PAVILION™

PB HEAT, LLC

Condensing Gas-Fired Combination Boiler

Rev : March 2020

PV199DV (GHQ-C3201WX-FF PB US)

Service Manual

- Refer to this manual whenever performing service or maintenance on this appliance.
- This manual will be used for service technical training seminars.
- The specifications and descriptions in this manual may be changed without prior notice.
- For further assistance, contact Pavilion Customer Center at 1-855-443-8468.

Do not short circuit any safety device on this appliance.

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Important Safety Information

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

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

1. Safety Tips for Service

• Wear the appropriate clothing and protective gear:

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 PB HEAT 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. Simultaneous Operation of Domestic Hot Water and Heating
   - Typical combi-boilers prioritize domestic hot water and shut down operation of heating. The PR series feature a fully modulating 3 way valve that allows proportional distribution for simultaneous heating and DHW supply. (See Operation Flow Charts)

2. Three Stainless Steel Heat Exchangers
   - Primary, secondary, and plate(DHW) heat exchangers made of high strength anti-corrosion stainless steel.

3. Domestic Hot Water: Dual Modulating Flow Control Valves
   - Max flow 11.1 gpm
   - Stable and quick domestic hot water temperature response.

4. Quick Connect Multi System
   - Allows the installation of a PR series combi-boiler with an UT series tankless water heater, linked together using a Quick Connect Cord.

2. Specifications/Performance Table

Specifications

Model Name			PV199DV (GHQ-C3201WX-FF PB US)
Weight			95 (pounds)
Operating Pressure			15 - 150 psi
Gas Supply Pressure			NG: 3.5″ - 10.5″ LP: 8.0″ - 14.0″
Water Holding Capacity			Under 2 Gallons
Connection Sizes	Water Inlet		3/4" NPT
	Hot Water Outlet		3/4" NPT
	Gas Inlet		3/4" NPT
	Condensate Drain		1/2" Threaded NPT
	Auto Feeder Inlet		1/2" NPT
	Heating Supply		1"
	Heating Return		1"
Power	Supply		120VAC 60Hz
	Consumption		Operation : 210W (NG&LP), Freeze Prevention : 125W
Freeze Protection			39°F (4°C)
Temperature Settings	Domestic Hot Water	°F Mode	90-140°F(In 5°F intervals) (11 Options)
		°C Mode	32°C,35°C,37°C-48°C (In 1°C intervals),50°C,55°C,60°C (17 Options)
	Heating	°F Mode	80*-180°F (In 1°F intervals) (81 Options)
		°C Mode	27-82°C (In 1°C intervals)(43 Options)

* Default temperature for heating setting is 100°F . Refer to the installation manual in order to set it to 80°F.

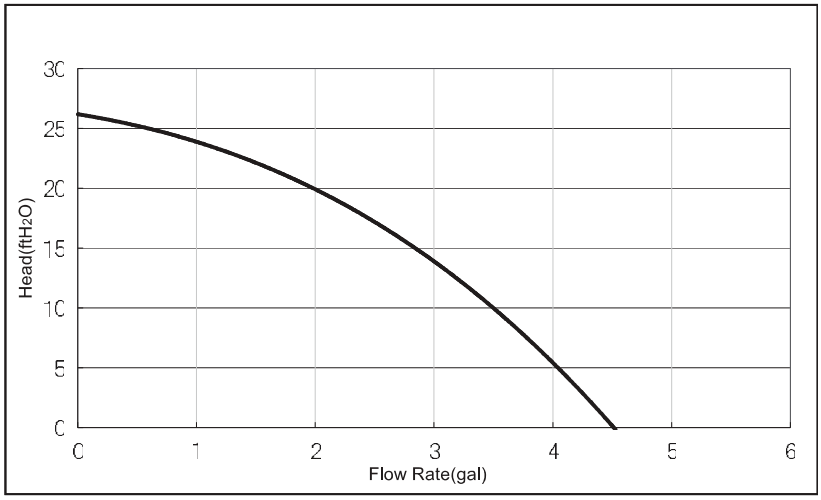
Performance

Gas Consumption	DHW (input BTU/h)	18,000 - 199,900
	Heating (input BTU/h)	18,000 - 120,000
DHW Flow Capacity (GPM)		0.29 - 11.1
Heating Capacity*1 (MBH)		111
NET AHRI Rating Water*2 (MBH)		97
AFUE (%)		95
Pump Performance (maximum GPM)		5.4

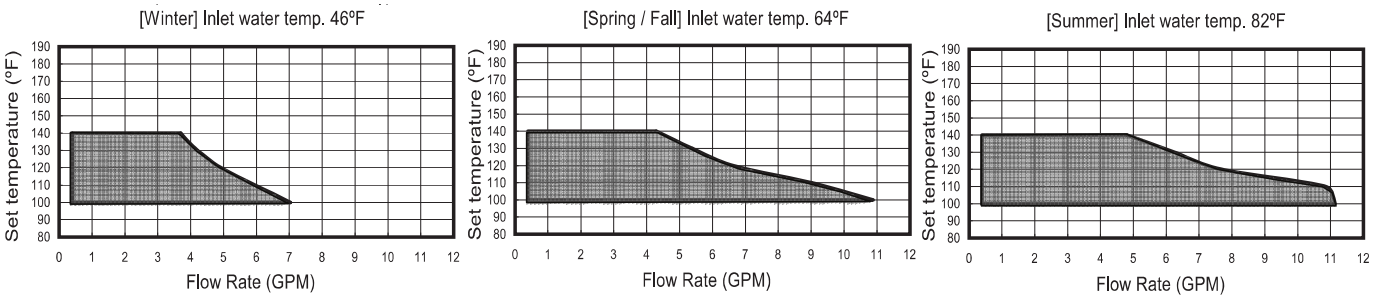
*1 Based on standard test procedures prescribed by United States Department of Energy (DOE).

*2 The Net AHRI water ratings shown are based on a piping and pickup allowance of 1.15.
Consult Pavilion Customer Center before selecting a boiler for installations having unusual piping and pickup requirements, such as intermittent system operation, extensive piping system, etc.

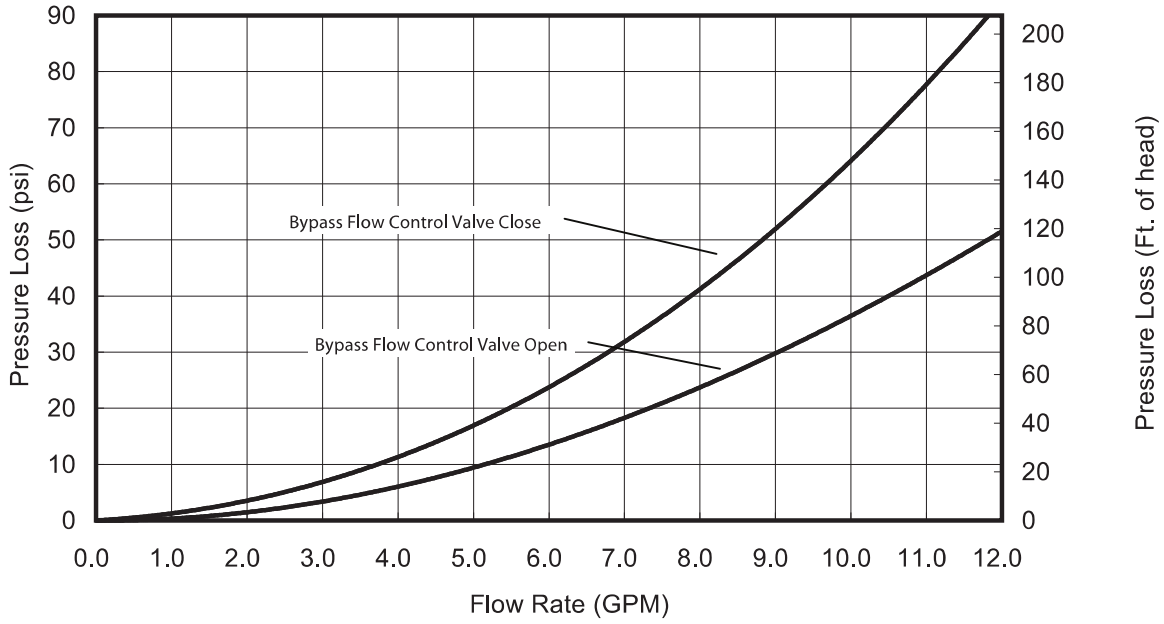
■ Pump Performance (w/ internal pressure drop)



■Hot Water Supply Capabilities

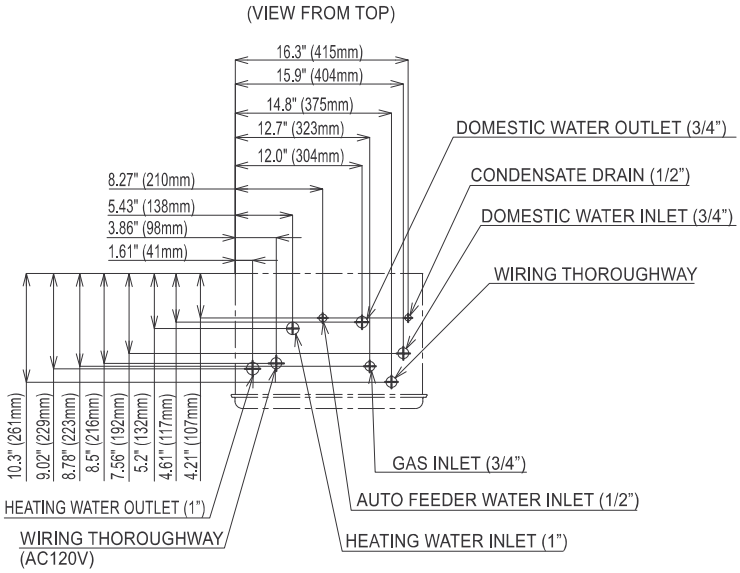


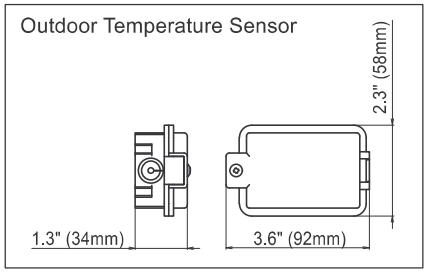
■ Pressure Loss Characteristics

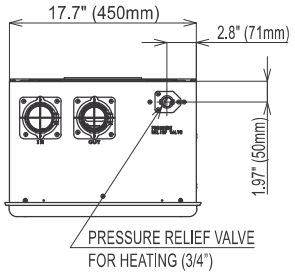


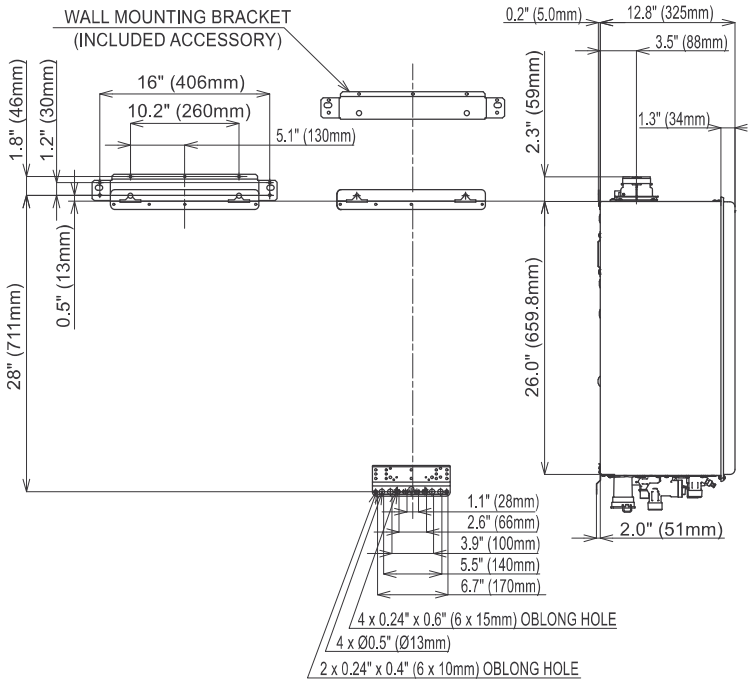
3. Dimensions

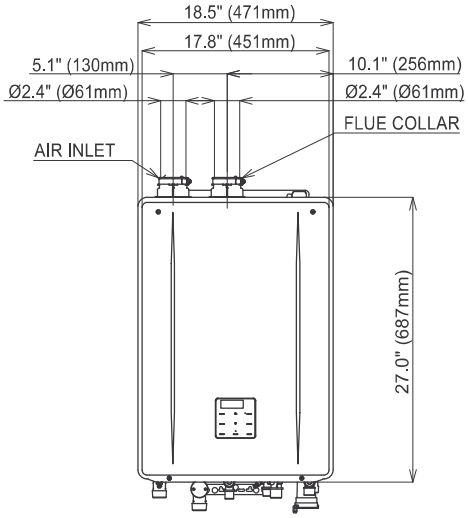
< inch (mm) >





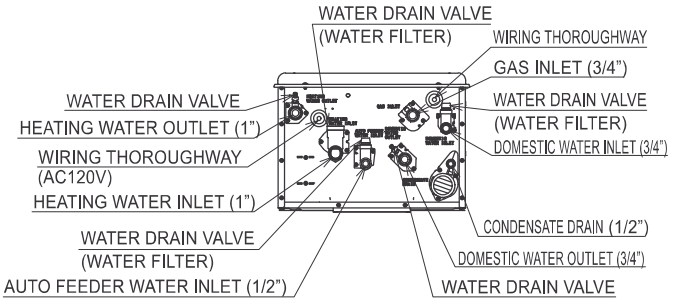






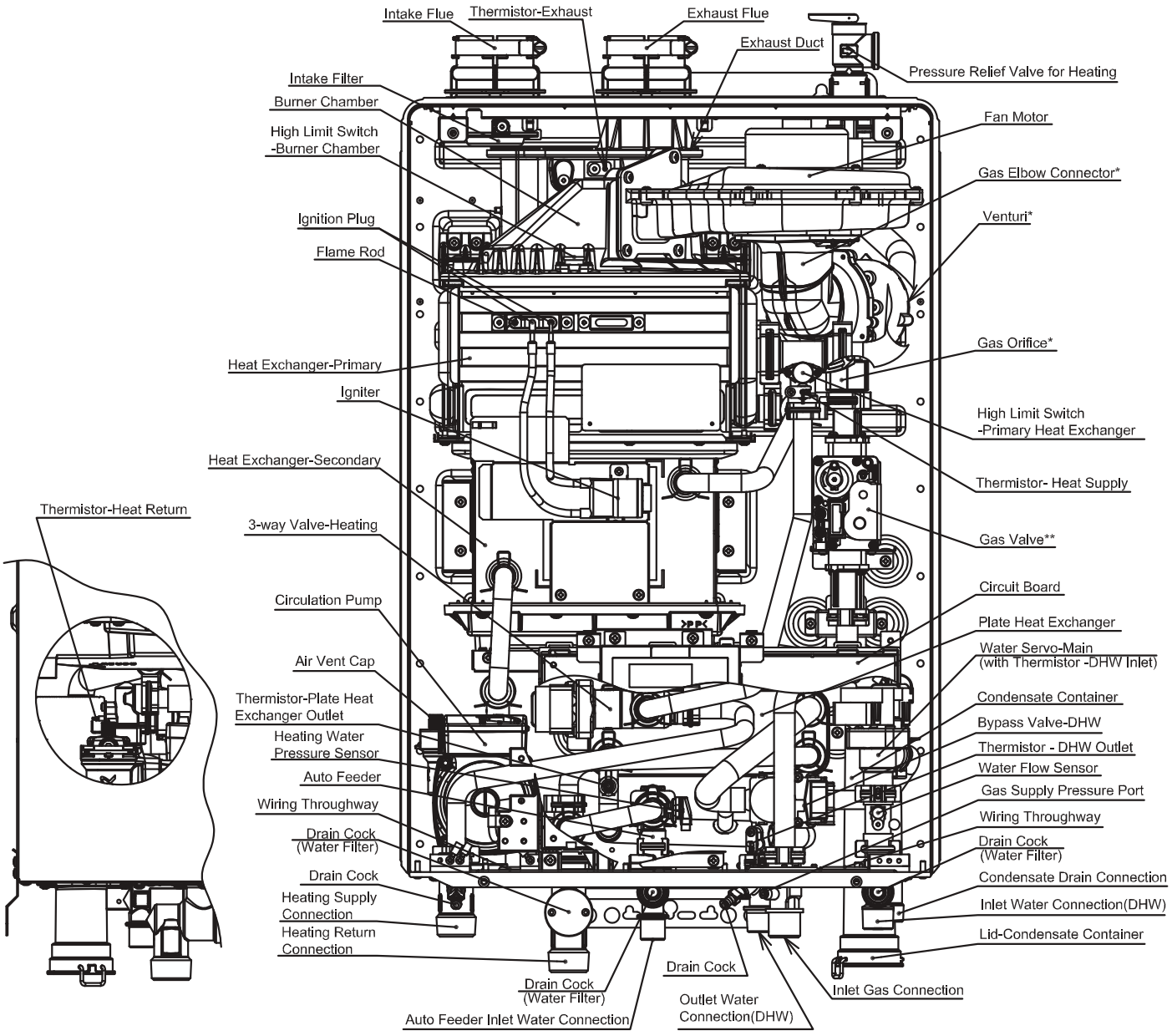
HEIGHT OF EACH FITTING
FROM CASE

PRESSURE RELIEF VALVE FOR HEATING	TOP	1.0" (26mm)
DOMESTIC WATER OUTLET	BOTTOM	2.0" (51mm)
DOMESTIC WATER INLET	BOTTOM	1.9" (49mm)
HEATING WATER OUTLET	BOTTOM	2.2" (55mm)
HEATING WATER INLET	BOTTOM	3.4" (86mm)
AUTO FEEDER WATER INLET	BOTTOM	2.3" (58mm)
CONDENSATE DRAIN	BOTTOM	1.7" (42mm)
GAS INLET	BOTTOM	2.2" (55mm)

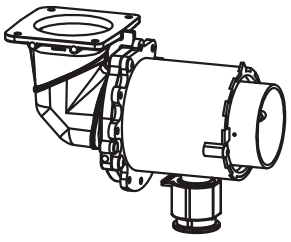


4. Components

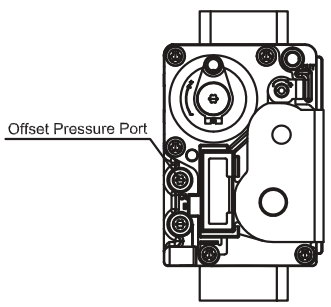
PV199DV (GHQ-C3201WX-FF PB US)



* Venturi, Gas Orifice and Gas Elbow Connector



**Gas Valve



5. Operating Principle

PV199DV (GHQ-C3201WX-FF PB US)

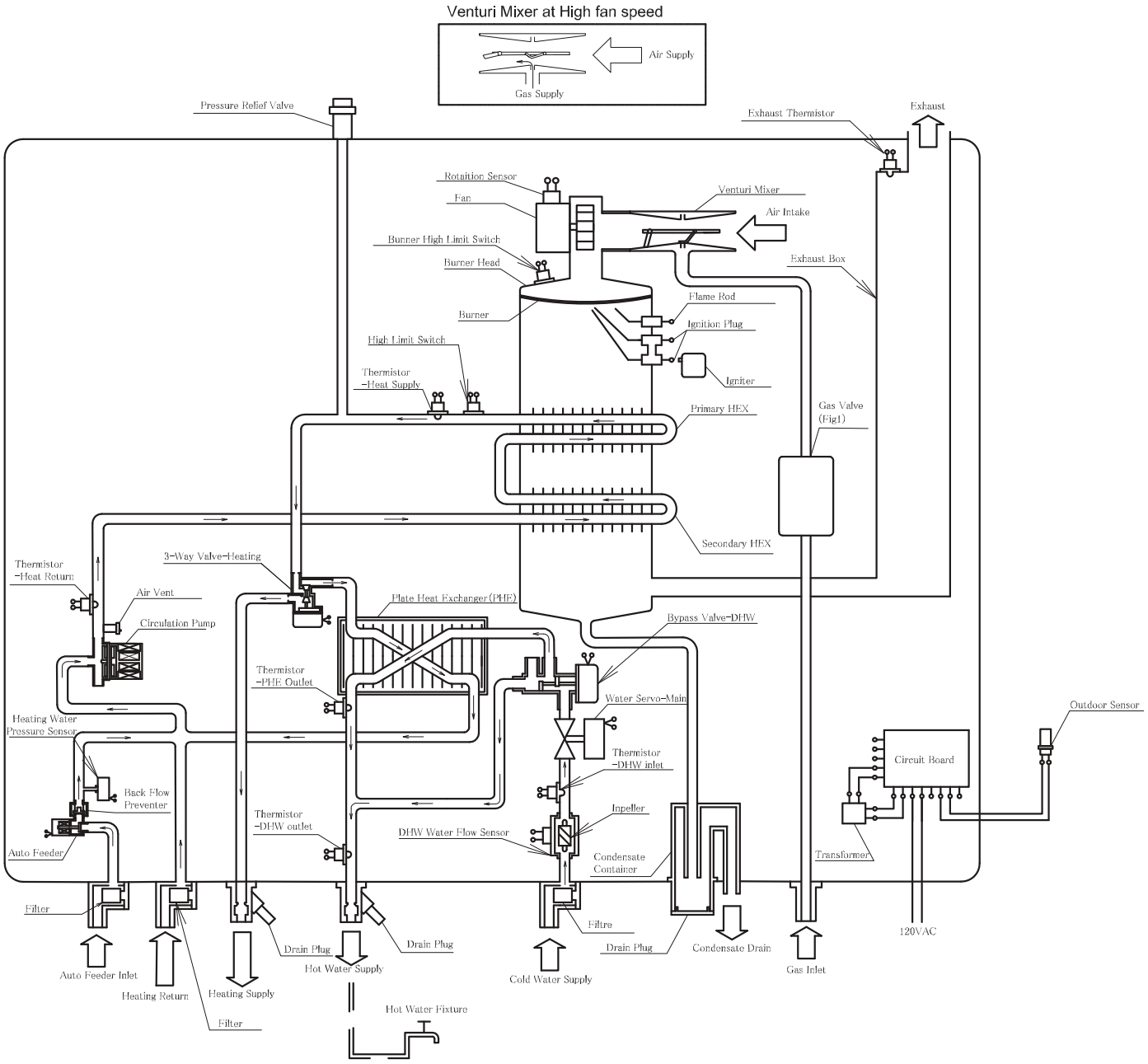
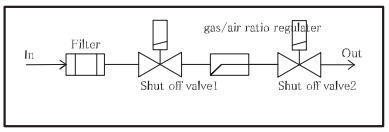
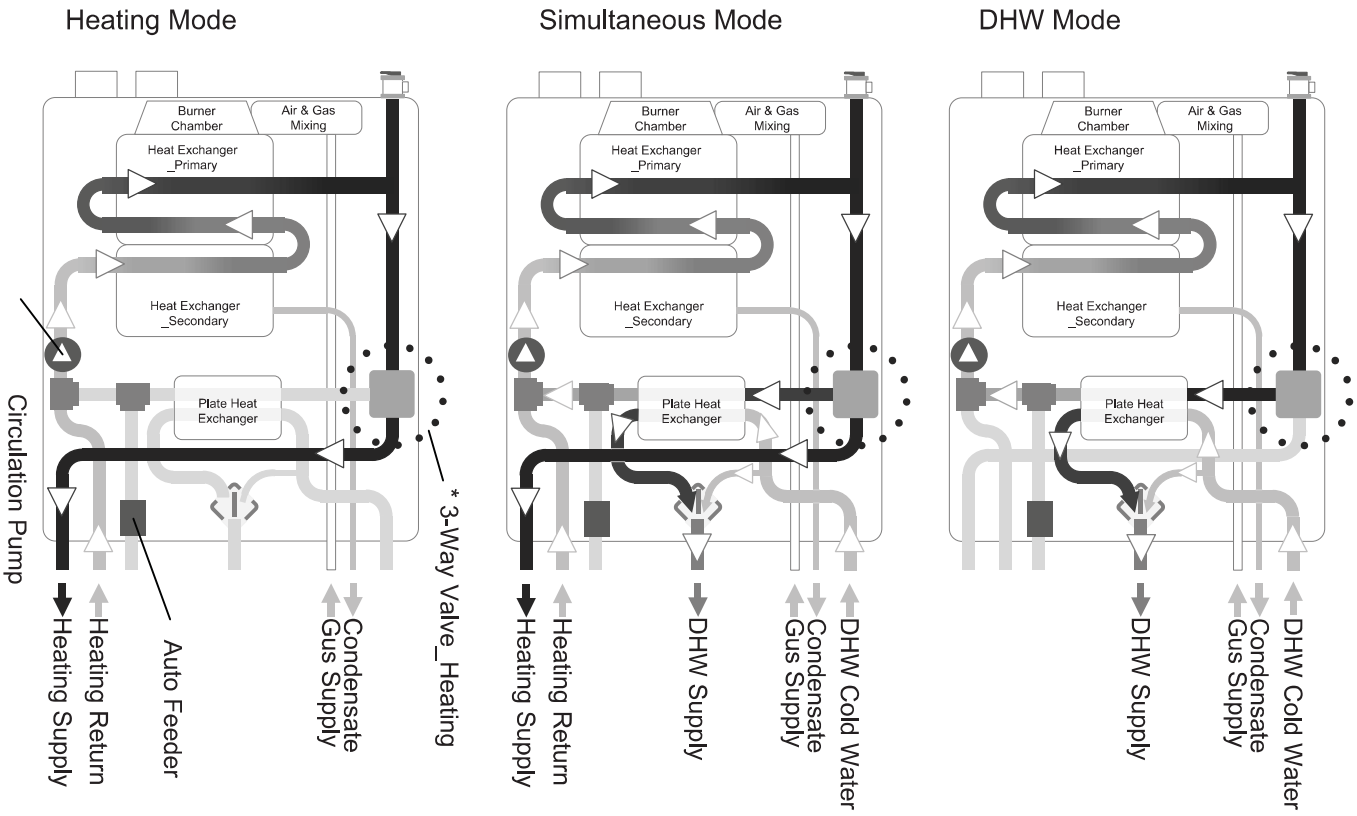


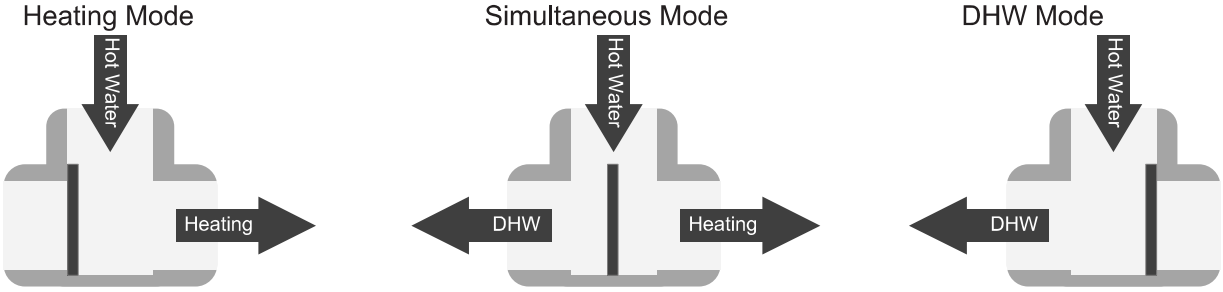
Fig.1 Gas valve



■ Operating Principle

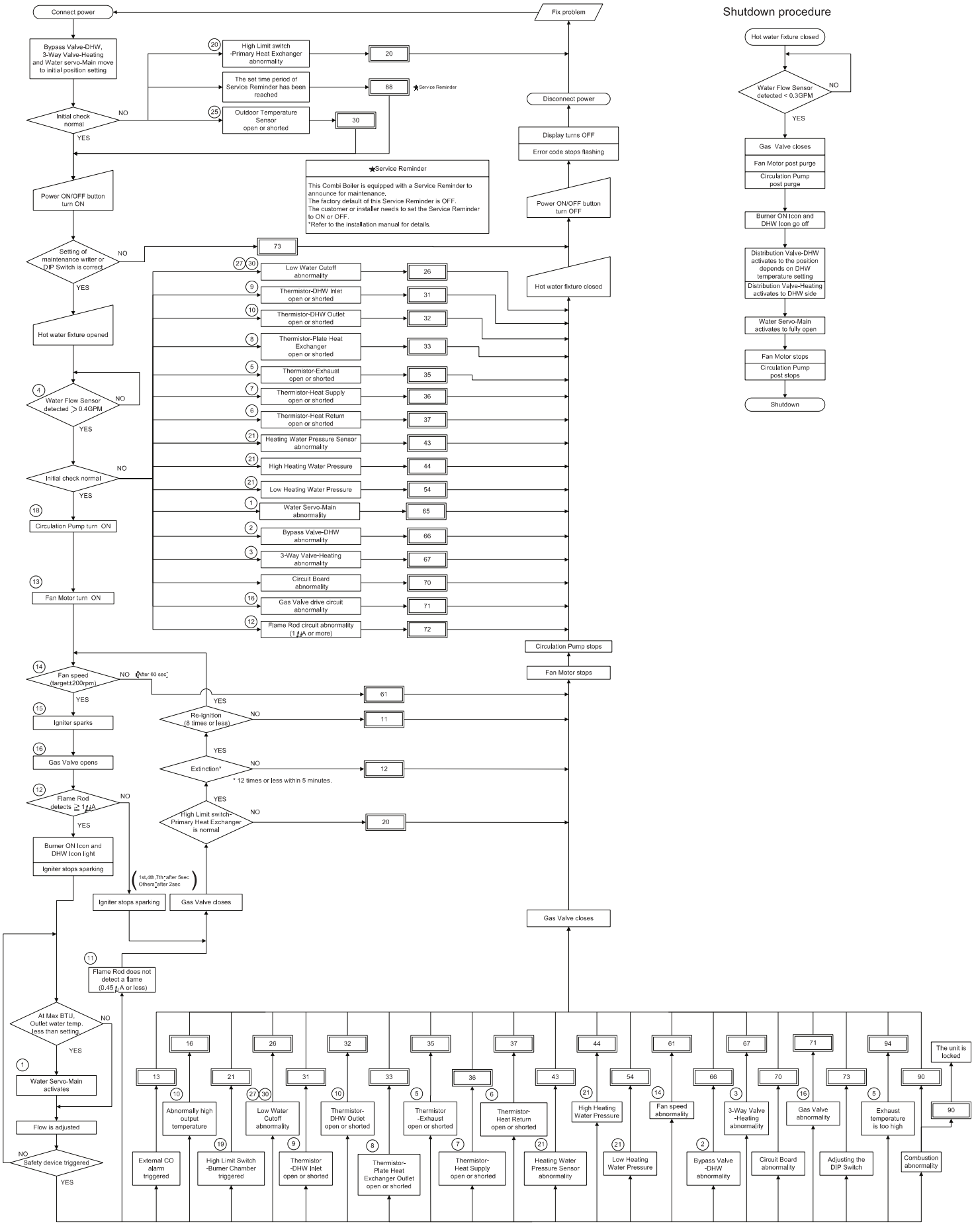


* Variable Distribution Ratio Control (3-Way Valve)

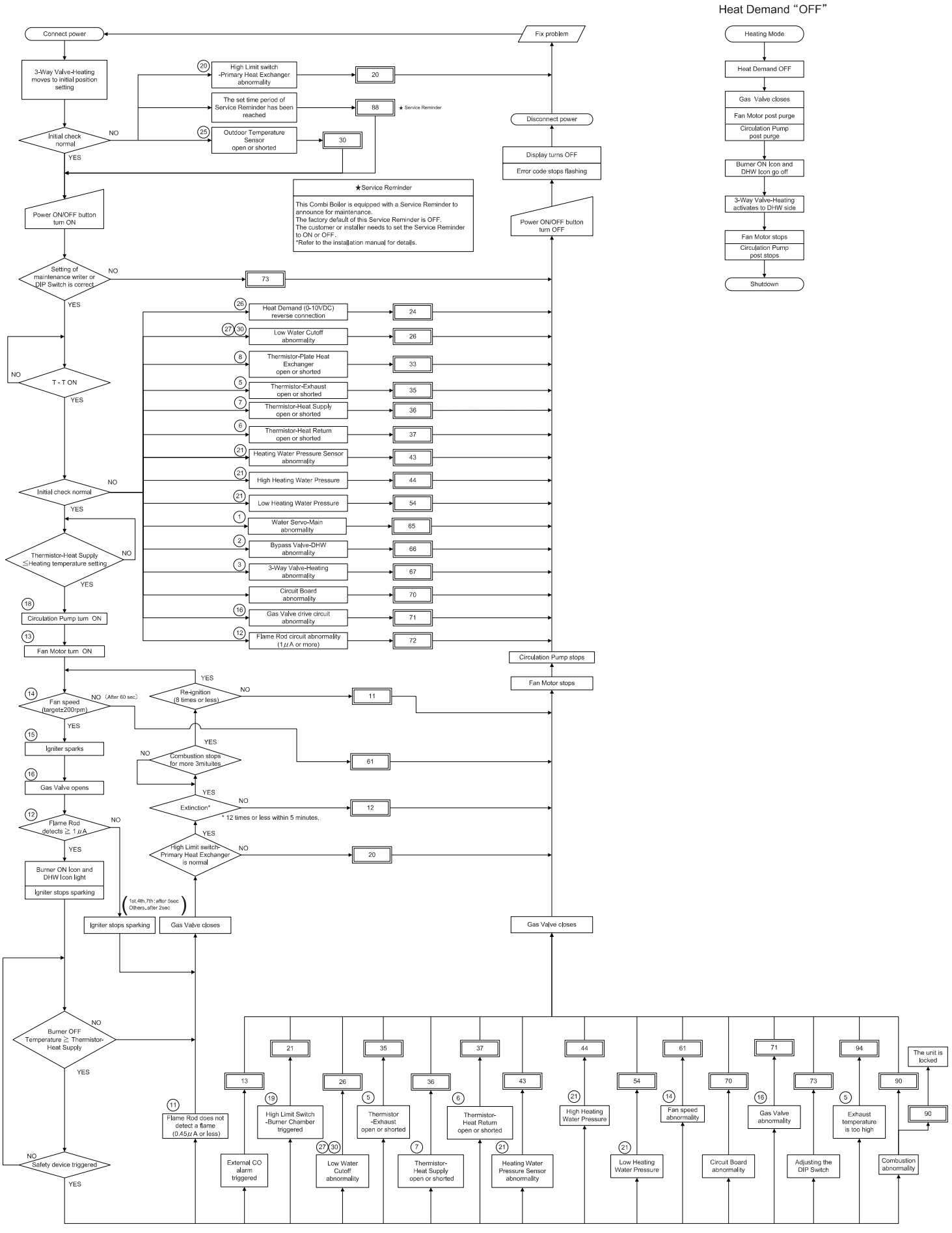


10. Operation Flow Chart

DHW Mode



■Operation Flow Chart < Heating Mode>

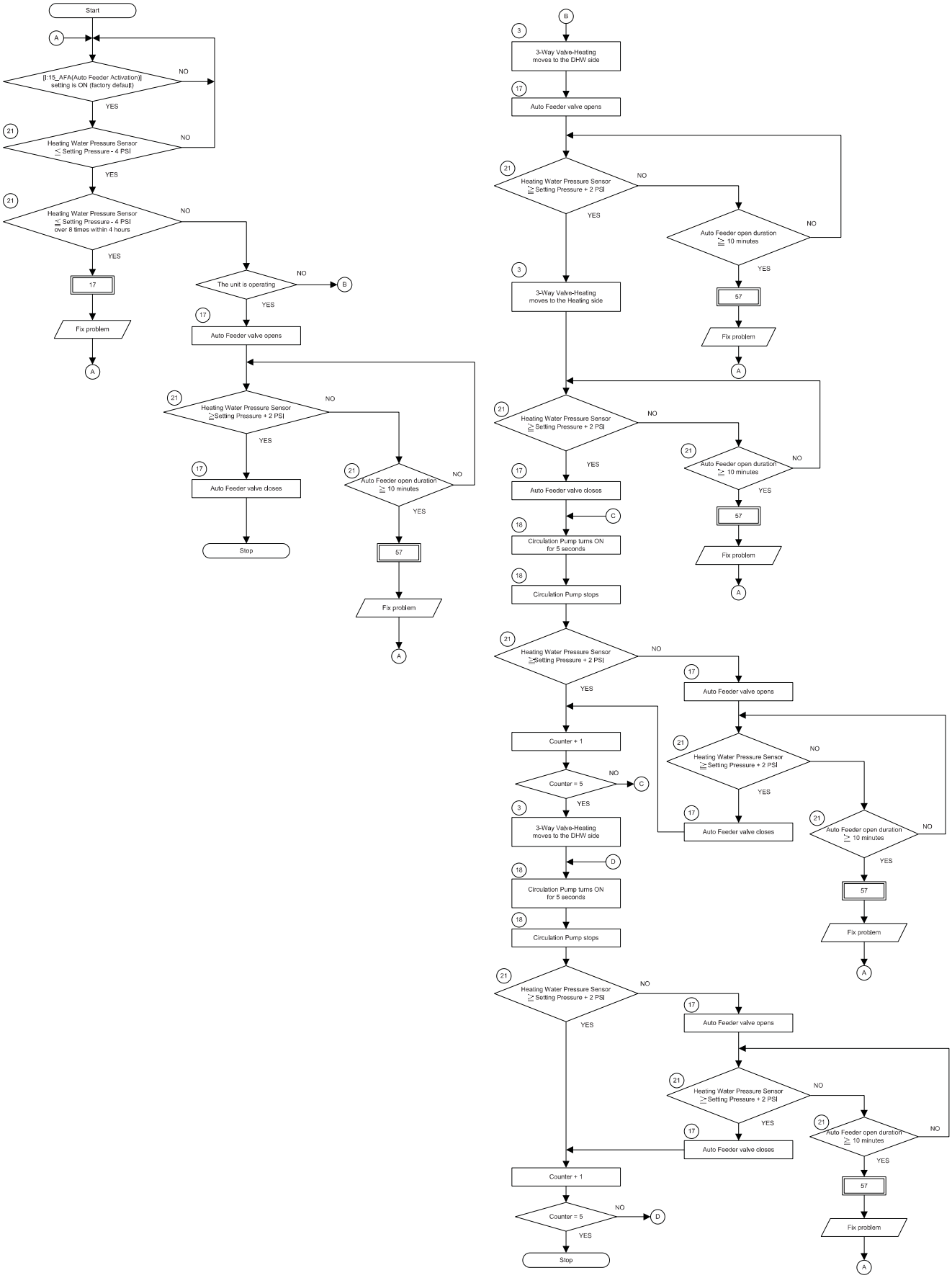


*** If the heating system does not require the Auto Feeder operation, set [I:15_AFA(Auto Feeder Activation)] OFF in "Installer Mode" and plug the Auto Feeder Water Inlet Connection.**

*** The factory default of the Auto Feeder Activation is ON.**

*** The Auto Feeder Process operates only when the Operation Panel is ON except for during Freeze Prevention.**

*** The Process does not operate during flushing of the Heat Exchanger and the draining the water out of the unit.**



■Operation Flow Chart <Freeze prevention control>

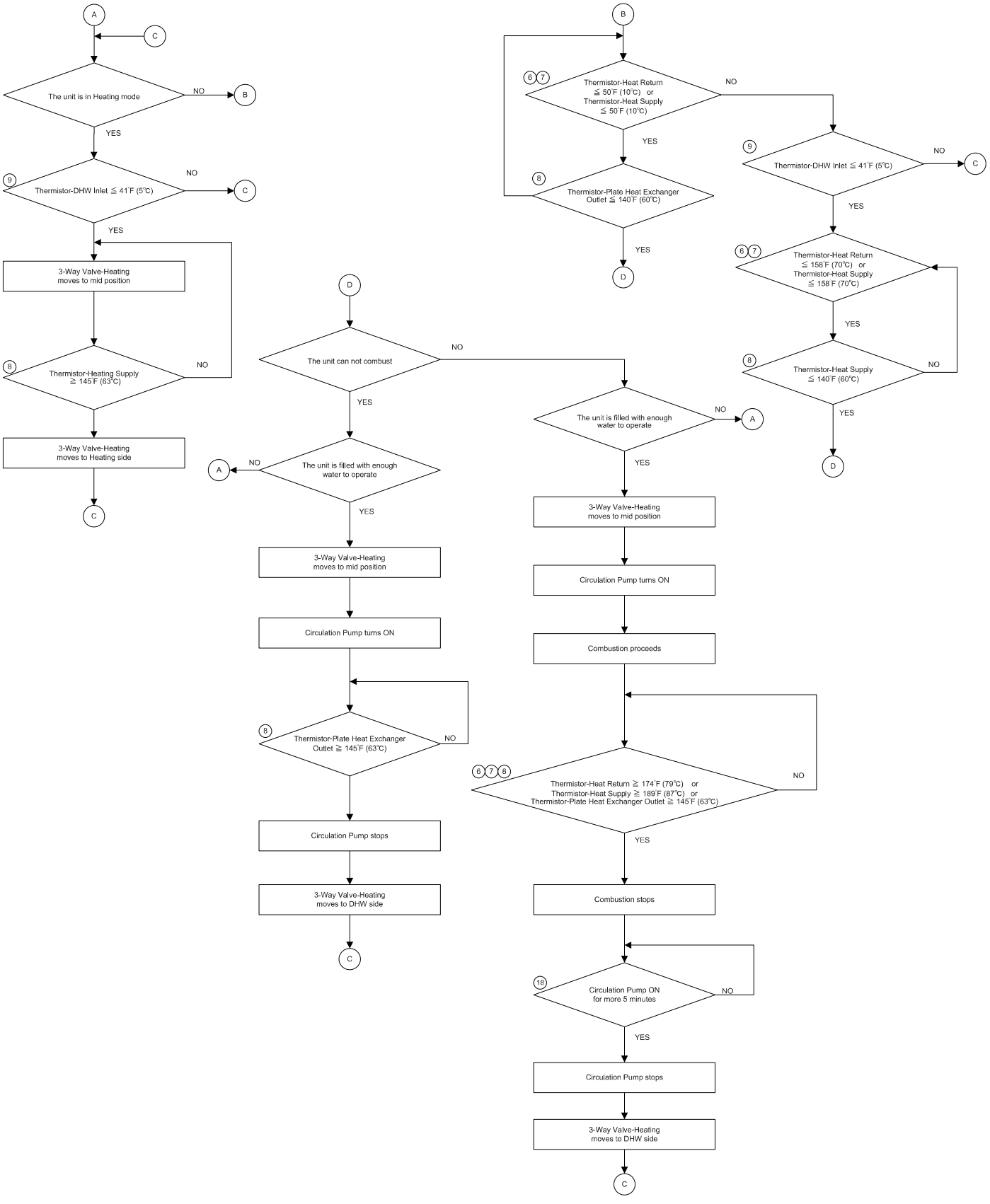
***Do not remove the power plug. Freezing cannot be prevented when the power plug is disconnected.**

***Do not close the gas valve and water valve. The unit will automatically operate (combust) to warm the water within the circuit to prevent freezing.**
Note: Freezing of water within the circuit may not be prevented depending on the heating system.

***Freezing will be prevented regardless of whether the operation switch is ON or OFF.**

***During freeze prevention, is lit on the Operation Panel.**

***The freeze prevention will not prevent freezing in the external plumbing of the unit.**
Protect this plumbing with insulation, heat tape, electric heaters, solenoids, and/or pipe covers.



■ Operation Flow Chart <Simultaneous operation>

When the combi boiler starts simultaneous operation, the combi boiler always operates DHW only at the first time.
After that the combi boiler judges if the combi boiler can operate simultaneously or not by confirming below conditions.

[1] DHW is stable.

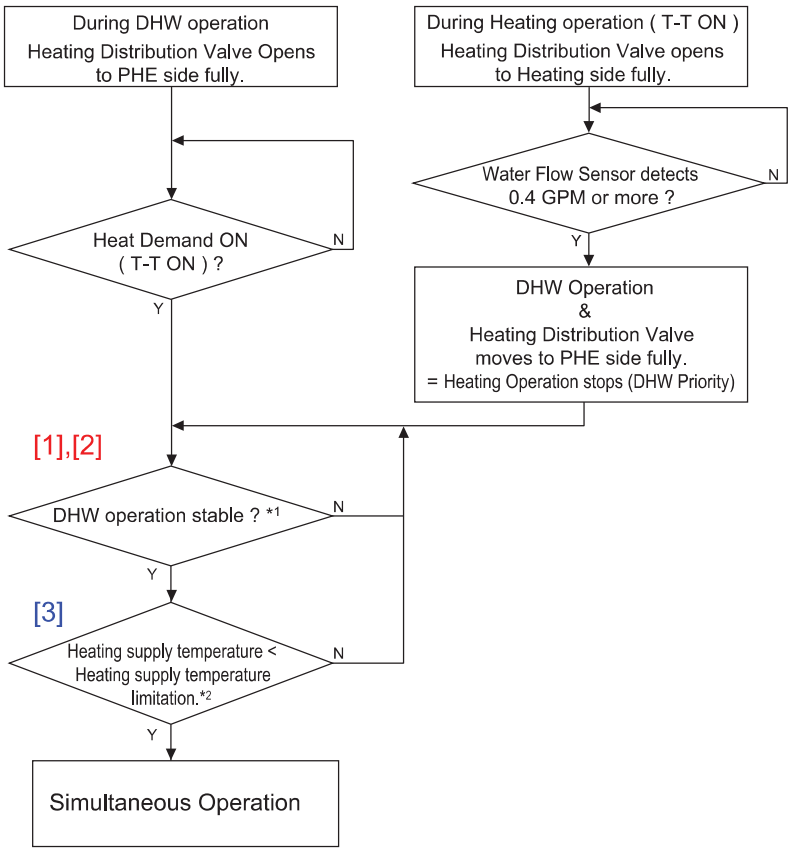
[2] DHW demand capacity is under a capacity range.

[3] Heating setting temperature is under a heating supply water temperature range.

A heating supply water temperature range depends on heating setting temperature.

[In case the above conditions are unsatisfying.]
- When large DHW flow rate change happens.
- When there is a high DHW demand.

[Good conditions for simultaneous operation.]
- Domestic water flow rate is low.
- Heating temperature setting is high.
- DHW temperature setting is low.



*1: DHW supply temperature does not fluctuate.

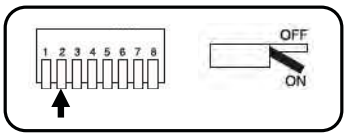
*2: It depends on heating setting temperature or Type of Heating System[I:02_tHS].

When the dip switch #2 is ON, heating temperature setting is increased up to approximately +30°F during simultaneous operation. Damage caused by increased heating temperature is not covered by the Pavilion Limited Warranty. Check whether if increased supply temperature is acceptable for the hydronic heating system.

Simultaneous operation table sample1

These tables show if simultaneous operation is available or not.

*Circuit Board Dip Switch #2 ON



: Simultaneous operation is available. - Default area
: Simultaneous operation is available. - Expanded area by the Dip SW #2 ON
: Simultaneous operation is unavailable.

Domestic water flow rate	2.0 GPM
Domestic water inlet temperature	50 F

Heating setting temperature F(C)	DHW setting temperature F(C) 90(32)	100(38)	110(43)	115(46)	120(49)	125(52)	130(54)	135(57)	140(60)
180(82)									
170(77)									
160(71)									
150(66)									
140(60)									
130(54)									
120(49)									
110(43)									
100(38)									
90(32)									
80(27)									

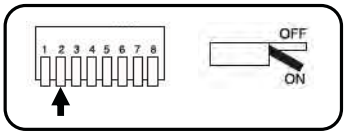
DHW flow rate	2.0 GPM
Domestic water inlet temperature	40 F

Heating setting temperature F(C)	DHW setting temperature F(C) 90(32)	100(38)	110(43)	115(46)	120(49)	125(52)	130(54)	135(57)	140(60)
180(82)									
170(77)									
160(71)									
150(66)									
140(60)									
130(54)									
120(49)									
110(43)									
100(38)									
90(32)									
80(27)									

Simultaneous operation table sample 2

These tables show if simultaneous operation is available or not.

*Circuit Board Dip Switch #2 ON



: Simultaneous operation is available. - Default area
: Simultaneous operation is available. - Expanded area by the dip SW #2 ON
: Simultaneous operation is unavailable.

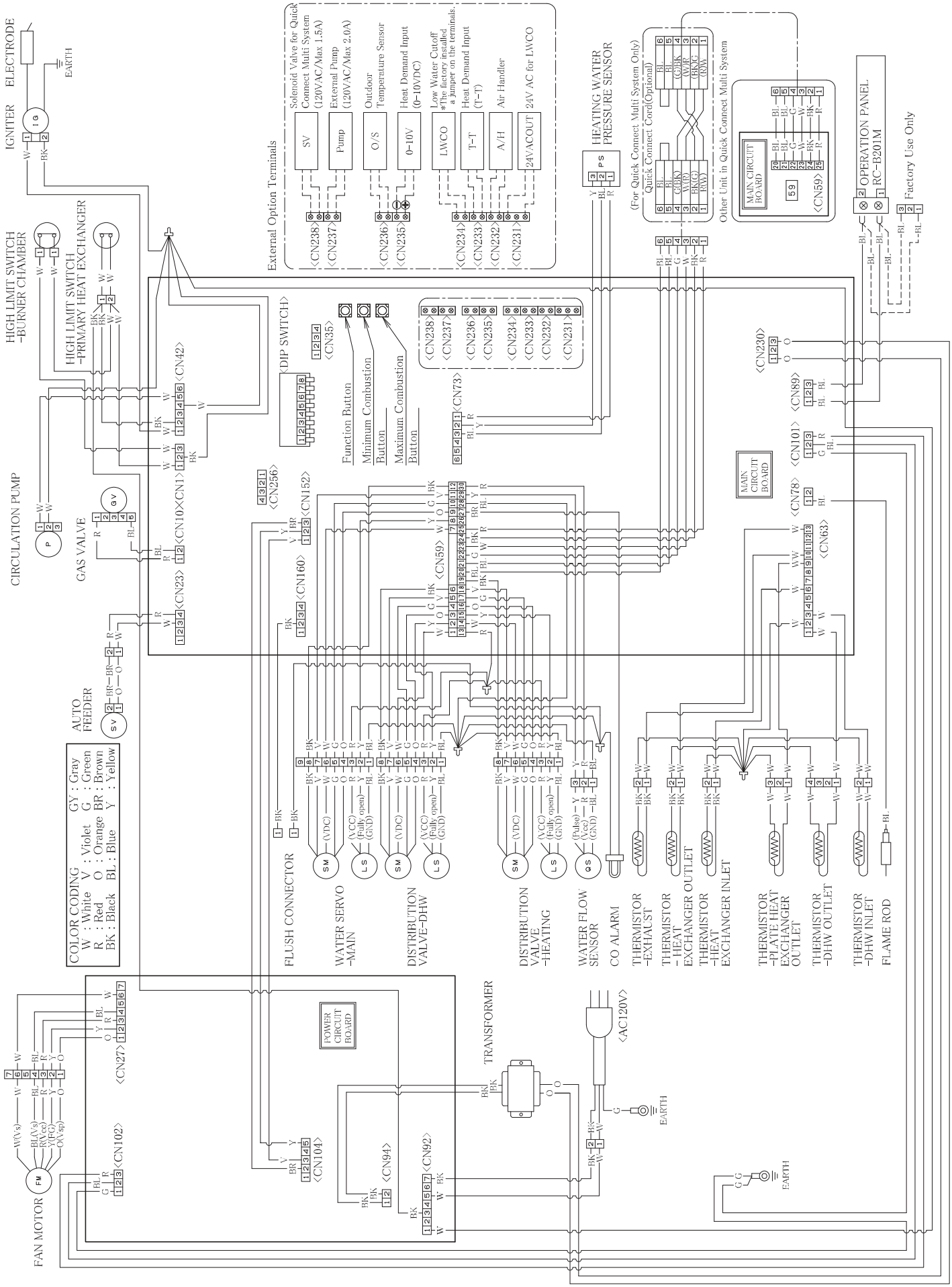
Domestic water flow rate	4.0GPM
Domestic water inlet temperature	50 F

Heating setting temperature F(C)	DHW setting temperature F(C) 90(32)	100(38)	110(43)	115(46)	120(49)	125(52)	130(54)	135(57)	140(60)
180(82)									
170(77)									
160(71)									
150(66)									
140(60)									
130(54)									
120(49)									
110(43)									
100(38)									
90(32)									
80(27)									

Domestic water flow rate	4.0 GPM
Domestic water inlet temperature	40 F

Heating setting temperature F(C)	DHW setting temperature F(C) 90(32)	100(38)	110(43)	115(46)	120(49)	125(52)	130(54)	135(57)	140(60)
180(82)									
170(77)									
160(71)									
150(66)									
140(60)									
130(54)									
120(49)									
110(43)									
100(38)									
90(32)									
80(27)									

16. Wiring Diagram



8. Troubleshooting <Circuit Board Checkpoints>

Ref. No.	Part	Circuit board Check points (Check the wiring diagram behind the front cover)					Normal value	Remarks
		CN & Pin	No.	Wire color	CN & Pin	No.		
1	Water Servo-Main	CN59	7	W - O	CN59	9	1 - 16 V DC	
			7	W - G		10	1 - 16 V DC	
			7	W - V		11	1 - 16 V DC	
			7	W - BK		12	1 - 16 V DC	
			8	Y - BL		28	1V DC or less	When valve is fully open
			13	R - BL		28	14 - 16 V DC	
2	Bypass Valve-DHW	CN59	1	W - O	CN59	3	1 - 16 V DC	
			1	W - G		4	1 - 16 V DC	
			1	W - V		5	1 - 16 V DC	
			1	W - BK		6	1 - 16 V DC	
			2	Y - BL		28	4 - 6 V DC	
			13	R - BL		28	14 - 16 V DC	
3	3-Way Valve-Heating	CN59	14	W - O	CN59	16	1 - 16 V DC	
			14	W - G		17	1 - 16 V DC	
			14	W - V		18	1 - 16 V DC	
			14	W - BK		19	1 - 16 V DC	
			15	Y - BL		28	1V DC or less	When valve is on the DHW side
			13	R - BL		28	14 - 16 V DC	
4	Water Flow Sensor	CN59	30	R - BL	CN59	28	14 - 16 V DC	
			29	Y - BL		28	DC 0.5 - 15 V	
5	Thermistor-Exhaust	CN63	10	W - W	CN63	2	Note 2)	Note 2)
6	Thermistor-Heat Return	CN63	6	W - W	CN63	2	Note 3)	Note 3)
7	Thermistor-Heat Supply	CN63	13	W - W	CN63	2	Note 3)	Note 3)
8	Thermistor-Plate Heat Exchanger Outlet	CN63	9	W - W	CN63	2	Note 3)	Note 3)
9	Thermistor-DHW Inlet	CN63	3	W - W	CN63	2	Note 3)	Note 3)
10	Thermistor-DHW Outlet	CN63	1	W - W	CN63	2	Note 3)	Note 3)
11	Flame Rod	CN78	1	BL -Heat Exchanger	-	GND	10 kHz - 100 kHz	
			1	BL -Electrode		Flame Rod	DC 0.45μA or less	When no flame is detected
12	Flame Rod	CN78	1	BL -Heat Exchanger	-	GND	10 kHz - 100 kHz	
			1	BL -Electrode		Flame Rod	DC 1μA or more	At flame detection
13	Fan Motor	CN27	6	W - BL	CN27	4	140 - 187 V DC	
14	Fan Motor	CN27	3	R - BL	CN27	4	13 - 16 V DC	
			1	O - BL		4	1.69 - 8.25 V DC	When fan is rotating
			2	Y - BL		4	194 Hz - 1302 Hz	12 pulse/revolution
15	Igniter	CN42	1	W - BK	CN1	2	108 - 132 V AC	When igniter is sparking
16	Gas Valve	CN10	1	R - BL	CN10	2	90 - 120 V DC	When valve is open
							1.22 kΩ - 1.50 kΩ	Coil resistance Note 4)
17	Auto Feeder	CN23	3	W - R	CN23	4	13.5 - 16.5 V DC	When valve is open
18	Circulation Pump	CN42	4	W - W	CN42	5	108 - 132 V AC	When pump is rotating
19	High Limit Switch -Burner Chamber	CN1	1	W - W	CN1	3	1Ω or less	Contact resistance Note 4)
20	High Limit Switch -Primary Heat Exchanger	CN1	1	W - BK	CN42	2	1Ω or less	Contact resistance Note 4)
21	Heating Water Pressure sensor	CN73	1	R - BL	CN73	3	4.5 - 5.5 V DC	
22	Quick connect cord	CN59	20	BL - BL	CN59	28	DC 14 - 16 V	
			21	BL - BL		28	DC 14 - 16 V	
23	Solenoid Valve	CN238	-	-	CN238	-	120 V AC	External Option
24	External Pump	CN237	-	-	CN237	-	120 V AC	External Option
25	Outdoor Temperature Sensor	CN236	-	-	CN236	-	-	External Option Note 5)
26	Heat Demand(0-10VDC)	CN235	-	-	CN235	-	-	External Option
27	LWCO	CN234	-	-	CN234	-	-	External Option
28	Heat Demand(T-T)	CN233	-	-	CN233	-	-	External Option
29	Air Handler	CN232	-	-	CN232	-	-	External Option
30	24VACOUT	CN231	-	-	CN231	-	22.8 - 25.2 V AC	External Option
-	Power Supply (Main Circuit Board)	CN230	1	O - O	CN230	3	22.8 - 25.2 V AC	
-	Power Supply (Power Circuit Board)	CN94	1	BK - BK	CN94	2	108 - 132 V AC	
-	Power Supply (Power Circuit Board)	CN92	5	W - BK	CN92	7	108 - 132 V AC	
-	Operation Panel	CN89	1	BL - BL	CN89	3	14 - 16 V DC	

Note 2) •Thermistor - Exhaust Temperature Characteristics

Temperature (° F)	-4	14	32	50	68	86
Temperature (° C)	-20	-10	0	10	20	30
Resistance (k Ω)	487	276	162	98.3	61.4	39.5
Voltage (V)	4.6	4.3	3.9	3.4	2.8	2.3

Note 4) When measuring the resistance, disconnect the connector from the Circuit Board and check the connector side.

Note 3) •Thermistor - Heat Return / Heat Supply / Plate Heat Exchanger Outlet / DHW Outlet / DHW Inlet Temperature Characteristics

Temperature (° F)	32	50	68	86	104	122	140	158	176
Temperature (° C)	0	10	20	30	40	50	60	70	80
Resistance (k Ω)	23.7	15.5	10.3	7.0	4.9	3.5	2.5	1.9	1.4
Voltage (V)	4.5	4.3	4.0	3.6	3.2	2.8	2.4	2.0	1.7

Note 5) •Outdoor Temperature Sensor Temperature Characteristics

Temperature (° F)	-40	-22	-4	14	32	50	68	86	104	122
Temperature (° C)	-40	-30	-20	-10	0	10	20	30	40	50
Resistance (k Ω)	1724.5	896.2	487.4	276.1	162.2	98.3	61.5	39.5	26.1	17.6
Voltage (V)	4.6	4.3	3.8	3.2	2.6	2.0	1.4	1.0	0.7	0.5

■ Error Codes and Checkpoints PV199DV (GHQ-C3201WX-FF PB US)

Display*	Description	Diagnosis Point (Trouble Point)	Remarks
(F) 10	Combustion abnormality (Only memorized in error code history)	Check air supply vent for blockage or obstruction. Check exhaust vent for blockage or obstruction. Have a professional check the gas supply pressure. Check if the condensate drain line is clogged or frozen. Check that the condensate drain pipe slopes down. Check the Dip Switch settings on the Circuit Board.	
(F) 11	Ignition failure (Initial flame fault detection)	Check the gas supply piping and pressure. Check for Igniter spark (15). Check Gas valve (16). Check Flame Rod (12). 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 Valve (16). Check Flame Rod (12). Check ground, especially on Circuit Board.	
(F) 13	External CO alarm triggered	Check for abnormal combustion. Check all vent components are secure and fully connected. Check for any exhaust leaking from vent pipes. Check if CO alarm wire cut off.	
(F) 16	Abnormally high output temperature	Measure the resistance through the Thermistor-DHW Outlet (10). Check for the offset pressure of the gas valve. Check gas type.	
17	Low Heating Water Pressure (Small amount of water leakage)	Water pressure becomes lower than [Setting Pressure - 4] psi 8 times in 4 hours. Check the Auto Feeder (17). Check the water leakage.	
(F) 20	High Limit Switch-Primary Heat Exchanger triggered	Check if High Limit Switch-Primary Heat Exchanger is triggered (20). Check for improper connection of High Limit Switch-Primary Heat Exchanger. Clean the water filter in the Drain Cock. Check the Circulation Pump speed setting as speed III. Check if the Scale Build-up in the Heat Exchanger. (This error code may be caused by Scale Build-up in the Heat Exchanger.)	To reset this error code, the power needs to be disconnected and then reconnected.
(F) 21	High Limit Switch-Burner Chamber triggered	Check if High Limit Switch-Burner Chamber is triggered (19). Check for improper connection of High Limit Switch-Burner Chamber. Clean the water filter in the Drain Cock. Check the Circulation Pump speed setting as speed III. Check if the Scale Build-up in the Heat Exchanger. Check if the Burner Chamber is clogged or damaged.	To reset this error code, Contact the nearest agent.
24	Heat Demand(0-10VDC) reverse connection	Check the Heat Demand(0-10VDC) wires connect the correct terminals on the Circuit Board (26). This terminals has electrical polarity.	
26	Low Water Cutoff abnormality	In case using LWCO : Measure 24VAC from terminal on Circuit Board (30), and check if LWCO operates normally (27). In case not using LWCO : Measure 24VAC from terminal on Circuit Board (30), and check that a short circuit connector is connected. Ensure that the LWCO in piping system is properly installed. Make-up water to the system if necessary. Check the Auto Feeder (17).	
(F) 30	Outdoor Temperature Sensor Open or Short Circuit	Check Outdoor Temperature Sensor. Ensure connections are secure (25). Check sensor resistance. If resistance is zero, replace the sensor.	
(F) 31	Thermistor-DHW Inlet abnormality	Measure the resistance through the Thermistor-DHW Inlet (9). Check for an open or short circuit. Check for improper connection of Thermistor-DHW Inlet.	
(F) 32	Thermistor-DHW Outlet abnormality	Measure the resistance through the Thermistor-DHW Outlet (10). Check for an open or short circuit. Check for improper connection of Thermistor-DHW Outlet.	
(F) 33	Thermistor-Plate Heat Exchanger Outlet abnormality	Measure the resistance through the Thermistor-Plate Heat Exchanger Outlet (8). Check for an open or short circuit. Check for improper connection of Thermistor-Plate Heat Exchanger Outlet.	
(F) 35	Thermistor-Exhaust abnormality	Measure the resistance through the Thermistor-Exhaust (5).Check for an open or short circuit. Check for improper connection of Thermistor-Exhaust.	
(F) 36	Thermistor- Heat Supply abnormality	Measure the resistance through the Thermistor- Heat Supply (7). Check for an open or short circuit. Check for improper connection of Thermistor- Heat Supply. Clean the water filter in the Drain Cock. Check the Circulation Pump speed setting as speed III. Check if the Scale Build-up in the Heat Exchanger.	
37	Thermistor-Heat Return abnormality	Measure the resistance through the Thermistor-Heat Return (6). Check for an open or short circuit. Check for improper connection of Thermistor-Heat Return.	
43	Heating Water Pressure Sensor abnormality	Check the Heating Water Pressure Sensor (21). Check for an open or short circuit.	

44	High Heating Water Pressure	Water pressure higher than 42 psi over 10 seconds. Check the Heating Water Pressure Sensor wiring connection. Check the output voltage of the Heating Water Pressure Sensor (21). Check the Pressure Relief Valve for Heating.	
54	Low Heating Water Pressure	Water pressure is lower than [Setting Pressure - 8] psi. Check the Auto Feeder (17). Check the Auto Feeder inlet pressure. Check the Heating Water Pressure Sensor (21). Check the water leakage.	
56	External Solenoid Valve abnormality	Check the Solenoid Valve terminal on the Circuit Board (23). Check the Solenoid Valve for Quick Connect Multi System. Check for improper connection of the valve.	
57	Stopped Water Supply	Auto Feeder valve opens over 600 seconds. Check the Heating Water Pressure Sensor wiring connection. Check the Auto Feeder inlet pressure. Check the voltage from Auto Feeder (17). Check the output voltage of the Heating Water Pressure Sensor (21). Check the water leakage.	
(F) 61	Fan Motor abnormality	Check that the Fan Motor is rotating and check the pulse frequency from the fan rotational frequency sensor (13, 14). Check for improper connection of the fan. Check voltage from the Circuit Board.	
(F) 65	Water Servo-Main abnormality	Check that the Water Servo-Main is functioning (1). Check for improper connection of the valve.	To reset this error code, the power needs to be disconnected and then reconnected.
(F) 66	Bypass Valve-DHW abnormality	Check that the Bypass Valve-DHW is functioning (2). Check for improper connection of the valve.	
67	3-Way Valve-Heating abnormality	Check that the 3-Way Valve-Heating is functioning (3). Check for improper connection of the valve.	
(F) 70	Circuit Board abnormality	The Circuit Board failure.	
(F) 71	Gas Valve drive circuit abnormality	Check for damage to the Gas Valve drive circuit on the Circuit Board. Measure the resistance through High Limit Switch-Primary Heat Exchanger and High Limit Switch-Burner Chamber (19, 20).	To reset this error code, the power needs to be disconnected and then reconnected.If the display continues, contact nearest agent.
(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 (11). Check for a ground fault.	
(F) 73	Circuit Board setting abnormality (Improper Maintenance Writers settings, Dip Switch settings, etc.)	Check for proper setting of maintenance writers on the Circuit Board. Check the Circuit Board (microcomputer) for damage. Check the Dip Switch settings. e.g.) Exhaust type, vent length, etc.	This error is displayed when switching the Dip Switch with the power on. 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 (22).	
760	Operation Panel transmission abnormality	Check connection from the Operation Panel to the Circuit Board. Check the Operation Panel and the Circuit Board for damage.	
88	Service Reminder (Warning indication)	The Combi Boiler is equipped with a Service Reminder to announce for maintenance.	To reset this error code, press the power button on the Operation Panel 5 times in 5 seconds. Contact the nearest agent.
(F) 90	Combustion abnormality (Unit shuts off)	Check the air supply vent for blockage or obstruction. Check the exhaust vent for blockage or obstruction. Have a professional check the gas supply pressure. Check if the condensate drain line is clogged or frozen. Check that the condensate drain pipe slopes down. Check the Dip Switch settings on the Circuit Board.	To reset this error code, the power needs to be disconnected and then reconnected. If the display continues, contact nearest agent.
(F) 94	Exhaust temperature is too high	Check for abnormal combustion (5).	To reset this error code, the power needs to be disconnected and then reconnected.
FC1	Water Heater's Service Reminder	Refer to Water Heater's Technical Sheet.	

* In a Quick Connect Multi-System, "F##"(except F76) indicates an error code from the Water Heater. Refer to the Combi Boiler's Technical Sheet.

■ Troubleshooting with Error Code Flowcharts

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 PB HEAT 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.

● 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.

■ Error Code Flow Charts Table of Contents

No Error Code

	Error	Page
1-1	The set temperature is not displayed on Remote Controller when electrical power is connected. Operation indicator does not light when turned on.	23
1-2	The fan does not operate when the hot water fixture is opened.	24
1-3	Outlet water temperature incorrect.	26
1-4	Circulation Pump failure.	28

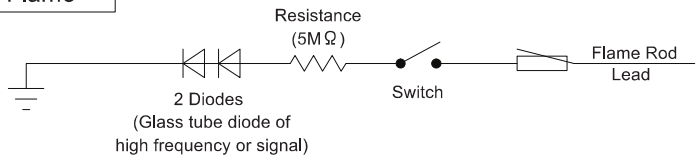
Error Code displayed

Error Codes Operation Panel	Description	Page
11	Ignition failure (Initial flame fault detection)	29
12	Flame Rod does not detect flame (Flame fault detection)	32
13	Optional CO alarm abnormality	32
16	Abnormally high Outlet temperature	32
17	Low Heating Water Pressure (Small amount of Water Leakage)	33
20	High Limit Switch − Primary Heat Exchanger triggered	34
21	High Limit Switch − Burner Chamber triggered	35
24	Heat Demand(0-10VDC) reverse connection	35
26	Low Water Cutoff abnormality	36
30	Outdoor Temperature Sensor Open or Short Circuit	40
31	Thermistor − DHW Inlet abnormality	41
32	Thermistor − DHW Outlet abnormality	42
33	Thermistor − Plate Heat Exchanger Outlet abnormality	41
35	Thermistor −Exhaust abnormality	43
36	Thermistor − Heat Exchanger Inlet abnormality	44
37	Thermistor − Heat Exchanger Outlet abnormality	44
43	Heating Water Pressure Sensor abnormality	45
44	High Heating Water Pressure	46
54	Low Heating Water Pressure	47
56	Circuit Board setting abnormality	48
57	Multi system communication error	49
61	Fan Motor abnormality	50
65	Water Servo-Main abnormality	51
66	Bypass Valve-DHW abnormality	51
67	3-Way Valve-Heating abnormality	52
70	Circuit Board abnormality	52
71	Gas Valve drive circuit abnormality	52
72	Flame Rod circuit abnormality	53

Error Code displayed

Error Codes Operation Panel	Description	Page
73	Circuit Board setting abnormality	53
F76	Multi system communication error	54
760	Operation Panel transmission abnormality	54
88	Service Reminder	55
90 / 10	Combustion abnormality(Unit shuts off)	56
94	Exhaust temperature is too high	56
FC1	Water Heater's Service Reminder. Refer to Water Heater's Technical Sheet.	-

Specification of Dummy Flame



1.No Error Code

1-1. The set temperature is not displayed on the Operation Panel when electrical power is connected. Operation indicator does not light when turned on.

Check the power outlet voltage.

YES

NO

Check the activation of the indoor distribution board breaker.

Abnormal (Activated)

Turn the breaker on.

* If activated again, eliminate the cause for activation.

Normal (Not activated)

Consult power company.

⚠WARNING Beware of electric shock due to short-circuiting of the 120V circuit.

Check the supply voltage of the power circuit board.

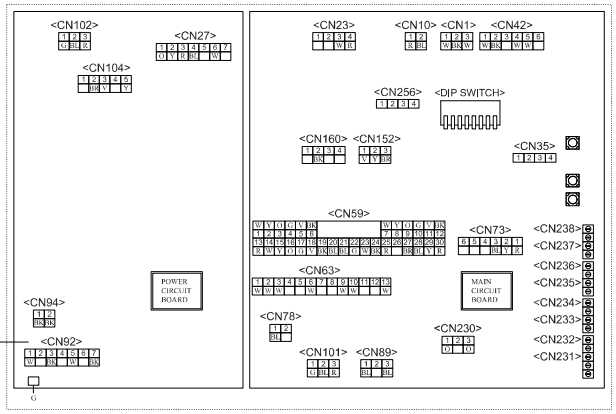
Normal

CN92 : Between White 1 - Black 3

AC108 - 132V

Abnormal

Circuit Board



<CN92>

1	2	3	4	5	6	7
W		BK		W		BL

Check for improper connection of wiring, damage, short-circuiting or ground fault.

Abnormal

Replace the wiring.

Check the voltage of the Operation Panel terminals on the Circuit Board.

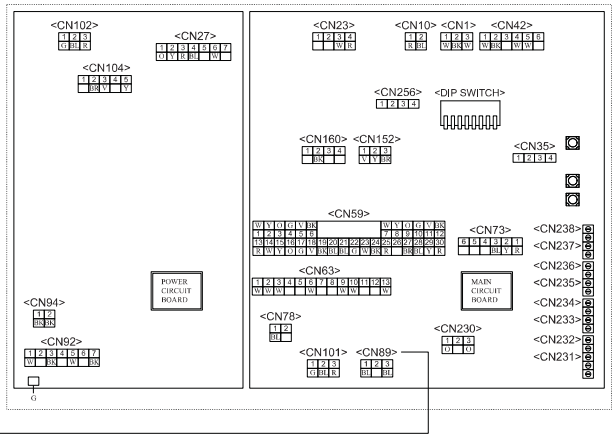
Abnormal

Check for improper connection of wiring, damage, short-circuiting or ground fault.

Normal（DC14 - 16V）

CN89 : Between Blue 1 – Blue 3

Circuit Board



<CN89>

1	2	3
BL		BL

Check for the Operation Panel wiring harness damage, short-circuiting or ground fault, and if there is no problem replace the Operation Panel.

*If there is wiring harness damage, short-circuiting or ground fault, replace the Operation Panel wiring harness.

1-2. The fan does not operate when the hot water fixture is opened.

Check whether the Water Flow Sensor is normal.

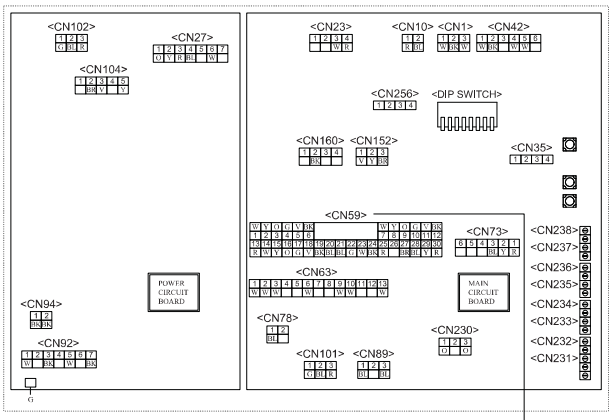
Normal

Open the hot water fixture fully.
Confirm 0.4 gal/min. or more by using maintenance monitor #14.

When not using the maintenance monitor:
①CN59
Between Red 30 - Blue 28
DC 14 - 16V
or
②CN59
Between Yellow 29 - Blue 28
DC 0.5 − 15V

Abnormal

Circuit Board



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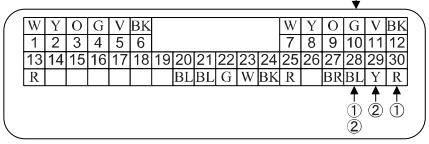


①Check the voltage between CN59 Red 30 and Blue 28.

Normal

②Check the pulses between CN59 Yellow 29 and Blue 28.

Normal

Abnormal

Replace the Circuit Board.

Abnormal

Check for improper connection of wiring.
Replace the Water Flow Sensor.

Replace the Circuit Board.

Check whether the Thermistor-Cold Water Detection is too high.
(Check the Inlet Water temperature.)*1

Normal
*1 to the right does not apply in this case.

Abnormal

*1<< How to check >>
Confirm the maintenance monitor # 29 to know the cause.
[001] : Water inlet temperature is too high
→ If possible decrease water inlet temperature
[004] : Inlet and Outlet temperature are reversed
→ Check the pipes and re-install it correctly

Check whether a solar water heater is directly coupled or whether the hot water fixture is not fully opened.

A

A

Check whether the Thermistor – DHW Inlet is normal.

Normal

Check that actual water temperature and maintenance monitor #30 match.

When not using the maintenance monitor:

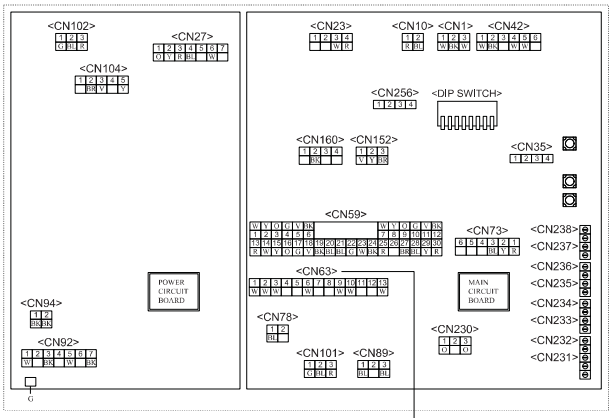
Thermistor-DHW Inlet resistance between CN63 White 3 - White 2

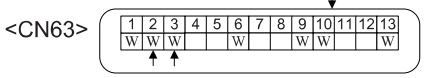
(refer to the thermistor temperature characteristics below) and the actually measured water temperature should be about the same.

When measuring the resistance, disconnect the connector and check the male side.

Abnormal

Circuit Board





Check for improper connection of wiring.

Replace the Thermistor – DHW Inlet.

●DHW Inlet / Outlet / Plate Heat Exchanger Outlet 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
Voltage (V)	4.5	4.3	4.0	3.6	3.2	2.8	2.4	2.0	1.7

Replace the Circuit Board.

*If the temperature of the heating water has reached the maximum temperature, the fan will not operate, even when there is demand.

1-3. Outlet water temperature incorrect

Only connect and disconnect the connector after the fan and the pump have stopped rotating and then disconnect the electrical power. (The Circuit Board, the Fan Motor and the Circulation Pump may be damaged otherwise.)

In this case, the actual outlet water temperature is colder than the Set Temperature.
Confirm "Thermistor-DHW Outlet", "Water Servo-Main", "Gas Valves" are normal.

Check whether the Thermistor-DHW Inlet / DHW Outlet / Plate Heat Exchanger Outlet) are normal.

Normal

1) Turn the power ON/OFF button "OFF"
2) Press the MAINTENANCE button. Select  using the ▲ or ▼ button.
3) Press the ENTER button. The "Diagnostic Mode" screen appears.
4) Select  using the ▲ or ▼ button.
5) Press the ENTER button. The "Components Check Mode" screen appears.
6) Select  using the ▲ or ▼ button.
7) Press the ENTER button. The display shows  .
8) Select  using the ▲ or ▼ button.
9) Open the fixture. (pass through the water to the Unit.)
10) Check the maintenance monitor. The difference between # 30 and # 31 and # 32 data should be within ±5 °F.

Abnormal

Check the thermistor resistance.

Abnormal → Check for improper connection of wiring, connectors, etc. then replace the thermistor.

When measuring the resistance, disconnect the connector and check the male side.

Normal

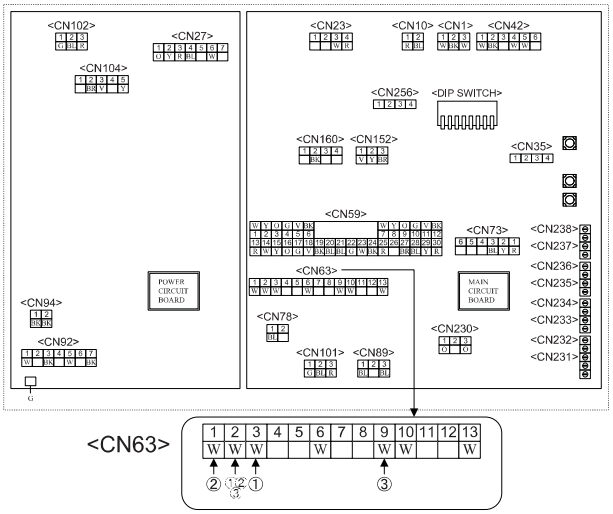
① CN63 White 3 - White 2 (DHW Inlet)
② CN63 White 1 - White 2 (DHW Outlet)
③ CN63 White 9 - White 2 (Plate Heat Exchanger Outlet)

Refer to the thermistor temperature characteristics below.

●DHW Inlet / Outlet / Plate Heat Exchanger Outlet 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

Circuit Board



<CN63>

Replace the Circuit Board.

Check whether the Thermistor – DWH Inlet is normal.

Normal

Turn the unit on, and then set the temperature to "100 °F" and "140 °F" by using the Operation Panel.
Open the hot water fixture fully, and then confirm Thermistor-DHW Outlet by the maintenance monitor.
31 data should be within ±5 °F of the set temperature.

No abnormality in appliance.

Abnormal

◎1

Check if the Water Servo-Main is normal. (Check the maintenance monitor # 60.)

Normal

Maintenance monitor # 60
[000] - [1700] : Normal ("1700" is displayed on the Operation Panel)
→ Check whether the maintenance monitor # 60 moves between [000] and [1700].
[EEE] : Abnormal
→Check for improper connection of wiring, then replace the Water Servo-Main.

Check whether the primary gas pressure is normal.

Normal

Abnormal → Check the gas supply valve, etc.

* Check the primary pressure (dynamic pressure) at the time of maximum combustion.

Primary gas pressure list

Pressure \ Gas Group		LP	NGA
Maximum Pressure	Inch H_2O	13.0	10.5
Standard Pressure	Inch H_2O	11.0	7.0
Minimum Pressure	Inch H_2O	8.0	3.5

B

B

Check whether the gas pressure is normal.

Normal

Abnormal

◎2

Check the voltage of Gas Valve.

Abnormal

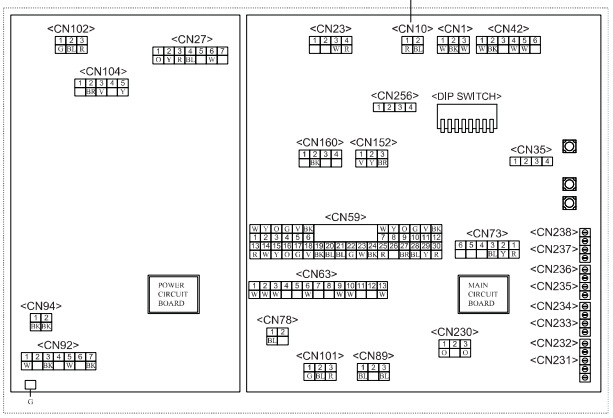
Replace the Circuit Board.

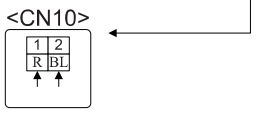
Normal

CN10:Between Red 1 - Blue 2

DC 90 - 120V

Circuit Board





Check for improper connection of wiring, then replace the Gas Valve.

* Check the gas pressure (dynamic pressure) at the time of minimum combustion.

Gas Offset Value

Gas type	Supply Pressure (inch H_2O)		Offset (inch H_2O)
NG	Inch H_2O	11.0	-0.01
LPG	Inch H_2O	8.0	-0.02

Check for the Water Flow Sensor or water fixtures.

1-4. Circulation Pump failure

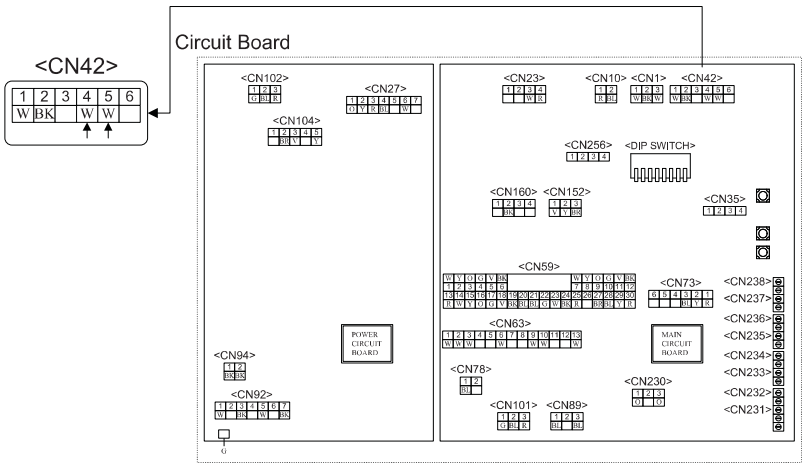
◎3

Check the Circulation Pump rotation by Diagnostic Mode.

Yes

1) Turn the power ON/OFF button "OFF"
2) Press the MAINTENANCE button. Select d:di using the ▲ or ▼ button.
3) Press the ENTER button. The "Diagnostic Mode" screen appears.
4) Select d:02 / t:CH using the ▲ or ▼ button.
5) Press the ENTER button. The "Components Check Mode" screen appears.
6) Select t:PP using the ▲ or ▼ button.
7) Press the ENTER button. The display shows t:oF .
8) Select 2:on using the ▲ or ▼ button.
9) Check the Circulation Pump is rotating.

No



Check the voltage to the Circulation Pump (on the pump connector).

Normal
AC108 – 132V between connectors
→ Check for improper connection of wiring.
Replace the Circulation Pump.

Abnormal

Check the voltage to the Circulation Pump (on the Circuit Board).

Normal
CN42 : White 4 – White 5
AC108 – 132V between connectors
→ Check for improper connection of wiring.
Replace the Wiring Harness.

Abnormal

→ Replace the Circuit Board.

Verify all of the air is removed from the system.

Normal

Abnormal
→ Removed all of the air from the system.

The error occurs only when using Heating?

Yes

No
→ Replace the Circuit Board.

Check the water drain valve (with water filter) of the Heating Return Connection for blockage or obstruction.

Normal

Abnormal
→ Clean the water drain valve(with water filter) with a brush under running water.

The problem may be due to a Heating system rather than the appliance.

2.Error Code Displayed

Error Codes Operation Panel	Description
11	Ignition failure (Initial flame fault detection)

Only connect and disconnect the connector after the fan and the pump have stopped rotating and then disconnect the electrical power. (The Circuit Board, the Fan Motor and the Circulation Pump may be damaged otherwise.)

<Condition of occurrence for Error Code 11>
Displayed if flame detection is not possible at the time of initial ignition due to the causes listed below.
(Defective ignition device, leakage of ignition plug, problem in gas supply, poor connection of ground wire, defective flame rod, etc.)

Check that the flame ignites (check through the peephole of the burner).

YES

NO

Check whether the Igniter is normal.

YES

NO

Check the voltage to the Igniter (on the connector).

Normal
AC108 - 132V between connector

Check for improper connection of ignition plug, then replace the Igniter.

Abnormal

Check the voltage to the Igniter (on the Circuit Board).

Abnormal

Check High Limit Switches conduction, and if 1Ω or more (High Limit Switch), replace the Circuit Board.

Normal

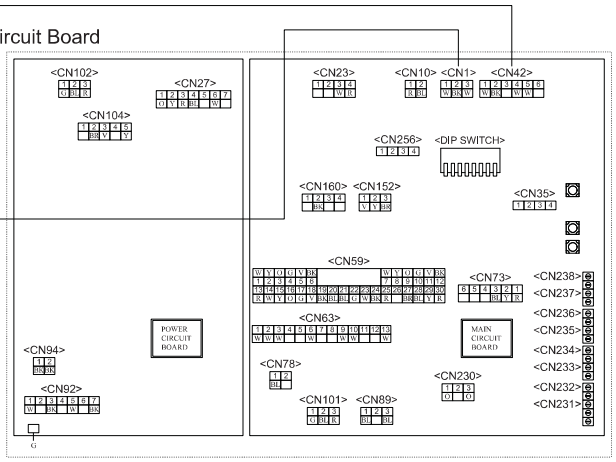
Between
CN42 : White 1 – CN1 : Black 2
AC108 - 132V

<CN42>

1	2	3	4	5	6
W	BK		W	W	

<CN1>

1	2	3
W	BK	W



Replace the Igniter or the Ignition Plug.

Check whether the primary gas pressure is normal.

Abnormal

Check the gas supply valve, etc.

Normal

* Check the primary pressure (dynamic pressure) at the time of maximum combustion.

Primary gas pressure list

Pressure \ Gas Group		LP	NGA
Maximum Pressure	Inch H_2O	14.0	10.5
Standard Pressure	Inch H_2O	11.0	7.0
Minimum Pressure	Inch H_2O	8.0	3.5

A

B

A B

Check whether the offset gas pressure is normal.

Normal

Abnormal

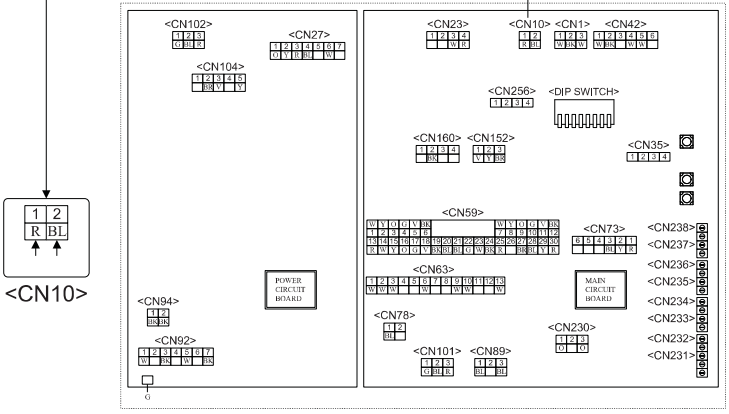
Check the voltage of Gas Valve.

Abnormal → Replace the Circuit Board.

Normal

CN10:Between Red 1 - Blue 2
DC90 - 120V

Circuit Board



Check for improper connection of wiring, then replace the Gas Valve.

Check for the Fan Motor clogging, etc.

Check that combustion conditions are normal. (Is the flame small?, Is there lift?, etc.)

Normal

Abnormal

Check whether the primary gas pressure is normal.

Abnormal → Check the gas supply valve, etc.

* Check the primary pressure (dynamic pressure) at the time of maximum combustion.

Normal

Check if the Fan Motor speed is normal.

Abnormal → Adjust the model type setting, etc.

Normal

Check for the Fan Motor, Burner, Venturi, clogging.

Primary gas pressure list

Pressure \ Gas Group		LP	NGA
Maximum Pressure	Inch H_2O	14.0	10.5
Standard Pressure	Inch H_2O	11.0	7.0
Minimum Pressure	Inch H_2O	8.0	3.5

Check whether the Burner On Lamp is lit by the Dummy Flame*. (at the Flame Rod.)

Shown

* The Specification of Dummy Flame is shown in page 3.

⚠ WARNING Fully close the gas supply valve.

Open the hot water fixture, with the Operation Panel turned on.
The unit starts sparking, and then connect the Dummy Flame Between the Flame Rod and Earth. Check whether “Burner On Lamp” is lit.
(“72” should be indicated after a while.)

Not Shown

Check whether the Burner On Lamp is lit by the Dummy Flame*. (on the Circuit Board.)

Replace the Circuit Board.

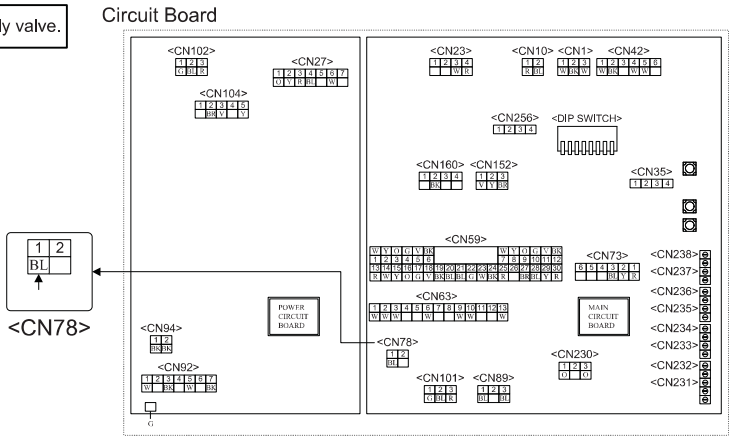
Shown

* The Specification of Dummy Flame is shown in page 3.

⚠ WARNING Fully close the gas supply valve.

Open the hot water fixture, with the Operation Panel turned on. The unit starts sparking, and then connect the Dummy Flame between CN78 Blue 1 - Green (earth). Check whether “Burner On Indicator” is lit.
(“72” should be indicated after a while.)
Current: DC 1μA or more

Circuit Board



Check for the wiring. (Flame Rod, grounding wire, grounding screw etc.)

Replace the Flame Rod.

In many cases, the Error Code 11 for ignition failure does not reappear. In some cases the error is caused by fluctuations due to environmental factors (time, humidity, etc.). If the error does not reappear, also check the items listed below.

Item	Check contents	Fluctuation factors and check procedure
Gas supply	Low primary pressure	Check whether the gas supply valve is half open. Check the primary pressure (dynamic pressure) at the time of maximum combustion. Check whether the error occurs when there is high gas consumption. (The primary gas pressure (dynamic pressure) may fluctuate during high usage.)
	Gas Valve	Check whether the cable was caught between the front cover and the casing or not.
Ignition device (faulty spark)	Igniter	Check for faulty insertion of wiring from Igniter to the Ignition Plug.
	Ignition Plug	Check for water on or traces of water on the Ignition Plug.
Control and settings	Faulty the gas pressure	Check whether the gas pressure can be adjusted and readjust the gas pressure.
	Flame Rod	Check whether “the grounding wire was caught between the front cover and the casing” or “the leakage occurred” or not. Check for looseness or faulty connection of grounding screw.
	Gas Valve	Press the Maximum and Minimum offset Pressure Set Button and check that the offset gas pressure switches smoothly.
Other	Wiring	Faulty connection due to looseness of connector pins or incomplete insertion of connectors. Check whether the cable was caught between the front cover and the casing.

Error Codes Operation Panel	Description
12	Flame Rod does not detect flame (Flame fault detection)

The trouble diagnosis for “Error Code 12” is the same as “Error Code 11”.

Error Codes Operation Panel	Description
13	Optional CO alarm abnormality

This Error Code is displayed due to failure on the optional CO alarm device. Please check the procedure below after cleaning the air of installation site.

1.Check all bent components are secure and fully connected.
2.Check for any exhaust leaking from vent pipes
3.Check if CO alarm wire cut off.
4.Check the type of CO alarm (Normal close type is correct).

Error Codes Operation Panel	Description
16	Abnormally high Outlet temperature

Check the thermistor − DHW Outlet or Plate Heat Exchanger resistance.

Normal

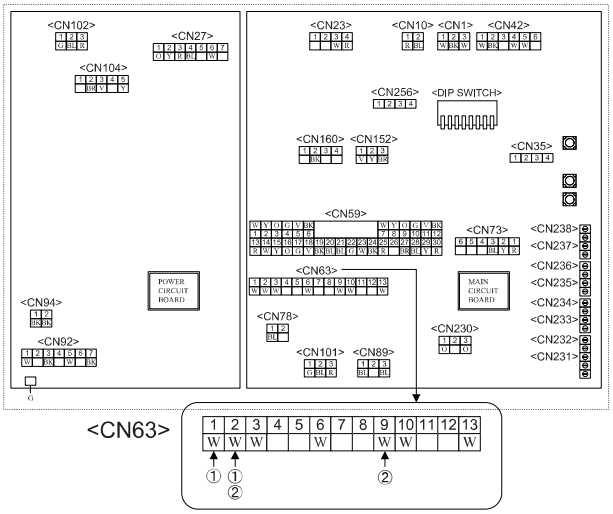
①(Error Code 16) :
CN63 : Between White 1 - White 2
(DHW Outlet)
② CN63 : Between White 9 - White 2
(Plate Heat Exchanger Outlet)

When measuring the resistance, disconnect the connector and check the male side.

Refer to the thermistor temperature characteristics below.

Abnormal

Circuit Board



<CN63>

Check for improper connection of wiring.
Replace the Thermistor.

●DHW Inlet / Outlet / Plate Heat Exchanger Outlet 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
Voltage (V)	4.5	4.3	4.0	3.6	3.2	2.8	2.4	2.0	1.7

Check the Gas Valve.

It shown on page 8 (◎2)

Normal

Check for the offset pressure of the Gas Valve.

Refer to the Technical Sheet “Adjusting Gas Valve Offset Pressure”.

Normal

Check the Water Servo Main.

It shown on page 7 (◎1)

Normal

Replace the Circuit Board.

Error Codes Operation Panel	Description
17	Low Heating Water Pressure (Small amount of Water Leakage)

Check for leaks in a heating system.

Normal

Abnormal

Repair leak in the system.

Check the Heating Water Pressure Sensor.

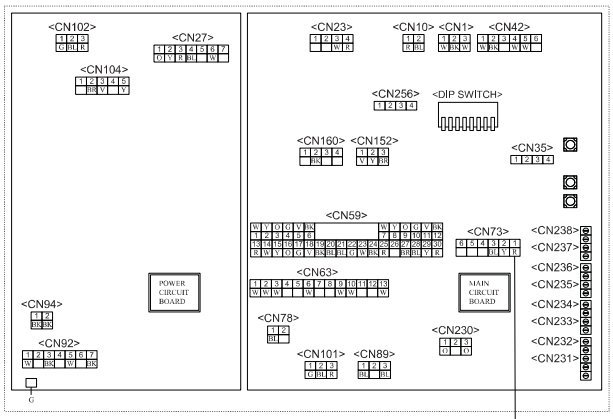
Normal

Abnormal

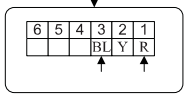
Replace the Circuit Board.

Between
CN73 : Red 1 – CN 73 Black 3
DC 4.5 – 5.5 V

Circuit Board



<CN73>



Check the Expansion Tank and the External Pump position.

Normal

Abnormal

Correct the Expansion Tank and the External Pump position.

Normal : Installing the External Pump downstream the Expansion Tank.
Abnormal : Installing the External Pump upstream the Expansion Tank.

Replace Heating Water Pressure Sensor.

Check for improper connection of wiring.

Error Codes Operation Panel	Description
20	High Limit Switch − Primary Heat Exchanger triggered

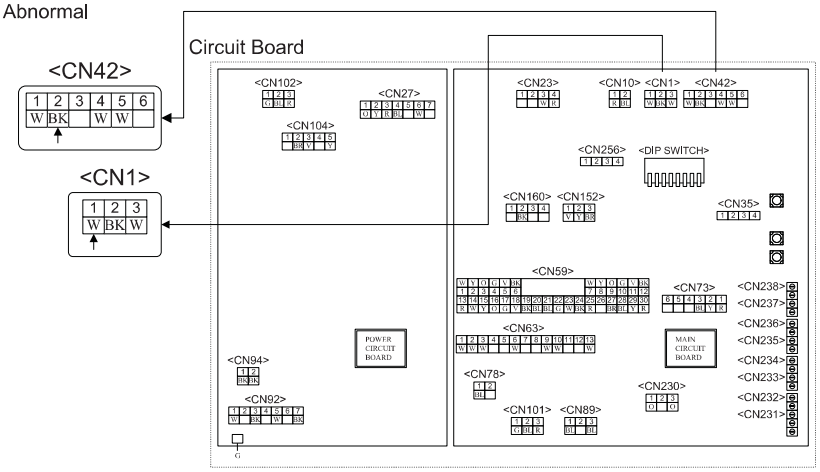
Check the High Limit Switch − Primary Heat Exchanger resistance.

Normal

Between
CN1 : White 1 – CN 42 Black 2
1 Ω or less

When measuring the resistance, disconnect the connector and check the male side.

Abnormal



Check for improper connection of wiring.
Replace the High Limit Switch.

Check the Circulation Pump is rotating when the unit is operating.

Yes

No

Check the voltage to the Circulation Pump (on the connector).

Normal
AC108 − 132V between connector

Check for improper connection of wiring.
Replace the Circulation Pump.

Abnormal

Check the voltage to the Circulation Pump (on the Circuit Board).

Normal
AC108 − 132V between connector

Check for improper connection of wiring.
Replace the Wiring Harness.

Abnormal

Replace the Circuit Board.

Verify all of the air is removed from the system.

Normal

Abnormal

Removed all of the air from the system.

The error only occurs when using Heating?

Yes

No

Replace the Circuit Board.

Check the water drain valve (with water filter) for blockage.

Normal

Abnormal

Clean the water drain valve(with water filter) with a brush under running water.

The problem may be due to a Heating system rather than the appliance.

Error Codes Operation Panel	Description
21	High Limit Switch − Burner Chamber triggered

Check the High Limit Switch − Burner Chamber triggered.

Normal

CN1 : Between White 1 – White 3
1Ω or less

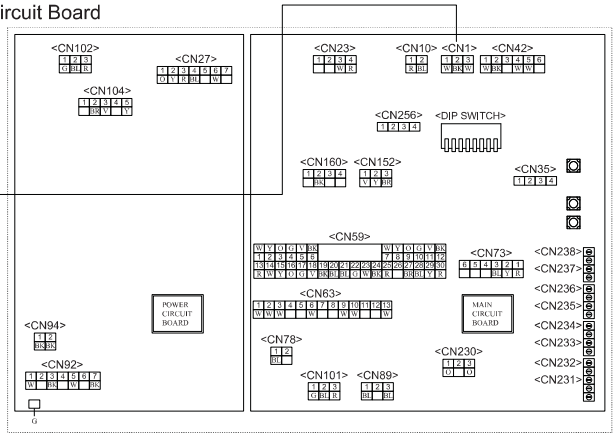
When measuring the resistance, disconnect the connector and check the male side.

<CN1>

1 2 3
W BK W

Abnormal

Circuit Board



Check for improper connection of wiring.
Replace the High Limit Switch.

Check the Burner Chamber and Heat Exchanger are clogged or damaged.

Normal

Abnormal

Replace the malfunction parts.

Replace the Circuit Board.

Error Codes Operation Panel	Description
24	Heat Demand(0-10VDC) reverse connection

This error code appears only when "I:01_HCt(Heating Control Type) setting is "3:EC".

Check the Heat Demand connection.

Normal

The CN235 has electrical polarity.

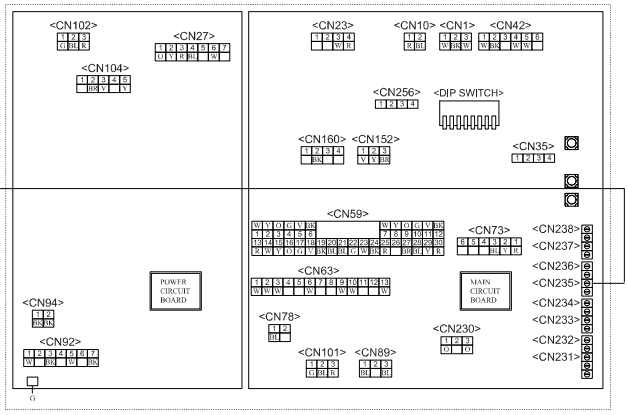
Abnormal

Connect the Head Demand wire correctly.

<CN235>

(-)
(+)

Circuit Board



Check the CN235.

Normal

Abnormal

Replace the Circuit Board.

Disconnect the Heat Demand wire(0-10V) from the CN235.
Normal : EC24 disappears.
Abnormal : EC24 appears continuously.

The problem may be due to a Heating system rather than the appliance

Error Codes Operation Panel	Description
26	Low Water Cutoff abnormality

Check whether a LWCO is connected.

Yes

No

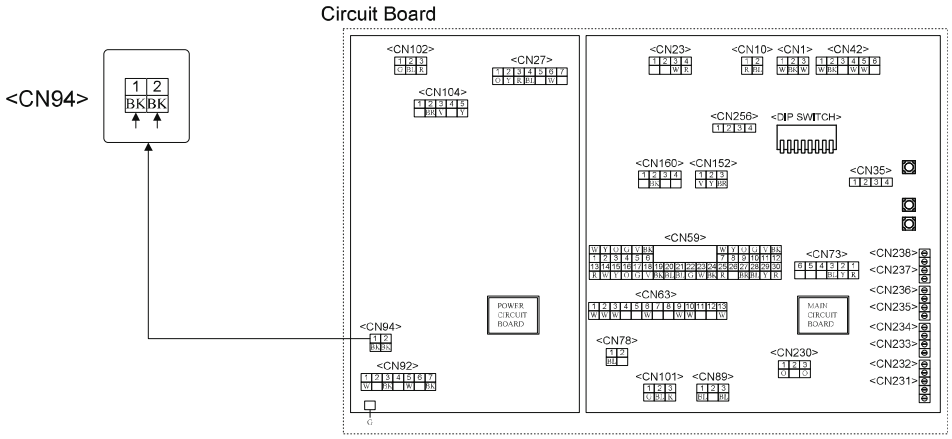
Check the CN94.

Abnormal

Replace the Circuit Board.

Normal

CN94 : Between Black 1 – Black 2
AC 108 – 132V



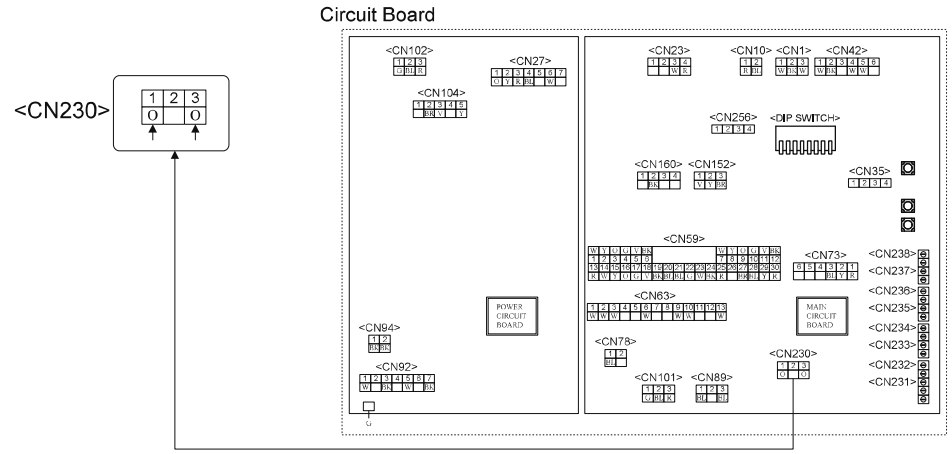
Check the CN230.

Abnormal

Replace the Transformer.

Normal

CN230 : Between Orange 1 – Orange 3
AC 22.8 – 25.2V



A

B

A

B

Check the factory installed jumper connection to the CN234.

Normal

Abnormal

Correct for the improper connection of the CN234.

Check the CN234.

Abnormal

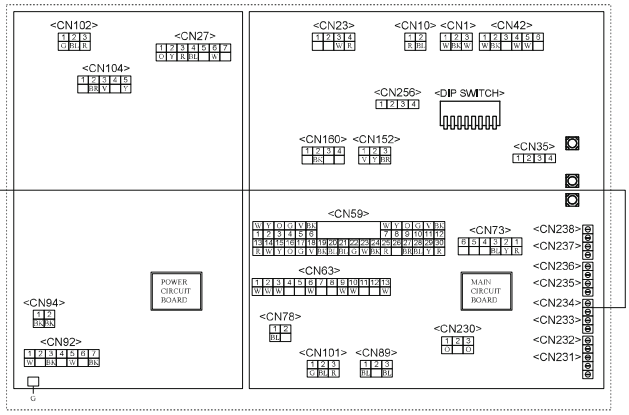
Replace the jumper connection.

Normal

CN234 :There is conduction between CN234

Circuit Board

<CN234>



Replace the Circuit Board.

Check the LWCO wire connection.

Abnormal

Connect the LWCO wire correctly.

Normal

CN231 is for “24VAC OUT”.

CN234 is for “LWCO”.

Check the CN94.

Abnormal

Replace the Circuit Board.

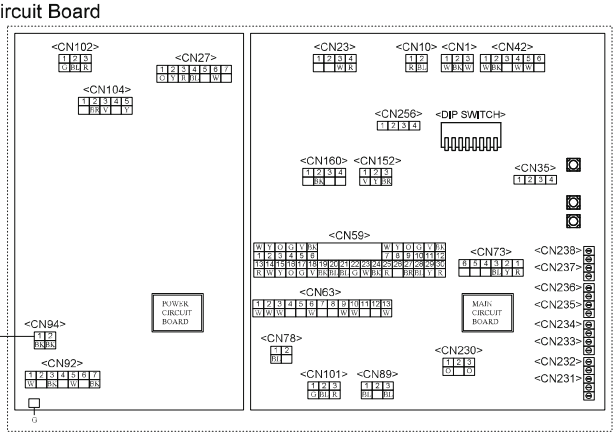
Normal

CN94 : Between Black 1 – Black 2

AC 108 – 132V

Circuit Board

<CN94>



C

C

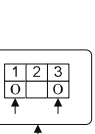
Check the CN230.

Abnormal → Replace the Transformer

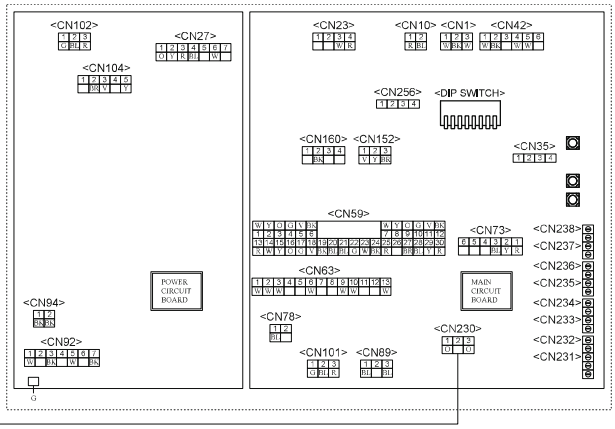
Normal

CN230 : Between Olange 1 – Olange 3
AC 22.8 – 25.2V

<CN230>



Circuit Board



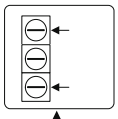
Check the CN231.

Abnormal → Replace the Circuit Board.

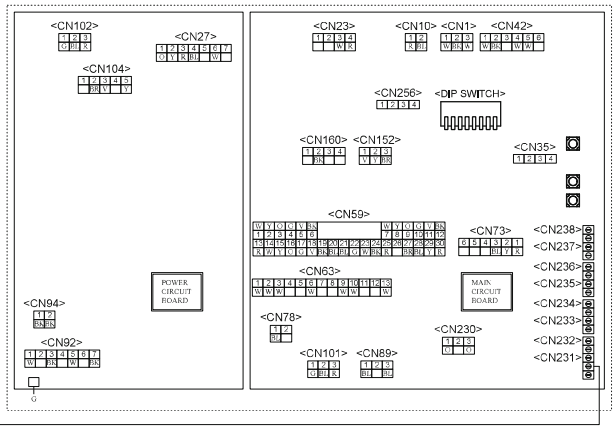
Normal

CN231 : AC 22.8 – 25.2V

<CN231>



Circuit Board



Check the heating system are properly filled with water.

Normal

Abnormal → Fill the heating system with water properly.

D

D

Check the CN234.

Abnormal

Check the LWCO wire.

Abnormal

The problem may be due to a LWCO rather than the appliance.

Normal

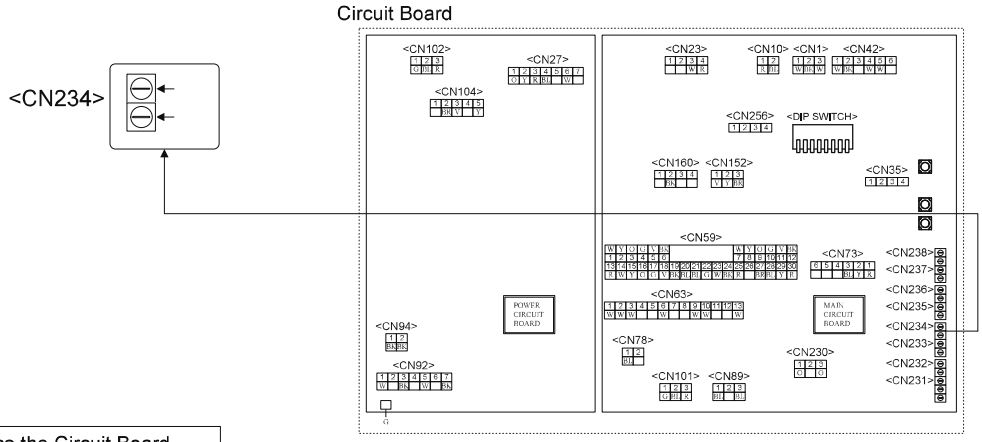
There is conduction between LWCO wire.

Replace the Circuit Board.

When measuring the conduction, disconnect the LWCO wire from the CN234 and check the wire.

Normal

CN234 :There is conduction between CN234



Replace the Circuit Board.

Error Codes Operation Panel	Description
30	Outdoor Temperature Sensor Open or Short Circuit

This error code appears only when "I:01_HCt(Heating Control Type) setting is "2:or".

Check the Outdoor Temperature Sensor connection.

Normal

Abnormal → Connect the Outdoor Temperature Sensor wire correctly.

Check the Temperature Sensor – Air open or short circuit.

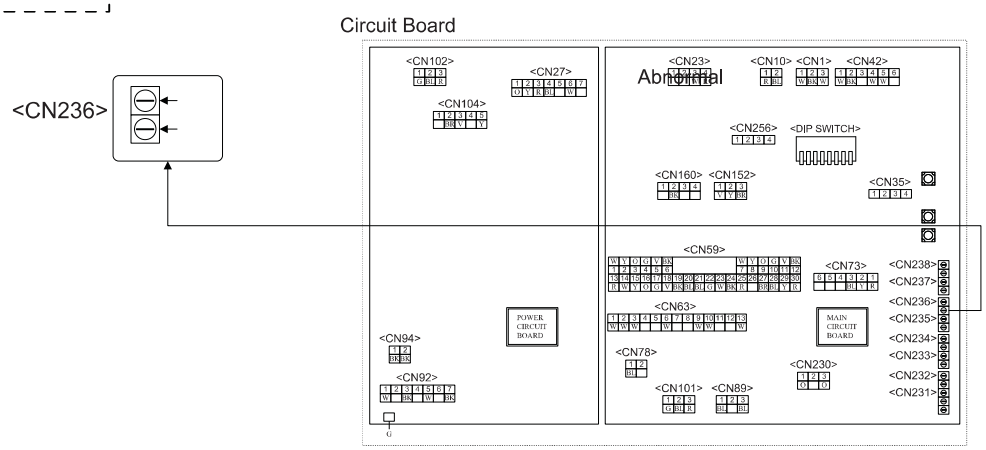
Normal

CN236 : DC 0.5 – 4.6V

Refer to the thermistor temperature characteristics below.

Abnormal → Check for improper connection of wiring. / Replace the Thermistor.

When measuring the resistance, disconnect the Outdoor Temperature Sensor wire from the CN236 and check the wire.



●Outdoor Temperature Sensor Temperature Characteristics

Temperature (°F)	-40	-22	-4	14	32	50	68	86	104	122
Temperature (°C)	-40	-30	-20	-10	0	10	20	30	40	50
Resistance (kΩ)	1724.5	896.2	487.4	276.1	162.2	98.3	61.5	39.5	26.1	17.6
Voltage (V)	4.598	4.280	3.818	3.223	2.590	1.972	1.447	1.038	0.737	0.522

Replace the Circuit Board.

Error Codes Operation Panel	Description
31 / 33	Thermistor − DHW Inlet / Plate HEX Outlet abnormality

Check the Thermistor − DHW Inlet / Plate HEX Outlet open or short circuit.

Normal

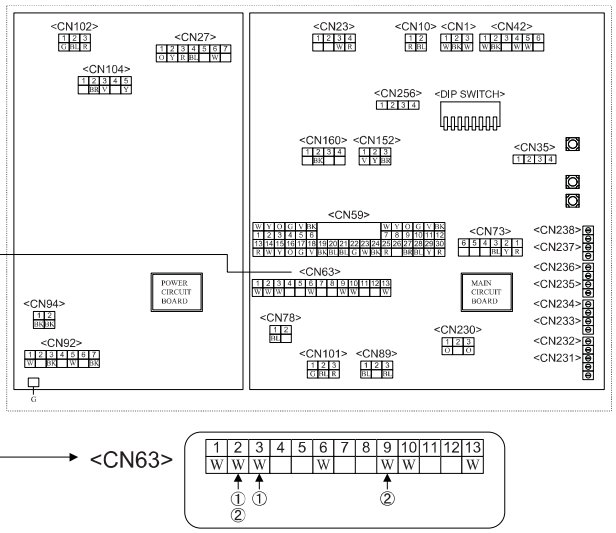
①(Error Code 31) :
CN63 : Between White 3 - White 2
(DHW Inlet)
②(Error Code 33) :
CN63 : Between White 9 - White 2
(Plate HEX Outlet)
DC 1.7 − 4.5V

Refer to the thermistor temperature characteristics below.

When measuring the resistance, disconnect the connector and check the male side.

Abnormal

Circuit Board



Check for improper connection of wiring.

Replace the Thermistor.

●DHW Inlet / Outlet / Plate Heat Exchanger Outlet 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
Voltage (V)	4.5	4.3	4.0	3.6	3.2	2.8	2.4	2.0	1.7

Replace the Circuit Board.

Error Codes Operation Panel	Description
32	Thermistor − DHW Outlet abnormality

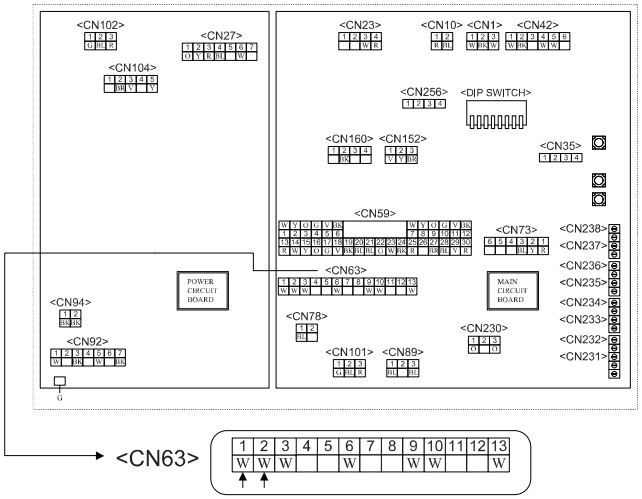
Check the Thermistor − DHW Outlet open or short circuit.

Normal

1) Turn the power ON/OFF button "OFF"
2) Open the fixture and keep running water. (It is 5 minutes or more, and 1.0 Gal/min or more.)
3) After 5 minutes or more, check the maintenance monitor. The difference between # 30, # 31 and # 32 data should be within ±5 °F.

Abnormal

Circuit Board



Check for improper connection of wiring.

Replace the Thermistor.

CN63 : Between White 1 - White 2
DC 1.7 − 4.5V

Refer to the thermistor temperature characteristics below.

When measuring the resistance, disconnect the connector and check the male side.

●DHW Inlet / Outlet / Plate Heat Exchanger Outlet 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
Voltage (V)	4.5	4.3	4.0	3.6	3.2	2.8	2.4	2.0	1.7

Replace the Circuit Board.

Error Codes Operation Panel	Description
35	Thermistor − Exhaust abnormality

Check the Thermistor − Exhaust open or short circuit.

Normal

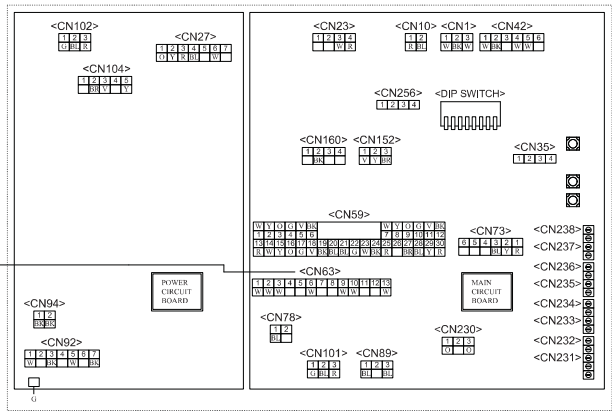
CN63 : Between White 10 - White 2
DC 2.3 − 4.6V

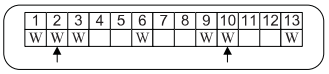
Refer to the thermistor temperature characteristics below.

When measuring the resistance, disconnect the connector and check the male side.

Abnormal

Circuit Board





Check for improper connection of wiring.

Replace the Thermistor.

●Thermistor − Exhaust Temperature Characteristics

Temperature (°F)	-4	14	32	50	68	86
Temperature (°C)	-20	-10	0	10	20	30
Resistance (kΩ)	487	276	162	98.3	61.4	39.5
Voltage (V)	4.6	4.3	3.9	3.4	2.8	2.3

Replace the Circuit Board.

Error Codes Operation Panel	Description
36/37	Thermistor − Heat Supply / Return abnormality

Check the Thermistor − Heat Supply / Return open or short circuit.

Normal

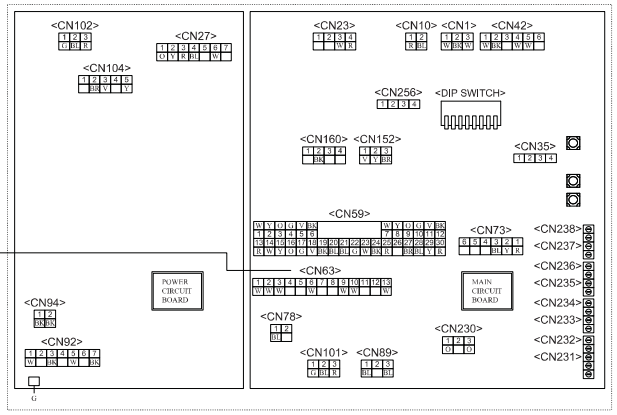
①(Error Code 36) :
CN63 : Between White 13 - White 2
(Heat Supply)
②(Error Code 37) :
CN63 : Between White 6 - White 2
(Heat Return)
DC 1.7 − 4.5V

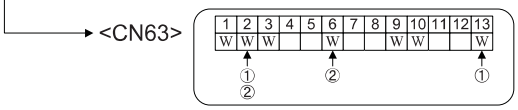
Refer to the thermistor temperature characteristics below.

When measuring the resistance, disconnect the connector and check the male side.

Abnormal

Circuit Board





●Heating Supply / Return 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
Voltage (V)	4.5	4.3	4.0	3.6	3.2	2.8	2.4	2.0	1.7

Check for improper connection of wiring.
Replace the High Limit Switch.

Check the Circulation Pump rotation by Diagnostic Mode.

It shown on page 9 (◎3)

Error Codes Operation Panel	Description
43	Heating Water Pressure Sensor abnormality

Check the Heating Water Pressure Sensor wire connection.

Normal

Abnormal

Connect the Heating Water Pressure Sensor wire correctly.

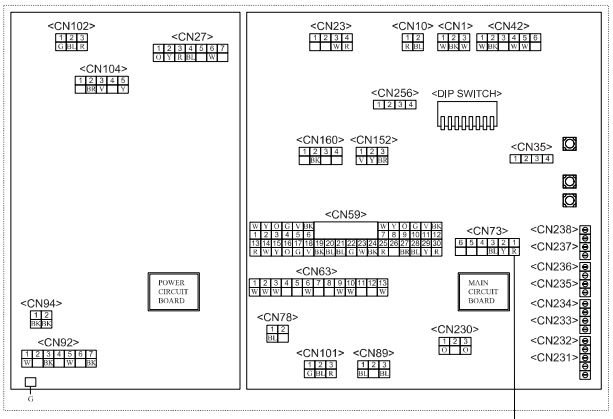
Check the voltage to the Heating Water Pressure Sensor.

Normal

Between
CN73 : Red 1 – CN 73 Black 3
DC 4.5 – 5.5 V

Abnormal

Circuit Board



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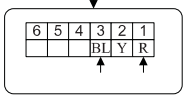


Replace the Heating Water Pressure Sensor.
Check for improper connection of wiring.

Replace the Circuit Board.

Error Codes Operation Panel	Description
44	High Heating Water Pressure

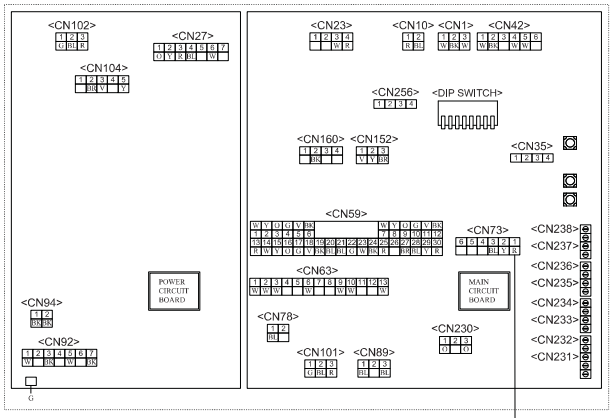
Check the voltage to the Heating Water Pressure Sensor.

Normal

Between
CN73 : Red 1 – CN 73 Black 3
DC 4.5 – 5.5 V

Abnormal

Circuit Board



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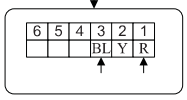


Replace the Circuit Board.

Check the Heating Water Pressure Sensor.

Normal

Abnormal

Replace the Heating Water Pressure Sensor.
Check for improper connection of wiring.

Open the Pressure Relief Valve on the unit and then reset the EC44 by pressing ON/OFF button.
Normal : EC44 disappears.
Abnormal : EC44 appears continuously.

The problem may be due to a Heating system rather than the Heating Water Pressure Sensor.

Error Codes Operation Panel	Description
54	Low Heating Water Pressure

Check for leaks in a heating system.

Normal

Abnormal

→ Repair the leak in the heating system.

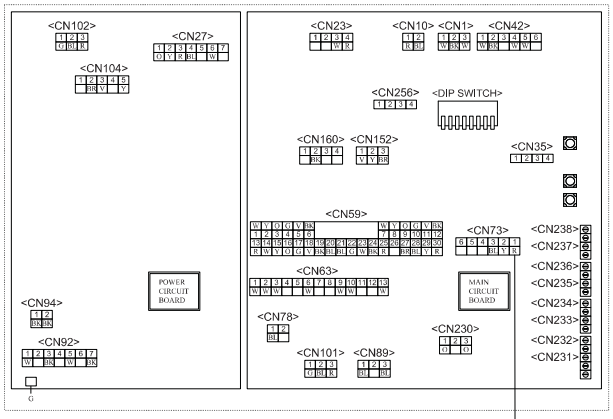
Check the voltage to the Heating Water Pressure Sensor.

Normal

Between
CN73 : Red 1 – CN 73 Black 3
DC 4.5 – 5.5 V

Abnormal

Circuit Board



<CN73>

6	5	4	3	2	1
			BL	Y	R

→ Replace the Circuit Board.

Check the Expansion Tank and the External Pump position.

Normal

Abnormal

→ Correct the Expansion Tank and the External Pump position.

Normal : Installing the External Pump downstream the Expansion Tank.
Abnormal : Installing the External Pump upstream the Expansion Tank.

Replace the Heating Water Pressure Sensor.

Check for improper connection of wiring.

Error Codes Operation Panel	Description
56	External Solenoid valve abnormality

Check the voltage to the External Solenoid valve.

Normal

1) Turn the power ON/OFF button "OFF"

2) Press the MAINTENANCE button. Select  using the ▲ or ▼ button.

3) Press the ENTER button. The "Diagnostic Mode" screen appears.

4) Select  using the ▲ or ▼ button.

5) Press the ENTER button. The "Components Check Mode" screen appears.

6) Select  using the ▲ or ▼ button.

7) Press the ENTER button. The display shows  .

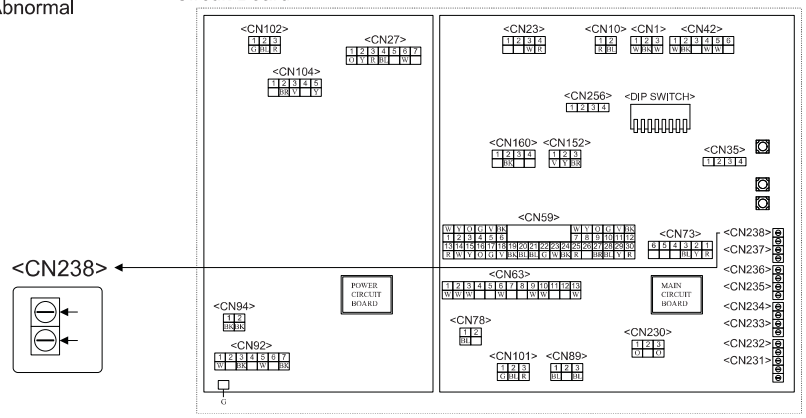
8) Select  using the ▲ or ▼ button.

9) Check the voltage to the External Solenoid valve.

CN238 : AC 120 V

Abnormal

Circuit Board



<CN238>

Replace the Circuit Board.

Check the water passage.

Normal

Abnormal

Ensure proper piping and water flow.

Check for improper connection of wiring.

Replace the External Solenoid valve.

Error Codes Operation Panel	Description
57	Stopped Water Supply

Check the voltage to the Auto Feeder.

Normal

1) Turn the power ON/OFF button "OFF"

2) Press the MAINTENANCE button. Select  using the ▲ or ▼ button.

3) Press the ENTER button. The "Diagnostic Mode" screen appears.

4) Select  using the ▲ or ▼ button.

5) Press the ENTER button. The "Components Check Mode" screen appears.

6) Select  using the ▲ or ▼ button.

7) Press the ENTER button. The display shows  .

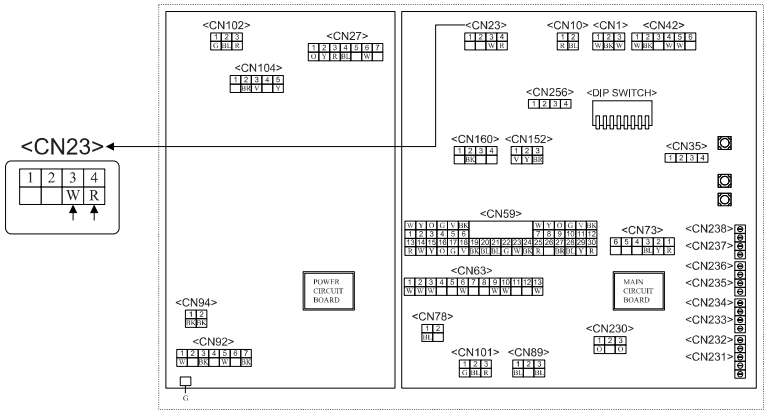
8) Select  using the ▲ or ▼ button.

9) Check the voltage to the Auto Feeder.

CN23
Between White 3 − Red 4
DC 13.5 − 16.5 V

Abnormal

Circuit Board



Check for improper connection of wiring.
Replace the Circuit Board.

Check the Auto Feeder Inlet's water passage.
Check the Auto Feeder Inlet's Water Filter.

Abnormal

Ensure proper piping and water flow.
Clean the Water Filter.

Normal

Check for improper connection of wiring.
Replace the Auto Feeder.

Error Codes Operation Panel	Description
61	Fan Motor abnormality

Only connect and disconnect the connector after the fan has stopped rotating and then disconnect the electrical power.
(The Circuit Board and Fan Motor may be damaged otherwise.)

<Condition of occurrence for Error Code 61>
When the Unit is in following conditions, the Error Code is displayed.
- If the fan speed is 200rpm more or less than the target speed during ignition or pre purge.
- If the fan speed is lower than 500rpm during the combustion.
- If the fan speed is 500 (200) rpm more or less than the target speed during combustion.

Fan Motor is rotating.

YES

NO

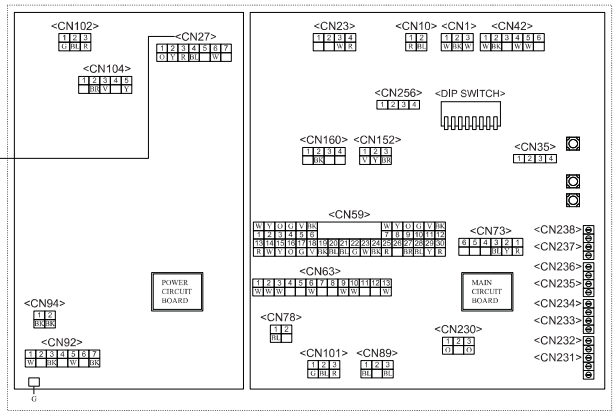
Check the Voltage to the Fan Motor.

Abnormal → Replace the Circuit Board.

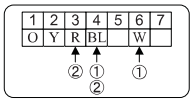
Normal

CN27 :
① Between White 6 - Blue 4
DC 140 − 187V
② Between Red 3 - Blue 4
DC 13 − 16V

Circuit Board



<CN27>



(because there is the possibility of fan phase interruption) → Replace the Fan Motor.

Check the Fan speed.

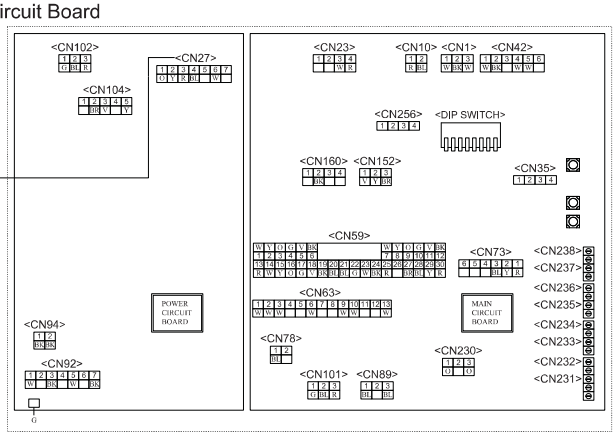
Abnormal → Replace the Fan Motor.

Normal

CN27 :
① Between Yellow 2 - Blue 4
194 − 1302Hz
② Between Orange 1 - Blue 4
DC 1.69 − 8.25V

Compare the data indicated on maintenance monitor #10 and #20.

Circuit Board



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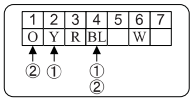


The problem may be due to a cause rather than the appliance.

* If the problem does not reappear and only appears on the Error Code history, it could be due to a cause rather than the unit, such as temporary blockage due to wind gusts or obstruction, a drop in the supply voltage (below AC 108V), etc.
Please explain this to the customer.

Error Codes Operation Panel	Description
65	Water Servo-Main abnormality

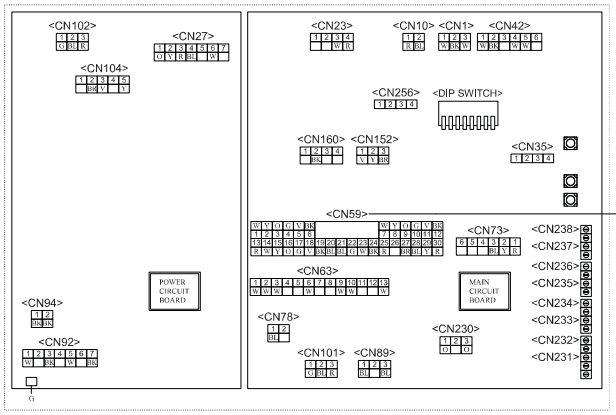
Check the voltage to the Water Servo-Main.

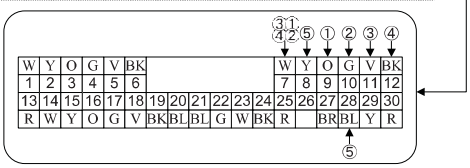
Normal

CN59 :
① Between Orange 9 – White 7
DC 1 – 16V
② Between Green 10 – White 7
DC 1 – 16V
③ Between Violet 11 – White 7
DC 1 – 16V
④ Between Black 12 – White 7
DC 1 – 16V
⑤ Between Yellow 8 – Blue 28
DC 1V or less
(When valve is fully open)

Abnormal

Circuit Board





Check for improper connection of wiring.
Replace the Circuit Board.

Check for improper connection of wiring.
Replace the Water Servo-Main.

Error Codes Operation Panel	Description
66	Bypass Valve-DHW abnormality

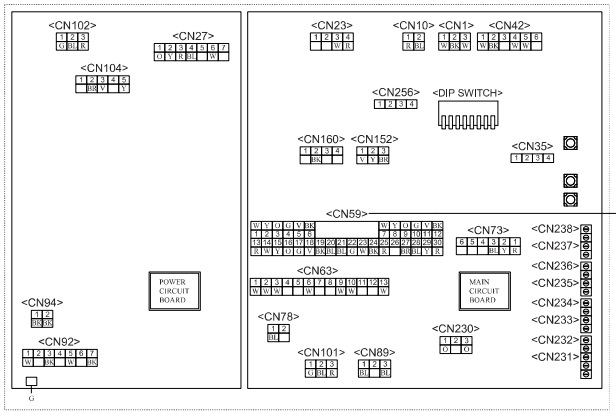
Check the voltage to the Bypass Valve-DHW .

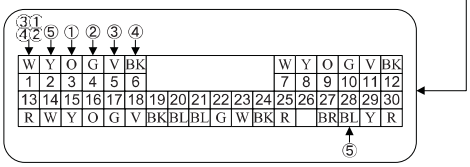
Normal

CN59 :
① Between Orange 3 – White 1
DC 1 – 16V
② Between Green 4 – White 1
DC 1 – 16V
③ Between Violet 5 – White 1
DC 1 – 16V
④ Between Black 6 – White 1
DC 1 – 16V
⑤ Between Yellow 2 – Blue 28
DC 4 – 6V
(When valve is fully open)

Abnormal

Circuit Board





Check for improper connection of wiring.
Replace the Circuit Board.

Check for improper connection of wiring.
Replace the Water Servo-Bypass.

Error Codes Operation Panel	Description
67	3-Way Valve-Heating abnormality

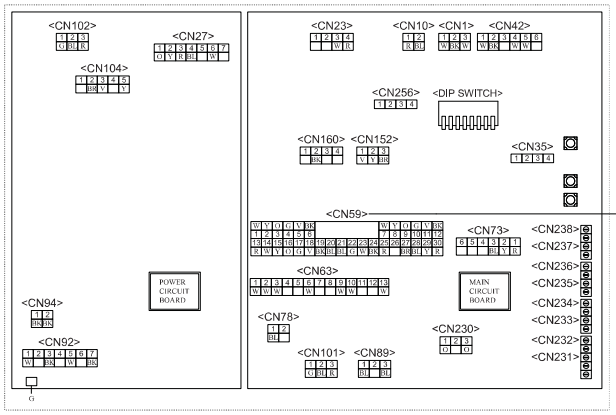
Check the 3-Way Valve-Heating.

Normal

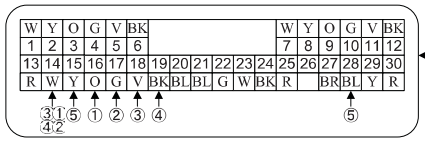
CN59 :
① Between Orange 16 – White 14
DC 1 – 16V
② Between Green 17 – White 14
DC 1 – 16V
③ Between Violet 18 – White 14
DC 1 – 16V
④ Between Black 19 – White 14
DC 1 – 16V
⑤ Between Yellow 15 – Blue 28
DC 1V or less
(When valve is on the DHW side)

Abnormal

Circuit Board



<CN59>



Check for improper connection of wiring.
Replace the Circuit Board.

Check for improper connection of wiring.
Replace the Water Servo-Main.

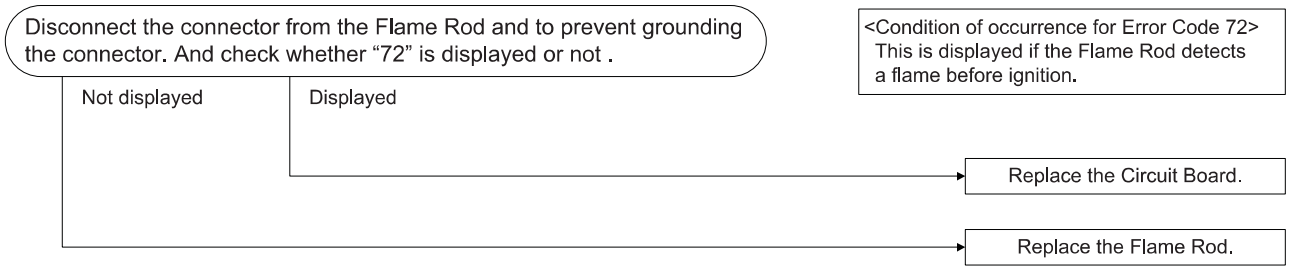
Error Codes Operation Panel	Description
70	Circuit Board abnormality

Disconnect the electrical power, then reconnect electrical power to the Unit to reset the system.
If the Circuit Board abnormality continues, replace the Circuit Board set.

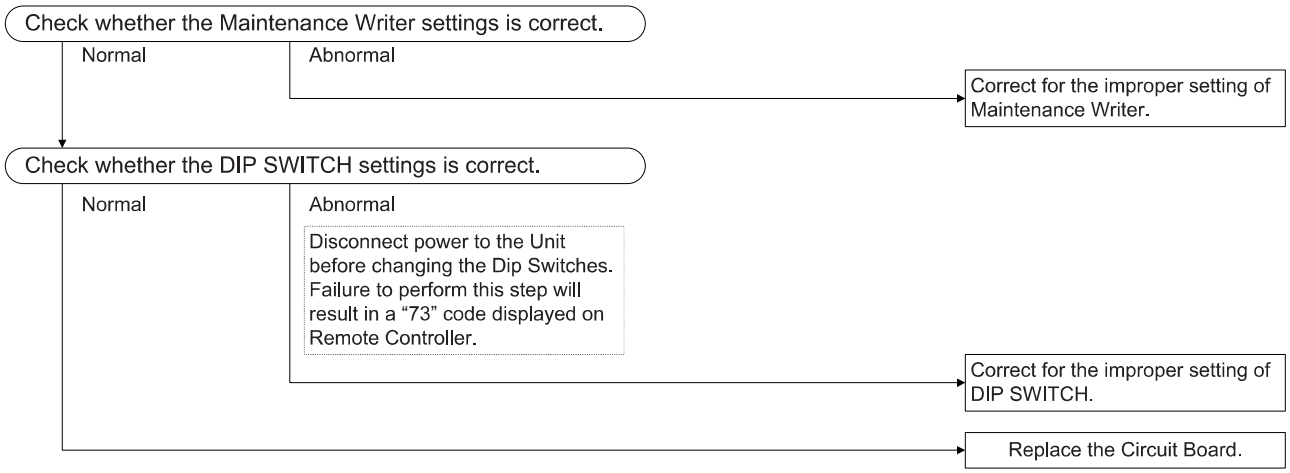
Error Codes Operation Panel	Description
71	Gas Valve drive circuit abnormality Circuit Board abnormality

This Error Code is rarely displayed due to failure on the High Limit Switch – Primary Heat Exchanger. Please check the Error Code “20” procedure.(page 15)
If the Error Code“71” display continues, it’s due to a failure of the circuit board (Gas Valve drive circuit) or in the Gas Valve drive system's ground. The cause could be a welding issue on the Circuit Board. Basically, if this error occurs the Circuit Board set should be replaced.

Error Codes Operation Panel	Description
72	Flame Rod circuit abnormality (Detection of flame when no flame is present)



Error Codes Operation Panel	Description
73	Circuit Board setting abnormality (Improper maintenance writers settings and DIP SWITCH settings) Circuit Board abnormality



Error Codes Operation Panel	Description
(F)76	Multi system communication error

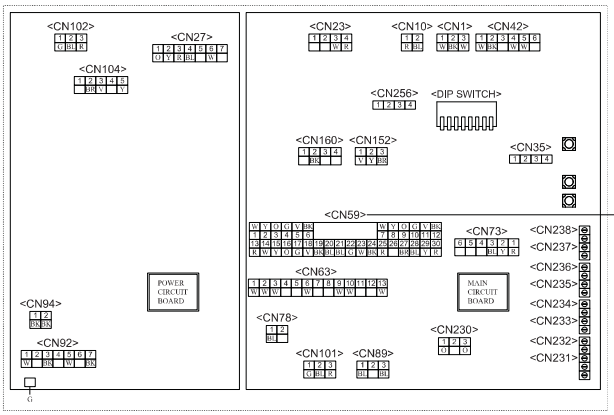
Check the voltage to the Circuit Board.

Normal

CN59 :
①:Between Blue 20 - Blue 28
DC 14 – 16V
②:Between Blue 21 - Blue 28
DC 14 – 16V

Abnormal

Circuit Board



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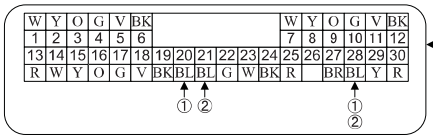


Check for improper connection of wiring.
Replace the Circuit Board.

Check Disconnection of Quick connect cord.

Normal

Abnormal

Replace the Quick connect cord.

Check for improper connection of wiring.
Replace the Circuit Board.

Error Codes Operation Panel	Description
760	Operation Panel transmission abnormality

Check the Voltage of Operation Panel terminal.

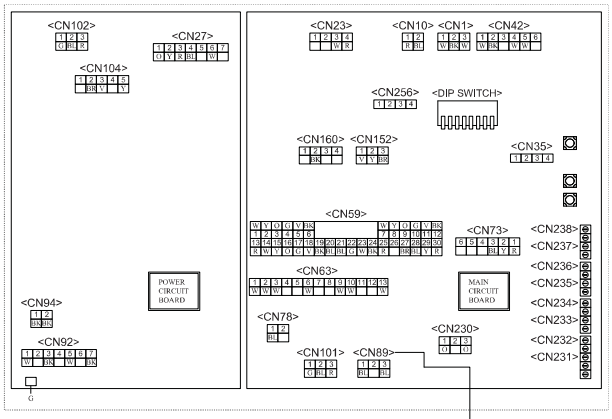
Normal

CN89 : Between Blue 1 – Blue 3
DC 14 – 16V

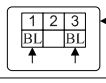
When measuring the voltage, remove the Operation Panel cord.

Abnormal

Circuit Board



<CN89>



Check for improper connection of wiring.
Replace the Circuit Board.

Check for Remote Controller cord damage, short-circuiting or ground fault.

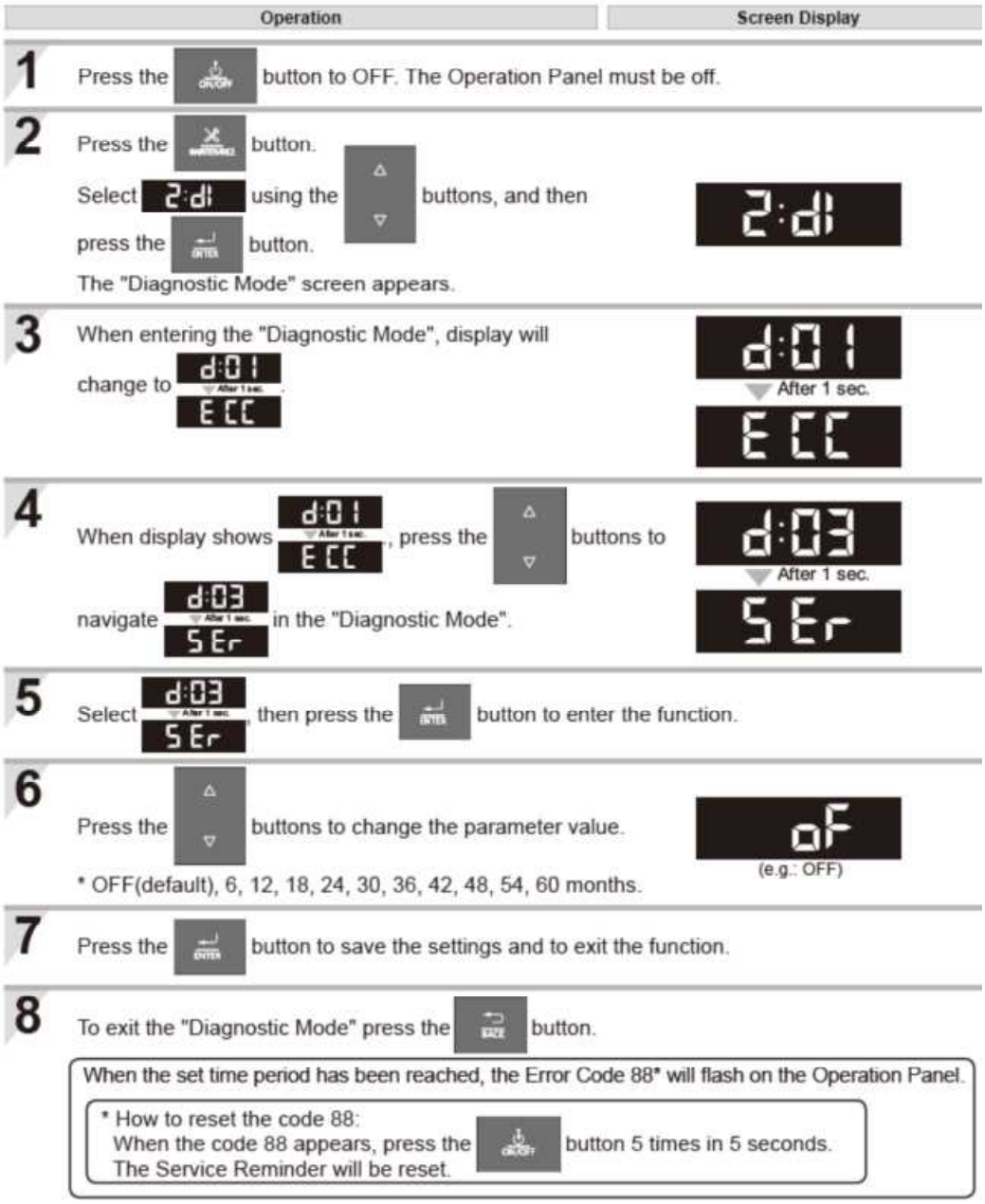
Error Codes Operation Panel	Description
88	Service Reminder (Warning Indication)

The combi boiler is equipped with a Service Reminder to announce for maintenance.
When the set time period has been reached, the Error Code 88 will flash on the Operation Panel.

How to reset the code 88
When the code 88 appears, press the button 5 times in 5 seconds.
The Service Reminder will be reset.

After reseting the Service Reminder, the code 88 will appear again when the set time period has been reached.

* Refer to the below procedure for complete procedure.



Error Codes Operation Panel	Description
10 / 90-1 , 90-2	Air flow abnormality(Unit shuts off)

<Condition of occurrence for Error Code 90>
Detected abnormal air flow when the unit starts.
- If the Unit detects "Error Code 90" 30 times, the Unit is locked for safety.

<NOTE>
In case the Heating value is too low, this error may occur.

Check air inlet for blockage or obstruction.
Check the intake air filter.(inside of the unit)
Check exhaust for blockage or obstruction.
→ Abnormal → After fixing the problem, reconnect the power
↓ Normal

Check the Condensate drain line is clogged or frozen.
Check that the Condensate drain pipe slopes down.
→ Abnormal → After fixing the problem, reconnect the power
↓ Normal

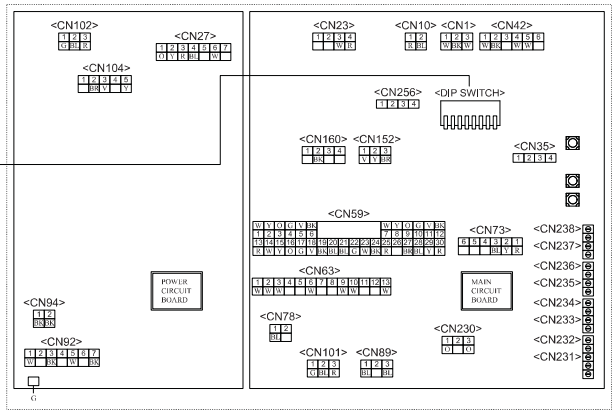
Check the DIP SWITCH setting.
→ Abnormal → After fixing the problem, reconnect the power
↓ Normal

① Exhaust type.
② High Elevation Adjustment.
③ Vent Length Adjustment and Vent Size.

Settings : Refer to the table below.

<DIP SWITCH>
1 8
OFF
ON

Circuit Board



●Setting list for DIP Switches (●:ON ○:OFF)

SW3		SW5 & SW6			SW7 & SW8		
Exhaust type		Elevations above 2000ft			Vent Length Adjustment and Vent Size		
SW3	Description	SW5	SW6	Description	SW7	SW8	Description
○	DV	○	○	0 − 2,000ft (0 − 610m)	○	○	2" Short Length
●	SV	●	○	2,001 − 4,000ft (611 − 1,220m)	●	○	2" Long Length
		○	●	4,001 − 7,000ft (1,221 − 2,135m)	○	●	3" Short Length
		●	●	7,001 − 10,000ft (2,136 − 3,50m)	●	●	3" Long Length

Check whether the Primary gas pressure is normal.
→ Abnormal → Check the gas supply valve, etc.
↓ Normal

* Check the primary pressure (dynamic pressure) at the time of maximum combustion.

Primary gas pressure list

Pressure \ Gas Group		LP	NGA
Maximum Pressure	Inch H_2O	14.0	10.5
Standard Pressure	Inch H_2O	11.0	7.0
Minimum Pressure	Inch H_2O	8.0	3.5

A

A

Displayed Error Cord

90-1

90-2 → B (Next page)

Check whether the Thermistor- DHW (Inlet / Outlet) are normal.

Normal

1) Turn the power ON/OFF button "OFF"

2) Open the fixture and keep running water. (It is 5 minutes or more, and 1.0 Gal/min or more.)

3) After 5 minutes or more, check the maintenance monitor. The difference between #31 and #32 data should be within ±5 °F.

Abnormal

Check the thermistor resistance.

Abnormal → Check for improper connection of wiring, connectors, etc. then replace the thermistor.

Normal

When measuring the resistance, disconnect the connector and check the male side.

CN63 :

③ Between White 3 − White 2 (DHW Inlet)

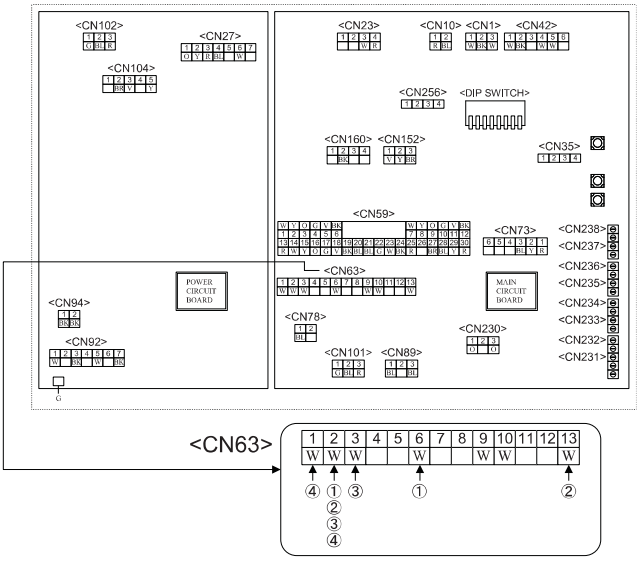
④ Between White 1 − White 2 (DHW Outlet)

Refer to the thermistor temperature characteristics below.

●DHW Inlet / Outlet / Plate Heat Exchanger Outlet 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

Circuit Board



Replace the Circuit Board.

Check for clogged water fixtures, then replace the Water Flow Sensor.

Abnormal → Replace the Circuit Board.

Normal

Check if the Fan Motor is clogged.

Abnormal → Replace the Fan Motor.

Normal

Check if the Venturi is clogged.

Abnormal → Replace the Venturi.

Normal

Check if the Intake/Exhaust Duct is clogged.

Abnormal → Replace the Exhaust Duct.

Normal

Check if the Primary / Secondary Heat Exchanger is clogged.

Abnormal → Replace the Primary / Secondary Heat Exchanger.

Normal

Check the Plate Heat Exchanger is clogged.

Abnormal → Replace the Plate Heat Exchange.

Normal

Replace the Burner Chamber.

B

Check whether the Thermistor- Heating Supply / Return are normal.

Normal

1) Turn the power ON/OFF button "OFF"

2) Press the MAINTENANCE button. Select  using the ▲ or ▼ button.

3) Press the ENTER button. The "Diagnostic Mode" screen appears.

4) Select  using the ▲ or ▼ button.

5) Press the ENTER button. The "Components Check Mode" screen appears.

6) Select  using the ▲ or ▼ button.

7) Press the ENTER button. The display shows  .

8) Select  using the ▲ or ▼ button.

9) After 1 minutes or more, check the maintenance monitor. The difference between #34 and #35 data should be within ±5 °F.

Abnormal

Check the thermistor resistance.

Abnormal → Check for improper connection of wiring, connectors, etc. then replace the thermistor.

Normal

When measuring the resistance, disconnect the connector and check the male side.

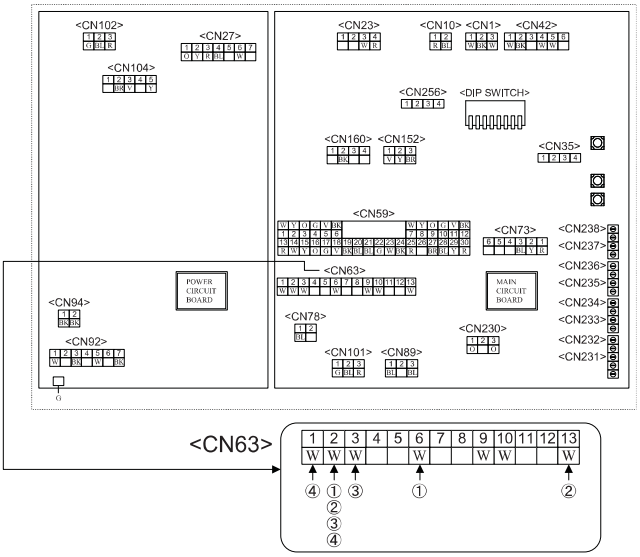
CN63 :
① Between White 6 - White 2 (Heat Exchanger Inlet)
② Between White 13 - White 2 (Heat Exchanger Outlet)

Refer to the thermistor temperature characteristics below.

●Heating Supply / Return 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

Circuit Board



Replace the Circuit Board.

Check if the Drain Cook (Water Filter) is clogged.

Abnormal → Replace the Drain Cook (Water Filter).

Normal

Check if the Fan Motor is clogged.

Abnormal → Replace the Fan Motor.

Normal

Check if the Venturi is clogged.

Abnormal → Replace the Venturi.

Normal

Check if the Intake/Exhaust Duct is clogged.

Abnormal → Replace the Exhaust Duct.

Normal

Check if the Primary / Secondary Heat Exchanger is clogged.

Abnormal → Replace the Primary / Secondary Heat Exchanger.

Normal

Replace the Burner Chamber.

Error Codes Operation Panel	Description
94	Exhaust temperature is too high

<Condition of occurrence for Error Code 94>
The Unit detects high exhaust temperature.

Check the procedure below.

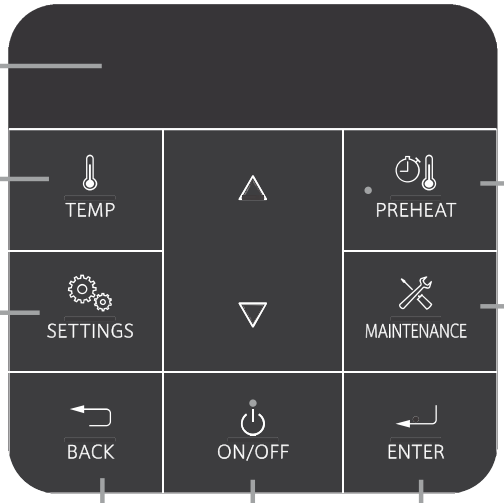
1. Check air inlet for blockage or obstruction.
2. Check exhaust for blockage or obstruction.
3. Check the Fan Motor. (ex. Clogging of fan blades, etc.)
4. Check for sudden environmental changes. (ex. Hurricane, storm, etc.)
5. Check if the Circulation Pump is running normally.
6. Check the water drain valve (with water filter) of the Heating Return Connection for blockage or obstruction.

How to reset lock of the Unit (for Error Code 90-8)

1. Make sure the Operation Panel is OFF (completely blank),
   If it is ON, turn it OFF and wait for 10 seconds.
2. Disconnect electrical power.
3. Wait 10 seconds and reconnect power.
   Leave the Operation Panel OFF.
4. Press the ▲ button, the display blinks "99".
   You are now in the maintenance writer (MW) mode and can scroll through the MWs using the ▲ and ▼ buttons.
5. Select “3F” using the ▲ or ▼ button.
6. Leave the display blink “3F”, press and hold the ENTER button, then the  (DHW Icon) is OFF on the Operation Panel.
7. Once complete, hold the ▲ and ▼ buttons together for 5 seconds until the Operation Panel starts beeping rapidly.
   This is the signal that the changes to the MW has been saved and the unit is ready for use.

Operation Panel (RC-B201M)

The Operation Panel will emit a tone when a button is pressed.



Display Screen

TEMP Button

For setting and checking the Heating / Domestic Hot Water (DHW) temperature.

SETTINGS Button

Use to change the User Mode settings.

BACK Button

Returns to the previous screen while making system settings or checking status.

PREHEAT Button / Indicator(Orange)

Activates the PREHEAT “ON” or “OFF” setting as determined by the user selected schedule.

MAINTENANCE Button

Use to check information about the Combi Boiler.

ENTER Button

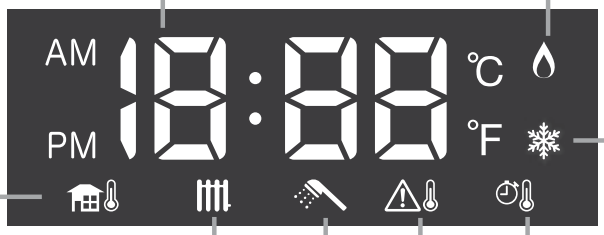
Confirms changes made by the user.

Power ON/OFF Button / Indicator(Orange)

For turning the Combi Boiler ON/OFF.

■ Operation Panel

* The Display Screen shown below is for illustration purposes only.
The actual display will vary depending on how the Combi Boiler is being used.



Temperature Setting
During normal operation, the set temperature is displayed.

Clock

Error Code
A number will flash if a failure occurs.

Burner ON Icon
When burning, the icon is lit.

Freeze Prevention Icon
When unit operates freeze prevention, the icon is lit.

Outdoor Reset Icon
When Outdoor Reset is activated, the icon is lit.

Heating Icon

DHW Icon

DHW Preheat Icon
When DHW Preheat is activated, the icon is lit.

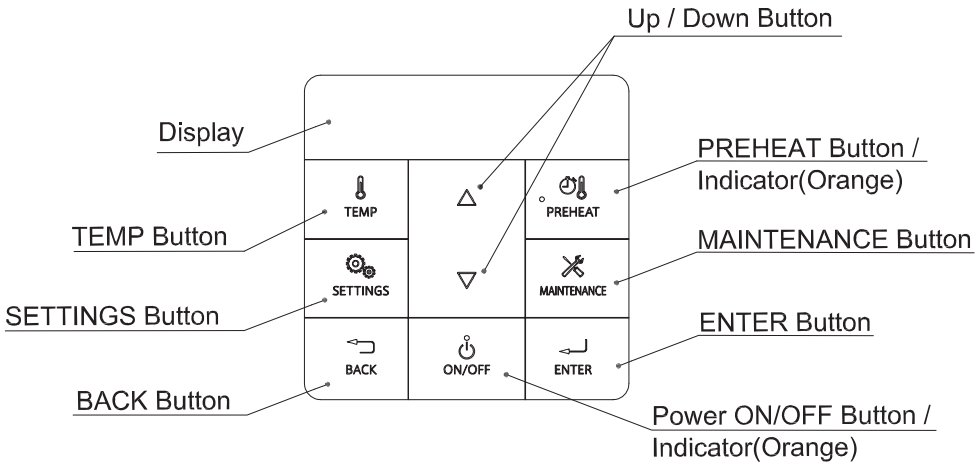
DHW High Temperature Icon
When setting the unit to 125°F (55°C in °C mode) or higher, the icon is lit.

* Before use, remove the protective sheet from the Operation Panel surface.

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

■ Operation Panel

RC-B201M



■ Set the temperature and flow rate units

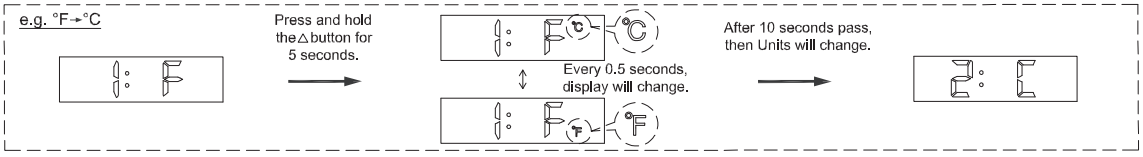
The factory default is °F & GPM. This function will appear within the first 10 minutes of connecting electrical power and before pressing the ON/OFF button.

<Units Setting>

Operation	Screen Display
1. Press the SETTINGS button. Select 2:In using the △ ▽ buttons, and then press the ENTER button.	2:In
2. Display will change to 1:00 (After 1 sec.) FC , then press the ENTER button.	1:00
3. To change the unit. °F→°C : Press and hold the △ button for approximately 5 seconds. °C→°F : Press and hold the ▽ button for approximately 5 seconds.	

Units Choices (Factory Setting is Shaded)

1: F	2: C
°F / Gal (Fahrenheit / Gallon)	°C / L (Celsius / Liter)



4. Press the BACK button to exit the function.

■ Maintenance Monitors

<Display Procedure>

1. Press "MAINTENANCE" button.
2. Display shows "1:td", then press "ENTER" button to enter "Maintenance Monitors" Mode. This setting can be done regardless of whether the power button is ON/OFF.

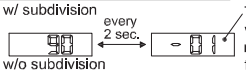
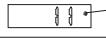
<Indications>

1. The maintenance monitor data No. will appear on the display for two seconds, and then the data will appear.
2. Press either the Up [△] or Down [▽] buttons to navigate through "Maintenance Monitors". When the maintenance monitor data No. is changed, the data No. will be displayed for two seconds, after which the data will appear.

<Returning to Normal Mode>

1. Press "BACK" button twice or let it sit for approximately 10 minutes to return to the home screen.

●Maintenance Monitor List

Data No.	Item	Data (Display Reading X Multiplier) Multiplier	Unit	Minimum Value for Indication	Remarks
00	Heating Setting	---	---	---	*1
01	Total Heating Combustion Time	X 10	hour	10 hour	Disp. Range [000] - [999]
02	Total Heating Combustion Time	X 10,000	hour	10,000 hour	Disp. Range [000] - [065]
03	Total Plug-in Time	X 100	hour	100 hour	Disp. Range [000] - [1310]
04	Total DHW Combustion Time	X 1	hour	1 hour	Disp. Range [000] - [999]
05	Total DHW Combustion Time	X 1,000	hour	1,000 hour	Disp. Range [000] - [065]
06	Total simultaneous use of DHW & Heating Time	X 1	hour	1 hour	Disp. Range [000] - [1999]
07	Number of DHW Ignition Times	X 100	time	100 times	Disp. Range [000] - [999]
08	Number of DHW Ignition Times	X 100,000	time	100,000 times	Disp. Range [000] - [065]
10	Fan Rotational Frequency	X 10	rpm	10 rpm	
11	Number of Heating Ignition Times	X 100	time	100 times	Disp. Range [000] - [999]
12	Number of Heating Ignition Times	X 100,000	time	100,000 times	Disp. Range [000] - [065]
14	Total Flow Rate	X 0.1	gal/min	0.1 gal/min	*2
		X 0.1	L/min	0.1 L/min	*3
18	Output-DHW (%)	X 1	%	1 %	
20	Calculated Fan Speed	X 10	rpm	10 rpm	
29	Logic for unit not operating correctly	---	---	—	[000] : Normal operation [001] : Water inlet temperature is too high → If possible decrease water inlet temperature [004] : Inlet and Outlet temperature are reversed → Check the pipes and re-install it correctly
30	Thermistor-DHW Inlet Detection Temperature	X 1	°F	1°F	*2
		X 0.1	°C	0.5°C	*3
31	Thermistor-DHW Outlet Detection Temperature	X 1	°F	1°F	*2
		X 0.1	°C	0.5°C	*3
32	Thermistor-Plate Heat Exchanger Outlet Detection Temperature	X 1	°F	1°F	*2
		X 0.1	°C	0.5°C	*3
34	Thermistor-Heat Return Temperature	X 1	°F	1°F	*2
		X 0.1	°C	0.5°C	*3
35	Thermistor- Heat Supply Temperature	X 1	°F	1°F	*2
		X 0.1	°C	0.5°C	*3
36	Thermistor-Exhaust Detection Temperature	X 1	°F	1°F	*2
		X 1	°C	1°C	*3
38	Outdoor Temperature Sensor Detection Temperature	X 1	°F	1°F	Disp. Range [-40] - [122] *2
		X 1	°C	1°C	Disp. Range [-40] - [050] *3
41	Temperature setting_DHW Outlet	X 1	°F	1°F	*2
		X 0.1	°C	0.5°C	*3
45	Temperature setting _ Heat Exchanger Outlet	X 1	°F	1°F	*2
		X 0.1	°C	0.5°C	*3
50	FF No.-Primary Heat exchanger	X 0.1	---	0.1	
51	FF+FB No.-Primary Heat exchanger	X 0.1	---	0.1	
52	Output-DHW	X 0.1	---	0.1	
54	Service Remainder	X 1	month	1 month	[000](OFF), [006] - [060]
55	Simultaneous use of DHW & Heating	---	---	—	[001] : Available [002] : Unavailable [003] : N/A
56	External Pump setting	---	---	—	[001] : N/A, [002] : Available
57	Air Handler	---	---	—	[001] : N/A, [002] : Available
58	Auto Feeder	---	---	—	[001] : Available, [002] : N/A
59	Boost Time function	X 1	minute	1 minute	[000](OFF), [001] - [120]
60	Position of Water Servo-Main	X 2	Step	—	[000](open) - [1700](closed)
62	Position of Bypass Valve-DHW	X 2	Step	—	[000](Bypass side) - [550](PHE side)
64	Position of 3-Way Valve-Heating	X 2	Step	—	[000](DHW side) - [1935](Heating side)
66	Heat Demand Connection	X 0.1	V	0.1V	Disp. Range [000] - [100]
67	Heating Water Pressure	X 0.1	psi	0.1psi	Disp. Range [000] - [450]
68	Heating Water Pressure Setting	X 0.1	psi	0.1psi	Disp. Range [120] - [260]
74	Number of units(in the Quick Connect System)		[x:yz]	—	[001] : 1, [002] : 2
75	Number of combustion units(In the Quick Connect System)		[x:yz]	—	[000] : 0, [001] : 1, [002] : 2
77	Circulation pump	[x:yz]		—	[000] : OFF, [001] : ON
78	Total Circulation pump Run Time	X 10	hour	10 hour	Disp. Range [000] - [999]
79	Total Circulation pump Run Time	X 10,000	hour	10,000 hour	Disp. Range [000] - [065]
80	Remaining Time of Scale Flushing	X 1	minute	1 minute	Disp. Range [000] - [060]
82	Number of Scale Flushing Times	X 1	time	1 time	Disp. Range [000] - [255]
84	Model type1	---	---	—	[199] : NRCB199DV(GHQ-C3201WX-FF US) [180] : NRCB180DV(GHQ-C2801WX-FF US)
85	Model type2(subdivision number)	---	---	—	[001]
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. The screen display will show below. ● w/ subdivision  The subdivision number will appear. Contact the nearest NORITZ agent for more information. ● w/o subdivision  The Error Code Is lit.
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 [100]: Standard, [201]:Outdoor Reset Control_Ft, [202]:Outdoor Reset Control_AH, [203]:Outdoor Reset Control_CI, [204]:Outdoor Reset Control_Lr, [205]:Outdoor Reset Control_rF, [206]:Outdoor Reset Control_rA, [207]:Outdoor Reset Control_CU, [300]:Heat Demand (0 - 10 V)

*2 When the Operation Panel is in °F/Gallons mode.

*3 When the Operation Panel is in °C/Liters mode.

■ Diagnostic Mode

●How to enter the Diagnostic Mode

1. Press the power button to OFF. The Operation Panel must be off.
2. Press "MAINTENANCE" button. Select "2:dI" using the Up [△] and Down [▽] buttons, and then press "ENTER" button.
   The "Diagnostic Mode" screen appears.
3. When entering the "Diagnostic Mode", display will change to "d:01".
   "d:01" displayed for one second, after which "ECC" will appears.
4. Using the Up [△] and Down [▽] buttons to navigate into the desired function in the "Diagnostic Mode".
5. Select the desired function, then press "ENTER" button to enter the function.
6. Using the Up [△] and Down [▽] buttons to change the parameter value. Refer to below list for detail.
7. Press "ENTER" button to save the settings and to exit the function.
8. To exit the "Diagnostic Mode" or another function, press "BACK" button.

●Diagnostic Mode List

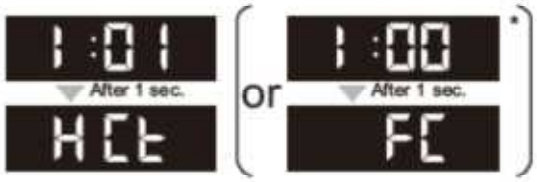
<table>
<tr><th>Screen Display
& Function Name</th><th>Description</th></tr>
<tr><td>d:01
▼ After 1 sec.
ECC
Error Code Clear</td><td>Press and hold the Up [△] button for approximately 5 seconds.
(The Down [▽] button cannot accept.)</td></tr>
<tr><td>d:02
▼ After 1 sec.
C CH
Components Check</td><td>Using the Up [△] and Down [▽] buttons to navigate into the desired sub menu*,and press "ENTER" button. Using the Up [△] and Down [▽] buttons to change the parameter value, and let it sit for approximately 3 seconds. These parameters can not operate simultaneously.
* Sub Menu
<table>
<tr><th colspan="2">Screen Display</th><th colspan="2">Parameter value</th></tr>
<tr><td rowspan="2">1:PP</td><td rowspan="2">Pump</td><td>1:oF</td><td>Stop Pump</td></tr>
<tr><td>2:on</td><td>Run Pump</td></tr>
<tr><td rowspan="4">2:FA</td><td rowspan="4">Fan</td><td>1:oF</td><td>OFF</td></tr>
<tr><td>2:Lo</td><td>Lowest</td></tr>
<tr><td>3:HH</td><td>Heating Highest</td></tr>
<tr><td>4:dH</td><td>DHW Highest</td></tr>
<tr><td rowspan="4">3:HV</td><td rowspan="4">3way Valve-Heating</td><td>1:oF</td><td>OFF</td></tr>
<tr><td>2:dS</td><td>DHW Side</td></tr>
<tr><td>3:Cr</td><td>Center</td></tr>
<tr><td>4:HS</td><td>Heating Side</td></tr>
<tr><td rowspan="2">4:AF</td><td rowspan="2">Auto Feeder</td><td>1:oF</td><td>Close Auto Feeder</td></tr>
<tr><td>2:on</td><td>Open Auto Feeder</td></tr>
<tr><td rowspan="4">5:FC</td><td rowspan="4">Flow Control Valve</td><td>1:oF</td><td>OFF</td></tr>
<tr><td>2:oP</td><td>Open</td></tr>
<tr><td>3:Cr</td><td>Center</td></tr>
<tr><td>4:CL</td><td>Close</td></tr>
<tr><td rowspan="4">6:db</td><td rowspan="4">DHW bypass Valve</td><td>1:oF</td><td>OFF</td></tr>
<tr><td>2:PH</td><td>Plate Heat Exchanger</td></tr>
<tr><td>3:Cr</td><td>Center</td></tr>
<tr><td>4:bY</td><td>Bypass</td></tr>
</table></td></tr>
<tr><td>d:03
▼ After 1 sec.
SEr
Service Reminder</td><td>The Combi Boiler is equipped with a Service Reminder to announce for maintenance.
Refer to Installation Manual for detail.
Setting Range : OFF(default), 6, 12, 18, 24, 30, 36, 42, 48, 54, 60 months.

When the set time period has been reached, the Error Code 88* will flash on the Operation Panel.
* How to reset the code 88:
When the code 88 appears, press the ON/OFF button 5 times in 5 seconds.
The Service Reminder will be reset.</td></tr>
</table>

■ Service Parts Replacement Procedures

Service parts replacement instructional procedures are intended for use by a qualified service professional or authorized PB HEAT Service Representative. Any unauthorized use may result with voided combi-boiler warranty.

Contact Pavilion Customer Center (1-855-443-8468) for additional support or a color PDF copy.

	Operation	Screen Display
1	Press the ON/OFF button to OFF. The Operation Panel must be off.	
2	Press the SETTINGS button. Select 2:1 n using the ▲ ▼ buttons, and then press the ENTER button. The "Installer Mode" screen appears.	
3	When entering the "Installer Mode", display will change to 1:01 / HCt (or 1:00 / FC)*. *This function will appear within the first 10 minutes of connecting electrical power and before pressing the ON/OFF button.	
4	Press the ▲ ▼ buttons to navigate into the desired function in the "Installer Mode".	
5	Select the desired function, then press the ENTER button to enter the function.	
6	Press the ▲ ▼ buttons to change the parameter value.	
7	When you are done, press the ENTER button to save the settings and to exit the function.	
8	To exit the "Installer Mode" or another function, press the BACK button.	

Circuit Board Data Transfer Procedure

When swapping in a new circuit board, the new circuit board needs to be programmed.
Failure to successfully program the circuit board will result in a 73 error code.
Typically this programming can be done with a data transfer from the old circuit board to the new circuit board.
Even a damaged circuit board can usually transfer data properly.
Always attempt the data transfer first, and if unsuccessful, retry the data transfer procedure.
Only if the data transfer is unsuccessful, then you should follow the procedure for manual programming on the reverse side of this page.
Noritz recommends to record the installation mode settings before starting circuit board replacement.

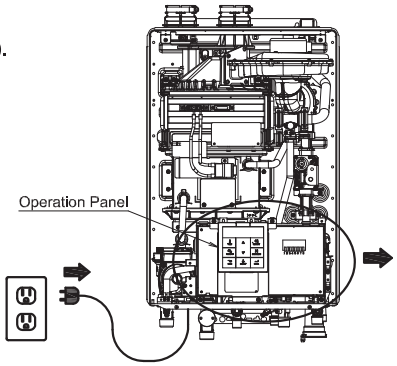
1. Data Transfer Procedure

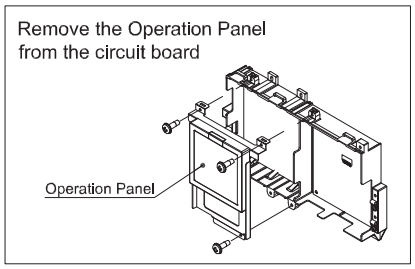
1. Make sure the Operation Panel is OFF (completely blank).
   If it is ON, turn it OFF and wait for 10 seconds.

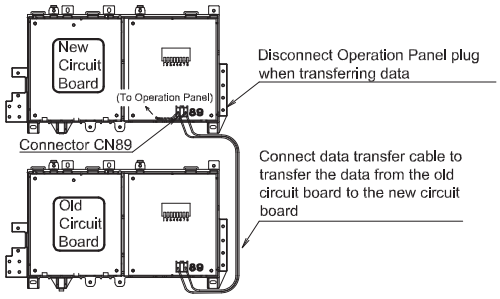
2. Disconnect electrical power.

3. Remove the old circuit board out of the unit.
   And remove the Operation Panel from the circuit board.
   Then transfer all electrical connections to the new circuit board except connector CN89.
   CN89 should be left unplugged.

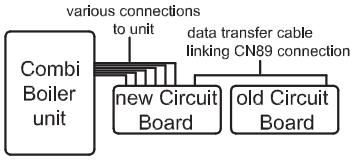
4. Use the blue and white data transfer cable supplied with the new circuit board to connect the CN89 connection from the old circuit board to the new one.
   And replace the Operation Panel on the circuit board.



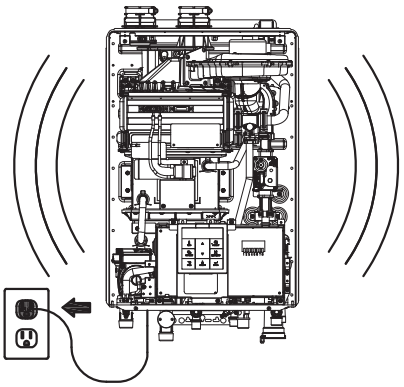




(for illustration only)



5. Connect power and wait about 30 seconds to a minute.
   The unit will signal a successful data transfer by spinning the fan for about 3 minutes.



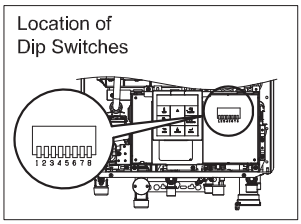
If you get a successful data transfer: disconnect electrical power to the unit, disconnect the data transfer cable and reconnect the original CN89 connector.
The circuit board can now be mounted back into the unit.
Note: (If you disconnected any wires to pull out the circuit board, make sure to reconnect all wires.)

If you fail to get a successful data transfer, refer to the manual "Circuit Board Manual Program Procedure".

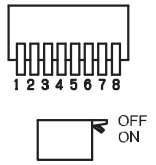
2. DIP Switch Settings

Disconnect the electrical power to the unit before adjusting the DIP Switches.
DIP Switch Settings are set to the same as the old circuit board.
The following settings can be adjusted using the Dip Switches:

1. By using SW 2, it can expand the simultaneous use of DHW & Heating. **
2. SW 3, adjustments can be make for the exhaust type. ***
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 Dip Switches" table for details.



[DIP Switches]



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

SW2	SW3	SW5	SW6	SW7	SW8
Adjustment for simultaneous use of DHW & Heating**	Exhaust type***	Elevations above 2000ft		Vent Length Adjustment and Vent Size	

SW2		SW3		SW5	SW6	High Elevation Adjustment	SW7	SW8	
○	Normal	○	DV	○	○	0~2000ft (0~610m)	○	○	2" Short Length
●	Expanding	●	SV	●	○	2001~4000ft (611~1220m)	●	○	2" Long Length
				○	●	4001~7000ft (1221~2135m)	○	●	3" Short Length
				●	●	7001~10000ft (2136~3050m)	●	●	3" Long Length

* SW 1 and 4 are blank.
** When the dip switch #2 is ON, Heating temperature setting is increased up to approximately max 30°F during simultaneous operation. Damage caused by increasing Heating temperature is not covered by the Noritz America Limited Warranty. Check whether for the hydronic heating appliance and plumbing are acceptable it. Refer to Installation Manual for detail information.
*** DV : Direct Vent, SV : Single Vent (using SV Conversion Kit)

Circuit Board Manual Program Procedure

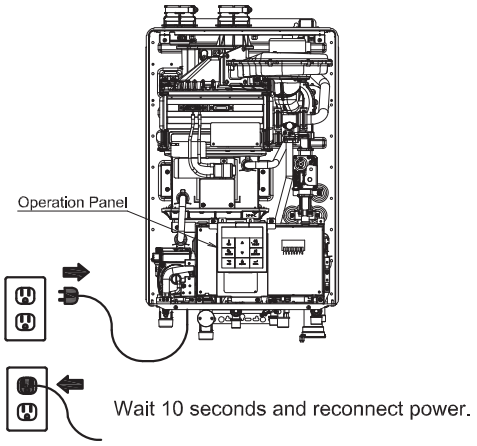
This procedure will require the Operation Panel.
Make sure the circuit board is completely connected including connector CN89.

If connected in a multi unit configuration, undo Quick Connect Cord.
After Manual Programing, make sure all connections are made before making the initial circuit board settings.

1. Make sure the Operation Panel is OFF (completely blank).
   If it is ON, turn it OFF and wait for 10 seconds.

2. Disconnect electrical power.

3. Wait 10 seconds and reconnect power.
   Leave the Operation Panel off.

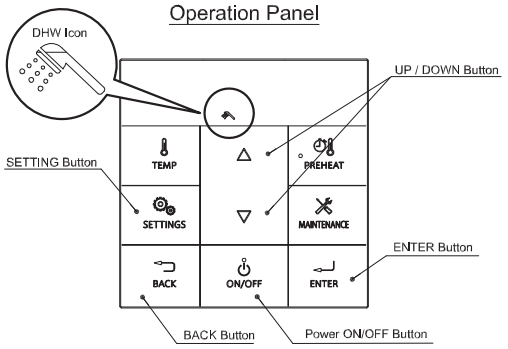


4. With the Operation Panel blank, hold the Up [△] button until the display blinks "99".
   You are now in the "Maintenance Writer (MW) Mode" and can scroll through the MWs using the Up [△] and Down [▽] buttons.

   For each MW the  (DHW Icon) will either be on, indicating that the MW is ON,

   or off, indicating the MW is OFF.
   You can toggle each MW to be ON or OFF pressing and holding "ENTER" button for approximately 1 seconds.

   a) Turn MWs "15" and "20" ON.
   b) Turn MWs "FC" and "FE" ON and press the Up [△] or Down [▽] button.
      (Display blinks with "A0".)
   Configure the remaining MWs according to the table below based on your unit's model and gas type.



Setting list for MW settings (Check the rating plate for model and gas type)

Model	Gas type	Circuit board MW setting (●:ON ○:OFF)															
		A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	AD	AE	B0	B1
	NG	●	○	○	○	●	●	○	○	○	●	●	○	●	●	●	●
	LP	○	○	○	○	●	●	○	○	○	●	●	○	●	●	●	●

5. Once complete, hold the Up [△] and Down [▽] buttons together for 5 seconds until the Operation Panel starts beeping rapidly.
   This is the signal that the changes to the MWs have been saved and the unit is ready for use.

6. Reset the installer mode settings.
   a) Press the power button to OFF. The Operation Panel must be off.
   b) Press "SETTINGS" button. Select "2:In" using the Up [△] and Down [▽] buttons,and then press "ENTER" button.
      The "Installer Mode" screen appears.
   c) When entering the "Installer Mode", display will change to "I:01". "I:01" displayed for one second, after which "HCt" will appears.
   d) Using the Up [△] and Down [▽] buttons to navigate "I:18" in the "Installer Mode".
      "I:18" displayed for one second, after which "CLr" will appears.
   e) Select "I:18" ("CLr"), then press "ENTER" button to enter the function.
   f) Press and hold the Up [△] button for approximately 5 seconds.
      (The Down [▽] button cannot accept.)
   g) To exit the "Installer Mode", press "BACK" button.

7. Set the Installer Mode (Parameter Settings).
   The Installer Mode is set to the same as the old circuit board.
   Refer to Installation Manual for details.

●Installer Mode List

Function	Screen Display	Function Name	Function	Screen Display	Function Name
I:00_FC	FC	Fahrenheit / Celsius * This function will appear within the first 10 minutes of connecting electrical power and before pressing the power button.	I:09_EPP	EPP	External Pump
			I:10_rFt	rFt	Re Fire Time
I:01_HCt	HCt	Heating Control Type	I:11_Pot	Pot	Pump Overrun Time
I:02_tHS	tHS	Type of Heating System	I:12_bFt	bFt	Differential Burner OFF Temperature
I:03_Hot	Hot	Highest Outdoor Temperature	I:13_bot	bot	Differential Burner ON Temperature
I:04_Lot	Lot	Lowest Outdoor Temperature	I:14_HPS	HPS	Heating Water Pressure Setting
I:05_HHt	HHt	Heating High Temp Range	I:15_AFA	AFA	Auto Feeder Activation
I:06_HLt	HLt	Heating Low Temp Range	I:16_dHP	dHP	DHW/Space Heating Priority
I:07_bSt	bSt	Boost Timing	I:17_dHt	dHt	DHW Wait Time
I:08_Air	Air	Air Handler	I:18_CLr	CLr	Setting Clear

1) Disconnect the power to unit. Detach the Wiring Harness from the Wire Clamps. Unplug the Fan Motor connector.

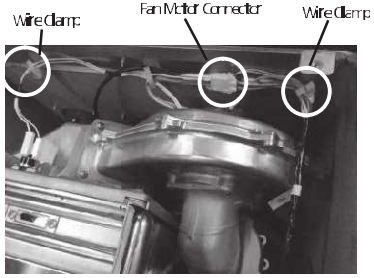


Figure 1

2) Remove the C-Clamp -16B. Then remove the 4 screws with a Philips screwdriver (Figure 2). **DO NOT use a power drill**.

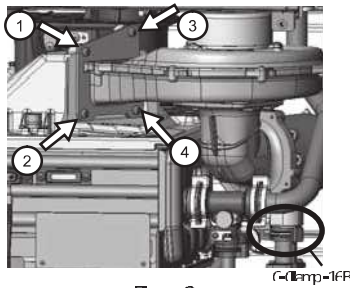


Figure 2

3) Detach Fan Motor and Venturi assembly as following procedures.
(Fan Motor and Venturi can be detached without removing Heating pipes.)

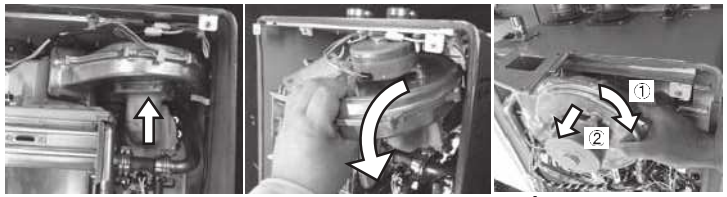


Figure 3

4) Replace the Gasket - Chamber inlet to new one.
Make sure that the Gasket is secured properly in place.
Failure to do so will cause gas leaks, possibly resulting in severe personal injury or death.

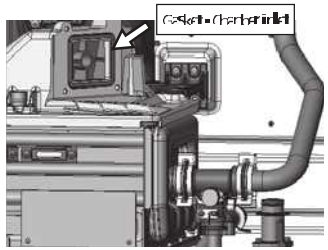


Figure 4

5) Remove the 4 screws with a Philips screwdriver (Figure 5) from Gas Elbow Connector.
Replace the O-ring –Venturi Φ60 to new one.
Make sure that the O-Ring is secured properly in place (Figure 6) .
Failure to do so will cause gas leaks, possibly resulting in severe personal injury or death.

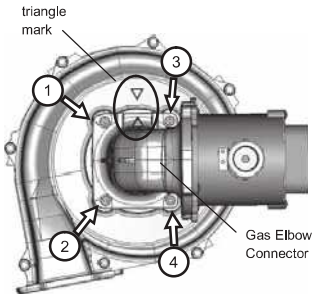


Figure 5

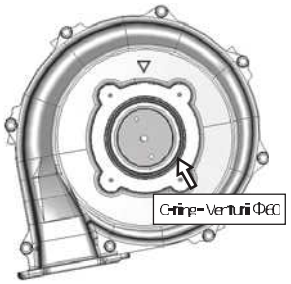


Figure 6

6) Secure the new Fan Motor onto Gas Elbow Connector by tightening the 4 screws with a Philips screwdriver. Be careful to make triangle mark face the same direction (Figure 5).

7) Attach the Fan Motor and Venturi assembly and connect to Gas Valve Outlet Connector. (in reverse order of Step 3)

8) **Attach the C-Clamp -16B at the bottom of Venturi** (Figure 2). **Failure to do so will cause gas leaks, possibly resulting in severe personal injury or death.** Secure the Venturi to the Burner Chamber by tightening the 4 screws removed in Step 2. The screws need only to be hand tightened and should not be tightened using a drill. First, insert screws 1-4 in Figure 2, but do not fully tighten these screws. Once all screws are inserted, proceed to completely tighten screws 1-4.

NOTE: When tightening the screws, be certain not to apply excess force. Excess force can strip out the original holes and screws. Keep the Fan Motor in horizontal. It makes easier to tighten the screws correctly.

9) Connect the Fan Motor connecor. And tie the Wiring Harness by using the Wire Clamps (Figure 1).

10) Before closing the front cover, carry out trial operation and check gas leakage.

Plate Heat Exchanger Replacement Procedure

Drain the water from the combi boiler as following procedure.

Drainage Using the Operation Panel

1

(1) Press the ON/OFF button OFF.
The Operation Panel must be off.

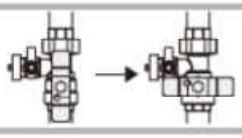
(2) Press the SETTING button, Select 1:05 using the ▲▼ buttons. Press the ENTER button.
The "User Mode" screen appears.

(3) Select U:05 / drA (drA:Drain The Water) using the ▲▼ buttons, and then press the ENTER button.

(4) Press and hold the ▲ button approximately 2 seconds to turn "ON".

(☞Refer to page 21 for details.)

2 Close the water supply valve and the auto feeder shutoff valve. (☞p. 8)

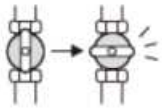


3 Fully open all hot water fixtures/faucets.

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

5 When the screen display turns off, replace all drain plugs and close the hot water fixtures/ faucets.

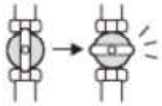
6 Close the gas valve and disconnect the electrical power supplied to the unit.



Do not touch with wet hands.

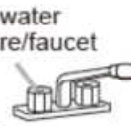
Manual Draining

1 Close the gas valve.



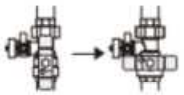
2 (1) Turn the power button on.

(2) Turn and leave open the hot water fixtures/ faucets for more than 2 minutes and close.



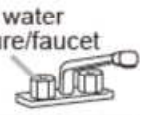
* If multiple units are being used, drain two minutes for each unit.
* An 11 Error Code may appear on the Operation Panel. This is not a malfunction of the unit. Do not turn the power button off.

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



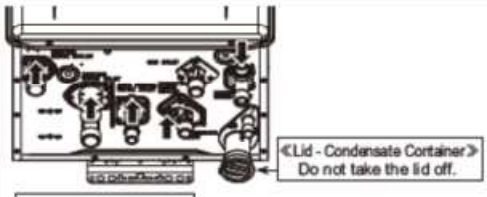
Do not touch with wet hands.

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

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

Plate Heat Exchanger Replacement Procedure

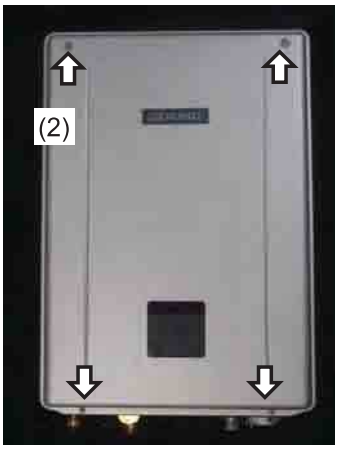
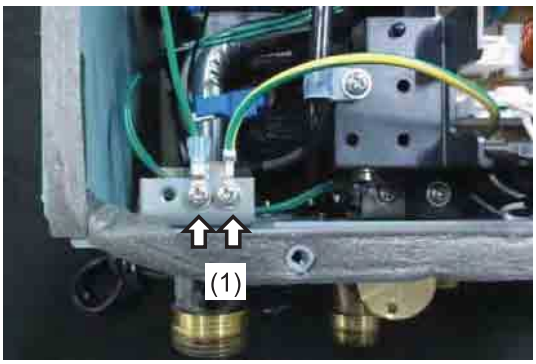
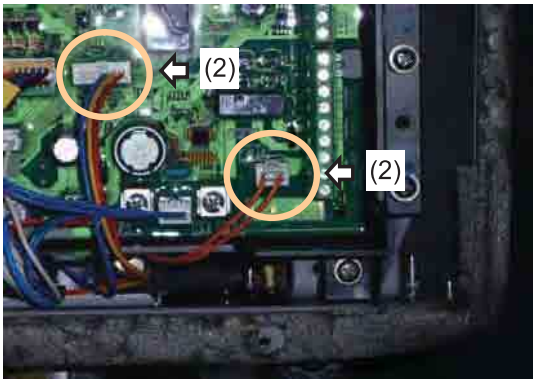
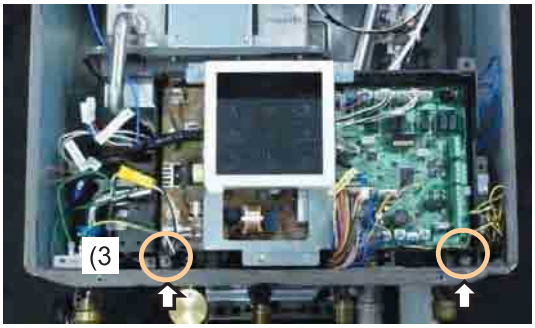
Procedure	Diagram
2. Remove Front Cover (1) Disconnect electrical power to the unit. (2) Remove 4 screws w/ washer(M4×12).	
3. Remove ground wires and unplug connector (1) Remove the 2 ground wires. (2) Unplug the 2 connectors. (3) Remove the 2 screws(M4×12) that hold Circuit Board.	  

Plate Heat Exchanger Replacement Procedure

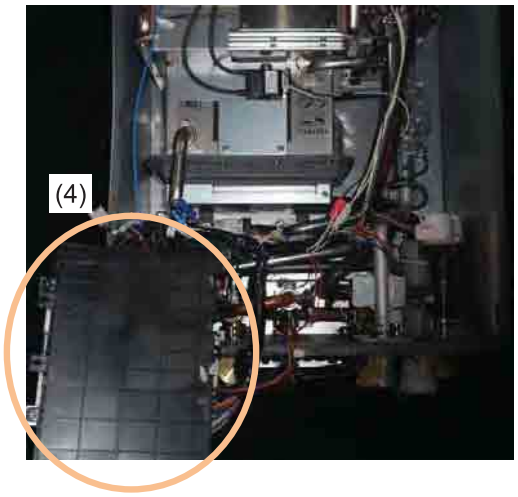
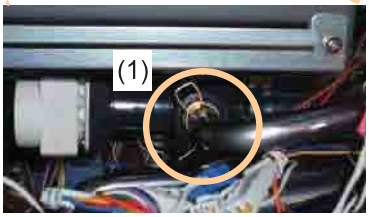
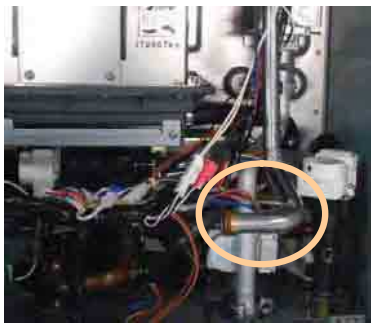
Procedure	Diagram
(4) Remove Circuit Board to outside of unit. Caution! : Do not let the Circuit Board get wet.	
4. Remove Pipe - T-Elbow to 3-Way Valve - Heating (1) Remove a "C" Clamp and rotate the Pipe - T-Elbow to 3-Way Valve - Heating from 3-Way Valve - Heating as the bottom picture.	  

Plate Heat Exchanger Replacement Procedure

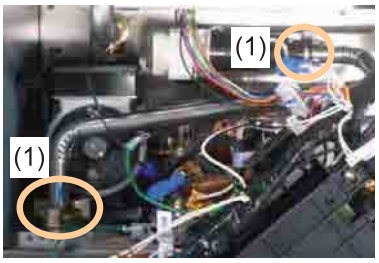
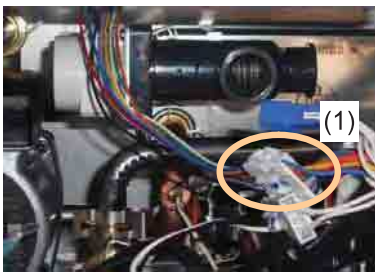
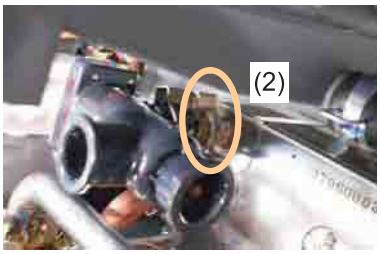
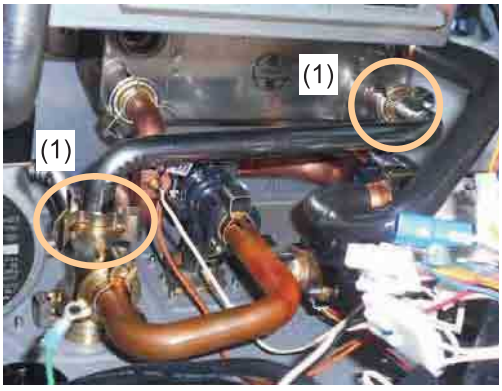
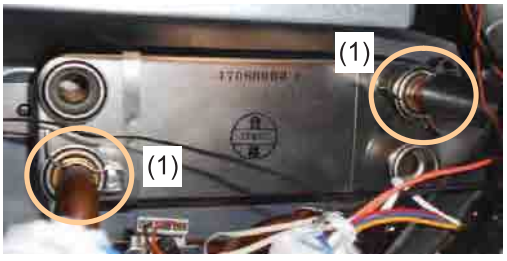
Procedure	Diagram
5. Remove Pipe - 3-Way Valve - Heating to Heating Supply Connection (1) Remove 2 "C" Clamps and Pipe - 3-Way Valve - Heating to Heating Supply Connection.	
6. Remove 3-Way Valve - Heating (1) Unplug the connector. (2) Remove a "C" Clamp and Distribution Valve - Heating.	 
7. Remove Pipe - Plate Heat Exchanger to Heating Return Connector (1) Remove 2 "C" Clamps and Pipe - Plate Heat Exchanger to Heating Return.	
8. Disconnect Pipe - Distribution Valve - DHW to Plate Heat Exchanger and Pipe - Plate Heat Exchanger to Outlet Water Connection (SET) from Plate Heat Exchanger (1) Remove 2 "C" Clamps. (2)Disconnect Pipe - Distribution Valve - DHW to Plate Heat Exchanger and Pipe - Plate Heat Exchanger to Outlet Water Connection (SET) from Plate Heat Exchanger	

Plate Heat Exchanger Replacement Procedure

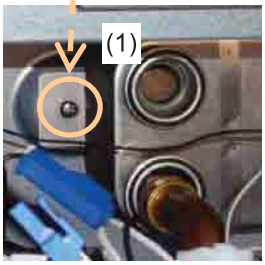
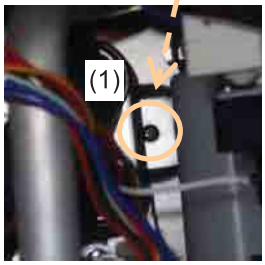
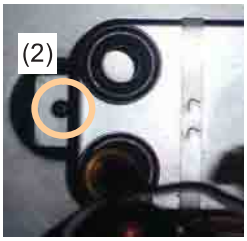
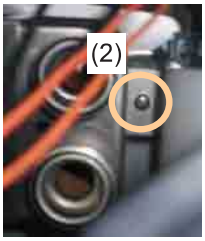
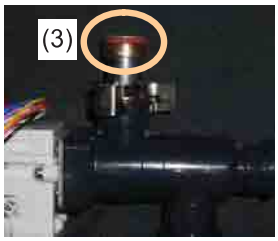
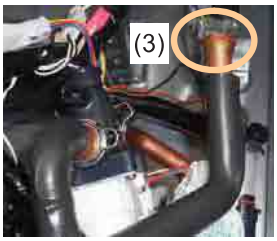
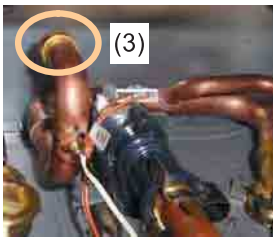
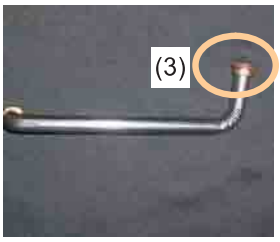
Procedure	Diagram
9. Remove Plate Heat Exchanger (1) Remove 2 screws(M4×10) and Plate Heat Exchanger.	  
10. Install the new Plate Heat Exchanger (1) Install the new Plate Heat Exchanger so the printing is upright (2) Install the new Plate Heat Exchanger and mount with 2 screws (M4×10). (3) Exchange 4 O-Rings for new ones: ·Pipe - 3-Way Valve - Heating to Plate Heat Exchange ·Pipe - Bypass Valve - DHW to Plate Heat Exchanger ·Pipe - Plate Heat Exchanger to Outlet Water Connection ·Pipe - Plate Heat Exchanger to Heating Return Connector	      

Plate Heat Exchanger Replacement Procedure

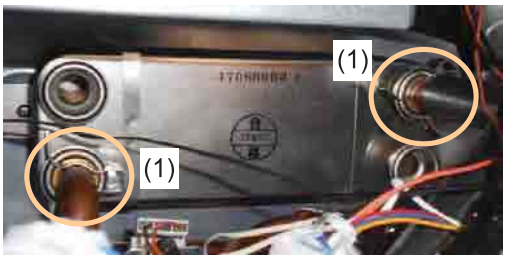
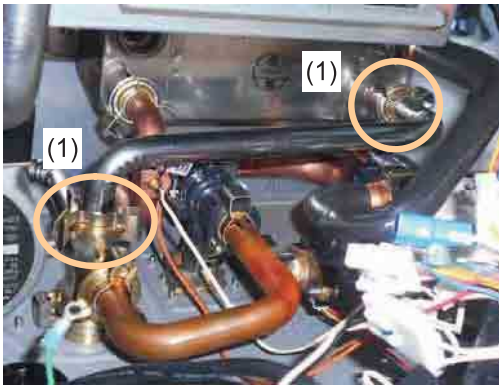
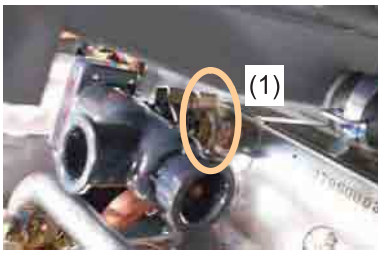
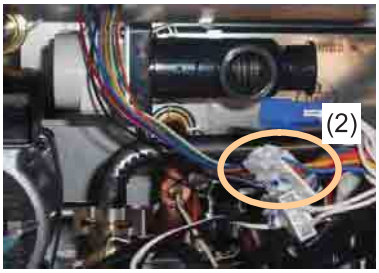
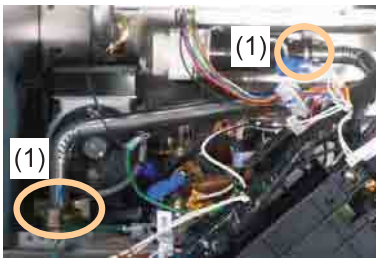
Procedure	Diagram
11. Attach Pipe - Bypass Valve - DHW to Plate Heat Exchanger and Pipe - Plate Heat - Exchanger to Outlet Water Connection (SET). (1) Attach Pipe - Distribution Valve - DHW to Plate Heat Exchange and Pipe - Plate Heat - Exchanger to Outlet Water Connection (SET) and fix it with 2 "C" Clamps.	
12. Attach Pipe - Plate Heat Exchanger to Heating Return Connector (1) Attach Pipe - Plate Heat Exchanger to Heating Return Connector and fix it with 2 "C" Clamps. This pipe has assembly direction. When attaching this pipe to the Heating Return Connector, insert the pipe end with the mark (shorter bend) to the Heating Return Connector. 	
13. Attach 3-Way Valve - Heating (1) Attach 3-Way Valve - Heating and fix it with a "C" Clamp. (2) Plug the connector.	 
16. Attach Pipe - Distribution Valve - Heating to Heating Supply Connection (1) Attach Pipe - Distribution Valve - Heating to Heating Supply Connection and fix it with 2 "C" Clamps.	

Plate Heat Exchanger Replacement Procedure

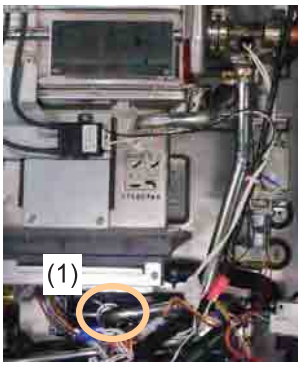
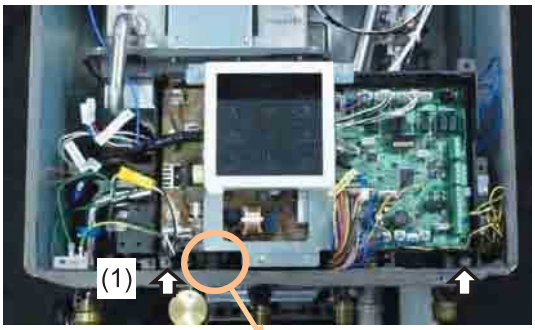
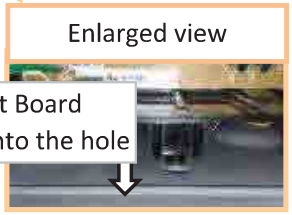
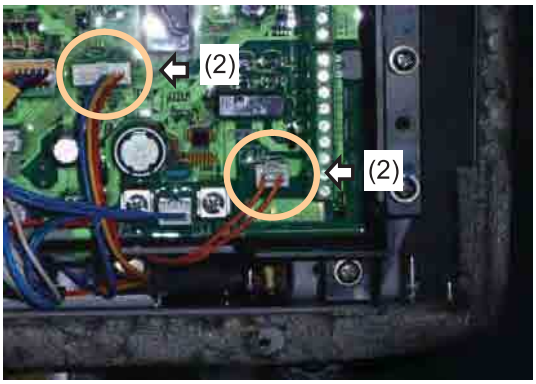
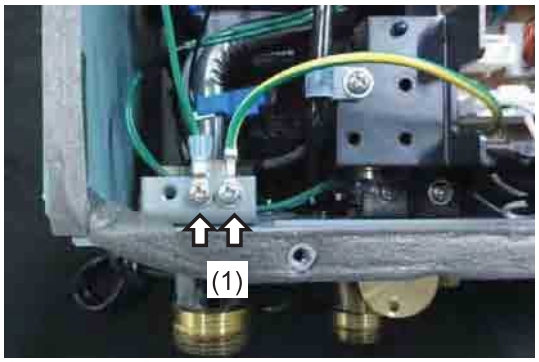
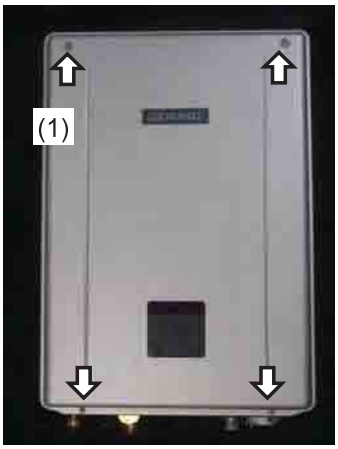
Procedure	Diagram
14. Attach Pipe - T-Elbow to 3-Way Valve - Heating (1) Attach Pipe - T-Elbow to 3-Way-Valve - Heating and fix it with a "C" Clamp.	
15. Attach Circuit Board (1) Attach Circuit Board with the 2 screws(M4×12). (2) Plug the 2 connectors.	  
16. Attach ground wires (1) Attach the 2 ground wires.	

Plate Heat Exchanger Replacement Procedure

Procedure	Diagram
17. Attach Front Cover (1) Attach Front Cover with 4 screws w/ washer(M4×12).	

Circulation Pump Replacement Procedure

Procedure

1. Drain the unit as shown in following procedure

Drainage using the Operation Panel

1

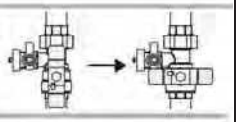
(1) Press the ON/OFF button OFF.
The Operation Panel must be off.

(2) Press the SETTINGS button, Select 1:05 using the ▲▼ buttons. Press the ENTER button.
The "User Mode" screen appears.

(3) Select U:05 (After 1 sec.) d-A (drA: Drain The Water) using the ▲▼ buttons, and then press the ENTER button.

(4) Press and hold the ▲ button approximately 2 seconds to turn "ON".

2 Close the water supply valve and the auto feeder shutoff valve.

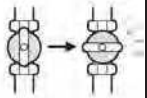


3 Fully open all hot water fixtures/faucets.

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

5 When the screen display turns off, replace all drain plugs and close the hot water fixtures/ faucets.

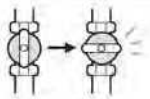
6 Close the gas valve and disconnect the electrical power supplied to the unit.



Do not touch with wet hands.

Manual Draining

1 Close the gas valve.



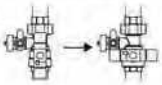
2

(1) Turn the power 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 Operation Panel. This is not a malfunction of the unit. Do not turn the power button off.

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

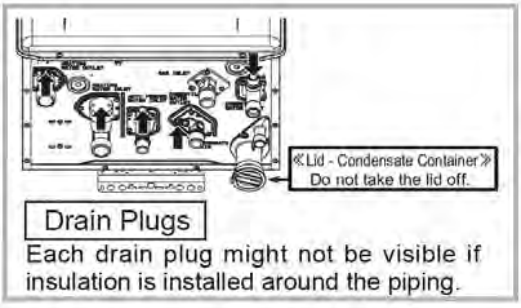


Do not touch with wet hands.

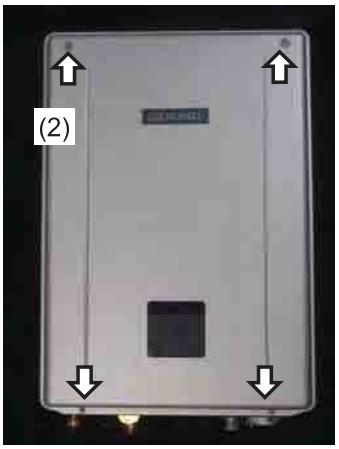
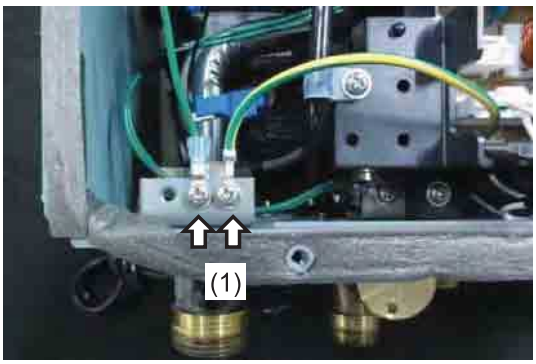
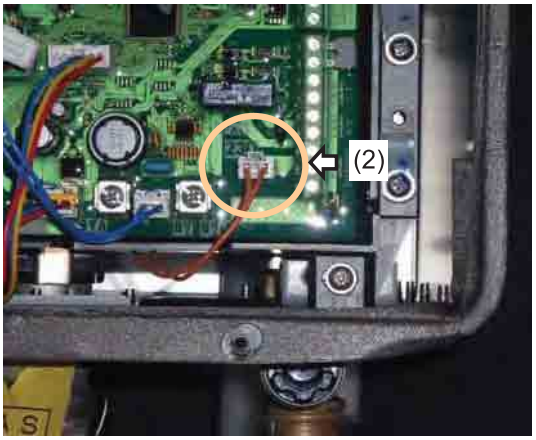
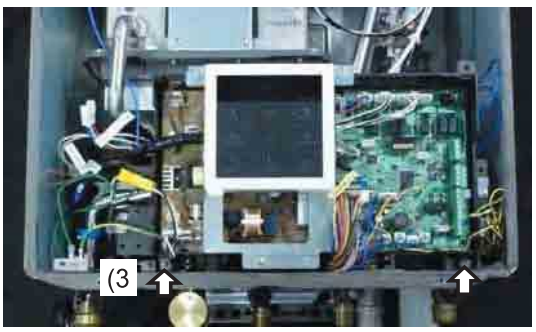
4 Fully open all hot water fixtures/faucets.

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

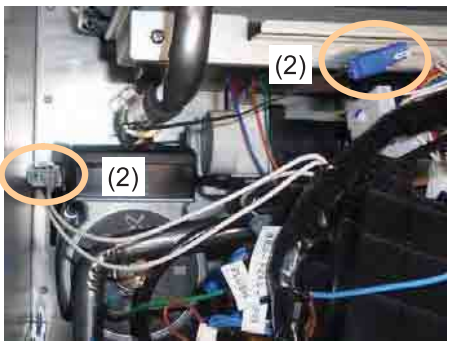
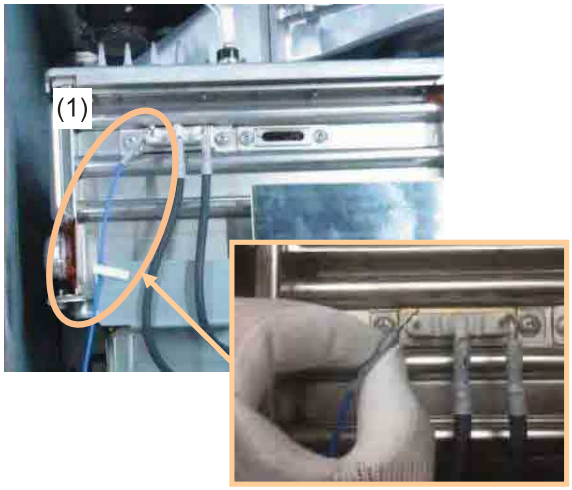
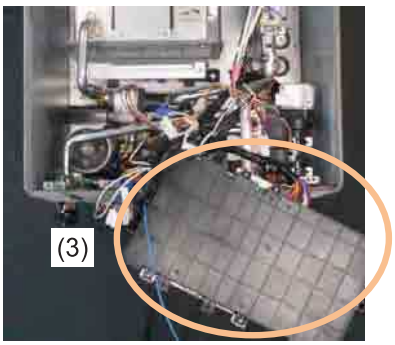
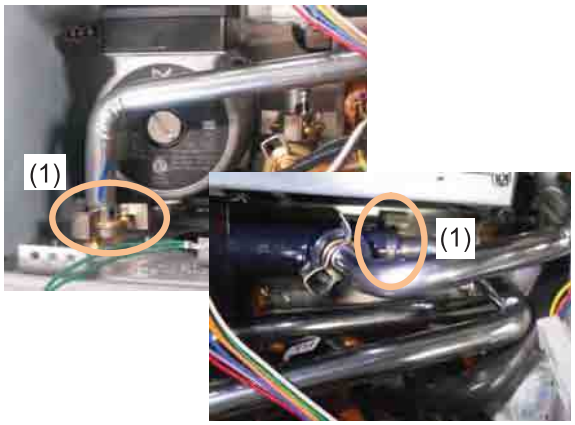
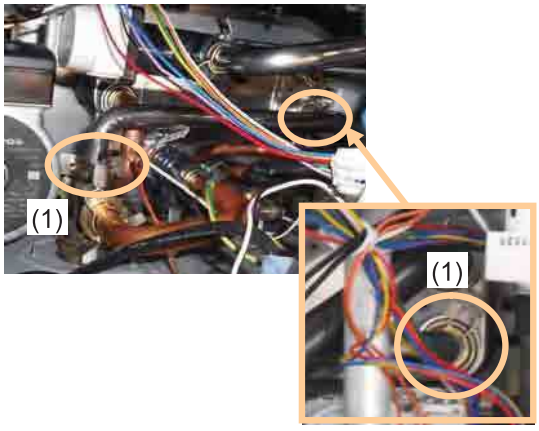
6 When the water is completely drained, replace all drain plugs and close the hot water fixtures/faucets.



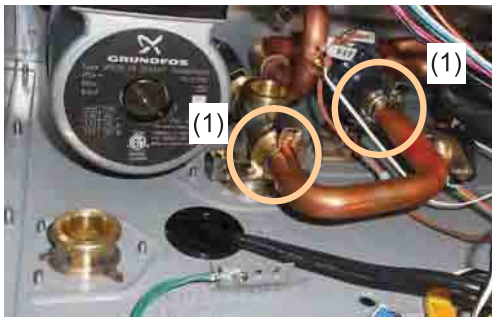
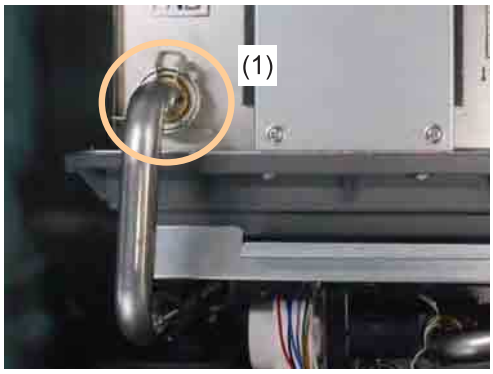
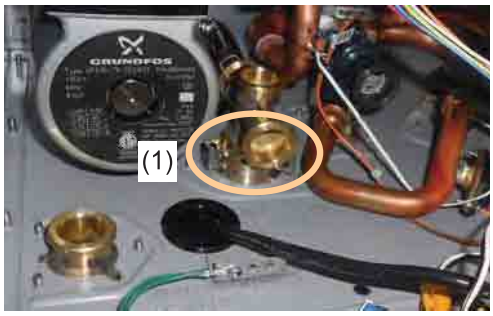
Circulation Pump Replacement Procedure

Procedure	Diagram
2. Remove Front Cover (1) Disconnect electrical power to the unit. (2) Remove 4 screws w/ washer(M4×12).	
3. Remove ground wires and unplug connector (1) Remove 2 ground wires. (2) Unplug the connector. (3) Remove 2 screws(M4×12) that hold Circuit Board.	  

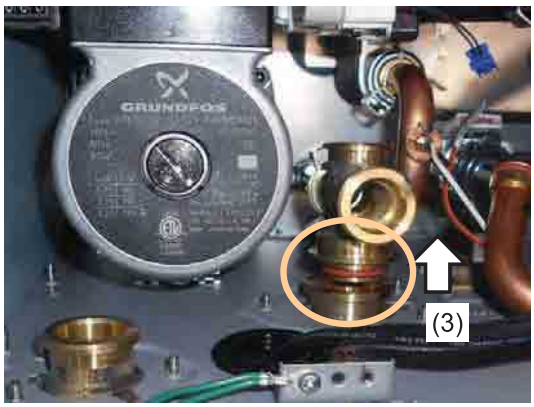
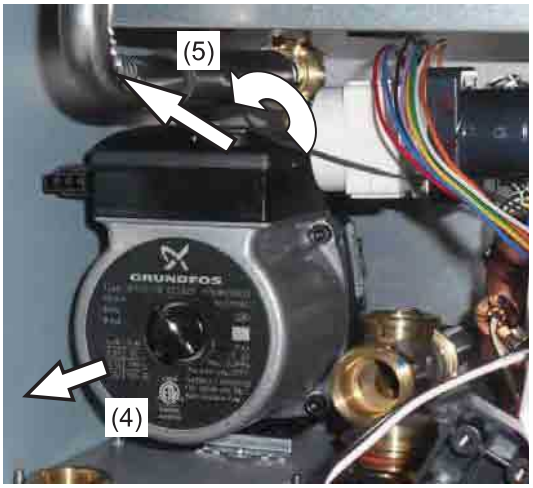
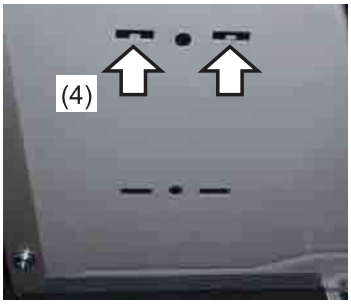
Circulation Pump Replacement Procedure

Procedure	Diagram
4. Unplug all wires that attach to Wiring Harness (1) Unplug Flame Rod. Hold this point in figure by finger and remove plug. (2) Unplug the 2 connectors. (3) Remove Circuit Board to outside of unit. Caution! : Do not let the Circuit Board get wet. 	 
5. Remove Pipe - 3-Way Valve-Heating - Heating to Heating Supply Connection (1) Remove 2 "C" Clamps and Pipe - 3-Way Valve - Heating to Heating Supply Connection.	
6. Remove Pipe - Plate Heat Exchanger to Heating Return Connector (1) Remove 2 "C" Clamps and Pipe - Plate Heat Exchanger to Heating Return Connector.	

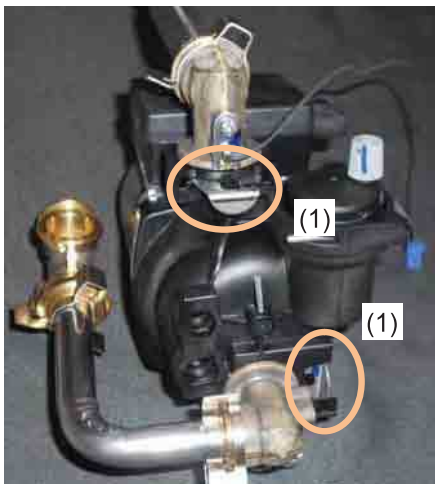
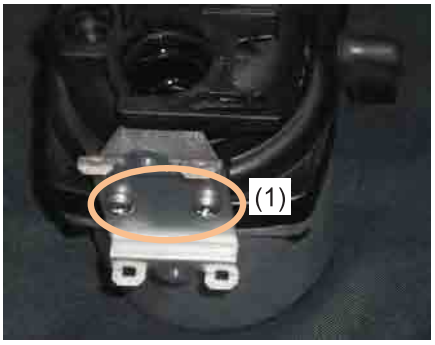
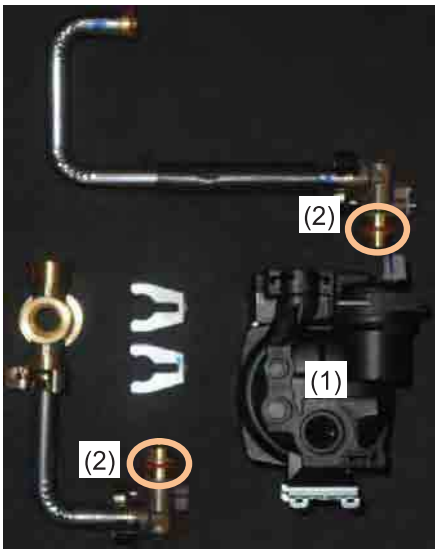
Circulation Pump Replacement Procedure

Procedure	Diagram
7. Remove Pipe - Auto Feeder to Heating Return Connector (1) Remove 2 "C" Clamps and Pipe - Auto Feeder to Heating Return Connector. (2) Put Pipe - Auto Feeder to Heating Return Connector on the bottom of the unit.	 
8. Remove Circulation Pump (1) Remove 2 "C" Clamps. (2) Remove 2 screws(M4×12).	  

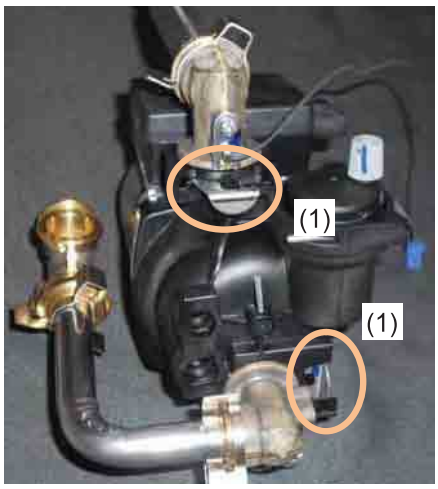
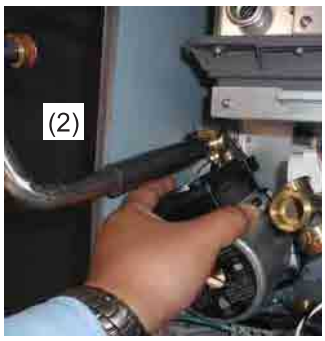
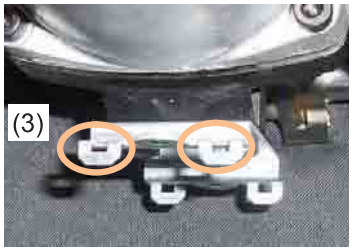
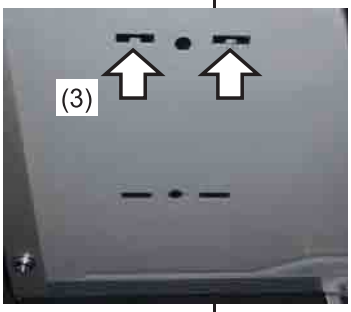
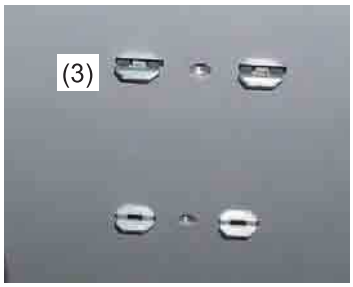
Circulation Pump Replacement Procedure

Procedure	Diagram
(3) Pull up Heating Return Connector from Heating Return Connection. (4) Pull Circulation Pump ahead. (There are hooks in insertion holes for Circulation Pump.) (5) Lift Circulation Pump. (6) Then Circulation Pump with pipes are out from the case. Circulation Pump with pipes 	   

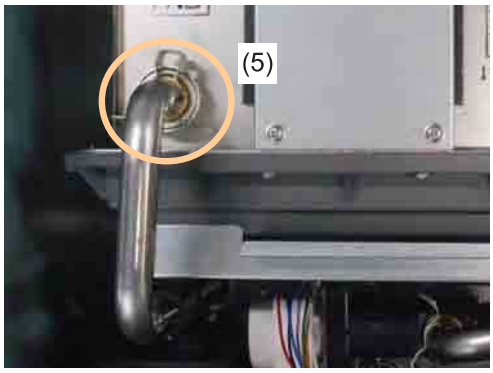
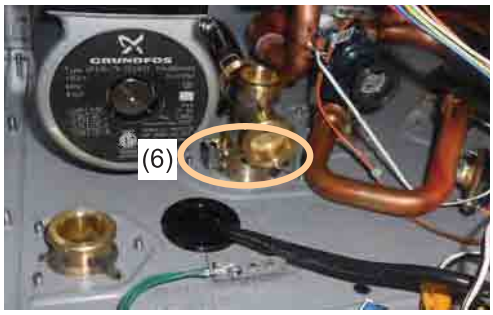
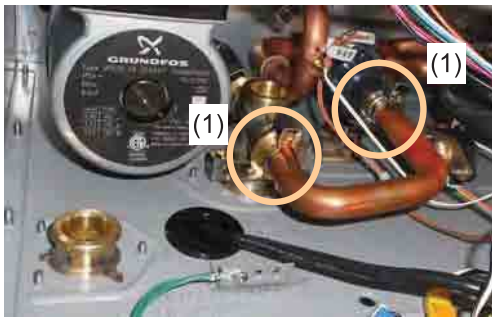
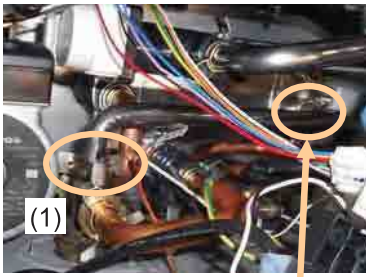
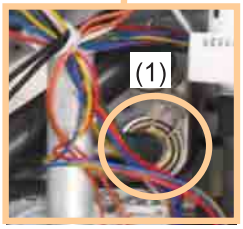
Circulation Pump Replacement Procedure

Procedure	Diagram
9. Remove Pump Inlet/Outlet - Elbows and Pipes (1) Remove 2 Pump Clips and Pump Inlet/Outlet - Elbows and Pipes.	
10. Replace Mounting Plate - Pump to new Circulation Pump (1) Remove 2 screws and Mounting Plate - Pump and fix Mounting Plate - Pump to new Circulation Pump with 2 screws.	
11. Attach new Circulation Pump (1) New Circulation Pump (2) Exchange O-Rings of Pump Inlet/Outlet - Elbow for new ones.	

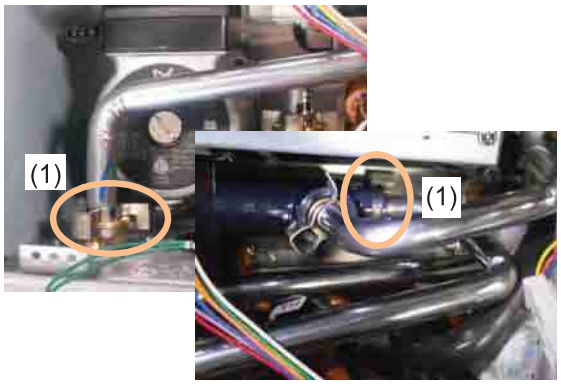
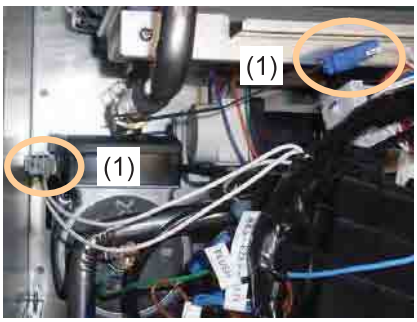
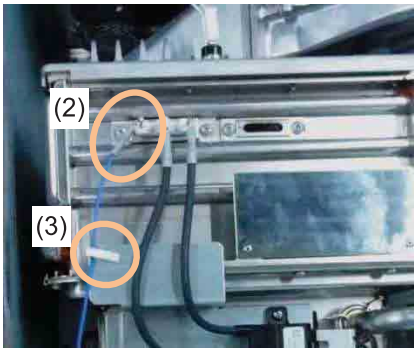
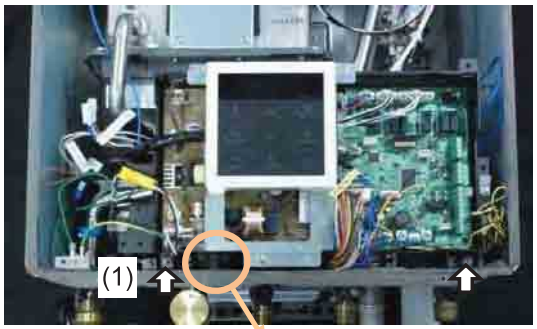
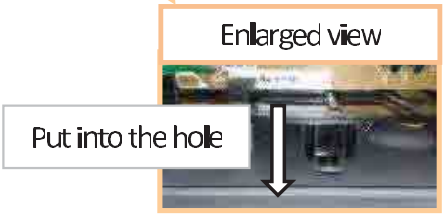
Circulation Pump Replacement Procedure

Procedure	Diagram
12. Install Circulation Pump to the case (1) Attach Pump Inlet/Outlet - Elbow and fasten 2 Pump Clips to Circulation Pump. (2) Install Circulation Pump into the unit. (3)Do not forget to hook Mounting Plate - Pump to in insertion holes for Circulation Pump. (4) Fix Circulation Pump with 2 screws.	     

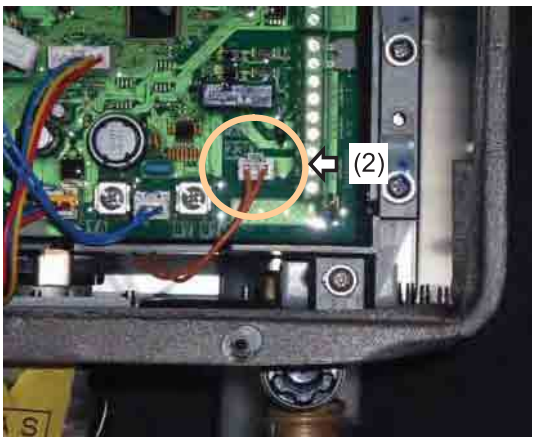
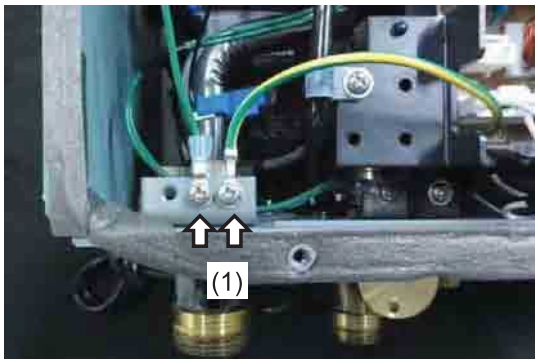
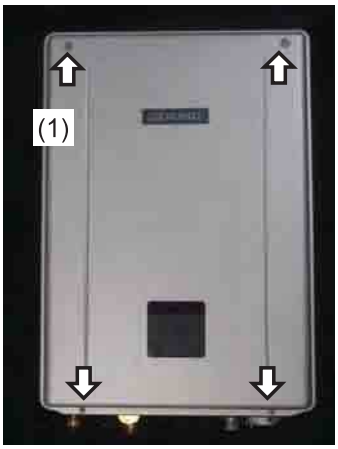
Circulation Pump Replacement Procedure

Procedure	Diagram
(5) Attach Pipe - Pump Outlet - Elbow to Secondary SS HEX with a "C" Clamp. (6) Attach Heating Return Connector with a "C" Clamp.	 
13. Fix Pipe - Auto Feeder to Heating Return Connector (1) Attach Pipe - Auto Feeder to Heating Return Connector with 2 "C" Clamps.	
14. Fix the Pipe - Plate Heat Exchanger to Heating Return Connector (1) Attach Pipe - Plate Heat Exchanger to Heating Return Connector with 2 "C" Clamps.	 

Circulation Pump Replacement Procedure

Procedure	Diagram
15. Fix Pipe - 3-Way Valve - Heating to Heating Supply Connection (1) Attach Pipe - 3-Way Valve - Heating to Heating Supply Connection with 2 "C" Clamps.	
16. Plug all wires that attach to Wiring Harness (1) Plug 2 connectors. (2) Plug Flame Rod. (3) Hook Flame Rod to Wire Clamp.	 
17. Attach Circuit Board (1) Attach Circuit Board with 2 screws(M4×12).	 

Circulation Pump Replacement Procedure

Procedure	Diagram
(2) Plug the connector.	
18. Attach ground wires (1) Attach 2 ground wires.	
18. Attach Front Cover (1) Attach Front Cover with 4 screws w/ washer(M4×12).	

■ Gas Line Requirements

Follow the instructions from the gas supplier.

⚠ WARNING

The sizing and installation of the gas system for this Combi Boiler, as with any gas appliance, is the sole responsibility of the installer.
The installer must be professionally trained to do such work and must always follow all local and national codes and regulations.

Gas Type

The gas type indicated on the Combi Boiler's rating plate (NG or LP) must match the type of gas being supplied to the Combi Boiler.

Gas Conversions

- If the supplied gas does not match the gas type on the rating plate, contact your Combi Boiler supplier for a replacement Combi Boiler with the proper gas type.
- If a gas conversion is needed, there are conversion kits available for some models.
- The conversion kit shall be installed by a qualified service agency in accordance with the manufacturer's instructions and all applicable codes and requirements of the authority having jurisdiction. The qualified service agency is responsible for the proper installation of this kit. Improper installation of this kit will void the Pavilion Limited Warranty.
  Conversion kits will only be shipped directly to the Distributor or Agency performing the conversion.

Meter

- The gas meter must be sized properly for the Combi Boiler and other gas appliances to operate properly.
- Select a gas meter capable of supplying the entire Btu/h demand of all gas appliances in the building.

Regulators

⚠ WARNING

- Ensure that all gas regulators used are operating properly and providing gas pressures within the specified range of the Combi Boiler being installed.
- Excess gas inlet pressure may cause serious accidents.

Pressure

- Check the gas supply pressure immediately upstream at a location provided by the gas company.
- Supplied gas pressure must be within the limits shown in the specifications section with all gas appliances operating.

⚠ WARNING

The inlet gas pressure must be within the range specified.
This is for the purposes of input adjustment.
Low gas pressure may cause a loss of flame or ignition failure at other appliances in the home, which may result in unburned gas in the home. Serious accidents such as fire or explosion may result.

Pressure Test

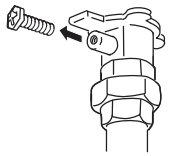
The appliance and its gas connections must be leak tested before placing the appliance in operation.

- Test at test pressures equal to or less than ½ psi (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.
- If test pressures are in excess of 1/2 psi (3.5 kPa), the appliance and its individual shut off valve must be completely disconnected from the gas supply piping system during the test process.

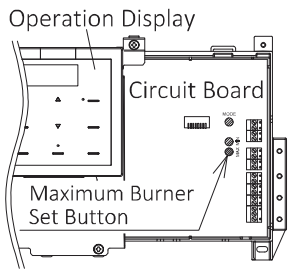
Measuring Gas Pressure

In order to check the gas supply pressure to the Combi Boiler, a tap is provided on the gas inlet.

1. Remove the **9/32 in. hex head /Phillips screw** from the tap.



2. Connect a manometer using a silicon tube.
3. Open up at least two fixtures with hot water side fully.
4. Hold in the "Maximum Burner Set Button" on the circuit board.



Pipe Sizing

- A gas shut off valve must be installed on the supply line.
- Gas piping shall be in accordance with local utility company requirements and/or in the absence of local codes, use the latest edition of National Fuel Gas Code (NFPA54GC), ANSI Z223.1. In Canada, use the latest edition of CSA B149.1, Natural Gas and Propane installation code.
- Size the gas line according to total Btu/h demand of the building and length from the meter or regulator so that the following supply pressures are available even at maximum demand.

	Supply Pressure	
	Natural Gas	LP Gas
Min	3.5 in. W.C.	8 in. W.C.
Max	10.5 in. W.C.	14 in. W.C.

⚠ WARNING

Gas pressures below the required minimum pressure may result in ignition failure, personal injury or death.

Flexible Connectors

Flexible gas lines are not recommended unless the minimum inside diameter is ¾ in. or greater and the rated capacity of the connector is equal to or greater than the Btu/h demand of the Combi Boiler.

Reference Tools & Sample Calculations

NOTICE

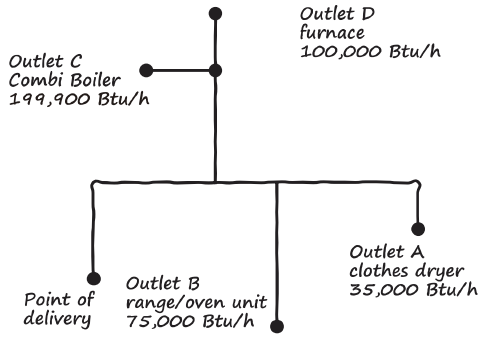
The tables and samples below are for reference only. The professional sizing and installing the gas line should always run the appropriate calculations before all installations.

[Calculation Example]

A partial set of sizing tables are printed on page 39. In cases where these tables are not appropriate, refer to the NFPA.

1. Draw a sketch of a piping system. Enter the system information.

(e.g.)



2. • Determine the gas type used and supply gas Pressure, and enter it.
   • Determine the piping material and enter it to the below.
   • Select the appropriate pipe sizing table from page 39 and enter it to the below.

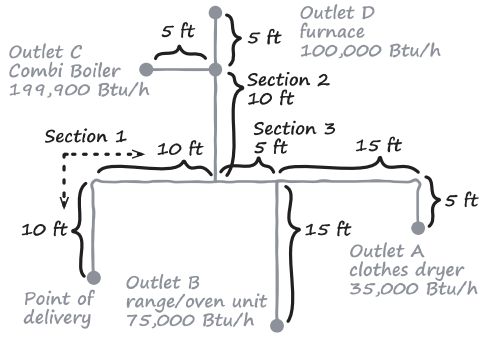
(e.g.)

Gas type: Natural
Supply gas pressure: 6 in. W.C.
Piping material: Sch 40 steel
Table used: 2
Pressure drop: 1.0 in. W.C.

Gas type: _____
Supply gas pressure: _____
Piping material: _____
Table used: _____
Pressure drop: _____

3. • On the sketch, label the section of pipe from the point of delivery (meter or regulator) to the first tee as Section 1.
   • Label the section from the first tee to the second tee as Section 2, and label the section from the first tee to the third tee as Section 3. Use similar section numbers for additional sections.

(e.g.)



4. • Enter the demand is the amount of gas flowing through a section of pipe in the table below.
   - For natural gas, use total Btu/h rating/1000 (ft^3/h).
   - For propane, use total Btu/h.
   • For each section, determine the longest piping from the point of delivery to the furthest appliance through each section. Enter this length for all pipe sections in the table below.
   • Round up to the lengths in the appropriate table on page 39. Read across until a capacity equal to or greater than the required demand for the section is found. Read up to find the size. Repeat for each section of piping. Enter this size in the table below.

   (e.g.)

Section	Demand	The longest length	Size
1	409.9	45 ft	1 in.
2	299.9	35 ft	1 in.
3	110	45 ft	3/4 in.
4			
5			

Section	Demand	The longest length	Size
1			
2			
3			
4			
5			

5. • Enter the input rating for each appliance in the table below.
   - For natural gas appliances, enter the input rating in Btu/h/1000 (ft^3/h).
   - For propane appliances, enter the input rating in Btu/h.
   • Enter the outlet length from each appliance to the point of delivery in the table below.
   • Round up to the lengths in the appropriate table on page 39. Read across until a capacity equal to or greater than the required demand for the section is found. Read up to find the size. Repeat for each appliance. Enter this size in the table below.

   (e.g.)

Appliance	Demand	Outlet length	Size
Outlet A	35	45 ft	1/2 in.
Outlet B	75	40 ft	1/2 in.
Outlet C	199.9	35 ft	3/4 in.
Outlet D	100	35 ft	1/2 in.

Appliance	Demand	Outlet length	Size
Outlet A			
Outlet B			
Outlet C			
Outlet D			

Final Check

1. Turn on and operate all gas appliances including the Combi Boiler.
2. Check the inlet pressure at each appliance shall be such that the supply pressure at the appliance is greater than or equal to the minimum pressure required by the appliance.

NOTE If all appliances are not receiving the minimum inlet pressure, the gas piping system may need to be changed.

[Gas pipe sizing tables]

- These tables are for reference only. Consult gas pipe manufacturer for actual pipe capacities.
- It is an example of Schedule 40 Metallic Pipe.
- (Only Table 1- 4) Values in Table are in ft³ of Gas per Hour. Contact your gas supplier for Btu/ft³ ratings. For simplification of your calculations, 1 ft³ of Gas is approximately equivalent to 1,000 Btu.

1. Maximum Natural Gas Delivery Capacity (For Less than 6 in. W.C. initial supply pressure)

0.5 in. W.C. Pressure Drop

Pipe Size	Length (including fittings)													
	10 ft	20 ft	30 ft	40 ft	50 ft	60 ft	70 ft	80 ft	90 ft	100 ft	125 ft	150 ft	175 ft	200 ft
	(3 m)	(6 m)	(9 m)	(12 m)	(15 m)	(18 m)	(21 m)	(24 m)	(27 m)	(30 m)	(38 m)	(45 m)	(53 m)	(60 m)
1/2 in.	172	118	95	81	72	65	60	56	52	50	44	40	37	34
3/4 in.	360	247	199	170	151	137	126	117	110	104	92	83	77	71
1 in.	678	466	374	320	284	257	237	220	207	195	173	157	144	134
1 1/4 in.	1,390	957	768	657	583	528	486	452	424	400	355	322	296	275
1 1/2 in.	2,090	1,430	1,150	985	873	791	728	677	635	600	532	482	443	412
2 in.	4,020	2,760	2,220	1,900	1,680	1,520	1,400	1,300	1,220	1,160	1,020	928	854	794
2 1/2 in.	6,400	4,400	3,530	3,020	2,680	2,430	2,230	2,080	1,950	1,840	1,630	1,480	1,360	1,270

2. Maximum Natural Gas Delivery Capacity (For 6 - 7 in. W.C. initial supply pressure)

1.0 in. W.C. Pressure Drop

Pipe Size	Length (including fittings)													
	10 ft	20 ft	30 ft	40 ft	50 ft	60 ft	70 ft	80 ft	90 ft	100 ft	125 ft	150 ft	175 ft	200 ft
	(3 m)	(6 m)	(9 m)	(12 m)	(15 m)	(18 m)	(21 m)	(24 m)	(27 m)	(30 m)	(38 m)	(45 m)	(53 m)	(60 m)
1/2 in.	250	172	138	118	105	95	87	81	76	72	64	58	53	50
3/4 in.	524	360	289	247	219	199	183	170	160	151	134	121	111	104
1 in.	986	678	544	466	413	374	344	320	300	284	252	228	210	195
1 1/4 in.	2,030	1,390	1,120	957	848	768	707	657	617	583	516	468	430	400
1 1/2 in.	3,030	2,090	1,680	1,430	1,270	1,150	1,060	985	924	873	774	701	645	600
2 in.	5,840	4,020	3,230	2,760	2,450	2,220	2,040	1,900	1,780	1,680	1,490	1,350	1,240	1,160
2 1/2 in.	9,310	6,400	5,140	4,400	3,900	3,530	3,250	3,020	2,840	2,680	2,380	2,150	1,980	1,840

3. Maximum Natural Gas Delivery Capacity (For 7 - 8 in. W.C. initial supply pressure)

2.0 in. W.C. Pressure Drop

Pipe Size	Length (including fittings)													
	10 ft	20 ft	30 ft	40 ft	50 ft	60 ft	70 ft	80 ft	90 ft	100 ft	125 ft	150 ft	175 ft	200 ft
	(3 m)	(6 m)	(9 m)	(12 m)	(15 m)	(18 m)	(21 m)	(24 m)	(27 m)	(30 m)	(38 m)	(45 m)	(53 m)	(60 m)
1/2 in.	364	250	201	172	153	138	127	118	111	105	93	84	77	72
3/4 in.	762	524	420	360	319	289	266	247	232	219	194	176	162	151
1 in.	1,440	986	792	678	601	544	501	466	437	413	366	332	305	284
1 1/4 in.	2,950	2,030	1,630	1,390	1,230	1,120	1,030	957	898	848	751	681	626	583
1 1/2 in.	4,420	3,030	2,440	2,090	1,850	1,680	1,540	1,430	1,350	1,270	1,130	1,020	938	873
2 in.	8,500	5,840	4,690	4,020	3,560	3,230	2,970	2,760	2,590	2,450	2,170	1,970	1,810	1,680
2 1/2 in.	13,600	9,310	7,480	6,400	5,670	5,140	4,730	4,400	4,130	3,900	3,460	3,130	2,880	2,680

4. Maximum Natural Gas Delivery Capacity (For 8 - 10.5 in. W.C. initial supply pressure)

3.0 in. W.C. Pressure Drop

Pipe Size	Length (including fittings)													
	10 ft	20 ft	30 ft	40 ft	50 ft	60 ft	70 ft	80 ft	90 ft	100 ft	125 ft	150 ft	175 ft	200 ft
	(3 m)	(6 m)	(9 m)	(12 m)	(15 m)	(18 m)	(21 m)	(24 m)	(27 m)	(30 m)	(38 m)	(45 m)	(53 m)	(60 m)
1/2 in.	454	312	250	214	190	172	158	147	138	131	116	105	96	90
3/4 in.	949	652	524	448	397	360	331	308	289	273	242	219	202	188
1 in.	1,790	1,230	986	844	748	678	624	580	544	514	456	413	380	353
1 1/4 in.	3,670	2,520	2,030	1,730	1,540	1,390	1,280	1,190	1,120	1,060	936	848	780	726
1 1/2 in.	5,500	3,780	3,030	2,600	2,300	2,090	1,920	1,790	1,680	1,580	1,400	1,270	1,170	1,090
2 in.	10,600	7,280	5,840	5,000	4,430	4,020	3,700	3,440	3,230	3,050	2,700	2,450	2,250	2,090
2 1/2 in.	16,900	11,600	9,310	7,970	7,070	6,400	5,890	5,480	5,140	4,860	4,300	3,900	3,590	3,340

5. Maximum Undiluted Propane (LP) Delivery Capacity in Thousands of Btu/h

0.5 in. W.C. Pressure Drop

Pipe Size	Length (including fittings)											
	10 ft	20 ft	30 ft	40 ft	50 ft	60 ft	80 ft	100 ft	125 ft	150 ft	175 ft	200 ft
	(3 m)	(6 m)	(9 m)	(12 m)	(15 m)	(18 m)	(24 m)	(30 m)	(38 m)	(45 m)	(53 m)	(60 m)
1/2 in.	291	200	160	137	122	110	101	94	89	84	74	67
3/4 in.	608	418	336	287	255	231	212	197	185	175	155	140
1 in.	1,150	787	632	541	480	434	400	372	349	330	292	265
1 1/4 in.	2,350	1,620	1,300	1,110	985	892	821	763	716	677	600	543
1 1/2 in.	3,520	2,420	1,940	1,660	1,480	1,340	1,230	1,140	1,070	1,010	899	814
2 in.	6,790	4,660	3,750	3,210	2,840	2,570	2,370	2,200	2,070	1,950	1,730	1,570

■ Adjusting Gas Valve Offset Pressure

Use the following procedure to adjust the gas valve offset pressure:

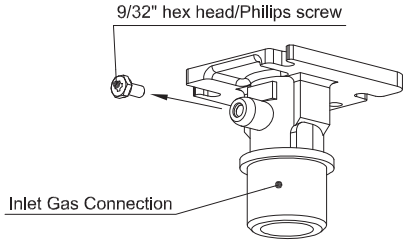
1.Shut off the main gas supply valve.
2.When the gas valve offset pressure is adjusted, remove the front cover.
Because it is not possible to adjust the gas valve offset pressure with the front cover attached.
3.Remove the 9/32" hex head/Philips screw from the Gas Supply Pressure port on the Inlet Gas Connection and connect the manometer or pressure gauge using a silicon tube.
4.Loosen the screw of Offset Pressure Port on the gas valve and connect the manometer or pressure gauge using a silicon tube.
For dual port manometer, use the positive pressure side.
5.Open the gas supply valve and the power button on the Operation Panel to ON, and open up fixtures.
6.Press and hold both the "Mode" and "Minimum" buttons on the Circuit Board simultaneously for more than 3 seconds.
After releasing your fingers, the low fire condition will last 30 minutes.
7.If gas valve offset pressure adjustment needed, remove the Cap of the gas valve, and then adjust the gas offset pressure by turning the Set Screw no more than 1/8 turn.
8.After offset pressure adjustment, do not forgot to tighten the 9/32" hex head/Philips screw to the Gas Supply Pressure Port.
Tighten the screw of Offset Pressure Port and the Cap on the gas valve.
To return to the normal operation, press and hold the "Mode" button for more than 3 seconds.

●Gas Offset Value

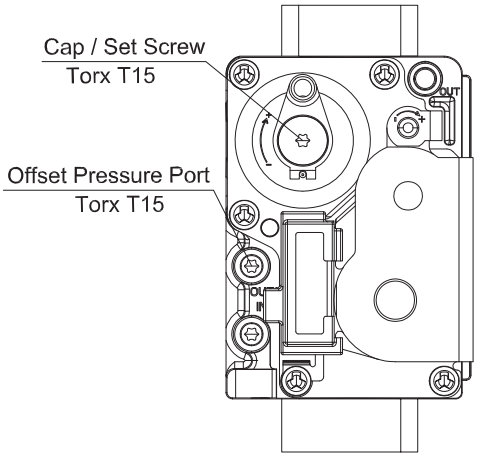
Gas type	Supply Pressure (inch H_2O)	Offset (inch H_2O)
NG	7.0	-0.01
LP	11.0	-0.02

* Gas offset pressure values are subject to change without prior notice.
Check the latest burner specification table.

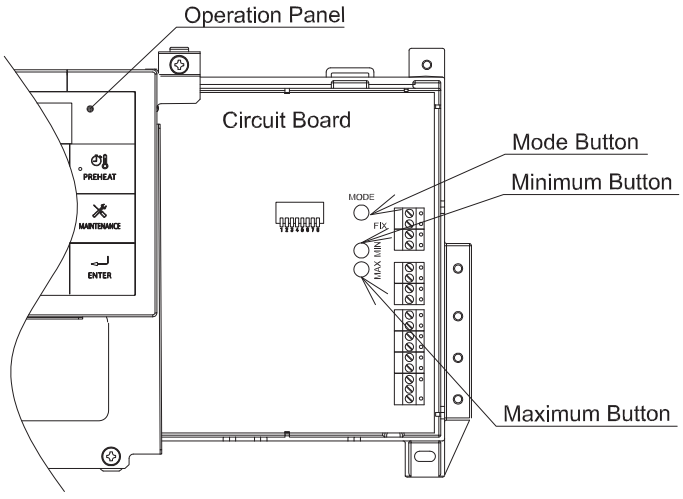
●Gas Supply Pressure Port



●Gas Valve



●Circuit Board



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.

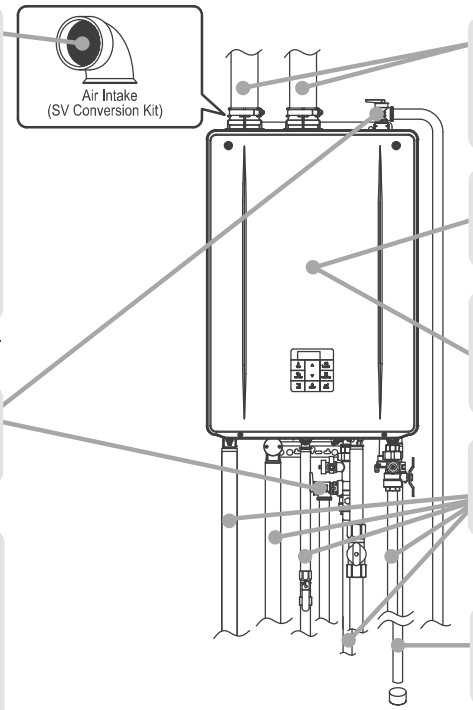
[When supplying combustion air from the indoors]

Check For smear or blockage with dust, oil, etc. at the air supply vent.
If blocked, remove the build-up with a vacuum cleaner or damp towel.

* Do not permanently remove the Inlet Screen.

Check For proper operation of pressure relief valve.

Check For laundry, newspaper, timber, oil, spray cans and other combustible materials near the heater or the exhaust vent terminal.



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

Check For abnormal sounds during operation.

Check For abnormalities in external appearance, discoloration or flaws.

Check For water leaks from the equipment and piping.

Check For blockage at the drain pipe discharge.

Expansion Tank

Inspect the expansion tank once a year for proper air pressure within the tank.
Follow the instructions of the expansion tank manufacturer.
For inspection, contact your installer or a qualified service technician.

Safety Relief Valve

Inspect the safety relief valve once a year to see if the valve works correctly.
For inspection, contact your installer or a qualified service technician.

Periodic Maintenance

Unit

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.

Operation Panel

Wipe the surface with a wet cloth.

- Do not use benzene, oil or fatty detergents to clean the Operation Panel; deformation may occur.
- The Operation Panel is not water resistant. Keep it dry.

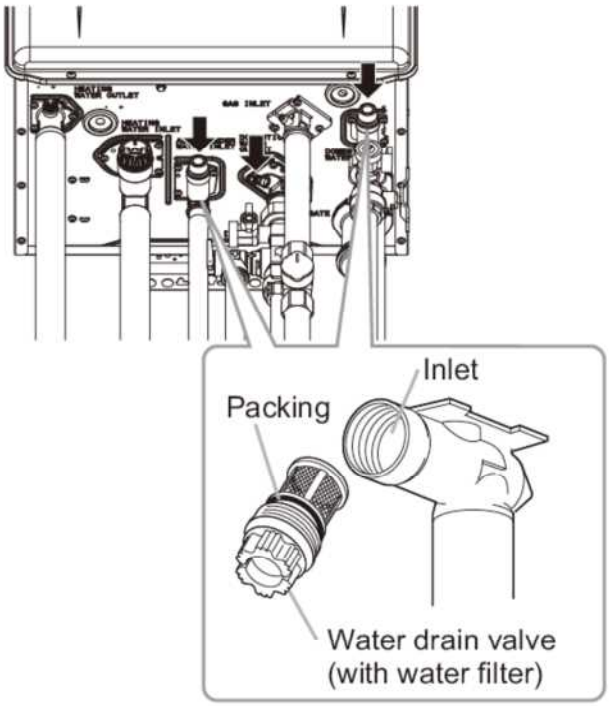
Water Drain Valve (with Water Filter)

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 unit cools down before draining the water. The unit will remain hot after it is turned off.**

Domestic Water Inlet / Auto Feeder Inlet

1. Close the water supply valve. Press the power button to turn off the Operation Panel and disconnect the power cord to the Combi Boiler.
2. Open all hot water fixtures/faucets.
3. With a bucket ready, remove the DHW inlet, the DHW outlet and the Auto feeder inlet drain plugs. (about 0.13 gallon (0.5 L) will drain out)
4. Remove the water drain valves (with water filter) out of the inlets. (See illustration to right).
5. Clean the water drain valves (with water filter) with a brush under running water.
6. Replace the water drain valves (with water filter) and close the drain plugs. (Take care not to lose the packing.)
7. Close all hot water fixtures/faucets.
8. Open the water supply valve and check that water does not leak from the drain plugs or water drain valves (with water filter).
9. Plug back the power cord and press the power button to power the unit on and readjust the clock time.

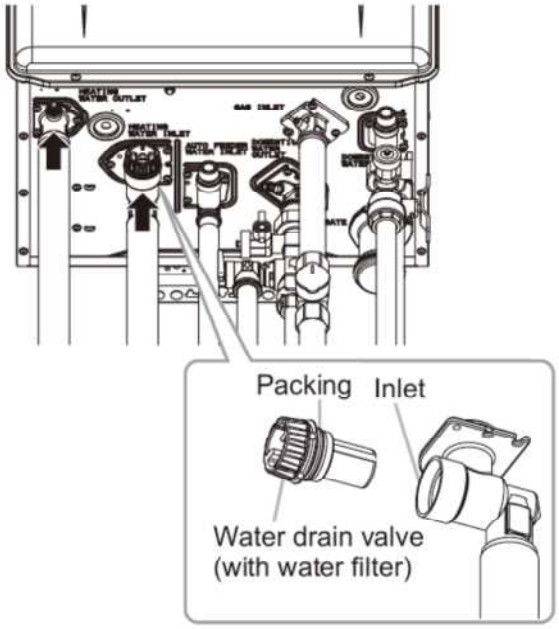


Periodic Maintenance

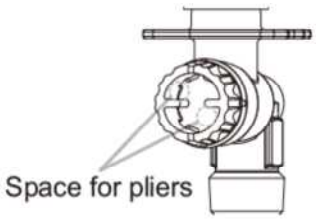
Water Drain Valve (with Water Filter)

Heating Water Inlet

1. The Operation Panel is OFF and disconnect the power cord to the Combi Boiler.
2. With a bucket ready, remove the inlet and outlet drain plugs (about 0.76 gallon (2.9 L) will drain out)
3. Remove the water drain valve (with water filter) out of the inlet. (See illustration below).
4. Clean the water drain valve (with water filter) with a brush under running water.
5. Replace the water drain valve (with water filter) and close the drain plugs.
   (Take care not to lose the packing.)
6. Plug back the power cord and press the power button to power the unit on and check that water does not leak from the drain plugs or water drain valve (with water filter) and readjust the clock time.



* If it is difficult to remove the heating water inlet drain plug:
  Use a needle-nose pliers and insert the tips of pliers into the holes or space shown below illustration.



When Using Anti-Freeze

- Anti freeze products ma y be used f or the heating system. Anti freeze for new or existing systems requires specially formulated glycol, which contains inhibitors to prevent the glycol from attacking the metallic system components.
- Before using anti freeze products, ensure that system fluid contains proper glycol concentration and the inhibitor level is appropriate. PB HEAT recommends against exceeding a 50% concentration of glycol.
- When using the anti freeze products, the system must be tested at least once a year, and as recommended by the manufacturer of the glycol solution.

■ Flushing Procedure for Plate Heat Exchanger

NOTE This procedure is only intended for use by a qualified service professional or authorized Service Representative. Any unauthorized use of this procedure may result in voiding the Pavilion Limited Warranty. Contact Pavilion Customer Center at 1-855-443-8468 for additional support.

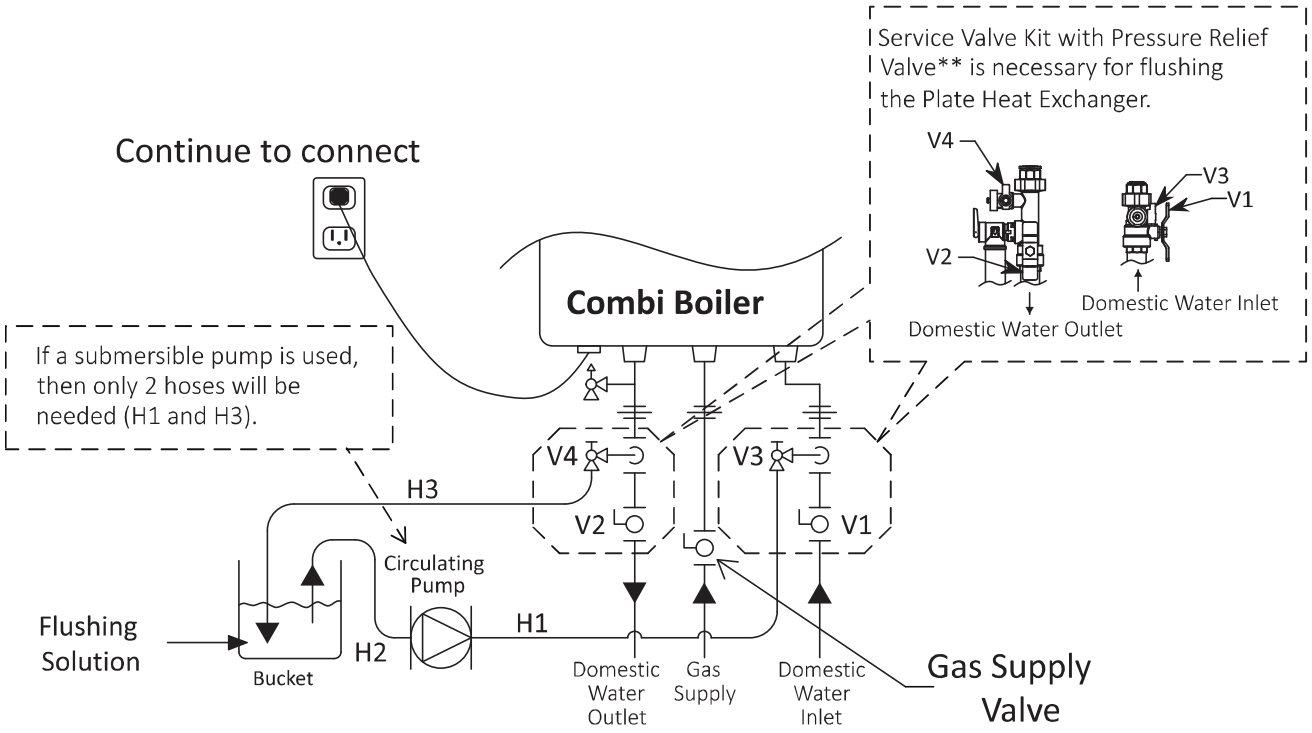
To prevent damage to the Plate Heat Exchanger from Scale Build-up, the Plate Heat Exchanger needs to be flushed* to remove the Scale Build-up.
Damage to the Combi Boiler due to Scale Build-up is not covered by the Combi Boiler's warranty.

* Connect the blue connector marked "FLUSH" for flushing near the Circuit Board when flushing the Plate Heat Exchanger.

NOTE The Combi Boiler must remain connected to the electrical power when flushing the Plate Heat Exchanger.

The preparation of the flushing system

1. Close the gas supply valve.
2. Close the Domestic Water Inlet valve (V1) and the Domestic Water Outlet valve (V2).
3. Connect the one drain hose (H1) to the drain valve (V3), and then the other to the circulating pump.
4. Connect the drain hose (H2) to the circulating pump.
5. Connect the drain hose (H3) to the drain valve (V4).
6. Pour 1 gallon of "Calcium, Lime and Rust Removal Product" and 1 gallon water into the bucket.
   It is recommended "Calcium, Lime and Rust Removal Product" for flushing.
7. Place the both drain hoses (H2 and H3) into the bucket filled with the flushing solution.
8. Open the both drain valves (V3 and V4).



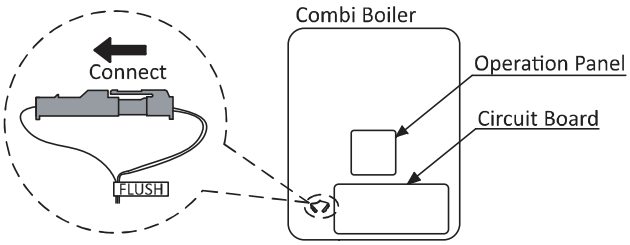
** Service Valve Kit with Pressure Relief Valve may be purchased as an accessory from an authorized manufacturer's wholesaler.
This allows for full diagnostic testing and easy flushing of the system.
Contact Pavilion Customer Center for more information. (1-855-443-8468)

For Single Unit

[Procedure 1. Flushing the Plate Heat Exchanger]

1. Open the front cover.
2. Connect the blue connector* marked "FLUSH" for flushing near the Circuit Board.

* The connector color is blue and labeled "FLUSH".



3. Then the code "CCC" is displayed on the Operation Display.
4. Turn on the circulating pump to circulate the flushing solution through the Combi Boiler for 1 hour at a rate of 1.5 gallons per minute or more.
5. CCC → C60 → C59 → C00

   The code "C60" is displayed on the Operation Display when the Combi Boiler detects the flow of the flushing solution.

   When 1 minute passes, the code "C60" will change to "C59" on the Operation Display.

   When 1 hour passes, the code "C00" is flashing on the Operation Display.

   Do not disconnect the blue connector marked "FLUSH" for flushing.

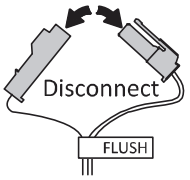
   NOTE Check whether the reverse connection of the hose (H1) and (H3) if the display number will not change. In that case, the flow rate of the flushing solution may be under 1.5 GPM.

6. Turn off the circulation pump.

[Procedure 2. Cleaning the Plate Heat Exchanger]

The flushing solution needs to be rinsed and cleaned out of the Combi Boiler.
Below is the way to rinse and clean the flushing solution.

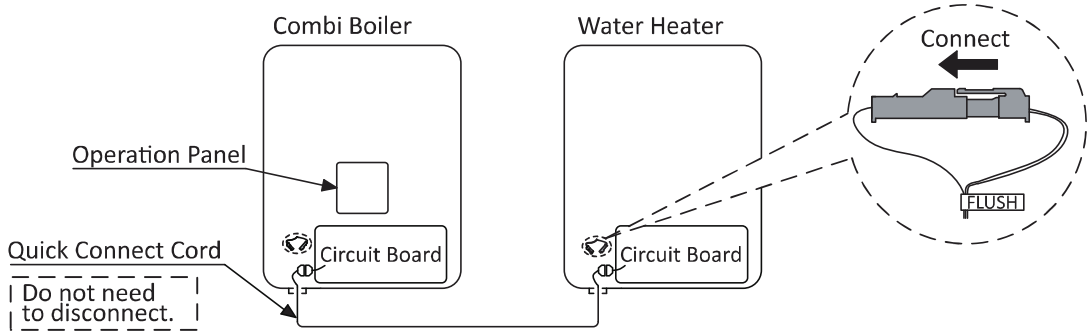
1. Remove both drain hoses (H2 and H3) from the bucket. And then place the drain hose (H3) into the sink or outside to drain.
2. Close the drain valve (V3) and then open the Domestic Water Inlet valve (V1).
   Do not open the Domestic Water Outlet valve (V2).
3. Clean the Combi Boiler with fresh water for 3 minutes or more.
   (Needs to have enough time to clean the Combi Boiler.)
4. Close the drain valve (V4) and then remove the drain hose (H3) from the drain valve (V4).
5. Remove the drain hose (H1) from the drain valve (V3).
6. Disconnect the blue connector marked "FLUSH" for flushing.
   The code "C00" goes out on the Operation Display.



7. Close the front cover.
8. Open the gas supply valve and Domestic Water Outlet valve (V2).
9. CCheck for correct operation of the Combi Boiler.

For Quick Connect Multi-System

1. Open the front covers.
2. Connect the blue connector marked "FLUSH" for unit needing to be flushed.
   (The unit is isolated from Quick Connect Multi System when the blue connector marked "FLUSH" for flushing is connected. Not need to disconnect the Quick Connect Cord.)



3. Then the code **CCC** or **FCC** is displayed on the Operation Display.
   - "CCC" is displayed when the Combi Boiler's blue connector is connected.
   - "FCC" is displayed when the Water Heater's blue connector is connected.
4. Turn on the circulating pump to circulate the flushing solution through the units for 1 hour at a rate of 1.5 gallons per minute or more.
5. **CCC** or **FCC**
   ↓
   C60 The code "C60" is displayed on the Operation Display when the Combi Boiler detects the flow of the flushing solution.
   ↓
   C59 When 1 minute passes, the code "C60" will change to "C59" on the Operation Display.
   ↓
   C00 When 1 hour passes, the code "C00" is flashing on the Operation Display.

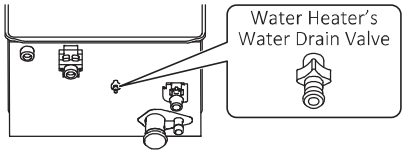
   Do not disconnect the blue connector marked "FLUSH" for flushing.

(e.g. The display when the both units are flushed at the same time)

Connect the Blue Connector of the Combi Boiler
↓
CCC
↓
Detects the flow
↓
C50 (10 minutes pass)
↓

Connect the Blue Connector of the Water Heater
↓
FCC The remaining time of flushing gives indication priority to the connector which is connected later.
↓
C60 Detects the flow
↓
C00 (1 hour passes) Flashing

6. Turn off the circulation pump.
7. Rinse and clean the flushing solution out of the units in accordance with [Procedure 2]".
   (See the "Procedure 2.1-2.5".)



NOTE For Water Heater, place a bucket under the unit to drain water from the "Water Drain Valve".
Carefully unscrew the "Water Drain Valve" to rinse flushing solution out of the unit for about 10 seconds. Then close the "Water Drain Valve".

8. Disconnect the blue connector marked "FLUSH" for flushing. The Code "C00" goes out on the Operation Display.
9. Close the front covers.
10. Open the gas supply valves and water outlet valves.
11. Check for correct operation of the unit.

Preventing Damage from Freezing-1

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 operating the pump and turning on the burner.

Perform the following to prevent freezing

■ Do not remove the power plug

Freezing cannot be prevented when the power plug is disconnected.

■ Do not close the gas valve and water valve

The unit will automatically operate (combust) to warm the water within the circuit to prevent freezing.
Note: Freezing of water within the circuit may not be prevented depending on the heating system. For details, contact your installer.

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).
  - 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 of the Combi Boiler 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 PB HEAT agent.

Take the measures below for extremely cold temperatures*.

Outside temperature including wind chill factor less than -30°F (-35°C) .
- 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/faucet, 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, 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 Combi Boiler or the piping is frozen, do not use the Combi Boiler or it may get damaged.

Preventing Damage from Freezing-2

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

Drain the water as follows:

⚠ CAUTION

High Temperature

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

To prevent damage from freezing, the Combi Boiler must be plugged into power at all times. If power is unplugged, drain the water completely from the Combi Boiler. Then use an air compressor to remove all water from inside the unit's water piping. It is recommended that Isolation Valves are installed on the Combi Boiler, otherwise the water connections will need to be removed to drain the unit completely. Freeze damage due to not draining properly will not be covered under warranty.

Drain water into a bucket to prevent water damage.

Drainage Using the Operation Panel

1 (1) Press the ON/OFF button OFF.

The Operation Panel must be off.

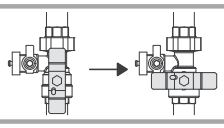
(2) Press the SETTINGS button, Select 1:05 using the △ ▽ buttons. Press the ENTER button.

The "User Mode" screen appears.

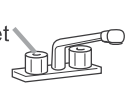
(3) Select U:05 (After 1 sec.) drA (drA Drain The Water) using the △ ▽ buttons, and then press the ENTER button.

(4) Press and hold the △ button approximately 2 seconds to turn "ON".

2 Close the water supply valve and the auto feeder shutoff valve.



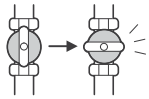
3 Fully open all hot water fixtures/faucets.



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

5 When the screen display turns off, replace all drain plugs and close the hot water fixtures/ faucets.

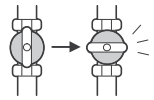
6 Close the gas valve and disconnect the electrical power supplied to the unit.



Do not touch with wet hands.

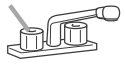
Manual Draining

1 Close the gas valve.



2 (1) Turn the power button on.

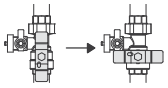
(2) Turn and leave open the hot water fixtures/ faucets for more than 2 minutes and close.



* If multiple units are being used, drain two minutes for each unit.

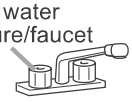
* An 11 Error Code may appear on the Operation Panel.
This is not a malfunction of the unit.
Do not turn the power button off.

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



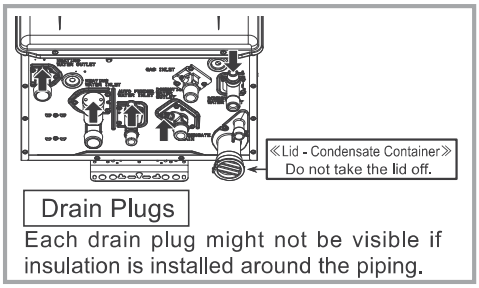
Do not touch with wet hands.

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.



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

Turning the Unit Back On

1. Check that all drain plugs are inserted.
2. Check that all hot water fixtures/faucets are closed.
3. Follow the procedure “Initial operation”, steps 1 through 5.
4. 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 Combi Boiler, 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.)

* If water does not appear at the end of the drain line, a qualified service technician must clean the condensate line.

⚠ DANGER

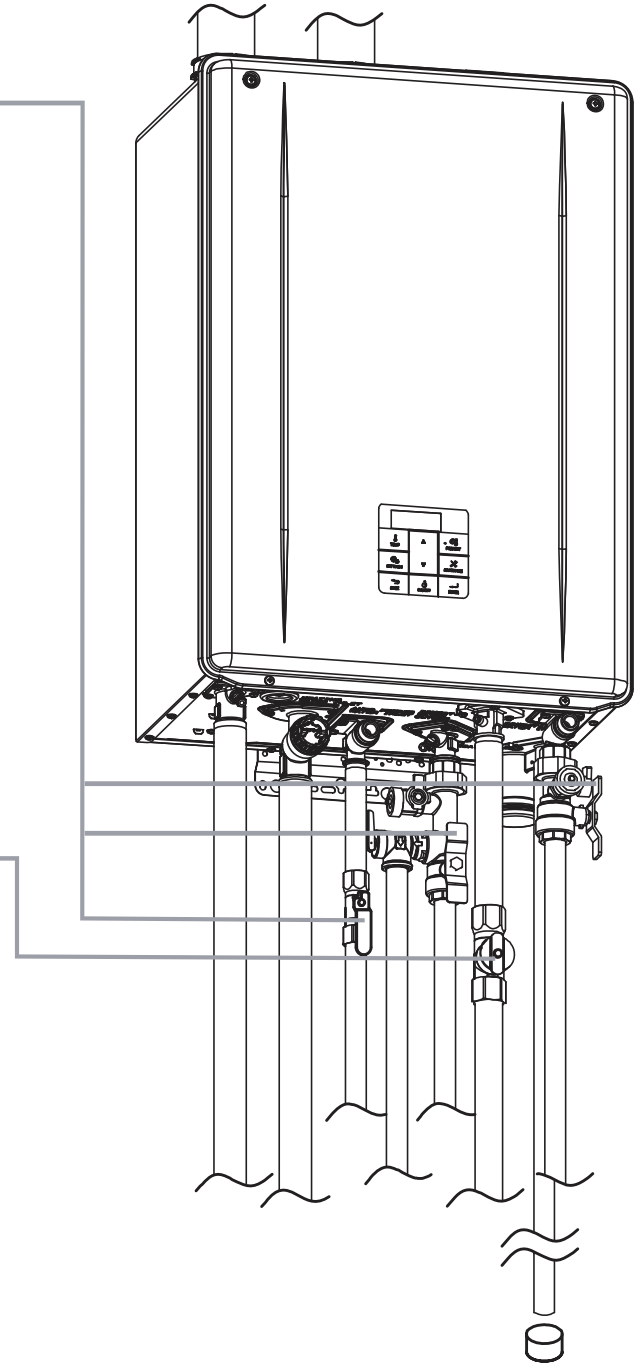
Be sure to do.

After the Combi Boiler has been out of use for a long time 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.
(By performing step 4 as described above, the condensate trap will automatically fill itself with water.)

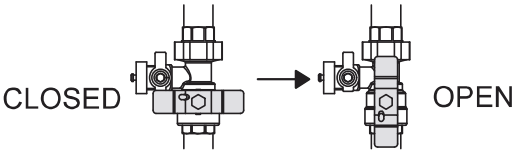
Initial Operation

Before the first use of your Combi Boiler do the following:

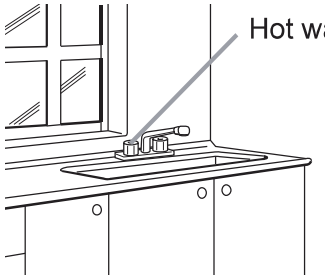
Follow steps **1 through 5**.



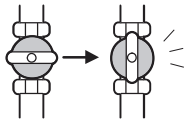
1 Open the water supply valve and the auto feeder shutoff valve.



2 Open a hot water fixture to confirm that water is available, and then close the fixture again.



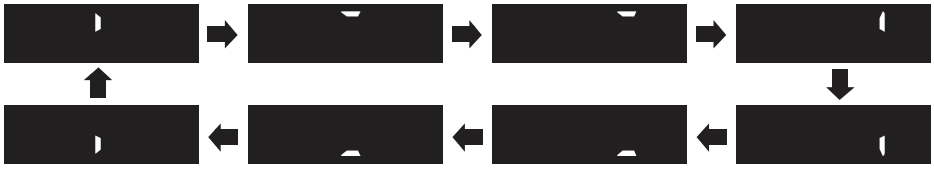
3 Open the gas supply valve.



4 Turn on the power.

Do not touch with wet hands.

5 The unit starts auto feeding for heating. The display will change to the following rotational pattern.
This is normal operation. When auto feeding is complete, the rotational pattern turns off automatically.



9. Installation Related Content

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 unit 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 con□gured for high elevation installations by adjusting the high elevation dip switches located inside of the unit. Refer to the"Installation Manual" for detailed instructions.

Air Supply/Exhaust

1. Make sure that the installation location provides suf□cient 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.

■ Installation Caution

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 unit.

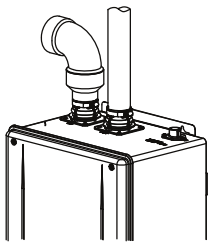
Air Supply and Vent Pipe

Before installation, note the following:

- Vent pipe diameters and maximum vent length (For DV models):

Vent Pipe Diameter	2" PVC or CPVC Pipe	3"PVC or CPVC Pipe
Maximum Vent Length	12 feet with 6 - 90° elbows*	60 feet with 8 - 90° elbows*

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



*SV (single vent) with combustion air conversion kit.

- 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 firewall.
- 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.

Electrical

- The electrical power supply to the unit should be installed by a qualified electrician.
- Allocate 4A on the circuit for this unit.
  If more than one unit is being installed, allocate an appropriate circuit to provide power for each unit.

Filling the Condensate Container with Water

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

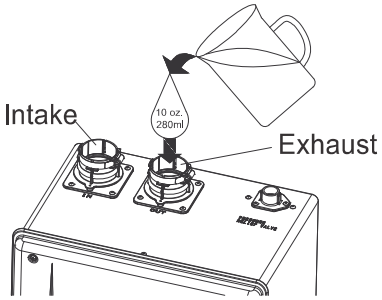
Filling the condensate container before vent pipe installation.

⚠ DANGER

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

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

1) Fill the condensate container by pouring approx. 10 oz.(280ml) of water into the exhaust accessory on the top of the appliance as illustrated below.



Or, if the vent pipe has already been installed:

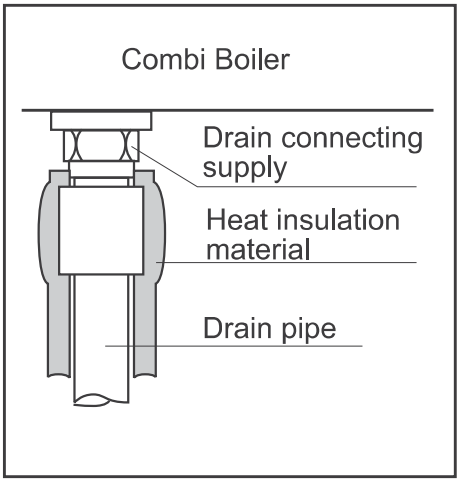
2) After installing the drain pipe, make sure that the area around the appliance is well ventilated; open a window or a door if necessary.
Then, operate the unit and verify that condensate is coming out of the drain pipe.
(During normal use of the Combi Boiler, condensate will begin to discharge from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

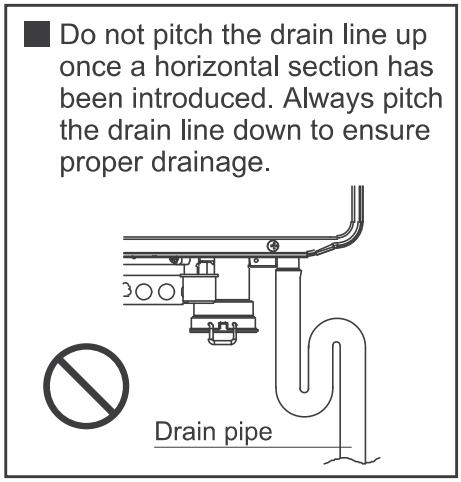
⚠ CAUTION

Due to the acidic nature of the condensate, be sure to properly drain and if necessary, treat the condensate prior to disposal. Damage caused by improperly handled condensate is not covered by the warranty.

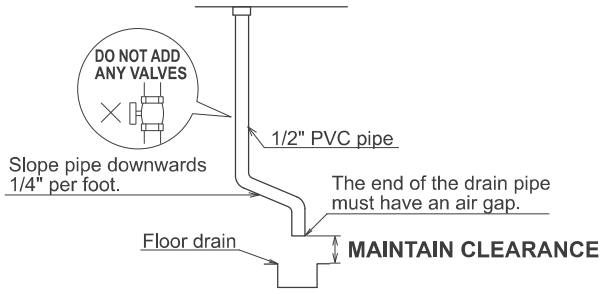
- This Combi Boiler is a high efficiency, fully condensing appliance which produces acidic condensate during operation. The Combi Boiler incorporates a collection and removal system which must be properly drained in order to ensure proper operation of this appliance.
- The pH level of the condensate 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 Combi Boiler. 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 acidic condensate.
- Keep the length of the drain pipe as short as possible. Long runs or applications where the nearest drain is above the Combi Boiler will require the use of a condensate pump. Size the pump to allow for a maximum condensate discharge of 2 GPH from the Combi Boiler.
- 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 Combi Boiler within 15 minutes after operation has started.
- Take measures to prevent the condensate drain lines from freezing (insulation, heat tape, electric heaters, etc.).

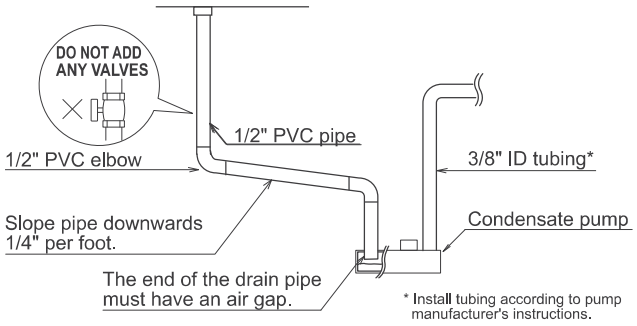




Condensate piping to floor drain



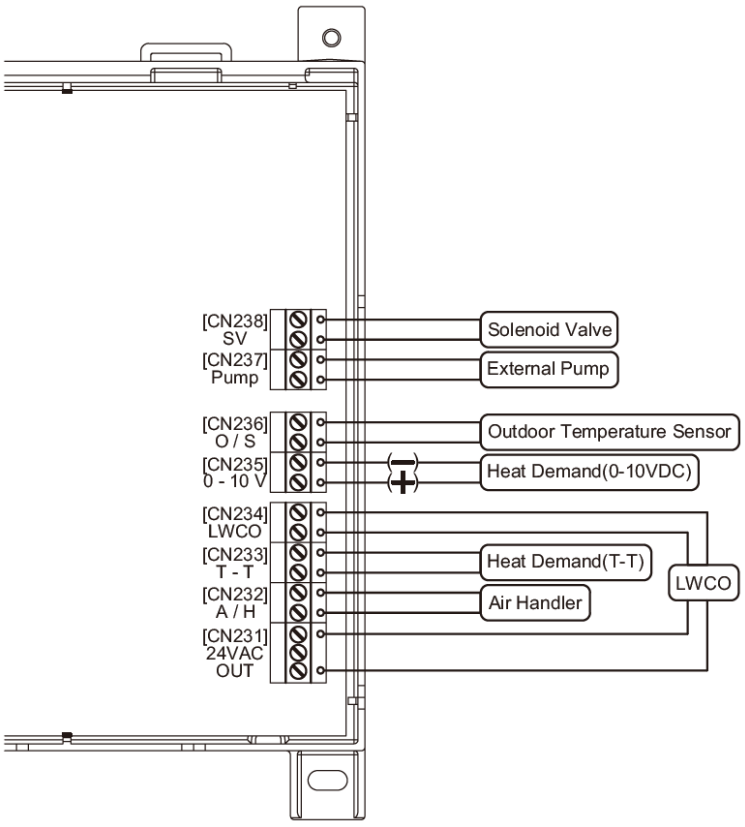
Condensate piping with pump



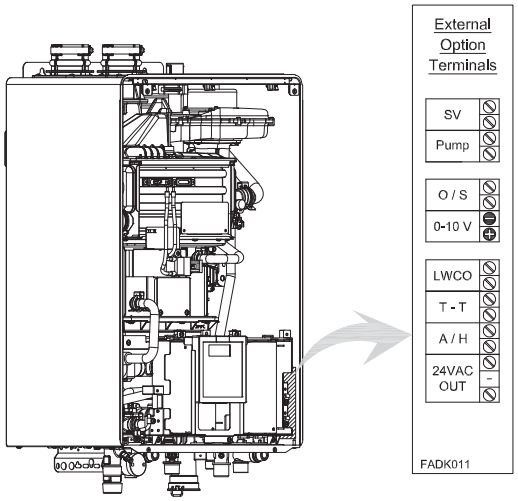
Note:
If the drain line becomes clogged or frozen, condensate will back-up into the Combi Boiler and a "90" error code will flash on the Operation Panel, ceasing operation. If this occurs, clear the clog or freeze so that condensate can freely flow. Be sure to slope the drain pipe, use the appropriate size pipe, allow the proper clearances, and apply freeze prevention measures (when necessary) to prevent the drain line from clogging or freezing.

External Options

Wiring Diagram for External Options



* These External Option terminals are indicated by the label on right side of the unit.



	Connection Item	note
[CN231] 24VACOUT	24VAC for LWCO	
[CN232] A/H *	Air Handler	
[CN233] T-T	Heat Demand Input (T-T)	
[CN234] LWCO	LWCO	The factory installed a jumper on the terminals.
[CN235] 0-10V	Heat Demand Input (0-10VDC)	This terminal has electrical polarity.
[CN236] O/S	Outdoor Temperature Sensor	
[CN237] Pump **	External Pump	120VAC / Max 2.0A
[CN238] SV	Solenoid Valve for Quick Connect Multi System	120VAC / Max 1.5A

■ LWCO_[CN231] 24VACOUT(24VAC for LWCO), [CN234] LWCO

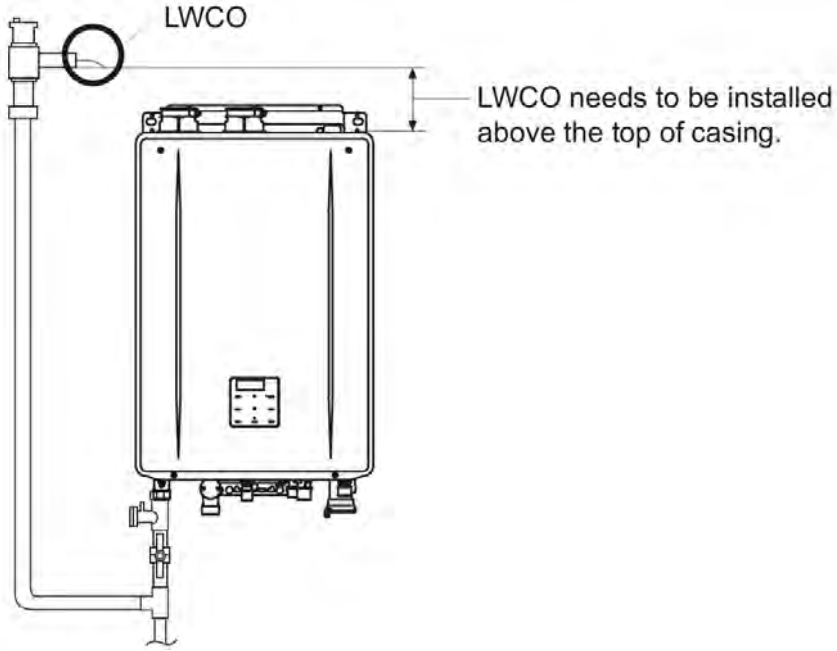
Internal of the Combi Boiler

The Noritz Combi Boiler is equipped with a factory installed, pressure sensor type low water cutoff device. The lowest operation pressure for this device is 8 psi. (operation pressure = (default valve 12 psi) - (4 psi))

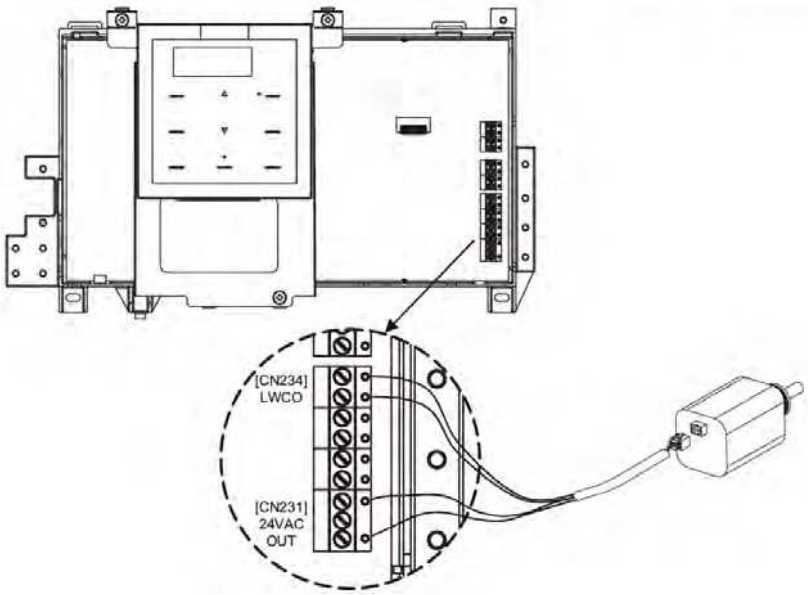
- The Combi Boiler performs water replenishment automatically when the built-in water pressure sensor detects insufficient water level in the Combi Boiler system.

External of the Combi Boiler

- Low water cutoffs shall comply with the Safety Standard for Limit Controls, ANSI/UL 353, or the Standard for Temperature Indicating and Regulating Equipment, CAN/CSA C22.2, No. 24, as applicable. The following illustrates example of typical LWCO installation.
- Install the probe above the minimum safe water level.
  NOTE: This may be in a tapping on the Combi Boiler or in the Combi Boiler supply or return piping.
- Install the probe to extend into the Combi Boiler cavity or piping to make contact with the water.
- Low water cutoffs shall be located so as to provide adequate access for cleaning, repairing, testing and inspection.



- Remove the factory installed jumper on the LWCO terminals (CN234) prior to connecting the LWCO.
- The Combi Boiler supplies 24 VAC from the terminal (CN231) (see below illustration).

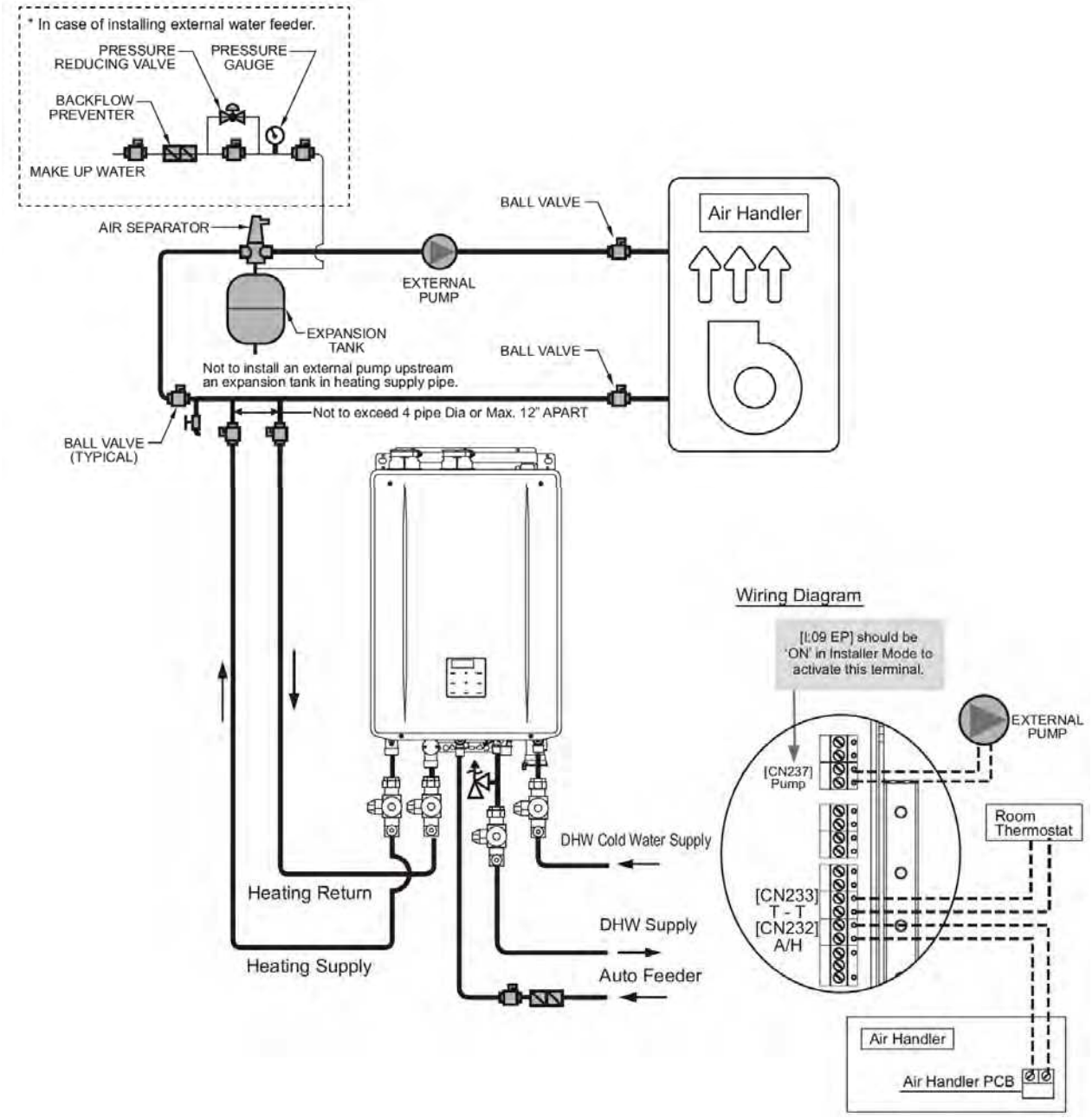


■ Air Handler_[CN232] A/H *

* Air Handler Terminal : [I:08_Air] should be “on” in Installer Mode to activate this terminal.

■Plumbing

The Noritz Combi Boiler can control the operation of an Air Handler when thermostat is used in combination with the Air Handler.
The Air Handler function is designed to stop the Air Handler's pump and fan operation when the Combi Boiler's operation is not suitable for the Air Handler.
This drawing is meant to show system piping concept only.
Installer is responsible for all equipment & detailing required by local codes.



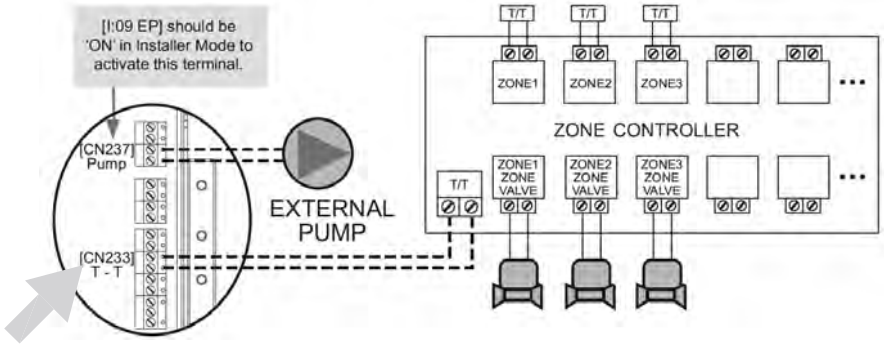
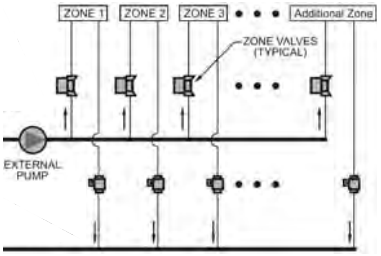
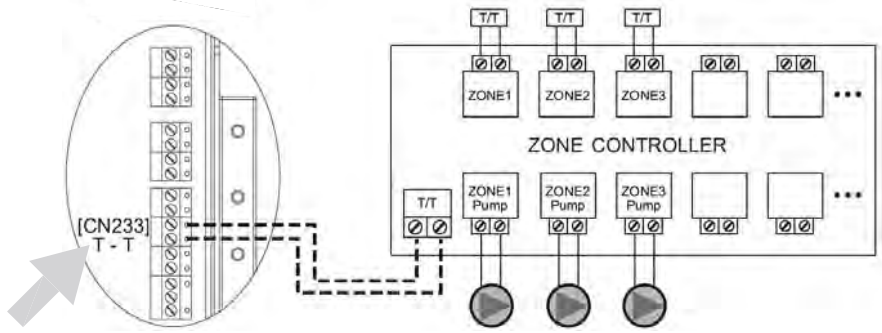
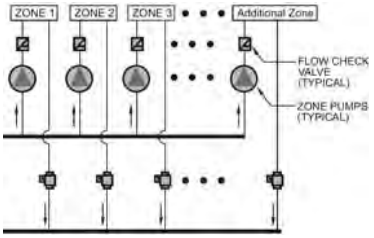
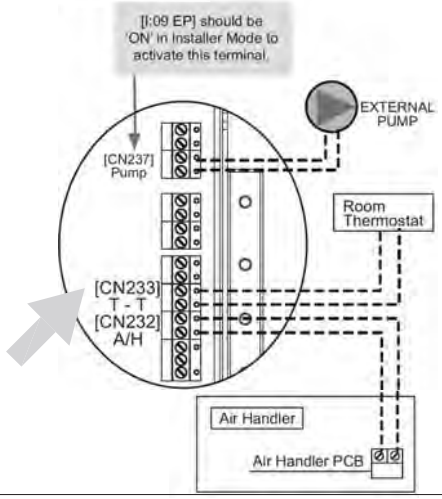
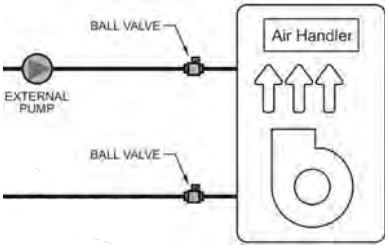
■Installer Mode Setting_[I:08_Air]

Screen Display: 

This function needs to be turned ‘on’ if an Air Handler is being used as a heating type.
The Air Handler function is designed to stop the Air Handler’s pump and fan operation when the Combi Boiler's operation is not suitable for the Air Handler.
OFF: When an Air Handler is not used(Default Setting).
ON: When an Air Handler is used.

■ Heat Demand Input (T-T)_[CN233] T-T

■Wiring Diagram

	piping image
Zoned with Valves 	
Zoned with Pumps 	
Air Handler 	

■ Heat Demand Input(0-10VDC)_[CN235] 0-10V

- The Outdoor Reset Control feature may be used to enhance energy efficiency while maintaining optimal heating performance.

  With the Outdoor Reset Control, the heating temperature setting automatically changes according to the voltage input from external controller that is decided by outdoor temperature.
- Blinking ( ) on the Operation Panel is not an Error Code.
- ( ) is lit on the Operation Panel, when the Combi Boiler receive 1.5 VDC or more and the Outdoor Reset (Energy Saving) is enabled.

- A signal from external (i.e. building management system) may be connected to the Combi Boiler to enable remote control.

  This signal should be a 0 -10 volt positive DC signal. When this input is enabled (1.5 VDC or more), an external control system can be used to control the set point temperature of the Combi Boiler.
- The control interprets the 0 -10 volt signal as follows; when the signal is between 0 and 1.5 volts, the Combi Boiler will be in standby mode, not firing [Blinking ( ) on the Operation Panel. This is not an Error Code.]

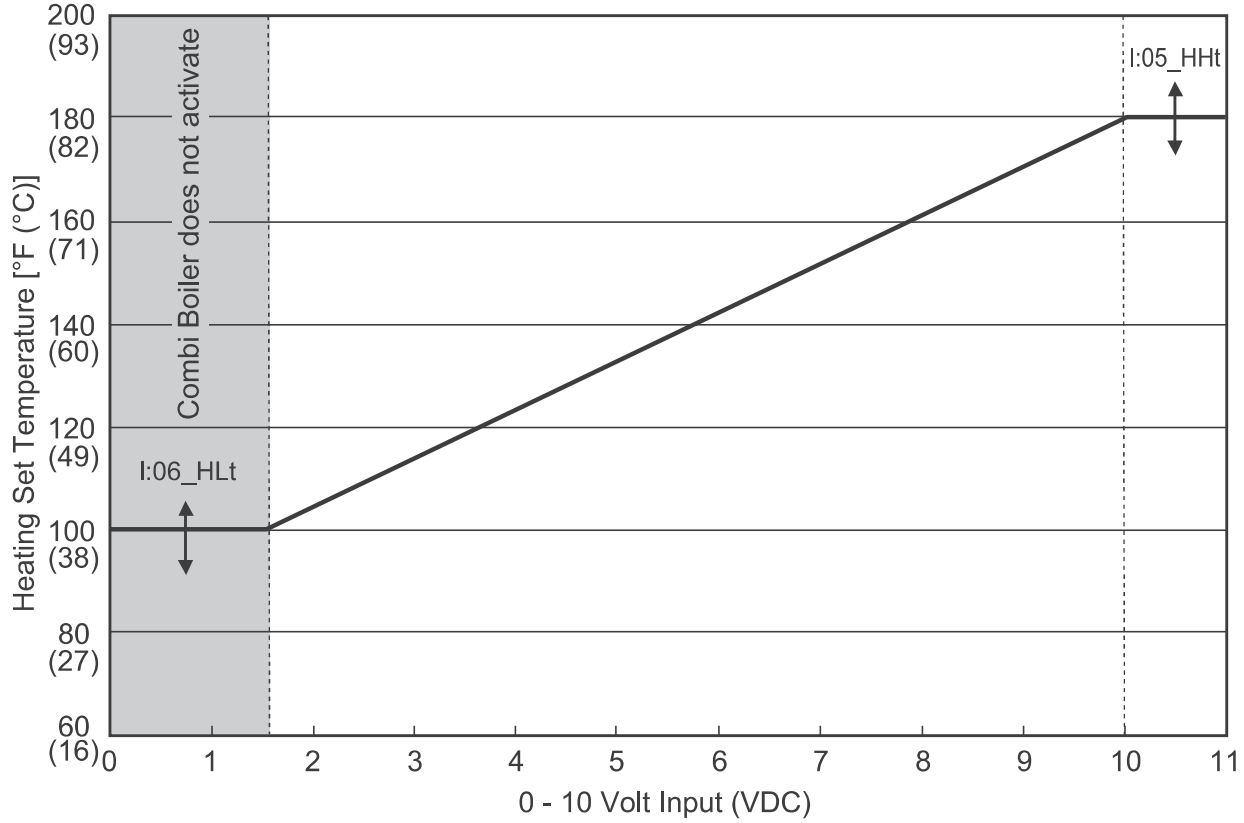
  When the signal rises above 1.5 volts, the Combi Boiler will ignite. As the signal continues to rise towards its maximum of 10 volts, the Combi Boiler will increase the set point temperature.
- Connect an external control system to the terminals marked for this purpose on the Combi Boiler terminal block (refer to next page).Caution should be used to ensure that the 0 – 10 volt connection does not become connected to ground.

Note: Ensure that the polarity of the connections from the external modulating controller to the Combi Boiler is correct.

Reversed polarity could lead to erratic and/or no response from the Combi Boiler controller.

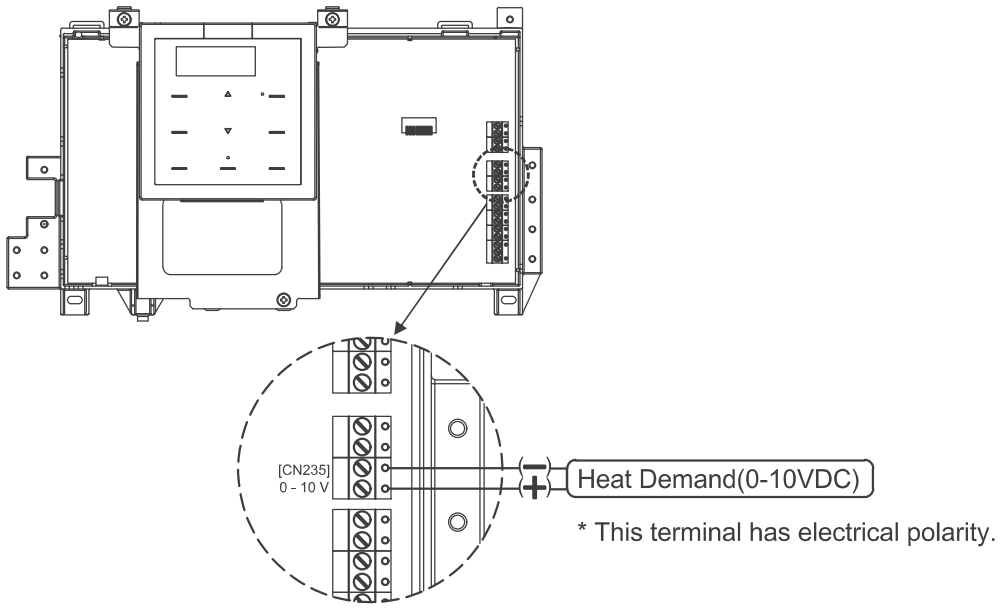
Note: ( ) will flash if an external control system does not supply 1.5 VDC or more.

Outdoor Reset Control [0 – 10 Volt Input Control]



- Do NOT connect room thermostat to heat demand (T-T) when an external control system is connected.
  * The Combi Boiler is activated only by receiving voltage.

Note: DO NOT mix [Room Thermostat Control], [External Voltage Control System (without Room Thermostat)] and [Outdoor Temperature Control with Outdoor Temperature Sensor and Room Thermostat]



■Setting the Outdoor Reset Control [0 – 10 Volt Input control] - [I:01_HCt

Operation	Screen Display

1 Connect Heat Demand(0-10VDC) to terminal.

2 Press the ON/OFF button to OFF. The Operation Panel must be off.

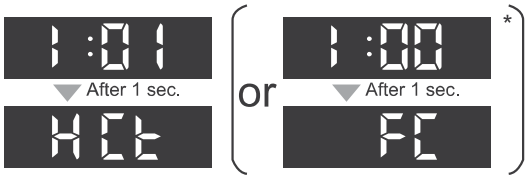
3 Press the SETTINGS button.

Select 2:1 n using the △ ▽ buttons, and

then press the ENTER button.

The "Installer Mode" screen appears.

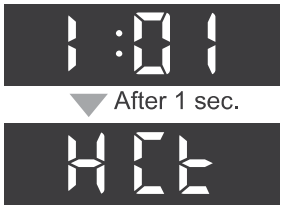
4 When entering the "Installer Mode", display will change to 1:01 / HCt (After 1 sec.) or 1:00 / FC (After 1 sec.) *.



*This function will appear within the first 10 minutes of connecting electrical power and before pressing the ON/OFF button.

5 When display shows 1:00 / FC (After 1 sec.),

press the △ ▽ buttons to navigate 1:01 / HCt (After 1 sec.)



in the "Installer Mode".

6 Select 1:01 / HCt (After 1 sec.), then press the ENTER button to enter the function.

7 Press the △ ▽ buttons to change the parameter value 3:EC,

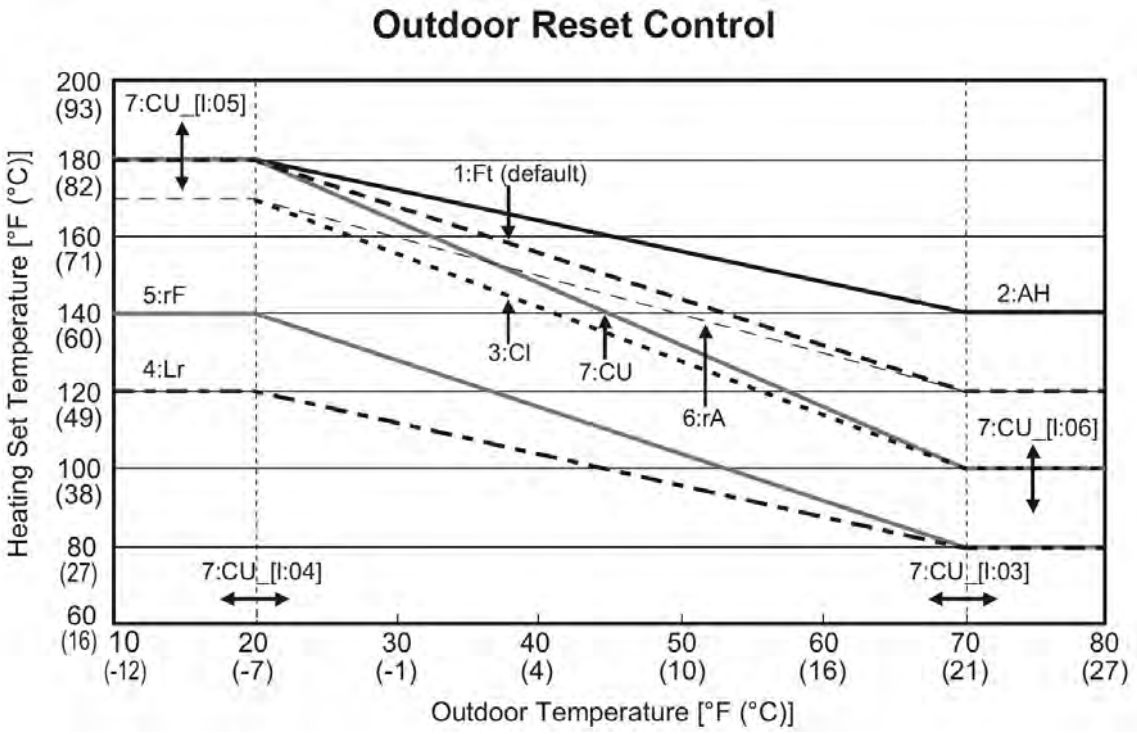
and then press the ENTER button to save the settings and to exit the function.

The icon will flash if the Heat Demand Input (0-10VDC) is not detected.

■ Outdoor Temperature Sensor_[CN236] O/S

■Outdoor Reset Control

- The Outdoor Reset Control feature may be used to enhance energy efficiency while maintaining optimal heating performance.
  With the Outdoor Reset Control, the heating temperature setting automatically changes according to the outdoor temperature and the current heating system application.
- There are various pre-defined temperature range options available to assist matching the system heat load with the applicable outdoor temperature range.
- The built in outdoor reset control provides simple heating curve selection based upon pre-defined Combi Boiler set temperature ranges determined by the type of heating application. This can be adjusted either by selecting the appropriate menu option, or by utilizing the fully customizable mode.



Note:
The optimal set up should be determined for each job location.
[7:CU] default setting: Max Temperature: 180°F, Min Temperature: 100°F

■Setting the Outdoor Reset Control Mode - [I:01_HCt]

Operation	Screen Display

1 Connect Outdoor Temperature Sensor to terminal.

2 Press the ON/OFF button to OFF. The Operation Panel must be off.

3 Press the SETTINGS button.

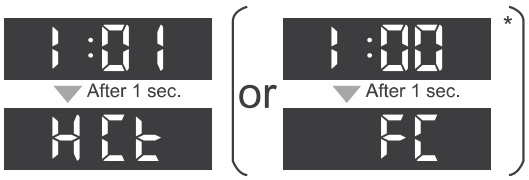
Select 2:1 n using the △ ▽ buttons, and

then press the ENTER button.

The "Installer Mode" screen appears.

4 When entering the "Installer Mode", display will change to 1:01 (After 1 sec.) HCt or 1:00 (After 1 sec.) FC *.

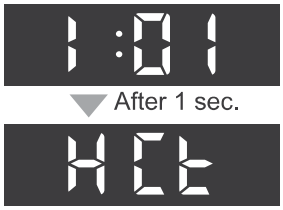
*This function will appear within the first 10 minutes of connecting electrical power and before pressing the ON/OFF button.



5 When display shows 1:00 (After 1 sec.) FC,

press the △ ▽ buttons to navigate 1:01 (After 1 sec.) HCt

in the "Installer Mode".



6 Select 1:01 (After 1 sec.) HCt, then press the ENTER button to enter the function.

7 Press the △ ▽ buttons to change the parameter value 2:or,

and then press the ENTER button to save the settings and to exit the function.

And additional menu items will become available to adjust.

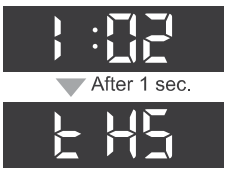
The icon will flash if the outdoor sensor is not detected.

■Adjusting Outdoor Reset Control Options

Note: The Operation Panel must be off.

Operation	Screen Display

1 Press the △ ▽ buttons to navigate in the "Installer Mode".



2 Select 

, and then press the ENTER button to enter the function.

3 Press the △ ▽ buttons to navigate into desired system.

Types of Heating System

Type of Heating System	Screen Display	Temperature(°F)		Temperature(°C)		Note
		LOW	HIGH	LOW	HIGH	
[1:Ft] Fin Tube Baseboard	1:Ft	120	180	49	82	Default
[2:AH] Air Handler	2:AH	140	180	60	82	
[3:Cl] Cast Iron Baseboard	3:Cl	100	170	38	76	
[4:Lr] Low Mass Radiant Floor	4:Lr	80	140	27	60	
[5:rF] Mass Radiant Floor	5:rF	80	120	27	49	
[6:rA] Radiator	6:rA	120	170	49	76	
[7:CU] Custom	7:CU	100*	180*	38*	82*	

* Factory Default.

4 When you are done, press the ENTER button to save the settings and to exit the function.

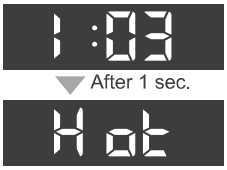
5 To exit the "Installer Mode" or another function, press the BACK button.

■Customized Settings

Note: The Operation Panel must be off.

 allows for adjustment of the outdoor temperature range and heating temperature range.

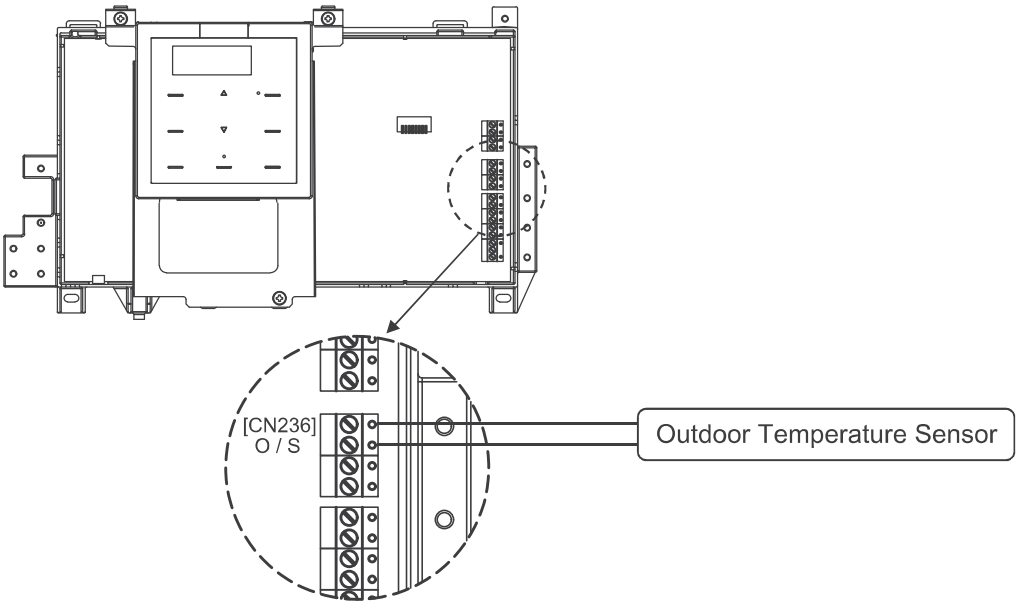
e.g. To set Highest Outdoor Temperature

Operation	Screen Display
1 Press the △ ▽ buttons to navigate in the "Installer Mode".	 
2 Select  , and then press the ENTER button to enter the function.	
3 Press the △ ▽ buttons to the desired temperature.	
4 Press the ENTER button to save the settings and to exit the function. * The others are similar to the above mentioned method.	

NOTE:
Installer Mode [I:03_Hot] :Highest Outdoor Temperature
Installer Mode [I:04_Lot] :Lowest Outdoor Temperature
Installer Mode [I:05_HHt] :Heating High Temp Range
Installer Mode [I:06_HLt] :Heating Low Temp Range

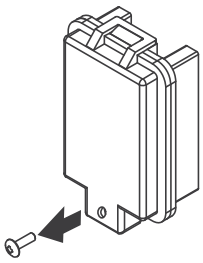
■Outdoor Temperature Sensor Installation Guidelines

- Avoid areas with direct sunlight and where temperatures may not be representative of true outdoor temperature.
- Avoid placing sensor in close proximity of heat sources that may affect correct temperature sensing. (fans, exhausts, vents, lights)
- Avoid installing the sensor in areas where the sensor is subjected to excessive moisture.
- Make sure wiring connections are secure before closing the cap.
- The sensor is a water resistant device.
- Any damage to the device may require the replacement of the entire component.
- If the system requires a fixed operating temperature, the outdoor sensor is not required and should not be installed.
  There is no connection required if an outdoor sensor is not used in the installation.
- Use a minimum 22 AWG wire for runs of 100 feet or less and minimum 18 AWG wire for runs of up to 150 feet.
- Mount the outdoor sensor on an exterior surface of the building, preferably on the North or Northeast side, in an area that will not be affected by direct sunlight or will be exposed to varying weather conditions.
- For correct mounting procedures, follow instructions provided with the sensor.
- If sensor wires are located in an area with sources of potential electromagnetic interference (EMI), the sensor wires should be shielded, or the wires routed in a grounded metal conduit.
  If using shielded cable, the shielding should be connected to the common ground of the appliance.

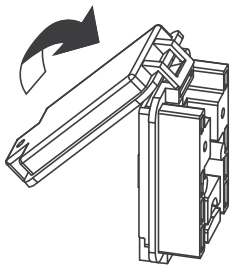


■Outdoor Temperature Sensor Installation

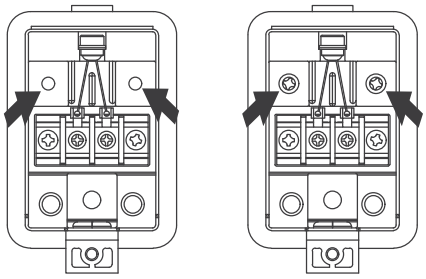
1. Loosen the screw by hand using a Phillips screwdriver indicated in the figure.



2. Remove the cover by lifting it and pulling it outward.

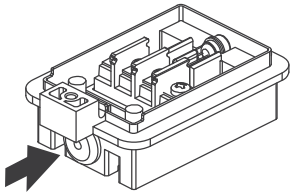


3. Mount the outdoor sensor onto an exterior surface of the building with the supplied screws (2 pcs) by hand using a Phillips screwdriver.

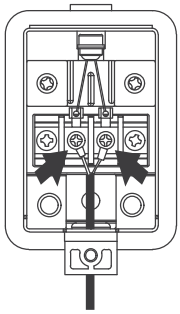


* if neccesarry, use anchors(Included Accessory).

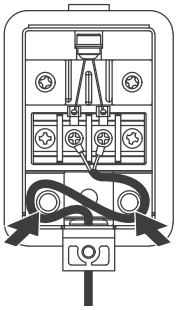
4. There is a through hole to pass wire into the case.



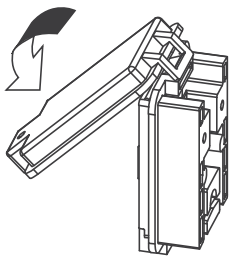
5. After leading wire into the case, connect wire to the terminal by hand using a Phillips screwdriver.



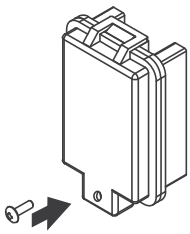
6. You can use two knobs to relieve stress of wire.



7. Replace the cover.
   The hook should be attached to the stopper.



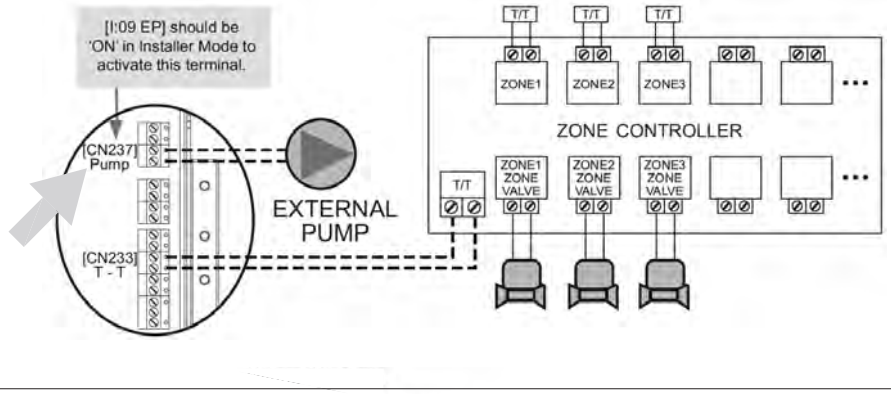
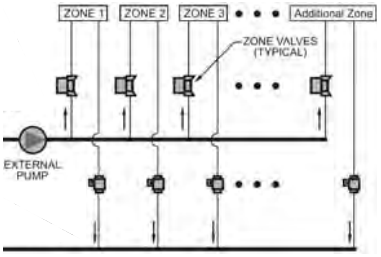
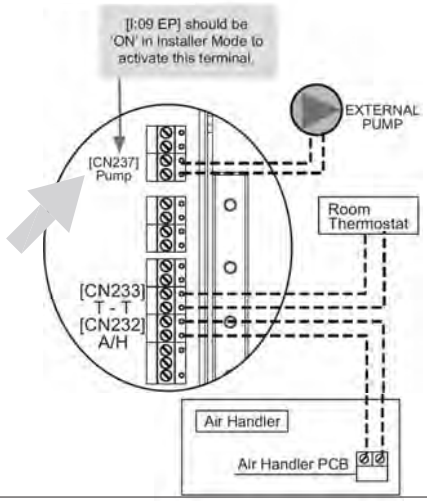
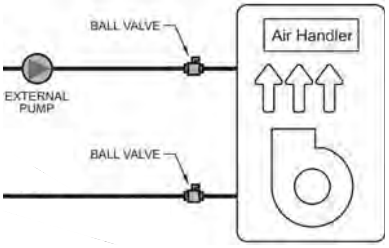
8. Tighten the screw by hand using a Phillips screwdriver indicated in the figure.



■ External Pump_[CN237] Pump *

* External Pump Terminal : [I:09_EP] should be “on” in Installer Mode to activate this terminal.

■Wiring Diagram

	piping image
Zoned with Valves 	
Air Handler 	

■Installer Mode Setting_[I:09_EPP]

Screen Display: 

This setting can activate or deactivate the terminals in the Combi Boiler for an External Pump (secondary pump) on the circuit board.

OFF: When an external pump is not used(Default Setting).

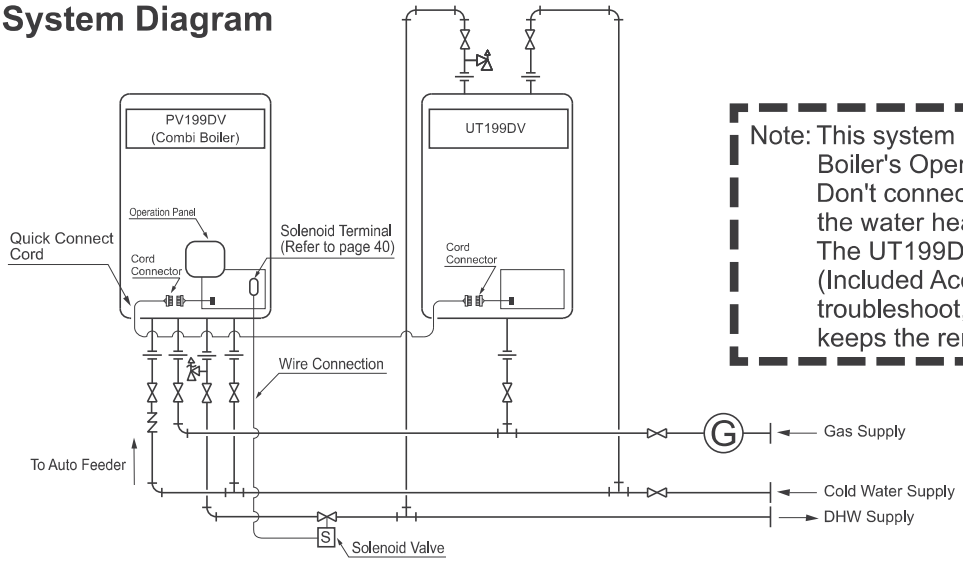
ON: When an external pump is used.

■ Solenoid Valve for Quick Connect Multi System_[CN238] SV

• The Quick Connect Multi System allows the installation of two units together utilizing only the Quick Connect Cord. Unit's MAX Btuh must be same in order to quick connect. e,g. When installing PV199DV(GHQ-3201WX-FF PB US), you must install UT199DV(GQ-C3259WX-FF PB US).

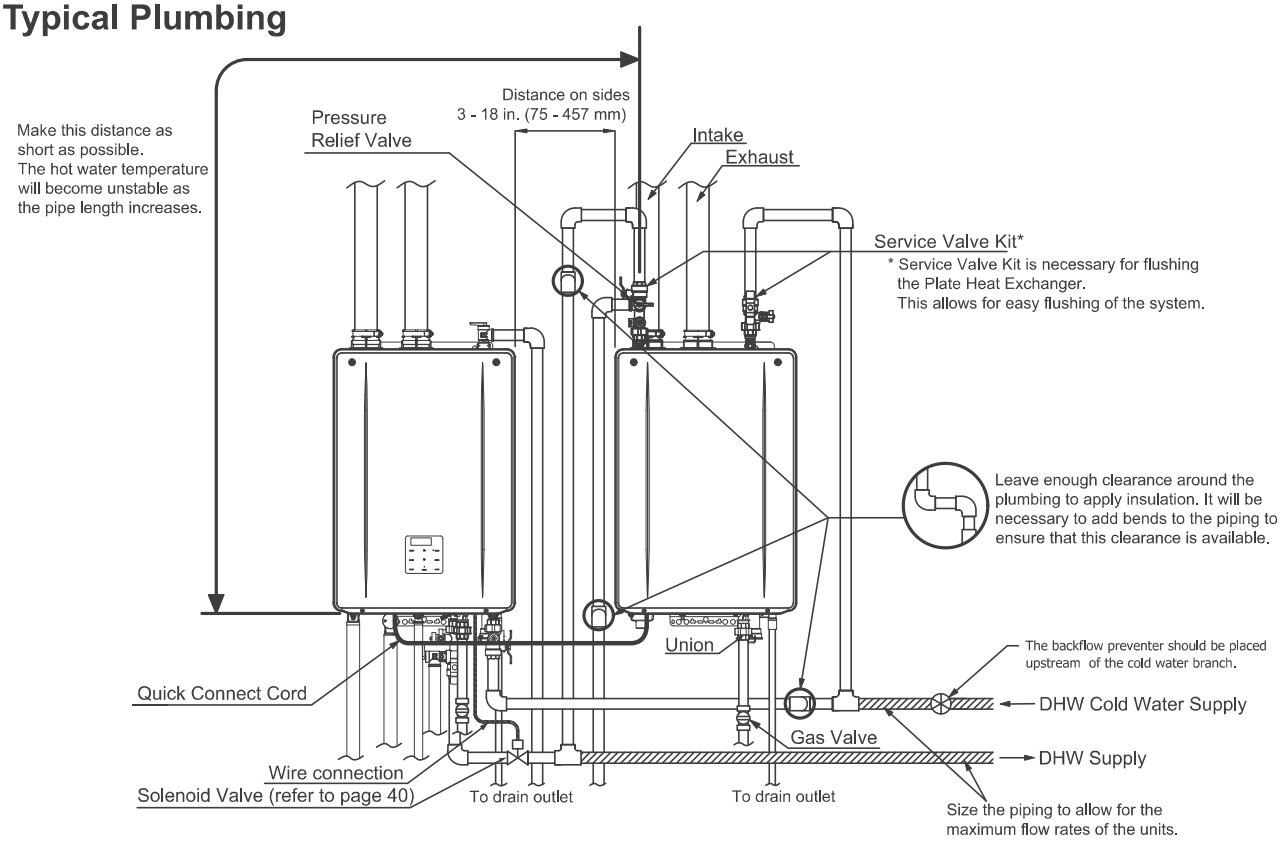
The Quick Connect Cord is 6 ft.(2m) long. Install the units 3-18" (75-457mm) apart from each other to ensure the cord will be able to reach between the units. (See Typical Plumbing diagram). (If the distance between the two units is too great, not only will the cord not be able to reach, but the water temperature may also become unstable because of the difference in pipe length between the two units).

System Diagram



Note: This system is operated by the Combi Boiler's Operation Panel.
Don't connect the remote controller to the water heater.
The UT199DV remote controller (Included Accessory) will be required to troubleshoot, make sure the customer keeps the remote for future use.

Typical Plumbing



• Insulate the hot water piping to prevent heat loss. Insulate and apply heating materials to the cold water supply piping to prevent heat loss and freezing of pipes when exposed to excessively cold temperatures.

■Connecting Quick Connect Cord-2

* For Quick Connect Multi System Installation use part #QC-2 only. (sold separately).

Do not connect electrical power to the unit until all electrical wiring has been completed.

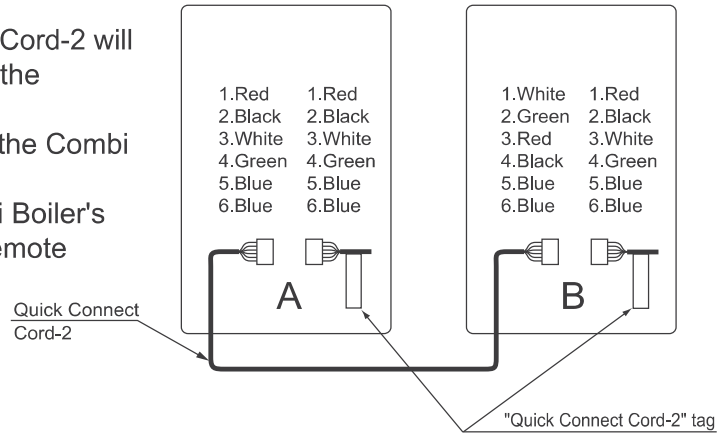
⚠ WARNING

Electrical Shock Hazard
Do not turn power on until electrical wiring is finished. Disconnect power before servicing.
Failure to do so may result in death or serious injury from electrical shock.

Caution

The wire coloring on the Quick Connect Cord-2 will not be the same as the wire coloring of the connection plug inside the unit.

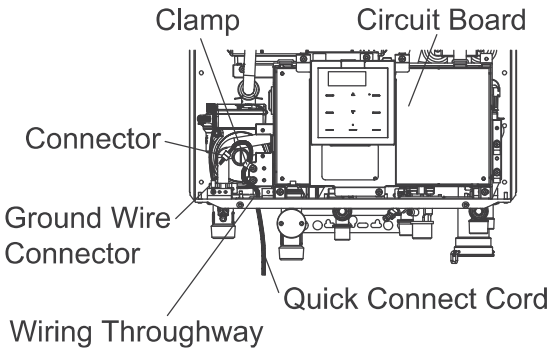
* When connecting two units, use only the Combi Boiler's Operation Panel.
* This system is operated by the Combi Boiler's Operation Panel. Don't connect the remote controller to the other unit.



Connecting the Quick Connect Cord.

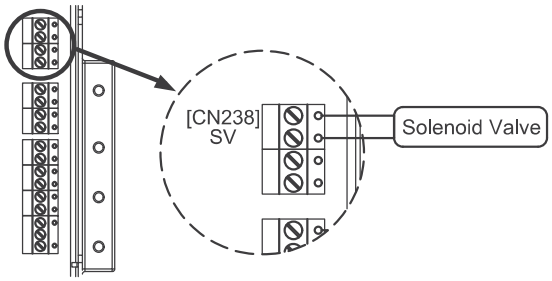
1. Turn off the power.
2. Remove the front cover of the unit (4 screws).
3. Pass the Quick Connect Cord through the wiring throughway and into the unit.
4. Plug the connector on the Quick Connect Cord to the receptacle inside the unit.
5. Attach the ground wire of the Quick Connect Cord to the terminal block fixing plate. (If the ground wire is not attached, electrical noise may cause problems).
6. Secure the Quick Connect Cord with a clamp.
7. Replace the front cover.

Connecting the cord to the Combi Boiler



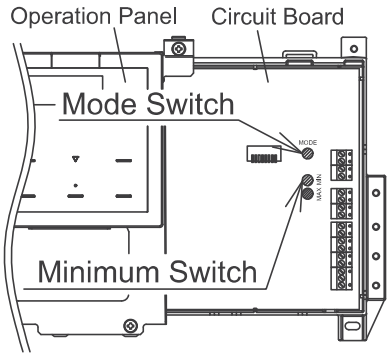
* Connecting the cord to the other unit, refer to the unit's Installation Manual.

* Specifications for a solenoid valve.
• Pipe size : 3/4"
• Voltage : 120VAC
• Current : Max 1.5A
• Normally closed (Closed when de-energized)
* A slow-closing solenoid is recommended to prevent water hammer from occurring.



■Check the Quick Connect Multi System Installation

After install the Quick Connect System, do the following step to check proper installation:

Operation	Screen Display
1 Press the ON/OFF button ON.	
2 Press the MAINTENANCE button.	1:td (td:technical data)
3 Press the ENTER button to view the "Technical Data".	03 (Data No. 03) ▼ After 2 sec. 100 (e.g.: 100)
4 Press the △ ▽ buttons to navigate through the "Technical Data". * Pressing and holding the button to change it in increments of 10.	
5 Check the Quick Connect Cord-2 connection Select 74, then check 002 appears. If 001 appears, check the Quick Connect Cord-2 connection.	74 (Data No. 74) ▼ After 2 sec. 002
6 Open the front cover and a hot water fixture. Press and hold the "Mode" and "Minimum" Switches on the Circuit Board simultaneously for more than 3 seconds. Check step 7 within 30 minutes.	
7 Check the Combi Boiler operation Select 75, then check 002 appears. If 001 appears, check the plumbling and the Solenoid Valve. When you are done, press the "Mode" Switch for more than 3 seconds, then close the hot water fixture and the front cover.	75 (Data No. 75) ▼ After 2 sec. 002
8 Press the BACK button twice or let it sit for approximately 10 minutes to return to the home screen.	

Note

The water heater can be set as the master unit in the quick connect multi system. The master unit controls the DHW ON/OFF status of the Combi Boiler in the system. Once turned on by the master unit, the Combi Boiler will operate in stages to satisfy the DHW demands.

* Please contact Noritz America at 866-766-7489 if you have any questions or concerns.

■ CO Alarm Connection (Only SV Configuration)

*When the CO Alarm operates, the unit will stop combusion for safety.<EC13>
Find out the cause of CO detection carefully. After remove the cause of CO detection, press the POWER button twice to operate again.
**On the Multi system with System Controller, System-down will occur when the System Controller is broken. <No Error code>
***CO Alarm are not required on Direct Vent (DV) systems.

1. CO Alarm Requirements

<Required>

- No voltage break contact (Normally Closed Contact) output, or connectable to a relay module with No voltage break contact output. Contact Rating: more than 2.7 mA @ 15VDC.
- Break contact output when pressing (e.g.) TEST / RESET / HUSH Button on CO Alarm.
- CO Alarm has a visual indication of operation.

<Recommended>

- Has 120 VAC 60 Hz connection and/or auxillary battery power.
- It has a warning function of End of the CO Alarm's Life.

2. Approved CO Alarm

◆ **Manufacturer :Kidde**

● **Combination Carbon Monoxide & Smoke Alarm**
Model#:KN-COPE-IC
Model#:KN-COSM-IBA

● **Carbon Monoxide Relay Module**
Model#:CO120X (Contact Rating: 10 A @ 120VAC / NON INDUCTIVE / 5 A @ 30VDC)

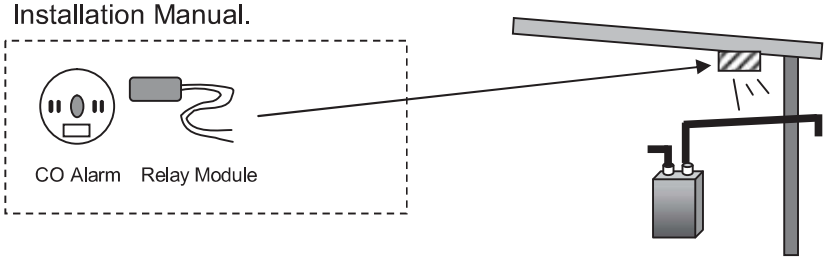
*Model number or specification will be modified by manufacturer's circumstances.
Be sure to contact the CO Alarm manufacturer.

⚠ WARNING

Be sure to maintain the CO Alarm in accordance with CO Alarm's User Manual for safety.
When the CO Alarm reaches the end of service life, be sure to replace immediately.

3. Procedure for CO Alarm connection <Single Unit>

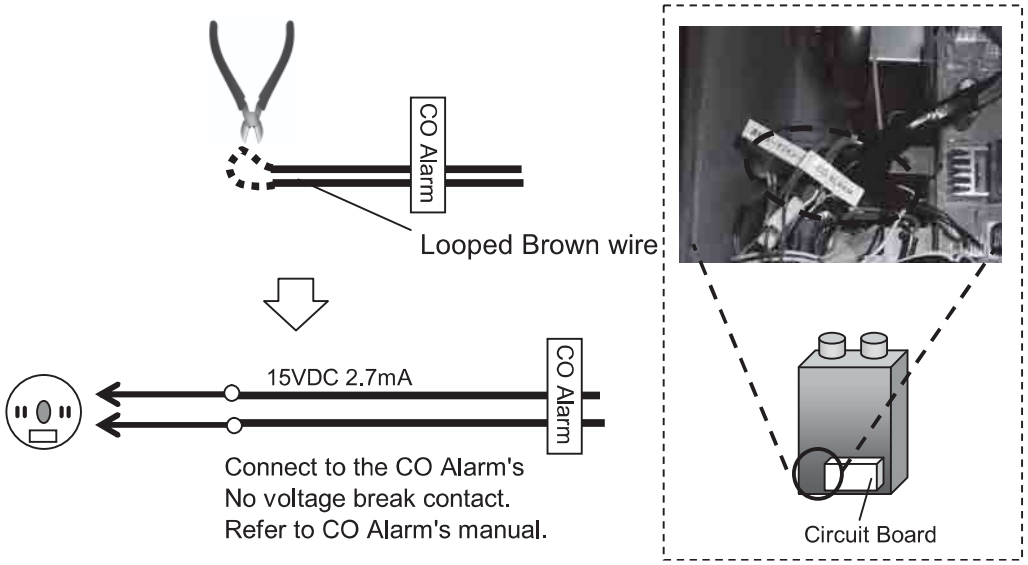
1 Disconnect power to unit and CO Alarm before the installation of electrical wiring.
Install CO Alarm (and Relay modules) in accordance with CO Alarm's Installation Manual.



*Install the CO Alarm in the same room where the units are installed.

2 Cut the CO Alarm (Looped Brown) wire in the unit.
Connect the CO Alarm (Brown) wires to CO Alarm's Break contact (Normally Closed).

⚠ DANGER
DO NOT supply any voltage in this circuit.



3 Connect power to the unit and CO Alarm.
If the remote shows [EC13], follow the directions below.
1) Disconnect power to unit.
2) Confirm the wiring is connected to break contact of the CO Alarm.
2) Confirm the wiring to the CO Alarm is correct.
3) Connect power to unit again.

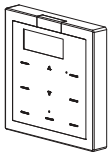
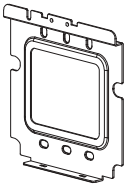
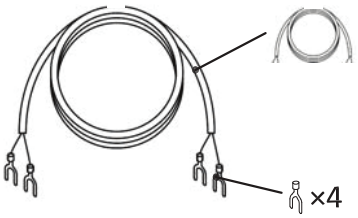
End of the installation

■ Relocating the Operation Panel to a Remote Location

Do not connect electrical power to the unit until the electrical wiring has been completed.

- Optional Accessories

The accessories listed below are not included with the unit,
but may be necessary for relocating the Operation Panel to a remote location.

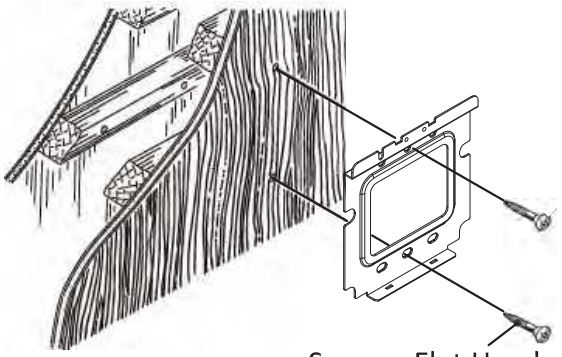
Part	Order Nos.	Shape	Q'ty/unit
Operation Panel - RC-B201M (SET)	QNCJ035		1
Wall Mounting Plate - Operation Panel	QNCA020		1
Screws and Anchors (SET)	SHE6571	 Screw - Flat Head Wood 4.1X20	2
		 Dry Wall Anchors 6X25	2
		 Screw - Flat Head Machine M4X35	2
		 Screw - Round Head Machine M3X6	2
Long Cord with Y terminals		 a wire • Recommend wire : 18-22 AWG sheathed cable • Maximum length : 160 Ft. ×4 4 of Y terminals	1

*** A new Operation Panel is required to relocate the Operation Panel.**

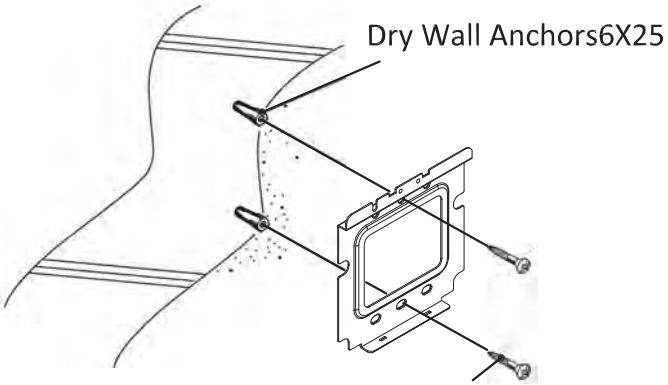
- Procedure_Attach the new Operation Panel

1. Affix the Wall Mounting Plate securely to the wall.

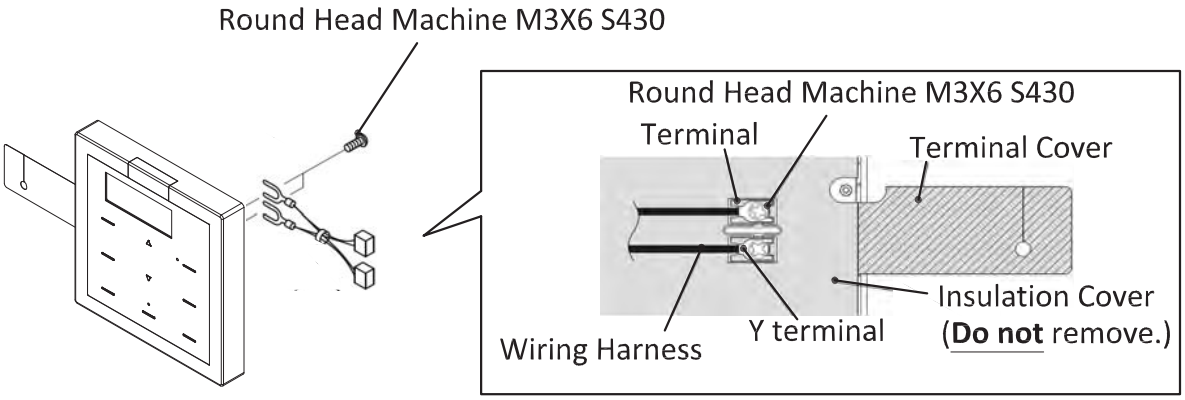
<In case of the Wooden Wall>



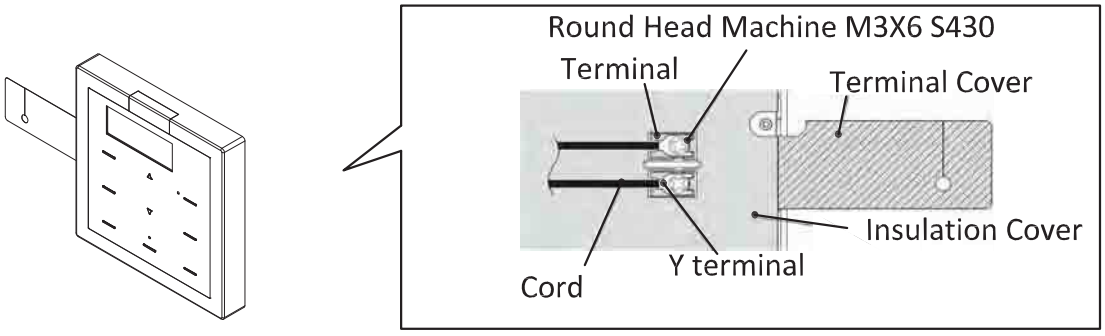
<In case of the Concrete Wall>



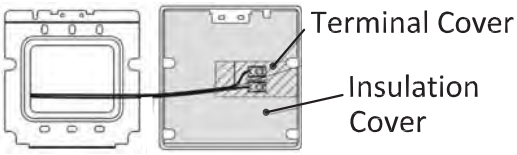
2. Remove the Wiring Harness from the new Operation Panel.



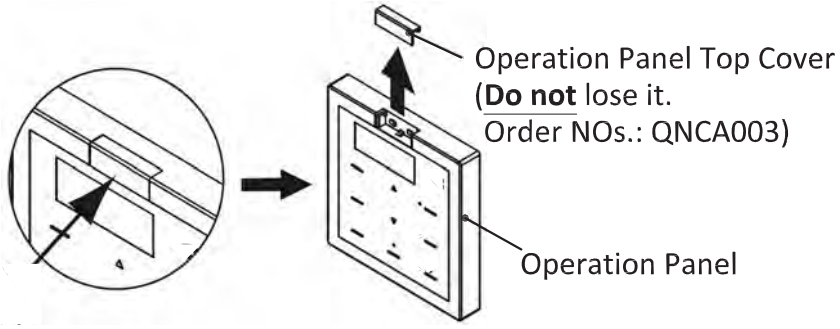
3. Attach the Long Cord to the new Operation Panel.



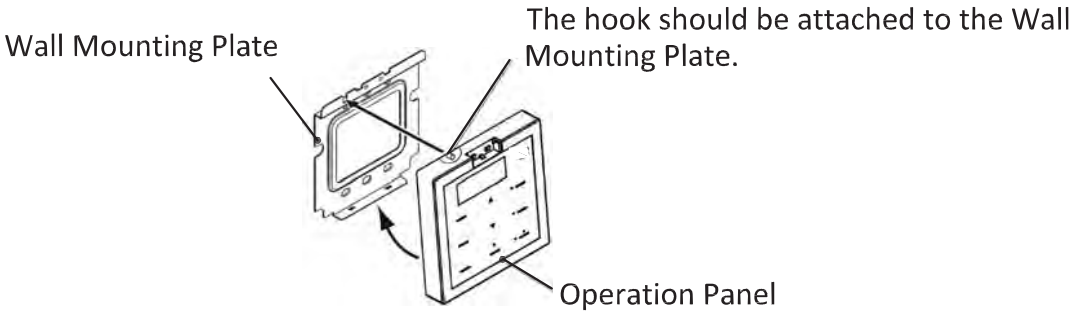
* After connecting the cord, cover Y terminals with the terminal cover.



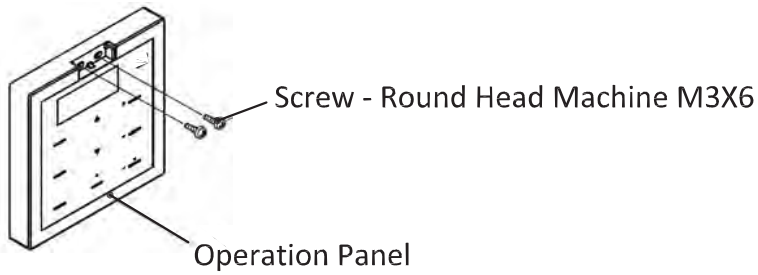
4. Remove the Operation Panel Top Cover.



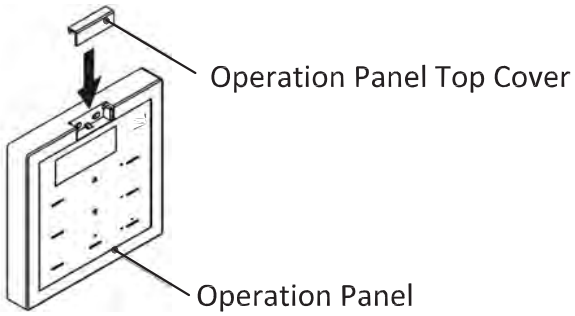
5. Attach the Operation Panel to the Wall Mounting Plate.



6. Affix the Operation Panel to the Wall Mounting Plate by Screws
   - Round Head Machine M3X6.

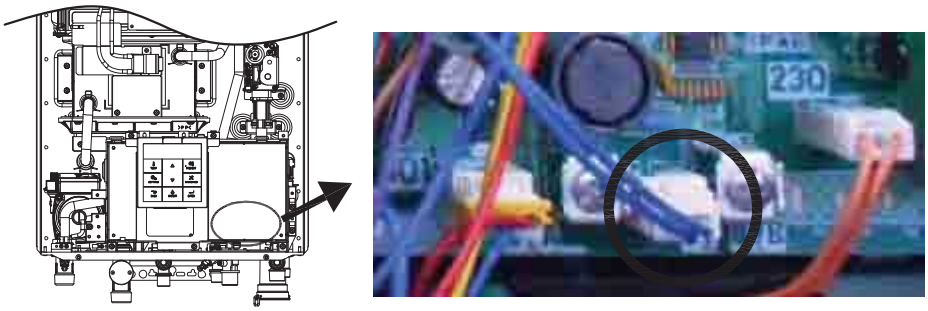


7. Attach the Operation Panel Top Cover to the Operation Panel.

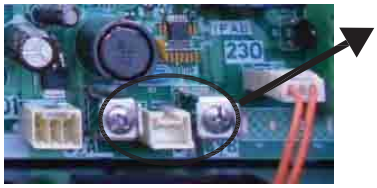


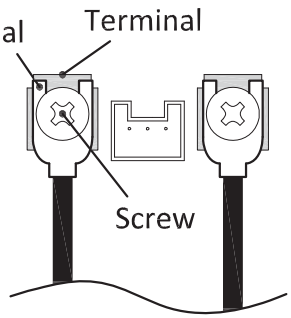
- Procedure_Plug to the unit

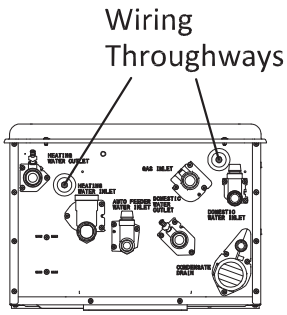
8. Remove the Front Cover of the unit (4 screws).
   Unplug the Operation Panel connector from the Circuit Board.
   (**Do not** remove the old Operation Panel from the unit.)



9. Attach the Long Cord to the Terminals on the Circuit Board with 2 Screws.
   (There are Wiring Throughways to pass the cord into the unit on bottom of the unit.)
   Attach the Front Cover with the 4 screws.

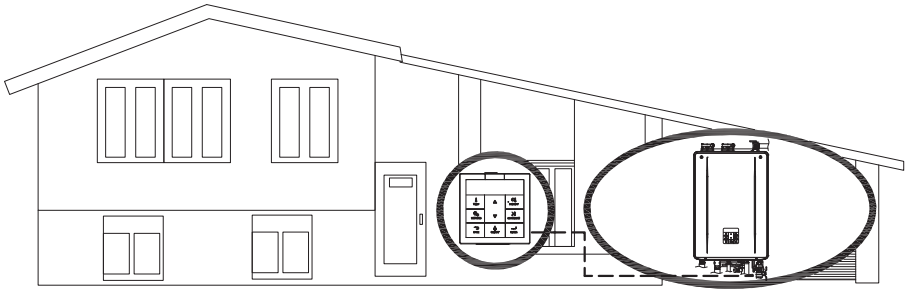






(View from bottom of the unit)

10. Connect electrical power to the unit.
    Try to operate by using the Operation Panel at the remote location.



Installer Mode (Parameter Settings)

How to enter "Installer Mode".

Operation	Screen Display

1 Press the ON/OFF button to OFF. The Operation Panel must be off.

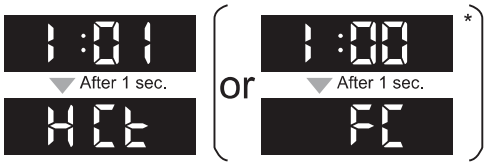
2 Press the SETTINGS button.

Select 2:1 n using the △ ▽ buttons, and

then press the ENTER button.

The "Installer Mode" screen appears.

3 When entering the "Installer Mode", display will change to 1:01 / HCt (After 1 sec.) or 1:00 / FC (After 1 sec.) *.



*This function will appear within the first 10 minutes of connecting electrical power and before pressing the ON/OFF button.

4 Press the △ ▽ buttons to navigate into the desired function in the "Installer Mode".

5 Select the desired function, then press the ENTER button to enter the function.

6 Press the △ ▽ buttons to change the parameter value.

7 When you are done, press the ENTER button to save the settings and to exit the function.

8 To exit the "Installer Mode" or another function, press the BACK button.

Function	Function Name & Description
I:00_FC (Skipped*)	Fahrenheit / Celsius 
	This mode is for changing temperature and flow rate units on the Operation Panel. * This function will appear within the first 10 minutes of connecting electrical power and before pressing the ON/OFF button.
I:01_HCt	Heating Control Type 
	This mode is for changing heating control type.
I:02_tHS (Skipped**)	Type of Heating System 
	This mode is for choosing Type of Heating System, when [I:01_HCt] setting is "2:or". There are 6 typical Heating Systems that are available. For these 6 heating types the low and high temperature points are pre-programmed. (See ranges to the below) If "2:AH" is selected, additional steps are needed to be programmed, see [I:08_Air]. To use custom low and high temperature points, select "7:CU" and follow [I:03_Hot], [I:04_Lot], [I:05_HHt] and [I:06_HLt] to set custom low and high temperature points.

TYPE	Fahrenheit [°F]		Celsius [°C]	
	LOW	HIGH	LOW	HIGH
1:Ft	120	180	49	82
2:AH	140	180	60	82
3:CI	100	170	38	76
4:Lr	80	140	27	60
5:rF	80	120	27	49
6:rA	120	170	49	76
7:CU	80 ~ [Max Set-point - 30]	[Min Set-point +30] ~ 180	27 ~ [Max Set-point - 17]	[Min Set-point +17] ~ 82

	**When [I:01_HCt] setting is "1:St" or "3:EC", this function will not appear.
I:03_Hot (Skipped***)	Highest Outdoor Temperature 
I:04_Lot (Skipped***)	Lowest Outdoor Temperature 
	These settings are for changing the highest and the lowest outdoor temperature range. You can set the Highest Outdoor Temperature [I:03_Hot] and the Lowest Outdoor Temperature [I:04_Lot], when [I:02_tHS]_"7:CU" is selected. ***When [I:02_tHS] setting is "7:CU", [I:03_Hot] and [I:04_Lot] functions will appear.

Settings		Default
1: F	F: Fahrenheit & Gallon All of the units shown on the display screen are °F & GPM.	Default
2: C	C: Celsius & Liter All of the units shown on the display screen are °C & LPM.	
To change the setting: Press and hold the △ or ▽ button for approximately 5 seconds. (°F→°C : △ button, °C→°F : ▽ button)		
1: St	St: Standard You can change the Heating Set Temperature by Operation Panel.	Default
2: or	or: Outdoor Reset Control Outdoor Reset Control is activated.	
3: EC	EC: External Control (0-10V) External Control(0-10V) is activated.	
1: Ft	Ft: Fin Tube Baseboard	Default
2: AH	AH: Air Handler	
3: CI	CI: Cast Iron Baseboard	
4: Lr	Lr: Low Mass Radiant Floor	
5: rF	rF: Mass Radiant Floor	
6: rA	rA: Radiator	
7: CU	CU: Custom	
[Min Set-point+10] ~ 110 (°F) [Min Set-point+5] ~ 43 (°C)	This should be set to the highest average outdoor temperature during the winter season. (not the highest possible outdoor temperature.)	70 °F (21 °C)
-4 ~ [Max Set-point-10] (°F) -20 ~ [Max Set-point-5] (°C)	This should be set to the lowest average outdoor temperature during the winter season. (not the lowest possible outdoor temperature.)	20 °F (-7 °C)

Function	Function Name & Description	Settings		Default
I:05_HHt	Heating High Temp Range 	[Min Set-point+30] ~ 180 (°F) [Min Set-point+17] ~ 82 (°C)		180 °F (82 °C)
I:06_HLt	Heating Low Temp Range 	80 ~ [Max Set-point-30] (°F) 27 ~ [Max Set-point-17] (°C)		100 °F (38 °C)
	These settings are for changing the heating high temperature range and low temperature range. You can change the Highest Set Temperature [I:05_HHt] and the Lowest Set Temperature [I:06_HLt] by adjusting the numbers on the display. If [I:01_HCt]_"2:or" is selected then the settings for [I:05_HHt] and [I:06_HLt] will be overridden by [I:02_tHS] settings. (except below) If [I:02_tHS]_"7:CU" is selected then the settings for [I:05_HHt] will be the heating high temperature range and [I:06_HLt] will be heating low temperature range.			
I:07_bSt (Skipped*)	Boost Timing 	OFF, 1 - 120min	OFF: Boost Timing is deactivated. 1 - 120min: Time before starting the boost operation.	OFF
	This setting is to increase the set temperature during unit cold start up if the actual room temperature doesn't reach the thermostat set temperature quick enough, the Boost time function will increase the set temperature of the Combi Boiler by 10°F (5°C) after the selected Boost time setting has passed. Example : Room thermostat set at 72°F, Combi Boiler set temp at 140°F, and Boost time function set to 30 min. If the room temperature does not reach 72°F within 30 min then the Combi Boiler will increase its set temp from 140°F to 150°F. *When [I:01_HCt] setting is "2:or" or "3:EC", this function will appear.			
I:08_Air	Air Handler 	OFF, ON	OFF: When an air handler is not used. ON: When an air handler is used.	OFF
	This function needs to be turned 'on' if an Air Handler is being used as a heating type. The Air Handler function is designed to stop the Air Handler's pump and fan operation when the Combi Boiler's operation is not suitable for the Air Handler.			
I:09_EPP	External Pump 	OFF, ON	OFF:When an external pump is not used. ON:When an external pump is used.	OFF
	This setting can activate or deactivate the terminals in the Combi Boiler for an External Pump (secondary pump) on the circuit board.			
I:10_rFt	Re Fire Time 	0 - 20min		3min
	This function is to set up the interval time in Heating Mode to prevent inconsistent heating. If the selected time passes and the Combi Boiler's inside temperature drops, this function will automatically reignite the burner in the Combi Boiler.			

Function	Function Name & Description	Settings		Default
I:11_Pot	Pump Overrun Time 	OFF, 1 - 40min		OFF
	This mode is to control how long the pump will run after the heating demand is satisfied. This setting is to prevent unnecessary running of the pump and extend the life of the pump.			
I:12_bFt	Differential Burner OFF Temperature 	0 - 27 (°F) 0 - 15 (°C)		13 °F (7 °C)
I:13_bot	Differential Burner ON Temperature 	5 - 27 (°F) 3 - 15 (°C)		18 °F (10 °C)
	When the internal temperature of the Combi Boiler is too high or low the unit will stop burning or start burning.	Burner OFF Temperature = Heating Set Temperature + [I:12_bFt] Burner ON Temperature = Heating Set Temperature - [I:13_bot]		
I:14_HPS	Heating Water Pressure Setting 	12 - 26 PSI		12 PSI
	This function is to control the water pressure on the heating side of the Combi Boiler. This will insure there is enough water inside the Combi Boiler to operate correctly. When using the external water feeder, set to the proper pressure for the external water feeder. If not, the Combi Boiler may shut down frequently.	Water Refilling Pressure = Setting Pressure - 4 PSI Water Refilling Stop Pressure = Setting Pressure + 2 PSI		
I:15_AFA	Auto Feeder Activation 	OFF, ON	ON: The Auto Feeder is activated. OFF: The Auto Feeder is deactivated.	ON
	This setting can activate or deactivate the Auto Feeder. If the heating system does not require the Auto Feeder operation, set [I:15_AFA] OFF and plug the Auto Feeder Water Inlet Connection.	To change the setting: Press and hold the △ or ▽ button for approximately 2 seconds. (ON→OFF : △ button, OFF→ON : ▽ button)		
I:16_dHP	DHW/Space Heating Priority 	1:St	St:Standard Mode Simultaneous use of DHW & Heating.	Default
	This mode is for choosing the Combi Boiler operation "Simultaneous use of DHW & Heating" or "DHW Priority". This Combi Boiler can operate DHW/Heating at the same time.* But if a heating system is not suitable for simultaneous use of DHW & Heating, set [I:16_dHP] "2:dH". *Depend on the conditions (refer to pages 60-61).	2:dH	dH:dHW DHW Priority.	
		To change the setting: Press and hold the △ or ▽ button for approximately 2 seconds. (1:St→2:dH : △ button, 2:dH→1:St : ▽ button)		
I:17_dHt	DHW Wait Time 	OFF, 1 - 30min		OFF
	This setting is when the duration of the Combi Boiler maintains the DHW supply mode after a DHW demand. (The circulation pump will keep running and if necessary, burner will ignite.) With the DHW Wait Time is enabled, a faster DHW supply may be available when there is a subsequent DHW demand.			

Function	Function Name & Description	Settings		Default
I:18_CLr	Setting CLear 	OFF, ON		OFF
	This setting may be used to reset all the parameters in installer mode to their factory default settings. * Except [I:00_FC] setting.	Press and hold the △ button for approximately 5 seconds to reset all parameters. (The ▽ button cannot accept.)		

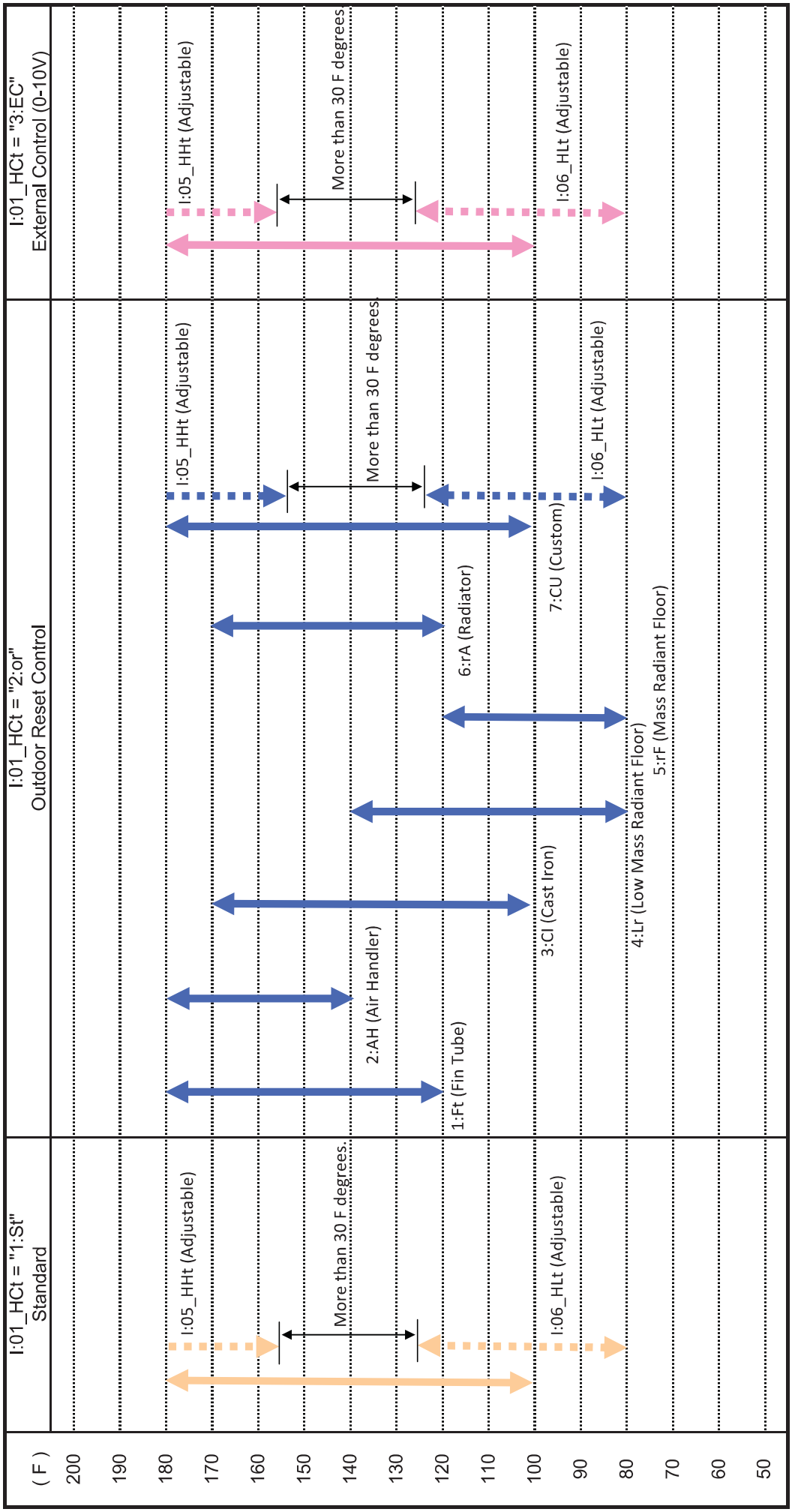
■ Installer Mode (Parameter Settings) table

			1	2	3	4	5	6	7	8	9
I:00_FC	***F***ahrenheit / ***C***elsius						O*				
I:01_HCt	***H***eating ***C***ontrol ***T***ype 1:St Standard 2:Or Outdoor reset control 3:EC External Control	1:St	●								
		2:Or					●				
		3:EC									●
I:02_tHS	***T***ype of ***H***eating ***S***ystem 1: Ft Fin Tube Baseboard 2: AH Air Handler 3: CI Cast Iron Baseboard 4: Lr Low Mass Radiant Floor 5: rF Mass Radiant Floor 6: rA Radiator 7: CU Custom	1: Ft		●							
		2: AH			●						
		3: CI				●					
		4: Lr					●				
		5: rF						●			
		6: rA							●		
		7: CU								●	
I:03_Hot	***H***ighest ***O***utdoor ***T***emperature									O	
I:04_Lot	***L***owest ***O***utdoor ***T***emperature									O	
I:05_HHt	***H***eating ***H***igh ***T***emp Range		O							O	O
I:06_HLt	**H**eating ***L***ow ***T***emp Range		O							O	O
I:07_bSt	***B***oo***s***t ***T***iming			O	O	O	O	O	O	O	O
I:08_Air	Air Handler		O	O	O	O	O	O	O	O	O
I:09_EPP	***E***xternal ***P***um***p***		O	O	O	O	O	O	O	O	O
I:10_rFt	***R***e ***F***ire ***T***ime		O	O	O	O	O	O	O	O	O
I:11_Pot	***P***ump ***O***verrun ***T***ime		O	O	O	O	O	O	O	O	O
I:12_bFt	Differential ***B***urner O***F***F ***T***emperature		O	O	O	O	O	O	O	O	O
I:13_bot	Differential ***B***urner ***O***N ***T***emperature		O	O	O	O	O	O	O	O	O
I:14_HPS	***H***eating Water ***P***ressure ***S***etting		O	O	O	O	O	O	O	O	O
I:15_AFA	***A***uto ***F***eeder ***A***ctivation		O	O	O	O	O	O	O	O	O
I:16_dHP	***D***HW/Space ***H***eating ***P***riority		O	O	O	O	O	O	O	O	O
I:17_dHt	***DH***W Wait ***T***ime		O	O	O	O	O	O	O	O	O
I:18_CLr	Setting ***CL***ear		O	O	O	O	O	O	O	O	O

● : Valid item O : Available item

* This function will appear within the first 10 minutes of connecting electrical power and before pressing the ON/OFF button.

■Heating temperature range



END