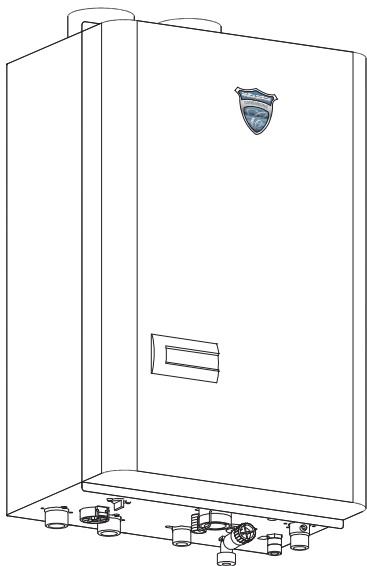


# Condensing

# NAVIEN

Navigating Energy and Environment

## Installation Manual



For potable water heating and space heating



### MODEL

**CH-180**

**CH-210**

**CH-240**

Keep this manual near the Navien Combination Water Heater for future reference whenever maintenance or service is required.

### **⚠ WARNING**

If not followed this installation manual 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.
- **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.

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# Accessories:

**1**
**Included with the Combination Water Heater:**

Item	Description	Qty
Navien Combination Water Heater		1
Remote Controller		1
Operation and Installation Manual		1
Wall Mounting Bracket		1
Condensate Drain Hose		1
Tapping Screws & Anchors		4
Vent terminators		2
Wall Flanges		4





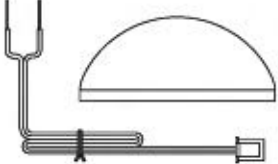


Check that you have received all of the above parts before installing the combination water heater.

## Optional Accessories:

### 2

#### Optional Accessories:

Item	Description
Navien Plumb Easy Valve Set (Pressure Relief Valve) – Heating (1")	
Navien Plumb Easy Valve Set (Pressure Relief Valve) – Domestic Water (3/4")	
Navien Condensate Neutralizer	
Navien Ready-Link Communication Cable	
Outdoor Temperature Sensor with Cable	



Contact your Navien combination water heater supplier for optional accessories.

# Specifications:

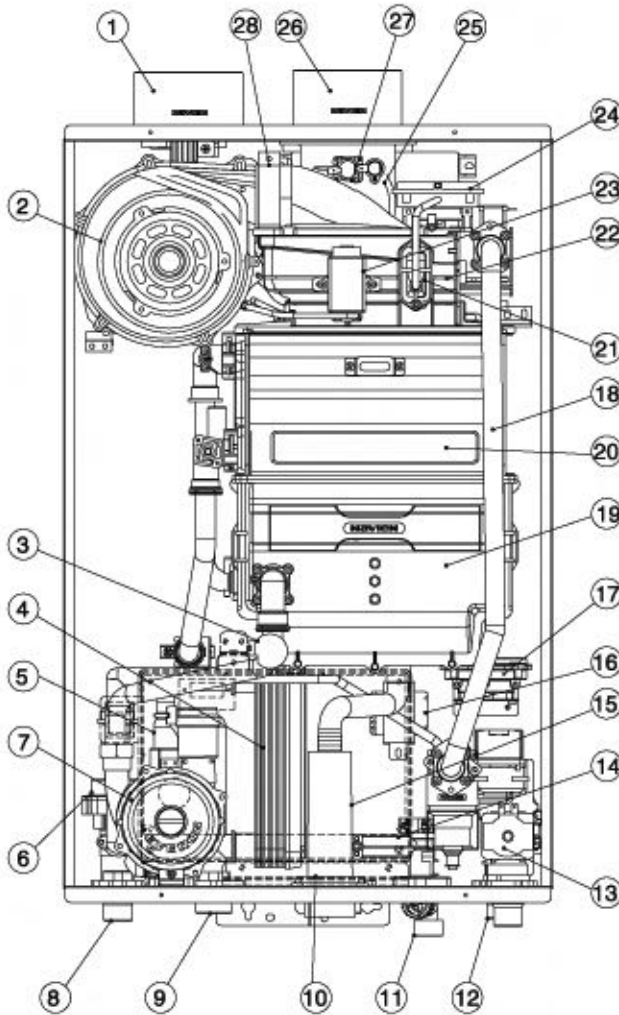
Please review these specifications before installation to confirm proper unit selection: As Navien is dedicated to continuous product improvement, Navien reserves the right to change specifications as well as re-design and / or discontinue any model or feature without prior notice and without incurring obligations.

Item		CH-180	CH-210	CH-240
Heat Capacity (Input)	Natural Gas	Min: 17,000 Btu/h Max: 150,000 Btu/h	Min: 20,000 Btu/h Max: 175,000 Btu/h	Min: 20,000 Btu/h Max: 199,000 Btu/h
	35°F Rise	8.3 Gal / Min	10.0 Gal / Min	11.0 Gal / Min
Heat Capacity (Input)	45°F Rise	6.5 Gal / Min	7.7 Gal / Min	8.6 Gal / Min
	77°F Rise	3.8 Gal / Min	4.6 Gal / Min	5.1 Gal / Min
Dimensions		W17" x H28" x D12"	W17" x H28" x D12"	W17" x H28" x D12"
Weight		74 lbs	84 lbs	84 lbs
Installation Type		Indoor/Outdoor Wall- Hung		
Venting Type		Forced Draft Direct Vent		
Ignition		Electronic Ignition		
Domestic Water Pressure (min- max)		15 - 150 Psi		
Heating Water Pressure (min- max)		7.0 - 30 Psi		
Gas Supply Pressure (from source; min- max)		NG : 3.75" WC ~ 10.5" WC		
180 Manifold Gas Pressure (min- max)		NG : 0.4" WC ~ 3.7" WC		
210 Manifold Gas Pressure (min- max)		NG : 0.4" WC ~ 3.0" WC		
240 Manifold Gas Pressure (min- max)		NG : 0.6" WC ~ 4.0" WC		
Minimum Flow Rate		0.5 GPM		
Efficiency AFUE		91%	91%	91%
Connection Sizes	Heating Supply / Heating Return	1" NPT		
	Auto Feeder	1/2" NPT		
	Cold Water Inlet / Hot Water Outlet	3/4" NPT		
	Gas Inlet	3/4" NPT		
Power Supply	Main Supply	120VAC, 60Hz		
	Maximum Power Consumption	200W (max 2A)		
Materials	Casing	Cold Rolled Carbon Steel		
	Heat Exchangers	Primary Heat Exchanger : Stainless Steel Secondary Heat Exchanger : Stainless Steel Domestic water Heat Exchanger : Plate Stainless Steel		
Venting	Exhaust ( $\phi$ 3")	$\phi$ 3" PVC, $\phi$ 3" Special Gas Vent Type BH (Class II (PVC) and Class I (Stainless Steel))		
	Intake ( $\phi$ 3")	PVC, Flex Aluminum, Flex Stainless Steel, ABS,		
	Vent Clearances	0" to combustibles		
Safety Devices		Flame Rod, Overheat Cut Off device APS, GPS, Gas- Valve Operation Detector, Ignition Operation Detector, Water Temperature High Limit Switch, Exhaust Temperature High Limit Switch		
Accessories		Room Remote Controller, Plumb Easy Valve Set, Venting Kit, Condensate Neutralizer		

# Key Components: CH Model

## NAVIEN Combination Water Heater

### "CH" Series Models

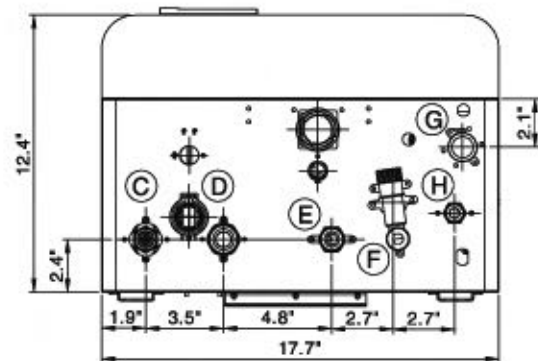
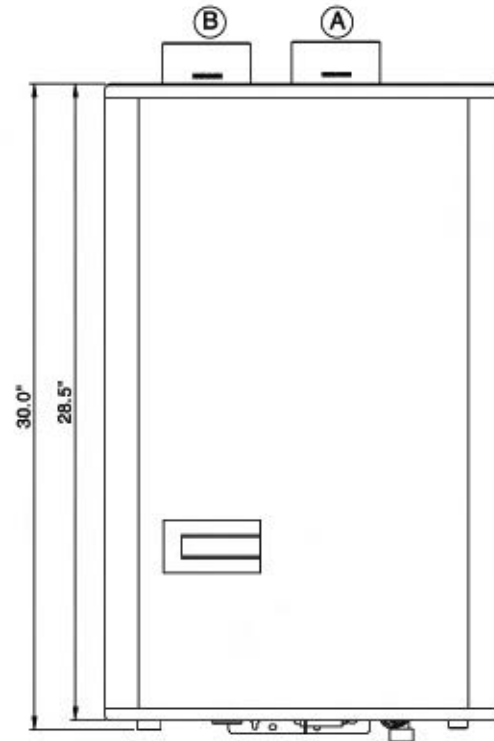
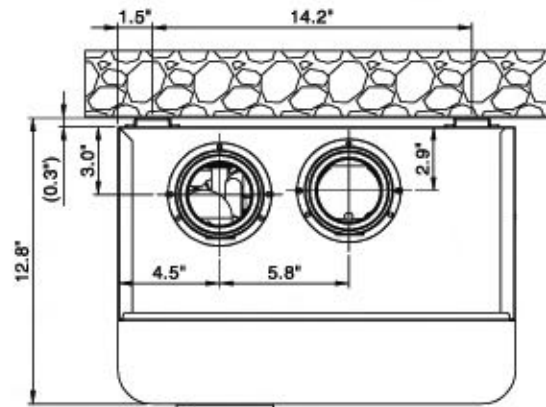


Number	Description
1	Intake air collar
2	Fan
3	Water pressure sensor
4	Hot water exchanger
5	Heating Filter
6	Automatic 3-way valve
7	Circulation pump
8	Heating supply connection
9	Heating return connection
10	Controller
11	Cold water inlet connection
12	Auto Feeder Connection
13	Main gas valve
14	Water flow sensor
15	Condensate trap
16	Power transformer
17	Gas pressure sensor (GPS)
18	Gas inlet pipe
19	Secondary heat Exchanger
20	Primary heat Exchanger
21	APS device
22	Burner
23	Ignition transformer
24	Air pressure sensor (APS)
25	Exhaust duct
26	Exhaust collar
27	Over heat preventer
28	Combustion air intake duct

# Dimensions: CH Model

■ CH

	Description	Diameter
A	Exhaust	3"
B	Air Intake	3"
C	Heating Supply Connection	1"
D	Heating Return Connection	1"
E	Hot Water Outlet	3/4"
F	Cold Water Inlet	3/4"
G	Gas Inlet	3/4"
H	Auto Feeder	1/2"



# Installation Warnings



## WARNING

Read all safety warnings in the "Operation Manual". The additional safety issues outlined below must also be followed completely when installing this Navien Combination Water Heater.



### WARNING

Failure to remove or maintain the area free of combustible material, gasoline and other flammable liquids or vapors can result in severe personal, injury, death or substantial property damage.

1. All applicable local, state, national and provincial codes, ordinances, regulations and laws.
2. For installations in Massachusetts – code requires the boiler to be installed by a licensed plumbing or gas fitter.
3. The National Fuel Gas Code NFPA 54/ ANSI Z223.1
4. National Electric Code ANSI/NFPA 70.
5. For Installations in Canada – "Installation Code for Gas Burning Equipment" CGA/B 149.1 or B149.2 Canadian Electrical Code Part 1 CSA C22.1
6. Standard for Controls and safety devices for automatically fired boilers, ANSI/ASME CSD-1, when required.



### WARNING

Follow all local codes and/or the most recent edition of the National Fuel Gas Code (ANSI Z223.1/NFPA 54) in the USA or the Natural Gas and Propane Installation Code in Canada (CAN/CGA B149.1).

1. This unit is designed for indoor/outdoor installations. DO NOT operate this unit without the vent piping connected. Exhaust gases must be completely expelled out of the building.
2. DO NOT use this appliance if any part has been underwater. Immediately call a qualified service technician to inspect the appliance and replace any part of the control system and any gas control which has been underwater.
3. Be sure not to reverse the water and gas connections as this may damage the gas valves.
4. Water temperatures over 125°F can cause severe burns instantly or death from scalding. If the proposed water heater outlet temperature is above 125°F, a thermostatically controlled mixing valve (or a temperature limiting valve) for reducing point of use water temperature is recommended to reduce the risk of scald injury. Contact a licensed plumber or the local plumbing authority for further information.



## Installation Warnings



5. The appliance should be located in an area where leakage within the unit or at its connections will not result in damage to the surrounding area. Navien will not be responsible for any damage resulting from leaking if adequate drainage is not provided.
6. **DO NOT** use this combination water heater for any purpose other than water heating and space heating.
7. If the water quality is known to be highly acidic and/or extremely hard, water treatments (i.e. water softeners) are recommended to maintain full warranty. Consult the local water authority.
8. Protect against snow accumulation around the vent terminations. Ensure the exhaust vent pipe and the intake pipe remain clear from obstructions at all times.
9. **DO NOT** overtighten fittings as pipe and/or fitting damage may occur causing leakage.
10. **DO NOT** install water heater where subject to vibrations.
11. The vent for this appliance shall not terminate over public walkways; or near soffit vents, crawl space vents and other areas where condensate or vapor could create a nuisance, hazard or cause property damage. Or where condensate and vapor could cause damage to or could be detrimental to the operation of regulators, relief valves, or other equipment.
12. For other than a direct vent appliance, the appliance must be located as close as possible to a chimney or gas vent.
13. Should overheating occur or the gas supply fails to shut off, turn off the manual gas control valve to the appliance. Contact a Service Technician immediately.

# Getting Started



## CHECK THE RATING PLATE

Navien units come from the factory configured for use with either Natural Gas (NG). **Before starting the installation**, check the rating plate (side of unit) of the water heater to ensure the unit matches gas type, gas pressure, water pressure and electrical supply. **If the unit does not match the following requirements, Do Not Install;**



### WARNING

Be sure the gas type and electricity voltage match the Rating Plate.

- ❑ Use only the gas type indicated on the rating plate of the Navien Combination Water Heater. Using a different gas type will cause abnormal combustion and water heater malfunction.



- ❑ Be sure to use 120VAC 60Hz minimum 2A current. Using abnormally high or low AC voltage may cause abnormal operation, and may reduce the life expectancy of this product.



If not certain, please contact Navien immediately.



### WARNING

Conversion of this unit from natural gas to propane or vice versa cannot be done in the field. Please re-confirm gas type on the rating plate (side of unit) before installing. **DO NOT** attempt any field conversion; this will result in dangerous operating conditions and will void all warranty.

**Navien America Inc. is not liable for any property damage and/or personal injury resulting from unauthorized conversions.**

# Check Rating Plate

## Sample Rating Plate

**Rating Plate, \*Plaque Signalétique**

**Automatic Instantaneous Combination Water Heater,**  
 \*Chauffe-eau automatique instantané  
 Navien America Inc.  
 1371 Santa Fe Drive, Tustin CA 92780  
 Tel: 714 258 9005

**Model No. , \*N° de modèle**  
 CH-180

**Max. Input Rating, \*Entrée G.P.L. max.**  
 150,000 BTU

**Recovery Rating, \*Calibre de recouvrement :**

**Max. Inlet Gas Pressure, \*Pression max. de gaz d'entrée**  
 Min. Inlet Gas Pressure, \*Pression min. de gaz d'entrée  
 Manifold Pressure, \*Pression d'admission

**Electrical Rating, \*Régime nominal électrique**  
**Max. Water Pressure, \*Pression d'eau max.**

**Type of Gas**  
 N.G.

**Min. Input Rating, \*Débit calorifique max.**  
 17,000 BTU

**227 Gallons/Hour, \*gallons/heures**  
 10.5 Inches W.C. \*pouces W.C.  
 3.75 Inches W.C. , \*pouces W.C.  
 3.7 Inches W.C. \*po W.C.

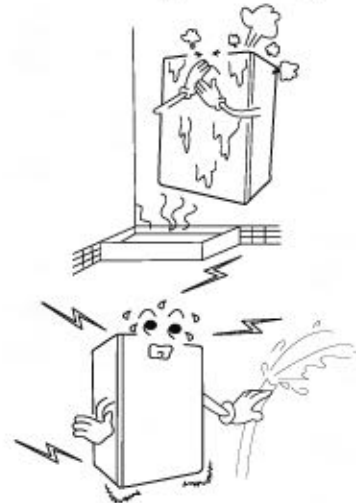
**AC \*c.a. 120 Volts 60Hz Use less than 2 Amp, \*Utilise moins de 2A**  
 150 Psi \*l'pca2 ANSI Z21. 10. 3b - CSA 4.3B-2004

SAMPLE




**DO NOT install the Navien water heater in areas with excessive high humidity:**

- ▶ DO NOT install the unit in a location where there is excessive high humidity such as a bathroom, damp crawl space and other areas such as this. This may cause the unit to malfunction.
- ▶ To avoid possible electrical shock, DO NOT touch the internal components of the water heater or the power cord with wet hands;
- ▶ DO NOT splash excessive water on the water heater or remote controller when cleaning; they are water resistant, not water proof;



## Locating the Combination Water Heater



### **WARNING** Considering the Location

Location selection may not necessarily affect the operation of the Navien Combination Water Heater but it will affect the customer's experience and level of satisfaction with the product. Understanding that each building is different, the contractor will have to select the best location based on a combination of the following factors:

1. Locate the Navien Combination Water Heater close to a drain where condensed water and possible water leakage will not do damage to surrounding areas. A significant amount of condensed water will be produced each time the combination water heater is used. In addition, as with any water heating appliance, the potential for leakage at some time in the life of the product does exist. If there is no drain, Navien will not be responsible for any water damage that may occur.
2. Locate where the city water supply comes into the building.
3. Locate where the gas supply comes into the building.
4. Locate the main fixtures in the home (bathrooms, kitchen, laundry, etc.). Select a location that minimizes the water piping distance between the major fixtures.
5. Consider venting options: Select a location that minimizes the amount of venting required. Consider venting restrictions from windows, doors, air intakes, gas meters, neighbor's house, etc.
  - Maintain proper clearances from any openings in the building (see chart in venting section).
  - Navien combination water heater requires a minimum clearance of 12 inches above the exterior grade.
  - Do not install the water heater where moisture from the exhaust may cause discoloration or damage to walls.
  - Install the exhaust vent so that there are no obstacles around the termination and so that exhaust cannot accumulate.
  - Do not enclose the termination.
  - Do not install the combination water heater near vents for heating or cooling. A minimum distance of 4 feet (1.2m) should be maintained.
6. It is not recommended to install the combination water heater in bathrooms, bedrooms, any occupied rooms normally kept closed, or in indoor areas without proper venting.

7. Select a location that ensures the water heater will have sufficient and clean, combustion air; avoid installation where dust or debris will accumulate; avoid installation where chemical agents (e.g., hair spray, spray detergent, chlorine, chemicals) are used.
8. If installing into a very tight space or corner, please ensure there is sufficient service and maintenance access to all gas and water piping to ensure that regular maintenance (such as cleaning the water filter, the air filter and the condensate trap) will not become problematic.

Allow sufficient clearance:

Top of heater	Min. 9 inches
Back of heater	Min. 0.5 inches
Front of heater	Min. 4 inches
Sides of heater	Min. 0.5 inches
Bottom of heater	Min. 12 inches

9. DO NOT install in an area that contains or stores gasoline or other flammables.
10. Ensure that combustibles are clear of the immediate area. Ensure hanging laundry or other such items will not impede the air movement into or out of the water heater or its venting.
11. For commercial applications, avoid greasy fumes or a large amount of steam; take measures to prevent the fumes and steam from entering in the equipment.

---

## Mounting the Unit to the Wall:

---

1. All Navien units come with an upper mounting bracket pre-drilled at 16" on center for easy installation on standard stud walls. Affix the bracket to the wall securely, ensuring that it is level and that it can support the weight of the combination water heater. If the strength of the wall is not sufficient, reinforce the area to prevent any unsafe situations.
2. If the framing is not standard, reinforcement of the wall is required or if installing on an uneven surface, fasten 3/4" plywood to the stud wall and then attach the mounting brackets to the plywood.
3. When using the supplied mounting bracket, it creates a 5/8" clearance from the back of the unit.
4. The upper bracket is installed on the wall and the combination water heater is then hung on the bracket. On the back of the combination water heater at each of the top corners, there is a hanger bracket on the back of the combination water heater that interlocks with a tabs on the wall mounting bracket.

# Plumbing

## Plumbing and Water Connection Guidelines

- The piping materials used should meet local codes and industry standards.
- Piping must be cleaned and flushed-out before installation.
- Do not apply torch heat within 12" of the bottom connections of the unit.
- Perform all solder connections at a safe distance from the (brass) male connectors below the unit. Allow fittings to cool, before attaching to unit. Use only approved coupling unions with O-rings to attach field piping to unit.
- The 'heating' pipe should be 1" or bigger diameter copper or PEX. Never use aluminum, PVC or galvanized steel piping.
- The pipe size used for supply heating water should be the same size used for the return heating water.
- Use only copper piping with lead-free solder for the domestic water side.
- The size of the domestic hot water pipe should be 1" diameter.
- The length of piping should be as short as possible and the piping should have minimal number of bends and connections.
- Use only ball type isolating valves. Do not use gate valves.
- Never leave the heating pipes disconnected while operating the unit as a water heater. This will cause damage to the heat exchanger and void the manufacturers warranty.
- All piping should be insulated.
- After making the piping connections, check for gas or water leaks.
- If the water supply pressure is 142 psi or higher, install the water pressure regulator on the water supply piping.

# Plumbing



## WARNING

Failure to properly pipe Water Heater may result in improper operation and damage to Water Heater or structure.

**CAUTION** : This combination water heater must only be used with the following water supply system conditions :

- With clean, potable water free of corrosive chemicals, sand, dirt, or other contaminants.
- With inlet water temperatures above 32°F(0°C), but not exceeding 140°F(60°C).
- Free of lime and scale deposits.

## Low Water Cut Off device

1. Navien Combination Water Heater is equipped with a factory installed pressure sensor type Low Water Cut Off device.
2. The Minimum operation system pressure allowable with this device is 7 psig.
3. Check local code if a Low Water Cut Off is required. If so, determine if this device meets the requirements of the local codes.
4. If a separate LWCO device is required by certain local jurisdictions or when the Navien Combination Water Heater is installed above the system piping, the following guidelines must be followed:
  - The LWCO device must be installed in a tee connection on the Water Heater supply piping above the Water Heater.

**CAUTION** : If the installation is to comply with ASME or Canadian requirements, an additional high temperature limitation device may be needed.

Consult local code requirements to determine compliance.

## Backflow Preventer

- Use a backflow preventer valve in the make-up water supply to the unit as required by local codes.



# Plumbing

## Expansion Tank

- ❑ The expansion tank must be located as shown in A~F basic application drawings.(page 17 ~ 24) (Refer to the expansion tank manufacturer's instructions for additional installation details.)
- ❑ Connect the expansion tank to an air separator only if the air separator is located on the suction side of the system circulator.
- ❑ Always locate and install the system fill connection at the same location as the expansion tank's connection to the system.
- ❑ If the expansion tank must be replaced, consult the expansion tank manufacturer's literature for proper sizing.

### Diaphragm Expansion Tank

- ❑ Always install an automatic air vent on the top of the air separator to remove residual air from the system.

### Closed-Type Expansion Tank

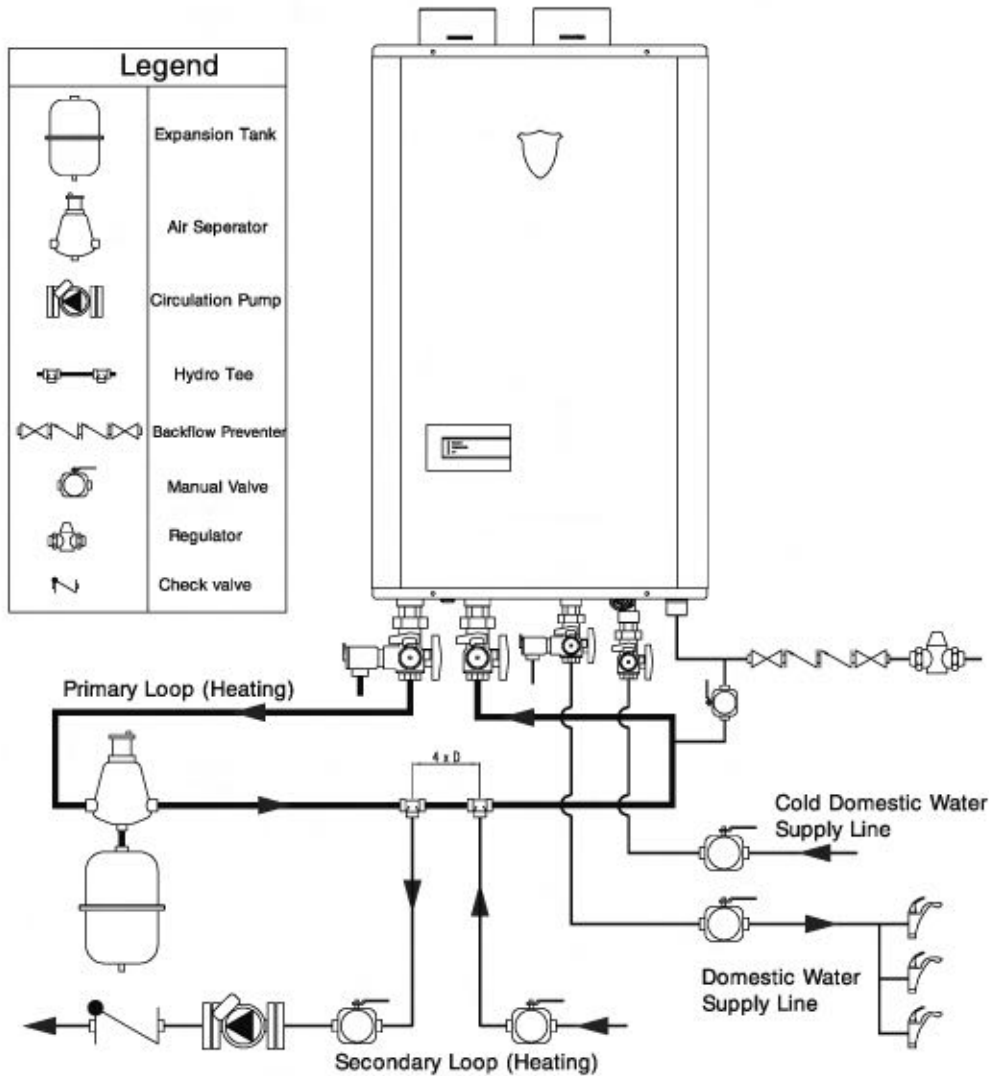
- ❑ It is recommended to pitch any horizontal piping upward toward the expansion tank 1 inch per 5 feet of piping.
- ❑ Use 3/4" piping for the expansion tank to allow air within the system to rise.

**CAUTION :** DO NOT install automatic air vents on a closed-type expansion tank system. Air must remain in the system and be returned to the expansion tank to provide an air cushion.



## Plumbing Guideline

CH Model: With backflow preventer



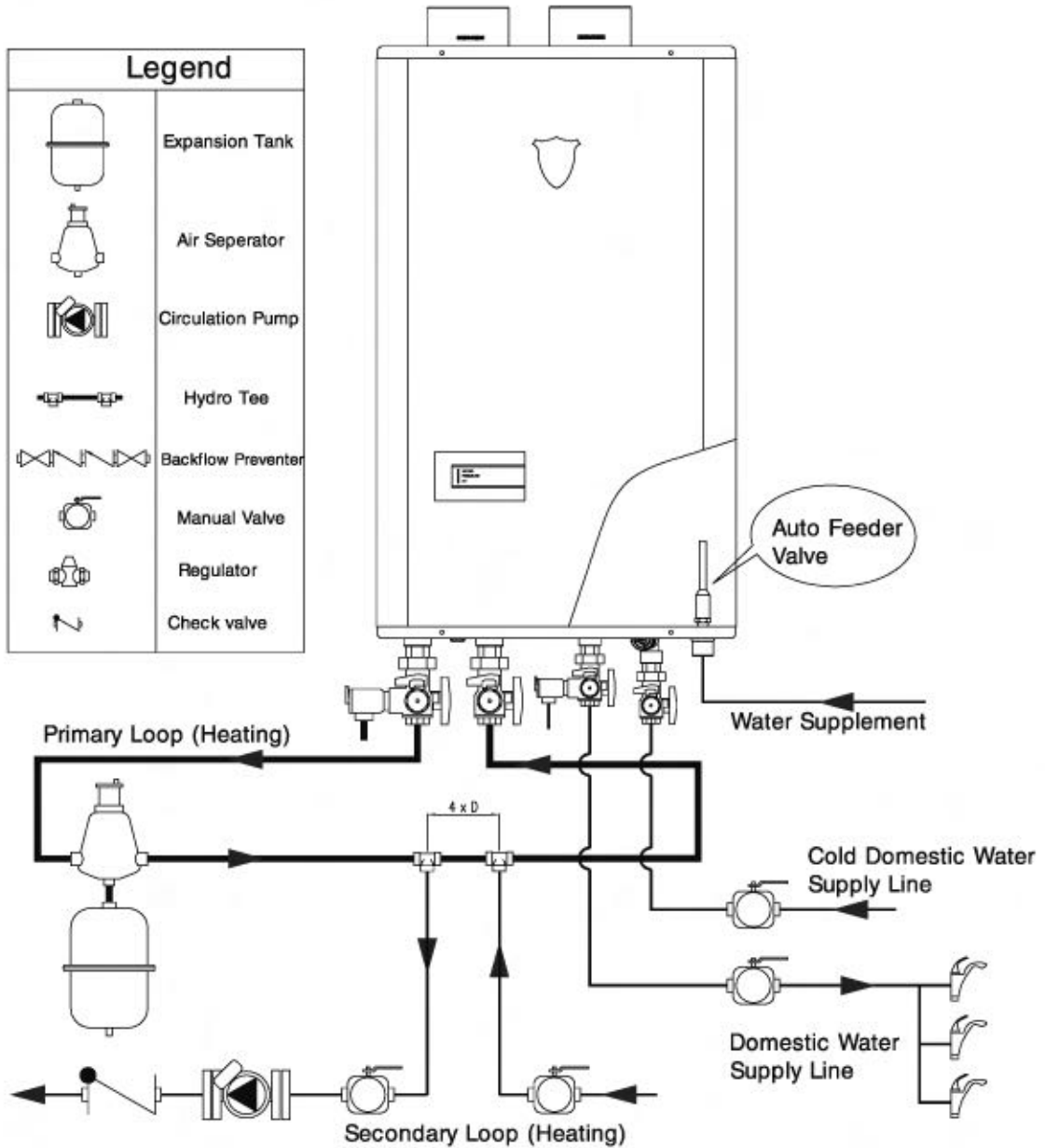
**NOTICE** : If using mixing valves on the domestic hot water outlet, choose one which prevents cold water pressure from overcoming hot water line pressure. The flow rate of hot water may vary when more than two faucets (appliances, fixtures, etc.) are being used simultaneously.

If a combination water heater is installed in a closed water supply system, such as one having a backflow preventer in the cold water supply line, means shall be provided to control thermal expansion device. Contact the water supplier or local plumbing inspector on how to control this situation.

# Plumbing

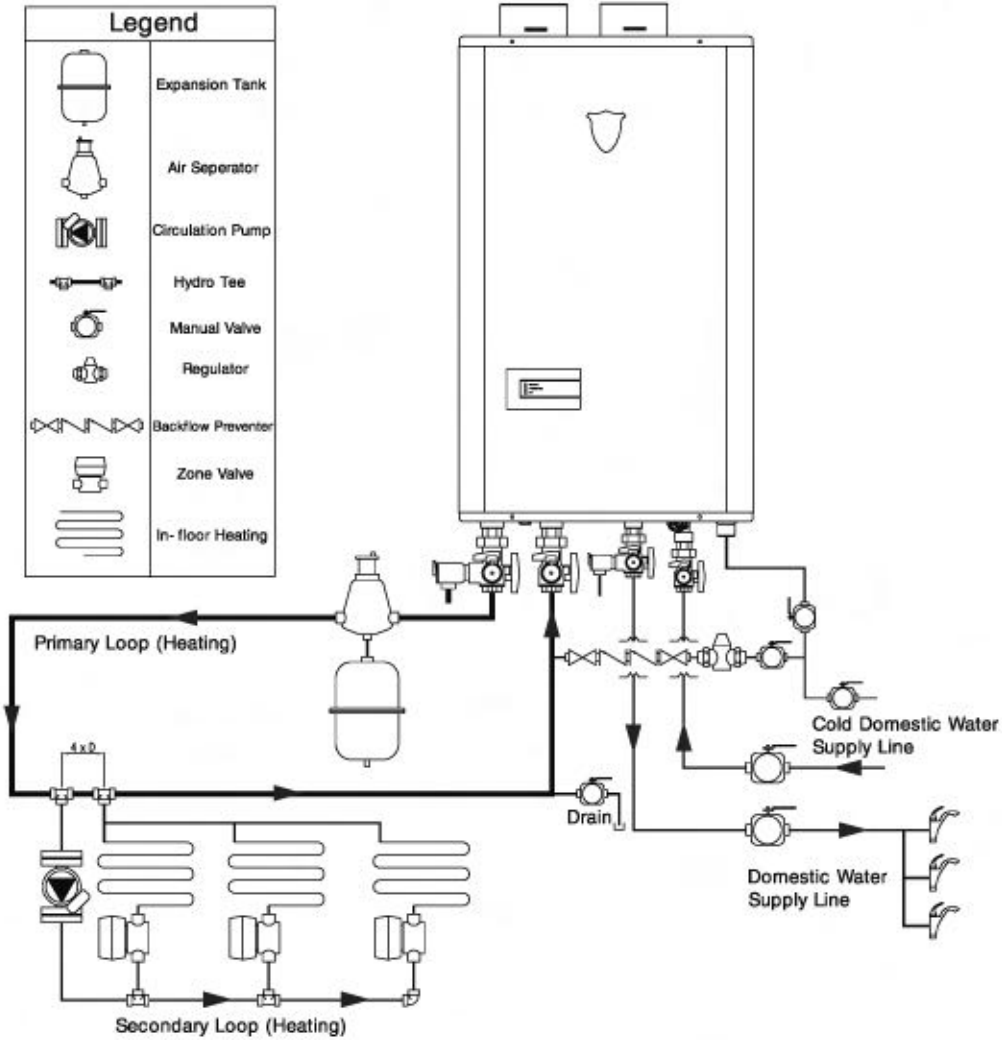
## Plumbing Guideline

CH Model: Non-backflow preventer

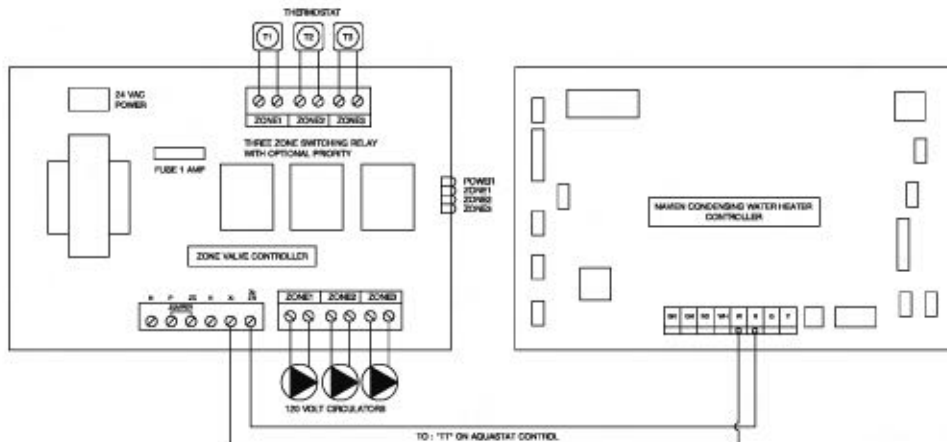


**NOTICE** : If using mixing valves on the domestic hot water outlet, choose one which prevents cold water pressure from overcoming hot water line pressure. Hot water Temperature may vary when more than two faucets (appliances, fixtures, etc.) are being used simultaneously.

## A. In-Floor Heating (Zoning Control) System (with Wiring Diagram)












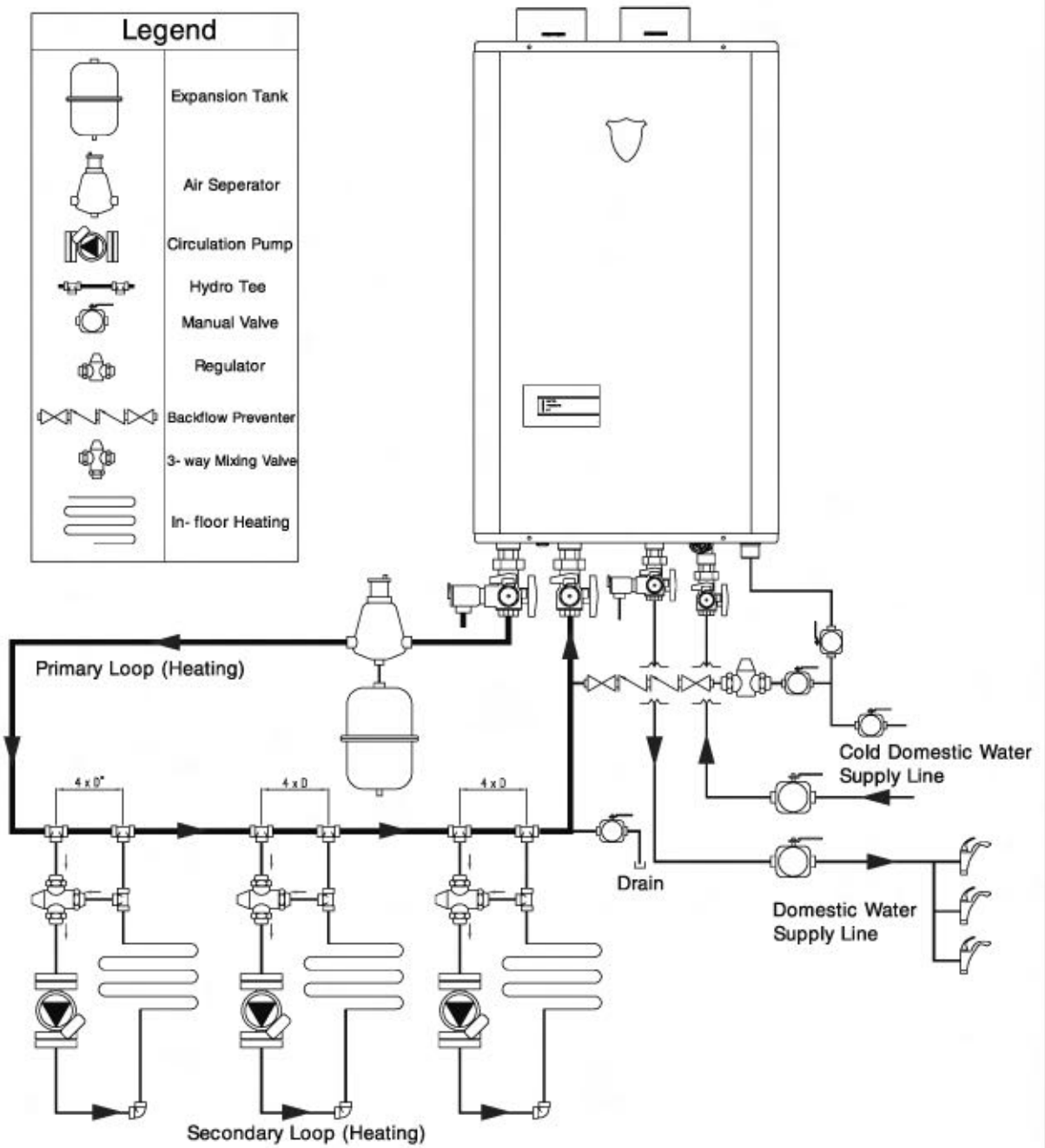
### Wiring Diagram



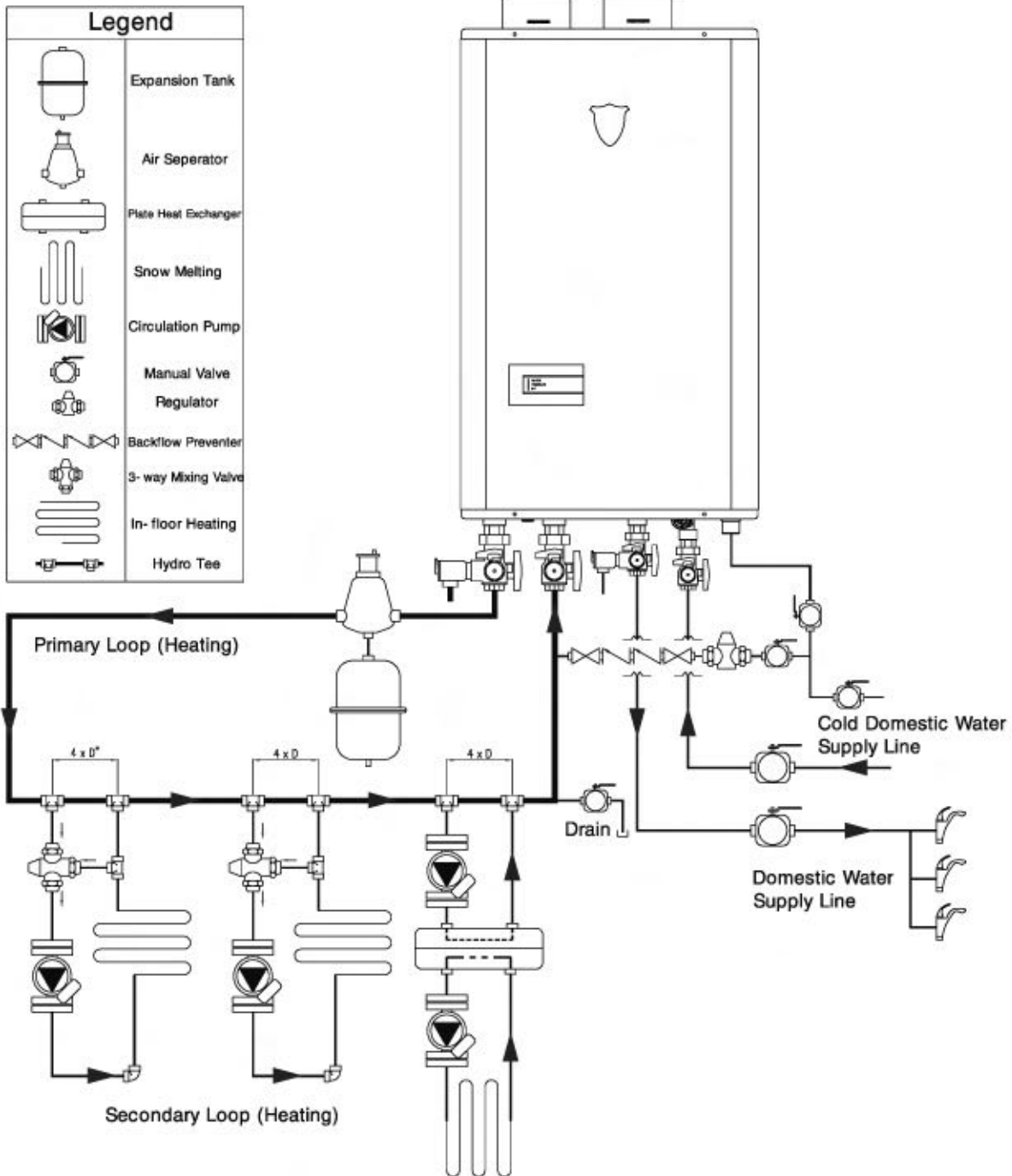
# Plumbing

## B. In-Floor Heating System (Recovery Control)

Legend	
	Expansion Tank
	Air Separator
	Circulation Pump
	Hydro Tee
	Manual Valve
	Regulator
	Backflow Preventer
	3-way Mixing Valve
	In-floor Heating













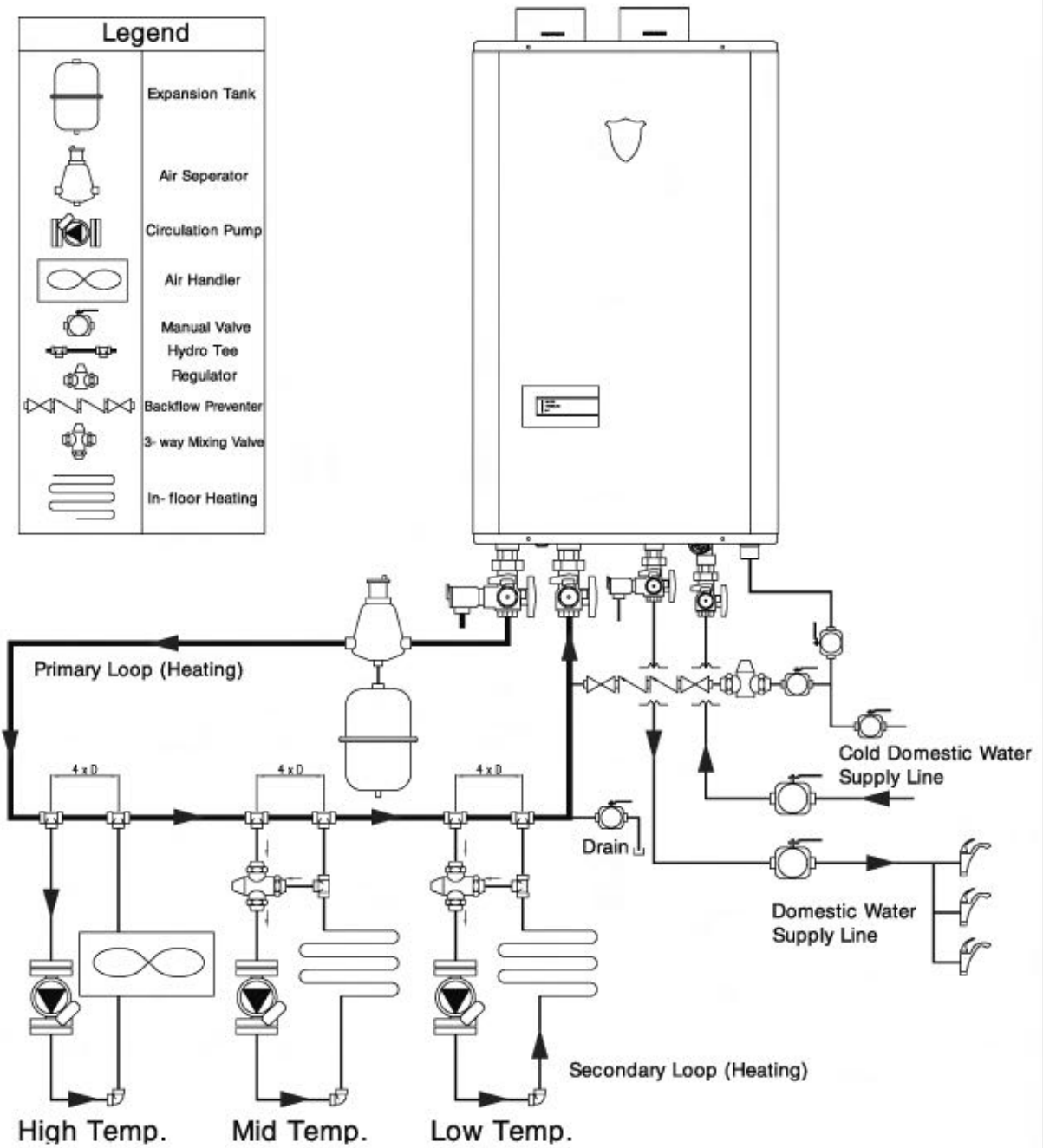
## C. Snow Melting System.













# Plumbing

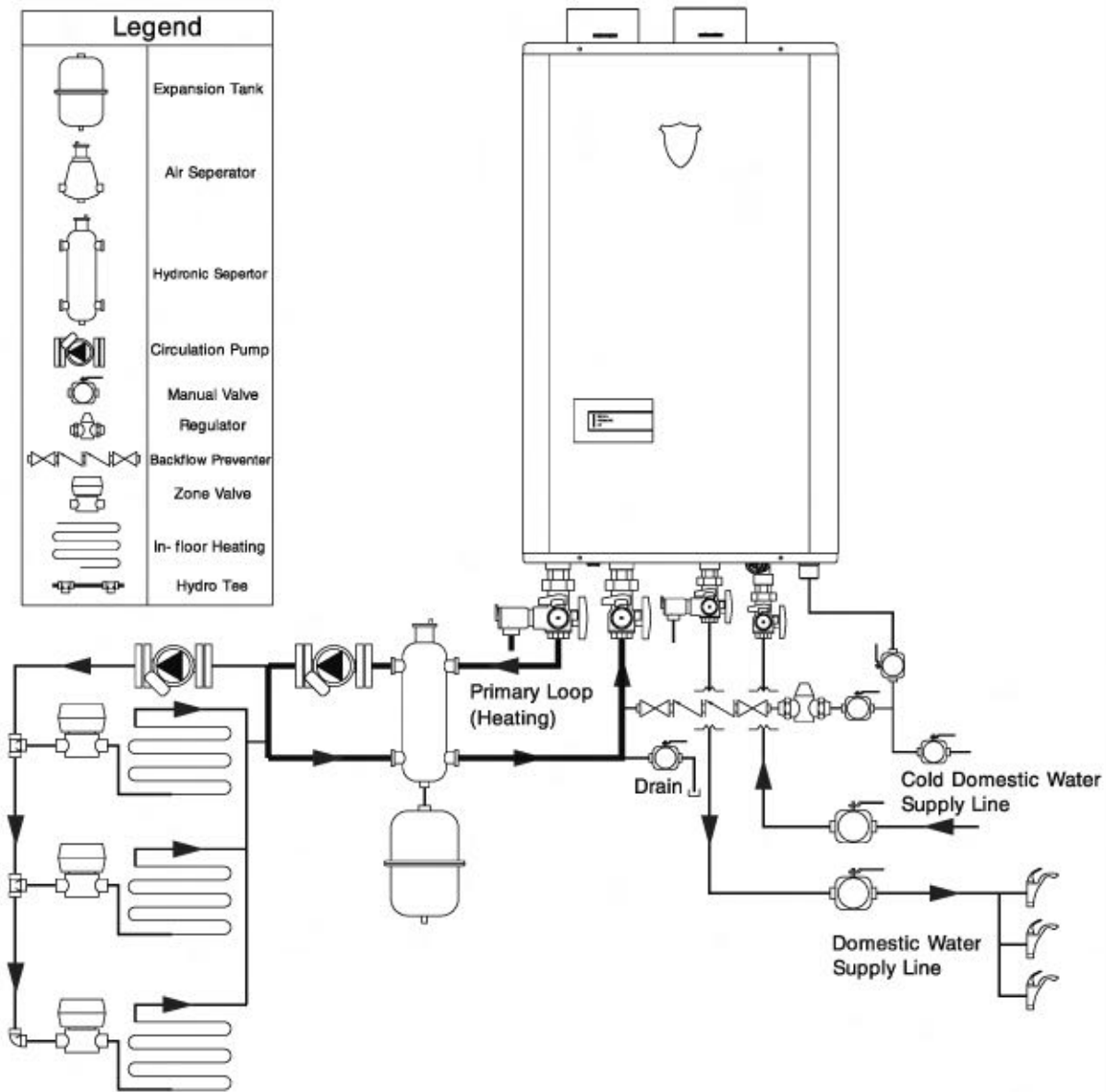
## D. High – Low Temperature System.

Legend	
	Expansion Tank
	Air Separator
	Circulation Pump
	Air Handler
	Manual Valve
	Hydro Tee
	Regulator
	Backflow Preventer
	3-way Mixing Valve
	In-floor Heating



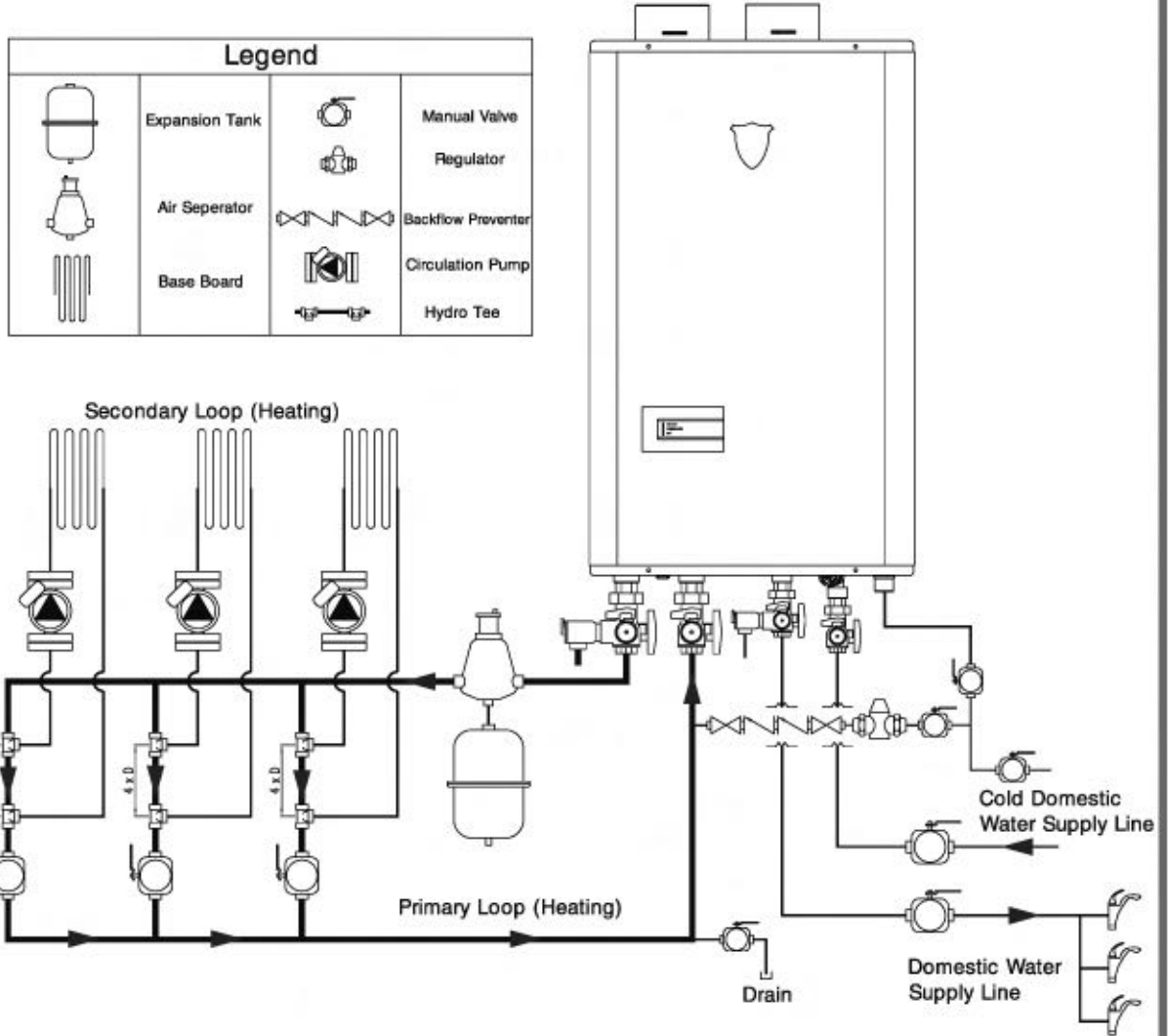
## E. Hydro – Separator System.

Legend	
	Expansion Tank
	Air Separator
	Hydronic Separator
	Circulation Pump
	Manual Valve
	Regulator
	Backflow Preventer
	Zone Valve
	In-floor Heating
	Hydro Tee



# Plumbing

## F. Base Board System.





# Pressure Relief Valve



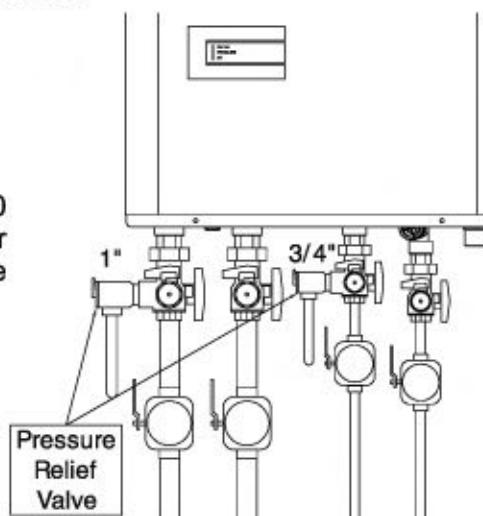
## WARNING

Failure to comply with the guidelines on installing the pressure relief valve and discharge piping can result in personal injury, death or substantial property damage.

- ❑ An approved 3/4", maximum 150 psi pressure relief valve must be installed on the hot water outlet, as close to the unit as possible. Please see below for more information on approved pressure relief valves.
- ❑ Each Navien combination water heater has a high-temperature shut off switch built in as a standard safety feature (called a temperature high limit switch) therefore a "pressure only" relief valve is required. This unit does not come with a pressure relief valve but one must be installed on the hot water outlet.
- ❑ The discharge capacity of the pressure relief valve must be at least equal to the maximum pressure rating of the water heater.
- ❑ The maximum input BTU rating on the valve must be equal to or greater than the maximum input BTU rating of the water heater.
- ❑ The discharge piping for the pressure relief valve must be directed so that the hot water cannot splash on anyone or on nearby equipment. Attach the discharge tube to the pressure relief valve and run the end of the tube to within 6" from the floor. This discharge tube must allow free and complete drainage without any restrictions. No reducing coupling or other restriction may be installed in the discharge line.
- ❑ The following 3/4", maximum 150 psi valves are examples of valves approved for use with all Navien products for domestic Hot water.
  1. Wilkins P-1000A (Zurn Industries)
  2. Conbraco 17-402-04
  3. Watts Industries 3L (M7)
  4. Cash Acme FWL-2 3/4"

The following 1" space heating, maximum 30 psi valves are examples of valves approved for use with all Navien products for Hydronic space heating loop.

5. Wilkins P-1000A (Zurn Industries)
6. Conbraco RVW40
7. Watts Industries 374A
8. Cash Acme F30

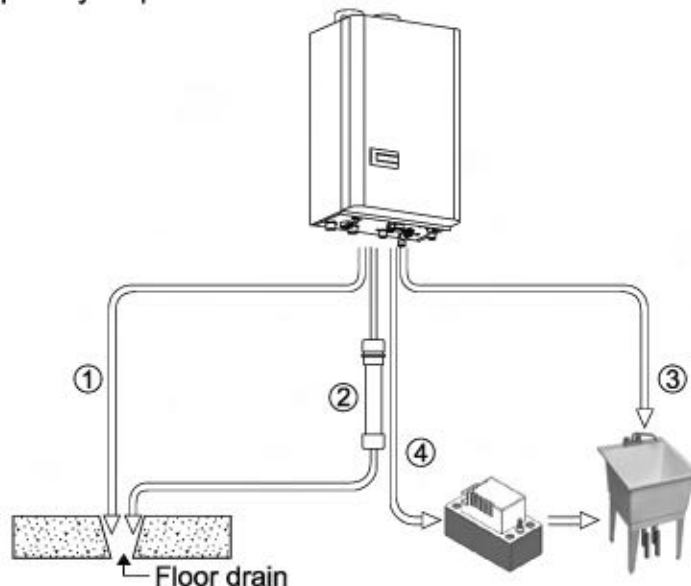


Instructions for pressure, temperature and vacuum relief valves shall specify that no valve is to be placed between the relief valve and the tank. The instructions shall specify installation in such a manner that the discharge from temperature and pressure relief valves will be conducted to a suitable place for disposal when relief occurs and that no reducing coupling or other restriction be installed in the discharge line.

# Disposal of Condensate

## Disposal of Condensate

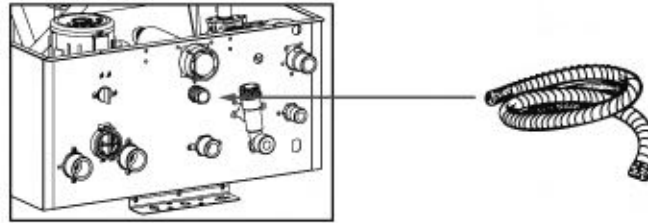
- ❑ This Navien combination water heater is a high efficiency gas appliance that creates condensation when it operates. Condensation has an acidic (pH) of approximately 3~4. Follow your local code with regards to the disposal of condensation. Here are several options for the Disposal of Condensate (see diagram below):
  - ① From combination water heater direct to drain.
  - ② From combination water heater to neutralizer to drain.
  - ③ From combination water heater to laundry tub (bottom of combination water heater must be above the height of laundry tub; must have a negative slope to properly drain).
  - ④ From combination water heater to condensate pump to laundry tub (for long distances between combination water heater and laundry tub or when bottom of combination water heater is installed below height level of laundry tub).
- ❑ All Navien's CH model combination water heaters are condensing gas appliances. A condensate trap comes factory installed inside each water heater.
- ❑ All condensate must be drained in accordance with all local regulations. Navien recommends draining the condensate to a laundry tub as the alkalie in the detergent from the washing machine will neutralize the acid in the condensation. If a laundry tub is not close by, you may need to install a condensate pump to push the condensate to the nearest laundry tub or consider installing a condensate neutralizer so that you can release the neutralized (non-acidic) water into a regular, nearby drain.
- ❑ If a neutralizer is installed, periodic replacement of the lime stone (or neutralizing agent) will be required. The rate of depletion of the lime stone varies upon usage of the combination water heater. During the first year of operation, please check the neutralizer every few months for depletion. If you notice any depletion order some replacement neutralizer lime stone.
- ❑ Use only corrosion-resistant materials for the condensate drain lines such as 3/4" ID PVC pipe vinyl or plastic hose.



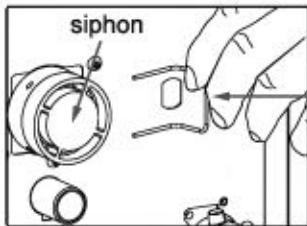
# Condensate Drain & Cleaning

## Disposal of Condensate

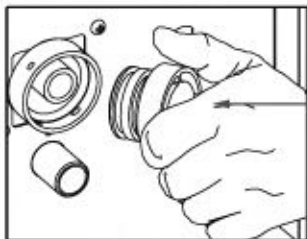
- ❑ A condensate drain tube is included with the Navien Water Heater. This tube must be connected to the port at the bottom of the unit (see below). The end of the tube should drain to a laundry tub or to a floor drain. If additional tubing is required, any 3/4" polyvinyl tubing should suffice.



- ❑ Over time, blockage of the siphon by debris may occur. When the condensate cannot be released, the water heater will go into error and will shut down. When this occurs, the siphon must be cleaned. To clean, you will need a bucket to collect any residual water. See figures below.

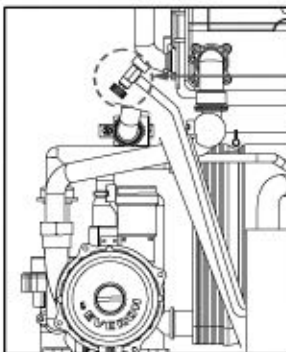


Remove retaining clip



Prepare bucket; twist and remove cap; drain, clean out siphon and re-insert cap and retaining clip.

- ❑ Once the cap and clip have been re-inserted, the siphon must be re-filled. See figure below.



- Open the valve and water will begin to fill in the siphon. Fill the siphon to the top and then close the valve.
- Open a hot water faucet; examine the open end of the condensate drain line to ensure no flue gases are exiting from that pipe. If the flue gases are exiting, immediately stop the unit and call Navien for additional instructions.

## Gas Piping

### Gas Piping Guidelines:

- Navien recommends the combination water heater be the first appliance installed downstream of the gas meter to ensure it will have sufficient gas supply.
- Use the charts on the following pages to properly size the gas supply line.
- The gas connection fitting on all Navien units is 3/4". **DO NOT** use less than 3/4" piping.
- When using flexible gas line, ensure the pipe's inner diameter is sufficient to supply the required BTU; also ensure that the flexible line has no crimps or tight bends as this will restrict gas flow.
- Install a manual gas shut-off valve on the gas supply line and the water heater.
- When using rigid pipe, Navien recommends the installing a union on the gas supply line close to the water heater to facilitate any future maintenance and service.

### Gas Supply Line Pressures:

1. The minimum and maximum inlet gas pressures are:  
**Natural Gas Min. 3.75" WC - Max. 10.5" WC**
2. Gas pressures over and above the specified ranges will result in adverse performance and dangerous operating conditions; any damage resulting from extreme gas supply pressures will not be covered by the limited warranty.
3. Until pressure testing of the main gas supply line is completed, ensure the gas line to the Navien Combination Water Heater is disconnected to avoid any damage to the water heater.
4. The appliance must be isolated from the gas supply piping system by closing its individual manual shut-off valve during any pressure testing of the gas supply system at test pressures equal to or less than 0.5 psi (3.5 kPa).
5. The gas appliance and its gas connections must be leak tested before placing the appliance in operation. Leaks can be found by using a gas leak detection device or by applying soapy water to all gas fittings. Should bubbles occur tighten those connections and re-test.
6. Always purge the gas line for any debris before connecting to the water heater gas inlet.
7. Never use an open flame to test for gas leaks as property damage, personal injury or death could result.

# Gas Pipe Sizing Chart

Referenced from Uniform Plumbing Code 1997

## Gas Pipe Sizing

### Maximum Natural Gas Delivery Capacity

in Cubic Feet (ft<sup>3</sup>) per Hour (0.60 Specific Gravity, 0.5" WC Pressure Drop)

Pipe Size	Length in Feet										
	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'	125'
3/4"	363	249	200	171	152	138	127	118	111	104	93
1"	684	470	377	323	286	259	239	222	208	197	174
1 1/4"	1,404	965	775	663	588	532	490	456	428	404	358
1 1/2"	2,103	1,445	1,161	993	880	798	734	683	641	605	536
2"	4,050	2,784	2,235	1,913	1,696	1,536	1,413	1,315	1,234	1,165	1,033
2 1/2"	6,455	4,437	3,563	3,049	2,703	2,449	2,253	2,096	1,966	1,857	1,646
3"	11,412	7,843	6,299	5,391	4,778	4,329	3,983	3,705	3,476	3,284	2,910
3 1/2"	16,709	11,484	9,222	7,893	6,995	6,338	5,831	5,425	5,090	4,808	4,261
4"	23,277	15,998	12,847	10,995	9,745	8,830	8,123	7,557	7,091	6,698	5,936

Contact your gas supplier for BTU/ft<sup>3</sup> rating. Use 1000 BTU/ft<sup>3</sup> for simplified calculation.

### Maximum Natural Gas Delivery Capacity with Corrugated Stainless Steel Pipe

in Cubic Feet (ft<sup>3</sup>) per Hour (0.60 Specific Gravity, 0.5" WC Pressure Drop)

Pipe Size	Length in Feet											
	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'	150'	200'
3/4"	206	147	121	105	94	86	80	75	71	67	55	48
1"	383	269	218	188	168	153	141	132	125	118	94	82
1 1/4"	614	418	334	284	251	227	209	194	181	171	137	116
1 1/2"	1,261	888	723	625	559	509	471	440	415	393	320	277
2"	2,934	2,078	1,698	1,472	1,317	1,203	1,114	1,042	983	933	762	661

\*\* For reference only. Please consult gas pipe manufacturer for actual pipe capacities.

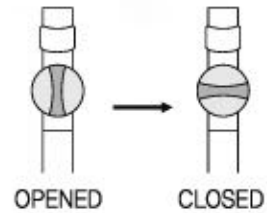
## Measuring Inlet Gas Pressure

The Navien Combination Water Heater cannot operate properly without sufficient inlet gas pressure and volume. Below are instructions on how to check the inlet gas pressure.

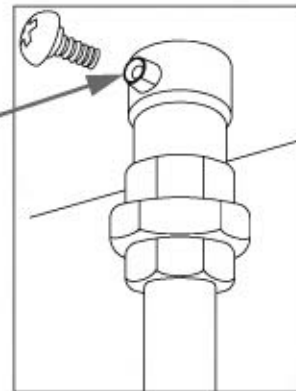
**THIS IS ONLY TO BE DONE BY A LICENSED PROFESSIONAL**

### Procedure to measure the inlet gas pressure:

1. Shut off the manual gas valve on the supply line.
2. Open a hot water faucet. The unit should turn on and the gas in the gas pipe line should purge. Leave the faucet on to keep the unit running until the unit shuts down due to lack of gas supply. Then shut off the hot faucet.
3. Remove the screw for the pressure port located on the gas inlet of the water heater.



Pressure test port on gas line



4. Connect a manometer to the pressure port and reset it to zero.
5. Re-open the manual gas valve. Check to see that there are no gas leaks.
6. Open multiple fixtures that have high flow rates ( i.e. bathtub, showers, kitchen sink) to ramp the water heater up to its maximum burn.
7. When the Navien water heater is at maximum burn, check the inlet gas pressure reading on the manometer; it should read between 3.0" and 10.5" WC for Natural gas.
8. The maximum inlet gas pressure must not exceed the value specified by the manufacturer and that the minimum value listed is for the purposes of input adjustment.



# Venting



## WARNING

Improper venting of combination water heater can result in excessive levels of carbon monoxide which can result in severe personal injury or death. This combination water heater must be vented in accordance with the "Venting of Equipment" section of the latest edition of the ANSI Z223.1 / NFPA 54 Natural Fuel Gas Code and/or the "Venting systems and air supply for appliances" section of the latest version of the CAN/CGA B149.1 Natural Gas and Propane Installation Code in Canada and in accordance with all applicable local building codes.



## WARNING

This Navien Combination Water Heater can be vented with (PVC) plastic or stainless steel. PVC Vent can be used in all cases up to Exhaust flue Temperature 149°F(65°C). **IF** you set the water heater at a temperature higher than 160°F (70°C) **AND** are running an external recirculation loop or a combination heating system, you **MUST** use the Navien stainless steel venting or any 3" venting system approved for use with Category IV appliances (typically Type BH Special Gas Vent approved to UL1738-S636).

## Venting Guidelines

- For best results, keep the vent system as short and straight as possible.
- Locate the combination water heater as close as possible to the vent terminator.
- The combination water heater vent must not be common vented with any other gas appliance or vent stack.
- Slope the vent upwards toward the vent terminal at a rate of 1/4" per foot (2% slope).
- When sloping the vent using any other manufacturer's stainless steel vent, the assembly of the vent pipe must be such that it is male-to-female in the direction of the flow of condensate.
- The exhaust vent and air-intake vent pipes must be sealed air tight at each joint from flue collar to terminator.
- Make sure that the seam of the vent pipe in horizontal runs toward the top of the installation.
- Do not downsize the vent system as this will affect the operation of the unit.

# Venting

- ❑ Do not store hazardous or flammable substances near the vent terminator.
- ❑ If this product will be installed in an area where snow is known to accumulate, protect the vent termination from blockage.
- ❑ Vent terminator must be a minimum of 12" above ground.
- ❑ Support the vent pipe with hangers at regular intervals or as required by local code; the weight of the vent pipe must not rest on the water heater.
- ❑ Do not common vent nor connect any other appliance to this combination water heater's venting system.
- ❑ Vent and air intake pipe must be supported every 5 feet.

## **Navien and Direct Vent:**

- ❑ All Navien Combination Water Heaters are prepared at the factory to be direct vent (sealed combustion) units which draw all of their required combustible air directly from outside the building.
- ❑ All Navien Combination Water Heaters use 3" diameter exhaust and 3" diameter air intake pipe. To ensure the draw and exhaust of air directly to and from the outside, the exhaust vent and air intake vent must be sealed airtight from unit collar to terminator.
- ❑ **The air intake vent materials** can be made of ABS, PVC, galvanized steel, corrugated aluminum or any other such materials. If you are using a corrugated material, ensure there is no inadvertent crimping of, or damage to, the air intake vent.

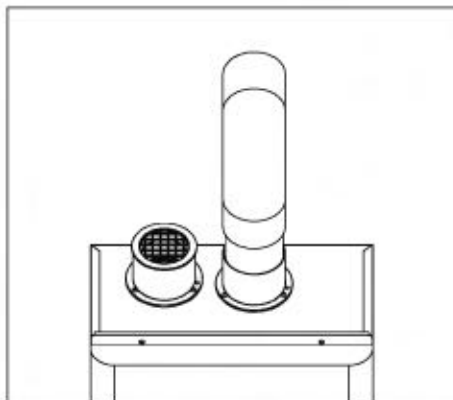
## **Navien and Non-Direct Vent**

- ❑ Navien recommends direct vent installations whenever possible to avoid back drafting cold air through the unit; if you cannot use direct vent, it is essential to have an ample supply of make-up air.
- ❑ If at any time, the building experiences a negative pressure situation when using a non-Direct Vent unit, there is a possibility of back drafting cold, winter air from outside through the heat exchanger of the water heater. This situation may freeze the water heater's heat exchanger. According to the building codes in most jurisdictions, a negative pressure in homes is not allowed. In a home with a well-balanced air supply, freezing of the heat exchanger will not occur.
- ❑ Since the cause of the back drafting is insufficient make-up air within the home or building. This will not be deemed a manufacturing problem and any freezing damage which occurs from back drafting will not be covered under warranty. To avoid any such issues in colder climates, Navien requires the use of direct vent.



# Venting

- ❑ To fit the unit for non-direct venting, insert the termination end cap (provided with the water heater) into the air intake collar. Do not glue to allow for easy removal and cleaning of the cap.



## Combustion Air Supply Requirement for Non-Direct Vent:

- ❑ When a Navien Combination Water Heater is installed without a dedicated air intake pipe (non-Direct Vent) communicating directly with the outdoors, combustion air must be supplied to the space. The opening sizes below are Navien's minimum requirements. Follow the latest version of the National Fuel Gas Code (ANSI Z223.1 / NFPA 54) or CAN/CGA B-149.1.

Model	CH-180	CH-210	CH-240
Maximum Input (BTU)	150,000	175,000	199,000
Outdoor make up air is provided, a <u>minimum free area</u> of 1 in <sup>2</sup>	5.3 in <sup>2</sup> 3" (W) x 2" (H) or 3" round	6.1 in <sup>2</sup> 2.5" (W) x 2.5" (H) or 3" round	7 in <sup>2</sup> 2¾" (W) x 2¾" (H) or 3" round
Indoor make up air is provided, a <u>minimum free area</u> of 1 in <sup>2</sup>	150 in <sup>2</sup> 12¼" (W) x 12¼" (H)	175 in <sup>2</sup> 13¼" (W) x 13¼" (H)	199 in <sup>2</sup> 14¼" (W) x 14¼" (H)

Have to enough make up air for all other gas appliances that may be located in the vicinity as well.

# Venting

## Contaminated Make-Up Air Will Damage the Unit

- Do not operate the combination water heater in an area that is or will be under construction or renovation.
- Do not install the combination water heater in an area with contaminated air (containing a high level of dust, sawdust, sand, flour, aerosols or any other such airborne contaminants) as those contaminants will cause operational problems.
- The Navien warranty will not cover damage caused to the unit due to installation in a contaminated environment.
- To minimize operational problems, direct venting (sealed combustion) must be used such that contaminant free combustion air will be supplied directly from outside. Even with direct venting, regular filter cleaning and maintenance is recommended for these types of environments.

## Exhaust Vent Pipe Materials

- Venting requirements in USA and Canada are different. Please consult the chart below and the most recent edition of the National Fuel Gas Code (ANSI Z223.1 / NFPA 54) or CAN/CGA B-149.1 as well as local codes for applicable venting regulations and restrictions;
- All Navien water heaters are Category IV appliances;

<b>Navien Recommended Vent Materials</b>		
<b>Model Type</b>	<b>USA</b>	<b>CANADA</b>
CH-180 CH-210 CH-240	PVC Schedule 40 ABS Schedule 40	Navien's Stainless Steel Vent Kit or Type BH Special Gas Vent Class IIB (PVC)

- Navien does NOT recommend the use of cellular core ABS as venting on any of its products.
- When using stainless steel BH type gas vent, the exhaust vent system must be sealed air tight and must be male-to-female in the direction of the flow of condensate. Follow the vent pipe manufacturer's certified installation instructions.

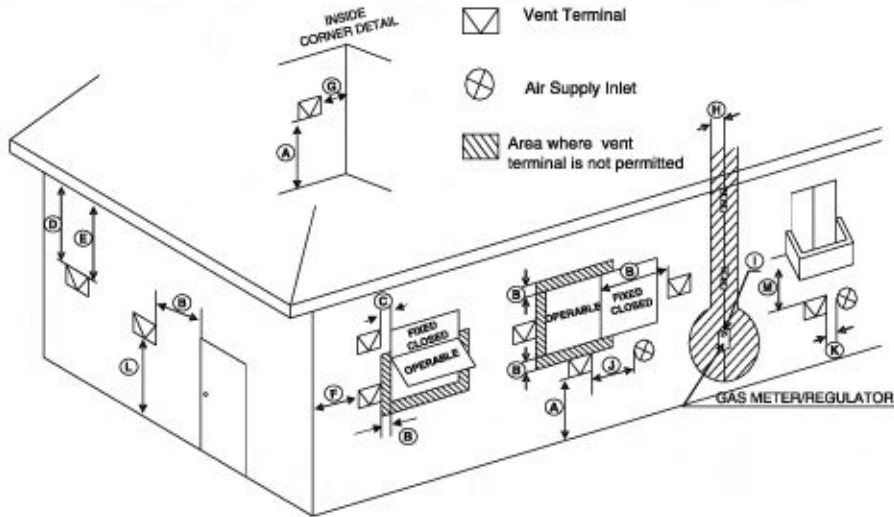
### **A New requirement for Canada**

For installation in Canada, field supplied plastic vent piping must comply with CAN/CGA B149 1 (latest edition) and be certified to the Standard For Type BH Gas Venting Systems, ULC **S636** Components of this listed system shall not be interchanged with other vent systems or unlisted pipe/fittings. All plastic components and specified primers and glues of the certified vent system must be from a single system manufacturer and not intermixed with other system manufacturer's vent system parts. The supplied vent connector and vent termination are certified as part of the combination water heater.

# Venting Clearances

All clearance requirements are in accordance with ANSI Z21.10.3 and the National Fuel Gas Code, ANSI Z223.1 / NFPA 54 and CGA B149.1 National Gas and Propane Installation Code.

ANSI Z233.1 / NFPA 54 and CGA B149.1 National Gas and Propane Installation Code.



	Clearance To:	US Direct Vent Indoor Installation	Canada Direct Vent Indoor Installation
A	Above grade, veranda, porch, deck or balcony	1'	1'
B	Window or door that may be opened	1'	3'
C	Permanently closed window	*	*
D	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet from the center of the terminal	*	*
E	Unventilated soffit	*	*
F	Outside corner	*	*
G	Inside corner	*	*
H	Each side of center line extended above meter/regulator assembly	*	3' within a height 15' above meter/regulator assembly
I	Service regulator vent outlet	*	3'
J	Non-mechanical air supply inlet or combustion air inlet to any other appliance	1'	3'
K	Mechanical air supply inlet	3' above if within 10' horizontally	6'
L	Above paved sidewalk or paved driveway located on public property	*	7'
M	Under veranda, porch, deck, or balcony	*	1'

## Venting

### Allowable 3" Vent Lengths

MODEL	MAX LENGTH	MAX # of ELBOWS	EQUIVALENT LENGTHS
180	100'	6	Reduce the maximum vent length accordingly for each elbow used:  Each 90° elbow equates to 5 linear feet of vent. Each 45° elbow equates to 2 linear feet of vent.
210	100'	6	
240	100'	6	

**NOTE:** The maximum lengths listed above are for the exhaust vent section only. The intake vent length can be of equal length. The maximum lengths are not including elbows.

### Allowable 2" Venting

The 2" diameter Sch 40 PVC venting pipe installation is a maximum 12 feet, plus 1 elbow and elbow termination (2 elbows total) up to 2,000 feet elevation. Installations above 2,000 feet require all 3" venting.

MODEL	MAX LENGTH	MAX # OF ELBOWS	REMARK
180	12'	2	Type BH Special gas Vent Class IIA(PVC) for Canada
210	12'	2	
240	12'	2	

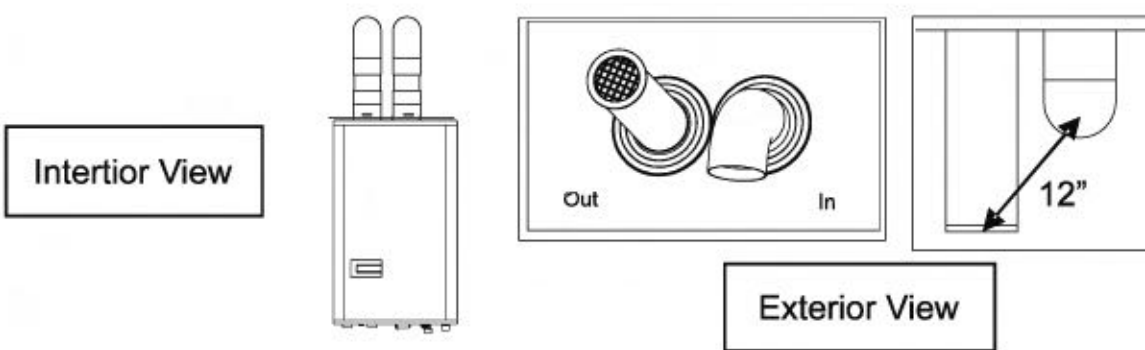
**NOTE :** Non - concentric venting through a side wall. Air is drawn from different location at a minimum of 12" from the termination. Please try to minimize the length of the air intake vent length.

# Venting

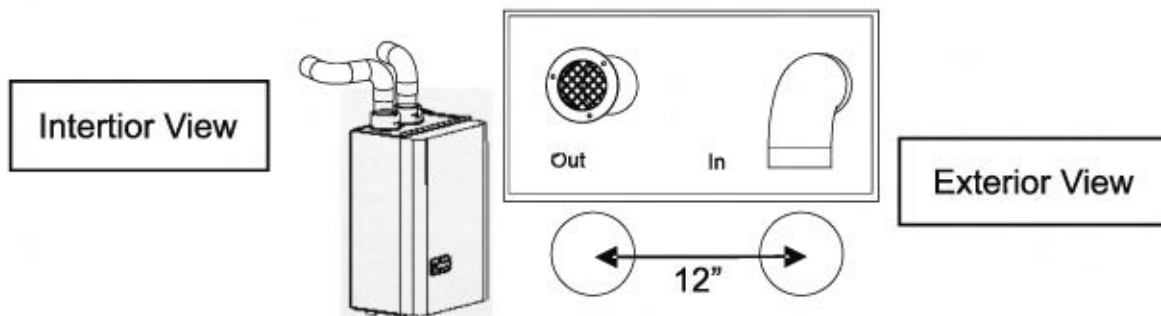
## **Vent Configuration Options:**

The following diagrams represent some typical venting configurations and are included to assist you in designing your vent system. Possible configurations are not limited to these diagrams.

### **Option #1: 3" 2-pipe side wall vent**



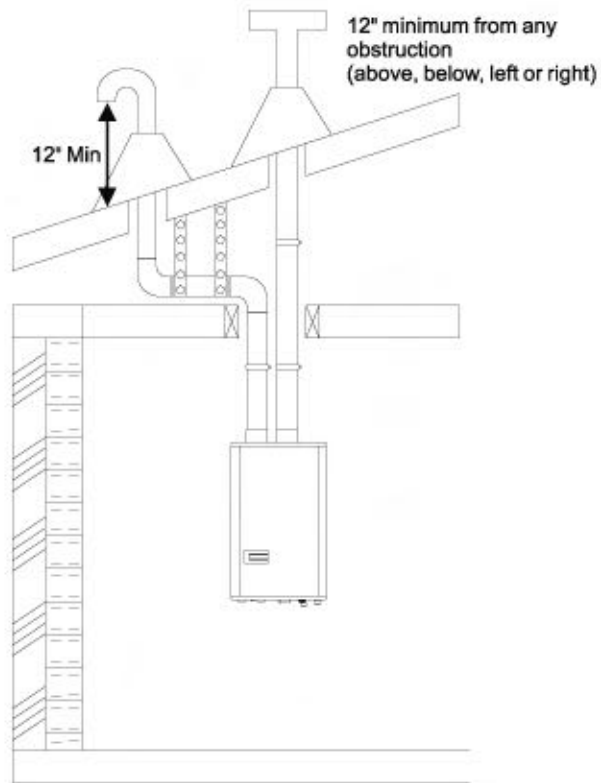
**Option #2: Non-concentric venting through a side wall. Air is drawn from different location at a minimum of 12" from the termination. Please try to minimize the length of the air intake vent length.**



# Venting

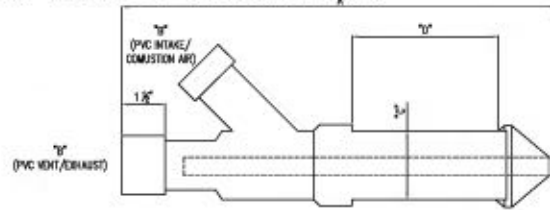
## Option #3: 3" 2-Pipe Vertical Vent Termination

Where shown Tee as vent terminator is just an idea. Please find and use proper terminator following each jurisdiction.



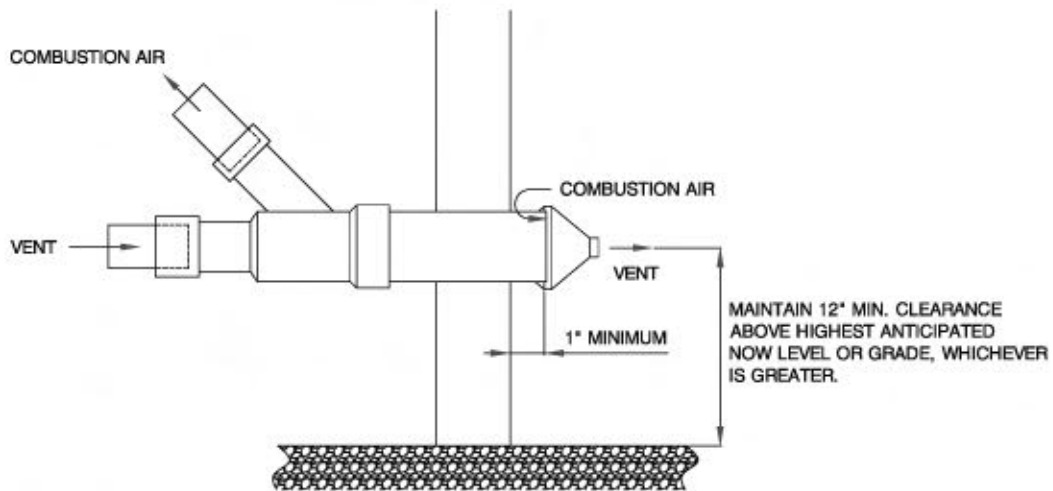
# Venting

## CONCENTRIC VENT TERMINATION

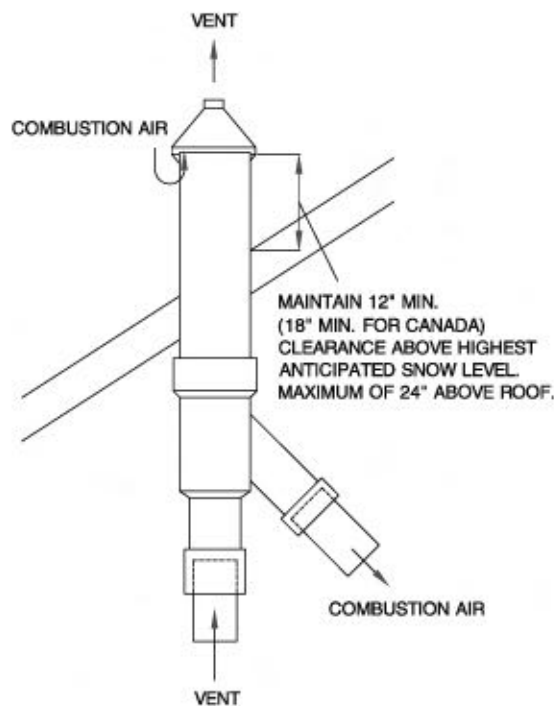


	"A"	"B"	"C"	"D"
DIMENSION	38- 7/8"	3"	4- 1/2"	21- 1/8"

### 1. Sidewall Installation



### 2. Roof Installation



## Outdoor Temperature Sensor

### Outdoor Temperature Sensor Installation

- Pull the terminal block out
- Attach the body to the wall with screws/anchors provided
- Run wire into the body through grommet opening
- Connect wires to the terminal block
- Reinstall the terminal block into the body
- Attach the cap to the body

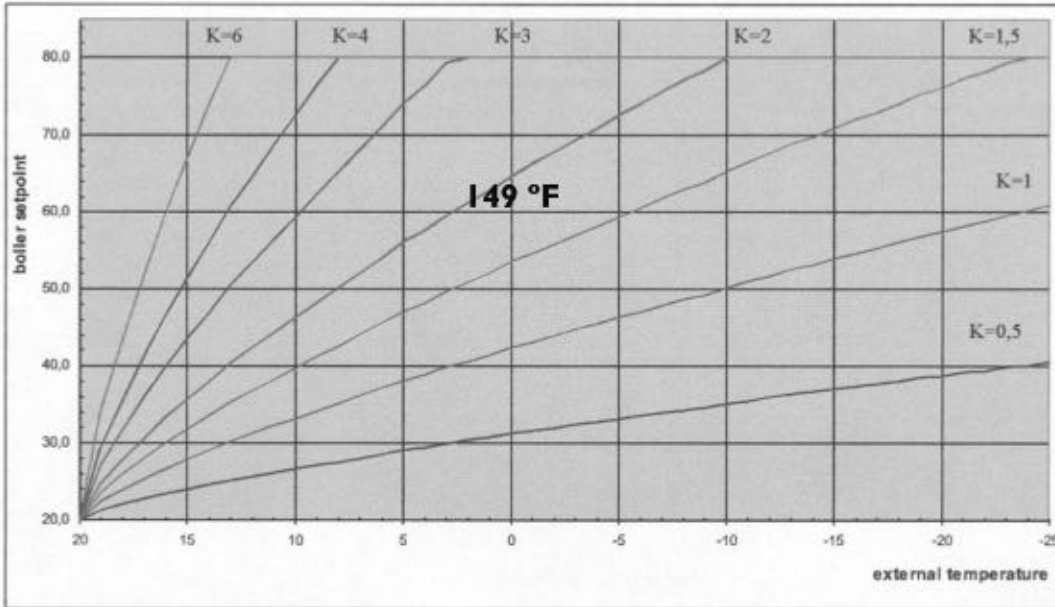
### Outdoor Temperature Sensor Installation Guidelines

- Avoid areas with temperature fluctuations caused by direct sunlight, and not representative of true outdoor temperature.
- Best location is on North or Northeast side of structure under eave or shielded from direct sunlight.
- Avoid placing sensor in close proximity of heat sources that may affect correct temperature sensing. (fans, exhausts, vents, lights)
- Avoid placing sensor in area subjected to excessive moisture.
- Use 18 gauge wiring (thermostat wiring) with no splices. (except at unit harness connection with yellow leader wire)
- Caution should be taken to avoid potential electromagnetic interference (EMI) by routing separately from potential sources such as line voltage wiring. When necessary, shielded cable may be used.
- Make sure wiring connections are secure before closing the cap.
- References for the data and temperature of sensor is on the back of this page.
- The unit is a water resistant device, but any damage to the device may require replacing the entire component.



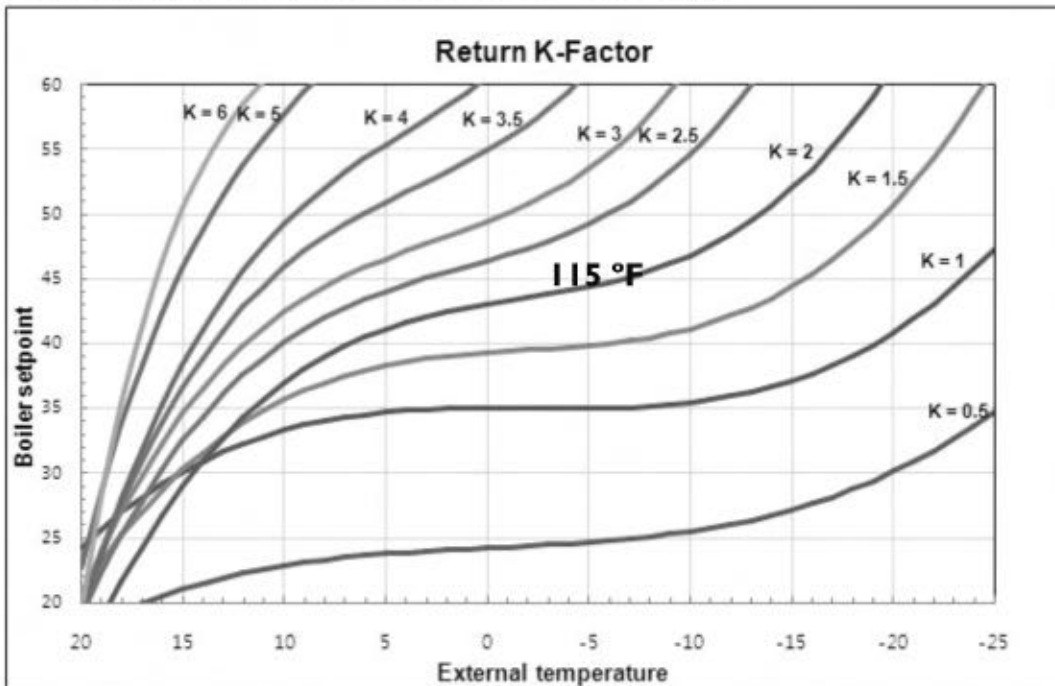
# Outdoor Temperature Sensor (Optional)

## K-Factor (Supply Temperature Setting)



[ Dip Switch #4 of 8 OFF]

## K-Factor (Return Temperature Setting)



[ Dip Switch #4 of 8 ON]

# Electrical Connections



## WARNING

Follow the electrical code requirements of the local authority having jurisdiction. In the absence of such requirements, follow the latest edition of the National Electrical Code (NFPA 70) in the U.S. or the latest edition of CGA C22.1 Canadian Electrical Code - Part 1 in Canada.

### Electric Wiring: Grounding and Surges

- ❑ All units come with a factory installed 3-pronged (grounded) plug end. The combination water heater can be plugged into any electrical outlet close to the unit as it requires only 2 Amperes. It is not necessary to run a dedicated electrical line to the combination water heater.
- ❑ If the local jurisdiction requires the unit to be wired directly, remove and discard the factory installed plug. An ON/OFF switch controlling the main power between the breaker and the Navien Water Heater should be provided to facilitate end-user maintenance and servicing.
- ❑ The combination water heater must be electrically grounded. Ensure the electrical receptacle, in which the water heater will be plugged into, is properly grounded; if wiring directly, do not attach the ground wire to either the gas or the water piping as plastic pipe or dielectric unions may isolate the water heater electrically.
- ❑ The use of a surge protector is recommended to protect from power surges.
- ❑ **Do not plug electrical power to the unit until all plumbing and gas piping is complete and the combination water heater has been filled with water.**
- ❑ The electrical supply required by the water heater is 110~120VAC at 60Hz with a maximum 2A rating with proper grounding.
- ❑ **Do not connect 220~240VAC to this Navien Combination Water Heater. It will damage the combination water heater and this damage is not covered under warranty.**
- ❑ Do not disconnect the power supply when the unit is in normal operation.
- ❑ If there is a power failure in cold weather areas, the freeze prevention system in the water heater will not operate and may result in freezing of the heat exchanger; in cold weather areas where power failures are common, you must completely drain the unit to prevent damage if the power will be off for any extended period of time.
- ❑ A battery back-up (available at most computer retailers) may be used to supply hot water during periods of power outages.
- ❑ Damage caused by freezing is not covered under warranty.

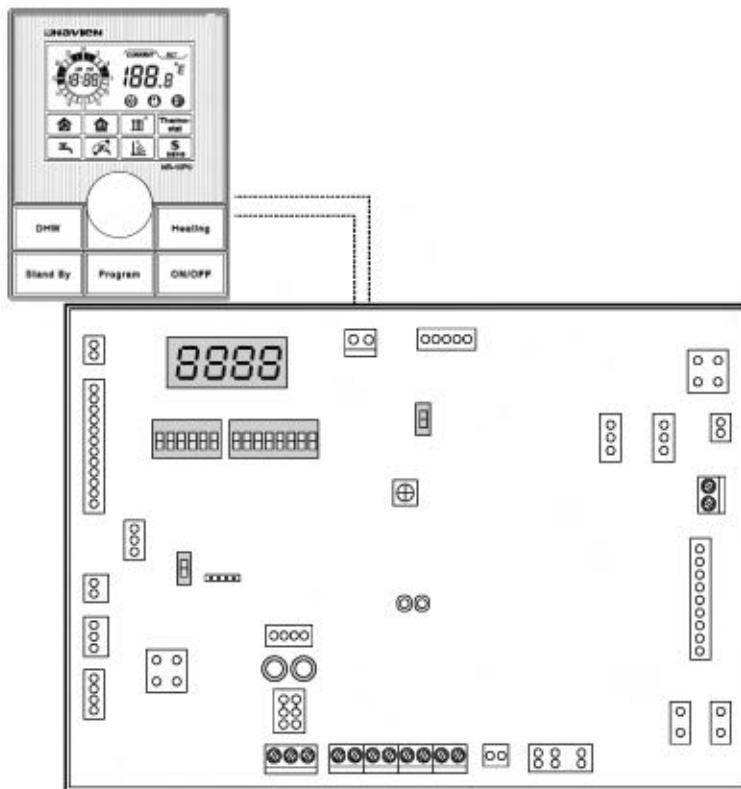
**Caution :** Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.  
Verify proper operation after servicing.

# Remote Controller Installation

Remote Controller NR-10PU

The following are considerations for determining the location of the remote controller:

- Disconnect the power to the combination water heater before installing the remote controller.
- The remote controller connects to the computer board inside the water heater using **at least** 18 gauge wire; **DO NOT** connect 110~120VAC to this remote controller.
- The maximum length of wire between the combination water heater and the remote controller installation location is limited to a maximum of 300 feet.
- There is no polarity.
- The remote controller is water resistant but not water proof.
- Do not install the remote controller outdoors.
- Do not install the remote controller in any area where the controller will be directly exposed to water, heat, humidity or steam.
- Place remote controller out of children's reach.
- Do not disassemble the remote controller.
- Feed the remote controller wire through the black rubber seal at the bottom, right hand, back corner of the case.
- The remote controller attaches to the computer board to the right of the LED (see below):



# Computer Board Settings

## Combination Water Heater Temperature Settings:

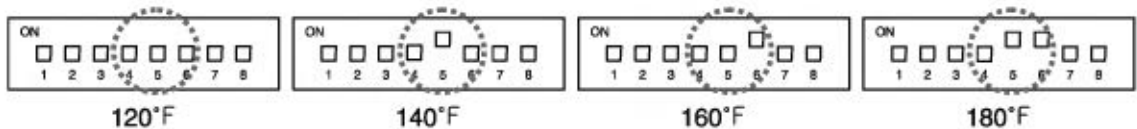


### WARNING

Hot water temperatures over 125°F can cause severe burns instantly or death from scalding.

- ❑ With the Navien Combination Water Heaters, the temperature has been preset at the factory to 120°F (49°C). The computer will electronically control this temperature. The output hot water temperature can be adjusted either manually using the main computer board's DIP switches or with the remote controller. Using the dipswitches, 4 hot water output temperatures can be selected. Please refer to the chart below.
- ❑ Once the remote control is connected to the water heater, it overrides the computer board dipswitch settings. If the remote controller is disconnected from the unit, the computer board will automatically revert to the temperature indicated by the dipswitches. The computer does not store the remote controller's temperature in memory. As such, the remote controller must remain connected to the water heater at all times to maintain any temperature other than the 4 presets.

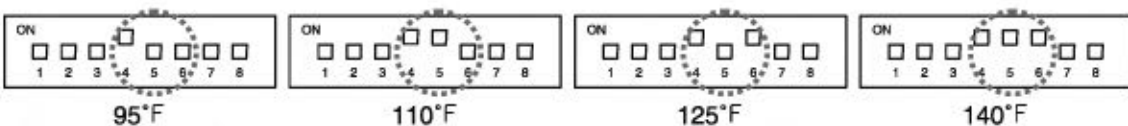
### Supply Temperature Setting



**Warning :** Only change relevant switches. Do not touch another switches

The factory default setting temperature is 125°F (51°C) of Return control mode.

### Return Temperature Setting

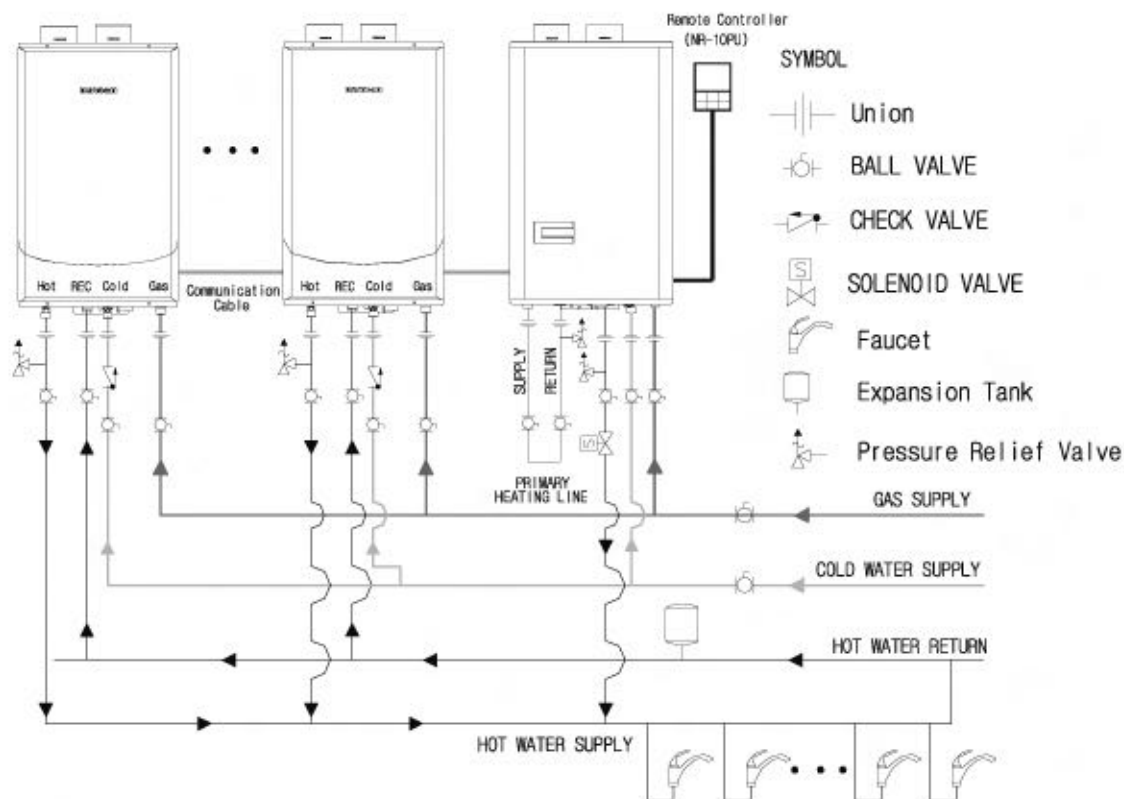


**Warning :** Only change relevant switches. Do not touch another switches

# Cascade Connection and Set-up Procedures

## 1. Step 1: Plumbing

Only 1 Combination Water Heater can be installed in a cascade system and it must be the master. The slave units can only be Navien NR or NP Water Heaters. The maximum number of units per cascade is 16, supplying as much hot water as needed. (In case of cascade setting with CR/CC model, additional download is needed. In case of cascade setting with NP model, the maximum hot water temperature is limited to 140°F)



The trunk line should be sized properly to fit individual applications.

During step 1, the power supply should be OFF.

In case of installing solenoid valves to CH model pipes(supply hot water), the connection should be made to computer board external power port. (refer to wiring diagram)

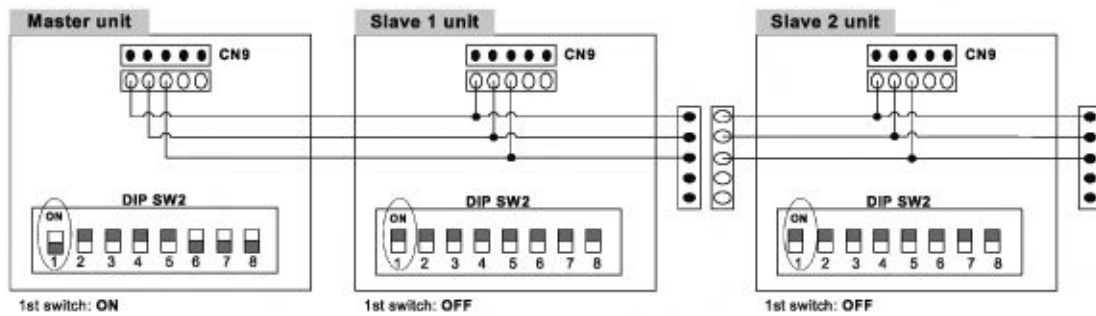
# Cascade Connection and Set-up Procedures

## 2. Step 2: Cable connection and DIP switch change

A multiple unit, which is composed of 1 combination water heater and up to 15 water heater, can be connected by using Naviens' Multi-Link communication cables inside.

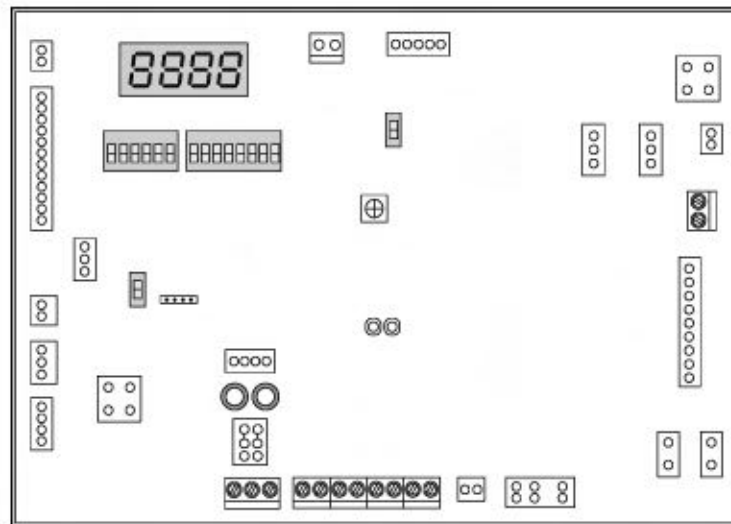
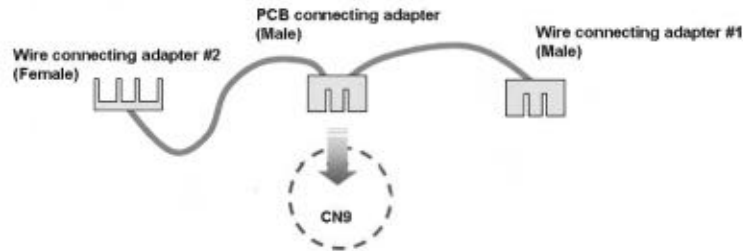
The combination water heater shall be set as a master unit, which can be done by switching the 1<sup>st</sup> switch of DIP SW2 on. All water heaters shall be set as slave units, which also can be done by switching the 1<sup>st</sup> switch of DIP SW2 off. (as shown in the figure below)

During step 2, the power supply should be OFF.



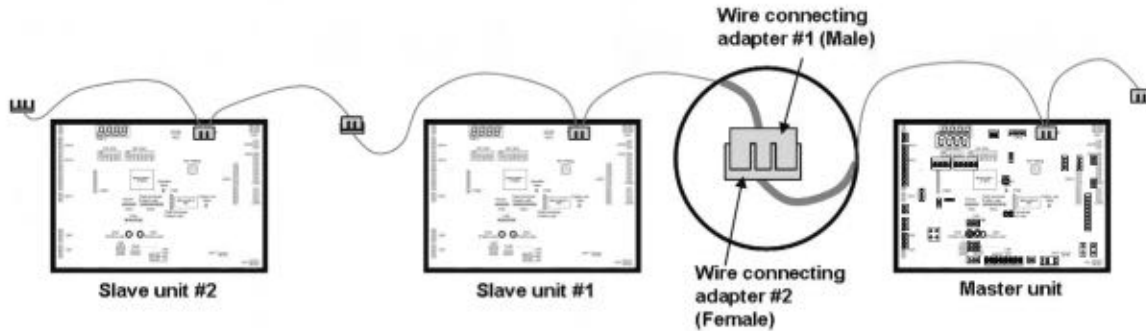
Cable connection and DIP switch set-up

-cascade communication cable PCB connecting adapter PCB CN9 port.



# Cascade Connection and Set-up Procedures

- The diagram above displays the master unit and slave unit connected with the ready link communication cable.



-The recommended location for the master unit is in the center.

## 3. Step 3: Communication set-up

After the cable connections and DIP switches are set-up, the communication set-up should be done.

### 3.1 Master set-up

After the power ON, each FND1 will display on the PCB as below:

Unit	Master Unit	Slave 1 Unit	Slave 2 Unit
FND1	H.0.0.1.	5.0.0.0.	5.0.0.0.

FND1 display: Master set-up

### 3.2 Slave set-up

After the master set-up, push and hold the Tack SW3 and Tack SW4 of slave 1 unit simultaneously for 3 seconds.

FND1 of the slave 1 unit will read "S001".

Slave 2 unit also can be set-up as above.

After the slave set-up, each FND1 will read as below:

Unit	Master Unit	Slave 1 Unit	Slave 2 Unit
FND1	H.0.0.1.	5.0.0.1.	5.0.0.2.

FND1 display: Slave set-up



# Cascade Connection and Set-up Procedures

### 3.3 Set-up finish

After the slave set-up, push and hold the Tack SW3 and Tack SW4 of the master unit simultaneously for 3 seconds.

All the FNDs will display the setting temperature and set-up procedures are finished.

### 4. Master unit Change

Because a multiple unit shall use only 1 combination water heater and the combination water heater shall be a master unit, it is impossible to change the master unit.

### 5. Slave unit Addition/Removal

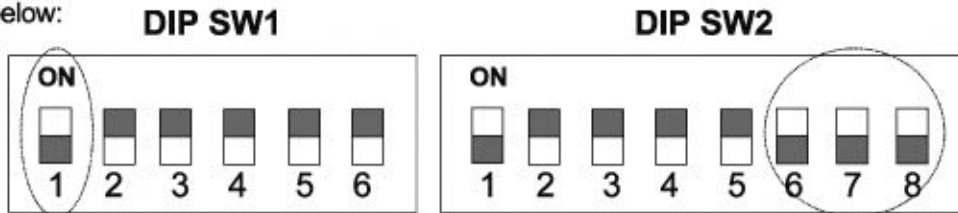
It is always possible to add or remove the slave unit. After all unit power OFF, the communication cable is added or removed on the PCB according to slave unit addition or removal.

There are two cases for system set-up;

Master unit unchanged: In this case, it is necessary to change the processing mechanism of the master unit. The set-up procedures are as below: (5.1 – 5.3)

#### 5.1 Master unit set-up

To add or remove the slave unit, DIP SW1 and SW2 of the master unit PCB are changed as below:



**DIP Switch set-up of the master unit PCB: Slave unit addition/removal**

# 1 switch (DIP SW1) and #6-8 switch (DIP SW2) should be set to ON position.

After all unit power ON, push and hold the Tack SW3 and Tack SW4 of the master unit simultaneously for 3 seconds.

Each FND1 will display on the PCB as below:

Unit	Master Unit	Slave 1 Unit	Slave 2 Unit	Slave 3 Unit
FND1	4000	5000	5000	5000

**FND1 display: Master set-up (slave unit addition)**



# Cascade Connection and Set-up Procedures

## 5.2 Slave unit set-up

This procedure is same as the 3.2 Slave set-up of Step 3: Communication set-up.

After the slave set-up, each FND1 will display on the PCB as below:

Unit	Master Unit	Slave 1 Unit	Slave 2 Unit	Slave 3 Unit
FND1	H.00.1	5.00.1	5.00.2	5.00.3

## 5.3 Set-up finish

After the slave set-up, DIP SW1 and DIP SW2 should be set to the original position and push and hold the Tack SW3 and Tack SW4 of the master unit simultaneously for 3 seconds. All the FND's will display the setting temperature and set-up procedures are finished.

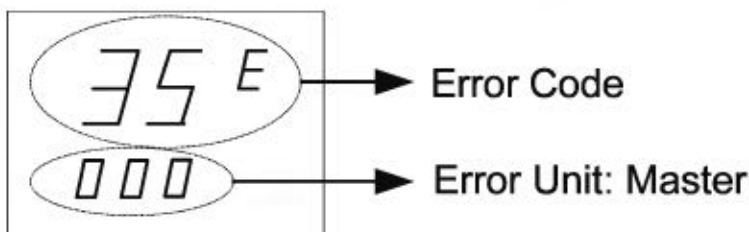
## 6. Error display

In case of the error condition in the cascade system, a relevant error and unit are displayed on the remote controller.

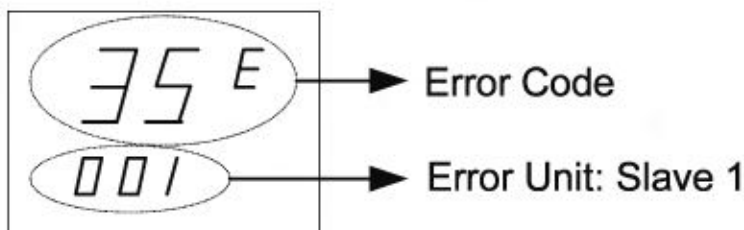
If a master unit is in DHW operation mode, instead of slave error code, the hot water temperature of the master unit is displayed.

Error display example:

- 1) Error code 35 of the master unit



- 2) Error code 35 of the slave 1 unit



## Combination Water Heater DIP Switch Settings

There are two sets of DIP switches; one set has 6 switches and the other has 8 switches.

### Set of 6 Switches:

DIP S/W No.	Description		
	Function	ON	OFF
1	Operation Select 1	<b>(1) Operation Mode Select</b>	
2	Operation Select 2		
3	Gas Type Select	-	NG
4	Cascade Vent Select	Individual Vent	Common Vent
5	BTU Select 1	<b>(2) BTU Select</b>	
6	BTU Select 2		

### (1) #1 & 2: Burner Operation Mode Select

Operation Mode	DIP Switch	
	1	2
Normal Operation	OFF	OFF
Maximum Operation	ON	OFF
Minimum Operation	OFF	ON
3 Stage Minimum	ON	ON

**This dip switch set up is only for Factory use.**

# Combination Water Heater DIP Switch Settings

## (2) #5 & 6: Model Selection

BTU	DIP S/W	
	5	6
150,000 BTU (180)	OFF	OFF
175,000 BTU (210)	ON	OFF
199,000 BTU (240)	OFF	ON

## Set of 8 Switches : Operating Mode Selection

DIP S/W No.	Description		
	Function	ON	OFF
1	Quick Link multi-System Select	Quick Link multi-System	Normal System
2	-	-	-
3	External Thermostat Select	Using External Thermostat	Non-Using External Thermostat
4	Temperature Control	Return Temperature Control	Supply Temperature Control
5	Heating Temperature 1	(3) Supply / Return Temperature Selection	
6	Heating Temperature 2		
7	Hot Water Temperature 1	(4) Hot Water Temperature Selection	
8	Hot Water Temperature 2		

## Combination Water Heater DIP Switch Settings

### (3) #4 & 5& 6: Supply / Return Temperature Selection

Temperature	DIP Switch		
	4	5	6
120°F (49°C)	OFF (Supply)	OFF	OFF
140°F (60°C)		ON	OFF
160°F (71°C)		OFF	ON
180°F (82°C)		ON	ON
95°F (35°C)	ON (Return)	OFF	OFF
110°F (43°C)		ON	OFF
125°F (51°C)		OFF	ON
140°F (60°C)		ON	ON

### (4) #7 & 8: Hot Water Temperature Selection

Temperature	DIP Switch	
	7	8
110°F (43°C)	OFF	OFF
120°F (49°C)	ON	OFF
130°F (54°C)	OFF	ON
140°F (60°C)	ON	ON

### (5) Dip Switch 7

The dip switch 7, which is used only for organizing cascade system, Be switched ON if the corresponding unit is the first or the last unit of Cascade connection.

# Installation Checklist

## Selecting the location and installing the combination water heater:

- Are the proper clearances from windows, doors and other intake vents maintained?
- Is the distance between the combination water heater and point of vent termination minimized?
- Is distance between combination water heater and major fixtures within the house minimized?
- Are the proper service clearances maintained?
- Is the make-up air supply sufficient for proper operation of the combination water heater?
- Is the make-up air supply free of dust, dirt, corrosive elements and flammable vapors?
- Is there a drain in close proximity of the combination water heater?
- Are all combustible materials including clothing, cleaning materials, rags, etc. clear of the combination water heater and vent piping?
- Is the combination water heater securely mounted to the wall?

## Water Supply

- Is the water supply pressure sufficient (should be greater than 40psi)?
- Are there shut-off valves on the inlet and outlet to facilitate cold water inlet filter cleaning?
- Has the air been bled out of each fixture?
- Has each fixtures been checked to ensure hot water is being supplied?
- Has the cold inlet water filter been cleaned?
- If a recirculation line has been installed, have all of the hot water pipes and the recirculation return lines been insulated?

# Installation Checklist

## Pressure Relief Valve

- Is there an approved pressure relief valve installed on the hot water outlet and space heating outlet?
- Does the rating plate on the pressure relief valve indicate a BTU level equal to the maximum BTU rating of the combination water heater?
- Is the pressure relief valve 3/4" on the hot water outlet?
- Is the pressure relief valve 1" on the space heating outlet?
- Has the pressure relief valve been installed on the hot outlet pipe and space heating outlet close to the exit of the combination water heater?
- Has a discharge drain tube been installed from the pressure relief valve to within 6~8" of the floor?

## Gas Supply

- Does the gas supply match the combination water heater's gas type indicated on the rating plate?
- Is the gas line a minimum of 3/4" ID (inner diameter)?
- Is the gas supply line length and diameter sufficient to deliver the required BTUs?
- Has the gas supply line pressure been measured?
- Is the gas supply pressure sufficient for proper operation (within the ranges indicated in the specifications section of this manual)?
- Is the gas line equipped with a manual shut-off valve?
- Has the gas line been pressure tested and/or have all fittings been checked for leaks?
- Has the gas company inspected the installation (if required)?

# Installation Checklist

## Venting

- Has the combination water heater been vented with 3" ABS (except cellular core ABS), 3" PVC, Navien's 4" Stainless Steel Concentric Vent kit or Type BH Special Gas Vent (S636 PVC or stainless steel) for Category IV appliances or in accordance with this manual and/or your local code?
- Ensure that ABS cellular core or PVC cellular core pipe has not been used as venting for this water heater.
- Ensure the water heater is not common vented with any other appliance or vent stack.
- Is the vent sloped upwards toward the vent terminal at a rate of 1/4" per foot (2% grade)?
- Are all vent runs properly supported?
- Has the vent terminal been properly supported?
- Have all air intake and exhaust joints from flue collar to termination been properly sealed?
- Have the vent end caps been installed on the exhaust and the intake pipes?
- Has the venting been checked for leakage?
- Is the vent terminal a minimum of 12" above the exterior grade?
- Has sufficient make-up air been supplied?
- Is the total vent length within the stated maximum vent length restriction?
- Has a condensation drain line been installed from the combination water heater to a floor drain or laundry tub?

## Electrical Wiring

- Is the supplied voltage 110~120VAC?
- Is the combination water heater plugged into a properly grounded electrical outlet?
- If the supplied power cord has been discarded to meet local codes, has an "ON/OFF" switch been installed to facilitate end-user maintenance?

# Installation Checklist

## DIP Switch Settings:

### For the set of 6 DIP switches:

- Are switch #1 and #2 in the down (OFF) position?
- Is switch #3 properly set for the gas supply type?
- Is switch #4 properly set for the cascade vent type? (Individual vent or common vent)
- Are switch #5 and #6 set for the proper model number?

### For the set of 8 DIP switches:

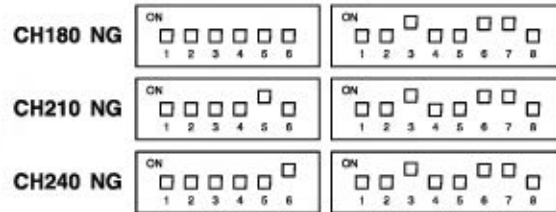
- Unless using quick link multi-system, is switch #1 in the down (OFF) position?
- Is switch #2 in the down (OFF) position?
- Unless using Thermostat, is switch #3 in the down (OFF) position?
- Is switch #4 properly set for the Supply control or Return control mode?
- Are switches #5 and #6 set to the customer's desired CH temperature?
- Are switches #7 and #8 set to the customer's desired DHW temperature? Recommended temperature should not exceed 140°F.

## Final

- Has the owner been advised of the minimum flow rate to trigger the burner?
- Has the owner been shown how to clean the cold water inlet filter?
- Has the owner been left with the operation and installation manual for future reference?
- Has the owner been shown how to shut off the gas in case of an emergency?



## Factory Default Setting of Dip Switch

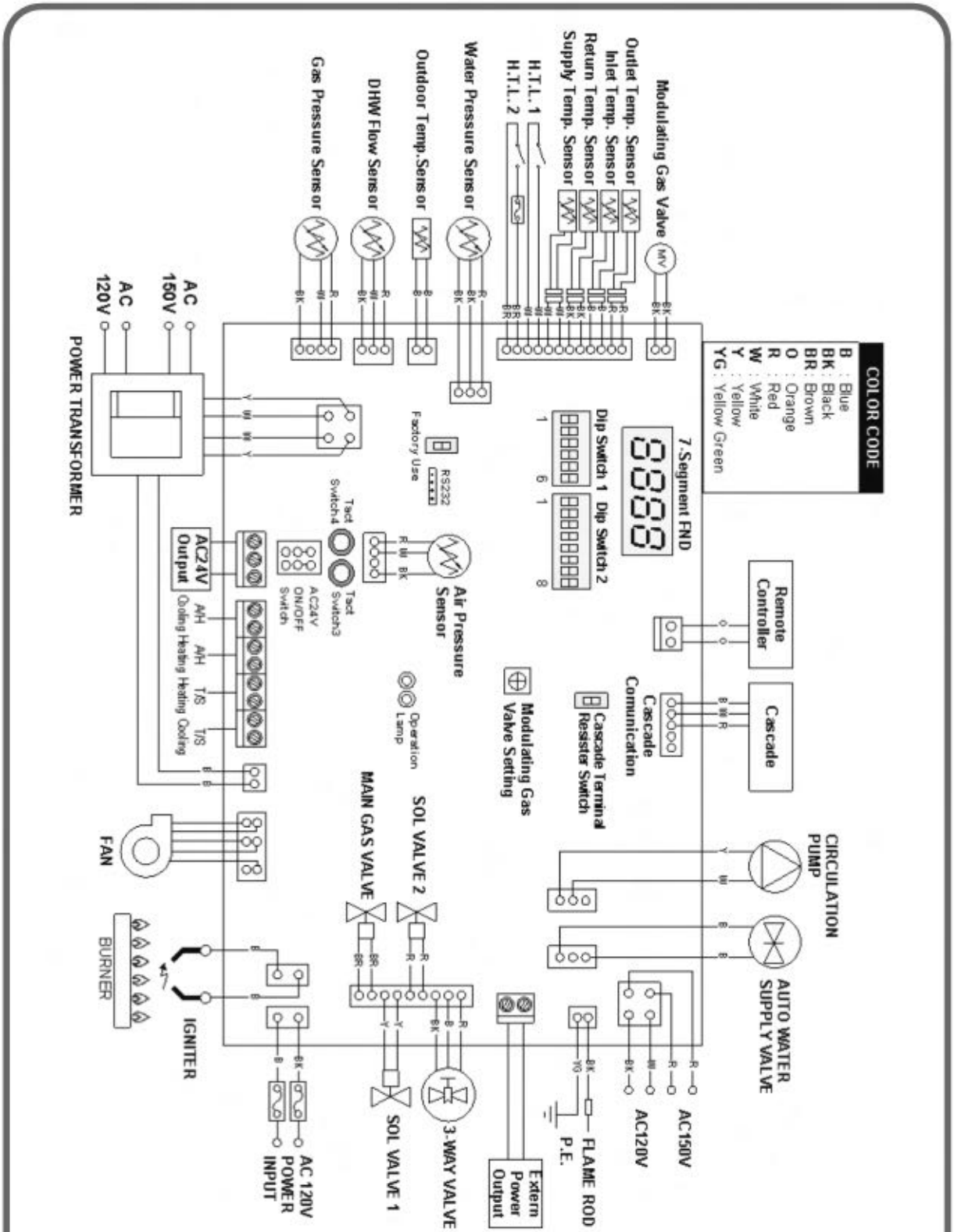


## Completing the Install

If you answered “yes” to all of the questions in the above checklist, your install is now complete. If you answered “no” to any of the points in the checklist, please review the installation and operation manuals to confirm your installation. For any troubleshooting issue, see the “Error Codes” section of the operating manual. For any questions or problems during the installation, contact Navien’s technical department toll-free at 1-800-519-8794 (949-955-9009) or visit the technical support section of the website at:

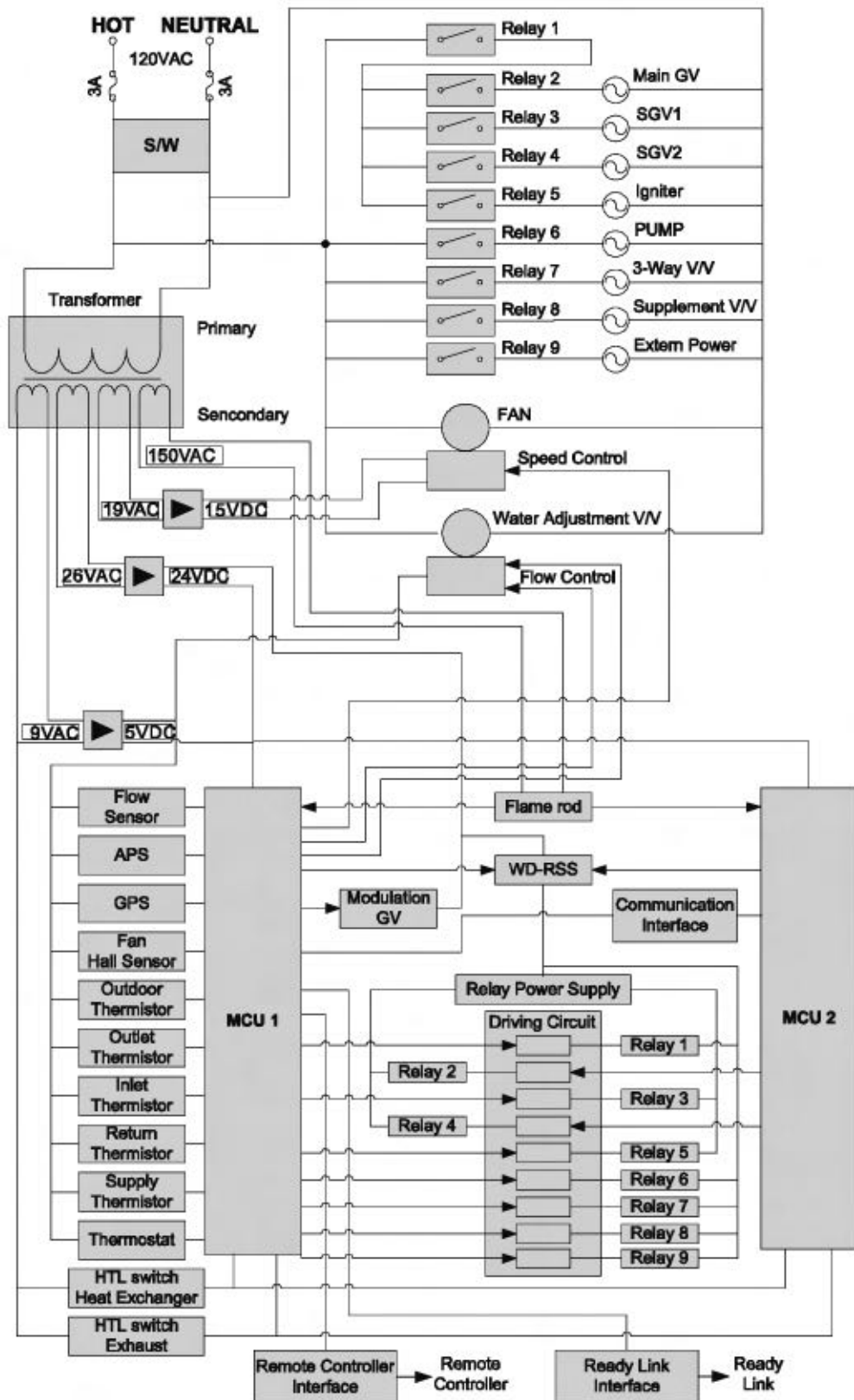
- [www.navienamerica.com](http://www.navienamerica.com)

# Wiring Diagram



If any of the original wire as supplied with the combination water heater must be replaced, it must be replaced with its equivalent.

# Ladder Diagram

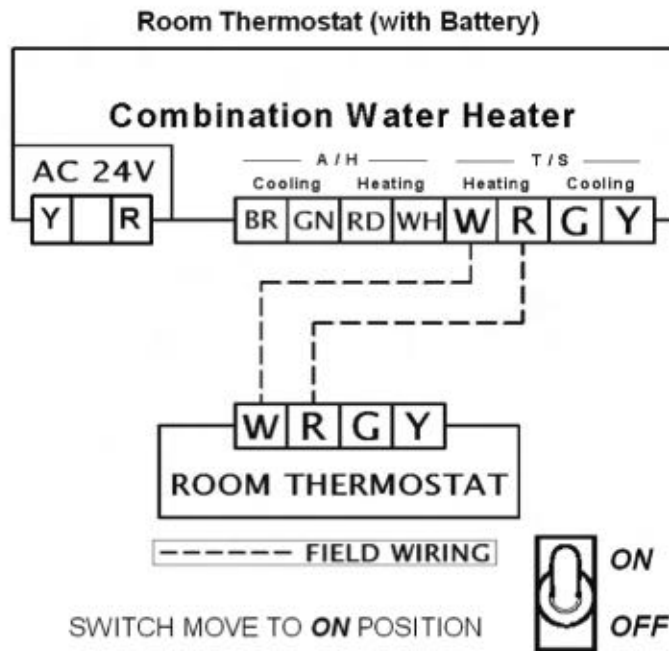


## Wiring

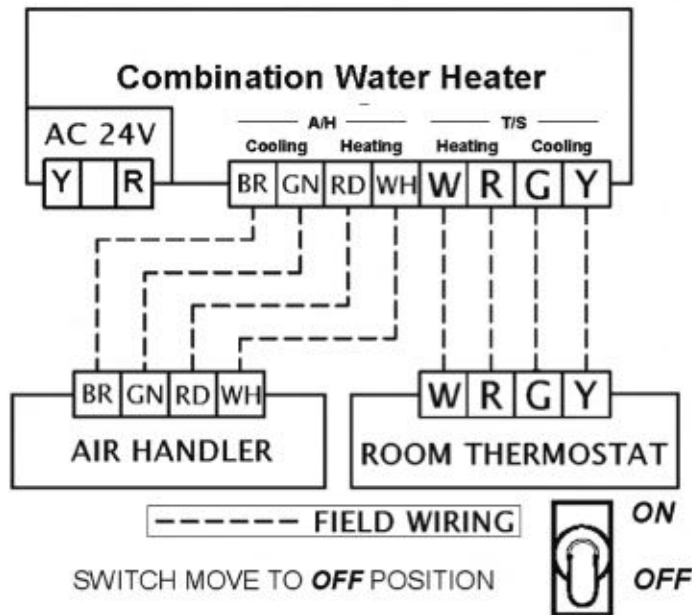
- ❑ The unit must be in OFF position before connecting the electrical wires.
- ❑ Make sure the circuit breaker on the distribution panel is OFF or ON/OFF switch in Navien combination water heater is OFF.
- ❑ From the bottom of Navien combination water heater, connect the 120 VAC.
- ❑ When Room Thermostat needs external 24 VAC power, Navien Combination Water Heater provides 24 VAC power for your convenience or having external 24 VAC transformer.
- ❑ Terminal for connecting Thermostat R and W not required any power.
- ❑ It works as contact point.
- ❑ It is advised that main supply voltage fluctuations are not to exceed 10 percent of the nominal supply voltage.
- ❑ It is specified that a switch or circuit-breaker shall be included in the building Installation; it shall be in close proximity to the equipment; and it shall be marked as the disconnecting device for the equipment.
- ❑ It is required to have insulation for external circuits to conform to the requirements for protection against electric shock.
- ❑ It is required to have over current protection devices when installed indoors.

# Wiring

❑ In-Floor Radiant Heating System and Baseboard Heating System



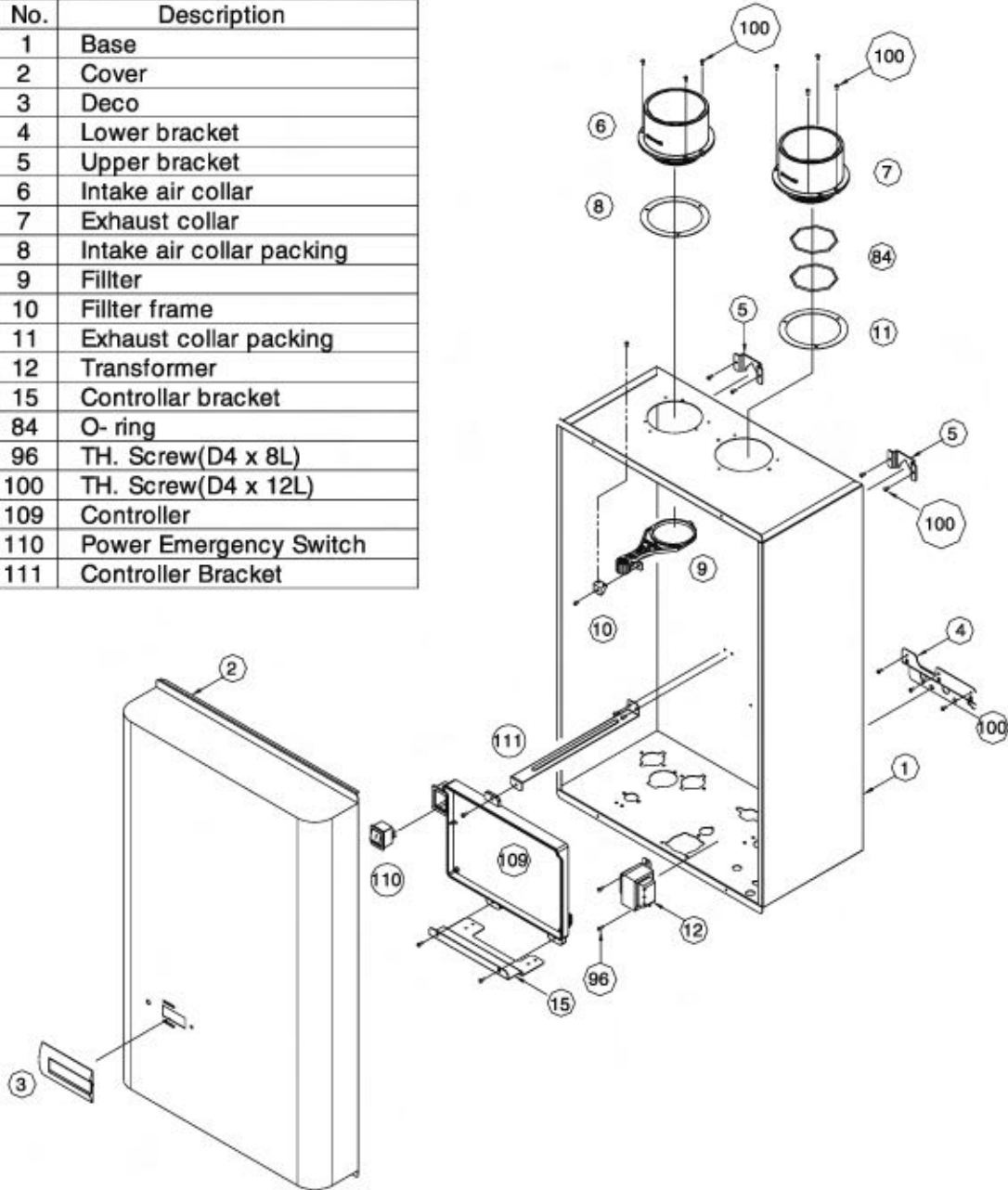
❑ Fan-Assisted Hydro Heating System



# Components Diagram & Parts List

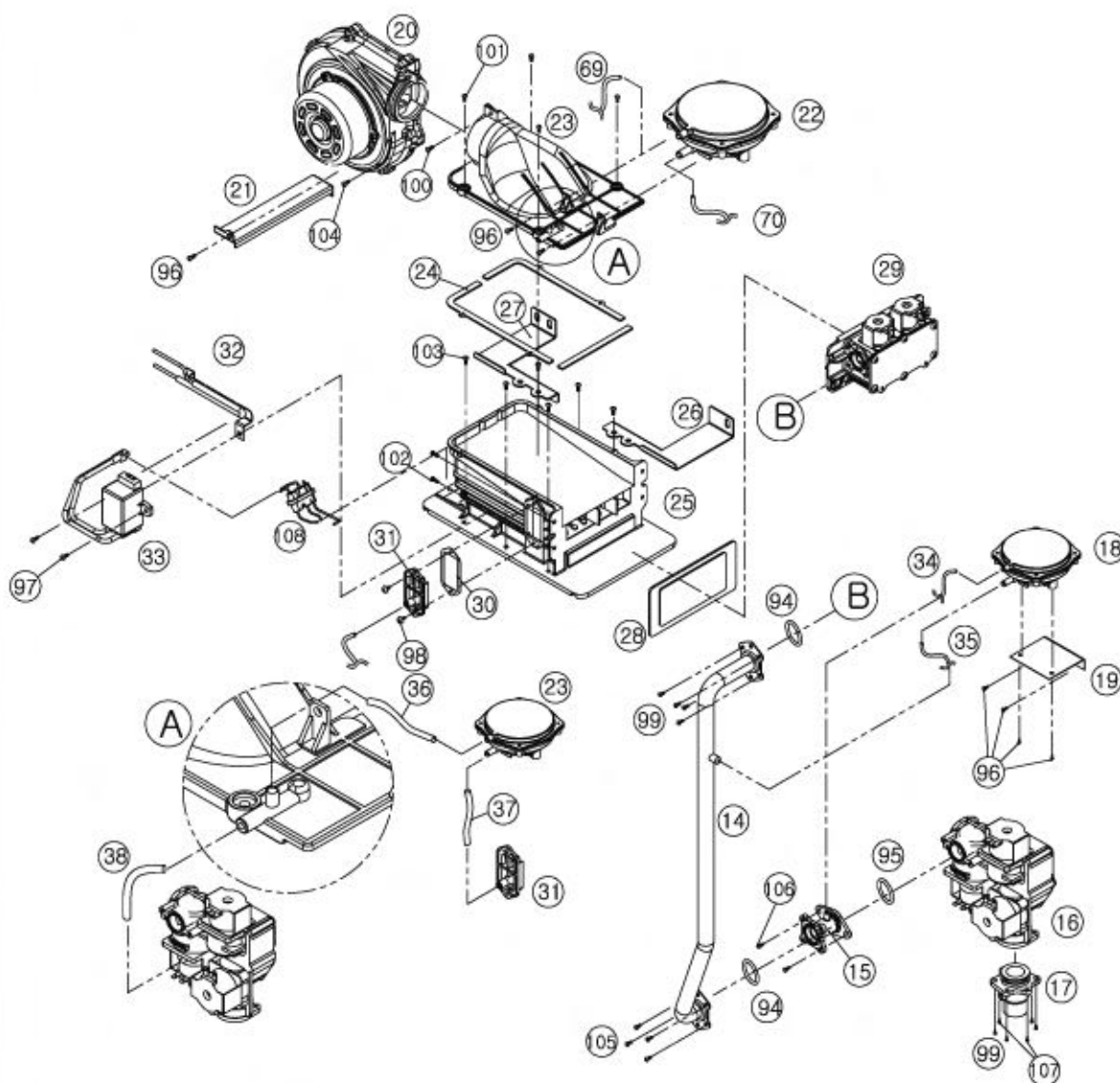
## CASE ASSEMBLY : CH

No.	Description
1	Base
2	Cover
3	Deco
4	Lower bracket
5	Upper bracket
6	Intake air collar
7	Exhaust collar
8	Intake air collar packing
9	Filter
10	Filter frame
11	Exhaust collar packing
12	Transformer
15	Controllar bracket
84	O- ring
96	TH. Screw(D4 x 8L)
100	TH. Screw(D4 x 12L)
109	Controller
110	Power Emergency Switch
111	Controller Bracket



# Components Diagram & Parts List

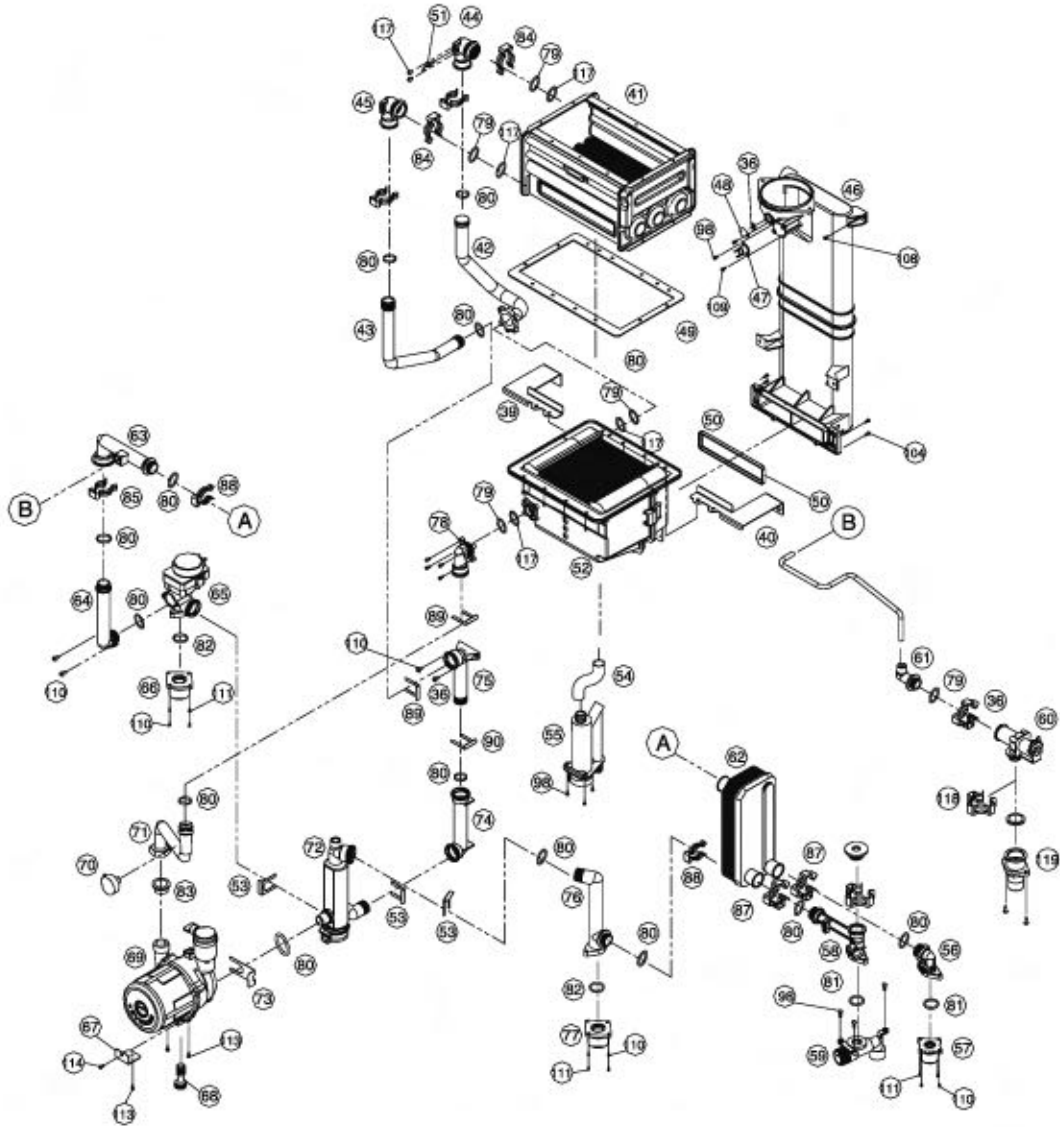
## BURNER ASSEMBLY : CH



No.	Description	No.	Description	No.	Description
14	Gas pipe	28	Packing	97	TH. Screw (D4×6L)
15	GPS venturi	29	Manifold	98	TH. Screw (D4×12L)
16	Main gas valve	30	APS venturi packing	99	TH. Screw (D4×6L) STS
17	Gas inlet	31	APS venturi	100	Tap Screw (D4×8L)
18	Gas pressure sensor	32	Temperature fuse	101	Screw (M4×8L)
19	GPS bracket	33	Igniter	102	Screw (D4×12L)
20	Fan	34	Tube 7×4×550L	103	Screw (D4×14L)
21	Fan bracket	35	Tube 7×4×170L	104	Screw (D4×16L)
22	Air pressure sensor	36	Tube (black) 7×4×50L	105	Bolt (M4×6L) STS
23	Combustion air intake duct	37	Tube (black) 7×4×170L	106	Bolt (M4×10L) STS
24	CAID packing	38	Tube (black) 6×3×550L	107	Bolt (M4×12L) STS
25	Burner assembly	94	O-ring 19.8×2.4t	108	Ignitor and flame rod
26	Burner bracket (L)	95	O-ring 19.8×2.7t		
27	Burner bracket (R)	96	TH. Screw (D4×8L)		

# Components Diagram & Parts List

## WATER WAY ASSEMBLY : CH



60 Auto water supplement valve	82 Packing 20A		
59 Cold water inlet adaptor	81 Packing 15A	120 Blank Plate	
58 Water flow sensor	80 O- ring $\varnothing 17.5 \times 2.7t$	119 Auto Feeder Connector	
57 Hot water outlet adaptor	79 O- ring P18	118 Fastener "D"	
56 Hot water outlet pipe	78 Heat exchanger inlet pipe adaptor	117 Back-up ring	
55 Siphon	77 Heating return adaptor	115 TH. SCREW (D4X6L)	
54 siphon hose	76 Heating return pipe	114 BOLT (M4X8L)	
53 Fastener	75 Heating supply pipe 2	113 TH. SCREW (D4X8L)	
52 Secondary heat exchanger	74 Heating supply pipe 1	112 TH. SCREW (D4X12L)	
51 Thermistor	73 Pump Fastener	111 BOLT M4 X 6L	
50 Exhaust dust packing	72 Strainer	110 HEAD SCREW (D4X14L)	
49 packing	71 Heat exchanger inlet pipe	109 BOLT (M3X5L)	
48 Gas check port plate	70 Water pressure sensor	108 HEAD SCREW (D4X16L)	
47 High- limit switch	69 Circulation pump	99 TH. SCREW (D4X10L)	
46 Exhaust duct	68 Pump drain plug	98 TH. SCREW (D4X10L)STS	
45 Water pipe adaptor "A"	67 Pump bracket	89 Fastener	
44 Water pipe adaptor "B"	66 3- way valve adaptor	88 Fastener "A"	
43 Hot water supply pipe	65 3- way valve	87 Fastener "A"	
42 H/E connecting pipe	64 Hot water inlet pipe 2	86 Fastener "B"	
41 Primary heat exchanger	63 Hot water inlet pipe 1	85 Fastener "C"	
40 Burner B/K (R)	62 Hot water exchanger	84 Fastener "A"	
39 Burner B/K (L)	61 Water supplement pipe	83 Packing	



**MEMO**

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**MEMO**

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# Service

## GENERAL TROUBLESHOOTING PROBLEM POSSIBLE SOLUTIONS

### **It takes a long time to get hot water to the fixtures.**

- ▶ Circulation pump is in Freeze protection mode. Circulation pump needs to change hot water circulation mode.

### **The water is not hot enough.**

- ▶ Check ground water temperature first and system setting temperature.
- ▶ Check cross plumbing between cold water lines and hot water lines.

How? Shut off Main cold water supply valve to water heater, which means no water supply to water heater. Open any hot water faucet. If cold water comes from hot side faucet, there is cross hot and cold water lines somewhere in facility.

- ▶ Is the gas supply valve fully open?
- ▶ Is the gas line sized properly?
- ▶ Is the gas supply pressure enough?
- ▶ Is the set temperature too low?

### **The water is too hot.**

- ▶ Is the set temperature set too high?

### **The hot water is not available when a fixture is opened.**

- ▶ Make sure the unit gets 120V 60Hz power supply.
- ▶ Is the gas supply valve fully open?
- ▶ Is the water supply valve fully open?
- ▶ Is the filter on cold water inlet clean?
- ▶ Is the hot water fixture sufficiently open to draw at least 0.5 GPM through the water heater?
- ▶ Is the unit frozen?
- ▶ Is there enough LPG gas in the tank?

### **The hot water turns cold and stays cold.**

- ▶ Is the flow rate enough to keep the Model 35-1 running?
- ▶ If there is a recirculation system installed, does the recirculation line have right check valves?
- ▶ Is the gas supply valve fully open?
- ▶ Is the filter on cold water inlet clean?
- ▶ Are the fixtures clean of debris and obstructions?
- ▶ Check cross plumbing between cold water lines and hot water lines.

### **Hot water temperature fluctuating.**

- ▶ Check incoming cold water pressure whether it is too low. (needs minimum 15PSI)
- ▶ Is the filter on cold water inlet clean?
- ▶ Is the gas line sized properly?
- ▶ Is the supply gas pressure enough?
- ▶ Check for cross connection between cold water lines and hot water lines.

Condensing  
**NAVIENT**  
Navigating Energy and Environment

***Navient Gas Combination Water Heater***



Navient America Inc.  
1371 Santa Fe Drive, Tustin CA 92780  
Tel: 714 258 9005, Fax: 714 258 9010, Toll Free: 1-800-519-8794  
[www.NavientAmerica.com](http://www.NavientAmerica.com)