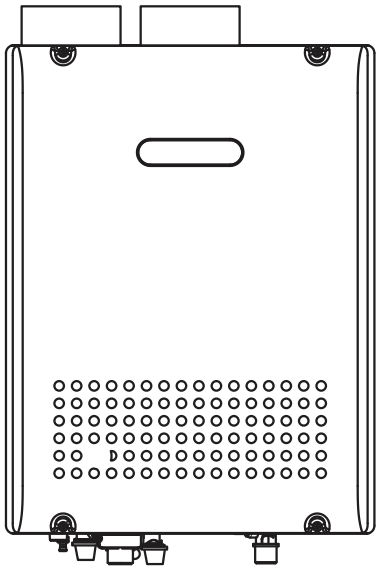
NORITZ

NORITZ America Corporation

Gas Water Heater

NRC83 (-DV, -OD)
NRC98 (-DV, -OD)
NRC1111/NCC1991(-DV,-OD)
NR981/NC1991(-DVC,-OD,-SV)
NR83-DVC

Rev: October, 2012



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

Contents

Important Safety Information 2
1. Features 3
2. Specifications/Performance Table 4
3. Dimensions 11
4. Components 16
5. Operating Principle 26
6. Operation Flow Chart 29
7. Wiring Diagram 36
8. Troubleshooting 40
   - Error Codes and Checkpoints 40
   - Circuit board checkpoints 44
   - Error Descriptions and How to Reset 48
   - Remote Controller 62
   - Displaying Maintenance Monitors 62
   - Maintenance Monitor List 64
   - Circuit Board Replacement 67
   - When Changing the Fan Motor 71
   - Gas Line Requirements 72
   - Manifold Gas Pressure Adjustment 74
   - Periodic Inspection 78
   - Periodic Maintenance 79
   - Changing Default Temperature Setting 81
9. Installation Check 85

KS-11-0004

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:

Caution

● 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:

Warning

● 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:

Warning

● 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:

Warning

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

2. Post-Service Checks

• Check parts for leaks:

Caution

● 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:

Caution

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

• Check insulation resistance:

Warning

● 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:

Warning

● 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
   • Allows the simple installation of up to 2 units linked together using a Quick Connect Cord

   CCP Valve
   System controller } Not required

2. 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.

3. Temperature Lockout Function
   • The remote controller can be set to restrict the maximum allowable temperature setting for added safety. See "Changing Default Temperature Setting" section for details.

4. Elevation Adjustment
   • The water heater can be quickly configured for installations above 2000' by simply adjusting dip switches inside of the unit. No additional equipment or adjustments are necessary. See the "Installation Manual" for details.

2. Specifications/Performance Table

Specifications

NRC98(-DV/-OD)

Item		Specification	
Model Name		NRC98-DV	NRC98-OD
Type	Installation	Indoor Wall Mounted	Outdoor Wall Mounted
	Air Supply/Exhaust	Power Vented	
Ignition		Direct Ignition	
Operating Pressure		15-150 psi	
Minimum Flow Rate		0.5 GPM (2 L/min.)	
Dimensions (Height) x (Width) x (Depth)		24.2" (615mm) x 18.3" (464mm) x 9.4" (240mm)	
Weight		58 lbs.	57 lbs.
Water Holding Capacity		0.5 Gallon (1.8L)	
Connection Sizes	Water Inlet	3/4"	
	Hot Water Outlet	3/4”	
	Gas Inlet	3/4”	
	Condensate Drain	1/2” Threaded	
Power Supply	Supply	120 VAC (60Hz)	
	Consumption	NG : 73W LP : 78W Freeze Prevention 213W	NG : 64W LP : 68W Freeze Prevention 203W
Materials	Casing	Zincified Steel Plate/Polyester Coating	
	Flue Collar	PVC	Stainless Steel
	Primary Heat Exchanger	Copper Sheeting, Copper Tubing	
	Secondary Heat Exchanger	Stainless Steel Sheeting, Stainless Steel Tubing	
Safety Devices		Flame Rod, Thermal Fuse, Lightning Protection Device (ZNR), Overheat Prevention Device, Freezing Prevention Device, Fan Rotation Detector	
Accessories		Remote Controller, Remote Controller Cord, Anchoring Screws	

NRC83(-DV/-OD)

Item		Specification	
Model Name		NRC83-DV	NRC83-OD
Type	Installation	Indoor Wall Mounted	Outdoor Wall Mounted
	Air Supply/Exhaust	Power Vented	
Ignition		Direct Ignition	
Operating Pressure		15-150 psi	
Minimum Flow Rate		0.5 GPM (2 L/min.)	
Dimensions (Height) x (Width) x (Depth)		24.2" (615mm) x 18.3" (464mm) x 9.4" (240mm)	
Weight		58 lbs.	57 lbs.
Water Holding Capacity		0.5 Gallon (1.8L)	
Connection Sizes	Water Inlet	3/4"	
	Hot Water Outlet	3/4”	
	Gas Inlet	3/4”	
	Condensate Drain	1/2” Threaded	
Power Supply	Supply	120 VAC (60Hz)	
	Consumption	NG : 58W LP : 64W Freeze Prevention 213W	NG : 51W LP : 54W Freeze Prevention 203W
Materials	Casing	Zincified Steel Plate/Polyester Coating	
	Flue Collar	PVC	Stainless Steel
	Primary Heat Exchanger	Copper Sheeting, Copper Tubing	
	Secondary Heat Exchanger	Stainless Steel Sheeting, Stainless Steel Tubing	
Safety Devices		Flame Rod, Thermal Fuse, Lightning Protection Device (ZNR), Overheat Prevention Device, Freezing Prevention Device, Fan Rotation Detector	
Accessories		Remote Controller, Remote Controller Cord, Anchoring Screws	

■ NRC1111(-DV,-OD) / NCC1991(-DV,-OD)

Item		Specification	
Model Name		NRC1111-DV NCC1991-DV	NRC1111-OD NCC1991-OD
Type	Installation	Indoor, 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		24.4"(Height) x 18.3"(Width) x 9.4"(Depth)	
Weight		68 lbs.	66 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 : 81W	NG : 78W
		LP : 83W	LP : 80W
		Freeze Prevention 223W	
Materials	Casing	Zincified Steel Plate/Polyester Coating	
	Flue Collar	PVC	
	Heat Exchanger	Copper Sheeting, Copper Tubing	
Safety Devices		Flame Rod, Thermal Fuse, Lightning Protection Device (ZNR), Overheat Prevention Device, Freeze Prevention Device, Fan Rotation Detector	
Accessories		Anchoring Screws	

■ NR981 (-SV,-OD,-DVC) / NC1991 (-OD,-DVC)

Item		Specification		
Model Name		NR981-OD NC1991-OD	NR981-SV	NR981-DVC NC1991-DVC
Type	Installation	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)		23.6"(Height) x 13.8"(Width) x 11.0"(Depth)
Weight		54 lbs.		58 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 : 65W	NG : 65W	NG : 80W
		LP : 69W	LP : 67W	LP : 83W
		Freeze Prevention 161W	Freeze Prevention 193W	
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, Fan Rotation Detector		
Accessories		Remote Controller, Remote Controller Cord, Anchoring Screws		Anchoring Screws

■ NR83-DVC

Item		Specification
Model Name		NR83-DVC
Type	Installation	Indoor Wall Mounted
	Air Supply/Exhaust	Power Vented
Ignition		Direct Ignition
Operating Pressure		15-150 psi
Minimum Flow Rate		0.5 GPM (2 L/min.)
Dimensions (Height) x (Width) x (Depth)		23.6" (600mm) x 13.8" (350mm) x 9.4" (240mm)
Weight		49 lbs.
Water Holding Capacity		0.2 Gallon (0.95L)
Connection Sizes	Water Inlet	3/4"
	Hot Water Outlet	3/4"
	Gas Inlet	3/4"
Power Supply	Supply	120 VAC (60Hz)
	Consumption	NG : 82W LP : 90W Freeze Prevention 161W
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, Freezing Prevention Device, Fan Rotation Detector
Accessories		Anchoring Screws

Performance

Item		NRC98-DV	NRC98-OD
Gas Consumption	Maximum Performance	NG : 180,000 btuh LP : 180,000 btuh	
	Minimum Performance	NG : 16,000 btuh LP : 16,000 btuh	
Maximum Hot Water Capacity	45°F (25°C) Rise	7.5 GPM (28.2 L/min.)	
Capacity Range		0.5-9.8 GPM (2-37.0 L/min.)	
Temperature Settings	°F Mode:	100-140°F (In 5°F intervals) (9 Options)	
	°C Mode:	37-48°C (In 1°C intervals), 50,55,60°C (In 5°C intervals) (15 Options)	
Default Temperature Options		120°F (50°C), 130°F (55°C), 140°F (60°C) (Original is 120°F (50°C))	

Item		NRC83-DV	NRC83-OD
Gas Consumption	Maximum Performance	NG : 157,000 btuh LP : 157,000 btuh	
	Minimum Performance	NG : 16,000 btuh LP : 16,000 btuh	
Maximum Hot Water Capacity	45°F (25°C) Rise	6.6 GPM (25.0 L/min.)	
Capacity Range		0.5-8.3 GPM (2-31.4 L/min.)	
Temperature Settings	°F Mode:	100-140°F (In 5°F intervals) (9 Options)	
	°C Mode:	37-48°C (In 1°C intervals), 50,55,60°C (In 5°C intervals) (15 Options)	
Default Temperature Options		120°F (50°C), 130°F (55°C), 140°F (60°C) (Original is 120°F (50°C))	

Item		NRC1111-DV	NRC1111-OD	NCC1991-DV	NCC1991-OD
Gas Consumption	Maximum Performance	NG : 199,900 btuh LP : 199,900 btu			
	Minimum Performance	NG : 16,000 btuh LP : 16,000 btuh			
Maximum Hot Water Capacity	45°F Rise	8.4 Gal./min.			
Capacity Range		0.5 - 11.1 Gal./min.			
Default Temperature Options		120, 130, 140°F (Original is 120°F)		120, 130, 140, 185°F (Original is 120°F)	
Temperature Settings (Using the Remote Controller)		100 - 140°F (In 5°F intervals), (9 Options)		100 - 150°F (In 5°F intervals), 160, 170, 185°F (14 Options)	

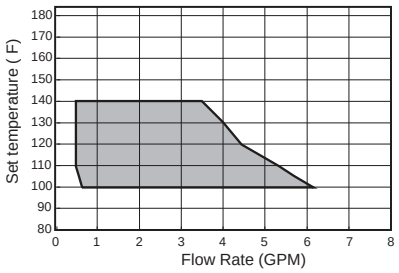
Item		NR981-DVC / NR981-OD / NR981-SV	NC1991-DVC	NC1991-OD
Gas Consumption	Maximum Performance	NG : 199,900 btuh LP : 199,900 btu		
	Minimum Performance	NG : 16,000 btuh LP : 16,000 btuh		
Maximum Hot Water Capacity	45°F Rise	7.5 Gal./min.		
Capacity Range		0.5 - 9.8 Gal./min.		
Default Temperature Options		120, 130, 140°F (Original is 120°F)	120, 130, 140, 185°F (Original is 120	
Temperature Settings (Using the Remote Controller)		100 - 140°F (In 5°F intervals), (9 Options)	100 - 150°F (In 5°F intervals), 160, 170, 185°F (14 Options)	

Item		NR83-DVC
Gas Consumption	Maximum Performance	NG : 180,000 btuh LP : 180,000 btuh
	Minimum Performance	NG : 18,000 btuh LP : 18,000 btuh
Maximum Hot Water Capacity	45°F (25°C) Rise	6.7 GPM (25.4 L/min.)
Capacity Range		0.5-8.3 GPM (2-31.4 L/min.)
Temperature Settings	°F Mode:	100-140°F (In 5°F intervals) (9 Options)
	°C Mode:	37-48°C (In 1°C intervals), 50,55,60°C (In 5°C intervals) (15 Options)
Default Temperature Options	°F Mode:	120,130,140°F (Original is 120°F)
	°C Mode:	50,55,60°C (Original is 50°C)

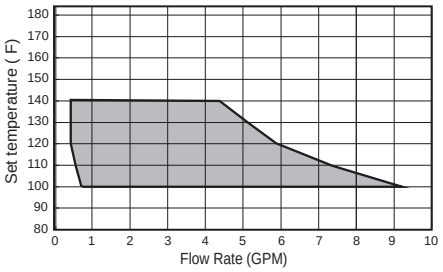
■ Hot Water Supply Capabillities

< NRC98 Series >

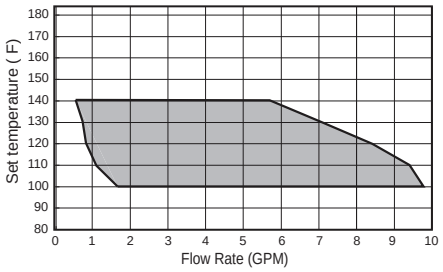
[Winter] Inlet water temp. 46 F



[Spring/Fall] Inlet water temp. 64 F

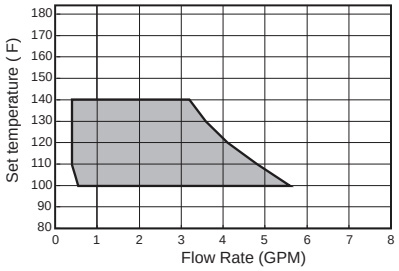


[Summer] Inlet water temp. 82 F

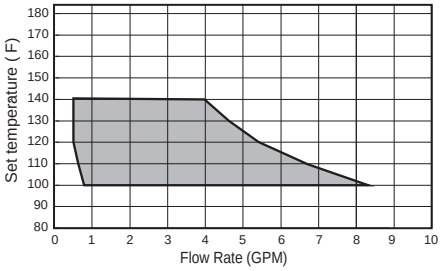


< NRC83 Series >

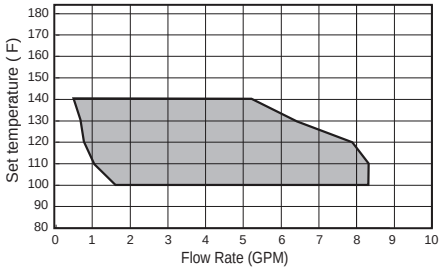
[Winter] Inlet water temp. 46 F



[Spring/Fall] Inlet water temp. 64 F

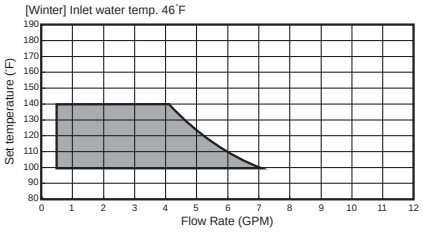


[Summer] Inlet water temp. 82 F

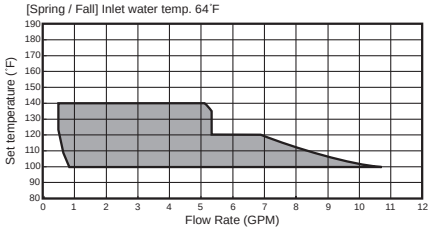


<NRC1111-DV, NRC1111-OD>

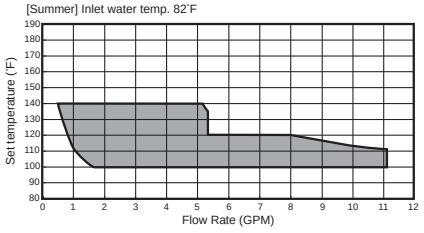
[Winter] Inlet water temp. 46˚F



[Spring / Fall] Inlet water temp. 64˚F

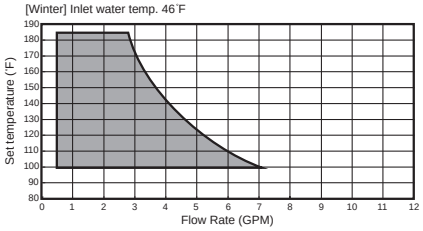


[Summer] Inlet water temp. 82˚F

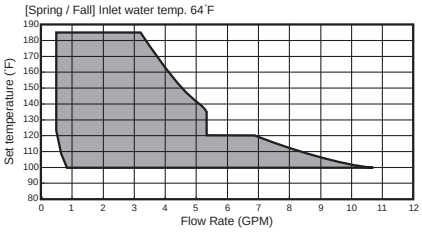


<NCC1991-DV, NCC1991-OD>

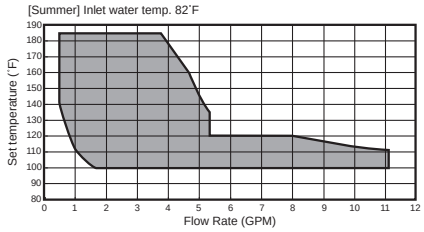
[Winter] Inlet water temp. 46˚F



[Spring / Fall] Inlet water temp. 64˚F

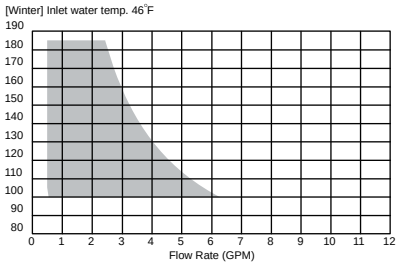


[Summer] Inlet water temp. 82˚F

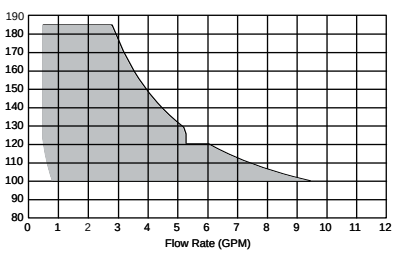


<NC1991-OD, NC1991-DVC>

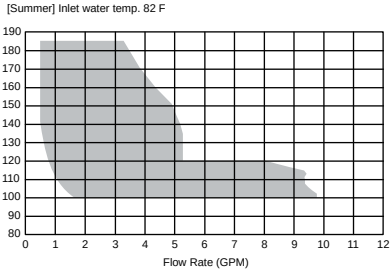
[Winter] Inlet water temp. 46˚F



[Spring / Fall] Inlet water temp. 64 F

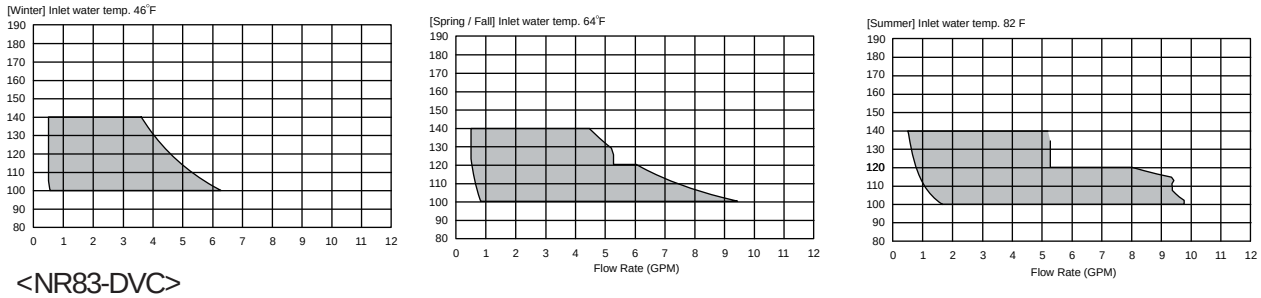


[Summer] Inlet water temp. 82 F

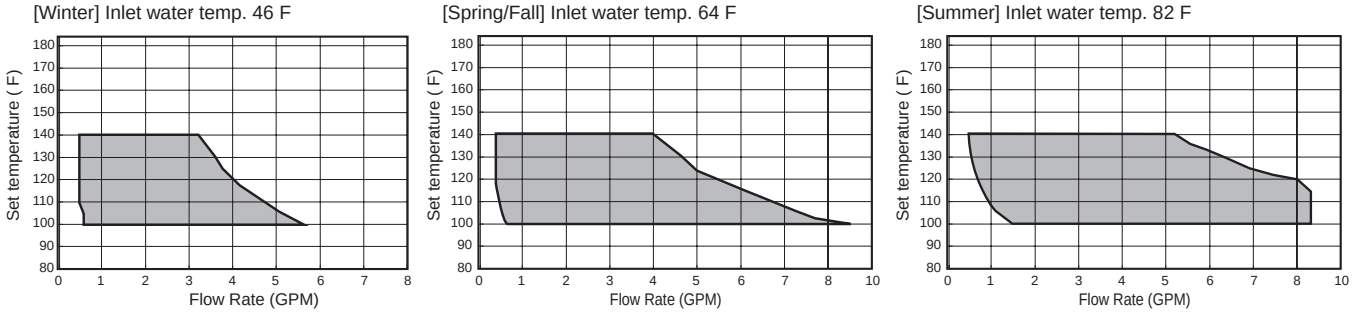


■ Hot Water Supply Capabillities

<NR981-OD, NR981-DVC, NR981-SV>

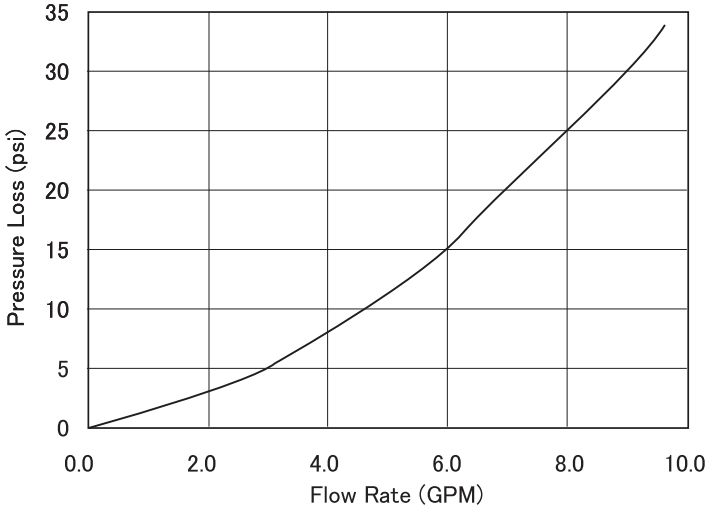


<NR83-DVC>

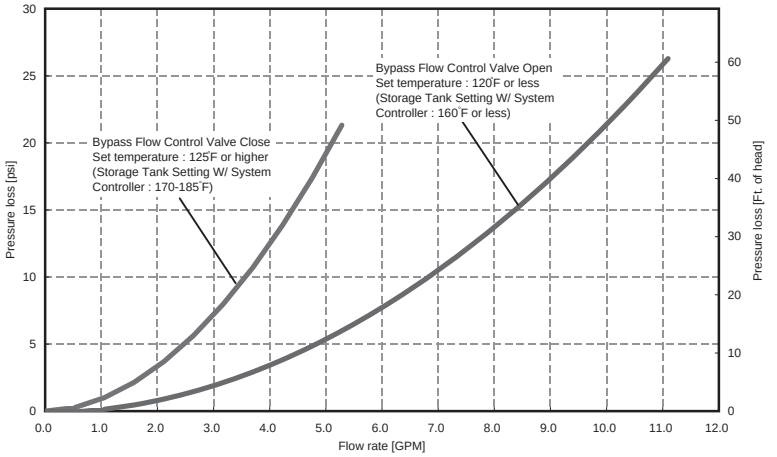


■ Pressure Loss Characteristics

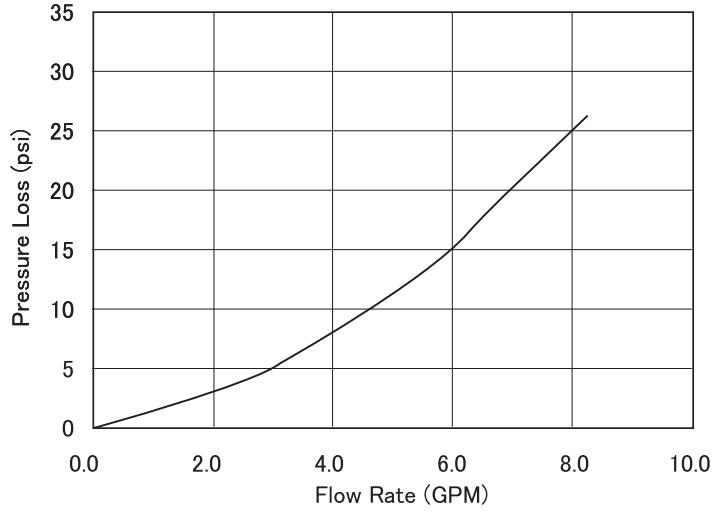
< NRC98 Series >



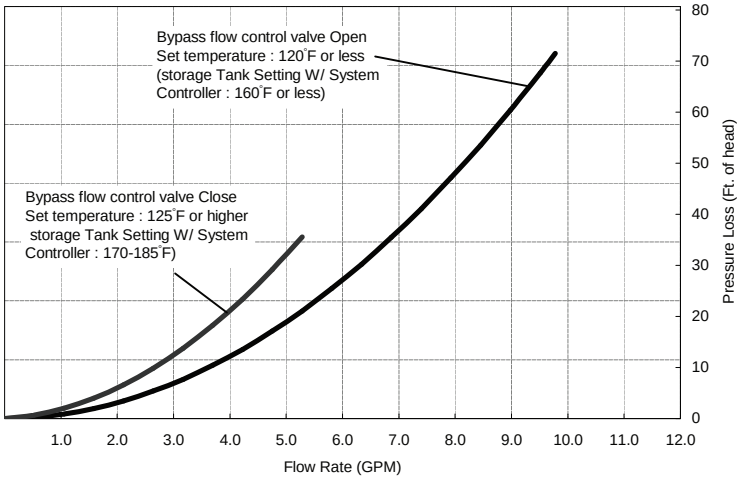
<NRC1111/NCC1991>



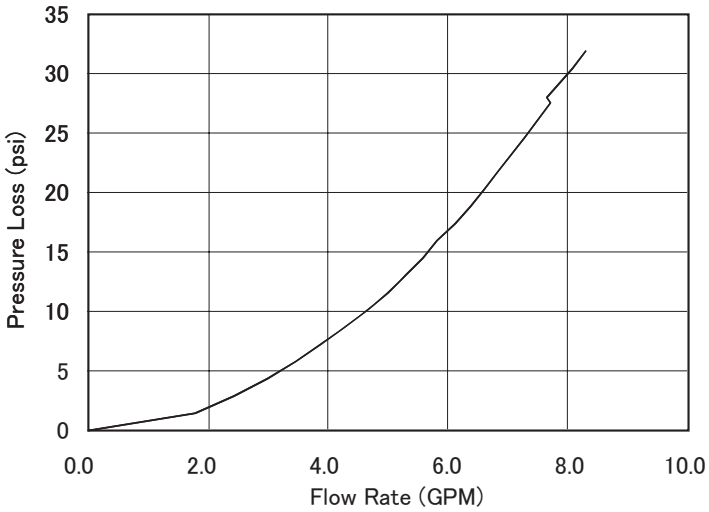
< NRC83 Series >



<NR981/NC1991>



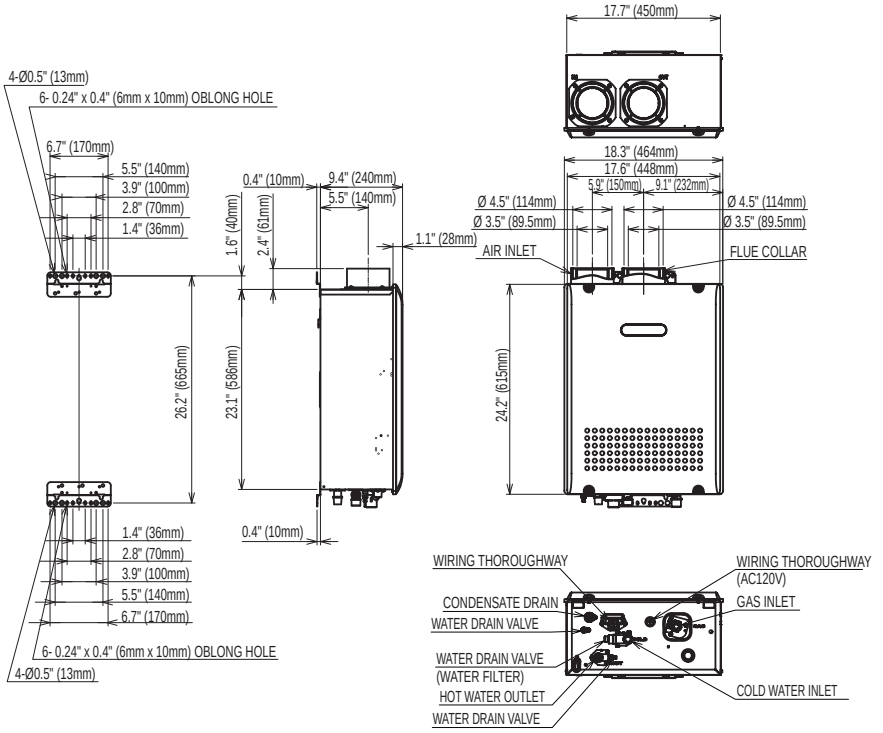
< NR83-DVC>


35
30
25
20
15
10
5
0
Pressure Loss (psi)
0.0
2.0
4.0
6.0
8.0
10.0
Flow Rate (GPM)

3. Dimensions

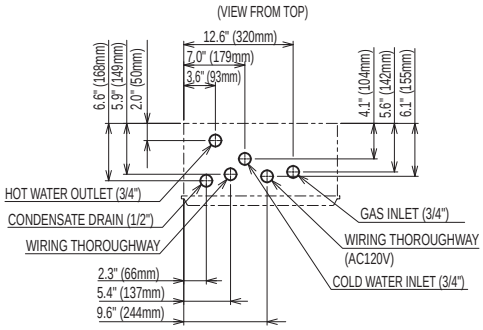
NRC98-DV
NRC83-DV

< inch (mm)>



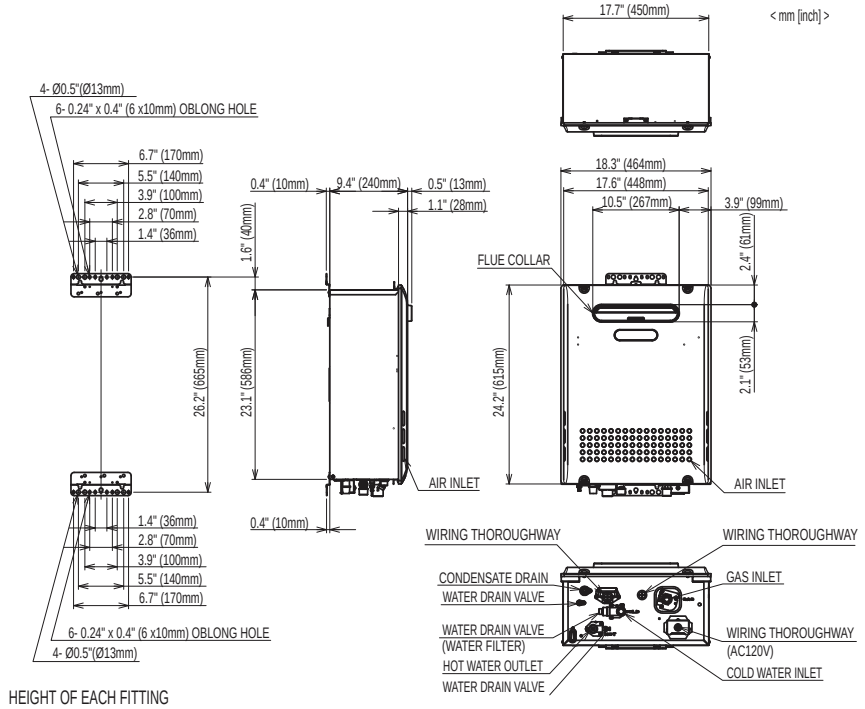
HEIGHT OF EACH FITTING FROM BOTTOM OF CASE

CONDENSATE DRAIN	0.9" (24mm)
HOT WATER OUTLET	1.8" (45mm)
COLD WATER INLET	1.9" (49mm)
GAS INLET	2.2" (56mm)



NRC98-OD
NRC83-OD

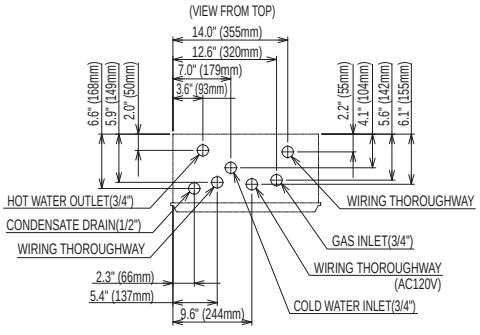
< mm [inch] >



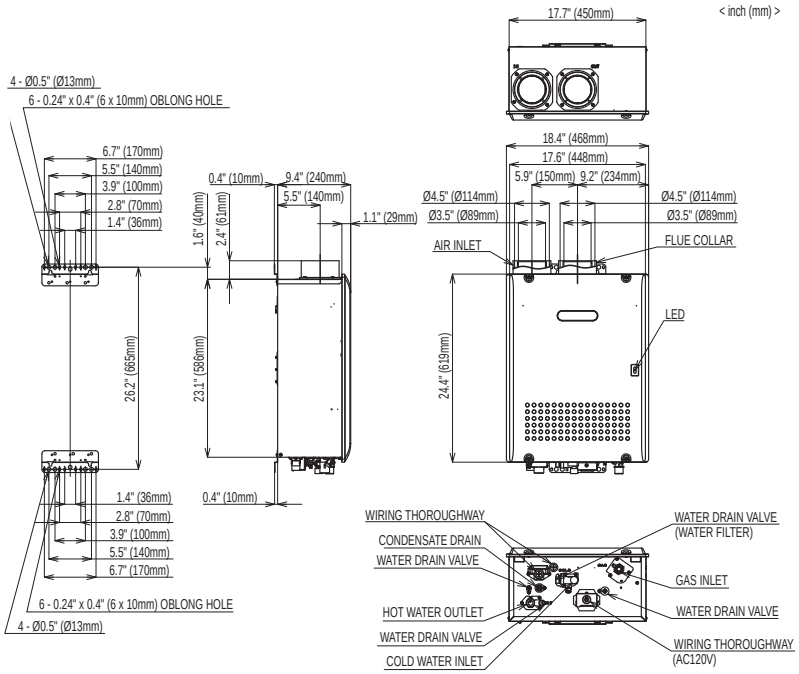
HEIGHT OF EACH FITTING

HEIGHT OF EACH FITTING FROM BOTTOM OF CASE

CONDENSATE DRAIN	0.8" (20mm)
HOT WATER OUTLET	1.8" (45mm)
COLD WATER INLET	1.9" (49mm)
GAS INLET	2.2" (65mm)

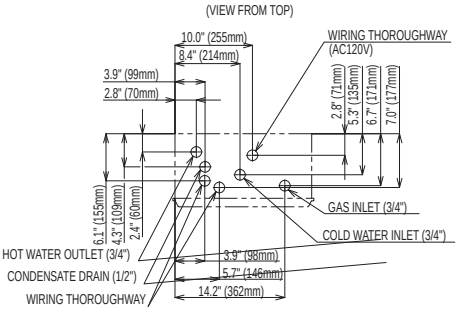


NCC1991-DV

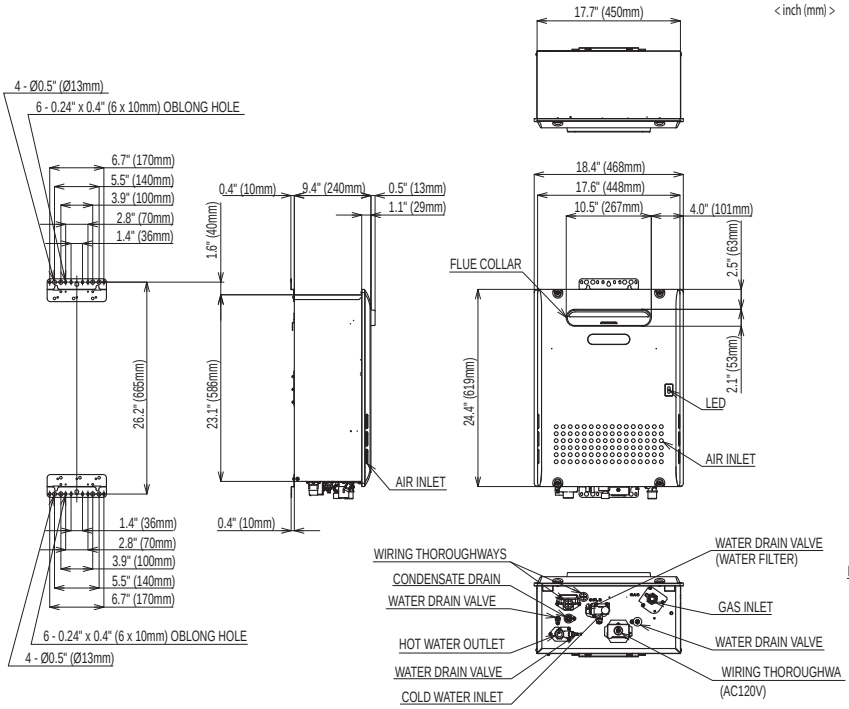


HEIGHT OF EACH FITTING
FROM BOTTOM OF CASE

	NCC1991-DV
CONDENSATE DRAIN	0.8" (20mm)
HOT WATER OUTLET	1.7" (44mm)
COLD WATER INLET	2.2" (55mm)
GAS INLET	2.2" (56mm)

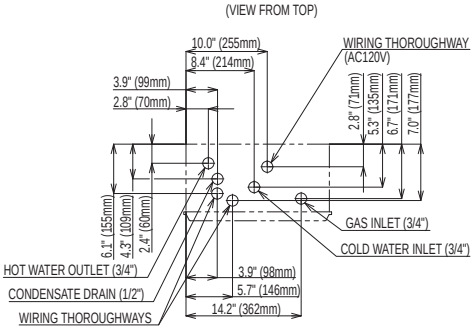


NCC1991-OD



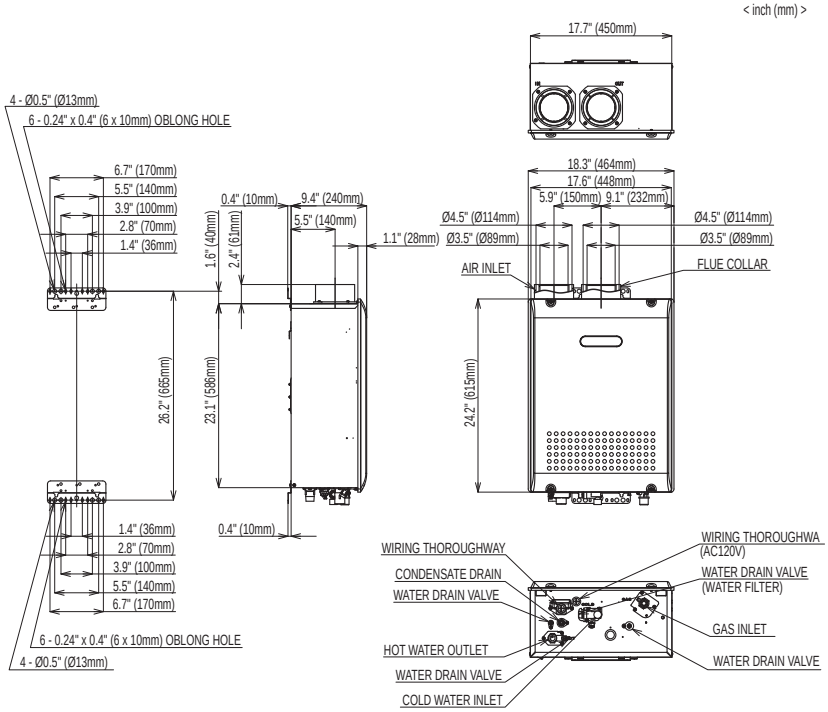
HEIGHT OF EACH FITTING
FROM BOTTOM OF CASE

	NCC1991-OD
CONDENSATE DRAIN	0.8" (20mm)
HOT WATER OUTLET	1.7" (44mm)
COLD WATER INLET	2.2" (55mm)
GAS INLET	2.2" (56mm)



NRC1111-DV

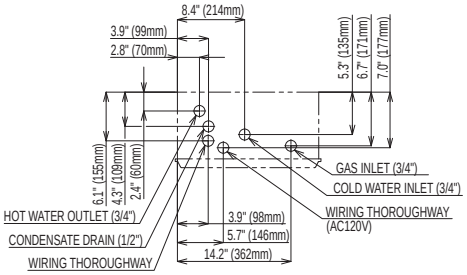
< inch (mm) >



HEIGHT OF EACH FITTING
FROM BOTTOM OF CASE

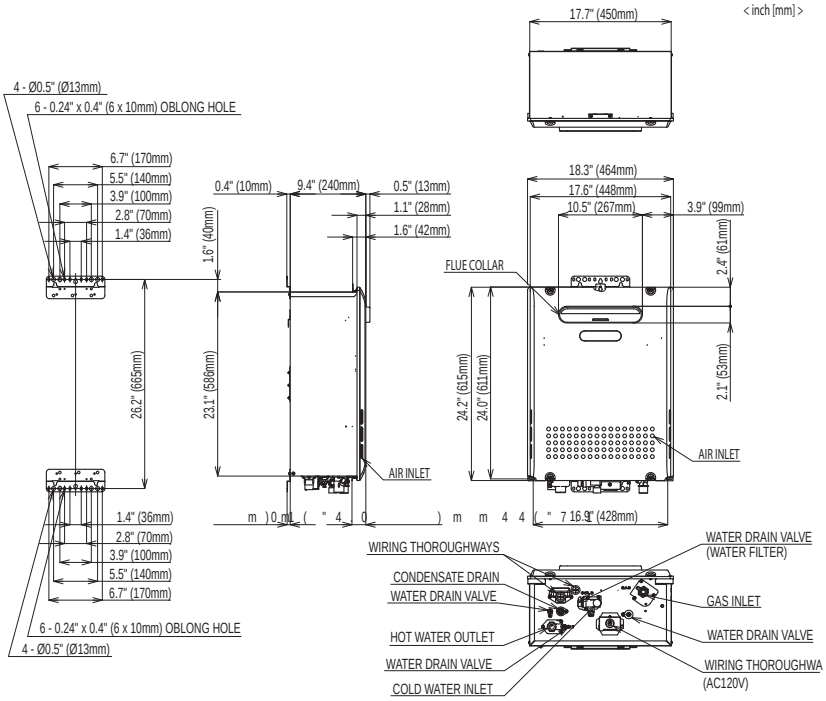
	NRC1111-DV
CONDENSATE DRAIN	0.8" (20mm)
HOT WATER OUTLET	1.7" (44mm)
COLD WATER INLET	2.2" (55mm)
GAS INLET	2.2" (56mm)

(VIEW FROM TOP)



NRC1111-OD

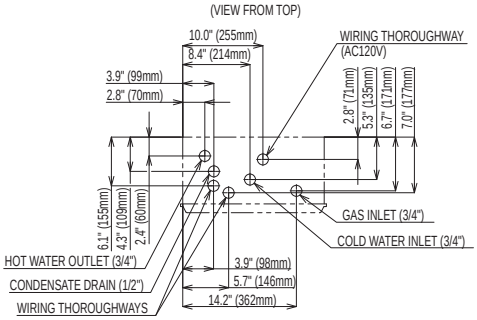
< inch [mm] >



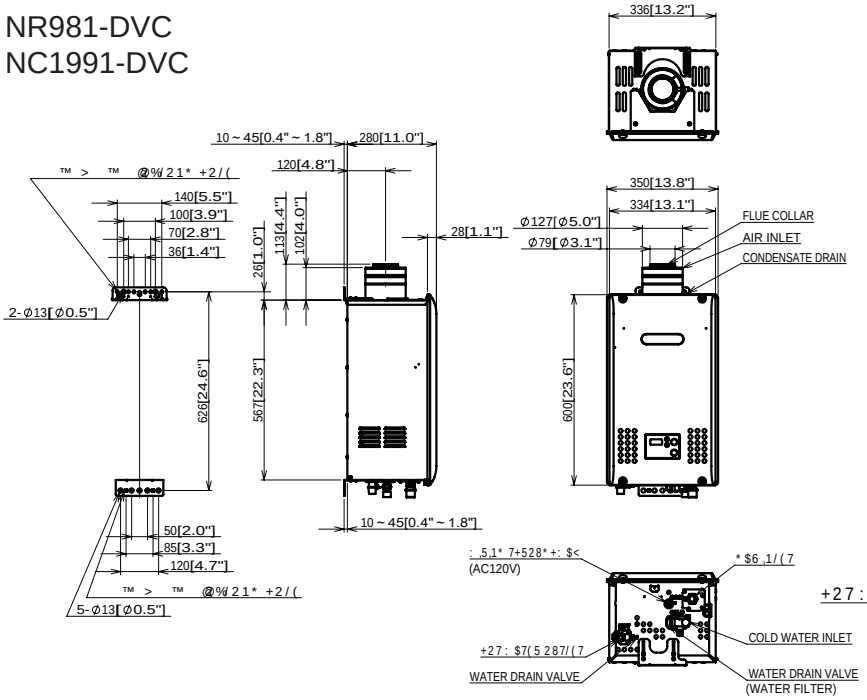
HEIGHT OF EACH FITTING
FROM BOTTOM OF CASE

	NRC1111-OD
CONDENSATE DRAIN	0.8" (20mm)
HOT WATER OUTLET	1.7" (44mm)
COLD WATER INLET	2.2" (55mm)
GAS INLET	2.2" (56mm)

(VIEW FROM TOP)



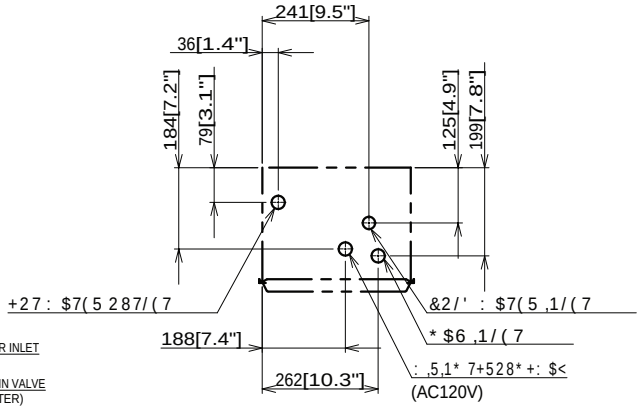
NR981-DVC
NC1991-DVC



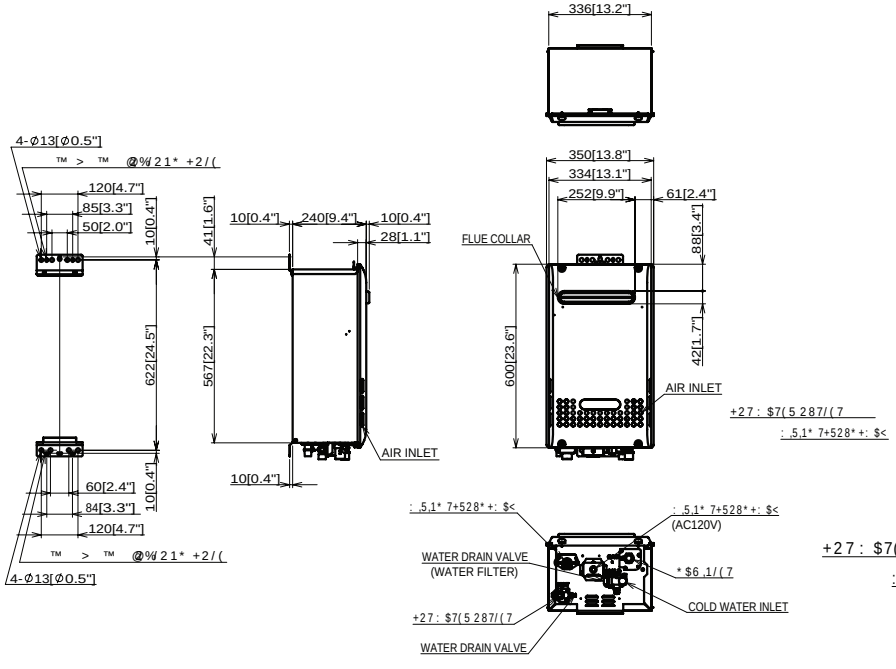
HEIGHT OF EACH FITTINGS
FROM BOTTOM OF CASE

	NR981-DVC/NC1991-DVC
HOT WATER OUTLET	1.8"[45mm]
COLD WATER INLET	2.2"[55mm]
GAS INLET	2.2"[56mm]

(VIEW FROM TOP)



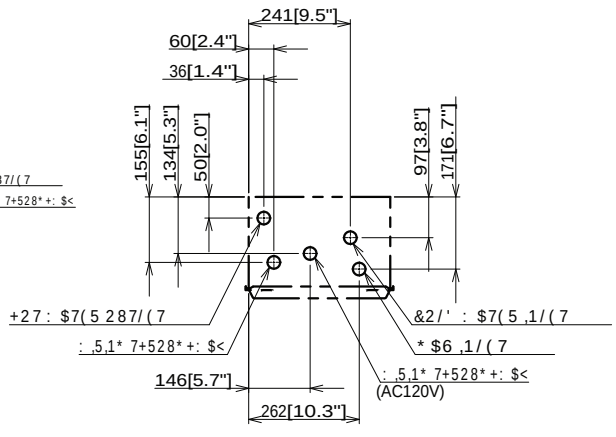
NR981-OD
NC1991-OD



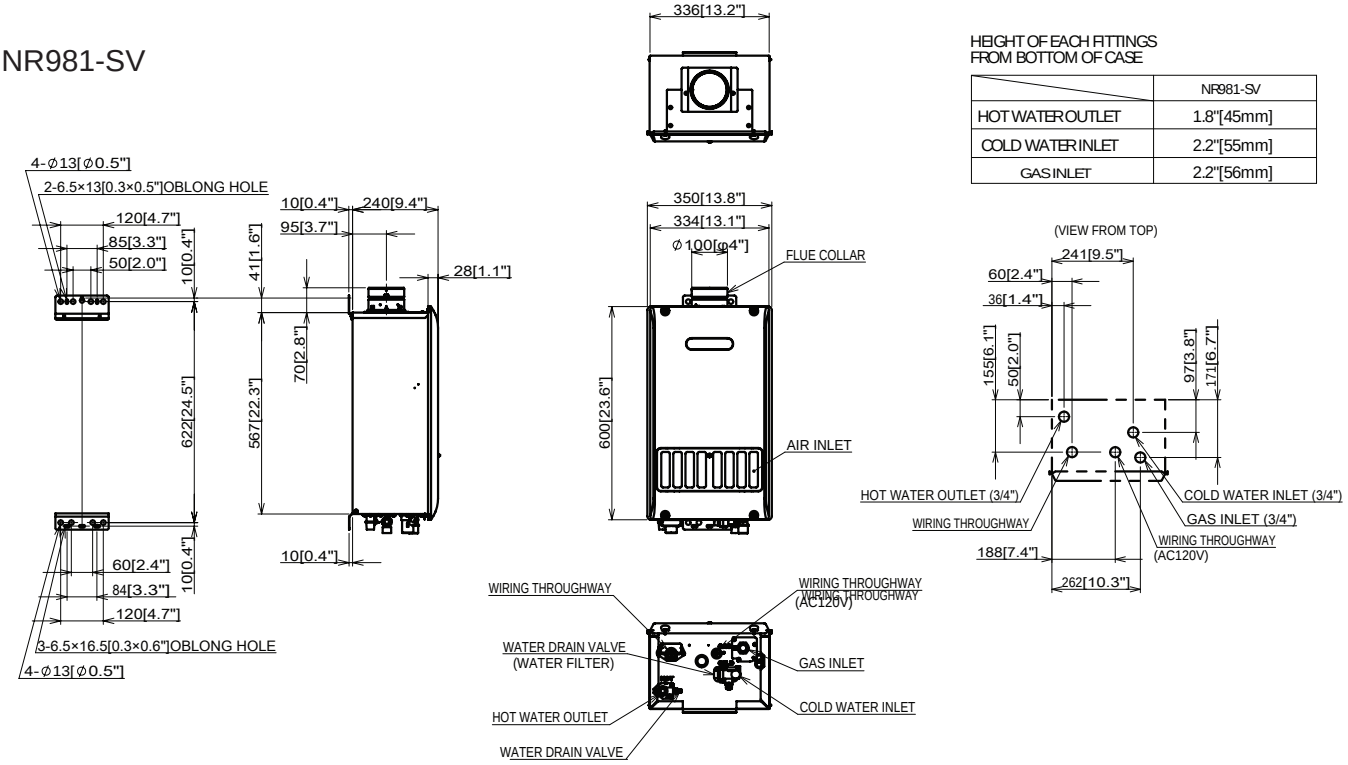
HEIGHT OF EACH FITTINGS
FROM BOTTOM OF CASE

	NR981-OD / NC1991-OD
HOT WATER OUTLET	1.8"[45mm]
COLD WATER INLET	2.2"[55mm]
GAS INLET	2.2"[56mm]

(VIEW FROM TOP)



NR981-SV

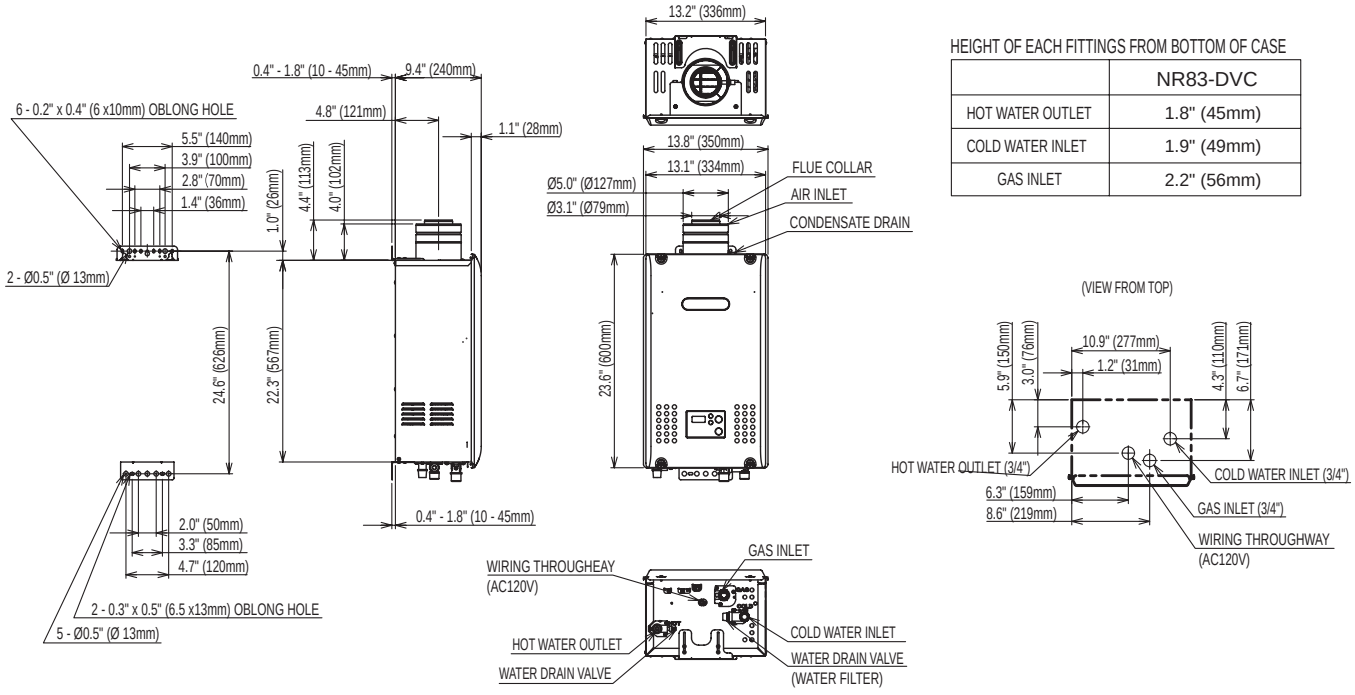


HEIGHT OF EACH FITTINGS FROM BOTTOM OF CASE

	NR981-SV
HOT WATER OUTLET	1.8"[45mm]
COLD WATER INLET	2.2"[55mm]
GAS INLET	2.2"[56mm]

NR83-DVC

<inch(mm)>

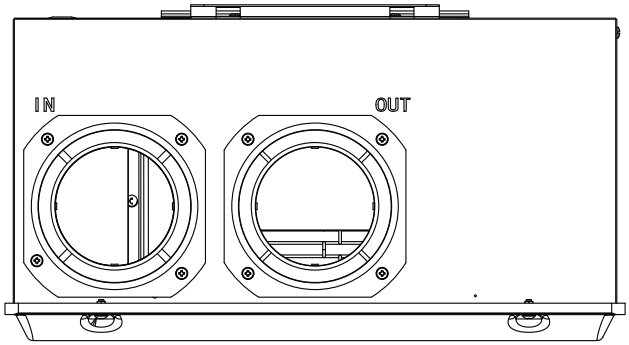


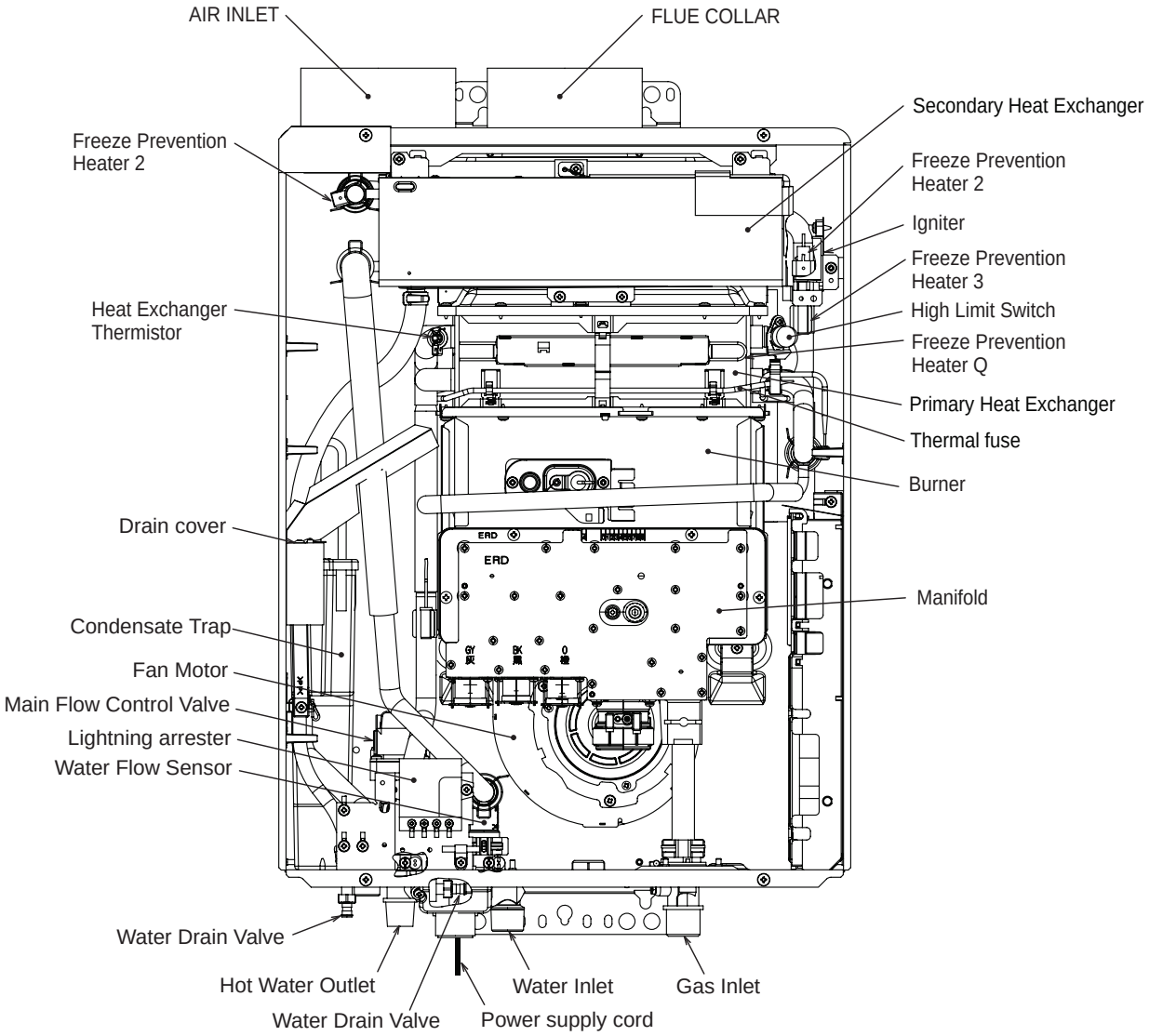
HEIGHT OF EACH FITTINGS FROM BOTTOM OF CASE

	NR83-DVC
HOT WATER OUTLET	1.8" (45mm)
COLD WATER INLET	1.9" (49mm)
GAS INLET	2.2" (56mm)

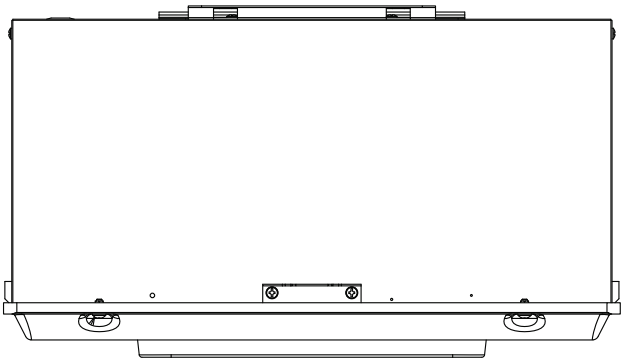
4. Components

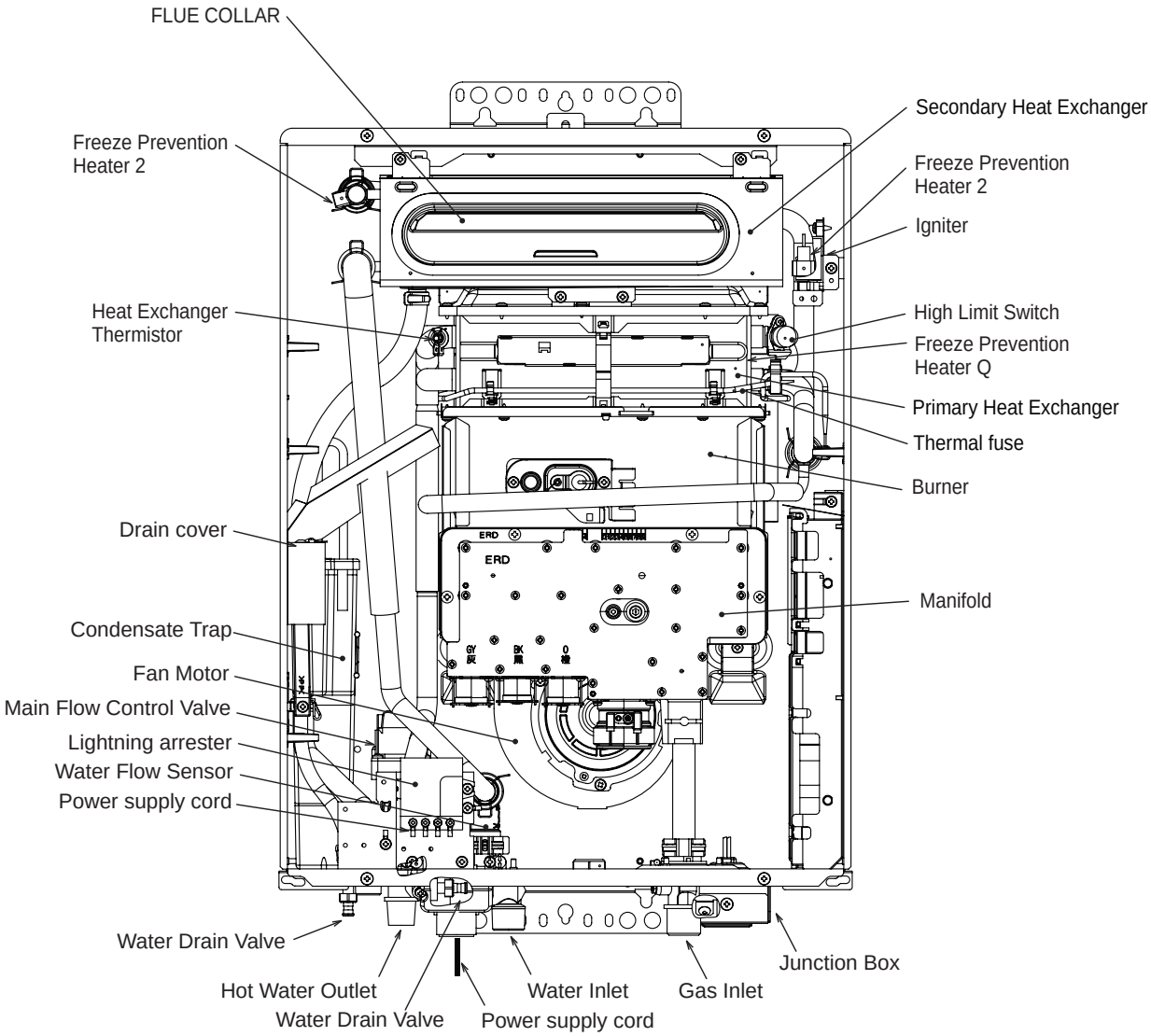
NRC98-DV
NRC83-DV

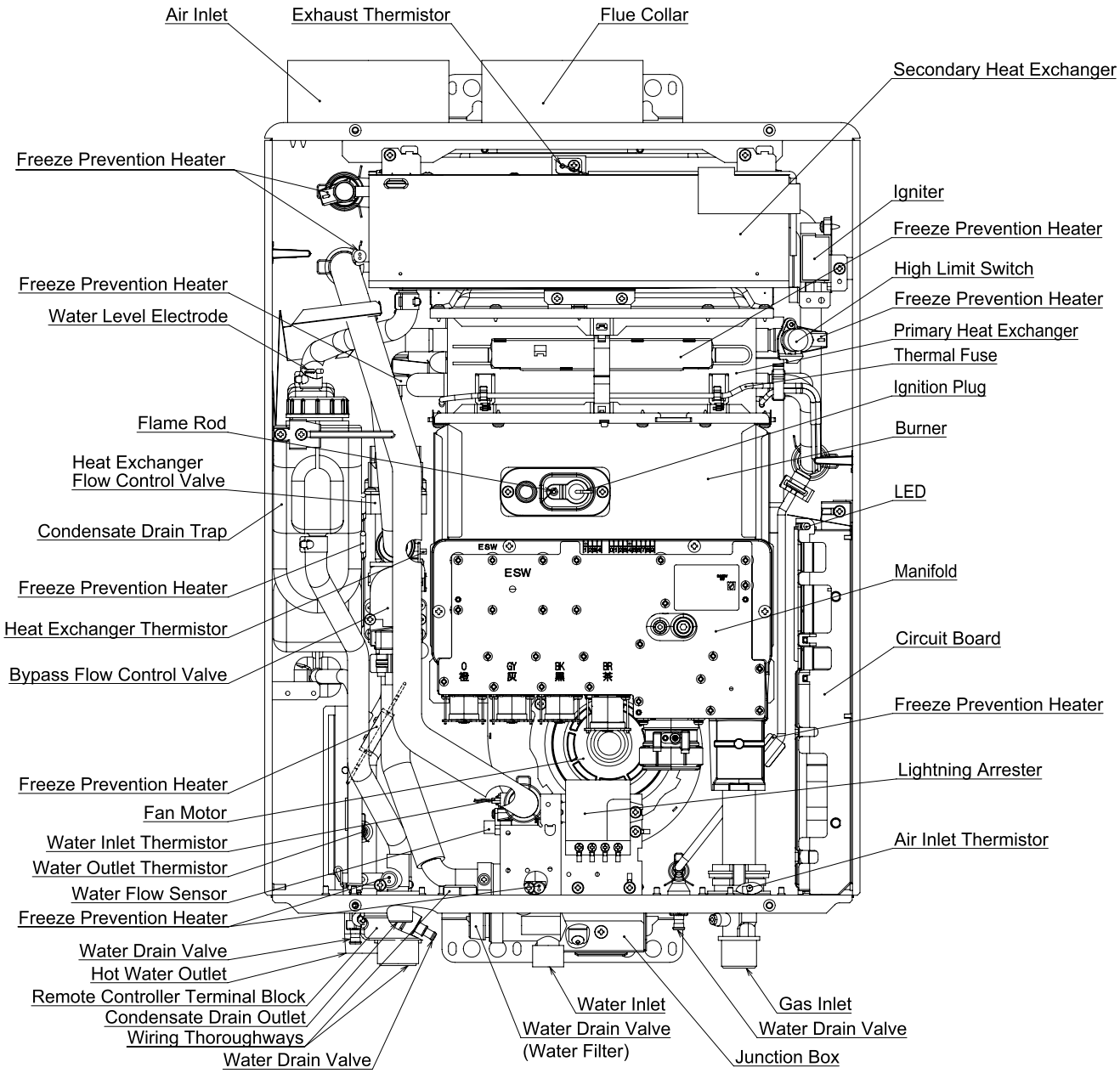




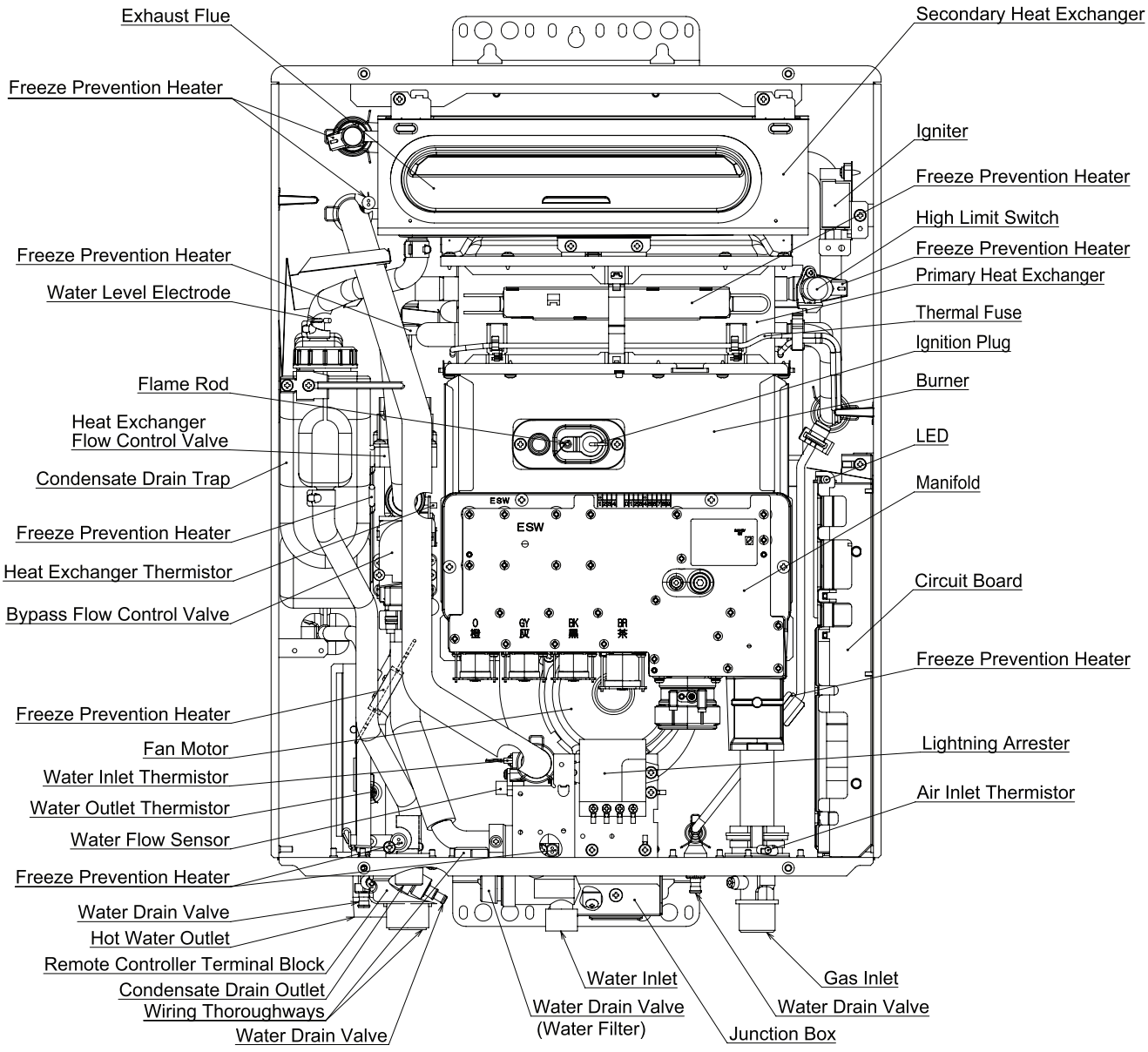
NRC98-OD
NRC83-OD



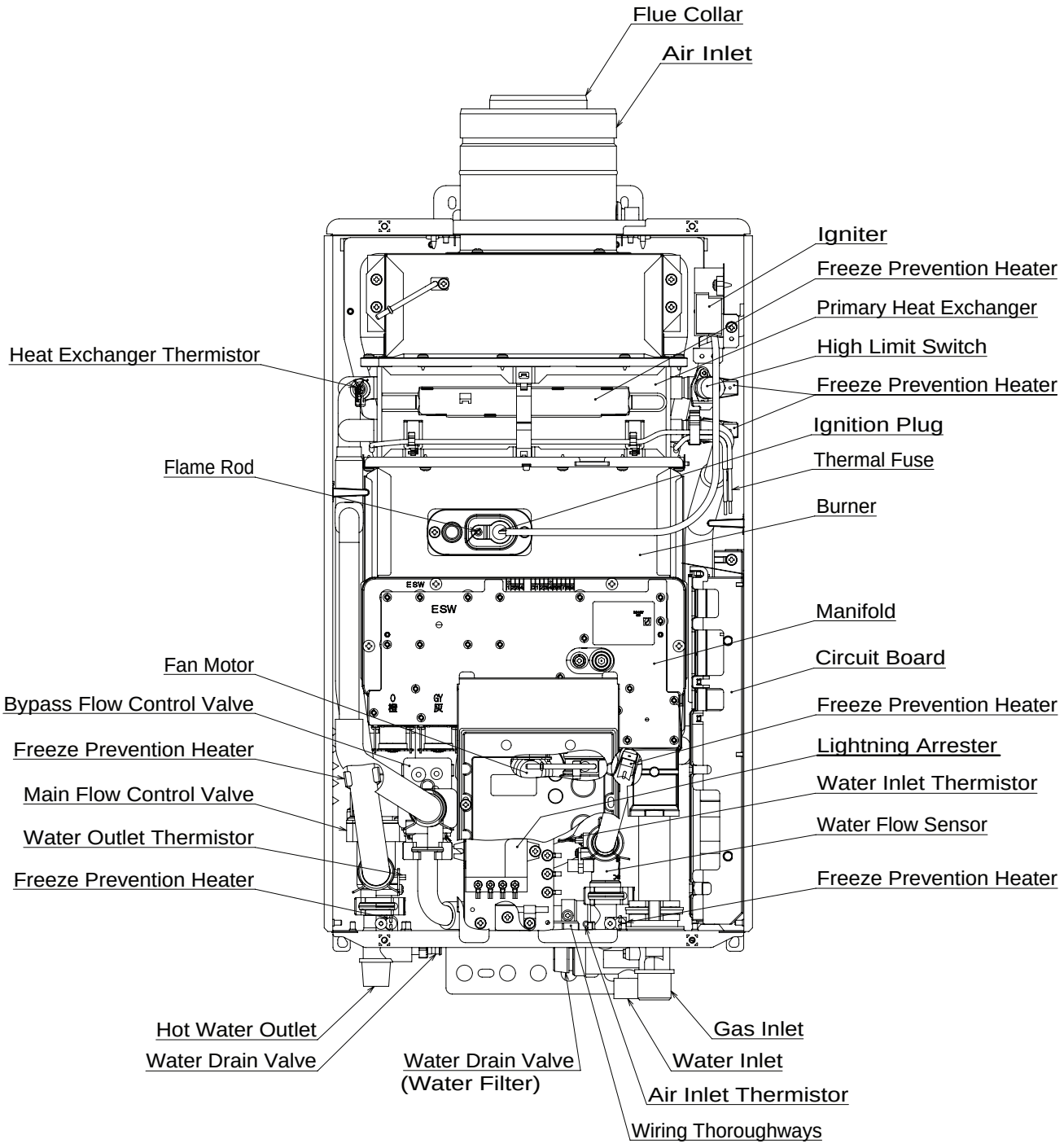



Air Inlet
Exhaust Thermistor
Flue Collar
Secondary Heat Exchanger
Freeze Prevention Heater
Igniter
Freeze Prevention Heater
High Limit Switch
Freeze Prevention Heater
Freeze Prevention Heater
Water Level Electrode
Primary Heat Exchanger
Thermal Fuse
Ignition Plug
Flame Rod
Burner
Heat Exchanger
Flow Control Valve
LED
Condensate Drain Trap
Manifold
Freeze Prevention Heater
Heat Exchanger Thermistor
Circuit Board
Bypass Flow Control Valve
Freeze Prevention Heater
Lightning Arrester
Freeze Prevention Heater
Fan Motor
Air Inlet Thermistor
Water Inlet Thermistor
Water Outlet Thermistor
Water Flow Sensor
Freeze Prevention Heater
Water Drain Valve
Hot Water Outlet
Remote Controller Terminal Block
Condensate Drain Outlet
Wiring Thoroughways
Water Drain Valve
Water Inlet
Water Drain Valve
(Water Filter)
Gas Inlet
Water Drain Valve
Junction Box
ESW
ESW

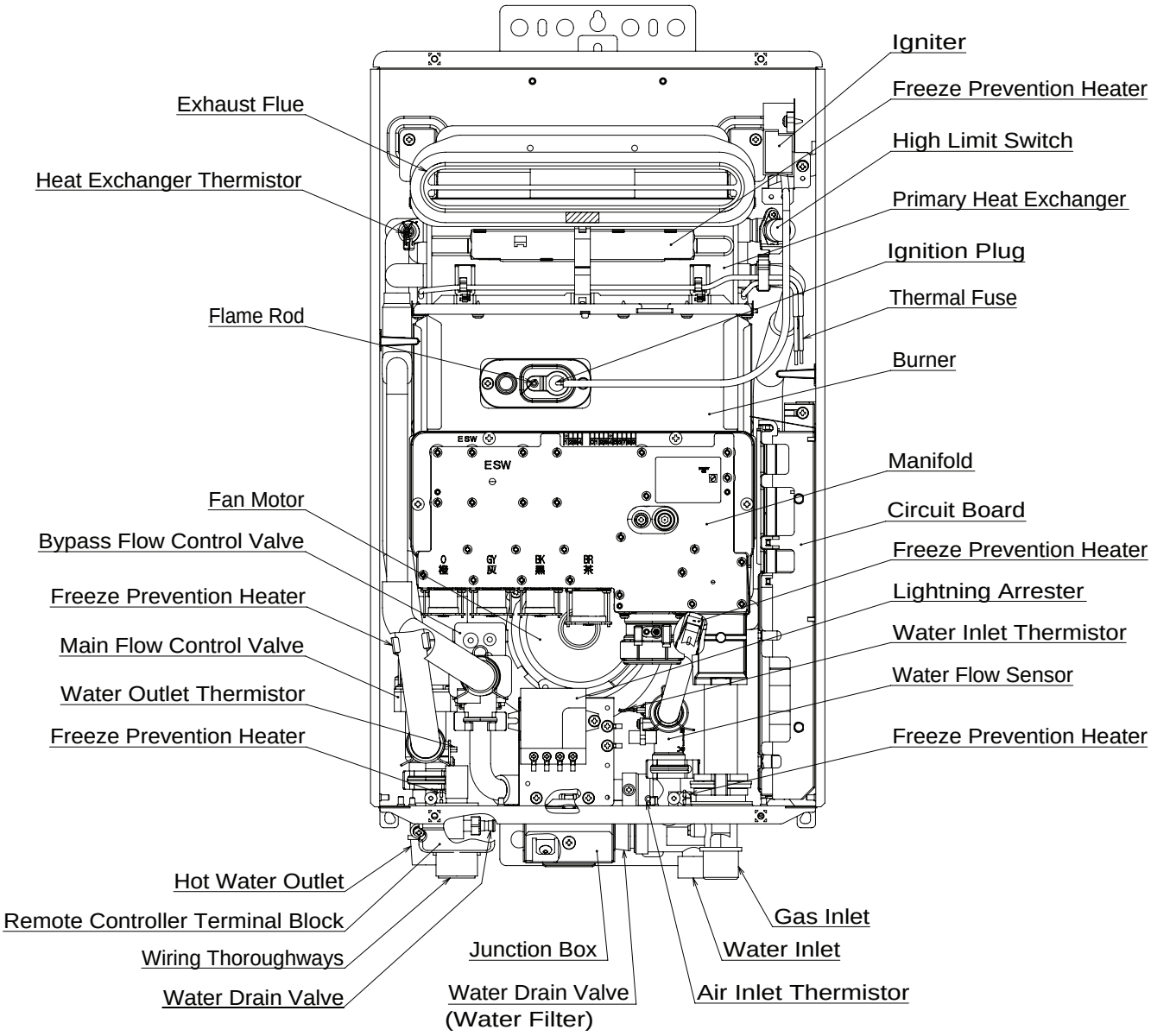
NRC1111-OD
NCC1991-OD



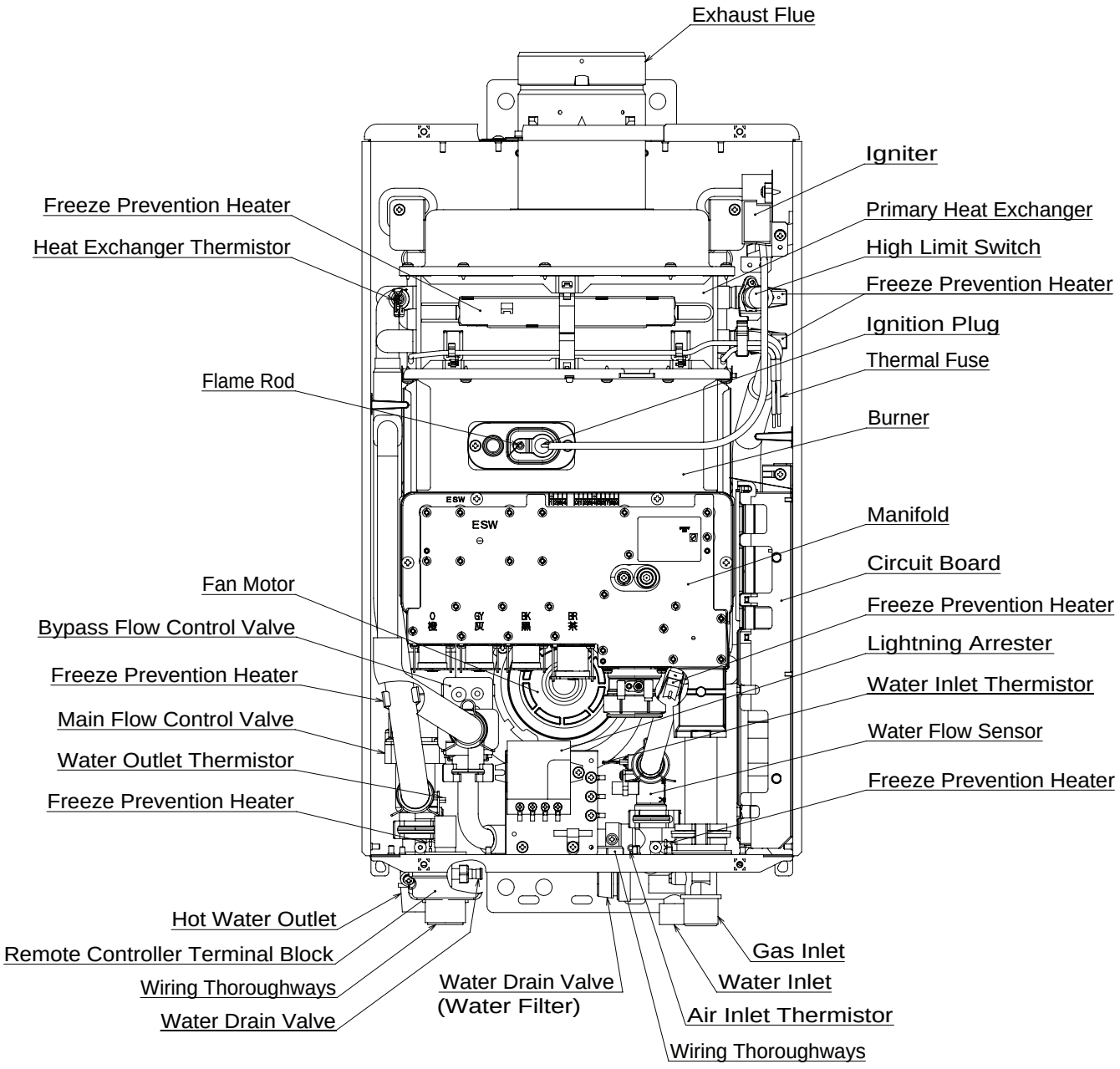
NR981-DVC
NC1991-DVC



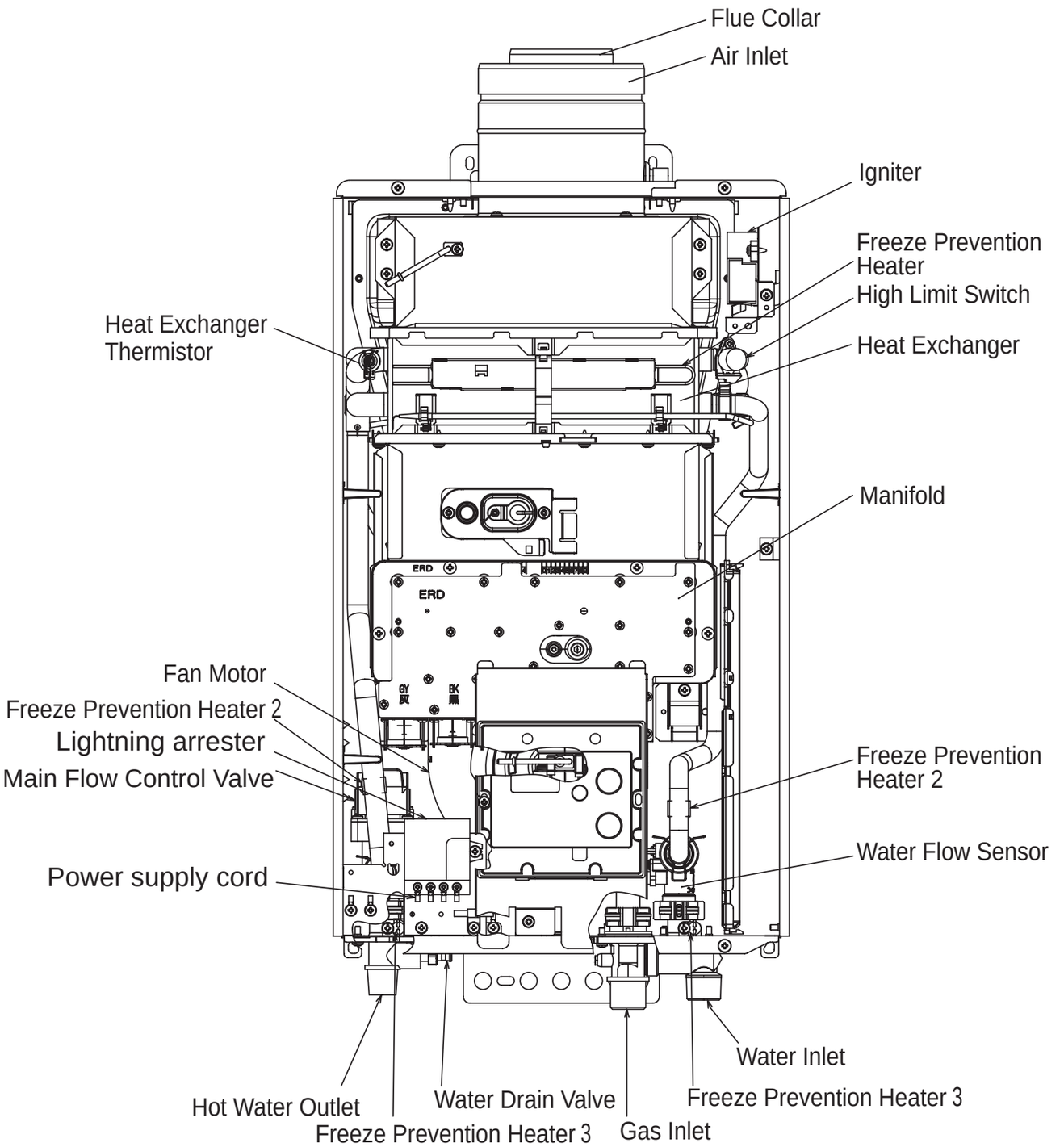
NR981-OD
NC1991-OD



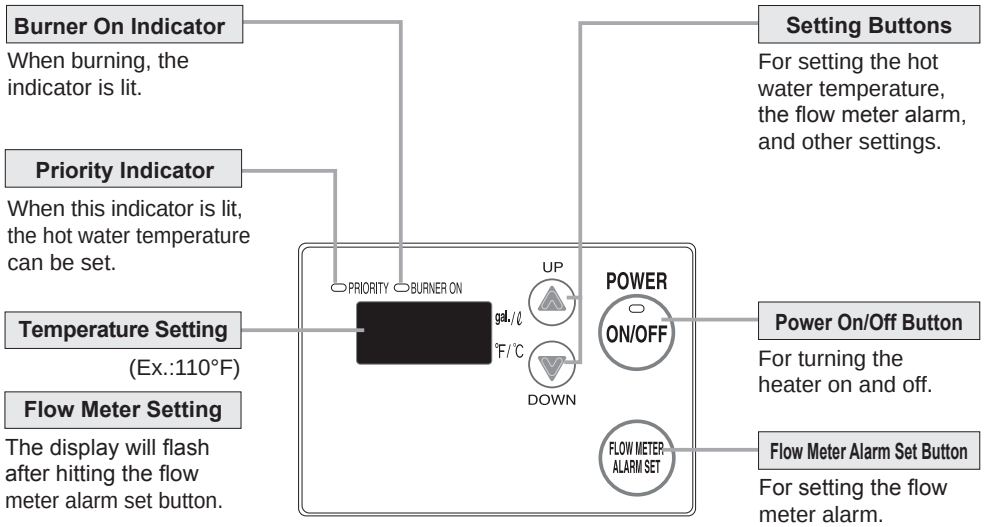
NR981-SV


Exhaust Flue
Igniter
Freeze Prevention Heater
Heat Exchanger Thermistor
Primary Heat Exchanger
High Limit Switch
Freeze Prevention Heater
Ignition Plug
Thermal Fuse
Flame Rod
Burner
Manifold
Circuit Board
Fan Motor
Freeze Prevention Heater
Bypass Flow Control Valve
Lightning Arrester
Freeze Prevention Heater
Water Inlet Thermistor
Main Flow Control Valve
Water Flow Sensor
Water Outlet Thermistor
Freeze Prevention Heater
Freeze Prevention Heater
Hot Water Outlet
Remote Controller Terminal Block
Gas Inlet
Wiring Thoroughways
Water Drain Valve
(Water Filter)
Water Inlet
Water Drain Valve
Air Inlet Thermistor
Wiring Thoroughways

NR83-DVC


Flue Collar
Air Inlet
Igniter
Freeze Prevention Heater
High Limit Switch
Heat Exchanger Thermistor
Heat Exchanger
Manifold
ERD
ERD
Fan Motor
Freeze Prevention Heater 2
Lightning arrester
Main Flow Control Valve
Freeze Prevention Heater 2
Power supply cord
Water Flow Sensor
Water Inlet
Hot Water Outlet
Water Drain Valve
Freeze Prevention Heater 3
Freeze Prevention Heater 3
Gas Inlet

■ Remote controller (RC-7651M)

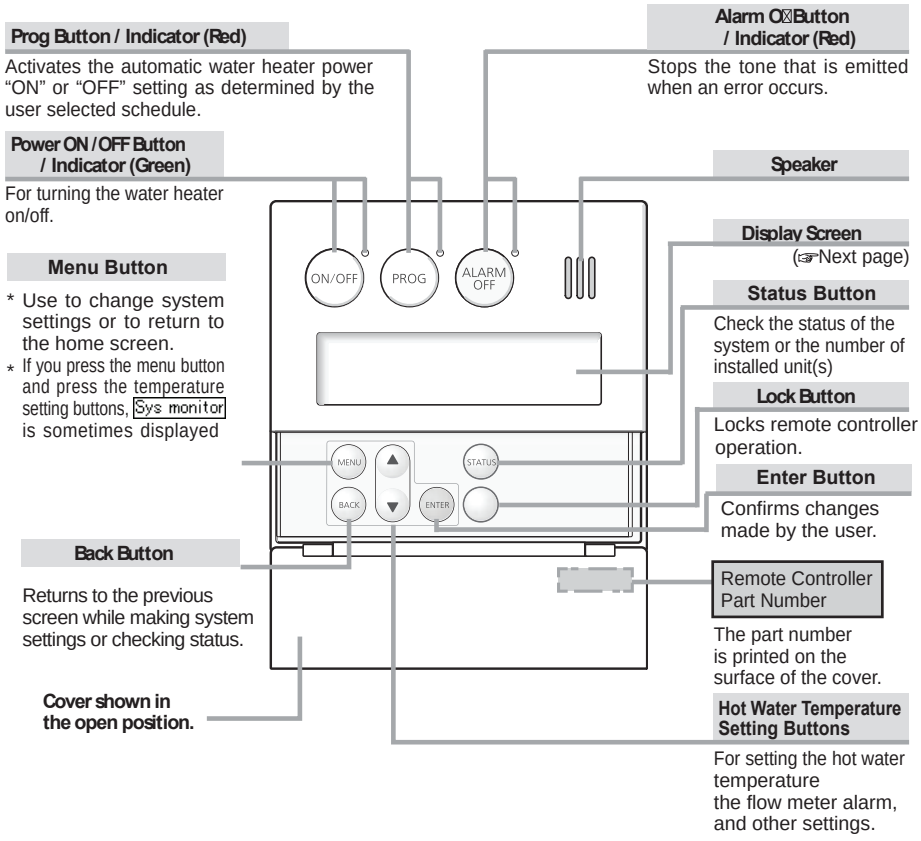


* Before use, remove the protective sheet from the operation panel surface.

Note: As shipped from the factory, the remote controller is set to display in °F and gallons.
To adjust the display to °C and liters, refer to the "Remote Controller" section for details.

■ Remote controller (RC-9018M)

The remote controller will emit a tone when a button is pressed.



Remote Controller (RC-9018M)

Screen Display

* The screen display shown below is for illustration purposes only.
  The actual display will vary depending on how the water heater is being used.
* After a button is pressed, the display will gradually become darker to prevent unnecessary power consumption by the remote controller.

Flame Symbol

The flame symbol is displayed during combustion when using hot water or recirculation functions.

Display for Recirculation Operation

* For systems that use recirculation operation, the symbol is displayed when the power ON/OFF button is set to "ON".
* It is displayed during the recirculation operation.

Display for Temperature Setting

During normal operation, the set temperature is displayed.

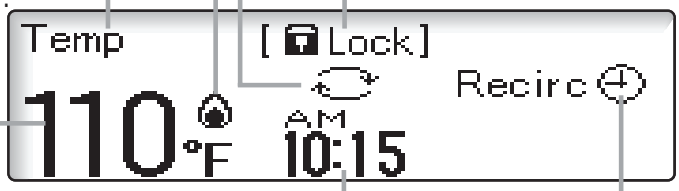
Locked Display

The lock symbol is displayed when the remote controller is locked.

Display for High Temperature

Hi temp

Displays when the set temperature is 125°F/55°C (131°F) or higher.



Temperature Setting

(Ex.: 110°F)

Clock Display

(Ex.: AM10:15)

Normally the clock display is not shown when the power ON/OFF button is "OFF".

* This setting can be changed so that the clock is displayed even when the power button is turned "OFF".

Recirculation Timer

The clock symbol is displayed when the recirculation timer is activated.

Error Code

A number will flash if a failure occurs.

Note: As shipped from the factory, the remote controller is set to display in °F and gallons.
To adjust the display to °C and liters, refer to the Installation Manual.

What is the home screen?

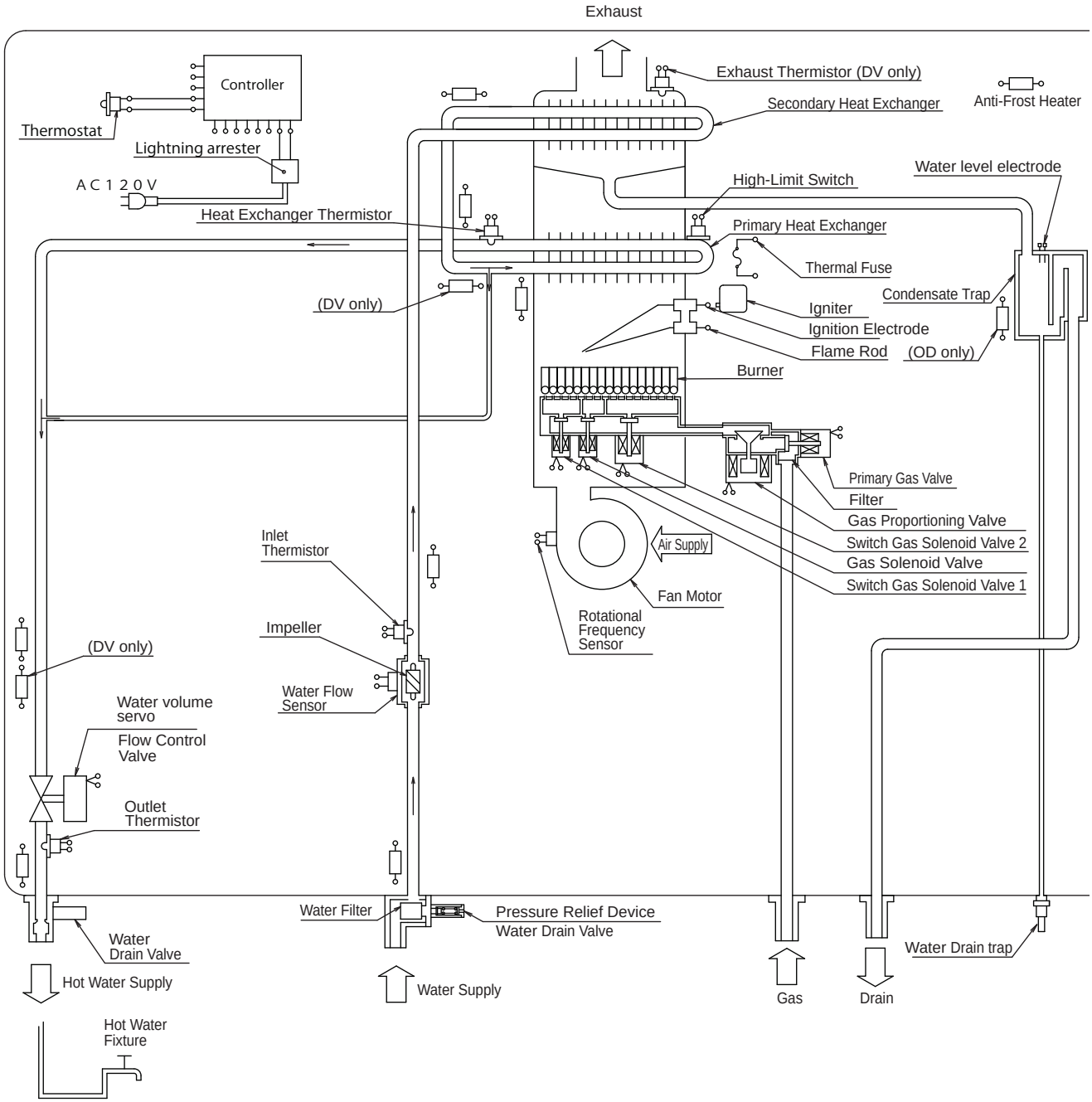
The home screen is displayed when the ON/OFF button is "ON".

Normally, the hot water temperature and the clock, etc. are displayed.

<Home Screen Example>

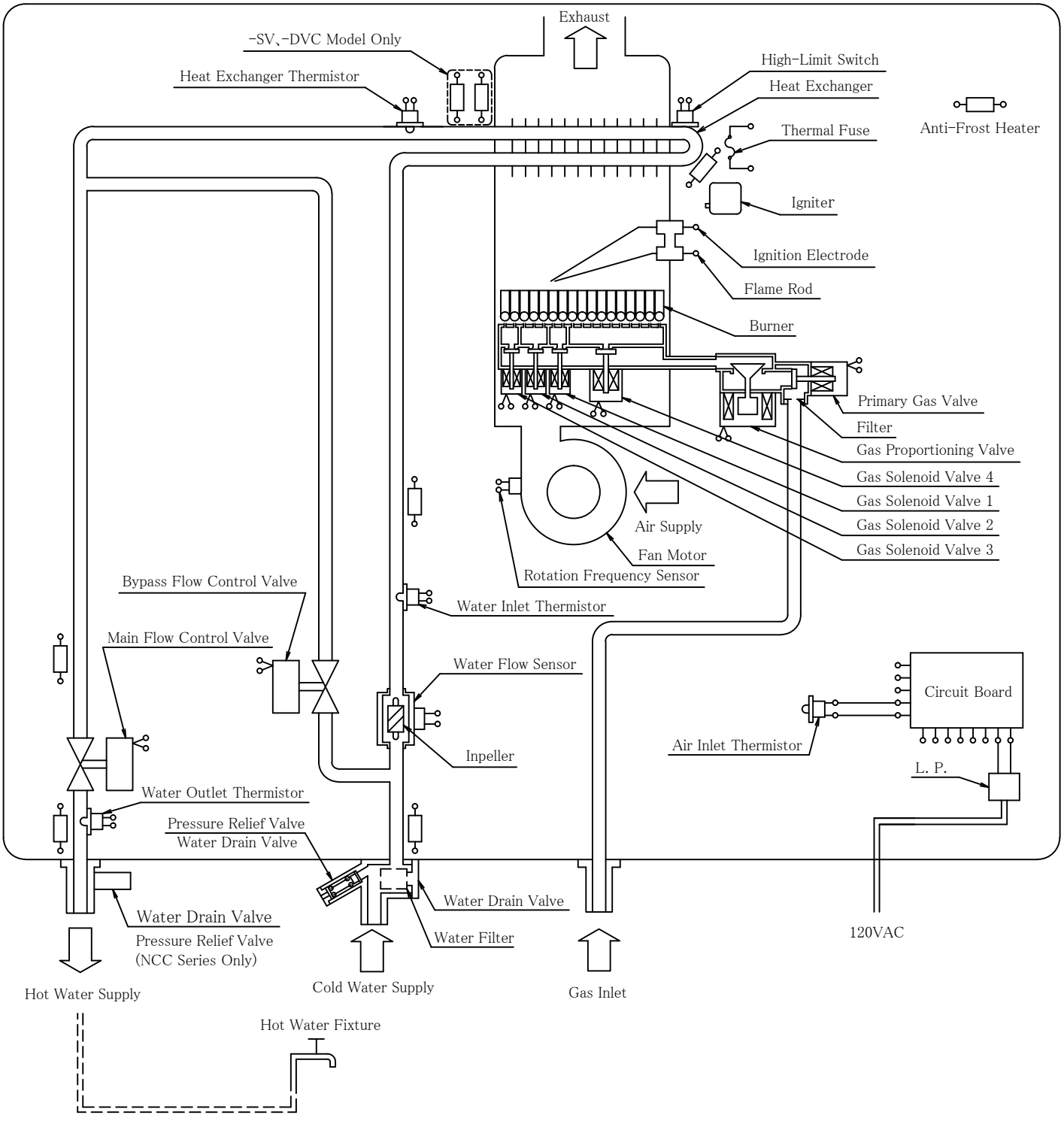
5. Operating Principle

<NRC98(-DV,-OD), NRC83(-DV,-OD), NCC1991(-DV,-OD) NRC1111(-DV,-OD)>



Note: This diagram is for illustrative purposes only.
Actual locations of the parts or connections may vary on the water heater.

<NC1991(-DVC,-OD), NR981(-DVC,-OD,-SV), NR83-DVC>



< How to Use >

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, alllowing 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.

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.

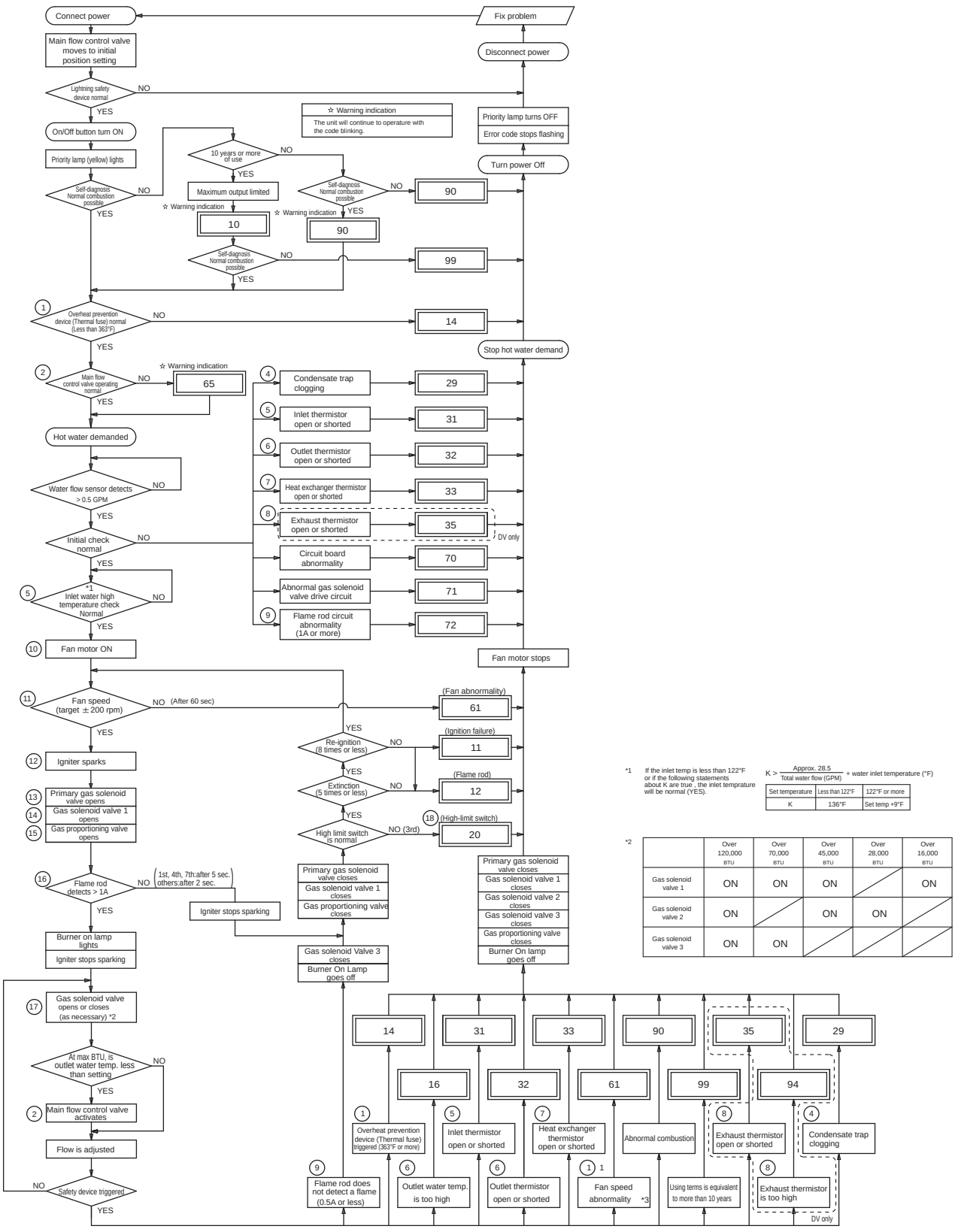
3. Miscellaneous

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

NRC98(-DV,-OD), NRC83(-DV,-OD)

Water heating



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

$$K > \frac{\text{Approx. } 28.5}{\text{Total water flow (GPM)}} + \text{water inlet temperature (°F)}$$

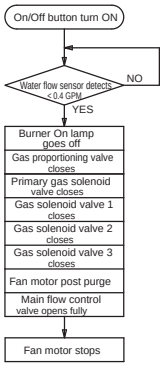
Set temperature	Less than 122°F	122°F or more
K	136°F	Set temp +9°F

*2

	Over 120,000 BTU	Over 70,000 BTU	Over 45,000 BTU	Over 28,000 BTU	Over 16,000 BTU
Gas solenoid valve 1	ON	ON	ON		ON
Gas solenoid valve 2	ON		ON	ON	
Gas solenoid valve 3	ON	ON			

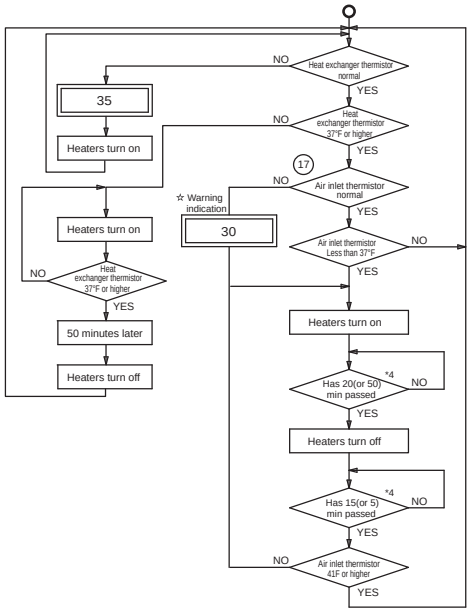
*3 When the present fan speed is 500rpm more or less than target speed.

Shutdown procedure



Freeze prevention control

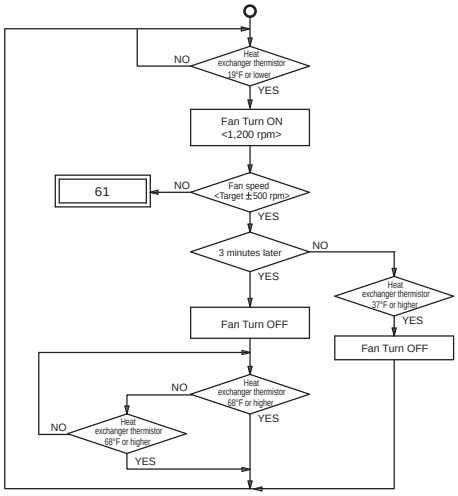
Anti-frost heater operation flow



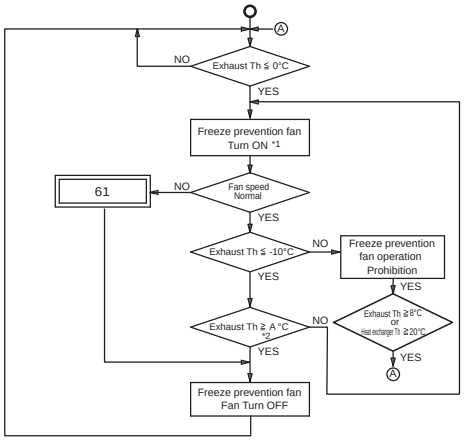
*4 When less than 60 minutes after combustion, it is 50°F or higher.

*5 Differs depending on set temperature.

Fan operation flow (DV only)



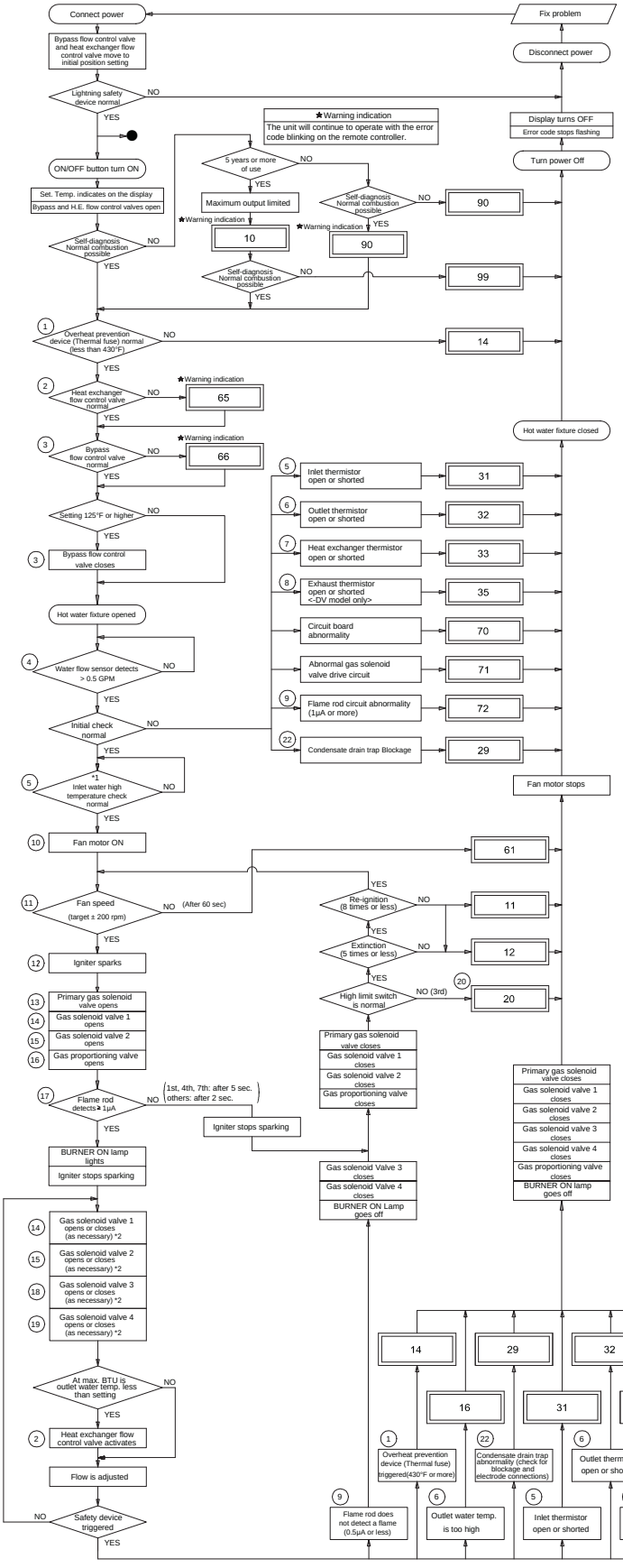
Fan operation flow (OD only)



*1 : Target number of rotations (Freeze prevention fan in operation)
F point Th ≤ 0°C : 1,000rpm
F point Th > 0°C : 2,400rpm
☆ Hysteresis
During 1,000rpm is controlled by "F point Th ≤ 0°C",
the condition for modifying into 2,400rpm is "F point Th ≥ 2°C".

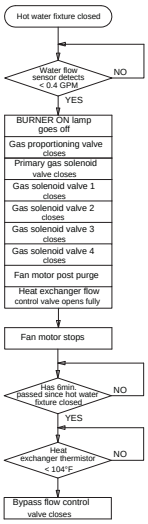
*2 : Fan stopped exhaust Th temperature A.
1,000rpm control of *1 : A = 8°C.
2,400rpm control of *1 : A = 15°C.

Water heating



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

Shutdown procedure



*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)

$$K > \frac{\text{Approx. } 29.7}{\text{Total water flow (GPM)}} + \text{water inlet temperature (°F)}$$

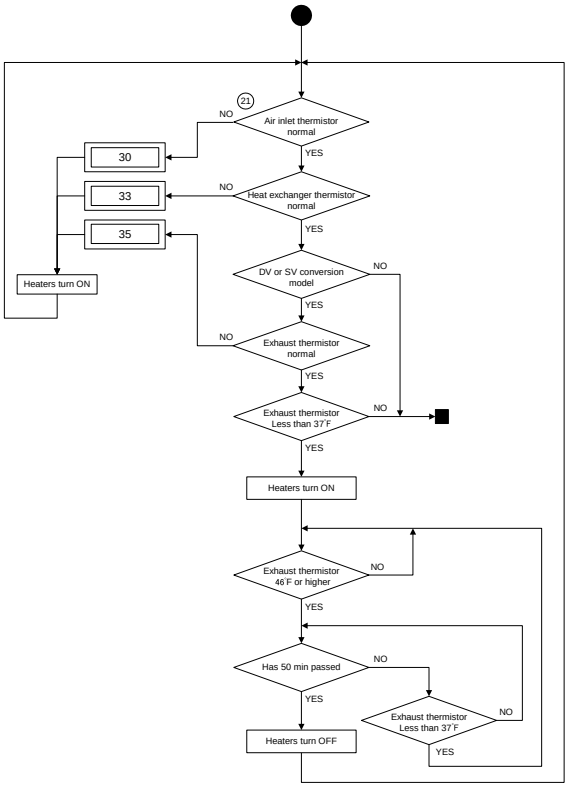
Set temperature	Less than 125°F	125°F or more
K	136°F	Set temp. + 9°F

*2

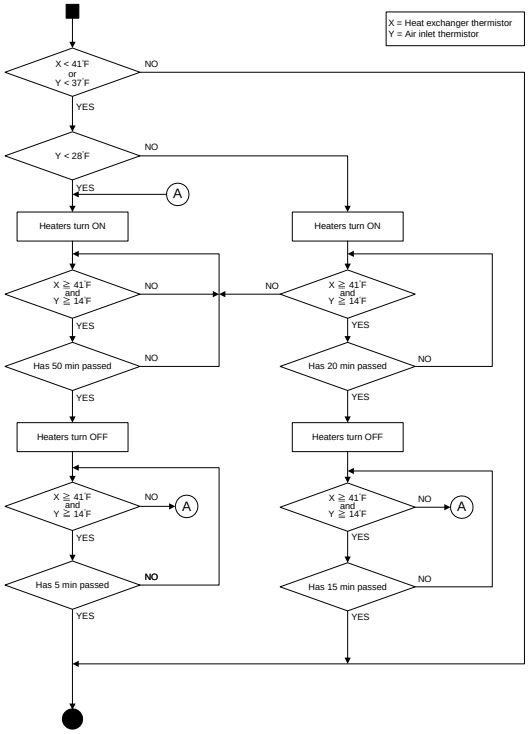
	Over 127,000 BTU	Over 76,200 BTU	Over 44,400 BTU	Over 31,750 BTU	Over 19,000 BTU	Over 16,000 BTU
Gas solenoid valve 1	ON	ON	ON	ON		ON
Gas solenoid valve 2	ON		ON	ON	ON	
Gas solenoid valve 3	ON		ON			
Gas solenoid valve 4	ON	ON				

Freeze prevention control

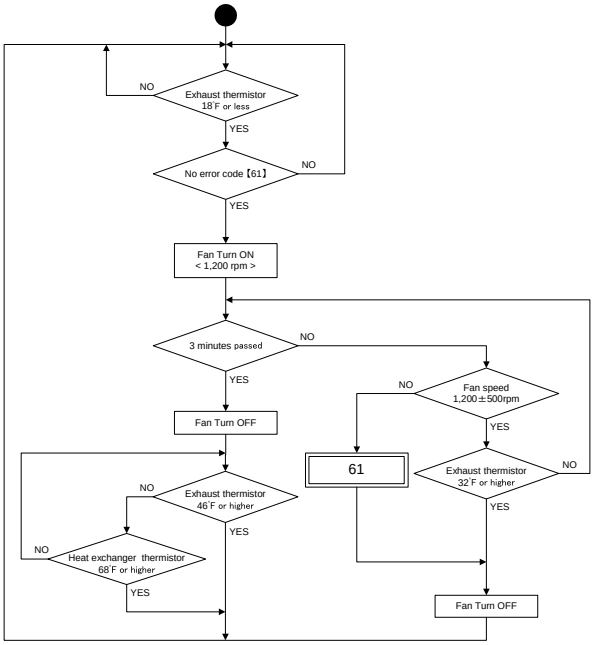
Anti-frost heater operation flow

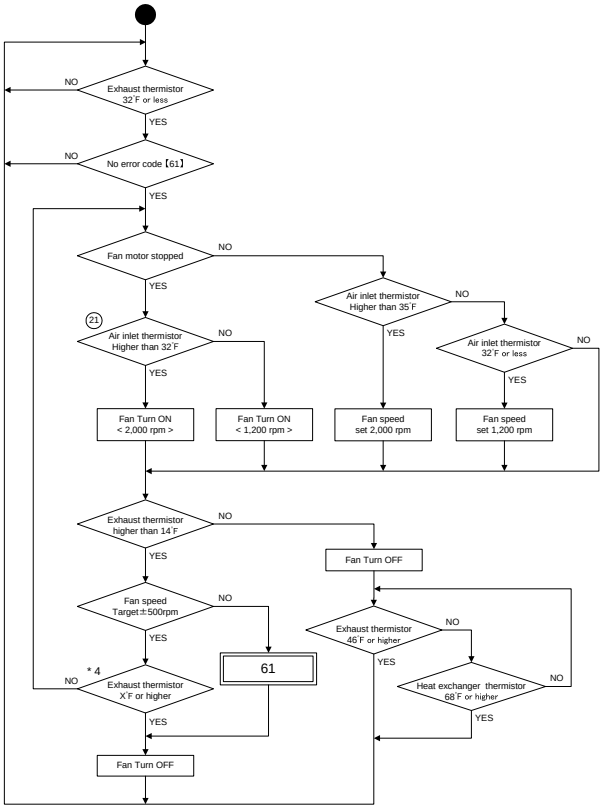


Fan motor operation flow (SV conversion)



Fan motor operation flow (DV model)

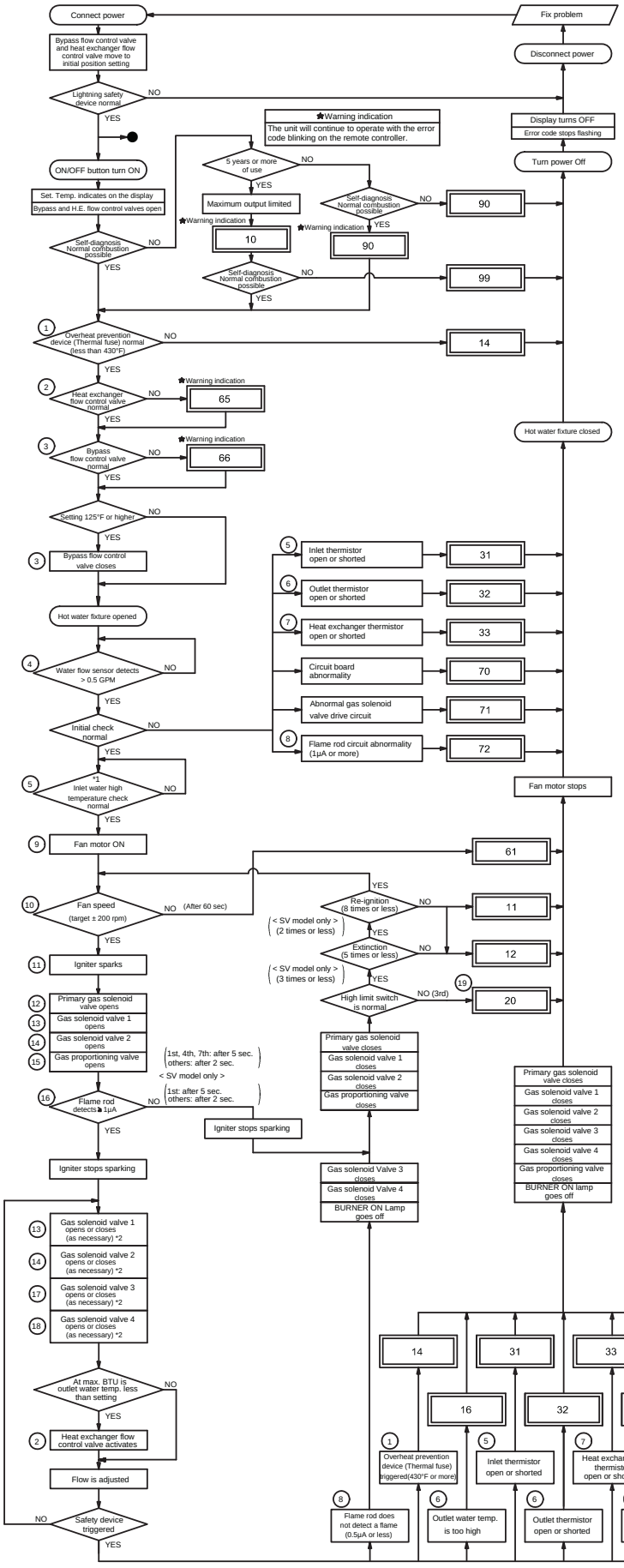




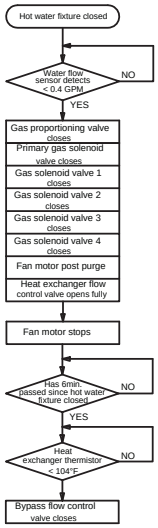
* 4 When fan speed is 1,200rpm, X = 46 ˚F.
When fan speed is 2,000rpm, X = 59 ˚F.

NC1991(-DVC,-OD), NR981(-DVC,-OD,-SV)

Water heating



Shutdown procedure



*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)

$$K > \frac{\text{Approx. } 29.7}{\text{Total water flow (GPM)}} + \text{water inlet temperature (°F)}$$

Set temperature	Less than 125°F	125°F or more
K	136°F	Set temp. + 9°F

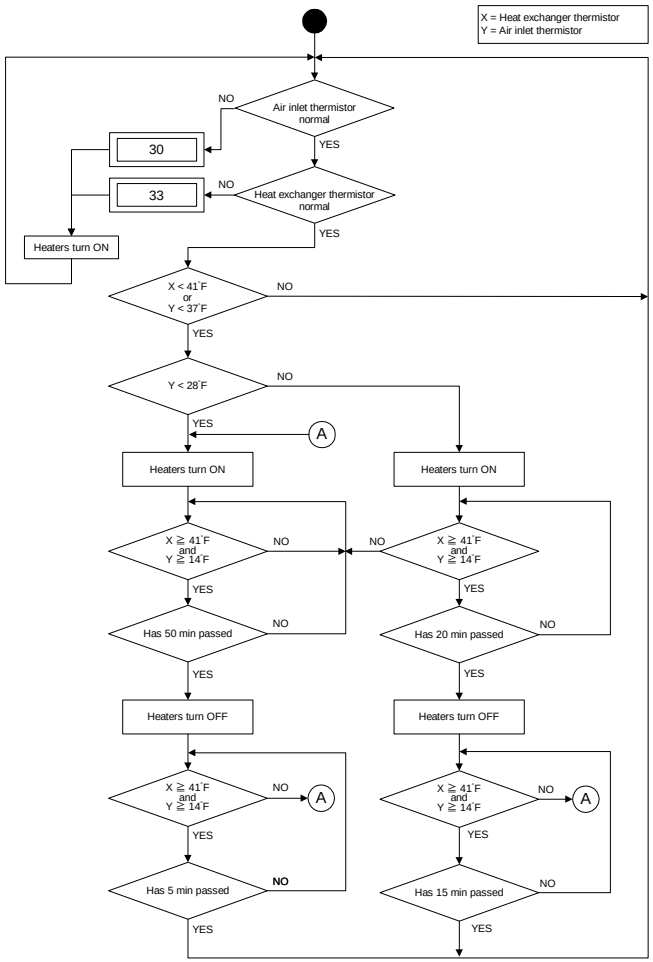
*2

	Over 127,000 BTU	Over 76,200 BTU	Over 44,400 BTU	Over 31,750 BTU	Over 19,000 BTU	Over 16,000 BTU
Gas solenoid valve 1	ON	ON	ON	ON		ON
Gas solenoid valve 2	ON		ON	ON	ON	
Gas solenoid valve 3	ON		ON			
Gas solenoid valve 4	ON	ON				

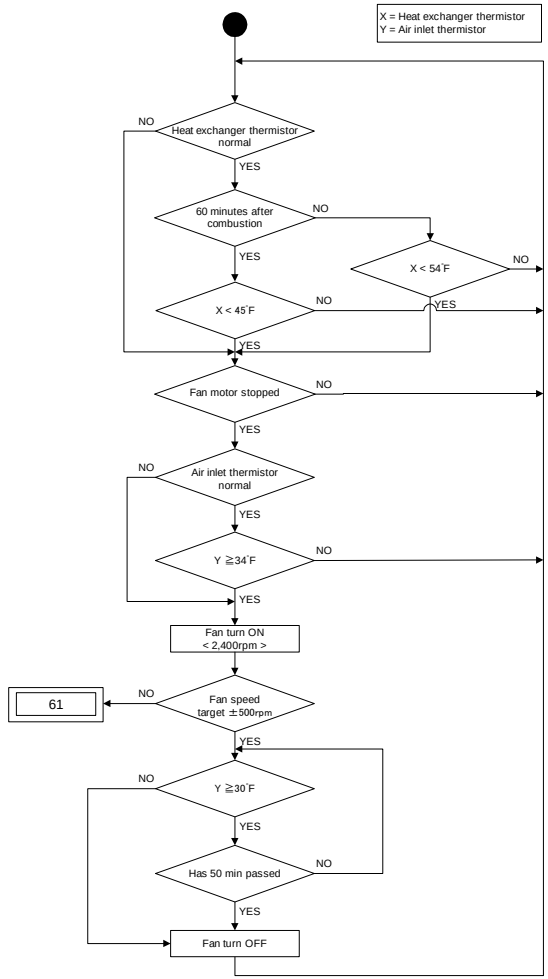
*3 When the present fan speed is 500rpm more or less than target speed.

Freeze prevention control

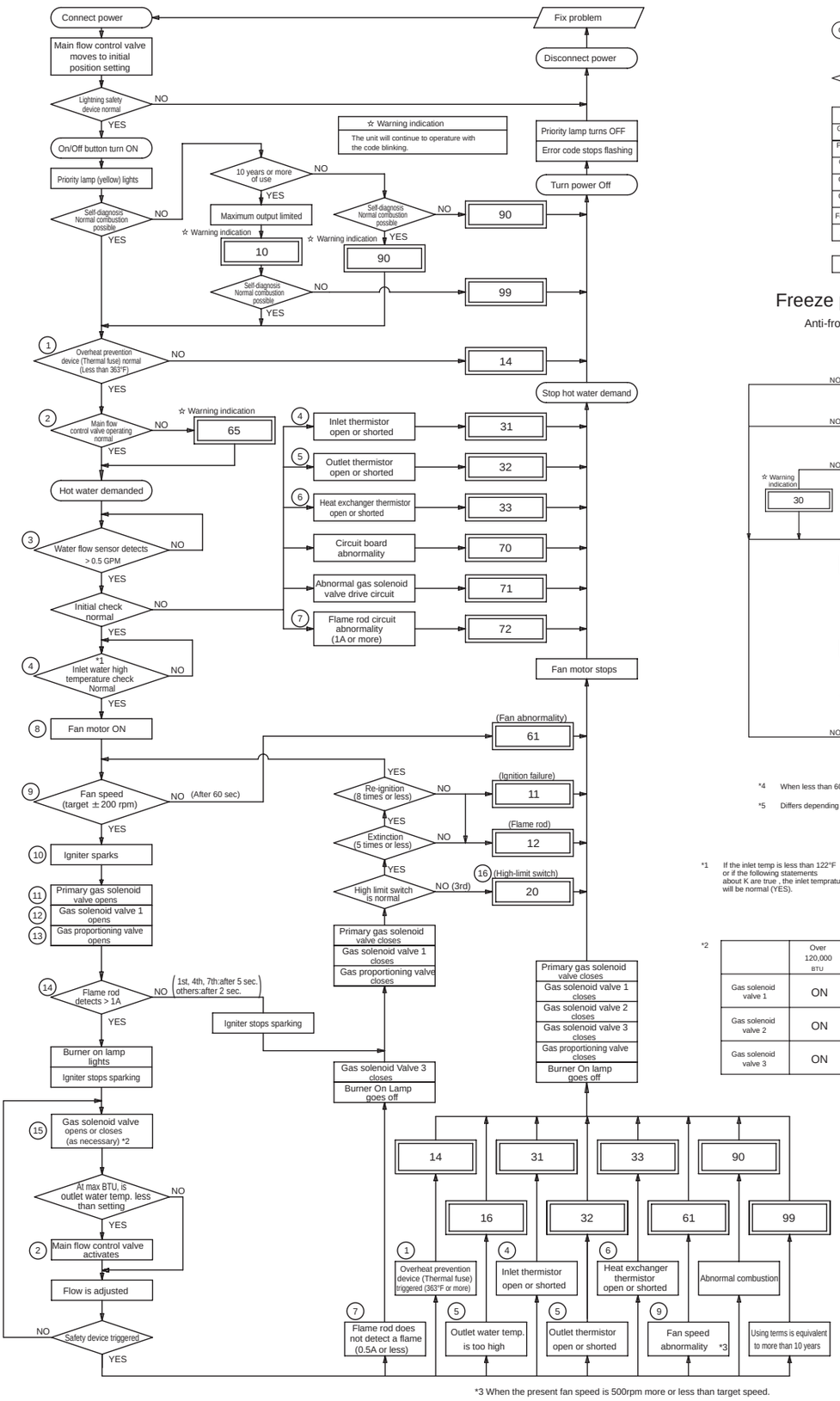
Anti-frost heater operation flow



Fan motor operation flow (SV model)

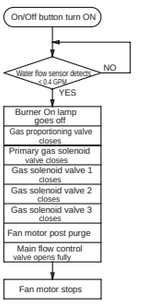


Water heating



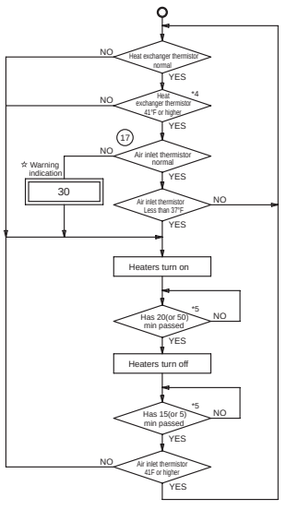
*3 When the present fan speed is 500rpm more or less than target speed.

Shutdown procedure



Freeze prevention control

Anti-frost heater operation flow



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

*5 Differs depending on set temperature.

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

$$K > \frac{\text{Approx. } 28.5}{\text{Total water flow (GPM)}} + \text{water inlet temperature (°F)}$$

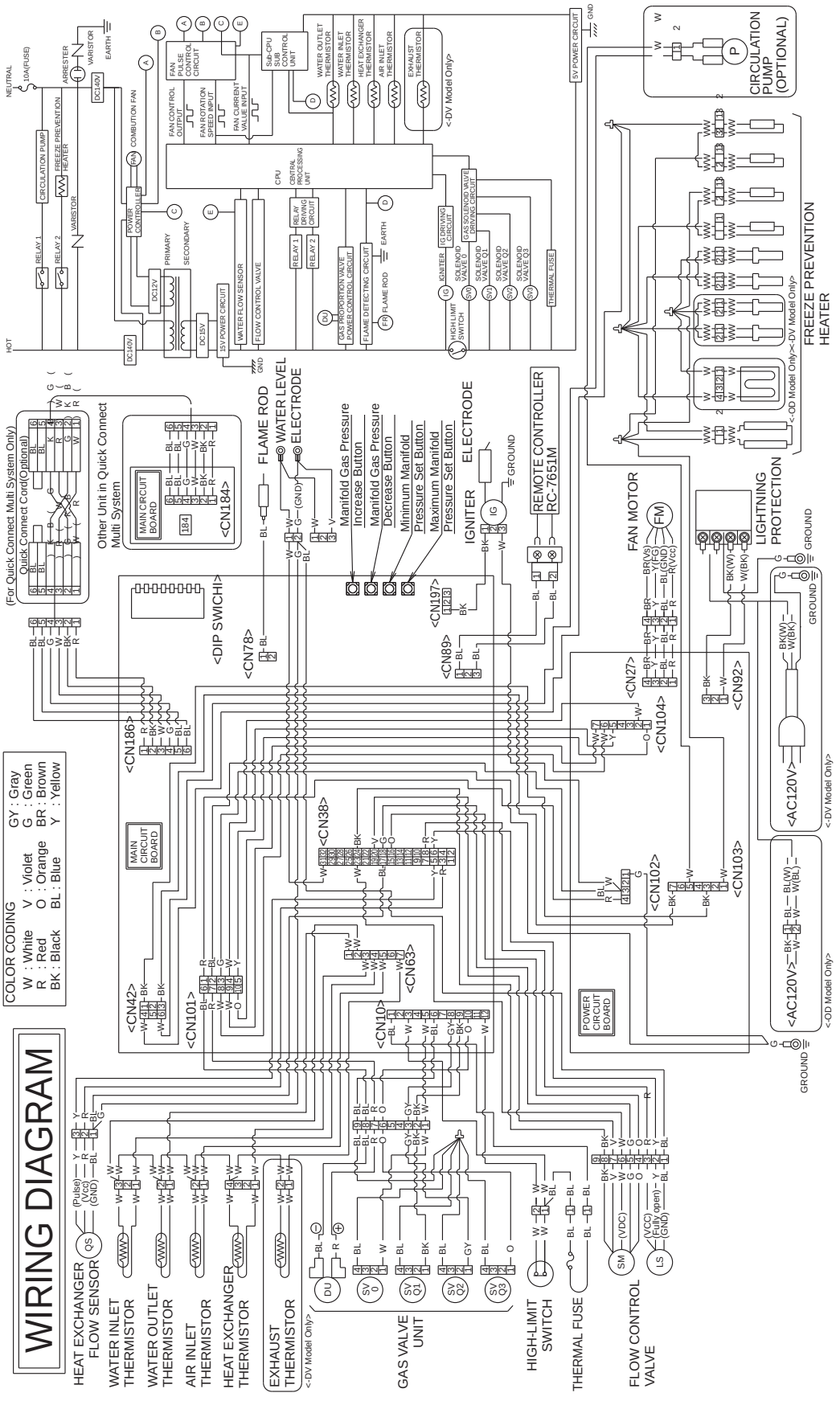
Set temperature	Less than 122°F	122°F or more
K	136°F	Set temp +9°F

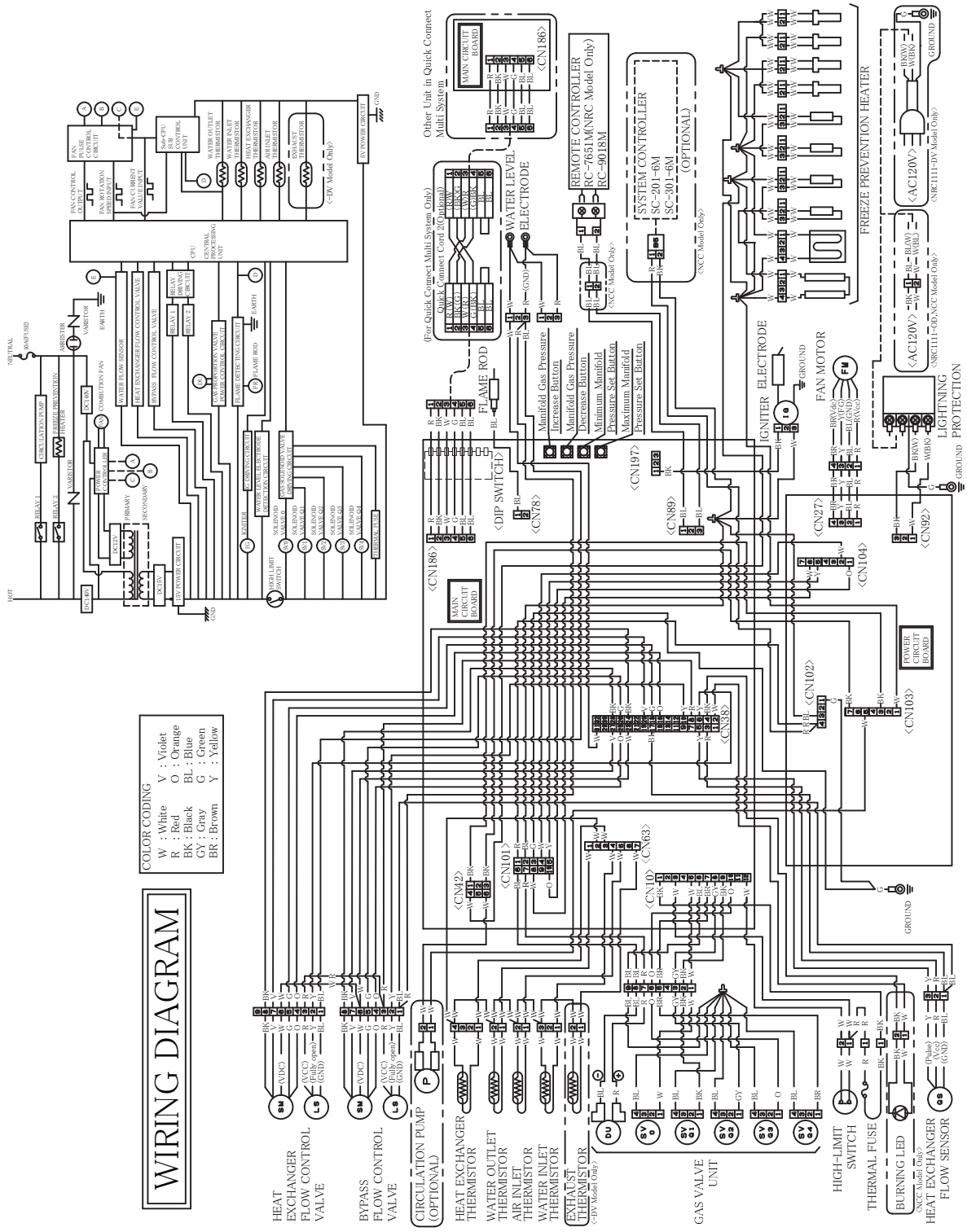
*2

	Over 120,000 BTU	Over 75,000 BTU	Over 45,000 BTU	Over 28,000 BTU	Over 18,000 BTU
Gas solenoid valve 1	ON	ON	ON		ON
Gas solenoid valve 2	ON		ON	ON	
Gas solenoid valve 3	ON	ON			

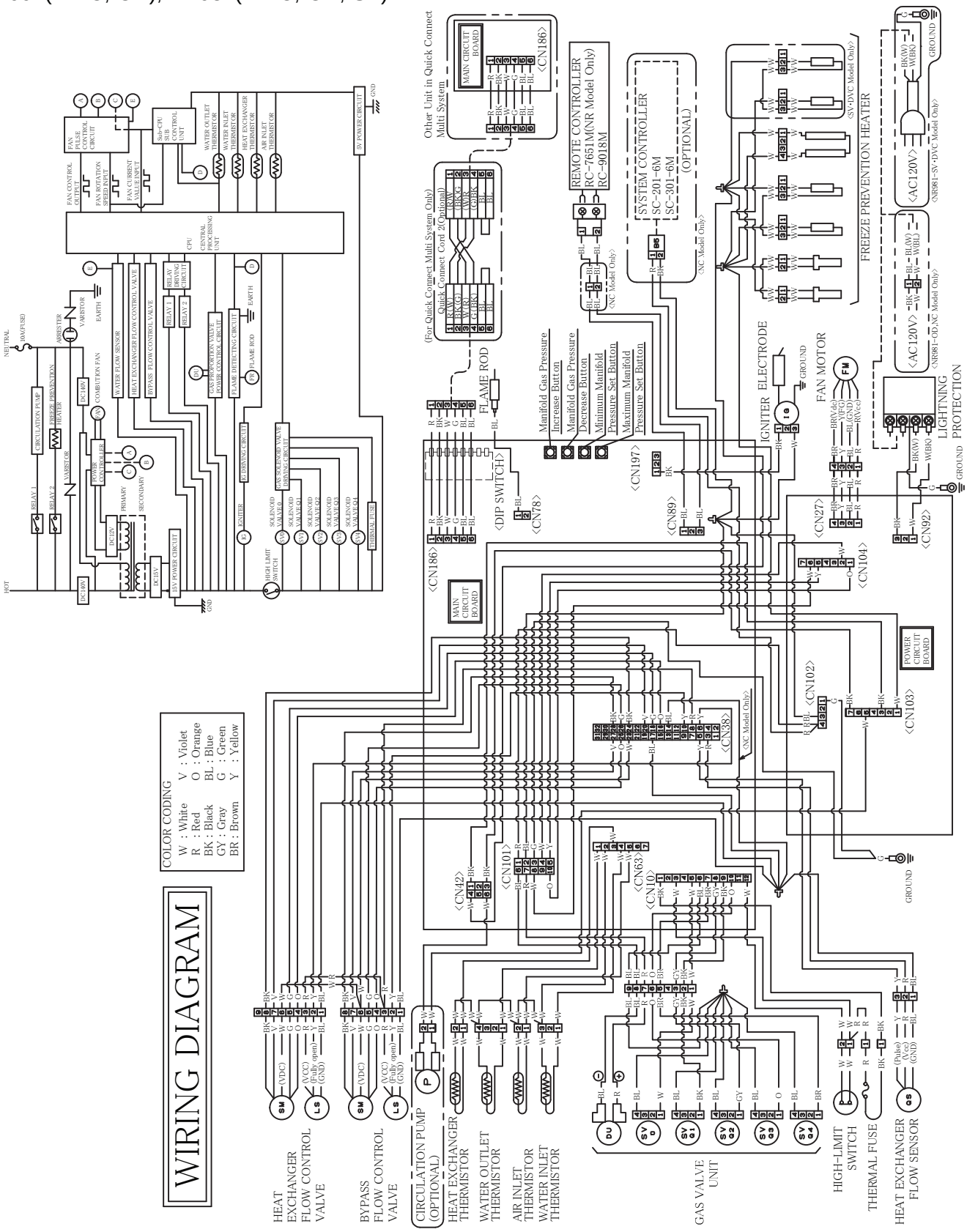
7. Wiring Diagram

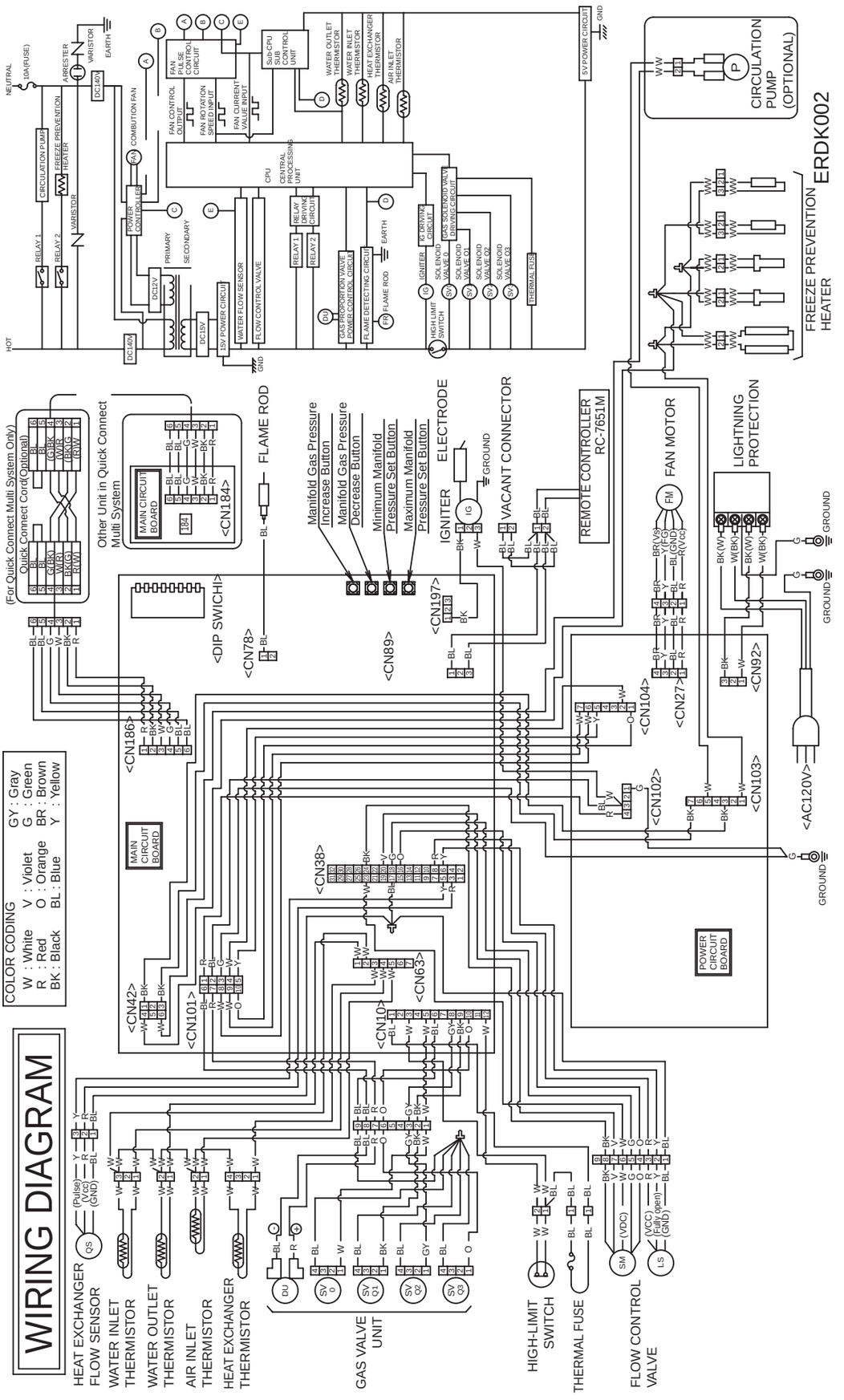
NRC98(-DV,-OD), NRC83(-DV,-OD)




WIRING DIAGRAM
COLOR CODING
W : White
R : Red
BK : Black
GY : Gray
BR : Brown
V : Violet
O : Orange
BL : Blue
G : Green
Y : Yellow
HEAT EXCHANGER FLOW CONTROL VALVE
BYPASS FLOW CONTROL VALVE
CIRCULATION PUMP (OPTIONAL)
HEAT EXCHANGER THERMISTOR
WATER OUTLET THERMISTOR
AIR INLET THERMISTOR
WATER INLET THERMISTOR
EXHAUST THERMISTOR
<DV Model Only>
GAS VALVE UNIT
HIGH-LIMIT SWITCH
THERMAL FUSE
BURNING LED
<NCC Model Only>
HEAT EXCHANGER FLOW SENSOR
Other Unit in Quick Connect Multi System
MAIN CIRCUIT BOARD
<CN186>
REMOTE CONTROLLER
RC-7651M(NRC Model Only)
RC-9018M
SYSTEM CONTROLLER
SC-201-6M
SC-301-6M
(OPTIONAL)
<NCC Model Only>
(For Quick Connect Multi System Only)
Quick Connect Cord 2(Optional)
WATER LEVEL ELECTRODE
FLAME ROD
<DIP SWITCH>
<CN78>
Manifold Gas Pressure Increase Button
Manifold Gas Pressure Decrease Button
Minimum Manifold Pressure Set Button
Maximum Manifold Pressure Set Button
<CN197>
<CN89>
IGNITER ELECTRODE
FAN MOTOR
<CN27>
<CN104>
<CN102>
<CN103>
<CN92>
POWER CIRCUIT BOARD
FREEZE PREVENTION HEATER
<AC120V>
<NRC1111-DV Model Only>
<AC120V>
<NRC1111-OD,NCC Model Only>
LIGHTNING PROTECTION
GROUND
<CN42>
<CN101>
<CN63>
<CN10>
<CN38>

NC1991(-DVC,-OD), NR981(-DVC,-OD,-SV)




WIRING DIAGRAM
ERDK002
COLOR CODING
W : White
R : Red
BK : Black
V : Violet
O : Orange
BL : Blue
GY : Gray
G : Green
BR : Brown
Y : Yellow
HEAT EXCHANGER FLOW SENSOR
WATER INLET THERMISTOR
WATER OUTLET THERMISTOR
AIR INLET THERMISTOR
HEAT EXCHANGER THERMISTOR
GAS VALVE UNIT
HIGH-LIMIT SWITCH
THERMAL FUSE
FLOW CONTROL VALVE
FLAME ROD
IGNITER ELECTRODE
VACANT CONNECTOR
REMOTE CONTROLLER RC-7651M
FAN MOTOR
LIGHTNING PROTECTION
CIRCULATION PUMP (OPTIONAL)
FREEZE PREVENTION HEATER
Other Unit in Quick Connect Multi System
(For Quick Connect Multi System Only) Quick Connect Cord(Optional)
Manifold Gas Pressure Increase Button
Manifold Gas Pressure Decrease Button
Minimum Manifold Pressure Set Button
Maximum Manifold Pressure Set Button
MAIN CIRCUIT BOARD
POWER CIRCUIT BOARD
<DIP SWICH>
<AC120V>
GROUND

8. Troubleshooting

<NRC98(-DV,-OD), NRC83(-DV,-OD)>

■ Error Codes and Checkpoints

Display	Description	Diagnosis Point (Trouble Point)	Remarks
(F) 05	Service reminder	The predetermined service period has been reached. Flush the heat exchanger and/or service the water treatment device.	To reset this error code, refer to the "Water Treatment" section.
(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 (12). Check gas solenoid valves (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) 29	Condensate trap clogging	Check if the drain line is clogged or frozen (4).	
(F) 30	Air inlet thermistor abnormality	Measure the resistance through the air inlet thermistor (17). 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) 35	Exhaust thermistor abnormality	Measure the resistance through the exhaust thermistor (8). Check for an open or short circuit. Check for improper connection of exhaust thermistor.	
(F) 51	Failure of gas solenoid valve (other than drive circuit)	Check for proper connection of the gas solenoid valves. Check for damage to the gas solenoid valve connections.	
(F) 61	Fan motor abnormality	Check that the fan is rotating and check the pulse frequency from the fan rotational frequency sensor (10 11). 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) 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 (9). Check for a ground fault.	
(F) 73	Circuit board setting abnormality (Dip switch setting, etc.)	Check for proper setting of maintenance writers on circuit board. Check the circuit board (microcomputer) for damage. Check the dip switch settings. (ex.high elevation, vent length, etc.). Note 1)	To reset this error code, the power needs to be disconnected and then reconnected.
F76	Multi-system communication error	Check for proper connection of quick connect cord. 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)	
(F) 90	Combustion abnormality (Warning indication)	Check for abnormal combustion. Check flue and air inlet 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) 91	Improper gas type	Check gas type	To reset this error code, the power needs to be disconnected and then reconnected.
(F) 94	Exhaust temperature is too high	Check for abnormal combustion (8).	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.

<NCC1991(-DV,-OD), NRC1111(-DV,-OD)>

■ Error Codes and Checkpoints

	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 (12). Check gas solenoid valves (13, 14, 15, 16). Check flame rod (17). 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 (17). 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 (16).	
(F) 20	High limit switch triggered	Check if high limit switch is triggered (20). Check for improper connection of high limit switch.	To reset this error code, the power needs to be disconnected and then reconnected.
(F) 29	Condensate drain trap abnormality	Check for Condensate Drain trap blockage (22). Check for drain pipe blockage. Check for improper connection of water level electrode.	Note 2)
(F) 30	Air inlet thermistor abnormality	Measure the resistance through the air inlet thermistor (21). 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) 35	Exhaust thermistor abnormality	Measure the resistance through the exhaust thermistor (8). Check for an open or short circuit. Check for improper connection of exhaust thermistor.	-DV model only
(F) 51	Failure of gas solenoid valve (other than drive circuit)	Check for proper connection of the gas solenoid valves. Check for damage to the gas solenoid valve connections.	Note 1)
(F) 61	Fan motor abnormality	Check that the fan is rotating and check the pulse frequency from the fan rotational frequency sensor (10, 11). Check for improper connection of the fan. Check voltage from circuit board.	
(F) 65	Heat exchanger 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 (9). Check for a ground fault.	
(F) 73	Circuit board setting abnormality (Dip switch, Hard dip switches, etc)	Check for proper setting of maintenance writers on circuit board. Check the circuit board (microcomputer) for damage. Check the Dip switch. Check the Hard dip switches(located on circuit board).	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)	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) 91	Improper gas type	Check gas type.	To reset this error code, the power needs to be disconnected and then reconnected. Note 1)
(F) 94	Exhaust temperature is too high	Check for abnormal combustion (8).	-DV model only 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.

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 "001", the condition of the electrode is abnormal.

<NC1991(-DVC,-OD), NR981(-DVC,-OD,-SV)>

■ Error Codes and Checkpoints

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 (12). Check gas solenoid valves (13, 14, 15, 16). Check flame rod (17). 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 (17). 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 (16).	
(F) 20	High limit switch triggered	Check if high limit switch is triggered (20). Check for improper connection of high limit switch.	To reset this error code, the power needs to be disconnected and then reconnected.
(F) 30	Air inlet thermistor abnormality	Measure the resistance through the air inlet thermistor (21). 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) 51	Failure of gas solenoid valve (other than drive circuit)	Check for proper connection of the gas solenoid valves. Check for damage to the gas solenoid valve connections.	Note 1)
(F) 61	Fan motor abnormality	Check that the fan is rotating and check the pulse frequency from the fan rotational frequency sensor (10, 11). Check for improper connection of the fan. Check voltage from circuit board.	
(F) 65	Heat exchanger 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 (9). Check for a ground fault.	
(F) 73	Circuit board setting abnormality (Dip switch, Hard dip switches, etc)	Check for proper setting of maintenance writers on circuit board. Check the circuit board (microcomputer) for damage. Check the Dip switch. Check the Hard dip switches(located on circuit board).	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)	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) 91	Improper gas type	Check gas type.	To reset this error code, the power needs to be disconnected and then reconnected. Note 1)
(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.

<NR83-DVC>

Display	Description	Diagnosis Point (Trouble Point)	Remarks
(F) 05	Service reminder	The predetermined service period has been reached. Flush the heat exchanger and/or service the water treatment device.	To reset this error code, refer to the "Water Treatment" section.
(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 (10). Check gas solenoid valves (11, 12, 13). Check flame rod (14). 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 (14). 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 (5). Check for proportional gas valve trouble (13).	
(F) 20	High limit switch triggered	Check if high limit switch is triggered (16). Check for improper connection of high limit switch.	To reset this error code, the power needs to be disconnected and then reconnected.
(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 (4). 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 (5). 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 (6). Check for an open or short circuit. Check for improper connection of heat exchanger thermistor.	
(F) 51	Failure of gas solenoid valve (other than drive circuit)	Check for proper connection of the gas solenoid valves. Check for damage to the gas solenoid valve connections.	
(F) 61	Fan motor abnormality	Check that the fan is rotating and check the pulse frequency from the fan rotational frequency sensor (8 , 9). 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) 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 (7). Check for a ground fault.	
(F) 73	Circuit board setting abnormality (Dip switch setting, etc.)	Check for proper setting of maintenance writers on circuit board. Check the circuit board (microcomputer) for damage. Check the dip switch settings. (ex.high elevation, vent length, etc.). Note 1)	To reset this error code, the power needs to be disconnected and then reconnected.
F76	Multi-system communication error	Check for proper connection of quick connect cord. 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)	
(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.

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)	CN10	3	W - BL	CN10	1	2Ω or less	
2	Flow Control Valve	CN38	23	BL - O	CN38	16	DC 1 - 16 V	
			23	BL - G		18	DC 1 - 16 V	
			23	BL - V		20	DC 1 - 16 V	
			23	BL - BK		24	DC 1 - 16 V	
			6	Y - BL		17	DC 1V or less	When valve is fully open
3	Water Flow Sensor	CN38	3	R - BL	CN38	17	DC 14 - 16 V	
			5	Y - BL		17	DC 0.5 - 15 V over 408 pulses/min. (over 6.8Hz)	Y (+) BL (-)
4	Water Inlet Thermistor	CN63	4	W - W	CN63	2	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
5	Water Outlet Thermistor	CN63	1	W - W	CN63	2	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
6	Heat Exchanger Thermistor	CN63	3	W - W	CN63	2	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
7	Flame Rod	CN78	1	BL - Burnercase	-	GND	10 kHz - 100 kHz	
			1	BL - Electrode		Flame Rod	DC 0.45μA or less	When no flame is detected
8	Fan Motor	CN27	4	BR - BL	CN27	2	DC 7 - 45 V	
9	Fan Motor	CN27	1	R - BL	CN27	2	DC 10 - 14 V	
			3	Y - BL		2	100 Hz - 400 Hz	
10	Igniter	CN197	1	BK - W	CN102	3	DC 16 - 14 V	When igniter is sparking
11	Primary Gas Solenoid Valve	CN10	5	W - BL	CN10	6	DC 14 - 16 V	When valve is open
							19 - 31 Ω	Coil resistance
12	Gas Solenoid Valve - 1	CN10	9	BK - BL	CN10	6	DC 14 - 16 V	When valve is open
							36 - 58 Ω	Coil resistance
13	Gas Solenoid Valve - 2	CN10	8	GY - BL	CN10	6	DC 14 - 16 V	When valve is open
							36 - 58 Ω	Coil resistance
14	Gas Proportioning Valve	CN101	6	BL - R	CN101	7	DC 0.3 - 15 V	
							50 - 80 Ω	Coil resistance
15	Gas Solenoid Valve - 3	CN10	10	O - BL	CN10	6	DC 14 - 16 V	When valve is open
							36 - 58 Ω	Coil resistance
16	High Limit Switch	CN10	12	BK - W	CN1	3	1Ω or less	Contact resistance
17	Air Inlet Thermistor	CN63	5	W - W	CN63	2	DC 0.7 - 4.4 V	Note 2)
-	Exhaust Thermistor	CN63	7	W - W	CN63	2		Note 3)
-	Power Supply (Power Circuit Board)	CN92	1	W - BK	CN92	3	AC 108 - 132 V	
-	Power Supply (Power Circuit Board)	C102	4	R - BL	C102	6	DC 14 - 16 V	
-	Remote Controller	CN89	1	BL - BL	CN89	3	DC 14 - 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

Note 3) •Exhaust Thermistor Temperature Characteristics

Temperature (°F)	-4	14	32	50	68	86
Temperature (°C)	-20	-10	0	10	20	30
Resistance (kΩ)	487	296	162	98.3	61.4	39.5
Voltage (V)	4.6	4.3	3.9	3.4	2.8	2.3

<NCC1991(-DV,-OD), NRC1111(-DV,-OD)>

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)	CN10	3	W - BK	1	CN10	2 or less	
2	Heat Exchanger Flow Control Valve	CN38	23	W - O	16	CN38	DC 1 - 16 V	
			23	W - G	18		DC 1 - 16 V	
			23	W - V	20		DC 1 - 16 V	
			23	W - BK	24		DC 1 - 16 V	
			6	Y - BL	17		DC 1V or less	When valve is fully open
3	Bypass Flow Control Valve	CN38	23	W - O	25	CN38	DC 1 - 16 V	
			23	W - G	26		DC 1 - 16 V	
			23	W - V	27		DC 1 - 16 V	
			23	W - BK	28		DC 1 - 16 V	
			10	Y - BL	17		DC 1V or less	When valve is fully open
4	Water Flow Sensor	CN38	3	R - BL	17	CN38	DC 14 - 16 V	
			5	Y - BL	17		DC 0.5 - 15 V over 408 pulses/min. (over 6.8Hz)	Y (+) BL (-)
5	Water Inlet Thermistor	CN63	4	W - W	2	CN63	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
6	Water Outlet Thermistor	CN63	1	W - W	2	CN63	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
7	Heat Exchanger Thermistor	CN63	3	W - W	2	CN63	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
8	Exhaust Thermistor <-DV Model Only>	CN63	7	W - W	2	CN63	Note 2)	Note 2)
9	Flame Rod	CN78	1	BL - Burnercase	GND	-	10 kHz - 100 kHz	
			1	BL - Electrode	Flame Rod	-	DC 0.45µ A or less	When no flame is detected
10	Fan Motor	CN27	4	BR - BL	2	CN27	DC 7 - 45 V	
11	Fan Motor	CN27	1	R - BL	2	CN27	DC 10 - 14 V	
			3	Y - BL	2		100 Hz - 400 Hz	4 pulse/revolution
12	Igniter	CN197	1	BK - BL	3	CN102	DC 14 - 16 V	When igniter is sparking
13	Primary Gas Solenoid Valve	CN10	5	W - BL	6	CN10	DC 14 - 16 V	When valve is open
							19 - 31	Coil resistance
14	Gas Solenoid Valve - 1	CN10	9	BK - BL	6	CN10	DC 14 - 16 V	When valve is open
							36 - 58	Coil resistance
15	Gas Solenoid Valve - 2	CN10	8	GY - BL	6	CN10	DC 14 - 16 V	When valve is open
							36 - 58	Coil resistance
16	Gas Proportioning Valve	CN101	7	R - BL	6	CN101	DC 0.3 - 15 V	
							50 - 80	Coil resistance
17	Flame Rod	CN78	1	BL - Burnercase	GND	-	10 kHz - 100 kHz	
			1	BL - Electrode	Flame Rod	-	DC 1µ A or more	At flame detection
18	Gas Solenoid Valve - 3	CN10	10	O - BL	6	CN10	DC 14 - 16 V	When valve is open
							36 - 58	Coil resistance
19	Gas Solenoid Valve - 4	CN10	7	BR - BL	6	CN10	DC 14 - 16 V	When valve is open
							36 - 58	Coil resistance
20	High Limit Switch	CN10	3	W - W	12	CN10	1 or less	Contact resistance
21	Air Inlet Thermistor	CN63	5	W - W	2	CN63	DC 0.7 - 4.4 V	Note 3)
22	Water Level Electrode	CN38	31	W - BL	17	CN38	DC 14 - 16 V	Note 4)
-	Power Supply (Power Circuit Board)	CN92	1	W - BK	3	CN92	AC 108 - 132 V	
-	Power Supply (Main Circuit Board)	C102	4	R - BL	3	C102	DC 14 - 16 V	
-	Remote Controller	CN89	1	BL - BL	3	CN89	DC 14 - 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)	23.7	15.5	10.3	7.0	4.9	3.5	2.5	1.9	1.4

Note 2) •Exhaust Thermistor Temperature Characteristics

Temperature (°F)	-4	14	32	50	68	86
Temperature (°C)	-20	-10	0	10	20	30
Resistance (k)	487	296	162	98.3	61.4	39.5
Voltage (V)	4.6	4.3	3.9	3.4	2.8	2.3

Note 3) •Air Inlet Thermistor Temperature Characteristics

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

Note 4) The ON/OFF condition of 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 "001", the condition of the electrode is abnormal.

<NC1991(-DVC,-OD), NR981(-DVC,-OD,-SV)>

■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)	CN10	3	W - BK	1	CN10	2 Ω or less	
2	Heat Exchanger Flow Control Valve	CN38	23	W - O	16	CN38	DC 1 - 16 V	
			23	W - G	18		DC 1 - 16 V	
			23	W - V	20		DC 1 - 16 V	
			23	W - BK	24		DC 1 - 16 V	
			6	Y - BL	17		DC 1V or less	When valve is fully open
3	Bypass Flow Control Valve	CN38	23	W - O	25	CN38	DC 1 - 16 V	
			23	W - G	26		DC 1 - 16 V	
			23	W - V	27		DC 1 - 16 V	
			23	W - BK	28		DC 1 - 16 V	
			10	Y - BL	17		DC 1V or less	When valve is fully open
4	Water Flow Sensor	CN38	3	R - BL	17	CN38	DC 14 - 16 V	
			5	Y - BL	17		DC 0.5 - 15 V over 408 pulses/min. (over 6.8Hz)	Y (+) BL (-)
5	Water Inlet Thermistor	CN63	4	W - W	2	CN63	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
6	Water Outlet Thermistor	CN63	1	W - W	2	CN63	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
7	Heat Exchanger Thermistor	CN63	3	W - W	2	CN63	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
8	Flame Rod	CN78	1	BL - Burnercase	GND	-	10 kHz - 100 kHz	
			1	BL - Electrode	Flame Rod	-	DC 0.45 μA or less	When no flame is detected
9	Fan Motor	CN27	4	BR - BL	2	CN27	DC 7 - 45 V	
10	Fan Motor	CN27	1	R - BL	2	CN27	DC 10 - 14 V	
			3	Y - BL	2		100 Hz - 400 Hz	4 pulse/revolution
11	Igniter	CN197	1	BK - BL	3	CN102	DC 14 - 16 V	When igniter is sparking
12	Primary Gas Solenoid Valve	CN10	5	W - BL	6	CN10	DC 14 - 16 V	When valve is open
							19 - 31 Ω	Coil resistance
13	Gas Solenoid Valve - 1	CN10	9	BK - BL	6	CN10	DC 14 - 16 V	When valve is open
							36 - 58 Ω	Coil resistance
14	Gas Solenoid Valve - 2	CN10	8	GY - BL	6	CN10	DC 14 - 16 V	When valve is open
							36 - 58 Ω	Coil resistance
15	Gas Proportioning Valve	CN101	7	R - BL	6	CN101	DC 0.3 - 15 V	
							50 - 80 Ω	Coil resistance
16	Flame Rod	CN78	1	BL - Burnercase	GND	-	10 kHz - 100 kHz	
			1	BL - Electrode	Flame Rod	-	DC 1 μA or more	At flame detection
17	Gas Solenoid Valve - 3	CN10	10	O - BL	6	CN10	DC 14 - 16 V	When valve is open
							36 - 58 Ω	Coil resistance
18	Gas Solenoid Valve - 4	CN10	7	BR - BL	6	CN10	DC 14 - 16 V	When valve is open
							36 - 58 Ω	Coil resistance
19	High Limit Switch	CN10	3	W - W	12	CN10	1 Ω or less	Contact resistance
20	Air Inlet Thermistor	CN63	5	W - W	2	CN63	DC 0.7 - 4.4 V	Note 2)
-	Power Supply (Power Circuit Board)	CN92	1	W - BK	3	CN92	AC 108 - 132 V	
-	Power Supply (Main Circuit Board)	C102	4	R - BL	3	C102	DC 14 - 16 V	
-	Remote Controller	CN89	1	BL - BL	3	CN89	DC 14 - 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

<NR83-DVC>

Ref. No.	Part	Circuit board Check points					Normal value	Remarks
		CN & Pin No.		Wire color	CN & Pin No.			
1	Overheat Prevention Device (Thermal Fuse)	CN10	3	W - BL	CN10	1	2Ω or less	
2	Flow Control Valve	CN38	23	BL - O	CN38	16	DC 1 - 16 V	
			23	BL - G		18	DC 1 - 16 V	
			23	BL - V		20	DC 1 - 16 V	
			23	BL - BK		24	DC 1 - 16 V	
			6	Y - BL		17	DC 1V or less	When valve is fully open
3	Water Flow Sensor	CN38	3	R - BL	CN38	17	DC 14 - 16 V	
			5	Y - BL		17	DC 0.5 - 15 V over 408 pulses/min. (over 6.8Hz)	Y (+) BL (-)
4	Water Inlet Thermistor	CN63	4	W - W	CN63	2	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
5	Water Outlet Thermistor	CN63	1	W - W	CN63	2	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
6	Heat Exchanger Thermistor	CN63	3	W - W	CN63	2	DC 1 - 4.5 V	32 - 212°F 0 - 100°C Note 1)
7	Flame Rod	CN78	1	BL - Burnercase	-	GND	10 kHz - 100 kHz	
			1	BL - Electrode		Flame Rod	DC 0.45μA or less	When no flame is detected
8	Fan Motor	CN27	4	BR - BL	CN27	2	DC 7 - 45 V	
9	Fan Motor	CN27	1	R - BL	CN27	2	DC 10 - 14 V	
			3	Y - BL		2	100 Hz - 400 Hz	
10	Igniter	CN197	1	BK - W	CN102	3	DC 16 - 14 V	When igniter is sparking
11	Primary Gas Solenoid Valve	CN10	5	W - BL	CN10	6	DC 14 - 16 V	When valve is open
							Undecided	Coil resistance
12	Gas Solenoid Valve - 1	CN10	9	BK - BL	CN10	6	DC 14 - 16 V	When valve is open
							Undecided	Coil resistance
13	Gas Solenoid Valve - 2	CN10	8	GY - BL	CN10	6	Undecided	When valve is open
							Undecided	Coil resistance
14	Gas Proportioning Valve	CN101	6	BL - R	CN101	7	DC 0.3 - 15 V	
							50 - 90 Ω	Coil resistance
15	Gas Solenoid Valve - 3	CN10	10	O - BL	CN10	6	DC 14 - 16 V	When valve is open
							Undecided	Coil resistance
16	High Limit Switch	CN10	12	BK - W	CN1	3	1Ω or less	Contact resistance
17	Air Inlet Thermistor	CN63	5	W - W	CN63	2	DC 0.7 - 4.4 V	Note 2)
-	Power Supply (Power Circuit Board)	CN92	1	W - BK	CN92	3	AC 108 - 132 V	
-	Power Supply (Power Circuit Board)	C102	4	R - BL	C102	6	DC 14 - 16 V	
-	Remote Controller	CN89	1	BL - BL	CN89	3	DC 14 - 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

<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 ouput line form the power (source circuit board.)	CN-102	3	BL-R	4	DC13 – 16V	If there is AC 120V 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	3	BL-R	4	DC13 – 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. & Code Color.			Normal Value	How to Fix Problem and Reset Unit
10	Combusiton Abnormality (Unit continues burning with error code flashing and drop in heat output)	Check for abnormal combustion. Check flue and air inlet 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-10	3	W-BL	1	2Ω or less	If the overheat prevention device (Thermal fuse) has fused, it has been exposed to temperatures in excess of 363F. 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.
		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.
90	Combustion Abnormality	Check for abnormal combustion. Check flue and air inlet 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.
	Combustion Abnormality (Warning Indication) (Unit Shuts Off)							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.
99	Combustion Abnormality (Unit Shuts Off)	Check for abnormal combustion. Check flue and air inlet 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. & Code Color.			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 > 28.5/Flow Rate (GPM) + inlet water temp (°F), where K = 136°F for 127°F or lower temperature setting, K= Set 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-10	12	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-63	4	W-W	2	DC1 – 4.5V	Compare to temperature characteristic list on pg. 17. 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	2	DC1 – 4.5V	Compare to temperature characteristic list on pg. 17. 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 pg. 17. Check for open or short circuit or for an improper connection.

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	Elect-rode	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-197, 102	1	W-BK	3	DC12.75V – 16.5V	Replace Igniter
		Check primary gas solenoid valve	CN-10	5	W-BL	6	DC14V – 16V	Gas Solenoid Valve typical resistance: 20 Ω– 35Ω.
		Check gas solenoid valve 1		9	BK-BL	6	DC14V – 16V	Gas Solenoid Valve typical resistance: 35 Ω– 65Ω.
		Check gas proportioning valve	CN-101	6	BL-R	7	DC0.3V – 15V	Current value changes depending on the load. Proportioning value 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 the current from the flame rod		1	BL-Electrode	F-rod	DC1μA or more	
		Check for a diconnected ground from the circuit board						Check for damage or improper connection of the ground wire between the circuit board and the metal case of the unit.
	Gas Supply Pressure or Manifold Pressure Abnormality	Check gas supply and manifold pressures					See pg. 27, 28	
		Check gas proportioning valve	CN-101	6	BL-R	7	DC0.3 – 15V	Current value changes depending on the load. Proportioning value 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 the current from the flame rod		1	BL-Electrode	F-rod	DC1μA or more	
		Check for a diconnected ground from the circuit board						Check that the input is proper for the load.
	Gas Supply Pressure or Manifold Pressure Abnormality	Check gas supply and manifold pressures					See pg. 27, 28	
		Check gas proportioning valve	CN-101	6	BL-R	8	DC0.3 – 15V	Current value changes depending on the load. Proportioning value resistance: 50 Ω– 90Ω.
29	Condensate Trap Water Level Electrode Abnormality	Check maintenance monitor no. 19					OFF [000]	If no.19 is ON [111], check the following. Check for condensate trap blockage. Check for drain pipe blockage. Check for proper connection of condensate water level electrode. Check for short circuit of condensate water level electrode cord. If normal value, replace the circuit board.
35	Exhaust Thermistor Abnormality * DV only	Check the resistance through the thermistor. Check for open or short circuit,or improper connection.	CN-63	7	W-W	2		Compare to temperature characteristic list on pg. 17. Check for open or short circuit or for an improper connection.
94	Exhaust Temperature Abnormality * DV only	Check the resistance through the thermistor	CN-63	7	W-W	2		Check for heat exchanger pipe clogging. Check for heat exchanger fin blockage. Check for intake water temperature. (too high?)
		Check for abnormal combustion. Check flue and air inlet for blockage or obstruction.						

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	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	2	DC10V – 14V	
				3	Y-BL	2	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	Flow Control Valve Abnormality	Check main flow control valve. Check for improper connection of the valve.	CN-38	23	BL-O	16	DC1 – 16V	During Operation.
				23	BL-G	18	DC1 – 16V	During Operation.
				23	BL-V	20	DC1 – 16V	During Operation.
				23	BL-BK	24	DC1 – 16V	During Operation.
				6	Y-BL	17	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	2	DC1 – 4.5V	1. When 90°C or more is continuously detected for 0.3 second 2. When the setting temperature +10°C or more is continued for 25 seconds (when setting temperature is over 50°C & MOQ_ON flow rate 2.5L/min) 3. When the setting temperature +10°C or more is continued for 25 seconds (when setting temperature is over 50°C & MOQ_ON flow rate 2.0L/min) 4. When 60°C or more is continuously detected for 4 seconds (only when the setting temperature 50°C or less & moderation Dip OFF) 5. When 60°C or more is continuously detected for 25 seconds (when setting temperature is 50°C or less)
		Check gas proportioning valve.	CN-101	6	BL-R	7	DC0.3 – 15V	Check for short or open circuit or improper connection of wiring to valve.

<After Pressing the Operation Button on the Remote Controller>

1. If the Priority lamp does not come on:

Error Code	Possible Causes	Checkpoint	Circuit board Check points					Normal Value	How to Fix Problem and Reset Unit
			CN & Pin No.		Wire color	CN & Pin No.			
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 ouput line form the power (source circuit board.)	CN102	4	R - BL	3	CN102	DC14 - 16V	If there is AC 120V 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.	CN102	4	R - BL	3	CN102	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.	CN89	1	BL - BL	3	CN89	DC14 - 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	Circuit board Check points					Normal Value	How to Fix Problem and Reset Unit
			CN & Pin No.		Wire color	CN & Pin No.			
14	Overheat Prevention Device (Thermal Fuse)	Check for melting or improper connection of the overheat prevention device (Thermal fuse).	CN10	3	W - BK	1	CN10	2 or less	If the overheat prevention device (Thermal fuse) has fused, it has been exposed to temperatures in excess of 430℉. 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.	CN89	1	BL - BL	3	CN89	DC14 - 16V	If there is a voltage abnormality, replace the circuit board.
		Check remote control cord for a short or open circuit, or for a ground fault.						Closed circuit (not open or shorted)	If an open or short circuit or a ground fault exists, replace Remote Control cord.
90	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.
	Combustion Abnormality (Warning Indication) (Unit Shuts Off)								Check maintenance monitor No.49. If the fan has increased its speed by 103%, the error code will flash but combustion continues. If the fan has increased its speed by 104%, 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 (NRC series) / 5 years (NCC series), 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	Circuit board Check points					Normal Value	How to Fix Problem and Reset Unit
			CN & Pin No.		Wire color	CN & Pin No.			
No Error	Inlet Water Temperature is too High	Check inlet water temperature	CN63	4	W - W	2	CN63	less than 122℉ using thermistor characteristics	OK if K > Approx. 29.7 / Flow Rate (GPM) + inlet water temp (℉), where K = 136℉ for less than 125℉ temperature setting, K= Set Temp (C) + 9℉ for 125℉ or more setting. Also check thermistor temperature characteristics.
20	High Limit Switch Triggered	Check if high limit switch is triggered or improperly connected.	CN10	3	W - W	12	CN10	1 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.
29	Condensate Darin Trap (Water Level Electrode) abnormality	Check maintenance monitor No. 19						OFF [000]	If No.19 is ON [001], check the following : Check for Condensate Darin Trap blockage. Check for drain pipe blockage. Check for proper connection of Condensate Darin Trap water level electrode. Check for short circuit of Condensate Darin Trap 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.	CN63	4	W - W	2	CN63	DC 1 - 4.5 V	Compare to temperature characteristic list(*). 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.	CN63	1	W - W	2	CN63	DC 1 - 4.5 V	Compare to temperature characteristic list(*). 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.	CN63	3	W - W	2	CN63	DC 1 - 4.5 V	Compare to temperature characteristic list(*). 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. Check for a ground fault.	CN78	1	BL - Burnercase	GND	-	10 kHz - 100 kHz	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	Flame Rod		DC 0.45μ A or less	

*Inlet / Outlet / Heat Exchanger Thermistor Temperature Characteristics

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

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

Error Code	Possible Causes	Checkpoint	Circuit board Check points					Normal Value	How to Fix Problem and Reset Unit
			CN & Pin No.		Wire color	CN & Pin No.			
11	Ignition Failure	Igniter failure	CN197	1	BK - BL	3	CN102	DC 14 - 16 V	Replace Igniter
		Check primary gas solenoid valve	CN10	5	W - BL	6	CN10	DC 14 - 16 V	Gas Solenoid Valve typical resistance: 19 - 31
		Check gas solenoid valve - 1	CN10	9	BK - BL	6	CN10	DC 14 - 16 V	Gas Solenoid Valve typical resistance: 36 - 58
		Check gas proportioning valve	CN101	7	R - BL	6	CN101	DC 0.3 - 15 V	Current value changes depending on the load. Proportioning value resistance: 50 - 80

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

Error Code	Possible Causes	Checkpoint	Circuit board Check points					Normal Value	How to Fix Problem and Reset Unit
			CN & Pin No.		Wire color	CN & Pin No.			
11	Flame Detecting Circuit abnormality (initial flame fault detection)	Check the flame rod	CN78	1	BL - Burnercase	GND	-	10 kHz - 100 kHz	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	Flame Rod		DC 1µ A or more	
		Check for a diconnected ground from the circuit board							Check for damage or improper connection of the ground wire between the circuit board and the metal case of the unit.
	Gas Supply Pressure or Manifold Pressure Abnormality	Check gas supply and manifold pressures						Refer to "Manifold Pressure Adjustment Procedure"	
		Check gas proportioning valve	CN101	7	R - BL	6	CN101	DC 0.3 - 15 V	Current value changes depending on the load. Proportioning value resistance: 50 - 80

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

Error Code	Possible Causes	Checkpoint	Circuit board Check points					Normal Value	How to Fix Problem and Reset Unit
			CN & Pin No.		Wire color	CN & Pin No.			
12	Flame Rod Triggered (Doesn't sense flame during operation)	Check the flame rod	CN78	1	BL - Burnercase	GND	-	10 kHz - 100 kHz	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	Flame Rod		DC 1µ A or more	
		Check for a diconnected ground from the circuit board							Check for damage or improper connection of the ground wire between the circuit board and the metal case of the unit.
	Gas Solenoid Valve or Gas Supply Pressure or Manifold Pressure Abnormality	Check gas solenoid valve - 1	CN10	9	BK - BL	6	CN10	DC 14 - 16 V	Gas Solenoid Valve typical resistance: 36 - 58
		Check gas solenoid valve - 2	CN10	8	GY - BL	6	CN10	DC 14 - 16 V	Gas Solenoid Valve typical resistance: 36 - 58
		Check gas supply and manifold pressures						Refer to "Manifold Pressure Adjustment Procedure"	
		Check gas proportioning valve	CN101	7	R - BL	6	CN101	DC 0.3 - 15 V	Current value changes depending on the load. Proportioning value resistance: 50 - 80
29	Condensate Darin Trap (Water Level Electrode) abnormality	Check maintenance monitor No. 19						OFF [000]	If No.19 is ON [001], check the following : Check for Condensate Darin Trap blockage. Check for drain pipe blockage. Check for proper connection of Condensate Darin Trap water level electrode. Check for short circuit of Condensate Darin Trap water level electrode cord. If normal value, replace the circuit board.
35	Exhaust Thermistor Abnormality <-DV Model Only>	Check the resistance through the thermistor. Check for open or short circuit,or improper connection.	CN63	7	W - W	2	CN63		Compare to temperature characteristic list(**). Check for open or short circuit or for an improper connection.
94	Exhaust Temperature Abnormality <-DV Model Only>	Check the resistance through the thermistor	CN63	7	W - W	2	CN63		Check for heat exchanger pipe clogging. Check for heat exchanger fin blockage. Check for intake water temperature. (too high?)
		Check for abnormal combustion. Check flue for blockage or obstruction.							

**Exhaust Thermistor Temperature Characteristics

Temperature (℉)	-4	14	32	50	68	86
Temperature (℃)	-20	-10	0	10	20	30
Resistance (k)	487	296	162	98.3	61.4	39.5
Voltage (V)	4.6	4.3	3.9	3.4	2.8	2.3

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

Error Code	Possible Causes	Checkpoint	Circuit board Check points					Normal Value	How to Fix Problem and Reset Unit
			CN & Pin No.		Wire color	CN & Pin No.			
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.	CN27	4	BR - BL	2	CN27	DC 7 - 45 V	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		DC 10 - 14 V	
				3	Y - BL	2		100 Hz - 400 Hz	

<During Regular Operation>
6. Temperature control problem:

Error Code	Possible Causes	Checkpoint	Circuit board Check points					Normal Value	How to Fix Problem and Reset Unit
			CN & Pin No.		Wire color	CN & Pin No.			
No Indication	Gas supply pressure or manifold pressure abnormality	Check gas supply and manifold pressures.						Refer to "Manifold Pressure Adjustment Procedure"	
65	Heat Exchanger Flow Control Valve Abnormality	Check heat exchanger flow control valve. Check for improper connection of the valve.	CN38	23	W - O	16	CN38	DC 1 - 16 V	During Operation.
				23	W - G	18		DC 1 - 16 V	During Operation.
				23	W - V	20		DC 1 - 16 V	During Operation.
				23	W - BK	24		DC 1 - 16 V	During Operation.
				6	Y - BL	17		DC 1V 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.	CN38	23	W - O	25	CN38	DC 1 - 16 V	During Operation.
				23	W - G	26		DC 1 - 16 V	During Operation.
				23	W - V	27		DC 1 - 16 V	During Operation.
				23	W - BK	28		DC 1 - 16 V	During Operation.
				10	Y - BL	17		DC 1V or less	When valve is fully open.
16	Abnormally High Output (temperature is too hot)	Check the resistance of the outlet thermistor.	CN63	1	W - W	2	CN63	DC 1 - 4.5 V	1. If the heat exchanger thermistor temp. is 210℉ and over for one second with the all set temp. 2. If the outlet thermistor temp. is 203℉ and over for two seconds with the set temp. 170℉ and more. 3. If the outlet thermistor temp. is 194℉ and over for two seconds with the set temp. less than 170℉. 4. If the outlet thermistor temp. is (set temp. + 18℉) and over for 25 seconds with the set temp. more than 122℉. 5. If the outlet thermistor temp. is 140℉ and over for 4 seconds with the set temp. 122℉ and less. The unit will shut off and a 16 error code will flash.
		Check gas proportioning valve.	CN101	7	R - BL	6	CN101	DC 0.3 - 15 V	Check for short or open circuit or improper connection of wiring to valve.

<After Pressing the Operation Button on the Remote Controller>

1. If the Priority lamp does not come on:

Error Code	Possible Causes	Checkpoint	Circuit board Check points					Normal Value	How to Fix Problem and Reset Unit
			CN & Pin No.		Wire color	CN & Pin No.			
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 ouput line form the power (source circuit board.)	CN102	4	R - BL	3	CN102	DC14 - 16V	If there is AC 120V 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.	CN102	4	R - BL	3	CN102	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.	CN89	1	BL - BL	3	CN89	DC14 - 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	Circuit board Check points					Normal Value	How to Fix Problem and Reset Unit
			CN & Pin No.		Wire color	CN & Pin No.			
14	Overheat Prevention Device (Thermal Fuse)	Check for melting or improper connection of the overheat prevention device (Thermal fuse).	CN10	3	W - BK	1	CN10	2 Ω or less	If the overheat prevention device (Thermal fuse) has fused, it has been exposed to temperatures in excess of 430°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.	CN89	1	BL - BL	3	CN89	DC14 - 16V	If there is a voltage abnormality, replace the circuit board.
		Check remote control cord for a short or open circuit, or for a ground fault.						Closed circuit (not open or shorted)	If an open or short circuit or a ground fault exists, replace Remote Control cord.
90	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.
	Combustion Abnormality (Warning Indication) (Unit Shuts Off)								Check maintenance monitor No.49. If the fan has increased its speed by 103%, the error code will flash but combustion continues. If the fan has increased its speed by 104%, 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 (NRC series) / 5 years (NCC series), 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	Circuit board Check points					Normal Value	How to Fix Problem and Reset Unit
			CN & Pin No.		Wire color	CN & Pin No.			
No Error	Inlet Water Temperature is too High	Check inlet water temperature	CN63	4	W - W	2	CN63	less than 122°F using thermistor characteristics	OK if K > Approx. 29.7 / Flow Rate (GPM) + inlet water temp (°F), where K = 136°F for less than 125°F temperature setting, K= Set Temp (C) + 9°F for 125° F or more setting. Also check thermistor temperature characteristics.
20	High Limit Switch Triggered	Check if high limit switch is triggered or improperly connected.	CN10	3	W - W	12	CN10	1 Ω 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.	CN63	4	W - W	2	CN63	DC 1 - 4.5 V	Compare to temperature characteristic list(*). 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.	CN63	1	W - W	2	CN63	DC 1 - 4.5 V	Compare to temperature characteristic list(*). 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.	CN63	3	W - W	2	CN63	DC 1 - 4.5 V	Compare to temperature characteristic list(*). 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. Check for a ground fault.	CN78	1	BL - Burnercase	GND	-	10 kHz - 100 kHz	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	Flame Rod		DC 0.45 μA or less	

*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

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

Error Code	Possible Causes	Checkpoint	Circuit board Check points					Normal Value	How to Fix Problem and Reset Unit
			CN & Pin No.		Wire color	CN & Pin No.			
11	Ignition Failure	Igniter failure	CN197	1	BK - BL	3	CN102	DC 14 - 16 V	Replace Igniter
		Check primary gas solenoid valve	CN10	5	W - BL	6	CN10	DC 14 - 16 V	Gas Solenoid Valve typical resistance: 19 - 31 Ω
		Check gas solenoid valve - 1	CN10	9	BK - BL	6	CN10	DC 14 - 16 V	Gas Solenoid Valve typical resistance: 36 - 58 Ω
		Check gas proportioning valve	CN101	7	R - BL	6	CN101	DC 0.3 - 15 V	Current value changes depending on the load. Proportioning value resistance: 50 - 80 Ω

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

Error Code	Possible Causes	Checkpoint	Circuit board Check points					Normal Value	How to Fix Problem and Reset Unit
			CN & Pin No.		Wire color	CN & Pin No.			
11	Flame Detecting Circuit abnormality (initial flame fault detection)	Check the flame rod	CN78	1	BL - Burnercase	GND	-	10 kHz - 100 kHz	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	Flame Rod		DC 1 μA or more	
		Check for a diconnected ground from the circuit board							Check for damage or improper connection of the ground wire between the circuit board and the metal case of the unit.
	Gas Supply Pressure or Manifold Pressure Abnormality	Check gas supply and manifold pressures						Refer to "Manifold Pressure Adjustment Procedure"	
		Check gas proportioning valve	CN101	7	R - BL	6	CN101	DC 0.3 - 15 V	Current value changes depending on the load. Proportioning value resistance: 50 - 80 Ω

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

Error Code	Possible Causes	Checkpoint	Circuit board Check points					Normal Value	How to Fix Problem and Reset Unit
			CN & Pin No.		Wire color	CN & Pin No.			
12	Flame Rod Triggered (Doesn't sense flame during operation)	Check the flame rod	CN78	1	BL - Burnercase	GND	-	10 kHz - 100 kHz	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	Flame Rod		DC 1 μA or more	
		Check for a diconnected ground from the circuit board							Check for damage or improper connection of the ground wire between the circuit board and the metal case of the unit.
	Gas Solenoid Valve or Gas Supply Pressure or Manifold Pressure Abnormality	Check gas solenoid valve - 1	CN10	9	BK - BL	6	CN10	DC 14 - 16 V	Gas Solenoid Valve typical resistance: 36 - 58 Ω
		Check gas solenoid valve - 2	CN10	8	GY - BL	6	CN10	DC 14 - 16 V	Gas Solenoid Valve typical resistance: 36 - 58 Ω
		Check gas supply and manifold pressures						Refer to "Manifold Pressure Adjustment Procedure"	
		Check gas proportioning valve	CN101	7	R - BL	6	CN101	DC 0.3 - 15 V	Current value changes depending on the load. Proportioning value resistance: 50 - 80 Ω

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

Error Code	Possible Causes	Checkpoint	Circuit board Check points					Normal Value	How to Fix Problem and Reset Unit
			CN & Pin No.		Wire color	CN & Pin No.			
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.	CN27	4	BR - BL	2	CN27	DC 7 - 45 V	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		DC 10 - 14 V	
				3	Y - BL	2		100 Hz - 400 Hz	

<During Regular Operation>

6. Temperature control problem:

Error Code	Possible Causes	Checkpoint	Circuit board Check points					Normal Value	How to Fix Problem and Reset Unit
			CN & Pin No.		Wire color	CN & Pin No.			
No Indication	Gas supply pressure or manifold pressure abnormality	Check gas supply and manifold pressures.						Refer to "Manifold Pressure Adjustment Procedure"	
65	Heat Exchanger Flow Control Valve Abnormality	Check heat exchanger flow control valve. Check for improper connection of the valve.	CN38	23	W - O	16	CN38	DC 1 - 16 V	During Operation.
				23	W - G	18		DC 1 - 16 V	During Operation.
				23	W - V	20		DC 1 - 16 V	During Operation.
				23	W - BK	24		DC 1 - 16 V	During Operation.
				6	Y - BL	17		DC 1V 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.	CN38	23	W - O	25	CN38	DC 1 - 16 V	During Operation.
				23	W - G	26		DC 1 - 16 V	During Operation.
				23	W - V	27		DC 1 - 16 V	During Operation.
				23	W - BK	28		DC 1 - 16 V	During Operation.
				10	Y - BL	17		DC 1V or less	When valve is fully open.
16	Abnormally High Output (temperature is too hot)	Check the resistance of the outlet thermistor.	CN63	1	W - W	2	CN63	DC 1 - 4.5 V	1. If the heat exchanger thermistor temp. is 210°F and over for one second with the all set temp. 2. If the outlet thermistor temp. is 203°F and over for two seconds with the set temp. 170°F and more. 3. If the outlet thermistor temp. is 194°F and over for two seconds with the set temp. less than 170°F. 4. If the outlet thermistor temp. is (set temp. + 18°F) and over for 25 seconds with the set temp. more than 122°F. 5. 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.
		Check gas proportioning valve.	CN101	7	R - BL	6	CN101	DC 0.3 - 15 V	Check for short or open circuit or improper connection of wiring to valve.

<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 ouput line form the power (source circuit board.)	CN-102	3	BL-R	4	DC13 – 16V	If there is AC 120V 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	3	BL-R	4	DC13 – 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. & Code Color.			Normal Value	How to Fix Problem and Reset Unit
10	Combusiton 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-10	3	W-BL	1	2Ω or less	If the overheat prevention device (Thermal fuse) has fused, it has been exposed to temperatures in excess of 363F. 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.
		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.
90	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.
	Combustion Abnormality (Warning Indication) (Unit Shuts Off)							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.
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. & Code Color.			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 > 28.5/Flow Rate (GPM) + inlet water temp (°F), where K = 136°F for 127°F or lower temperature setting, K= Set 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-10	12	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-63	4	W-W	2	DC1 – 4.5V	Compare to temperature characteristic list on pgs. 59, 60. 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	2	DC1 – 4.5V	Compare to temperature characteristic list on pgs. 59, 60. 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. 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.	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	Elect-rode	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-197, 102	1	W-BK	3	DC12.75V – 16.5V	Replace Igniter
		Check primary gas solenoid valve	CN-10	5	W-BL	6	DC14V – 16V	Gas Solenoid Valve typical resistance: 20 Ω– 35Ω.
		Check gas solenoid valve 1		9	BK-BL	6	DC14V – 16V	Gas Solenoid Valve typical resistance: 35 Ω– 65Ω.
		Check gas proportioning valve	CN-101	6	BL-R	7	DC0.3V – 15V	Current value changes depending on the load. Proportioning value 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 the current from the flame rod		1	BL-Electrode	F-rod	DC1µA or more	
		Check for a diconnected ground from the circuit board						Check for damage or improper connection of the ground wire between the circuit board and the metal case of the unit.
	Gas Supply Pressure or Manifold Pressure Abnormality	Check gas supply and manifold pressures					See pg. 87, 88	
		Check gas proportioning valve	CN-101	6	BL-R	7	DC0.3 – 15V	Current value changes depending on the load. Proportioning value 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 the current from the flame rod		1	BL-Electrode	F-rod	DC1µA or more	
		Check for a diconnected ground from the circuit board						Check that the input is proper for the load.
	Gas Supply Pressure or Manifold Pressure Abnormality	Check gas supply and manifold pressures					See pg. 87, 88	
		Check gas proportioning valve	CN-101	6	BL-R	8	DC0.3 – 15V	Current value changes depending on the load. Proportioning valve resistance: 50 Ω– 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	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	2	DC10V – 14V	
				3	Y-BL	2	100Hz – 400Hz	

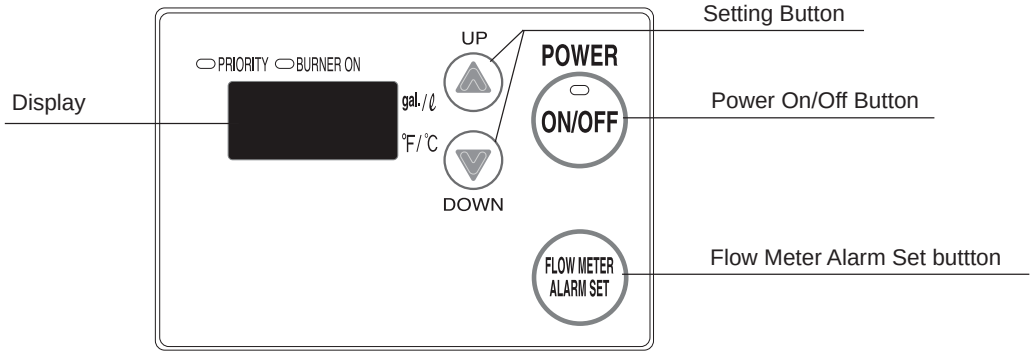
7. Temperature control problem:

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	Flow Control Valve Abnormality	Check main flow control valve. Check for improper connection of the valve.	CN-38	23	BL-O	16	DC1 – 16V	During Operation.
				23	BL-G	18	DC1 – 16V	During Operation.
				23	BL-V	20	DC1 – 16V	During Operation.
				23	BL-BK	24	DC1 – 16V	During Operation.
				6	Y-BL	17	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	2	DC1 – 4.5V	1. When 90°C or more is continuously detected for 0.3 second 2. When the setting temperature +10°C or more is continued for 25 seconds (when setting temperature is over 50°C & MOQ_ON flow rate 2.5L/min) 3. When the setting temperature +10°C or more is continued for 25 seconds (when setting temperature is over 50°C & MOQ_ON flow rate 2.0L/min) 4. When 60°C or more is continuously detected for 4 seconds (only when the setting temperature 50°C or less & moderation Dip OFF) 5. When 60°C or more is continuously detected for 25 seconds (when setting temperature is 50°C or less)
		Check gas proportioning valve.	CN-101	6	BL-R	7	DC0.3 – 15V	Check for short or open circuit or improper connection of wiring to valve.

<NRC98(-DV,-OD), NRC83(-DV,-OD), NRC1111(-DV,-OD), NR981(-DVC,-OD,-SV), NR83-DVC>

■ Remote Controller

RC-7651M



■ Adjusting the Temperature Display

Note: The setting must be done within the first 10 minutes of connecting electrical power to the water heater.

1. Turn the water heater off by pressing the Power On/Off Button on the remote controller.
2. Disconnect, then reconnect electrical power to the water heater.
3. Press the Flow Meter Alarm Set Button and hold it in for 2 seconds or more.
4. Press the Flow Meter Alarm Set Button until the remote controller displays item number "12".
5. Press Setting Button "▲" for 5 seconds or more to change the display units to °F.
6. Press Setting Button "▼" for 5 seconds or more to change the display units to °C.
7. To confirm the setting, turn the water heater on by pressing the Power On/Off Button on the remote controller.

■ 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>

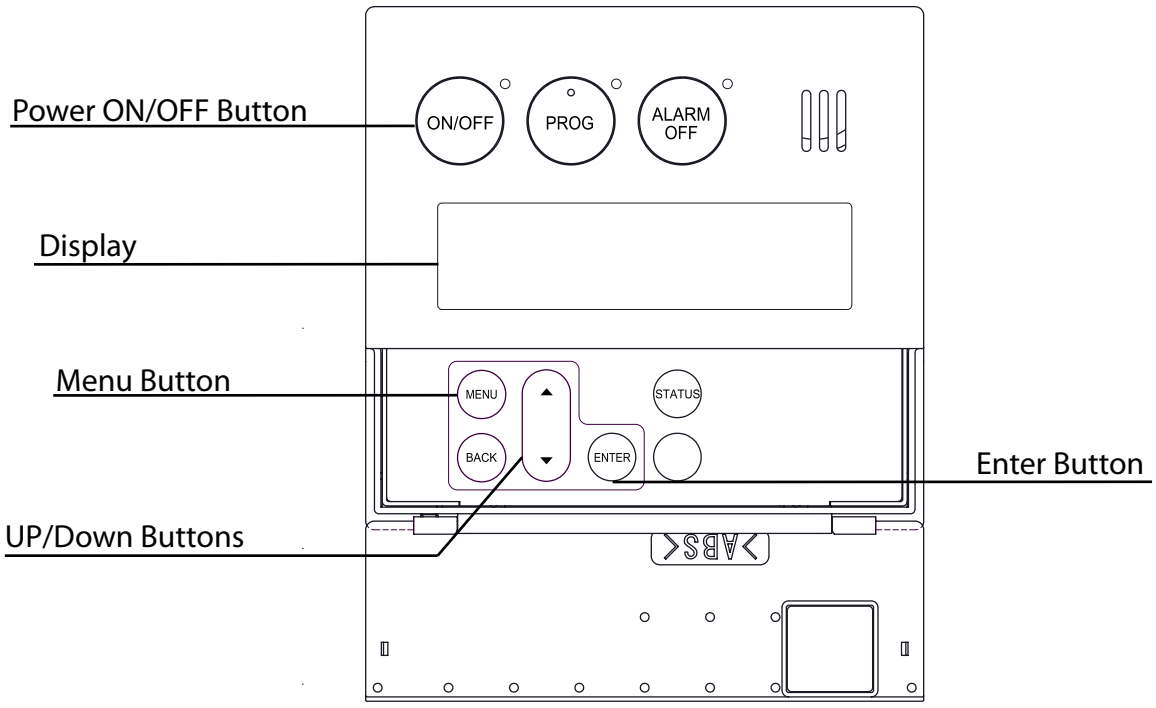
1. For releasing the indication, press and hold both [▲] and [▼] of the setting button simultaneously more than two seconds, or leave it alone for more than 10 minutes.

<Clearing Error Codes from Memory>

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

<NCC1991(-DV,-OD), NC1991(-DVC,-OD)>

■ Remote Controller
RC-9018M



■ Adjusting the Temperature Display

Note: The setting must be done within the first 10 minutes of connecting electrical power to the water heater.

1. Turn the water heater off by pressing the Power On/Off Button on the remote controller.
2. Disconnect, then reconnect electrical power to the water heater.
3. Press the MENU Button inside the cover, select "Initial settings" using the ▲/▼ Buttons.
4. Press the ENTER button, the "Initial settings" screen appears on the display.
5. Select "[℉ / gal]◀▶[℃ / L]" using the ▲/▼ Buttons.
6. Press the ENTER Button and select either [℉ / g al] or [℃ / L] using the ▲/▼ Buttons.
7. Press the ENTER Button, "Set complete Please wait..." appears on the display for 5seconds and then the "Initial settings" screen appears on the display.
8. To confirm the setting, turn the water heater on by pressing the Power On/Off Button on the remote controller.

■ Displaying Maintenance Monitors

<Display Procedure>

1. Press and hold both the up [▲] and down [▼] setting buttons simultaneously for more than 5 seconds. This can be done regardless of whether the power has been turned on or the unit is operating.

<Indications>

1. [Unit No.], [Item(Data) No.], [Data] will appear on the display.
2. Different Item(Data) No. can be selected using the up [▲] or down [▼] buttons.
3. With the remote controller in maintenance mode, the hot water set temperature and other functions cannot be adjusted.

<Returning to Normal Mode>

1. For releasing the indication, press and hold both [▲] and [▼] of the setting button simultaneously more than 2 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.

<NRC98(-DV,-OD), NRC83(-DV,-OD), NCC1991(-DV,-OD), NRC1111(-DV,-OD)>

■ Maintenance Monitor List

Data No.	Item	Data (Display Reading X Multiplier) Multiplier	Unit	Minimum Value for Indication	Remarks
02	Gas quality judging result	Judging [000] ,NG_Lo [1100] ,NG_Hi [1300] ,NG_Lo_fix (Dip fixation) [1109] ,NG_Hi_fix (Dip fixation) [1309]			
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	
11	Service Reminder Hours Accumulated	X 1	time	1 hours	Disp. Range [000] - [999]
12	Service Reminder Hours Accumulated	X 1000	time	1000 hours	Disp. Range [000] - [65]
14	Total Flow Rate	X 0.1	gal/min	0.1 gal/min	*3
		X 0.1	L/min	0.1 L/min	*4
18	Output (%)	X 1	%	% 1	
19	Condensate trap clogging				OFF [000] , ON [001]
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
36	Exhaust Thermistor Detection Temperature	X 1	°F	1°F	
		X 1	°C	1°C	
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		1 . 0	
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 maintenace 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 remote controller is in °F/Gallons mode.

*4 When remote controller is in °C/Liters mode.

■Maintenance Monitor List

Data No.	Item	Data (Display Reading × Multiplier)		Minimum Value for Indication	Remarks
		Multiplier	Unit		
02	Gas quality judging result	Judging [000], NG_Lo [1100], NG_Hi [1300] ,NG_Lo_fix (Dip fixation) [1109] ,NG_Hi_fix (Dip fixation) [1309]			
03	Total Plug-in Time	× 100	hour	100 hours	Disp. Range [000] - [1310]
04	Total Combustion Time	× 1	hour	1 hours	Disp. Range [000] - [999]
05	Total Combustion Time	× 1000	hour	1000 hours	Disp. Range [000] - [65]
07	Number of Ignition Times	× 10	time	10 times	Disp. Range [000] - [999]
08	Number of Ignition Times	× 10000	time	10000 times	Disp. Range [000] - [65]
10	Fan Rotational Frequency	× 10	rpm	25 rpm	
11	Service Reminder Hours Accumulated	× 1	hour	1 hours	Disp. Range [000] - [999]
12	Service Reminder Hours Accumulated	× 1000	hour	1000 hours	Disp. Range [000] - [65]
14	Total Flow Rate	× 0.1	gal/min	0.1 gal/min	*3
		× 0.1	L/min	0.1 L/min	*4
18	Output (%)	× 1	%	1 %	
20	Calculated Fan Speed	× 10	rpm	25 rpm	*2
30	Water Inlet Thermistor Detection Temperature	× 1	˚F	1 ˚F	*3
		× 0.1	˚C	0.5 ˚C	*4
31	Water Outlet Thermistor Detection Temperature	× 1	˚F	1 ˚F	*3
		× 0.1	˚C	0.5 ˚C	*4
32	Heat Exchanger Thermistor Detection Temperature	× 1	˚F	1 ˚F	*3
		× 0.1	˚C	0.5 ˚C	*4
38	Air Inlet Thermistor Detection Temperature	× 1	˚F	1 ˚F	Disp. Range [014] - [050] *3
		× 1	˚C	1 ˚C	Disp. Range [-10] - [010] *4
39	Fan Motor Current Value	× 10	mA	10 mA	Disp. Range [000] - [1999]
47	Simple Self-diagnosis Counter	[0:xx]	Decimal		[000] - [036]
48	Initial Fan Speed Correction	× 1	%	1 %	[100] - [104]
49	Final Fan Speed Correction	× 1	%	1 %	[100] - [104]
50	FF No.	× 0.1		0.1	
51	FF+FB No.	× 0.1		0.1	
52	Output	× 0.1		0.1	
60	Position of Heat Exchanger Flow ControlValve	× 2	Step		[000](open) - [1700](closed) [EEE](error)
62	Position of Bypass Flow ControlValve	× 2	Step		[000](open) - [1700](closed) [EEE](error)
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: Product 3	[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. *5
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 maintenace monitors of another unit in a multi-system installation,
When use RC-7651M, press the "FLOW METER ALARM SET" button (while in monitor mode) to switch to the desired unit.
When use RC-9018M, press the "ENTER" button (while in monitor mode) and press the "▲" to switch to the desired unit.

*2 A difference in the calculated (#20) and the measured (# 0) fan speeds of 500 or less is normal.

*3 When remote controller is in °F/Gallons mode.

*4 When remote controller is in °C/Liters mode.

*5 When use RC-9018M, [Data No.91-98] are displayed [Error record / 1-8].

<NR83-DVC>

■Maintenance Monitor List

Data No.	Item	Data (Display Reading X Multiplier) Multiplier	Unit	Minimum Value for Indication	Remarks
02	Gas quality judging result	Judging [000] ,NG_Lo [1100] ,NG_Hi [1300] ,NG_Lo_fix (Dip fixation) [1109] ,NG_Hi_fix (Dip fixation) [1309]			
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
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 maintenace 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 remote controller is in °F/Gallons mode.

*4 When remote controller is in °C/Liters mode.

<NRC98(-DV,-OD), NRC83(-DV,-OD)>

■Circuit Board Replacement

* Be sure to read.

It is necessary to transfer data and adjust the hard dip switches 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.

Dip Switch Settings

* Disconnect power to the water heater before adjusting the Hard Dip Switches.

The following settings can be adjusted using the Hard Dip Switches:
1. By using SW 1 and 2, the maximum temperature can be set.
2. By using SW 3, the air supply type can be set to direct vent(DV) or non-direct vent(SV).
3. By using SW 5 and 6, adjustments can be made for use at high elevation.
4. By using SW 7 and 8, adjustments can be made for extended vent lengths. Refer to the "Setting list for Hard Dip Switches" table for details.

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.
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 remote controller connections.
5. Before connecting electrical power, confirm that the hard dip switch settings on the new board match the settings on the old board. Refer to the "Dip Switch Settings" section for details.

* 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

* 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 "2B" 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 Soft Dip Switches" 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.
10. If necessary, adjust the hard dip switch settings on the new board to match the settings on the old board. Refer to the "Dip Switch Settings" section for details.

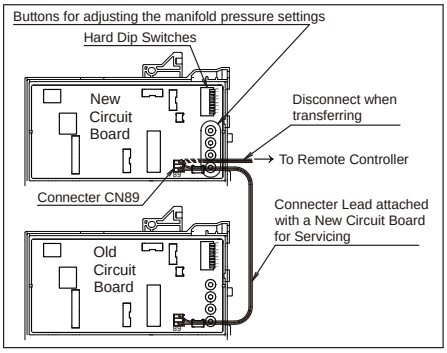
Note 1. To cancel the settings, let the controller sit for 10 minutes, or turn on the operation button. The information set previously will be canceled. To change settings again, follow steps 1 through 8.
Note 2. Only change data as listed in the "Setting list for Soft Dip Switches" table.

Setting list for Hard Dip Switches (●:ON ○:OFF)

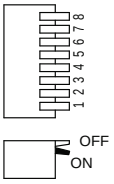
SW1	SW2		SW3		SW5	SW6		SW7	SW8		
Max temp Switches			Air supply Switches		High elevation Switches			Airflow Switches			
Maximum temperature setting			Air supply type **-DV Model only		Elevations above 2000ft			Vent Length Adjustment			
SW1	SW2		SW3	Air supply	SW5	SW6		SW7	SW8	-DVC	-DV
○	○	120°F *	○	Outdoor : DV	○	○	0~2000ft	○	○	Minimum	3"Short
●	○	130°F	●	Indoor : SV	●	○	2001~4000ft	●	○	Short	3"Long
○	●	140°F			○	●	4001~6000ft	○	●	Long	4"Short
●	●	120°F			●	●	6001~8000ft	●	●	Maximum	4"Long

*Maximum temperature can be adjusted using the Soft Dip Switches.

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



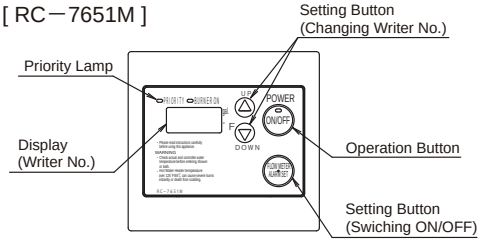
[Hard Dip Switches]



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 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－7651M]



Setting list for Gas manifold pressures (NR83-DVC)

Manifold Pressure for NR83-DVC (inch H_2O) Cover off								
Vent length adjustment	Dip7=OFF Dip8=OFF		Dip7=ON Dip8=OFF		Dip7=OFF Dip8=ON		Dip7=ON Dip8=ON	
	Minimum length		Short length		Long length		Maximum length	
Gas type	Max value	Min value	Max value	Min value	Max value	Min value	Max value	Min value
Natural	2.55	1.00	2.55	1.00	2.50	0.95	2.50	0.95
(Vertical termination)*	(2.50)	(0.95)	(2.45)	(0.95)	(2.40)	(0.95)	(2.40)	(0.95)
LPG	3.70	1.35	3.65	1.35	3.60	1.35	3.60	1.35
(Vertical termination)*	(3.60)	(1.30)	(3.55)	(1.30)	(3.50)	(1.30)	(3.50)	(1.30)

*Use these settings when the unit terminates using the vertical rain cap.
Note: If the supply gas is a propane/air mix, adjust the manifold pressures using the natural gas settings.

Setting list for Soft Dip Switches

Model	Gas type	Circuit board DIP setting (●:ON ○:OFF)																			Manifold Pressure (inch H_2O) Cover off	
		A1	A2	A3	A5	A6	A7	A8	A9	AB	AD	AE	B1	B2	B5	B7	B8	BC	C1	C3	C7	Max value	Min value
NR83-DVC	Natural	●	○	○	●	○	●	○	●	●	●	●	●	○	●	●	●	●	●	○	○	Refer to the "Setting list for gas manifold pressures (NR83-DVC) "	
	LPG	○	○	○	●	○	●	○	●	●	●	●	●	○	●	●	●	●	●	○	○		
	LPG/Air Mix	●	●	●	●	○	●	○	●	●	●	●	●	○	●	●	●	●	●	○	○		
NRC98-DV	Natural	●	○	○	●	●	○	○	●	●	●	●	●	●	●	●	●	●	●	●	●	2.95	1.10
	LPG	○	○	○	●	●	○	○	●	●	●	●	●	●	●	●	●	●	●	●	●	3.60	1.35
NRC83-DV	Natural	●	○	○	●	●	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●	2.95	1.10
	LPG	○	○	○	●	●	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●	3.60	1.35
NRC98-OD	Natural	●	○	○	○	○	○	○	●	●	●	●	●	○	●	●	●	●	●	○	●	2.60	0.95
	LPG	○	○	○	○	○	○	○	●	●	●	●	●	○	●	●	●	●	●	○	●	3.65	1.25
NRC83-OD	Natural	●	○	○	○	○	○	●	●	●	●	●	●	○	●	●	●	●	●	○	●	2.60	0.95
	LPG	○	○	○	○	○	○	●	●	●	●	●	●	○	●	●	●	●	●	○	●	3.65	1.25

■Circuit Board Data Transfer Procedure

∗ Be sure to read.

It is necessary to transfer data and adjust the hard dip switches 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.

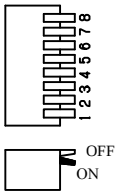
① Hard Dip Switch Settings

*Disconnect the electrical power to the water heater before adjusting the Hard Dip Switches.

The following settings can be adjusted using the Hard Dip Switches:

1. By using SW 1 and 2, this unit can be programmed so that it will default temperatures if the remote controller is removed.
2. (NRC/NCC -DV Model only) By using SW 3, the air supply type can be set to direct vent(DV) or non-direct vent(SV).
3. By using SW 5 and 6, adjustments can be made for use at high elevation.
4. By using SW 7 and 8, adjustments can be made for extended vent lengths. Refer to the "Setting list for Hard Dip Switches" table for details.

[Hard Dip Switches]



Setting list for Hard Dip Switches (● :ON ○ :OFF)

SW1		SW2		SW3		SW5		SW6	SW7		SW8	
Default temperature setting				Air supply type NRC/NCC-DV Model only		Elevations above 2000ft			Vent Length Adjustment			
		NRC/NR Model	NCC/NC Model								NRC/NCC -DV(SV) Model	NR/NC -DVC Model
SW1	SW2			SW3	Air supply	SW5	SW6	High Elevation Adjustment	SW7	SW8		
○	○	120°F (50°C)		○	Outdoor : DV	○	○	0~2000ft (0~610m)	○	○	3"Short	Minimum
●	○	135°F (57°C)		●	Indoor : SV	●	○	2001~4000ft (611~1220m)	●	○	3"Long	Short
○	●	140°F (60°C)				○	●	4001~6000ft (1221~1830m)	○	●	4"Short	Long
●	●	140°F (60°C)	185°F (85°C)			●	●	6001~8000ft (1831~2440m)	●	●	4"Long	Maximum

② 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:

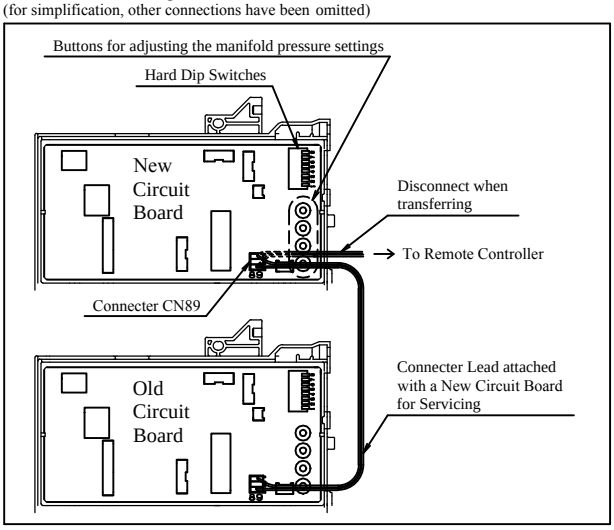
■Special Case: Quick-Connect System
It is not necessary to disconnect the Quick-Connect Cord during this procedure.
■Special Case: Multi-unit System (NCC/NC models only)
It is necessary to disconnect the remote controller cord between the heater and the System Controller before attempting this procedure (The power must be disconnected before doing so).

1. With the electrical power disconnected, remove the remote controller connection from connection number CN89.
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 remote controller connections.
5. Before connecting electrical power, confirm that the hard dip switch settings on the new board match the settings on the old board. Refer to the ① "Hard Dip Switch Settings" section for details.

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

*When you cannot transfer data between the boards, please follow the procedures ③ "Data Transfer Troubleshooting".

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



■Circuit Board Manual Program Procedure

③ Data Transfer Troubleshooting

1. When you cannot transfer data between the boards, please follow the procedure ⑥"Circuit Board Resetting".
2. When you cannot transfer data between the boards throug h step 1, please follow the procedures indicated in④"Initial Circuit Board Settings" and ⑤"Remote Controller Settings".

*If data has already been transferred to the board, follow the step 1.

④ 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. Turn the water heater off by pressing the power ON/OFF button on the remote controller.
2. Disconnect, then reconnect electrical power to the unit and wait ten seconds before proceeding to step 3.
3. Within the first ten minutes of connecting electrical power, before turning on the Power ON/OFF button, press the "▲" or "▼" 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.
4. ■Case Remote controller RC-7651M
   ･Use the "▲" or "▼" button on the remote controller to change the maintenance writer number.
   ･Press the "FLOW METER ALARM SET" button for 0.5 sec to change the setting ON/OFF.
   ON: "PRIORITY" lamp flashes.
   OFF: "PRIORITY" lamp goes off.
   ■Case Remote controller RC-9018M
   ･Use the "▲" or "▼" button on the remote controller to change the "Item" number or "Data" ON/OFF.
   ･Press the "ENTER" button to select "Item" or "Data".
5. Change "15" "34" "3B" "3E" from OFF to ON.
6. Change "1B" from OFF to ON. (-DV models only)
7. Change "35" from OFF to ON. (NCC1991,NC1991 models only)
8. Change "FE" and "FC" from OFF to ON in order to access the hidden maintenance writers. (Display blinks with "A0".)
9. Now the maintenance writers can be accessed by pressing the "▲" or "▼" button on the remote controller. Refer to the "Setting list for Soft Dip Switches and Gas manifold pressures" table for the correct writer setting.
   After completing the setting, press the "ENTER" button to select "Item".
10. When all of the maintenance writers have been set correctly, confirm the settings by pressing and holding both the "▲" and "▼" buttons on the remote controller until the controller emits a beeping noise. The new settings will be lost if this is not done.
11. If necessary, adjust the hard dip switch settings on the new board to match the settings on the old board. Refer to the ① "Hard Dip Switch Settings" section for details.

Note 1. To cancel the settings, let the controller sit for 10 minutes, or turn on the Power ON/OFF button. The information set previously will be canceled. To change settings again, follow steps 1 through 11.
Note 2. Only change data as listed in the "Setting list for Soft Dip Switch settings and Gas manifold pressures" table.

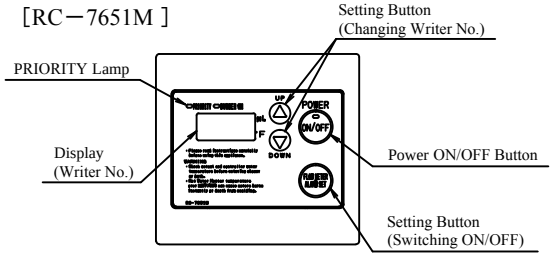
⑤ Remote Controller Settings (RC-9018M only)

1. After turn off the Power ON/OFF button, press the "MENU" button and select "Misc settings" by pressing the "▲" or "▼" button.
   The "Misc settings" screen appears by pressing the "ENTER" button again.
2. Select "Default all settings" by pressing the "▲" or "▼" button, and then press the "ENTER" button.
3. "Default all settings now ?" screen appears, select "Yes" by pressing the "▲" or "▼"button. Confirm the settings by pressing and holding the "ENTER" button for 5 sec.
4. To return to the home screen, press the "MENU" button or let it sit for approximately 20 sec.

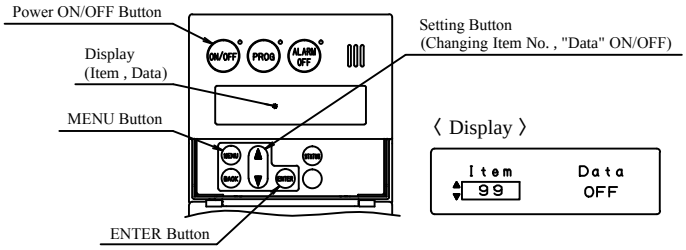
⑥ Circuit Board Resetting

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 8 of the ④ "Initial Circuit Board Settings" procedure. This should result in "A0" blinking on the remote controller.
3. ■Case Remote controller RC-7651M
   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).
   ■Case Remote controller RC-9018M
   If the "A0" maintenance writer is "ON", press the "ENTER" and select "Data" to change "A0" to "OFF".
   After completing the setting, press the "ENTER" to select "ITEM".
4. Press and hold both the "▲" and "▼" buttons on the remote controller until the controller emits a beeping noise. The new settings will be lost if this is not done.
5. The circuit board is now ready for data transfer. Please follow ② "Data Transferring Procedure".

［RC－7651M ］



［RC－9018M ］



(NCC1991, NC1991 model only)

5. Within the first ten minutes of connecting electrical power, before turning on the Power ON/OFF button, press the "MENU" button on the remote controller and select "Initial settings" by pressing the "▲" or "▼" button. If the unit does not go into "Initial settings" mode, unplug the unit and try again.
6. Change "Save backlight" from "Normal" to "On".
7. To return to the home screen, press the "MENU" button or let it sit for approximately 20 sec.

Setting list for Soft Dip Switch settings and Gas manifold pressures (Check the rating plate for model and gas type)

Model	Gas type	Circuit board DIP setting (●:ON ○:OFF)																				Manifold Pressure (inch H_2O) Cover off	
		A1	A5	A6	A7	A8	A9	AA	AB	AD	AE	B0	B1	B2	B5	B7	B8	BC	C1	C2	C3	C7	Max value	Min value
NRC1111-OD	Natural	●	○	○	○	○	○	●	●	●	●	○	●	○	●	●	●	●	●	○	○	●	3.05	1.30
	LP	○	○	○	○	○	○	●	●	●	●	○	●	○	●	●	●	●	●	○	○	●	3.40	1.45
NRC1111-DV	Natural	●	●	●	○	○	○	●	●	●	●	○	●	○	●	●	●	●	●	○	●	●	3.20	1.50
	LP	○	●	●	○	○	○	●	●	●	●	○	●	○	●	●	●	●	●	○	●	●	3.70	1.50
NCC1991-OD	Natural	●	○	○	○	○	○	●	●	●	●	●	●	●	●	●	●	●	●	○	○	●	3.05	1.30
	LP	○	○	○	○	○	○	●	●	●	●	●	●	●	●	●	●	●	●	○	○	●	3.40	1.45
NCC1991-DV	Natural	●	●	●	○	○	○	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	3.20	1.50
	LP	○	●	●	○	○	○	●	●	●	●	●	●	●	●	●	●	●	●	○	●	●	3.70	1.50
NR981-OD	Natural	●	○	○	○	●	●	○	●	●	●	○	●	○	●	●	●	●	●	○	○	○	2.73	1.25
	LP	○	○	○	○	●	●	○	●	●	●	○	●	○	●	●	●	●	●	○	○	○	4.22	1.81
NR981-DVC	Natural	●	●	○	●	●	●	○	●	●	●	○	●	○	●	●	●	●	●	○	○	○	Refer to the "Setting list for gas manifold pressures (NR981/NC1991-DVC) "	
	LP	○	●	○	●	●	●	○	●	●	●	○	●	○	●	●	●	●	●	○	○	○		
NR981-SV	Natural	●	○	●	○	●	●	○	●	●	●	○	●	○	●	●	●	●	●	●	●	○	2.57	1.21
	LP	○	○	●	○	●	●	○	●	●	●	○	●	○	●	●	●	●	●	●	●	○	4.14	1.77
NC1991-OD	Natural	●	○	○	○	●	●	○	●	●	●	●	●	●	●	●	●	●	●	○	○	○	2.73	1.25
	LP	○	○	○	○	●	●	○	●	●	●	●	●	●	●	●	●	●	●	○	○	○	4.22	1.81
NC1991-DVC	Natural	●	●	○	●	●	●	○	●	●	●	●	●	●	●	●	●	●	●	○	○	○	Refer to the "Setting list for gas manifold pressures (NR981/NC1991-DVC) "	
	LP	○	●	○	●	●	●	○	●	●	●	●	●	●	●	●	●	●	●	○	○	○		

Setting list for Gas manifold pressures (NR981/NC1991-DVC)

Manifold Pressure (inch H_2O) Cover off									
Vent length adjustment	Dip7=OFF	Dip8=OFF	Dip7=ON	Dip8=OFF	Dip7=OFF	Dip8=ON	Dip7=ON	Dip8=ON
	Minimum		Short		Long		Maximum	
Gas type	Max value	Min value	Max value	Min value	Max value	Min value	Max value	Min value
Natural	2.87	1.34	2.81	1.32	2.77	1.30	2.73	1.30
LPG	3.23	1.43	3.13	1.39	3.09	1.36	3.05	1.34

<NR83-DVC>

■ Circuit Board Replacement

∗ Be sure to read.

It is necessary to transfer data and adjust the hard dip switches 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.

Dip Switch Settings

* Disconnect power to the water heater before adjusting the Hard Dip Switches.

The following settings can be adjusted using the Hard Dip Switches:
1. By using SW 1 and 2, the maximum temperature can be set.
2. By using SW 5 and 6, adjustments can be made for use at high elevation.
3. By using SW 7 and 8, adjustments can be made for extended vent lengths. Refer to the "Setting list for Hard Dip Switches" table for details.

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.
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 remote controller connections.
5. Before connecting electrical power, confirm that the hard dip switch settings on the new board match the settings on the old board. Refer to the "Dip Switch Settings" section for details.

*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.

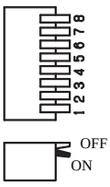
Initial Circuit Board Settings

*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 "2B" 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 Soft Dip Switches" 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.
10. If necessary, adjust the hard dip switch settings on the new board to match the settings on the old board. Refer to the "Dip Switch Settings" section for details.

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 Soft Dip Switches" table.

［Hard Dip Switches ］

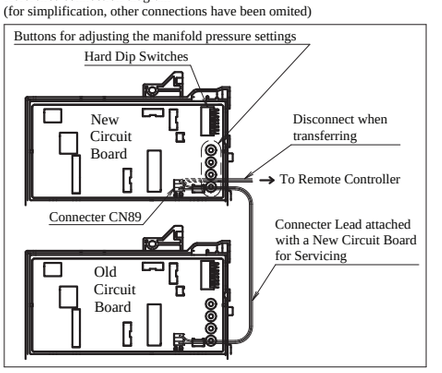


Setting list for Hard Dip Switches (●:ON ○:OFF)

SW1	SW2		SW5	SW6		SW7	SW8	
Max temp Switches			High elevation Switches			Airflow Switches		
Maximum temperature setting			Elevations above 2000ft			Vent Length Adjustment		
SW1	SW2		SW5	SW6		SW7	SW8	
○	○	120°F ∗	○	○	0~2000ft(610m)	○	○	Minimum
●	○	130°F	●	○	2000ft(610m)	●	○	Short
○	●	140°F	○	●	4000ft(1219m)	○	●	Long
●	●	120°F	●	●	6000ft(1829m)	●	●	Maximum

*Maximum temperature can be adjusted using the Soft Dip Switches.

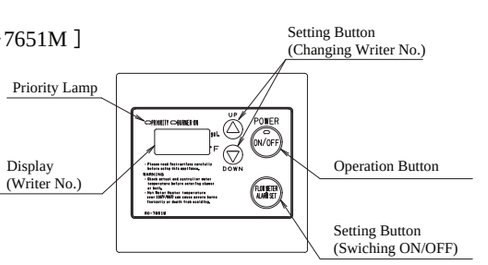
Reference connection diagram
(for simplification, other connections have been omited)



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 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－7651M ］



Setting list for Gas manifold pressures (NR83-DVC)

Manifold Pressure for NR83-DVC (inch H2O) Cover off								
Vent length adjustment	Dip7=OFF	Dip8=OFF	Dip7=ON	Dip8=OFF	Dip7=OFF	Dip8=ON	Dip7=ON	Dip8=ON
	Minimum length		Short length		Long length		Maximum length	
Gas type	Max value	Min value	Max value	Min value	Max value	Min value	Max value	Min value
Natural	2.55	1.00	2.55	1.00	2.50	0.95	2.50	0.95
(Vertical termination)*	(2.50)	(0.95)	(2.45)	(0.95)	(2.40)	(0.95)	(2.40)	(0.95)
LPG	3.70	1.35	3.65	1.35	3.60	1.35	3.60	1.35
(Vertical termination)*	(3.60)	(1.30)	(3.55)	(1.30)	(3.50)	(1.30)	(3.50)	(1.30)

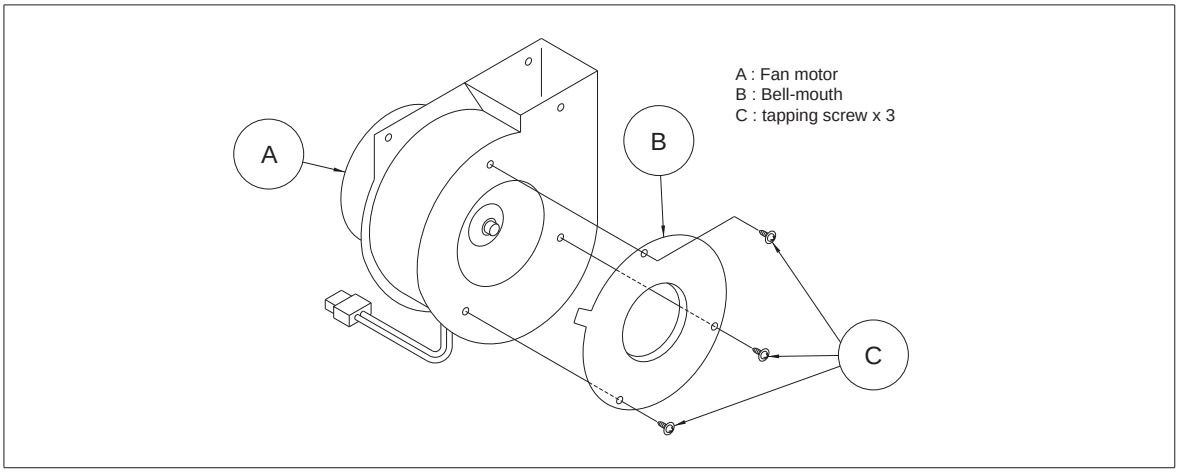
*Use these settings when the unit terminates using the vertical rain cap.
Note: If the supply gas is a propane/air mix, adjust the manifold pressures using the natural gas settings.

Setting list for Soft Dip Switches

Model	Gas type	Circuit board DIP setting (●:ON ○ :OFF)																Manifold Pressure (inch H2O) Cover off	
		A1	A2	A3	A5	A6	A7	A9	AB	AD	AE	B1	B5	B7	B8	BC	C1	Max value	Min value
NR83-DVC	Natural	●	○	○	●	○	●	●	●	●	●	●	●	●	●	●	●	Refer to the "Setting list for gas manifold pressures (NR83-DVC) "	
	LPG	○	○	○	●	○	●	●	●	●	●	●	●	●	●	●	●		
	LPG/Air Mix	●	●	●	●	○	●	●	●	●	●	●	●	●	●	●	●		

■ When 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.

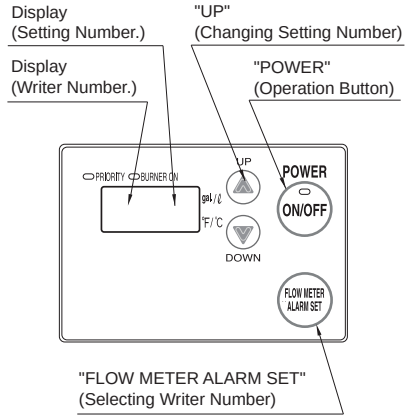
Circuit Board Settings 2

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.

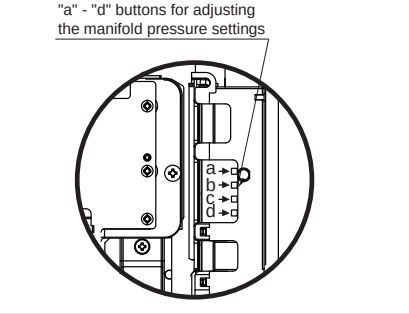
Note 1. Disconnect electrical power after setting the "POWER" button off on the remote controller. The water heater will automatically turn on when electrical power is reconnected if this step is not followed.

Remote Controller

[RC-7651M]



Circuit Board



Gas Line Requirements

The appliance and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of ½ psig (3.5 kPa).
The Appliance must be isolated from the gas supply piping system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than ½ psig (3.5 kPa).

The appliance and its gas connections must be leak tested before placing the appliance in operation.

The inlet gas pressure must be within the range specified. This is for the purposes of input adjustment.

In order to choose the proper size for the gas line, consult local codes or the National Fuel Gas Code ANSI Z223.1.

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:

Natural Gas Supply Pressure
Min. 4" WC
Max. 10.5" WC

LP Gas Supply Pressure
Min. 8" WC
Max. 14" WC

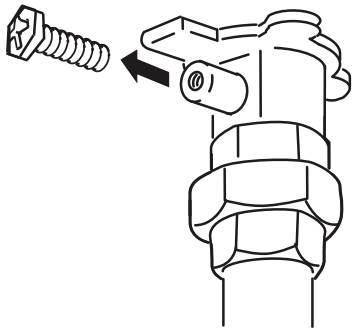
Gas Meter
Select a gas meter capable of supplying the entire btuh demand of all gas appliances in the building.

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 199,900 btuh (180,000 btuh (NRC98-DV,-OD), 157,000 btuh (NRC83-DV,-OD).
- Install a gas shutoff valve on the supply line.
- Use only approved gas piping materials.

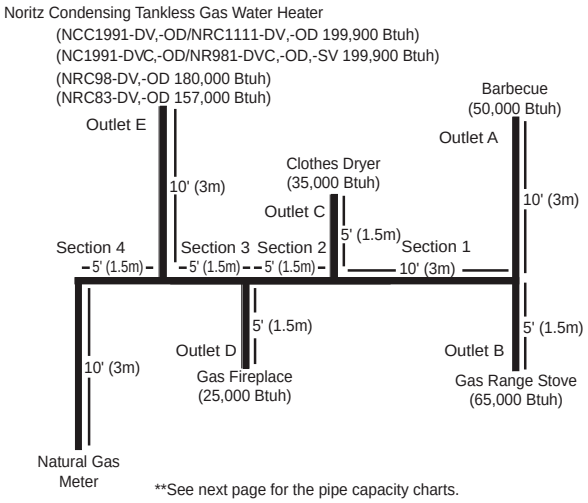
Measuring Gas Pressure

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



**See next page for the pipe capacity charts.

Instructions

1. Size each outlet branch starting from the furthest using the Btuh required and the length from the meter.
2. 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' (13.5m) (Use 50' (15m)), 50,000 Btuh requires 1/2"
Outlet B: 40' (12m), 65,000 Btuh requires 1/2"
Section 1: 45' (13.5m) (Use 50' (15m)), 115,000 Btuh requires 3/4"
Outlet C: 30' (9m), 35,000 Btuh requires 1/2"
Section 2: 45' (13.5m) (Use 50' (15m)), 150,000 Btuh requires 3/4"
Outlet D: 25' (7.5m) (Use 30' (9m)), 25,000 Btuh requires 1/2"
Section 3: 45' (13.5m) (Use 50' (15m)), 175,000 Btuh requires 1"
Outlet E: 25' (7.5m) (Use 30' (9m)),199,900 Btuh requires 3/4" (NCC1991/NRC1111, NC1991/NR981),
180,000 Btuh requires 3/4" (NRC98-DV,-OD),
157,000 Btuh requires 3/4" (NRC83-DV,-OD)
Section 4: 45' (13.5m) (Use 50' (15m)), 355,000 Btuh requires 1-1/4"

Gas Line Sizing for a Noritz Condensing Tankless Gas Water Heater

Adapted from UPC 1997

Maximum **Natural Gas** Delivery Capacity in Cubic Feet per Hour (0.60 Specific Gravity, 0.5" WC Pressure Drop)

Pipe	Length in Feet										
Size	10' (3m)	20' (6m)	30' (9m)	40' (12m)	50' (15m)	60' (18m)	70' (21m)	80' (24m)	90' (27m)	100' (30m)	125' (37.5m)
1/2"	174	119	96	82	73	66	61	56	53	50	44
3/4"	363	249	200	171	152	138	127	118	111	104	93
1"	684	470	377	323	286	259	239	222	208	197	174
1 1/4"	1404	965	775	663	588	532	490	456	428	404	358
1 1/2"	2103	1445	1161	993	880	798	734	683	641	605	536
2"	4050	2784	2235	1913	1696	1536	1413	1315	1234	1165	1033
2 1/2"	6455	4437	3563	3049	2703	2449	2253	2096	1966	1857	1646
3"	11,412	7843	6299	5391	4778	4329	3983	3705	3476	3284	2910
3 1/2"	16,709	11,484	9222	7893	6995	6338	5831	5425	5090	4808	4261
4"	23,277	15,998	12,847	10,995	9745	8830	8123	7557	7091	6698	5936

Contact the Gas Supplier for Btu/Cubic Ft. of the Supplied Gas. 1000 BTU/Cubic Ft. is a Typical Value

Maximum **Liquefied Petroleum** (Undiluted) Delivery Capacity in Thousands of Btuh (0.5" WC Pressure Drop)

Pipe	Length in Feet												
Size	10' (3m)	20' (6m)	30' (9m)	40' (12m)	50' (15m)	60' (18m)	70' (21m)	80' (24m)	90' (27m)	100' (30m)	125' (37.5m)	150' (45m)	200' (60m)
1/2"	275	189	152	129	114	103	96	89	83	78	69	63	55
3/4"	567	393	315	267	237	217	196	185	173	162	146	132	112
1"	1071	732	590	504	448	409	378	346	322	307	275	252	213
1 1/4"	2205	1496	1212	1039	913	834	771	724	677	630	567	511	440
1 1/2"	3307	2299	1858	1559	1417	1275	1181	1086	1023	976	866	787	675
2"	6221	4331	3465	2992	2646	2394	2205	2047	1921	1811	1606	1496	1260

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

Maximum Capacity of Flex TracPipe® in Cubic Feet per Hour of **Natural Gas** (0.60 Specific Gravity, 0.5" WC Pressure Drop)

Pipe	Length in Feet											
Size	10' (3m)	20' (6m)	30' (9m)	40' (12m)	50' (15m)	60' (18m)	70' (21m)	80' (24m)	90' (27m)	100' (30m)	150' (45m)	200' (60m)
3/4"	206	147	121	105	94	86	80	75	71	67	55	48
1"	383	269	218	188	168	153	141	132	125	118	94	82
1 1/4"	614	418	334	284	251	227	209	194	181	171	137	116
1 1/2"	1261	888	723	625	559	509	471	440	415	393	320	277
2"	2934	2078	1698	1472	1317	1203	1114	1042	983	933	762	661

Maximum Capacity of Flex TracPipe® in Thousands of Btuh **Liquefied Petroleum** (0.5" WC Pressure Drop)

Pipe	Length in Feet											
Size	10' (3m)	20' (6m)	30' (9m)	40' (12m)	50' (15m)	60' (18m)	70' (21m)	80' (24m)	90' (27m)	100' (30m)	150' (45m)	200' (60m)
3/4"	325	232	191	166	149	136	126	118	112	106	87	76
1"	605	425	344	297	265	241	222	208	197	186	143	129
1 1/4"	971	661	528	449	397	359	330	307	286	270	217	183
1 1/2"	1993	1404	1143	988	884	805	745	696	656	621	506	438
2"	4638	3285	2684	2327	2082	1902	1761	1647	1554	1475	1205	1045

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

TracPipe® is a registered trademark of Omega Flex.

Maximum Capacity for Gas Flex Connectors in Cubic Feet per Hour of **Natural Gas** (0.60 Specific Gravity, 0.5" WC Pressure Drop)

Pipe	Length in Inches					
Size	12" (300mm)	24" (600mm)	36" (900mm)	48" (1200mm)	60" (1500mm)	72" (1800mm)
1/2"	180	150	125	106	93	86
3/4"	—	290	255	215	197	173
1"	—	581	512	442	397	347
1 1/4"	—	1470	1200	1130	960	930

Maximum Capacity for Gas Flex Connectors in Thousands of Btuh **Liquefied Petroleum** (0.5" WC Pressure Drop)

Pipe	Length in Inches					
Size	12" (300mm)	24" (600mm)	36" (900mm)	48" (1200mm)	60" (1500mm)	72" (1800mm)
1/2"	288	240	200	169	149	137
3/4"	—	465	409	344	315	278
1"	—	930	825	708	638	556
1 1/4"	—	2352	1920	1808	1536	1488

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

■ Manifold Gas Pressure Adjustment

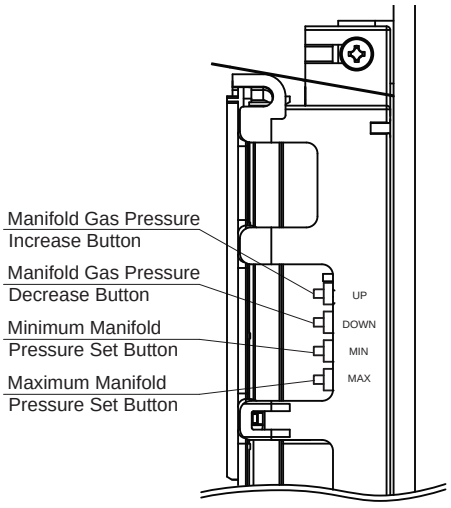
Note 1) Use the following procedure to adjust the manifold gas pressure only if it can be done with a high flow rate through the unit.

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 Pressures Maximum and Minimum Values

Model Name	Gas type	Supply Pressure (inch H_2O)	Manifold Pressure (inch H_2O) Cover off	
			Max value	Min value
NRC98-DV NRC83-DV	NG	7.9	2.95	1.10
	LPG	11.0	3.60	1.35
NRC98-OD NRC83-OD	NG	7.9	2.60	0.95
	LPG	11.0	3.65	1.25

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

Manifold Gas Pressures Maximum and Minimum Values

Model Name	Gas type	Supply Pressure (inch H_2O)	Manifold Pressure (inch H_2O) Cover off	
			Max. value	Min. value
NRC1111-DV	NG	7.9	3.20	1.50
NCC1991-DV	LP	11.0	3.70	1.50
NRC1111-OD	NG	7.9	3.05	1.30
NCC1991-OD	LP	11.0	3.40	1.45

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

Manifold Gas Pressures Maximum and Minimum Values

Model Name	Gas type	Supply Pressure (inch H_2O)	Manifold Pressure (inch H_2O) Cover off	
			Max. value	Min. value
NR981-OD	Natural	7.9	2.73	1.25
NC1991-OD	LP	11.0	4.22	1.81
NR981-DVC	Natural	7.9	Refer to the "Setting list for Gas	
NC1991-DVC	LP	11.0	manifold pressure(NR981/NC1991-	
NR981-SV	Natural	7.9	2.57	1.21
	LP	11.0	4.14	1.77

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

Setting list for Gas manifold pressure(NR981/NC1991-DVC)

Manifold Pressure (inch H_2O) Cover off								
Vent length	Dip7=OFF	Dip8=OFF	Dip7=ON	Dip8=OFF	Dip7=OFF	Dip8=ON	Dip7=ON	Dip8=ON
adjustment	Minimum		Short		Long		Maximum	
Gas type	Max. value	Min. value	Max. value	Min. value	Max. value	Min. value	Max. value	Min. value
Natural	2.87	1.34	2.81	1.32	2.77	1.30	2.73	1.30
LP	3.23	1.43	3.13	1.39	3.09	1.36	3.05	1.34

<NR83-DVC>

■Manifold Gas Pressure Adjustment

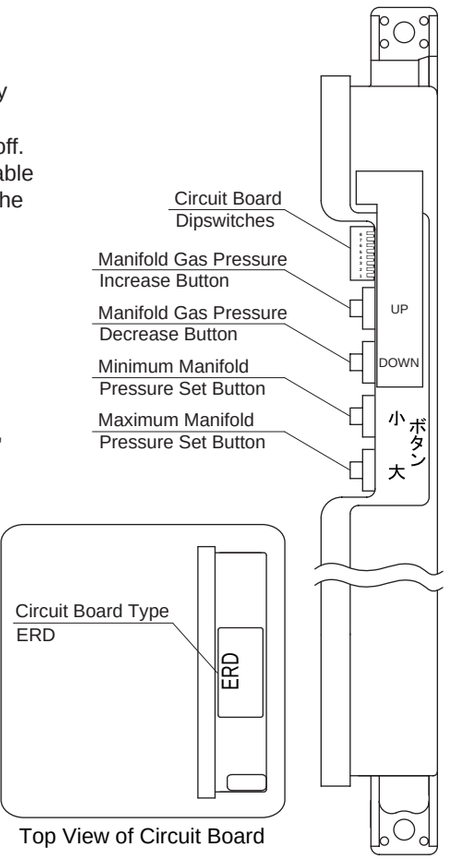
Note 1) Use the following procedure to adjust the manifold gas pressure only if it can be done with a high flow rate through the unit.

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.



Top View of Circuit Board

<Maximum Vent Length Configurations>

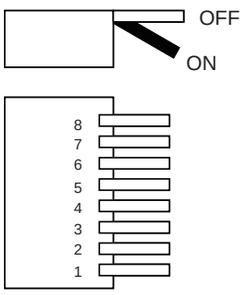
Vent length			Elbows						
ft	m	Number of pieces**	0	1	2	3	4	5	6
3	0.90	1	①	①	②	③	③	④	④
6	1.80	2	①	②	②	③	③	④	
9	2.70	3	①	②	③	③	④	④	
12	3.60	4	②	②	③	④	④		
15	4.50	5	②	③	③	④	④		
18	5.40	6	②	③	④	④			
21	6.30	7	③	③	④	④			
24	7.20	8	③	④	④				
27	8.10	9	③	④	④				
30	9.00	10	④	④					
32	9.90	11	④	④					
35	10.80	12	④						
38	11.70	13	④						

① Minimum length
② Short length
③ Long length
④ Maximum length

Setting list for Gas manifold pressures (NR83-DVC)

Manifold Pressure for NR83-DVC (inch H_2O) Cover off								
Vent length adjustment	Dip7=OFF Dip8=OFF		Dip7=ON Dip8=OFF		Dip7=OFF Dip8=ON		Dip7=ON Dip8=ON	
	Minimum length		Short length		Long length		Maximum length	
Gas type	Max value	Min value	Max value	Min value	Max value	Min value	Max value	Min value
Natural	2.55	1.00	2.55	1.00	2.50	0.95	2.50	0.95
(Vertical termination)*	(2.50)	(0.95)	(2.45)	(0.95)	(2.40)	(0.95)	(2.40)	(0.95)
LPG	3.70	1.35	3.65	1.35	3.60	1.35	3.60	1.35
(Vertical termination)*	(3.60)	(1.30)	(3.55)	(1.30)	(3.50)	(1.30)	(3.50)	(1.30)

*Use these settings when the unit terminates using the vertical rain cap.
Note: If the supply gas is a propane/air mix, adjust the manifold pressures using the natural gas settings.



	DIP7	DIP8
Minimum length	OFF	OFF
Short length	ON	OFF
Long length	OFF	ON
Maximum length	ON	ON

<NR83-DVC>

■ Concentric Pipe (Optional pipe)

Concentric Pipe Name	Type	NR98-DVC	NC199-DVC	NR83-DVC
CVK-V-CF	Vertical	OK	OK	Cannot be used.
CVK-V-CF-1	Vertical	OK	OK	Cannot be used.
CVK-V-CF-2	Vertical	OK	OK	OK
CVK-V-CA	Vertical	OK	OK	Cannot be used.
CVK-V-CA-1	Vertical	OK	OK	Cannot be used.
CVK-V-CA-2	Vertical	OK	OK	OK
CVK-V-F	Vertical	OK	OK	Cannot be used.
CVK-V-A	Vertical	OK	OK	Cannot be used.
CVK-H	Horizontal	OK	OK	OK
CVK-H2	Horizontal	OK	OK	OK
CVT-S	Horizontal	OK	OK	OK
CVK-S2	Horizontal	OK	OK	OK

■ Propane(LPG)-Air Mixture Adjustments

1. When installing the water heater in an area that uses a propane-air mixture for the supply gas, it will be necessary to adjust the dip switches as outlined below.
2. For natural gas units, it will also be necessary to change the gas manifold main damper. This part is not supplied with natural gas units and must be ordered separately.

<<Notes for converting natural gas units>>
Natural gas water heaters can be changed to "LPG/Air Mix specification".
The changing method is shown below.
1. Change the main damper from ”Main damper 17-12 EFW" to "Main damper 17-11 EFW”.
2. Change Soft DIP setting as shown in the table below (A1,A2=ON).

Change Soft DIP

Model	Gas type	Circuit board DIP setting (●: ON ○:OFF)		Main damper
		A1	A2	
NR83-DVC	NG	●	○	Main damper 17-12 EFW
	LPG	○	○	Main damper 17-11 EFW
	Air-LPG	●	●	Main damper 17-11 EFW

■ Measures against oscillating combustion

If the oscillating combustion is generated in NR83-DVC, check the following items.

1. Check whether the exhaust extension condition is properly set (hard DIP setting SW7, 8)
2. Check whether the elevation condition is properly set (hard DIP setting SW5, 6)
3. Check that the gas type is proper

If the settings above are not wrong, change the Soft DIP setting shown below.

Change Soft DIP

Model	Gas type	Circuit board DIP setting (●: ON ○:OFF)
		30
NR83-DVC	NG	●
	LPG	●
	Air-LPG	●

Change “30” from OFF to ON.

<NRC98(-DV,-OD), NRC83(-DV,-OD), NR83-DVC>

■ Water Treatment

This water heater is equipped with an optional automatic service reminder function to alert the user when flushing or a cartridge/filter change is required. Once activated, the unit will display an "05" error code on the remote controller when maintenance is due. The service interval can be set for either 6, 12, or 24 months; refer to page 28 for recommended flushing intervals. If a water treatment device is installed, refer to the instructions provided with the device for suggested service intervals. By default, the service reminder function is disabled.

To activate or adjust the service reminder error "05", refer to the below procedures.
Note: The setting must be done within the first 10 minutes of connecting electrical power to the water heater.

Setting Procedure:

1. Turn the water heater off by pressing the Power On/Off Button on the remote controller.
2. Disconnect, then reconnect electrical power to the water heater.
3. Press Setting Button "▲" or "▼" within 10 minutes of connecting electrical power until the remote controller displays "99".
4. Press Setting Button "▲" or "▼" until the remote controller displays "2C".
5. Press the Flow Meter Alarm Set Button for more than 0.5 seconds to switch between ON and OFF.
   "oF" PRIORITY LED goes out
   "on" PRIORITY LED blinks
6. If "2D" also needs to be changed, repeat steps 4 and 5.
7. To confirm the settings, press the Setting Buttons "▲" and "▼" simultaneously for more than 5 seconds. After the settings are confirmed, the maintenance writer mode will end and the remote controller display will disappear.

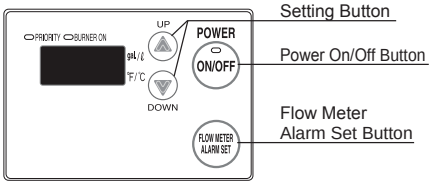
	2D	2C
No warning	○	○
6 months	○	●
12 months	●	○
24 months	●	●

ON=● OFF=○ *Initial factory setting.

Reset the display of the operation panel in the following way after the water heater is serviced.
When the "05" error code appears, reset the display only after the water heater is flushed and/or the water treatment device is serviced.
If the error is reset without performing the necessary service, the water heater may fail prematurely.
Note : In the case of Quick connect multi system, perform scale cleaning of both units.

How to reset the scale warning:

1. Set the Power On/Off Button to the OFF position.
2. Push the Flow Meter Alarm Set Button more than 2 seconds.
3. Push the Flow Meter Alarm Set Button several times until "7 oF" is displayed.
4. Press Setting Button "▲" more than 5 seconds.
   This will complete the service warning reset.
5. Push the Power On/Off Button.
6. The preset temperature is displayed.



Press setting button "▲" more than 5 seconds. At this time, a sound is emitted from the operation panel.

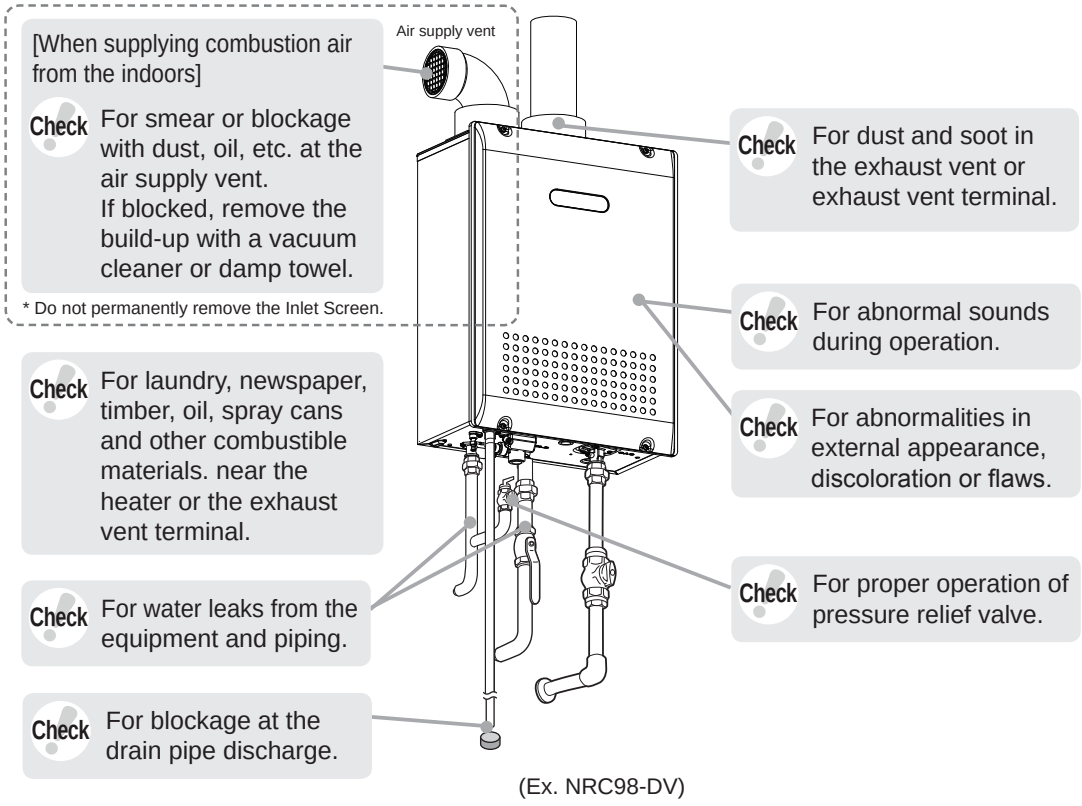
Push the Power On/Off Button.

Periodic Inspection

⚠ CAUTION

Be sure to do.

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



(Ex. NRC98-DV)

Periodic Maintenance

Equipment

Wipe the outside surface with a wet cloth, then dry the surface. Use a neutral detergent to clean any stains.
If an external condensate neutralizer is installed, periodic replacement of the neutralizing agent will be required.
Refer to the instructions supplied with the neutralizer for suggested replacement intervals.

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 water proof. Keep it as dry as possible.

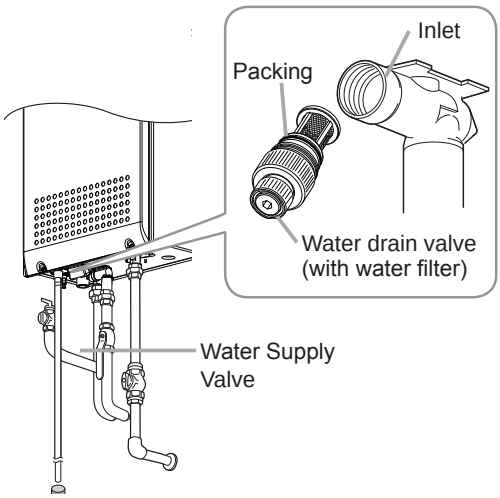
Periodic Maintenance

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 (about 0.4 gallon (1.4L) 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).



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.
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.
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.

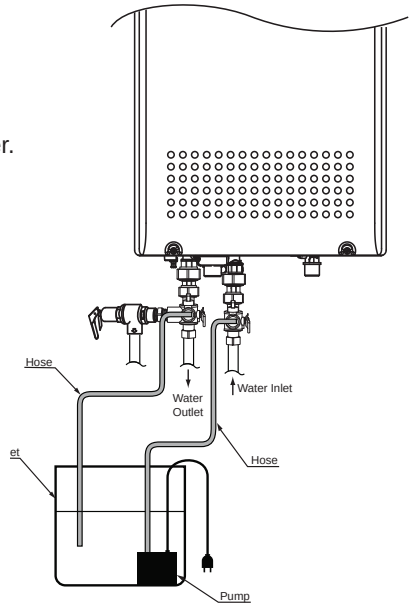


Figure 1. Flush Set-up

■ Changing Default Temperature Setting

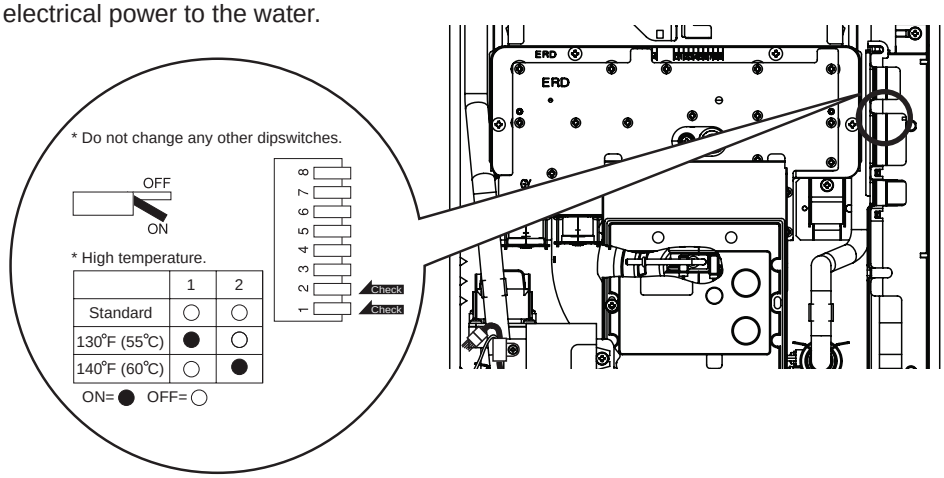
* The water heater has been factory set to allow a maximum temperature setting of 120 °F (50 °C). To access higher temperature settings through the remote controller, follow the below steps.

<When setting the maximum temperature to 130-140 °F (55-60 °C)>

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 (50 °C) appears on the display.
3. Set the upper limit of the hot-water supply temperature to 130 °F (55 °C) or 140 °F (60 °C) 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.

- The tankless gas water heater can be programmed so that it will default to one of three temperatures if the remote controller is removed (140, 130, 120 °F (60, 55, 50 °C). To change the default temperature, adjust the dip switches as described below. The default temperature is 120 °F (50 °C).

1. Disconnect electrical power to the water heater.
2. Remove the front cover of the water heater (4 screws).
3. Disconnect the remote controller. Adjust the dip switches as illustrated below.
4. Replace the front cover of the water heater (4 screws).
5. Reconnect electrical power to the water.



⚠ WARNING

- 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.
- Hot water heater temperatures over 125 °F (52 °C) can cause severe burns instantly or death from scalding.

CAUTION

* Damage can occur from frozen water within the device and pipes even in warm environments. Be sure to read below for appropriate measures.
* Repairs for damage caused by freezing are not covered by the warranty.

Freezing is prevented within the device automatically by the freeze-prevention heater.

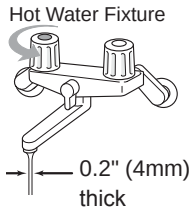
Freezing cannot be prevented when the power plug is unplugged. Do not remove the power plug from the wall outlet.
Freezing will be prevented regardless of whether the operation switch is ON or OFF.

* In normal operation, freezing is prevented within the device automatically unless the outside temperature without wind is below -30°F (-35°C) for NRC98-DV, NRC83-DV or -4°F (-20°C) for NRC98-OD, NRC83-OD.
  - For models NRC98-DV and NRC83-DV, when supplying combustion air from the indoors, the room temperature must be greater than 32°F (0°C) to prevent freezing and the room inside must not have negative pressure.
* The freeze prevention heaters will not prevent the plumbing external to the unit from freezing. Protect this plumbing with insulation, heat tape or electric heaters, solenoids, or pipe covers. If there remains a freezing risk, contact the nearest Noritz agent.

Take the measures below for extremely cold temperatures*.
Outside temperature including wind chill factor less than -30°F (-35°C) for NRC98-DV, NRC83-DV or -4°F (-20°C) for NRC98-OD, NRC83-OD.
- For models NRC98-DV and NRC83-DV, when supplying combustion air from the indoors, the room temperature must be greater than 32°F (0°C) to prevent freezing and the room inside must not have negative pressure.

This method can protect not only the heater, but also the water supply, water piping and mixing valves.

1. Turn off the power.
2. Close the gas supply valve.
3. Open a hot water fixture, and keep a small stream of hot water running. (0.1 gallon (400cc)/minute or about 0.2" (4mm) thick.)
   * If there is a mixing valve, set it to the highest level.
   * When linking multiple units, discharge water equivalent to (0.1 gallon (400cc)/minute per unit.)
4. The flow may become unstable from time to time. Check the flow 30 minutes later.
   * In general, it is not advisable to run water through the unit when it is OFF (p. 6), but in this case freeze prevention is more important.



* Remember to set mixing valves and fixtures to their original levels before using the unit again to prevent scalding.
* If there is still a risk that the unit will freeze, drain the unit as shown on the next page.

If water will not flow because it is frozen

1. Close the gas and water valves.
2. Turn off the power button.
3. Open the water supply valve from time to time to check whether water is running.
4. When the water is flowing again, check for water leaks from the equipment and piping before using.

If the heater or the piping is frozen, do not use the heater or it may get damaged.

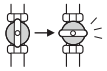
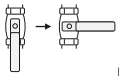
If the water heater will not be used for a long period of time, Drain the water.

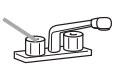
Drain the water as follows:

⚠ CAUTION

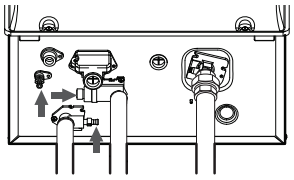
To avoid burns, wait until the equipment cools down before draining the water.
The appliance will remain hot after it is turned off.

Drain water into a bucket to prevent water damage.

1. Close the gas valve. 
2. Turn off ther power button.
3. Turn off the power supply.
   Do not touch with wet hands.
4. Close the water supply valve. 
5. Fully open all hot water fixtures.



6. Turn the drain plug to the left to open, and then remove.
7. Check that the water is completely drained, close all the drain plugs and the hot water fixtures after 10 minutes or more pass from operation of 6.



Drain Plugs

Each drain plug mignt not be visible if insulation is installed around the piping.

If the water heater will not be used for a long period of time, drain the water.

Drain the water as follows:

⚠ 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.

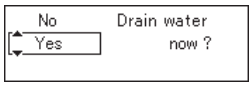
Drainage Using the Remote Controller

1 (1) ON/OFF button is "OFF".

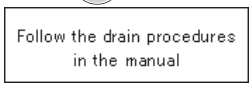
(2) Press the MENU button inside the cover,
Select Misc settings using the ▲▼ buttons.
Press the ENTER button.
The "Misc settings" screen appears.

(3) Select Drain water using the ▲▼ buttons,
and then press ENTER button.

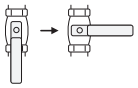
(4) Select "YES" using the ▲▼ buttons,



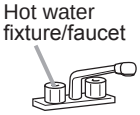
Press ENTER button.



2 Close the water supply valve.



3 Fully open all hot water fixtures/faucets.

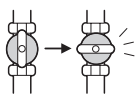


4 Open all drain plugs and drain the water out of the unit.

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

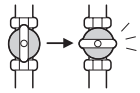
6 Close the gas valve and disconnect the electrical power supplied to the unit.

Do not touch with wet hands.



Manual Draining

1 Close the gas valve.



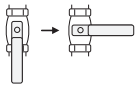
2 (1) Turn the power on/off button "On".

(2) Turn and leave open the hot water fixtures/ faucets 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.

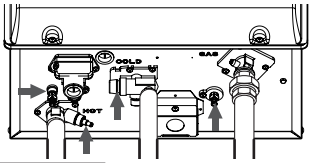


Do not touch with wet hands.

4 Fully open all hot water fixtures/faucets.

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/faucets.



Drain Plugs (Ex. NCC1991-DV)

Each drain plug mignt not be visible if insulation is installed around the piping.

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 adjusting the high elevation dip switches 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	3" or 4" PVC or CPVC Pipe
Maximum Vent Length	35 feet with 4- 90° elbows*

*Refer to the installation manual for proper settings to achieve this vent length.

- 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 condensate trap can be filled before connecting the vent pipe.

Filling the condensate trap with water (-DV type only)

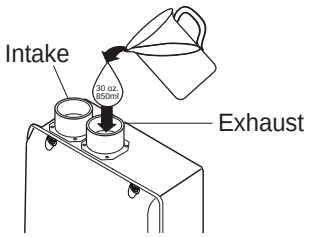
The condensate trap can be filled before connecting the vent pipe.

Filling the condensate trap before vent pipe installation.

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

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

1) Fill the condensate trap by pouring approx. 30 oz.(850ml) 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.)

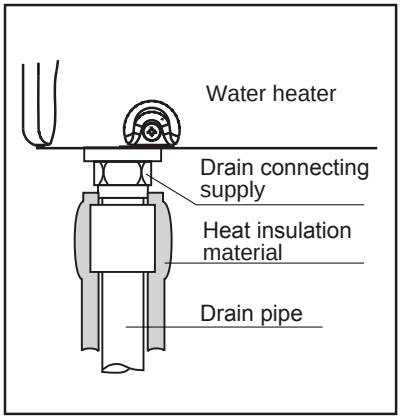
Note: The condensate discharged from the water heater has a pH level of approximately 2-3.
If required by local code, the condensate must be neutralized prior to disposal into the sewer system.
Refer to pages 22-23 for additional details.

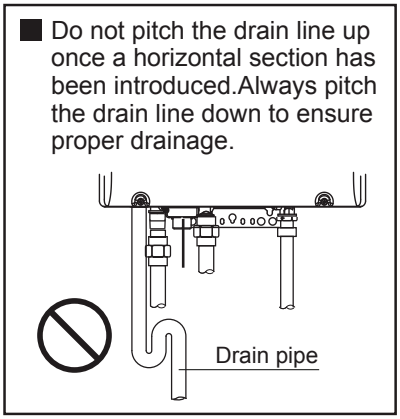
Electrical

- The electrical power supply to the unit should be installed bu\y a qualified electrician.
- Allocate 4A 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.

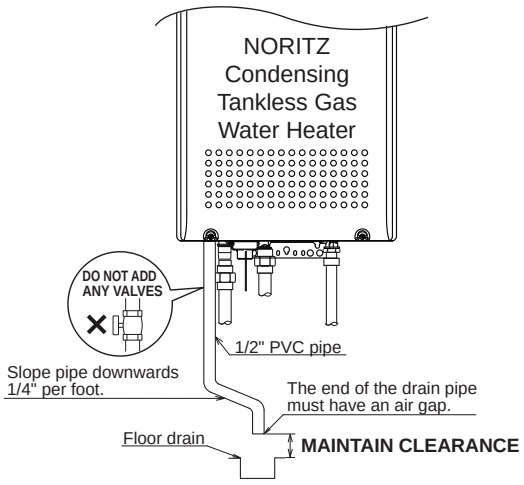
Condensate Piping

- This water heater is a high efficiency, fully condensing appliance which produces acidic condensate during operation. The water heater incorporates a collection and removal system which must be properly drained in order to ensure proper operation of this appliance.
- The pH level of the condensate is approximately 2-3. An external neutralizer must be installed on the drain piping prior to disposal when required by local code or when the condensate could cause damage.
- If an external neutralizer is installed, periodic replacement of the neutralizing agent will be required. Refer to the instructions supplied with the neutralizer for suggested replacement intervals.
- 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".
  In cold climates, do not drain the condensate to the outdoors. If the drain pipe freezes during cold weather, the pipe will not drain condensate and the unit will stop operating.
- 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 condensate will be discharged by gravity force only. Make the drain pipe run as short as possible.
- The end of the drain pipe must not be submerged in water or blocked in any way. To ensure proper drainage, leave the end of the drain pipe open to the atmosphere. Do not have a trap. Also, make sure that there are no obstructions blocking the drain line from discharging condensate.
- 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.).

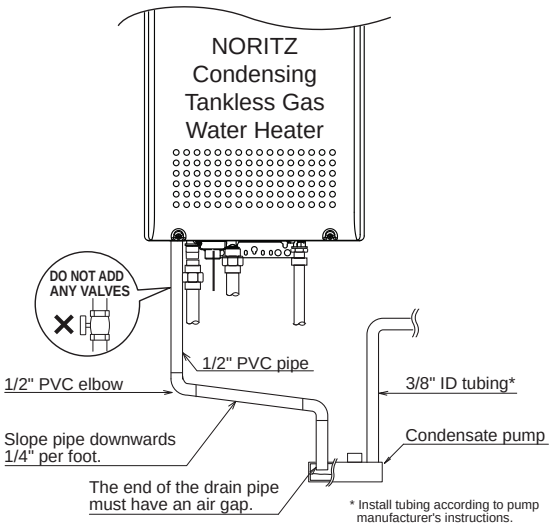




Condensate piping to floor drain



Condensate piping with pump



Note:

If the drain line becomes clogged or frozen, condensate will back-up into the water heater and a "29" error code will flash on the remote controller, ceasing operation. If this occurs, clear the clog or freeze so that condensate can freely flow. Be sure to slope the drain pipe, use the appropriate size pipe, allow the proper clearances, and apply freeze prevention measures (when necessary) to prevent the drain line from clogging or freezing.