation is in accordance with all local building codes. Consult with local building officials before installation.
Rinnai Tankless
Hydronic Heating via Heat Exchanger

Primary Pump
Pump must be sized for the flow rate of the heating system. Pump must also be sized to overcome pressure loss through the system at the desired flow rate. Refer to the Operation and Installation Manual for the model’s pressure loss curve. To be of bronze or stainless construction.

Condensate Drain Line As Appropriate

Cold Water Supply

Hot Water Supply

Building Hot Water Supply

Gas Supply

Primary Pump

Space Heating

Note: This is not an engineering drawing; it is intended only as a guide and not as a replacement for professional engineering project drawings. This drawing is not intended to describe a complete system. It is up to the contractor or engineer to determine the necessary components and configuration of the particular system to be installed. The drawing does not imply compliance with local building code requirements. It is the responsibility of the engineer or contractor to ensure that the installation is in accordance with all local building codes. Consult with local building officials before installation.
Notes:
1. Ensure tank aquastat is in top 1/3 section of the tank.
2. Ensure the hot water return is in the top 1/2 section of the tank.
**Notes:**
1. Ensure TMV1 check valves are removed. (This will be the diverter valve)
2. Set TMV1 20°F below Rinnai set point.
3. TMV2 should be set to desired domestic temperature.

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This is not an engineering drawing; it is intended only as a guide and not as a replacement for professional engineering project drawings. This drawing is not intended to describe a complete system. It is up to the contractor or engineer to determine the necessary components and configuration of the particular system to be installed. The drawing does not imply compliance with local building code requirements. It is the responsibility of the engineer or contractor to ensure that the installation is in accordance with all building codes. Consult with local building officials before installation.
Note:
Installation must conform to applicable code and all requirements listed in the installation manual. Balancing valves, equivalent piping, pressure gages, and temperature gages are to be used as necessary to ensure proper flow between units.
Hybrid Tank-Tankless
2 Unit System

Note:
Installation must conform to applicable code and all requirements listed in the installation manual. Balancing valves, equivalent piping, pressure gages, and temperature gages are to be used as necessary to ensure proper flow between units.
Hybrid Tankless
1 Unit System with Circulation

Note:
Installation must conform to applicable code and all requirements listed in the installation manual. Balancing valves, equivalent piping, pressure gages, and temperature gages are to be used as necessary to ensure proper flow between units.
Hybrid Tank-Tankless
2 Unit System with Circulation

Note:
Installation must conform to applicable code and all requirements listed in the installation manual. Balancing valves, equivalent piping, pressure gauges, and temperature gauges are to be used as necessary to ensure proper flow between units.

Rinnai Equipment List
RH180
QTY 2
Rinnai Tankless
Single Unit Flush Procedure

Flush Procedure
1. Disconnect electrical power to the water heater.
2. Close the shut-off valves on both the hot water heater and the cold water lines (V3 and V4).
3. Connect pump outlet hose (H1) to the cold water line at service valve V2.
4. Connect drain hose (H3) to service valve V1.
5. Pour approximately 4 gallons of virgin, food grade, white vinegar or citric acid into pail.
6. Place the drain hose (H3) and the hose (H2) to the pump inlet into the cleaning solution.
7. Open both service valves (V1 and V2) on the hot water and cold water lines.
8. Operate the pump and allow the cleaning solution to circulate through the water heater for at least 45 minutes.
9. Turn off the pump.
10. Rinse the cleaning solution from the water heater by:
   a. Remove the free end of the drain hose (H3) from the pail.
   c. Allow water to flow through the water heater for 5 minutes.
   d. Close service valve, V1, and open shut-off valve, V3.
11. Disconnect all hoses.
12. remove the inline filter at the cold water inlet and clean out any residue. Place filter back into the unit.
13. Restore electrical power to the water heater.
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