

NR50-OD

NR66 (-SV,-OD) / N-0531S (-OD)

NR71 (-SV,-OD) / N-0631S (-OD)

NR98 (-SV,-OD,-DVC) / NC199 (-OD, -DVC) / N-0751M (-OD,-DVC)

NCC199 (-SV,-DV) / N-0841MC (-DV)

NRC111 (-SV,-DV) / N-0842MC (-DV)

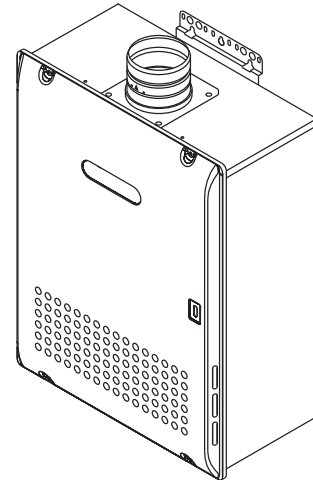
NR111 (-SV,-OD,-DV) / NC250 (-SV,-DV)-ASME / N-0931M (-OD,-DV)

NC380-SV-ASME / N-1321M-ASME

Service Manual

- Refer to this manual whenever performing service or maintenance on this appliance.
- This manual will be used for service technician training seminars.
- The specifications and descriptions in this manual may be changed without prior notice.
- For further assistance, contact Noritz Technical Support at 1-866-766-7489.

Do not short circuit any safety device on this appliance



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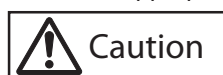
Important Safety Information

To prevent damage to property and injury to the user, the icons below warn of varying levels of risk.

 Warning	Ignoring this indication will cause an immediate danger of death or serious injury.
 Caution	Ignoring this indication may result in death or serious injury.
	Prohibited.

1. Safety Tips for Service

- Wear the appropriate clothing and protective gear:



- In order to prevent injury or accident, wear a protective helmet, safety boots and a lifting belt whenever necessary.

- Use only the appropriate tools and parts:



- Only use replacement parts manufactured by Noritz for this model as listed in the Installation Manual Parts List for service on this unit. Use appropriate tools.

- Modification of the unit is prohibited:



- Do not attempt to modify or alter the unit. This will cause a fire hazard and a risk of electrical shock.

- When servicing:



- Disconnect the power supply during maintenance and repairs to reduce the risk of electric shock. If it is necessary to have the electricity connected during repairs, use extreme caution not to touch parts that may cause a shock.

- Do not short circuit any safety device on this appliance:



- If a safety device is not functioning properly, replace the part. Do not under any circumstances short circuit the part.

- Exhaust and gas leakage caution:



- Always check for leaks when installing or modifying the exhaust vent or gas piping.

2. Post-Service Checks

- Check parts for leaks:



- Confirm that there are no gas, water, or exhaust leaks regardless of whether the service performed could have caused them.
- If the unit is installed indoors, check that the flue collar and vent pipe are installed correctly and that they are in good condition. Confirm that there are no gas, water or exhaust leaks regardless of whether the service performed could have caused them.

- Check for combustibles:



- After service or maintenance is completed, check that there are no combustibles in the vicinity of the unit.

- Check insulation resistance:



- After service or maintenance is completed, measure the resistance between the electrical wires and ground. If it is less than 10MΩ, there is a risk of electrical shock.

- Properly reconnect the power supply:



- Confirm that the power supply has been reconnected properly after service or maintenance is completed. Also confirm that there is no dust or other obstacles that might cause an electric shock or a fire hazard.

1. Features

- 1. Quick Connect Multi System** (For NR98/NC199/N-0751M Series, NCC199/N-0841MC Series, NRC111/N-0842MC Series, NR111/NC250/N-0931M Series, and NC380/N-1321M Series only)
- Allows the simple installation of up to 2 units linked together using a Quick Connect Cord

CCP Valve } Not required
System Controller

- 2. Secondary Recirculation Pump in a Multi-System** (For NCC199/N-0841MC Series, NRC111/N-0842MC Series, NR111/NC250/N-0931M Series, and NC380/N-1321M Series only)
- Two recirculation pumps can be connected to the multi-system controller to provide a rotational pump system. The multi-system controller will rotate the run time of each pump to increase pump life and also provide a backup should one pump fail.

- 3. Multi-System Rotation Timing** (For NCC199/N-0841MC Series, NRC111/N-0842MC Series, NR111/NC250/N-0931M Series, and NC380/N-1321M Series only)
- (1) In a multi-system installation, the system controller rotates the primary unit every 8 hours of accumulated combustion time.
 - (2) If the primary unit is operating during the rotation timing, rotation is made after combustion is finished (wait time of up to 16 hours).
 - (3) Rotation is made every 24 hours, regardless of the burn, to ensure even wear.

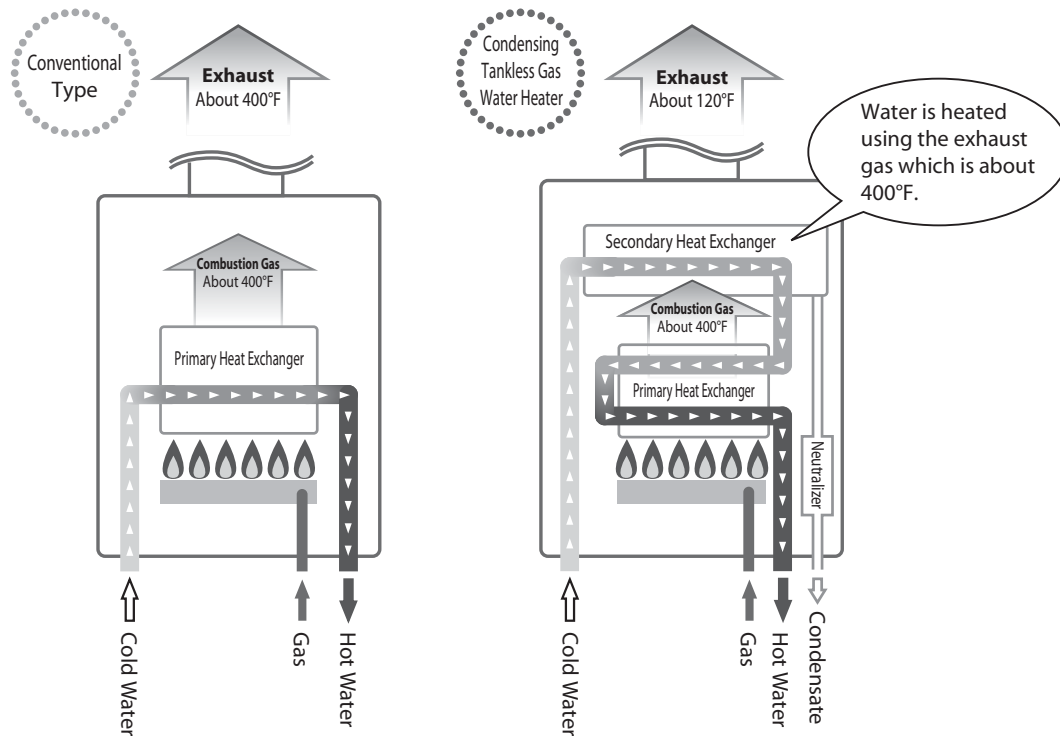
- 4. Maximum Remote Controller Length** (Only one remote controller can be connected.)
- Remote Controller (1 unit): Cord can be extended up to 300' with 18AWG wire.
 - * Note: In a Quick Connect Multi-System, only one remote controller will be installed.
(For NR98/NC199/N-0751M Series, NCC199/N-0841MC Series, NRC111/N-0842MC Series, NR111/NC250/N-0931M Series, and NC380/N-1321M Series only)

- 5. Temperature Lockout Function**
- The Remote Controller can be set to restrict the maximum allowable temperature setting for added safety. See page 82-83 for details.

- 6. Elevation Adjustment**
- The water heater can be quickly configured for installations above 2000' by simply disconnecting a jumper inside of the unit. No additional equipment or adjustments are necessary. See the "Installation Manual" for details.

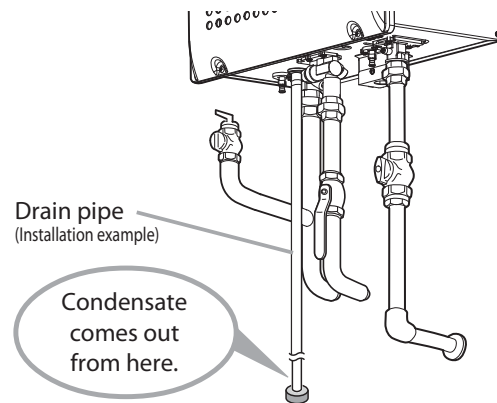
■ Overview of Condensing Tankless Gas Water Heater

This water heater is a high efficiency, fully condensing appliance. Unlike a traditional tankless water heater, a condensing type captures heat from the exhaust gas and uses it to preheat the incoming cold water as it passes through the secondary heat exchanger as illustrated below.



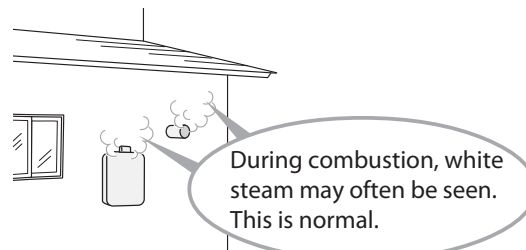
The condensing tankless gas water heater discharges condensate.

When heat from the exhaust gas is collected within the secondary heat exchanger, condensation occurs from moisture in the exhaust gas and the resulting water is discharged from the drain pipe (approx. 2 gallons/hour (GPH) maximum). It is not a water leak. Do not plug or block the drain line as it must always be allowed to freely flow.



The condensing tankless gas water heater tends to show white steam.

After the exhaust gas passes through the secondary heat exchanger, it becomes low in temperature and moisture rich which tends to produce steam at the vent discharge terminal. This is a normal occurrence.



2. Specifications/Performance Table

■ NR50-OD / NR66 (-SV,-OD) / N-0531S (-OD) / NR71 (-SV,-OD) / N-0631S (-OD)

Item		Specification				
Model Name		NR50-OD	NR66-SV N-0531S	NR66-OD N-0531S-OD	NR71-SV N-0631S	NR71-OD N-0631S-OD
Type	Installation	Outdoor, Wall Mounted	Indoor/Outdoor, Wall Mounted	Outdoor, Wall Mounted	Indoor/Outdoor, Wall Mounted	Outdoor, Wall Mounted
	Air Supply/Exhaust	Power Vented				
Ignition		Direct Ignition				
Operating Pressure		15-150 psi				
Minimum Flow Rate		0.5 GPM				
Dimensions		20.5"(Height) x 13.8"(Width) x 6.7"(Depth)			23.6"(Height) x 13.8"(Width) x 6.7"(Depth)	
Weight		33 lbs.	36 lbs.		41 lbs.	
Water Holding Capacity		0.2 Gallon				
Connection Sizes	Water Inlet	3/4"				
	Hot Water Outlet	3/4"				
	Gas Inlet	1/2"	3/4"			
Power Supply	Supply	120 VAC (60Hz)				
	Consumption	NG : 36W	NG : 54W	NG : 51W	NG : 59W	NG : 46W
		LP : 39W	LP : 59W	LP : 52W	LP : 66W	LP : 50W
		Freeze Prevention 141W (Optional for NR50-OD)				
Materials	Casing	Zincified Steel Plate/Polyester Coating				
	Flue Collar	Stainless Steel				
	Heat Exchanger	Copper Sheeting, Copper Tubing				
Safety Devices		Flame Rod, Thermal Fuse, Lightning Protection Device (ZNR), Overheat Prevention Device, Freeze Prevention Device (optional for NR50-OD), Fan Rotation Detector				
Accessories		Anchoring Screws				

■ NR98 (-SV,-OD,-DVC) / NC199 (-OD,-DVC) / N-0751M (-OD,-DV,-DVC)

Item		Specification			
Model Name		NR98-SV N-0751M	NR98-OD NC199-OD N-0751M-OD	N-0751M-DV	NR98-DVC NC199-DVC N-0751M-DVC
Type	Installation	Indoor/Outdoor, Wall Mounted	Outdoor, Wall Mounted	Indoor, Wall Mounted	
	Air Supply/Exhaust	Power Vented			
Ignition		Direct Ignition			
Operating Pressure		15-150 psi			
Minimum Flow Rate		0.5 GPM			
Dimensions		23.6"(Height) x 13.8"(Width) x 9.4"(Depth)	24.2"(Height) x 18.3"(Width) x 9.4"(Depth)	23.6"(Height) x 13.8"(Width) x 10.2"(Depth)	
Weight		47 lbs.	54 lbs.	55 lbs.	
Water Holding Capacity		0.2 Gallon			
Connection Sizes	Water Inlet	3/4"			
	Hot Water Outlet	3/4"			
	Gas Inlet	3/4"			
Power Supply	Supply	120 VAC (60Hz)			
	Consumption	NG : 62W	NG : 64W	NG : 85W	NG : 108W
		LP : 75W	LP : 77W	LP : 100W	LP : 96W
		Freeze Prevention 145W		Freeze Prevention 161W	
Materials	Casing	Zincified Steel Plate/Polyester Coating			
	Flue Collar	Stainless Steel			
	Heat Exchanger	Copper Sheetting, Copper Tubing			
Safety Devices		Flame Rod, Thermal Fuse, Lightning Protection Device (ZNR), Overheat Prevention Device, Freeze Prevention Device, Fan Rotation Detector			
Accessories		Remote Controller, Remote Controller Cord, Anchoring Screws			Anchoring Screws

■ NCC199 (-SV,-DV) / N-0841MC (-DV) / NRC111 (-SV,-DV) / N-0842MC (-DV)

Item		Specification			
Model Name		NCC199-SV N-0841MC	NCC199-DV N-0841MC-DV	NRC111-SV N-0842MC	NRC111-DV N-0842MC-DV
Type	Installation	Indoor/Outdoor, Wall Mounted	Outdoor, Wall Mounted	Indoor/Outdoor, Wall Mounted	Indoor, Wall Mounted
	Air Supply/Exhaust	Power Vented			
Ignition		Direct Ignition			
Operating Pressure		15-150 psi			
Minimum Flow Rate		0.5 GPM			
Dimensions		24.4"(Height) x 18.4"(Width) x 9.4"(Depth)			
Weight		73 lbs.			
Water Holding Capacity		0.5 Gallon			
Connection Sizes	Water Inlet	3/4"			
	Hot Water Outlet	3/4"			
	Gas Inlet	3/4"			
Power Supply	Supply	120 VAC (60Hz)			
	Consumption	NG : 106W			
		LP : 109W			
		Freeze Prevention 213W			
Materials	Casing	Stainless Steel		Zincified Steel Plate/Polyester Coating	
	Flue Collar	Stainless Steel			
	Heat Exchanger	Copper Sheetting, Copper Tubing			
Safety Devices		Flame Rod, Thermal Fuse, Pressure Relief Valve, Lightning Protection Device (ZNR), Overheat Prevention Device, Freeze Prevention Device, Fan Rotation Detector			
Accessories		Remote Controller, Remote Controller Cord, Anchoring Screws			

■ NR111 (-SV,-OD,-DV) / NC250 (-SV,-DV)-ASME / N-0931M (-OD,-DV) / NC380-SV-ASME

Item		Specification			
Model Name		NR111-SV NC250-SV-ASME N-0931M	NR111-OD N-0931M-OD	NR111-DV NC250-DV-ASME N-0931M-DV	NC380-SV-ASME
Type	Installation	Indoor/Outdoor, Wall Mounted	Outdoor, Wall Mounted	Indoor, Wall Mounted	Indoor/Outdoor, Wall Mounted
	Air Supply/Exhaust	Power Vented			
Ignition		Direct Ignition			
Operating Pressure		15-150 psi			
Minimum Flow Rate		0.5 GPM			0.7 GPM
Dimensions		24.2"(Height) x 18.3"(Width) x 9.4"(Depth)			29.7"(Height) x 19.1"(Width) x 11.8"(Depth)
Weight		62 lbs.			105 lbs.
Water Holding Capacity		0.3 Gallon			0.6 Gallon
Connection Sizes	Water Inlet	3/4"			1"
	Hot Water Outlet	3/4"			1"
	Gas Inlet	3/4"			1"
Power Supply	Supply	120 VAC (60Hz)			
	Consumption	NG : 115W	NG : 90W	NG : 115W	NG : 137W
		LP : 115W	LP : 95W	LP : 120W	LP : 142W
		Freeze Prevention 250W			Freeze Prevention 371W
Materials	Casing	Zincified Steel Plate/ Polyester Coating (Stainless Steel for ASME)	Zincified Steel Plate/ Polyester Coating	Zincified Steel Plate/ Polyester Coating (Stainless Steel for ASME)	Stainless Steel
	Flue Collar	Stainless Steel			
	Heat Exchanger	Copper Sheetting, Copper Tubing			
Safety Devices		Flame Rod, Thermal Fuse, Pressure Relief Valve, Lightning Protection Device (ZNR), Overheat Prevention Device, Freeze Prevention Device, Fan Rotation Detector			
Accessories		Remote Controller, Remote Controller Cord, Anchoring Screws			

Performance

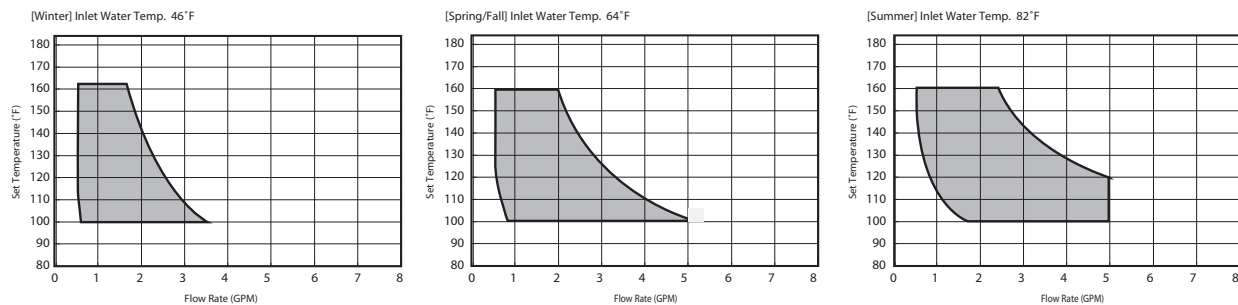
Item		NR50-OD	NR66-SV N-0531S	NR66-OD N-0531S-OD	NR71-SV N-0631S	NR71-OD N-0631S-OD
Gas Consumption	Maximum Performance	NG : 120,000 btuh LP : 120,000 btuh	NG : 140,000 btuh LP : 140,000 btuh	NG : 180,000 btuh LP : 180,000 btuh	NG : 180,000 btuh LP : 180,000 btuh	NG : 180,000 btuh LP : 180,000 btuh
	Minimum Performance	NG : 20,000 btuh LP : 20,000 btuh	NG : 20,000 btuh LP : 20,000 btuh	NG : 25,000 btuh LP : 25,000 btuh	NG : 25,000 btuh LP : 25,000 btuh	NG : 25,000 btuh LP : 25,000 btuh
Maximum Hot Water Capacity	45°F Rise	4.2 Gal./min.	5.3 Gal./min.	6.3 Gal./min.	6.3 Gal./min.	6.3 Gal./min.
Capacity Range		0.5 - 5.0 Gal./min.	0.5 - 6.6 Gal./min.	0.5 - 7.1 Gal./min.	0.5 - 7.1 Gal./min.	0.5 - 7.1 Gal./min.
Default Temperature Options		120, 130, 135 (for NR50-OD only), 140°F (Original is 120°F)				
Temperature Settings (Using the Remote Controller)		100 - 150°F (In 5°F intervals), 160°F (12 Options)				

Item		NR98 (-SV,-OD) N-0751M (-OD,-DV)	NR98-DVC N-0751M-DVC	NCC199 (-SV,-DV) N-0841MC (-DV)	NRC111 (-SV,-DV) N-0842MC (-DV)
Gas Consumption	Maximum Performance	NG : 199,900 btuh LP : 199,900 btuh			
	Minimum Performance	NG : 12,000 btuh LP : 12,000 btuh		NG : 11,000 btuh LP : 11,000 btuh	
Maximum Hot Water Capacity	45°F Rise	7.5 Gal./min.		8.4 Gal./min.	
Capacity Range		0.5 - 9.8 Gal./min.		0.5 - 11.1 Gal./min.	
Temperature Settings (Using the Remote Controller)		100 - 150°F (In 5°F intervals), 160, 170, 180°F (In 10°F intervals) (14 Options)			
Default Temperature Options		120, 130, 140, 180°F (Original is 120°F)			

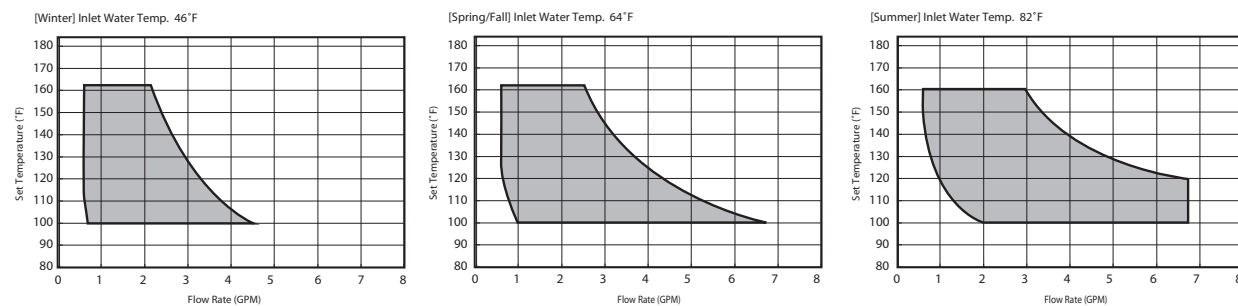
Item		NR111-SV NC250-SV-ASME N-0931M (-ASME)	NR111-OD N-0931M-OD	NR111-DV NC250-DV-ASME N-0931M-DV (-ASME)	NC380-SV-ASME	
Gas Consumption	Maximum Performance	NG : 250,000 btuh LP : 250,000 btuh		NG : 380,000 btuh LP : 380,000 btuh		
	Minimum Performance	NG : 11,000 btuh LP : 11,000 btuh		NG : 22,500 btuh LP : 22,500 btuh		
Maximum Hot Water Capacity	45°F Rise	9.3 Gal./min.			13.2 Gal./min.	
Capacity Range		0.5 - 11.1 Gal./min.			0.7 - 13.2 Gal./min.	
		100 - 150°F (In 5°F intervals), 160, 170, 180°F (In 10°F intervals) (14 Options)				
Temperature Settings (Using the Remote Controller)						
Default Temperature Options		120, 130, 140, 180°F (Original is 120°F)				

Hot Water Supply Capabilities

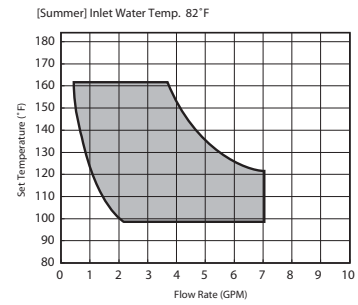
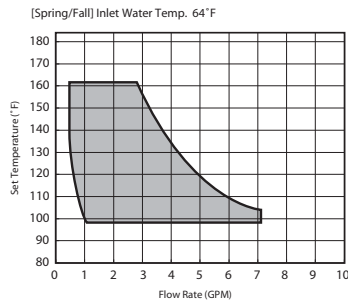
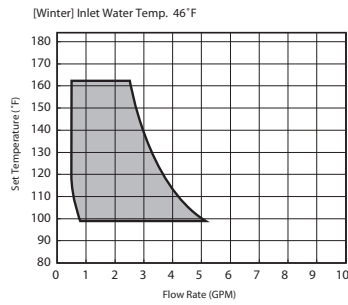
NR50-OD



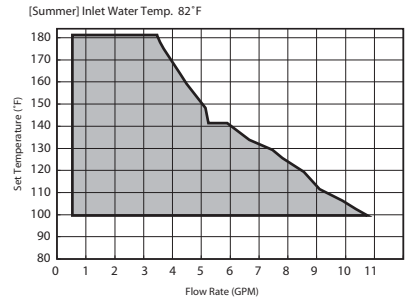
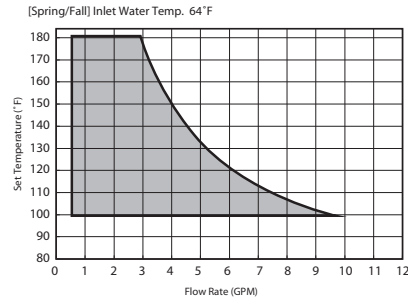
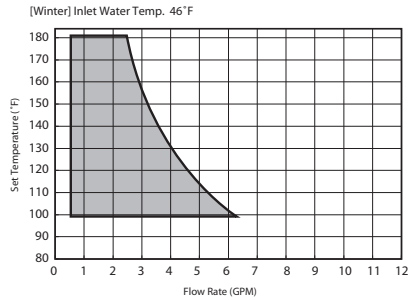
NR66 (-SV,-OD) / N-0531S (-OD)



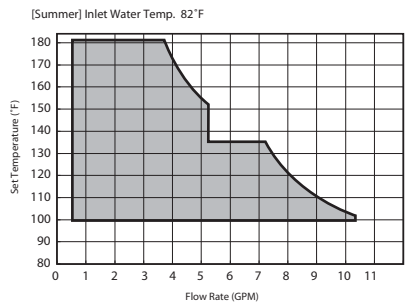
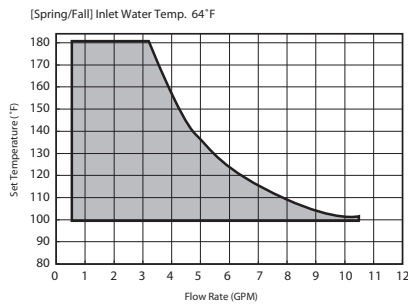
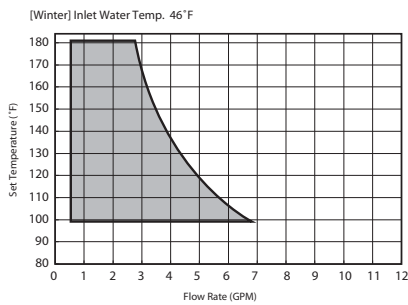
■ NR71 (-SV,-OD) / N-0631S (-OD)



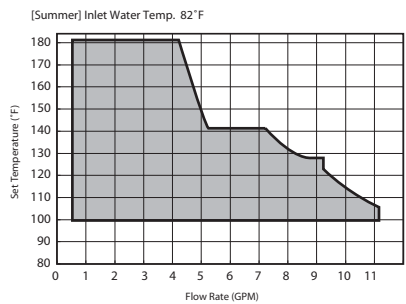
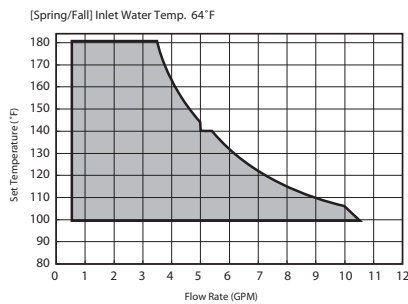
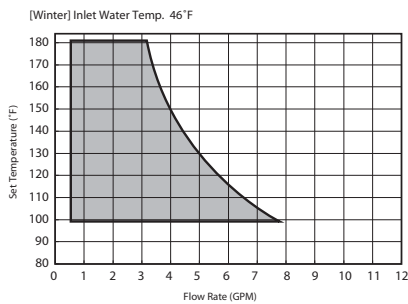
■ NR98 (-SV,-OD,-DVC) / NC199 (-OD,-DVC) / N-0751M (-OD,-DV,-DVC)



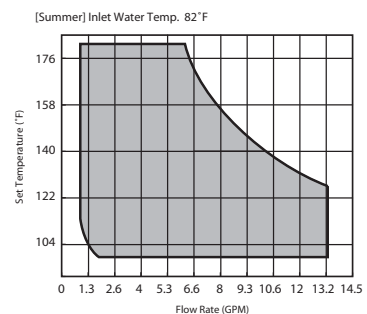
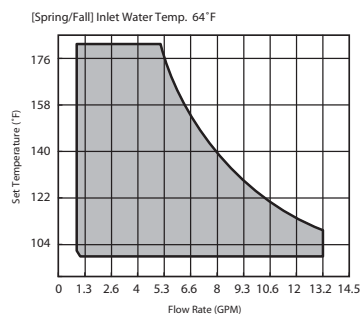
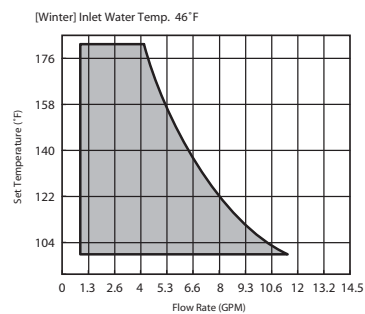
■ NCC199 (-SV,-DV) / N-0841MC (-DV) / NRC111 (-SV,-DV) / N-0842MC (-DV)



■ NR111 (-SV,-OD,-DV) / NC250 (-SV,-DV)-ASME / N-0931M (-OD,-DV)



■ NC380-SV-ASME / N-1321M-ASME

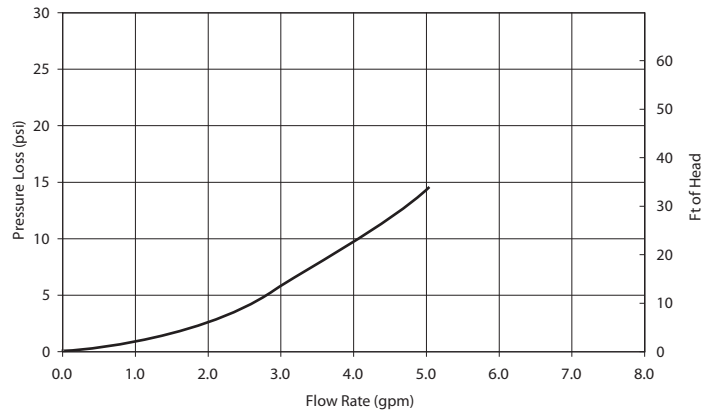


■ Pressure Loss Characteristics

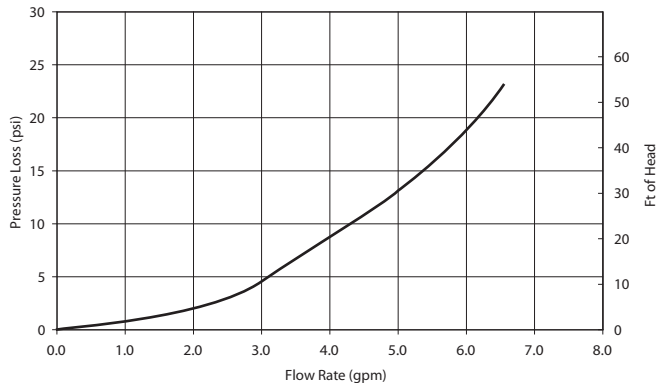
NOTE: Flow rates shown will vary slightly depending on the incoming water temperature and the setting temperature on the remote controller.

System Controllers are compatible with Commercial models only (NC199, NCC199, NC250, and NC380 Series). The Storage Tank setting is a feature that is only available with SC-201-6M(-EXT), SC-201-12M, and SC-201-24M System Controller models. See System Controller Manual for more information regarding installation and compatibility.

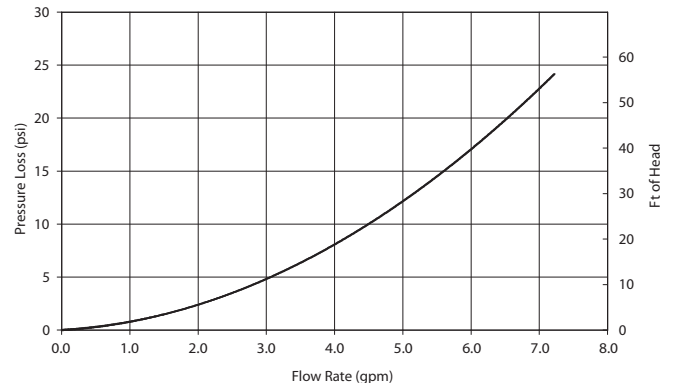
■ NR50-OD



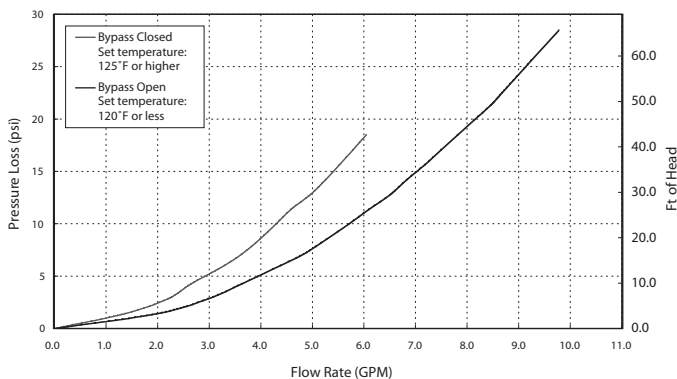
■ NR66 (-SV,-OD) / N-0531S (-OD)



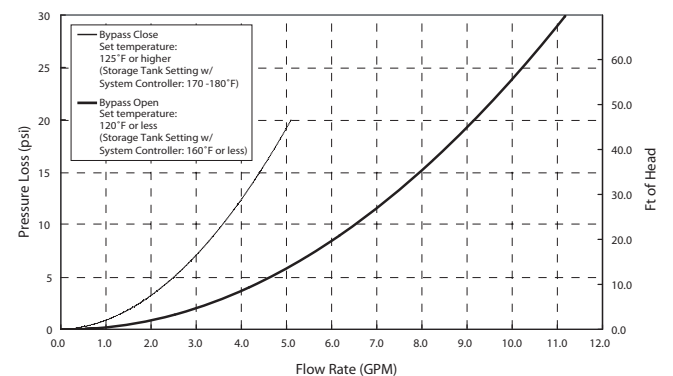
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■ NR98 (-SV,-OD,-DVC) / NC199 (-OD,-DVC) / N-0751M (-OD,-DV,-DVC)

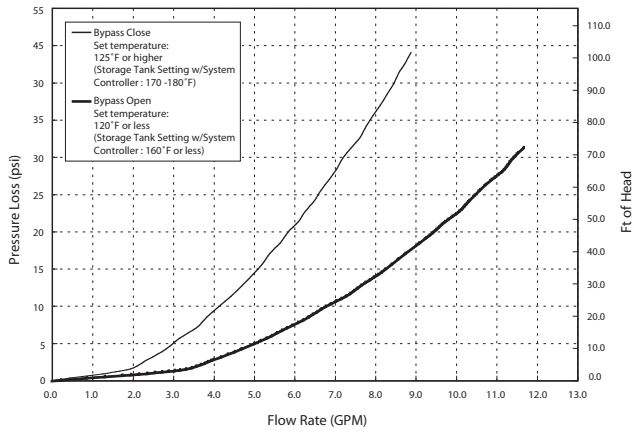


■ NCC199 (-SV,-DV) / N-0841MC (-DV) / NRC111 (-SV,-DV) / N-0842MC (-DV)

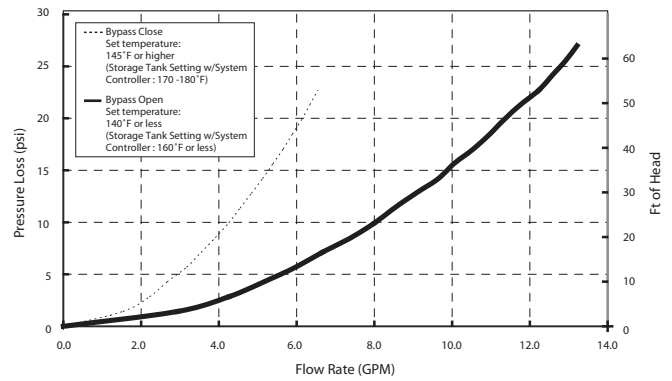


■ Pressure Loss Characteristics (continued)

■ NR111 (-SV,-OD,-DV) / NC250 (-SV,-DV)-ASME / N-0931M (-OD,-DV)

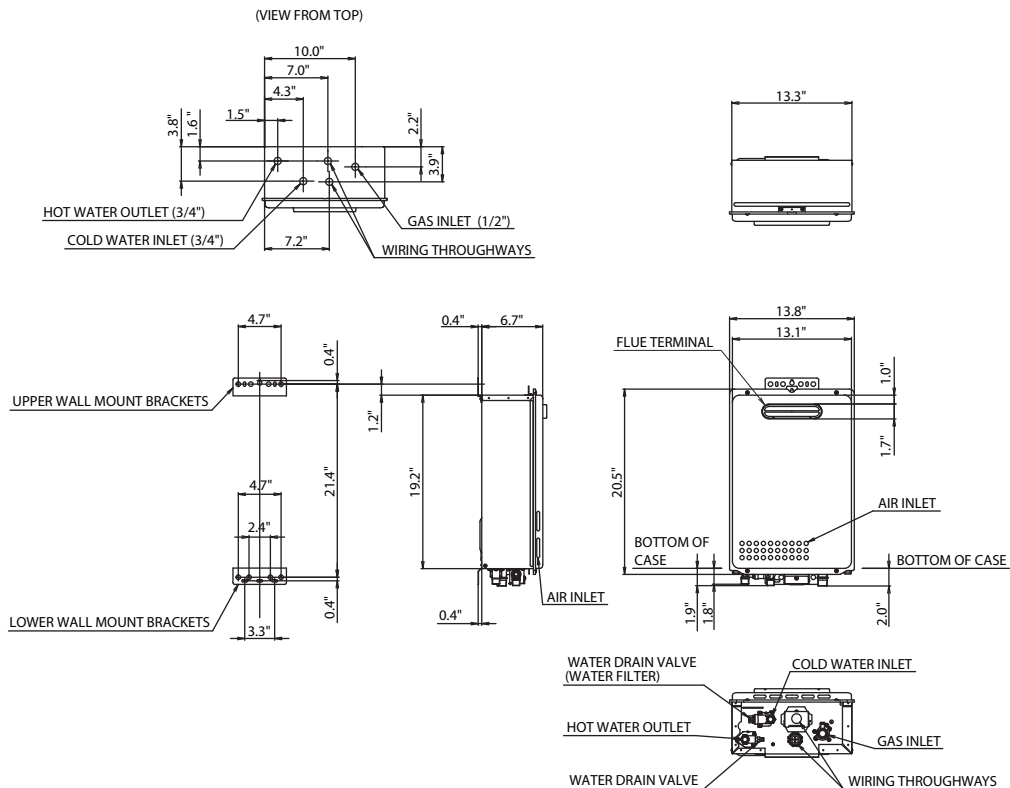


■ NC380-SV-ASME / N-1321M-ASME

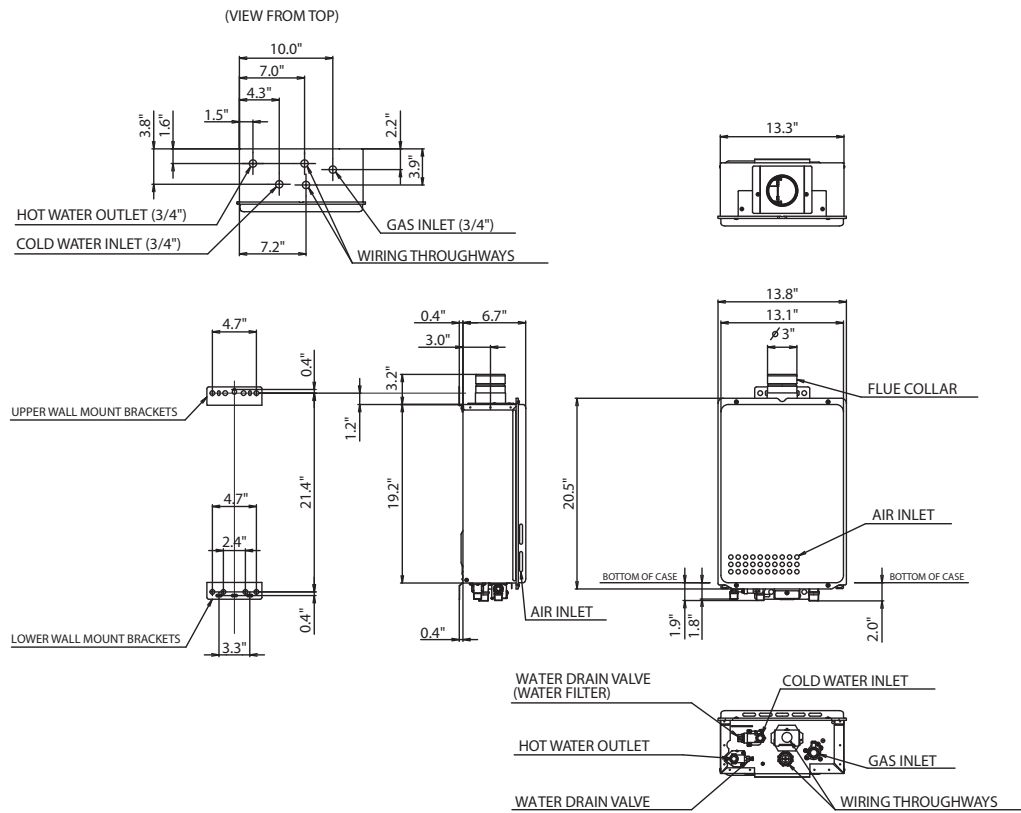


3. Dimensions

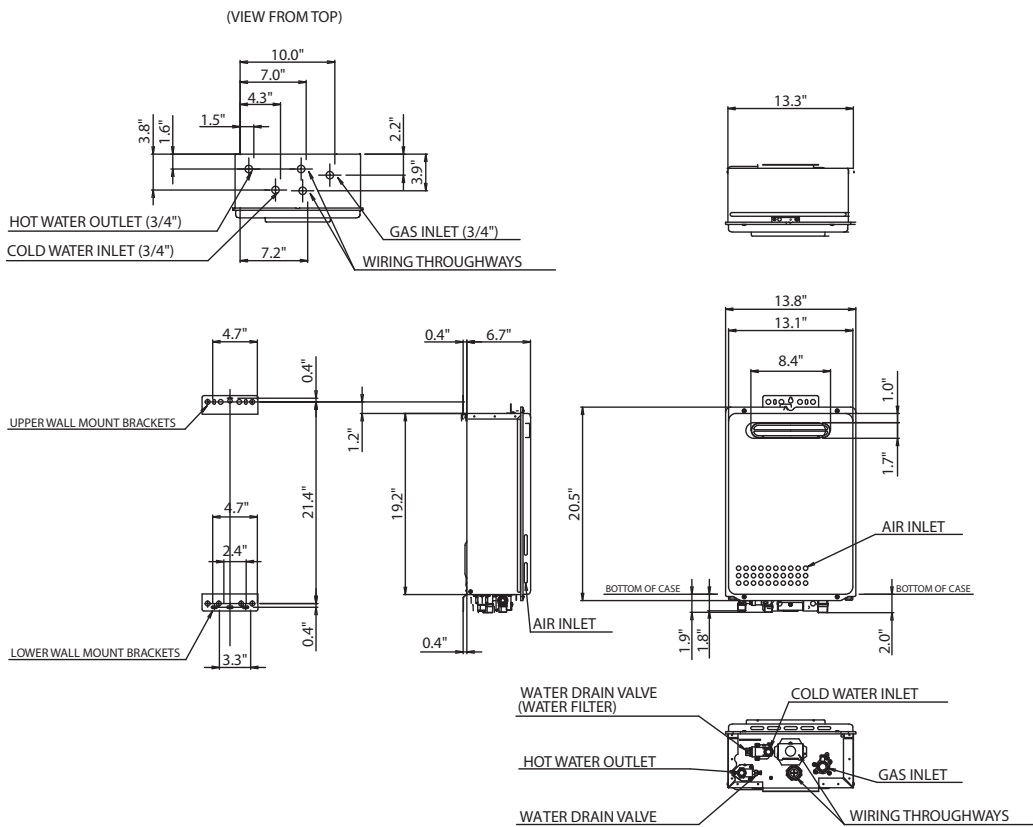
■ NR50-OD



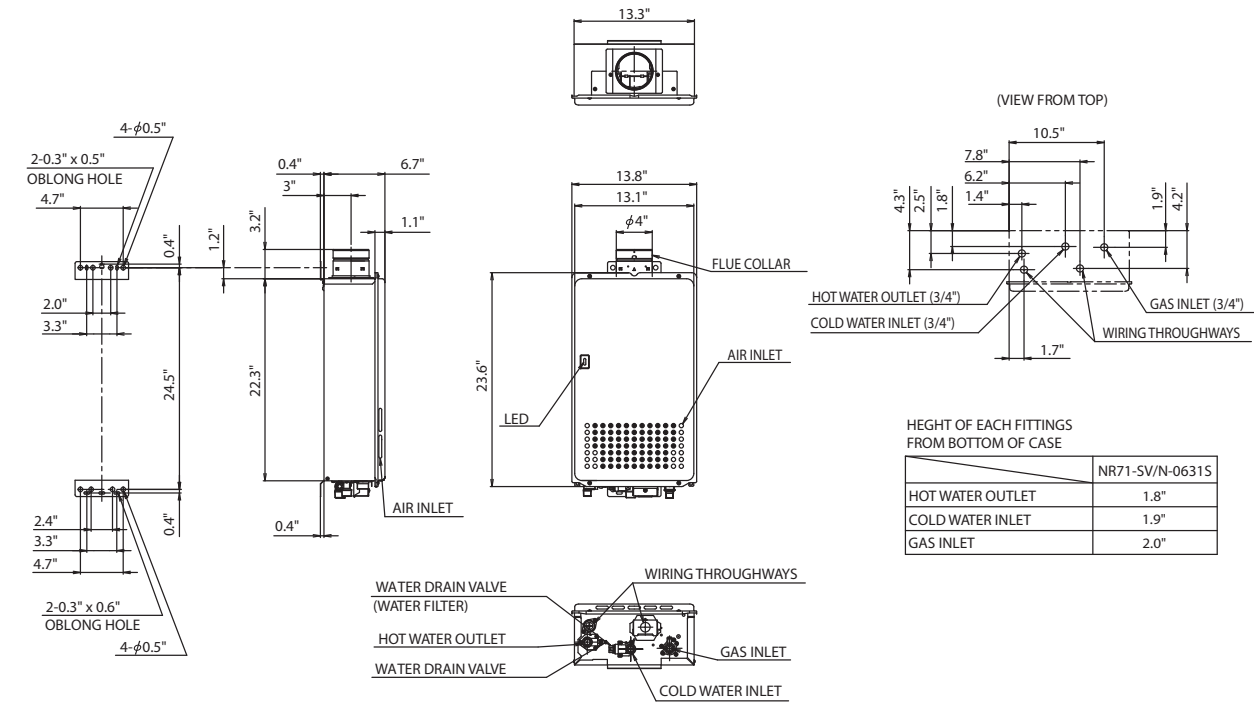
■ NR66-SV / N-0531S



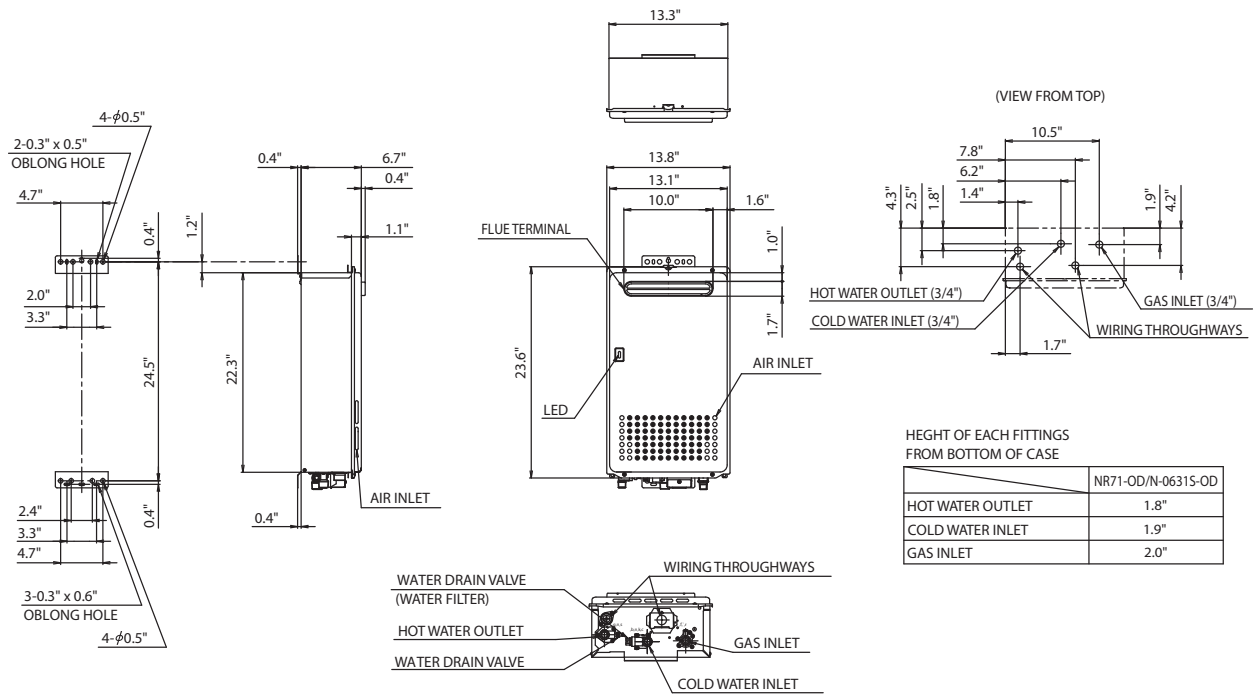
■ NR66-OD / N-0531S-OD



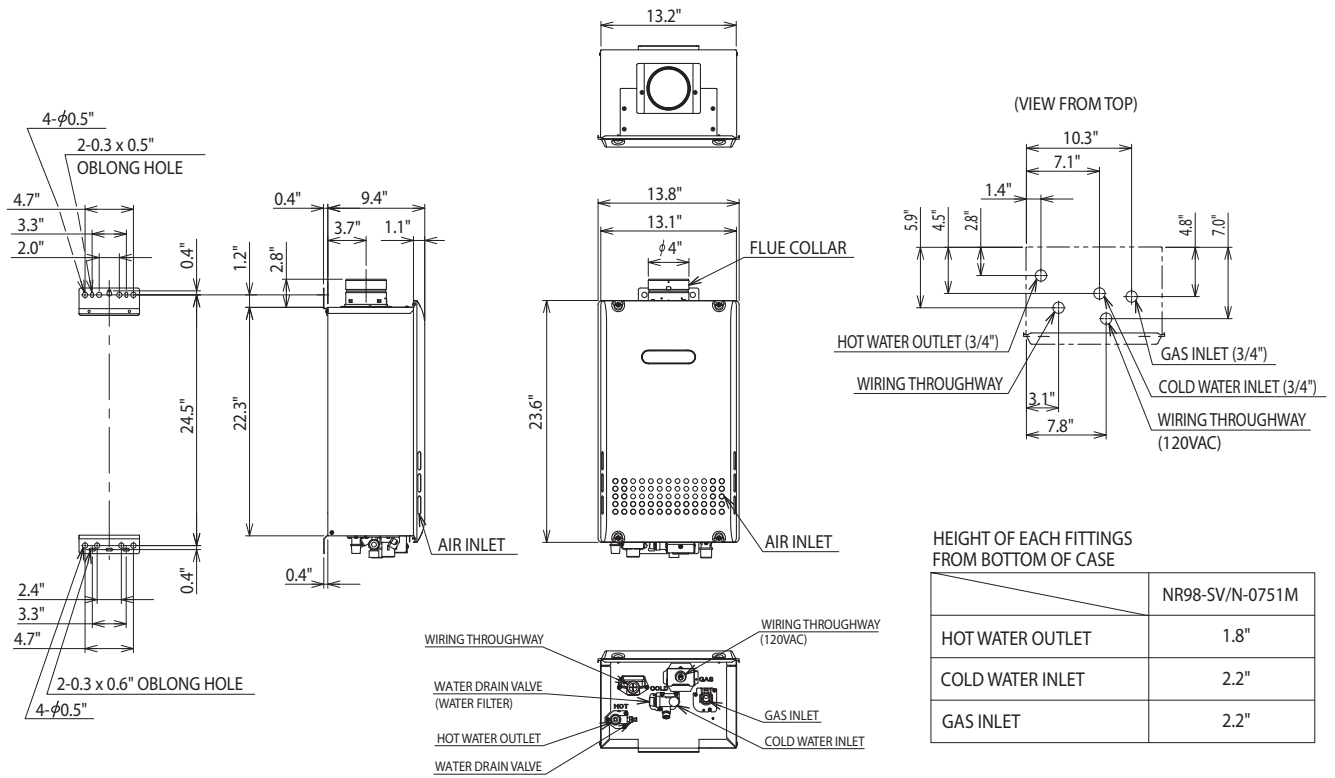
■ NR71-SV / N-0631S



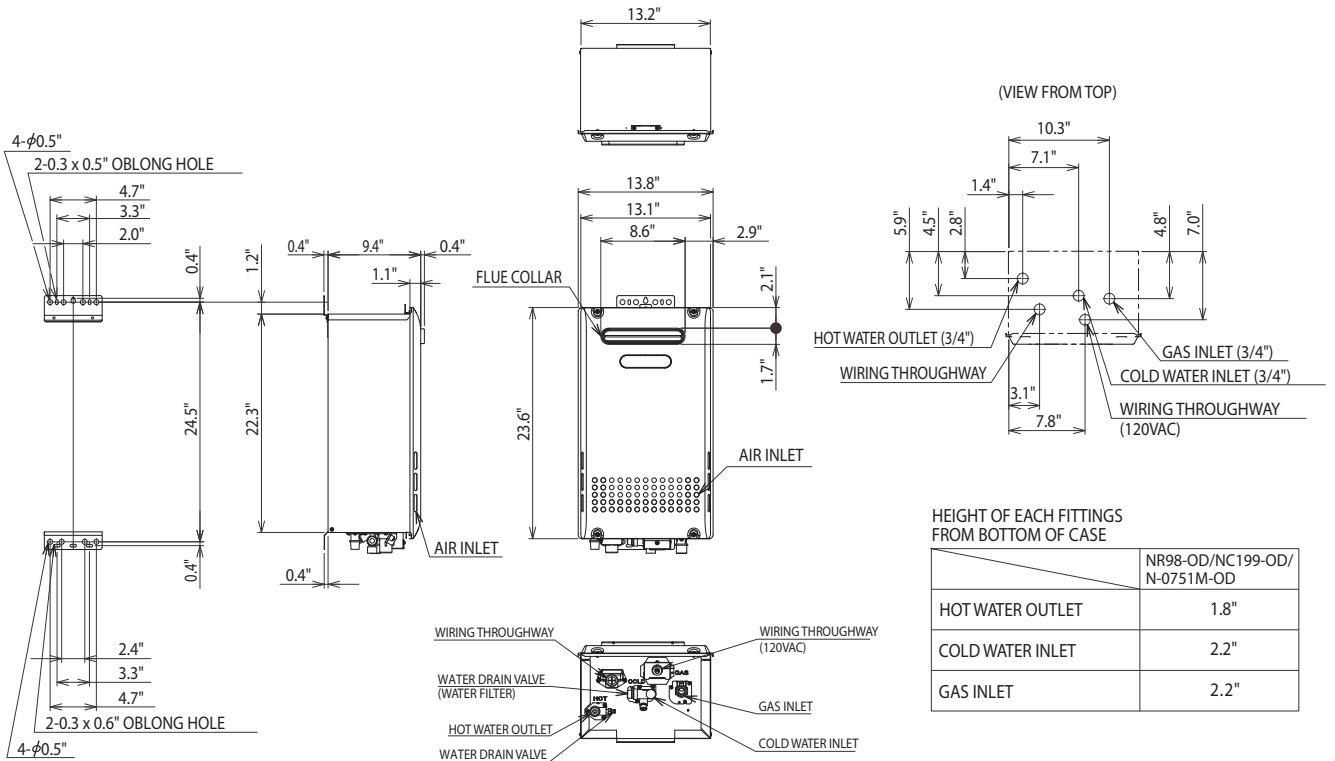
■ NR71-OD / N-0631S-OD



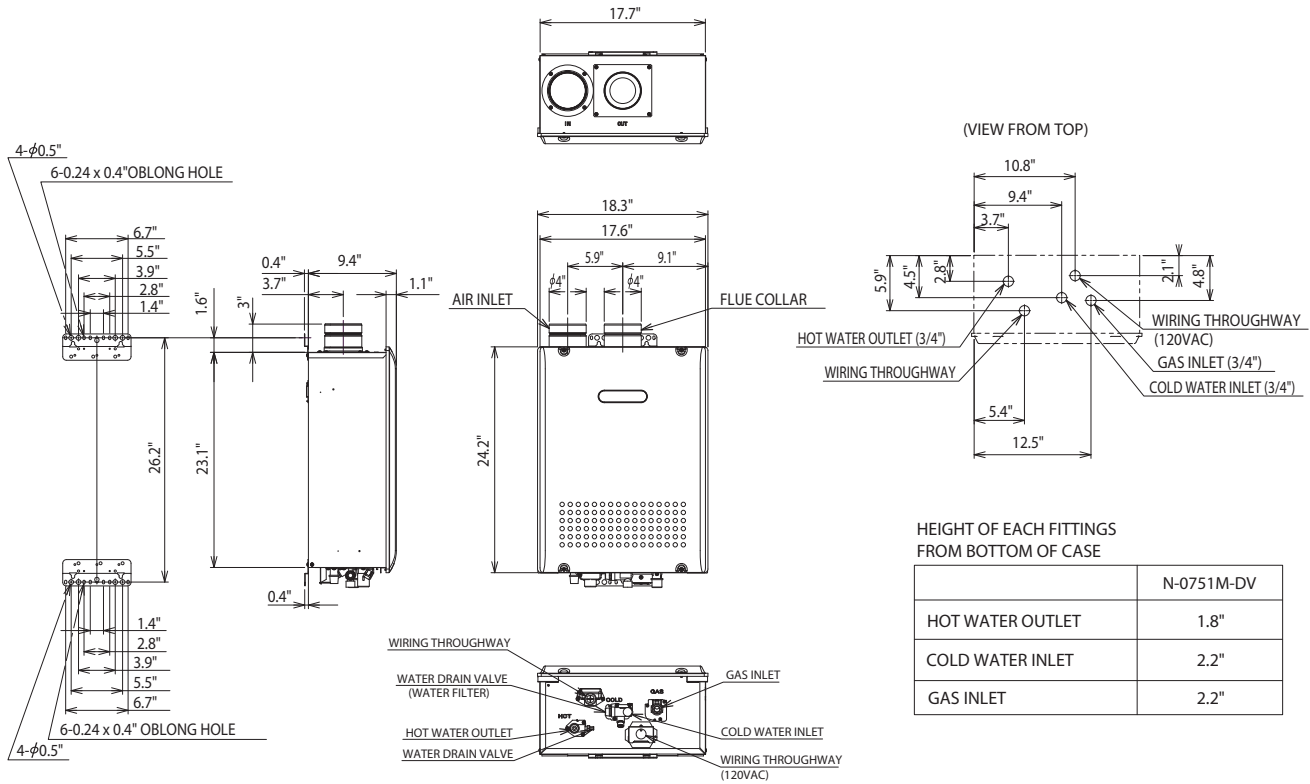
■ NR98-SV / N-0751M



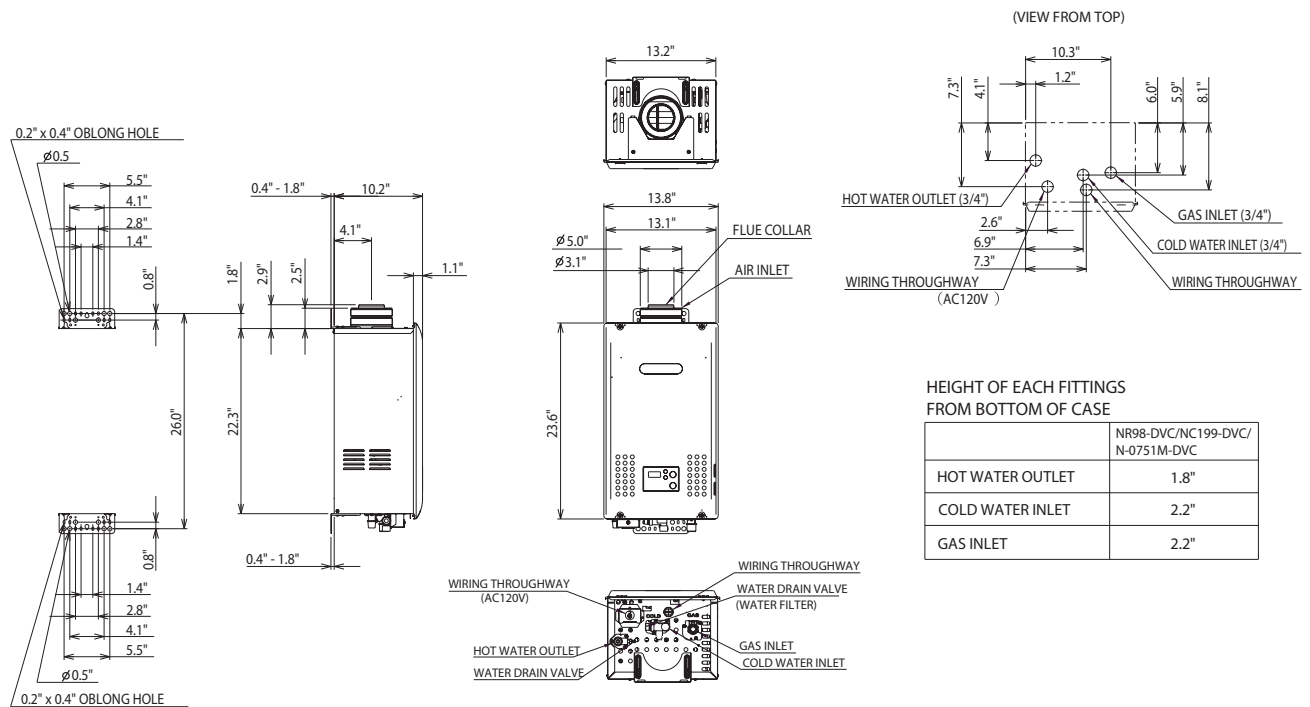
■ NR98-OD / NC199-OD / N-0751M- OD



■ N-0751M-DV



■ NR98-DVC / NC199-DVC / N-0751M-DVC



Technical drawing of the NCC111-SV/N-0841MC/N-0842MC unit, showing front, top, and side views with dimensions and labels.

Front View Dimensions:

- Top panel width: 17.7"
- Top panel height: 1.6"
- Top panel mounting holes: 4- $\phi 0.5"$
- Top panel mounting holes: 6-0.24 x 0.4" OBLONG HOLE
- Top panel mounting holes: 6.7", 5.5", 3.9", 2.8", 1.4"
- Top panel mounting holes: 0.4", 9.4", 5.1", 1.1"
- Top panel mounting holes: 26.2", 23.1", 3.1", 0.4"
- Top panel mounting holes: 1.4", 2.8", 3.9", 5.5", 6.7"
- Top panel mounting holes: 6-0.24 x 0.4" OBLONG HOLE
- Top panel mounting holes: 4- $\phi 0.5"$

Top View Dimensions:

- Top panel width: 18.4"
- Top panel height: 17.6"
- Top panel mounting holes: 18.3", 17.6", 16.1"
- Top panel mounting holes: 13.7", 10.4", 10.0", 8.4", 3.9"
- Top panel mounting holes: 6.1", 4.3", 2.4"
- Top panel mounting holes: 2.8", 4.7", 5.3", 6.1"

Side View Dimensions:

- Side panel width: 24.4"
- Side panel height: 17.6"
- Side panel mounting holes: 18.3", 17.6", 16.1"
- Side panel mounting holes: 13.7", 10.4", 10.0", 8.4", 3.9"
- Side panel mounting holes: 6.1", 4.3", 2.4"
- Side panel mounting holes: 2.8", 4.7", 5.3", 6.1"

Labels:

- FLUE COLLAR
- AIR INLET
- LED
- CONDENSATE DRAIN(1/2")
- HOT WATER OUTLET (3/4")
- WIRING THROUGHWAY
- GAS INLET (3/4")
- COLD WATER INLET (3/4")
- WATER DRAIN VALVE (WATER FILTER)
- WIRING THROUGHWAY
- GAS INLET
- WATER DRAIN VALVE
- WIRING THROUGHWAY
- CONDENSATE DRAIN
- WATER DRAIN VALVE
- HOT WATER OUTLET
- WATER DRAIN VALVE
- COLD WATER INLET

HEIGHT OF EACH FITTING FROM BOTTOM OF CASE

	NCC199-SV/N-0841MC NRC111-SV/N-0842MC
CONDENSATE DRAIN	0.9"
HOT WATER OUTLET	1.7"
COLD WATER INLET	2.2"
GAS INLET	2.2"

Technical drawings of the NCC199-DV/N-0841MC-DV and NRC111-DV/N-0842MC-DV water filtration units. The drawings include side, front, and top views with detailed dimensions.

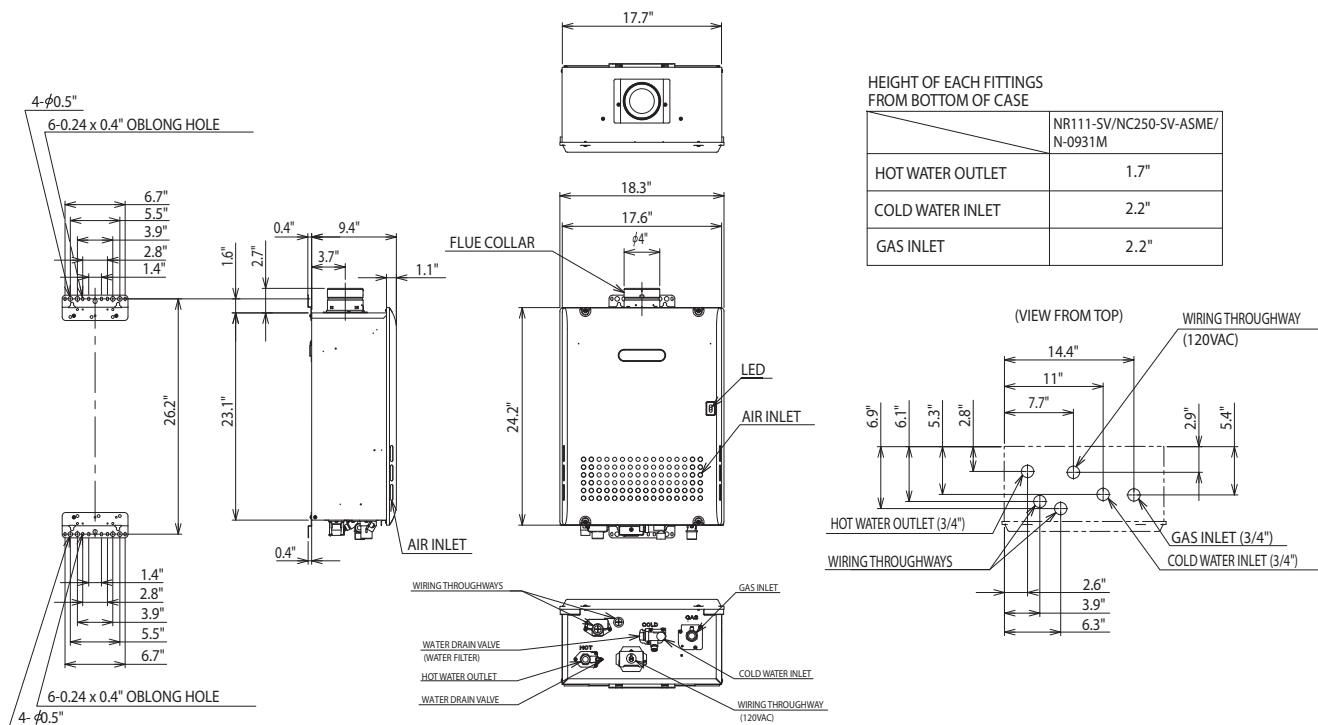
Key Features and Dimensions:

- Side View (Left):** Shows the unit's profile with dimensions for the top section (6.7", 5.5", 3.9", 2.8", 1.4") and the bottom section (1.4", 2.8", 3.9", 5.5", 6.7"). The total height is 26.2".
- Front View (Center):** Shows the front panel with dimensions for the top section (18.4", 17.6", 9.2") and the bottom section (5.9", 9.2"). The total height is 24.4".
- Top View (Right):** Shows the top of the unit with dimensions for the top section (13.7", 10.4", 10.0", 8.4", 3.9") and the bottom section (2.8", 3.9").
- Bottom View (Bottom):** Shows the bottom of the unit with dimensions for the top section (1.4", 2.8", 3.9", 5.5", 6.7") and the bottom section (1.4", 2.8", 3.9", 5.5", 6.7").

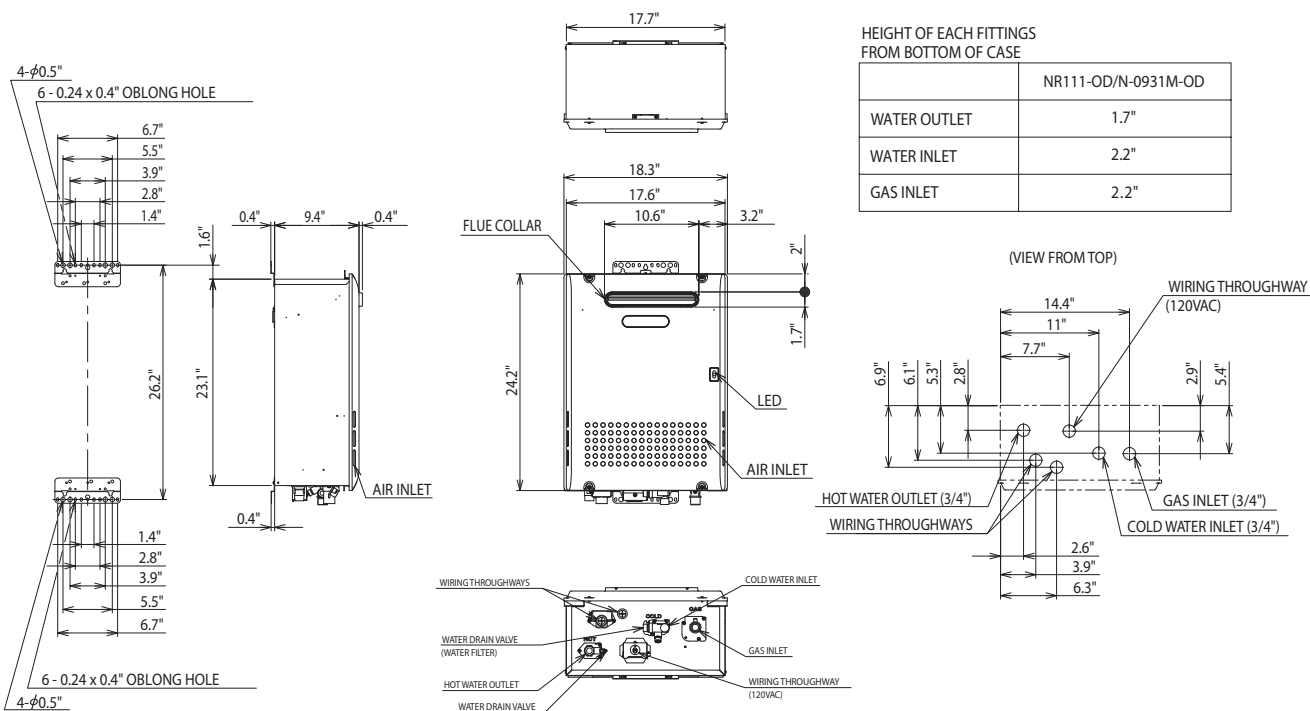
Table: HEIGHT OF EACH FITTING FROM BOTTOM OF CASE

	NCC199-DV/N-0841MC-DV/ NRC111-DV/N-0842MC-DV
CONDENSATE DRAIN	0.9"
HOT WATER OUTLET	1.7"
COLD WATER INLET	2.2"
GAS INLET	2.2"

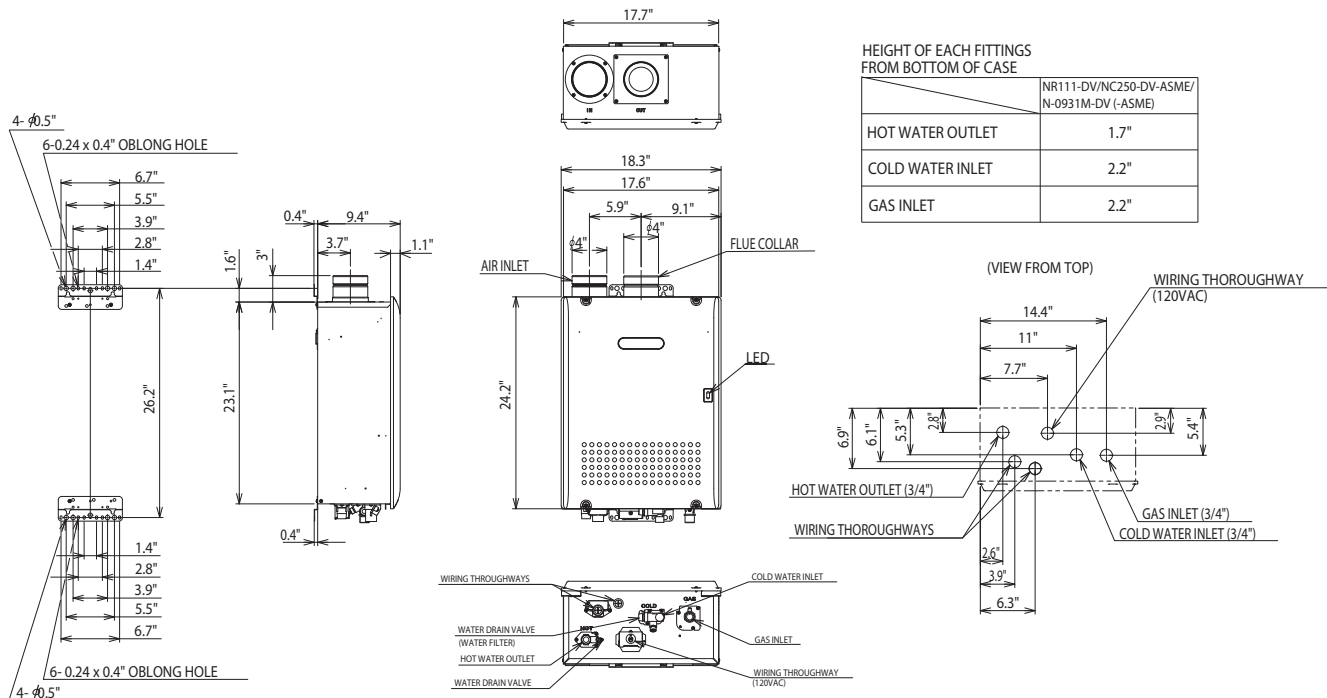
■ NR111-SV / NC250-SV-ASME / N-0931M



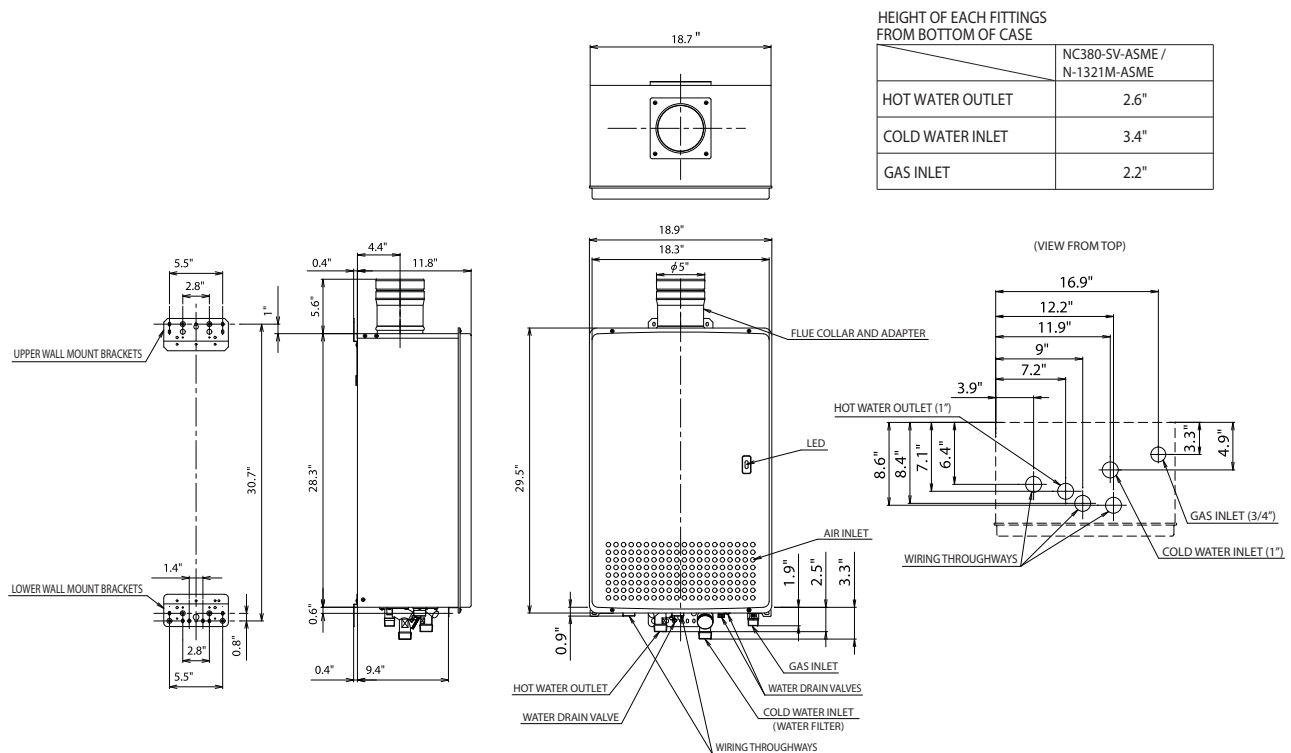
■ NR111-OD / N-0931M-OD



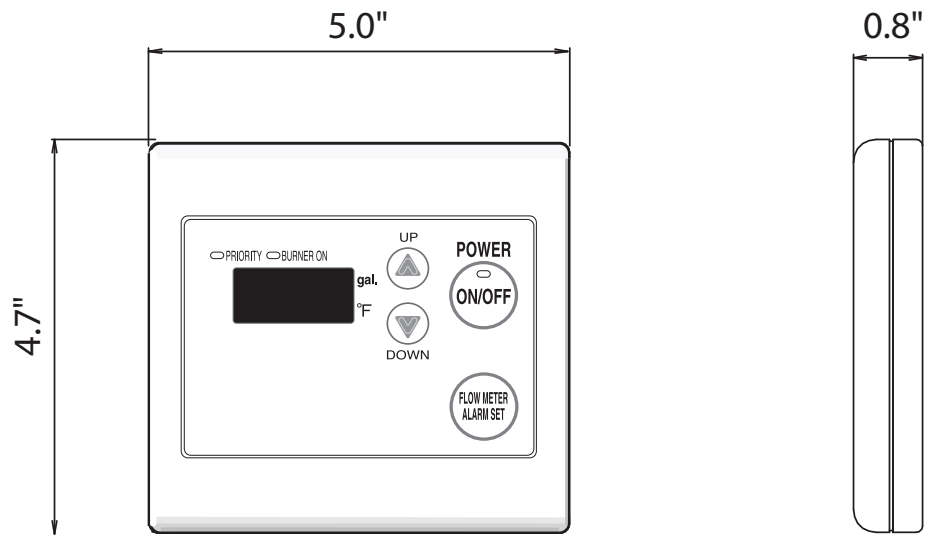
■ NR111-DV / NC250-DV-ASME / N-0931M-DV



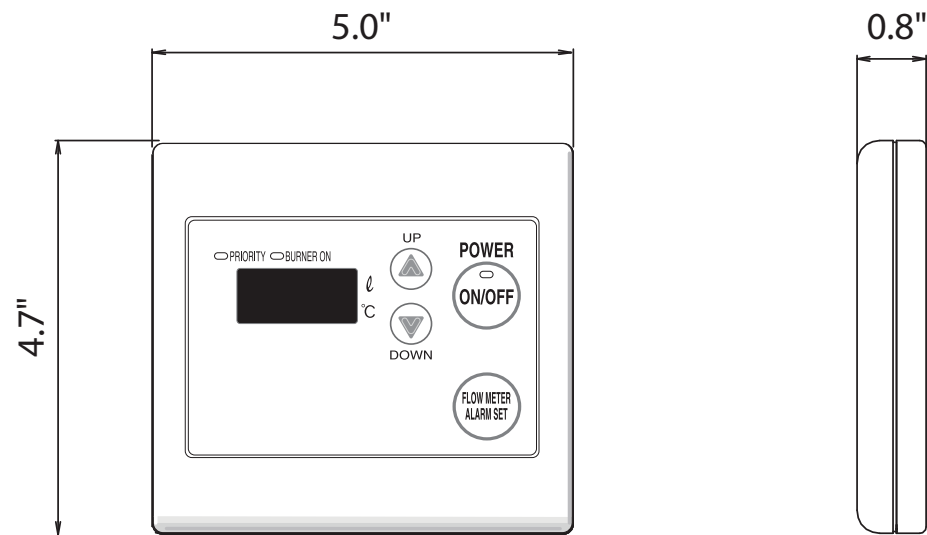
■ NC380-SV-ASME / N-1321M-ASME



- RC-7649M (Optional for NR50-OD / NR66 (-SV,-OD) / N-0531S (-OD) / NR71 (-OD) / N-0631S (-OD))

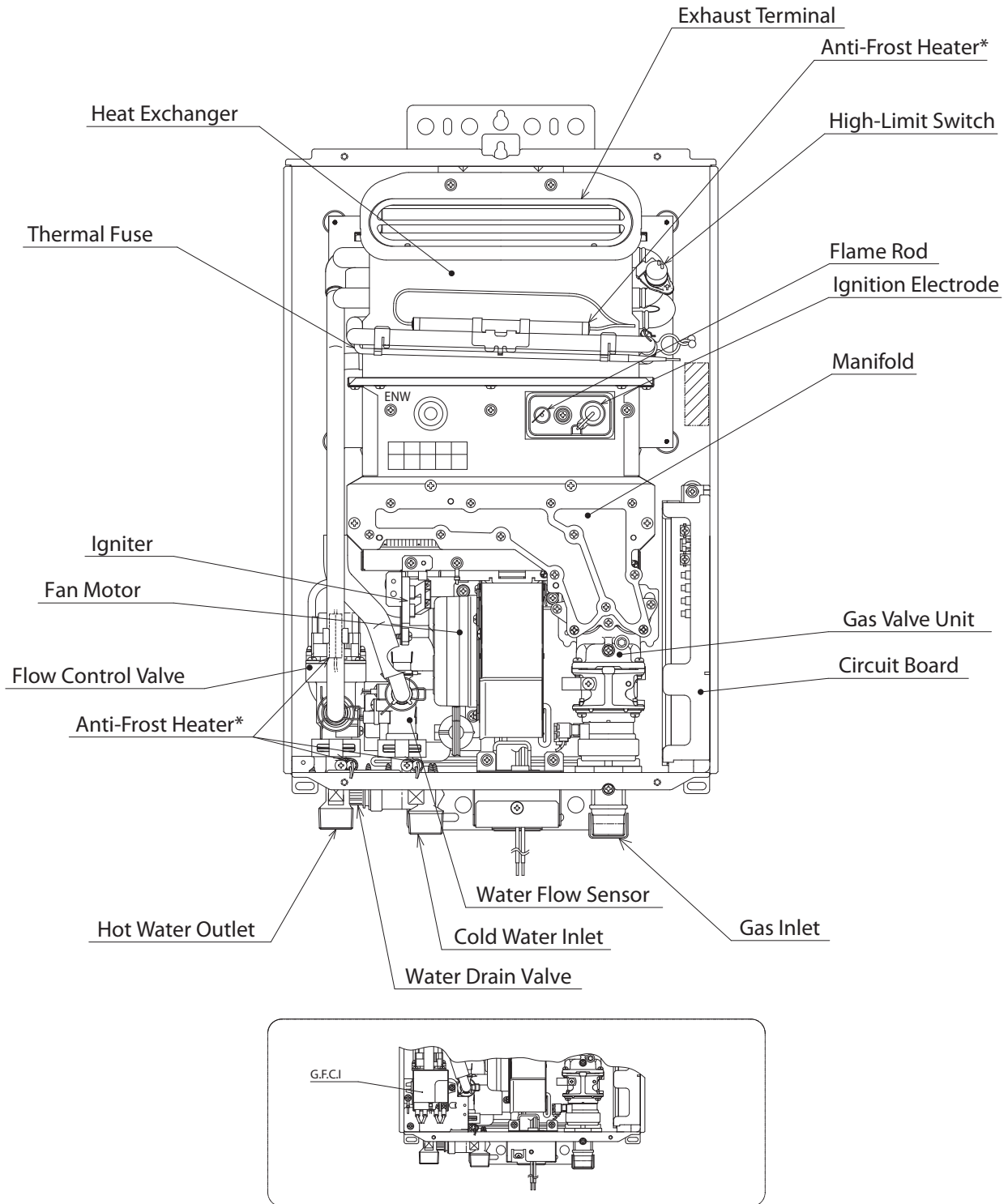


- RC-7650M (Optional Canadian Version)



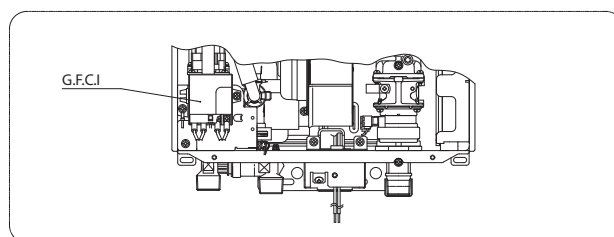
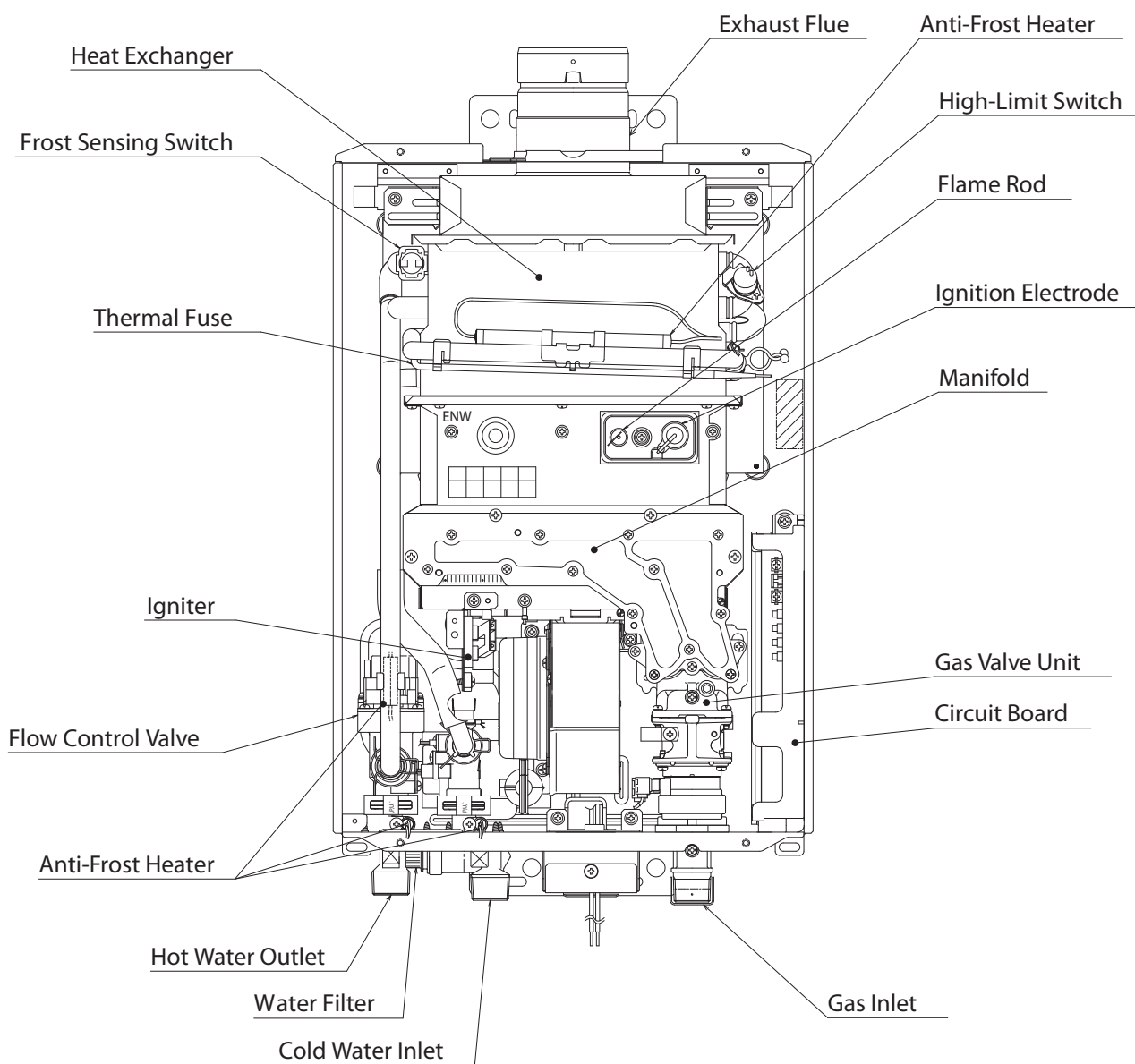
4. Components

■ NR50-OD / NR66-OD / N-0531S-OD

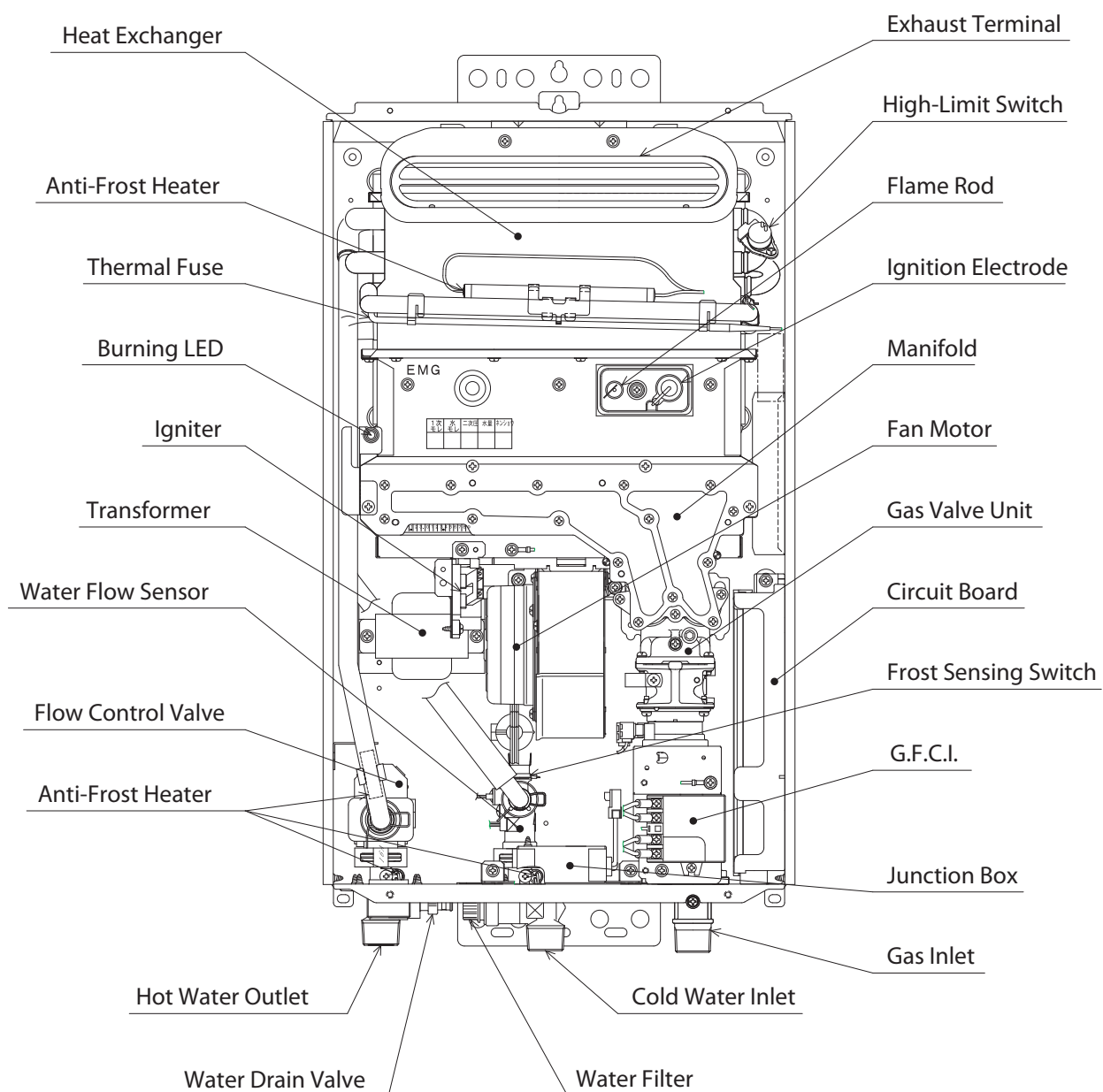


** Freeze protection kit is an optional accessory for the NR50-OD model and is not included with the unit. For cold weather installations, the optional Freeze Protection Kit (#SKG7772) is required in order to prevent internal freezing. For more information about the Freeze Protection Kit, please contact Noritz Technical Support at 1-866-766-7489.*

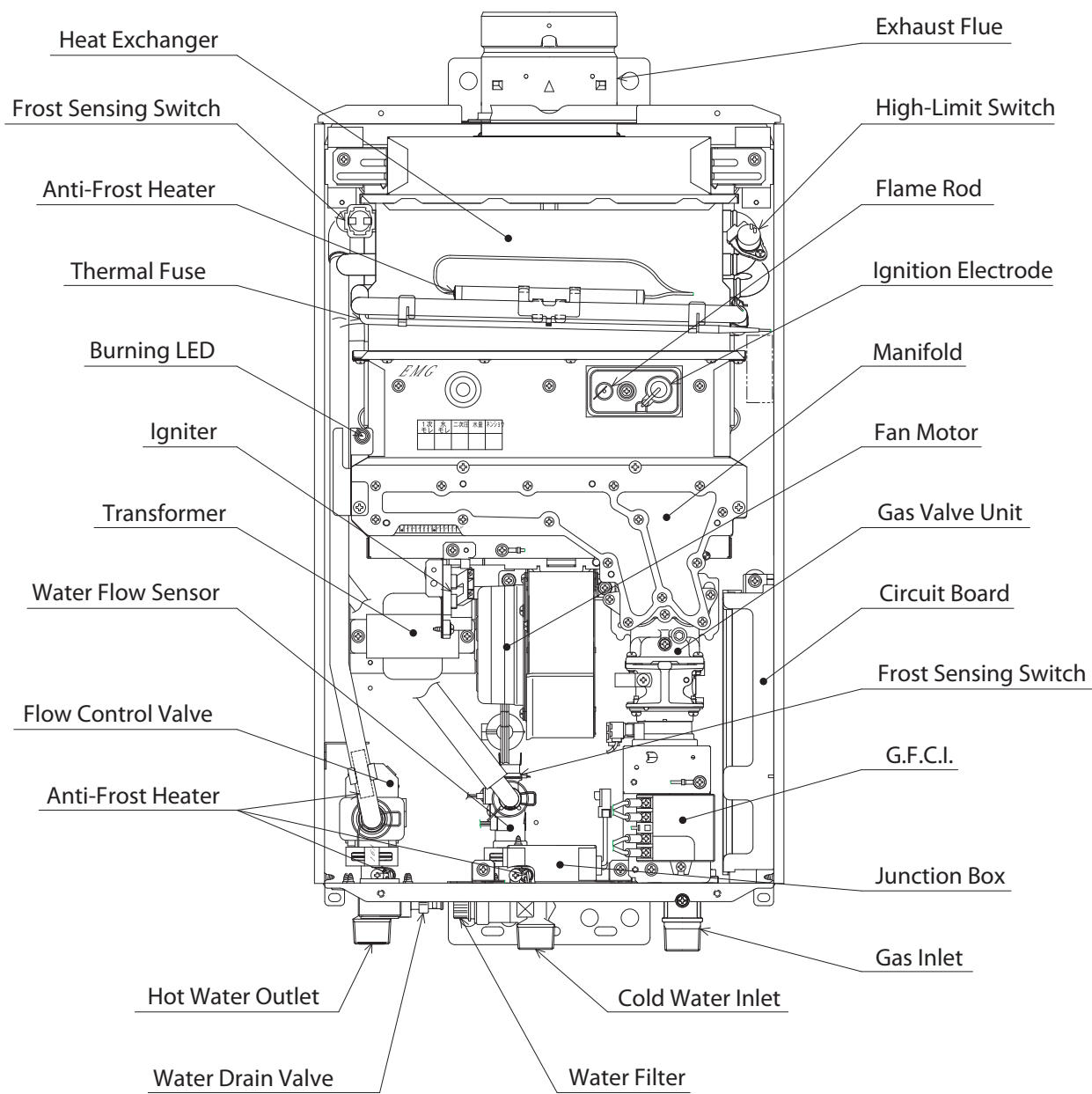
■ NR66-SV / N-0531S



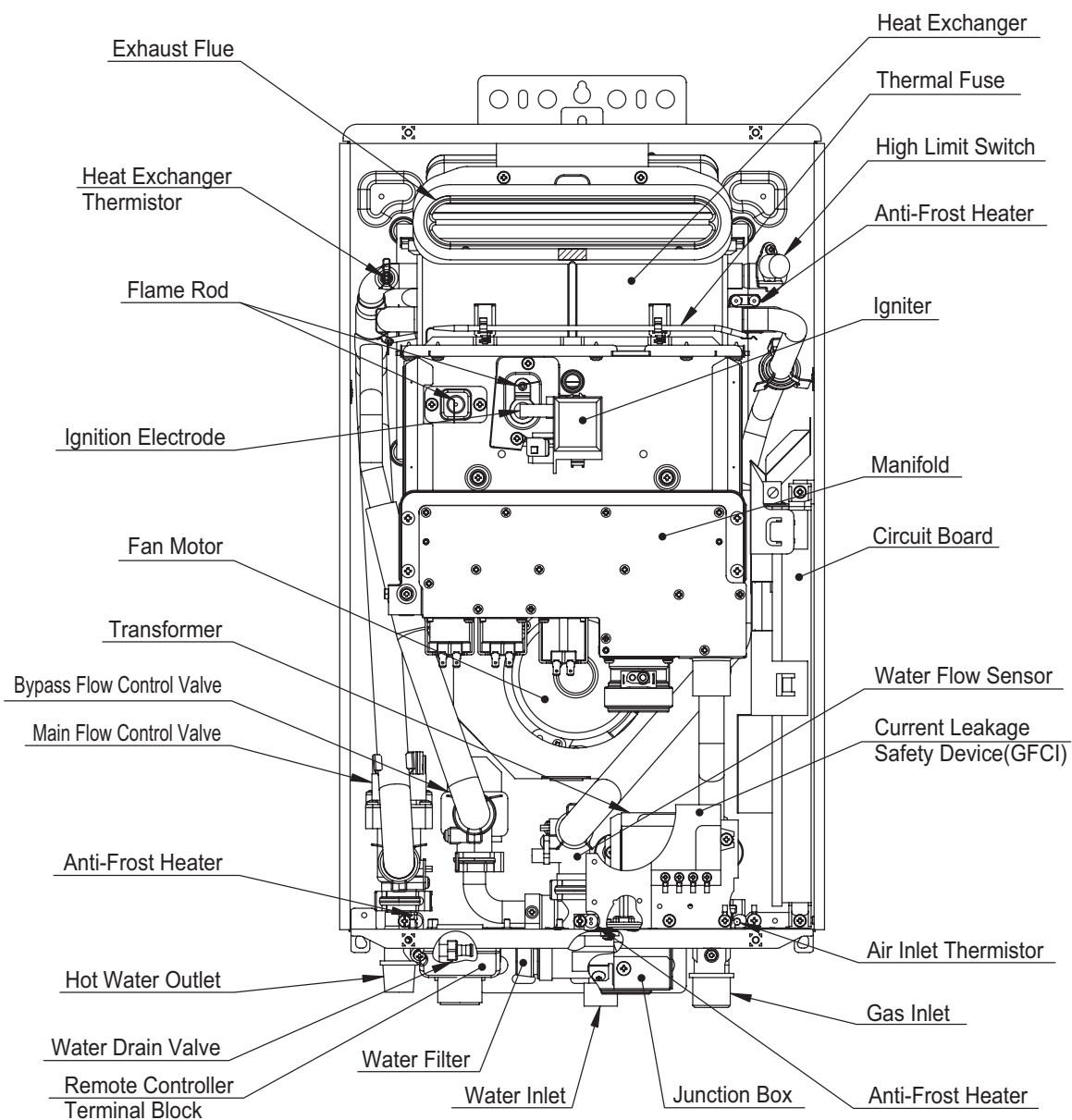
■ NR71-OD / N-0631S-OD



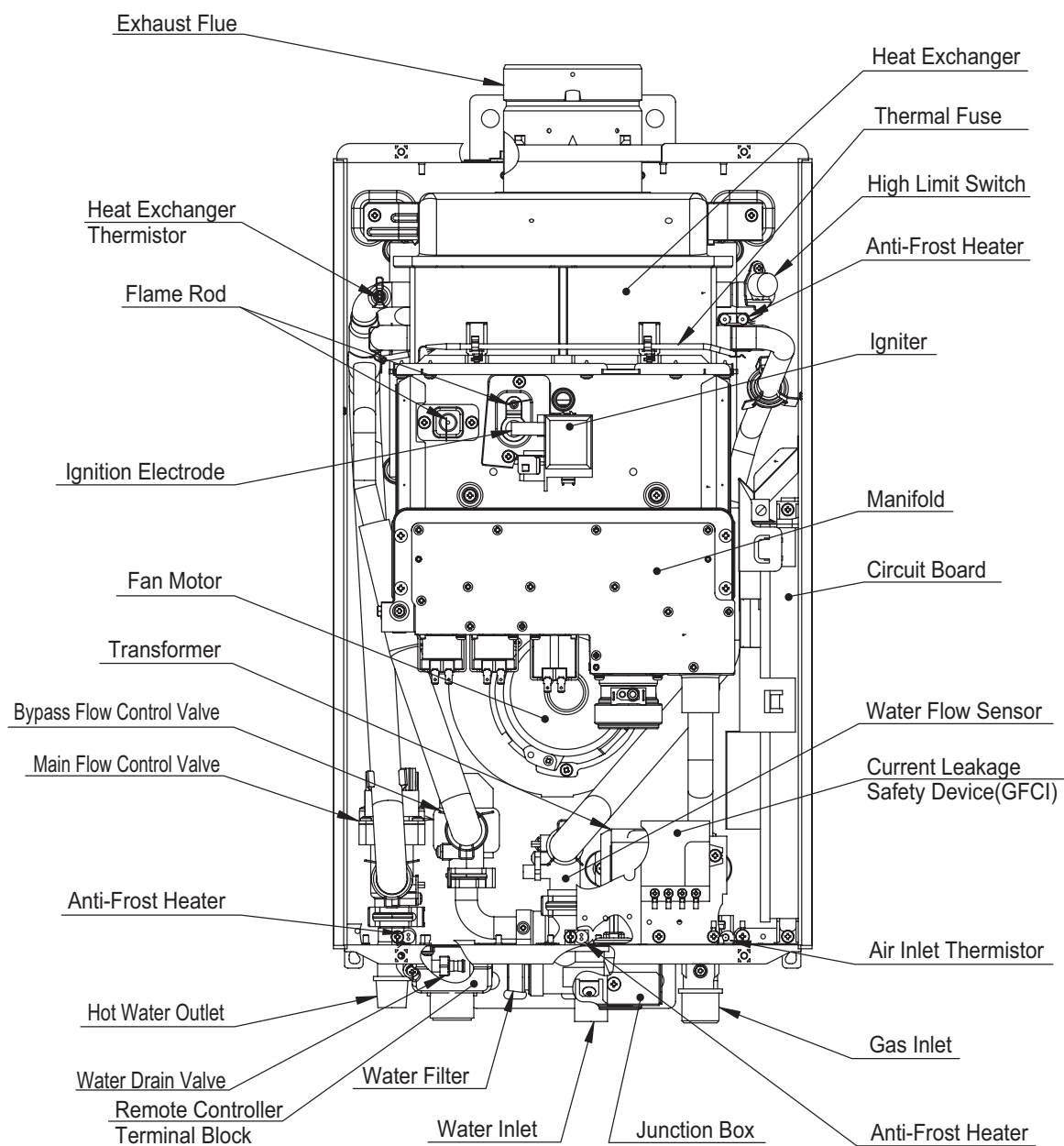
■ NR71-SV / N-0631S



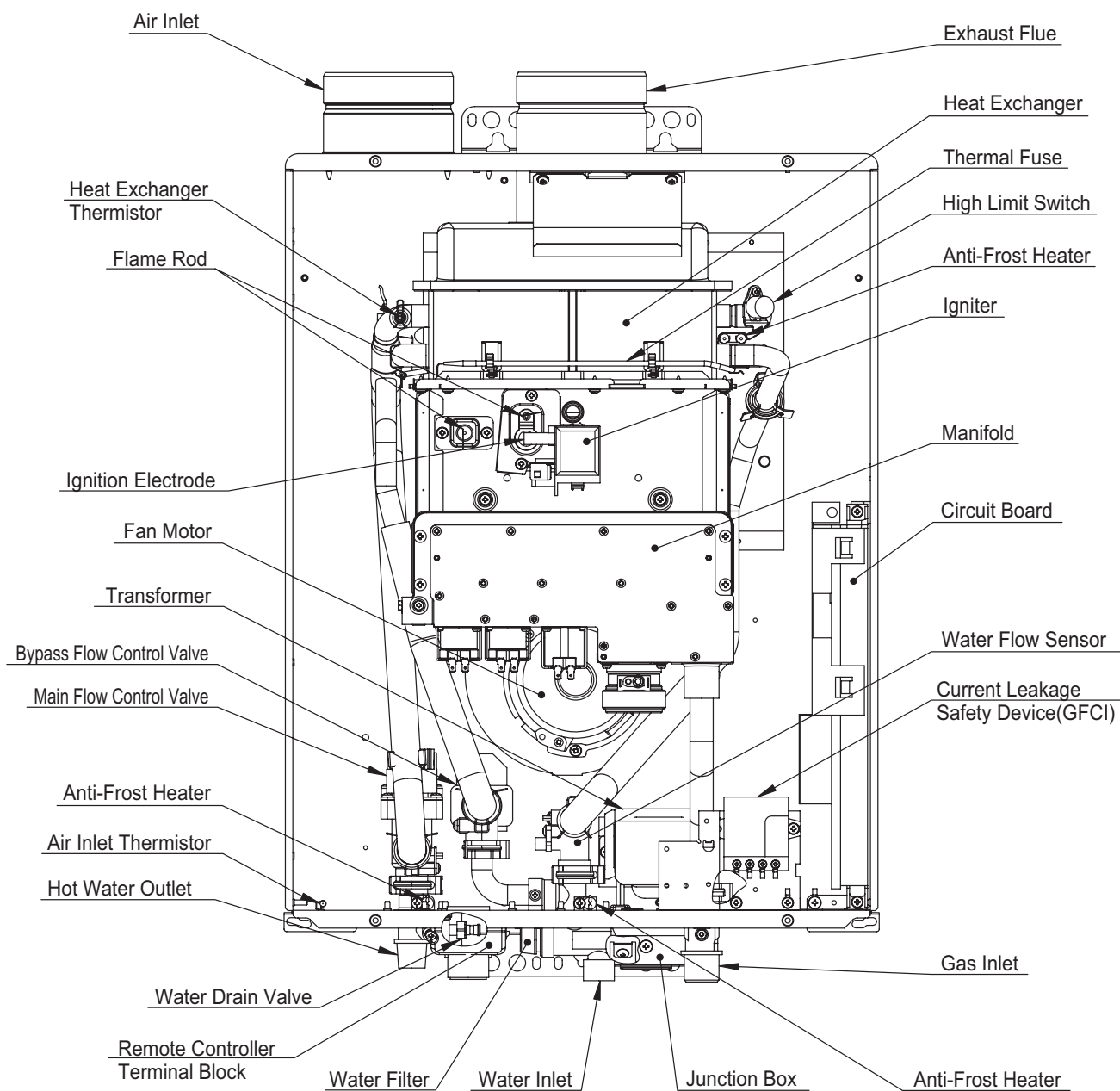
■ NR98-OD / N-0751M-OD



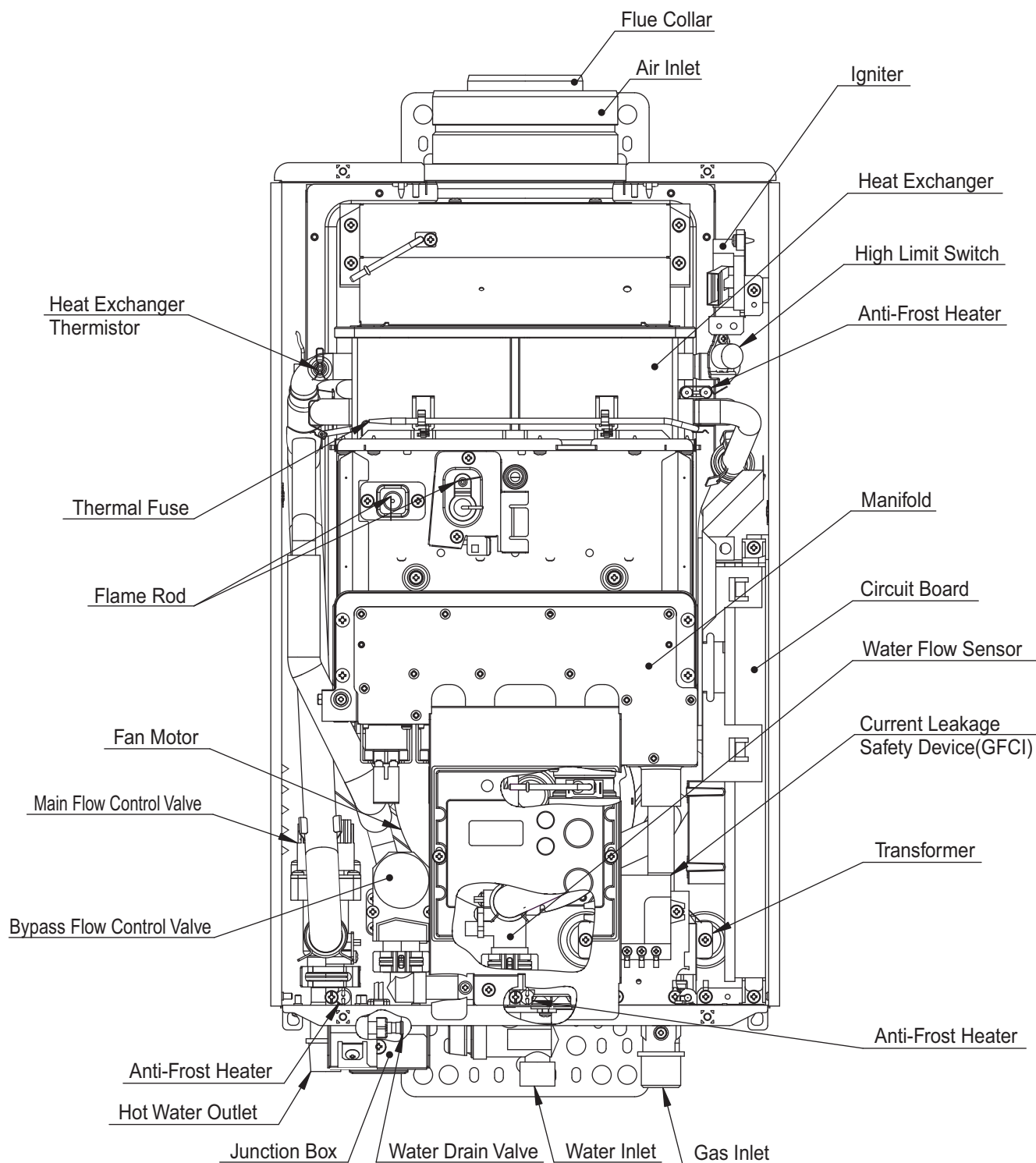
■ NR98-SV / N-0751M



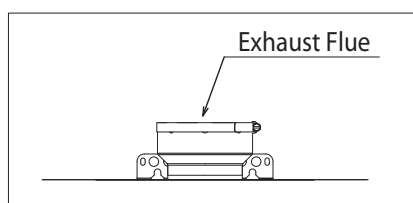
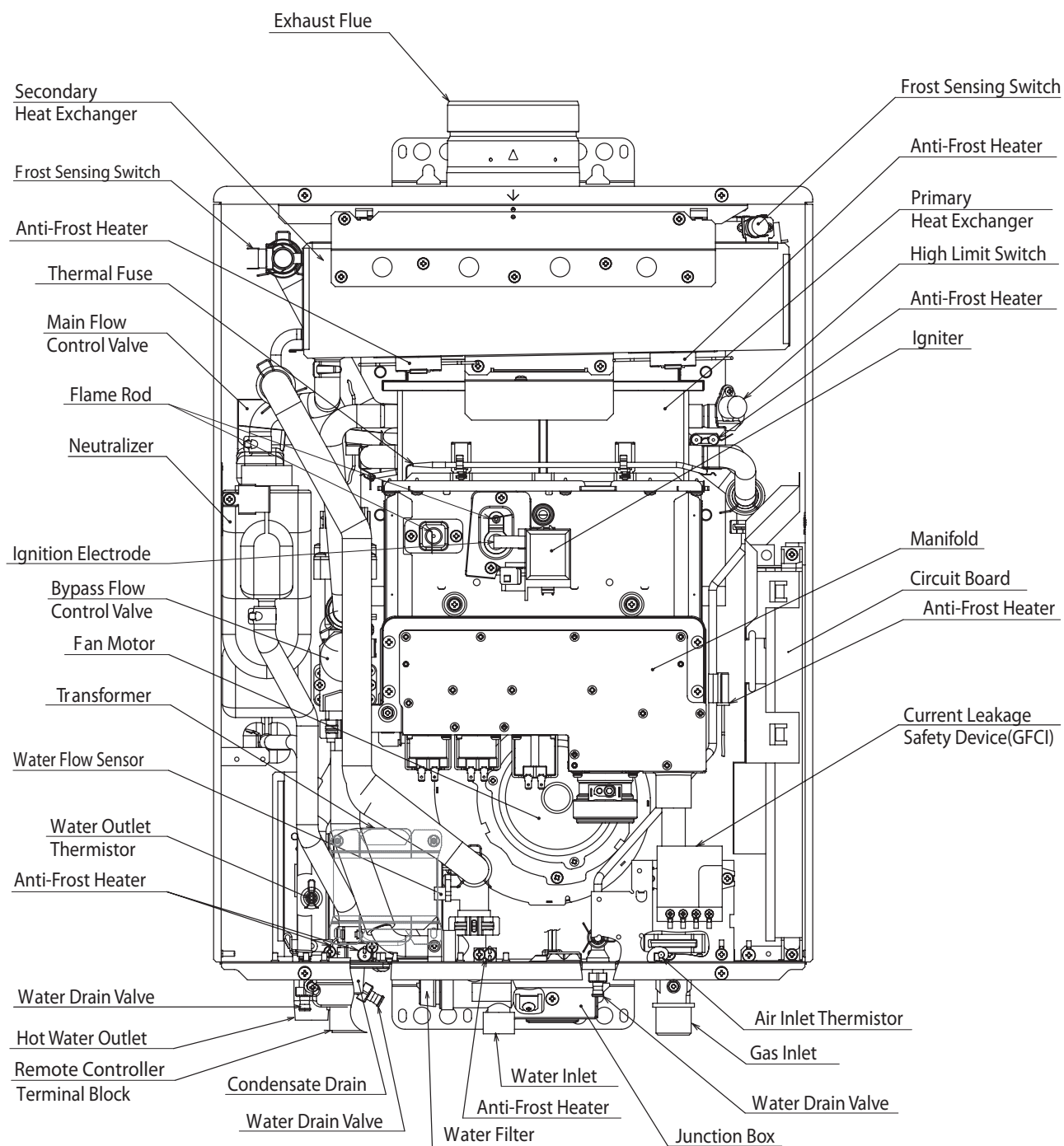
■ N-0751M-DV



■ NR98-DVC / NC199-DVC / N-0751M-DVC

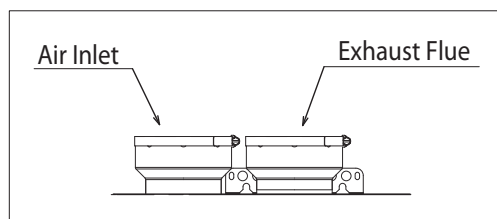
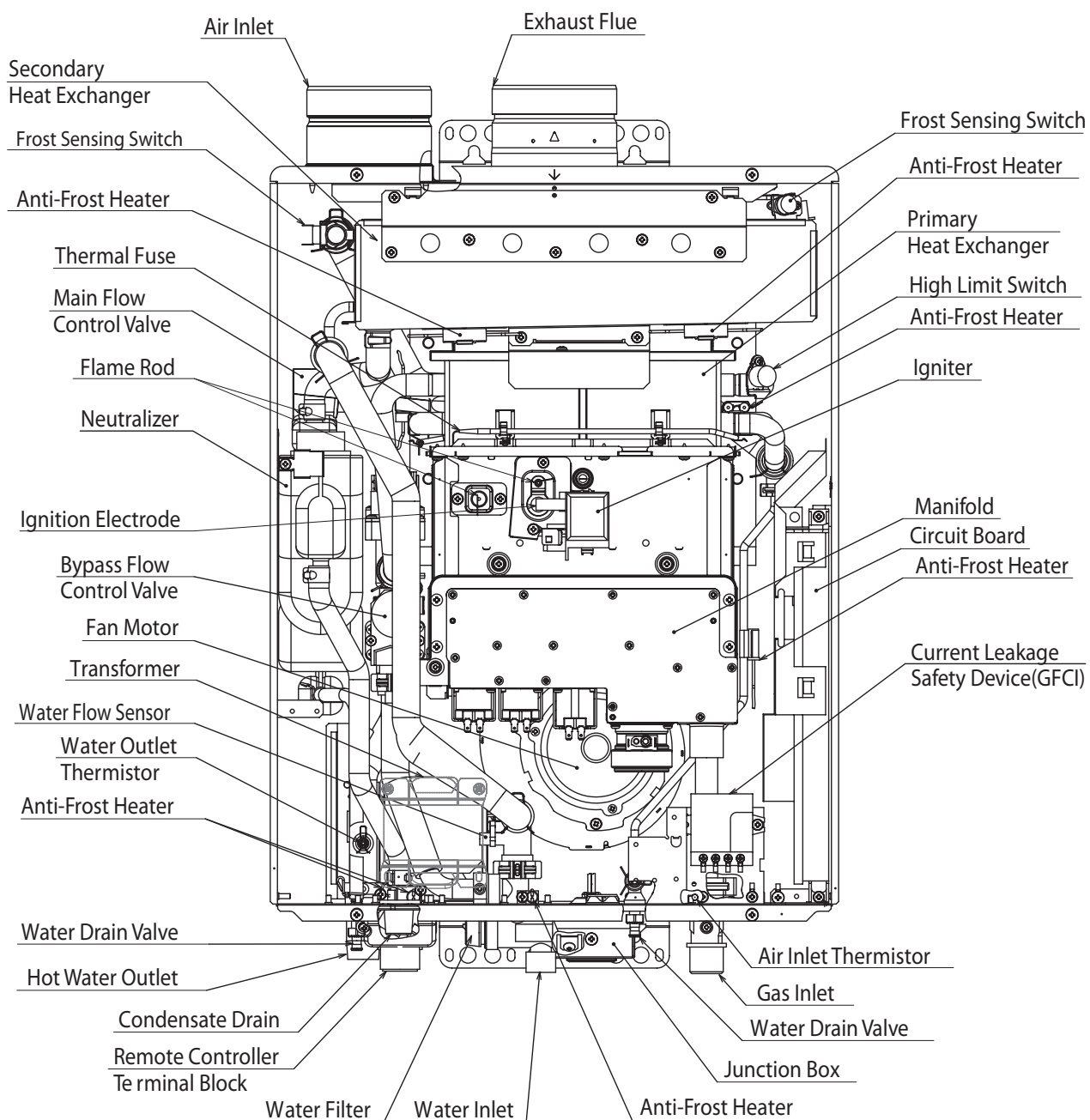


■ NCC199-SV / N-0841MC / NRC111-SV / N-0842MC



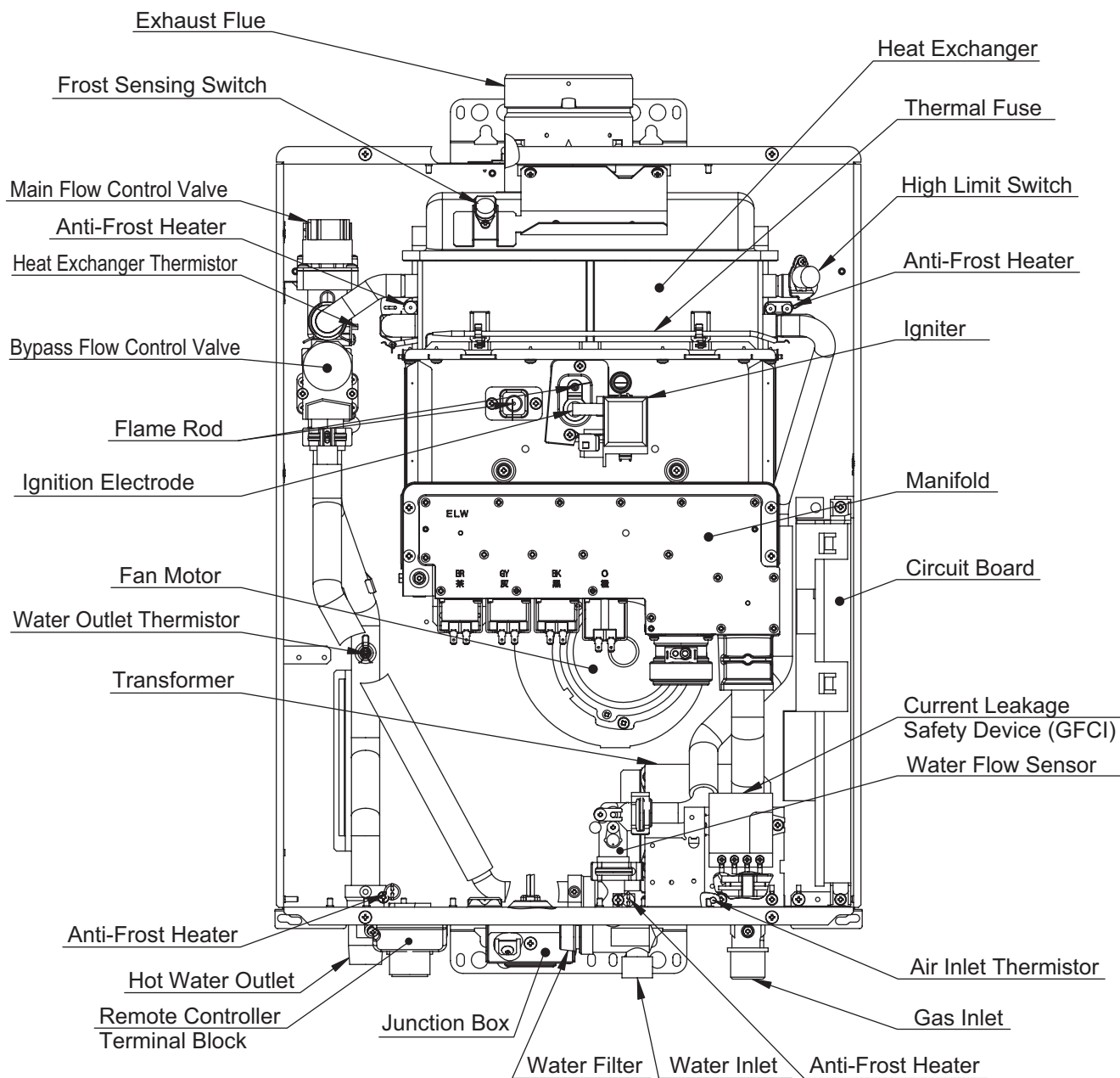
NRC111-DV /
N-0842MC-DV

■ NCC199-DV / N-0841MC-DV / NRC111-DV / N-0842MC-DV

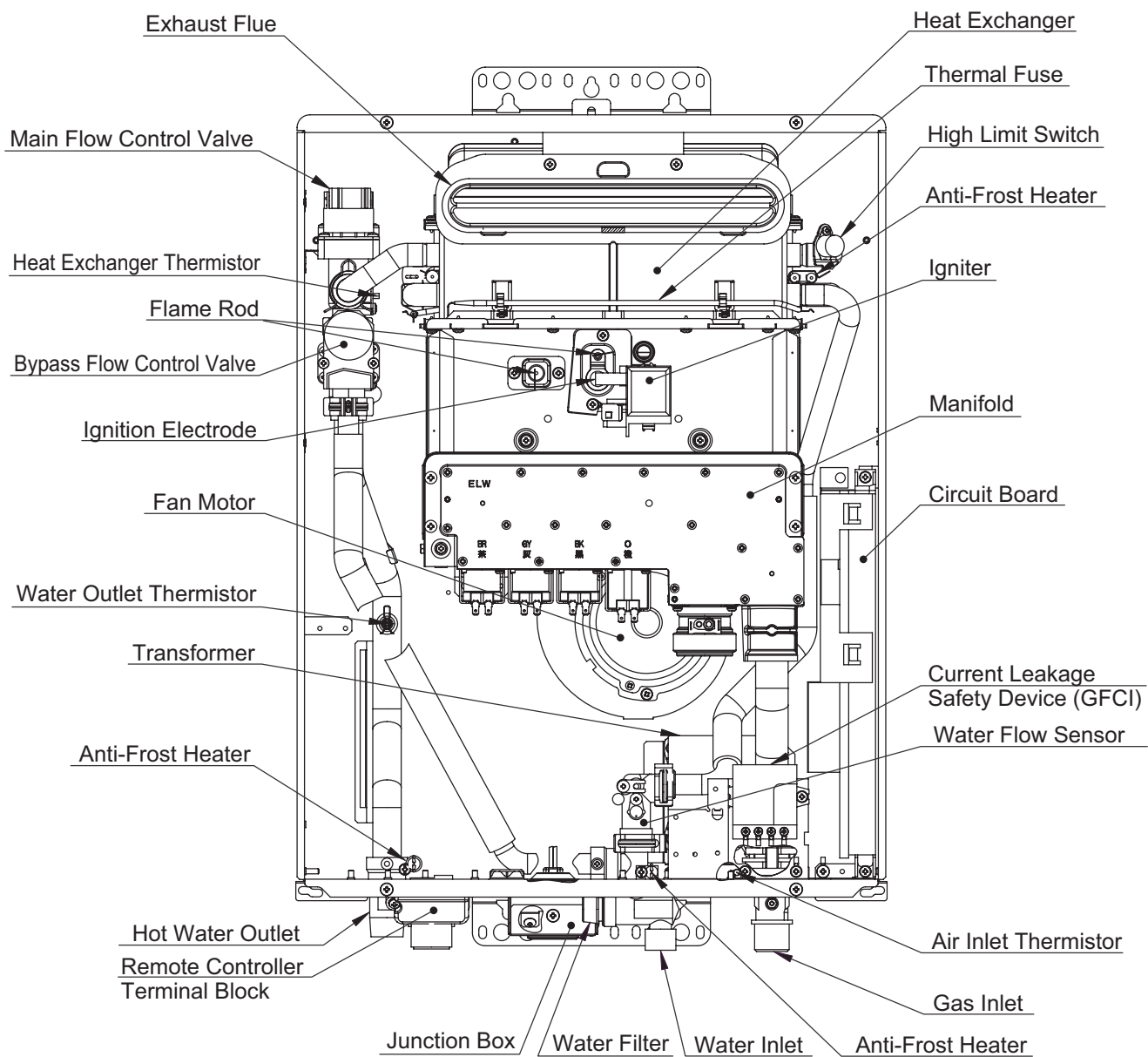


NRC111-DV /
N-0842MC-DV

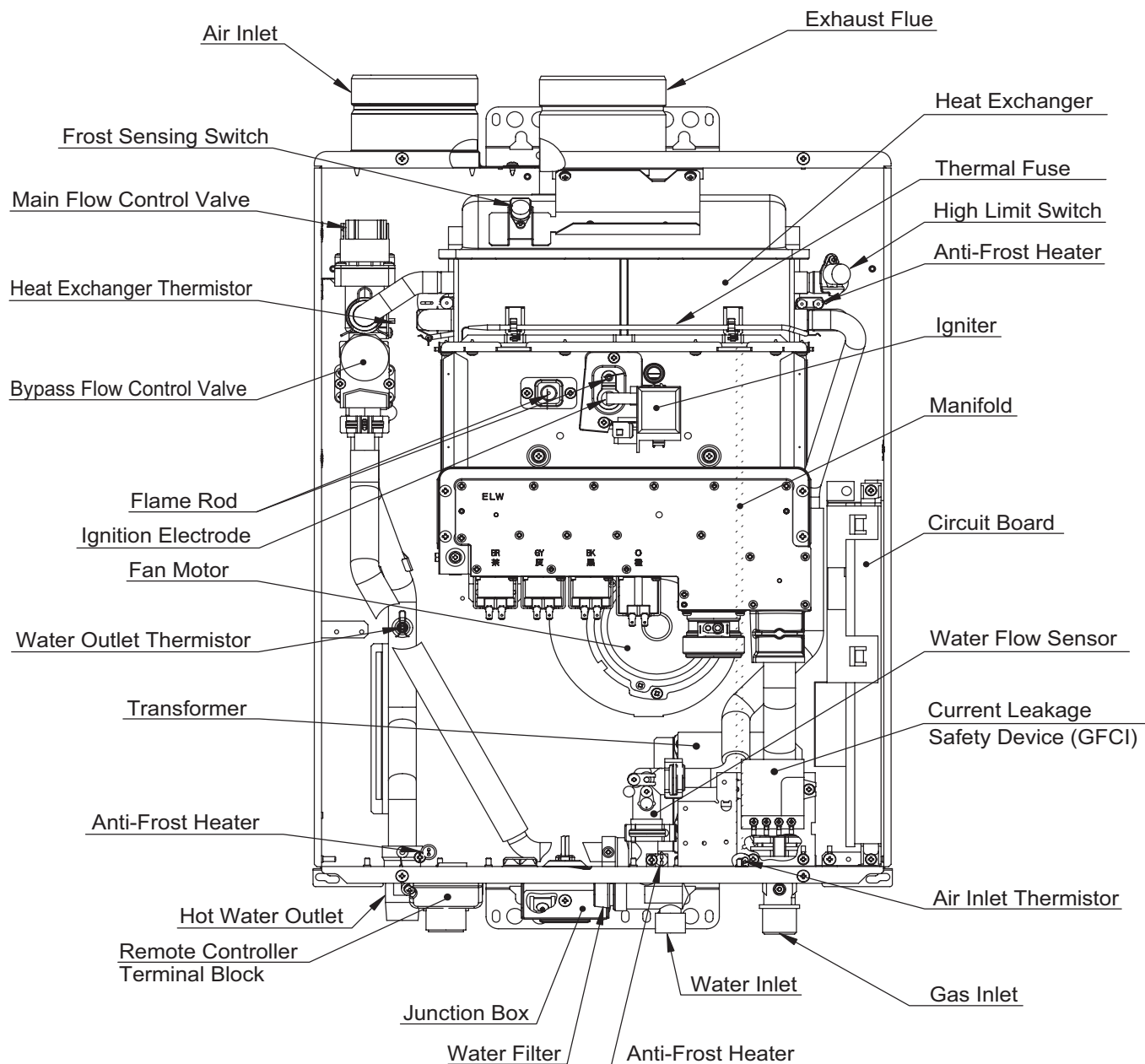
■ NR111-SV / NC250-SV-ASME / N-0931M



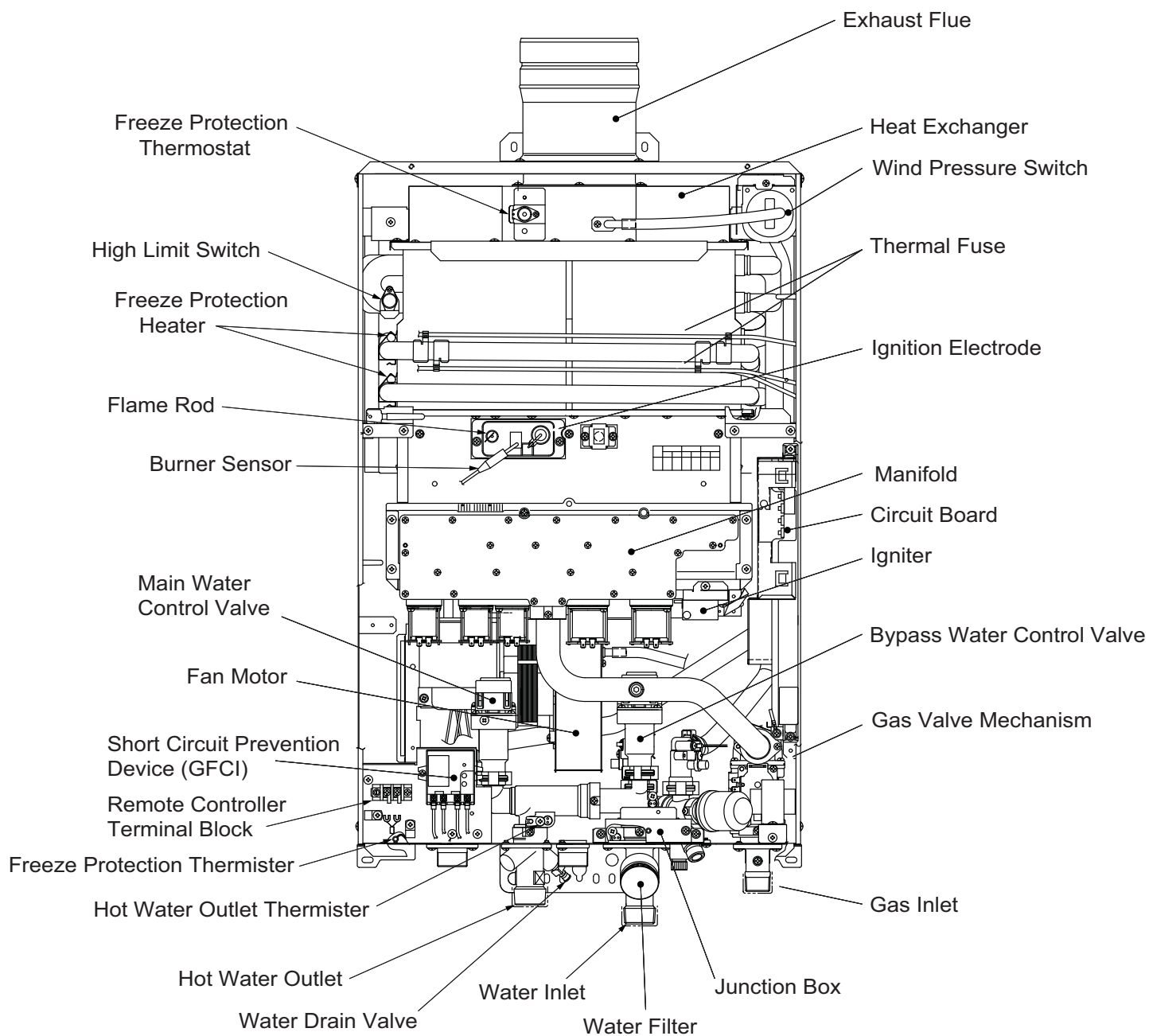
■ NR111-OD / N-0931M-OD



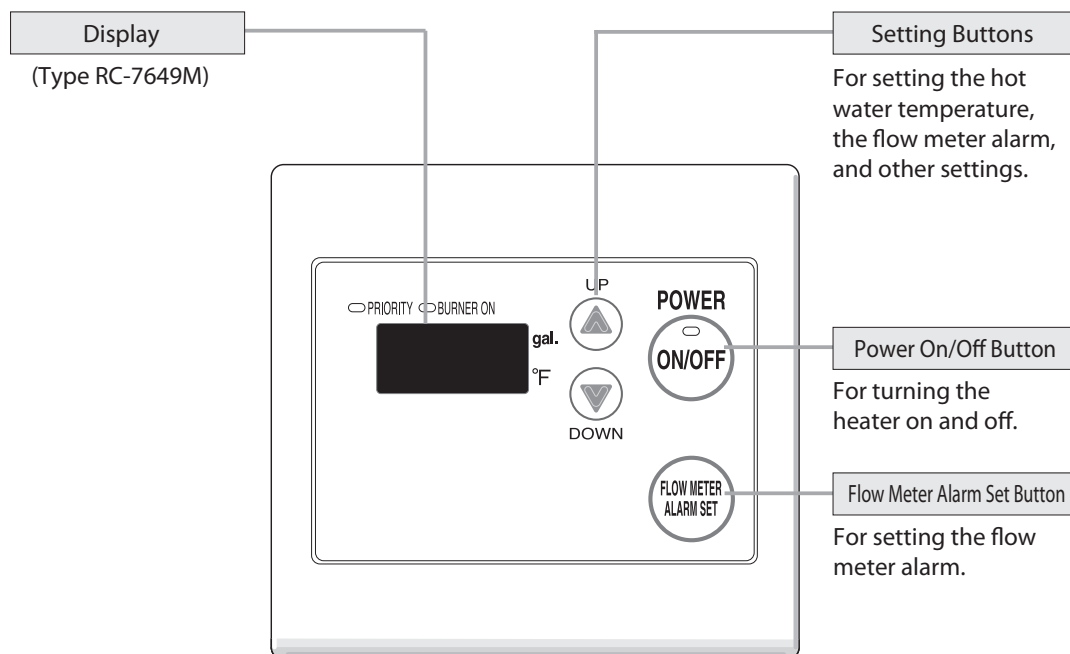
■ NR111-DV / NC250-DV-ASME / N-0931M-DV



■ NC380-SV-ASME / N-1321M-ASME



■ Remote Controller (RC-7649M and RC-7650M)

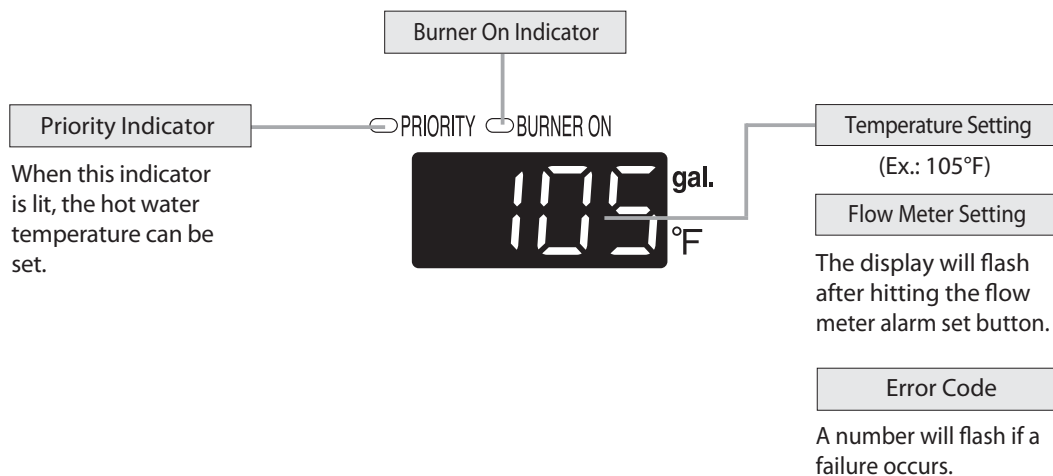


* Before use, remove the protective sheet from the remote controller surface.

* The unit has been shipped from the factory with the remote control set at 110°F.

Display (RC-7649M)

The illustration below shows an example of the remote controller display. What is actually displayed depends on how the water heater is set.

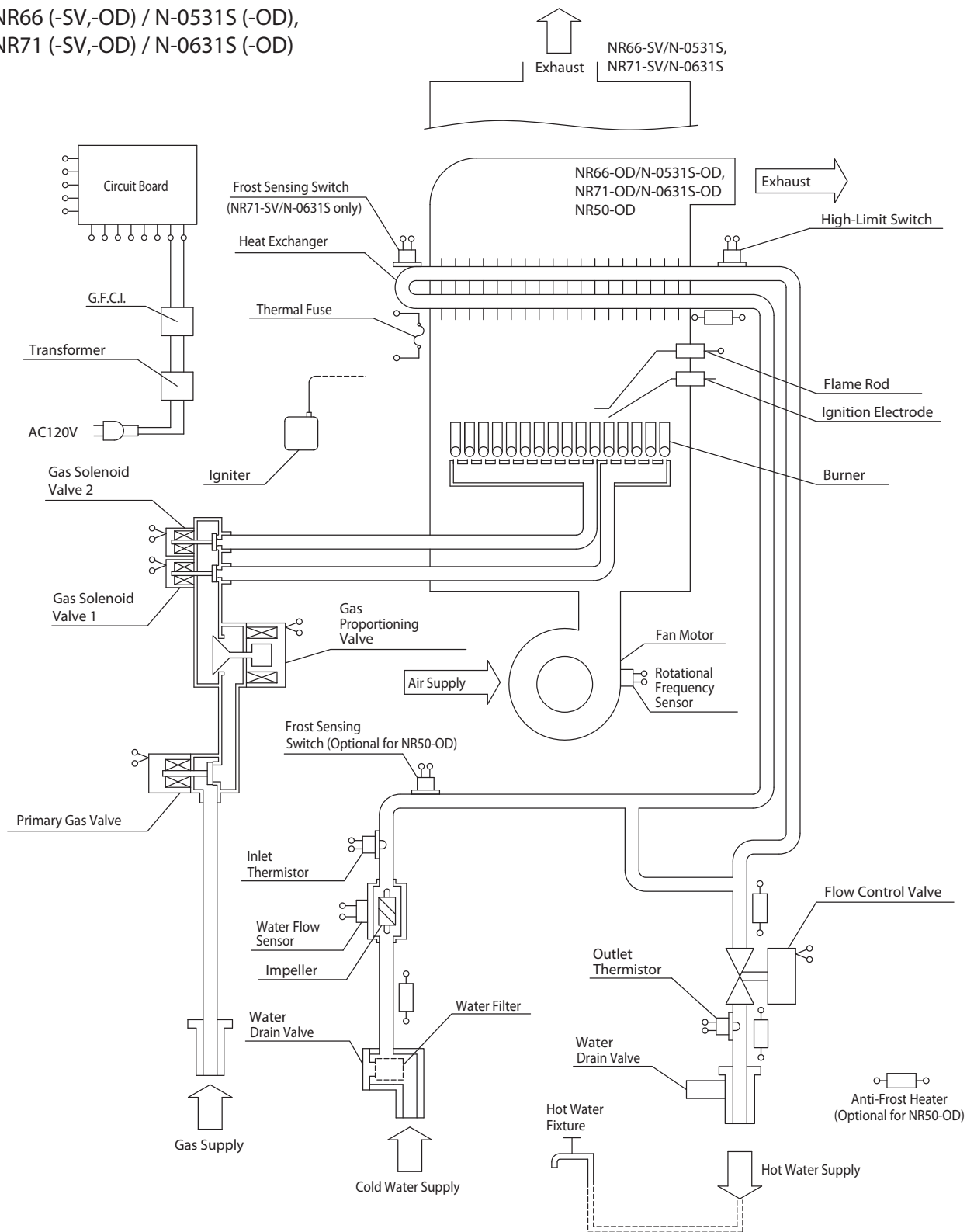


Display (RC-7650M)



5. Operating Principle

- NR50-OD
- NR66 (-SV,-OD) / N-0531S (-OD),
- NR71 (-SV,-OD) / N-0631S (-OD)



< How to Use NR50-OD, NR66 (-SV,-OD) / N-0531S (-OD), NR71 (-SV,-OD) / N-0631S (-OD) >

1. Normal Operation

1. Turn the unit on. If an optional remote controller is not installed with the unit, the unit will be on as soon as electricity is connected to it. If a remote controller is installed, the power button will need to be pushed to turn the unit on.
2. Whenever a hot water fixture is opened, or an appliance that requires hot water is turned on, as soon as the flow sensor detects at least the minimum flow rate required combustion, the fan will initiate and pre-purge any residual combustibles in the combustion chamber. The igniter will then create a spark and the gas valves will open allowing fuel into the combustion chamber where it be ignited by the spark.
3. When the flame rod detects a flame, the igniter will stop sparking.
4. The computer will then control the gas and water control valves to maintain the water at the temperature setting. The temperature can be adjusted by removing the temperature jumpers, or by changing the remote controller setting if one is installed.
5. When the demand for hot water ceases, the unit will stop heating.

When the flow sensor detects that the rate has dropped below the minimum rate for continued burning, the gas valves will close and the burner flame will go out. After the post purge removes residual gas from combustion chamber, the unit stops.

If necessary, turn off the power by either disconnecting the power supply, or pressing the power button on the remote controller if one is installed.

2. Error Codes

The unit will indicate problems with a flashing light on the circuit board inside the unit that will be visible outside the unit through a small window. If a remote controller is installed, it will display error codes as follows.

If the flame rod does not detect a flame, or if the high limit switch has been triggered, the gas valves will close, the flame will go out, and an error code will flash on the remote controller if one installed.

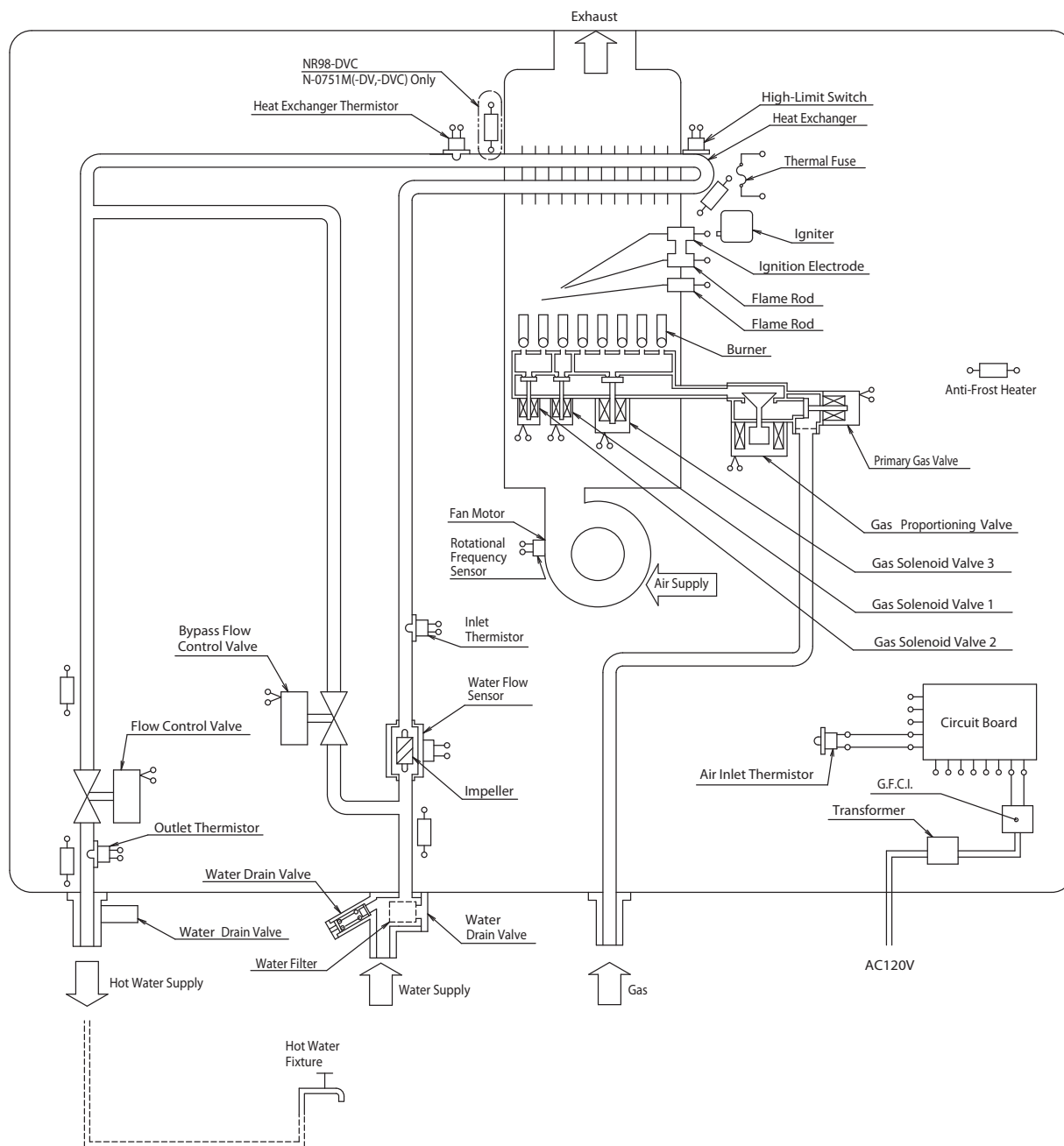
In order to reset the unit and remove the error code, turn the power off by either disconnecting the power supply or by pressing the "operation button" on the optional remote controller, and then press it again to turn the unit back on.

If the problem requires service (the thermal fuse is triggered, etc) the gas valve will stay closed and resetting the unit will not eliminate the error code. If this is the case, the unit must be serviced before it will work again.

3. Miscellaneous

If the unit will not be used for a long period of time, turn off the power, drain the unit of water, and close the manual gas valve on the supply line.

■ NR98 (-SV,-OD,-DVC) / NC199 (-OD,-DVC) / N-0751M (-OD,-DV,-DVC)



< How to Use NR98 (-SV,-OD,-DVC) / NC199 (-OD,-DVC) / N-0751M (-DV, -OD -DVC) >

1. Normal Operation (Hot Water Production)

1. Turn on the POWER by pressing the "POWER" button on the remote controller. (The priority lamp lights.)
2. Whenever a hot water fixture is opened, or an appliance that requires hot water is turned on, as soon as the flow sensor detects at least the minimum flow rate required for initiating combustion, the fan will initiate and pre-purge any residual combustibles in the combustion chamber. The igniter will then create a spark and the gas valves will open, allowing fuel into the combustion chamber where it will be ignited by the spark.
3. When the flame rod detects a flame, the igniter stops sparking.
4. The computer will then control the gas and water control valves to maintain the water at the temperature set on the remote controller. The temperature can be adjusted using the "Setting Buttons" on the remote controller (if the temperature is set 145°F or higher, the Bypass Water Control Valve will be closed).
5. When the demand for hot water ceases, the unit will stop heating:

When the flow sensor detects that the flow rate has dropped below the minimum rate for continued burning, the gas valves will close and the burner flame will go out. After the post purge removes residual gas from the combustion chamber, the unit stops.

If necessary, turn off the power by pressing the "Operation Button" on the remote controller (the priority lamp will turn off).

2. Error Codes

If the flame rod does not detect a flame, or if the high limit switch has been triggered, the gas valves will close, the flame will go out, and an error code will flash on the remote controller.

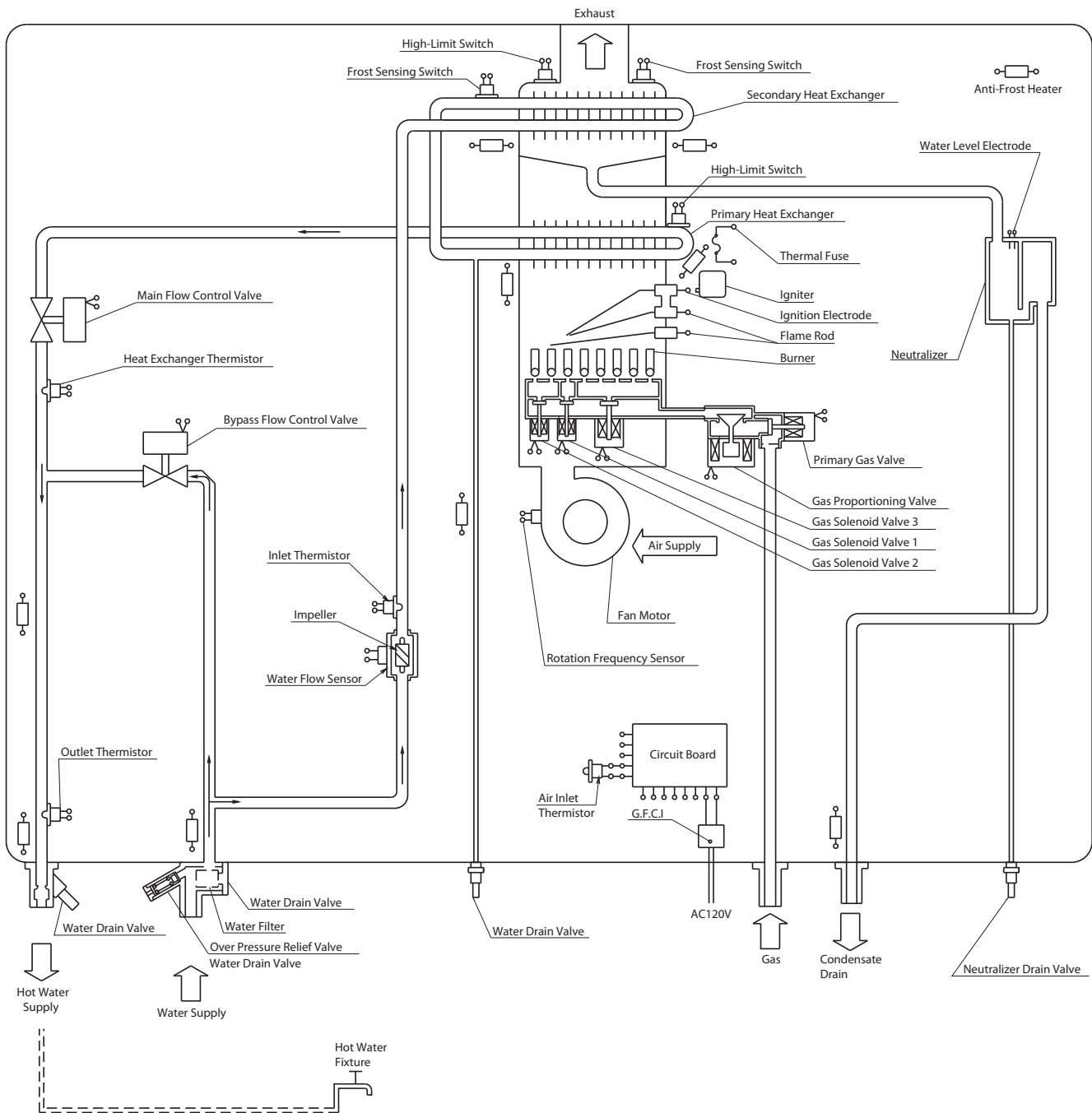
In order to reset the unit and remove the error code, turn the power off by pressing the "Operation Button" on the remote controller, and then press it again to turn the unit back on.

If the problem requires service (the thermal fuse is triggered, etc) the gas valves will stay closed and resetting the unit will not eliminate the error code. If this is the case, the unit must be serviced before it will work again.

3. Miscellaneous

If the unit will not be used for a long period of time, turn off the power, drain the unit of water, and close the manual gas valve on the supply line.

■ NCC199 (-SV,-DV) / N-0841MC (-DV), NRC111 (-SV,-DV) / N-0842MC (-DV)



< How to Use NCC199 (-SV,-DV) / N-0841MC (-DV), NRC111 (-SV,-DV) / N-0842MC (-DV) >

1. Normal Operation (Hot Water Production)

1. Turn on the POWER by pressing the "POWER" button on the remote controller. (The priority lamp lights.)
The main flow control valve will open.
2. Whenever a hot water fixture is opened, or an appliance that requires hot water is turned on, as soon as the flow sensor detects at least the minimum flow rate required for initiating combustion, the fan will initiate and pre-purge any residual combustibles in the combustion chamber. The igniter will then create a spark and the gas valves will open, allowing fuel into the combustion chamber where it will be ignited by the spark.
3. When the flame rod detects a flame, the igniter stops sparking.
4. The computer will then control the gas and water control valves to maintain the water at the temperature set on the remote controller. The temperature can be adjusted using the "Setting Buttons" on the remote controller (if the temperature is set 135°F or higher, the Bypass Water Control Valve will be closed).
5. When the demand for hot water ceases, the unit will stop heating:

When the flow sensor detects that the flow rate has dropped below the minimum rate for continued burning, the gas valves will close and the burner flame will go out. After the post purge removes residual gas from the combustion chamber, the unit stops.

If necessary, turn off the power by pressing the "Operation Button" on the remote controller (the priority lamp will turn off).

2. Error Codes

If the flame rod does not detect a flame, or if the high limit switch has been triggered, the gas valves will close, the flame will go out, and an error code will flash on the remote controller.

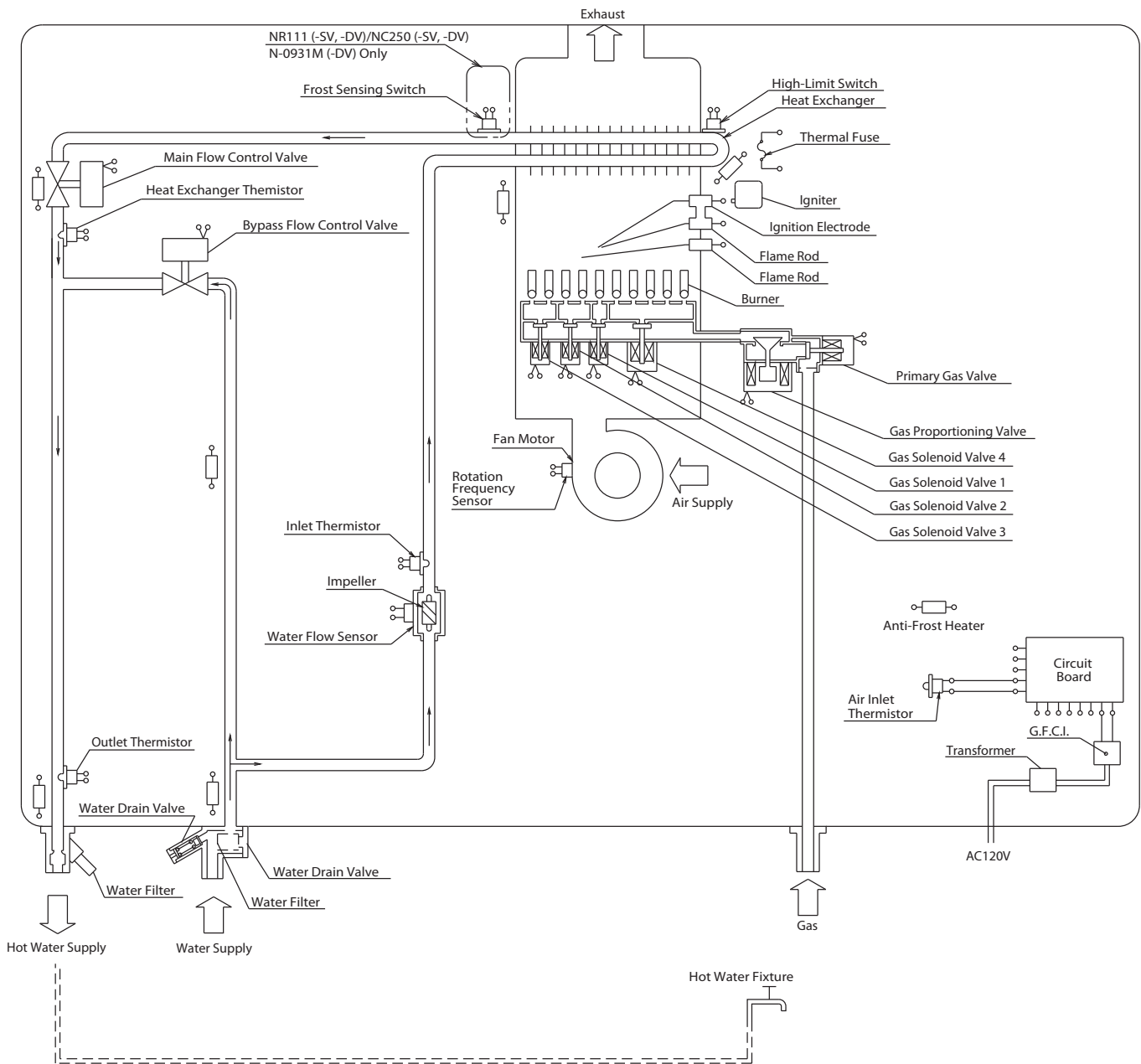
In order to reset the unit and remove the error code, turn the power off by pressing the "Operation Button" on the remote controller, and then press it again to turn the unit back on.

If the problem requires service (the thermal fuse is triggered, etc) the gas valves will stay closed and resetting the unit will not eliminate the error code. If this is the case, the unit must be serviced before it will work again.

3. Miscellaneous

If the unit will not be used for a long period of time, turn off the power, drain the unit of water, and close the manual gas valve on the supply line.

■ NR111 (-SV,-OD,-DV) / NC250 (-SV,-DV)-ASME / N-0931M (-OD,-DV)



< How to Use NR111 (-SV,-OD,-DV) / NC250 (-SV,-DV)-ASME / N-0931M (-OD,-DV) >

1. Normal Operation (Hot Water Production)

1. Turn on the POWER by pressing the "POWER" button on the remote controller. (The priority lamp lights.)
The main flow control valve will open.
2. Whenever a hot water fixture is opened, or an appliance that requires hot water is turned on, as soon as the flow sensor detects at least the minimum flow rate required for initiating combustion, the fan will initiate and pre-purge any residual combustibles in the combustion chamber. The igniter will then create a spark and the gas valves will open, allowing fuel into the combustion chamber where it will be ignited by the spark.
3. When the flame rod detects a flame, the igniter stops sparking.
4. The computer will then control the gas and water control valves to maintain the water at the temperature set on the remote controller. The temperature can be adjusted using the "Setting Buttons" on the remote controller (if the temperature is set 145°F or higher, the Bypass Water Control Valve will be closed).
5. When the demand for hot water ceases, the unit will stop heating:

When the flow sensor detects that the flow rate has dropped below the minimum rate for continued burning, the gas valves will close and the burner flame will go out. After the post purge removes residual gas from the combustion chamber, the unit stops.

If necessary, turn off the power by pressing the "Operation Button" on the remote controller (the priority lamp will turn off).

2. Error Codes

If the flame rod does not detect a flame, or if the high limit switch has been triggered, the gas valves will close, the flame will go out, and an error code will flash on the remote controller.

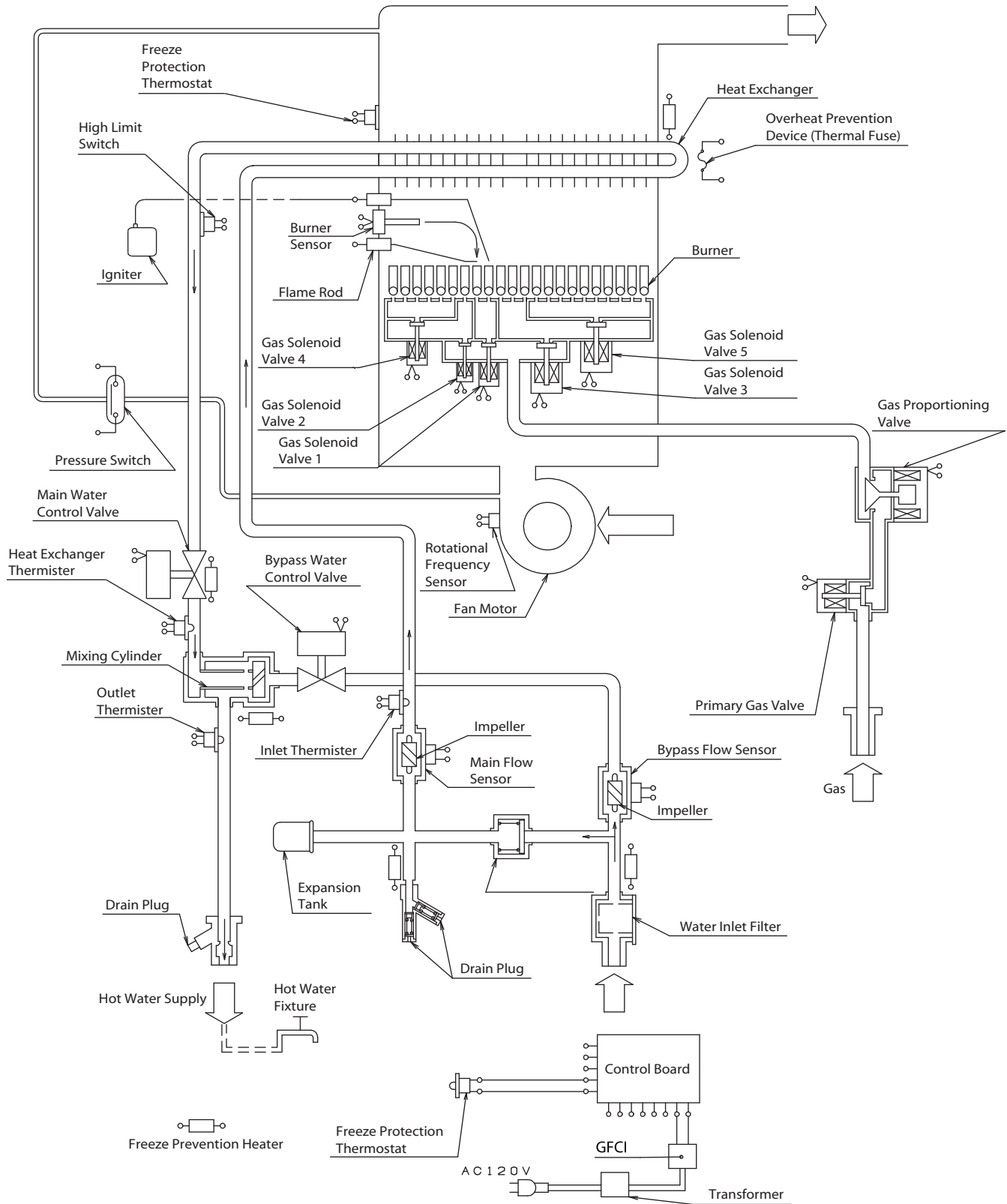
In order to reset the unit and remove the error code, turn the power off by pressing the "Operation Button" on the remote controller, and then press it again to turn the unit back on.

If the problem requires service (the thermal fuse is triggered, etc) the gas valves will stay closed and resetting the unit will not eliminate the error code. If this is the case, the unit must be serviced before it will work again.

3. Miscellaneous

If the unit will not be used for a long period of time, turn off the power, drain the unit of water, and close the manual gas valve on the supply line.

■ NC380-SV-ASME / N-1321M-ASME



< How to Use NC380-SV-ASME / N-1321M-ASME >

1. Normal Operation

(Hot Water Production)

1. Turn on the POWER by pressing the "POWER" button on the remote controller. (The priority lamp lights.)
The main flow control valve will open.
2. Whenever a hot water fixture is opened, or an appliance that requires hot water is turned on, as soon as the flow sensor detects at least the minimum flow rate required for initiating combustion, the fan will initiate and pre-purge any residual combustibles in the combustion chamber. The igniter will then create a spark and the gas valves will open, allowing fuel into the combustion chamber where it will be ignited by the spark.
3. When the flame rod detects a flame, the igniter stops sparking.
4. The computer will then control the gas and water control valves to maintain the water at the temperature set on the remote controller. The temperature can be adjusted using the "Setting Buttons" on the remote controller (if the temperature is set 145°F or higher, the Bypass Water Control Valve will be closed).
5. When the demand for hot water ceases, the unit will stop heating:

When the flow sensor detects that the flow rate has dropped below the minimum rate for continued burning, the gas valves will close and the burner flame will go out. After the post purge removes residual gas from the combustion chamber, the unit stops.

If necessary, turn off the power by pressing the "Operation Button" on the remote controller (the priority lamp will turn off).

2. Error Codes

If the flame rod does not detect a flame, or if the high limit switch has been triggered, the gas valves will close, the flame will go out, and an error code will flash on the remote controller.

In order to reset the unit and remove the error code, turn the power off by pressing the "Operation Button" on the remote controller, and then press it again to turn the unit back on.

If the problem requires service (the thermal fuse is triggered, etc) the gas valves will stay closed and resetting the unit will not eliminate the error code. If this is the case, the unit must be serviced before it will work again.

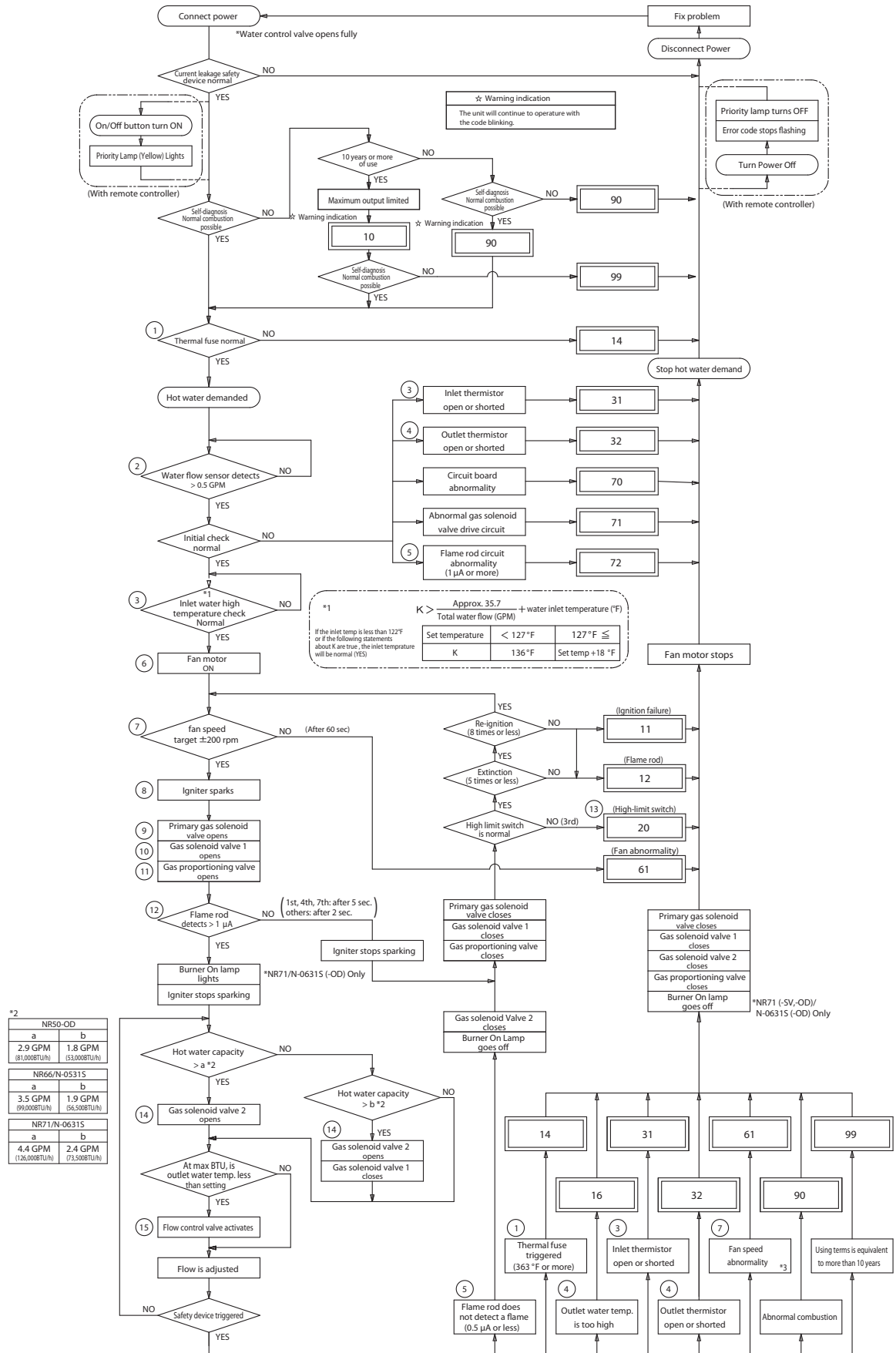
3. Miscellaneous

If the unit will not be used for a long period of time, turn off the power, drain the unit of water, and close the manual gas valve on the supply line.

6. Operation Flow Chart

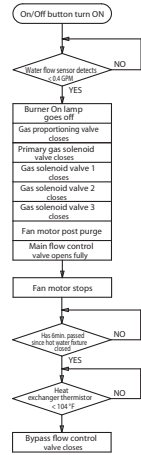
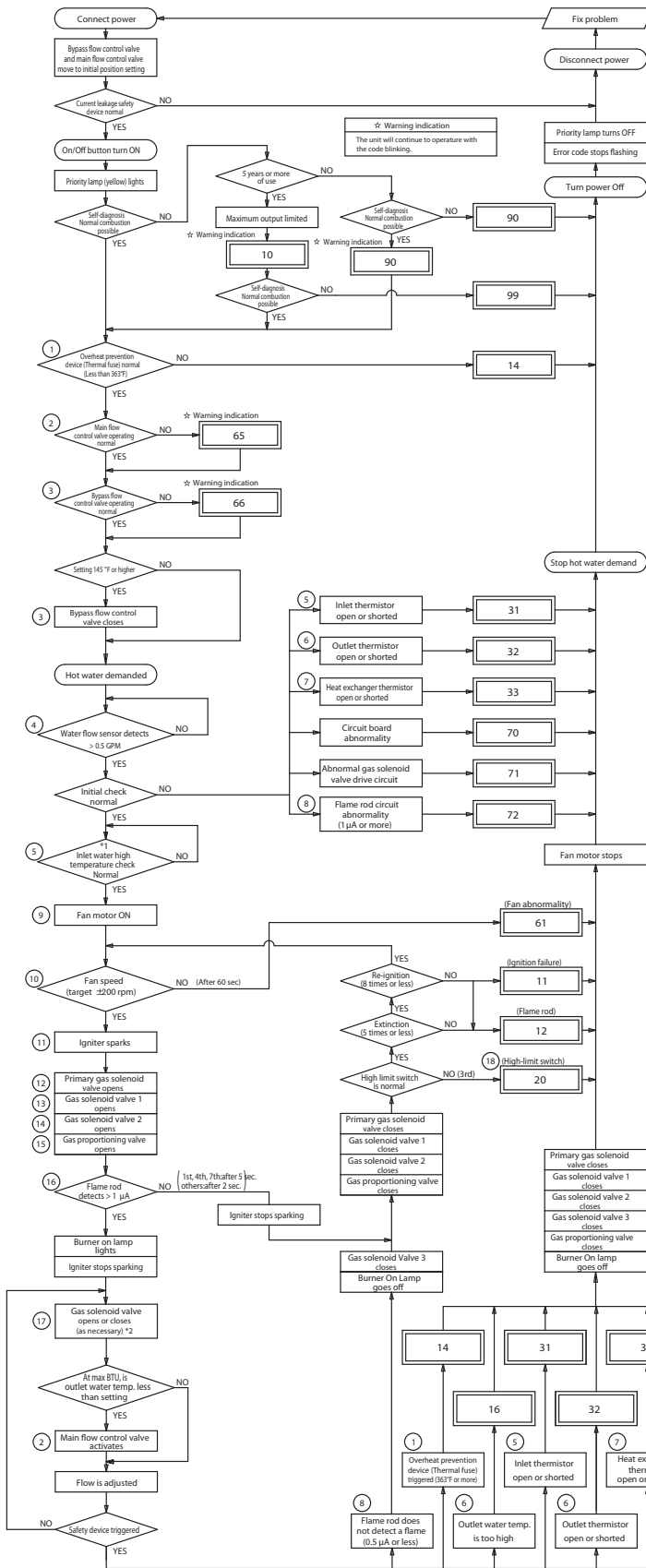
■ NR50-OD / NR66 (-SV,-OD) / N-0531S (-OD), NR71 (-SV,-OD) / N-0631S (-OD)

Water Heating

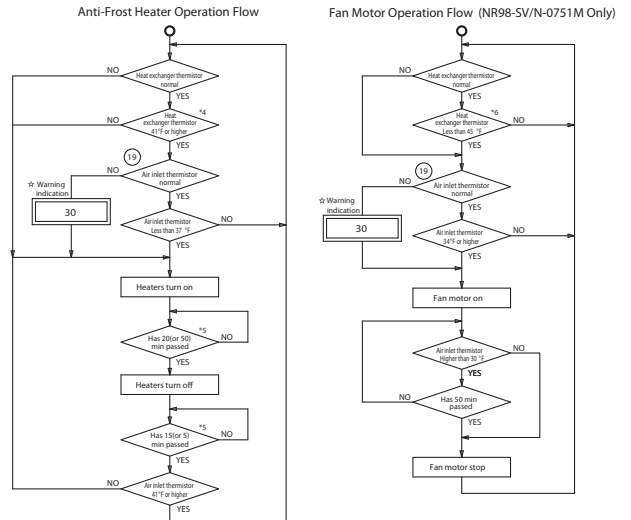


■ NR98 (-SV,-OD,-DVC) / NC199 (-OD,-DVC) / N-0751M (-OD,-DV,-DVC)

Shutdown procedure



Freeze Prevention Control



*4 When less than 60 minutes after combustion, it is 50 °F or higher.

*5 Differs depending on set temperature.

*6 When less than 60 minutes after combustion, it is less than 54 °F.

*1 If the inlet temp is less than 122 °F or if the following statements about K are true, the inlet temperature will be normal (YES).

$K > \frac{\text{Approx. 18}}{\text{Total water flow (GPM)}} + \text{water inlet temperature (°F)}$		
Set temperature	Less than 127 °F	127°F or more

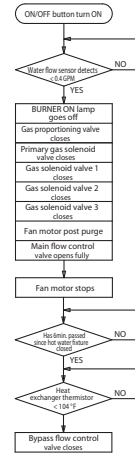
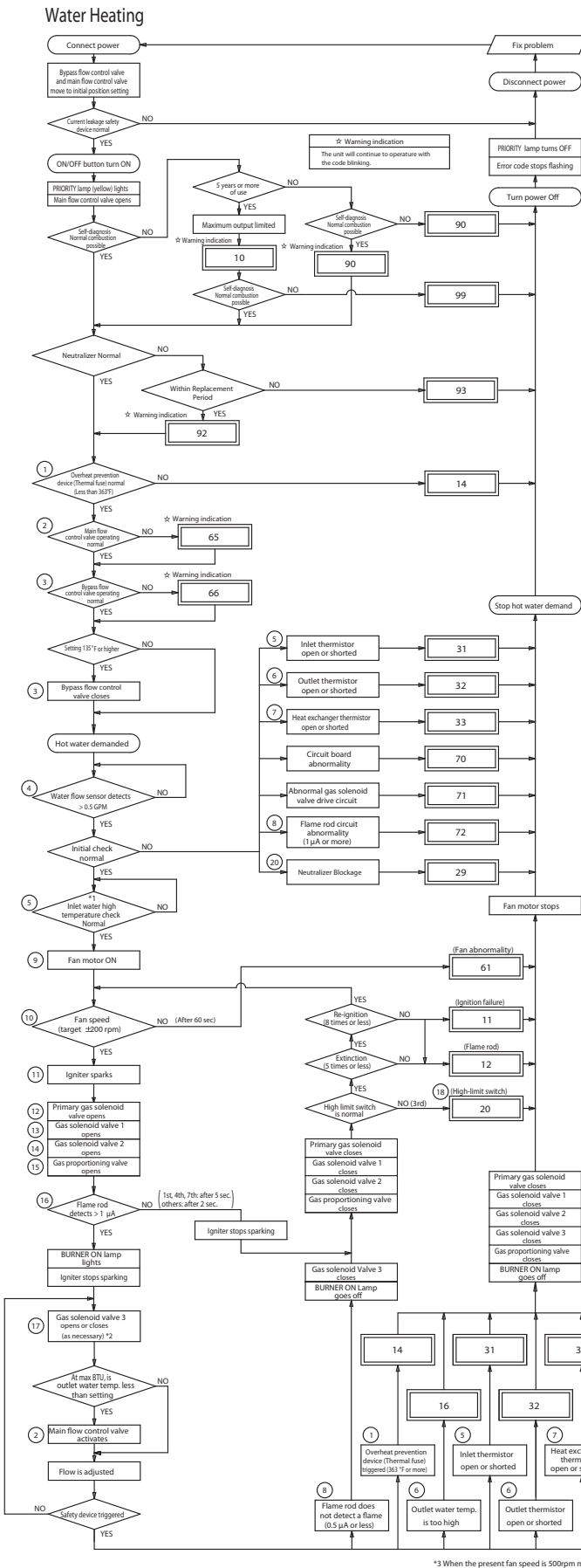
$K > \frac{\text{Approx. 18}}{\text{Total water flow (GPM)}} + \text{water inlet temperature (} ^\circ\text{F)}$

Set temperature	Less than 127 °F	127 °F or more
K	136 °F	Set temp +9 °F

	Over 110,000 BTU	Over 57,000 BTU	Over 35,000 BTU	Over 18,000 BTU	Over 8,000 BTU
Gas solenoid valve 1	ON	ON	ON		ON
Gas solenoid valve 2	ON		ON	ON	
Gas solenoid valve 3	ON	ON			

*3 When the present fan speed is 500rpm more or less than target speed.

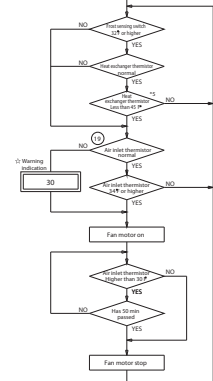
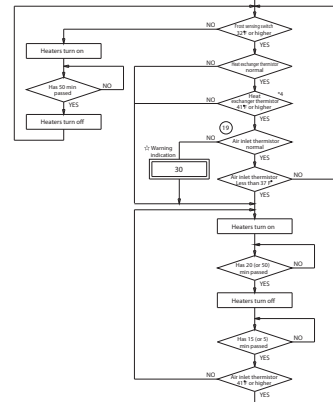
■ NCC199 (-SV, -DV) / N-0841MC (-DV), NRC111 (-SV, -DV) / N-0842MC (-DV)



Freeze Prevention Control

Anti-Frost Heater Operation Flow

Fan Motor Operation Flow (NCC199-SV/N-0841MC Only)



*5 When less than 60 minutes after combustion, it is less than 54 F.

⁻⁵ When less than 60 minutes after combustion, it is less than 54 F.

*1 If the inlet temp is less than 122°F or if the following statements about K are true, the inlet temperature will be normal (YES).

$K > \frac{\text{Approx. 18}}{\text{Total water flow (GPM)}} + \text{water inlet temperature (°F)}$		
Set temperature	Less than 127°F	127°F or more

$K > \frac{\text{Approx. 18}}{\text{Total water flow (GPM)}} + \text{water inlet temperature (}^{\circ}\text{F)}$

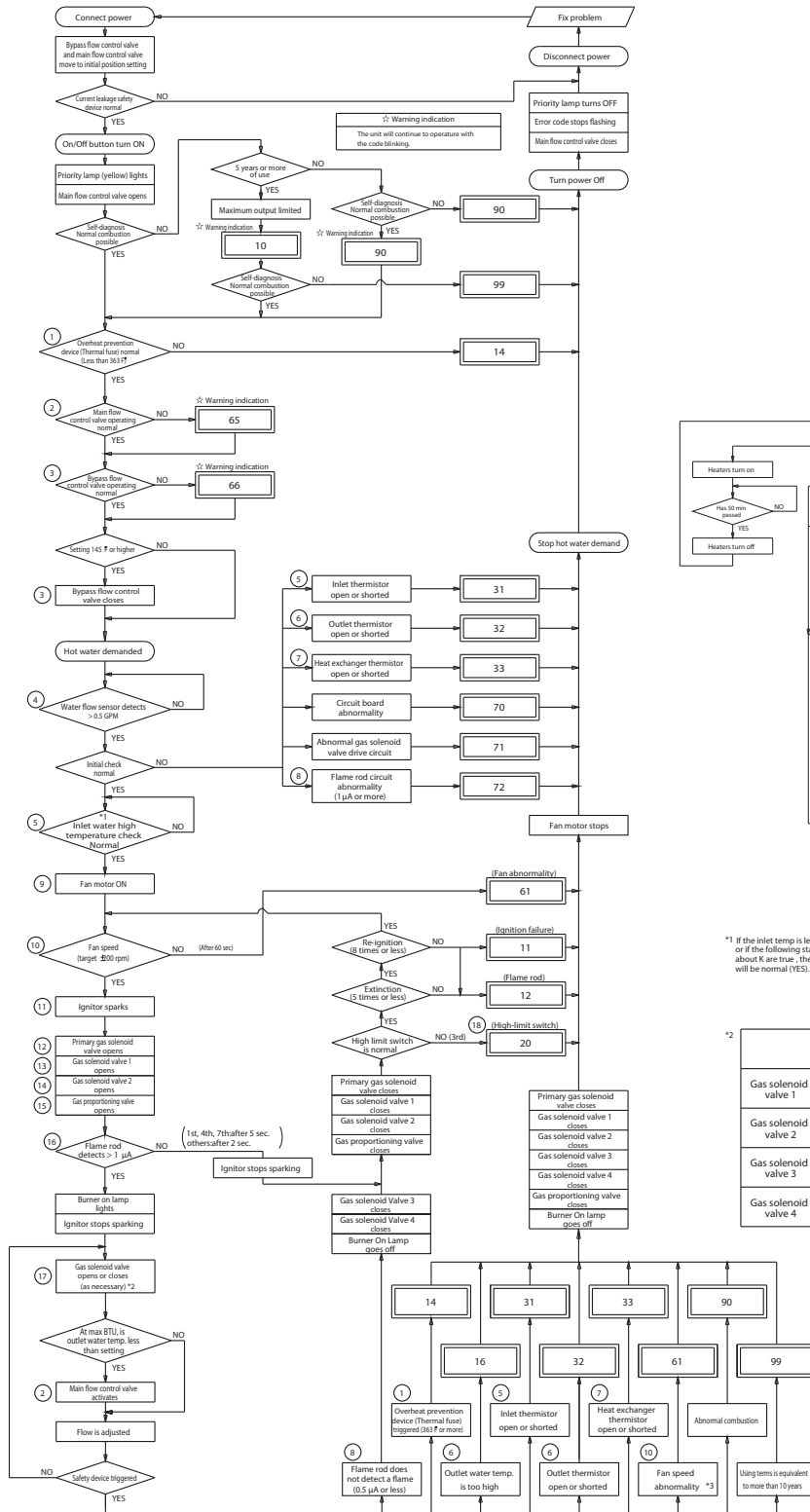
Set temperature	Less than 127°F	127°F or more
K	136°F	Set temp + 9°F

	Over 139,000 BTU	Over 64,000 BTU	Over 42,000 BTU	Over 23,000 BTU	Over 9,500 BTU
Gas solenoid valve 1	ON	ON	ON		ON
Gas solenoid valve 2	ON		ON	ON	
Gas solenoid valve 3	ON	ON			

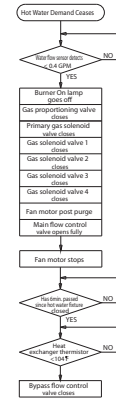
*3 When the present fan speed is 500rpm more or less than target speed

■ NR111 (-SV,-OD,-DV) / NC250 (-SV,-DV)-ASME / N-0931M (-OD,-DV)

Water heating

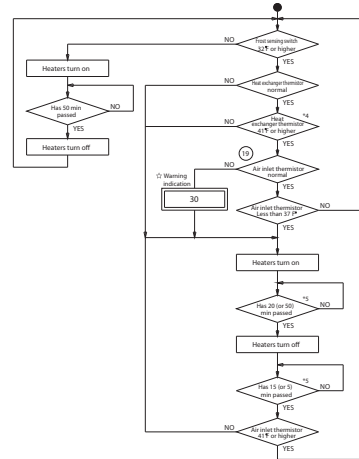


Shutdown Procedure

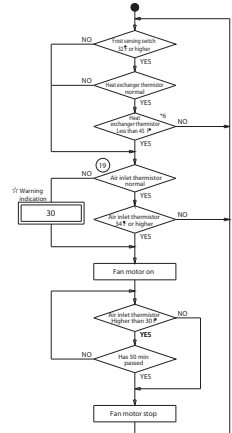


Freeze Prevention Control

Anti-Frost Heater Operation Flow



Fan Motor Operation Flow (NR111-SV/N-0931M Only)



*4 When less than 60 minutes after combustion, it is 50°F or higher.
 *5 Differs depending on set temperature.
 *6 When less than 60 minutes after combustion, it is less than 54°F.

1 If the inlet temp is less than 122°F or if the following statements about K are true, the inlet temperature will be normal (YES).

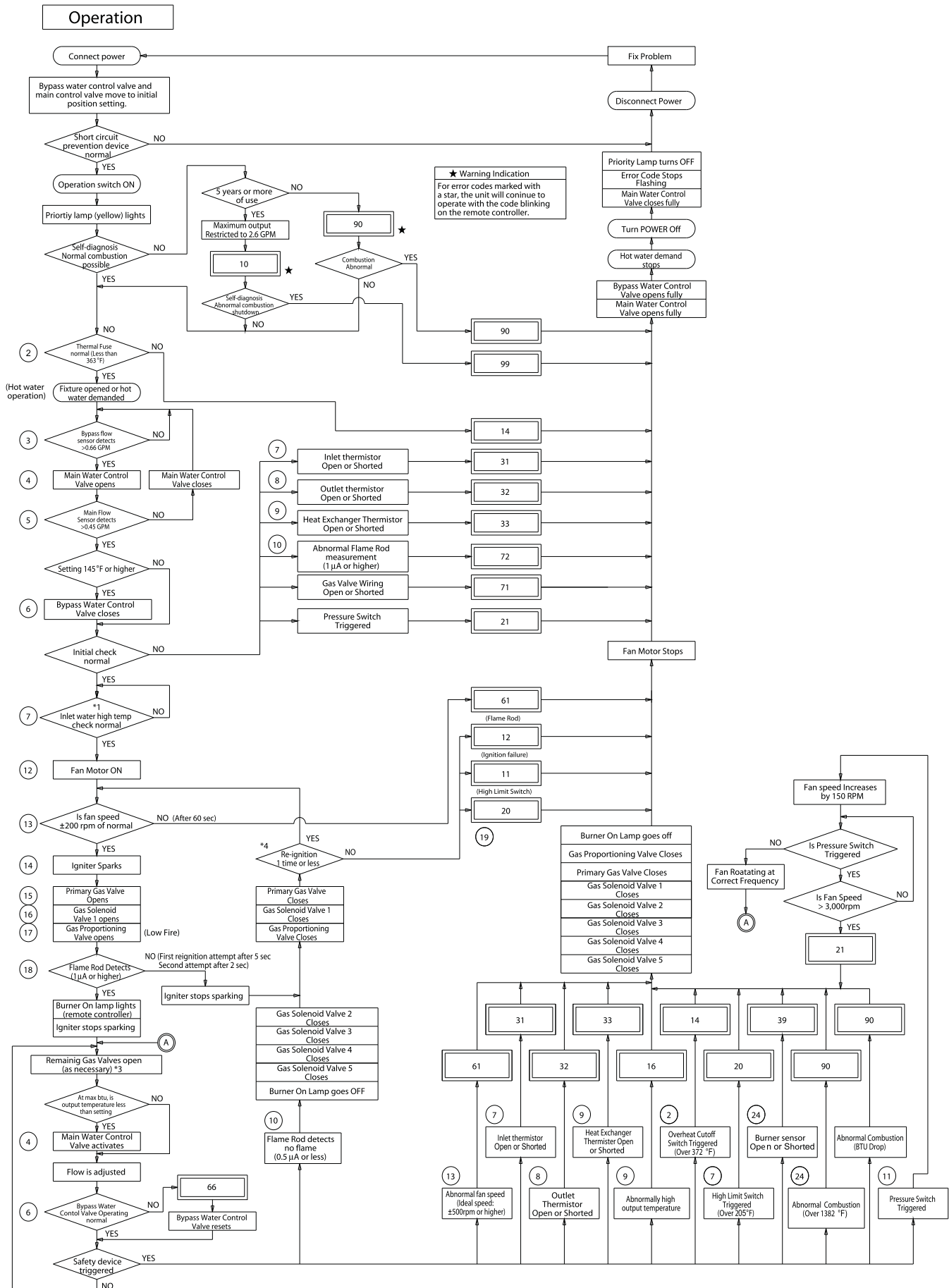
$$K = \frac{\text{Approx. 18}}{\text{Total water flow (GPM)}} + \text{water inlet temperature (°F)}$$

Set temperature	Less than 127°F	127°F or more
K	136°F	Set temp +9°F

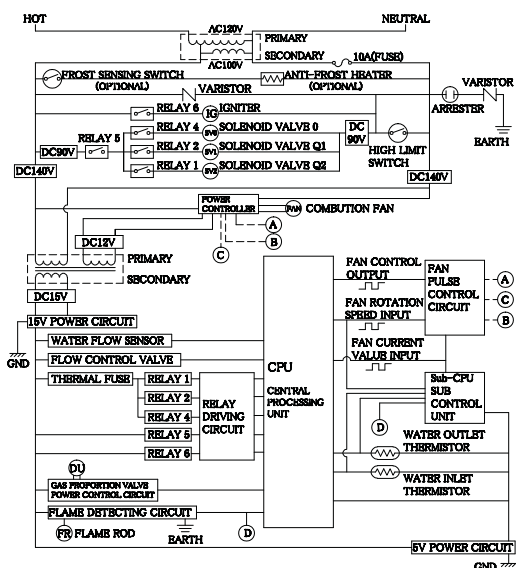
*2

	Over 120,000 BTU	Over 60,000 BTU	Over 40,000 BTU	Over 20,000 BTU	Over 8,000 BTU
Gas solenoid valve 1	ON	ON	ON	ON	ON
Gas solenoid valve 2	ON	ON	ON	ON	ON
Gas solenoid valve 3	ON	ON	ON	ON	ON
Gas solenoid valve 4	ON	ON	ON	ON	ON

*3 When the present fan speed is 500rpm more or less than target speed.



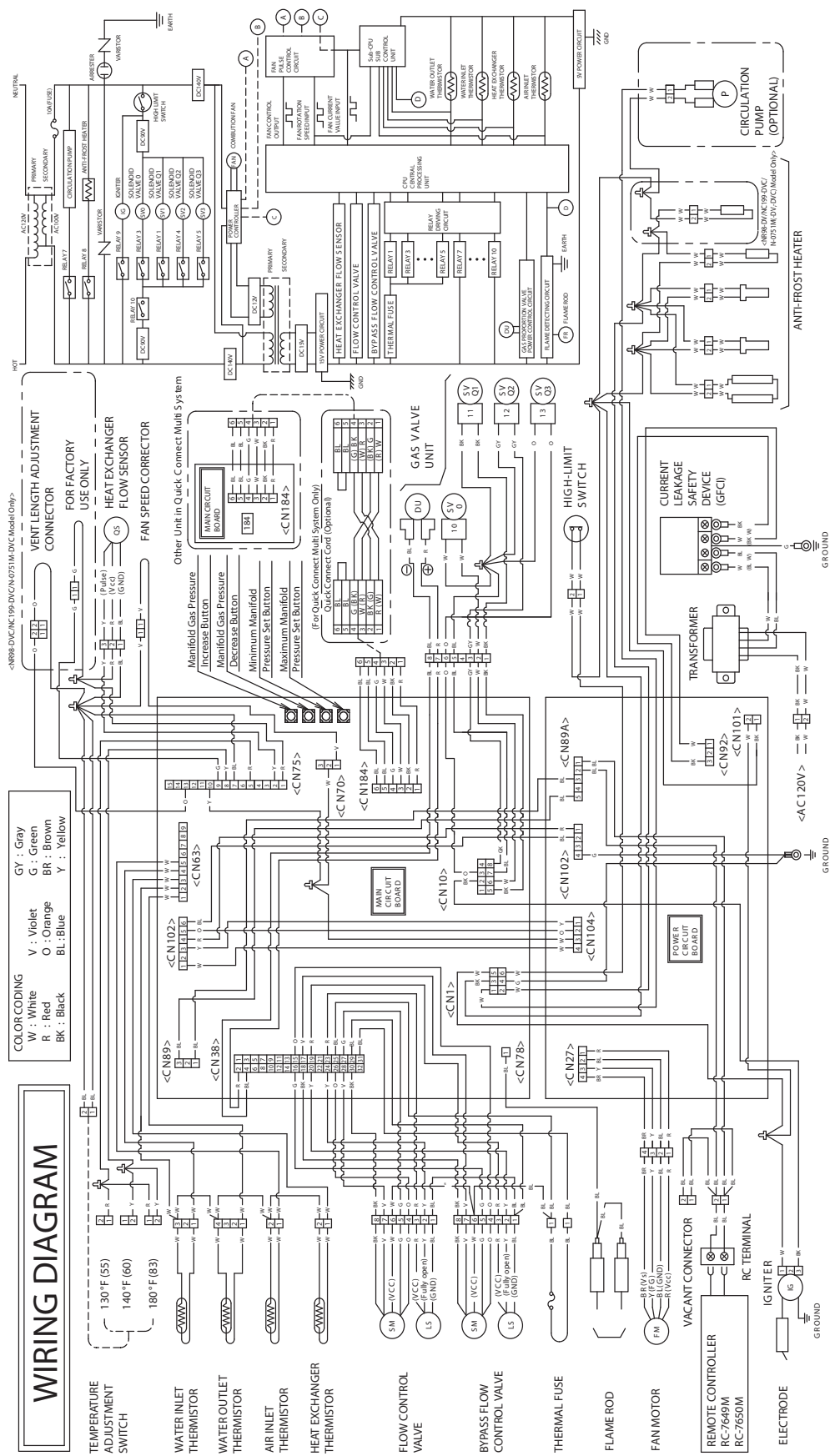
■ NR50-OD



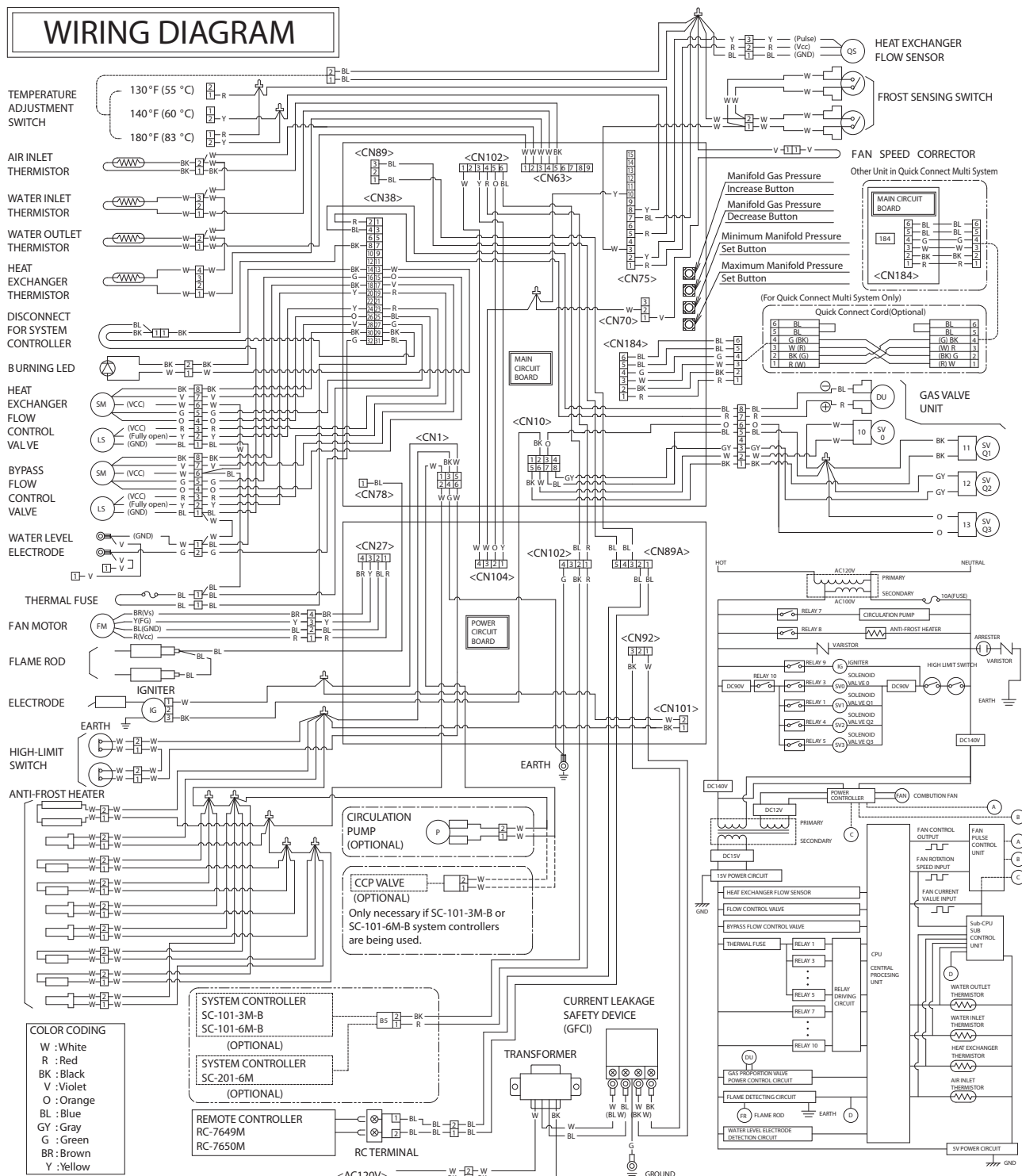
The diagram illustrates the control system for a gas furnace, showing the electrical connections between various components. The system is powered by a HOT line and a NEUTRAL line. The power supply section includes a transformer with AC120V primary and AC100V secondary, a FROST SENSING SWITCH, a VARISTOR, an ANTI-FROST HEATER, and a 10A FUSE. The control circuit includes a DC90V source, RELAY 5, RELAY 6, RELAY 4, RELAY 2, RELAY 1, and a DC140V source. The central processing unit (CPU) is connected to a POWER CONTROLLER, a COMBUSTION FAN, and a FAN CONTROL OUTPUT. The fan control circuit includes a FAN PULSE CONTROL CIRCUIT, a FAN ROTATION SPEED INPUT, and a FAN CURRENT VALUE INPUT. The water control circuit includes a WATER FLOW SENSOR, a FLOW CONTROL VALVE, a THERMAL FUSE, a RELAY 1, RELAY 2, RELAY 4, RELAY 5, and RELAY 6. The water control unit includes a WATER OUTLET THERMISTOR and a WATER INLET THERMISTOR. The gas control circuit includes a GAS PROPORTION VALVE POWER CONTROL CIRCUIT, a FLAME DETECTING CIRCUIT, and a FLAME ROD. The diagram also shows a DC15V POWER CIRCUIT, a DC12V source, a DC15V source, a DC140V source, and a DC100V source. The diagram is labeled with various components and their connections, including a GND symbol and an EARTH symbol.

NR66 (-SV, -OD) / N-0531S (-OD),
NR71 (-SV, -OD) / N-0631S (-OD)

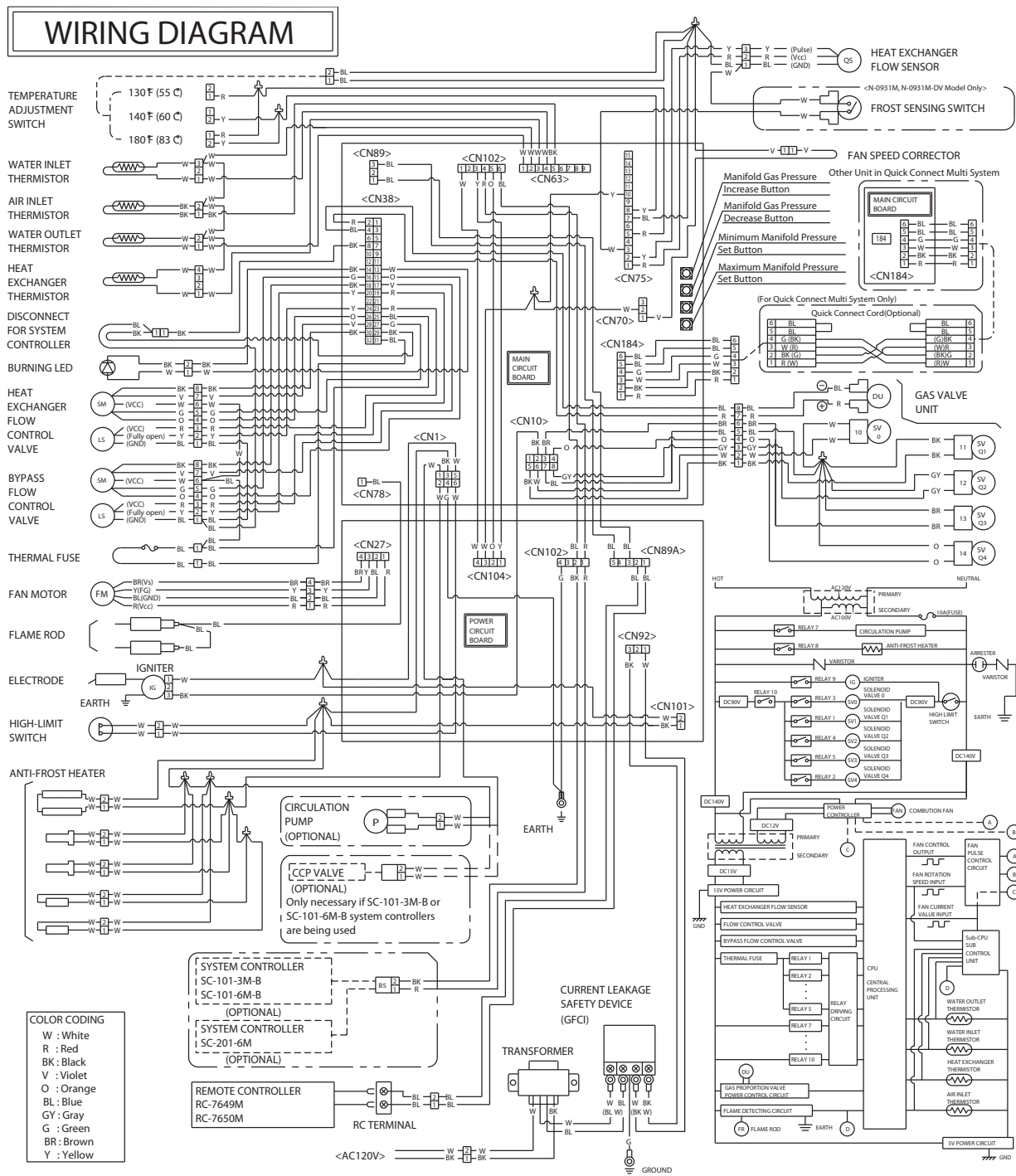
■ NR98 (-SV,-OD,-DVC) / NC199 (-OD,-DVC) / N-0751M (-OD,-DV,-DVC)



■ NCC199 (-SV,-DV) / N-0841MC (-DV) / NRC111 (-SV,-DV) / N-0842MC (-DV)

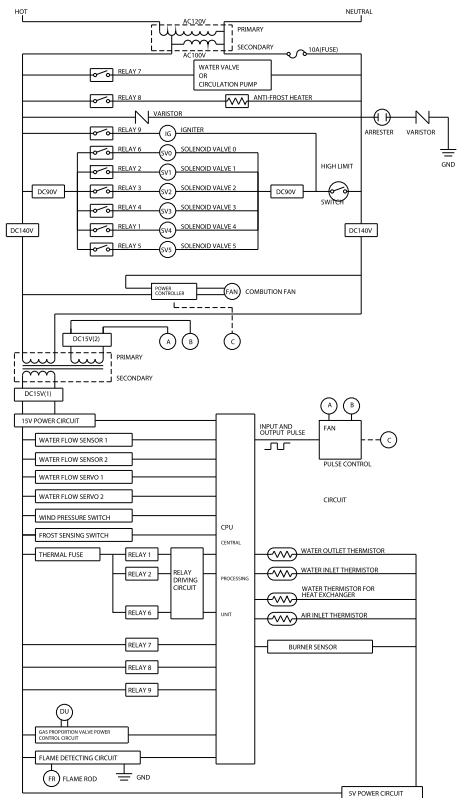
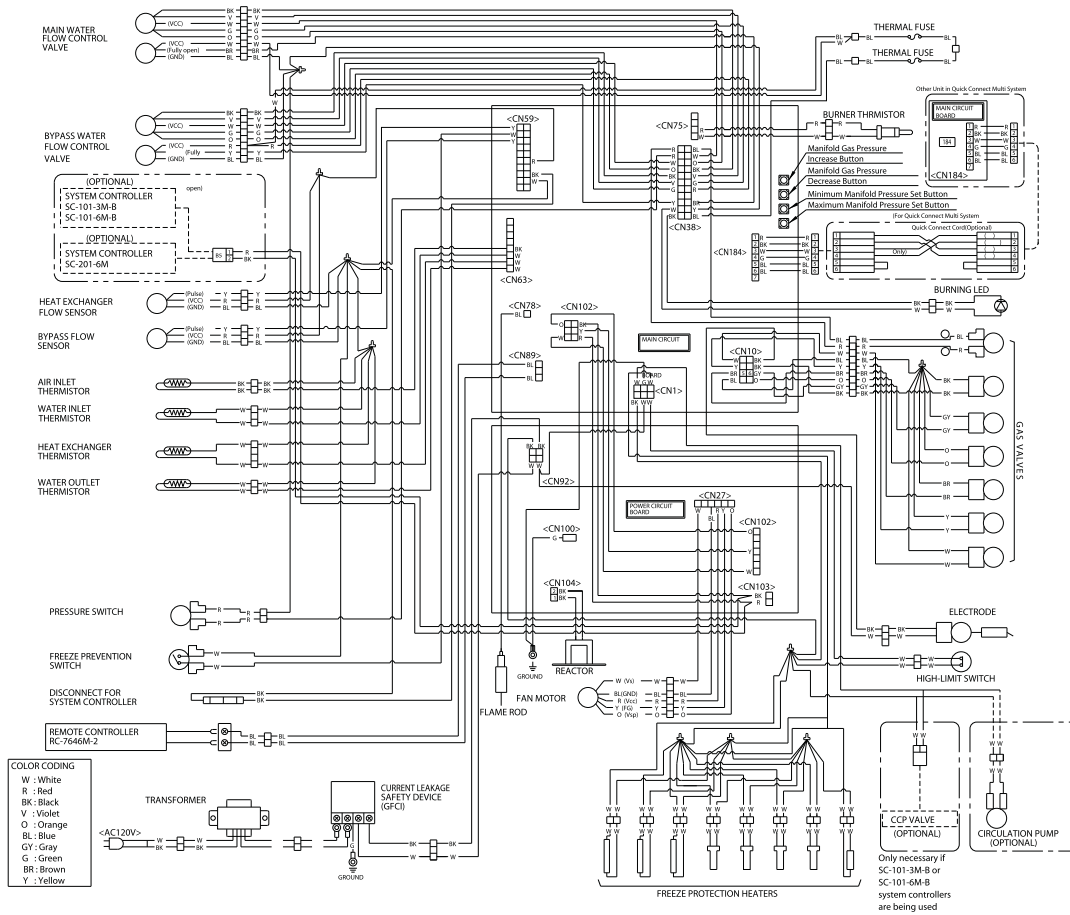


■ NR111 (-SV,-OD,-DV) / NC250 (-SV,-DV) / N-0931M (-OD,-DV)



■ NC380-SV-ASME / N-1321M-ASME

WIRING DIAGRAM



8. Troubleshooting

When adjusting the manifold gas pressure, be sure to remove the exhaust flue, the air inlet and the flue collar.

<NR50-OD / NR66 (-SV,-OD) / N-0531S (-OD), NR71 (-SV,-OD) / N-0631S (-OD)>

■ Error Codes and Checkpoints (With optional remote controller connected)

Display	Description	Diagnosis Point (Trouble Point)	Remarks
10	Combustion Abnormality (BTU Drop) (Unit Continues Working)	Check for abnormal combustion. Check flue for blockage or obstruction.	To reset this error code, the power needs to be disconnected and then reconnected.
11	Ignition Failure (Initial Flame Fault detection)	Check gas supply piping and pressure. Check for igniter spark (8). Check gas solenoid valves (9)(10)(11). Check flame rod (12). Check ground, paying special attention to the ground connection to the circuit board.	
12	Flame Rod Does Not Detect Flame (Secondary Flame Fault Detection)	Check for accidental extinction of the flame. Check for abnormal combustion, check gas solenoid valves, check flame rod (12). Check ground, especially on circuit board.	
14	Thermal Fuse Triggered	Check for melting or damage to the thermal fuse (1). Check for improper connection of thermal fuse.	
16	Abnormally High Output Temperature	Measure the resistance through the outlet thermistor (4). Check for proportional gas valve trouble (11).	
20	High Limit Switch Triggered.	Check if high limit switch is triggered (13). Check for improper connection of high limit switch.	To reset this error code, the power needs to be disconnected and then reconnected.
31	Inlet Thermistor Abnormality	Measure the resistance through the inlet thermistor (3). Check for an open or short circuit. Check for improper connection to the inlet thermistor.	
32	Outlet Thermistor Abnormality	Measure the resistance through the outlet thermistor (4). Check for improper connection or an open or short circuit.	
59	Heat Exchanger Flow Abnormality	Check for scale build-up in heat exchanger. Check for abnormal combustion. Check flue blockage or obstruction. Check that flame ignites all across the burner. Note 1)	
61	Fan Motor Abnormality	Check that the fan is rotating. Check the pulse frequency from the fan rotational frequency sensor (6)(7). Check for improper connection of the fan. Check voltage from circuit board.	
70	Circuit board Abnormality	Circuit board failure	
71	Gas Solenoid Valve Drive Circuit Abnormality	Check for damage to the gas solenoid valve drive circuit on the circuit board.	
72	Flame Rod circuit Abnormality (Detection of Flame when no flame is present)	Measure the current from the flame rod when there is no flame (5). Check for a ground fault.	
73	Circuit board setting abnormality (High elevation connector, dipswitch, etc)	Check for proper setting of maintenance writers on circuit board. Check the circuit board (microcomputer) for damage. Check the Dip switch. Check the "Control switch connector" (ex. high elevation connector etc.). Note 1)	To reset this error code, the power needs to be disconnected and then reconnected.
760	Remote Controller Transmission Abnormality	Check connection from remote controller to circuit board. Check remote controller and circuit board for damage. Note 1)	
90	Combustion Abnormality (Warning Indication)	Check for abnormal combustion. Check flue for blockage or obstruction.	To reset this error code, the power needs to be disconnected and then reconnected.
	Combustion abnormality (Unit Shuts Off)	Check for abnormal combustion. Check flue for blockage or obstruction. Check that flame ignites all across the burner.	
99	Combustion Abnormality (Unit Shuts Off)	Check for abnormal combustion. Check flue for blockage or obstruction.	To reset this error code, the power needs to be disconnected and then reconnected.

Note 1) This error code is not mentioned in the flowchart.

■ Error Codes and Checkpoints for NR71/N-0631S Series Only (No remote controller connected)

No. of Flashes	Reset Method (without Remote Controller)	Reset Method (with Remote Controller)	Will Unit Work After Being Reset	Other Symptoms	Error Code Representation	
Continuous Flashing	No Reset	No Reset	YES	It's available to burn even before reset.	10	90
	Turn Off Water	Turn Off Water	YES		90	
			YES		11	12
	Disconnect Power	Power Button	YES		90	
3	Disconnect Power	Power Button	YES	It's available to burn even before reset.	59	
	Turn Off Water	Turn Off Water	NO	If minimum flow rate is available immediately	31	
4	Turn Off Water	Turn Off Water	YES	Turning off the water will only reset the unit if there is no remote controller installed.	61	
	Disconnect Power	Power Button	NO	If power button is on immediately	14	
	Turn Off Water	Turn Off Water		If minimum flow rate is available immediately	32	
	Disconnect Power	Disconnect Power	YES		20	
5	Disconnect Power	Power Button	YES		72	
			NO		71	72
		Disconnect Power	YES		99	
			NO		70	73

<NCC199 (-SV,-DV) / N-0841MC (-DV), NRC111 (-SV,-DV) / N-0842MC (-DV)>

■ Error Codes and Checkpoints (In the case of optional remote controller connection)

Display	Description	Diagnosis Point (Trouble Point)	Remarks
(F) 10	Combustion abnormality (BTU Drop) (Unit Continues Working)	Check for abnormal combustion. Check flue for blockage or obstruction.	To reset this error code, the power needs to be disconnected and then reconnected.
(F) 11	Ignition failure (Initial flame fault detection)	Check the gas supply piping and pressure. Check for igniter spark ((11)). Check gas solenoid valves ((12)(13)(14)(15)). Check flame rod ((16)). Check ground, paying special attention to the ground connection to the circuit board.	
(F) 12	Flame rod does not detect flame (Flame fault detection)	Check for accidental extinction of the flame. Check for abnormal combustion. Check gas solenoid valves. Check flame rod ((16)). Check ground, especially on circuit board.	
(F) 14	Overheat Prevention Device (Thermal Fuse) triggered	Check for melting or damage to the thermal fuse ((1)). Check for improper connection of thermal fuse.	
(F) 16	Abnormally high output temperature	Measure the resistance through the outlet thermistor ((6)). Check for gas proportioning valve trouble ((15)).	
(F) 20	High limit switch triggered	Check if high limit switch is triggered ((18)). Check for improper connection of high limit switch. Check if exhaust gas temp. is too high.	To reset this error code, the power needs to be disconnected and then reconnected. * This model has 2 kinds of high limit switch.
(F) 29	Neutralizer Water Level Electrode abnormality	Check for drain pipe blockage. Check for Neutralizer blockage ((20)). Check for proper connection of neutralizer water level electrode.	Note 2)
(F) 30	Air inlet thermistor abnormality	Measure the resistance through the air inlet thermistor ((19)). Check for an open or short circuit. Check for improper connection of air inlet thermistor.	
(F) 31	Inlet thermistor abnormality	Measure the resistance through the inlet thermistor ((5)). Check for an open or short circuit. Check for improper connection of inlet thermistor.	
(F) 32	Outlet thermistor abnormality	Measure the resistance through the outlet thermistor ((6)). Check for an open or short circuit. Check for improper connection of outlet thermistor.	
(F) 33	Heat exchanger thermistor abnormality	Measure the resistance through the heat exchanger thermistor ((7)). Check for an open or short circuit. Check for improper connection of heat exchanger thermistor.	
(F) 59	Heat exchanger flow abnormality	Check for scale build-up in heat exchanger. Check for abnormal combustion. Check flue for blockage or obstruction. Check that flame ignites all across the burner.	Note 1)
(F) 61	Fan motor abnormality	Check that the fan is rotating and check the pulse frequency from the fan rotational frequency sensor ((9)(10)). Check for improper connection of the fan. Check voltage from circuit board.	
(F) 65	Main flow control valve abnormality	Check that the main flow control valve is functioning ((2)). Check for improper connection of the valve.	To reset this error code, the power needs to be disconnected and then reconnected.
(F) 66	Bypass flow control valve abnormality	Check that the bypass control valve is functioning ((3)). Check for improper connection of the valve.	To reset this error code, the power needs to be disconnected and then reconnected.
(F) 70	Circuit board abnormality	Circuit board failure	
(F) 71	Gas solenoid valve drive circuit abnormality	Check for damage to the gas solenoid valve drive circuit on the circuit board.	
(F) 72	Flame rod circuit abnormality (Detection of flame when no flame is present)	Measure the current from the flame rod when there is no flame ((8)). Check for a ground fault.	
(F) 73	Circuit board setting abnormality (High elevation connector, Dip switch, etc)	Check for proper setting of maintenance writers on circuit board. Check the circuit board (microcomputer) for damage. Check the Dip switch. Check the "Control switch connector" (ex.high elevation connector etc.).	To reset this error code, the power needs to be disconnected and then reconnected. Note 1)
760	Remote controller transmission abnormality	Check connection from remote controller to circuit board. Check remote controller and circuit board for damage.	Note 1)
F76	Multi-system communication error	Check for proper connection of quick connect cord.	Note 1)
(F) 90	Combustion abnormality (Warning indication) Combustion abnormality (Unit shuts off)	Check for abnormal combustion. Check flue for blockage or obstruction. Check for abnormal combustion. Check flue for blockage or obstruction. Check that flame ignites all across the burner.	To reset this error code, the power needs to be disconnected and then reconnected.
(F) 92	Neutralizer Life Cycle Warning	When replacing the neutralizer, refer to the instructions included with the replacement neutralizer.	
(F) 93	Neutralizer Life Cycle has ended		
(F) 99	Combustion abnormality (Unit shuts off)	Check for abnormal combustion. Check flue for blockage or obstruction.	To reset this error code, the power needs to be disconnected and then reconnected.

*In a quick connect multi-system, "F##" (except F76) indicates an error code from the secondary unit (unit without a remote).

Note 1) This error code is not mentioned in the flowchart.

Note 2) The ON/OFF condition of the neutralizer water level electrode can be checked using the maintenance monitors. When maintenance monitor number 19 reads "000", the condition of the electrode is normal. When this monitor reads "111", the condition of the electrode is abnormal.

<NR98 (-SV,-OD,-DVC) / NC199 (-OD,-DVC) / N-0751M (-OD,-DV,-DVC)
 NR111 (-SV,-OD,-DV) / NC250 (-SV,-DV)-ASME / N-0931M (-OD,-DV) /
 NC380-SV-ASME / N-1321M-ASME >

■ Error Codes and Checkpoints (In the case of optional remote controller connection)

Display	Description	Diagnosis Point (Trouble Point)	Remarks
(F) 10	Combustion abnormality (BTU Drop) (Unit Continues Working)	Check for abnormal combustion. Check flue for blockage or obstruction.	To reset this error code, the power needs to be disconnected and then reconnected.
(F) 11	Ignition failure (Initial flame fault detection)	Check the gas supply piping and pressure. Check for igniter spark ((11)). Check gas solenoid valves ((12)(13)(14)(15)). Check flame rod ((16)). Check ground, paying special attention to the ground connection to the circuit board.	
(F) 12	Flame rod does not detect flame (Flame fault detection)	Check for accidental extinction of the flame. Check for abnormal combustion. Check gas solenoid valves. Check flame rod ((16)). Check ground, especially on circuit board.	
(F) 14	Overheat Prevention Device (Thermal Fuse) triggered	Check for melting or damage to the thermal fuse ((1)). Check for improper connection of thermal fuse.	
(F) 16	Abnormally high output temperature	Measure the resistance through the outlet thermistor ((6)). Check for proportional gas valve trouble ((15)).	
(F) 20	High limit switch triggered	Check if high limit switch is triggered ((18)). Check for improper connection of high limit switch.	To reset this error code, the power needs to be disconnected and then reconnected.
(F) 21	Pressure switch triggered	Check pressure switch. Check fan motor. Check flue for blockage or obstruction. Check for abnormal combustion.	For NC380-SV-ASME/N-1321M-ASME only
(F) 30	Air inlet thermistor abnormality	Measure the resistance through the air inlet thermistor ((29)). Check for an open or short circuit. Check for improper connection of air inlet thermistor.	
(F) 31	Inlet thermistor abnormality	Measure the resistance through the inlet thermistor ((5)). Check for an open or short circuit. Check for improper connection of inlet thermistor.	
(F) 32	Outlet thermistor abnormality	Measure the resistance through the outlet thermistor ((6)). Check for an open or short circuit. Check for improper connection of outlet thermistor.	
(F) 33	Heat exchanger thermistor abnormality	Measure the resistance through the heat exchanger thermistor ((7)). Check for an open or short circuit. Check for improper connection of heat exchanger thermistor.	
(F) 41	Flow Sensor Abnormality	Check flow sensor for debris and/or damage.	
(F) 56	Multi-System CCP Valve Abnormality	Check for an obstruction in the CCP valve. Check for improper wiring connection of multi-system wiring.	For NC380-SV-ASME/N-1321M-ASME only
(F) 59	Heat exchanger flow abnormality	Check for scale build-up in heat exchanger. Check for abnormal combustion. Check flue for blockage or obstruction. Check that flame ignites all across the burner. Note 1)	
(F) 61	Fan motor abnormality	Check that the fan is rotating and check the pulse frequency from the fan rotational frequency sensor ((9)(10)). Check for improper connection of the fan. Check voltage from circuit board.	
(F) 65	Main flow control valve abnormality	Check that the main flow control valve is functioning ((2)). Check for improper connection of the valve.	To reset this error code, the power needs to be disconnected and then reconnected.
(F) 66	Bypass flow control valve abnormality	Check that the main water control valve is functioning ((3)). Check for improper connection of the valve.	To reset this error code, the power needs to be disconnected and then reconnected.
(F) 70	Circuit board abnormality	Circuit board failure	
(F) 71	Gas solenoid valve drive circuit abnormality	Check for damage to the gas solenoid valve drive circuit on the circuit board.	
(F) 72	Flame rod circuit abnormality (Detection of flame when no flame is present)	Measure the current from the flame rod when there is no flame ((8)). Check for a ground fault.	
(F) 73	Circuit board setting abnormality (High elevation connector, Dip switch, etc)	Check for proper setting of maintenance writers on circuit board. Check the circuit board (microcomputer) for damage. Check the Dip switch. Check the "Control switch connector" (ex. high elevation connector etc.). Note 1)	To reset this error code, the power needs to be disconnected and then reconnected.
760	Remote controller transmission abnormality	Check connection from remote controller to circuit board. Check remote controller and circuit board for damage. Note 1)	
F76	Multi-system communication error	Check for proper connection of quick connect cord. Note 1)	
(F) 90	Combustion abnormality (Warning indication)	Check for abnormal combustion. Check flue for blockage or obstruction.	
	Combustion abnormality (Unit shuts off)	Check for abnormal combustion. Check flue for blockage or obstruction. Check that flame ignites all across the burner.	To reset this error code, the power needs to be disconnected and then reconnected.
(F) 99	Combustion abnormality (Unit shuts off)	Check for abnormal combustion. Check flue for blockage or obstruction.	To reset this error code, the power needs to be disconnected and then reconnected.

*In a quick connect multi-system, "F##" (except F76) indicates an error code from the secondary unit (unit without a remote).

Note 1) This error code is not mentioned in the flowchart.

<NR50-OD / NR66 (-SV,-OD) / N-0531S (-OD), NR71 (-SV,-OD) / N-0631S (-OD)>

■ Circuit Board Checkpoints

Ref No.	Part	Circuit Board Checkpoints				Normal Value	Remarks 1	Remarks 2
		CN & Pin No.	Harness Color	CN & Pin No.				
1	Thermal Fuse	CN59	1 BL-R	CN59	4	2Ω or less		
2	Water Flow Sensor	CN59	4 R-BL	CN59	6	DC14 – 16V	YI (+) BI (–)	
			5 Y-BL		6	DC0.5 – 15V more than 1440 pulse/min. (more than 24Hz)		
3	Inlet Thermistor	CN59	13 W-W	CN59	14	DC0.6 – 4V	32°F – 212°F	Note 1)
4	Outlet Thermistor		15 W-W		14	DC0.6 – 4V	32°F – 212°F	Note 1)
5	Flame Rod	CN78	1 BL-Burnercase	—	–	75kHz – 92kHz		
			1 BL-Electrode		–	DC0.45 μA or less	When no flame is detected	
6	Fan Motor	CN27	4 BR-BL	CN27	2	DC0 – 43V		
			1 R-BL		2	DC11 – 13V		
7	Fan Motor		3 Y-BL		2	7200 – 23200pulses/min. (120Hz – 387Hz)		
8	Igniter	CN1	2 BK-W	CN1	4	AC90 – 110V	When igniter is sparking	
9	Primary Gas Solenoid Valve	CN10	4 W-BL	CN10	6	DC80 – 100V 1.0 – 2.0kΩ	Measure coil resistance	
10	Gas Solenoid Valve 1		1 BK-BL		6	DC80 – 100V 1.0 – 2.0kΩ	Measure coil resistance	
11	Gas Proportioning Valve	CN59	4 R-BL	CN59	3	DC0.3 – 15V 50 – 90Ω	Measure coil resistance	
12	Flame Rod	CN78	1 BL-Burnercase	—	–	75kHz – 92kHz		
			1 BL-Electrode		–	DC1 μA or more	At flame detection	
13	High Limit Switch	CN1	1 W-W	CN1	3	less than 1Ω	Measure contact resistance	
14	Gas Solenoid Valve 2	CN10	2 GY-BL	CN10	6	DC80 – 100V 1.0 – 2.0kΩ	Measure coil resistance	
15	Water Control Valve	CN86	8 R-BL	CN86	1	DC14 – 16V	When valve is fully open. (ON/OFF switch OFF)	
			2 Y-BL		1	DC1V or less		
			3 W-G		5	DC1 – 16V		
			3 W-V		7	DC1 – 16V		
			3 W-O		4	DC1 – 16V		
			3 W-BK		6	DC1 – 16V		
—	Power Supply	CN92	1 W-BK	CN92	2	AC90 – 110V		
—	Remote Controller	Terminal	– —	—	–	DC13 – 16V		

Note 1) • Temperature characteristic of inlet / outlet thermistor

Temperature (°F)	32	50	68	86	104	122	140	158	176
Temperature (°C)	0	10	20	30	40	50	60	70	80
Resistance (kΩ)	23.7	15.5	10.3	7.0	4.9	3.5	2.5	1.9	1.4

<NR98 (-SV,-OD,-DVC) / NC199 (-OD,-DVC) / N-0751M (-OD,-DV,-DVC)>

■ Circuit Board Checkpoints

Ref. No.	Part	Circuit board Checkpoints				Normal value	Remarks	
		CN & Pin No.	Wire color	CN & Pin No.				
1	Overheat Prevention Device (Thermal Fuse)	CN38	25	BL - BL	CN38	31	2Ω or less	
2	Main Flow Control Valve	CN38	25	BL - O	CN38	26	DC 1 - 16 V	
			25	BL - G		27	DC 1 - 16 V	
			25	BL - V		28	DC 1 - 16 V	
			25	BL - BK		30	DC 1 - 16 V	
			24	Y - BL		29	DC 1V or less	When valve is fully open
3	Bypass Flow Control Valve	CN38	25	BL - O	CN38	15	DC 1 - 16 V	
			25	BL - G		16	DC 1 - 16 V	
			25	BL - V		17	DC 1 - 16 V	
			25	BL - BK		18	DC 1 - 16 V	
			20	Y - BL		29	DC 1V or less	When valve is fully open
4	Water Flow Sensor	CN75	1	R - BL	CN75	7	DC 14 - 16 V	
			2	Y - BL		7	DC 0.5 - 15 V over 408 pulses/min. (over 6.8Hz)	Y (+) BL (-)
5	Water Inlet Thermistor	CN63	4	W - W	CN63	2	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
6	Water Outlet Thermistor	CN63	1	W - W	CN63	2	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
7	Heat Exchanger Thermistor	CN63	3	W - W	CN63	2	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
8	Flame Rod	CN78	1	BL - Burner case	-	-	10 kHz - 100 kHz	
			1	BL - Electrode		-	DC 0.45mA or less	When no flame is detected
9	Fan Motor	CN27	4	BR - BL	CN27	2	DC 7 - 45 V	
10	Fan Motor	CN27	1	R - BL	CN27	2	DC 10 - 14 V	
			3	Y - BL		2	100 Hz - 400 Hz	
11	Igniter	CN10	2	BK - W	CN1	5	AC 90 - 110 V	When igniter is sparking
12	Primary Gas Solenoid Valve	CN10	6	W - BL	CN10	7	DC 80 - 100 V	When valve is open
							0.5 - 2 kΩ	Coil resistance
13	Gas Solenoid Valve - 1	CN10	5	BK - BL	CN10	7	DC 80 - 100 V	When valve is open
							0.5 - 2 kΩ	Coil resistance
14	Gas Solenoid Valve - 2	CN10	8	GY - BL	CN10	7	DC 80 - 100 V	When valve is open
							0.5 - 2 kΩ	Coil resistance
15	Gas Proportioning Valve	CN38	2	R - BL	CN38	4	DC 0.3 - 15 V	
							50 - 90 W	Coil resistance
16	Flame Rod	CN78	1	BL - Burner case	-	-	10 kHz - 100 kHz	
			1	BL - Electrode		-	DC 1mA or more	at Flame detection
17	Gas Solenoid Valve - 3	CN10	3	O - BL	CN10	7	DC 80 - 100 V	When valve is open
							0.5 - 2 kΩ	Coil resistance
18	High Limit Switch	CN1	3	BK - W	CN1	6	1Ω or less	Contact resistance
19	Air Inlet Thermistor	CN63	5	W - W	CN63	2	DC 0.7 - 4.4 V	Note 2)
-	Power Supply (Main Circuit Board)	CN1	3	BK - W	CN1	5	AC 90 - 110 V	
-	Power Supply (Power Circuit Board)	CN92	1	W - BK	CN92	3	AC 90 - 110 V	
-	Power Supply (Power Circuit Board)	C102	4	R - BL	C102	6	DC 13 - 16 V	
-	Remote Controller	CN89	1	BL - BL	CN89	3	DC 13 - 16 V	

Note 1) • Inlet / Outlet / Heat Exchanger Thermistor Temperature Characteristics

Temperature (°F)	32	50	68	86	104	122	140	158	176
Temperature (°C)	0	10	20	30	40	50	60	70	80
Resistance (kΩ)	23.7	15.5	10.3	7.0	4.9	3.5	2.5	1.9	1.4

Note 2) • Air Inlet Thermistor Temperature Characteristics

Temperature (°F)	-4	14	32	50	68	86
Temperature (°C)	-20	-10	0	10	20	30
Resistance (kΩ)	106.5	59.6	34.4	20.6	12.6	8.0

<NCC199 (-SV,-DV) / N-0841MC (-DV), NRC111 (-SV,-DV) / N-0842MC (-DV)>

■ Circuit Board Checkpoints

Ref. No.	Part	Circuit board Check points				Normal value	Remarks
		CN & Pin No.	Wire color	CN & Pin No.			
1	Overheat Prevention Device (Thermal Fuse)	CN38	25 BL - BL	CN38	31	2 Ω or less	
2	Main Flow Control Valve	CN38	25 BL - O	CN38	26	DC 1 - 16 V	
			25 BL - G		27	DC 1 - 16 V	
			25 BL - V		28	DC 1 - 16 V	
			25 BL - BK		30	DC 1 - 16 V	
			24 Y - BK		29	DC 1V or less	When valve is fully open
3	Bypass Flow Control Valve	CN38	25 BL - O	CN38	15	DC 1 - 16 V	
			25 BL - G		16	DC 1 - 16 V	
			25 BL - V		17	DC 1 - 16 V	
			25 BL - BK		18	DC 1 - 16 V	
			20 Y - BK		29	DC 1V or less	When valve is fully open
4	Water Flow Sensor	CN75	1 R - BL	CN75	7	DC 14 - 16 V	
			2 Y - BL		7	DC 0.5 - 15 V over 408 pulses/min. (over 6.8Hz)	Y (+) BL (-)
5	Water Inlet Thermistor	CN63	4 W - W	CN63	2	DC 1 - 4.5 V	32 - 212 °F 0 - 100 °C Note 1)
6	Water Outlet Thermistor	CN63	1 W - W	CN63	2	DC 1 - 4.5 V	32 - 212 °F 0 - 100 °C Note 1)
7	Heat Exchanger Thermistor	CN63	3 W - W	CN63	2	DC 1 - 4.5 V	32 - 212 °F 0 - 100 °C Note 1)
8	Flame Rod	CN78	1 BL - Burner case	-	-	10 kHz - 100 kHz	
			1 BL - Electrode		-	DC 0.45mA or less	When no flame is detected
9	Fan Motor	CN27	4 BR - BL	CN27	2	DC 7 - 48 V	
10	Fan Motor	CN27	1 R - BL	CN27	2	DC 10 - 14 V	
			3 Y - BL		2	155 Hz - 400 Hz	4 pulse/rpm
11	Igniter	CN10	2 BK - W	CN1	5	AC 90 - 110 V	When igniter is sparking
12	Primary Gas Solenoid Valve	CN10	6 W - BL	CN10	7	DC 80 - 100 V	When valve is open
						0.5 - 2 k Ω	Coil resistance
13	Gas Solenoid Valve - 1	CN10	5 BK - BL	CN10	7	DC 80 - 100 V	When valve is open
						0.5 - 2 k Ω	Coil resistance
14	Gas Solenoid Valve - 2	CN10	8 GY - BL	CN10	7	DC 80 - 100 V	When valve is open
						0.5 - 2 k Ω	Coil resistance
15	Gas Proportioning Valve	CN38	2 R - BL	CN38	4	DC 0.3 - 15 V	
						50 - 90 Ω	Coil resistance
16	Flame Rod	CN78	1 BL - Burner case	-	-	10 kHz - 100 kHz	
			1 BL - Electrode		-	DC 1 mA or more	at Flame detection
17	Gas Solenoid Valve - 3	CN10	3 O - BL	CN10	7	DC 80 - 100 V	When valve is open
						0.5 - 2 k Ω	Coil resistance
18	High Limit Switch	CN1	3 BK - W	CN1	6	1 Ω or less	Contact resistance
19	Air Inlet Thermistor	CN63	5 BK - W	CN63	2	DC 0.7 - 4.4 V	Note 2)
20	Neutralizer Water Level Electrode	CN38	32 G - BK	-	29	DC 14 - 16 V	Note 3)
-	Power Supply (Main Circuit Board)	CN1	3 BK - W	CN1	5	AC 90 - 110 V	
-	Power Supply (Power Circuit Board)	CN92	1 W - BK	CN92	3	AC 90 - 110 V	
-	Power Supply (Main Circuit Board)	C102	4 R - BL	C102	6	DC 13 - 16 V	
-	Remote Controller	CN89	1 BL - BL	CN89	3	DC 13 - 16 V	

Note 1) •Inlet / Outlet / Heat Exchanger Thermistor Temperature Characteristics

Temperature (°F)	32	50	68	86	104	122	140	158	176
Temperature (°C)	0	10	20	30	40	50	60	70	80
Resistance (k Ω)	23.7	15.5	10.3	7.0	4.9	3.5	2.5	1.9	1.4

Note 2) •Air Inlet Thermistor Temperature Characteristics

Temperature (°F)	-4	14	32	50	68	86
Temperature (°C)	-20	-10	0	10	20	30
Resistance (k Ω)	106.5	59.6	34.4	20.6	12.6	8.0

Note 3) The ON/OFF condition of the neutralizer water level electrode can be checked using the maintenance monitors. When maintenance monitor number 19 reads "000", the condition of the electrode is normal. When this monitor reads "111", the condition of the electrode is abnormal.

<NR111 (-SV -OD,-DV) / NC250 (-SV,-DV)-ASME / N-0931M (-OD)>

■ Circuit Board Checkpoints

Ref. No.	Part	Circuit board Checkpoints					Normal value	Remarks
		CN & Pin No.		Wire color	CN & Pin No.			
1	Overheat Prevention Device (Thermal Fuse)	CN38	25	BL - BL	CN38	31	2Ω or less	
2	Main Flow Control Valve	CN38	25	BL - O	CN38	26	DC 1 - 16 V	
			25	BL - G		27	DC 1 - 16 V	
			25	BL - V		28	DC 1 - 16 V	
			25	BL - BK		30	DC 1 - 16 V	
			24	Y - BL		29	DC 1V or less	When valve is fully open
3	Bypass Flow Control Valve	CN38	25	BL - O	CN38	15	DC 1 - 16 V	
			25	BL - G		16	DC 1 - 16 V	
			25	BL - V		17	DC 1 - 16 V	
			25	BL - BK		18	DC 1 - 16 V	
			20	Y - BL		29	DC 1V or less	When valve is fully open
4	Water Flow Sensor	CN75	1	R - BL	CN75	7	DC 14 - 16 V	
			2	Y - BL		7	DC 0.5 - 15 V over 408 pulses/min. (over 6.8Hz)	Y (+) BL (-)
5	Water Inlet Thermistor	CN63	4	W - W	CN63	2	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
6	Water Outlet Thermistor	CN63	1	W - W	CN63	2	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
7	Heat Exchanger Thermistor	CN63	3	W - W	CN63	2	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
8	Flame Rod	CN78	1	BL - Burner case	-	-	10 kHz - 100 kHz	
			1	BL - Electrode		-	DC 0.45 mA or less	When no flame is detected
9	Fan Motor	CN27	4	BR - BL	CN27	2	DC 7 - 45 V	
10	Fan Motor	CN27	1	R - BL	CN27	2	DC 10 - 14 V	
			3	Y - BL		2	100 Hz - 400 Hz	
11	Igniter	CN10	2	BK - W	CN1	5	AC 90 - 110 V	When igniter is sparking
12	Primary Gas Solenoid Valve	CN10	6	W - BL	CN10	7	DC 80 - 100 V	When valve is open
							0.5 - 2 k Ω	Coil resistance
13	Gas Solenoid Valve - 1	CN10	5	BK - BL	CN10	7	DC 80 - 100 V	When valve is open
							0.5 - 2 k Ω	Coil resistance
14	Gas Solenoid Valve - 2	CN10	8	GY - BL	CN10	7	DC 80 - 100 V	When valve is open
							0.5 - 2 k Ω	Coil resistance
15	Gas Proportioning Valve	CN38	2	R - BL	CN38	4	DC 0.3 - 15 V	
							50 - 90 W	Coil resistance
16	Flame Rod	CN78	1	BL - Burner case	-	-	10 kHz - 100 kHz	
			1	BL - Electrode		-	DC 1 mA or more	at Flame detection
17	Gas Solenoid Valve - 3	CN10	3	BR - BL	CN10	7	DC 80 - 100 V	When valve is open
							0.5 - 2 k Ω	Coil resistance
	Gas Solenoid Valve - 4	CN10	4	O - BL	CN10	7	DC 80 - 100 V	When valve is open
							0.5 - 2 k W	Coil resistance
18	High Limit Switch	CN1	3	BK - W	CN1	6	1 Ω or less	Contact resistance
19	Air Inlet Thermistor	CN63	5	W - W	CN63	2	DC 0.7 - 4.4 V	Note 2)
-	Power Supply (Main Circuit Board)	CN1	3	BK - W	CN1	5	AC 90 - 110 V	
-	Power Supply (Power Circuit Board)	CN92	1	W - BK	CN92	3	AC 90 - 110 V	
-	Power Supply (Power Circuit Board)	C102	4	R - BL	C102	6	DC 13 - 16 V	
-	Remote Controller	CN89	1	BL - BL	CN89	3	DC 13 - 16 V	

Note 1) -Inlet / Outlet / Heat Exchanger Thermistor Temperature Characteristics

Temperature (°F)	32	50	68	86	104	122	140	158	176
Temperature (°C)	0	10	20	30	40	50	60	70	80
Resistance (k Ω)	23.7	15.5	10.3	7.0	4.9	3.5	2.5	1.9	1.4

Note 2) -Air Inlet Thermistor Temperature Characteristics

Temperature (°F)	-4	14	32	50	68	86
Temperature (°C)	-20	-10	0	10	20	30
Resistance (k Ω)	106.5	59.6	34.4	20.6	12.6	8.0

<NC380-SV-ASME / N-1321M-ASME>

■ Circuit Board Checkpoints

Ref. No.	Part	Circuit Board Checkpoints				Normal Value	Remarks 1	Remarks 2	
		CN & Pin No.		Code Color	CN & Pin No.				
2	Overheat Prevention Device (Thermal Fuse)	CN38	14	R-BL	CN38	22	less than 2 Ω		
3	Bypass Flow Sensor	CN59	12	R-W	CN59	18	DC 14 – 16V		
			5	Y-W		18	DC 0.5 – 15V over 600 pulses/min. (o ver 10Hz)	Y (+) W (–)	
4	Main Water Control Valve	CN38	4	W-BK	CN38	8	DC 1 – 16V		
			4	W-O		6	DC 1 – 16V		
			4	W-G		12	DC 1 – 16V		
			4	W-V		10	DC 1 – 16V		
			18	BR-BL		20	less than DC 1V	When valve is fully open	
5	Main Flow Sensor	CN59	12	R-W	CN59	18	DC 14 – 16V		
			1	Y-W		18	DC 0.5 – 15V over 408 pulses/min. (over 6.8Hz)	Y (+) W (–)	
6	Bypass Water Control Valve	CN38	5	W-BK	CN38	7	DC 1 – 16V		
			5	W-O		13	DC 1 – 16V		
			5	W-G		11	DC 1 – 16V		
			5	W-V		9	DC 1 – 16V		
			17	BR-BL		20	less than DC 1V	When valve is fully open (Burner off)	
7	Inlet Water Thermister	CN63	3	W-W	CN59	18	DC 0.6 – 4V	32°F – 212°F	Note 1)
8	Outlet Water Thermister		1	W-W		18	DC 0.6 – 4V	32°F – 212°F	Note 1)
9	Heat Exchanger Thermister		2	W-W		18	DC 0.6 – 4V	32°F – 212°F	Note 1)
10	Flame Rod	CN78	1	BL-Burner case	—	–	70kHz – 92kHz		
			1	BL-Electrode		–	less than DC0.5 μA	When no flame is detected	
11	Pressure Switch	CN38	3	R-BL	CN38	20	DC 14 – 16V		
12	Fan Motor	CN27	6	W-BL	CN27	4	DC 110 – 150V		
			1	O-BL		4	DC 2 – 7.5V		
13	Fan Motor	CN102	5	Y-R	CN102	4	6600 – 24600 pulses/min. (110Hz – 410Hz)		
14	Igniter	CN1	5	W-BK	CN10	2	AC 90 – 110V	When igniter is sparking	
15	Primary Gas Solenoid Valve	CN10	1	W-BL	CN10	7	DC 80 – 100V 0.7 – 2.0k Ω	Coil Resistance Measurement	
16	Gas Solenoid Valve 1		4	BK-BL		7	DC 80 – 100V 1.0 – 2.0k Ω	Coil Resistance Measurement	
17	Gas Proportioning Valve	CN38	1	R-BL	CN38	2	DC 0.3 – 15V 50 – 90 Ω	Coil Resistance Measurement	
18	Flame Rod	CN78	1	BL-Burner case	—	–	AC 90 – 110V		
			1	BL-Electrode		–	over DC1 μA	at Flame Detection	
19	High Limit Switch	CN1	6	W-BK	CN92	4	less than 1 Ω	Contact Resistance Measurement	
20	Gas Solenoid Valve 2	CN10	6	GY-BL	CN10	7	DC 80 – 100V 1.0 – 2.0k Ω	Coil Resistance Measurement	
21	Gas Solenoid Valve 3		8	O-BL		7	DC 80 – 100V 0.7 – 2.0k Ω	Coil Resistance Measurement	
22	Gas Solenoid Valve 4		5	BR-BL		7	DC 80 – 100V 1.0 – 2.0k Ω	Coil Resistance Measurement	
23	Gas Solenoid Valve 5		3	Y-BL		7	DC 80 – 100V 0.7 – 2.0k Ω	Coil Resistance Measurement	
24	Burner Sensor	CN75	3	R-W	CN75	4	DC 0 – 40mV	Y (+) BL (–)	Note 2)
—	Freeze Thermister	CN63	4	BK-W	CN59	18	DC 0.7 – 4.4V		Note 3)
—	Power Supply	CN1	3	W-W	CN1	5	AC 90 – 110V		
—	Power Supply	CN92	2	W-BK	CN92	3	AC 90 – 110V		
—	Power Supply	CN102	4	R-BK	CN102	6	DC 14 – 16V		
—	Remote Controller	CN89	1	BL-BL	CN89	3	DC 13 – 16V		

Note 1) • Inlet/Outlet/Heat Exchanger Thermister Temperature Characteristics

Temp. (°F)	32	50	68	86	104	122	140	158	176
Resistance (kΩ)	23.7	15.5	10.3	7.0	4.9	3.5	2.5	1.9	1.4

Note 2) • Burner Sensor Temperature Characteristics

Temp. (°F)	32	212	752	1292
Voltage (mv)	0	4	16	29

Note 3) • Freeze Prevention Thermister Temperature Characteristics

Temp. (°F)	–4	14	32	50	68	86
Resistance (kΩ)	106.5	59.6	34.4	20.6	12.6	8.0

<NR50-OD / NR66 (-SV,-OD) / N-0531S (-OD), NR71 (-SV,-OD) / N-0631S (-OD)>

■ Error Descriptions and How to Reset

<After Pressing the Operation Button on the Remote Controller>

1. If the Priority lamp does not come on:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Color Code	Normal Value	How to Fix Problem and Reset Unit
No Error Code	A Fuse is Blown	Check whether the 10A fuse on the circuit board is open.			Closed circuit	Remove the cause of excess current, then replace the 10A fuse.
	Remote Control Terminal Voltage Abnormality	Check voltage supply from circuit board to remote controller.	terminal		DC 13 - 16 V	If voltage is abnormal, replace circuit board.
	Remote Controller Cord Abnormality	Check for open or short circuit			Closed circuit (not open or shorted)	If there is an open or short circuit, or a ground fault is detected, replace the cord.

2. The Priority lamp lights, but an error code appears soon after:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Color Code	Normal Value	How to Fix Problem and Reset Unit
10	Combustion Abnormality (Unit continues burning with error code flashing and drop in heat output)	Check for abnormal combustion. Check flue for blockage or obstruction.				A blinking 10 indicates there has been a loss of gas input, but combustion will continue. In order to reset the unit, the power must be disconnected and then reconnected.
14	Overheat Prevention Device (Thermal Fuse)	Check for melting or improper connection of the overheat prevention device (Thermal fuse).	CN-59	1 BL-R	4 2Ω or less	If the overheat prevention device (Thermal fuse) has fused, it has been exposed to temperatures in excess of 372°F. First fix the cause of the high temperature exposure (hole in heat exchanger, etc.) and then replace the overheat prevention device (Thermal fuse).
760	Remote Controller Transmission Abnormality	Check remote controller and circuit board. Check connection of remote control cord. Check remote control cord for a short or open circuit, or for a ground fault.	terminal		DC 13 - 16V	If there is a voltage abnormality, replace the circuit board.
90	Combustion Abnormality	Check for abnormal combustion. Check flue for blockage or obstruction.			Closed circuit (no open or short)	If an open or short circuit or a ground fault exists, replace Remote Control cord.
	Combustion Abnormality (Warning Indication) (Unit Shuts Off)					If abnormal combustion is detected, the error code will flash and combustion stops. This error code can be reset by turning the water heater OFF on the operation panel. Remove the cause of the abnormal combustion.
						Check maintenance monitor No.48, 49. If the fan has increased its speed by 110 % (N-0631S, -OD=115 %) and the unit plunge into input down mode, the error code will flash but combustion continues. If the fan has requested more improvement the error code will flash and combustion stops.
99	Combustion Abnormality (Unit Shuts Off)	Check for abnormal combustion. Check flue for blockage or obstruction.				If this error code is displayed and the water heater has been in use for 10 years, the unit has reached the end of its life cycle and should be replaced.

<During Regular Operation>

1. Fan does not begin rotating when hot water is being demanded:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Color Code	Normal Value	How to Fix Problem and Reset Unit
No Error	Water Flow Sensor Abnormality	Check maintenance monitor no. 14			0.5 GPM	If the flow monitor indicates higher than the minimum, the circuit board will need to be replaced.
	Inlet Water Temperature is too high	Check inlet water temperature	CN-59	13 W-W	less than 122°F using thermistor characteristics	OK if $K > 35.7 / \text{Flow Rate (GPM)} + \text{inlet water temp (°F)}$, where $K = 136^\circ\text{F}$ for 127°F or lower temperature setting, $K = 5$ at Temp (C) + 18°F for 127°F or more setting. Also check thermistor temperature characteristics.
20	High Limit Switch Triggered	Check if high limit switch is triggered or improperly connected.	CN-1	1 W-W	3 1Ω or less	Make Sure there is no flame left over in the burner. Check for short or open circuit. Reset unit by turning power off and on. Replace high limit if code remains.
31	Inlet Thermistor Abnormality	Check the resistance through the thermistor. Check for open or short circuit or improper connection.	CN-59	13 W-W		Compare to temperature characteristic list on pgs. 58. Check for open or short circuit or for an improper connection.
32	Outlet Thermistor Abnormality	Check the resistance through the thermistor. Check for open or short circuit or improper connection.	CN-59	14 W-W	15	Compare to temperature characteristic list on pgs. 58. Check for open or short circuit or for an improper connection.

<During Regular Operation>

2. Fan does not begin rotating when hot water is being demanded:

Error Code	Possible Causes	Checkpoint	Connector No.	P in No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
70	Circuit board Abnormality	Detection of circuit board abnormality.				Disconnect the electrical power, then reconnect electrical power to the water heater to reset the system. If the circuit board abnormality is continuous, replace the circuit board.
71	Gas Valve Drive Circuit Abnormality	Check for damage to the gas valve drive circuit on the circuit board.				Disconnect the electrical power, then reconnect electrical power to the water heater to reset the system. If the error code "71" is continuous, replace the circuit board.
72	Flame Rod Abnormality (Flame detected when no flame present)	Measure the current from the flame rod when there is no flame. Check for a ground fault.	CN-78	1 BL-Turner case GND	75kHz – 92kHz	If the "72" error code is displayed, check the signal from the flame rod (also make sure that there is not a problem with the grounding of the appliance). If the signal is normal, replace the circuit board. If it is abnormal, replace the flame rod.
				1 BL-Electrode	DC0.45µA or less	

3. Fan rotates normally, but no flame ignites on the burner:

Error Code	Possible Causes	Checkpoint	Connector No.	P in No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
11	Ignition Failure	Igniter failure	CN-1	4 W-BK 2	AC90V – 110V	Replace Igniter
		Check primary gas solenoid valve (SV0)	CN-10	4 W-BL 6	DC80V – 100V	Gas Solenoid Valve typical resistance: 1.0kΩ to 2.0k Ω
		Check gas solenoid valve 1 (SV1)		1 BK-BL 6	DC80V – 100V	Gas Solenoid Valve typical resistance: 1.0kΩ to 2.0k Ω
		Check gas proportioning valve	CN-59	4 R-BL 3	DC0.3V – 15V	Current value changes depending on the load. Proportioning valve resistance: 50Ω to 90Ω

4. A flame ignites on the burner, but it goes out immediately:

Error Code	Possible Causes	Checkpoint	Connector No.	P in No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
11	Flame Detecting Circuit abnormality (Initial flame fault detection)	Check the flame rod	CN-78	1 BL-Turner case GND	75kHz – 92kHz	Visually confirm that a flame ignites, check wiring connections to flame rod, and check wiring connections to gas proportioning and gas solenoid valves. Check for a bad contact or a bad connection between flame rod and circuit board, check for a ground fault in the unit, especially the circuit board ground.
		Check the current from the flame rod		1 BL-Electrode F-rod	DC 1µA or more	
		Check for a disconnected ground from the circuit board				
	Gas Supply Pressure or Manifold Pressure Abnormality	Check gas supply and manifold pressures Check gas proportioning valve	CN-59		See pg. 86 DC0.3 – 15V	Check for damage or improper connection of the ground wire between the circuit board and the metal case of the unit. Current value changes depending on the load. Proportioning valve resistance: 50Ω – 90 Ω.

5. Flame goes out while hot water is being supplied:

Error Code	Possible Causes	Checkpoint	Connector No.	P in No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
12	Flame Rod Triggered (Doesn't sense flame during operation)	Check the flame rod	CN-78	1 BL-Turner case GND	75kHz – 92kHz	Visually confirm that a flame ignites, check wiring connections to the flame rod, and check wiring connections to gas proportioning and gas solenoid valves. Check for a bad contact or a bad connection between the flame rod and circuit board. Check for a ground fault in the unit, especially the circuit board ground.
		Check the current from the flame rod		1 BL-Electrode F-rod	DC 1µA or more	
		Check for a disconnected ground from the circuit board				
	Gas Supply Pressure or Manifold Pressure Abnormality	Check gas supply and manifold pressures Check gas proportioning valve	CN-59		See pg. 86 DC0.3 – 15V	Check that the input is proper for the load. Current value changes depending on the load. Proportioning valve resistance: 50Ω - 90Ω.

6. Fan does not begin rotating, or the fan rotation is abnormal when hot water is being demanded:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
61	Fan Motor abnormality	Check that the fan is rotating and check the pulse frequency from the fan rotational frequency sensor. Check for improper connection of the fan. Check voltage from circuit board.	CN-27	4 BR-BL	2 DC0V – 43V	Confirm the measured fan speed by Maintenance Monitor (No.10). If the fan motor does not rotate, but voltage is normal, then the fan motor should be replaced. If the voltage is abnormal, replace the circuit board. If the fan motor is rotating and if the voltage is normal, but there is a "61" error code, then the fan motor should be replaced.
				1 R-BL	2 DC11V – 13V	
				3 Y-BL	2 120Hz – 387Hz	

7. Temperature control problem:

Error Code	Possible Causes	Checkpoint	Connector No.	P in No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
No Indication	Gas supply pressure or manifold pressure abnormality	Check gas supply and manifold pressures	CN-86		See pg. 86	
				3 W-O 4	DC1 – 16V	During Operation.
	3 W-G 5	DC1 – 16V		During Operation.		
	3 W-V 7	DC1 – 16V		During Operation.		
	3 W-BK 6	DC1 – 16V		During Operation.		
	2 Y-BL 1	DC 1V or less		When valve is fully open. (When operation is OFF.)		
16	Abnormally High Output (temperature is too hot)	Check the resistance of the outlet thermistor.	CN-59	8 R-BL 1	DC14 – 16V	During Operation.
				14 W-W 15		If the outlet temperature is over 194°F for 0.3 seconds, or over 27°F more than setting temp. for 25 seconds with the set temperature 125°F or more, or over 140°F for 4 seconds with the set temperature 120°F or less, the unit will shut off and a 16 error code will flash.
		Check gas proportioning valve.		4 R-BL 3	DC0.3 – 15V	Check for short or open circuit or improper connection of wiring to valve.

<NCC199 (-SV,-DV) / N-0841MC (-DV) / NRC111 (-SV,-DV) / N-0842MC (-DV)

■ Error Descriptions and How to Reset

<After Pressing the Operation Button on the Remote Controller>

1. If the Priority lamp does not come on:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Color Code	Normal Value	How to Fix Problem and Reset Unit
No Error Code	A Fuse is Blown	Check whether the 10A fuse on the circuit board is open.			Closed circuit	Remove the cause of excess current, then replace the 10A fuse.
	Power Source Circuit Board Abnormality	Check the 15V output line from the power (source circuit board).	CN-102	2 BK/BL-R	DC 14 – 16V	If there is AC 100V supplied to the power source circuit board, but there is not DC 15V out of it, the power source circuit board needs to be replaced.
	Circuit Board Abnormality	Input voltage measurement of a C.B.A.	CN-102	6 BL-R	DC 14 – 16V	Check for improper or damaged connections between the two boards, and for an open circuit on the circuit board.
	Remote Control Terminal Block Voltage Abnormality	Check voltage supply from circuit board to remote controller.	CN-89A	1 BL-BL	DC 13 – 16V	If voltage is abnormal, replace circuit board.
	Remote Controller Cord Abnormality	Check for open or short circuit.			Closed circuit (not open or shorted)	If there is an open or short circuit, or a ground fault is detected, replace the cord.

2. The Priority lamp lights, but an error code appears soon after:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Color Code	Normal Value	How to Fix Problem and Reset Unit
10	Combustion Abnormality (Unit continues burning with error code flashing and drop in heat output)	Check for abnormal combustion. Check flue for blockage or obstruction.				A blinking 10 indicates there has been a loss of gas input, but combustion will continue. In order to reset the unit, the power must be disconnected and then reconnected.
14	Overheat Prevention Device (Thermal Fuse)	Check for melting or improper connection of the overheat prevention device (Thermal fuse).	CN-38	25 BL-BL	2Ω or less	If the overheat prevention device (Thermal fuse) has fused, it has been exposed to temperatures in excess of 363°F. First fix the cause of the high temperature exposure (hole in heat exchanger, etc.) and then replace the overheat prevention device (Thermal fuse).
760	Remote Controller Transmission Abnormality	Check remote controller and circuit board. Check connection of remote control cord and cord to circuit board.	CN-89A	1 BL-BL	DC13 – 16V	If there is a voltage abnormality, replace the circuit board.
90	Combustion Abnormality	Check remote control cord for a short or open circuit, or for a ground fault.			Closed circuit (no open or short)	If an open or short circuit or a ground fault exists, replace Remote Control cord.
	Combustion Abnormality	Check for abnormal combustion. Check flue for blockage or obstruction.				If abnormal combustion is detected, the error code will flash and combustion stops. This error code can be reset by turning the water heater OFF on the operation panel. Remove the cause of the abnormal combustion.
92	Combustion Abnormality (Warning Indication) (Unit 5 huts Off)					Check maintenance monitor No.48. If the fan has increased its speed by 101 %, the error code will flash but combustion continues. If the fan has increased its speed by 102 %, the error code will flash and combustion stops.
	Neutralizer Life Cycle Warning	Check maintenance monitor no.13			[000]-[110]	This warning indicates replacement of the neutralizer is necessary. If no.13 value is [111] - [120], the unit will continue to operate normally. If no.13 value is [121] - [130], the unit will continue to operate at reduced maximum hot water capacity.
93	Neutralizer Life Cycle has Ended	Check maintenance monitor no.13			[000]-[110]	If normal value, replace the circuit board. Safe made. The unit will not operate. If not normal value, replace the neutralizer.
99	Combustion Abnormality (Unit 5 huts Off)	Check for abnormal combustion. Check flue for blockage or obstruction.				If normal value, replace the circuit board. If this error code is displayed and the water heater has been in use for 5 years, the unit has reached the end of its life cycle and should be replaced.

<During Regular Operation>

1. Fan does not begin rotating when hot water is being demanded:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
No Error	Main Flow Sensor Abnormality	Check maintenance monitor no. 15	CN-63		0.5 GPM	If the flow monitor indicates higher than the minimum, the circuit board will need to be replaced. OK if K > 18/Flow Rate (GPM) + inlet water temp (°F), where K = 136°F for 127 °F or lower temperature setting, K = Set Temp (C) + 9°F for 127 °F or more setting. Also check thermostat temperature characteristics.
	Inlet Water Temperature is too High	Check inlet water temperature		4 W-W	less than 122°F using thermostat characteristics	
20	High Limit Switch Triggered	Check if high limit switch is triggered or improperly connected.	CN-1	3 BK-W	1Ω or less	*This model has 2 kinds of High Limit Switch. Make Sure there is no flame left over in the burner. Check for short or open circuit. Reset unit by turning power off and on. Replace high limit if code remains.
29	Neutralizer Water Level Electrode abnormality	Check maintenance monitor no. 19			OFF [000]	If no. 19 is ON [111], check the following : Check for Neutralizer blockage. Check for drain pipe blockage. Check for proper connection of Neutralizer water level electrode. Check for short circuit of Neutralizer water level electrode cord. If normal value, replace the circuit board.
31	Inlet Thermistor Abnormality	Check the resistance through the thermistor. Check for open or short circuit or improper connection.	CN-63	4 W-W	DC1 – 4.5V	Compare to temperature characteristic list on pgs. 61. Check for open or short circuit or for an improper connection.
32	Outlet Thermistor Abnormality	Check the resistance through the thermistor. Check for open or short circuit or improper connection.	CN-63	1 W-W	DC1 – 4.5V	Compare to temperature characteristic list on pgs. 61. Check for open or short circuit or for an improper connection.
33	Heat Exchanger Thermistor Abnormality	Check the resistance through the thermistor. Check for open or short circuit or improper connection.	CN-63	3 W-W	DC1 – 4.5V	Compare to temperature characteristic list on pgs. 61. Check for open or short circuit or for an improper connection.
70	Circuit board Abnormality	Detection of circuit board abnormality.				Disconnect the electrical power, then reconnect electrical power to the water heater to reset the system. If the circuit board abnormality is continuous, replace the circuit board.
71	Gas Solenoid Valve Drive Circuit Abnormality	Check for damage to the gas solenoid valve drive circuit on the circuit board.				Disconnect the electrical power, then reconnect electrical power to the water heater to reset the system. If the error code "71" is continuous, replace the circuit board.
72	Flame Rod Abnormality (Flame detected when no flame present)	Measure the current from the flame rod when there is no flame.	CN-78	1 BL-Burner case	10kHz – 100kHz	If the "72" error code is displayed, check the signal from the flame rod (also make sure that there is not a problem with the grounding of the appliance). If the signal is normal, replace the circuit board. If it is abnormal, replace the flame rod.
		Check for a ground fault		1 BL-Electrode F-rod	DC0.5 or less	

2. Fan rotates normally, but no flame ignites on the burner:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
11	Ignition Failure	Igniter failure	CN-1, 10	5 W-BK	2 AC90V – 110V	Replace Igniter
		Check primary gas solenoid valve	CN-10	6 W-BL	7 DC 80V – 100V	Gas Solenoid Valve typical resistance: 0.5kΩ to 20k Ω.
		Check gas solenoid valve 1		5 BK-BL	7 DC 80V – 100V	
		Check gas proportioning valve	CN-38	2 R-BL	4 DC0.3V – 15V	Gas Solenoid Valve typical resistance: 0.5kΩ to 20k Ω. Current value changes depending on the load. Proportioning valve resistance: 50Ω – 90 Ω.

3. A flame ignites on the burner, but it goes out immediately:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
11	Flame Detecting Circuit abnormality (initial flame fault detection)	Check the flame rod	CN-78	1 BL-Burner case	10kHz – 100kHz	Visually confirm that a flame ignites. Check wiring connections to flame rod, and check wiring connections to gas proportioning and gas solenoid valves. Check for a bad contact or a bad connection between flame rod and circuit board. Check for a ground fault in the unit, especially the circuit board ground. Check for damage or improper connection of the ground wire between the circuit board and the metal case of the unit.
		Check the current from the flame rod		1 BL-Electrode rod	DC 1μA or more	
		Check for a disconnected ground from the circuit board				
		Check gas supply and manifold pressures			See pg. 89	
	Gas Supply Pressure or Manifold Pressure Abnormality	Check gas proportioning valve	CN-38	2 R-BL	4 DC0.3 – 15V	Current value changes depending on the load. Proportioning valve resistance: 50Ω – 90 Ω.

4. Flame goes out while hot water is being supplied:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
12	Flame Rod Triggered (Doesn't sense flame during operation)	Check the flame rod	CN-78	1 BL-Base case GND	10kHz – 100kHz	Visually confirm that a flame ignites, check wiring connections to the flame rod, and check wiring connections to gas proportioning and gas solenoid valves. Check for a bad contact or a bad connection between the flame rod and circuit board. Check for a ground fault in the unit, especially the circuit board ground.
		Check the current from the flame rod		1 BL-Electrode rod	DC 1µA or more	
		Check for a disconnected ground from the circuit board				
	Gas Supply Pressure or Manifold Pressure Abnormality	Check gas supply and manifold pressures			See pg. 89	Check that the input is proper for the load.
		Check gas proportioning valve	CN-38	2 R-BL	DC0.3 – 15V	Current value changes depending on the load. Proportioning valve resistance: 50 Ω - 90 Ω.

5. Fan does not begin rotating, or the fan rotation is abnormal when hot water is being demanded:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
61	Fan Motor abnormality	Check that the fan is rotating and check the pulse frequency from the fan rotational frequency sensor. Check for improper connection of the fan. Check voltage from circuit board.	CN-27	4 BR-BL	DC7V – 48V	Confirm the measured fan speed by Maintenance Monitor (No.10). If the fan motor does not rotate, but voltage is normal, then the fan motor should be replaced. If the voltage is abnormal, replace the circuit board. If the fan motor is rotating and if the voltage is normal, but there is a "61" error code, then the fan motor should be replaced.
				1 R-BL	DC10V – 14V	
				3 Y-BL	100Hz – 400Hz	

<During Regular Operation>

6. Temperature control problem:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
No Indication	Gas supply pressure or manifold pressure abnormality	Check gas supply and manifold pressures.			See pg. 89	
65	Main Flow Control Valve Abnormality	Check main flow control valve. Check for improper connection of the valve.	CN-38	25 BL-O	DC1 – 16V	During Operation.
				25 BL-G	DC1 – 16V	During Operation.
				25 BL-V	DC1 – 16V	During Operation.
				25 BL-BK	DC1 – 16V	During Operation.
66	Bypass Flow Control Valve Abnormality	Check that the bypass flow control valve is functioning. Check for improper connection of the valve.	CN-38	24 Y-BK	DC1V or less	When valve is fully open.
				25 BL-O	DC1 – 16V	During Operation.
				25 BL-G	DC1 – 16V	During Operation.
				25 BL-V	DC1 – 16V	During Operation.
				25 BL-BK	DC1 – 16V	During Operation.
				20 Y-BK	DC1V or less	When valve is fully open.
16	Abnormally High Output (temperature is too hot)	Check the resistance of the outlet thermistor.	CN-63	1 W-W	DC1 – 4.5V	If the heat exchanger thermistor temp. is 210°F and over for one second with the all set temp. If the outlet thermistor temp. is 203°F and over for two seconds with the set temp. 170°F and more. If the outlet thermistor temp. is 194°F and over for two seconds with the set temp. less than 170°F. If the outlet thermistor temp. is (set temp. + 18°F) and over for 25 seconds with the set temp. more than 122°F. If the outlet thermistor temp. is 140°F and over for 4 seconds with the set temp. 122°F and less. The unit will shut off and a 16 error code will flash.
				2 R-BL	DC0.3 – 15V	Check for short or open circuit or improper connection of wiring to valve.

<NR98 (-SV,-OD,-DVC) / NC199 (-OD,-DVC) / N-0751M (-DV, -OD, -DVC),
NR111 (-SV,-OD,-DV) / NC250 (-SV,-DV)-ASME / N-0931M (-DV, -OD),
NC380-SV-ASME / N-1321M-ASME>

■ Error Descriptions and How to Reset

<After Pressing the Operation Button on the Remote Controller>
1. If the Priority lamp does not come on:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Color Code	Normal Value	How to Fix Problem and Reset Unit
No Error Code	A Fuse is Blown	Check whether the 10A fuse on the circuit board is open.			Closed circuit	Remove the cause of excess current, then replace the 10A fuse.
	Power Source Circuit Board Abnormality	Check the 15V output line from the power (source circuit board.)	CN-102	6 BL-R	4 DC14 – 16V	If there is AC 100V supplied to the power source circuit board, but there is not DC 15V out of it, the power source circuit board needs to be replaced.
	Circuit Board Abnormality	Input voltage measurement of a C.B.A.	CN-102	6 BL-R	4 DC14 – 16V	Check for improper or damaged connections between the two boards, and for an open circuit on the circuit board.
	Remote Control Terminal Block Voltage Abnormality	Check voltage supply from circuit board to remote controller.	CN-89	1 BL-BL	3 DC13 – 16V	If voltage is abnormal, replace circuit board.
	Remote Controller Cord Abnormality	Check for open or short circuit.			Closed circuit (not open or shorted)	If there is an open or short circuit, or a ground fault is detected, replace the cord.

2. The Priority lamp lights, but an error code appears soon after:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Color Code	Normal Value	How to Fix Problem and Reset Unit
10	Combustion Abnormality (Unit continues burning with error code flashing and drop in heat output)	Check for abnormal combustion. Check flue for blockage or obstruction.				A blinking 10 indicates there has been a loss of gas input, but combustion will continue. In order to reset the unit, the power must be disconnected and then reconnected.
14	Overheat Prevention Device (Thermal Fuse)	Check for melting or improper connection of the overheat prevention device (Thermal fuse).	CN-38	25 BL-BL	31 2Ω or less	If the overheat prevention device (Thermal fuse) has fused, it has been exposed to temperatures in excess of 343 °F. First fix the cause of the high temperature exposure (hole in heat exchanger, etc.) and then replace the overheat prevention device (Thermal fuse).
760	Remote Controller Transmission Abnormality	Check remote controller and circuit board. Check connection of remote control cord and cord to circuit board.	CN-89	1 BL-BL	3 DC13 – 16V	If there is a voltage abnormality, replace the circuit board.
90	Combustion Abnormality	Check remote control cord for a short or open circuit, or for a ground fault.			Closed circuit (no open or short)	If an open or short circuit or a ground fault exists, replace Remote Control cord.
	Combustion Abnormality	Check for abnormal combustion. Check flue for blockage or obstruction.				If abnormal combustion is detected, the error code will flash and combustion stops. This error code can be reset by turning the water heater OFF on the operation panel. Remove the cause of the abnormal combustion.
99	Combustion Abnormality (Warning Indication) (Unit Shuts Off)	Check maintenance monitor No.48.				Check maintenance monitor No.48. If the fan has increased its speed by 108 - 109 %, the error code will flash but combustion continues. If the fan has increased its speed by 110 %, the error code will flash and combustion stops.
	Combustion Abnormality (Unit Shuts Off)	Check for abnormal combustion. Check flue for blockage or obstruction.				If this error code is displayed and the water heater has been in use for 5 years, the unit has reached the end of its life cycle and should be replaced.

<During Regular Operation>

1. Fan does not begin rotating when hot water is being demanded:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Color Code	Normal Value	How to Fix Problem and Reset Unit
No Error	Main Flow Sensor Abnormality	Check maintenance monitor no. 15			0.5 GPM	If the flow monitor indicates higher than the minimum, the circuit board will need to be replaced.
	Inlet Water Temperature is too High	Check inlet water temperature	CN-63	4 W-W	2 less than 122°F using thermistor characteristics	OK if K > 18 Flow Rate (GPM) + inlet water temp (°F), where K = 136°F for 127 °F or lower temperature setting, K = Set Temp (C) + 9°F for 127 °F or more setting. Also check thermistor temperature characteristics.
20	High Limit Switch Triggered	Check if high limit switch is triggered or improperly connected.	CN-1	3 BK-W	6 1Ω or less	Make Sure there is no flame left over in the burner. Check for short or open circuit. Reset unit by turning power off and on. Replace high limit if code remains.
31	Inlet Thermistor Abnormality	Check the resistance through the thermistor. Check for open or short circuit or improper connection.	CN-63	4 W-W	2 DC1 – 4.5V	Compare to temperature characteristic list on pgs. 59, 60.
32	Outlet Thermistor Abnormality	Check the resistance through the thermistor. Check for open or short circuit or improper connection.	CN-63	1 W-W	2 DC1 – 4.5V	Check for open or short circuit or for an improper connection.
33	Heat Exchanger Thermistor Abnormality	Check the resistance through the thermistor. Check for open or short circuit or improper connection.	CN-63	3 W-W	2 DC1 – 4.5V	Compare to temperature characteristic list on pgs. 59, 60.
	Burner Sensor abnormality	Check the voltage from the Burner Sensor	CN-75	3 R-W	4 DC 0 - 40 mV	Check for open or short circuit or for an improper connection. (NC380-SV/ASME/N-1321M-ASME only).

<During Regular Operation>

2. Fan does not begin rotating when hot water is being demanded:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
70	Circuit board Abnormality	Detection of circuit board abnormality.				Disconnect the electrical power, then reconnect electrical power to the water heater to reset the system. If the circuit board abnormality is continuous, replace the circuit board.
71	Gas Valve Drive Circuit Abnormality	Check for damage to the gas valve drive circuit on the circuit board.				Disconnect the electrical power, then reconnect electrical power to the water heater to reset the system. If the error code "71" is continuous, replace the circuit board.
72	Flame Rod Abnormality (Flame detected when no flame present)	Measure the current from the flame rod when there is no flame. Check for a ground fault.	CN-78	1 BL-Burner case GND	10kHz – 100kHz	If the "72" error code is displayed, check the signal from the flame rod (also make sure that there is not a problem with the grounding of the appliance). If the signal is normal, replace the circuit board. If it is abnormal, replace the flame rod.
				1 BL-Electrode	DC0.45µA or less	

3. Fan rotates normally, but no flame ignites on the burner:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
11	Ignition Failure	Igniter failure	CN-1, 10	5 W-BK 2	AC90V – 110V	Replace Igniter
		Check primary gas solenoid valve	CN-10	6 W-BL 7	DC80V – 100V	
		Check gas solenoid valve 1		5 B-K-BL 7	DC80V – 100V	Gas Solenoid Valve typical resistance: 0.5kΩ to 20kΩ.
		Check gas proportioning valve	CN-38	2 R-BL 4	DC0.3V – 15V	Gas Solenoid Valve typical resistance: 0.5kΩ to 20kΩ. Current value changes depending on the load. Proportioning valve resistance: 50 Ω – 90Ω.

4. A flame ignites on the burner, but it goes out immediately:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
11	Flame Detecting Circuit abnormality (Initial flame fault detection)	Check the flame rod	CN-78	1 BL-Burner case GND	10kHz – 100kHz	Visually confirm that a flame ignites, check wiring connections to flame rod, and check wiring connections to gas proportioning and gas solenoid valves. Check for a bad contact or a bad connection between flame rod and circuit board, check for a ground fault in the unit, especially the circuit board ground. Check for damage or improper connection of the ground wire between the circuit board and the metal case of the unit.
		Check the current from the flame rod		1 BL-Electrode	DC 1µA or more	
		Check for a disconnected ground from the circuit board				
		Check gas supply and manifold pressures			See pg. 87, 88	
	Gas Supply Pressure or Manifold Pressure Abnormality	Check gas proportioning valve	CN-38	1 R-BL 2	DC0.3 – 15V	Current value changes depending on the load. Proportioning valve resistance: 50 Ω – 90Ω.

5. Flame goes out while hot water is being supplied:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
12	Flame Rod Triggered (Doesn't sense flame during operation)	Check the flame rod	CN-78	1 BL-Burner case GND	10kHz – 100kHz	Visually confirm that a flame ignites, check wiring connections to the flame rod, and check wiring connections to gas proportioning and gas solenoid valves. Check for a bad contact or a bad connection between the flame rod and circuit board. Check for a ground fault in the unit, especially the circuit board ground. Check that the input is proper for the load.
		Check the current from the flame rod		1 BL-Electrode	DC 1µA or more	
		Check for a disconnected ground from the circuit board				
		Check gas supply and manifold pressures			See pg. 87, 88	
21	Check if pressure switch is triggered	Check gas proportioning valve	CN-38	2 R-BL 4	DC0.3 – 15V	Current value changes depending on the load. Proportioning valve resistance: 50 Ω – 90 Ω.
		Check fan speed to confirm either strong winds or a flue blockage has occurred (maintenance monitor No.10)	CN-38	3 R-BL 20	ON: DC 0V OFF: 14 – 16V	Significant back pressure in the flue will cause the unit to increase its fan speed in increments of 150 RPM until it reaches 3000 RPM, at which point the unit will shut off and display a 21 error code. (NC380-SV-ASME/N-1321M-ASME only)

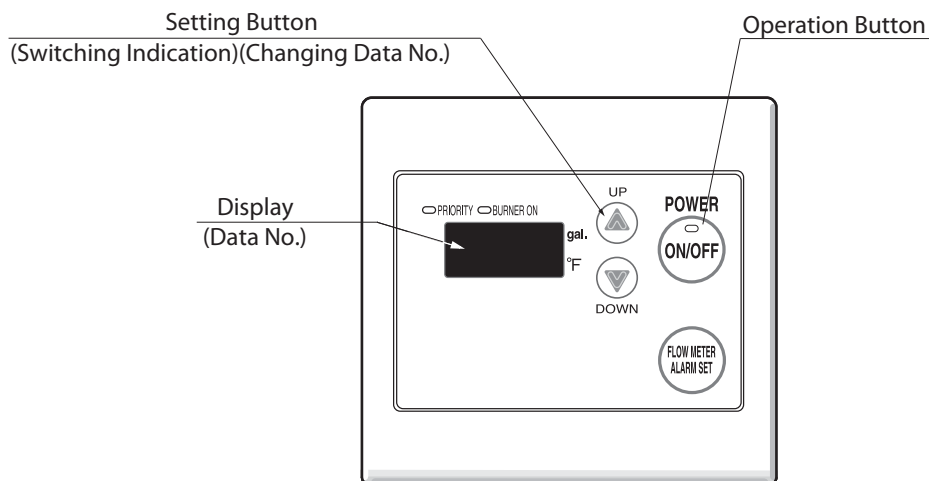
6. Fan does not begin rotating, or the fan rotation is abnormal when hot water is being demanded:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
61	Fan Motor abnormality	Check that the fan is rotating and check the pulse frequency from the fan rotational frequency sensor . Check for improper connection of the fan. Check voltage from circuit board.	CN-27	4 BR-BL	DC7V – 45V	Confirm the measured fan speed by Maintenance Monitor (No.10). If the fan motor does not rotate, but voltage is normal, then the fan motor should be replaced. If the voltage is abnormal, replace the circuit board. If the fan motor is rotating and if the voltage is normal, but there is a '61" error code, then the fan motor should be replaced.
				1 R-BL	DC 10V – 14V	
				3 Y-BL	100Hz – 400Hz	

7. Temperature control problem:

Error Code	Possible Causes	Checkpoint	Connector No.	Pin No. & Code Color	Normal Value	How to Fix Problem and Reset Unit
No Indication	Gas supply pressure or manifold pressure abnormality	Check gas supply and manifold pressures.			See pg. 87, 88	
65	Main Flow Control Valve Abnormality	Check main flow control valve. Check for improper connection of the valve.	CN-38	25 BL-O	DC1 – 16V	During Operation.
				25 BL-G	DC1 – 16V	During Operation.
				25 BL-V	DC1 – 16V	During Operation.
				25 BL-BK	DC1 – 16V	During Operation.
				24 Y-BL	DC1V or less	When valve is fully open.
66	Bypass Flow Control Valve Abnormality	Check that the bypass flow control valve is functioning. Check for improper connection of the valve.	CN-38	25 BL-O	DC1 – 16V	During Operation.
				25 BL-G	DC1 – 16V	During Operation.
				25 BL-V	DC1 – 16V	During Operation.
				25 BL-BK	DC1 – 16V	During Operation.
				20 Y-BL	DC1V or less	When valve is fully open.
16	Abnormally High Output (temperature is too hot)	Check the resistance of the outlet thermistor.	CN-63	1 W-W	DC1 – 4.5V	If the outlet temperature is over 194°F for two seconds (or for sixty seconds if the set temperature is 167°F), or over 176 °F for ten seconds with the set temperature 118°F or less, or over 140°F for ninety seconds with the set temperature 118°F or less, the unit will shut off and a 16 error code will flash.
		Check gas proportioning valve.	CN-38	2 R-BL	DC0.3 – 15V	Check for short or open circuit or improper connection of wiring to valve.

- Remote Controller (Optional for NR50-OD / NR66 (-SV,-OD) / N-0531S (-OD), NR71 (-SV,-OD) / N-0631S (-OD))
- RC-7649M



■ Displaying Maintenance Monitors

<Display Procedure>

1. Press and hold both the up [▲] and down [▼] setting buttons simultaneously for more than two seconds.
This can be done regardless of whether the power has been turned on or the unit is operating.

<Indications>

1. The maintenance monitor data no. will appear on the display for two seconds, and then the data will appear.
2. In order to switch to other maintenance monitor data, press either the up or down button once. The data no. will then reappear, then different data nos. can be selected using the up [▲] and [▼] down buttons. When the maintenance monitor data no. is changed, the data no. will be displayed for two seconds, after which the data will appear.
3. With the remote controller in maintenance mode, the hot water set temperature and flow meter alarm cannot be adjusted.

<Returning to Normal Mode>

1. For releasing the indication, press and hold both [▲] and [▼] of the setting button simultaneously more than two seconds, or leave it alone for more than 10 minutes.

<Clearing Error Codes from Memory>

- When the power is OFF, press and hold the down [▼] button for more than 5 seconds.

<NR50-OD / NR66 (-SV,-OD) / N-0531S (-OD), NR71 (-SV,-OD) / N-0631S (-OD)>

■ Maintenance Monitor List (Using Optional Remote Controller)

Data No.	Item	Data (Display Reading x Multiplier)		Minimum Value for Indication	Remarks
		Multiplier	Unit		
03	Total Plug-inTime	X 100	hour	100 hours	Disp. Range [000] – [1310]
04	Total Combustion Time	X 1	hour	1 hours	Disp. Range [000] – [999]
05	Total Combustion Time	X 1000	hour	1000 hours	Disp. Range [000] – [65]
07	Number of Ignition Times	X 10	time	10 times	Disp. Range [000] – [999]
08	Number of Ignition Times	X 10000	time	10000 times	Disp. Range [000] – [65]
10	Fan Rotational Frequency	X 10	rpm	25 rpm	
14	Total Flow Rate	X 0.1	gal/min.	0.1 gal/min.	*1
		X 0.1	L/min.	0.1 L/min.	*2
18	Output (%)	X 1	%	1 %	
20	Calculated Fan Speed	X 10	rpm	25 rpm	
28	Calculated Fan Speed (no correction)	X 10	rpm	25 rpm	
30	Inlet Thermistor Temperature Reading	X 1	°F	1°F	*1
		X 1	°C	0.5 °C	*2
31	Outlet Thermistor Temperature Reading	X 1	°F	1°F	*1
		X 1	°C	0.5 °C	*2
39	Fan Motor Current Value	X 10	mA	10mA	Disp. Range [000] – [1999]
47	Simple self-diagnosis counter	[0 : xy]	Decimal		[000] – [255]
48	Initial Fan Speed Correction	X 1	%	1 %	[100] – [118]
49	Final Fan Speed Correction	X 1	%	1 %	[100] – [118]
50	FF No.	X 0.1		0.1	
51	FF+FB No.	X 0.1		0.1	
52	Output	X 0.1		0.1	
60	Position of Main Water Control valve	X 2	step		[000] (open)– [1350](close)
87	Circuit Board ID1: Product 1	[1 : xy]			A=101,B=102,C=103,...Z=126
88	Circuit Board ID2: Product 2	[2 : xy]			A=201,B=202,C=203,...Z=226
89	Circuit Board ID3:Version	[3 : xy]			A=301,B=302,C=303,...Z=326
91	Error Code History 1	Most Recent Error Code		— — —	If the same error code is repeated, it will appear in the history list twice. If it is repeated more than twice, it will only appear twice.
92	Error Code History 2	Next Most Recent Error Code		— — —	
93	Error Code History 3	Next Most Recent Error Code		— — —	
94	Error Code History 4	Next Most Recent Error Code		— — —	
95	Error Code History 5	Next Most Recent Error Code		— — —	
96	Error Code History 6	Next Most Recent Error Code		— — —	
97	Error Code History 7	Next Most Recent Error Code		— — —	
98	Error Code History 8	Next Most Recent Error Code		— — —	

*1 When RC-7649 is used.

*2 When RC-7650 is used.

<NCC199 (-SV,-DV) / N-0841MC (-DV), NRC111 (-SV,-DV) / N-0842MC (-DV)>

■ Maintenance Monitor List

Data No.	Item	Data (Display Reading X Multiplier)		Minimum Value for Indication	Remarks
		Multiplier	Unit		
03	Total Plug-in Time	X 100	hour	100 hours	Disp. Range [000] - [1310]
04	Total Combustion Time	X 1	hour	1 hours	Disp. Range [000] - [999]
05	Total Combustion Time	X 1000	hour	1000 hours	Disp. Range [000] - [1999]
07	Number of Ignition Times	X 10	time	10 times	Disp. Range [000] - [999]
08	Number of Ignition Times	X 10000	time	10000 times	Disp. Range [000] - [1999]
10	Fan Rotational Frequency	X 10	rpm	25 rpm	
13	Neutralizer Life Cycle Counter	X 10	hour	10 hours	[000] - [1999]
14	Total Flow Rate	X 0.1	gal/min	0.1 gal/min	*3
		X 0.1	L/min	0.1 L/min	*4
15	Heat Exchanger Flow Rate	X 0.1	gal/min	0.1 gal/min	*1 *3
		X 0.1	L/min	0.1 L/min	*1 *4
18	Output (%)	X 1	%	1%	
19	Neutralizer Water Level Electrode	[x:xx]			OFF : [000], ON : [111]
20	Calculated Fan Speed	X 10	rpm	25 rpm	*2
30	Water Inlet Thermistor Detection Temperature	X 1	°F	1°F	*3
		X 0.1	°C	0.5 °C	*4
31	Water Outlet Thermistor Detection Temperature	X 1	°F	1°F	*3
		X 0.1	°C	0.5 °C	*4
32	Heat Exchanger Thermistor Detection Temperature	X 1	°F	1°F	*3
		X 0.1	°C	0.5 °C	*4
38	Air Inlet Thermistor Detection Temperature	X 1	°F	1°F	Disp. Range [014] - [050] *3
		X 1	°C	1 °C	Disp. Range [-10] - [010] *4
39	Fan Motor Current Value	X 10	mA	10 mA	Disp. Range [000] - [1999]
47	Simple Self-diagnosis Counter	[0:xx]	Decimal		[000] - [036]
48	Initial Fan Speed Correction	X 1	%	1 %	[100] - [110]
49	Final Fan Speed Correction	X 1	%	1 %	[100] - [110]
50	FF No.	X 0.1		0.1	
51	FF+FB No.	X 0.1		0.1	
52	Output	X 0.1		0.1	
60	Position of Main Water Control Valve	X 2	Step		[000](open) - [1350](closed)
62	Position of Bypass Water Control Valve	X 2	Step		[000](open) - [1350](closed)
87	Circuit Board ID1: Product 1	[1:xy]			A=101,B=102,C=103, . . . ,Z=126
88	Circuit Board ID2: Product 2	[2:xy]			A=201,B=202,C=203, . . . ,Z=226
89	Circuit Board ID3: Version	[3:xy]			A=301,B=302,C=303, . . . ,Z=326
91	Error Code History 1	Most Recent Error Code			If the same error code is repeated, it will appear in the history list twice. If it is repeated more than twice, it will only appear twice.
92	Error Code History 2	Next Most Recent Error Code			
93	Error Code History 3	Next Most Recent Error Code			
94	Error Code History 4	Next Most Recent Error Code			
95	Error Code History 5	Next Most Recent Error Code			
96	Error Code History 6	Next Most Recent Error Code			
97	Error Code History 7	Next Most Recent Error Code			
98	Error Code History 8	Next Most Recent Error Code			

*1 To view the maintenance monitors of another unit in a multi-system installation, press the FLOW METER ALARM SET button (while in monitor mode) to switch to the desired unit.

*2 A difference in the calculated (#20) and the measured (#10) fan speeds of ± 500 or less is normal.

*3 When RC-7649 is used.

*4 When RC-7650 is used.

<NR98 (-SV,-OD,-DVC) / NC199 (-OD,-DVC) / N-0751M (-DV,-OD,-DVC),
NR111 (-SV,-OD,-DV) / NC250 (-SV,-DV)-ASME / N-0931M (-DV,-OD),
NC380-SV-ASME / N-1231M-ASME>

■ Maintenance Monitor List

Data No.	Item	Data (Display Reading X Multiplier)		Minimum Value for Indication	Remarks
		Multiplier	Unit		
03	Total Plug-in Time	X 100	hour	100 hours	Disp. Range [000] - [1310]
04	Total Combustion Time	X 1	hour	1 hours	Disp. Range [000] - [999]
05	Total Combustion Time	X 1000	hour	1000 hours	Disp. Range [000] - [1999]
07	Number of Ignition Times	X 10	time	10 times	Disp. Range [000] - [999]
08	Number of Ignition Times	X 10000	time	10000 times	Disp. Range [000] - [1999]
10	Fan Rotational Frequency	X 10	rpm	25 rpm	
14	Total Flow Rate	X 0.1	gal/min	0.1 gal/min	*3
		X 0.1	L/min	0.1 L/min	*4
15	Heat Exchanger Flow Rate	X 0.1	gal/min	0.1 gal/min	*1 *3
		X 0.1	L/min	0.1 L/min	*1 *4
18	Output (%)	X 1	%	1%	
20	Calculated Fan Speed	X 10	rpm	25 rpm	*2
30	Water Inlet Thermistor Detection Temperature	X 1	°F	1 °F	*3 **
		X 0.1	°C	0.5 °C	*4 **
31	Water Outlet Thermistor Detection Temperature	X 1	°F	1 °F	*3 **
		X 0.1	°C	0.5 °C	*4 **
32	Heat Exchanger Thermistor Detection Temperature	X 1	°F	1 °F	*3
		X 0.1	°C	0.5 °C	*4
38	Air Inlet Thermistor Detection Temperature	X 1	°F	1 °F	Disp. Range [014] - [050] *3
		X 1	°C	1 °C	Disp. Range [-10] - [010] *4
39	Fan Motor Current Value	X 10	mA	10 mA	Disp. Range [000] - [1999]
47	Simple Self-diagnosis Counter	[0:xx]	Decimal		[000] - [036]
48	Initial Fan Speed Correction	X 1	%	1 %	[100] - [110]
49	Final Fan Speed Correction	X 1	%	1 %	[100] - [110]
50	FF No.	X 0.1		0.1	
51	FF+FB No.	X 0.1		0.1	
52	Output	X 0.1		0.1	
60	Position of Main Water Control Valve	X 2	Step		[000](open) - [1350](closed)
62	Position of Bypass Water Control Valve	X 2	Step		[000](open) - [1350](closed)
87	Circuit Board ID1: Product 1	[1:xy]			A=101,B=102,C=103, ... ,Z=126
88	Circuit Board ID2: Product 2	[2:xy]			A=201,B=202,C=203, ... ,Z=226
89	Circuit Board ID3: Version	[3:xy]			A=301,B=302,C=303, ... ,Z=326
91	Error Code History 1	Most Recent Error Code			If the same error code is repeated, it will appear in the history list twice. If it is repeated more than twice, it will only appear twice.
92	Error Code History 2	Next Most Recent Error Code			
93	Error Code History 3	Next Most Recent Error Code			
94	Error Code History 4	Next Most Recent Error Code			
95	Error Code History 5	Next Most Recent Error Code			
96	Error Code History 6	Next Most Recent Error Code			
97	Error Code History 7	Next Most Recent Error Code			
98	Error Code History 8	Next Most Recent Error Code			

*1 To view the maintenance monitors of another unit in a multi-system installation, press the FLOW METER ALARM SET button (while in monitor mode) to switch to the desired unit.

*2 A difference in the calculated (#20) and the measured (#10) fan speeds of 500 or less is normal.

*3 When RC-7649 is used.

*4 When RC-7650 is used.

** For NC380-SV-ASME/N-1321M-ASME, the multiplier value is X 0.1.

<NR50-OD / NR66 (-SV,-OD) / N-0531S (-OD), NR71 (-SV,-OD) / N-0631S (-OD)>

■ Circuit Board Replacement

* Be sure to read.

It is necessary to transfer data when replacing a circuit board. Vital information about the water heater such as the settings and unit history will have to be written to the new board. Please transfer data using the following procedure. If the transfer is not successful, the unit will not operate and the error indicator light on the unit will flash or a "73" code will flash on the optional remote controller.

Note: A remote controller may be necessary to complete the set-up of the new circuit board.

Data Transferring Procedure

When a circuit board is replaced, data must be transferred from the old board, otherwise the error indicator light on the unit will flash or a "73" code will flash on the optional remote controller and the unit will not operate. After installing the new circuit board, please transfer data according to the following procedure:

1. With the electrical power disconnected, connect the new and old circuit boards by inserting the supplied data transfer wire into connection number CN75 (see Note 1) of each circuit board. If a temperature selection wire is inserted into CN75 on the old circuit board, remove this connector and save it for the new circuit board.
2. Reconnect the electrical power. The data transfer will be completed in about 30 seconds. The unit will signal a successful transfer by rotating the fan and opening and closing the gas solenoid valve (3 minutes).
3. After confirming a successful transfer, turn the power off. Remove the cable connecting the new and old circuit boards.
4. If a temperature selection wire was removed from the old circuit board, reinsert it into CN75 on the new circuit board.

Note 1. The data transfer wire is marked "89", but please connect it to connection number CN75.

- * After replacing the board, check and adjust manifold gas pressure settings to listed in the "Setting list for Gas manifold pressures" table of the unit.
- * When you cannot transfer data between the boards, please follow the procedures under "Data Transfer Troubleshooting".

Data Transfer Troubleshooting

1. If this is the first time that the circuit board has been replaced: Please follow the procedure "Initial Circuit Board Settings".
2. If this is the second time that the circuit board has been replaced: Please follow the procedure "Circuit Board Resetting".

- * If data has already been transferred to the board, follow the resetting procedure.
- * Once data has been transferred to a new board, the transfer procedure cannot be performed again.

Initial Circuit Board Settings

- * After replacing the circuit board, make sure all connections are made before making the initial circuit board settings.
- * When the water heater has no remote controller, make sure to connect a remote controller before performing the initial settings below.

1. Connect electrical power to the unit and wait ten seconds before proceeding to step 2.
2. Within the first ten minutes of connecting power, before turning it on, hit the "up" or "down" button on the remote controller and hold until the display blinks "99". If the unit does not go into maintenance mode, unplug the unit and try again.
3. Use the "up" or "down" button on the remote controller to change the maintenance writer number.
4. Press the "FLOW METER ALARM SET" for 0.5 sec to change the setting ON/OFF.
ON: "PRIORITY" lamp flashes.
OFF: "PRIORITY" lamp goes off.
5. Change "1F" from OFF to ON. (for NR50-OD, NR71 (-SV,-OD) and N-0631S (-OD) models only)
6. Change "2B" from OFF to ON.
7. Change "FE" and "FC" from OFF to ON in order to access the hidden maintenance writers. (Display blinks with "A0".)
8. Now the maintenance writers can be accessed by hitting the "up" or "down" button on the remote controller. Refer to the "Setting list for DIP settings" table for the correct writer setting.
9. Press the "FLOW METER ALARM SET" for 0.5 sec to change the setting ON/OFF.
ON: "PRIORITY" lamp flashes.
OFF: "PRIORITY" lamp goes off.
10. When all of the maintenance writers have been set correctly, confirm the settings by pressing and holding both the "up" and "down" buttons on the remote controller until the controller emits a beeping noise. The new settings will be lost if this is not done.

Note 1. To cancel the settings, let the controller sit for 10 minutes, or turn on the operation button. The information set previously will be canceled. To change settings again, follow steps 1 through 9.

Note 2. Only change data as listed in the "Setting list for DIP settings" table.

Setting list for DIP settings

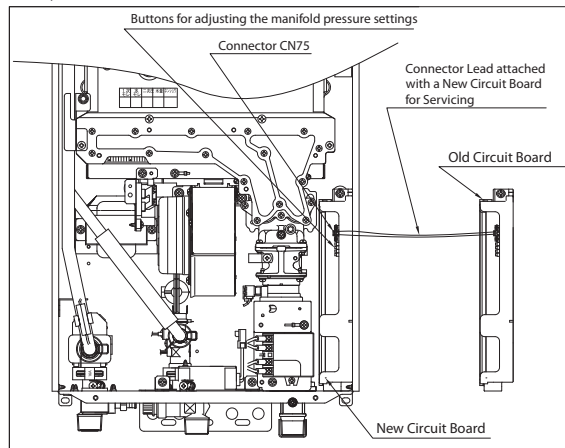
(check the rating plate for model and gas type)

Model	Gas Type	Circuit board DIP setting (●:ON ○:OFF)																				Manifold Pressure (inch H ₂ O) Cover off
		1F	2B	A1	A7	A8	A9	AB	AD	AE	B0	B1	B5	B7	B8	BC	BE	C1	C3	C4		
NR71-SV/N-0631S	NG	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
	LPG	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
NR71-OD/N-0631S-OD	NG	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
	LPG	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
NR66-SV/N-0531S	NG	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
	LPG	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
NR66-OD/N-0531S-OD	NG	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
	LPG	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
NR50-OD	NG	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
	LPG	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		

"Refer to Page.83 - 87"

"Refer to Page.83 - 87"

Reference connection diagram
(for simplification, other connections have been omitted)

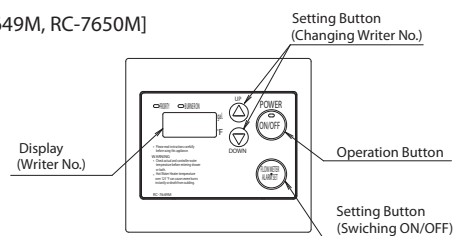


Circuit Board Resetting

* When the water heater has no remote controller, make sure to connect a remote controller before performing the below steps.

1. Install the circuit board into the unit and make all wiring connections.
2. Within the first ten minutes of connecting power to the unit, perform steps 1 through 4 and step 6 of the "Initial Circuit Board Settings" procedure. This should result in "A0" blinking on the remote controller.
3. If the "A0" maintenance writer is "ON" ("PRIORITY" lamp flashes), press the "FLOW METER ALARM SET" button for 0.5 seconds to change "A0" to "OFF" ("PRIORITY" lamp goes off).
4. Press and hold both the "up" and "down" buttons on the remote controller until the controller emits a beeping noise. The new settings will be lost if this is not done.
5. If this is a replacement board that had initial problems with data transfer, follow the "Data Transferring Procedure".

[RC-7649M, RC-7650M]



<NCC199 (-SV,-DV) / N-0841MC (-DV) / NRC111 (-SV,-DV) / N-0842MC (-DV)>

■ Circuit Board Replacement

* Be sure to read.

It is necessary to transfer data when replacing a circuit board. Vital information about the water heater such as the settings and unit history will have to be written to the new board. Please transfer data using the following procedure. If the transfer is not successful, the unit will not operate and a 73 error code will flash on the remote controller.

Data Transferring Procedure

When a circuit board is replaced, data must be transferred from the old board, otherwise a 73 error code will flash on the remote controller and the unit will not operate. After installing the new circuit board, please transfer data according to the following procedure:

1. With the electrical power disconnected, remove the remote controller connection from connection number CN89. Also, if connected, undo system controller connections (SC-101, SC-201) before transferring data.
2. Using the supplied transfer cable, connect the new and old boards by inserting the cable in connection number CN89 of each board.
3. Reconnect the electrical power. The data transfer will be completed in about 30 seconds. The unit will signal a successful transfer by rotating the fan and opening and closing the gas solenoid valve.
4. After confirming a successful transfer, turn the power off. Remove the cable connecting the new and old circuit boards. Reconnect system controller and remote controller connections.
5. Follow steps 1-5 and step 12 under "Initial Circuit Board Settings" to complete the settings for the new circuit board.

*After replacing the board, check and adjust manifold gas pressure settings to the values listed in the "Setting list for Gas manifold pressures" table.

*When you cannot transfer data between the boards, please follow the procedures under "Data Transfer Troubleshooting".

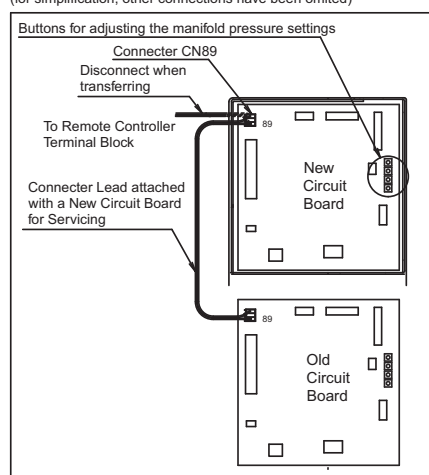
Data Transfer Troubleshooting

1. If this is the first time that the circuit board has been replaced:
Please follow the procedure "Initial Circuit Board Settings".
2. If this is the second time that the circuit board has been replaced:
Please follow the procedure "Circuit Board Resetting".

*If data has already been transferred to the board, follow the resetting procedure.

**Once data has been transferred to a new board, the transfer procedure cannot be performed again.

Reference connection diagram
(for simplification, other connections have been omitted)



Initial Circuit Board Settings

*If connected, undo system controller connections.

*A remote controller must be connected to the unit for this procedure.

*After replacing the circuit board, make sure all connections are made before making the initial circuit board settings.

1. Connect electrical power to the unit and wait ten seconds before proceeding to step 2.
2. Within the first ten minutes of connecting electrical power, before turning on the operation button, hit the "up" or "down" button on the remote controller and hold until the display blinks "99". If the unit does not go into maintenance mode, unplug the unit and try again.
3. Use the "up" or "down" button on the remote controller to change the maintenance writer number.
4. Press the "FLOW METER ALARM SET" for 0.5 sec to change the setting ON/OFF.
ON: "priority" lamp flashes.
OFF: "priority" lamp goes off.
5. Change "35" from OFF to ON.
6. Change "1B" from OFF to ON. (NCC199-DV/N-0841MC-DV/NRC111-DV/N-0842MC-DV Only)
7. Change "27" from OFF to ON.
8. Change "2F" from OFF to ON. (For Canada Only.)
9. Change "FE" and "FC" from OFF to ON in order to access the hidden maintenance writers. (Display blinks with "A0".)
10. Now the maintenance writers can be accessed by hitting the "up" or "down" button on the remote controller. Refer to the "Setting list for DIP settings" table for the correct writer setting.
11. Press the "FLOW METER ALARM SET" for 0.5 sec to change the setting ON/OFF.
ON: "priority" lamp flashes.
OFF: "priority" lamp goes off.
12. When all of the maintenance writers have been set correctly, confirm the settings by pressing and holding both the "up" and "down" buttons on the remote controller until the controller emits a beeping noise. The new settings will be lost if this is not done.
13. When a data transfer is not possible and the circuit board must be manually configured, the use time of the neutralizer cannot be entered into the new circuit board. Therefore, it will be necessary to replace the neutralizer unit. If the neutralizer is not replaced with a new unit, a "93" error code will flash on the remote controller and the water heater will not operate. Follow the instructions included with the new neutralizer to properly configure the new circuit board.

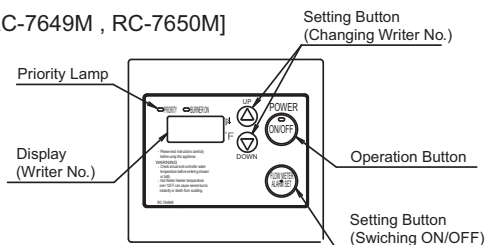
Note 1. To cancel the settings, let the controller sit for 10 minutes, or turn on the operation button. The information set previously will be canceled. To change settings again, follow steps 1 through 10.

Note 2. Only change data as listed in the "Circuit board DIP settings" table.

Circuit Board Resetting

1. Install the circuit board into the unit and make all wiring connections.
2. Within the first ten minutes of connecting power to the unit, perform steps 1 through 4 and step 9 of the "Initial Circuit Board Settings" procedure. This should result in "A0" blinking on the remote controller.
3. If the "A0" maintenance writer is "ON" ("priority" lamp flashes.), press the "FLOW METER ALARM SET" button for 0.5 seconds to change "A0" to "OFF" ("priority" lamp goes off).
4. Press and hold both the "up" and "down" buttons on the remote controller until the controller emits a beeping noise. The new settings will be lost if this is not done.
5. If this is a replacement board that had initial problems with data transfer, follow the "Data Transferring Procedure".

[RC-7649M, RC-7650M]



Setting list for DIP settings
(check the rating plate for model and gas type)

Model	Gas type	Circuit board DIP setting(● :ON ○ :OFF)																Manifold Pressure(inch H ₂ O) Cover off
		A1	A5	A6	A7	A8	AB	AD	AE	AF	B0	B1	B3	B5	B7	B8		
NCC199-SV/N-0841MC	Natural	●	○	○	○	●	●	●	●	●	○	●	●	●	●	●	"Refer to Page.82 - 86"	
NRC111-SV/N-0842MC	LPG	○	○	○	○	●	●	●	●	●	○	●	●	●	●	●		
NCC199-DV/N-0841MC-DV	Natural	●	●	●	○	●	●	●	●	●	○	●	●	●	●	●		
NRC111-DV/N-0842MC-DV	LPG	○	○	○	○	●	●	●	●	●	○	●	●	●	●	●		

<NR98 (-SV,-OD,-DVC) / NC199 (-OD,-DVC) / N-0751M (-OD,-DV,-DVC),
NR111 (-SV,-OD,-DV) / NC250 (-SV,-DV)-ASME / N-0931M (-OD,-DV)>

■ Circuit Board Replacement (When Circuit Board Type is ELV-A or ELW and later)

* Be sure to read.

It is necessary to transfer data when replacing a circuit board. Vital information about the water heater such as the settings and unit history will have to be written to the new board. Please transfer data using the following procedure. If the transfer is not successful, the unit will not operate and a 73 error code will flash on the remote controller.

Data Transferring Procedure

When a circuit board is replaced, data must be transferred from the old board, otherwise a 73 error code will flash on the remote controller and the unit will not operate. After installing the new circuit board, please transfer data according to the following procedure:

1. With the electrical power disconnected, remove the remote controller connection from connection number CN89. Also, if connected, undo system controller connections (SC-101,SC-201) before transferring data.
2. Using the supplied transfer cable, connect the new and old boards by inserting the cable in connection number CN89 of each board.
3. Reconnect the electrical power. The data transfer will be completed in about 30 seconds. The unit will signal a successful transfer by rotating the fan and opening and closing the gas solenoid valve.
4. After confirming a successful transfer, turn the power off. Remove the cable connecting the new and old circuit boards. Reconnect system controller and remote controller connections.
5. Follow steps 1-5 and step12 under "Initial Circuit Board Settings" to complete the settings for the new circuit board. (Only for type ELV-E or ELW-B and later.)

*After replacing the board, check and adjust manifold gas pressure settings to the values listed in the "Setting list for Gas manifold pressures" table.

*When you cannot transfer data between the boards, please follow the procedures under "Data Transfer Troubleshooting".

Data Transfer Troubleshooting

1. If this is the first time that the circuit board has been replaced:
Please follow the procedure "Initial Circuit Board Settings".
2. If this is the second time that the circuit board has been replaced:
Please follow the procedure "Circuit Board Resetting".

*If data has already been transferred to the board, follow the resetting procedure.

**Once data has been transferred to a new board, the transfer procedure cannot be performed again.

Initial Circuit Board Settings

*If connected, undo system controller connections.

*A remote controller must be connected to the unit for this procedure.

*After replacing the circuit board, make sure all connections are made before making the initial circuit board settings.

1. Connect electrical power to the unit and wait ten seconds before proceeding to step 2.
2. Within the first ten minutes of connecting electrical power, before turning on the operation button, hit the "up" or "down" button on the remote controller and hold until the display blinks "99". If the unit does not go into maintenance mode, unplug the unit and try again.
3. Use the "up" or "down" button on the remote controller to change the maintenance writer number.
4. Press the "FLOW METER ALARM SET" for 0.5 sec to change the setting ON/OFF.
ON: "priority" lamp flashes.
OFF: "priority" lamp goes off.
5. Change "35" from OFF to ON. (Only for type ELV-E or ELW-B and later.)
6. Change "1B" from OFF to ON. (NR98-DV/CNC199-DVC, N-0751M-DV-DVC and NR111-DV/NC250-DV-ASME/N-0931M-DV Only.)
7. Change "2D" from OFF to ON. (For LPG Only.)
8. Change "2F" from OFF to ON. (For Canada Only.)
9. Change "FE" and "FC" from OFF to ON in order to access the hidden maintenance writers.
(Display blinks with "A0".)
10. Now the maintenance writers can be accessed by hitting the "up" or "down" button on the remote controller. Refer to the "Setting list for DIP settings" table for the correct writer setting.
11. Press the "FLOW METER ALARM SET" for 0.5 sec to change the setting ON/OFF.
ON: "priority" lamp flashes.
OFF: "priority" lamp goes off.
12. When all of the maintenance writers have been set correctly, confirm the settings by pressing and holding both the "up" and "down" buttons on the remote controller until the controller emits a beeping noise. The new settings will be lost if this is not done.

Note 1. To cancel the settings, let the controller sit for 10 minutes, or turn on the operation button. The information set previously will be canceled. To change settings again, follow steps 1 through 10.

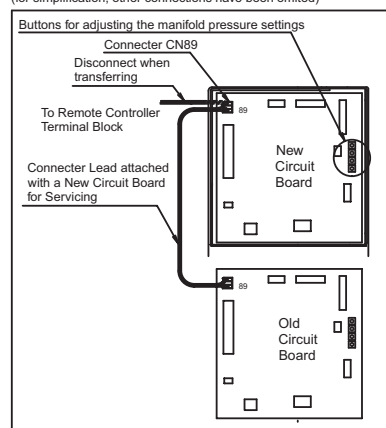
Note 2. Only change data as listed in the "Circuit board DIP settings" table.

Setting list for DIP settings

(check the rating plate for model and gas type)

Model	Gas type	Circuit board DIP setting (●:ON ○:OFF)																Manifold Pressure (inch H ₂ O) Cover off
		A1	A5	A6	A7	A8	A9	A8	AD	AE	B0	B1	B3	B5	B7	B8	BE	
NR98-SV/N-0751M	Natural	●	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	"Refer to Page.82 - 86"
	LPG	○	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	
NR98-OD/NC199-OD/ N-0751M-OD	Natural	●	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	
	LPG	○	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	
N-0751M-DV	Natural	●	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	
	LPG	○	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	
NR98-DVC/NC199-DVC/ N-0751M-DVC	Natural	●	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	
	LPG	○	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	
NR111-SV/N-0931M	Natural	●	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	
	LPG	○	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	
NR111-OD/N-0931M-OD	Natural	●	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	
	LPG	○	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	
NR111-DV/N-0931M-DV	Natural	●	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	
	LPG	○	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	
NC250-SV-ASME/ N-0931M-ASME	Natural	●	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	
	LPG	○	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	
NC250-DV-ASME/ N-0931M-DV-ASME	Natural	●	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	
	LPG	○	○	○	○	●	●	●	●	●	○	●	○	●	●	●	○	

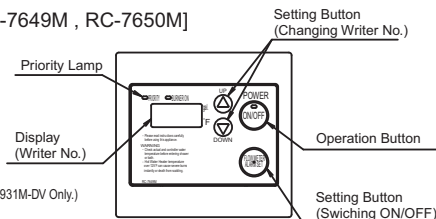
Reference connection diagram
(for simplification, other connections have been omitted)



Circuit Board Resetting

1. Install the circuit board into the unit and make all wiring connections.
2. Within the first ten minutes of connecting power to the unit, perform steps 1 through 4 and step 9 of the "Initial Circuit Board Settings" procedure. This should result in "A0" blinking on the remote controller.
3. If the "A0" maintenance writer is "ON" ("priority" lamp flashes.), press the "FLOW METER ALARM SET" button for 0.5 seconds to change "A0" to "OFF" ("priority" lamp goes off).
4. Press and hold both the "up" and "down" buttons on the remote controller until the controller emits a beeping noise. The new settings will be lost if this is not done.
5. If this is a replacement board that had initial problems with data transfer, follow the "Data Transferring Procedure".

[RC-7649M, RC-7650M]



<NC380-SV-ASME / N-1321M-ASME>

■ Circuit Board Replacement

* Be sure to read.

It is necessary to transfer data when replacing a circuit board. Vital information about the water heater such as the settings and unit history will have to be written to the new board. Please transfer data using the following procedure. If the transfer is not successful, the unit will not operate and a 73 error code will flash on the remote controller.

Data Transferring Procedure

When a circuit board is replaced, data must be transferred from the old board, otherwise a 73 error code will flash on the remote controller and the unit will not operate. After installing the new circuit board, please transfer data according to the following procedure:

1. With the electrical power disconnected, remove the remote controller connection from connection number CN89. Also, if connected, undo system controller connections (SC-101, SC-201) before transferring data.
2. Using the supplied transfer cable, connect the new and old boards by inserting the cable in connection number CN89 of each board.
3. Reconnect the electrical power. The data transfer will be completed in about 30 seconds. The unit will signal a successful transfer by rotating the fan and opening and closing the gas solenoid valve.
4. After confirming a successful transfer, turn the power off. Remove the cable connecting the new and old circuit boards. Reconnect system controller and remote controller connections.
5. Follow steps 1-5 and step 12 under "Initial Circuit Board Settings" to complete the settings for the new circuit board.

*After replacing the board, check and adjust manifold gas pressure settings to the values listed in the "Setting list for Gas manifold pressures" table.

*When you cannot transfer data between the boards, please follow the procedures under "Data Transfer Troubleshooting".

Data Transfer Troubleshooting

1. If this is the first time that the circuit board has been replaced:
Please follow the procedure "Initial Circuit Board Settings".
2. If this is the second time that the circuit board has been replaced:
Please follow the procedure "Circuit Board Resetting".

*If data has already been transferred to the board, follow the resetting procedure.

**Once data has been transferred to a new board, the transfer procedure cannot be performed again.

Initial Circuit Board Settings

*If connected, undo system controller connections.

*A remote controller must be connected to the unit for this procedure.

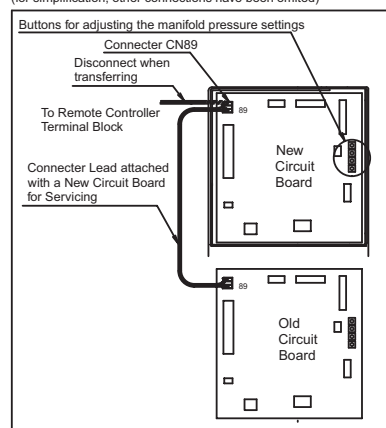
*After replacing the circuit board, make sure all connections are made before making the initial circuit board settings.

1. Connect electrical power to the unit and wait ten seconds before proceeding to step 2.
2. Within the first ten minutes of connecting electrical power, before turning on the operation button, hit the "up" or "down" button on the remote controller and hold until the display blinks "99". If the unit does not go into maintenance mode, unplug the unit and try again.
3. Use the "up" or "down" button on the remote controller to change the maintenance writer number.
4. Press the "FLOW METER ALARM SET" for 0.5 sec to change the setting ON/OFF.
ON: "priority" lamp flashes.
OFF: "priority" lamp goes off.
5. Change "Z7" from OFF to ON.
6. Change "FE" and "FC" from OFF to ON in order to access the hidden maintenance writers. (Display blinks with "A0".)
7. Now the maintenance writers can be accessed by hitting the "up" or "down" button on the remote controller. Refer to the "Setting list for DIP settings" table for the correct writer setting.
8. Press the "FLOW METER ALARM SET" for 0.5 sec to change the setting ON/OFF.
ON: "priority" lamp flashes.
OFF: "priority" lamp goes off.
9. When all of the maintenance writers have been set correctly, confirm the settings by pressing and holding both the "up" and "down" buttons on the remote controller until the controller emits a beeping noise. The new settings will be lost if this is not done.

Note 1. To cancel the settings, let the controller sit for 10 minutes, or turn on the operation button. The information set previously will be canceled. To change settings again, follow steps 1 through 10.

Note 2. Only change data as listed in the "Circuit board DIP settings" table.

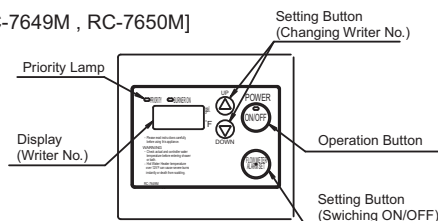
Reference connection diagram
(for simplification, other connections have been omitted)



Circuit Board Resetting

1. Install the circuit board into the unit and make all wiring connections.
2. Within the first ten minutes of connecting power to the unit, perform steps 1 through 4 and step 9 of the "Initial Circuit Board Settings" procedure. This should result in "A0" blinking on the remote controller.
3. If the "A0" maintenance writer is "ON" ("priority" lamp flashes.), press the "FLOW METER ALARM SET" button for 0.5 seconds to change "A0" to "OFF" ("priority" lamp goes off).
4. Press and hold both the "up" and "down" buttons on the remote controller until the controller emits a beeping noise. The new settings will be lost if this is not done.
5. If this is a replacement board that had initial problems with data transfer, follow the "Data Transferring Procedure".

[RC-7649M, RC-7650M]



Setting list for DIP settings

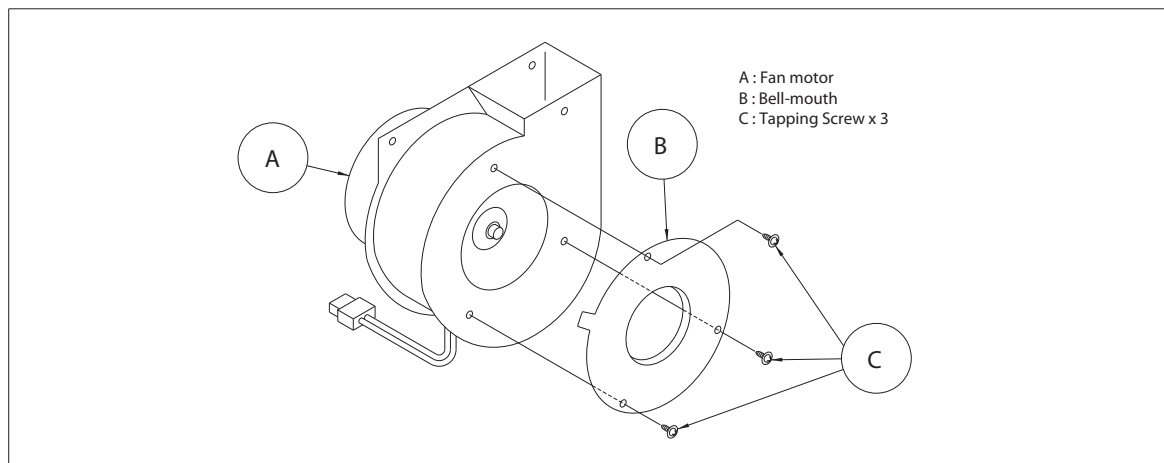
(check the rating plate for model and gas type)

(check the rating plate for model and gas type)									
Model	Gas type	Circuit board DIP setting (●:ON ○:OFF)							
		A1	A2	A4	A5	A6	A8	A9	AF
NC380-SV-ASME/ N-1321M-ASME	Natural	●	●	○	●	○	○	○	○
	LPG	○	●	○	●	○	○	○	○

"Refer to Page.82 - 86"

■ Changing the Fan Motor

When Bell-mouth(B) is installed in the old fan motor, install Bell-mouth (B) as shown in figure to maintain the proper air volume.
When you change the fan motor, please remove this part from the old fan motor, and install in the new fan motor.
After changing the fan motor, please follow the procedure "Circuit Board Settings 1" or "Circuit Board Settings 2".
The water heater will not operate properly unless you carry out this step.



*Please follow either procedure after changing the fan motor.
*When the water heater has no remote controller, make sure to connect a remote controller before performing the below steps.

Circuit Board Settings 1

1. Check that there is no water flow.
2. Within the first ten minutes of connecting electrical power, before turning it on (*1), press and hold the "FLOW METER ALARM SET" button on the remote controller until a tone is heard (2 sec.) and "120"(example) appears on the display.
3. Press the "FLOW METER ALARM SET" button to change the writer number until "11 1" appears on the display.
4. Press the "UP" button for 5 sec to change the setting number from "1" to "2". "11 2" appears on the display.
5. Set the "POWER" button to ON or let the unit sit for 30 seconds.

Note 1. Disconnect electrical power after setting the "POWER" button off on the remote controller.
The water heater will automatically turn on when electrical power is reconnected if this step is not followed.

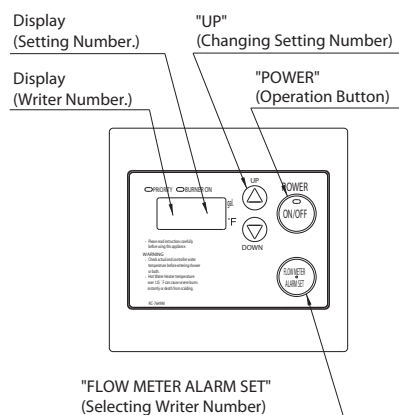
Circuit Board Settings 2

1. Check that there is no water flow.
2. Within the first ten minutes of connecting electrical power, before turning it on (*1), press and hold both the "UP" and "DOWN" buttons on the Circuit Board as illustrated to the right until the controller emits a beeping sound. The setting will be not completed if this is not done.

Note 1. Disconnect electrical power after setting the "POWER" button off on the remote controller. The water heater will automatically turn on when electrical power is reconnected if this step is not followed.

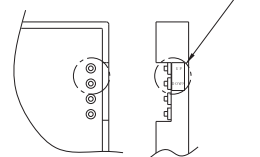
Remote Controller

[RC-7649M, RC-7650M]



Circuit Board

"UP" and "DOWN" buttons for adjusting the manifold pressure settings



■ Neutralizer Life Cycle Warning and Replacement Procedures (NCC199/NRC111 and N-0841MC/N-0842MC series only)

• Neutralizer Life Cycle Counter Operation: Neutralizer Usage Estimate

When the water heater operates at full capacity, the life cycle counter will add 1 hour of neutralizer usage for approximately every hour of water heater usage time.

Life Cycle Warning Steps

1. Error code "92" will display on the remote controller when life cycle counter has reached 1114 hours (maintenance monitor will display "111").
2. Error code "92" will display on the remote controller and the maximum hot water capacity will be limited to 2.6 GPM when the life cycle counter has reached 1214 hours (maintenance monitor will display "121").
3. When the life cycle counter has reached 1314 hours (maintenance monitor will display "131"), error code "93" will display on the remote controller and the water heater will operate in safe mode only.

Note : When replacing the neutralizer, it is necessary to reset the life cycle counter; refer to the proceeding sections for instructions.

■ Neutralizer Replacement

Replace the neutralizer following the procedures below:

1. Disconnect electrical power to the unit.
2. Drain water from the neutralizer using the drain valve located underneath the water heater (Fig. 1).
3. Disconnect the relay connector, remove the fixing screw, and remove drain hose 1, drain hose 2, and the neutralizer drain hose (Fig. 1). Remove the neutralizer by lifting up on it to disengage the tabs.
Note) When removing the drain hoses, make sure that water in the hose does not come into contact with your eyes or hands. If it comes into contact with your eyes or hands, rinse it off immediately with fresh water. Do not allow water from the drain hoses or neutralizer to leak into the water heater.
4. Connect the neutralizer drain hose (with pin clip) to the new neutralizer and install the neutralizer.

Reconnect drain hose 1 and drain hose 2 as well as the relay connector.

Note : Drain hose 1 and drain hose 2 must be oriented so that there is a downwards slope and there are no bends or kinks in the hoses.

Do not connect the wires labeled as "Connector (Factory Use Only)" as shown in Fig. 1.

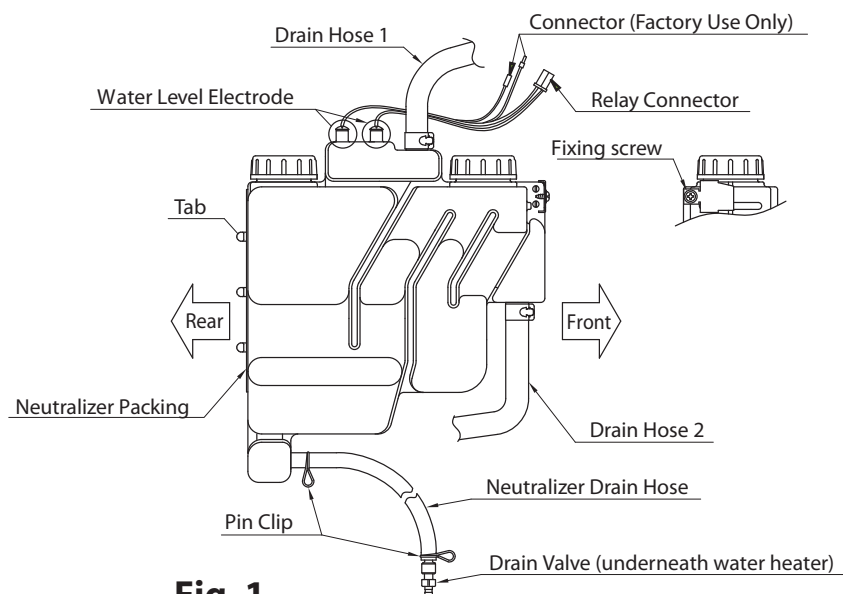


Fig. 1

Caution

5. Reset the Neutralizer Life Counter.
- 5-1 Reconnect electrical power to the unit.
- 5-2 Refer to the next section "Resetting the Unit" to reset the Neutralizer Life Counter at the circuit board.
- 5-3 Confirm that the neutralizer has been reset by using the Maintenance Monitors (refer to the section "Displaying Maintenance Monitors" for instructions). Maintenance Monitor number 13 should read "000" on the remote controller if a successful reset has been performed.

Danger

Prior to initial start up, make sure that you fill the neutralizer unit with water.
This is to prevent dangerous exhaust gases from entering the building.
Failure to fill the neutralizer unit could result in severe personal injury or death.
Refer to the installation manual or contact Noritz America Technical Support (866-766-7489) for instructions.

Disposal method of neutralizing agent (calcium carbonate) remaining in the neutralizer after replacement

The neutralizing agent is high purity calcium carbonate (limestone) and it does not contain chemical substances that are harmful to the environment. Dispose of the old neutralizer according to local waste regulations.

■ Resetting the Unit

Reset the Neutralizer Life Counter according to the procedures below after replacing the neutralizer:

<Resetting at the Circuit Board>

1. Within the first 10 minutes of connecting electrical power, with the unit turned off and no water passing through the unit, press "the Minimum Manifold Pressure Set Button" and "the Maximum Manifold Pressure Set Button" at the same time for 10 seconds (Fig. 2).
2. When the fan motor turns and the gas valve unit cycles ON/OFF (cycles of 2 seconds), the reset procedure is complete.

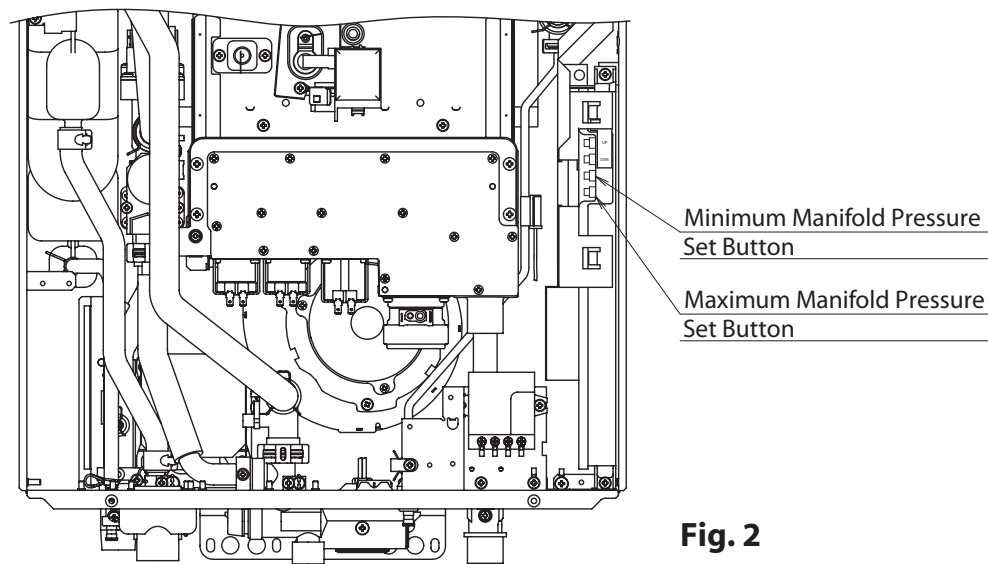


Fig. 2

■ Gas Line Requirements

All Noritz Tankless Water Heaters must be provided with a sufficient supply of gas in order to function properly. An undersized gas line could result in under heated water temperatures and an error code displayed on the operation panel. To verify a properly sized gas line, follow the below procedures. The gas line must provide at least the minimum stated pressure at the maximum firing rate. If the unit is being supplied gas from other than a dedicated line, it is recommended that the other appliances be turned on to ensure an adequate supply is available for the unit.

Gas Pressure

Size the gas line according to total btuh demand of the building and length from the meter or regulator so that the following supply pressures are available even at maximum demand:

NR50-OD NR66/531 Series NR71/631 Series	NCC199/841 Series NRC111/842 Series NR98/NC199/751 Series	NR111/NC250/931 Series NC380 Series/N-1321M Series
Natural Gas Supply Pressure Min: 4" WC Max: 10.5" WC		Natural Gas Supply Pressure Min: 5" WC Max: 10.5" WC
LP Gas Supply Pressure Min: 8" WC Max: 14" WC		LP Gas Supply Pressure Min: 10.5" WC Max: 14" WC

Gas Meter

Select a gas meter capable of supplying the entire btuh demand of all gas appliances in the building.

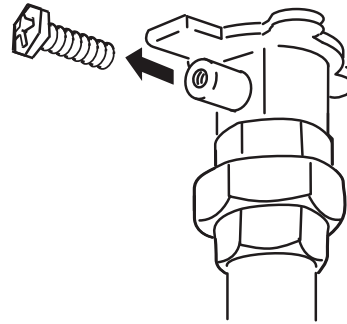
Gas Connection

- Do not use piping with a diameter smaller than the inlet diameter of the water heater.
- Gas flex lines are not recommended unless they are rated for max Btuh of the heater (see below).
- Install a gas shutoff valve on the supply line.
- Use only approved gas piping materials.

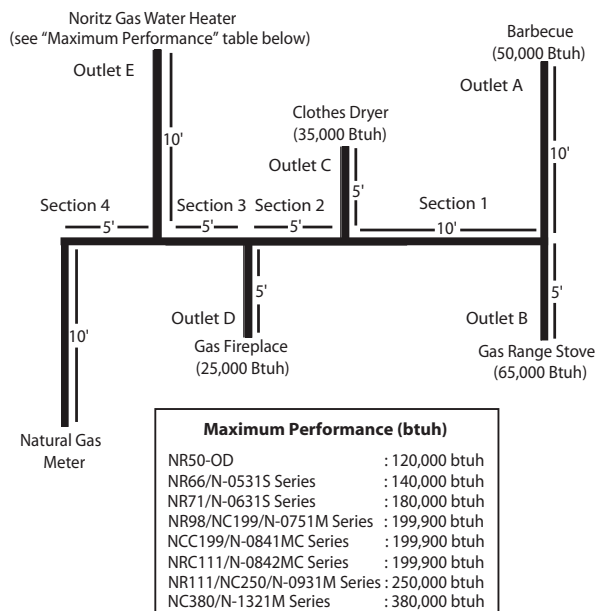
Measuring Gas Pressure

In order to check the gas supply pressure to the unit, a tap is provided on the gas inlet. Remove the hex head philips screw from the tap, and connect a manometer using a silicon tube.

In order to check the gas manifold pressure, a pair of taps are provided on the gas valve inside the unit. The pressure can be checked either by removing the hex head philips screw and connecting a manometer with a silicon tube, or by removing the 1/8" NPT screw with an allen wrench and connecting the appropriate pressure gauge.



Sample Gas Line



Instructions

- Size each outlet branch starting from the furthest using the Btuh required and the length from the meter.
- Size each section of the main line using the length to the furthest outlet and the Btuh required by everything after that section.

Sample Calculation

Outlet A: 45' (Use 50'), 50,000 Btuh requires 1/2"
 Outlet B: 40', 65,000 Btuh requires 1/2"
 Section 1: 45' (Use 50'), 115,000 Btuh requires 3/4"
 Outlet C: 30', 35,000 Btuh requires 1/2"
 Section 2: 45' (Use 50'), 150,000 Btuh requires 3/4"
 Outlet D: 25' (Use 30'), 25,000 Btuh requires 1/2"
 Section 3: 45' (Use 50'), 175,000 Btuh requires 1"
 Outlet E: 25' (Use 30'),
 180,000 Btuh requires 3/4" (NR71 Series)
 140,000 Btuh requires 3/4" (NR66 Series)
 120,000 Btuh requires 3/4" (NR50 Series)
 Section 4: 45' (Use 50'),
 355,000 Btuh requires 1-1/4" (NR71 Series)
 315,000 Btuh requires 1-1/4" (NR66 Series)
 295,000 Btuh requires 1-1/4" (NR50 Series)

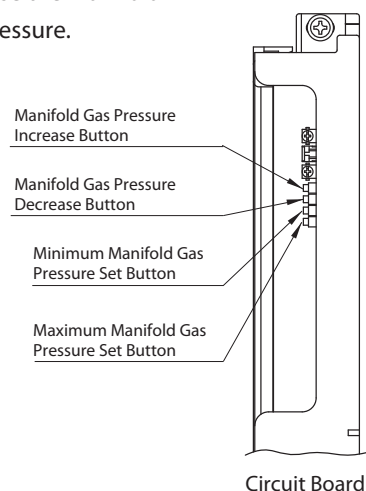
<NR50-OD / NR66 (-SV,-OD) / N-0531S (-OD), NR71 (-SV,-OD) / N-0631S (-OD)>

■ Manifold Gas Pressure Adjustment

Note 1) Use the following procedure to adjust the manifold gas pressure only if it can be done with a high flow rate through the unit.

Note 2) When the manifold gas pressure is adjusted, the front cover will be off. Adjust the manifold gas pressure to the value of "Cover Off" in the table (because it is not possible to adjust the manifold gas pressure with the front cover on).

- (1) With a manometer or pressure gauge connected to the manifold pressure tap, press and hold the maximum manifold gas pressure set button. Use the manifold gas pressure increase and decrease buttons to adjust to the correct pressure.
- (2) Press and hold the minimum manifold gas pressure set button. Use the manifold gas pressure increase and decrease buttons to adjust to the correct pressure.
- (3) Repeat steps (1) and (2) until both are at the correct pressure.



Manifold Gas Pressure Maximum and Minimum Values

Model	Gas Type	Supply Pressure (inch H ₂ O)	Manifold Pressure (inch H ₂ O) Cover on		Manifold Pressure (inch H ₂ O) Cover off	
			Max. Value	Min. Value	Max. Value	Min. Value
N-0631S	NG	7.9	2.25	0.55	2.89	0.72
	LPG	11.0	2.65	0.55	2.85	0.80
N-0631S-OD	NG	7.9	2.25	0.55	3.05	0.72
	LPG	11.0	2.50	0.50	3.46	0.84
N-0531S	NG	7.9	2.20	0.60	2.73	0.88
	LPG	11.0	2.75	0.70	3.09	1.00
N-0531S-OD	NG	7.9	2.20	0.60	2.69	0.88
	LPG	11.0	2.80	0.70	3.09	1.00
NR71-SV	NG	7.9	2.25	0.55	2.89	0.72
	LPG	11.0	2.65	0.55	3.09	0.88
NR71-OD	NG	7.9	2.25	0.55	3.05	0.72
	LPG	11.0	2.50	0.50	3.61	0.84
NR66-SV	NG	7.9	2.20	0.60	2.77	0.88
	LPG	11.0	2.75	0.70	3.46	1.09
NR66-OD	NG	7.9	2.20	0.60	2.77	0.84
	LPG	11.0	2.80	0.70	3.46	1.09
NR50-OD	NG	7.9	2.63	0.96	2.81	1.04
	LPG	11.0	3.05	0.92	3.26	1.00

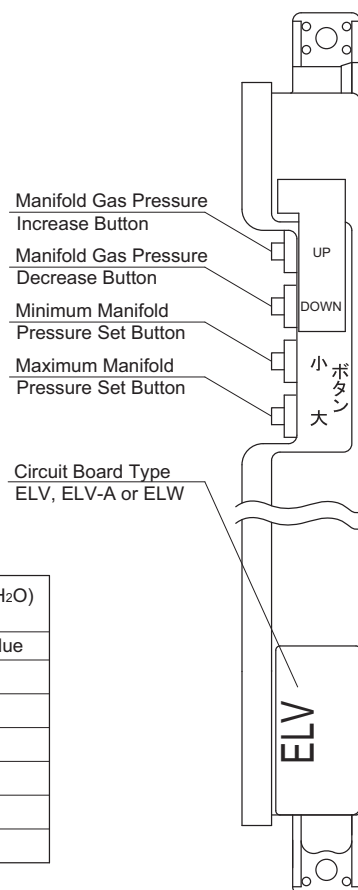
• Manifold gas pressure values are subject to change without prior notice.
Please check the latest burner specification table.

<NR98 (-SV,-OD,-DVC / NC199 (-OD,-DVC) / N-0751M (-OD,-DV,-DVC)>

■ Manifold Gas Pressure Adjustment

- Note 1) Use the following procedure to adjust the manifold gas pressure only if it can be done with a high flow rate through the unit.
- Note 2) When the manifold gas pressure is adjusted, the front cover will be off. Adjust the manifold gas pressure to the value of "Cover Off" in the table (because it is not possible to adjust the manifold gas pressure with the front cover on).

- (1) With a manometer or pressure gauge connected to the manifold pressure tap, press and hold the "Maximum Manifold Pressure Set Button". Use the "Manifold Gas Pressure Increase and Decrease Buttons" to adjust to the correct pressure.
- (2) Press and hold the "Minimum Manifold Pressure Set Button". Use the "Manifold Gas Pressure Increase and Decrease Buttons" to adjust to the correct pressure.
- (3) Repeat steps (1) and (2) until both are at the correct pressure.



Manifold Gas Pressure Maximum and Minimum Values
(When Circuit Board Type is ELV)

Model Name	Gas type	Supply Pressure (inch H ₂ O)	Manifold Pressure (inch H ₂ O) Cover On		Manifold Pressure (inch H ₂ O) Cover Off	
			Max. Value	Min. Value	Max. Value	Min. Value
NR98-SV N-0751M	NG	7.9	2.55	0.65	2.76	0.91
	LPG	11.0	4.40	1.00	4.17	1.14
NR98-OD NC199-OD N-0751M-OD	NG	7.9	2.50	0.60	2.68	0.75
	LPG	11.0	4.20	1.00	4.17	1.06
N-0751M-DV	NG	7.9	3.00	0.70	3.23	0.75
	LPG	11.0	4.70	1.08	4.69	1.10

* Manifold gas pressure values are subject to change without prior notice.
Please check the latest burner specification table.

Manifold Gas Pressure Maximum and Minimum Values
(When Circuit Board Type is ELV-A or ELW)

Model Name	Gas type	Supply Pressure (inch H ₂ O)	Manifold Pressure (inch H ₂ O) Cover On		Manifold Pressure (inch H ₂ O) Cover Off	
			Max. Value	Min. Value	Max. Value	Min. Value
NR98-SV N-0751M	NG	7.9	2.80	0.65	2.99	0.79
	LPG	11.0	4.40	1.00	4.17	1.14
NR98-OD NC199-OD N-0751M-OD	NG	7.9	2.70	0.60	2.95	0.75
	LPG	11.0	4.20	1.00	4.17	1.06
N-0751M-DV	NG	7.9	3.30	0.65	3.54	0.94
	LPG	11.0	4.70	1.08	4.69	1.10

* Manifold gas pressure values are subject to change without prior notice.
Please check the latest burner specification table.

Manifold Gas Pressure Maximum and Minimum Values
(When Circuit Board Type is ELV-B)

Model Name	Gas type	Supply Pressure (inch H ₂ O)	Manifold Pressure (inch H ₂ O) Cover On		Manifold Pressure (inch H ₂ O) Cover Off	
			Max. Value	Min. Value	Max. Value	Min. Value
NR98-SV N-0751M	NG	7.9	2.80	0.65	2.99	0.79
	LPG	11.0	4.40	1.00	4.25	1.12
NR98-OD NC199-OD N-0751M-OD	NG	7.9	2.70	0.60	2.95	0.75
	LPG	11.0	4.20	1.00	4.25	1.06
N-0751M-DV	NG	7.9	3.30	0.65	3.54	0.94
	LPG	11.0	4.70	1.08	4.69	1.06

* Manifold gas pressure values are subject to change without prior notice.
Please check the latest burner specification table.

**Manifold Gas Pressure Maximum and Minimum Values
(When Circuit Board Type is ELV-C)**

Model Name	Gas Type	Supply Pressure (inch H ₂ O)	Manifold Pressure (inch H ₂ O) Cover On		Manifold Pressure (inch H ₂ O) Cover Off	
			Max. Value	Min. Value	Max. Value	Min. Value
NR98-SV N-0751M	NG	7.9	2.80	0.65	2.99	0.79
	LPG	11.0	4.40	1.00	4.25	1.12
NR98-OD NC199-OD N-0751M-OD	NG	7.9	2.70	0.60	2.95	0.75
	LPG	11.0	4.20	1.00	4.25	1.06
N-0751M-DV	NG	7.9	3.30	0.65	3.54	0.94
	LPG	11.0	4.70	1.08	4.69	1.06

* Manifold gas pressure values are subject to change without prior notice.
Please check the latest burner specification table.

**Manifold Gas Pressure Maximum and Minimum Values
(When Circuit Board Type is ELV-D, ELV-E, ELW-A, or ELW-B)**

Model Name	Gas Type	Supply Pressure (inch H ₂ O)	Manifold Pressure (inch H ₂ O) Cover On		Manifold Pressure (inch H ₂ O) Cover Off	
			Max. Value	Min. Value	Max. Value	Min. Value
NR98-SV N-0751M	NG	7.9	2.80	0.65	2.99	0.79
	LPG	11.0	4.40	1.00	4.25	1.12
NR98-OD NC199-OD N-0751M-OD	NG	7.9	2.70	0.60	2.95	0.75
	LPG	11.0	4.20	1.00	4.25	1.06
N-0751M-DV	NG	7.9	3.30	0.65	3.54	0.94
	LPG	11.0	4.70	1.08	4.69	1.06
NR98-DVC NC199-DVC N-0751M-DVC	NG	7.9	3.10	0.65	Refer to the "Setting List for Gas Manifold Pressures (DVC Models)" below	
	LPG	11.0	4.20	1.00		

* Manifold gas pressure values are subject to change without prior notice.
Please check the latest burner specification table.

Setting List for Gas Manifold Pressures (DVC Models)

Manifold Pressure for NR98-DVC / NC199-DVC / N-0751M-DVC (inch H ₂ O) Cover Off						
Vent Length Adjustment	Connector ON		Connector OFF		Connector OFF, No Vent	
Gas Type/Vent Length	Max. Value	Min. Value	Max. Value	Min. Value	Max. Value	Min. Value
Natural / Min Length	3.16	0.77	2.91	0.71	3.29	0.80
(Vertical Termination)*	(2.79)	(0.69)	(2.68)	(0.65)		
Natural / Max Length	3.03	0.73	2.79	0.68		
(Vertical Termination)*	(2.79)	(0.67)	(2.61)	(0.63)		
LPG / Min Length	4.02	0.95	3.85	0.90	4.14	0.96
(Vertical Termination)*	(3.67)	(0.87)	(3.60)	(0.84)		
LPG / Max Length	3.89	0.91	3.75	0.87		
(Vertical termination)*	(3.63)	(0.85)	(3.54)	(0.83)		

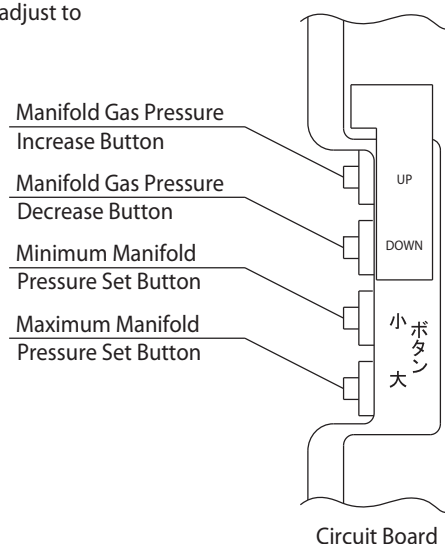
*Use these settings when the unit terminates using the vertical rain cap.

<NCC199 (-SV,-DV) / N-0841MC (-DV) / NRC111 (-SV,-DV) / N-0842MC (-DV), NR111 (-SV,-OD,-DV) / NC250 (-SV,-DV)-ASME / N-0931M (-OD,-DV)>

■ Manifold Gas Pressure Adjustment

- Note 1) Use the following procedure to adjust the manifold gas pressure only if it can be done with a high flow rate through the unit.
- Note 2) When the manifold gas pressure is adjusted, the front cover will be off. Adjust the manifold gas pressure to the value of "Cover Off" in the table (because it is not possible to adjust the manifold gas pressure with the front cover on).

- (1) With a manometer or pressure gauge connected to the manifold pressure tap, press and hold the "Maximum Manifold Pressure Set Button". Use the "Manifold Gas Pressure Increase and Decrease Buttons" to adjust to the correct pressure.
- (2) Press and hold the "Minimum Manifold Pressure Set Button". Use the "Manifold Gas Pressure Increase and Decrease Buttons" to adjust to the correct pressure.
- (3) Repeat steps (1) and (2) until both are at the correct pressure.



Manifold Gas Pressure Maximum and Minimum Values

Model Name	Gas Type	Supply Pressure (inch H ₂ O)	Manifold Pressure (inch H ₂ O) Cover On		Manifold Pressure (inch H ₂ O) Cover Off	
			Max. value	Min. value	Max. value	Min. value
NCC199-SV NRC111-SV N-0841MC N-0842MC	NG	7.9	3.05	0.85	3.43	0.92
	LPG	11.0	3.95	1.00	4.33	1.04
NCC199-DV NRC111-DV N-0841MC-DV N-0842MC-DV	NG	7.9	3.35	0.75	3.66	0.96
	LPG	11.0	4.35	1.00	4.70	1.12

Manifold Gas Pressure Maximum and Minimum Values

Model Name	Gas Type	Supply Pressure (inch H ₂ O)	Manifold Pressure (inch H ₂ O) Cover On		Manifold Pressure (inch H ₂ O) Cover Off	
			Max. Value	Min. Value	Max. Value	Min. Value
NR111-SV NC250-SV-ASME N-0931M	NG	7.9	3.20	0.80	3.46	0.87
	LPG	11.0	3.40	0.75	3.65	0.94
NR111-OD N-0931M-OD	NG	7.9	2.75	0.70	3.15	0.75
	LPG	11.0	4.00	0.75	4.37	0.98
NR111-DV NC250-DV-ASME N-0931M-DV	NG	7.9	3.25	0.75	3.45	0.94
	LPG	11.0	4.00	0.75	4.02	0.91

* Manifold gas pressure values are subject to change without prior notice.
Please check the latest burner specification table.

<NC380-SV-ASME / N-1321M-ASME>

■ Manifold Gas Pressure Adjustment

- Note 1) Use the following procedure to adjust the manifold gas pressure only if it can be done with a high flow rate through the unit.
- Note 2) When the manifold gas pressure is adjusted, the front cover will be off. Adjust the manifold gas pressure to the value of "Cover Off" in the table (because it is not possible to adjust the manifold gas pressure with the front cover on).

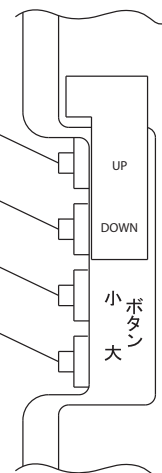
- (1) With a manometer or pressure gauge connected to the manifold pressure tap, press and hold the "Maximum Manifold Pressure Set Button". Use the "Manifold Gas Pressure Increase and Decrease Buttons" to adjust to the correct pressure.
- (2) Press and hold the "Minimum Manifold Pressure Set Button". Use the "Manifold Gas Pressure Increase and Decrease Buttons" to adjust to the correct pressure.
- (3) Repeat steps (1) and (2) until both are at the correct pressure.

Manifold Gas Pressure
Increase Button

Manifold Gas Pressure
Decrease Button

Minimum Manifold
Pressure Set Button

Maximum Manifold
Pressure Set Button



Circuit Board

Manifold Gas Pressure Maximum and Minimum Values (When Circuit Board Type is EJH)

Model Name	Gas Type	Supply Pressure (inch H ₂ O)	Manifold Pressure (inch H ₂ O) Cover On		Manifold Pressure (inch H ₂ O) Cover Off	
			Max. Value	Min. Value	Max. Value	Min. Value
NC380-SV-ASME N-1321M-ASME	NG	7.9	2.00	0.75	2.24	0.75
	LPG	11.0	3.90	1.40	4.21	1.38

Manifold Gas Pressure Maximum and Minimum Values (When Circuit Board Type is EJH-B~)

Model Name	Gas Type	Supply Pressure (inch H ₂ O)	Manifold Pressure (inch H ₂ O) Cover On		Manifold Pressure (inch H ₂ O) Cover Off	
			Max. Value	Min. Value	Max. Value	Min. Value
NC380-SV-ASME N-1321M-ASME	NG	7.9	2.00	0.75	2.28	1.02
	LPG	11.0	3.90	1.40	3.94	1.26

* Manifold gas pressure values are subject to change without prior notice.
Please check the latest burner specification table.

Periodic Inspection

CAUTION



Be sure to do.

To prevent burns or scalding, turn off the power button (or power supply*) and wait until the equipment cools before performing maintenance.

* = NR71 (-SV,-OD) and N-0631S (-OD) only



For laundry, newspaper, timber, oil, spray cans and other combustible materials.



For abnormal sounds during operation.



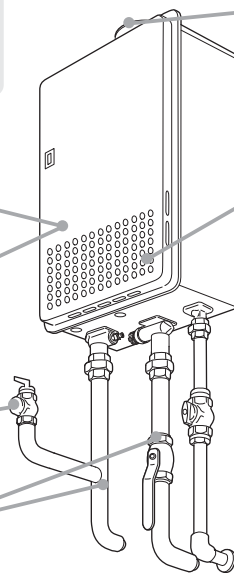
For abnormalities in external appearance, discoloration or flaws.



For proper operation of pressure relief valve.



For water leaks from the equipment and piping.



For dust and soot in the exhaust vent or exhaust vent terminal.



For dust or debris in the air inlet.

(Ex. NR71-SV/N-0631S)

Periodic Maintenance

Equipment

Wipe the outside surface with a wet cloth, then dry the surface. Use a neutral detergent to clean any stains.

Remote Controller

Wipe the surface with a wet cloth.

- Do not use benzene, oil or fatty detergents to clean the remote controller; deformation may occur.
- The remote controller is water resistant but not waterproof. Keep it as dry as possible.

Periodic Maintenance

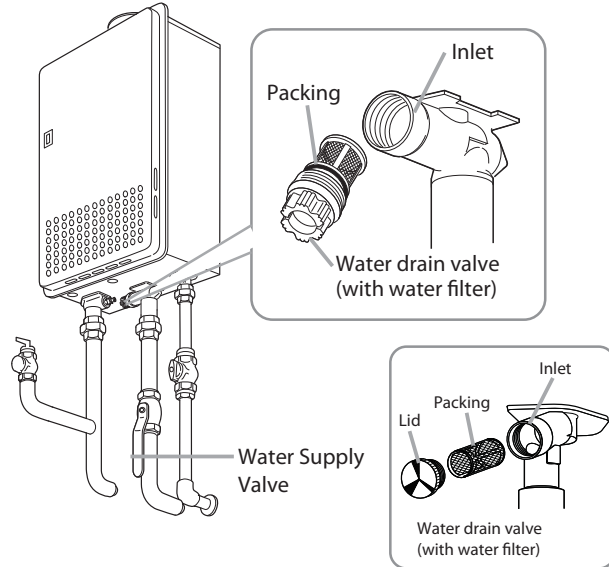
Water Drain Valve (with Water Filter)

If the water drain valve (with water filter) is covered with debris, the hot water may not run smoothly, or the unit may put out cold water. Check and clean the filter as explained below.

* To avoid burns, wait until the equipment cools down before draining the water.

The appliance will remain hot after it is turned off.

1. Close the water supply valve.
2. Open all hot water fixtures.
3. With a bucket ready, remove the inlet and outlet drain plugs (up to 0.5 gal. will drain out)
4. Take the water drain valve (with water filter) out of the inlet. (See illustration to right).
5. Clean the water drain valve (with water filter) with a brush under running water.
6. Replace the water drain valve (with water filter) and close the drain plugs.
(Take care not to lose the packing.)
7. Close all hot water fixtures.
8. Open the water supply valve and check that water does not leak from the drain plugs or water drain valve (with water filter).



For NC380-SV-ASME/N-1321M-ASME

Periodic Maintenance

If the unit becomes saturated with lime or scale build-up, the hot water may not run smoothly, or the unit may put out cold water. In addition, damage can occur resulting in failure of the unit if lime or scale deposits are left untreated within the unit. To remove these deposits from the unit, follow the procedure as explained below. To ensure full warranty coverage, hard, acidic, or otherwise impure water should be treated with approved methods.

Note : Isolation valves will need to be installed in order to perform this procedure.

1. If not already on, turn the unit on with the Power Button on the Remote Controller.
2. Close the gas supply valve.
3. Close both the hot and cold water valves with a quarter turn of the main valve wing handle.
The handle will be perpendicular to the main valve body.
4. Ensure the drain valve lever handles are closed on both the hot and cold valves (the lever will be perpendicular to the drain portion of the body) and slowly remove drain caps. Be sure to retain the rubber washer inside of the drain cap.
5. Connect the pump outlet hose to the cold water drain valve of the isolation valve as shown in Figure 1.
6. Connect a drain hose to the hot water drain valve outlet of the isolation valve as shown in Figure 1.
7. Pour approximately 5 gallons of virgin food grade white vinegar or a solution of Lime Away (or CLR) and water (diluted 3 parts water to 1 part Lime Away or CLR) into a bucket.
8. Place both the pump inlet hose and the drain outlet hose into the pail.
9. Open both drain valve lever handles on the isolation valves.

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10. Turn the pump on. The unit will attempt to ignite (make sure that the gas has been turned off) and a number "11" should flash on the remote controller after about 1 minute. Do not reset the unit. Allow the solution to circulate for 45 minutes.

Note: It may take a few minutes to clear air out of the heater and hoses.

11. Turn the pump off and close the cold water drain valve of the isolation valve.
12. Remove the hose from the cold water drain valve and replace cap and washer onto the drain valve outlet.
13. Remove the pump and hose from the bucket and empty the solution.
14. Put the hot water drain hose end back into the empty bucket and open the cold water main valve wing handle. This procedure will flush out the heater with fresh cold water. Flush for at least 5 minutes or until 20 gallons of water has passed through the heater.

Note: For NRC/NCC/841/842 Series condensing models, carefully unscrew the water drain valve from the bottom of the water heater near the gas inlet to flush any residual solution from the system (see Figure 2). The system will be under pressure and the drain valve will only require a couple of turns to allow sufficient flow from the drain. Place a bucket under the unit and flush for about 10 seconds. Attempting to remove the drain valve completely could result in an excessive leak.

15. Close the cold water main valve wing handle and clean the water inlet filter. Place the filter back into the unit.
16. Close the hot water drain valve lever handle, remove the drain hose and replace cap and washer onto the hot water drain valve outlet.
17. Open both the hot and cold water main valve wing handles. Wing handles should now be (OPEN) parallel to the main valve body and lever handles should be (CLOSED) perpendicular to the drain portion of the body, which is the normal operating position.
18. Open the gas supply valve and reset the unit by turning the power off and then on again using the Power Button on the Remote Controller. If no Remote Controller is installed, disconnect, then reconnect electrical power to the unit in order to reset the system.

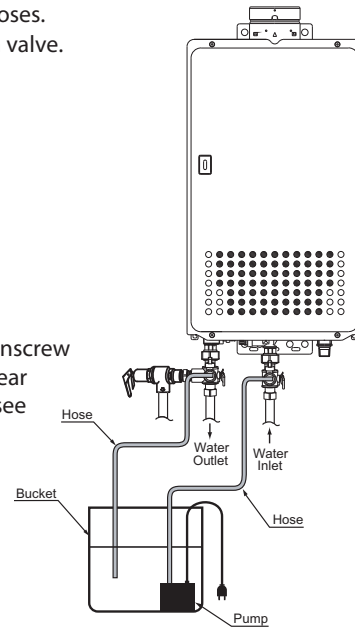


Figure 1. Flush Set-up

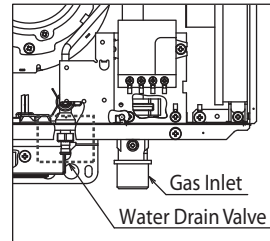


Figure 2. Water Drain Valve on Condensing Models

<NR50-OD, NR66/N-0531S Series, NR71/N-0631S Series>

■ Changing Default Temperature Setting

* The water heater has been factory set to allow a maximum temperature setting of 120°F. To access higher temperature settings through the remote controller, follow the below steps.

- The NR50-OD can be programmed so that it will default to one of four temperatures (140, 135, 130, 120°F) while the NR66/N-0531S and NR71/N-0631S can be set to one of three temperatures (140, 130, 120°F) when the optional remote controller is not connected. To change the default temperature, connect the temperature selection wire as shown in the below diagram.

Note: If the 160°F connector is being used, the unit will automatically default to a temperature of 120°F (135°F for the NR50-OD) when the remote controller is not installed.

- * The water heater has been factory set to allow a maximum temperature setting of 120°F. To access higher temperature settings with the optional remote controller installed, follow the below steps. The unit can only be set to temperatures in the range of 145-160°F when the optional remote controller is installed.

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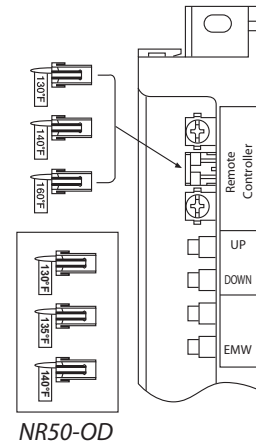
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<When setting the maximum temperature to 125-140°F>

1. Turn the water heater off by pressing the ON/OFF button on the remote controller.
2. Press and hold the FLOW METER ALARM SET button until a sound is heard (2 sec.) and "120°F" appears on the display.
3. Set the upper limit of the hot-water supply temperature to 125°F, 130°F, 135°F or 140°F using the UP and DOWN setting buttons.
4. To put the water heater back into operation, press the ON/OFF button on the remote controller.
To keep the water heater off, let the unit sit for 30 sec. to return to the original display.

<When setting the maximum temperature to 125-160°F>

1. Turn the water heater off by pressing the ON/OFF button on the remote controller.
2. Disconnect electrical power to the water heater.
3. Remove the front cover of the water heater (4 screws).
4. Locate the bag of temperature selection wires attached to the inside of the unit in the bottom left corner.
5. Connect the temperature selection wire labeled "160°F" to the circuit board as shown on the right.
6. Replace the front cover of the water heater (4 screws).
7. Reconnect electrical power to the water heater, but do not turn it on.
8. Press and hold the FLOW METER ALARM SET button until a sound is heard (2 sec.) and "120°F" appears on the display.
9. Set the upper limit of the hot-water supply temperature to 125°F, 130°F, 135°F, 140°F, 145°F, 150°F, 160°F using the UP and DOWN setting buttons.
10. To put the water heater back into operation, press the ON/OFF button on the remote controller.
To keep the water heater off, let the unit sit for 30 sec. to return to the original display.



<NR98/NC199/N-0751M Series, NCC199/N-0841MC Series, NRC199/N-0842MC Series, NR111/NC199/N-0931M Series>

■ Changing Default Temperature Setting

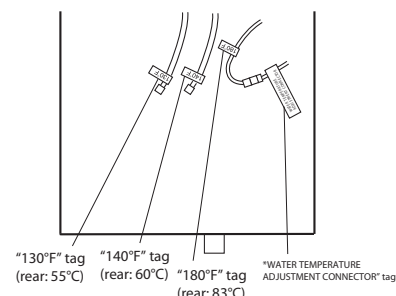
- * The water heater has been factory set to allow a maximum temperature setting of 120°F.
To access higher temperature settings through the remote controller, follow the below steps.
- * When using the remote controller with a multi-system controller, the maximum temperature of the water heater can be set up to 180°F without making the following settings.
 - When changing the temperature, make sure to confirm with the customer that the temperature of the hot water will be very high and that there is a risk of scalding.
 - Water temperatures above 125°F can cause severe burns or death from scalding.

<When setting the maximum temperature to 125-140°F>

1. Turn the water heater off by pressing the ON/OFF button on the remote controller.
2. Press and hold the FLOW METER ALARM SET button until a sound is heard (2 sec.) and 120°F appears on the display.
3. Set the upper limit of the hot-water supply temperature to 125°F, 130°F, 135°F or 140°F using the UP and DOWN setting buttons.
4. To put the water heater back into operation, press the ON/OFF button on the remote controller.
To keep the water heater off, let the unit sit for 30 sec. to return to the original display.

<When setting the maximum temperature to 125-180°F>

1. Turn the water heater off by pressing the ON/OFF button on the remote controller.
2. Disconnect electrical power to the water heater.
3. Remove the front cover of the water heater (4 screws).
4. Connect "WATER TEMPERATURE ADJUSTMENT CONNECTOR" tag connector to "180°F" tag connector as shown on the right.
5. Replace the front cover of the water heater (4 screws).
6. Reconnect electrical power to the water heater, but do not turn it on.
7. Press and hold the FLOW METER ALARM SET button until a sound is heard (2 sec.) and 120°F appears on the display.
8. Set the upper limit of the hot-water supply temperature to 125°F, 130°F, 135°F, 140°F, 145°F, 150°F, 160°F, 170°F or 180°F using the UP and DOWN setting buttons.
9. To put the water heater back into operation, press the ON/OFF button on the remote controller. To keep the water heater off, let the unit sit for 30 sec. to return to the original display.



- The water heater can be programmed so that it will default to one of four temperatures if the remote controller is removed (180, 140, 130, 120°F). To change the default temperature, connect the temperature selection wire as shown in the above diagram. The default temperature is 120°F when the temperature selection wire is not connected.

<NC380-SV-ASME / N-1321M-ASME>

■ Changing Default Temperature Setting

- * The NC380-SV-ASME / N-1321M-ASME can be programmed so that it will default to one of four temperatures if the remote controller is removed (180, 140, 130, 120°F). To change the default temperature, the remote controlled must be initially installed, and removed after programming.

1. Within the first ten minutes of connecting electrical power to the unit, but before pressing the Power On/Off button, hit the UP or DOWN button on the remote controller. This will put the unit into maintenance writer mode, unplug the unit for sixty seconds and try again.
2. The maintenance monitor item number will flash on the display. (the initial item number will be "99").
3. The UP and DOWN buttons can be used to change the maintenance writer item number.
4. Choose a temperature from the chart below and set the 14 and 15 maintenance writers according to the chart below. Pressing the Flow Meter Alarm Set button for 0.5 seconds will switch the indicated item number from "OFF" to "ON" or "ON" to "OFF". If the Priority Lamp is flashing when an item number is displayed, this indicates an "ON" setting from that item number, and if the Priority lamp is off, the item number is off.
5. After setting the 14 and 15 item numbers for the desired temperature, press and hold the UP and DOWN buttons together for five seconds to confirm the new settings. The remote controller will emit a tone when the settings are confirmed. If this is not done, the unit will not put the setting changes into effect. After confirming the setting, remove the remote controller to initiate the default temperature setting.

NOTE: The setting changes can be cancelled by pressing the Power On/Off button before confirming the settings, or if the unit is left alone for ten minutes without confirming the settings. If the default setting needs to be changes again, disconnect the electrical power to the unit, reconnect it and follow this procedure again.

<NC380-SV-ASME/N-1321M-ASME>

Temp. \ Item No.	14	15
180°F	ON	ON
140°F	OFF	ON
130°F	ON	OFF
120°F*	OFF	OFF

* Factory Default Setting

■ Draining the Water for Maintenance or for Freeze Prevention :

CAUTION



To avoid burns, wait until the equipment cools down before draining the water. The appliance will remain hot after it is turned off.

Drain water into a bucket to prevent water damage.

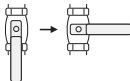
Drainage Using the Remote Controller (NCC/NRC/841/842 series only)

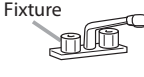
- 1 (1) Turn the power on/off button "off".

- (2) Press the flow meter alarm set button for about two seconds until the alarm sounds. The maximum hot water temperature will flash.


(Ex. 120°F)
- (3) Press the flow meter alarm set button again.

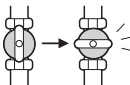
- (4) Press the setting button marked "UP". The display will change from "oF" to "on" after the button is pushed.


- 2 Close the water supply valve.


- 3 Fully open all hot water fixtures.


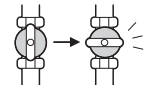
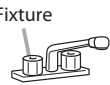
- 4 Open all drain plugs and drain the water out of the unit.

- 5 When the water is completely drained, replace all drain plugs and close the hot water fixtures.

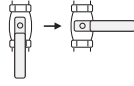
- 6 Close the gas valve and disconnect the electrical power supplied to the unit.


Do not touch with wet hands.

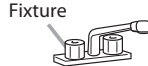
Manual Draining

- 1 Close the gas valve.

- 2 (1) Turn the power on/off button "On".
 (2) Turn and leave open the hot water fixtures for more than 2 minutes and close.


* If multiple units are being used, drain two minutes for each unit.
 * An 11 Error Code may appear on the remote controller.
 This is not a malfunction of the unit.
 Do not turn Power ON/OFF Button OFF.

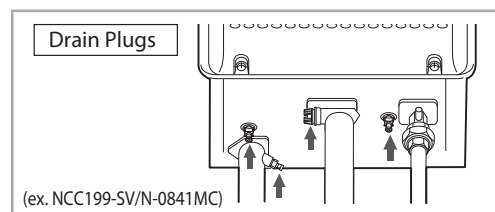
- 3 Close the water supply valve and disconnect the electrical power supplied to the unit.


Do not touch with wet hands.

- 4 Fully open all hot water fixtures.


- 5 Open all drain plugs and drain the water out of the unit.

- 6 When the water is completely drained, replace all drain plugs and close the hot water fixtures.



9. Installation Check

Installation problems can cause the unit to work unsatisfactorily. If the unit is not working properly, but there are no error codes or evidence of malfunction, check the installation.

<Installation Checks>

Altitude

1. If this water heater is installed in a location where the altitude is greater than 2000 ft., the combustion may become abnormal because of the thinness of the air. The unit must be configured for high elevation installations by disconnecting the "High Elevation Disconnect" jumper located inside of the water heater. Refer to the "Installation Manual" for detailed instructions.

Air Supply/Exhaust

1. Make sure that the installation location provides sufficient combustible air and enough space for an exhaust vent.
2. Install the venting only as outlined in the installation manual.

Installation Environment

1. If this unit will be installed in a factory, salon, or laundry service, install it in a location where it will not be exposed to steam, ammonia, sulfur, chlorine, ethylene compounds, or acids.
2. If this unit will be installed in a restaurant, locate it so that it will not be effected by steam.
3. Avoid any installation that will expose the unit to steam or moisture.

For Multiple Floor Water Supply

1. If the unit will be installed on the lower floor of a multiple story building, in order to get the maximum flow rate through the unit, there must be at least 29 PSI of water pressure at the inlet to the unit. If this supply water pressure cannot be maintained, install pumps to increase the pressure and install a pressure gauge to adjust the supply pressure to the desired level. If the supply pressure to the water heater falls below this level, boiling may occur in parts of the heat exchanger, causing an abnormal sound and possibly damaging the water heater.

Installation of Strainer

1. If the unit will be installed in a system with a circulating or pressure increasing pump, install a strainer with a #50 or greater mesh to protect the unit from damage caused by debris in the plumbing line. This is especially important for older piping.

<Installation Cautions>

Gas Supply Piping

Because a large quantity of gas is used with these appliances, make sure to size the gas meter and supply piping to match the maximum Btu rating of the heater.

Air Supply and Vent Pipe

■ Before installation, note the following:

- Vent pipe diameters and maximum vent length:

Vent Pipe Diameter	ø 4 inches
Maximum Vent Length	15 feet with 3- 90° elbows*

*Refer to venting specifications for other configurations.

For all -DV models, refer to the installation manual for proper venting configurations.

- Make sure the installation location allows for a flue to be built that will be shorter than the maximum allowable vent length.
 - * A longer vent will cause a danger of explosion.
- Choose a good path for the vent pipe.
- Do not penetrate the vent pipe through a fire wall.
- Extend the vent pipe all the way to the outdoors.
- Steam and condensed water may exit the vent pipe. Be sure to install the vent pipe so that the steam and water droplets will not harm anything.
- The neutralizer unit can be filled before connecting the vent pipe.

Filling the Neutralizer Unit before Vent Pipe Installation.

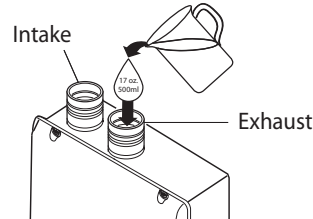


DANGER

Prior to initial start up, make sure that you fill the neutralizer unit with water. This is to prevent dangerous exhaust gases from entering the building. Failure to fill the neutralizer unit could result in severe personal injury or death.

Please follow one of the procedures described below to ensure that the neutralizer unit is filled with water.

- 1) Fill the neutralizer unit by pouring approx. 17 oz. (500ml) of water into the exhaust accessory on the top of the appliance as illustrated below.



Or, if the vent pipe has already been installed:

- 2) After installing the drain pipe, make sure that the area around the appliance is well ventilated; open a window or a door if necessary. Then, operate the unit and verify that condensate is coming out of the drain pipe. (During normal use of the water heater, condensate will begin to discharge from the drain pipe within 15 minutes of use. However, depending on the season and/or installation site conditions, it may take longer.)

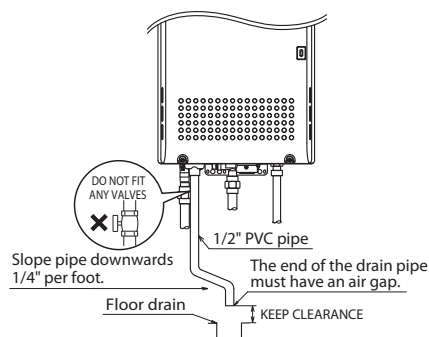
Electrical

- The electrical power supply to the unit should be installed by a qualified electrician.
 - Allocate 2A on the circuit for this water heater.
- If more than one unit is being installed, allocate an appropriate circuit to provide power for each unit.

Condensate Piping (all MC models only)

- NCC199/N-0841MC/NRC111/N-0842MC series is a high efficiency, fully condensing appliance which produces condensate during operation. The water heater incorporates a collection, neutralization, and removal system which must be properly drained in order to ensure proper operation of this appliance.
- The water heater is supplied with a pre-installed condensate neutralization system. No additional neutralizer is required unless local code dictates otherwise.
- In order to drain the condensate, a 1/2" threaded fitting is provided at the base of the water heater. Do not reduce the size of this fitting or the drain piping to less than 1/2".
- Use plastic pipe, such as PVC, for the drain line. Do not use steel, black iron, or any other material which can corrode when placed into contact with water.
- Keep the length of the drain pipe as short as possible. Long runs or applications where the nearest drain is above the water heater will require the use of a condensate pump. Size the pump to allow for a maximum condensate discharge of 2 GPH from the water heater.
- Horizontal runs must be sloped 1/4" per foot towards the drain or condensate pump.
- The end of the drain pipe must not be submerged in water or blocked in any way.
- Be sure to check that condensate is freely flowing from the drain piping after the system has been installed. Condensate will begin flowing out of the water heater within 15 minutes after operation has started.
- Take measures to prevent the condensate drain lines from freezing (insulation, heat tape, electric heaters, etc.).

Condensate Piping to Floor Drain



Condensate Piping with Pump

