CONDENSING GAS COMBI BOILER

Service Manual

Models

100K Heating (180K DHW) Btu/h Models
120K Heating (199K DHW) Btu/h Models

- **Natural Gas(NG) / Liquid Propane Gas (LP)**

NOTE TO CONSUMER: DO NOT DESTROY THIS MANUAL. PLEASE READ CAREFULLY AND KEEP ALL INSTRUCTIONS FOR FUTURE REFERENCE.

The surfaces of these products contacted by consumable water contain less than 0.25% lead by weight, as required by the Safe Drinking Water Act, Section 1417.

⚠ WARNING

WARNING: If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or death.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.
- Installation and service must be provided by a qualified installer, service agency or the gas supplier.

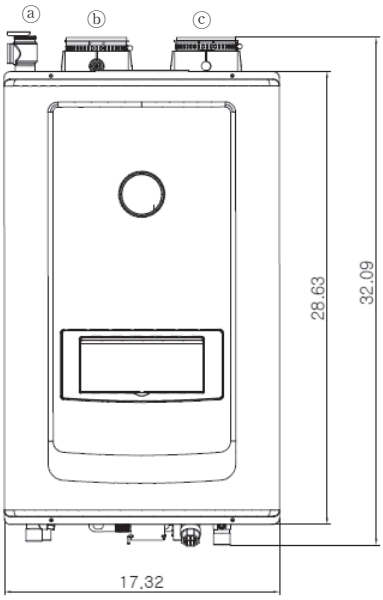
Improper installation, adjustment, alteration, service, or maintenance can cause injury, property damage, or death. Refer to this manual. Installation and service must be performed by a qualified installer, service agency, or gas supplier.

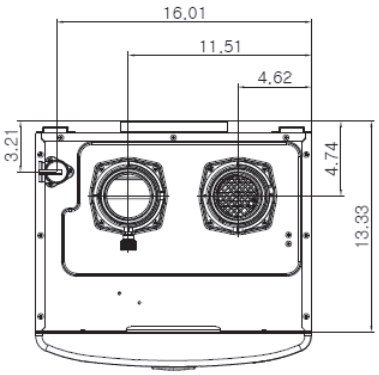
⚠ WARNING

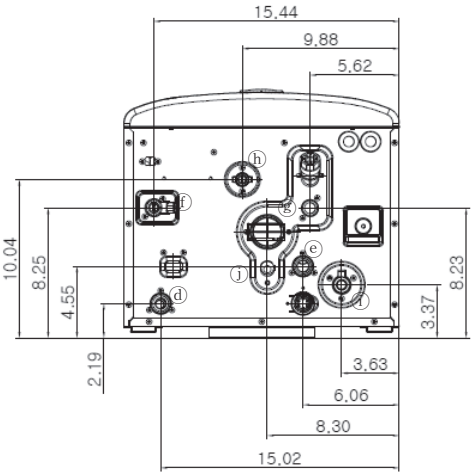
Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Model			120K Heating (199K DHW) Btu/hr		100K Heating (180K DHW) Btu/hr	
Gas Input Rate (DHW mode)	MAX		199,000 Btu/h (58.3 kW/h)		180,000 Btu/h (52.7 kW/h)	
	MIN		18,000 Btu/h (5.2 kW/h)		18,000 Btu/h (5.2 kW/h)	
DHW Capacity	35°F Rise		9.9 GPM (37.4 LPM)		9.0 GPM (34 LPM)	
	45°F Rise		7.7 GPM (29.1 LPM)		7.0 GPM (26.4 LPM)	
	77°F Rise		4.5 GPM (17 LPM)		4.1 GPM (15.5 LPM)	
Gas Input Rate (Heating mode)	MAX		120,000 Btu/h (35.1 kW/h)		100,000 Btu/h (29.3 kW/h)	
	MIN		18,000 Btu/h (5.2 kW/h)		18,000 Btu/h (5.2 kW/h)	
Installation			Indoor Wall Hung			
Flue System			Sealed Combustion Direct Vent, Single Vent			
Max Vent Run			2"(50ft) / 3"(100ft) Schedule 40 PVC, CPVC, PP			
Orifice Size	NG (Gas / Needle)		0.342"(8.7mm) / 0.354"(9.0mm)			
	LP (Gas / Needle)		0.259"(6.6mm) / 0.259"(6.6mm)			
Gas Supply Pressure	NG		3.5" WC to 10.5" WC (0.87 kPa to 2.62 kPa)			
	LP		8.0" WC to 14.0" WC (1.99 kPa to 3.49 kPa)			
Manifold Pressure	Gas Type		NG	LP	NG	LP
	Low Fire	2"/ 3" VENT	-0.04" WC (-10 Pa)	-0.04" WC (-10 Pa)	-0.04" WC (-10 Pa)	-0.04" WC (-10 Pa)
	High Fire	2"/ 3" VENT	-0.32" WC (-80 Pa)	-0.28" WC (-70 Pa)	-0.28" WC (-70 Pa)	-0.26" WC (-65 Pa)
Power Supply	Main Supply		120VAC 60Hz			
	Maximum Power Consumption		187W(71W+116W Pump)		180W (64W + 116W Pump)	
			120VAC Max 2A External Pump (Optional)			
Ignition System			Direct Electronic Ignition / Automatic Flame Sensing			
Burner System			Premixed Metal Fiber Burner			
Gas Valve System			Air Ratio Valve			
Minimum Flow Activation Flow			0.5 GPM (2 LPM)			
Internal Pipe Material			STS 304, Copper Tubing			
Dimensions			W17.3" – H28.7" – D14.8" (W440mm - H730mm - D375mm)			
Weight			90lb (40kg)			
Water Holding Capacity			Under 2 Gallons (7.5 Liters)			
Control Panel /Circuit Board			P-960C / NGTX-9600C			
Water Pressure	MAX		DHW 150 psi (10.5 kgf/cm^2) / Heating 30 psi (2.1 kgf/cm^2)			
	MIN		DHW 15 psi (1 kgf/cm^2) / Heating 12 psi (0.8 kgf/cm^2)			
Materials	Case		Cold Rolled Carbon Steel			
	Heat Exchanger		Primary Heat Exchanger : STS 304 Secondary Heat Exchanger : STS 304			
Safety Devices			Flame Sensor, High Limit Switch , Gas Leakage Detector , Water Leakage Detector Exhaust Thermistor, Pressure Sensor Heating Supply Thermistor			

Dimensions

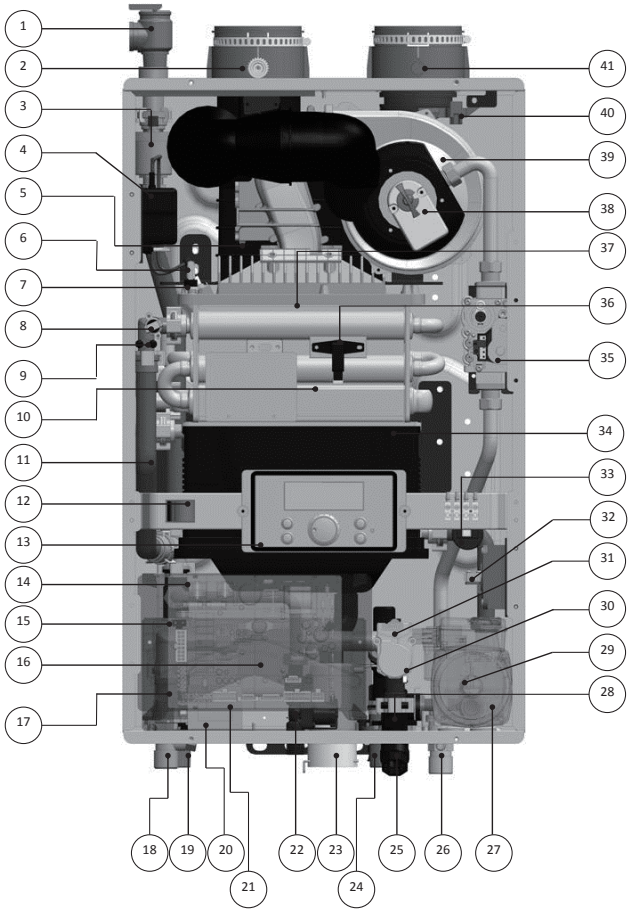






	DESCRIPTION	DIAMETER (ALL NPTM)
ⓐ	Pressure Relief Valve for Heating	3/4”
ⓑ	Exhaust Vent Connection	3”
ⓒ	Intake Pipe Connection	3”
ⓓ	CH Supply Connection	1”
ⓔ	CH Return Connection	1”
ⓕ	DHW Outlet Connection	3/4”
ⓖ	DHW Inlet Connection	3/4”
ⓗ	Auto Feeder Inlet Connection	1/2”
ⓘ	Gas Connection	3/4”
ⓙ	Condensate Drain Connection	1/2”

Name of Components

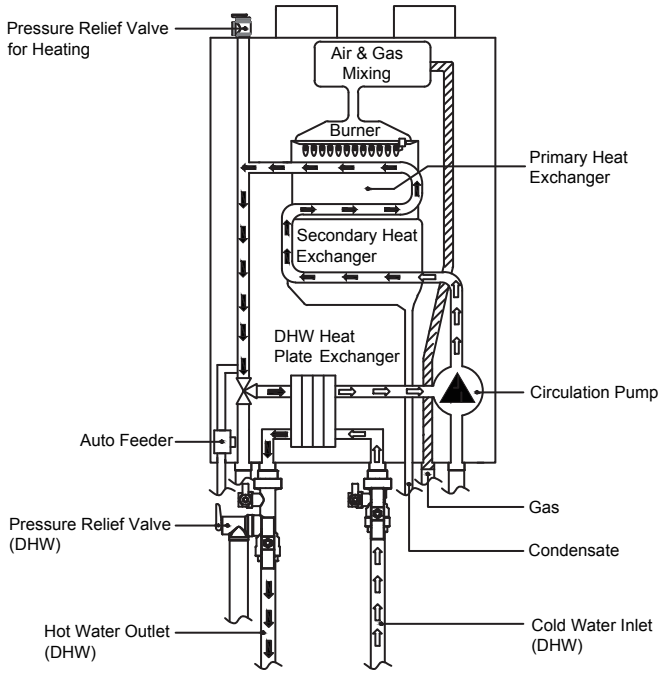


NO	Name of Component	NO	Name of Component	NO	Name of Component
1	Pressure Relief Valve	15	3-Way Valve	29	Heating Return Thermistor
2	Exhaust	16	DHW Plate Heat Exchanger	30	Water Flow Sensor
3	Air Vent	17	DHW Thermistor	31	Flow Control Valve
4	Igniter	18	DHW Connection	32	Air Pressure Switch
5	Exhaust Thermistor	19	Heating Supply Connection	33	Pressure Sensor
6	Ignition Rod	20	Water Leakage Detector	34	Secondary Heat Exchanger
7	Burner Limit Switch	21	AC 24V Transformer	35	Gas Valve
8	High Limit Switch	22	Auto Feeder Connection	36	Flame Sensor
9	Heating Supply Thermistor	23	Condensate Trap	37	Burner
10	Primary Heat Exchanger	24	Heating Return Connection (Filter)	38	AGM (Air Gas Mixer)
11	Heating Outlet Pipe	25	DHW Cold Water Connection	39	Fan Motor
12	Manual Power Switch	26	Gas Connection	40	Air Inlet Filter
13	Control Panel	27	Circulation Pump	41	Air Intake
14	Circuit Board	28	DHW Cold Water Thermistor		

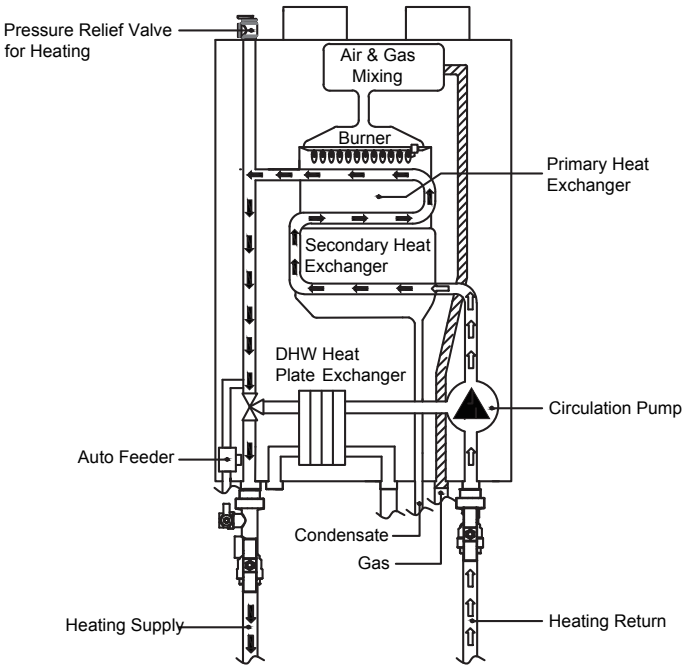
Water Route Schematic

- Pipe material must be suitable to meet local codes and industry standards.
- The pipe must be cleaned and without blemish before any connections are made.
- Do not apply a torch within 12” of the appliance. Doing so could damage the appliance. Such damages ARE NOT covered by product warranty.
- The size of the hot water pipe should be ¾” diameter and the central heating water pipe should be 1” in diameter.
- To ease future maintenance isolation valves are recommended on both the CH and DHW loops.
- All piping should be insulated.

[Domestic Hot Water Mode]

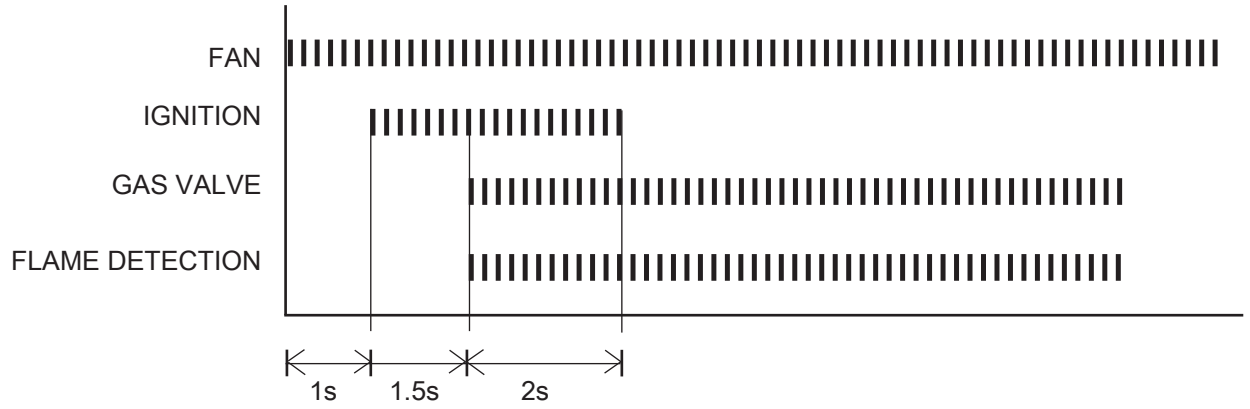


[Space Heating Mode]

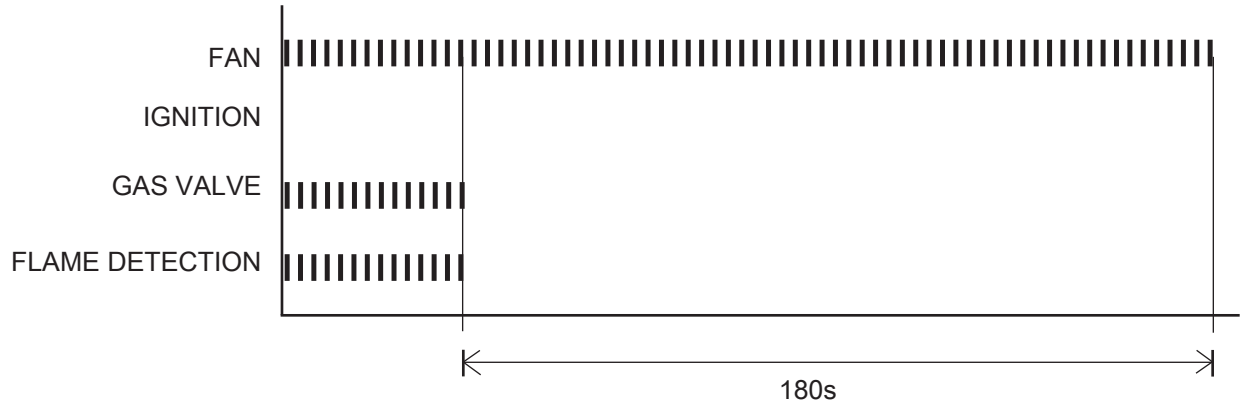


■ Timing Logic

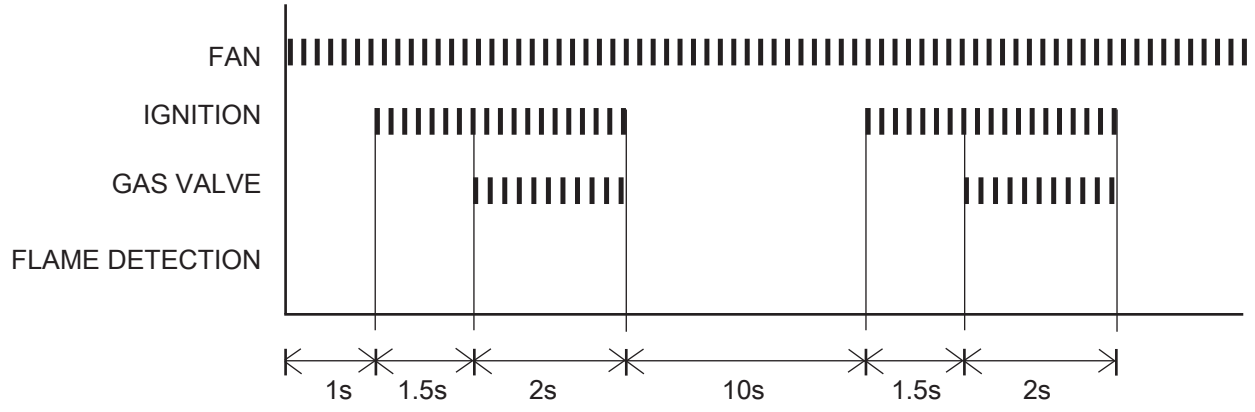
■ Normal Ignition



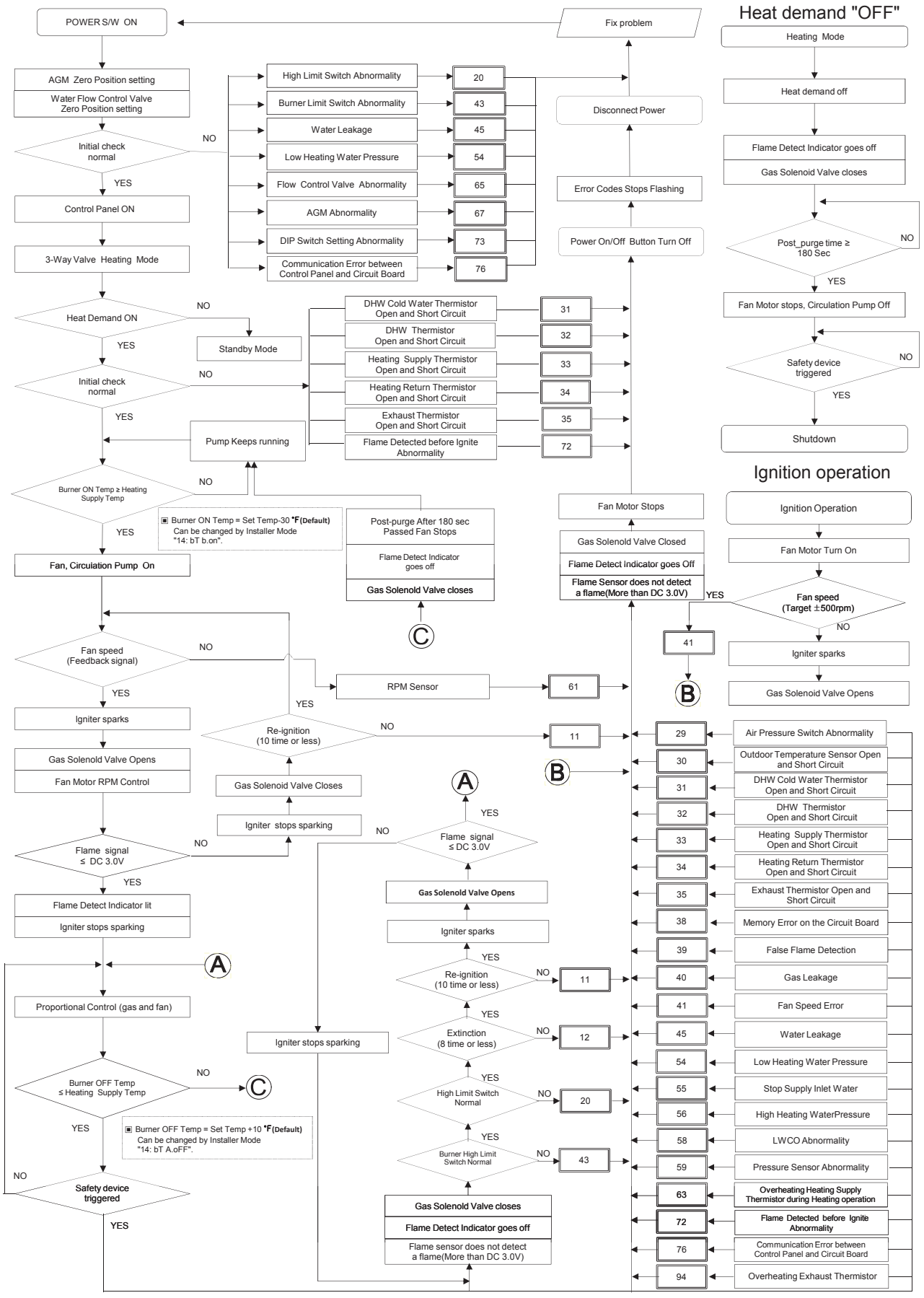
■ Normal Shutdown



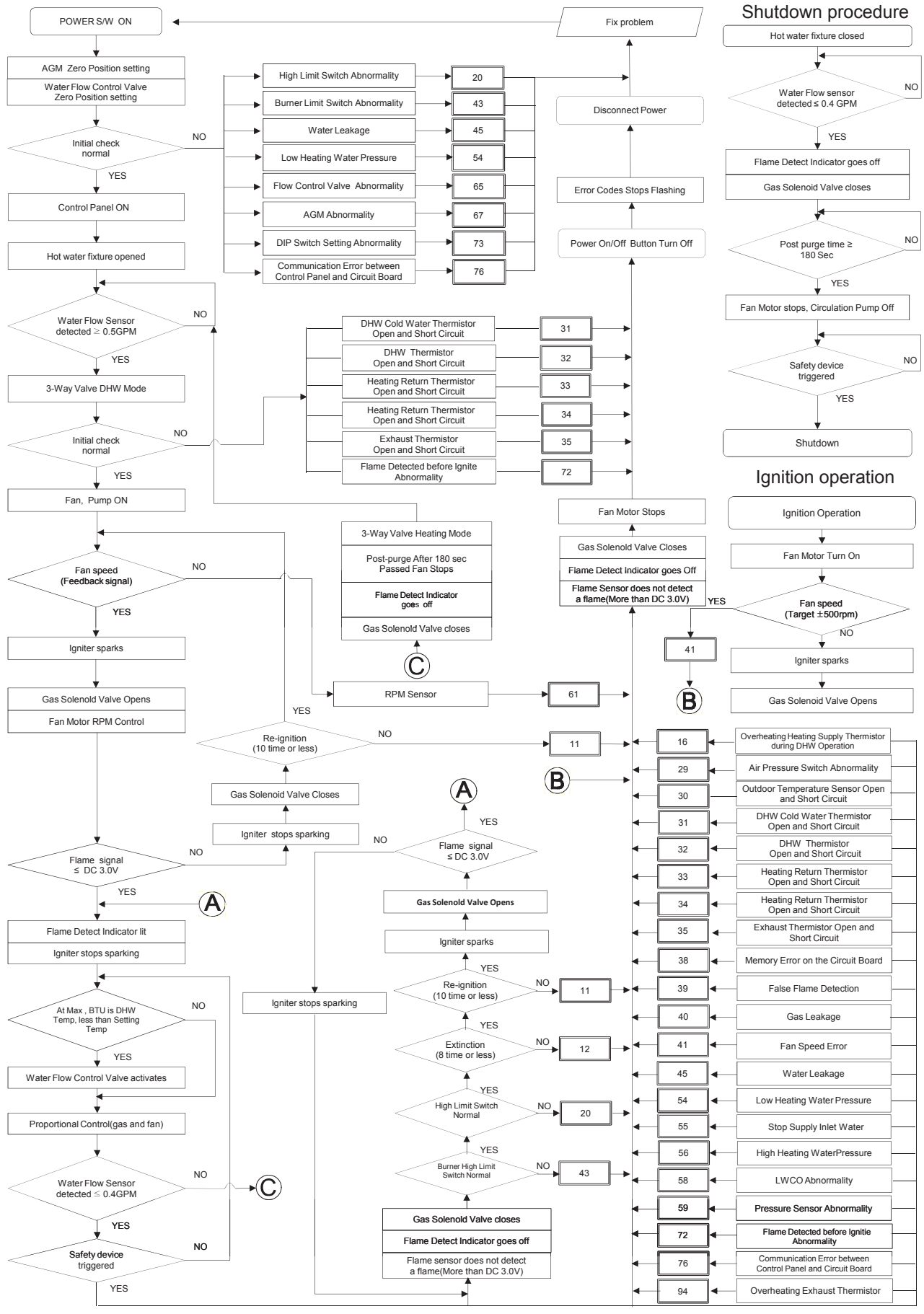
■ Ignition Failure (Error Code after 10 times)



Heating Mode Flow Chart

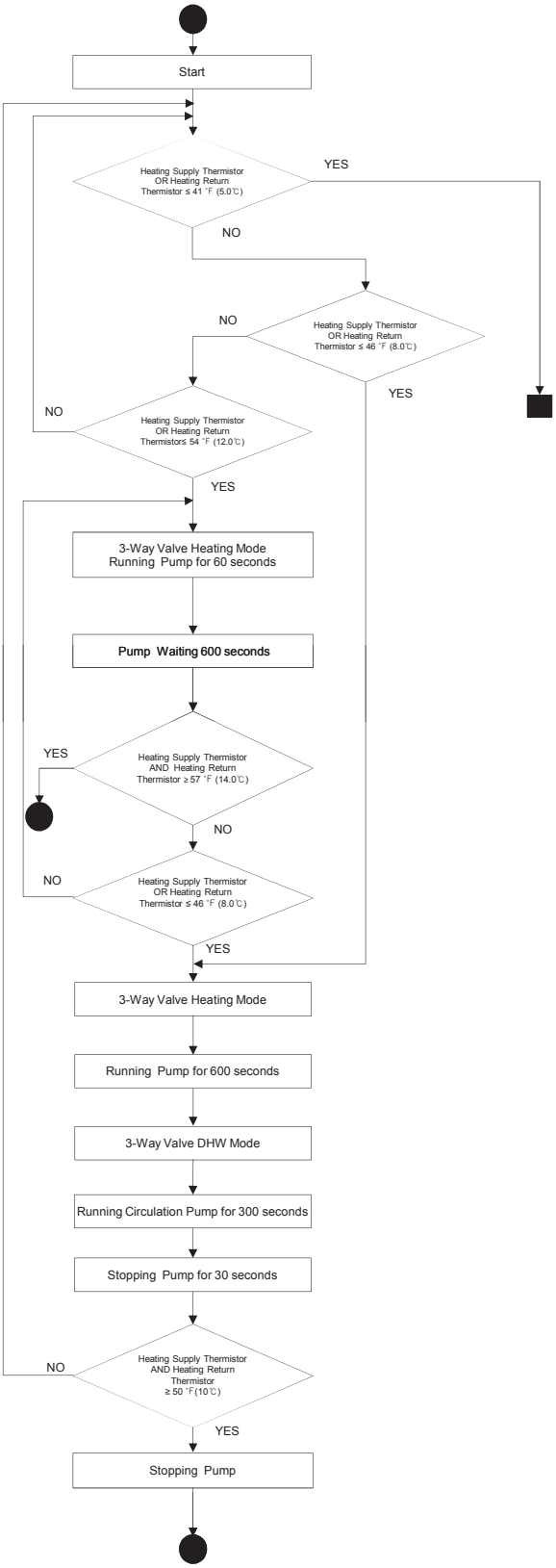


Hot Water Mode Flow Chart

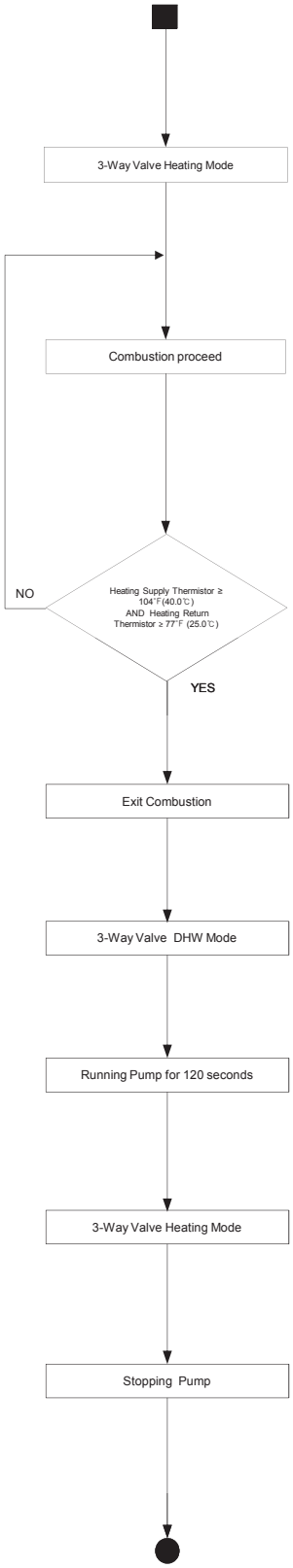


Freeze Protect Flow Chart

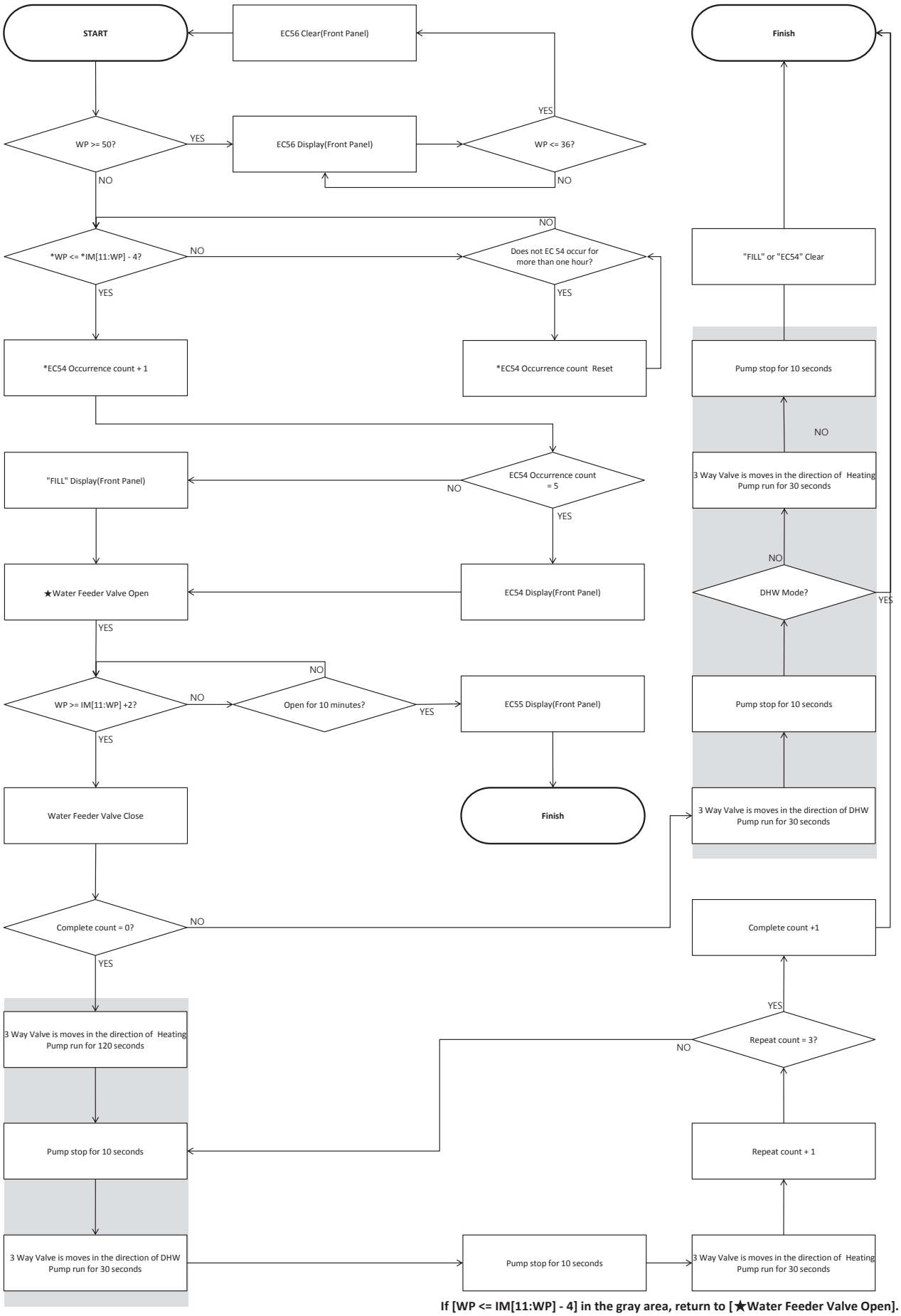
▶ Primary Freeze Prevention Control Flow



▶ Secondary Freeze Prevention Control Flow

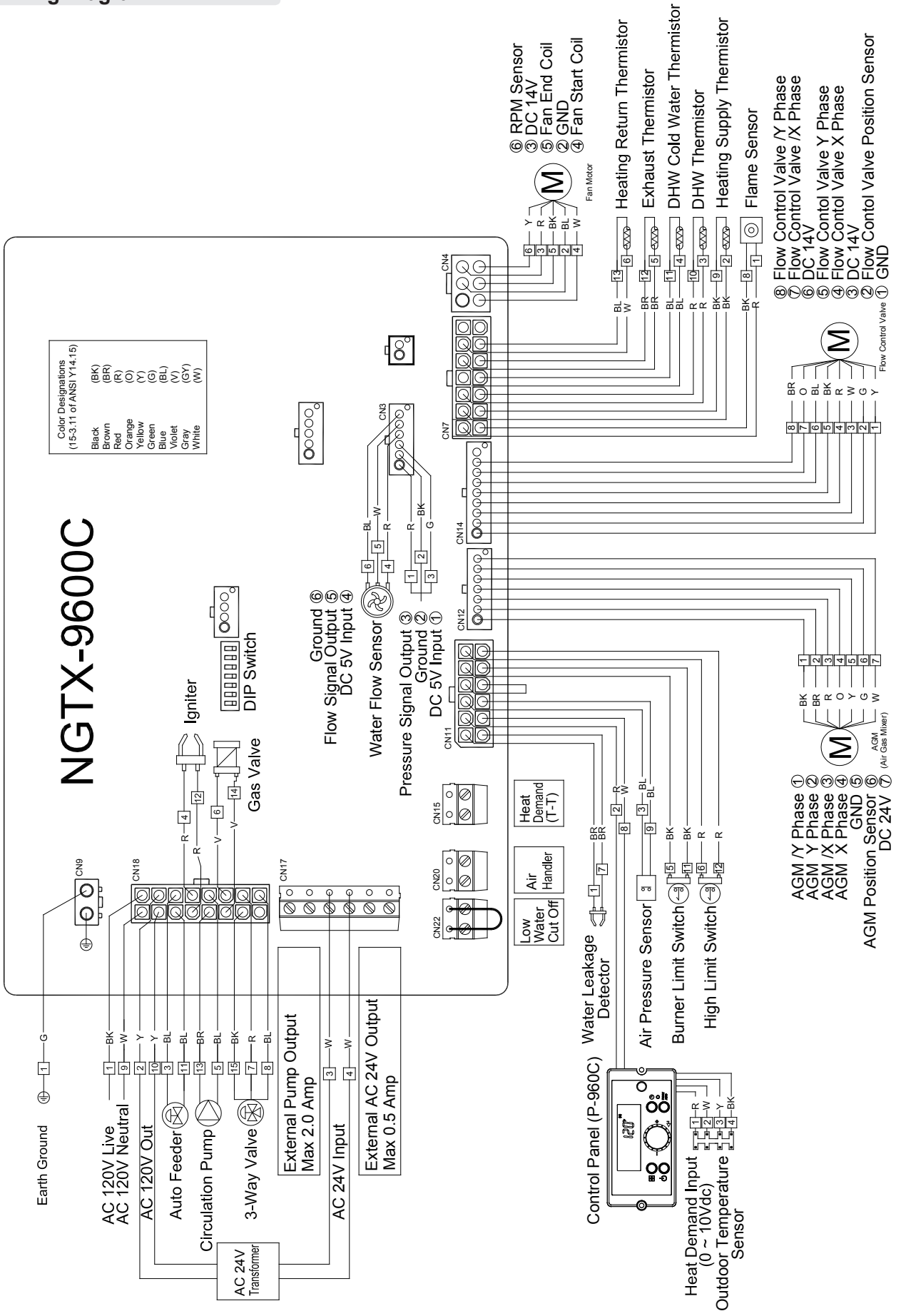


■ Auto Feeder Flow Chart



If [WP <= IM[11:WP] - 4] in the gray area, return to [★Water Feeder Valve Open].

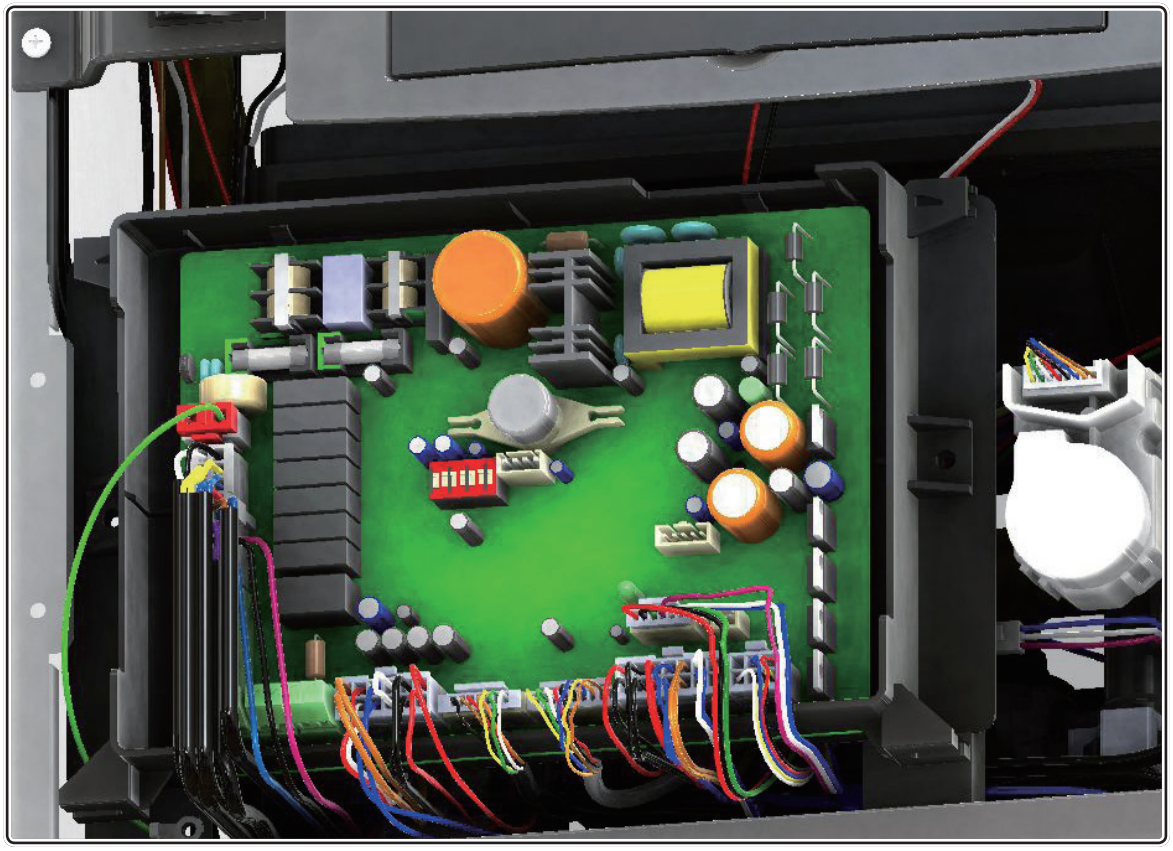
Wiring Diagram



CN No.	Pin No.	Part		Color	Normal Value
CN18	1,9	AC120V Input		BK/W	AC 120 V
	2,10	AC120V Output		Y/Y	AC 120 V
	3,11	Auto Feeder		BL/BL	AC 120 V
	4,12	Igniter		R/R	AC 120 V
	5,13	Circulation Pump		BL/BR	AC 120 V
	6,14	Gas Valve		V/V	AC 120 V
	7	3-Way Valve	Heating	R	AC 120 V
	8		DHW	BL	
	15		Common	BK	Common
	16	N/A		-	-
CN11	1	Water Leakage Detector		BR	DC 14 V
	7			BR	
	2	Control Panel (P-960C)		R	DC 14 V
	8			W	
	3	Air Pressure Sensor		BL	DC 14 V
	9			BL	
	4	N/A		-	-
	10			-	
	5	Burner Limit Switch (Overheat Limit Switch)		BK	DC 14 V
	11			BK	
	6	High Limit Switch (Overheat Limit Switch)		R	DC 14 V
	12			R	
CN17	1	External Pump		-	AC 120 V
	2			-	
	3	AC 24V Input		W	AC 24 V
	4			W	
	5	AC 24V Output		-	AC 24 V
	6			-	
CN20	1	Air Handler		-	-
	2			-	-
CN22	1	Low Water Cut Off		-	-
	2			-	-
CN15	1	Heat Demand (T-T)		-	-
	2			-	-
CN4	1	N/A		-	-
	2	Ground		BL	DC 30 V
	3	Fan VDD		R	DC 14 V
	4	Fan Start Coil		W	DC 30 V
	5	Fan End Coil		BK	DC 30 V
	6	Fan RPM Sensor		Y	DC 14 V

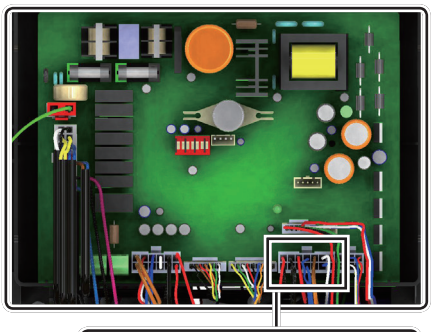
CN No.	Pin No.	Part	Color	Normal Value
CN7	1	Flame Sensor	R	DC 5 V
	8		BK	
	2	Heating Supply Thermistor	BK	DC 5 V
	9		BK	
	3	DHW Thermistor	R	DC 5 V
	10		R	
	4	DHW Cold Water Thermistor	BL	DC 5 V
	11		BL	
	5	Exhaust Thermistor	BR	DC 5 V
	12		BR	
	6	Heating Return Thermistor	W	DC 5 V
	13		BL	
	7	N/A	-	-
	14		-	
CN12	1	AGM /Y Phase	BK	DC 24 V
	2	AGM Y Phase	BR	DC 24 V
	3	AGM /X Phase	R	DC 24 V
	4	AGM X Phase	O	DC 24 V
	5	Ground	Y	DC 24 V
	6	AGM Position Sensor	G	DC 24V
	7	VDD	W	DC 24 V
CN14	1	GND	Y	DC 14 V
	2	Flow Control Valve Position Sensor	G	DC 14 V
	3	DC 14V	W	DC 14 V
	4	Flow Control Valve X Phase	R	DC 14 V
	5	Flow Control Valve Y Phase	BK	DC 14 V
	6	DC 14V	BL	DC 14 V
	7	Flow Control Valve /X Phase	O	DC 14V
	8	Flow Control Valve /Y Phase	BR	DC 14 V
CN3	1	VCC	R	DC 5 V
	2	Ground	BK	
	3	Pressure Sensor	G	
	4	VCC	R	
	5	Water Flow Sensor	W	
	6	Ground	BL	
CN9	1	Case Earth	G	-
	2	N/A	-	-

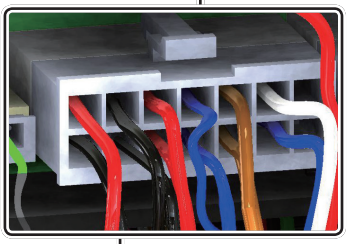
Model	NGTX 9600C : Circuit Board	Check Point (Circuit Board)	N/A
Function	The part for controlling all components contained in the Combi Boiler.		
Failure Event	Abnormal Circuit Board operation.		
Effects	All the features of the product will not work when the circuit board is damaged or broken.		
Error Code	Er 38		
Diagnostic	Replace the Circuit Board.		
Color / Wire Number	N/A		

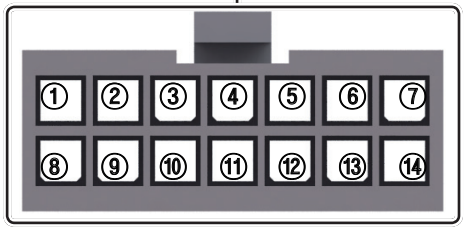


Model	SD-700 : Temperature Thermistor	Check Point (Circuit Board)	CN7
Function	Monitors hot water temperature so that the unit can adjust or turn off the burner when the measured temperature rises above the set temperature.		
Failure Event	Overheating is not detected.		
Effects	Product damage is caused.		
Error Code	Er 16, Er 31, Er 32, Er 33, Er 34, Er 35, Er 63		
Diagnostic	① Check the connection around the temperature thermistors. ② Measure the resistance across the thermistor by using a multi-meter.		
Color / Wire Number	① Heating Supply_GB-210N (Black/Black) : Connector ②,⑨ ② Hot Water Outlet_HB-220RE (Red/Red) : Connector ③,⑩ ③ DHW Cold Water_HB-220 (Blue/Blue) : Connector ④,⑪ ④ Exhaust_GB-200WE (Brown/Brown) : Connector ⑤,⑫ ⑤ Heating Return_HB-210-1 (White/Blue) : Connector ⑥,⑬		

NO	Item	Standard	
1	Temperature – Resistance Type Idling Condition	Temperature	Resistance(kΩ)
		77 ± 0.2°F (25 ± 0.1 ℃)	(8.520)
		122 ± 0.2°F (50 ± 0.1 ℃)	3.485 ± 3%
		185 ± 0.2°F (85 ± 0.1 ℃)	(1.250)
2	B Fixed Number (25/85)	3481K ± 2%	

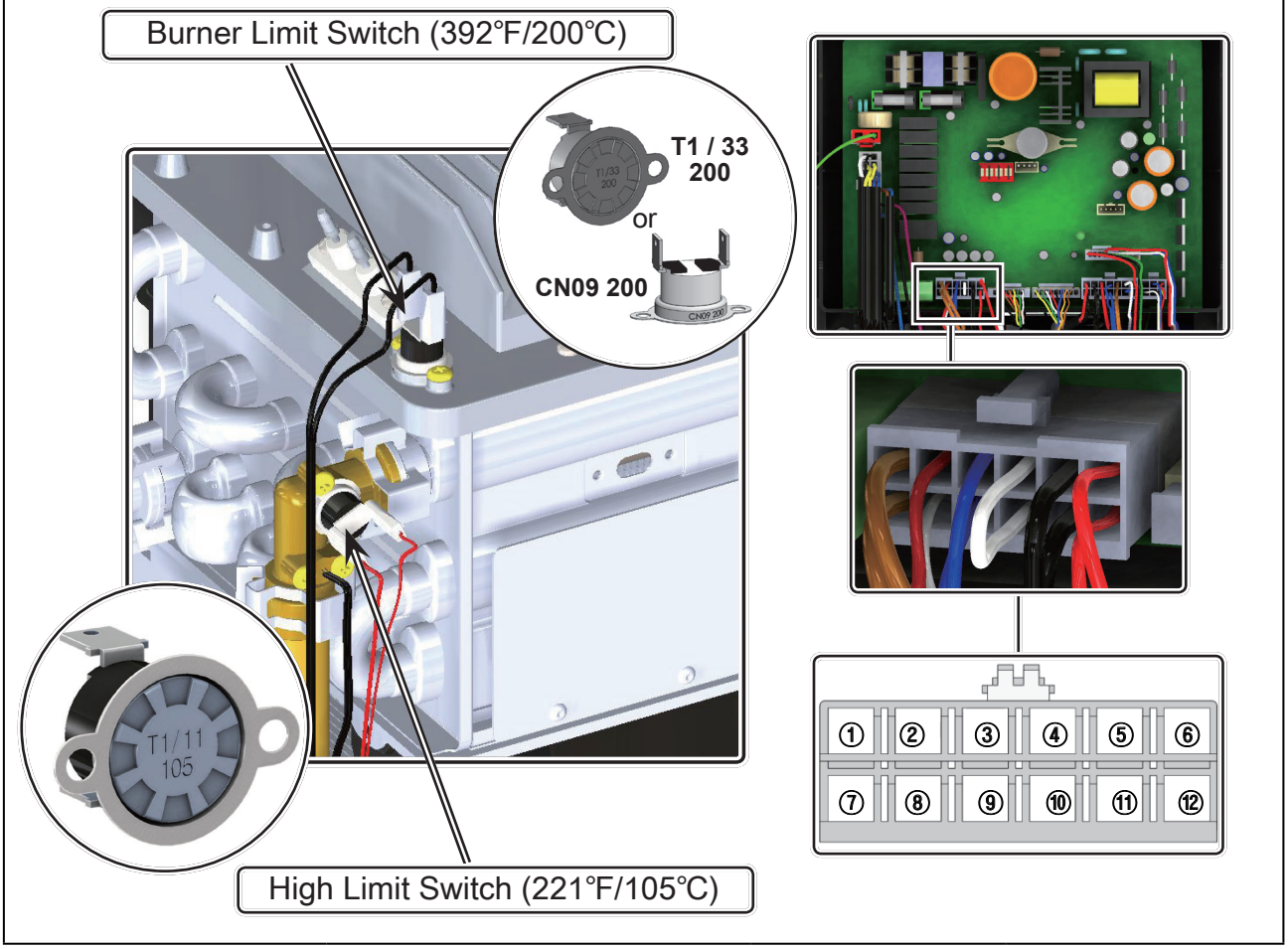




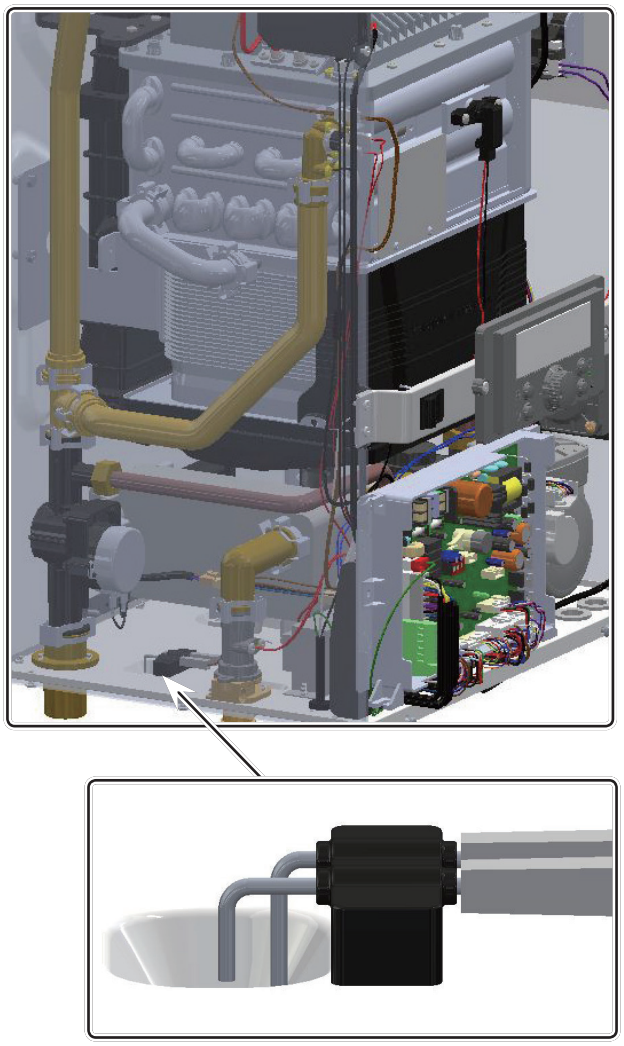


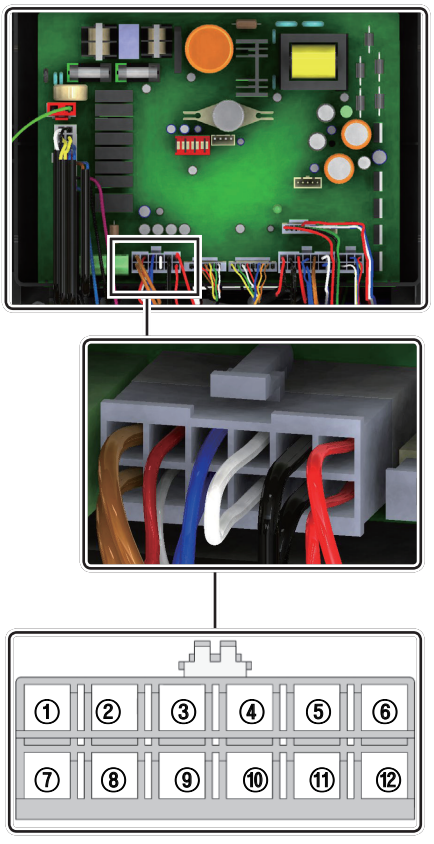
NO	Item	Standard	
1	Temperature – Resistance Type Idling Condition	Temperature	Resistance(kΩ)
		32 ± 0.2°F (0 ± 0.1 ℃)	(10.99)
		122 ± 0.2°F (50 ± 0.1 ℃)	(3.906)
		185 ± 0.2°F (85 ± 0.1 ℃)	0.552 ± 3%
2	B Fixed Number (25/85)	3482.4K ± 2%	

Model	T1-11 : Overheat Limit Switch	Check Point (Circuit Board)	CN11
Function	The part for automatically blocking the product operation when the temperature is beyond the set.		
Failure Event	Overheated water and burner temperature are not detected.		
Effects	Product damage is caused.		
Error Code	Er 20, Er 43		
Diagnostic	① Check for continuity across the Overheat Limit Switch by using a multi-meter. ② Check the Dip Switch setting. ③ Check the nozzles.		
Color / Wire Number	① Heat exchanger outlet pipe (Red/Red) : Connector ⑥, ⑫ ② Burner case (Black/Black) : Connector ⑤, ⑪		

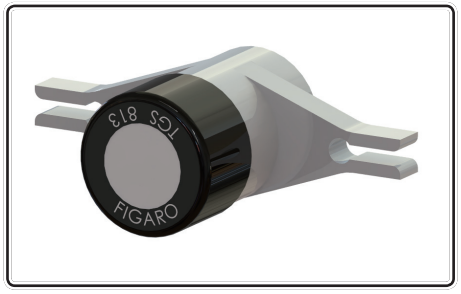


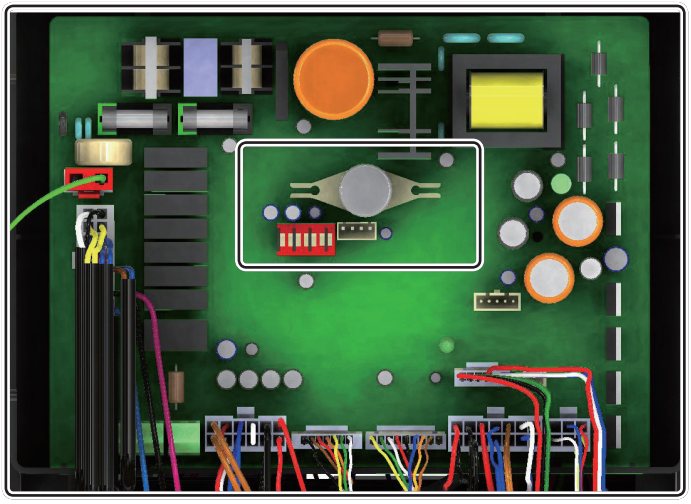
Model	Water Leakage Detector	Check Point (Circuit Board)	CN11
Function	Monitors for water leakage. If water leakage is detected, the combi boiler will close the water supply valve.		
Failure Event	Water leakage is not detected.		
Effects	Damage of the product is caused by the water leakage.		
Error Code	Er 45		
Diagnostic	Check the Water Leakage Detector connections.		
Color / Wire Number	Water leakage detector (Brown) : Connector ①,⑦		



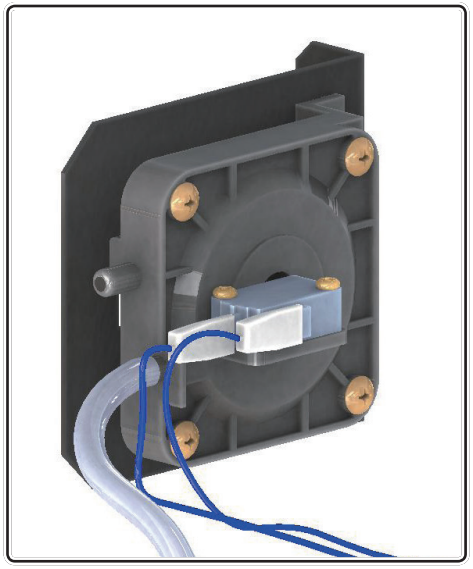


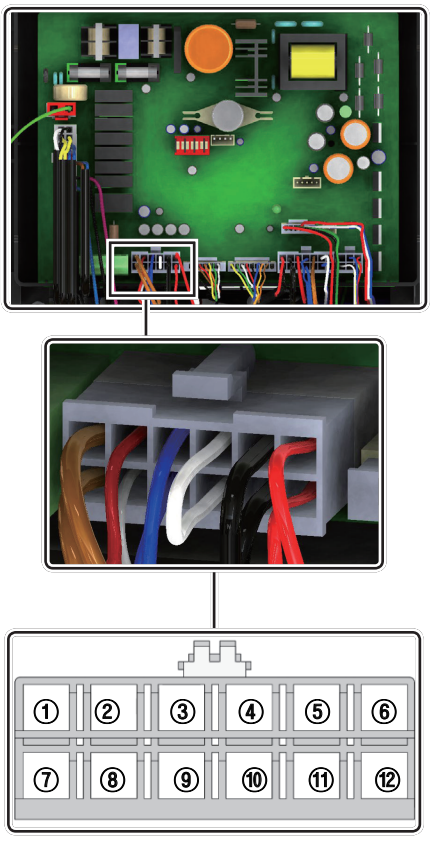
Model	Gas Leak Detection Sensor	Check Point (Circuit Board)	N/A
Function	Monitors for gas leakage. If gas leakage is detected, the Combi Boiler will power down.		
Failure Event	Gas leak detection sensor is not operated.		
Effects	Explosion risks by leaking the gas.		
Error Code	Er 40		
Diagnostic	① Check the leakage around the gas valve and connected pipes by using soapy water. ② Check the burner assembly		
Color / Wire Number	N/A		



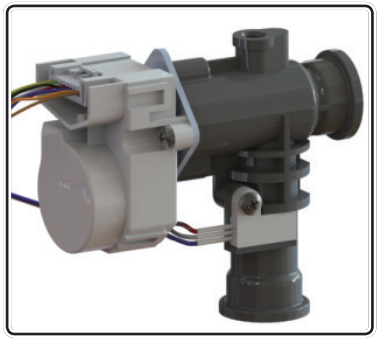


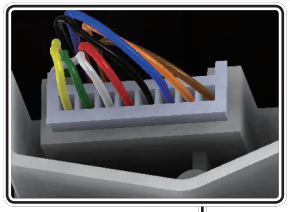
Model	SAPS 70F : Air Pressure Switch	Check Point (Circuit Board)	CN 11
Function	The part for preventing the inflow of exhaust gas, when exhaust vent and exhaust passage are blocked by condensate.		
Failure Event	① Combustion noise is generated. ② Imperfect and lifting flame occurs.		
Effects	Carbon monoxide exceeding the reference is discharged. The appliance is not working.		
Error Code	Er 29		
Diagnostic	① Check the connection around the Air Pressure Switch. ② Check the hose for blockage or bending. ③ Check the condensate passage. ④ Check voltage range of Air Pressure Switch.		
Color / Wire Number	Air pressure switch (blue) : connector ③, ⑨		

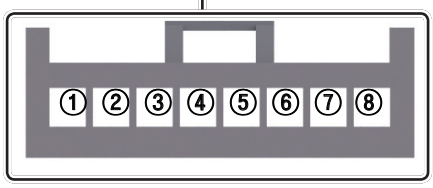




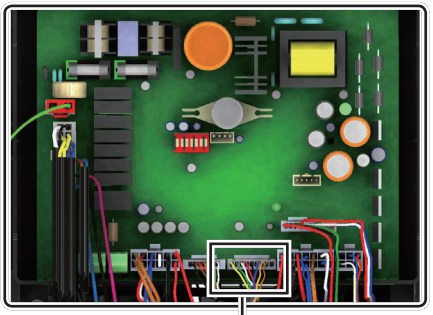
Model	T405-158R : Flow Control Valve	Check Point (Circuit Board)	CN 14
Function	The part controlling the water quantity for supplying the stable hot water by detecting the water flow rate (More than 0.5 gallon) in the pipes.		
Failure Event	Water flow rate is not detected and water leakage occurs around the flow control valve.		
Effects	① Ignition sequence does not start. ② Operation of product is stopped once detecting water leakage.		
Error Code	Er 65		
Diagnostic	① Restart the product ② Check the connection around the flow control valve.		
Color / Wire Number	[IWM (Inlet Water Modulation)] GND (yellow) : connector ① IWM Stepper motor position (green) : connector② VDD (white) : connector ③ IWM Stepper motor coil X phase (red) : connector ④ IWM Stepper motor coil Y phase (black) : connector ⑤ VDD (blue) : connector ⑥ IWM Stepper motor coil /X phase (orange) : connector ⑦ IWM Stepper motor coil /Y phase(brown) : connector ⑧		

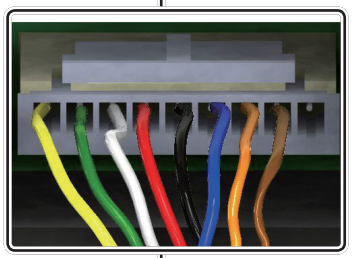


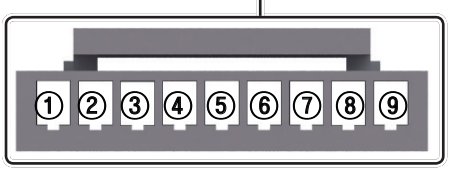




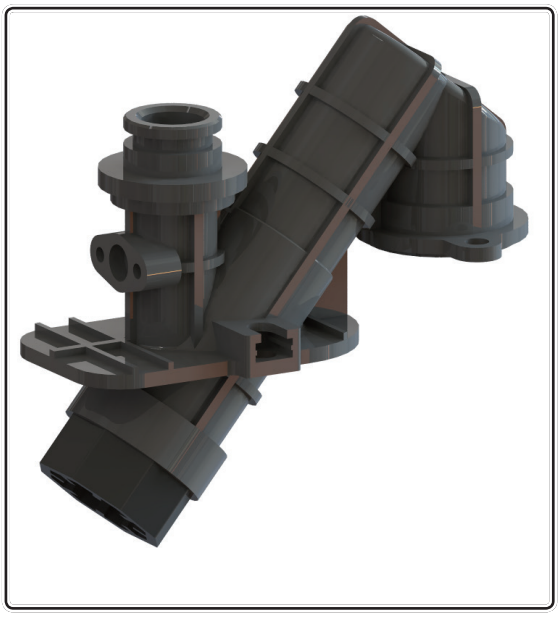
1. PPS material Body
2. Hall sensor rated voltage DC5~24V 10mA. Max
   - ■ Minimum Operating Flow Rate :
     ON: 0.47gal (1.8 lpm) , OFF: 0.39 gal (1.5 lpm)
   - ■ Maximum Operating Flow Rate : 9.2 gal (35 lpm)

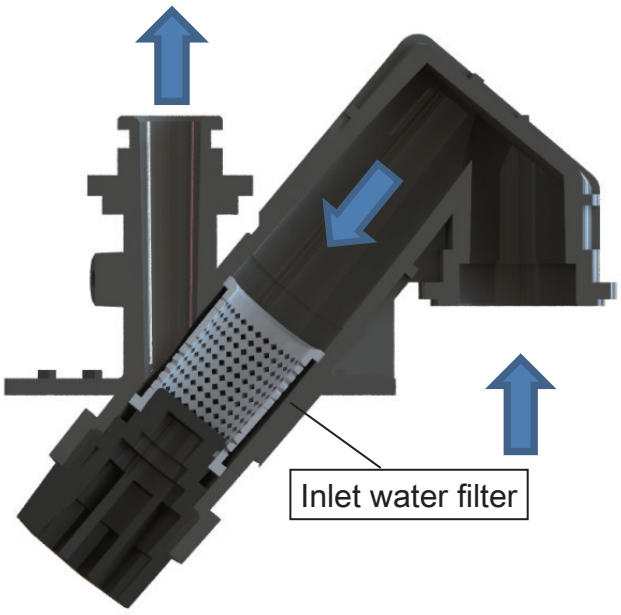






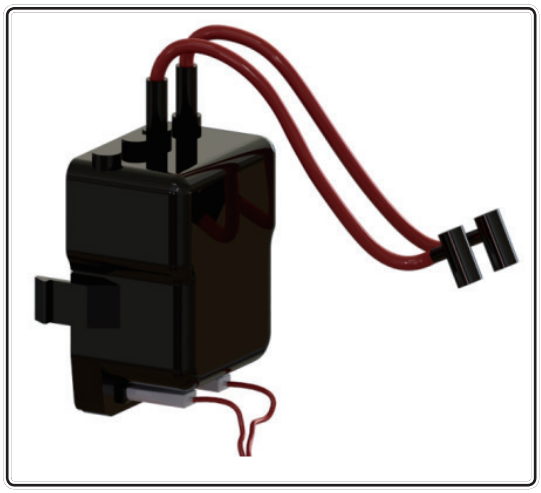
Model	DHW Cold Water Filter	Check Point (Circuit Board)	N/A
Function	The part consists of durable STS, PPS material for filtering out debris and heavy metals.		
Failure Event	Input capacity of cold water is not constant and thermal efficiency is poor.		
Effects	Noise at the heat exchanger is generated and pipes are blocked by the debris.		
Error Code	N/A		
Diagnostic	Clean the DHW Cold water inlet filter.		
Color / Wire Number	N/A		

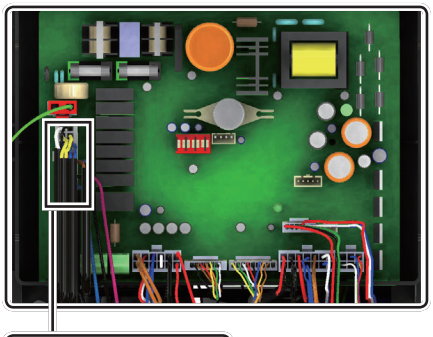


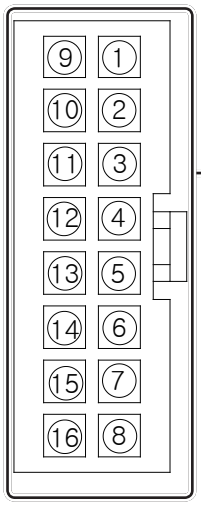


Model	KI-790U : Igniter	Check Point (Circuit Board)	CN 18
Function	The part for supplying the ignition energy to the burner by continuously discharging the high voltage.		
Failure Event	Ignition is not generated.		
Effects	Operation of product is stopped.		
Error Code	Er 11		
Diagnostic	① Visual inspection : Connection and/or breakage of wire. ② Check : voltage range		
Color / Wire Number	Ignition Transformer (red) : connector ④ Ignition Transformer (red) : connector ⑫		

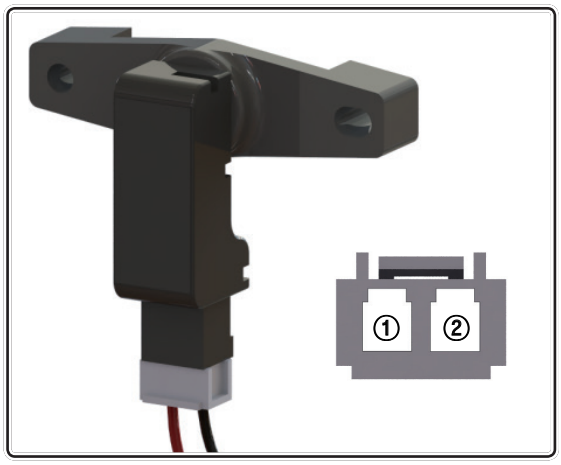
Input voltage	Output current	Output voltage
AC 120V /60Hz	15 ± 2kW	6 ± 2mA

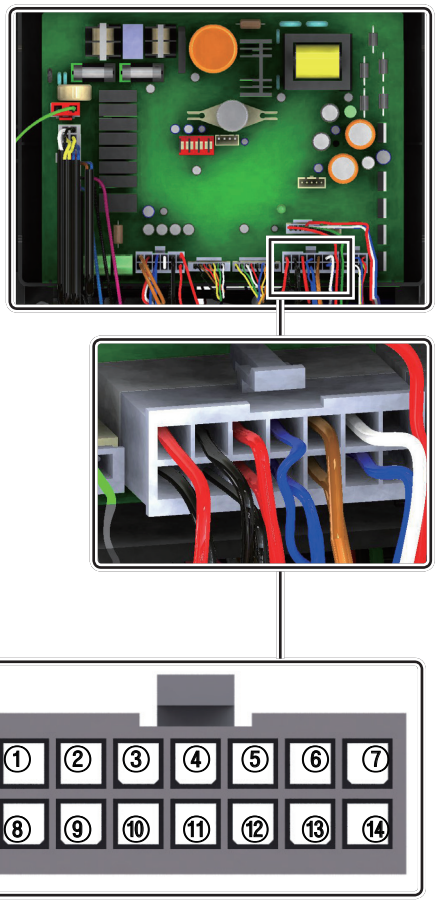






Model	RS-100 : Flame Detection Sensor	Check Point (Circuit Board)	CN 7
Function	Self-made part to indicate the normal status of burner by detecting the flame after igniting and inflowing the gas and air mixture.		
Failure Event	Ignition fault.		
Effects	Abnormal product operation.		
Error Code	Er 11, Er 39, Er 72		
Diagnostic	① Check the discoloration of flame monitoring window. ② Check the connection around the flame detection sensor. ③ Check the flame sensor by using a multi-meter.		
Color / Wire Number	Flame Detect Sensor (black) ① : connector ⑧ Flame Detect Sensor (red) ② : connector ①		

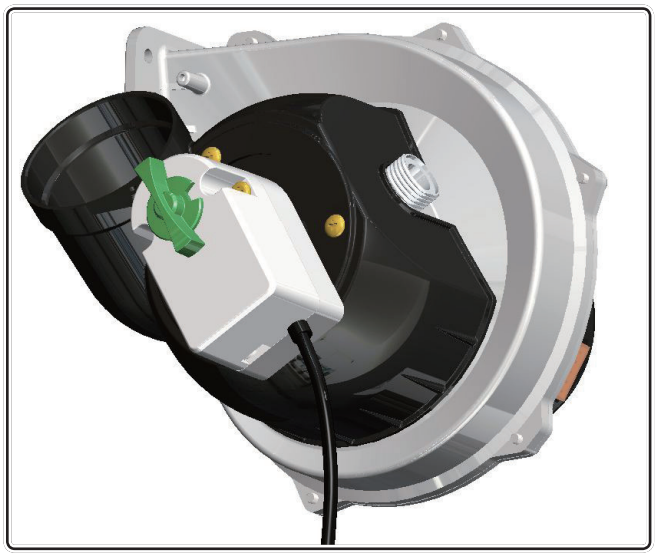


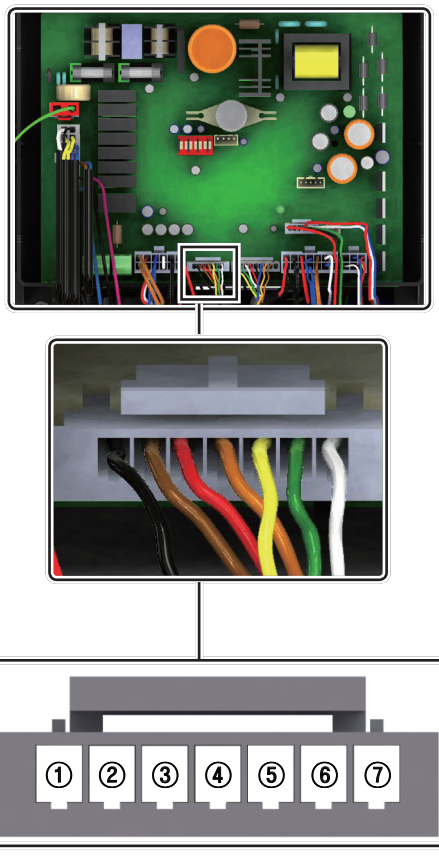


1. Electrical Characteristics
   - Maximum workable voltage :DC 35V
   - Maximum allowable current :DC 30mA
   - Maximum power dissipation :DC 80mW

2. Optical characteristics
   - Dark current : 0.05uA/ MAX (0.6uA)
     [Condition: 0LX (Intensity of illumination), 10V(Voltage)]
   - Spectrum luminosity curve
     : 880nm (Peak Sensitivity)
   - Range of sensing : 800 ~ 1000nm
   - Flame ON: DC 3.0V or less
   - Flame OFF: More than DC 3.0V

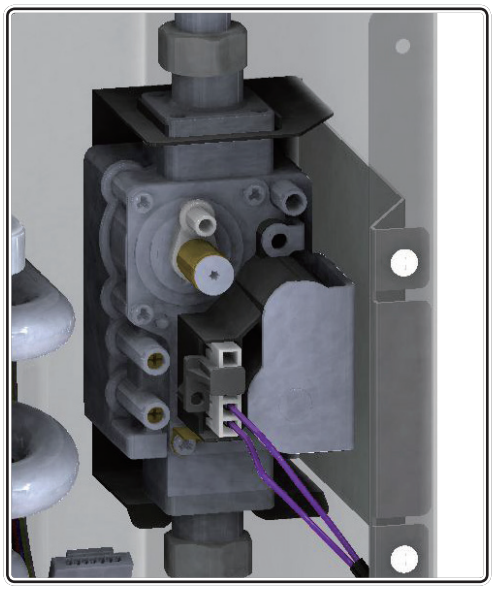
Model	AGM : Air Gas Mixer	Check Point (Circuit Board)	CN12
Function	The part for supplying ideally the air and gas mixture to the heat exchanger.		
Failure Event	① Imperfect combustion occurs. ② lifting flame occurs.		
Effects	① Abnormal product operation. ② Carbon monoxide exceeding the reference is discharged.		
Error Code	Er 67		
Diagnostic	① Restart the Combi Boiler. ② Check the connection. ③ Check the fan intake.		
Color / Wire Number	Air Gas Mixer (black) : ① connector (AGM / Y Phase) Air Gas Mixer (brown) : ② connector (AGM Y Phase) Air Gas Mixer (red) : ③ connector (AGM / X Phase) Air Gas Mixer (orange): ④ connector (AGM X Phase) Air Gas Mixer (yellow) : ⑤ connector (GND) Air Gas Mixer (green) : ⑥ connector (AGM Position Sensor) Air Gas Mixer (white) : ⑦ connector (DC 24V)		



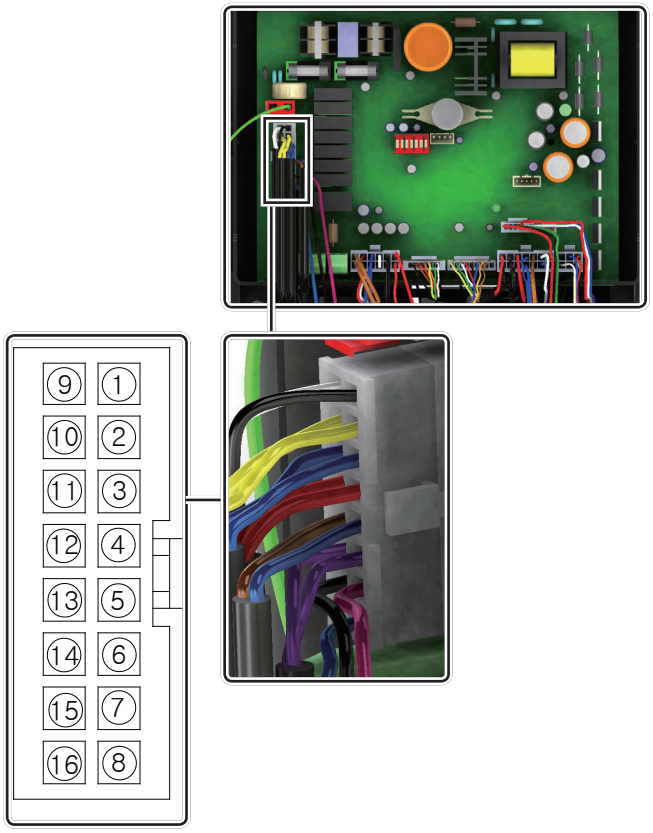


1. Operating Temperature : 0~60 ℃
2. Motor Specification
   - Type : Stepping Motor
   - Phase : 4 Phase
   - Drive type : Unipolar Drive / V-Constant
   - Supply Power : < 24 VDC (Non-continuous operation)
   - Phase excitation system : 2-2
   - Step angle : 7.5 deg(2-2Phase), (1-2 Phase : 3.75 deg)
   - Direction of rotation : CW / CCW (Bidirectional)
   - Reduction ratio : 1 / 60

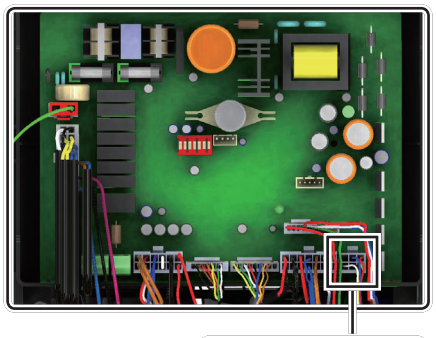
Model	ET72J0209 : Gas Valve	Check Point (Circuit Board)	CN18
Function	The part for controlling electrically the supplied gas volume and for performing optimally the combustion.		
Failure Event	① Gas leakage occurs. ② Gas valve is not operated. (Unable to open/close) ③ Gas flow is not modulated. (Proportional gas valve)		
Effects	① Gas leakage from the Combi Boiler. ② Spark is not generated.. ③ Operation of product is stopped. ④ Carbon monoxide exceeding the reference is discharged.		
Error Code	Er 40, Er 11		
Diagnostic	① Check the connection and breakage of gas valve. ② Check the connection and mounting location. ③ Check the flue of Combi Boiler. ④ Check range of voltage.		
Color / Wire Number	Gas Valve (purple) : connector ⑥, ⑭		

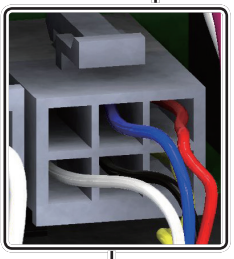


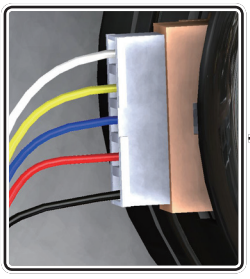
1. Backpressure
   : 1st valve: 0.725 PSI (5 kPa)
   : 2nd valve: 0.145 PSI (1 kPa)
2. Ambient temperature:
   : 5 ~ 158°F(-15°C ~ 70°C)
3. Max inlet pressure: 0.87 PSI (6 kPa)
4. Operating Ratings: AC 120 V/60 Hz

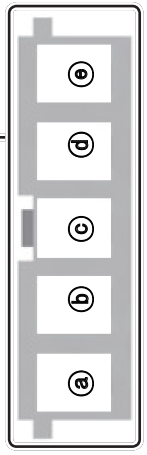


Model	KBP-126H : Fan	Check Point (Circuit Board)	CN4
Function	The part for supplying the air and gas into the burner required for the combustion.		
Failure Event	① Abnormal noise occurs at the fan. ② Abnormal fan speed(RPM). ③ Poor connection.		
Effects	① Abnormal combustion. ② Abnormal noise occurs. ③ Improper or no operation of Combi Boiler.		
Error Code	Er 41		
Diagnostic	① Check the clogging of the vents. ② Check status of the connection. ③ Check range of voltage.		
Color / Wire Number	[BLDC FAN] Fan Start Coil (white) ⓔ : connector ④ RPM Sensor (yellow) ⓓ : connector ⑥ GND (blue) ⓒ : connector ② VDD (red) ⓑ : connector ③ Fan End Coil (black) ⓐ : connector ⑤		

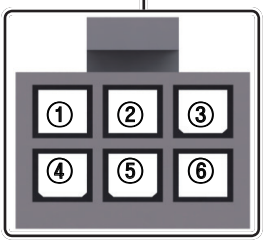






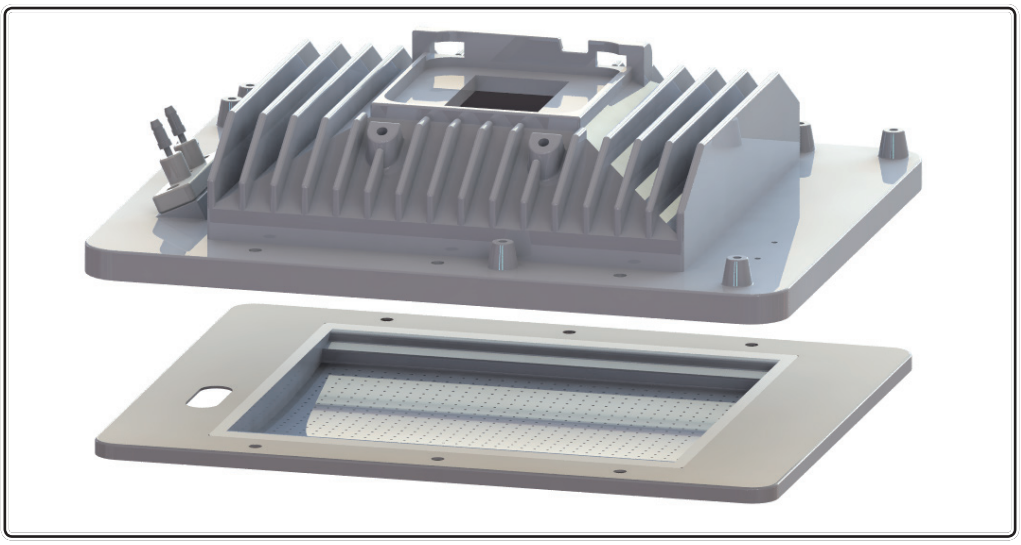


1. Rated Specifications
   - Motor type : DC BRUSHLESS MOTOR
   - Rated Voltage : Vs =28V / Vc =DC 12V
   - Working Voltage : Vs = DC 28V / Vc = DC 12V
   - Rated Current : 2A
   - Speed Control : PWM

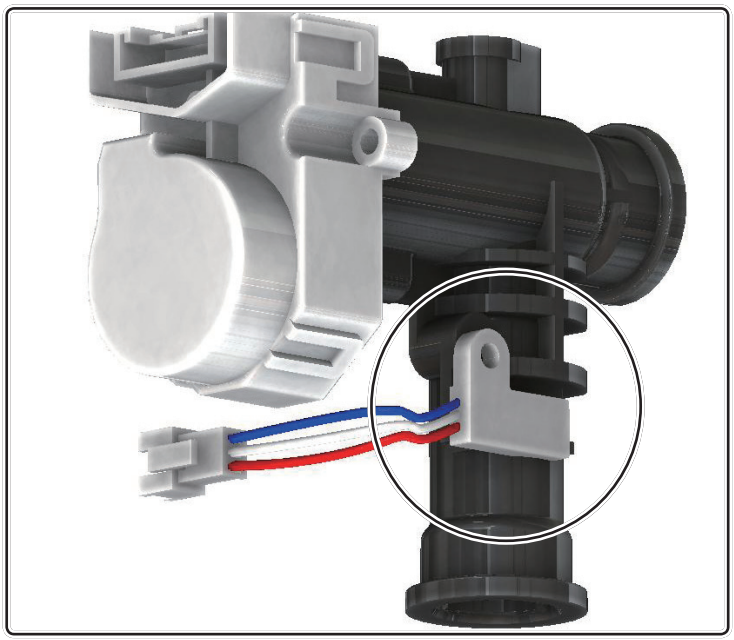


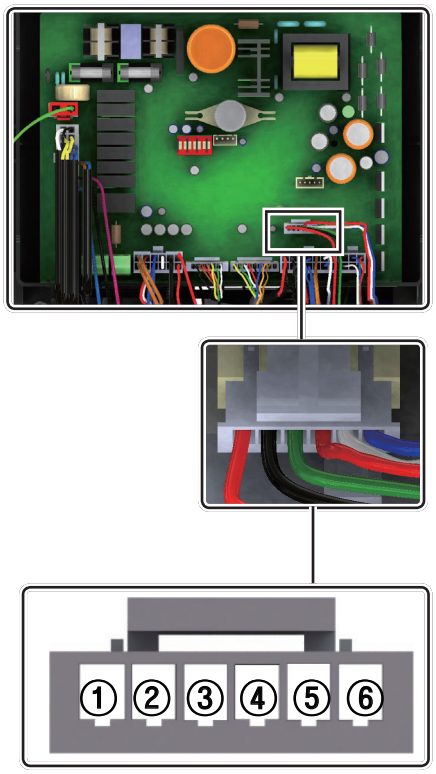
Model	Metal Fiber Premix Burner	Check Point (Circuit Board)	N/A
Function	The part supplying the heat source by mixing and combusting the air and gas.		
Failure Event	① Unable to initialize/sustain combustion. ② Soot occurs on the surface of burner. ③ Gas leakage occurs from burner.		
Effects	① Abnormal combustion. ② Unstable flame generation. ③ Ignition failure.		
Error Code	N/A		
Diagnostic	Check the debris on the burner surface and unstable flame.		
Color / Wire Number	N/A		

The design of the Premix Burner significantly reduces the amount of emitted carbon monoxide (CO), nitrous oxides (NOx), and other harmful flue gas components by regulating the air-fuel ratio unlike a typical Bunsen burner.

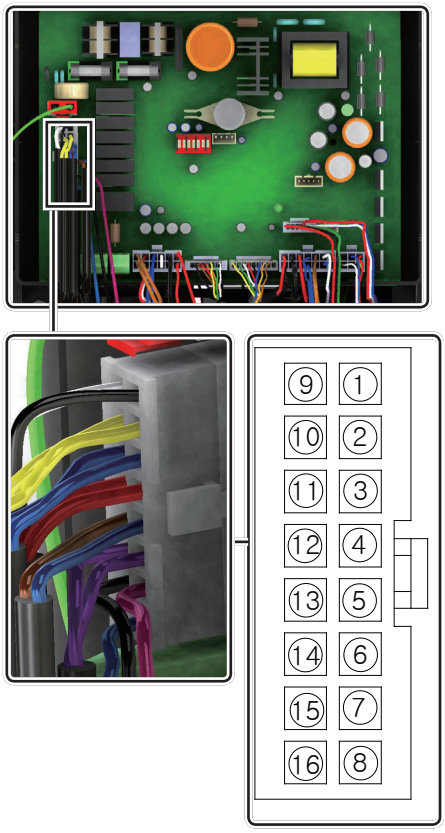


Model	Flow Sensor : 7855P-083	Check Point (Circuit Board)	CN3
Function	This sensor detects water flow (more than 0.5 GPM) through DHW loop.		
Failure Event	Water flow is not detected.		
Effects	Domestic hot water set point is not achieved.		
Error Code	N/A		
Diagnostic	① Restart the appliance. ② Visual inspection : check flow sensor wiring for proper connection. ③ Visual inspection : check flow sensor for debris.		
Color / Wire Number	① Ground : Connector (blue ⑥) ② Flow Signal : Connector (white ⑤) ③ DC 5V : Connector (red ④)		





Model	Circulation Pump	Check Point (Circuit Board)	CN18
Function	Provides circulation through the heat exchanger.		
Failure Event	Water flow is not detected.		
Effects	① Unit does not operate. ② Circulation pump is not operating.		
Error Code	Er 16, Er 20, Er 63		
Diagnostic	① Visual inspection : check wiring for proper connection. ② Check supply voltage.		
Color / Wire Number	Internal CH primary circulation pump : Connector (blue ⑤, brown ⑬)		

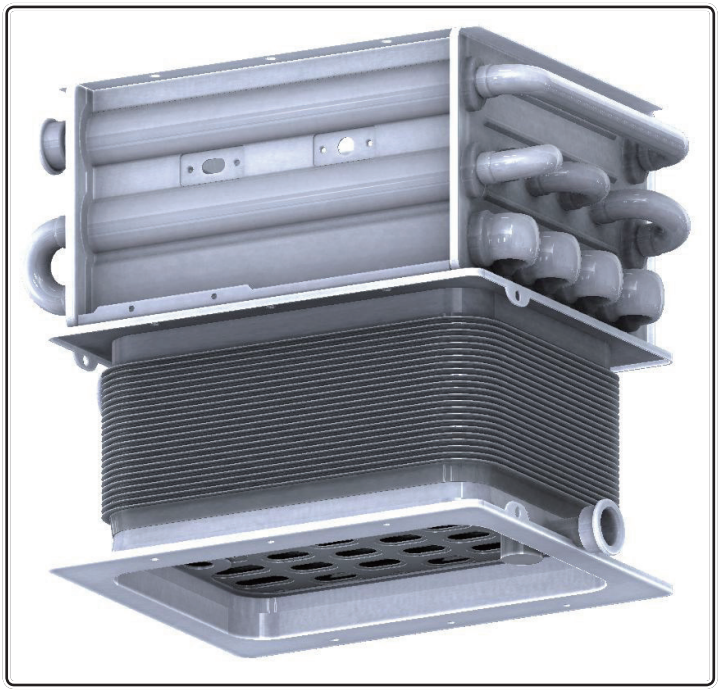


Model	Heat Exchanger(STS)	Check Point (Circuit Board)	N/A
Function	The part for heating the hot water by Absorbing the high-temperature heat generated at the burner.		
Failure Event	① Water or exhaust gas leakage. ② Abnormal heat exchange.		
Effects	① Operation of product is stopped. ② Exhaust gas leakage. ③ Abnormal noise occurs.		
Error Code	Er 20, Er 43, Er 33, Er 94		
Diagnostic	Check the heat exchanger surface for cracks or leaks.		
Color / Wire Number	N/A		

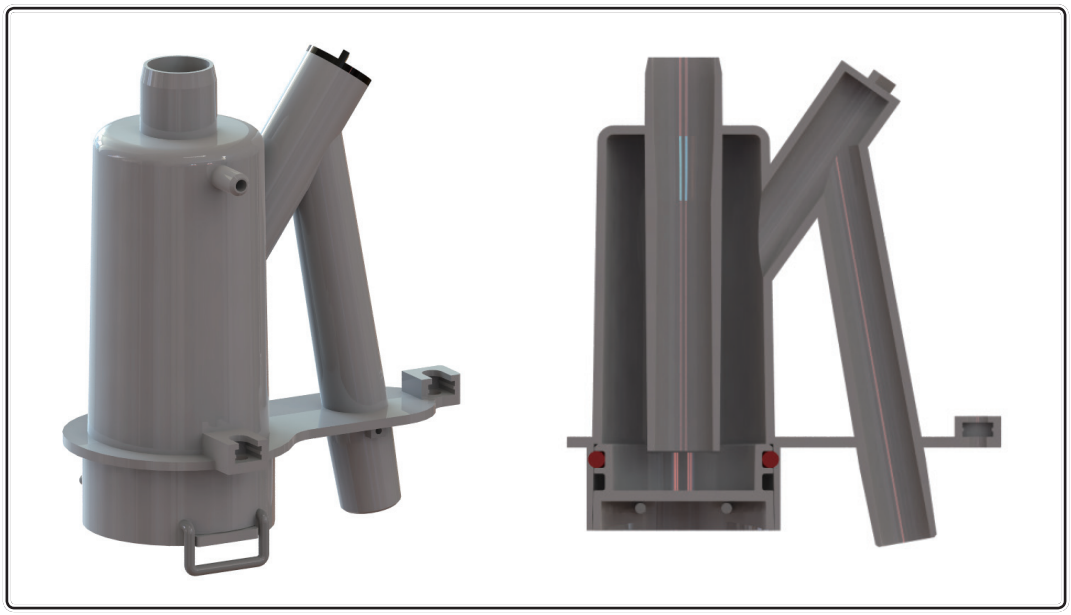
1. Heat exchange method : Instantaneous

2. Material : STS

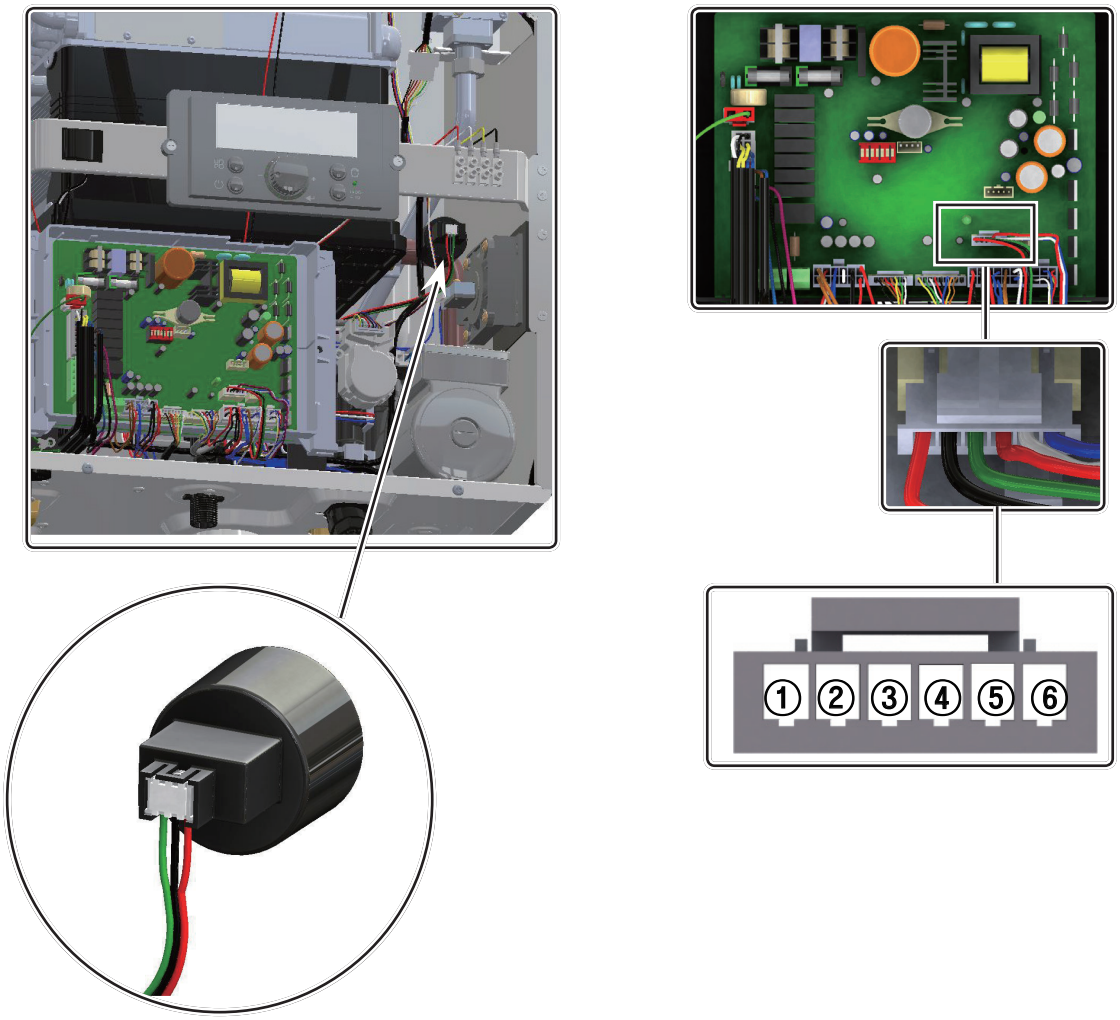
3. Construction : STS brazing



Model	Siphon : Condensate Trap	Check Point (Circuit Board)	N/A
Function	The part for reliably discharging the condensate generated by the combustion.		
Failure Event	Condensate fails to drain freely and backs up in the exhaust line.		
Effects	1. Product corrosion and degradation due to excessive condensate buildup. 2. Blockage of air flow.		
Error Code	Er 29		
Diagnostic	Check the hose for blockage or bending.		
Color / Wire Number	N/A		

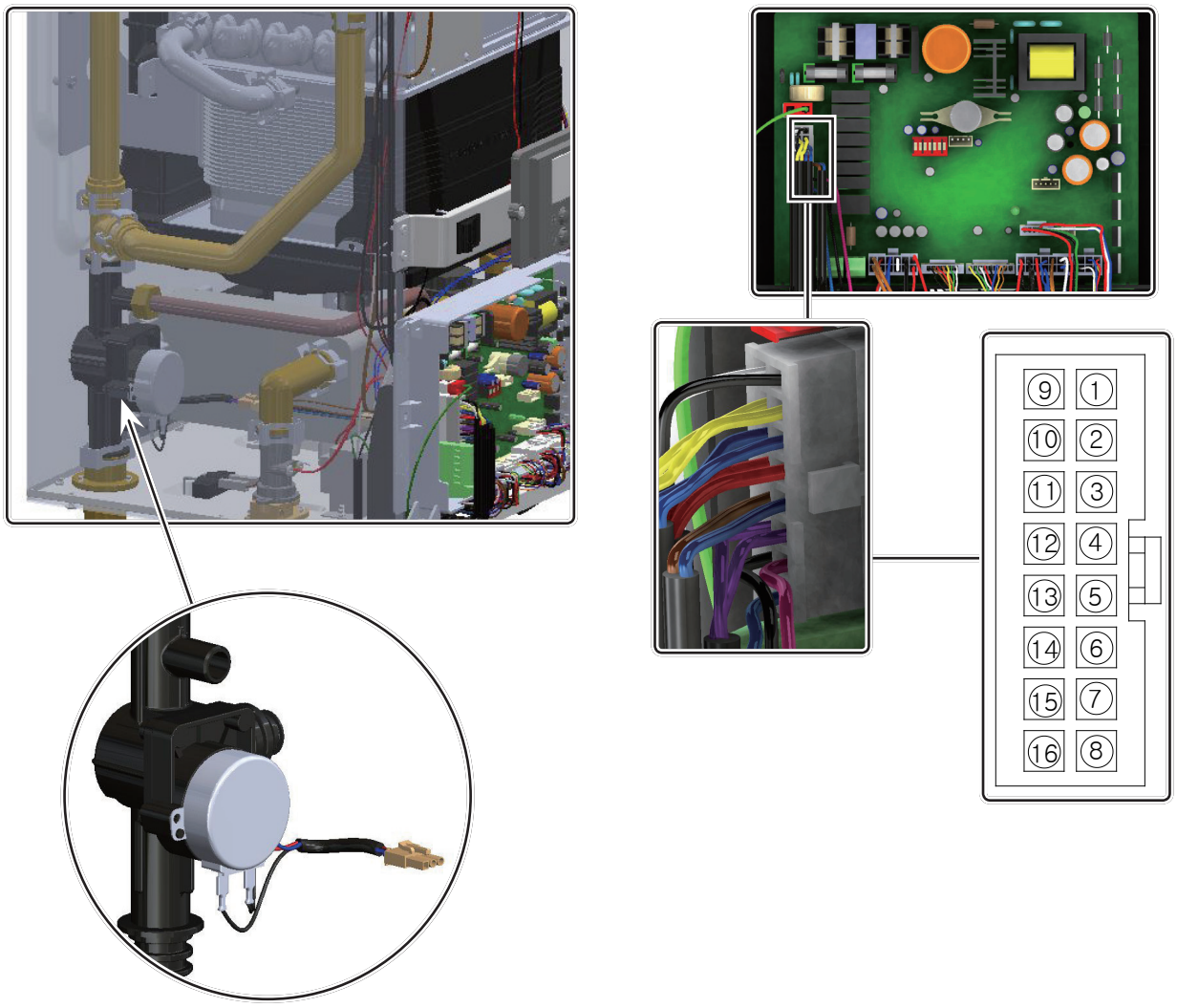


Model	Pressure Sensor	Check Point (Circuit Board)	CN3
Function	This sensor detects water pressure through heating loop.		
Failure Event	Water pressure is not detected.		
Effects	Operation of product is stopped.		
Error Code	Er 59, Er 54, Er 55, Er 56		
Diagnostic	① Check the pressure sensor. ② Visual inspection : check pressure sensor wiring for proper connection		
Color / Wire Number	① Input DC 5V : Connector (red ①) ② Ground : Connector (black ②) ③ Pressure Signal Output : Connector (green ③)		

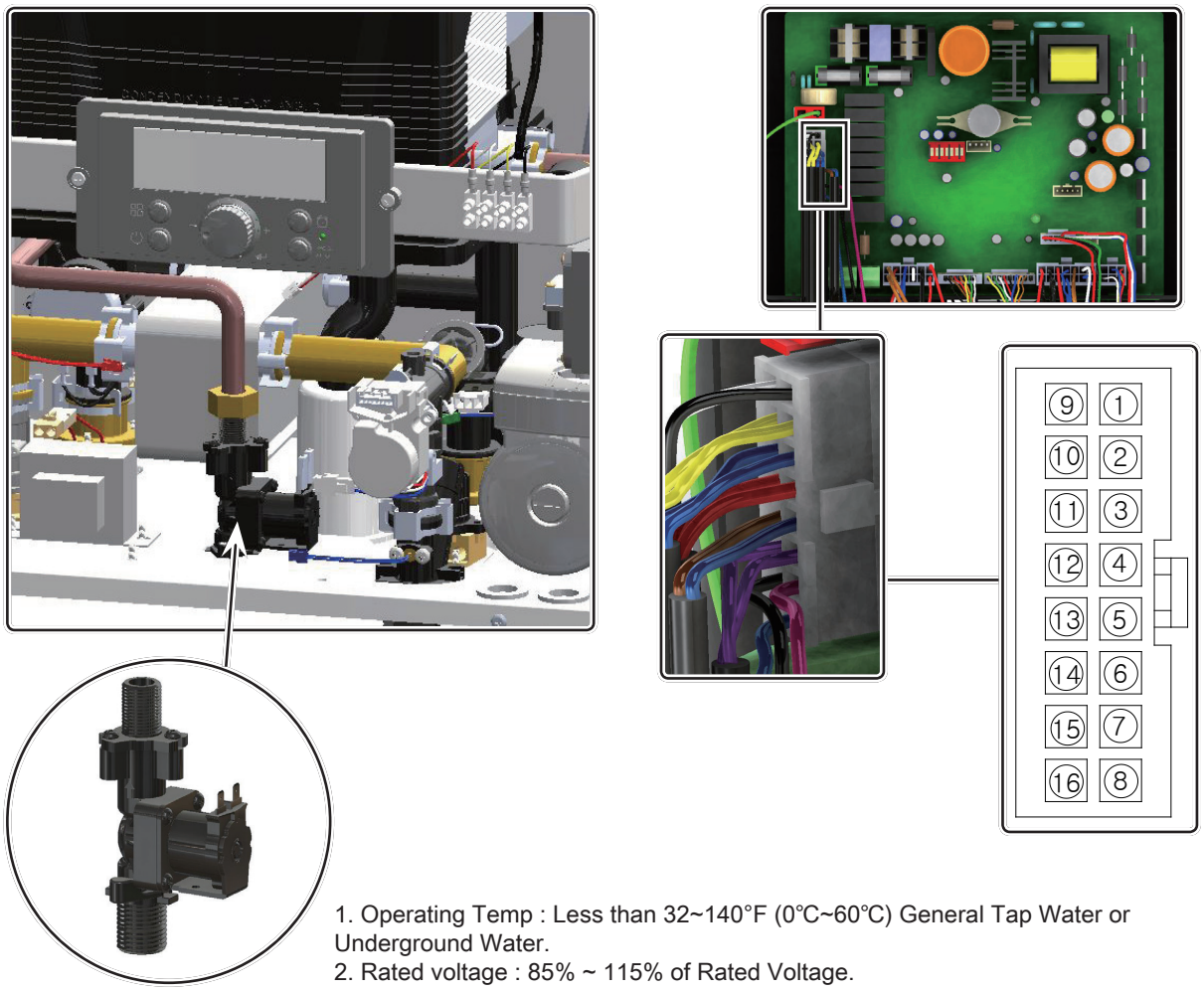


1. Er 54 → Water pressure lower than [Setting Pressure - 4] psi
2. Er 56 → Water pressure higher than 50 psi.
3. Er 55 → Water pressure is not increasing to at least 13 psi.

Model	3-Way Valve	Check Point (Circuit Board)	CN18
Function	The 3-Way Valve directs heated water to either the heating loop or the plate heat exchanger for DHW.		
Failure Event	The valve does not move in a fixed direction.		
Effects	Water temperature overheating occurs and operation of product is stopped.		
Error Code	Er 20, Er 63, Er 16		
Diagnostic	① Check the 3-way valve ② Visual inspection : check the 3-way valve wiring for proper connection		
Color / Wire Number	① Connector (black ⑮, red ⑦, blue ⑧)		

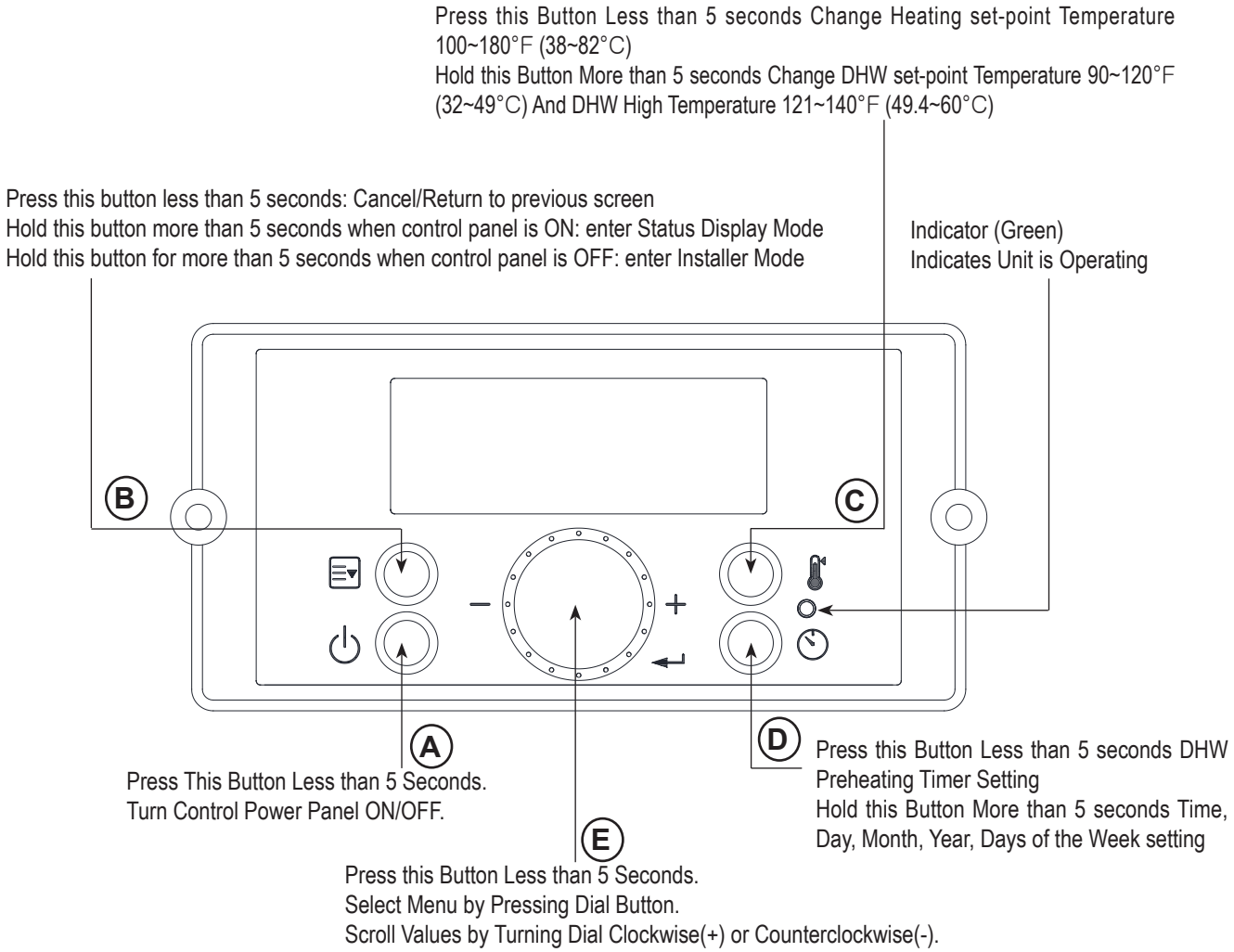


Model	Auto Feeder	Check Point (Circuit Board)	CN18
Function	Automatically supplies water to the Combi Boiler.		
Failure Event	Does not fill the water in the Combi Boiler.		
Effects	Operation of product is stopped.		
Error Code	Er 54, Er 55		
Diagnostic	① Check the auto feeder. ② Visual inspection : check auto feeder wiring for proper connection		
Color / Wire Number	① Connector (blue ③, ⑪)		



1. Operating Temp : Less than 32~140°F (0℃~60℃) General Tap Water or Underground Water.
2. Rated voltage : 85% ~ 115% of Rated Voltage.
3. Operating Voltage & pressure.
   : When you apply 85~115% of the rated voltage at the dynamic water pressure of 2.8~113.8 PSI (19~785 kPa), operate well without malfunction.

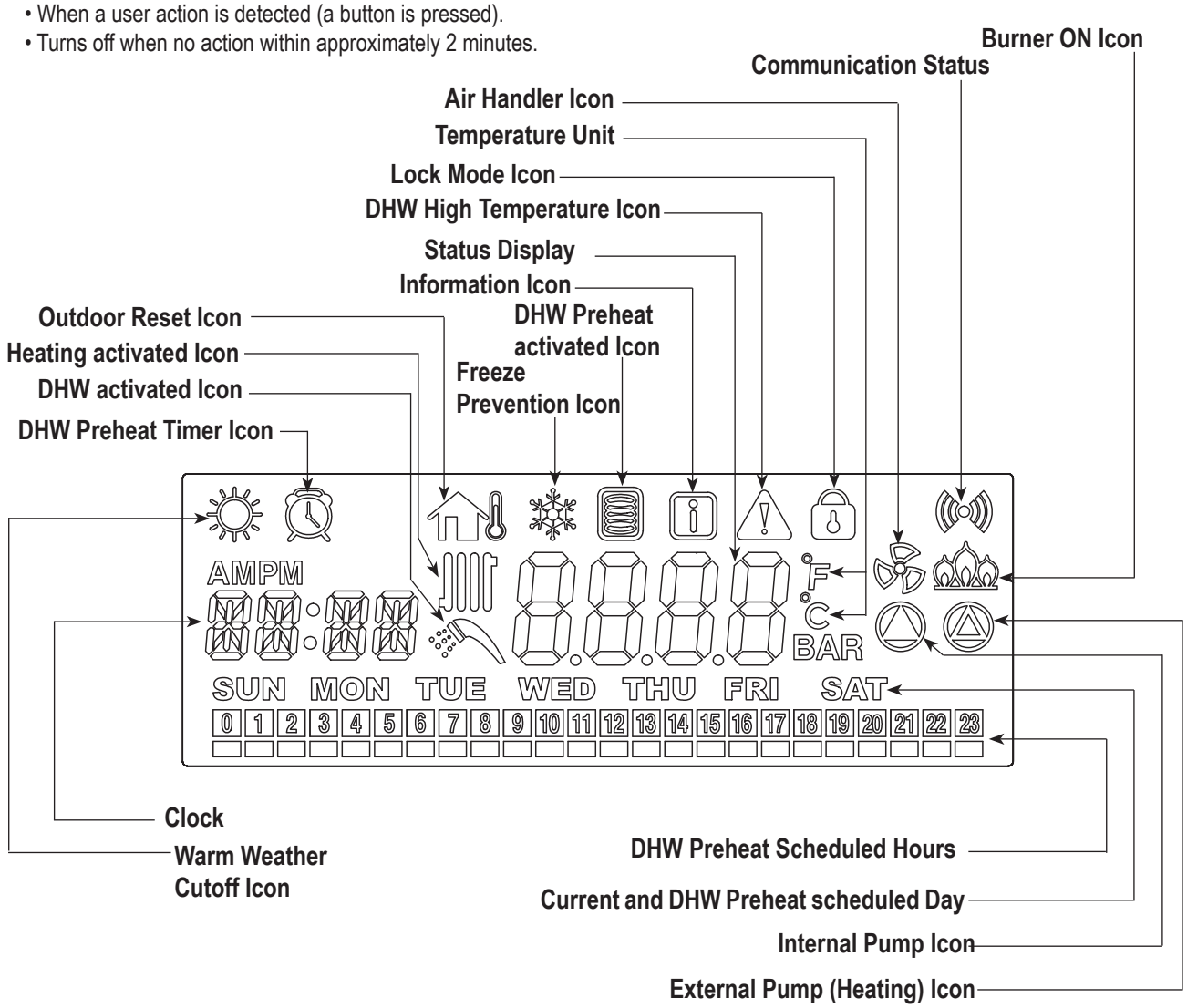
■ Control Panel



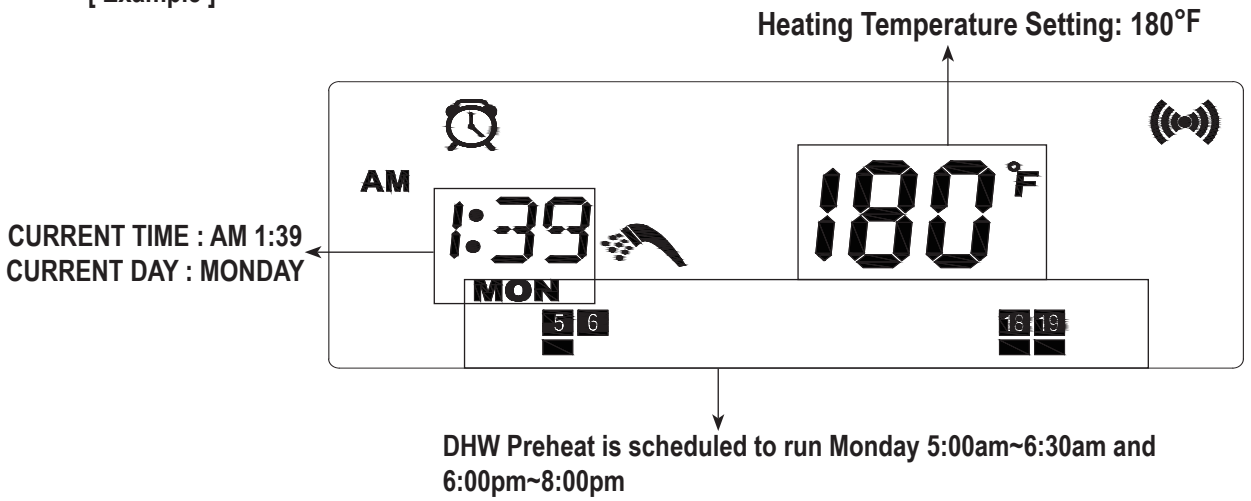
Buttons	Functionality	
	Press (under 5 seconds)	Press and Hold (more than 5 seconds)
A Power ON / OFF Button	Control Panel Power ON/OFF	N/A
B Function Button	Cancel / Return	Status display mode at power ON mode. Installer Mode at power OFF mode.
C Heating/Domestic Hot Water(DHW) Temperature Setting Button	Change Heating set-point Temperature 100~180°F (38~82°C)	Change DHW set-point Temperature 90~120°F (32~49°C) And DHW High Temperature 121~140°F (49.4~60°C)
D Timer Button	DHW Preheat timer setting	Time, Day, Month, Year, Days of the Week setting
E Dial (Enter) Button	Menu and Value Up(+) / Down(-)	N/A

■ Control Panel Display

LCD has a backlight that will illuminate:
- When a user action is detected (a button is pressed).
- Turns off when no action within approximately 2 minutes.



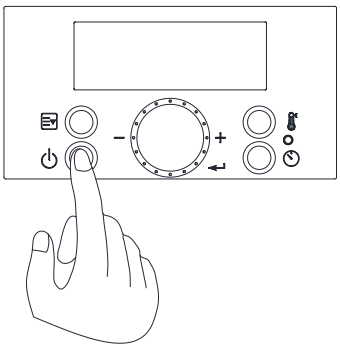
[Example]



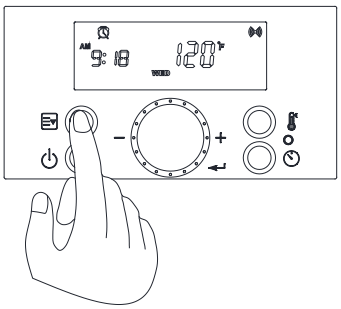
■ Control Panel Mode

[User's Mode]

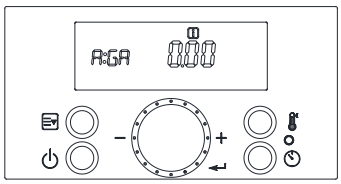
[To enter '**User Mode**']



1. Press the 'Power Button' ON.



2. Press and hold the 'Function Button' for 5 seconds to enter 'User Mode'.



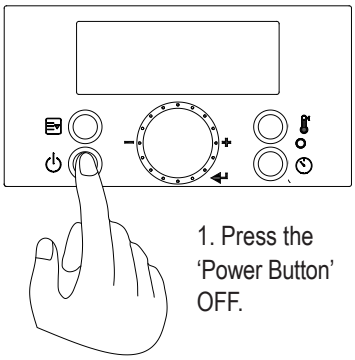
3. '[A:GA]' is displayed on the display screen. Turn the 'Dial Button' clockwise or counter-clockwise to navigate through the 'User Mode'.

4. Press the 'Function Button' to return to normal mode.

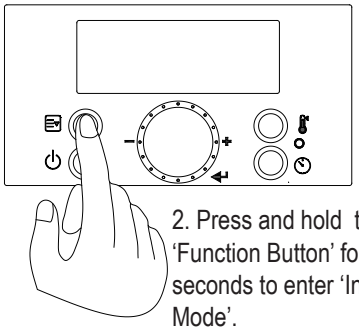
Display	Operation	Description
A:GA/L	DHW Flow Rate	• Current Flow Rate (GA: GPM/°F/psi(Default) or L: LPM/°C/BAR)
b:FM	Fan Speed	• Current Fan Speed
C:TL	Lock Mode	• Lock mode is used (On) or unused (oFF)
d:TP	H.SUP	• Current (Heating Supply Thermistor) temperature (°F / °C)
	H.rEt	• Current (Heating Return Thermistor) temperature (°F / °C)
	d.Hot	• Current (DHW Thermistor) temperature (°F / °C)
	d.CLd	• Current (DHW Cold Water Thermistor) temperature (°F / °C)
	Eht	• Current (Exhaust Thermistor) temperature (°F / °C)
	Od	• Current (Outdoor Temperature Sensor) temperature (°F / °C)
E:WP	Heating Water Pressure	• Current Heating Water Pressure (psi / BAR)
F:FS	Voltage of Flame Sensor	• Current Flame Sensor (Vdc)
g:EH	Error History	• View the Error History (E0:XX ~ E9:XX)
H:RH (Running History)	PLUg	• X 1000 hour (Power-on Time)
	bnH.H	• X 1000 hour (Heating Burn Hour)
	bnH.d	• X 1000 hour (DHW Burn Hour)
	bnC.H	• X 1000 Time (Heating Burn Cycle)
	bnC.d	• X 1000 Time (DHW Burn Cycle)
	PPHr	• X 1000 hour (Pump Running Time)
I:MD	120K/100K (Heating)	• Model
J:GT	ng/LP	• Current Gas type.
K:Pr	Pcb / PnL	• Current Software version.(Pcb:Circuit Board, PnL:Control Panel)

[Installer Mode]

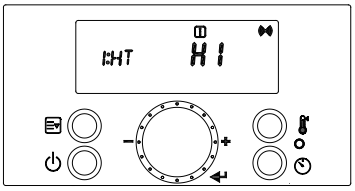
[To enter '**Installer Mode**']



1. Press the 'Power Button' OFF.



2. Press and hold the 'Function Button' for 5 seconds to enter 'Installer Mode'.



3. [1:HT] is displayed on the display screen. Turn the 'Dial Button' clockwise or counter-clockwise to navigate through the 'Installer Mode'.

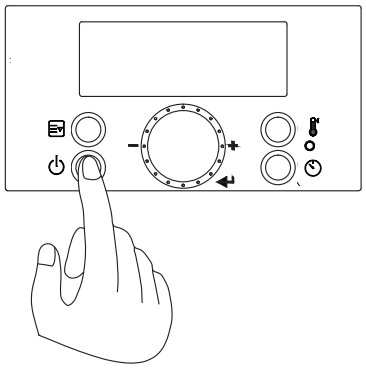
Display	Operation		Description
1:HT	HI (Heating Max Temperature)		• 121°F (49.5°C) ~ 180°F(82°C) (Min Temperature ~ Max Temperature). Default '180°F (82°C)'
	Lo (Heating Min Temperature)		• 80°F (26.5°C) ~ 120°F (49°C) (Min Temperature ~ Max Temperature). Default '100°F (38°C)'
2:TR	oFF / on		• Enable(on) / Disable(oFF) Outdoor Reset Control. Default 'oFF' ＊ 3:TY, 4:Od and 5:bS can't be seen if 2:TR is oFF
3:TY	A.Ftb (Finned Tube Baseboard)		• 120°F (49°C) ~ 180°F (82°C) (Min Temperature ~ Max Temperature) Default
	b.AH (Air Handler)		• 140°F (60°C) ~ 180°F (82°C) (Min Temperature ~ Max Temperature)
	C.CIb (Cast Iron Baseboard)		• 100°F (38°C) ~ 170°F (76.5°C) (Min Temperature ~ Max Temperature)
	d.LrF (Low Mass Radiant)		• 80°F (26.5°C) ~ 140°F (60°C) (Min Temperature ~ Max Temperature)
	E.rF (Mass Radiant)		• 80°F (26.5°C) ~ 120°F (49°C) (Min Temperature ~ Max Temperature)
	F.rAd (Radiators)		• 120°F (49°C) ~ 170°F (76.5°C) (Min Temperature ~ Max Temperature)
	G.CUS (Customer Set)	HI	• 121°F (49.5°C) ~ 180°F (82°C) (Min Temperature ~ Max Temperature) Default '180°F (82°C)'
		Lo	• 80°F (26.5°C) ~ 120°F (49°C) (Min Temperature ~ Max Temperature) Default '100°F (38°C)'
4:Od	A.HI (Highest Outdoor Temperature)		• [C.Lo + 9°F(5°C)] ~ 100°F (38°C). Default '70°F (21°C)'
	b.noH (Warm Weather Cutoff)		• on / oFF Default 'on', The unit stops heating at A.HI +5°F (2.5°C) automatically. <note> The unit restarts heating at A.HI automatically.
	C.Lo (Lowest Outdoor Temperature)		• - 4°F (-20°C)~ [A.HI - 9°F(5°C)]. Default '20°F (-6.5°C)'
5:bS	oFF, 1~120 (minutes)		• Setting the Boost Time. Default 'oFF'
6:Vt	PVC / CPVC(PP)		• Select the PVC Vent or CPVC(PP) Vent. Default 'PVC'
7:EL	High Elevation		• Select an altitude range from the following four options based on where the Combi Boiler is installed.
	0-2		• 0~1,999ft (0~609m) Default
	2-5		• 2,000~4,999ft (610~1,523m)
	5-8		• 5,000~7,999ft (1,524~2,438m)
	8-10		• 8,000~10,000ft (2,439~3,048m)

[Installer Mode]

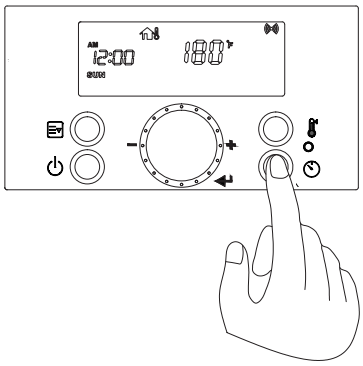
Display	Operation		Description
8:AH	on / oFF		• Connect the Air Handler(Option). Default 'oFF'
9:PH	on / oFF		• Setting the DHW Preheat. Default 'oFF'
10:EP	on / oFF		• Connect the External Pump(Option). Default 'oFF'
11:WP	12 ~ 26 (psi)		• Setting the Auto Feeder Pressure. Default '12 psi'
12:IV	0 ~ 20 (minutes)		• Setting the Re-Combustion Interval. Default '3 minutes'
13:Or	HEAt	0 ~ 60 (minutes)	• Setting the Pump Overrun Time in Heating mode. Default '20 minutes'
	do.H	1 ~ 20 (minutes)	• Setting the DHW Mode Maintain Time in DHW mode. Default '3 minutes'
14:bT	A.oFF	0°F (0°C) ~ 30°F (16.5°C)	• Heating mode Burner OFF : (Setting Temperature) + 0 ~ 30°F(16.5°C). Default '10°F(5.5°C)'
	b.on	1°F (0.5°C) ~ 30°F (16.5°C)	• Heating mode Burner ON : (Setting Temperature) - 1 ~ 30°F(-0.5~16.5°C). Default '30°F(16.5°C)'
15:CK	A.PP	on / oFF	• Select only Pump operation mode. Default' 'oFF'
	b.FAn	0 ~ 100(%)	• Select only Fan operation mode. Default '0%'
	C.Ag	on / oFF	• Select only AGM Zero Point Check mode. Default 'oFF'
	d.3-y	on / oFF	• Select only 3-Way Valve operation mode. Default 'oFF'
	E.FC	on / oFF	• Select only Flow Control Valve Zero Point Check mode. Default 'oFF'
16:CL	EHIS	YES / no	• Error History Clear. Default 'no'
	SYS	YES / no	• System Clear. Default 'no'
17:FS	A.FH2	- 30 ~ 30	• Maximum Fan RPM compensation in DHW mode : ±30.
	b.FH1	- 30 ~ 30	• Maximum Fan RPM compensation in Heating mode : ±30.
	C.FL	- 30 ~ 30	• Minimum Fan RPM compensation : ±30.
	d.Ag	- 50 ~ 50	• AGM Position compensation : ±50.
18:CP	HEAt	50 ~ 100 (%)	• Setting the Max Capacity for Heating. Default '100%'
	do.H	50 ~ 100 (%)	• Setting the Max Capacity for DHW. Default '100%'

1. Clock Setting

· Time, Day, Month, Year, Days of the Week setting.



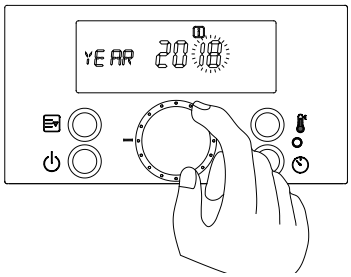
Press the 'Power Button' ON.



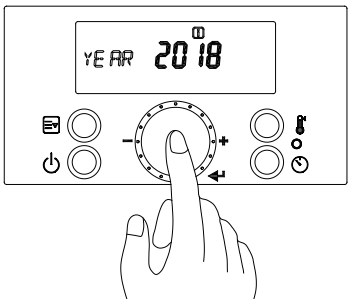
Press and hold 'Timer Button' for 5 seconds.

Blinking( ) - is not an Error Code.
Refer to page 50.

1.'Year' Setting
[For Example]
Year: 2018

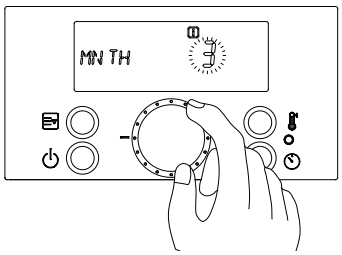


Set the 'Year' by turning the 'Dial Button'. (Only the blinking number can be changed.)

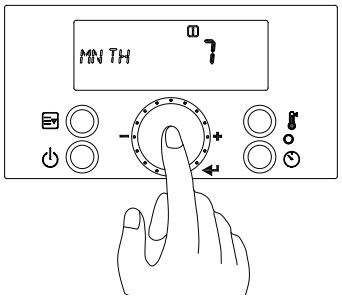


Press the 'Dial Button' to save the setting.

2. 'Month' Setting
[For Example]
Month: 7

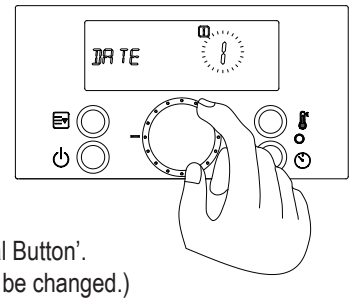


Set the 'month' by turning the 'Dial Button'. (Only the blinking number can be changed.)

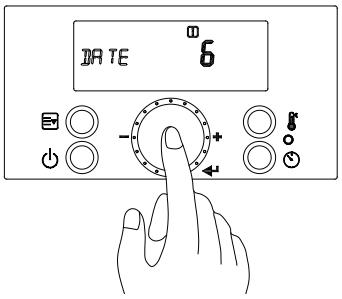


Press the 'Dial Button' to save the setting.

3. 'Day' Setting
[For Example]
Day: 6th

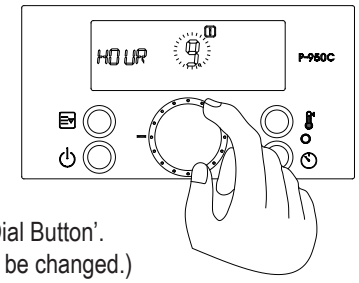


Set the 'day' by turning the 'Dial Button'.
(Only the blinking number can be changed.)

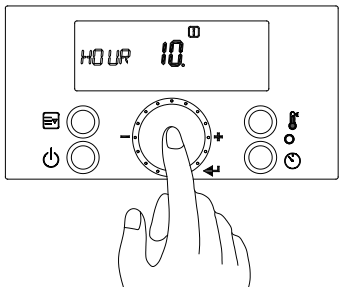


Press the 'Dial Button' to save the setting.

4. 'Hour' Setting
[For Example]
Hour: 10

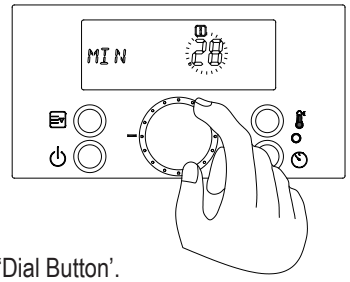


Set the 'hour' by turning the 'Dial Button'.
(Only the blinking number can be changed.)

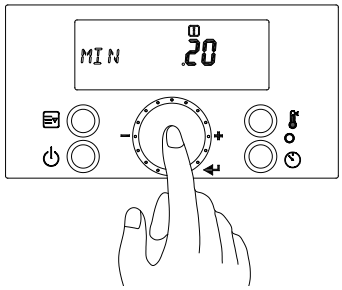


Press the 'Dial Button' to save the setting.

5. 'Minute' Setting
[For Example]
Minute: 20



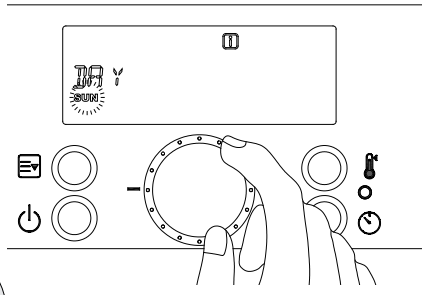
Set the 'minute' by turning the 'Dial Button'.
(Only the blinking number can be changed.)



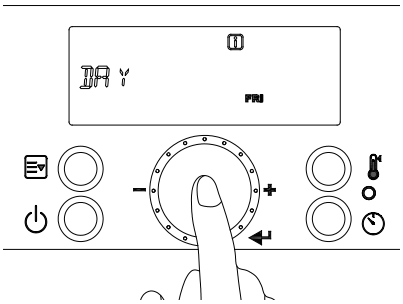
Press the 'Dial Button' to save the setting.

6. 'Day of the week' Setting
[For Example]
Day: Friday

[For example]
2018 / July / 6 / Friday 10 hour / 20 min

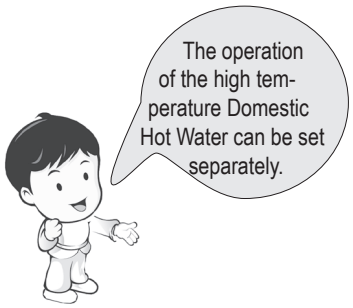


Set the 'day of the week' by turning the 'Dial Button'. (Only the blinking number can be changed.)



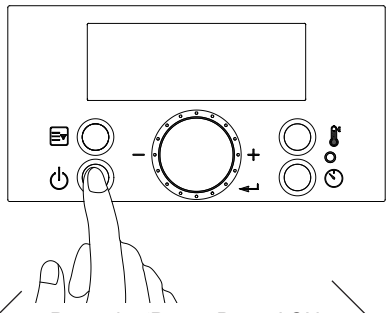
Press the 'Timer Button' to save the current setting.

2. Setting Domestic Hot Water Temperature (DHW)



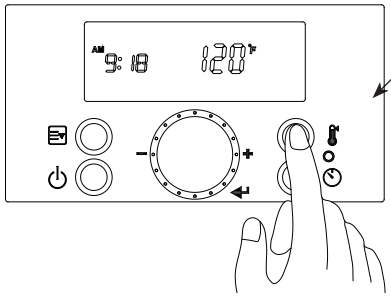
	General temperature range			High temperature range		
°F	90	·····	120 (Factory Default)	121	·····	140
℃	32	·····	49	49.5	·····	60

The temperature settings below are examples. The temperature setting necessary depends on the usage, the length of piping and the time of year.

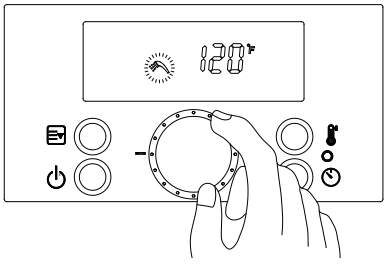


Press the 'Power Button' ON.

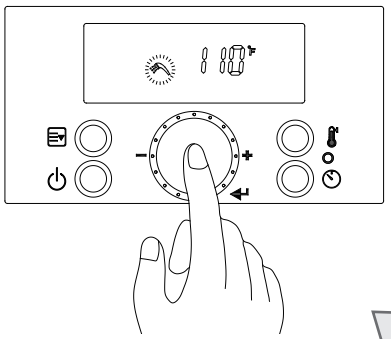
General temperature range



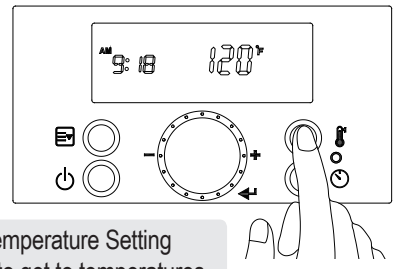
Press and hold the 'Temperature Setting Button' for 5 seconds for Domestic Hot Water temperature setting.



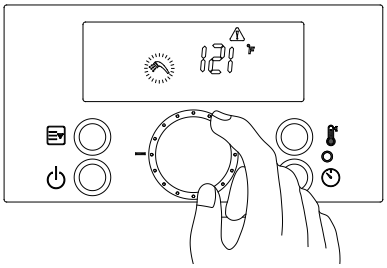
The 'DHW Icon' and 'current DHW setting temperature' will be blinking. DHW temperature setting can be adjusted by turning the 'Dial Button' from **90°F to 120°F (32°C~49°C) in 1°F(0.5°C) increments.**



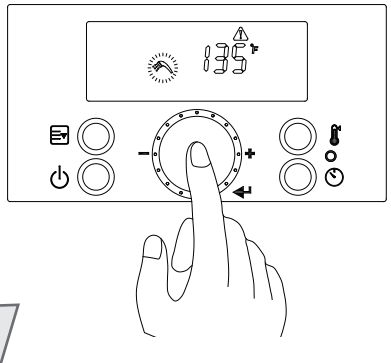
High temperature range



Press and hold the 'Temperature Setting Button' for 5 seconds to get to temperatures setting, then press and hold the 'Temperature Setting Button' again for 5 seconds for high temperature settings.

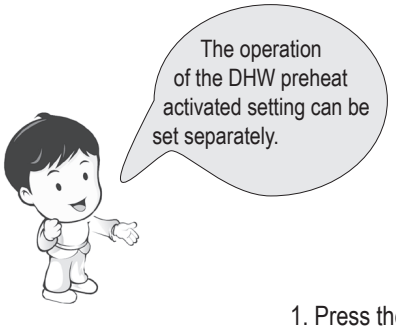


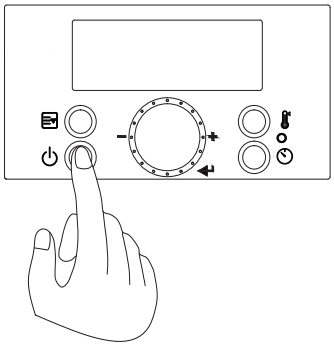
High temperature setting can be adjusted by turning the 'Dial Button' from **121°F to 140°F. (49.5°C~60°C) in 1°F(0.5°C) increments.**



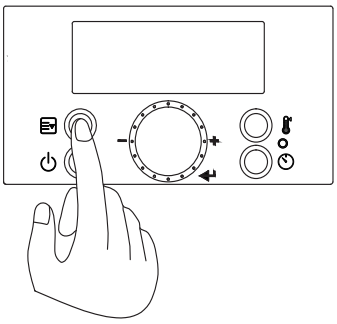
Press the 'Dial Button ( )' to save the DHW Temperature and return to normal mode.

3. DHW Preheat Activated Setting

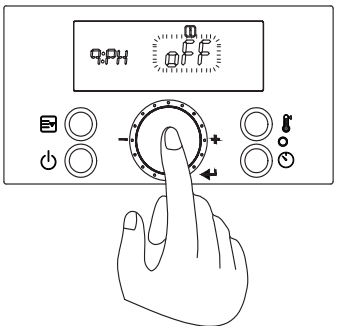




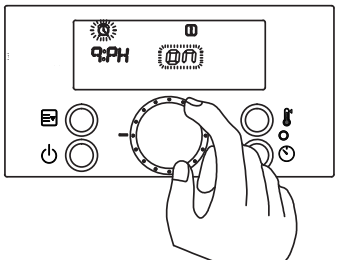
1. Press the 'Power Button' OFF.
The control panel must be off.



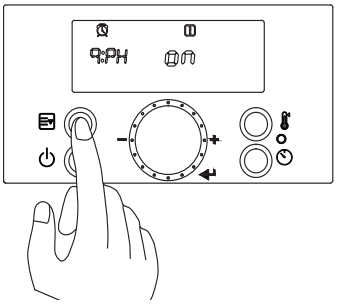
2. Press and hold the 'Function Button' for 5 seconds to enter 'Installer Mode'.



3. Turn the 'Dial Button' clockwise until 9:PH is displayed. Then press the 'Dial Button' so 'oFF' is blinking.

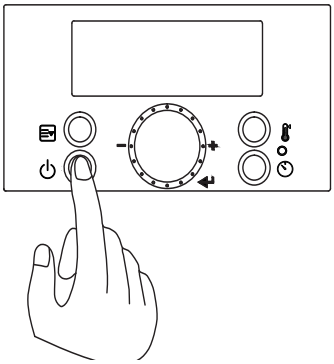


4. Turn the 'Dial Button' clockwise so 'on' and 'DHW Preheat Timer Icon' are blinking.
Then press the 'Dial Button' to save the setting.

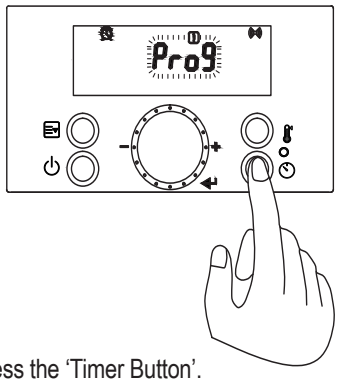


5. Press the 'Function Button' to exit 'Installer Mode'.

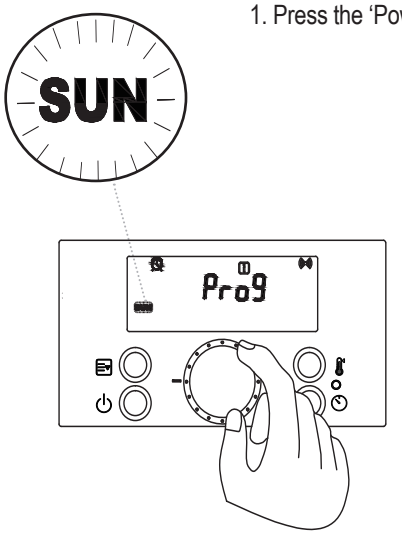
4. DHW Preheat Timer Setting



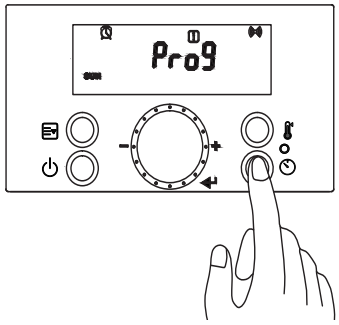
1. Press the ‘Power Button’ ON.



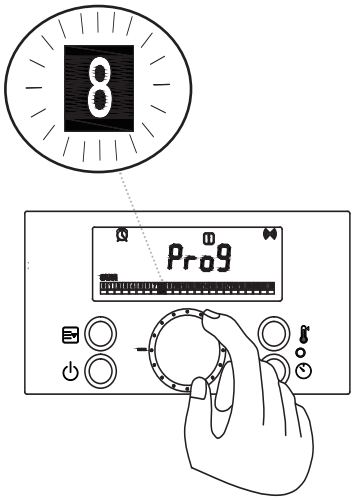
2. Press the ‘Timer Button’.



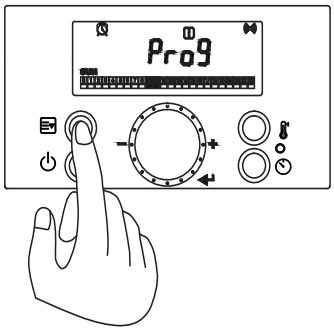
3. Press the ‘Timer Button’ again so today’s day [For Example: Sunday] is blinking. Then turn the ‘Dial Button’ clockwise or counter-clockwise until the ‘the desired day’ is displayed.



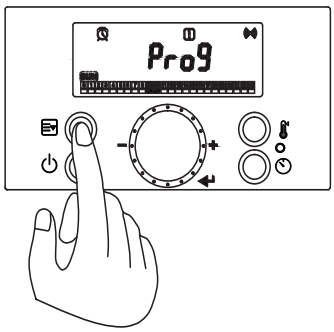
4. Press the ‘Timer Button’ to save the Day.



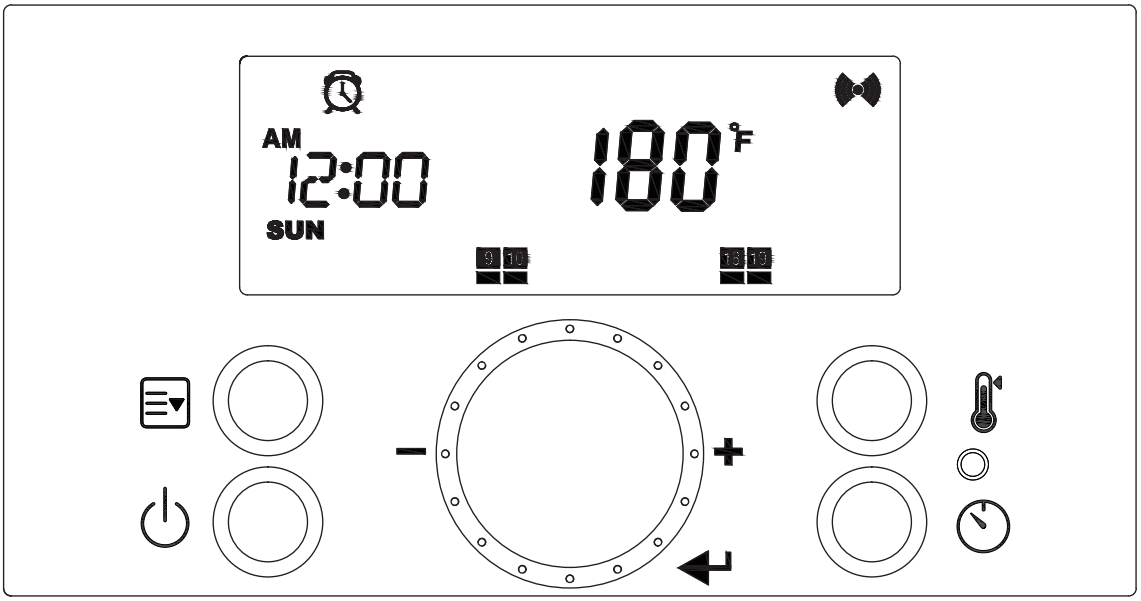
5. Current Time [For Example: 8am] is blinking,
then turn the ‘Dial Button’ clockwise or counter-clockwise until ‘the desired hour’ is displayed.
Press the ‘Dial Button’ to save the Hour(Icon is lit).
Then the next ‘Time Icon’ will be blinking.
Continue pushing the ‘Dial Button’ to select each 30 minute time block that is consecutive. To skip some time blocks turn the ‘Dial Button’ to next desired time and press the ‘Dial Button’ to select the next time blocks. Press the ‘Timer Button’ to save the setting.



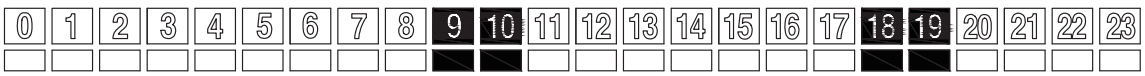
6. Press the 'Function Button' to return to 'Day'.
Repeat steps 3-5 for each day of the week.



7. After completing all settings,
press the 'Function Button' **three times** to
return to normal mode.



[For Example] Today is Sunday
DHW Preheat is scheduled to run Sunday 9:00am~11:00am and 6:00pm~8:00pm.

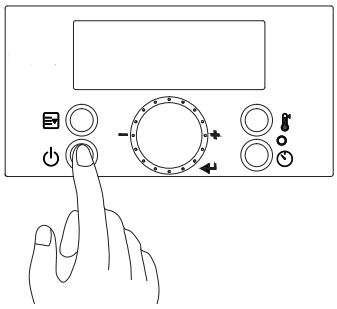


5. Setting Heating Temperature

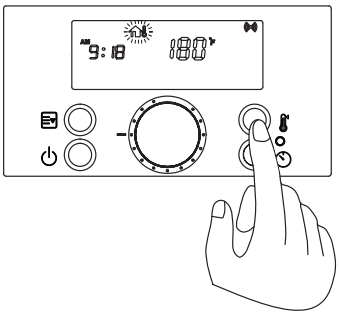
The following Heating Temperature Setting can be changed when the 'Outdoor Reset' is disabled.

General temperature range			
°F	100	.....	180
			Factory Default
℃	38	.....	82

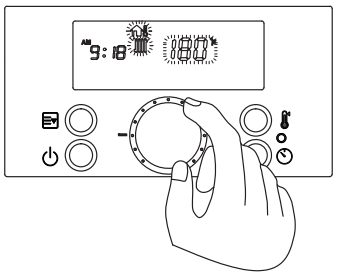
The temperature settings below are examples. The temperature setting necessary depends on the usage, the length of piping and the time of year.



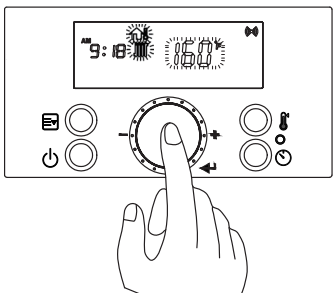
1. Press the 'Power Button' ON.



2. Press the 'Temperature Setting Button'.



3. The 'Heating Icon' and 'current Heating temperature setting' will be blinking.
Heating temperature can be adjusted by turning the 'Dial Button' from **100°F to 180°F (38°C~82°C) in 1°F(0.5 °C) increments.**

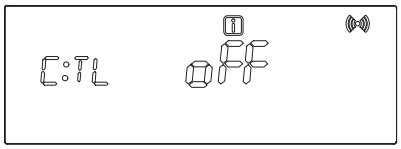


4. Press the 'Dial Button' to set the Heating Temperature and return to normal mode.

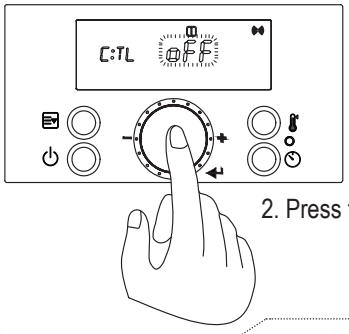
6. Lock Mode [C:TL]

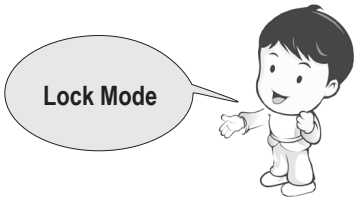
By locking the control panel, the settings cannot be accidentally changed if a button is pressed by mistake.

- Refer to page 41 for directions on how to enter 'User Mode'.

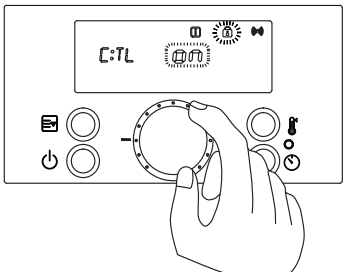


1. In the 'User Mode', turn the 'Dial Button' until [C:TL] is displayed.

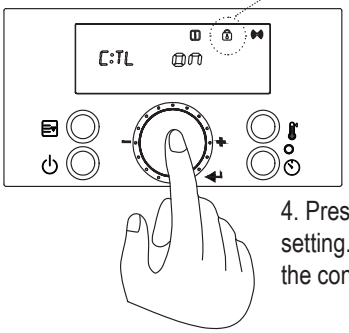




2. Press the 'Dial Button' so 'oFF' is blinking.



3. Turn the 'Dial Button' clockwise so 'on' and 'Lock Mode Icon' are blinking.

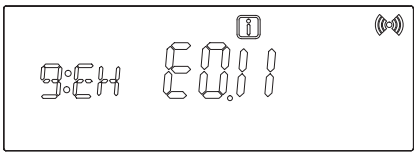


'Lock Mode' Icon

4. Press the 'Dial Button' to save the setting. The Lock Icon will display on the control panel.

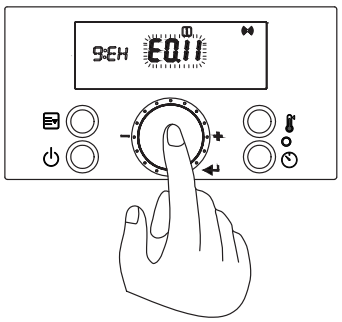
7. 'Error History'. [g:EH]

- Refer to page 41 for directions on how to enter 'User Mode'.

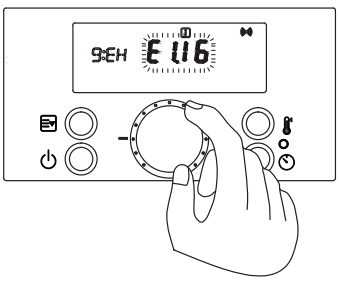


1. In the 'User Mode', turn the 'Dial Button' until [g:EH] is displayed.

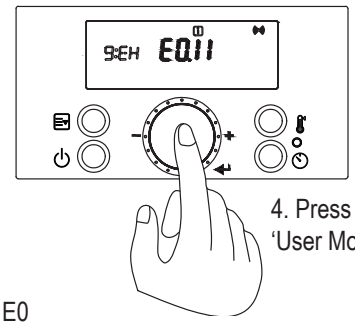
[For example]
1 st error occurs : 11
2 nd error occurs: 16



2. ERROR CODE that have occurred can be identified and 'E0.11' is blinking when the 'Dial Button' is pressed in '[g:EH] '.



3. ERROR CODE that have occurred from E0 to E9 can be identified by turning the 'Dial Button' clockwise.

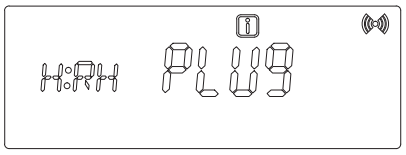


4. Press the 'Dial Button' to return to 'User Mode'.

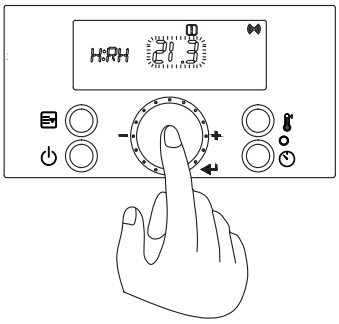
8. 'Running History' [H:RH]

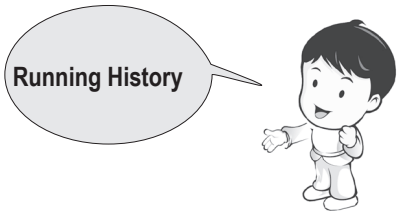
- Refer to page 41 for directions on how to enter 'User Mode'.

Screen Display	Description	Example
PLUg	Power-on Time	EX) 21.3 → 21.3 X 1,000 = 21,300 hour
bnH.H	Burner Running Hour with Heating Mode	EX) 3.2 → 3.2 X 1,000 = 3,200 hour
bnH.d	Burner Running Hour with DHW Mode	EX) 1.3 → 1.3 X 1,000 = 1,300 hour
bnC.H	Ignition Times with Heating Mode	EX) 86 → 86 X 1,000 = 86,000 times
bnC.d	Ignition Times with DHW Mode	EX) 57 → 57 X 1,000 = 57,000 times
PPHr	Pump Operation Hour	EX) 125.2 → 125.2 X 1,000 = 125,200 hour



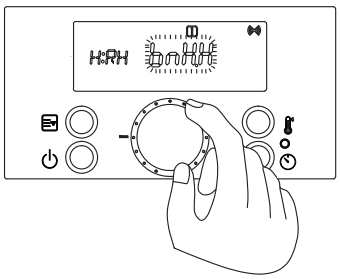
1. In the 'User Mode', turn the 'Dial Button' until [H:RH] is displayed.



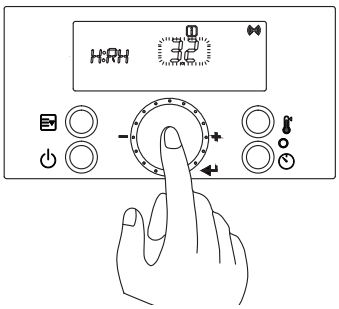


2. Press the 'Dial Button' so 'PLUg' is blinking. Then press the 'Dial Button' again to display the value. Press the 'Function Button' to return to 'PLUg' blinking.

[PLUg] : Means hour of the power supply.
EX) 21.3→ 21.3 X 1,000 = 21,300 hour



3.Turn the 'Dial Button' clockwise to display 'bnH.H', it will be blinking.

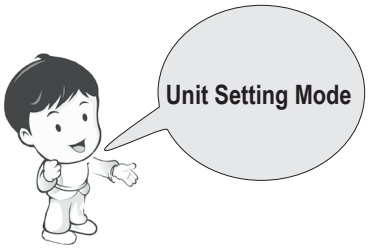


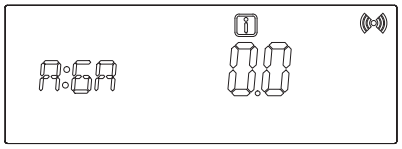
4. Press the 'Dial Button' to display the value.
Then press the 'Function Button' to return to 'bnH.H' blinking.
5. Repeat steps 2-4 with other items in the running history.

[bnH.H] :Means Burner Running Hour with Heating mode
EX)3.2 → 3.2 X 1,000 = 3,200 hour

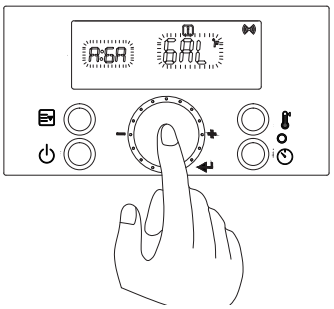
9. 'Unit' Setting [A:GA]

- Refer to page 41 for directions on how to enter 'User Mode'.

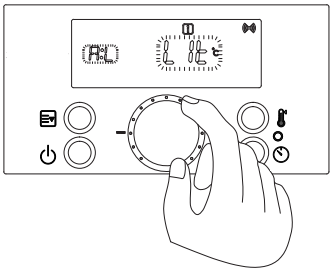




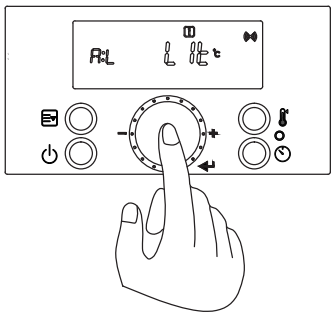
1. After entering 'User Mode' the first item displayed will be [A:GA].



2. Press the 'Dial Button' so 'A:GA', 'GAL' and '°F' are blinking.



3. Turn the 'Dial Button' counter-clockwise so 'A:L', 'Lit' and '°C' are blinking.
   * GAL = GPM / °F
   * LIt = LPM / °C

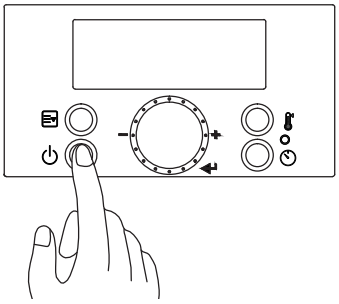


4. Push the 'Dial Button' to save the setting and return to 'User Mode'.

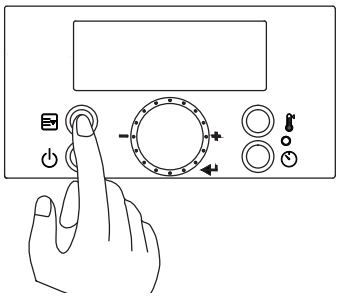
Screen Display	Operation	Description
GAL °F	Unit : Gallon & Fahrenheit	All of the units shown on the display screen are GPM & °F
L It °C	Unit : Liter & Celsius	All of the units shown on the display screen are LPM & °C

10. Setting the High Elevation

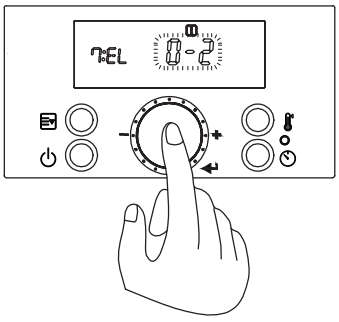
Elevation above Sea Level	7:EL setting
0~1,999ft (0~609m)	0 - 2
2,000~4,999ft (610~1,523m)	2 - 5
5,000~7,999ft (1,524~2,438m)	5 - 8
8,000~10,000ft (2,439~3,048m)	8 - 10



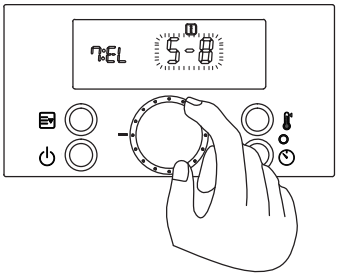
1. Turn off the power to control panel.



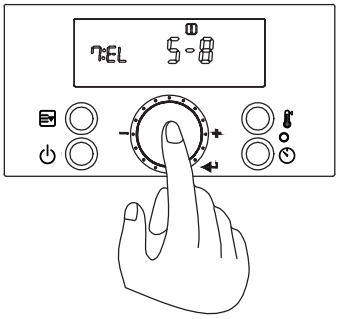
2. Press and hold the 'Function Button' for 5 seconds to enter the 'Installer Mode'. In 'Installer Mode', 'turn the dial button clockwise until the display reads '[7:EL]'.



3. '0-2' will flash when the 'Dial Button' is pressed. (The default setting is '0-2' for installations at 0~1,999ft elevation.)

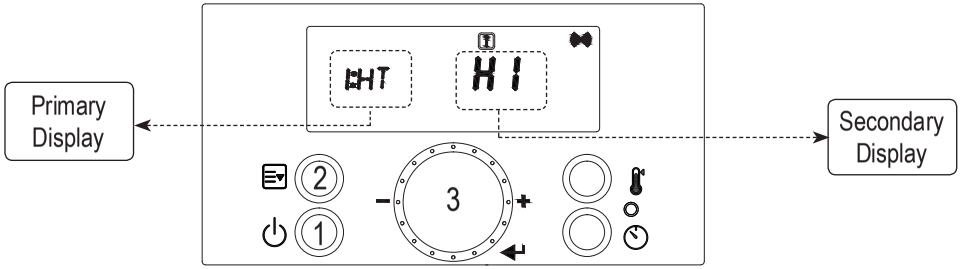


4. Turn the 'Dial Button' clockwise to select the value that corresponds to the installation elevation.



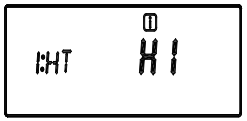
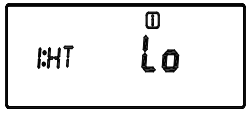
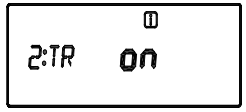
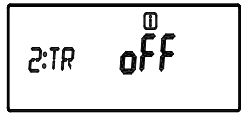
5. Press the 'Dial Button' to store the current setting and return back to 'Installer Mode'.

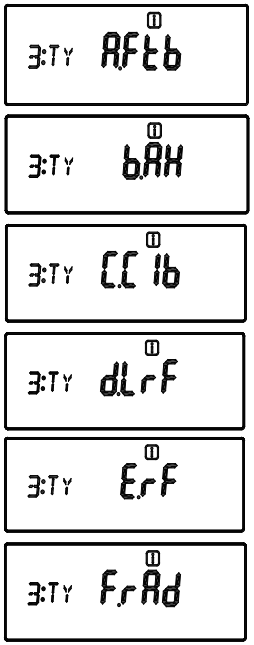
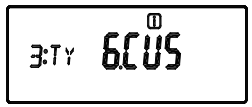
11. Installer Mode (Parameter Settings)

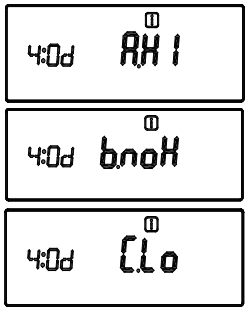
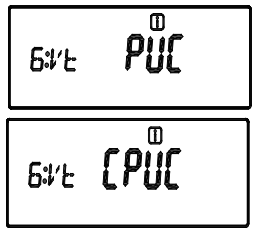


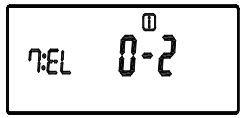
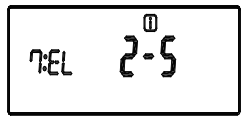
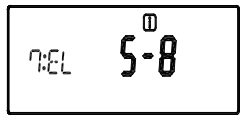
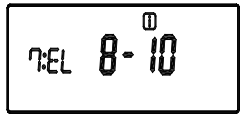
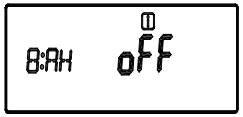
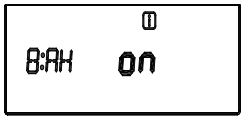
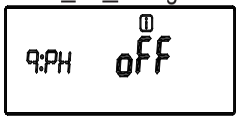
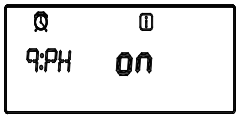
How to enter 'Installer Mode'

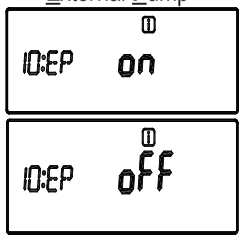
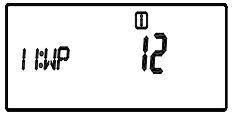
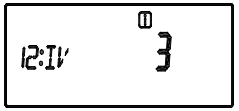
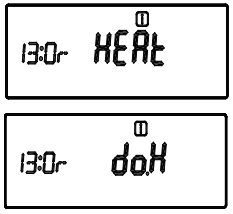
1. Turn off the power to the control panel.
2. Press and hold the 'Function Button' for approximately 5 seconds to get into the 'Installer Mode'.
3. Turn the 'Dial Button' clockwise or counter-clockwise to navigate to the desired function in the 'Installer Mode'. (Select)
4. Push 'Dial Button' to save setting. (Enter)

Primary Display		Secondary Display				Function Description	Reference Page(s)
Function (Select & Enter)	Function Name	Step 1 (Select & Enter)	Step 2 (Select & Enter)	Step 3 (Select & Enter)	Default		
1:HT	Heating Temp Range  	HI	121 - 180°F (49.5 - 82°C)		Default 180°F (82°C)	This setting is for changing the heating set temperature range. • You can change the Highest Set Temperature (HI) and the Lowest Set Temperature (Lo) by adjusting the numbers on the display. • If **2:TR** (Outdoor Temperature Reset) is activated ('on') then the settings for **1:HT** will be overridden by **2:TR** settings.	
		Lo	80 - 120°F (26 - 49°C)		Default 100°F (38°C)		
2:TR	Outdoor Temp Reset  	oFF			Default	This setting activates or deactivates the Outdoor Temperature Reset function. • icon appears and lights up when the Outdoor Temperature Reset function is activated. • Please check the connection of the outdoor temperature sensor if icon is blinking. • You can't change the heating set temperature manually while this function is on, because the heating set temperature is determined by the outdoor temperature automatically.	Page 42 in Installation Manual
		on					

Primary Display		Secondary Display				Function Description	Reference Page(s)
Function (Select & Enter)	Function Name	Step 1 (Select & Enter)	Step 2 (Select & Enter)	Step 3 (Select & Enter)	Default		
3:TY (Skipped if 2:TR is Off)	**TY**pe of Heating System 	A.Ftb	(Fin Tube Baseboard)		Default 120 - 180°F (49 - 82°C)	This section is used to select which type of Heating System is being used. • There are 6 typical Heating Systems that are available -Finned Tube Baseboard -Air Handler -Cast Iron Baseboard -Low Mass Radiant Floor - High Mass Radiant Floor -Radiator • For these 6 heating types the low and high temperature points are pre-programmed. (See ranges to the left) * If **b.AH** is selected, additional steps are needed to be programmed, see **8:AH** below.	Page 43 in Installation Manual
		b.AH	(Air Handler)*		140 - 180°F (60 - 82°C)		
		C.Clb	(Cast Iron Baseboard)		100 - 170°F (38 - 76.5°C)		
		d.LrF	(Low Mass Radiant Floor)		80 - 140°F (26.5 - 60°C)		
		E.rF	(Mass Radiant Floor)		80 - 120°F (26.5 - 49°C)		
		F.rAd	(Radiator)		120 - 170°F (49 - 76.5°C)		
		G.CUS (Customized)	HI	121 - 180°F (49.5 - 82°C)	Sub Default 180°F (82°C)	• If you would like to use custom low and high temperature points, select G.CUS and follow the sub menus to set custom low and high temperature points.	
			Lo	80 - 120°F (26.5 - 49°C)	Sub Default 100°F (38°C)		

Primary Display		Secondary Display				Function Description	Reference Page(s)
Function (Select & Enter)	Function Name	Step 1 (Select & Enter)	Step 2 (Select & Enter)	Step 3 (Select & Enter)	Default		
4:Od (Skipped if 2:TR is oFF)	**O**ut**d**oor Temp 	A.HI	23 - 110°F (-5 - 43°C)		Default 70°F (21°C)	The Combi Boiler will automatically use the Outdoor Temperature Settings and the Heating Application to adjust the set temperature of the unit for the most comfortable and economical heating temperature. • **A.HI** (Outdoor High Temperature Setting) This should be set at the highest average outdoor temperature in which the customer would like the heating system to continue to heat the home. • **b.noH** (Warm Weather Shutdown Temperature Setting) - When 'on' the unit will go into energy saving mode and automatically stop heating when the outdoor temperature is 5°F (3°C) over the A.HI set point. - When 'oFF' the unit will continue to heat at the lowest temperature setting even if the outdoor temperature is greater that A.HI set point. • **C.Lo** (Outdoor Low Temperature Setting) This should be set at the lowest average outdoor temperature during the winter season. (not the lowest possible outdoor temperature) • When the Warm Weather Cutoff is on the ☼ icon will flash on the control panel.	Pages 43 - 45 in Installation Manual
		b.noH	on		Default		
			oFF				
		C.Lo	-4 - 61°F (-20 - 16°C)		Default 20°F (-6.5°C)		
5:bS (Skipped if 2:TR is oFF)	**B**oo**s**t Timing 	oFF			Default	The setting is to increase the set temperature of the unit on cold start ups 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 10°F (5.5°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	
		1 - 120 min					
6:Vt	**V**ent Material 	PVC			Default	Vent Material function is used to limit the maximum exhaust temperature for the vent material used. For safety reasons the Combi Boiler operation will stop if the exhaust temperature exceeded maximum allowable temperature for the venting material. • PVC maximum exhaust temperature is 149°F (65°C) • CPVC and PP maximum exhaust temperature is 200°F (93°C)	Page 15 in Installation Manual
		CPVC					

Primary Display		Secondary Display				Function Description	Reference Page(s)
Function (Select & Enter)	Function Name	Step 1 (Select & Enter)	Step 2 (Select & Enter)	Step 3 (Select & Enter)	Default		
7:EL	High **El**evation 	0 - 2			Default	Select an altitude range from the following four options based on where the Combi Boiler is installed. **7:EL setting** / **Elevation above Sea Level** 0 - 2 / 0~1,999ft (0~609m) 2 - 5 / 2,000~4,999ft (610~1,523m) 5 - 8 / 5,000~7,999ft (1,524~2,438m) 5 - 10 / 8,000~10,000ft (2,439~3,048m)	Page 21 in Installation Manual
		2 - 5					
		5 - 8					
		8 - 5					
8:AH	**A**ir **H**andler 	oFF			Default	This function needs to be turned 'on' if an Air Handler is being used as a heating type. • When heating side is running the fan and pump for the Air Handler will be on. • If the DWH side is running the fan and pump for the Air Handler will be off. • If this is not set to 'on' the Air Handler fan will be running with no hot supply water from the Combi Boiler and blow cold air into the home while the DHW side is running. • When the Air Handle is operating, the icon will display on the control panel.	Pages 38 - 39 in Installation Manual
		on					
9:PH	**P**re-**H**eating 	oFF			Default	This function is used to preheat the internal DHW plate heat exchanger during selected times set. • After turning on this function the timer will need to be set. • When Pre Heating function is activated the icon will be displayed on the control panel.	Pages 18 - 20 in Owner's Guide
		on					

Primary Display		Secondary Display				Function Description	Reference Page(s)
Function (Select & Enter)	Function Name	Step 1 (Select & Enter)	Step 2 (Select & Enter)	Step 3 (Select & Enter)	Default		
10:EP	External Pump 	oFF			Default	This setting can activate or deactivate the terminals in the Combi Boiler for an External Pump (secondary pump) on the circuit board. • When the External Pump is activated the ⚠ icon will display on the control panel.	Pages 36 in Installation Manual
		on					
11:WP	Water Pressure 	12 - 26 PSI			Default	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. • The Auto Feeder will fill the system within 10 minutes. When the pressure of the system is over 2 PSI of Water Pressure Setting the Auto Feeder will close and water will stop filling the Combi Boiler. • Water Refilling Pressure: Set Valve - 4 PSI (0.002 BAR) • Water Refilling Stop Pressure: Set Valve + 2 PSI (0.001 BAR)	
12:IV	Interval 	0-20 min			Default 3 min	This function is to set up the Interval Time in Heating Mode to prevent inconsistency of 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.	
13:Or	Pump Overrun Time 	HEAt	0 - 60 min		Default 20 min	This mode is to control how long the pump will run after the heating or DHW demand is satisfied. • This setting is to prevent unnecessary running of the pump and extend the life of the pump. • **HEAt** is used for the time after the heating system stops burning. • **do.H** is used for the time after the DHW system stops burning.	
		do.H	1 - 20 min		Default 3 min		

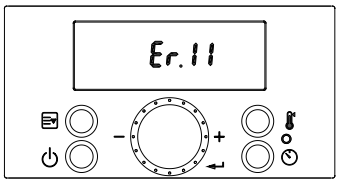
Primary Display		Secondary Display				Function Description	Reference Page(s)
Function	Function Name	Step 1	Step 2	Step 3	Default		
14:bT	**B**urner Set **T**emp	A.oFF	0 - 30°F [0 - 16.5°C]		Default 10°F (5.5°C)	This mode is to set the activation points for the Heating Mode. • When the internal temperature of the Combi Boiler is to high or low the unit will stop burning or start burning. • Burner Stop Temperature = Heating Set Temperature + **A.oFF** • Burner Operating Temperature = Heating Set Temperature - **b.on**	
		b.on	1 - 30°F [0.5 - 16.5°C]		Default 30°F (16.5°C)		

Error Code List

Code	Error Code Description	Possible Remedies
Er11	Ignition Failure	• Make sure that the main gas supply valve is open. • Make sure that the gas supply and inlet gas is within specification.
Er12	Flame Loss	• Clean the intake air filter. • Make sure that the main gas supply valve is fully open or have a professional to check the gas supply pressure.
Er16	Overheating Heating Supply Thermistor during DHW Operation (Exceed 205°F(96°C))	• Turn off the Combi Boiler for at least 30 minutes, and then restart it. • Clean the heating return filter. • Check the circulation pump operation or speed setting as speed III. • Flush the heat exchanger.
Er20	High Limit Switch Abnormality	• Turn off the Combi Coiler for at least 30 minutes, and then restart it. • Clean the heating return filter. • Check the circulation pump speed setting as speed III. • Flush the primary heat exchanger.
Er29	Air Pressure Switch Abnormality	• Make sure that the exhaust pipe is free of obstructions. • Clean the intake air filter. • Make sure that clogged of condensate trap or drain pipe.
Er30	Outdoor Temperature Sensor Open or Short Circuit	• Check outdoor temperature sensor. Ensure connections are secure. • Check sensor resistance. If resistance is zero, replace the sensor. • Contact technical support.
Er31	DHW Cold Water Thermistor Open or Short Circuit	• Ensure connections are secure. • Check sensor resistance. If resistance is zero, replace the sensor.
Er32	DHW Thermistor Open or Short	
Er34	Heating Return Thermistor Open or Short Circuit	
Er33	Heating Supply Thermistor Open or Short Circuit	
Er35	Exhaust Thermistor Open or Short Circuit	
Er38	Abnormal Operation; Memory Error on the Circuit Board	• Try to reset first → Still the same Error Code → Contact Technical Support.
Er39	False Flame Detection	• Clean the flame window. • Make sure that the front cover is closed securely. • Check the flame sensor.
Er40	Gas Leakage	• Turn off the gas. • Contact technical support.
Er41	Fan Speed Error	• To reset this error code, the power needs to be disconnected and then reconnected.
Er43	Burner Limit Switch Abnormality	• Contact technical support.
Er45	Water Leakage	• Close the water inlet valve before contacting technical support. • Contact technical support.
Er54	Low Heating Water Pressure	• Water pressure lower than [Setting Pressure - 4] psi • Check the auto feeder. • Check the auto feeder inlet pressure. • Check the pressure sensor.
Er55	Stop Supply Inlet Water.	• If the water pressure is not rising to at least 13 psi. • Check supply water and inlet shut off valve. This valve must be open. • Check the auto feeder.
Er56	High Heating Water Pressure	• Water pressure higher than 50 psi. • Check the pressure sensor. • Contact technical support.

Error Code List

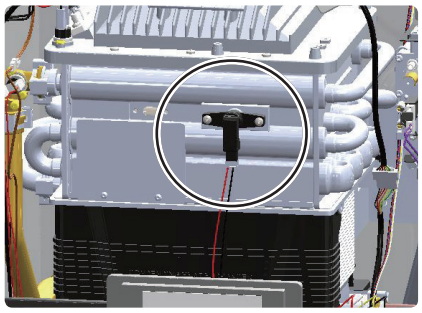
Code	Error Code Description	Possible Remedies
Er58	LWCO Abnormality	• Ensure the LWCO wiring connection on circuit board. • Measuring output AC24V from terminal on circuit board in the case of external LWCO install. • Measuring input AC 24V to terminal on circuit board. • Ensure that the LWCO in piping system is properly installed. • Make-up water to the system if necessary. • Contact technical support.
Er59	Pressure Sensor Abnormality	• Check the pressure sensor. • Contact technical support.
Er61	RPM Sensor	• Check fan motor.
Er63	Overheating Heating Supply Thermistor during Heating Operation (Exceed 205°F(96°C))	• Turn off the Combi Boiler for at least 30 minutes, and then restart it. • Clean the heating water return filter. • Flush the primary heat exchanger.
Er65	Flow Control Valve Abnormality	• Check flow control valve.
Er67	AGM Abnormality	• Try main power switch OFF/ON → Still the same Error Code → AGM failure.
Er72	Flame Detected before Ignition Abnormality	• Measure the current from the Flame Sensor when there is no flame. • To reset this error code, the power needs to be disconnected and then reconnected.
Er73	DIP Switch Setting Abnormality	• Check the DIP Switch settings.
Er76	Communication Error between Control Panel and Circuit Board.	• Check connections from Circuit Board to Control Panel. • To reset this error code, the power needs to be disconnected and then reconnected.
Er94	Overheating Exhaust Thermistor (The Combi Boiler shuts down when the exhaust temperature exceed PVC vent 149°F(65°C) or CPVC/PP vent 200°F(93°C))	• Turn off the Combi Boiler for at least 30 minutes, and then restart it. • Check the exhaust thermistor and related wiring. • Make sure that the vent / air intake are properly installed. • Flush the heat exchanger.

Error code	Meaning	Condition
	Ignition failure (Manual restore)	During burning operation, if it failed to ignite 10 times continuously, error code 11 will appear.

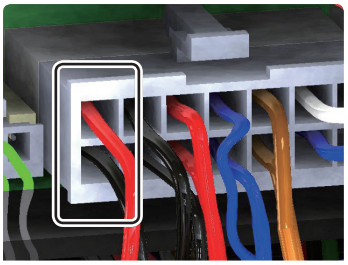
Failure event

If it failed to detect flame during ignition sequence pre-purge time will exceed 10 secs, and post-purge will be performed after the ignition causes manual restore error.

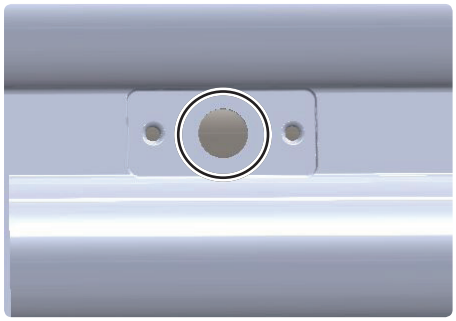
Check point



① Check flame detector sensor's connecting line and fixed spot.

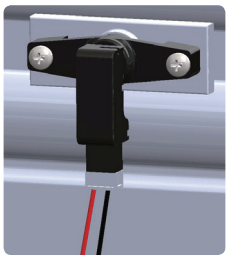


② Check wire color of connector. (CN 7 : red ① , black ⑧)



③ Check color changes of flame observation port. After separating stop ring by seeing color changes, replace the flame observation port.

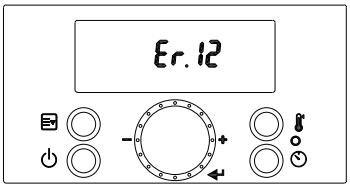
■ From more than DC 3.0V after ignition safety cut-off will appear
① When setting before ignition is less than DC 3.0V : Replace flame sensor.
② When setting before ignition is more than DC 3.0V : Replace the flame observation glass and gasket.



■ Voltage can be found in the 'User's mode' of the control panel. (Please check after closing front cover)

Display	Operation	Description
F : FS	Voltage of flame sensor	• Current flame sensor (Vdc)

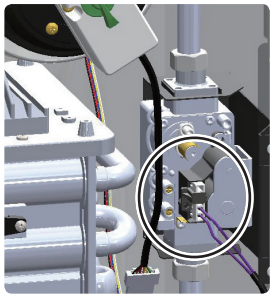
ITEM	Normal Value
Before ignition	More than DC 3.0V
After ignition	Less than DC 3.0V

Error code	Meaning	Condition
	Flame Loss (Manual restore)	If flame extinction issue repeats 8 times while combusting error code 12 will appear.

Failure event

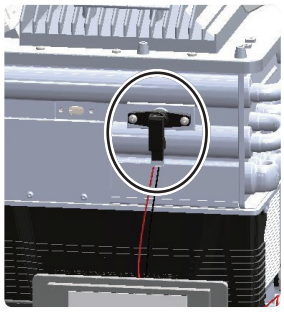
If flame loss occurs 8 consecutive times during combustion, the Er.12 will be displayed, the burner will turn off the flame, and the fan will post-purge.

Check point

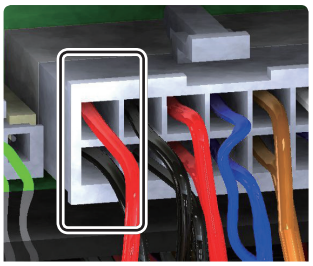


① Check gas valve connecting line.

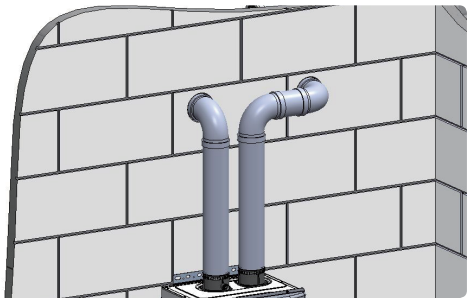
② Check wire color of connector.
(CN 18 : Purple ⑥, ⑭)



③ Check flame detector sensor's connecting line and fixed spot.

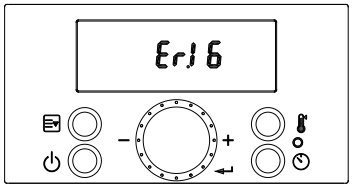


④ Check wire color of connector.
(CN 7 : red ① , black ⑧)



⑤ Check the flue. (Air intake & exhaust pipe)

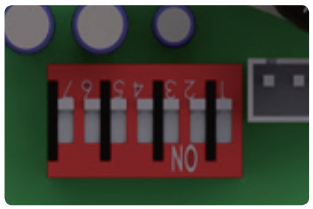
⑥ If the above issues are operating normally, replace circuit board.

Error code	Meaning	Condition
	Overheating Heating Supply Thermistor(Automatic restore)	In the case of DHW mode, when the Heating Supply Thermistor is detected higher than 205℉ (96℃), error code 16 will appear.

Failure event

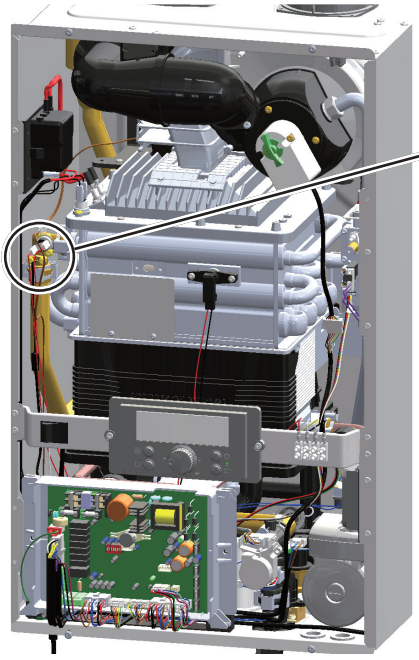
When Overheating Heating Supply Thermistor is more than 205℉ (96℃), DHW overheating error issue will appear and all the outputs except post-purge will stop. When lower than 176℉(80℃) it will restore automatically.

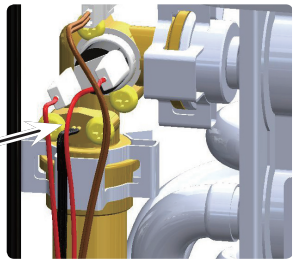
Check point



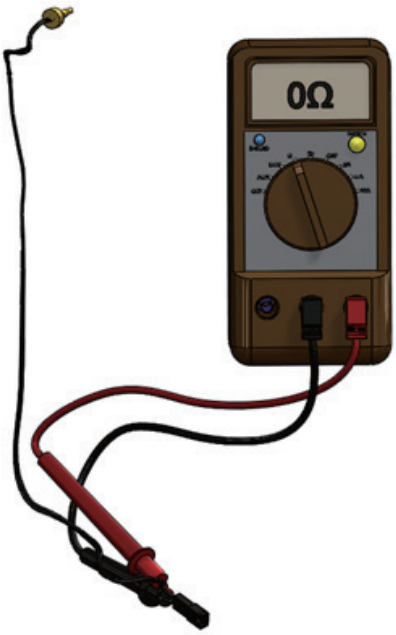
① Check the Circuit Board dip switch settings.

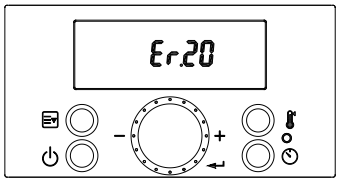
DIP SWITCH		OFF	ON
1 – 3	Factory Use Only	Factory Use Only	
4	Factory Use Only	Factory Use Only	
5	Gas Type	LP	NG
6	High Fire	Normal	High Fire
7	Low Fire	Normal	Low Fire





② If the value is 0Ω by measuring with a multi-meter machine, replace Heating Supply Thermistor.

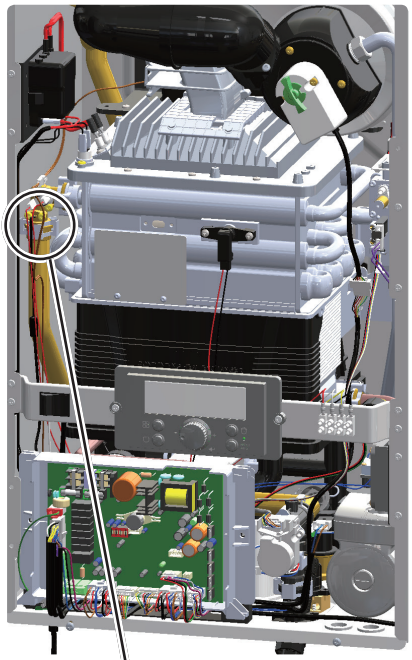


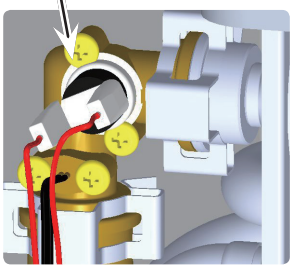
Error code	Meaning	Condition
	High Limit Switch Abnormality (Manual restore)	When the High Limit Switch temperature is overheated, error code 20 will appear.

Failure event

An Er. 20 will display if the temperature of the heating water exiting the primary heat exchanger exceeds the High Limit Switch's default settings. Combustion will stop and the fan will continue to run for post-purge.

Check point

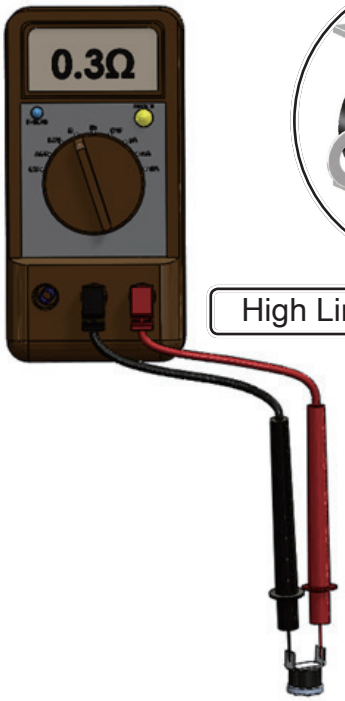


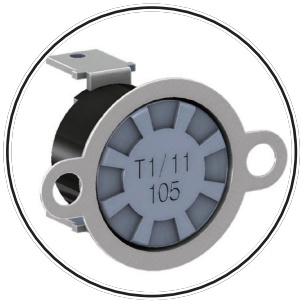


① Inspect the High Limit Switch when error code appears even if the heating supply temperature is not too high.

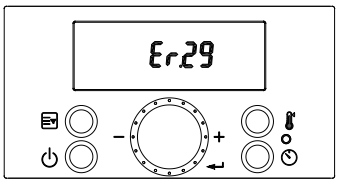
② Check connector and if no problem, measure High Limit Switch located at heat exchanger outlet and replace when the multi-meter value shows '0L'. (Normal value is '0~0.5Ω'.)
(CN 11 : red ⑥, ⑫)

③ Check the circulation pump speed setting as speed III.





High Limit Switch (221°F/105°C)

Error code	Meaning	Condition
	Air Pressure Switch (APS) Abnormality (Manual restore)	When APS at condensate discharging outlet is abnormal, error 29 will appear.

Failure event

Air pressure increase is most likely the result of an obstruction in the exhaust airflow line - for example, excessive condensate buildup or a blockage in the vent termination.

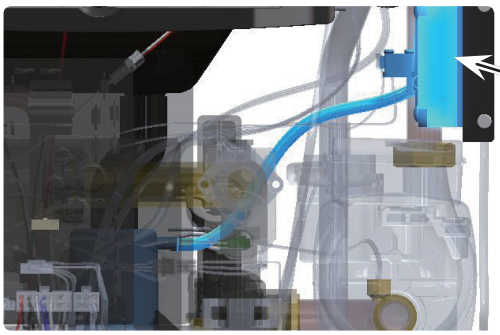
Check point

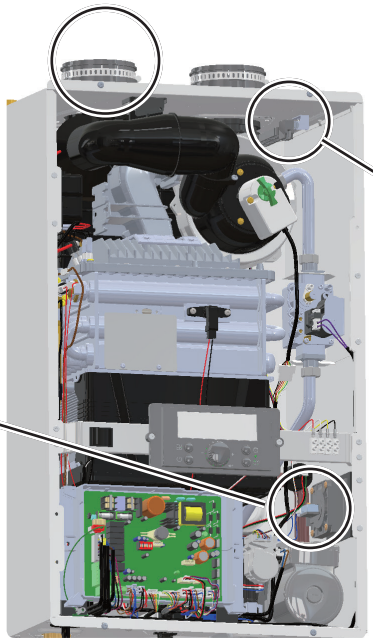
① Check APS and circuit board connection.

② Verify that the condensate trap and drain pipe are free of obstructions.

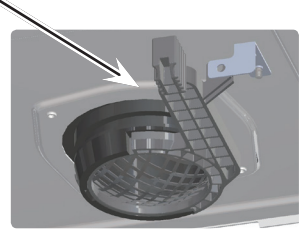
③ Check condensate discharging outlet is blocked by foreign substances.

④ Check the connecting hose between the condensate trap and APS.

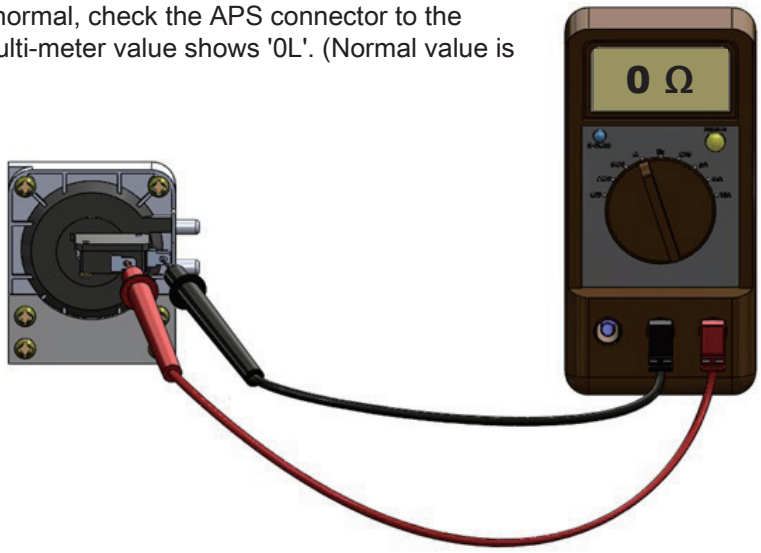


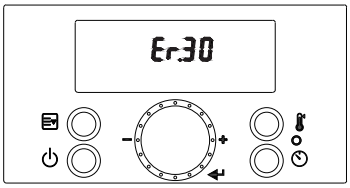


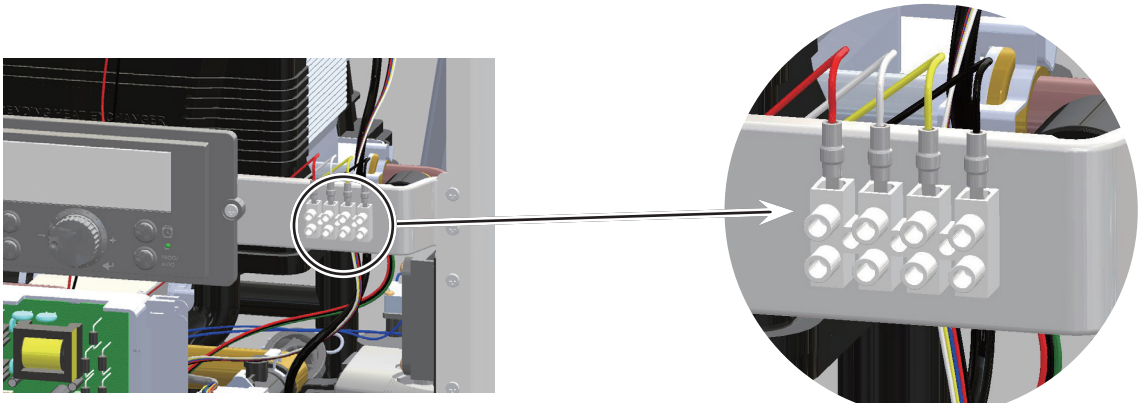
⑤ Check the exhaust pipe blockage and Air Inlet Filter clogging.



⑥ If above ①,②,③ check points are normal, check the APS connector to the multimeter. Replace APS when the multi-meter value shows '0L'. (Normal value is '0~0.5Ω'.)



Error code	Meaning	Condition
	Outdoor Temperature Sensor Open or Short (Manual restore)	When no response at Outdoor Sensor, error code 30 will appear.
Failure event		
When Outdoor Sensor wiring line located at terminal block is disconnected or abnormality outdoor sensor.		
Check point		

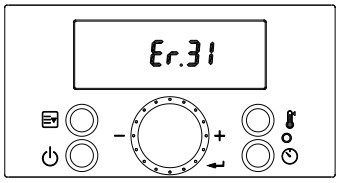


(Outdoor sensor connector : yellow , black)

① Check outdoor temperature sensor. Ensure connections are secure.

② Check sensor resistance. If resistance is zero, replace the sensor.

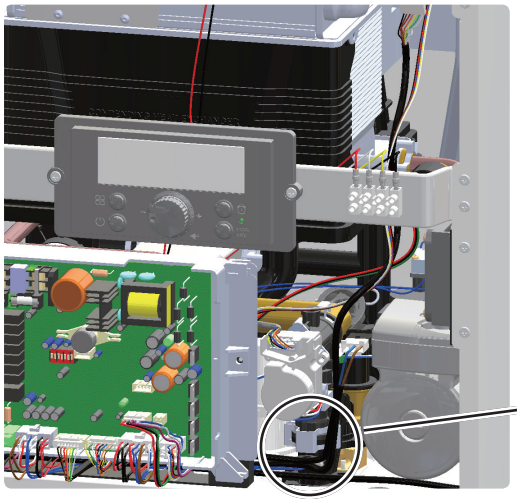
③ Contact technical support.

Error code	Meaning	Condition
	DHW Cold Water Thermistor Open or Short Circuit (Automatic restore)	When no response at DHW Cold Water Thermistor, error code 31 will appear.

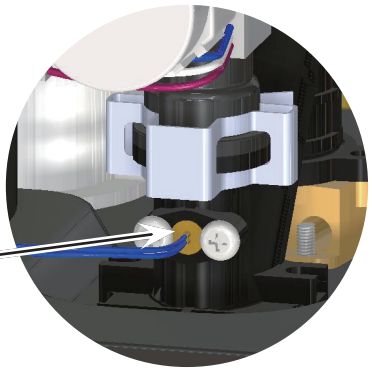
Failure event

When DHW Cold Water Thermistor's wiring line located at DHW cold water connection is disconnected.

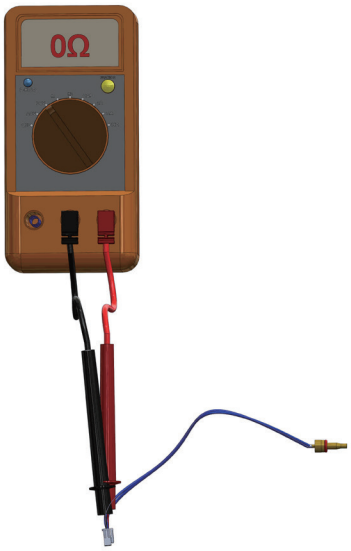
Check point

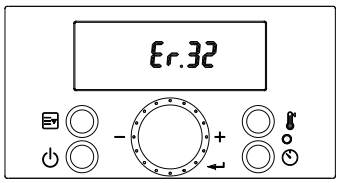


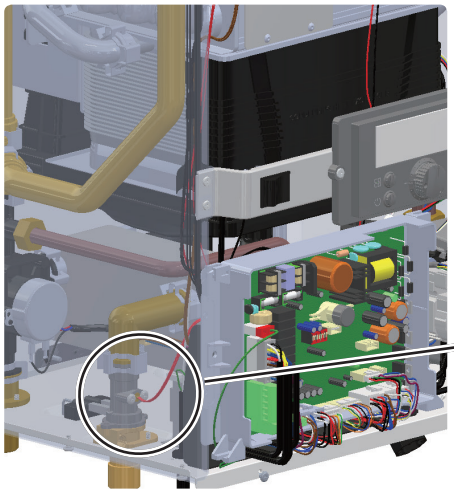
① Verify that the DHW Cold Water Thermistor is properly secured in the cold water connection. Verify proper connection of the DHW Cold Water Thermistor's wiring to the circuit board. (CN7 : blue ④, blue ⑪)



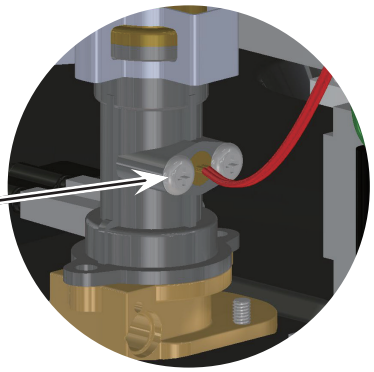
② Measure resistance across the DHW Cold Water Thermistor with a multi-meter. If the multi-meter displays 0Ω (short circuit), replace the DHW Cold Water Thermistor.



Error code	Meaning	Condition
	DHW Thermistor Open or Short (Automatic restore)	When no response at DHW Thermistor, error code 32 will appear.
Failure event		
When DHW Thermistor's wiring line located at DHW connection is disconnected.		
Check point		

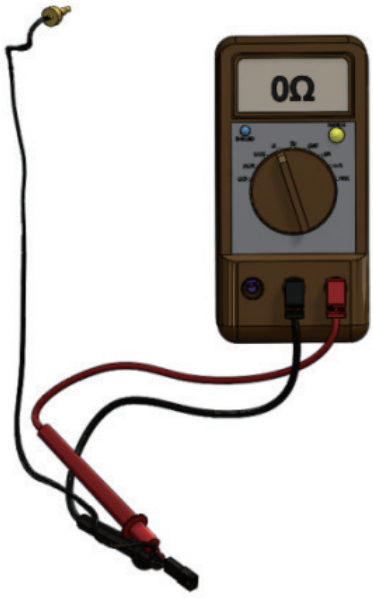


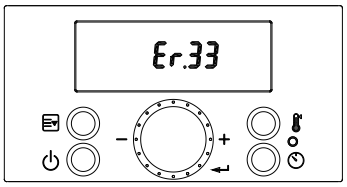
① Verify that the DHW Thermistor is properly secured in the DHW water connection. Verify proper connection of the DHW Thermistor's wiring to the circuit board. (CN7 : red ③, red ⑩)



Hot Water Outlet (red/red)

② Measure resistance across the DHW Thermistor with a multi-meter. If the multi-meter displays 0Ω (short circuit), replace the DHW Thermistor.

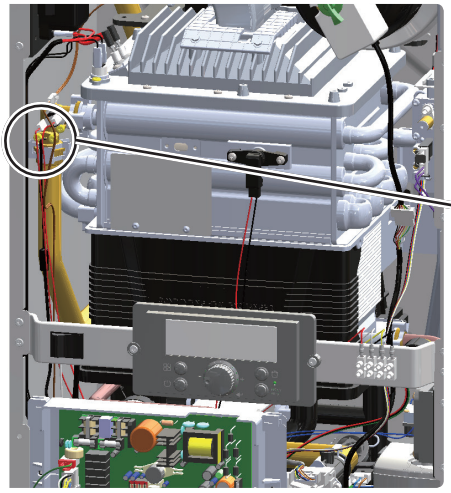


Error code	Meaning	Condition
	Heating Supply Thermistor Open or Short Circuit (Automatic restore)	When no response at Heating Supply Thermistor, error code 33 will appear.

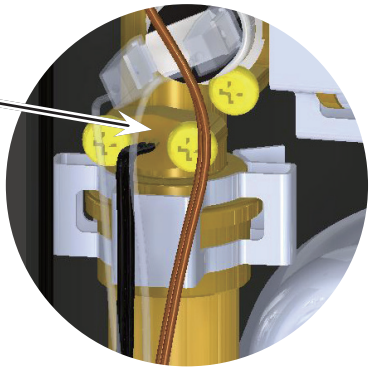
Failure event

When Heating Supply Thermistor's wiring line located at Heating Outlet Pipe is disconnected.

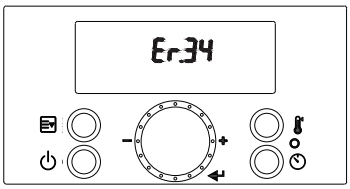
Check point



① Verify that the Heating Supply Thermistor is properly secured in the heating supply water connection. Verify proper connection of the Heating Supply Thermistor's wiring to the circuit board. (CN7 : black ②, black ⑨)



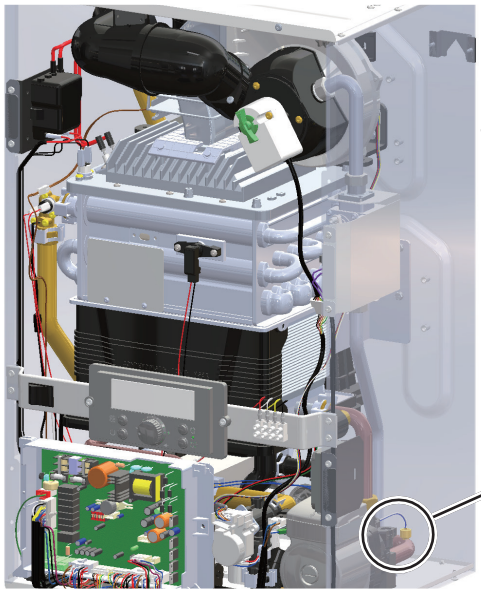
② Measure resistance across the Heating Supply Thermistor with a multi-meter. If the multi-meter displays 0Ω (short circuit), replace the Heating Supply Thermistor.

Error code	Meaning	Condition
	Heating Return Thermistor Open or Short (Automatic restore)	When no response at Heating Return Thermistor, error code 34 will appear.

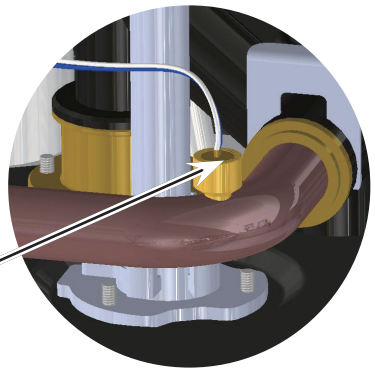
Failure event

When Heating Return Thermistor's wiring line located at Heating Return pipe is disconnected.

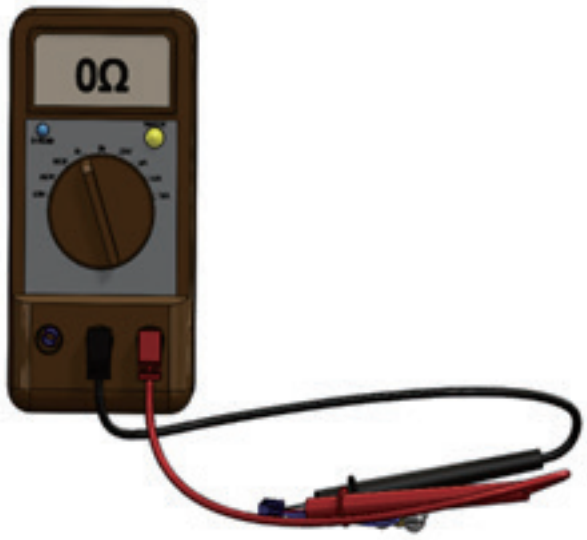
Check point

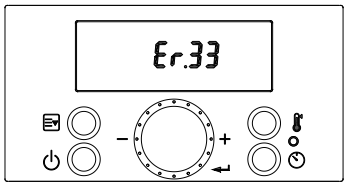


① Verify that the Heating Return Thermistor is properly secured in the heating return water connection. Verify proper connection of the Heating Return Thermistor's wiring to the circuit board." (CN7 : white ⑥, blue ⑬)



② Measure resistance across the Heating Return Thermistor with a multi-meter. If the multi-meter displays 0Ω (short circuit), replace the Heating Return Thermistor.

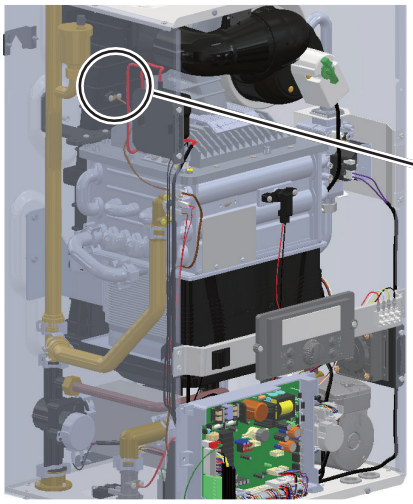


Error code	Meaning	Condition
	Exhaust Thermistor Open or Short Circuit (Automatic restore)	When no response at Exhaust Thermistor, error code 35 will appear.

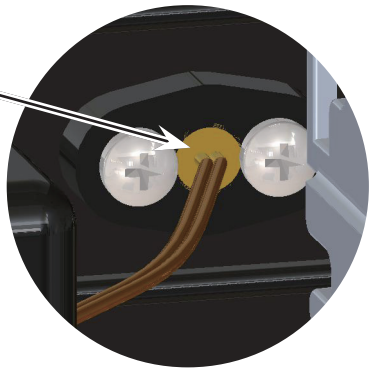
Failure event

When Exhaust Thermistor's wiring line located at Exhaust is disconnected.

Check point

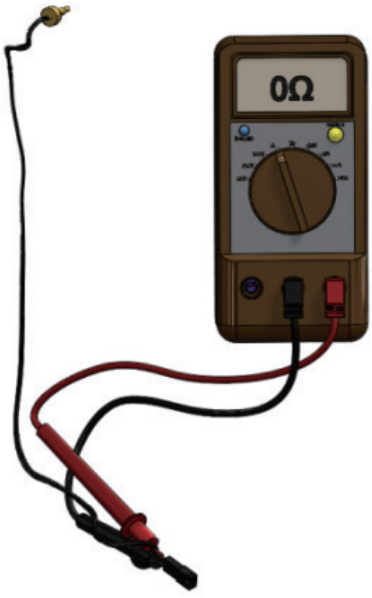


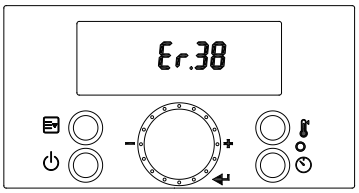
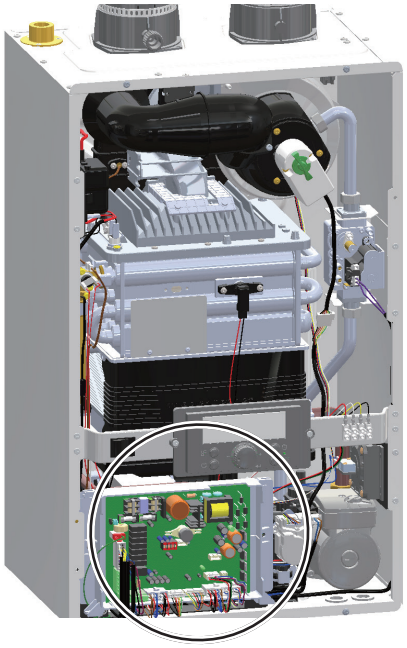
① Verify that the Exhaust Thermistor is properly secured in the exhaust connection. Verify proper connection of the Exhaust Thermistor's wiring to the circuit board.
(CN7 : brown ⑤, ⑫)

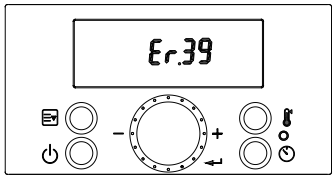


② Measure resistance across the Exhaust Thermistor with a multi-meter. If the multi-meter displays 0Ω (short circuit), replace the Exhaust Thermistor.

Exhaust (brown/brown)



Error code	Meaning	Condition
	Memory Error on the circuit board (Manual restore)	When error occurs at the circuit board, error code 38 will appear.
Failure event		
When memory error on the circuit board shows, error occurs and all of the outputs will stop except post-purge.		
Check point		
	① Try to reset first. ② Replace the circuit board when error occurs.	

Error code	Meaning	Condition
	False flame sensing (Automatic restore)	If false flame is detected after combustion is ended error code 39 will appear.

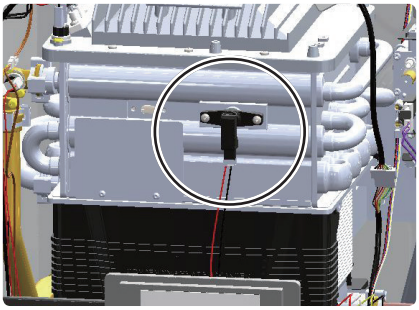
Failure event

After completion of the water heater combustion flame detection sensor detects In case the flame generated.

Check point

① Check the front cover will be closed.

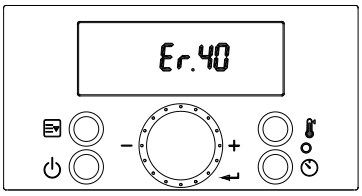
■ From more than DC 3.0V after ignition safety cut-off will appear
① When setting before ignition is less than DC 3.0V : Replace flame sensor.
② When setting before ignition is more than DC 3.0V : Replace the flame observation glass and gasket.



■ Voltage can be found in the 'User's mode' of the control panel. (Please check after closing front cover)

Display	Operation	Description
F : FS	Voltage of flame sensor	• Current flame sensor (Vdc)

ITEM	Normal Value
Before ignition	More than DC 3.0V
After ignition	Less than DC 3.0V

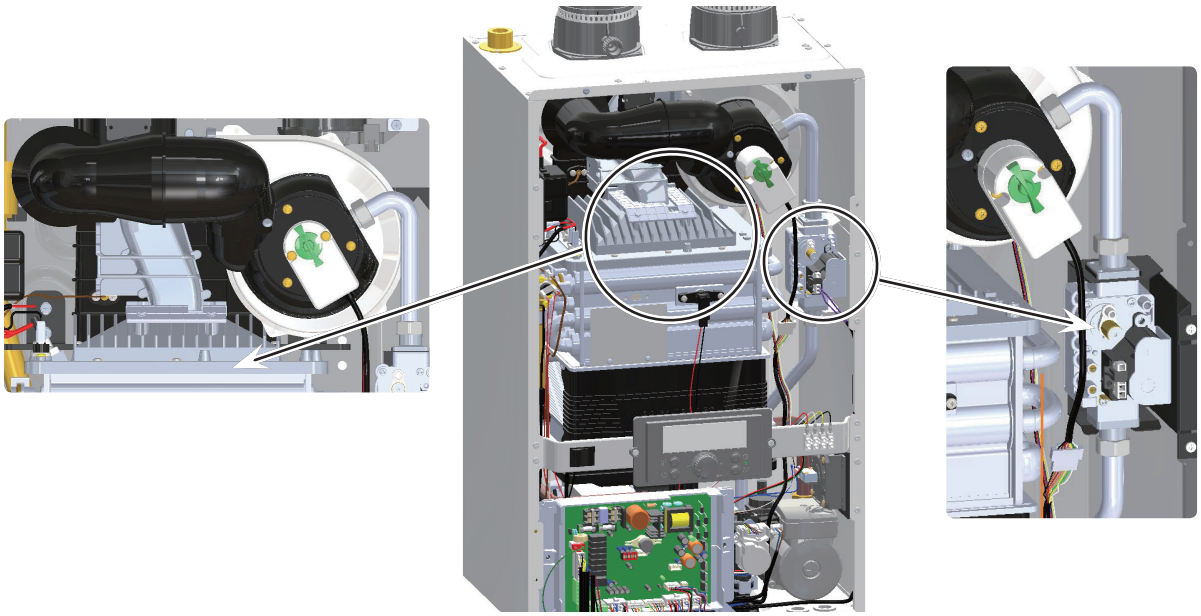
Error code	Meaning	Condition
	Gas leakage (Manual restore)	When gas leakage is detected during operation error code 40 will appear.

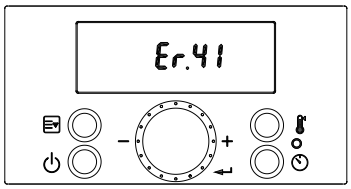
Failure event

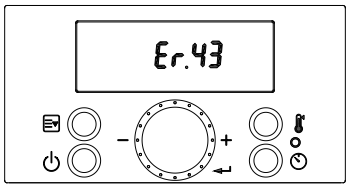
Stop all of the outputs except fan when detecting gas leakage signal for over 1 sec, it restores automatically after 5 min. When detecting more than 10 min continuously or 3 times in a hour, restore error manually. When leakage doesn't occur for one hour, past leakage history will be deleted.

Check point

① Turn off the gas.
② Check leakage part with using soapy water at the gas valve and flue joint, and re-assemble when leakage is found. Check condition of o-ring and packing and replace it.
③ Check joint condition of burner parts.



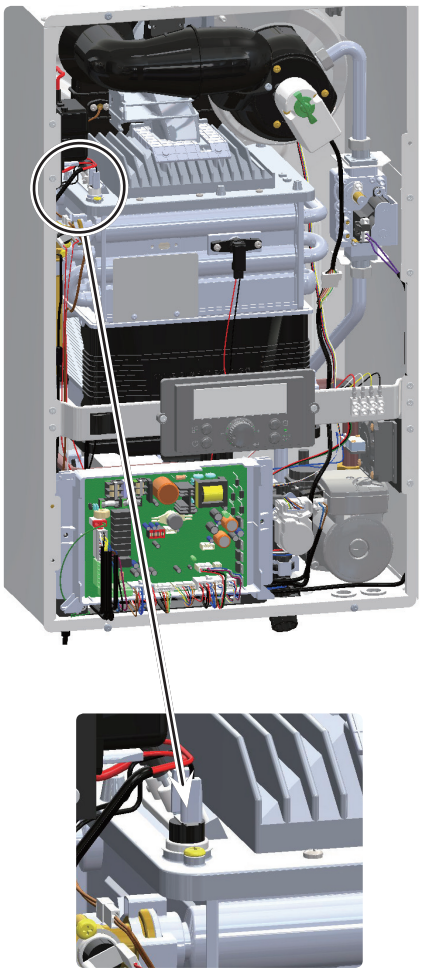
Error code	Meaning	Condition
	Excess Fan Speed detected (Manual restore)	When fan speed exceeds normal values during combustion, error code 41 will appear.
Failure event		
The circuit board has Fan Speed data. Before ignition, compare with standard Fan Speed before ignition and error appears when exceeding standard range, stop all of the outputs except post-purge.		
Check point		
 ① Check whether exhaust or intake duct is blocked. ② To reset this error code, the power needs to be disconnected and then reconnected.		

Error code	Meaning	Condition
	Burner Limit Switch abnormality (Manual restore)	Burner Limit Switch's temperature is above the acceptable range, error code 43 will appear.

Failure event

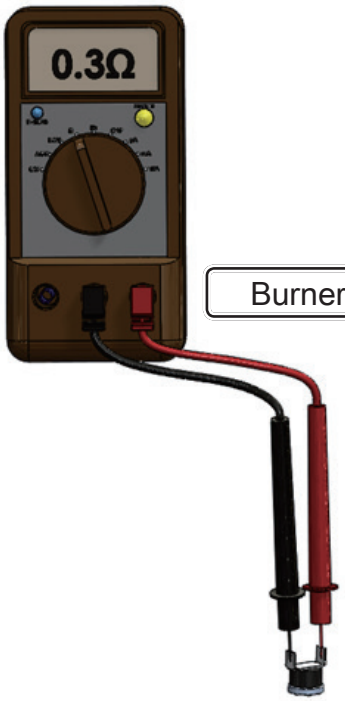
Stop all of the outputs except fan when Burner Limit Switch attached on burner upper plate shows temperature above 392°F(200°C).

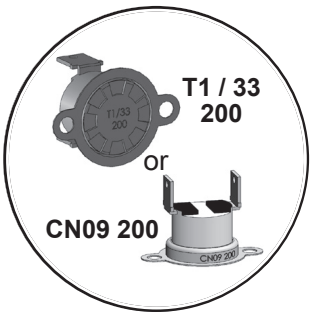
Check point



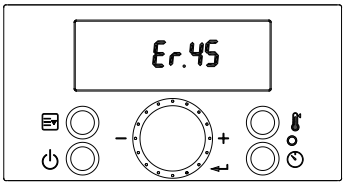
① Check conditions of burner limit switch connected with burner and circuit board, and disconnection.

② Check connector and if no problem, measure burner limit switch located at burner head and replace overheating switch when the multi-meter value shows '0L'. (Normal value is '0~0.5Ω'.) (CN 11 : black ⑤, ⑪)





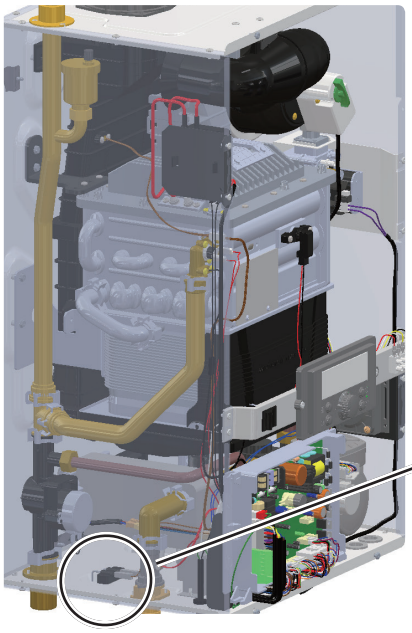
Burner Limit Switch (392°F/200°C)

Error code	Meaning	Condition
	Water Leakage (Manual restore)	When the Water Leakage Detector detects water, error code 45 will appear.

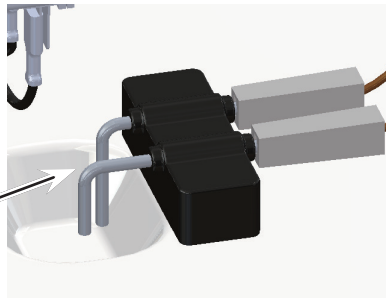
Failure event

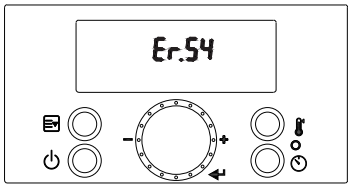
Stop all of the outputs except fan when the Water Leakage Detector attached on base under plate detected the water, it restores manually.

Check point



① Close the water inlet valve.
② Check the Water Leakage Detector's wire. (CN11 : brown ①, ⑦)
③ If there is standing water, find the leakage area, replace the part.



Error code	Meaning	Condition
	Low Heating Water Pressure (Automatic restore)	When the Heating Water Pressure is lower than [setting pressure - 4psi], error code 54 will appear.

Failure event

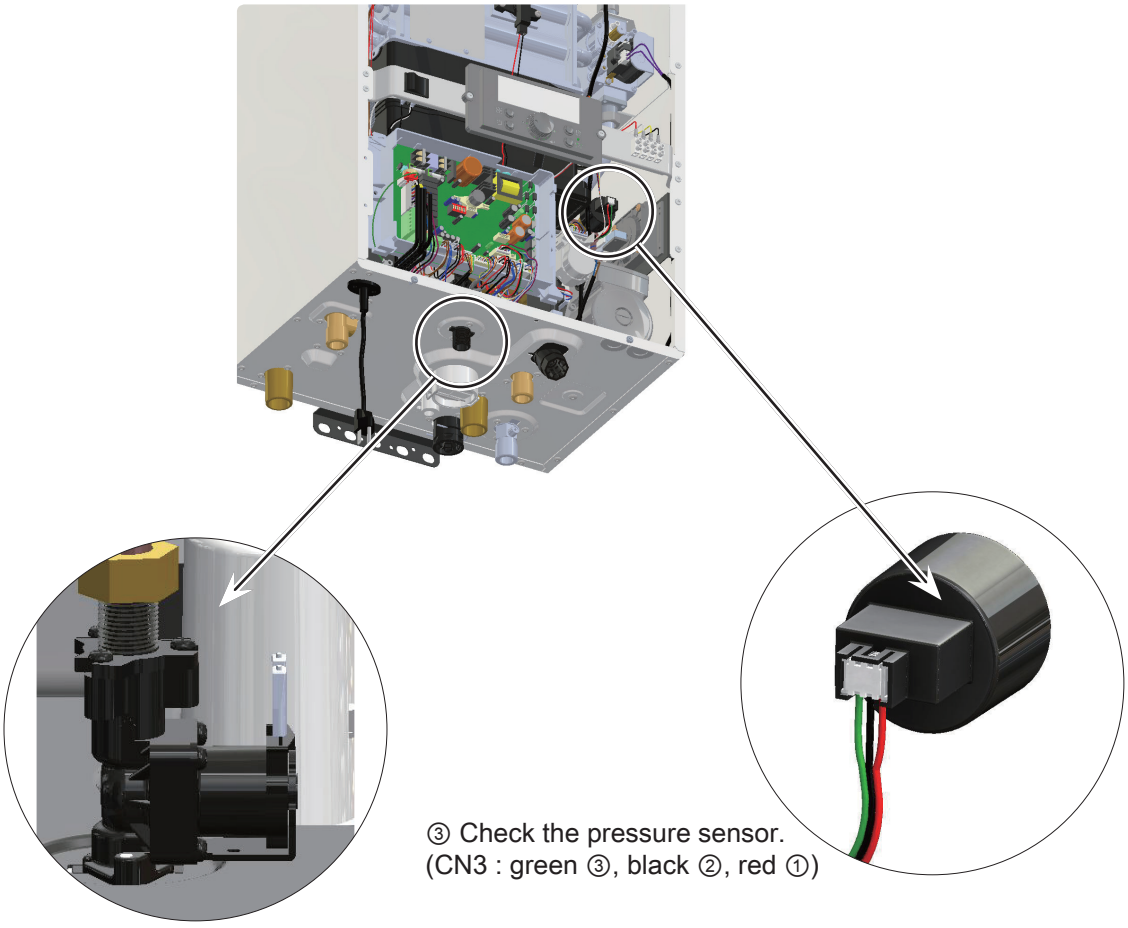
Stop all of the outputs except auto feeder when the Heating Water Pressure Sensor attached on exchanger inlet pipe detected low pressure [setting pressure - 4psi].

Check point

① Check the auto feeder.
② Check the auto feeder connector.(CN18 : blue ③, ⑪)

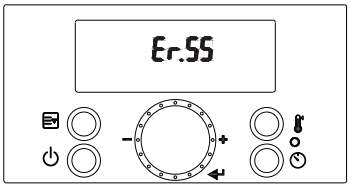
■ Heating loop pressure can be found in the 'User's mode' of the control panel.

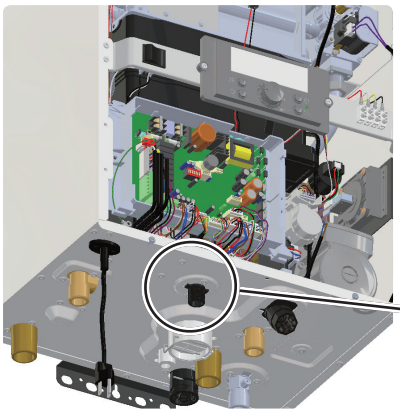
Display	Operation	Description
E : WP	Heating Water Pressure	• Current heating water pressure (psi / bar)



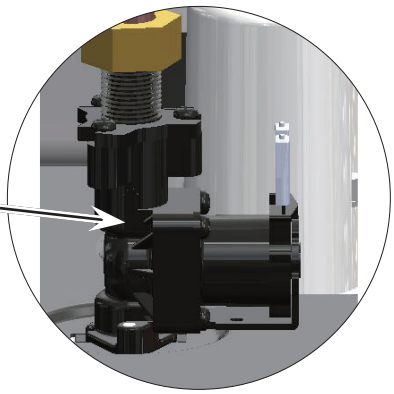
③ Check the pressure sensor.
(CN3 : green ③, black ②, red ①)

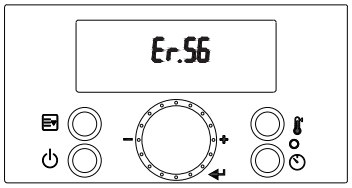
④ Check for open valves. If water did not fill the boiler loop, verify that there are no external water valves open.

Error code	Meaning	Condition
	Stop Supply Inlet Water (Automatic restore)	When the water pressure is not rising above 13 psi, error code 55 will appear.
Failure event		
Stop all of the outputs when the Heating Water Pressure Sensor attached on exchanger inlet pipe pressure is not rising above 13 psi.		
Check point		



① Check supply water and inlet shut off valve. This valve must be open.
② Check the auto feeder. (CN18 : blue ③, ⑪)



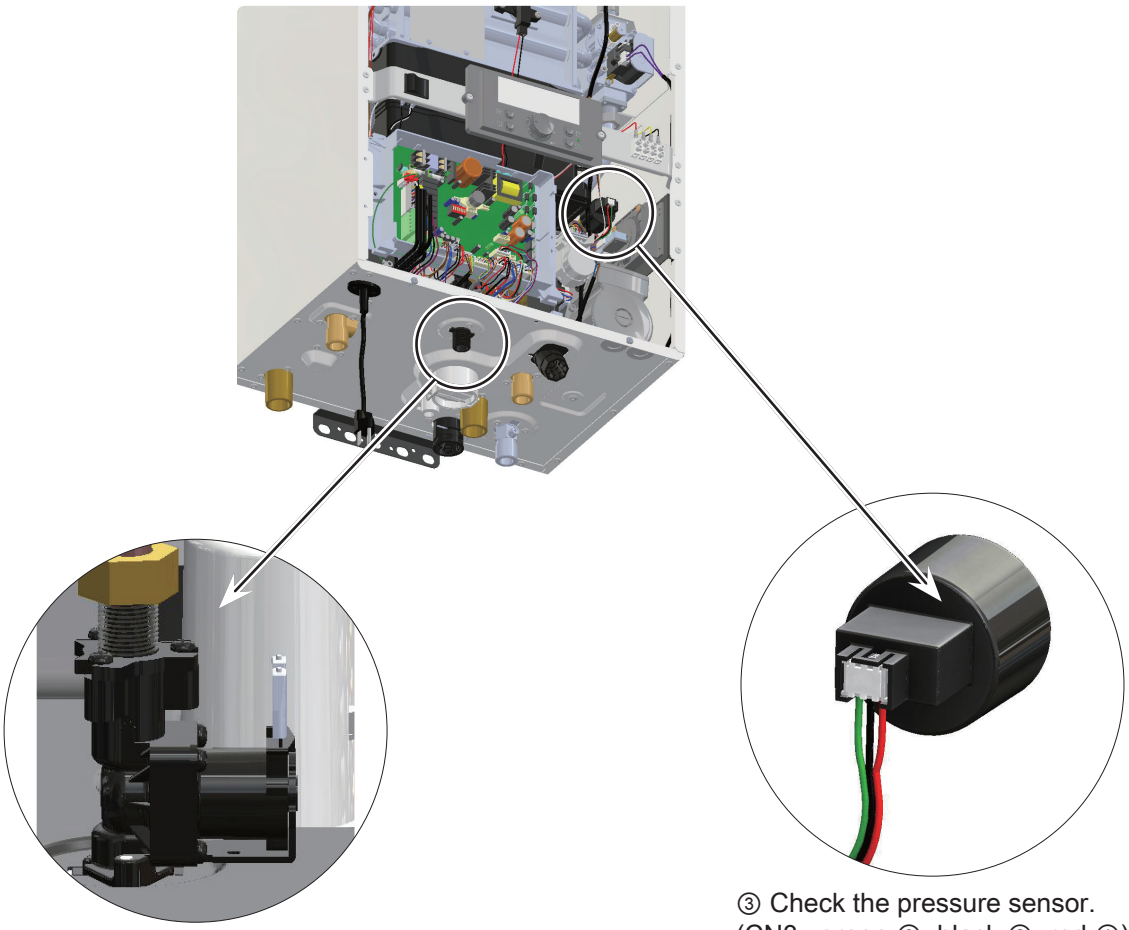
Error code	Meaning	Condition
	High Heating Water Pressure (Automatic restore)	When the Heating Water Pressure is above 50psi, error code 56 will appear.

Failure event

Stop all of the outputs except fan when the Heating Water Pressure Sensor attached on exchanger inlet pipe detects high pressure.

Check point

① Check the auto feeder.
② Check the auto feeder connector. (CN18 : blue ③, ⑪)

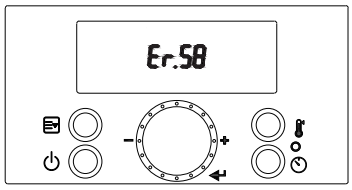


③ Check the pressure sensor.
(CN3 : green ③, black ②, red ①)

④ If high water pressure inside the boiler, the safety relief valve open until normal pressure.

■ Heating loop pressure can be found in the 'User's mode' of the control panel.

Display	Operation	Description
E : WP	Heating Water Pressure	• Current heating water pressure (psi / bar)

Error code	Meaning	Condition
	LWCO Abnormality (Automatic restore)	When the LWCO is connected to an abnormal state, error code 58 will appear.

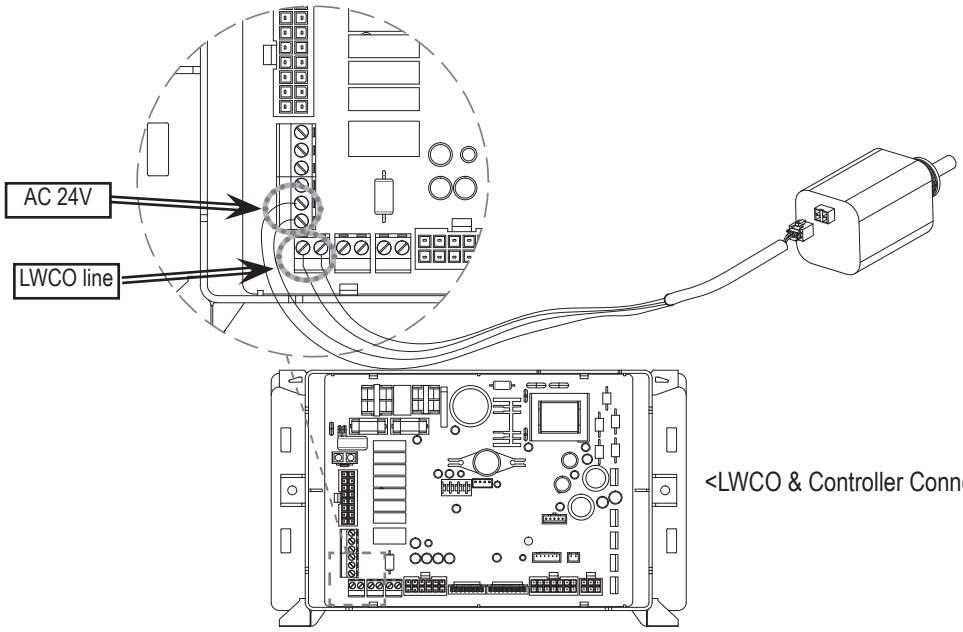
Failure event

Stop all of the outputs except fan when the LWCO is connected to an abnormal state.
(Refer to installation manual)

Check point

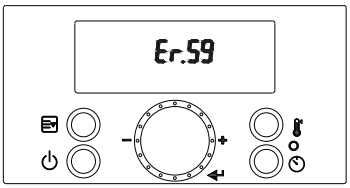
① Ensure the LWCO wiring connection on circuit board.
② Measuring input AC 24V to terminal on circuit board.

- Remove the factory installed jumper on the LWCO terminals (CN22) prior to connecting the LWCO
- The Combi Boiler supplies 24 VAC from the terminal CN17 #5 and #6 (see below illustration).

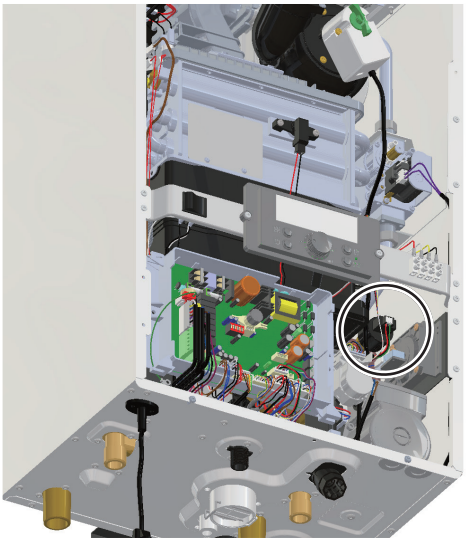


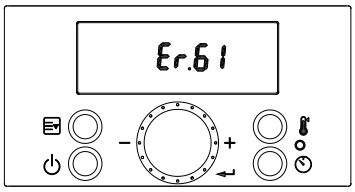
<LWCO & Controller Connection>

③ Measuring output AC24V from terminal on circuit board in the case of external LWCO install.
④ Ensure that the LWCO in piping system is properly installed.
⑤ Make-up water to the system if necessary.
⑥ Contact technical support.

Error code	Meaning	Condition
	Pressure Sensor Abnormality (Automatic restore)	When the Pressure Sensor is connected to an abnormal state and circuit broken, error code 59 will appear.

Failure event
Stop all of the outputs except fan when the Pressure Sensor is an abnormal state. (Refer to installation manual)

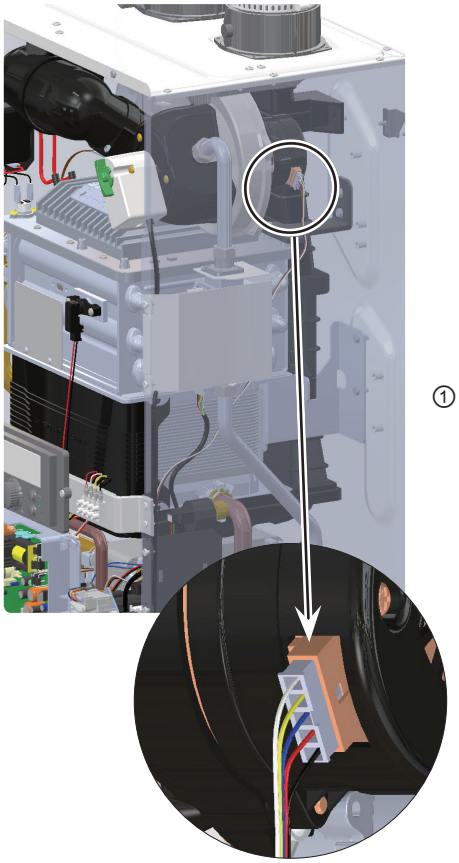
Check point
① Check the pressure sensor. (CN3 : green ③, black ②, red ①)    

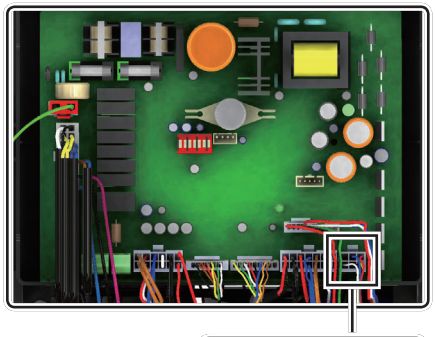
Error code	Meaning	Condition
	Fan RPM Sensor Abnormality (Automatic restore)	When the Fan RPM Sensor is abnormal state, error code 61 will appear.

Failure event

Stop all of the outputs when Fan RPM Sensor is connected to an abnormal state.
(Refer to installation manual)

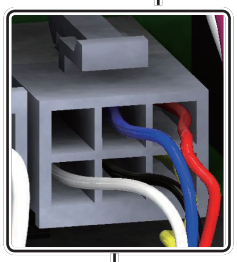
Check point

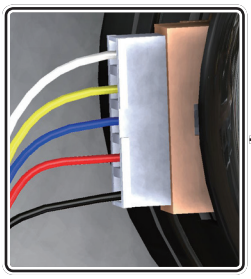


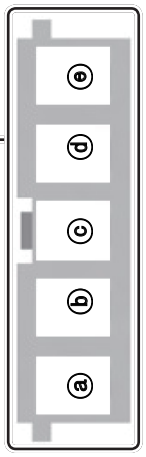


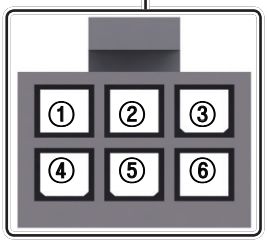
① Check wiring line connection carefully.

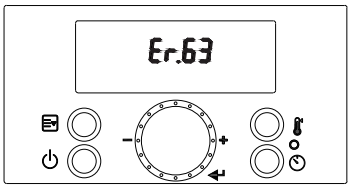
- Fan Start Coil (white) ⓔ : connector ④
- RPM Sensor (yellow) ⓓ : connector ⑥
- GND (blue) ⓒ : connector ②
- VDD (red) ⓑ : connector ③
- Fan End Coil (black) ⓐ : connector ⑤







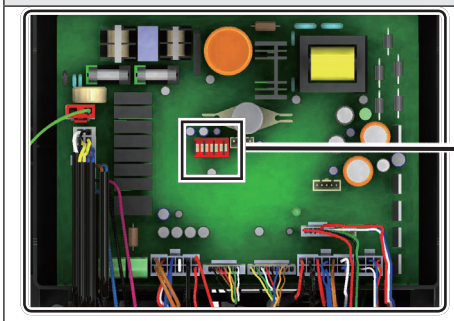


Error code	Meaning	Condition
	Overheating Heating Supply Thermistor (Automatic restore)	In the case of Heating mode, when the Heating Supply Thermistor is detected higher than 205℉ (96℃), error code 63 will appear.

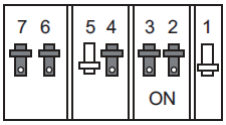
Failure event

When Overheating Heating Supply Thermistor is more than 205℉ (96℃), overheating error issue will appear and all the outputs except post-purge will stop. When lower than 176℉(80℃) it will restore automatically.

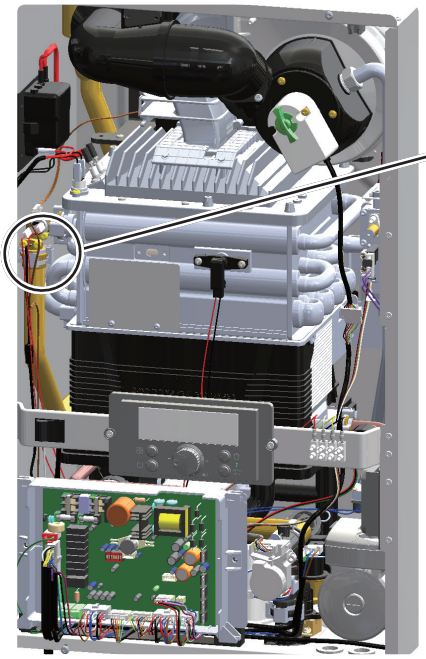
Check point

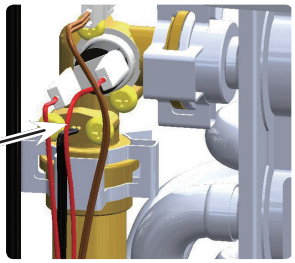


① Check the Circuit Board dip switch settings.

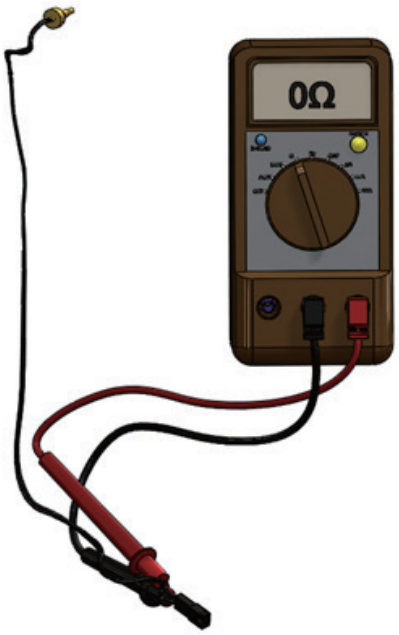


DIP SWITCH		OFF	ON
1 – 3	Factory Use Only	Factory Use Only	
4	Factory Use Only	Factory Use Only	
5	Gas Type	LP	NG
6	High Fire	Normal	High Fire
7	Low Fire	Normal	Low Fire

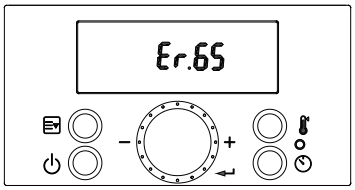




② When the value is 0Ω by measuring with a multi-meter machine, replace Heating Supply Thermistor.
(CN 7 : black ⑨, ②)



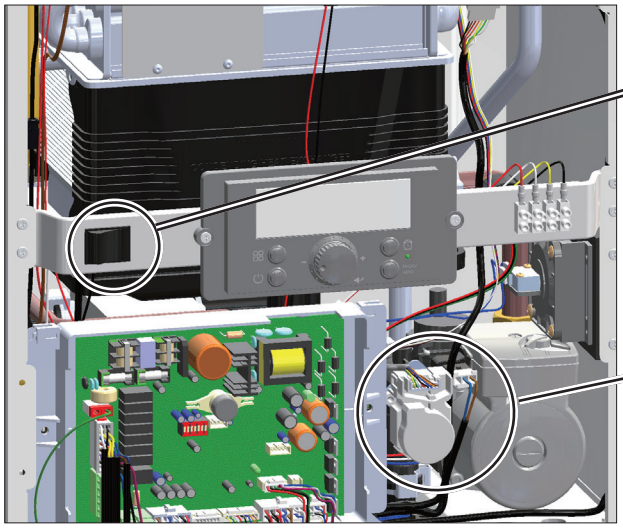
③ Clean the heating water return filter.
④ Flush the primary heat exchanger.

Error code	Meaning	Condition
	Water Flow Control Valve error (Manual restore)	① Occurs manual restore error. ② Not able to supply hot water to the set temperature when flow rate exceeds hot water heater's capacity. ③ Flow rate doesn't increase during malfunction when valve is locked.

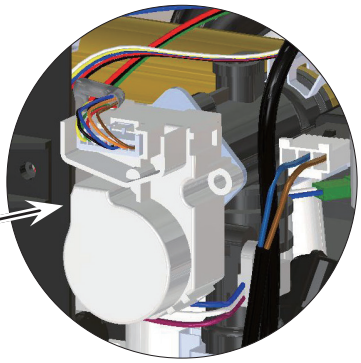
Failure event

Not able to sense reference point or motor doesn't rotate due to malfunction.

Check point

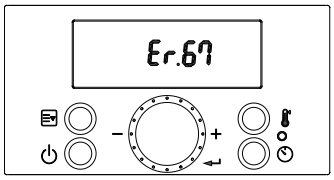


① Check error code sign after turning off and on the power.



② Check wiring line connection carefully.

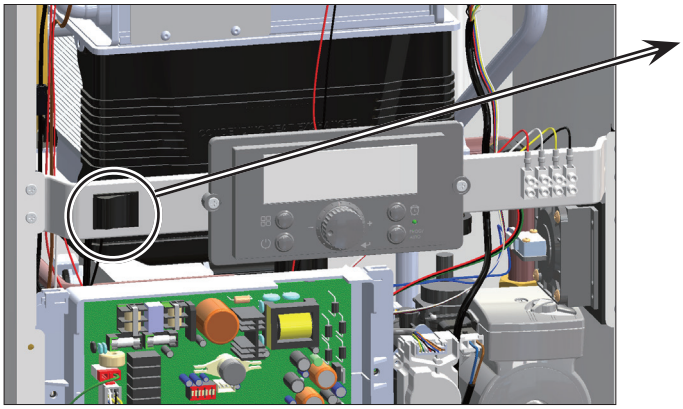
③ If above ①, ② operates abnormally replace Flow Valve.

Error code	Meaning	Condition
	AGM Abnormality (Manual restore)	Unable to sense proper positioning of AGM motor, error code 67 will appear.

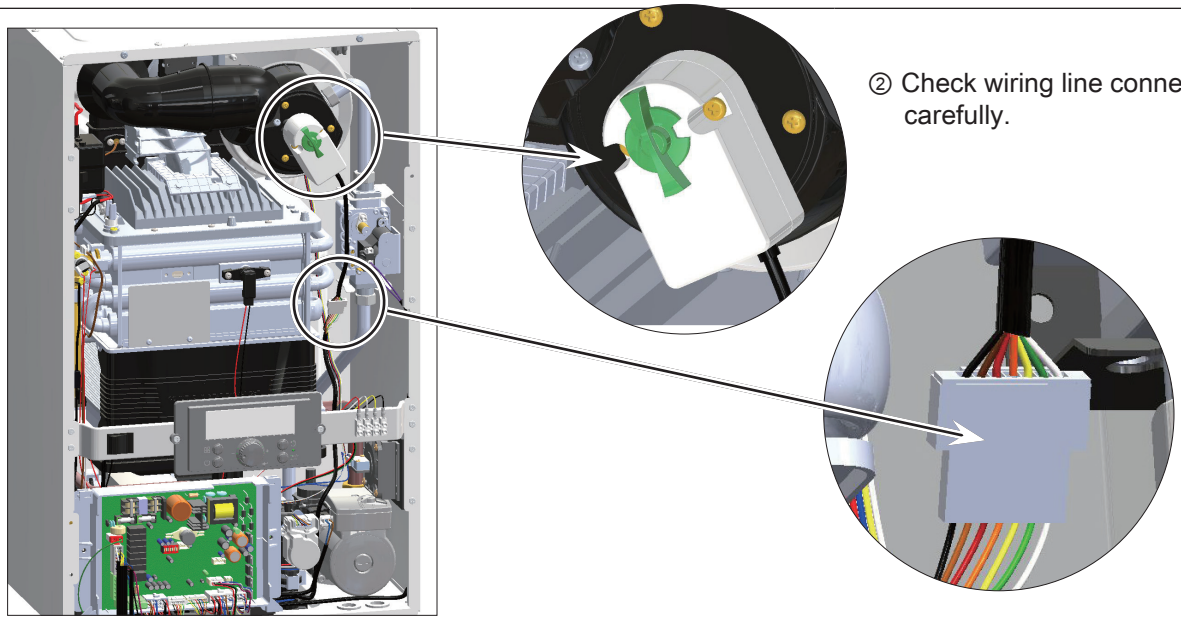
Failure event

During initialization or AGM check, the AGM motor rotates so that the position can be determined by the circuit board. If there is a discrepancy between the movement of the motor and the circuit board's input (i.e. AGM motor is stuck in one position and cannot rotate), Er. 67 is displayed.
Er. 67 must be cleared manually.

Check point

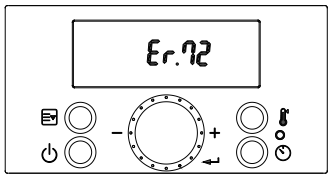


① Check error code sign after turning off and on the power.



② Check wiring line connection carefully.

③ If above ①, ② operates abnormally replace AGM.

Error code	Meaning	Condition
	Flame Detected before Ignite Abnormality (Automatic restore)	When detected the flame before ignition, error code 72 will appear.

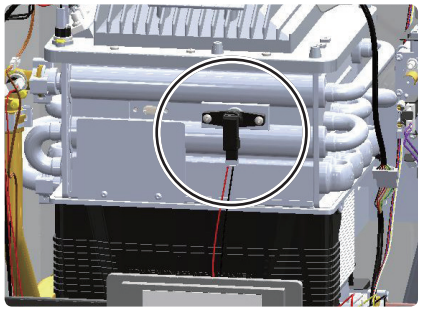
Failure event

When flame detected during no operation then error occurs and stop ignition. When flame after pre-purge and then flame is still shown even after pre-purge 10 times then manual restore error occurs. After combustion and post pre-purge is completed but flame is still shown then block ignition sequence performance by occurring error during no operation. Flame detecting error restores automatically when flame disappears.

Check point

① Check the front cover will be closed.

■ From more than DC 3.0V after ignition safety cut-off will appear
① When setting before ignition is less than DC 3.0V : Replace flame sensor.
② When setting before ignition is more than DC 3.0V : Replace the flame observation glass and gasket.

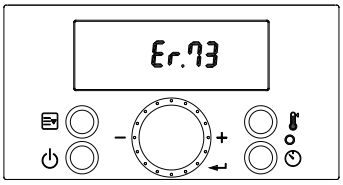


■ Voltage can be found in the 'User's mode' of the control panel. (Please check after closing front cover)

Display	Operation	Description
F : FS	Voltage of flame sensor	• Current flame sensor (Vdc)

ITEM	Normal Value
Before ignition	More than DC 3.0V
After ignition	Less than DC 3.0V

② To reset this error code, the power needs to be disconnected and then reconnected.

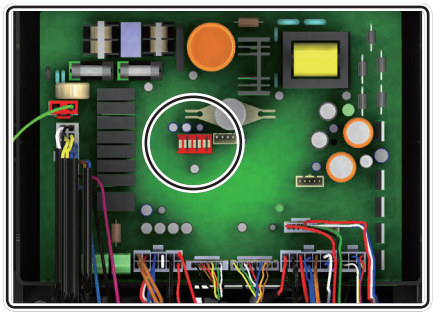
Error code	Meaning	Condition
	DIP Switch Setting Abnormality (Automatic restore)	When dip switch is set abnormally, error code 73 will appear.

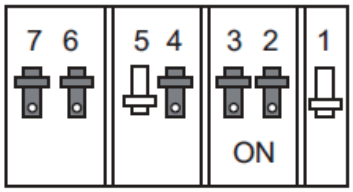
Failure event

This error occurs if the dip switches on the circuit board are changed or moved when the Combi Boiler is plugged into power.

Check point

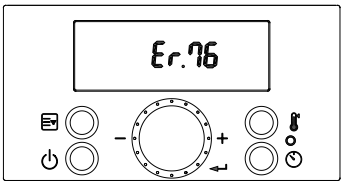
① Set accurately by checking capacity on the rating plate attached to the side of Combi Boiler and dip switch specification listed on the manual.

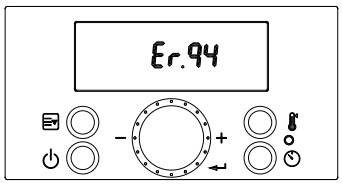




DIP SWITCH		OFF	ON
1 – 3	Factory Use Only	Factory Use Only	
4	Factory Use Only	Factory Use Only	
5	Gas Type	LP	NG
6	High Fire	Normal	High Fire
7	Low Fire	Normal	Low Fire

② To reset this error code, the power needs to be disconnected and then reconnected.

Error	Meaning	Condition
	Communication Error between Control Panel and Circuit Board (Automatic restore)	When communication with display panel is not established for 10 minutes, error code 76 will appear.
Fault		
Connection error between control panel and circuit board.		
Check point		
① Check connections from circuit board to Control Panel. ② To reset this error code, the power needs to be disconnected and then reconnected.		

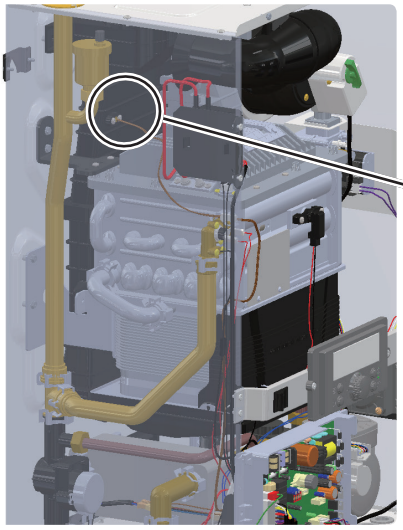
Error code	Meaning	Condition
	Exhaust temperature exceeds selected cutoff temperature. (Manual restore)	Overheating Exhaust Thermistor (The Combi Boiler shuts down when the exhaust temperature exceed PVC vent 149°F(65°C) or CPVC/PP vent 200°F(93°C))

Failure event

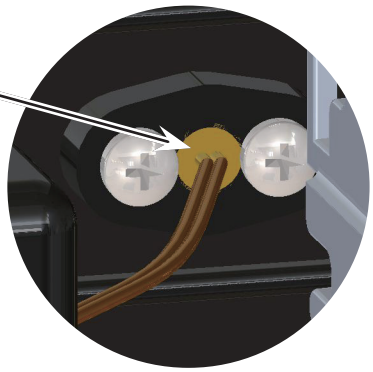
It occurs when exhaust gas emission is faulty due to exhaust flue blockage.
When excessive amount of gas inflows due to higher set of dip switch than its hot water heater capacity, exhaust gas temperature will increase more than excess temperature. Exhaust gas temperature may be high due to heat exchanger's malfunction.

Check point

① Turn off the Combi Boiler for at least 30 minutes, and then restart it.



② Check Exhaust Thermistor's wiring connected at exhaust duct is disconnected. And check circuit boards socket. (CN7 : brown ⑤, ⑫)

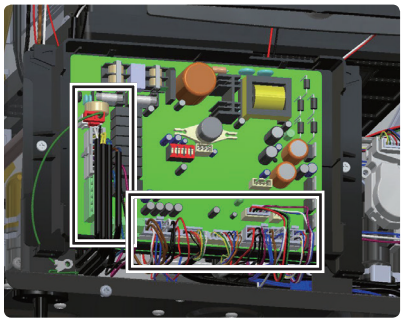


③ Check for any obstructions in the vent pipe.

Main components Replacement Instructions

1. Circuit Board

1. Close the gas shut off valve and water valve.
2. Turn the power on.
3. Enter 'Installer Mode' from control panel. (See page 42)
4. On a piece of paper, write down the factory settings in the 'Installer Mode' for 17:FS (A.FH2, b.FH1, C.FL, & d.Ag) These numbers MUST be recorded before the old circuit board is removed, the valves are specific to the unit.
5. Turn the power off water heater. (Use the manual switch)
6. Unplug connectors on Circuit board.



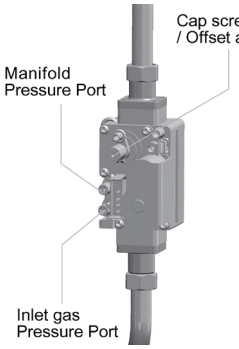
7. Loosen two screws to remove Circuit board.

8. Remove the circuit board and replace with new circuit board.
9. Reconnect all wire connections to the new circuit board.
10. Verify the dip switch settings are correct on the new circuit board. (see Normal Fire in figure below)
11. Open the gas shut off valve.
12. Open all water valves.
13. Turn the power on. (Use the manual switch)
14. Enter 'Installer Mode' from control panel.
15. Set the values for 17:FS. (A.FH2, b.FH1, C.FL, & d.Ag) (These are the numbers you wrote down in Step 4)
16. Save the values for 17:FS.
17. Turn the unit on and ensure proper operation.
18. Test operation.

If carbon dioxide and manifold pressure values are matched with Table 1 in the low fire combustion, switch dip switch from low to high fire and check carbon dioxide and manifold pressure values. If the values are matched with Table 1, shut off the unit and close the gas valve. Then disconnect the hose that is connected to the manifold pressure port, then tighten the screw for the manifold pressure port, and return the dipswitch back to normal condition. Finally, close the front cover.

NOTE

When assemble connector, check wiring color and locations to avoid any mistakes.



Dip Switch		State	
5	Gas Type	NG : ON	LP:OFF
6	High Fire	6: ON	7: OFF
7	Low Fire	6: OFF	7: ON
6, 7	Normal Fire	6: OFF	7: OFF

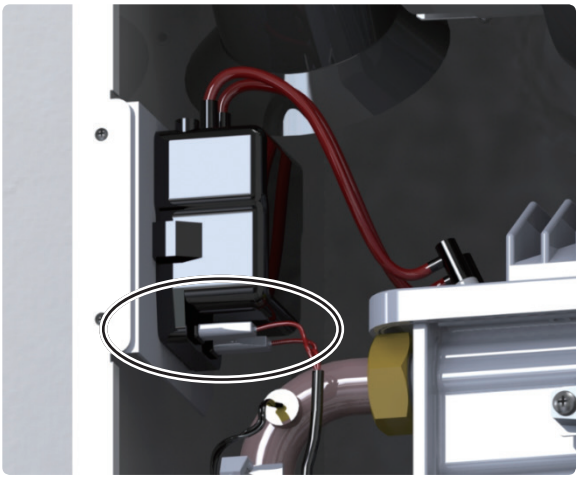
Table 1

	Gas Type		NG	LP	NG	LP
Manifold Pressure	Low Fire	2"/ 3" VENT	-0.04" WC (-10 Pa)	-0.04" WC (-10 Pa)	-0.04" WC (-10 Pa)	-0.04" WC (-10 Pa)
	High Fire	2"/ 3" VENT	-0.32" WC (-80 Pa)	-0.28" WC (-70 Pa)	-0.28" WC (-70 Pa)	-0.26" WC (-65 Pa)

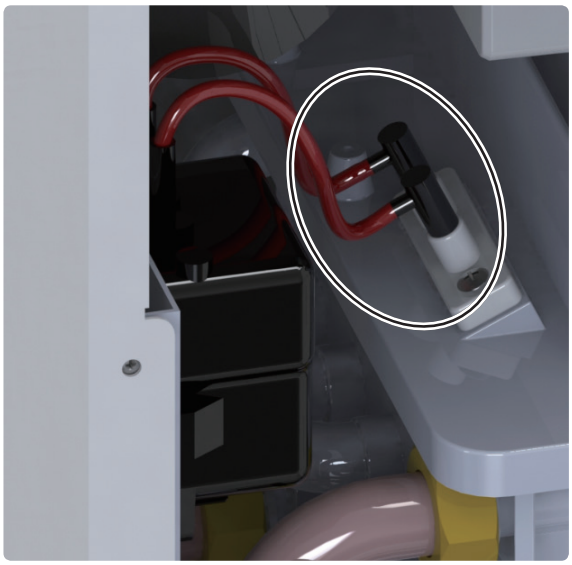
Main components Replacement Instructions

2. Igniter

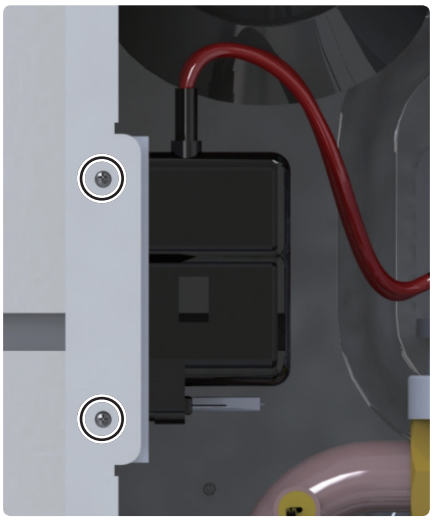
1. Close the gas shut off valve
2. Turn the power off.
3. Disconnect the wiring to the igniter.



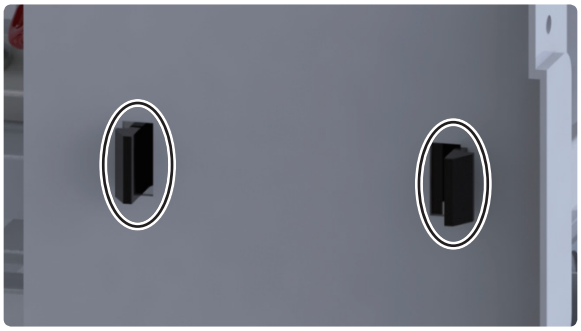
4. Remove the cable connected to the ignition plug.



5. Loosen two screws to separate igniter from the boiler cabinet.



6. Separate igniter from bracket by unlocking the plastic tabs on the backside of the bracket.



7. Replace igniter with new component.
8. Assemble in the reverse order as the part was removed.
9. Open the gas shut off valve.
10. Turn the power on.
11. Turn the unit on and ensure proper operation.

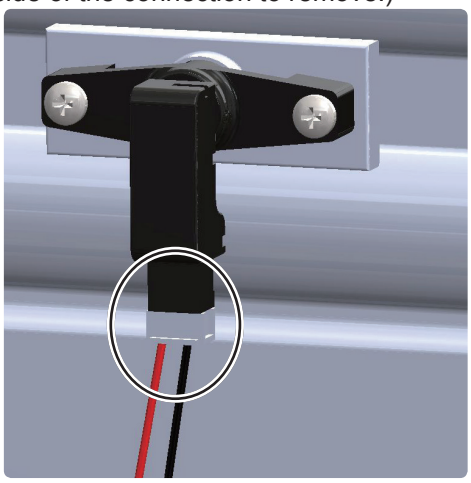
NOTE

1. Ensure the igniter is properly secured.

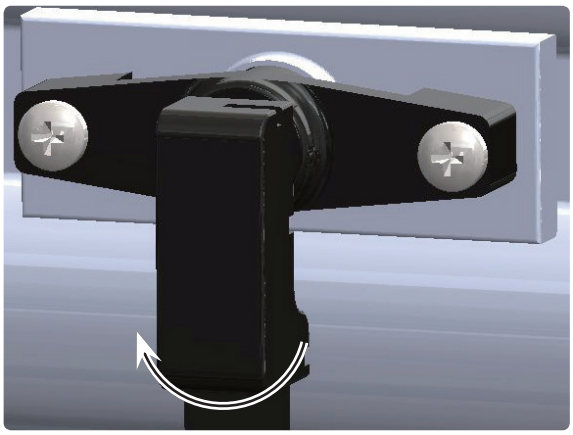
Main components Replacement Instructions

3. Flame Detection Sensor

1. Close the gas shut off valve.
2. Turn the power off.
3. Disconnect the electrical connection to the flame detection sensor. (Push and hold the button on the back side of the connection to remove.)



4. Rotate flame detection sensor 45 degrees clockwise and pull forward.



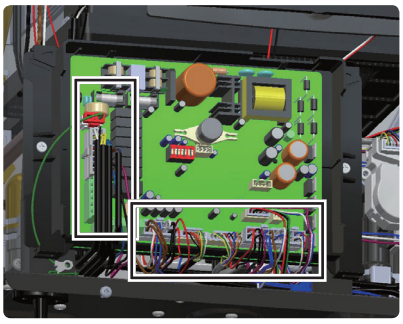
5. Replace flame detection sensor with new component.
6. Assemble in the reverse order as the part was removed.
7. Open the gas shut off valve.
8. Turn the power on.
9. Turn the unit on and ensure proper operation.

NOTE
1. Check fixed condition of the part.

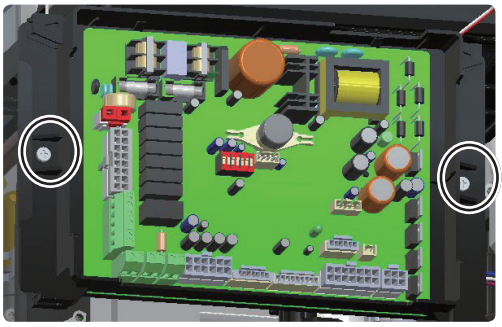
4. Gas Leak Detector

1. Close the gas shut off valve.
2. Turn the power off.
3. By using a hand screwdriver, remove 4 screws of the front cover.

4. Disconnect all the electrical connection to the circuit board.



5. Loosen two screws to remove the circuit board.

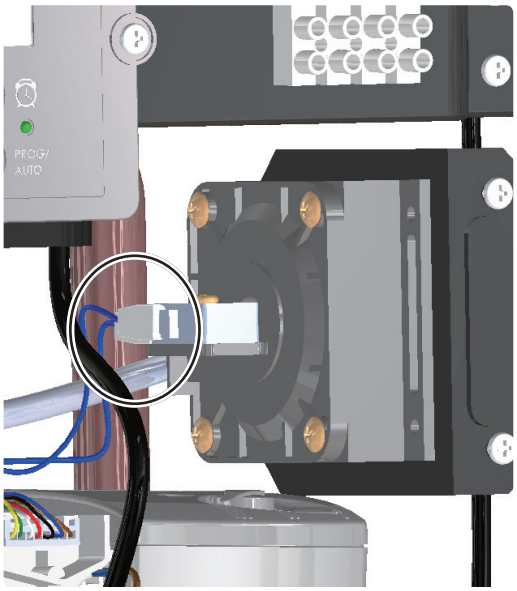


6. Replace the circuit board with new component.
7. Assemble in the reverse order as the part was removed.
8. Assemble connector on circuit board.
9. Open the gas shut off valve.
10. Turn the power on.
11. Turn back the water valve in the opening direction.
12. Test operation. (Please refer to page 94 for combustion characteristics test.)

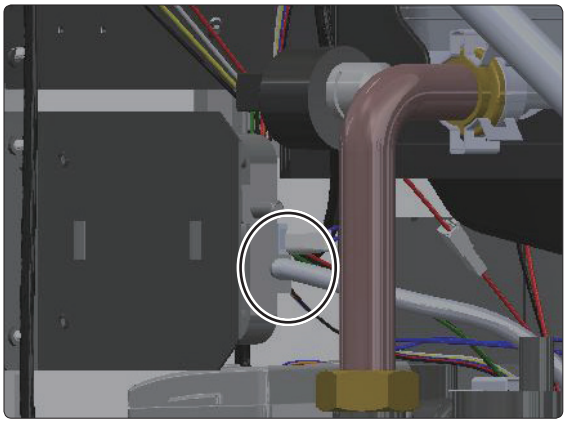
Main components Replacement Instructions

5. Air Pressure Switch

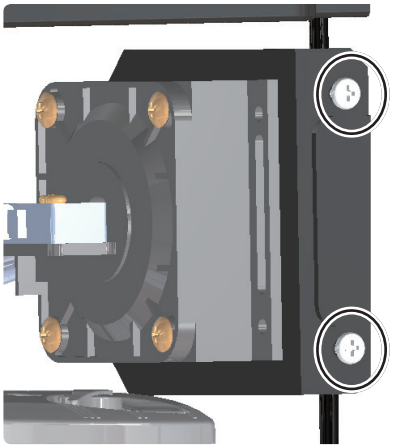
1. Close the gas shut off valve.
2. Turn the power off.
3. Disconnect the electrical connection to the APS.



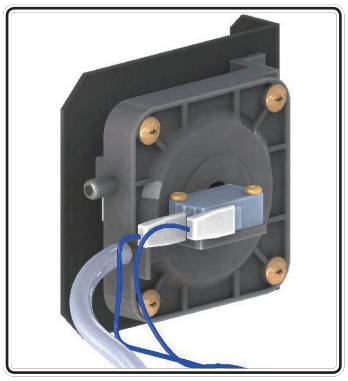
4. Separate hose from air pressure switch.



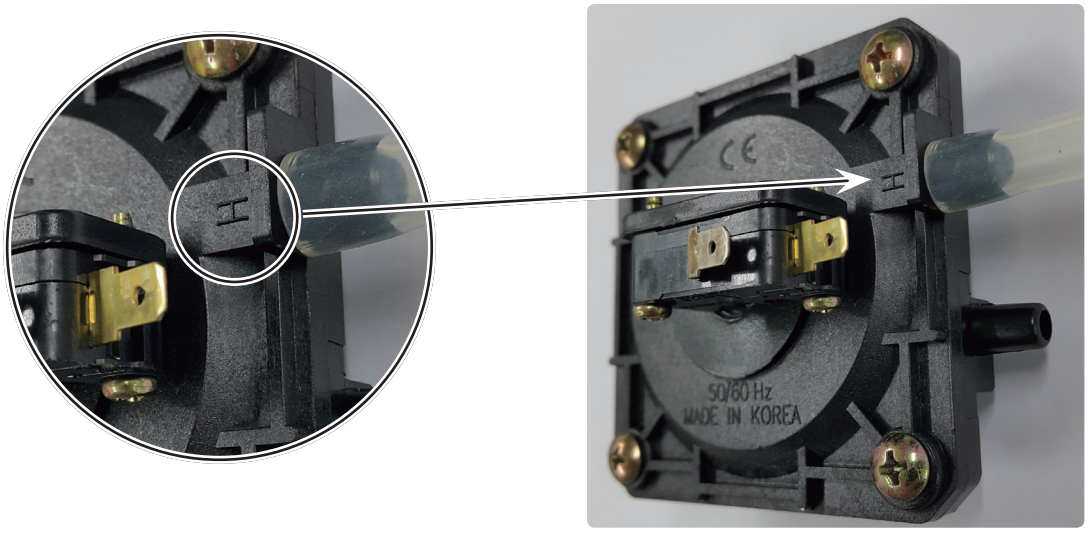
5. Loosen bracket's two screws and separate air pressure switch from the cabinet.



6. Replace air pressure switch with new component.
7. Assemble in the reverse order as the part was removed.
8. Open the gas shut off valve.
9. Turn the power on.
10. Open water valves (DHW and Heating)
11. Turn the unit on and ensure proper operation.



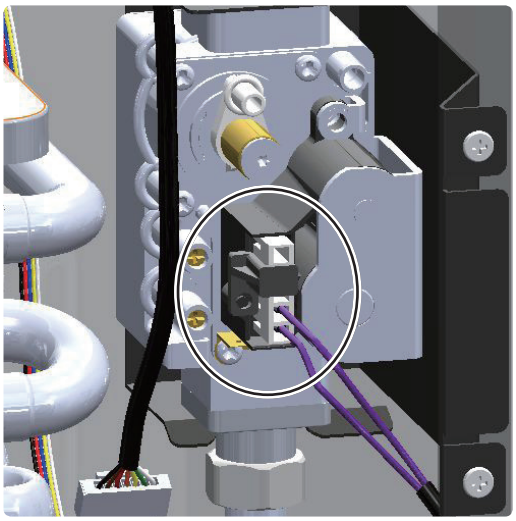
Connect a hose to the connector marked 'H' character.



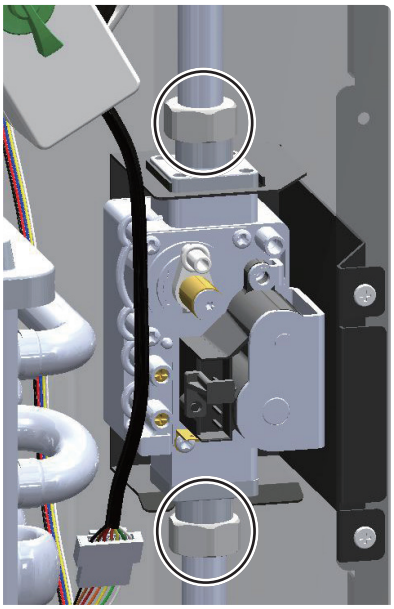
Main components Replacement Instructions

6. Gas Valve

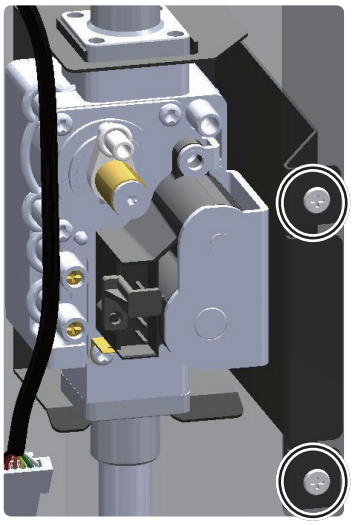
1. Close the gas shut off valve.
2. Turn the power off.
3. Close all water valve (DHW and Heating)
4. Disconnect the electrical connection to the gas valve.



5. Loosen the nuts as shown.



6. Remove the bracket's two screws and separate gas valve from the cabinet.



7. Replace the gas valve with new component. Check the o-rings for damage, if damaged, replace with new o-rings.
8. Assemble in the reverse order as the part was removed.
9. Open the gas shut off valve.
10. Turn the power on.
11. Open water valves (DHW and Heating)
12. Turn the unit on and ensure proper operation.

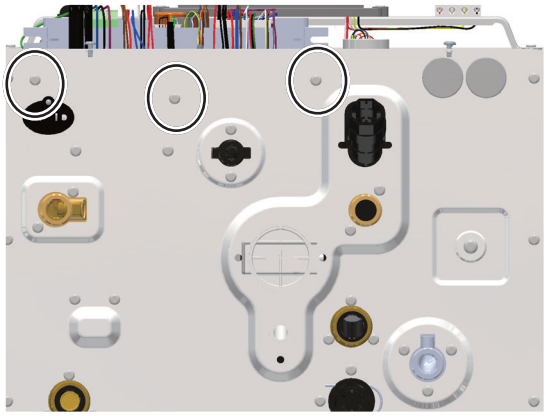
NOTE

1. Replace it with the new gas valve.
2. Check wire condition connected to gas valve.
3. Make sure the packing is inserted correctly when assembling the nuts.
4. Compare to the manifold pressure with pressure indicated at the rating plate after connecting gas valve.
5. Check for gas leaks after reinstalling new gas valve.

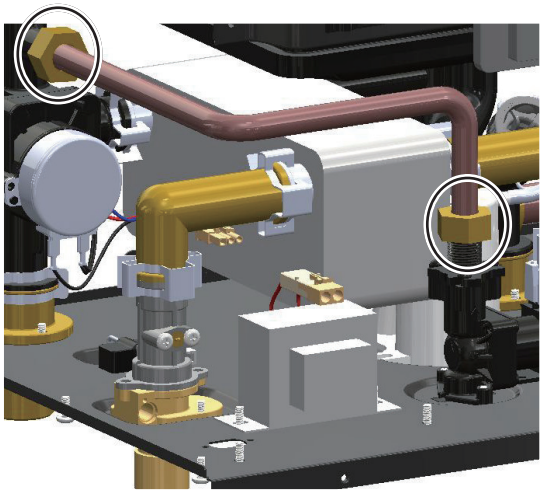
Main components Replacement Instructions

7. Auto Feeder

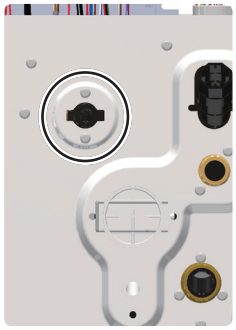
1. Close the gas shut off valve.
2. Turn the power off.
3. Place a bucket under the unit and rag around the valve to collect the residual water from the Combi Boiler.
4. Disconnect the electrical power to the Combi Boiler.
5. Close the both DHW inlet and Auto Feeder Inlet water valves and Heating valves.
6. Drain water from the hot water & DHW loop.
7. Disconnect all the electrical connection to the circuit board.
8. Remove the three screws to remove the Circuit Board and Circuit Board Bracket in one piece.

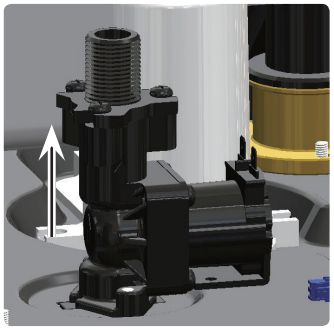


9. Loosen the nut connected to the Auto Feeder and 3-Way Valve. Remove the Pipe.



10. Remove the two screw that hold the Auto Feeder to the bottom of the case. Remove the Auto Feeder in the direction of the arrow.





11. Replace the Auto Feeder with new part. Check the o-rings for damage, if damaged, replace with new o-rings.
12. Assemble in the reverse order as the part was removed.
13. Open the gas shut off valve.
14. Turn the power on.
15. Open water valves (DHW and Heating).
16. Turn the unit on and ensure proper operation.

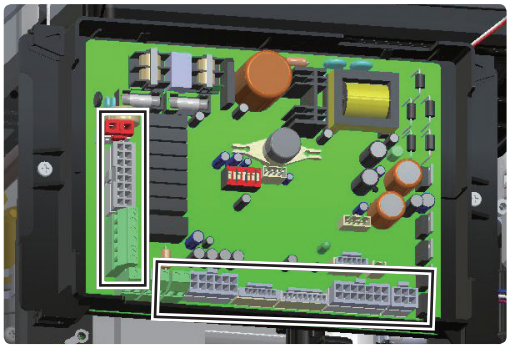
NOTE

1. Check wire condition connected to auto feeder.
2. Make sure the packing is inserted correctly when assembling the nuts.

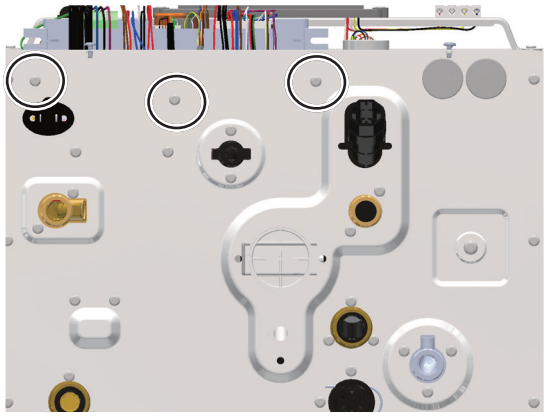
Main components Replacement Instructions

8. Flow Control Valve

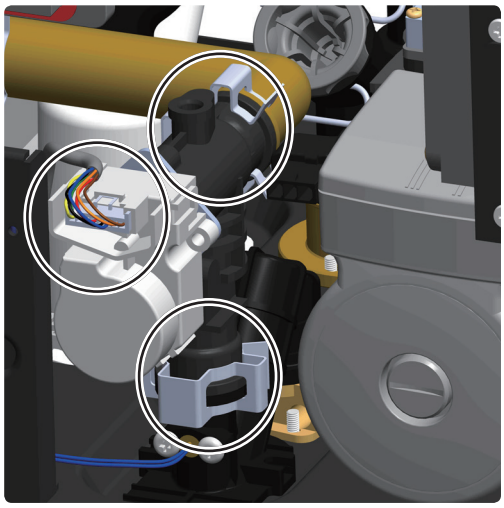
1. Close the gas shut off valve.
2. Turn the power off.
3. Place a bucket under the unit and rag under the valve to collect the residual water from the Combi Boiler.
4. Disconnect the electrical power to the Combi Boiler.
5. Close the both DHW inlet and Auto Feeder Inlet water valves and Heating valves.
6. Open the Hot water faucets completely.
7. Disconnect all the electrical connection to the circuit board.



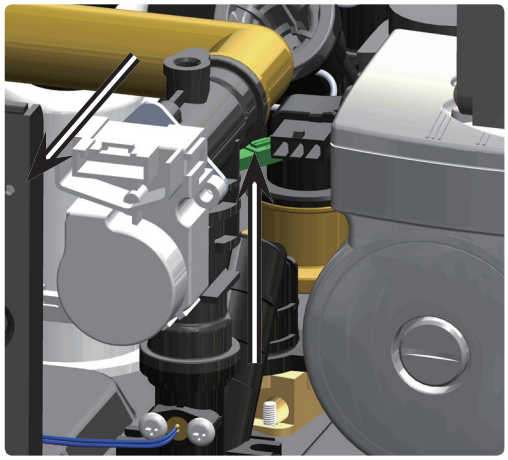
8. Remove the three screws to remove the Circuit Board and Circuit Board Bracket in one piece.



9. Remove two clips connected to the Flow Control Valve and remove the wire connection to the Flow Control Valve.



10. Remove the flow valve in the direction of the arrow.



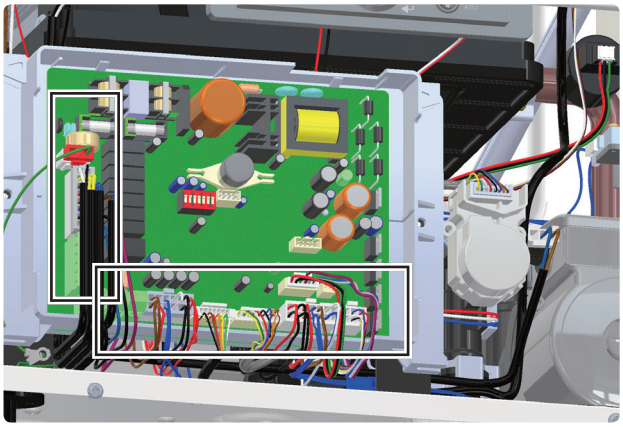
11. Replace the Flow Control Valve with new spare part. Check the o-rings for damage, if damaged, replace with new o-rings.
12. Assemble in the reverse order as the part was removed.
13. Open the gas shut off valve.
14. Turn the power on.
15. Open water valves (DHW and Heating).
16. Turn the unit on and ensure proper operation.

NOTE
1. Check wire condition connected to flow valve.
2. Make sure the o-ring is inserted correctly when assembling the pipe.

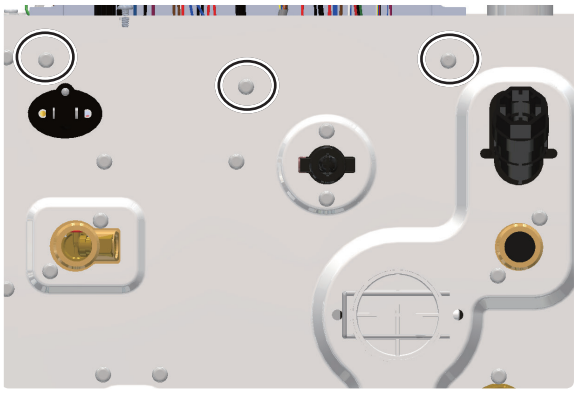
Main components Replacement Instructions

9. 3-Way Valve

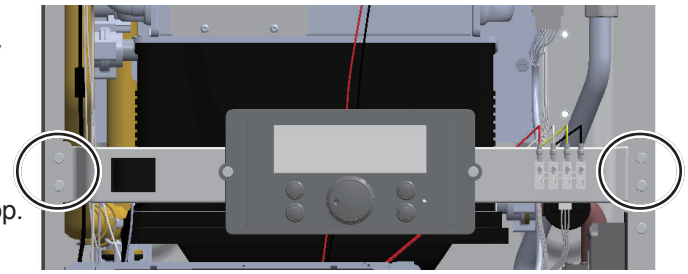
1. Close the gas shut off valve.
2. Remove 4 screws holding the front cover
3. Turn the power off .
4. Disconnect the electrical power to the Combi Boiler.
5. Place bucket under the unit and rag under 3-Way Valve to collect the residual water from the Combi Boiler.
6. Close both DHW inlet and the Auto Feeder Inlet water valves and Heating valves.
7. Drain water from the Heating loop and the DHW loop.
8. Disconnect all the electrical connection to the Circuit Board.



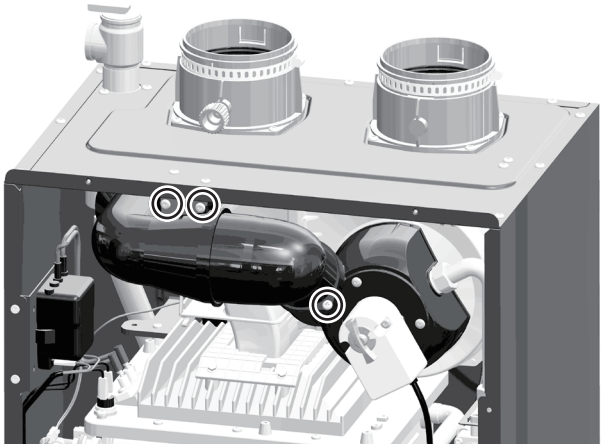
9. Remove the 3 screws to remove the Circuit Board and Circuit Board Bracket in one piece.



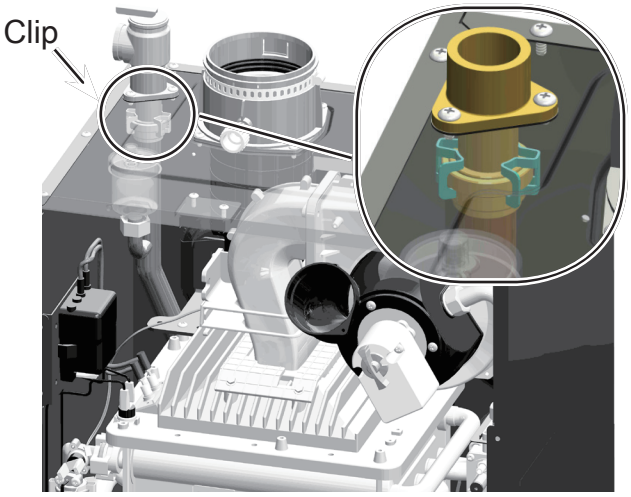
10. Remove the 4 screws and disconnect wires from the Control Panel and Power Switch.
11. Then remove the Control Panel Bar.

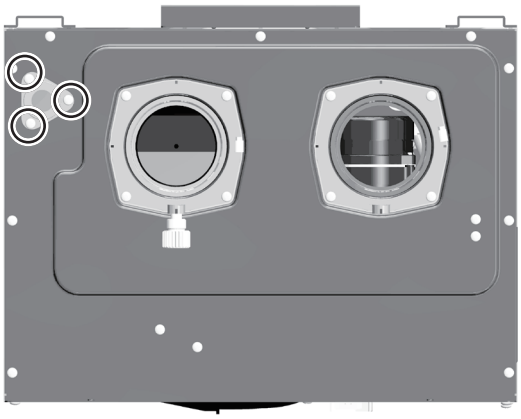


12. Remove the 3 screws from the Silencer Body to remove from the Fan Assembly.

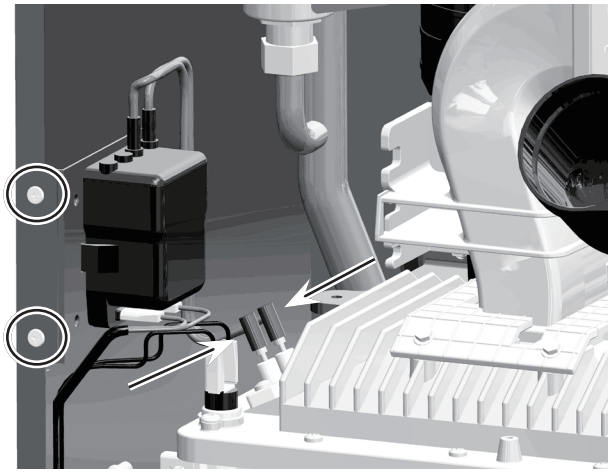


13. Remove the heating side Pressure Relief Valve and remove the 3 screws from the Relief Valve Connection. Remove the clip from the Relief Valve Pipe, then remove the Relief Valve Connection.

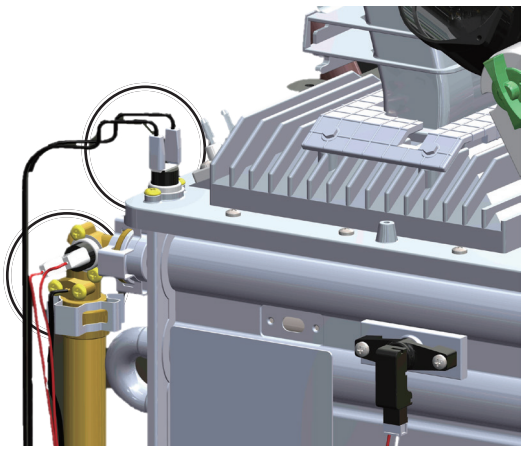




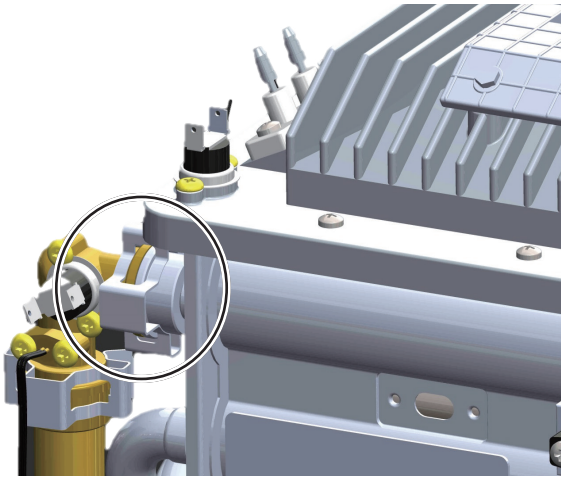
14. Remove the 2 screws holding the Igniter Box to the case and 2 wires connected to the Ignition Plug.



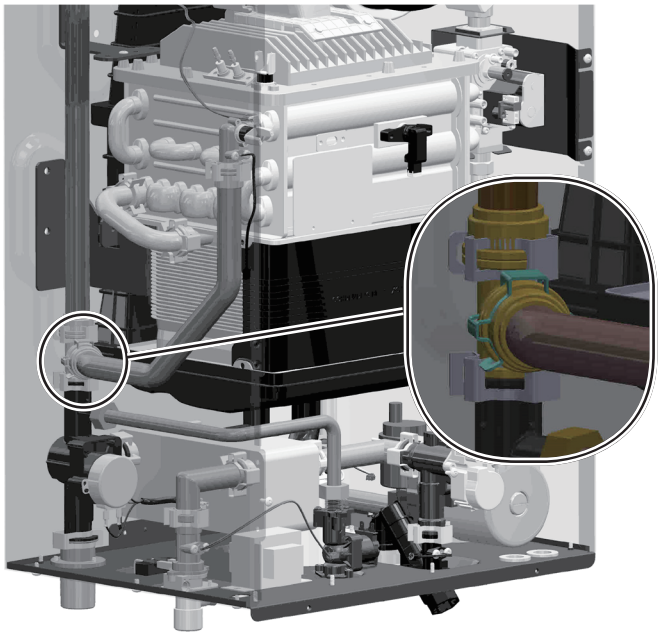
15. Disconnect both Burner and Heat Exchanger High Limit wires.



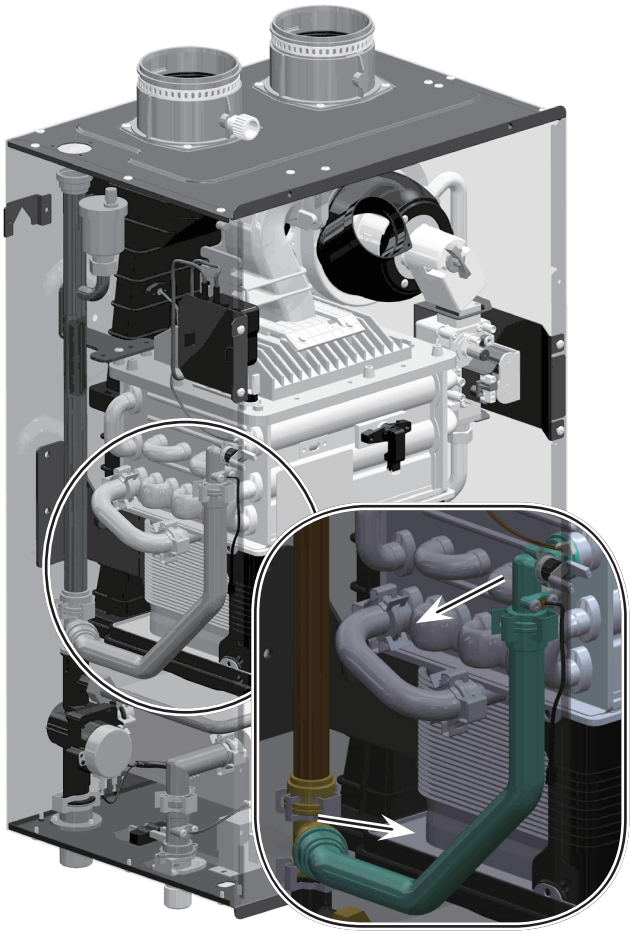
16. Remove the clip from the top of the Hot Water Outlet Elbow.



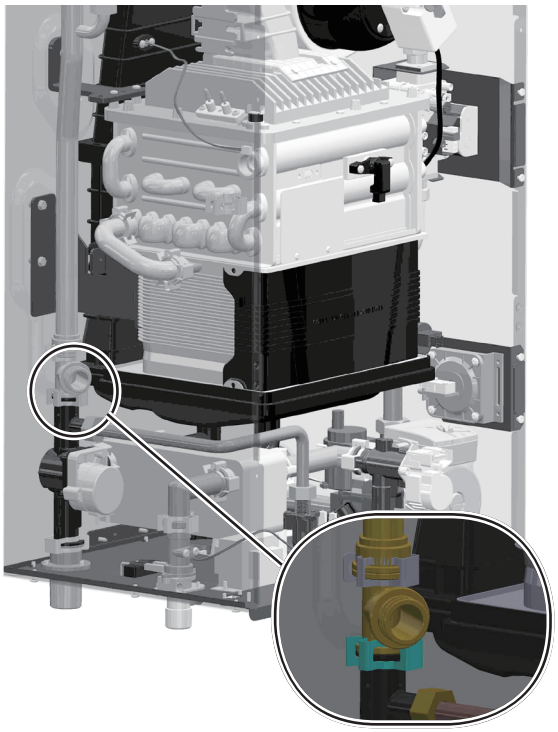
17. Remove the clip from the bottom of the Hot Water Outlet Pipe.



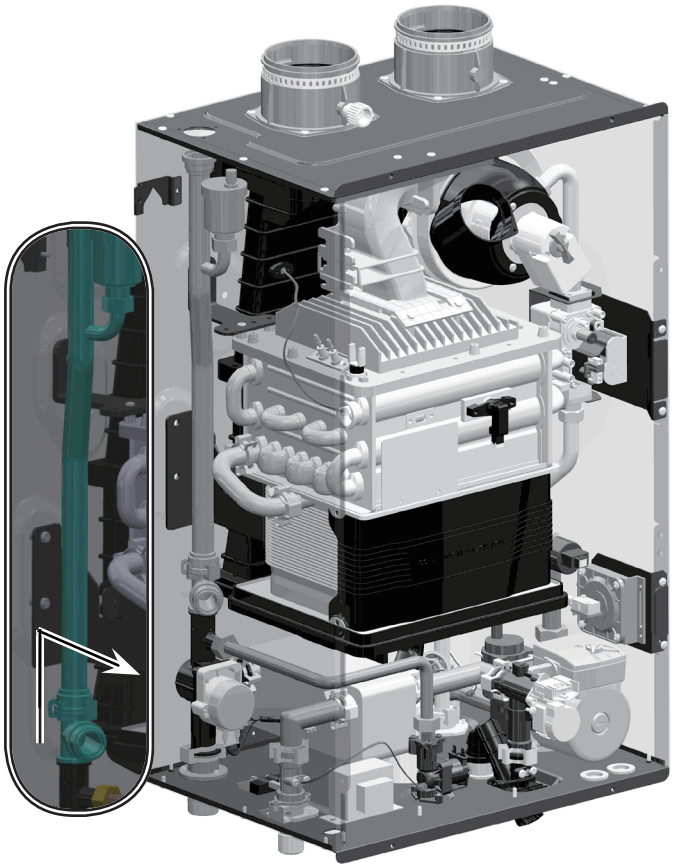
18. Remove the Hot Water Outlet Pipe.



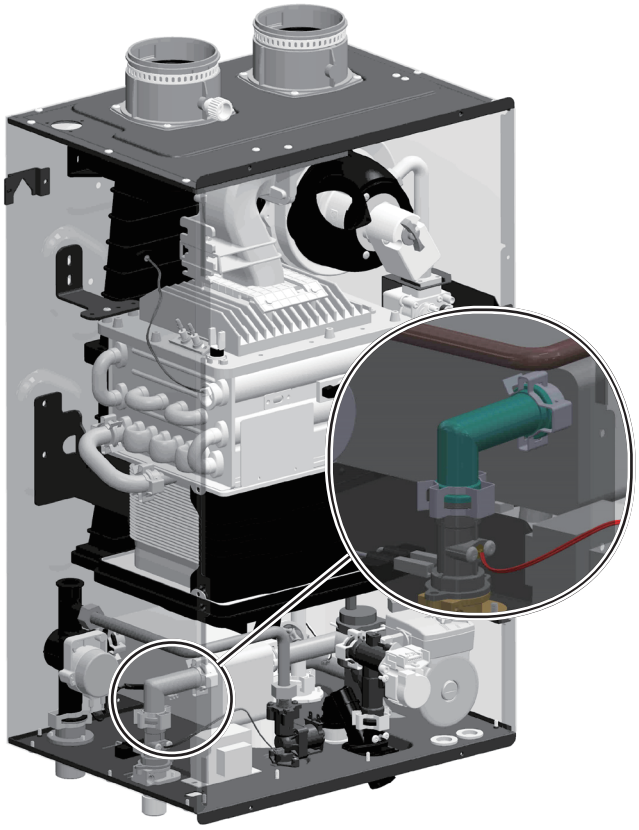
19. Remove the clip from the top of the 3-Way Valve.



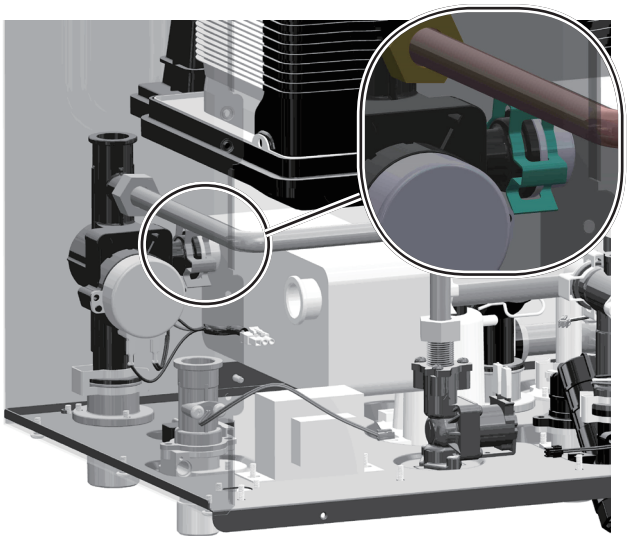
20. Pull up on the Relief Valve Pipe and remove.



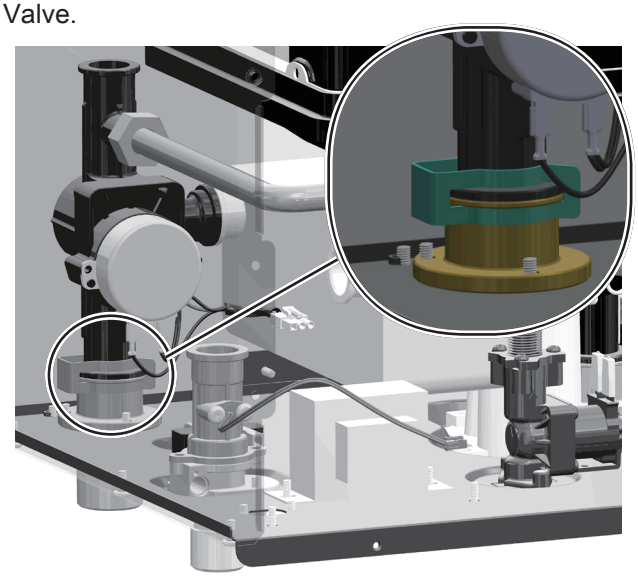
21. Remove the 2 clips on the Hot Water Elbow connected to the Flat Heat Exchanger, then remove the Hot Water Elbow.



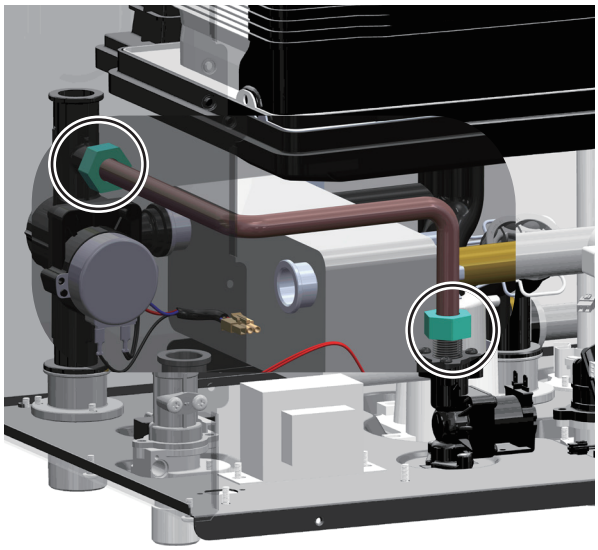
22. Remove the clip on the right side of the 3-Way Valve.



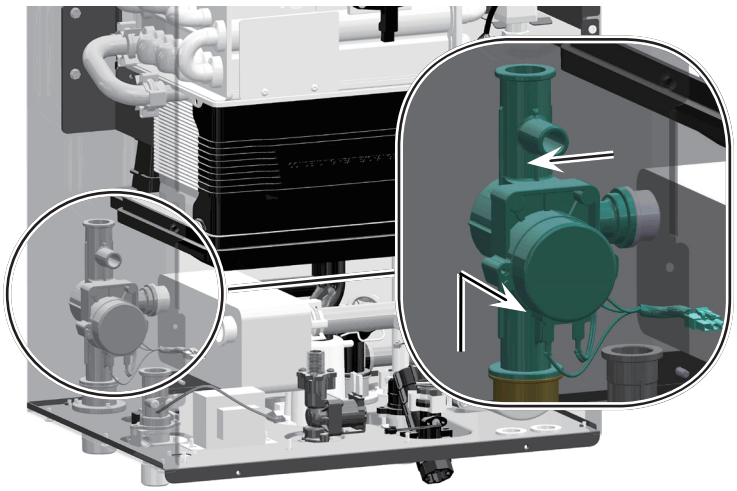
23. Remove the clip on the bottom of the 3-Way Valve.



24. Completely loosen both nuts on the Auto Feeder Pipe and remove the pipe. Ensure not to lose the Packings.



25. Slide the 3-Way Valve away from the Flat Plate Heat Exchanger and up off the Heating Supply Connection.



26. Replace the 3-Way Valve with new part. Check the O-rings for damage, if damaged, replace with new O-rings.
27. Assemble in the reverse order as the part was removed.
28. Open gas supply valve.
29. Open water valves to both Heating and DHW side.
30. Check for any water leaks.
31. Reconnect electrical power.
32. Turn unit on and check for any exhaust, gas and water leaks and ensure proper operation.

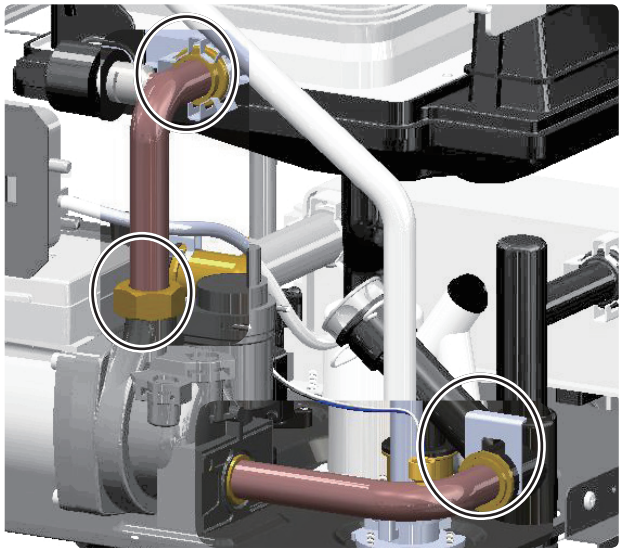
NOTE

1. Check wire condition connected to 3-Way Valve.
2. Make sure the O-rings are inserted correctly when assembling the unit back together.
If they are damaged, replace with new ones.

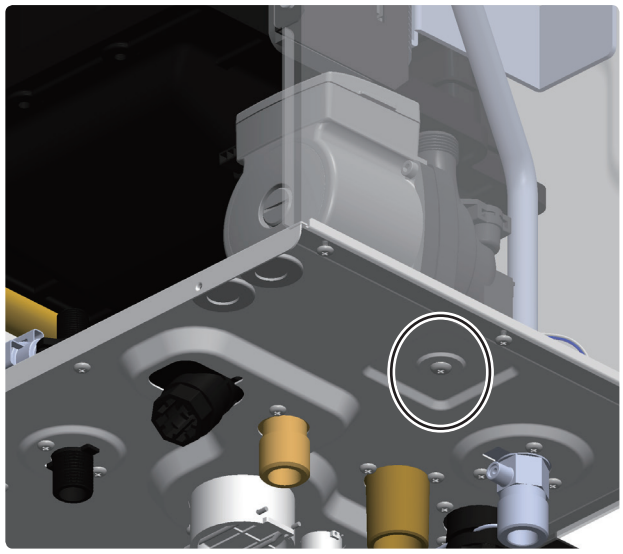
Main components Replacement Instructions

10. Circulation Pump

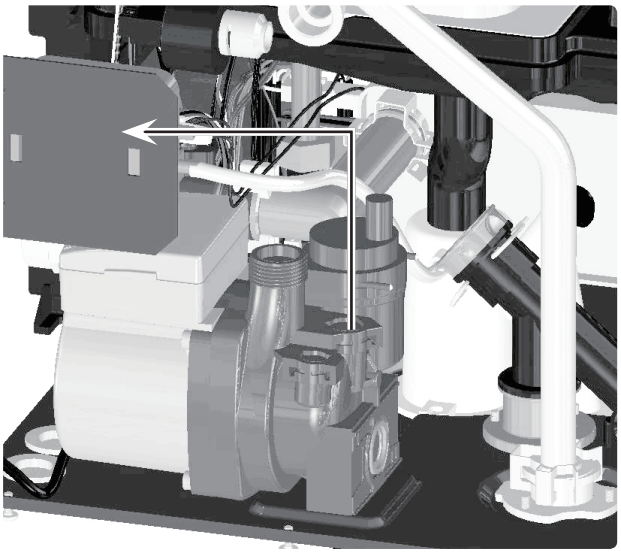
1. Close the gas shut off valve.
2. Turn the power off.
3. Place a bucket under the unit and rag around the pump to collect the residual water from the Combi Boiler.
4. Disconnect the electrical power to the Combi Boiler.
5. Close the both DHW inlet and Auto Feeder Inlet water valves and Heating valves.
6. Drain water from the hot water & DHW loop.
7. Remove wire connector connected to circulation pump.
8. Loosen nut and two clips to separate pump from the water piping.



9. Using a hand screwdriver, remove 1 screw of the pump fixing bracket.



10. Remove the circulation pump in the direction of the arrow.



11. Replace the pump with the new part. Check the o-rings for damage, if damaged, replace with new o-rings.
12. Assemble in the reverse order as the part was removed.
13. Open the gas shut off valve.
14. Turn the power on.
15. Open water valves (DHW and Heating).
16. Turn the unit on and ensure proper operation.

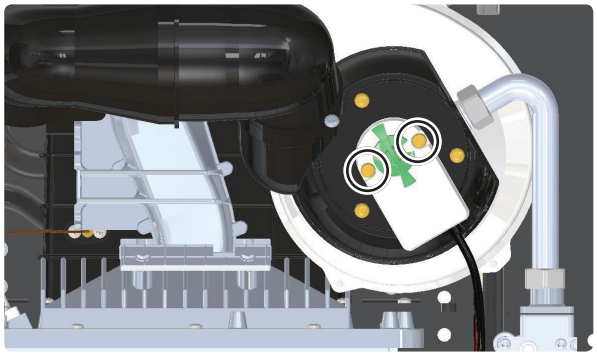
NOTE

1. Check wire condition connected to pump.
2. Make sure the o-ring is inserted correctly when assembling the pipe.

Main components Replacement Instructions

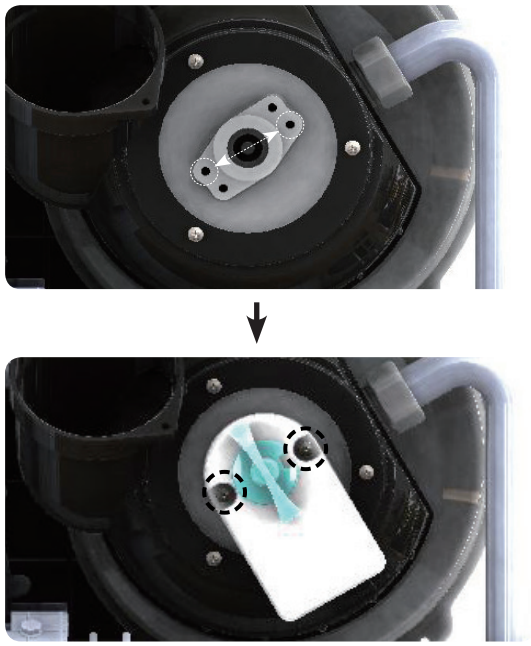
11. AGM

1. Close the gas shut off valve.
2. Turn the power off.
3. Close all water valve (DHW and Heating)
4. Disconnect the electrical connection to the AGM.
5. By using a hand screwdriver, remove 2 screws of the AGM.



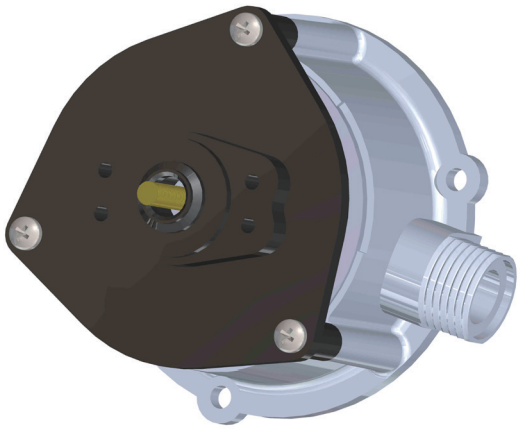
6. Replace AGM with new component.
7. Assemble in the reverse order as the part was removed.
8. Open the gas shut off valve.
9. Turn the power on.
10. Open water valves (DHW and Heating)
11. Turn the unit on and ensure proper operation.

■ Warning : AGM Mounting Position.



NOTE

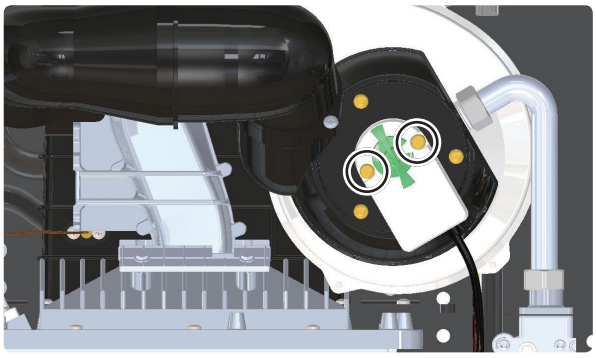
AGM comes with the Gas Mixer Body, if the Gas Mixer Body is damaged, replace it. Otherwise this part is not used.



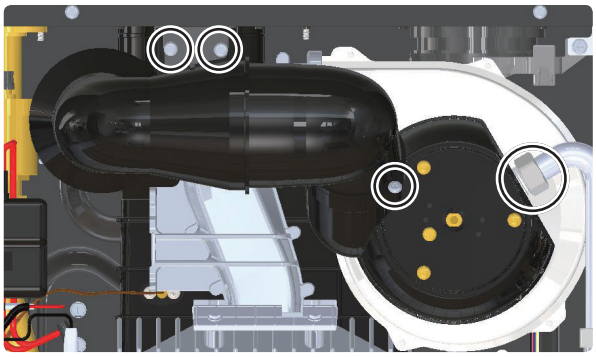
Main components Replacement Instructions

12. Fan Assembly

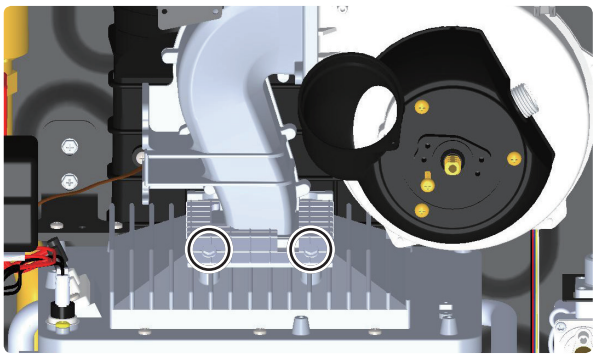
1. Close the gas shut off valve.
2. Turn the power off.
3. Close all water valve (DHW and Heating)
4. Disconnect the electrical connection to the AGM.
5. By using a hand screwdriver, remove 2 screws of the AGM.



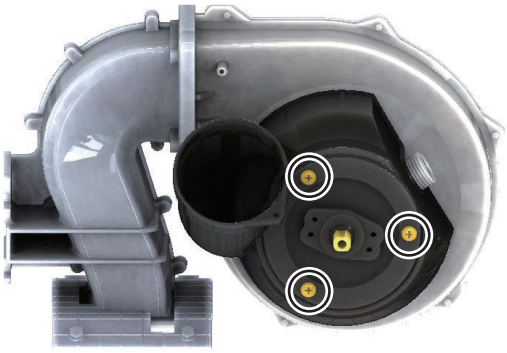
6. Remove 3 screws of the air intake pipe and loosen gas pipe nut.



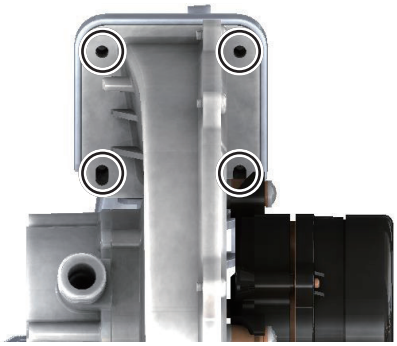
7. Loosen burner head bracket's 2 screws and separate from burner.



8. Remove 3 screws of the AGM plate.



9. Using a hand screwdriver or crescent wrench, remove the 4 screws to the Fan assembly.



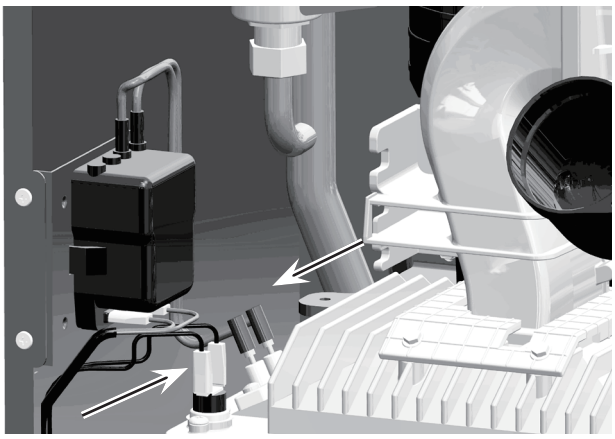
10. Replace the gas valve with new part.
Check the o-rings for damage, if damaged, replace with new o-rings.
11. Assemble in the reverse order as the part was removed.
12. Open the gas shut off valve.
13. Turn the power on.
14. Open water valves (DHW and Heating)
15. Turn the unit on and ensure proper operation.

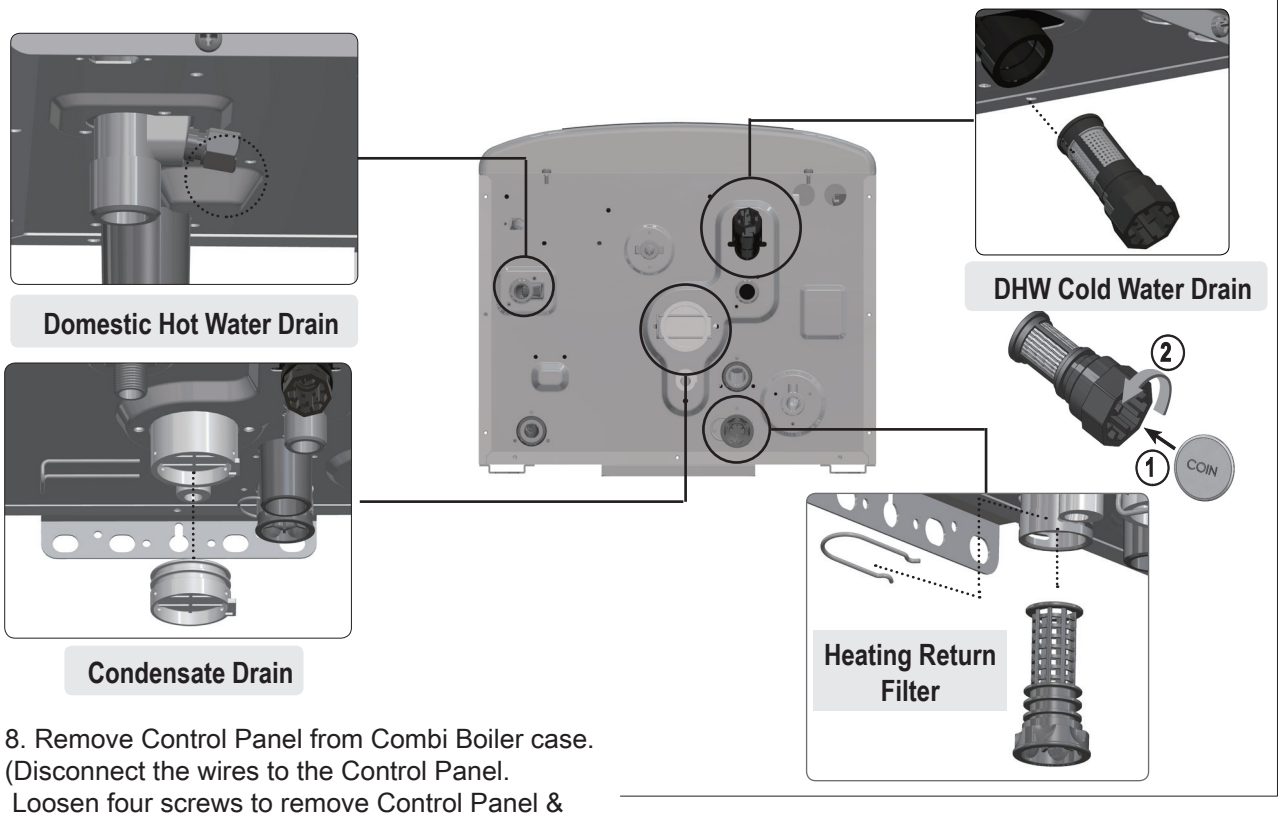
Main components Replacement Instructions

13. Heat Exchanger

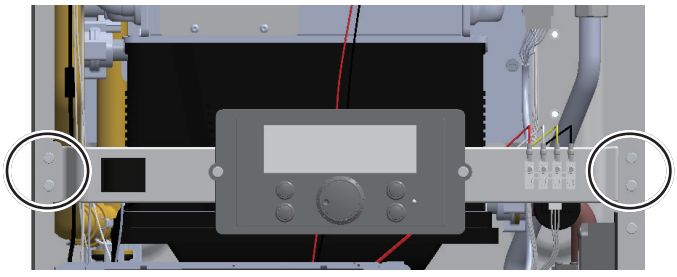
1. Close the gas shut off valve
2. Turn the power on/off button “On”.
3. Turn and leave open the hot water fixtures/ faucets for more than 2 minute and close.
* An 11 Error Code may appear on the control panel. This is not a malfunction of the unit. Do not turn Power ON/OFF Button OFF.
4. Close the water supply valve and disconnect the electrical power supplied to the unit.
5. Fully open all hot water fixtures/faucets.
6. Open all drain plugs and drain the water out of the unit.
7. When the water is completely drained, replace all drain plugs and close the hot water fixtures/faucets.

9. Unplug wire connectors that attach to the wiring harness.
(Burner Overheat switch, Ignition plug)

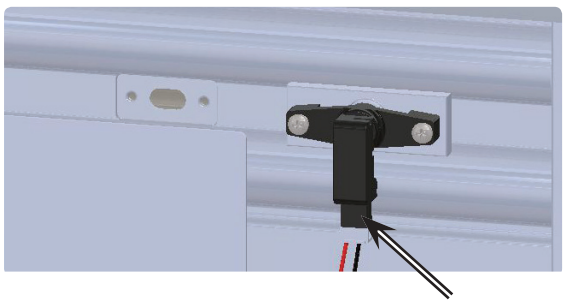




8. Remove Control Panel from Combi Boiler case.
(Disconnect the wires to the Control Panel.
Loosen four screws to remove Control Panel & bracket.)



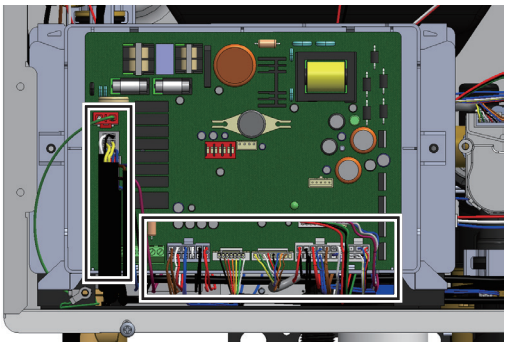
10. Remove Flame Detector connector.



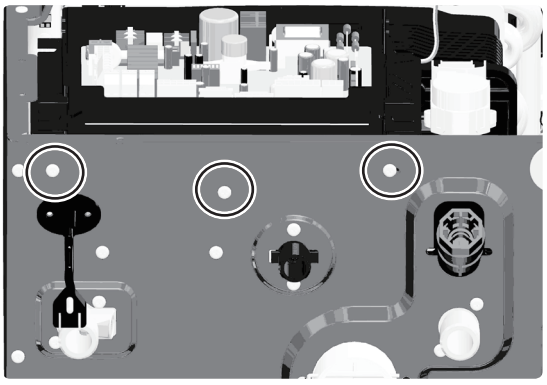
Main components Replacement Instructions

13. Heat Exchanger

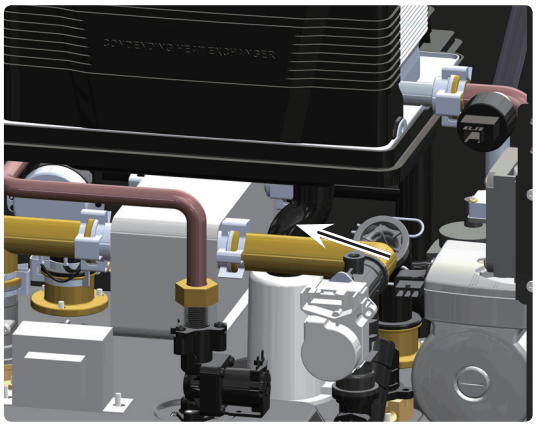
11. Unplug connectors on Circuit Board.



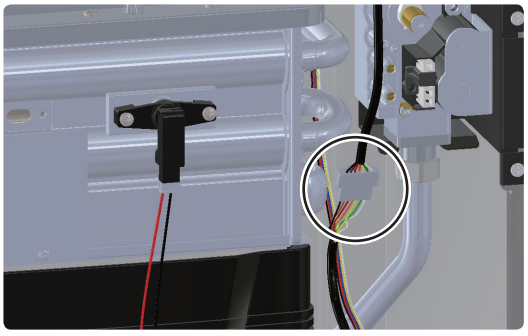
12. Loosen the three screws to remove the Circuit Board and Circuit Board Bracket in one piece.



13. Remove the clip and then pull out the Condensate Hose.

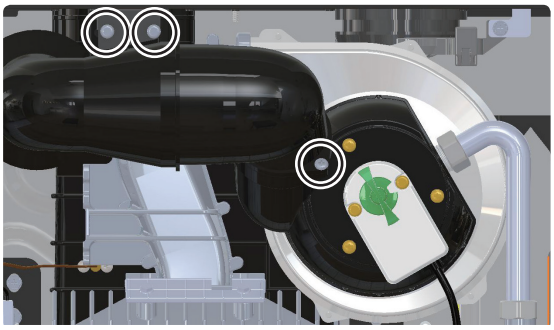


14. Remove the Fan assembly.
1) Remove AGM connector.

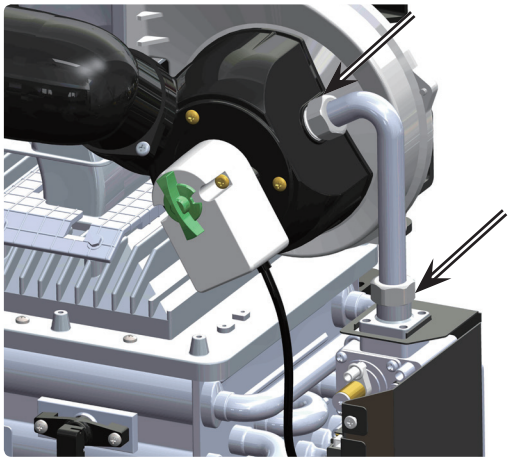


2) Remove Fan connector.

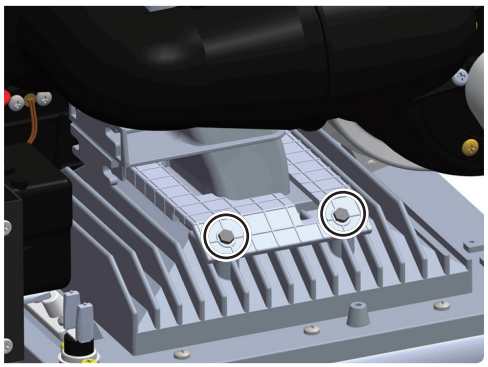
3) Loosen three screws to remove air pipe. Separate intake pipe attached to AGM.



4) Loosen gas pipe nut connected with AGM.



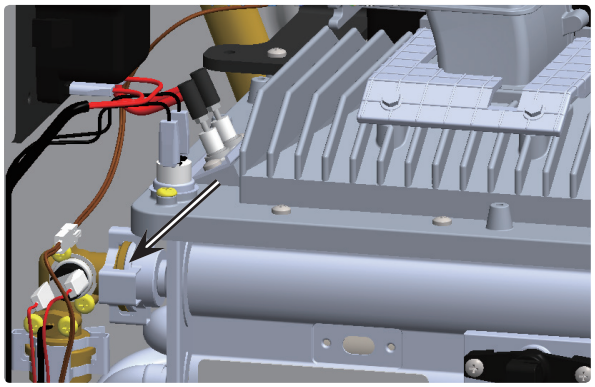
5) Loosen burner plate bracket's by loosen two screws as shown.

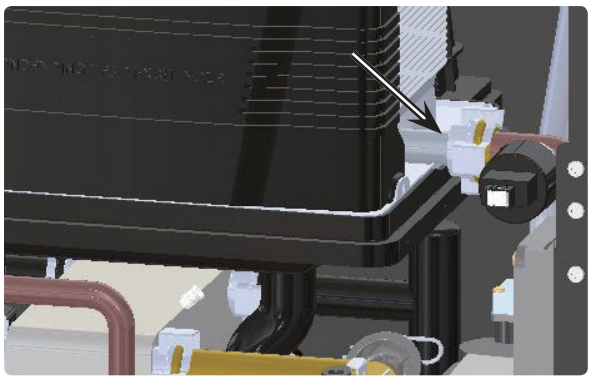


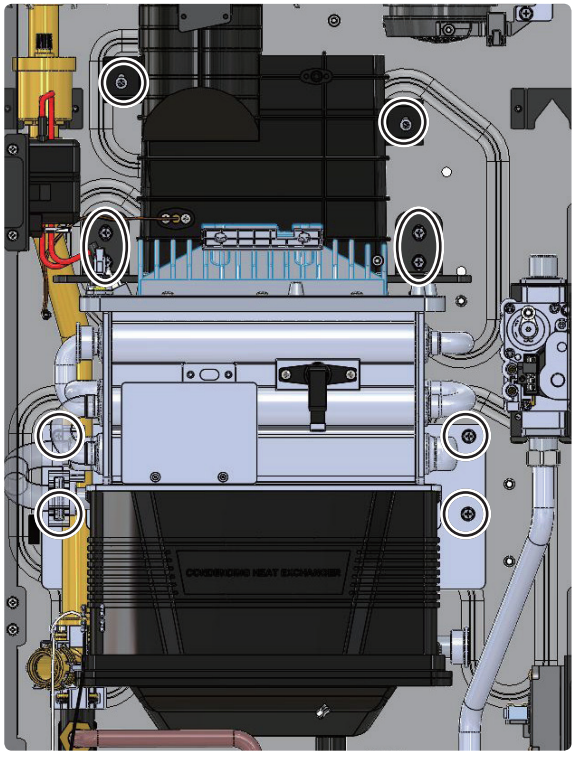
Main components Replacement Instructions

13. Heat Exchanger

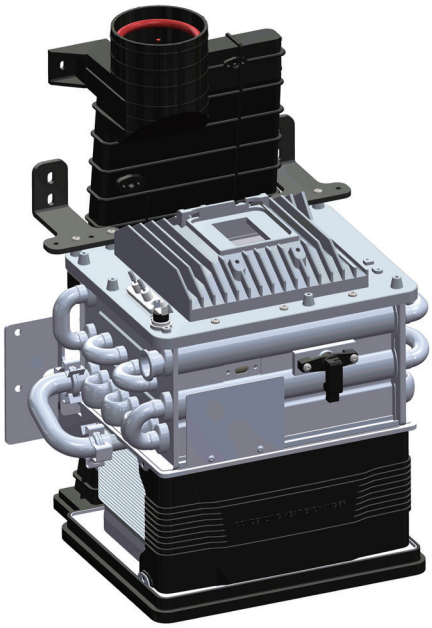
15. Remove two clips connected to the Heat Exchanger.
16. Loosen ten screws to remove Heat Exchanger. Pull out the Heat Exchanger inside case.







17. Replace Heat Exchanger assembly.

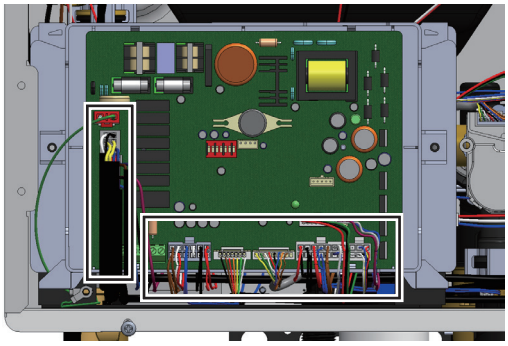


18. Assembly is in the reverse order as the part was repaired.
19. Open the gas shut off valve.
20. Open all water valves.
21. Turn the power on. (Use the manual switch)
22. Turn the unit on and ensure proper operation.

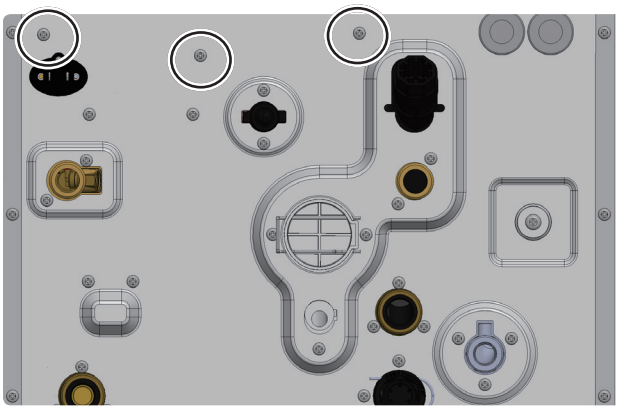
Main components Replacement Instructions

14. Heating Return Block

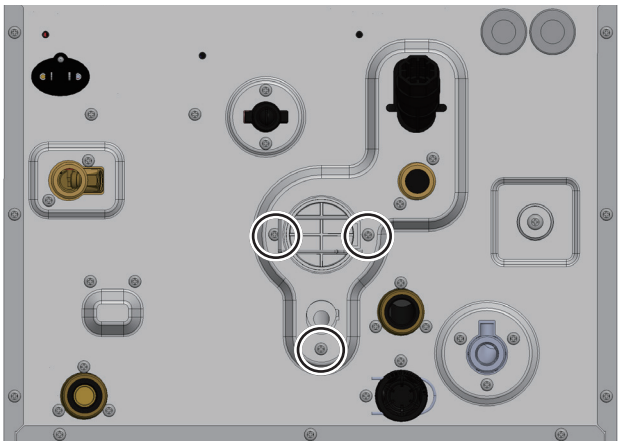
1. Close the gas shut off valve.
2. Remove 4 screws holding the front cover.
3. Turn the power off.
4. Disconnect the electrical power to the Combi Boiler.
5. Place bucket under the unit and rag under Heating Return Block to collect the residual water from the Combi Boiler.
6. Close DHW inlet, the Auto Feeder Inlet water valves and Heating valves.
7. Drain water from both the Heating loop and the DHW loop.
8. Disconnect all the electrical connection to the Circuit Board.



9. Remove 3 screws to remove the Circuit Board and Circuit Board Bracket in one piece.

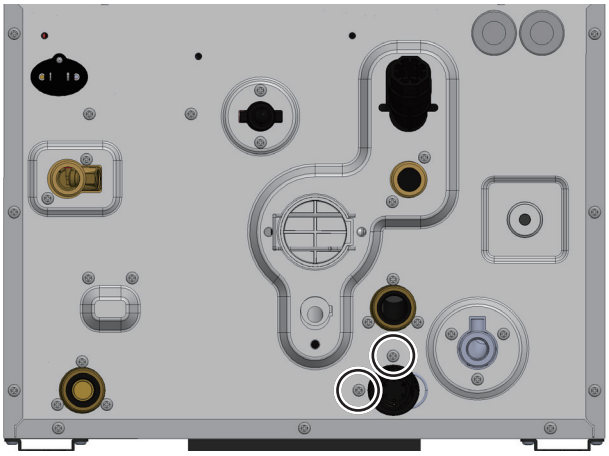


10. Remove 3 screws to remove the Condensate Trap.

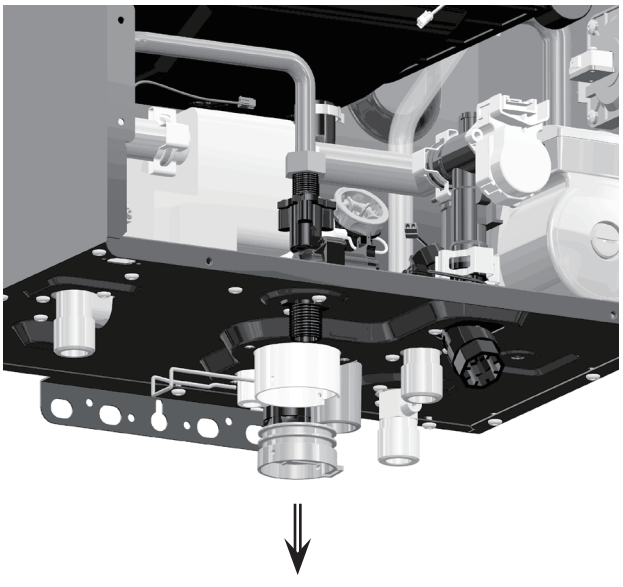


11. Remove 1 screw to remove the Circulation Pump.

12. Remove 2 screws to remove the Heating Return Block.



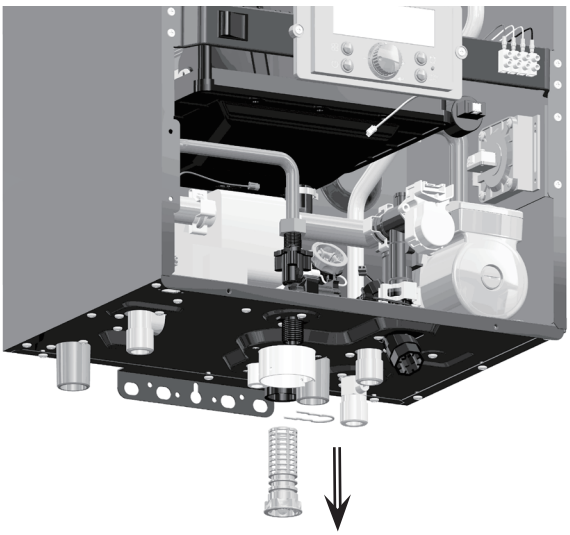
13. Remove the Condensate Clip and the plug from the Condensate trap.



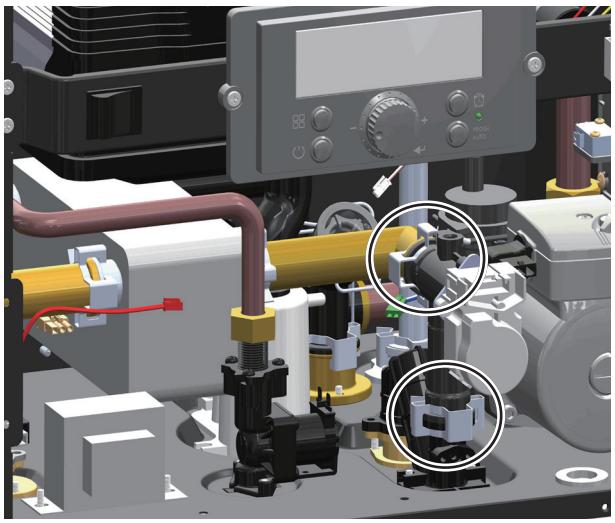
Main components Replacement Instructions

14. Heating Return Block

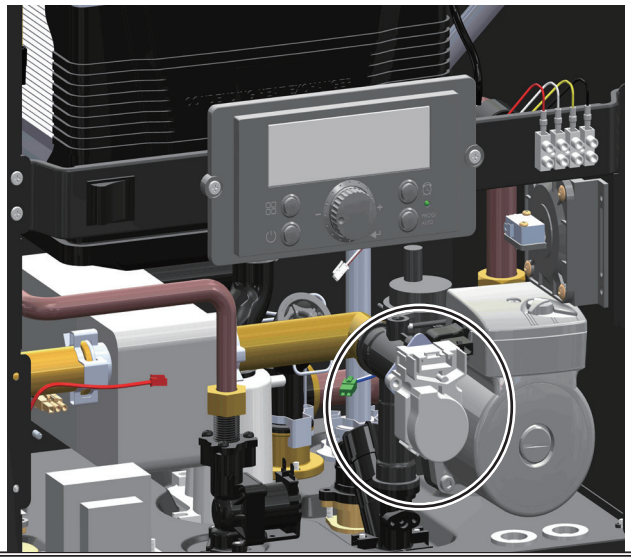
14. Remove the Filter Clip and Filter from the Heating Return Block.



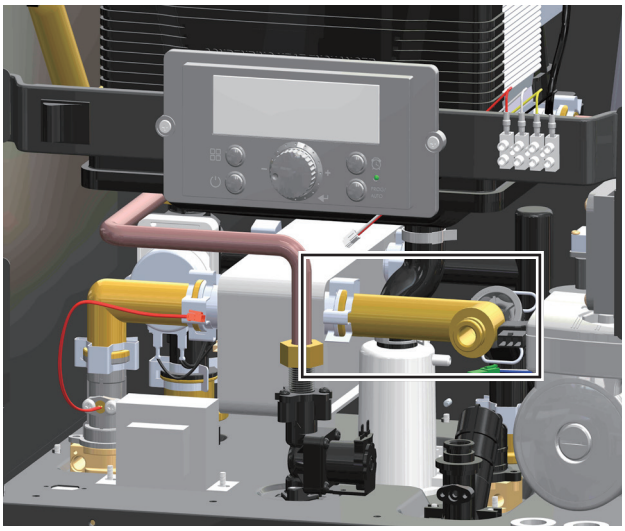
15. Remove 2 Clips to remove the Flow Control Valve.



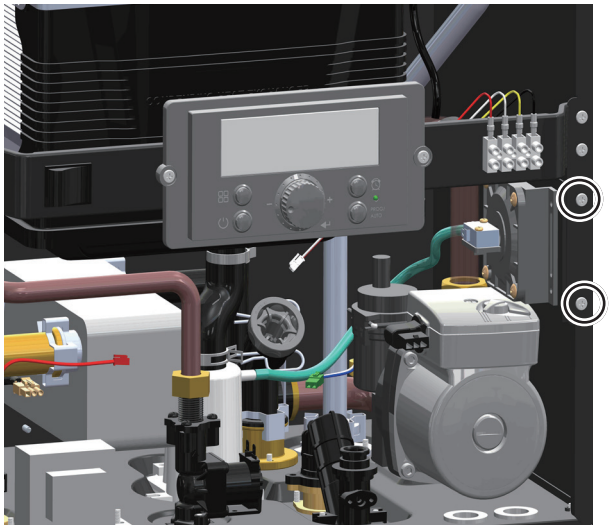
16. Remove the Flow Control Valve from the Combi Boiler.



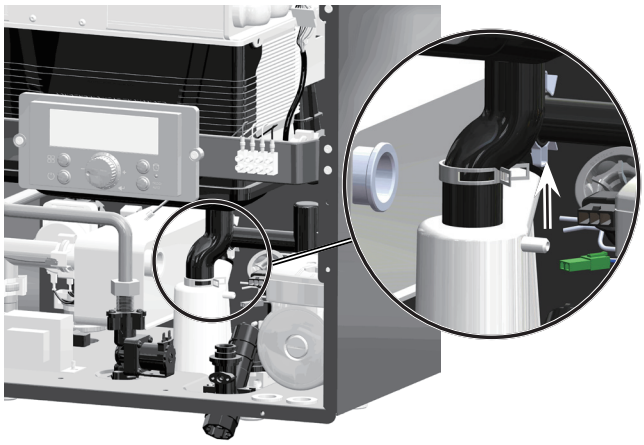
17. Remove the Water Inlet Elbow and Clip.



18. Disconnect the hose from the Air Pressure Switch to the Condensate Trap. Remove 2 screws to remove the Air Pressure Switch.



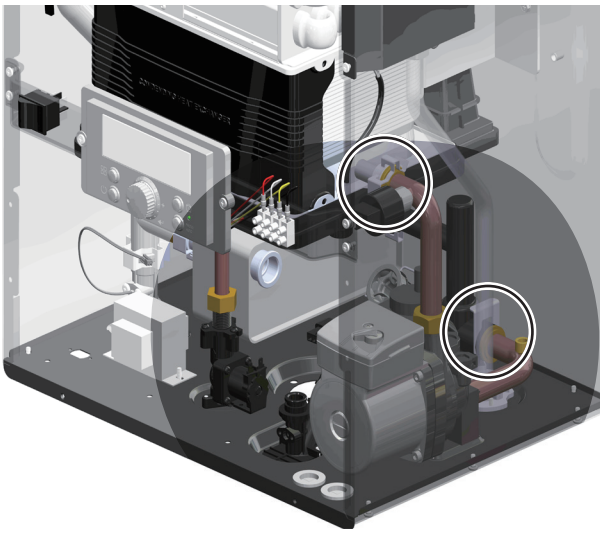
19. Loosen the Clips from the Condensate trap hose. Pull up on the Condensate trap hose to remove from the top of the Condensate trap, then remove the Condensate trap from the unit.



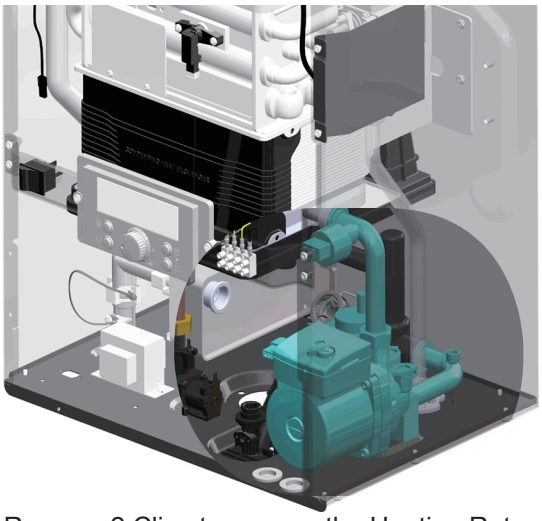
Main components Replacement Instructions

14. Heating Return Block

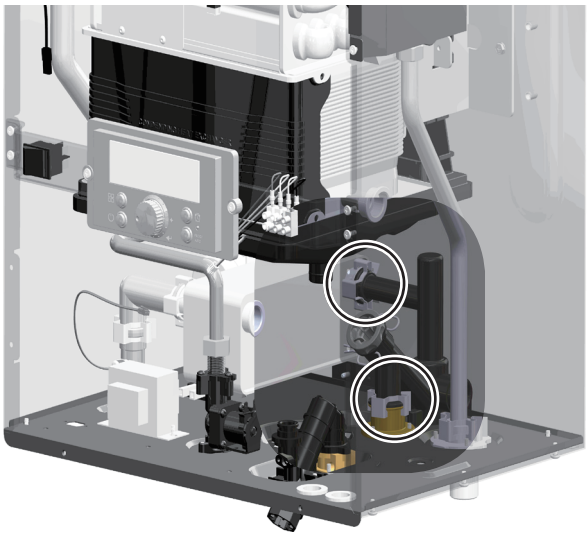
20. Remove 2 Clips to remove the Circulation Pump.



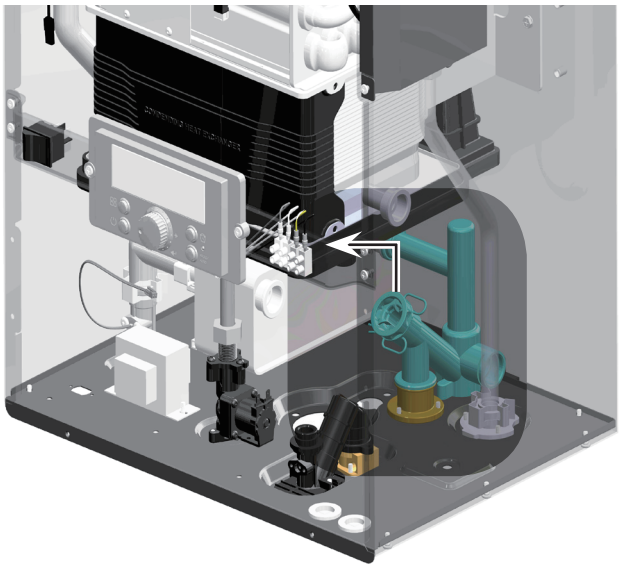
21. Remove the water inlet pipe and pump outlet pipe with the Circulation pump.



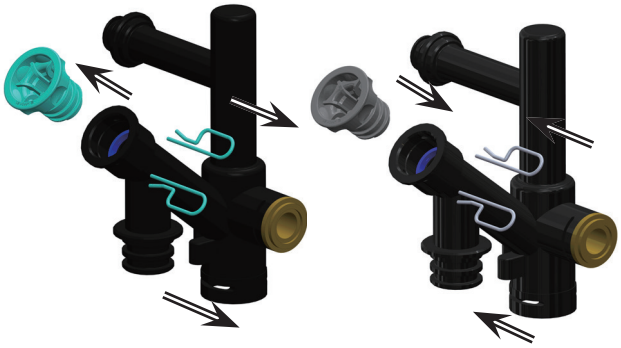
22. Remove 2 Clips to remove the Heating Return Block.



23. Remove the Heating Return Block.



24. Remove the Heating Return Cap from the damaged Heating Return Block and install on the new Heating Return Block.



<Disassembly> <Assembly>

25. Check the O-rings for damage, if damaged, replace with new O-rings.
26. Assemble in the reverse order as the part was removed.
27. Open the gas shut off valve.
28. Open water valves (DHW and Heating)
29. Check for leaks, if leaks are detected turn off water and repair leaks before continuing to the next step.
30. Plug unit into power.
31. Turn the unit on and ensure proper operation.

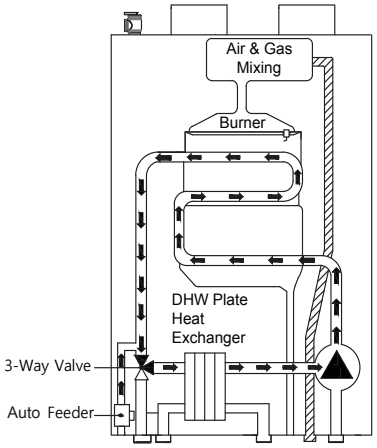
NOTE
Check for water leaks around the Heating Return Block and Clips. Do not connect to power if water leaks are detected.

1. Auto Feeder Processing

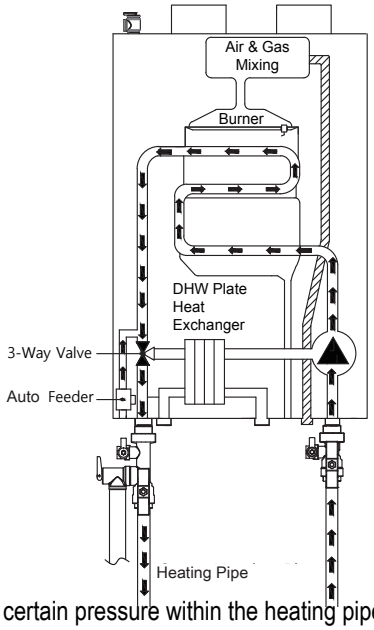
1. Turn on the power to the control panel.
2. Automatic water replenishment in progress when the Combi Boiler is less than the internal pressure 12psi.

Note) 'FILL' will be indicated at the beginning of auto feeding.

1) When the Combi Boiler's water pressure is below of a certain point, then the 3-Way Valve will be switched to the plate heat exchanger and add water.



2) When the water filling is finished, then the 3-Way Valve will be switched to heating supply pipe and proceed to add water to increase the pressure on the heating loop.



3) If the water adding is done up to a certain pressure within the heating pipe, then the circulation pump will operate in order to add water in the heating pipe.

4) When the heating loop reaches the set pressure, then the 3-Way Valve will switch to the plate heat exchanger and re-check the water pressure. After, the 3-Way Valve will re-check the heating loop.

5) Repeat the operation and stop processes of the circulation pump of the 1st 5 minutes of the heating loop air purge.

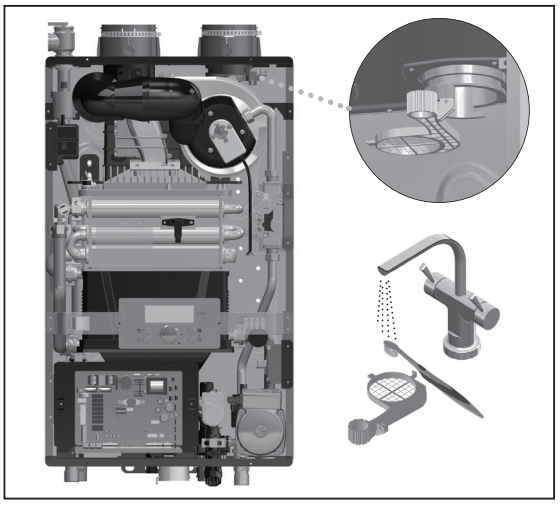
6) Repeat the operation and stop processes of the circulation pump of the 2nd 10 minutes of the heating loop air purge. Then, stop the trial run.

2. Cleaning Air Intake Filter & Vent & Relief Valve

Cleaning the Air Intake Filter

The air intake filter should be cleaned once a month. If not, the combi boiler could encounter combustion problems.
To clean the air intake filter:

1. Press the Power button on the control panel to turn off the combi boiler.
2. Disconnect the power supply from the combi boiler.
3. If water heater has been operating, wait for it to cool before continuing.
4. Remove the front cover of the combi boiler cabinet.
5. Pull the filter out of the air intake adapter.
6. Remove the filter from the plastic assembly and clean it with a toothbrush and clean running water.



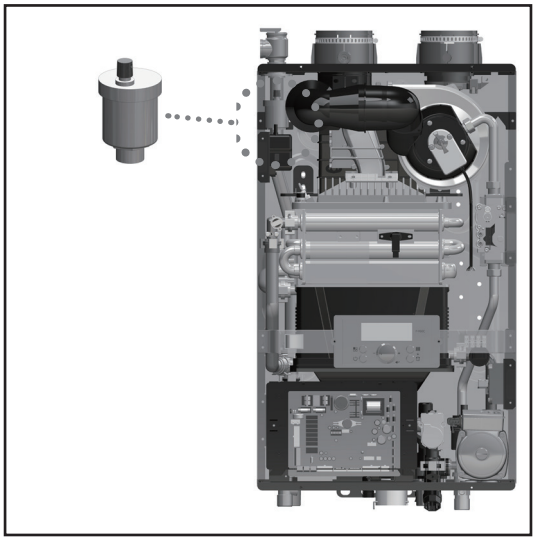
Check Exhaust Vent and Intake Piping

Visually inspect the exhaust vent for any signs of blockage, leakage, or deterioration of the piping. Inspect the exhaust vent bracing. Ensure bracing is undamaged and in good condition. Notify a qualified service technician immediately if any problems are found.

⚠ WARNING

Failure to inspect the venting system and have it repaired by a qualified service technician can result in vent system failure, causing severe personal injury or death.

Visually inspect the intake piping for any signs of blockage. Inspect the entire length of the intake pipe to ensure piping is intact and all joints are properly sealed. Inspect the intake pipe bracing. Ensure bracing is undamaged and in good condition. Notify a qualified service technician if any problems are found.



Check Pressure Relief Valve

・Visually inspect the primary pressure relief valve and discharge pipe for signs of weeping or leakage.
・If the pressure relief valve often weeps, the expansion tank may not be operating properly. Immediately contact a qualified service technician to inspect the appliance and system.

Check Vent Condensate Drain System

・While the appliance is running, check the discharge end of the condensate drain tubing. Ensure no flue gas is leaking from the condensate drain tubing by holding your fingers near the opening.
・If you notice flue gas leaking from the opening, this indicates a dry condensate drain trap. If problem persists, contact a qualified service technician to inspect the appliance and condensate line and refill the condensate trap.
・If applicable, check the condensate neutralizer and ensure it is full of condensate neutralizing marble chips.

Check the Air Vent

Loosen cap one counterclockwise turn to allow air vent to operate. See Figure 43. If the air vent valve works freely without leaking, close the valve by turning clockwise. If vent does not operate correctly, contact a qualified service technician to replace the vent.

Check Primary and Gas Piping

・Remove the appliance cover and perform a gas leak inspection following Operating Instructions, page 2, this manual. If gas odor or leak is detected, follow procedures on page 2. Call a qualified service technician.
・Visually inspect for leaks around the internal appliance water connections and around the heat exchanger. Visually inspect the external system piping, circulators, and system components and fittings. Immediately call a qualified service technician to repair any leaks.

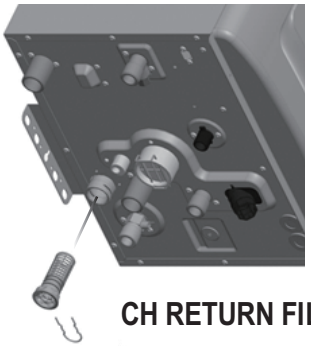
3 . Cleaning Cold Water Inlet Filter / Heating Filter

Cleaning the CH and DHW Inlet Filters (Draining the Appliance)

1. Place a bucket under the appliance to collect the residual water inside the appliance.
2. Press the Power button on the control panel to turn off the electrical power to the appliance. Then turn off the gas valve.
3. Valve off the appliance from the system. If the appliance cannot be isolated from the system, turn off the main water valve.
4. Open the hot water faucets in the system to aid in draining the system.

⚠ WARNING

Water drained from the appliance could be scalding hot. Wait for the appliance to cool before removing the CH or DHW inlet filters. Failure to do so could result in property damage, personal injury, or death.



CH RETURN FILTER

DHW INLET FILTER

5. Remove the DHW inlet filter. Then clean it with a toothbrush and clean running water. See Figure 45.
6. Reinstall the DHW inlet filter.
7. Purge air from the DHW lines by opening a hot water faucet in the system. When water flows freely, all air is purged.
8. Repeat the process on the CH inlet filter on the appliance.
9. Reinsert the filter and ensure the filter cap is securely tightened.
10. Connect electrical power to the appliance.
11. Restore water service to the appliance by opening the isolation valves, or turning on the main water valve.
12. Turn on the gas valve. Turn on electrical power to the appliance and press the Power button to turn the appliance on.

4. Flushing the Combi Boiler

- Read the temperature and pressure gauge to ensure the system is pressurized. Minimum is 10 psi. Maximum is 25 psi. Lift the relief valve top lever slightly, allowing water to relieve through the valve and discharge piping.
- If water flows freely, release the lever and allow the valve to seat. Watch the end of the relief valve discharge pipe to ensure that the valve does not weep after the line has had time to drain. If the valve weeps, lift the lever again to attempt to clean the valve seat. If the valve does not properly seat and continues to weep, contact a qualified service technician to inspect the valve and system.
- If water does not flow from the valve when you completely lift the lever, the valve or discharge line may be blocked. Immediately shut the appliance down per instructions on page 2 and call a qualified service technician to inspect the valve and system.

Check the Burner

Clean the exterior of the burner.

Flushing the CH Closed Loop Heat Exchanger

Flushing the heat exchanger is a complicated procedure that should only be performed by a qualified service technician. It is recommended to flush the heat exchanger annually if water hardness exceeds 12 grains per gallon (considered extremely hard water). If water hardness falls below 12 grains per gallon it is recommended to flush the heat exchanger every two to three years.

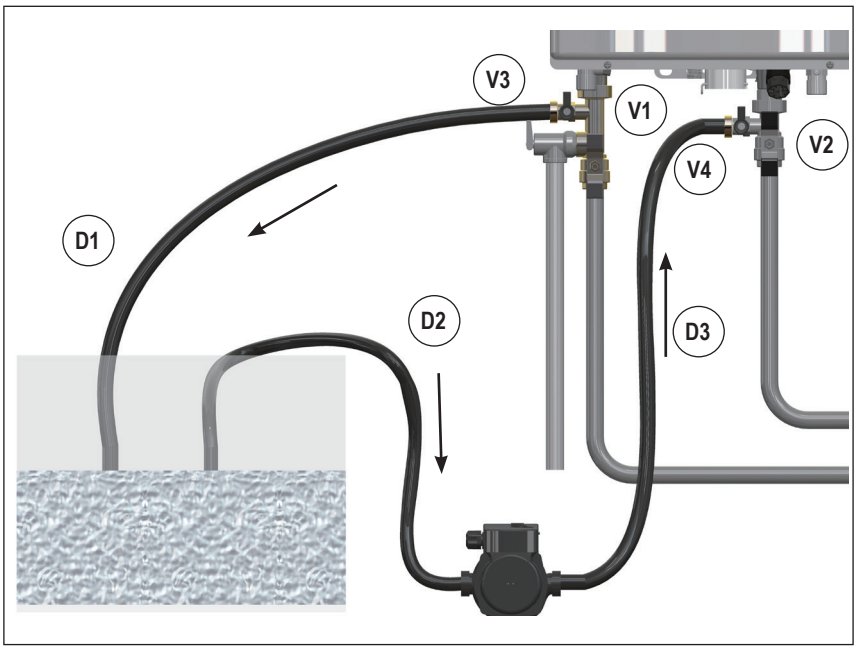
NOTE: Improper maintenance WILL VOID appliance warranty.

1. Disconnect electrical power to the appliance.

2. Close the shutoff valves on both CH supply and CH return lines (V1 and V2). See Figure 44.

3. Connect one hose (D1, Figure 44) to the valve (V3) and place the free end in a bucket. Connect one of the hoses (D3) to the circulation pump outlet and the cold water inlet line to valve V4. Connect the other hose (D2) to the circulation pump inlet and place the free end in the bucket.

4. Pour tankless cleaning solution into the bucket. Use an FDA approved cleaner for potable systems on the heat exchanger. Place the drain hose (D1) and hose D2 to the pump inlet in the cleaning solution.



5. Open service valves (V3 and V4) on the hot water outlet and cold water inlet lines.

6. Turn on the circulation pump. Operate the pump and allow the cleaning solution to circulate through the appliance for at least 1 hour at a rate of 4 gallons per minute.

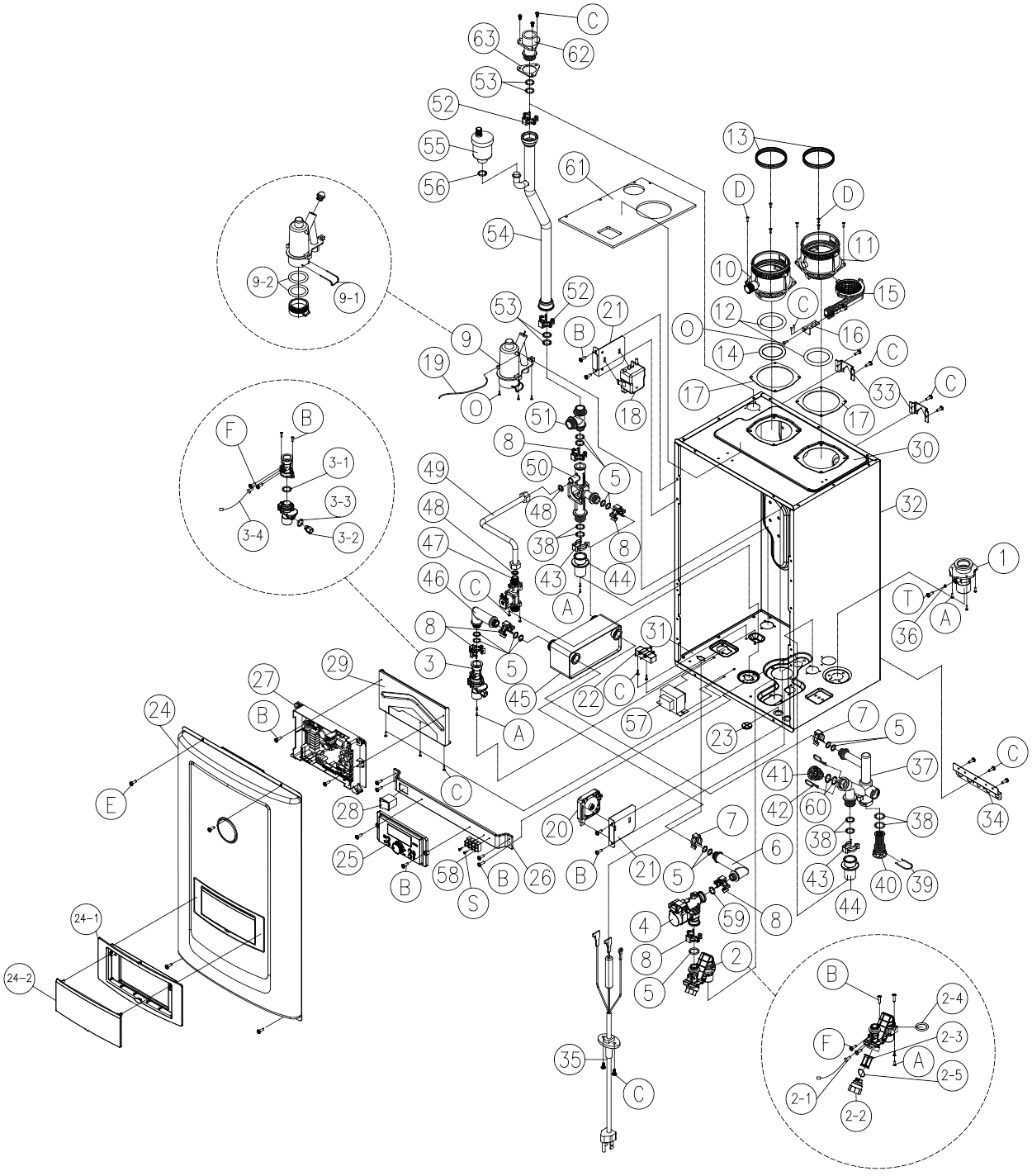
7. Rinse the cleaning solution from the heat exchanger as follows:
   a. Remove the free end of drain hose D1 from the bucket.
   b. Close service valve V4 and open shutoff valve V2.
   c. Do not open shutoff valve V1.
   d. Allow water to flow through the appliance for 5 minutes.
   e. Close shutoff valve V2.

8. Disconnect hoses from lines. Properly dispose of used cleaning solution.

9. Remove the CH filter from the appliance and clean out any residues.

10. Repeat process on the DHW loop of the appliance.

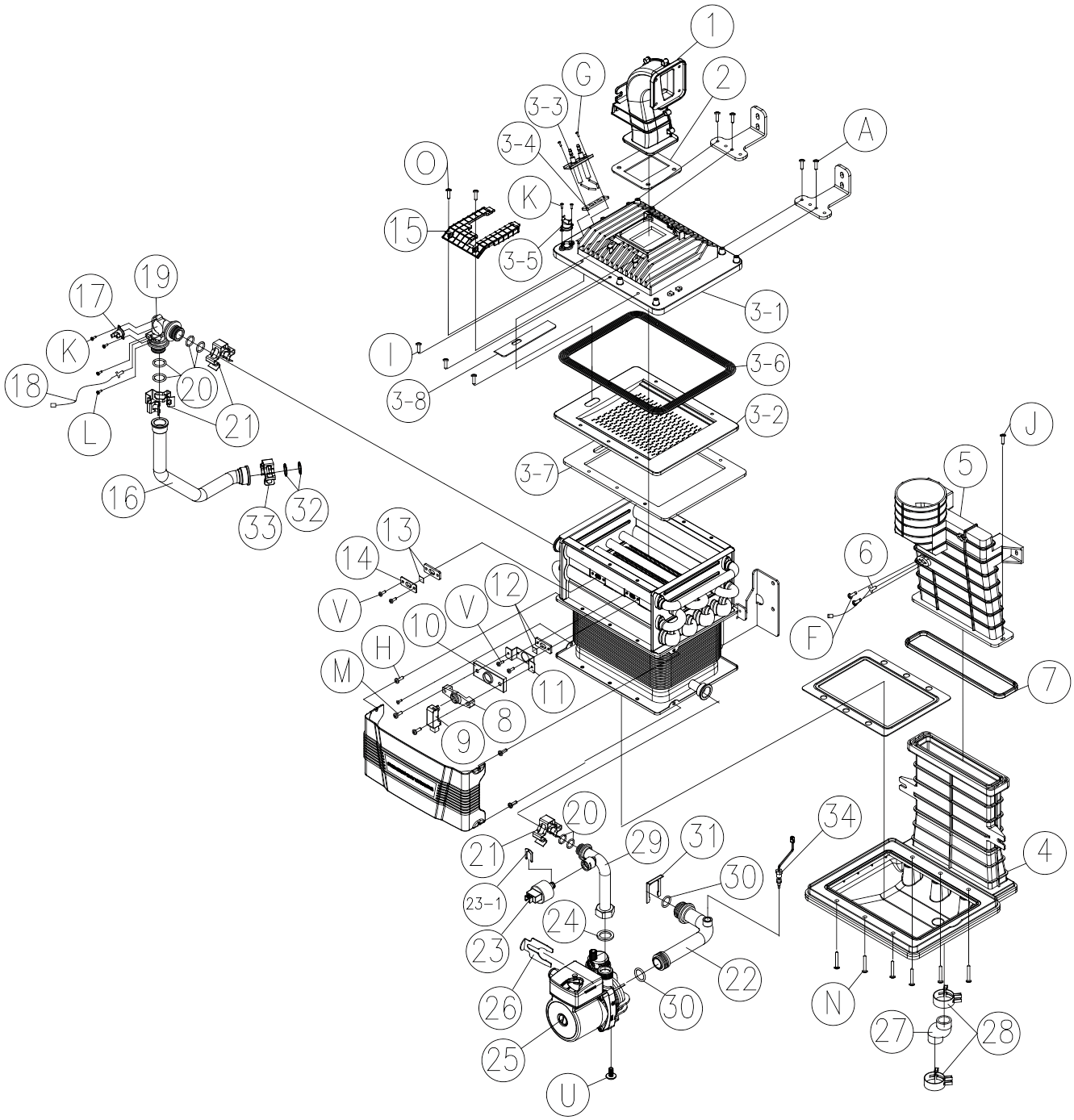
PART I _ CASE PART



Item	Description	Part Number	Qty
1	Gas Inlet Connection	RTG20298A	1
2	Water Inlet Valve Assy	RTG20298B	1
2-1	Cold Water Temperature Sensor	RTG20298C	1
2-2	Cold Water Filter Cap	RTG20298D	1
2-3	Cold Water Filter	RTG20316BU	1
2-4	O-ring (P20)	RTG20298F	1
2-5	O-ring (P18)	RTG20298G	1
3	Hot Water Pipe Assembly	RTG20316CD	1
3-1	O-ring (P20)	RTG20298F	1
3-2	Hot Water Plug	RTG20298K	1
3-3	O-ring (P10)	RTG20298L	1
3-4	Hot Water Temperature Sensor	RTG20316AF	1
4	Flow Control Valve	RTG20298N	1
5	O-ring (P16)	RTG20299AE	13
6	Water Inlet Elbow	RTG20316BL	1
7	Clip(Circle-Small)	RTG20316AX	2
8	Clip(Star-Small)	RTG20299AU	6
9	Condensate trap	RTG20298U	1
9-1	Condensate clip	RTG20298V	1
9-2	O-ring (P44)	RTG20298W	2
10	Exhaust Assembly	RTG20316F	1
11	Air Intake Assembly	RTG20298Y	1
12	O-ring (P85)	RTG20298Z	2
13	Exhaust and Intake Packing	RTG20298AA	2
14	O-ring (P75)	RTG20298AB	1
15	Air intake filter	RTG20298AC	1
16	Air Intake Filter Bracket	RTG20298AD	1
17	Gasket	RTG20298AE	2
18	Igniter	RTG20316Y	1
19	Siphon Air Pressure Hose	RTG20316AW	1
20	Air Pressure switch	RTG20298AH	1
21	Bracket (Igniter, Air Pressure Switch)	RTG20316H	2
22	Water Leak Detector	RTG20298AK	1
23	Wiring Through Way Packing	RTG20298AL	1
24	Front Cover Assembly	RTG20316A	1
24-1	Control Panel Bracket	RTG20298AN	1
24-2	Control Panel Window	RTG20298AP	1
25	Control Panel	RTG20316V	1
26	Control Panel Steel Bracket	RTG20316K	1

Item	Description	Part Number	Qty
27	PCB (Control Board)	RTG20316U	1
28	Rocker Switch	RTG20298AV	1
29	Control Board Bracket	RTG20316BE	1
30	Case (Top)	RTG20316C	1
31	Case (Bottom)	RTG20316B	1
32	Case	RTG20298AZ	1
33	Case Bracket	RTG20316G	1
34	Case Bracket (Bottom)	RTG20298BB	1
35	Power Cord	RTG20316AA	1
36	O-ring (P4)	RTG20316BZ	1
37	Heating Return Block	RTG20316R	1
38	O-ring (P22A)	RTG20316BY	6
39	Filter Clip	RTG20316BD	1
40	Heating Return Block Filter	RTG20316S	1
41	Heating Return Block Cap	RTG20316BV	1
42	Cap Clip	RTG20316AY	2
43	Clip (Φ25-Φ31)	RTG20316AZ	2
44	Heating Supply / Return Connection	RTG20316BR	2
45	Hot Water Plate Heat Exchanger	RTG20316AD	1
46	Hot Water Elbow	RTG20316BK	1
47	Auto Feeder	RTG20316BS	1
48	Packing (10A)	RTG20316BW	2
49	Auto Feeder Pipe	RTG20316AS	1
50	3 - Way Valve	RTG20316AN	1
51	T-Elbow	RTG20316BM	1
52	Clip (Star-large)	RTG20316BC	2
53	O-ring (P22)	RTG20316BX	4
54	Relief Valve Pipe	RTG20316AU	1
55	Air Vent	RTG20316AM	1
56	15A Packing	RTG20300J	1
57	Power Transformer	RTG20316Z	1
58	Terminal Block	RTG20316AB	1
59	O-ring (P15)	RTG20299AH	1
60	O-ring (P20)	RTG20298F	2
61	Top Case Packing	RTG20316CA	1
62	Relief Valve Adapter	RTG20316BN	1
63	Relief Valve Adapter Gasket	RTG20316CN	1

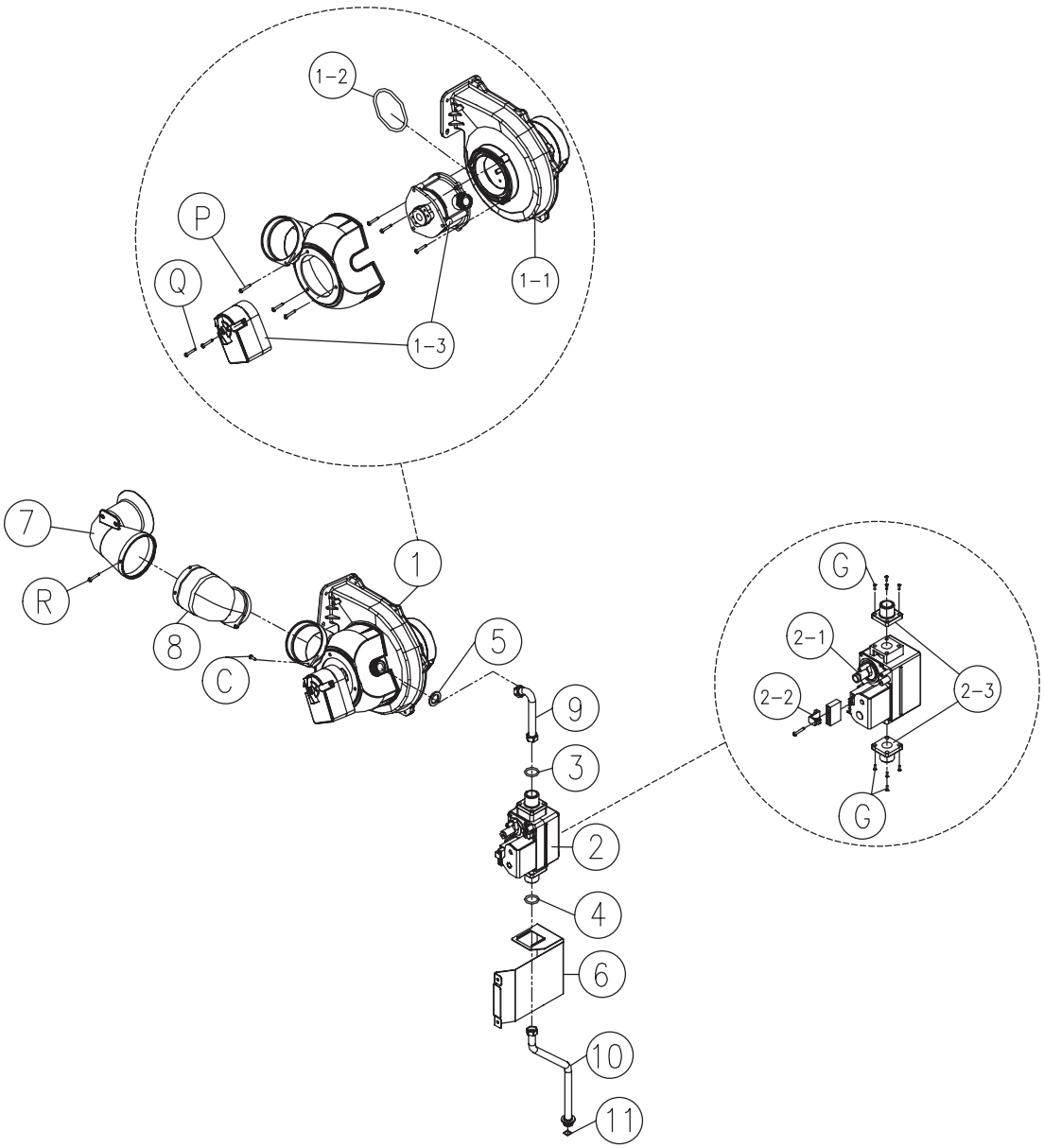
PART II _ HEAT EXCHANGER PART



Item	Description	Part Number	Qty
1	Blower Connector	RTG20299A	1
2	Blower Connector Packing	RTG20299B	1
3	Burner Assembly	RTG20299C	1
3-1	Burner Head	RTG20299D	1
3-2	Burner Flange	RTG20316BF	1
3-3	Ignition Rod	RTG20299F	1
3-4	Ignition Rod Gasket	RTG20299G	1
3-5	Overheat Switch (Burner)	RTG20316AK	1
3-6	Burner head packing	RTG20299J	1
3-7	Burner head gasket 1	RTG20316CB	1
3-8	Burner head gasket 2	RTG20299L	1
4	Exhaust Pipe Assembly (Lower)	RTG20316BT	1
5	Exhaust Pipe Assembly (Upper)	RTG20299R	1
6	Exhaust Temperature Sensor	RTG20316AH	1
7	Exhaust Duct Packing	RTG20316CE	1
8	Flame Detector Sensor Bracket	RTG20299W	1
9	Flame Detector Sensor	RTG20299X	1
10	Flame Detector Metal Plate	RTG20316CF	1
11	Flame Observation Bracket	RTG20316CG	1
12	Flame Observation Glass & Gasket	RTG20316CH	1
13	Flame View Glass & Gasket	RTG20316CJ (Glass) RTG20316CK (Gasket)	1
14	Flame View Bracket	RTG20316CL	1

Item	Description	Part Number	Qty
15	Burner Fixing Bracket	RTG20299Y	1
16	Hot Water Outlet Pipe	RTG20316AT	1
17	Overheat Sensor	RTG20316AJ	1
18	Water Temperature Sensor	RTG20316AE	1
19	Hot Water Outlet Elbow	RTG20316BJ	1
20	O-ring (P16)	RTG20299AE	6
21	Clip (Star-Small)	RTG20316BG	3
22	Water Inlet Pipe	RTG20316BP	1
23	Pressure Transmitter	RTG20316AL	1
23-1	Pressure Transmitter Clip	RTG20316BA	1
24	Packing (20A)	RTG20299AK	1
25	Circulation Pump	RTG20316W	1
26	Pump Clip	RTG20299AR	1
27	Condensate Hose	RTG20316AV	1
28	Condensate Hose Clip	RTG20299AT	2
29	Pump Outlet Pipe	RTG20316AR	1
30	O-ring (P20)	RTG20298F	2
31	Water Inlet Pipe Clip	RTG20316BB	1
32	O-ring (P22)	RTG20316BX	2
33	Clip (Star-large)	RTG20316BC	1
34	Water Return Temperature Sensor	RTG20316AG	1

PART III _ FAN MOTOR PART



Item	Description	Part Number	Qty
1	Fan & AGM Assy NG	RTG20316L	1
1	Fan & AGM Assy LP	RTG20316M	1
1-1	Fan	RTG20300B	1
1-2	O-ring (P62)	RTG20300C	1
1-3	AGM (Actuator) NG	RTG20316N	1
1-3	AGM (Actuator) LP	RTG20316P	1
2	Gas Valve Assembly	RTG20300E	1
2-1	Gas Valve	RTG20316X	1
2-2	Gas Valve Plug Bracket	RTG20316T	1

Item	Description	Part Number	Qty
2-3	Gas Valve Adapter (Straight)	RTG20316AP	2
3	15A Packing (Non-asbestos)	RTG20316CC	1
4	15A Packing	RTG20300J	1
5	Gas Mixer Packing	RTG20300K	1
6	Gas Valve Bracket	RTG20300L	1
7	Silencer Body	RTG20300M	1
8	Silencer Elbow	RTG20300N	1
9	Gas Pipe (Upper)	RTG20300P	1
10	Gas Pipe (Lower)	RTG20300R	1
11	O-ring (P18)	RTG20298G	1

Screw

Item	Description	Length
A	Truss Head Machine Screw	M4 x 8
B	Flat Head Machine Screw	M4 x 8
C	Truss Head Tapping Screw	M4 x 10
D	Truss Head Tapping Screw	M4 x 12
E	Truss Head with PC Washer Tapping Screw	M4 x 10
F	Truss Head Tapping Screw	M4 x 6
G	Round Head Machine Screw	M4 x 12
H	Round Head with Flange Tapping Screw	M3 x 6
I	Hexagon Head with Flange Machine Screw	M5 x 16
J	Truss Head Tapping Screw	M4 x 16
K	Round Head Machine Screw	M3 x 6

Item	Description	Length
L	Truss Head Machine Screw	M4 x 6
M	Round Head Tapping Screw	M4 x 16
N	Truss Head Machine Screw	M5 x 30
O	Hexagon Head with Flange Machine Screw	M5 x 12
P	Truss Head Machine Screw	M4 x 25
Q	Round Head Tapping Screw	M4 x 30
R	Binding Head Tapping Screw	M4 x 10
S	Round Head Tapping Screw	M3 x 16
T	Round Head Machine Screw	M4 x 10
U	Round Head Machine Screw	M5 x 12
V	Round Head Tapping Screw	M4 x 8

Service Manual