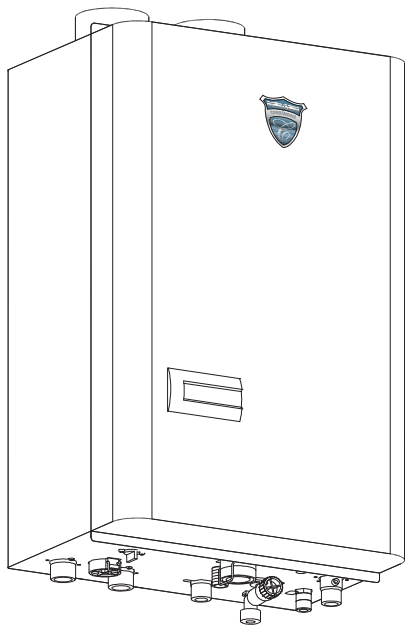


navien

Condensing

Combination Water Heater / Heating Boiler

Ver. 1.00



navien

Condensing

Combination Water Heater
/ Heating Boiler

MODEL

CH-180

CH-210

CH-240

CH-240 ASME

⚠ WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- WHAT TO DO IF YOU SMELL GAS
 - Do not try to light any appliance.
 - Do not touch any electrical switch; do not use any phone in your building.
 - Immediately call your gas supplier from a neighbor’s phone. Follow the gas supplier’s instructions.
 - If you cannot reach your gas supplier, call the fire department.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.

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Revisions

[illegible]

Navien Warranty

GENERAL

Navien America, Inc. (Navien) warrants this Navien gas condensing combination water heater / boiler and its component parts to be free from defects in materials and workmanship, under normal use and service, for the Applicable Warranty Period. At its option, Navien will replace the defective component part(s), in accordance with the terms of this Limited Warranty, if it fails in normal use and service during the Applicable Warranty Period. The replacement component part(s) must be Navien Original factory component part(s). The replacement component part(s) will be warranted only for the remaining portion of the original component part's Applicable Warranty Period.

APPLICABLE WARRANTY PERIODS

Period of Coverage	
Heat Exchanger	All other Parts and Components
10 years	5 years



Proof of purchase is required to obtain warranty service. You can show proof of purchase with dated sales receipt, by completing and mailing the enclosed warranty registration card within 30 days of purchasing the product or by registering online at www.navienamerica.com

EFFECTIVE DATE

The Effective Date of warranty coverage (the beginning of the Applicable Warranty Periods) is the date of purchase of this combination water heater / boiler, if properly registered.

HEAT EXCHANGER WARRANTY

The Applicable Warranty Period for a CH series Heat Exchanger failure installed in a Residential application is Ten (10) years from the Effective Date.

PARTS WARRANTY (excluding heat exchanger)

The Applicable Warranty Period for a CH series Part(s) failure installed in a Residential application is Five (5) years from the Effective Date.

LABOR ALLOWANCE:

The Applicable Period for this Labor Allowance for all Combination Water heater / boiler models is One (1) year from the Effective Date. The payment and amount of any payment are subject to approval at Navien's sole discretion. The Labor Allowance will be paid based on Navien's Schedule of Labor Allowances.

TRANSFERABILITY

This warranty is offered to the original and subsequent owners of the combination water heater / boiler but is limited to the original address registered with the warranty only. The warranty will be void if the combination water heater / boiler is relocated to any other location.

WARRANTY EXCLUSIONS

This warranty does not cover the following conditions:

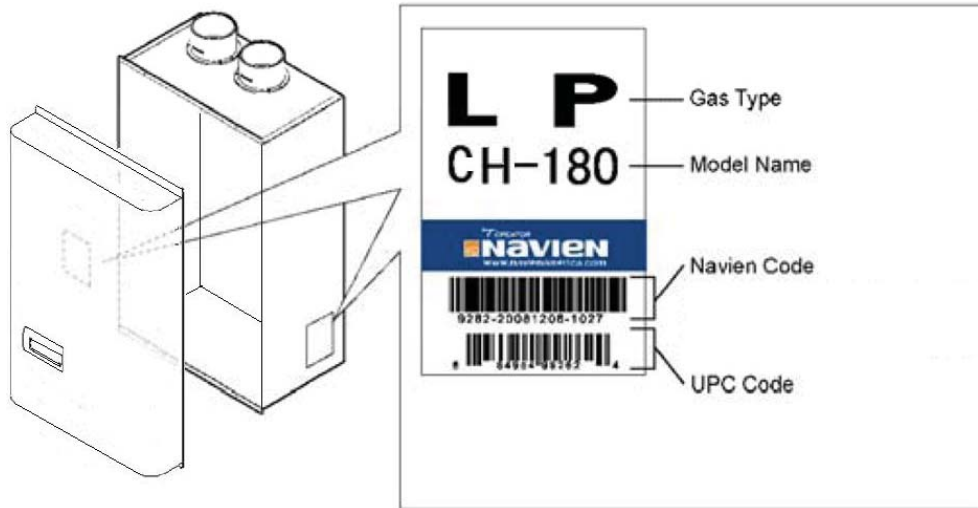
- ☐ Damages, malfunctions or failures resulting from failure to install the combination water heater / boiler in accordance with applicable building codes, ordinances or normal plumbing and electrical trade practices.
- ☐ Damages, malfunctions or failures resulting from improper installation or failure to operate and maintain the combination water heater / boiler in accordance with the manufacturer's instructions provided.
- ☐ Performance problems caused by improper sizing of the combination water heater / boiler or the gas supply line, the venting connection, combustion air openings, electric service voltage, wiring or fusing.
- ☐ Damages, malfunctions or the all failures caused by conversion from natural gas to LP gas or LP gas to natural gas or attempt to operate with a type of gas not specified for the combination water heater / boiler.
- ☐ Damages, malfunctions or failures caused by operating the combination water heater / boiler with any parts removed or with parts that have been modified, altered or unapproved for installation.
- ☐ Damages, malfunctions or failures caused by abuse, negligence, alteration, accident, fire, flood, freezing, lightning and other acts of God.
- ☐ Heat Exchanger failures caused by operating the combination water heater / boiler in a corrosive or contaminated atmosphere.
- ☐ Damages, malfunctions or failure caused by poor water quality, lime or mineral build-up or sediment build-up.
- ☐ Damages, malfunctions or failures caused by operating the unit at water temperatures outside the factory calibrated temperature limits and/or exceeding the maximum setting of the high limit control.
- ☐ Heat Exchanger failures caused by operating the combination water heater / boiler when it is not supplied with potable water at all times.
- ☐ Damages, malfunctions or failures caused by subjecting the heat exchanger to pressures or firing rates greater or lesser than those shown on the rating plate.
- ☐ Units installed outside of the fifty states (and the District of Columbia) of the United States of America and outside of Canada.
- ☐ Rating plate has been removed by an unauthorized person. A combination water heater / boiler should not be operated if the rating plate has been removed.
- ☐ Damage due to freezing.

Handling of this manual

Scope

This Service Manual is applicable to Navien Boiler CH Series.

Product Model discrimination label located in 2 places.



Precautions for Handling of This Manual

- Navien America Inc. reserves all rights related to this manual
- This manual should be accessible only to technical service personal authorized by Navien America Inc.
- Read and understand the safety information before operating or servicing this Navien Boiler.

About Notation in the Manual

Indication of Refer To

The “►” mark is used to indicate the chapter or section you should refer to its format is as indicated below.

►{3.1 General Specification} of ►{3.1}


Abbreviation and definition

Abbreviation	Description of changes
CH	General name of CH-180, CH-210, and CH-240 and CH-240 ASME
NG	Natural Gas
LP	Liquid Gas
AP	Air Pressure
APS	Air Pressure Sensor
DHW	Domestic Hot Water
FM	Fan Motor
GARC	Gas Air Ratio Control
GPM	Gallon per Minute
GPS	Gas Pressure Sensor
GV	Gas Valve : Main and Solenoid
MGV	Main Gas Valve
MV	Modulating Valve
SGV	Solenoid Gas Valve
RPM	Round per Minute
PCB	Printed Circuit Board
EMI	Electromagnetic Interface
HTL	High Temperature Limiter




1. Safety Considerations

1.1. Safety Definitions

All Safety messages will refer to potential hazards. Precisely follow the instructions to avoid the risk of injury.

	This is the safety alert symbol. It is used to alert you of potential personal injury hazards. Observe all of the safety messages that follow this symbol to avoid possible injury of death.
---	--

1.2. List of safety symbols in this manual

 DANGER	Indicates an imminently hazardous situation which, if not avoided, could result in severe injury or death.
 WARNING	Indicates a potential hazardous situation which, if not avoided, could result in injury or death.
 CAUTION	Indicates an imminent hazardous situation which, if not avoided, may result in minor or moderate injury.
CAUTION	Used without the safety alert symbol indicates a potential hazardous situation which, if not avoided, could result in property damage.

1.3. Symbols Used in the Instructions

The following symbols are used throughout the instructions to bring attention to important information concerning the appliance.

IMPORTANT	Warns of a risk of material loss and environmental pollution.
NOTE	Indicates additional information that is important but not related to personal injury or property damage.

1.4. Safety Precautions



DANGER

FLAMMABLE MATERIALS

Keep the area around the boiler clear and free from flammable materials.

- DO NOT place flammable liquids such as oils or gasoline, etc. near the boiler.
- DO NOT place combustibles such as newspapers and laundry etc. near the boiler or the venting system.
- DO NOT place or use hair spray, spray paint or any other type of spray can near the boiler or the venting system (including the vent terminator).
- DO NOT place anything in or around the vent terminals that could obstruct the air flow in and out of the boiler such as a clothes line.



DANGER



FLAMMABLE VAPORS

Vapors from flammable liquids will explode and catch fire causing death or severe burns.

Do not use or store flammable products such as gasoline, solvents or adhesives in the same room or area near the boiler

Keep flammable products:

far away from heater in approved containers, tightly closed, and out of children's reach.

Boiler has a main burner flame: which can come on at any time, and may ignite flammable vapors.

Vapors:

cannot be seen, are heavier than air, go a long way on the floor. And can be carried from other rooms to the main burner flame by air currents.



DANGER

COMPROMISED VENTING SYSTEM

- Failure to follow the Venting Section of the installation manual may result in the un-safe operation of this boiler. To avoid the risk of fire, explosion or asphyxiation from carbon monoxide, never operate the boiler unless it is properly vented to outside and has an adequate air supply for proper operation.
- Be sure to inspect the vent terminator and the air intake pipe annually to ensure safe operation of the boiler.
- Immediately turn off and do not use the boiler if any of the vent pipes, vent elbows and/or the boiler.
 - i. damaged in any way;
 - ii. have separated at a joint,
 - iii. are cracked or show evidence of corrosion, rusting or melting.



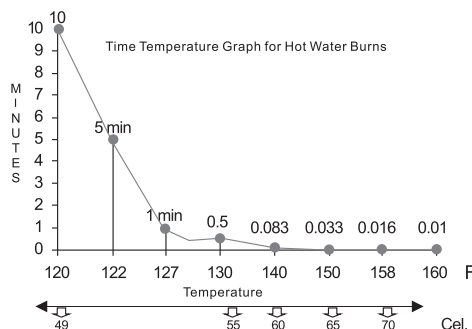
DANGER

HOT WATER TEMPERATURE SETTING

- Water temperature over 125°F can cause severe burns instantly or death from scalds.
- Households with small children, disabled, or elderly persons may require 120°F (49°C) or lower temperature setting to prevent contact with “HOT” water.
- To prevent scalding, check water temperature after servicing.
- If the proposed boiler outlet temperature is above 125°F, a thermostatically controlled mixing valve or temperature limiting valve should be considered to reduce the risk of scalding. Contact a licensed plumber or the local plumbing authority for further information.



Water Temperature	Time in which a young child can suffer a full thickness (3rd degree) burn*
70°C (160°F)	Less than 1 second
60°C (140°F)	1 second
55°C (130°F)	10 seconds
49°C (120°F)	10 minutes
37°C (100°F)	Very low scald risk





DANGER

WHAT TO DO IF YOU SMELL GAS

If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

DO NOT OPERATE THE BOILER.

DO NOT OPERATE ANY FAUCETS.

Smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

- Do not smoke.
- Extinguish any open flames and sparks.
- Do not operate light switches or electrical equipment switches.
- Do not use any phone in your building.
- Open the windows and doors.
- Close the gas shutoff valve.
- Keep people away from the danger zone.
- Observe the safety regulations of your local gas supplier, found on the gas meter.
- Immediately call your gas supplier from the outside of the building. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.
- Notify your plumbing/ heating contractor from the outside of the building.



DANGER

IMPORTANT SAFETY PREAUTIONS

- Read and understand this safety information before operating or servicing this Navien Boiler
- This manual must remain with the Navien Boiler.
- Confirm the location of the gas shut-off valve. Close the manual shut-off valve if the Navien Boiler over becomes subjected to overheating, fire, flood, physical damage or any other such damaging condition during servicing.
- DO NOT turn on the boiler unless water and gas supplies are fully opened.
- DO NOT turn on the boiler if cold water supply shut-off valve is closed.
- Make certain power to boiler is “OFF” before removing the front cover for any reason.
- Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.
- Improper adjustment, alteration, service or maintenance can cause property damage, personal injury, or death.
- To prevent scalding, always check the temperature of the hot water after servicing.
- DO NOT attempt to change the water temperature while someone is using the boiler.
- DO NOT use parts other than those specified for this equipment.
- DO NOT operate the boiler if you feel something is wrong with the unit.
- DO NOT allow children to operate or otherwise handle the unit.



DANGER

INSTALLATION REQUIRMENT

- Installation condition may affect the servicing. Read all related information in the “Installation manual” and the “User’s Operation Manual”.
- The Navien Boilers must be installed according to all local and state codes or, in the absence of local and state codes, the most recent edition of the “National Fuel Gas Code (ANSI Z223.1/NFPA 54)” in the USA or the “National Gas and Propane Installation Code (CAN/CSA B 149.1)” in Canada.
- Massachusetts code requires this boiler to be installed in accordance with Massachusetts Plumbing and Fuel Gas Code 248 CMR Section 2.00 and 5.00.



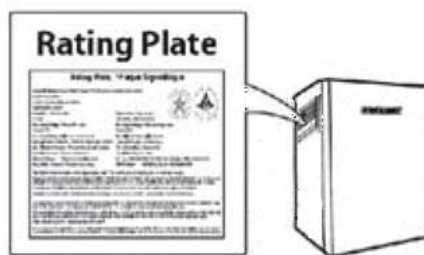
WARNING

GAS TYPE and AC VOLTAGE

Navien units come from the factory configured for use with either Liquid Propane (LP) or Natural Gas (NG).

Before starting the servicing, check the rating plate located on the side of the Boiler to ensure the unit matches gas type, gas pressure, water pressure and electrical supply. sure the gas type and electricity voltage match the Rating Plate.

- Use only the same gas type indicated on the rating plate of the Navien Boiler. Using different gas type will cause abnormal combustion and boiler malfunction.
- Be sure to use 120 VAD, 60 Hz, minimum 2 A current. Using abnormally high or low AC voltage may cause abnormal operation, and may reduce the life expectancy of this product.



If the unit does not match requirements, do not service, please contact Navien immediately.



WARNING

GAS CONVERSION

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

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

2. Product Information

2.1. Product Information

KD Navien condensing gas boiler is a fully automatic, wall hung, fan assisted balanced flue condensing boiler for use with Natural Gas and Liquid Propane Gas.

This appliance is fully modulating and provides central heating and domestic hot water. The following four models are available according to their maximum outputs.

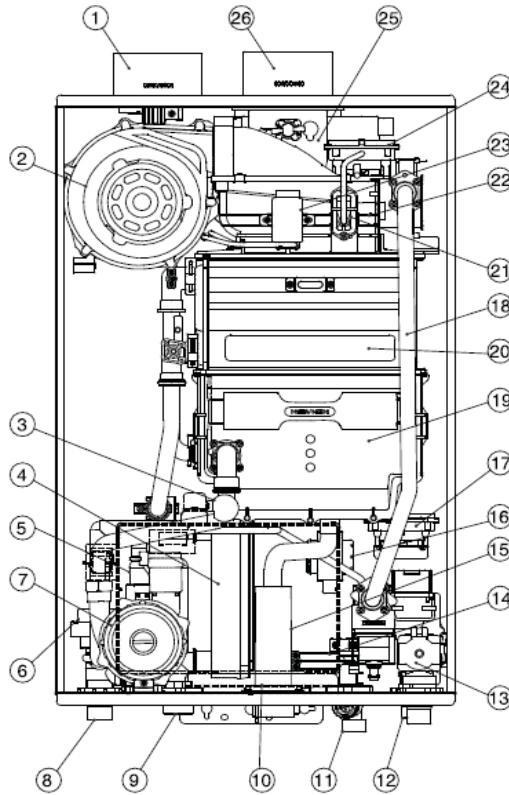
Model	Maximum Heating Input	Maximum DHW Input(45°F Rise)
CH-180	150,000 Btu/h	6.5 Gal/m
CH-210	175,000 Btu/h	7.7 Gal/m
CH-240	199,000 Btu/h	8.6 Gal/m
CH-240 ASME	199,000 Btu/h	8.6 Gal/m

The appliance always gives priority to DHW supply.

The appliance is designed to be used with a circulation pump, a divert valve assembly, a flow sensor, a DHW plate heat exchanger and safety valve. A separate heating expansion vessel is required.

Internal frost protection and an electronic control unit are incorporated within the boiler. Any non-power stealing room thermostat or set of contacts can be used with boiler.

2.2. Layout and Key Components



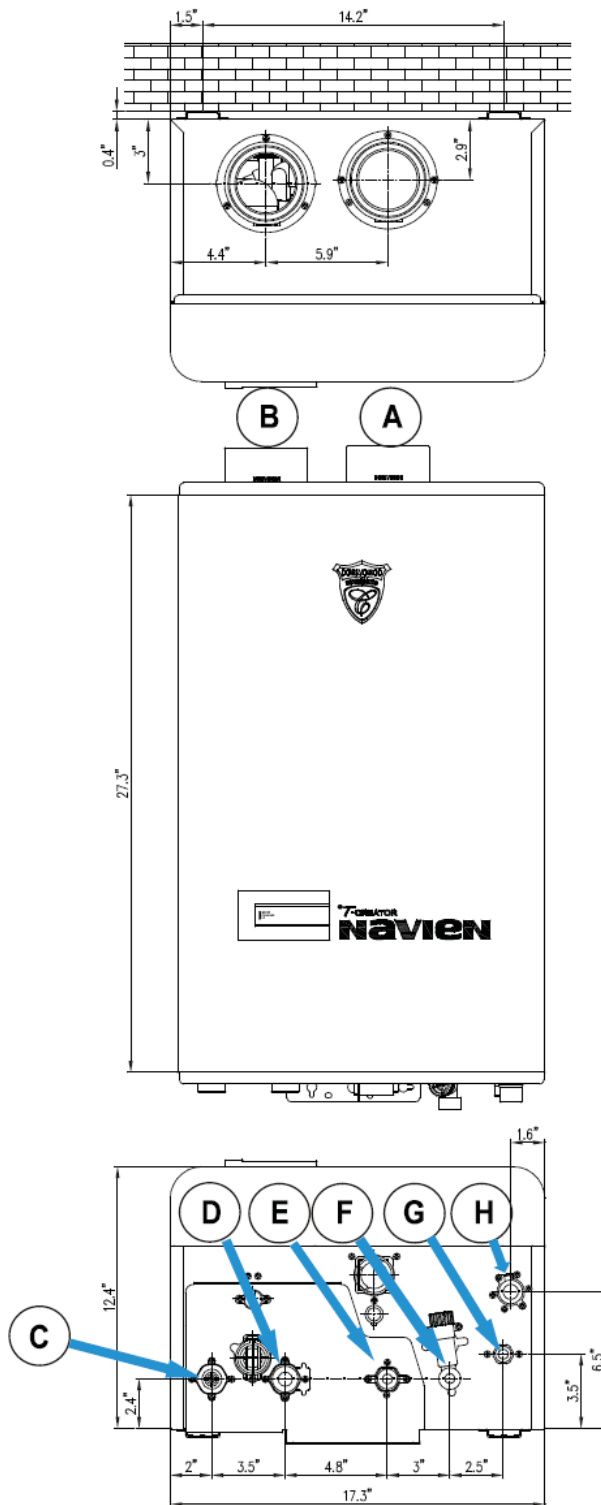
No	Description	Navien Part No.	No	Description	Navien Part No.
1	Intake Air Duct	BH2505400B	14	DHW Flow Sensor	AASS9EXFS002
2	Fan Motor	NAFA9GSFB002	15	Syphon	BH2501442C
3	WPS	BH2507535A	16	Transformer	BH1205011A
4	DHW Heat Exchanger	PAS30KHE_005	17	Gas Pressure Sensor	NASS9EXGPS01
5	S/H Strainer	BH1301020C	18	Gas Pipe	BH2546021A
6	Motorized 3-Way Valve	AAVC9EX00009	19	Secondary Heat Exchanger	-
7	Circulation Pump	NAPU9GLPCT10	20	Primary Heat Exchanger	-
8	S/H Supply Adaptor	BH2507551A	21	APS Venturi	BH2501413A
9	S/H Return Adaptor	BH2507551A	22	Burner	PABNCW48KDBN_002
10	PCB Board	NACR1GS32301	23	Ignition Transformer	BH1201045A
11	DHW Cold Water Inlet Adaptor	BH2507396A	24	Air Pressure Sensor	NASS9EX00009
12	Auto Feeder Valve	BH0904011A	25	Exhaust Duct	BH2544007D
13	Main Gas Valve	BH0901018A	26	Exhaust Pipe	BH2505401B

3. Technical Data

3.1. General Specifications

Item		CH-180	CH-210	CH-240, CH-240 ASME	
Heat Capacity (Input)	Natural Gas	Min: 17,000 Btu/h Max: 150,000 Btu/h	Min: 20,000 Btu/h Max: 175,000 Btu/h	Min: 20,000 Btu/h Max: 199,000 Btu/h	
Heat Capacity (Input)	35°F Rise	8.3 Gal/m	10.0 Gal/m	11 Gal/m	
	45°F Rise	6.5 Gal/m	7.7 Gal/m	8.6 Gal/m	
	77°F Rise	3.8 Gal/m	4.6 Gal/m	5.1 Gal/m	
Dimensions		W17" x H27"x D12"			
Weight		74 lbs	84 lbs		
Installation Type		Indoor / Outdoor Wall-Hung			
Venting Type		Forced Draft Direct Vent			
Ignition		Electronic Ignition			
Domestic Water Pressure (min-max)		15 ~ 150 Psi			
Heating Water Pressure (min-max)		7.0 ~ 30 Psi			
Efficiency AFUE		91%			
Gas Supply Pressure	Min. ~ Max.	6.0"~10.5" W.C			
Manifold Gas Pressure	Min.	NG: 0.4" W.C	NG: 0.4" W.C	NG: 0.6" W.C	
	Max.	NG: 3.7" W.C	NG: 3.0" W.C	NG: 4.0" W.C	
Minimum Flow Rate		0.5 GPM			
Connection Sizes		Heating Supply/Return	DHW Inlet/Outlet	Auto feeder	Gas Supply
		1" NPT	3/4" NPT	1/2" NPT	3/4" NPT
Temperature Range (R/C)	DHW	98 ~ 140°F (37 ~ 60°C)			
	Space Heating	98 ~ 185°F (37 ~ 85°C)			
Safety Devices		Flame Rod, Overheat Cut-off Device, Ignition Operation Detector, Water Temperature High Limit Switch, Exhaust Temperature High Limit Switch			
Accessories		Plumb Easy Valve Set, Outdoor Sensor, Pressure Relief Valve, Condensate Neutralizer, Communication Cable			

3.2. Dimensions



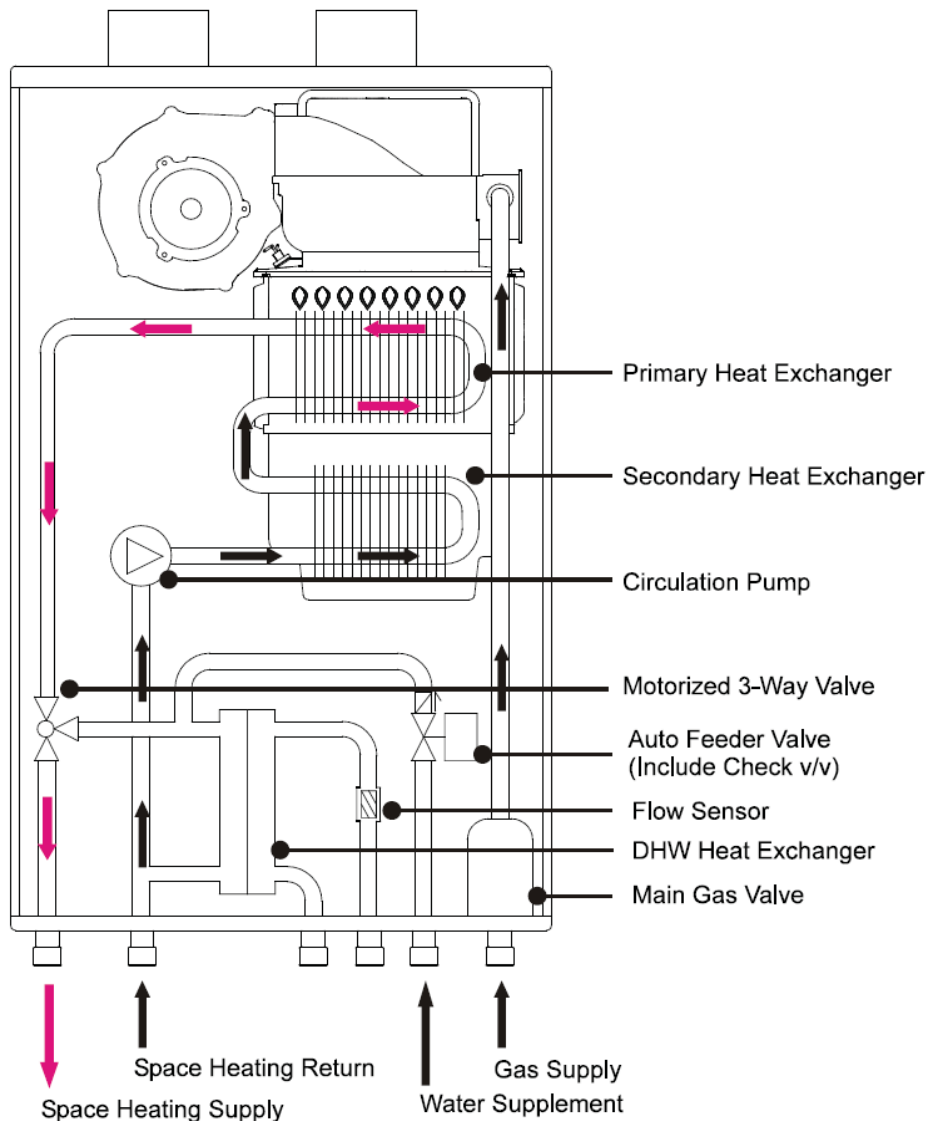
A. Connection Diameter

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

4. System Details

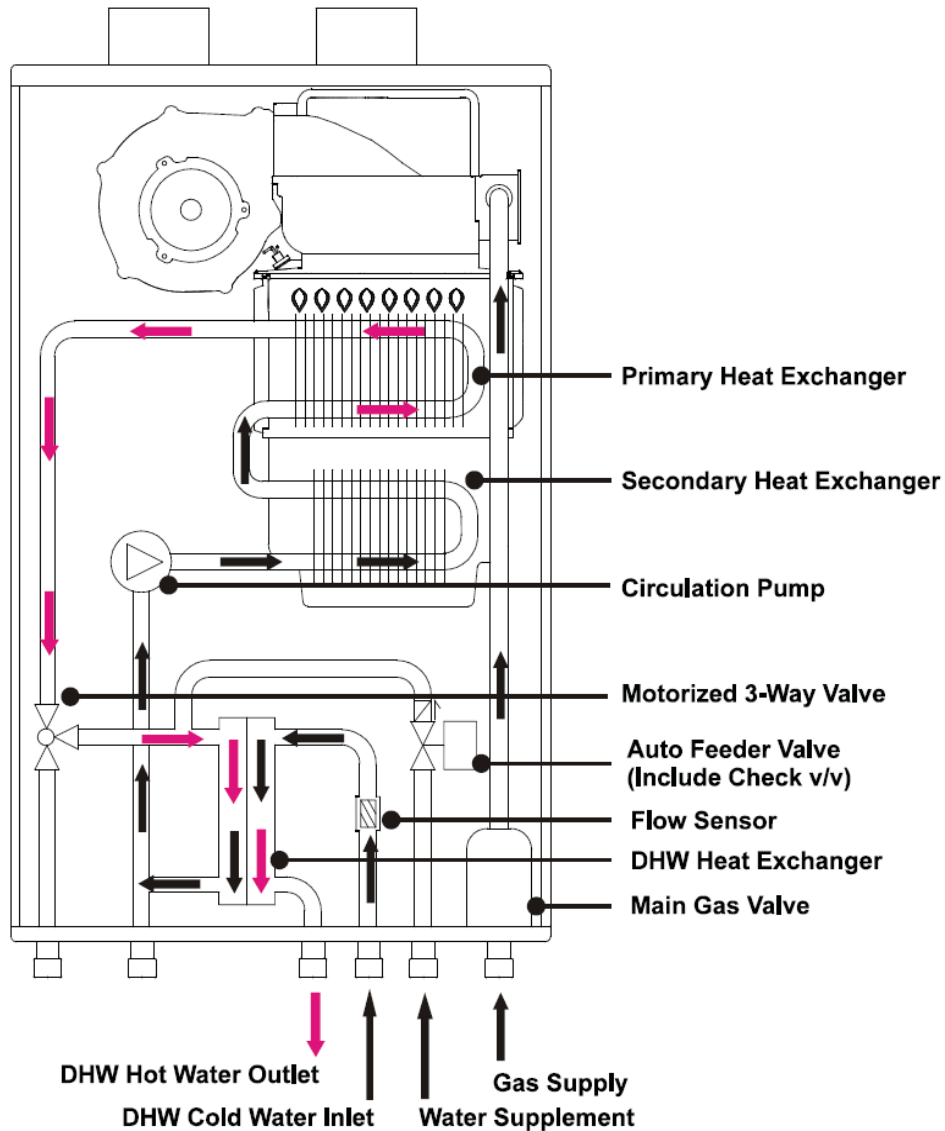
4.1. Schematic and Water Flow Diagram

4.1.1. Space Heating Mode



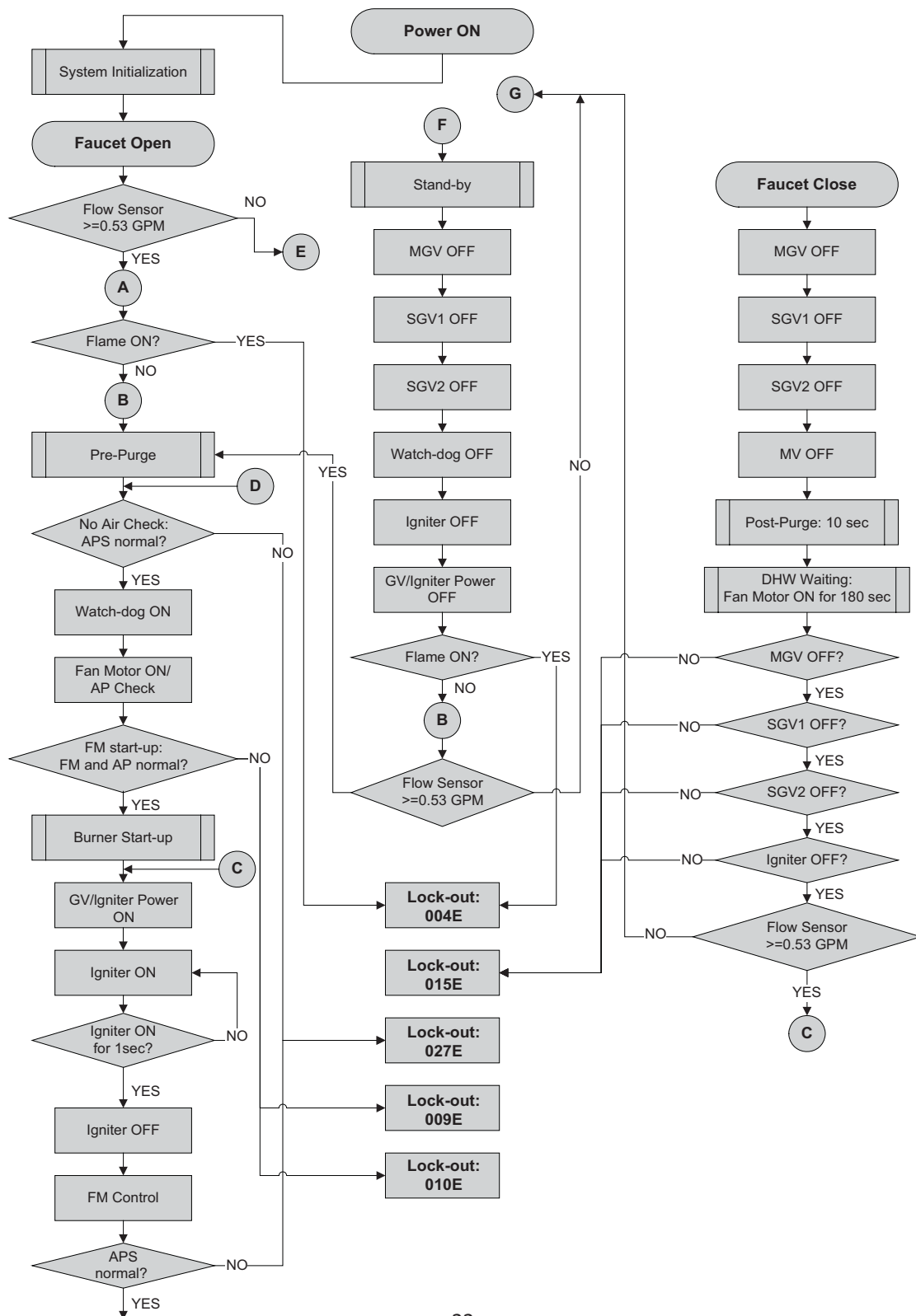
The space-heating water is controlled by the thermostat (boiler control) provided. This control enables the user to either set the desired room temperature or set the heating water temperature. In some cases this thermostat may not be suitable for multi-system applications. (The installing contractor will make this determination and install suitable alternative controls.)

4.1.2. Domestic Hot Water Mode

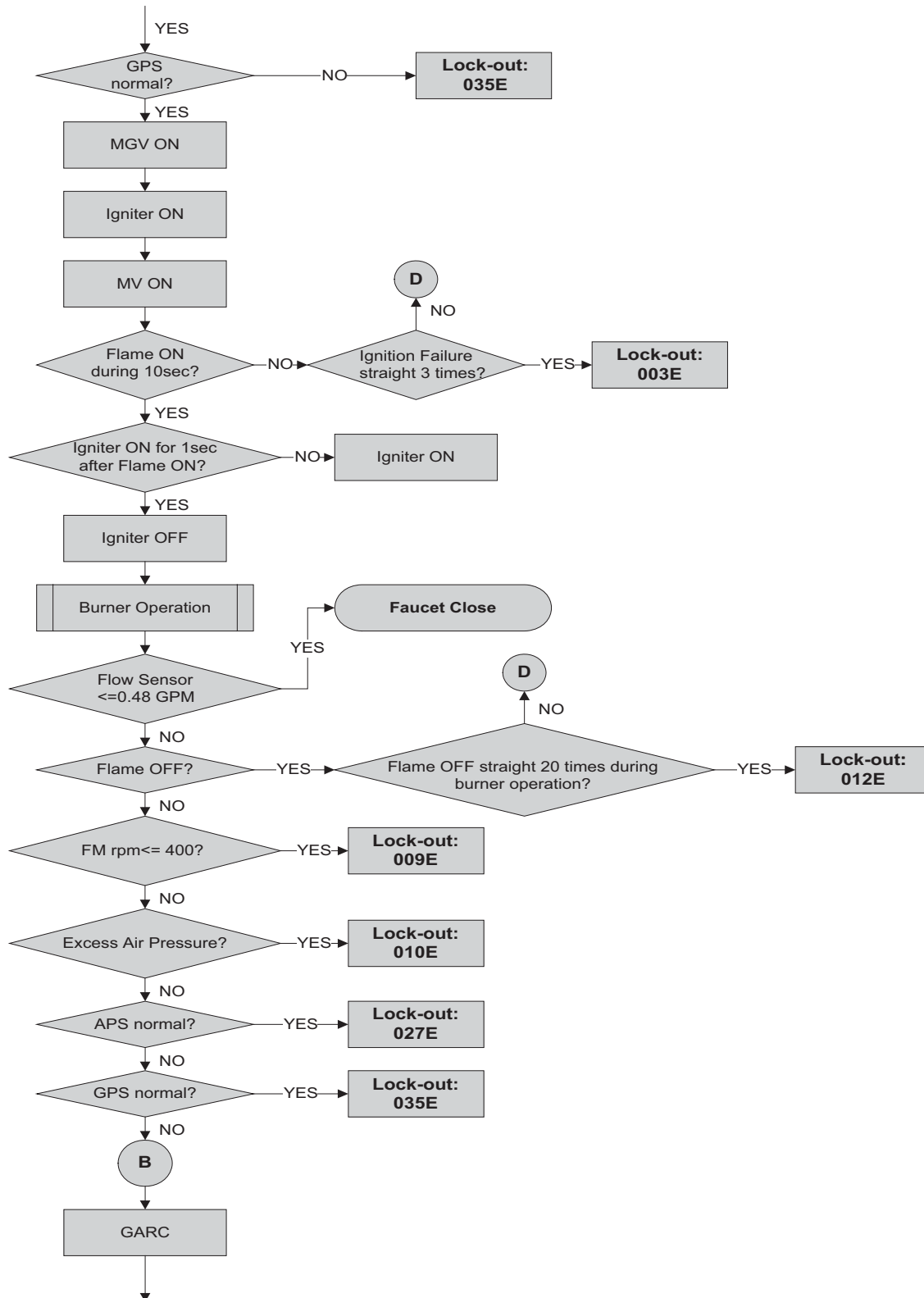


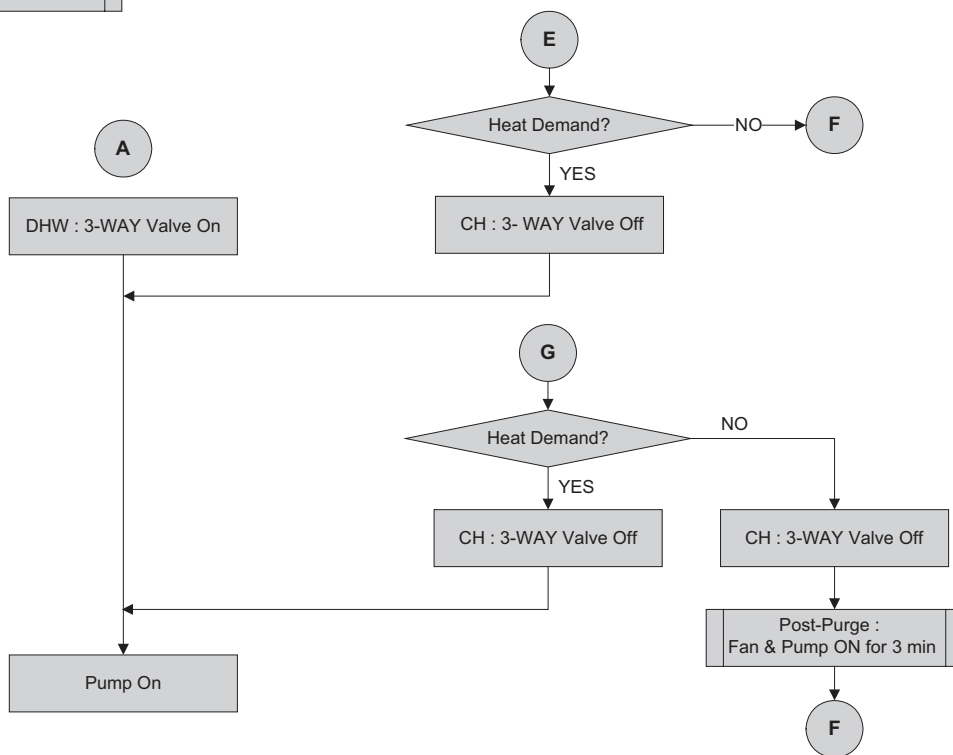
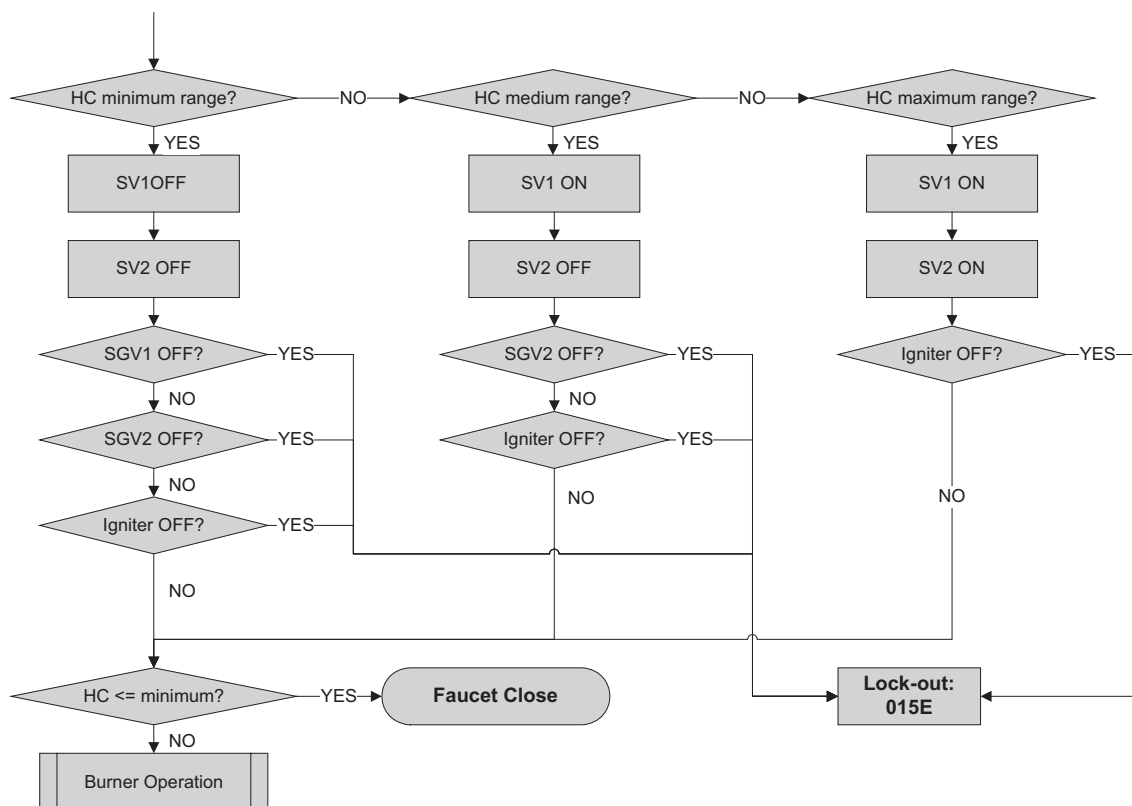
The domestic hot-water (DHW) is controlled by the user. Because the Navien Combination Boiler is a multi-purpose design, it can provide hot water on demand. Navien Combination Boiler will produce hot water only when you use it.

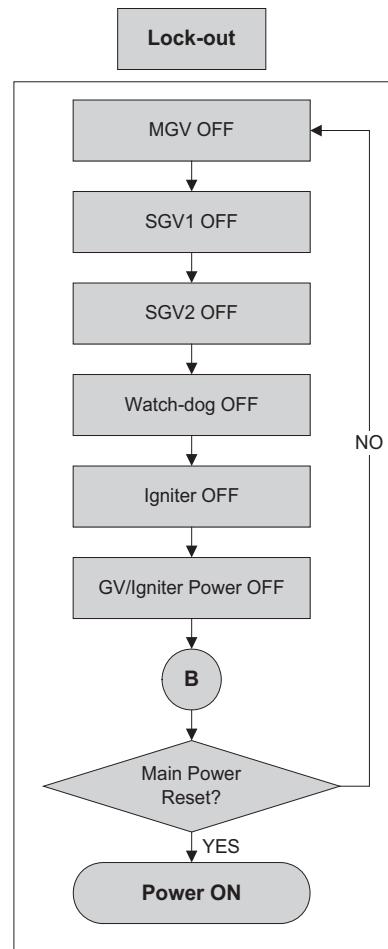
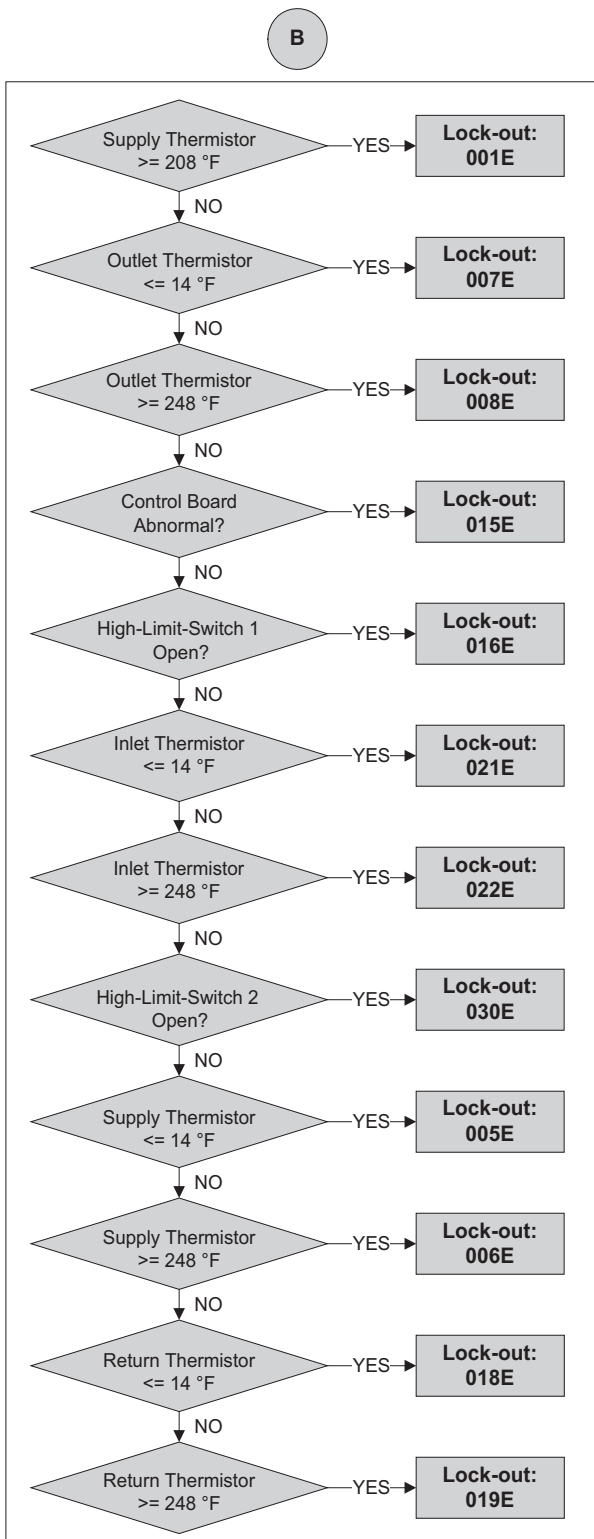
4.2. Operation Flow Chart



4.2. Operation Flow Chart







4.3. Dip Switch Settings

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

Set of Dip Switch #1. (6 Switches):

DIP S/W No.	Description		
	Function	ON	OFF
1	Operation Select 1	(1) Operation Mode Select	
2	Operation Select 2		
3	Gas Type Select	LP	NG
4	Vent Select	Individual Vent	Cascade Common Vent
5	Model Select 1	Factory Setting	
6	Model Select 2		

#1 & 2: Burner Operation Mode Select

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

#1 & 2: Burner Operation Mode Select

Model	DIP S/W	
	1	2
CH-180	OFF	OFF
CH-210	ON	OFF
CH-240, CH-240 ASME	OFF	ON

Set of 8 Switches: Operation Mode Selection

DIP S/W No.	Description		
	Function	ON	OFF
1	Ready-Link Multi-System Select	Ready-Link Multi-System Master	Normal System
2	–	–	–
3	External Thermostat Select	Using External Thermostat	Non-Using External Thermostat
4	Space Heating Temperature Control	Return Temperature Control	Supply Temperature Control
5	Space Heating Temperature 1	Refer to next page (#4 & 5)	
6	Space Heating Temperature 2		
7	DHW Temperature 1	Refer to next page (#7 & 8)	
8	DHW Temperature 2		

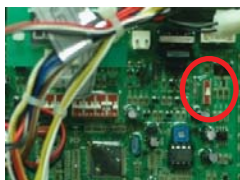
#4 & 5 & 6 (Space Heating Used Only):
Supply / Return Temperature Selection

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

#7 & 8 (DHW Used Only):
Hot Water Temperature Selection

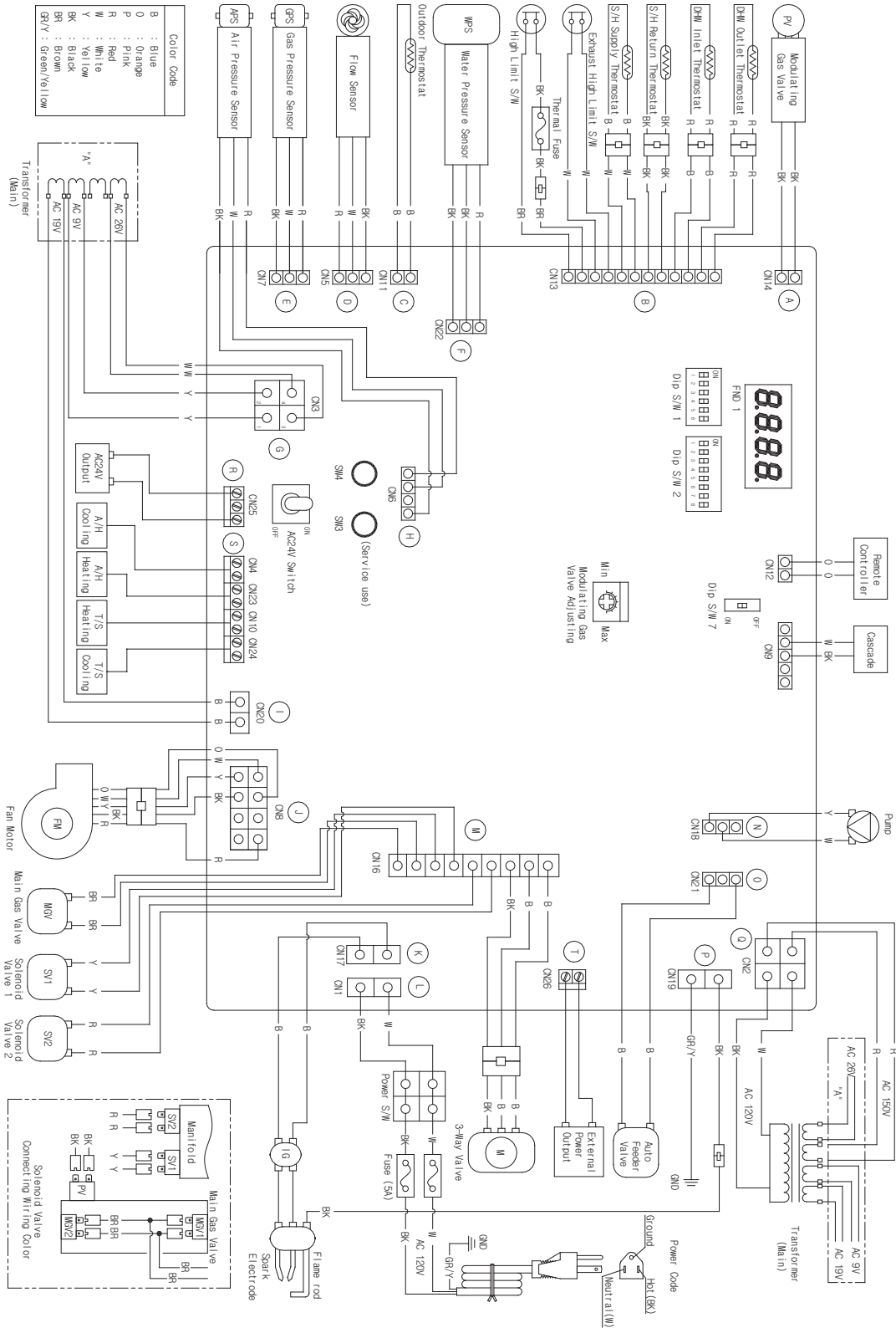
Temperature	DIP Switch	
	7	8
110°F (43°C)	OFF	OFF
120°F (49°C)	ON	OFF
130°F (54°C)	OFF	ON
140°F (60°C)	ON	ON

Single Dip Switch 7

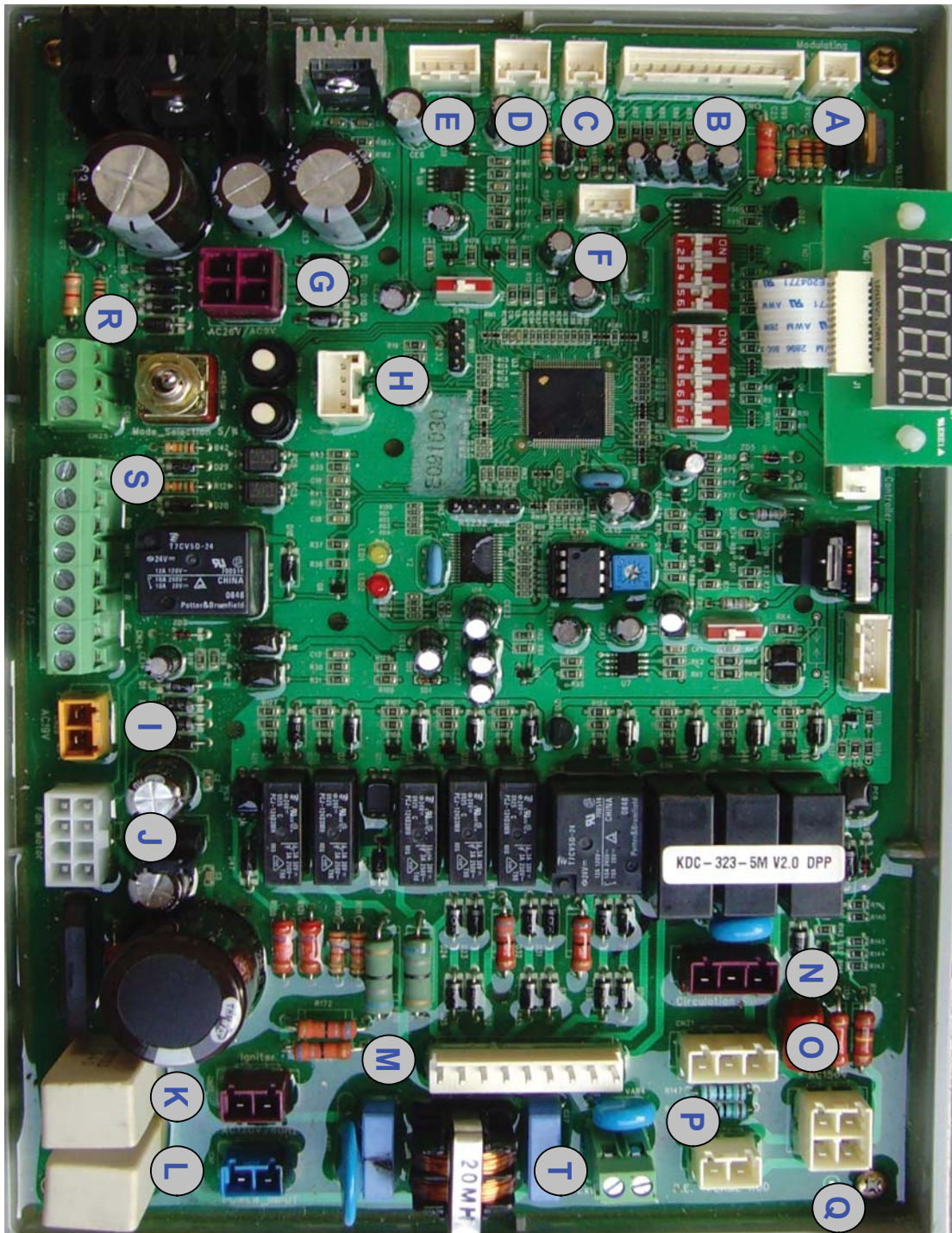


The dip switch 7 (to the right of the set of 8), which is used only for organizing cascade system, should be switched ON if the corresponding unit is the first or the last unit of cascade connection.

4.4. Wiring Diagram



4.5. Electrical Diagnostic Points



4.5. Electrical Diagnostic Points

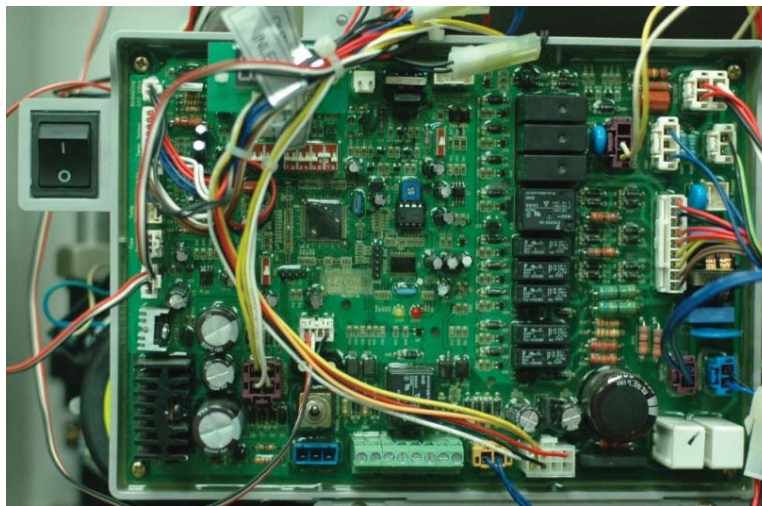
Point	nction	Wire Color	Normal Value	Check
A	Modulating Valve	BLACK-BLACK	0~250mA, DC 2~10V	Currency changes as controlling gas volume after operating the gas valve
	Outlet Temp.	RED-RED	DC 0~5V	Voltage change according to temperature.
B	Inlet Temp.	WHITE-WHITE	DC 0~5V	Voltage change according to temperature.
	Return Temp.	BLUE-BLUE	DC 0~5V	Voltage change according to temperature.
	Supply Temp.	BLACK-BLACK	DC 0~5V	Voltage change according to temperature.
	Exhaust HTP	WHITE-WHITE	DC 4~6V	Normally input pulse. Confirm rms voltage as measuring DC meter.
	H.EX HTP	BROWN-BROWN	DC 4~6V	Normally input pulse. Confirm rms voltage as measuring DC meter.
C	Outdoor Temp.	ORANGE-ORANGE	DC 0~5V	Voltage change according to temperature.
D	Flow Sensor	RED-BLACK	DC 5V	Confirm if voltage flows without any relations with the flow sensor operating.
		WHITE-BALCK	PULSE	Check Pulse.
E	GPS	RED-BLACK	DC 5V	Confirm if voltage flows without any relations with the GPS operating.
		WHITE-BLACK	DC 0.3~4.5V	Voltage changes according to the GPS operating.
F	WPS	BLACK-RED	DC 0~5V	Voltage change according to water pressure.
G	AC9V	YELLOW-YELLOW	AC 7~11V	Confirm output voltage.
	AC26V	WHITE-WHITE	AC 22~33V	Confirm output voltage.
H	APS	RED-BLACK	DC 5V	Confirm if voltage flows without any relations with the APS operating.
		WHITE-BLACK	DC 0.3~4.5V	Voltage changes according to the APS operating.
I	AC19V	BLUE-BLUE	AC 16~24V	Confirm output voltage.
J	DC Fan	BLACK-RED	DC 127~184V	Confirm if voltage flows without any relations with the GPS operating.
		BLACK-YELLOW	DC 15V	Confirm if voltage flows without any relations with the GPS operating.
		BLACK-ORANGE	DC 0~7.5V	Voltage changes as the fan operating
		BLACK-WHITE	0rpm~6500rpm	Check PULSE.

Point	nction	Wire Color	Normal Value	Check
K	Igniter	BLUE-BLUE	ON : AC 97~138V OFF : 0V	Confirm voltage as ignition operating.
L	Power Input	BLUE-BLACK	AC 97~138V	Confirm approval of the 1st power resource. Confirm the FUSE. Confirm the circuit breaker.
M	Gas Valve	BROWN-BROWN	ON : DC83~120V OFF : 0V	Confirm voltage as the Main Gas Valve operating.
		YELLOW-YELLOW	ON : DC83~120V OFF : 0V	Confirm voltage as the Gas So-lenoid Valve 1 operating.
		RED-RED	ON : DC83~120V OFF : 0V	Confirm voltage as the Gas So-lenoid Valve 2 operating.
	3-Way Valve	BLUE-BLACK	ON : AC97~138V OFF : 0V	Confirm voltage as the 3-Way Valve operating.
N	Pump	YELLOW-WHITE	ON : AC97~138V OFF : 0V	Confirm voltage as the circulation pump operating.
O	AWS	BLUE-BLUE	ON : AC 97~138V OFF : 0V	Confirm voltage as Auto Water Feeder valve operating.
P	P.E	GREEN	Protect Earth	Same to the case earth Protect Earth.
	Flame Rod	BLACK	0~20uA	Measure the currency as sensing flame.
Q	Power trans AC150V	RED-RED	AC 123~177V	Confirm output voltage.
	Power trans AC120V	WHITE-BLACK	AC 97~138V	Confirm output voltage.
R	AC 24V Out-put	—	AC 24V	Confirm output voltage.
S	T/S	—	Externally	If AC 24V is connected externally AC 24V input On/Off, Else dry contact input On/Off.
	A/H	—	Externally	If AC 24V is connected externally AC 24V output On/Off.
T	Extern Power	—	ON : AC 97~138V OFF : 0V	Confirm voltage as operating.

4.6. Key Components Description

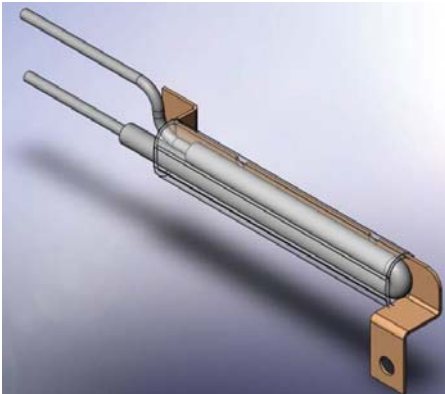
4.6.1. PCB

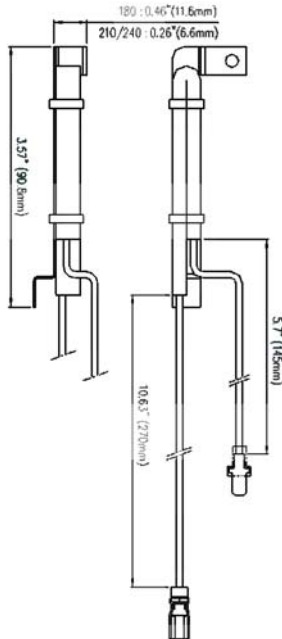
Navien Part No.	NACR1GS32301	Check Point	N/A
Function	1. To control each component and performance unit.		
Failure Event	1. Malfunctioning PCB Board.		
Effects	1. A component may not operate within the unit. In most cases of PCB Board failure, the whole unit does not operate at all.		
Error Code	E015		
Diagnostic	1. Visual inspection: Connection and/or breakage of wires and/or burn marks on the PCB Board.		
Color / Number of wires	N/A		



4.6.3. Transformer


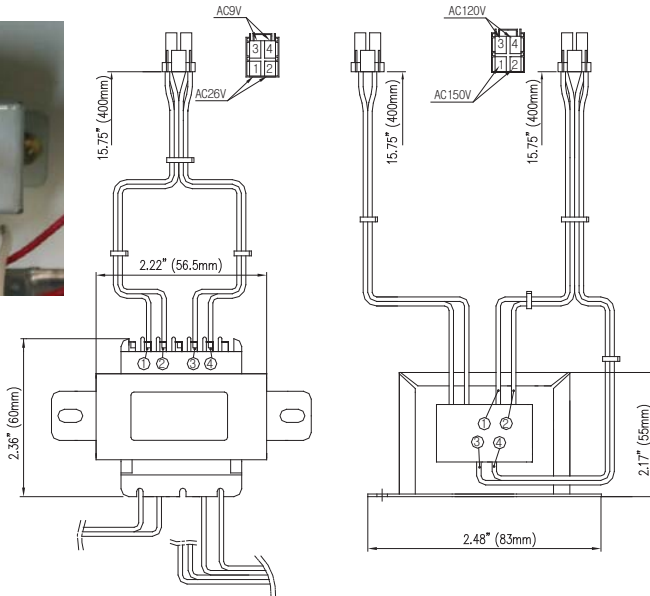
Navien Part No.	BH1419012A	Check Point	N/A
	BH14190013A		
Function	1. To supply power to the main PCB board. 2. Every electrical component of the unit is designed to only work with a 120VAC power supply; therefore, the unit comes equipped with this transformer.		
Failure Event	1. There is no power coming from the transformer. 2. The voltage from the power supply cannot be converted to 120 VAC.		
Effects	1. To supply power to the main PCB board. 2. Every electrical component of the unit is designed to only work with a 120VAC power supply; therefore, the unit comes equipped with this transformer.		
Error Code	N/A		
Diagnostic	1. Visual inspection: Connection and/or breakage of wires. 2. Voltage check: Check range of voltage shown below.		
Color / Number of wires	Black - Black		



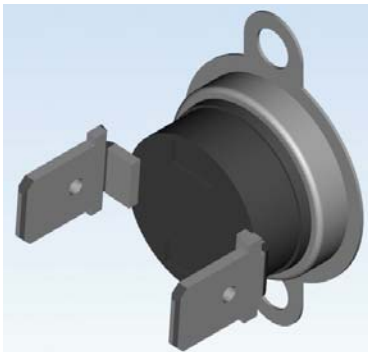
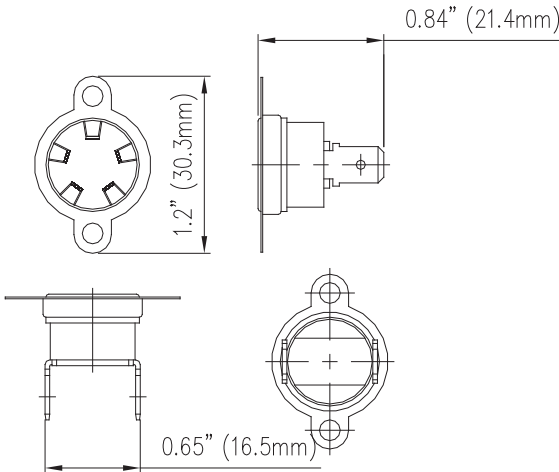


4.6.3. Transformer

Navien Part No.	BH1205008A	Check Point	H, K, S
Function	<ol style="list-style-type: none"> 1. To supply power to the main PCB board. 2. Every electrical component of the unit is designed to only work with a 120VAC power supply; therefore, the unit comes equipped with this transformer. 		
Failure Event	<ol style="list-style-type: none"> 1. There is no power coming from the transformer. 2. The voltage from the power supply cannot be converted to 120 VAC. 		
Effects	<ol style="list-style-type: none"> 1. The unit does not operate due to lack of power from transformer. 2. A failed transformer can cause electrical damage to other electrical components within the unit. 		
Error Code	N/A		
Diagnostic	<ol style="list-style-type: none"> 1. Visual inspection: Connection and/or breakage of wires and/or signs of electrical damage. 2. Voltage check: Check range of voltage shown below. 		
Color / Number of wires	<ol style="list-style-type: none"> 1. [AC 9 V] Yellow – Yellow : AC 7 ~ 11 V 2. [AC 26 V] White – White : AC 22~33 V 3. [AC 19 V] Blue – Blue : AC 16~24 V 4. [Power trans AC 150 V] Red – Red : AC 123~177 V 5. [Power trans AC 120 V] White – Black : AC 97~138 V 		

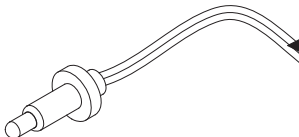



4.6.4. High Limit Switch or Exhaust Limit Switch

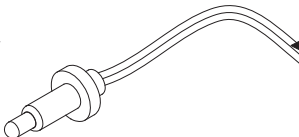
Navien Part No.	BH1401022A	Check Point	B									
	BH1401027A											
Function	1. Overheating preventing switch. 2. Due to the high temperature, it will automatically trip and automatically reset. 3. Detects excessively high water temperature (more than 197.6 °F) in heat exchanger. (BH1401022A) 4. Detects excessively high flue gas temperature (more than 149 °F) in exhaust duct. (BH1401027A)											
Failure Event	1. Unable to detect excessively high water temperature if switch fails. 2. Unable to detect excessively high flue gas temperature if switch fails.											
Effects	1. Unable to shut down the boiler if the water temperature from the heat exchanger exceeds 197.6 °F (92 °C). 2. Unable to shut down the boiler if the flue gas temperature from the exhaust duct exceeds 149 °F (65 °C).											
Error Code	E016, E030											
Diagnostic	1. Visual inspection: Connection and/or breakage of wires. 2. Voltage check: Check range of voltage shown below.											
Color / Number of wires	1. Yellow – Yellow : DC 4 ~ 6 V 2. Red – Red : DC 4 ~ 6 V											
<div><div></div><div></div></div>												
<table><tr><td></td><td>OFF (OPEN)</td><td>ON (CLOSE)</td></tr><tr><td>Flue Gas</td><td>149±39.2°F (65±4°C)</td><td>104±39.2°F (40±4°C) (Automatic Return)</td></tr><tr><td>Water</td><td>179.6±39.2°F (92±4°C)</td><td>170.6±39.2°F (77±4°C) (Automatic Return)</td></tr></table>					OFF (OPEN)	ON (CLOSE)	Flue Gas	149±39.2°F (65±4°C)	104±39.2°F (40±4°C) (Automatic Return)	Water	179.6±39.2°F (92±4°C)	170.6±39.2°F (77±4°C) (Automatic Return)
	OFF (OPEN)	ON (CLOSE)										
Flue Gas	149±39.2°F (65±4°C)	104±39.2°F (40±4°C) (Automatic Return)										
Water	179.6±39.2°F (92±4°C)	170.6±39.2°F (77±4°C) (Automatic Return)										

4.6.5. Thermistor

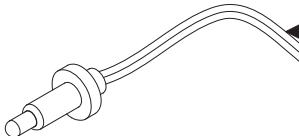
Navien Part No.	BH1403081A(Black)	Check Point	B
	BH1403082A(Blue)		
	BH1403083A(Red)		
	BH1403084A(Yellow)		
Function	Measure cold, mixing, H/E, hot water temperature in the boiler.		
Failure Event	Unable to properly measure water temperature within the boiler.		
Effects	1. If the Thermistors fail open or short, error code appears before starting operation. 2. If resistance values are just off, the boiler will have temperature fluctuations in hot water.		
Error Code	E007, E008, E021, E022, E032, E033, E041, E042		
Diagnostic	1. Visual inspection: Connection and/or breakage of wires. 2. Voltage check: Check range of voltage shown below. 3. Resistance check of sensor		
Color / Number of wires	1. Black – Black : DC 0 ~ 5 V 2. Blue – Blue : DC 0 ~ 5 V 3. Red – Red : DC 0 ~ 5 V 4. Yellow – Yellow : DC 0 ~ 5 V 5. Resistance-Open=infinite; Shorted=0 Nomal =4.121kΩ at 113°F		



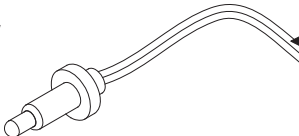
Wire Color : Black



Wire Color : Blue

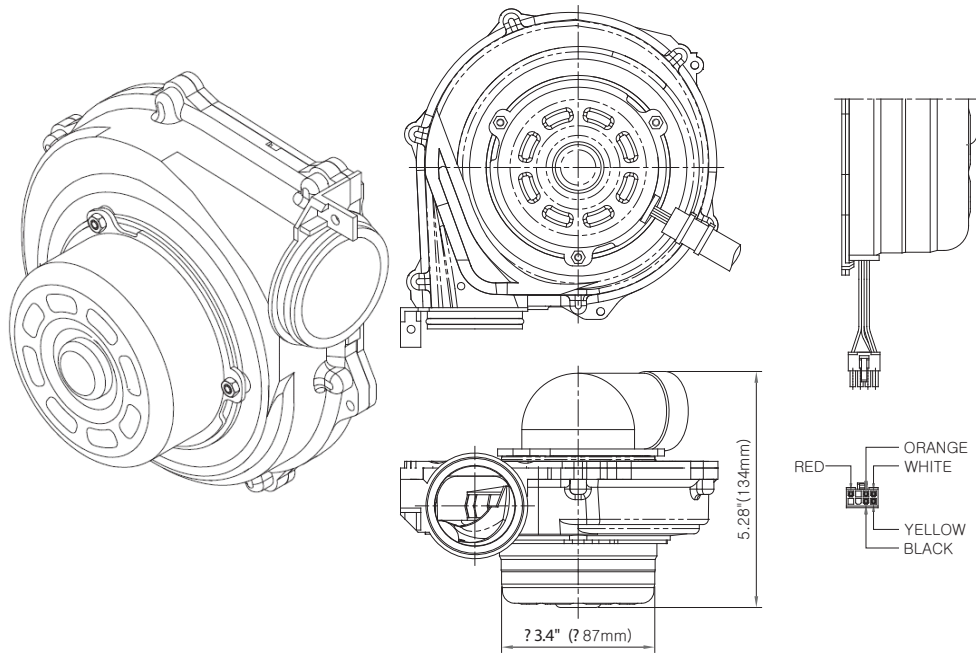


Wire Color : Red



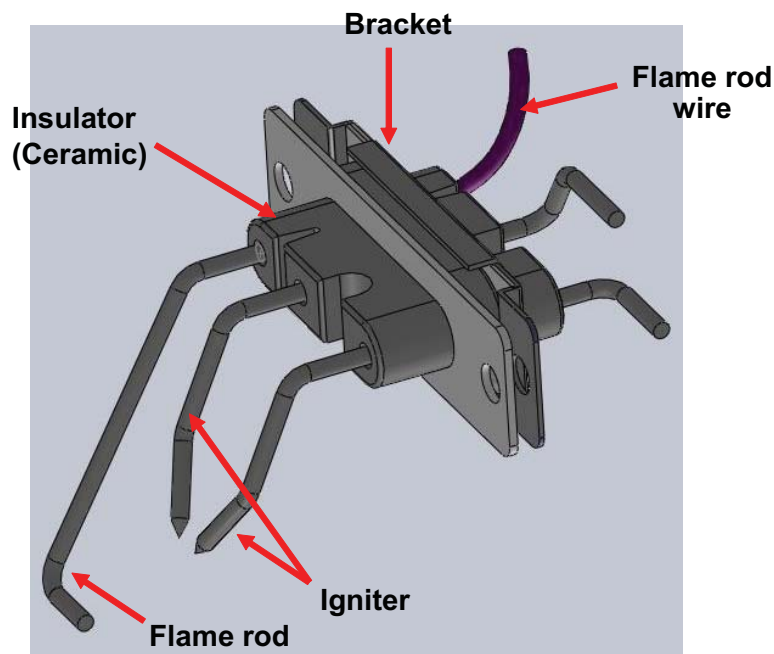
Wire Colo : Yellow

4.6.6. Fan motor

Navien Part No.	NAFA9GSFB002	Check Point	L
Function	To provide combustion air into the burner and to exhaust flue gas. Fan operated with APS or ideal combustion.		
Failure Event	1. Fan speed failure: the fan RPM are less than or equal to 400 RPM. 2. The fan assembly screw loosens and/or the fan is disassembled. 3. Connection terminal assembly defectiveness.		
Effects	1. Unstable combustion condition. 2. Unit vibrating and making a noise. 3. The boiler is not operating.		
Error Code	E009, E010, E027		
Diagnostic	1. Visual inspection: check the fan connection wire and/or the fan mounting location. 2. Voltage check: Check range of voltage shown below.		
Color / Number of wires	1. Black-Red : DC 127 ~ 184 V 2. Black-Yellow : DC 15 V 3. Black-Orange : DC 0~7.5 V 4. Black-White : 0 ~ 6,500 RPM		
<div></div>			

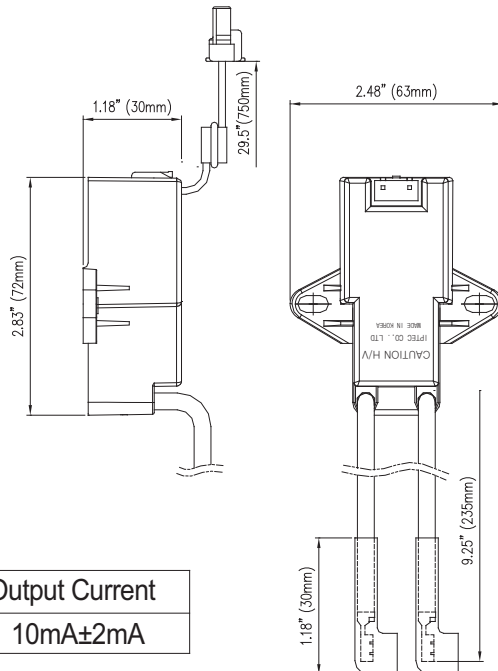
4.6.7. Flame Rod Ass'y

Navien Part No.	PH1603058D (NG)	Check Point	N/A
	PH1603059D (LP)		
Function	1. To igniting gas by repeatedly discharging the high voltage spark to the main burner until igniting gas.		
Failure Event	1. Unable to ignite during the ignition process. 2. Makes attempts to ignite at all times.		
Effects	1. The unit cannot ignite during the ignition process and “E003” or “E004” error codes will display. 2. No effects on the unit, however, the durability of the igniter wears down		
Error Code	E003, E004		
Diagnostic	1. Visual inspection: Connection and/or breakage of wires.		
Color / Number of wires	N/A		



4.6.8. Ignition Transformer

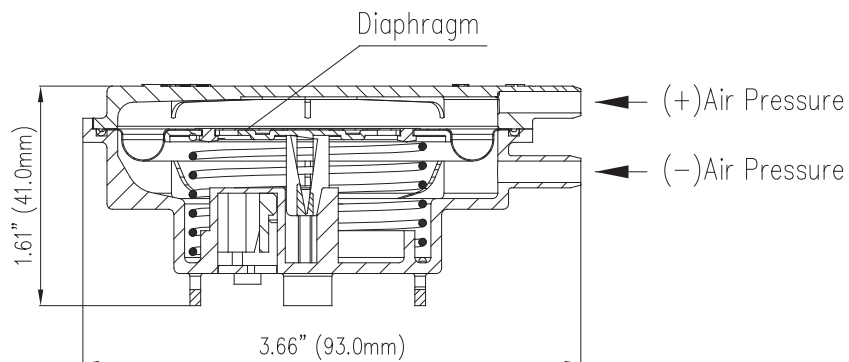
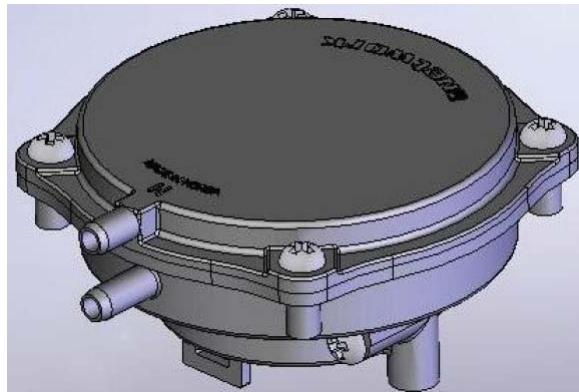
Navien Part No.	BH1201041D	Check Point	O
Function	1. To igniting gas by repeatedly discharging the high voltage spark to the main burner until igniting gas.		
Failure Event	1. Unable to ignite during the ignition process. 2. Makes attempts to ignite at all times.		
Effects	1. The unit cannot ignite during the ignition process and "E003" or "E004" error codes will display. 2. No effects on the unit, however, the durability of the igniter wears down.		
Error Code	E003, E004		
Diagnostic	1. Visual inspection: Connection and/or breakage of wires. 2. Voltage check: Check range of voltage shown below.		
Color / Number of wires	Blue – Blue : On : AC 97 ~ 138 V Off : 0 V		



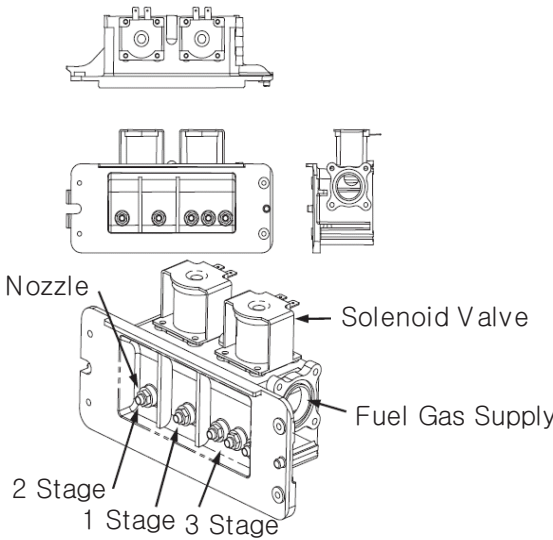
Input Voltage	Output Voltage	Output Current
115V,60Hz	19KV±2KV	10mA±2mA

4.6.9. APS

Navien Part No.	NASS9EX00009	Check Point	E
Function	1. Sensing the air-pressure for air velocity following gas supply. 2. APS device automatically controls the quantity of air supply operate with GPS.		
Failure Event	1. The combustion noise occurs. 2. Imperfect and/or lifting flame occurs.		
Effects	1. The boiler is not operating. 2. Excess carbon monoxide emissions-greater than 400ppm.		
Error Code	E009, E010, E027		
Diagnostic	1. Visual inspection: Connection and/or breakage of wires. 2. Voltage check: Check range of voltage shown below.		
Color / Number of wires	1. Red- black : DC 5 V 2. White – black : DC 0.3 ~ 4.5 V		

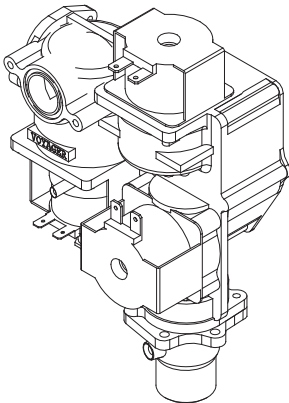


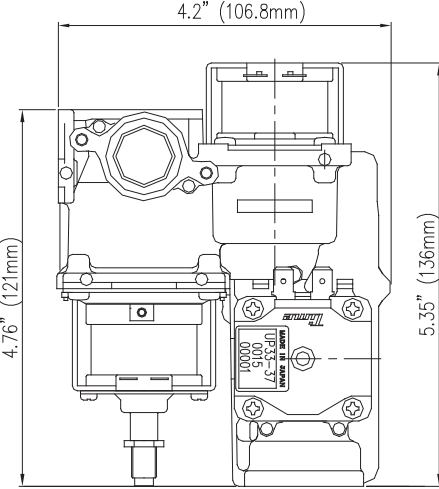
4.6.10. Manifold

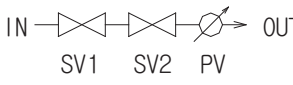
Navien Part No.	PABCR180AMF_001	Check Point	N/A																														
	PABNR/NP180AMF_001																																
	PABCC210AMF_001																																
	PABCC210AMF_002																																
Function	1. The manifold distributes gas from the gas valve to the burner. 2. To provide proper quantity of gas to burner in each stage. 3. There are 3 zones within the manifold, to ensure efficient combustion operation.																																
Failure Event	1. Dust deposit on the manifold. 2. Gas leakage from a failed manifold. 3. Ignition failure. 4. Imperfect combustion.																																
Effects	1. The burner cannot receive proper gas flow from the manifold, which can cause poor combustion in the combustion chamber. In this case, the flame rod will detect an improper flame condition and the PCB board will take safety measures. 2. Gas leakage from the manifold.																																
Error Code	E003, E004, E012																																
Diagnostic	1. Visual inspection: Connection and/or breakage of wires. 2. Voltage check: Check range of voltage shown below.																																
Color / Number of wires	1. Yellow – Yellow : On : DC 83 ~ 120 V, Off : 0 V 2. Red – Red : On : DC 83 ~ 120 V, Off : 0 V																																
<div><div></div><div><table><tr><th colspan="3">Model : 180</th></tr><tr><th></th><th>NG</th><th>PG</th></tr><tr><td>1-Stage</td><td>Φ0.138" x 1</td><td>Φ0.087" x 1</td></tr><tr><td>2-Stage</td><td>Φ0.138" x 1</td><td>Φ0.087" x 1</td></tr><tr><td>3-Stage</td><td>Φ0.112" x 3</td><td>Φ0.069" x 3</td></tr></table> <table><tr><th colspan="3">Model : 210/240</th></tr><tr><th></th><th>NG</th><th>PG</th></tr><tr><td>1-Stage</td><td>Φ0.111" x 2</td><td>Φ0.075" x 2</td></tr><tr><td>2-Stage</td><td>Φ0.111" x 2</td><td>Φ0.073" x 2</td></tr><tr><td>3-Stage</td><td>Φ0.13" x 5</td><td>Φ0.071" x 5</td></tr></table></div></div>				Model : 180				NG	PG	1-Stage	Φ0.138" x 1	Φ0.087" x 1	2-Stage	Φ0.138" x 1	Φ0.087" x 1	3-Stage	Φ0.112" x 3	Φ0.069" x 3	Model : 210/240				NG	PG	1-Stage	Φ0.111" x 2	Φ0.075" x 2	2-Stage	Φ0.111" x 2	Φ0.073" x 2	3-Stage	Φ0.13" x 5	Φ0.071" x 5
Model : 180																																	
	NG	PG																															
1-Stage	Φ0.138" x 1	Φ0.087" x 1																															
2-Stage	Φ0.138" x 1	Φ0.087" x 1																															
3-Stage	Φ0.112" x 3	Φ0.069" x 3																															
Model : 210/240																																	
	NG	PG																															
1-Stage	Φ0.111" x 2	Φ0.075" x 2																															
2-Stage	Φ0.111" x 2	Φ0.073" x 2																															
3-Stage	Φ0.13" x 5	Φ0.071" x 5																															

4.6.11. Main Gas Valve

Navien Part No.	BH0901018A	Check Point	Q
Function	<div>1. To control the amount of supply gas by electronically following the main PCB board.</div> <div>2. To maximize combustion, main gas valve harmonized with GPS.</div> <div>3. When some disorders occur for the inadequate combustion, it shuts off the gas valve automatically and prevents unsafe situations.</div>		
Failure Event	<div>1. Gas leak from the valves.</div> <div>2. Unable to open/close (main and solenoid gas valve)</div> <div>3. Unable to modulate the gas flow (proportional gas valve)</div>		
Effects	<div>1. Gas leak from the unit.</div> <div>2. No flames.</div> <div>3. No operation of the unit.</div> <div>4. Excess carbon monoxide emissions.</div>		
Error Code	E003, E012, E035, E048		
Diagnostic	<div>1. Visual inspection: Connection and/or breakage of wires.</div> <div>“clunk” sounds from the gas valves opening.</div> <div>2. Voltage check: Check range of voltage shown below.</div>		
Color / Number of wires	<div>1. Brown - brown : ON – DC83 ~ 120 V, OFF – 0 V</div> <div>2. Yellow - yellow : ON – DC83 ~ 120 V, OFF – 0 V</div> <div>3. Red – red : ON – DC83 ~ 120 V, OFF – 0 V</div>		








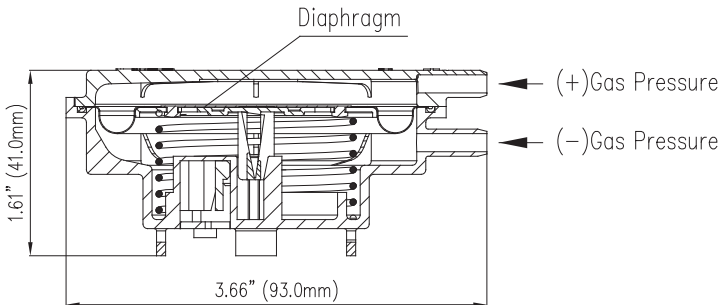
[Gas Flow Diagram]

4.6.12. GPS

Navien Part No.	NASS9EXGPS01	Check Point	A
Function	1. Sensing the gas-pressure for gas velocity to control combustible air supply. 2. GPS device automatically detects the quantity of gas supply in any moment for ideal combustion with proper air supply. 3. The unit is designed to operate properly even when there's low gas pressure supply (within certain range of gas pressure 95 %) because GPS makes if possible to check and modulate gas ratio for stable combustion.		
Failure Event	1. Gas leak from the valves.		
Effects	1. Gas leak from the unit. 2. No flames. 3. No operation of the unit. 4. Excess carbon monoxide emissions.		
Error Code	E035, E048(only PG model)		
Diagnostic	1. Visual inspection: Connection and/or breakage of wires. 2. Voltage check: Check range of voltage shown below.		
Color / Number of wires	1. Red- black : DC 5 V 2. White – black : DC 0.3 ~ 4.5 V		



Diaphragm



1.61" (41.0mm)

3.66" (93.0mm)

(+) Gas Pressure

(-) Gas Pressure

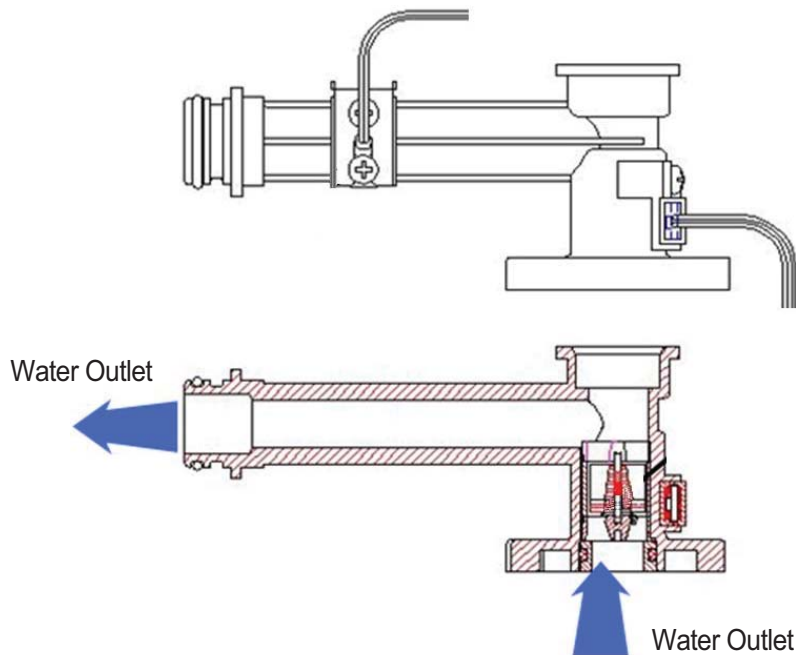
4.6.13. Burner

Navien Part No.	PABNCN30KDBN_003	Check Point	N/A
	PABNCW48KDBN_002		
Function	1. Pre-Mixed burner. 2. Pre-Mix system reduces emissions and increase efficiency. 3. The burner facilitates the air/gas mixture necessary to produce the proper heat during the combustion reaction.		
Failure Event	1. Unable to initialize/sustain combustion. 2. Dust or soot deposit on the burner(fin) surface 3. Gas leakage from burners.		
Effects	1. An unexpected combustion. 2. Unstable flame conditions and/or flame loss. 3. Ignition failure.		
Error Code	E003, E004, E012		
Diagnostic	Visual inspection: Excessive dust deposit on the burner (fin) surface and/or unstable flame conditions during operation.		
Color / Number of wires	N/A		

The diagram illustrates a 3-stage burner assembly. It features a burner body with three distinct stages labeled '1-Stage Burner', '2-Stage Burner', and '3-Stage Burner'. The burner body is shown in a cutaway view, revealing the internal components. A label 'Burner Body (Fuel Gas + Combustion Air)' points to the main body. A 'Fuel Gas Supply' inlet is shown at the bottom left, and a 'Combustion Air Supply' inlet is shown at the bottom right. The burner is mounted on a base with various electrical and gas connections.

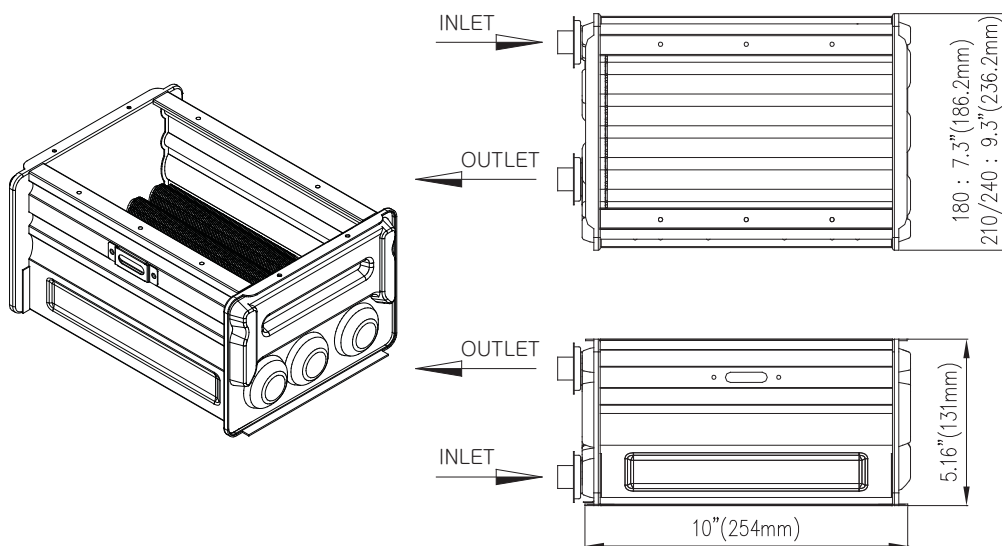
4.6.14. DHW Flow Sensor

Navien Part No.	AASS9EXFS002	Check Point	D
Function	1. To sensing water flow and GPM (Gallons per minute) for steady hot water temperature.		
Failure Event	1. Unable to detect or measure any water flow rate. 2. Water leakage from the water flow sensor.		
Effects	1. Ignition sequence does not start. 2. Stop operating once detecting water leakage.		
Error Code			
Diagnostic	1. Visual inspection: Connection and/or breakage of wires. 2. Voltage check: Check range of voltage shown below. 3. Open/drain and verify that impellor spins freely		
Color / Number of wires	1. Red- black : DC 5 V 2. White – black : DC 0.3 ~ 4.5 V		



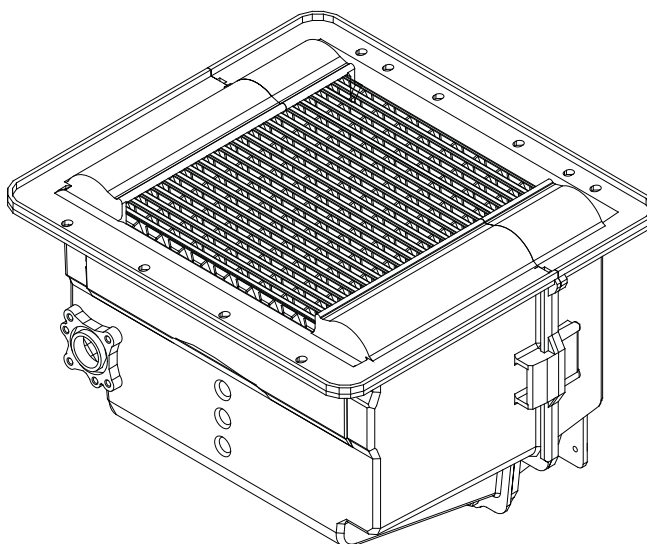
4.6.15. Primary Heat Exchanger

Navien Part No.	N/A	Check Point	N/A
Function	1. Main part for heat transfer from the burner. 2. There is additional path of water pipes on the heat exchanger surface as well as inside the combustion chamber and it minimizes the heat loss.		
Failure Event	1. Water and/or exhaust gas leakage through a crack. 2. Improper heat transfer can cause the water in heat exchanger to boil.		
Effects	1. The unit will stop operating once detecting water leakage. 2. Exhaust gas leakage. 3. Make boiling sound.		
Error Code	E001, E016, E030, E037		
Diagnostic	1. Visual inspection: check if there is a crack on the surface of heat exchanger. 2. Sound inspection: check if there's boiling noise.		
Color / Number of wires	N/A		



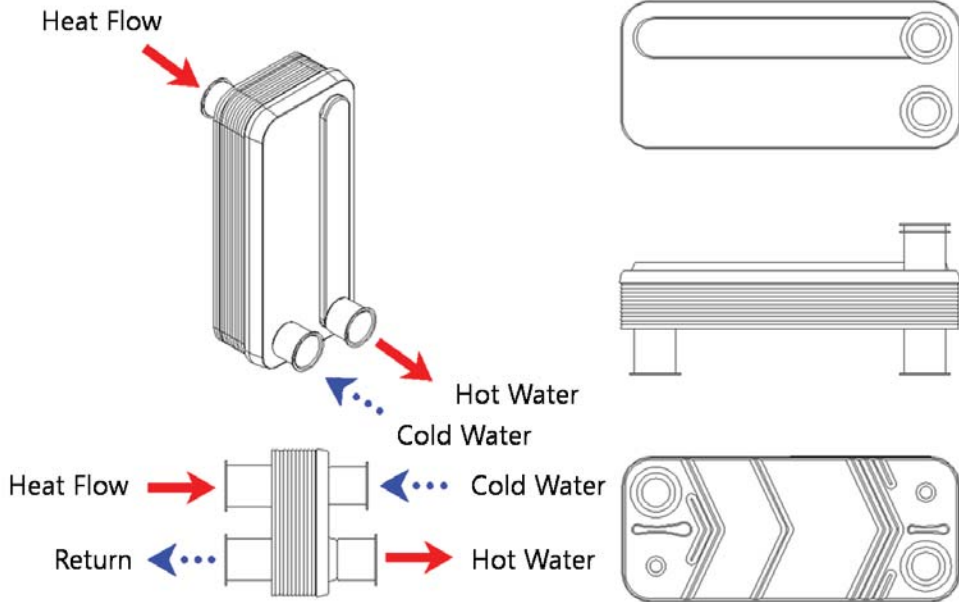
4.6.16. Secondary Heat Exchanger

Navien Part No.	N/A	Check Point	N/A
Function	1. Main part for heat transfer from the burner. 2. There is additional path of water pipes on the heat exchanger surface as well as inside the combustion chamber and it minimizes the heat loss.		
Failure Event	1. Water and/or exhaust gas leakage through a crack. 2. Improper heat transfer can cause the water in heat exchanger to boil.		
Effects	1. The unit will stop operating once detecting water leakage. 2. Exhaust gas leakage. 3. Make boiling sound.		
Error Code	E001, E016, E030, E037		
Diagnostic	1. Visual inspection: check if there is a crack on the surface of heat exchanger. 2. Sound inspection: check if there's boiling noise.		
Color / Number of wires	N/A		



4.6.17. DHW Heat Exchanger

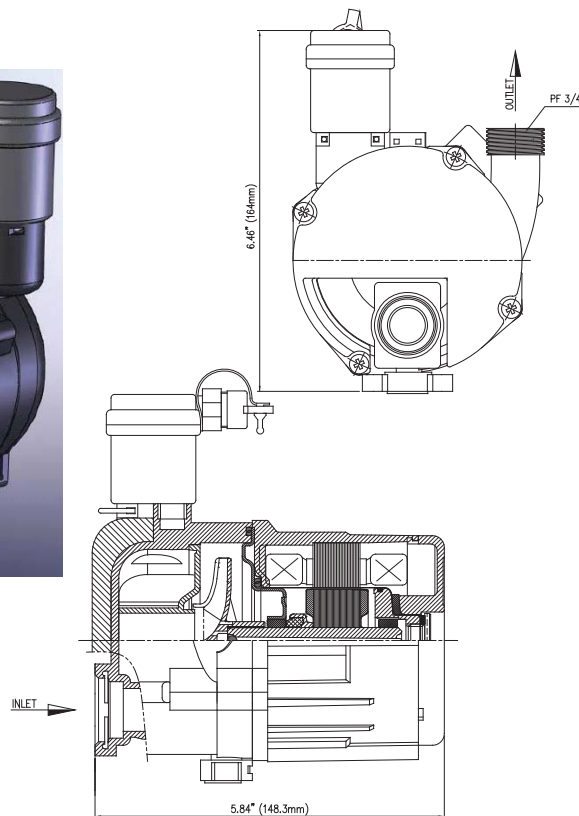
Navien Part No.	PAS40KHE_003(210/240)	Check Point	N/A
	PAS30KHE_005(180)		
	PAS4DKHE_004(240 ASME)		
Function	Water heated in the primary/secondary heat exchanger is circulated to the plate heat exchanger, where the heat of heating water and tap water are exchanged so that hot water is available.		
Failure Event	1. Water leakage through a crack. 2. Improper heat transfer can cause the cold water in heat exchanger.		
Effects	1. The unit will stop operating once detecting water leakage. 2. DHW does not come out.		
Error Code	E001, E016, E030		
Diagnostic	The plate heat exchanger filters out impurities in space heating pipes to prevent heating problems caused by impurities. Leak in plate heat exchanger will cause pressure in space heating side to increase to tap water pressure level.		
Color / Number of wires	N/A		



The diagrams illustrate the DHW Heat Exchanger's operation. The top left shows a 3D view of the heat exchanger with a red arrow labeled "Heat Flow" entering from the top. The top right shows a side view of the unit. The bottom left shows a cross-section of the heat exchanger with red arrows labeled "Hot Water" and "Cold Water" entering from the left, and a blue arrow labeled "Return" entering from the right. The bottom right shows a top-down view of the heat exchanger with red arrows labeled "Hot Water" and "Cold Water" entering from the left, and a blue arrow labeled "Return" entering from the right.

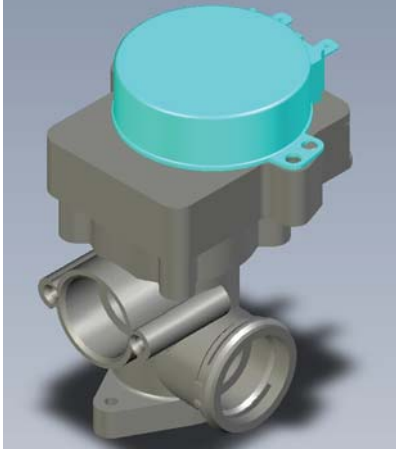
4.6.18. Circulation Pump

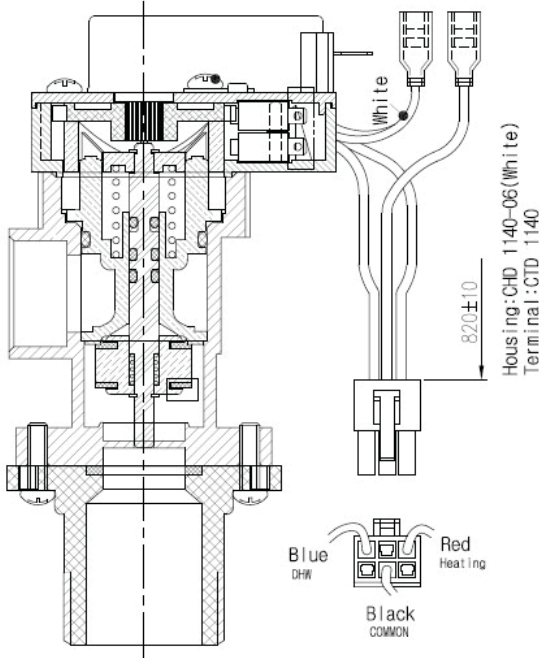
Navien Part No.	NAPU9GLPCT10	Check Point	P
Function	1. Pump operates for internal or external hot water circulation. 2. Internal circulation will avoid hot and cold water sandwich and external hot water circulation delivers hot water to fixtures quickly resulting in water conservation.		
Failure Event	1. Unable to detect or measure water flow rate. (Only circulation mode)		
Effects	1. The water heater freezing. 2. Abnormal of internal circulation caused by preheating failure. 3. Abnormal of external circulation caused by preheating failure.		
Error Code	E011, E013		
Diagnostic	1. Visual inspection: check the circulation pump connection wire. 2. Voltage check: Check range of voltage shown below.		
Color / Number of wires	1. Brown-White : ON AC 97 ~ 138 V, OFF 0 V 2. Brown-black : ON AC 97 ~ 138 V, OFF 0 V		



4.6.19. 3-Way Valve


Navien Part No.	AAVC9EX00009	Check Point	M
Function	Diverts the water from the space heating system to the DHW plate heat exchanger and back based on input from DHW flow sensor and PCB.		
Failure Event	1. No hot water in space heating mode. 2. No domestic hot water in DHW mode.		
Effects	In the case that the temperature of space heating is lower than the set temperature, it blocks the water flow path for domestic hot water so that heating water can flow through space heating pipes.		
Error Code	E01, E16		
Diagnostic	1. Visual inspection: check the 3-Way Valve connection wire. 2. Voltage check: Check range of voltage shown below.		
Color / Number of wires	Blue-Black : ON AC 97 ~ 138 V, OFF 0 V ※ Confirm voltage as the 3-Way Valve operating		

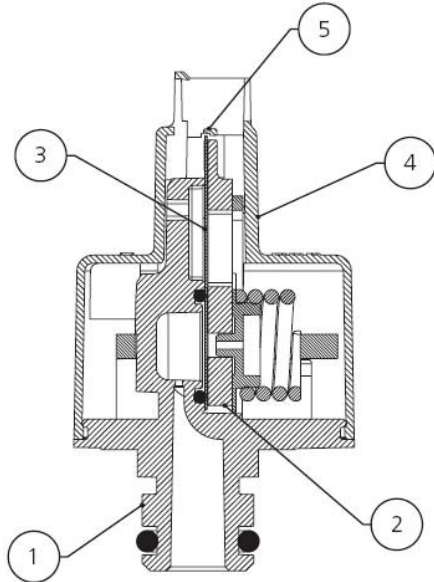




4.6.20. Water pressure Sensor

Navien Part No.	BH2507535A	Check Point	F
Function	They are suitable for analyzing water pressure ratios in heating.		
Failure Event	1. Unable to detect or measure to change water pressure		
Effects	1. Water filling system does not operate automatically		
Error Code	E02, E11, E13		
Diagnostic	1. Visual inspection: check the circulation pump connection wire. 2. Voltage check: Check range of voltage shown below.		
Color / Number of wires	1. Black-Red : DC 0~5V		



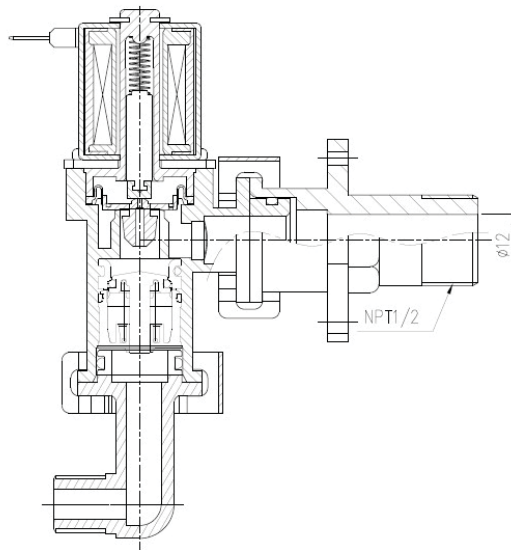


Legend to cross-section drawing

- 1 Pressure connection
- 2 Ceramic sensor
- 3 Amplifier electronics
- 4 Cover
- 5 Electrical connection (RAST 2.5)

4.6.21. Auto Feeder Valve

Navien Part No.	BH0904011A	Check Point	O
Function	Detect low and high water pressure using the electronic water pressure sensor If water pressure is low, Water filling system operates automatically		
Failure Event	1. Water filling system does not operate automatically. 2. Water filling system operates continuously.		
Effects	1. System is low water pressure 2. If system is high water pressure for automatic filling, it is over flow		
Error Code	E02		
Diagnostic	1. Visual inspection: check the Auto feeder valve connection wire. 2. Voltage check: Check range of voltage shown below.		
Color / Number of wires	Blue-Blue : ON AC 97 ~ 138 V, OFF 0 V		



5. Troubleshooting

5.1. Error Code List

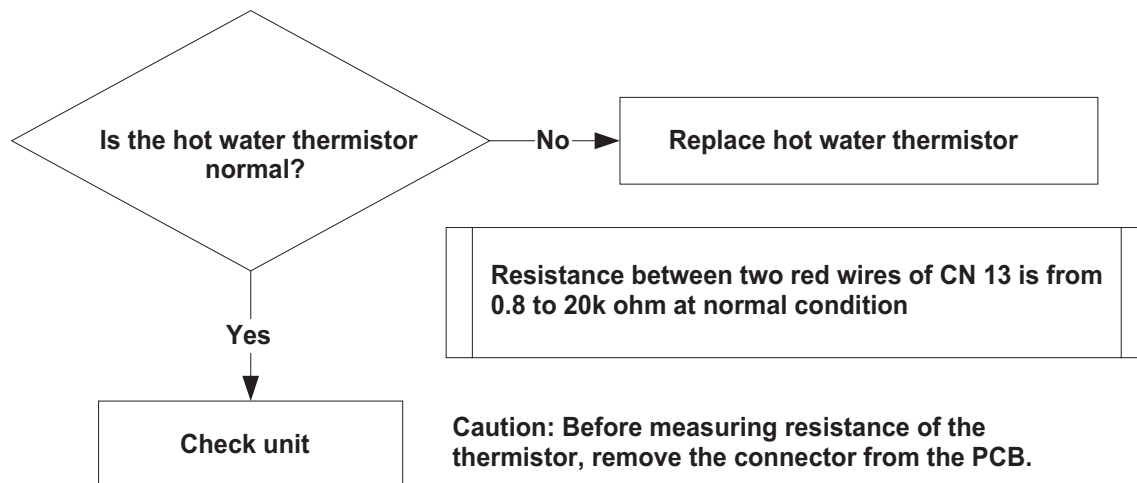
Error Code	Reason	Self-diagnostic / Action	Reset
E001	Water is boiling inside the heat exchanger	1. Clean the inlet water filter 2. Check the heat exchanger; flush with a cleaning solution	Manual
E002	Low water pressure	1. Wait until water supplement is terminated.	Automatic
E003	Ignition failure	1. Check if the main gas supply valve is open 2. Check the igniter for spark	Manual
E004	False flame detection	1. Check if the main gas supply valve is open 2. Check the igniter for spark	Automatic
E005	Heating supply outlet: Thermistor–open	1. Ensure ground wire is connected 2. Check the igniter for spark	Automatic
E006	Heating supply outlet: Thermistor–short	1. Check the thermistor 2. Check for loose connection 3. Replace the thermistor	Automatic
E007	Hot water outlet: Thermistor–open	1. Check the thermistor 2. Check for loose connection 2. Replace the thermistor	Automatic
E008	Hot water outlet: Thermistor–short	1. Check the thermistor 2. Look for short or water in connection 3. Replace the thermistor	Automatic
E009	Abnormal fan motor activity	1. Check and clean the air filter 2. Check and clean the fan motor 3. Check tower on board for loose connection	Manual
E010	Abnormal air pressure	1. Check the vent and fresh air pipe for obstructions 2. Check and clean the air filter 3. Check hoses and condensate drain	Manual
E011	High water pressure	1. Check the water pressure sensor	Automatic
E012	Flame loss	1. Check the main gas line (valve open?) 2. Check intake air pipe 3. Check ground wire 4. Check power supply 5. Clean flame rod	Manual
E013	Abnormal pump	1. Check the pump 2. Remove air from the pipe	Manual
E015	Abnormal control board	1. Check power supply 2. Check the Emergency Switch	Manual

Error Code	Reason	Self-diagnostic / Action	Reset
E016	Overheating of heat exchanger	1. Turn OFF the system for at least 30 minutes then restart 2. Clean the inlet water filter 3. Check the heat exchanger; flush with a cleaning solution	Manual
E018	Heating return inlet: Thermistor–open	1. Check the Thermistor 2. Check for loose connection 3. Replace the Thermistor	Automatic
E019	Heating return inlet: Thermistor–short	1. Check the Thermistor 2. Check for short or water in connection 3. Replace the Thermistor	Automatic
E021	Cold water inlet: Thermistor–open	1. Check the Thermistor 2. Check for loose connection 3. Replace the Thermistor	Automatic
E022	Cold water inlet: Thermistor–short	1. Check the Thermistor 2. Check for short or water in connection 3. Replace the Thermistor	Automatic
E027	Abnormal activity of the air pressure sensor	1. Check the vent pipe for obstructions 2. Check and clean the air filter	Automatic
E028	Water leak pipe line	1. Check pipe line.	Manual
E030	Exhaust Overheat: exhaust high limit switch shuts down the unit when the flue temperature exceed 149°F (65°C)	1. Clean the inlet water filter 2. Check the heat exchanger; flush with a cleaning solution.	Automatic
E035	Abnormal activity of the gas pressure sensor	1. Measure gas pressure drop 2. Check hose connection 3. Replace GPS.	Manual
E036	Communication failure	1. Contact to Navien tech. dept.	Automatic
E039	Abnormal the Water Flow Senor	1. Check the water flow sensor.	Manual
E040	Outdoor: Thermistor–short	1. Check the Thermistor 2. Replace the Thermistor	Manual
E048	Abnormal LPG Gas Pres-sure	1. Check the LPG Gas. 2. Fill the LPG Gas.	Manual


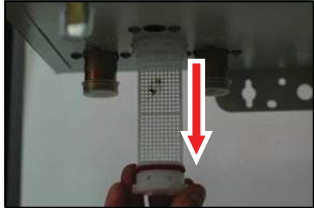
5.3. 01Error

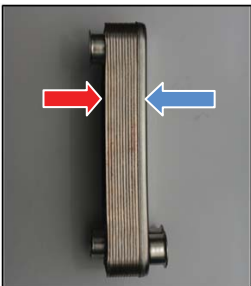
Error conditions and check items

Error	Description
01E Boiling	In order to prevent boiling of the heat exchanger, if the heating water temperature of 208 °F (98 °C) or higher is sensed continuously for 15 seconds, the thermostat displays the error message 01E (manually cancelled), and the boiler becomes Lock-Out, performing post-purge. The system stops the post-purge process if the heating (or returned) water temperature becomes 167 °F (75 °C) or lower.
Check items	<ol style="list-style-type: none"> 1. Check the circulation pump operating status. 2. Check the 3-way valve operating status. 3. Check if the heating strainer is clogged. 4. Check if the main heat exchanger or the hot water heat exchanger is clogged. 5. Check the heating inlet/outlet valve and distributor room valve. 6. Check the heating outlet temperature sensor. 7. Check the PCB DIP S/W capacity setting. 8. Check if the PCB works properly.



Check method

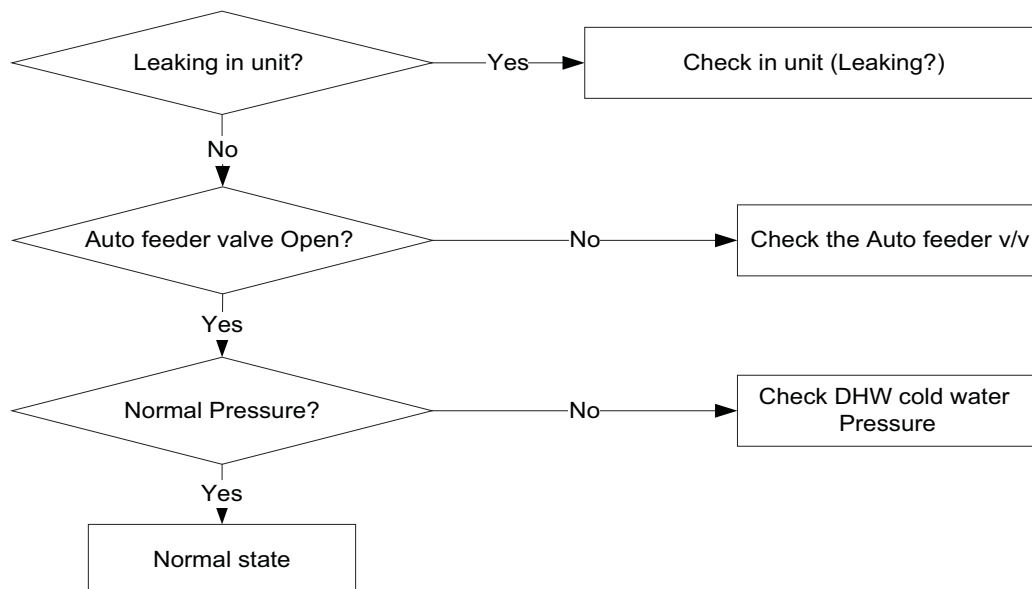
Failure mode	Cause	Check method
Thudding noise caused by minimum flow	Defective circulation pump	<p>Check the circulation pump. In the error condition, the circulation pump and the fan run continuously.</p> <ol style="list-style-type: none"> 1. Check power supply to the circulation pump (AC 120V). 2. Replace the PCB if power is not supplied.
	Defective 3-way valve	<p>Touch the heating outlet pipe as the heating function is on, and check if the temperature changes. If there is no change in temperature, check the operation error in the 3-way valve hot water mode.</p> <ul style="list-style-type: none"> ✓ Red+Black (AC 120V): Heating ✓ Blue+Black (AC 120V): Hot water ✓ Defective 3-way valve if power is normally supplied ✓ Defective PCB if power is not supplied.
Thudding noise caused by minimum flow	The heating strainer is clogged.	<ol style="list-style-type: none"> 1. Check if the strainer is clogged with debris. 2. Check the cause of debris if the strainer is clogged. (Aluminum distributor oxidized steel, etc.)
	<div style="display: flex; justify-content: space-around; align-items: center;">   </div> <div style="display: flex; justify-content: space-around; margin-top: 5px;"> <Heating strainer> <Checking strainer> </div>	
	The main heat or the hot water heat exchanger is clogged.	<ol style="list-style-type: none"> 1. Separate inlet/outlet pipe of the main heat exchanger, and blow air with mouth to check if the pipe is clogged. 2. If the 01 Error occurs when hot water is used only, check if the hot water heat exchanger is clogged.

	 <p><Check if the hot water heat exchanger is clogged></p>	
	Valve closed	Check heating inlet/outlet valve and distributor room valve. ✓ At least one valve of the distributor must be always open.)
Thudding noise caused by minimum flow	Defective heating outlet temperature sensor	<p>The system recognizes the heating water temperature higher than it actually is due to a defective sensor.</p> <p>✓ Check the heating outlet temperature displayed (<u>5120</u>).</p> <p>✓ Check if there is a significant difference between the temperature displayed and the one actually sensed.</p> <p>✓ Remove the heating outlet temperature sensor connector only, connect a good temperature sensor, and determine if the temperature sensor is defective. Refer to the resistance measuring criteria and the method of measurement.</p>
Other trouble	Capacity setting	Sudden increase of temperature due to PCB DIP S/W model setting error or max setting.
	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

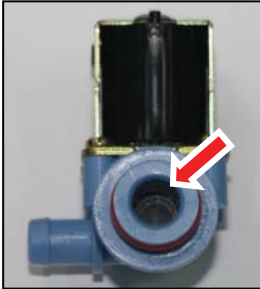
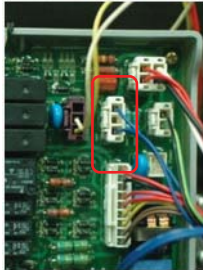
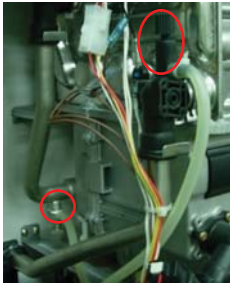
5.3. 02Error

Error conditions and check items

Error	Description
02E Low water level	<p>If the water pressure sensor senses low water level as the heating pipe pressure is low, the system stops operation of the boiler, and refills water automatically. As water is filled to the normal water pressure, the system automatically cancels error, operates the pump for 15 seconds, and returns the system to the previous state.</p> <p>When water is filled for the first time after the power is connected, the system operates the pump in the hot water mode.</p> <p><Conditions for low water level detection></p> <p>The system refills water if water level of 7.3 PSI or lower is detected for over 4 seconds.</p> <p>The system stops filling water at the water level 12 PSI (the value is depending on the set-ting).</p> <p>Filling is stopped forcefully if the water level is 7.4 PSI or higher after 3 minutes from starting of water refilling.</p>
Check items	<ol style="list-style-type: none"> 1. Defective pressure sensor 2. Defective pressure display
	<ol style="list-style-type: none"> 1. Water is not refilled. ✓ Check if the cold water valve is closed or frozen. ✓ Check if the auto feeder valve works normally. 2. Water overflows through condensed water hose. ✓ Check the left drain valve of the main heat exchanger. ✓ Check if water leaks due to a defective heat exchanger. 3. Check if water leaks from the heating pipe.



Check method

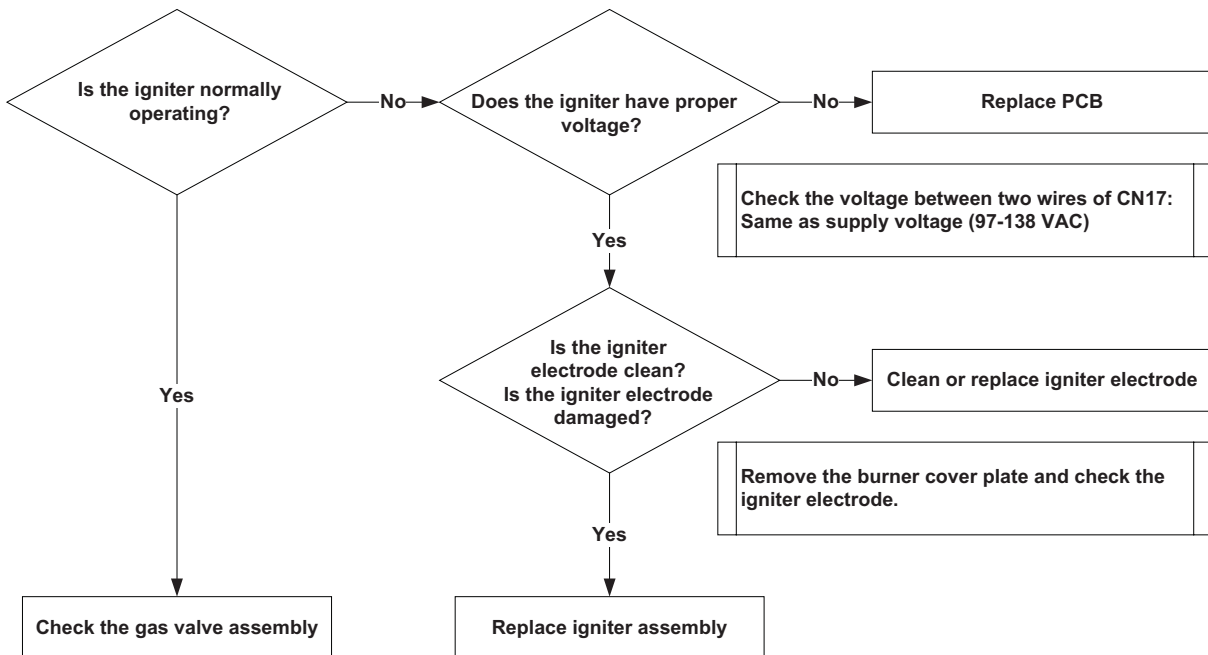
Failure mode	Cause	Check method
Water is not refilled.	Cold water valve is closed or frozen	Turn on cold water tap and check if the valve works or is frozen.
Water is not refilled.	Defective auto feeder valve	1. Check the auto feeder valve filter if water is not refilled. 2. Check the power supply (AC 120V). ✓ Replace the auto feeder valve if power is supplied normally. 1. Replace the PCB if power is not supplied.
	 <Check if the filter is clogged with debris>	 <Auto feeder valve terminal in purple>
Water flow over through the condensed water hose.	Drain valve open	Check the drain valve under the left of the main heat exchanger.
		 <Drain valve>
	Defective heat exchanger	Water leaks through the condensed water hose due to a defective heat exchanger.
Frequent 02E	Pipe leaks	Frequent water filling can occur due to leakage of pipe. Check the leakage on the pipe connector and distributor. Check if the water level becomes lower through the expansion tank, and give the explanation to the customer. (28E)

5.4. 03Error

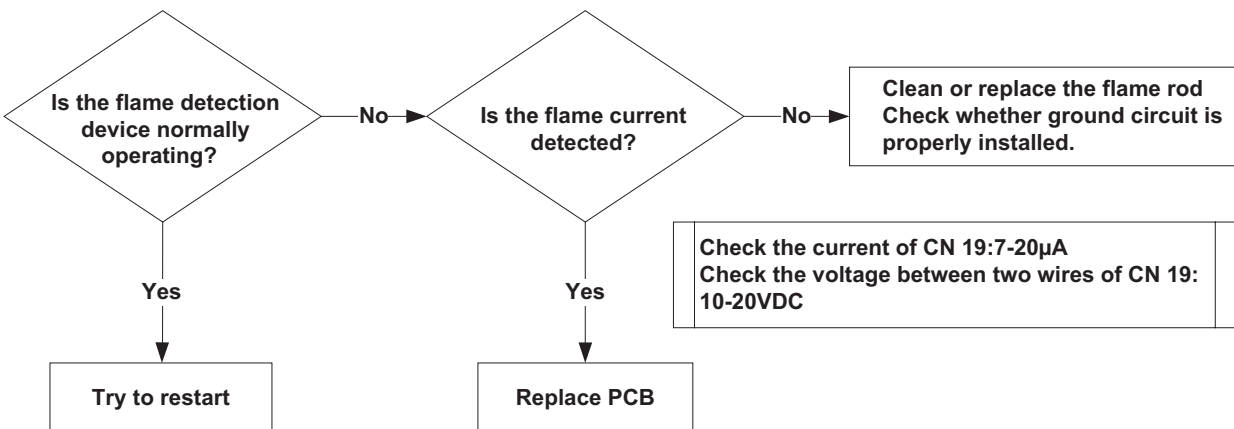
Error occurrence conditions and check items

Error	Description
03E	In case of an ignition failure, repeat restart 10 times. If no flame is detected, the system displays the error message 03E (manually cancelled) on the indoor thermostat.
Check items	<ol style="list-style-type: none">1. Check the gas supply (check the gas valve and supply pressure).2. Check the gap of electrode, electricity discharge, or deformation of flame rod.3. Check the operation of the ignition transformer (ignition state, input power (AC 120V))4. Check the operation of the gas control valve (DC 100V, coil short circuit, solenoid valve).5. Check the flame rod, and wiring and grounding.6. Check if the APS hose is broken or clogged.7. Check if the APS works properly.8. Check the PCB DIP S/W model setting.9. Adjust differential pressure to MIN between 3 stages with the gas manometer (17mmH₂ O±1)10. Disassemble the manifold and check the nozzle.11. Check the flue and air supply (downward installation / rainwater collected)12. If the trouble continues despite the checking of above items, replace the PCB.

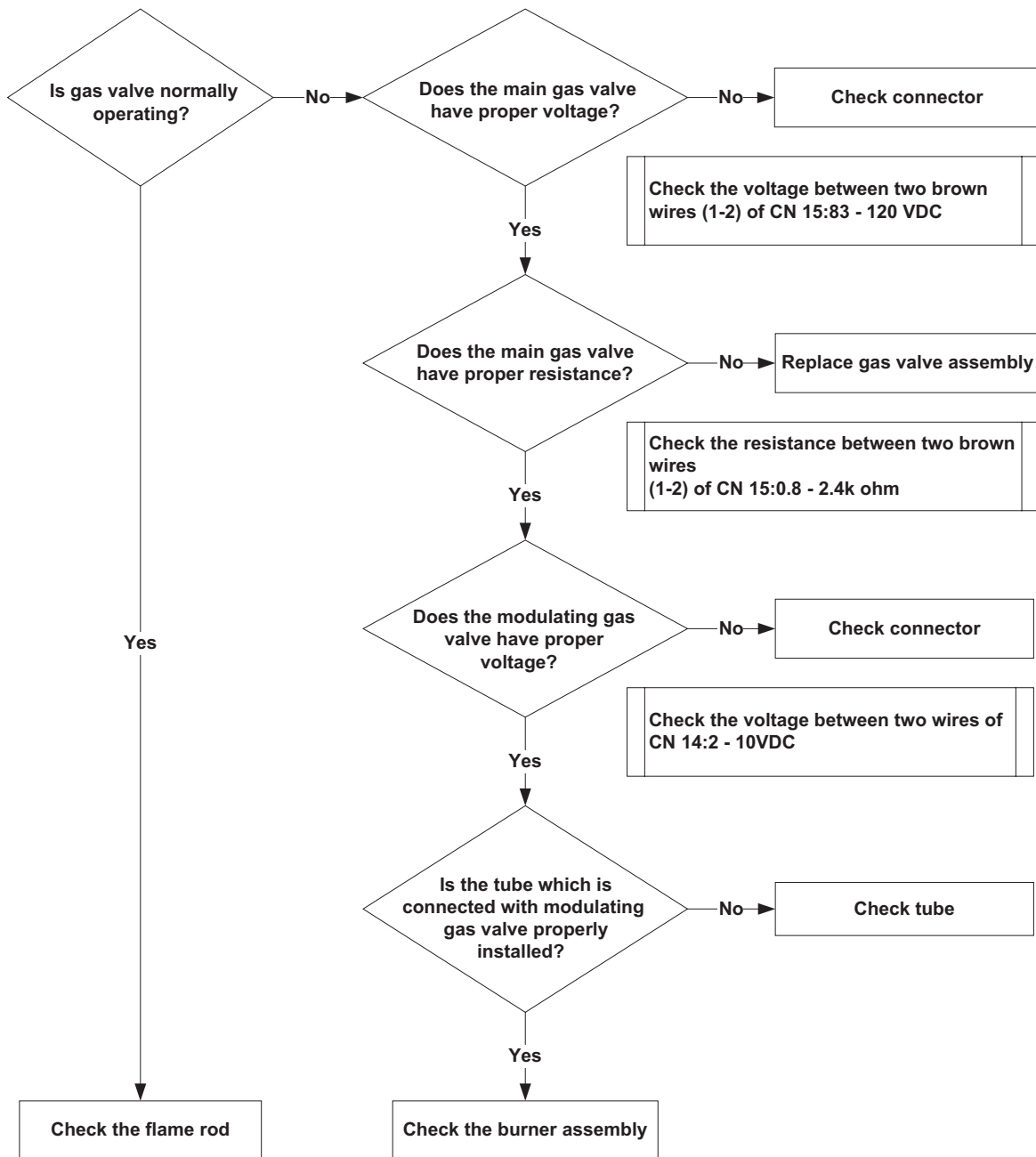
Scenario1





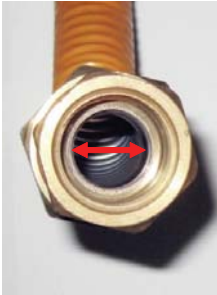
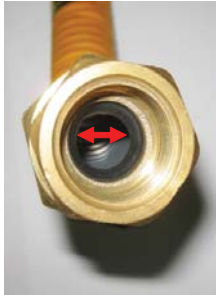
Scenario2

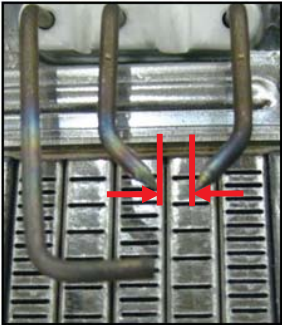




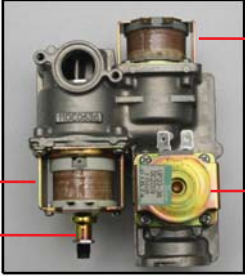


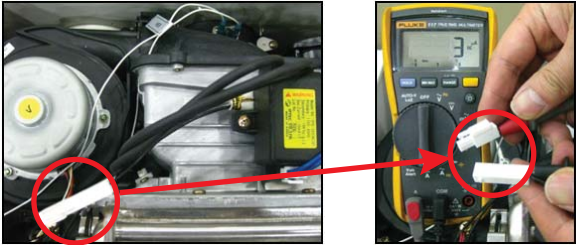
Scenario3



Check method

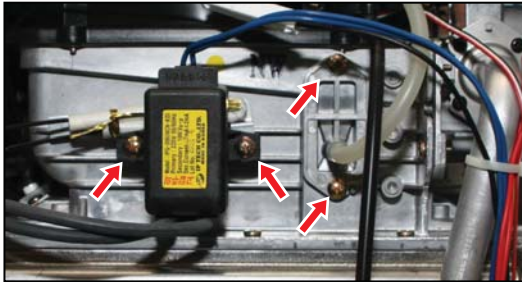
Failure mode	Cause	Check method
Ignition failure	Gas supply error	<ol style="list-style-type: none"> 1. Check if the gas valve is open. 2. Check the gas supply pressure. NG: 6 ~ 10.5 inch WC 3. Check the flexible pipe dia. (3/4 inch or larger) 4. While the static pressure is normal, a large difference of dynamic pressure may cause drop of gas pressure. Therefore, it is required to check the dynamic pressure. ※ Static pressure: Gas pressure at the stop of the boiler. Dynamic pressure: Gas pressure at boiler max combustion. 5. Excessive force in fastening nuts at installation of gas pipe may move the packing and block the Teflon sealing, causing a drop of gas supply pressure. 6. Check the gas meter class. 425 CFH (or higher) : Combination Heater/Boiler (195 CFH) + Furnace (58.8 CFH) + Domestic gas range (63.7 CFH) ● 1 CFH = 1,020 Btuh
	<div>     </div> <p><Check gas supply pressure> <Moved packing narrows the inner diameter.></p>	
	Defective electrode gap and shape	<p>Defective electrode gap and shape disables ignition.</p> <ul style="list-style-type: none"> ✓ Appropriate electrode gap: approx. 3~4mm (replace if defective) ✓ An ignition failure may occur due to improper gap, while discharge seems normal when checked via the flame monitoring window. Therefore, it is required to check the gap after disassembly.

Ignition failure	<div style="display: flex; justify-content: space-around; align-items: center;">   </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <Electrode gap 3~4mm> <Electrode gap error> </div>	
	No spark from electrode	<p>When no spark is made from the electrode at ignition:</p> <ul style="list-style-type: none"> ✓ Remove the electrode and check if there is a crack on the insulator. ✓ Adjust the gap if there is a discharge of electricity from the metallic part of the combustion room. ✓ Add the insulating packing to the insulator of the electrode. ✓ Check the input power to the ignition transformer (AC 120V). ✓ If there is no trouble in the input power to the ignition transformer, replace the ignition transformer. ✓ Replace the PCB if there is a trouble in the power supply to the ignition transformer. ✓ Check the insulator boots on spark wires for cracks/holes.
	 <p style="text-align: center;"><Ignition transformer></p>	
	Main gas valve	<ol style="list-style-type: none"> 1. Check the primary/secondary power supply to the main gas control valve. ✓ Check, with a tester, if the input power is DC 100V. 2. Replace the PCB if power is not supplied. 3. If power supply is normal, check if the coil is open. 4. Check if the solenoid valve works properly. ✓ Feel or hear a click.

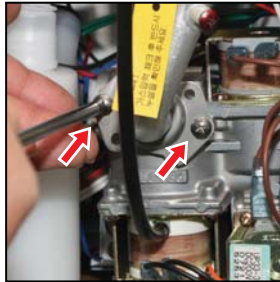
	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p><Main gas valve></p> </div> <div style="text-align: center;">  <p><Check DC voltage></p> </div> </div>	
Repeated ignition failure after ignition ok	Flame sensing error	<ol style="list-style-type: none"> 1. Check the location of the flame rod, if there is any deformation or debris, and repair or replace the part. 2. Check the sheath of the flame rod wire, and if it is open. 3. Check the grounding to the base, verify grounding at the outlet ✓ There is a case of defective grounding due to the painting of cabinet. Therefore, remove the painting in the screw fastening part, and reconnect. Verify outlet is grounded properly. 4. Check the flame sensing current. ✓ Or use a tester to measure the flame sensing current (1~20 μA)
	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p><Grounding wire fixing position></p> </div> <div style="text-align: center;">  <p><Measuring flame current></p> </div> </div>	
Flame lifting and noise occurs at ignition	Defective APS hose	<ol style="list-style-type: none"> 1. The APS hose is broken. ✓ Increased RPM may cause flame lifting and noise. ✓ 10E may occur with the same trouble. 2. Check if the hose is clogged with water remained from installation.
	APS	The system works but combustion is not normal due to the defective APS.

	<div data-bbox="451 391 730 683" data-label="Image"> </div> <div data-bbox="750 391 1039 683" data-label="Image"> </div> <div data-bbox="1058 391 1347 683" data-label="Image"> </div> <p data-bbox="784 697 1005 725"><Defective APS hose></p>
PCB DIP S /W model setting error	<p data-bbox="649 768 1315 832">Incorrect DIP S/W setting per model on the PCB may cause a problem on ignition and combustion.</p>
Adjust gas pressure	<p data-bbox="649 874 1360 959">Adjust differential pressure to MIN between 3 stages with the gas manometer (17mmH₂ O±1). → refer to 6.2.2 Adjusting the Gas-Air Ratio</p> <ul data-bbox="649 963 1347 1140" style="list-style-type: none"> ✓ Turn the adjusting screw under the gas block ½ turn and restart. ✓ When an ignition failure occurs due to a problem in supplying gas or adjusting gas pressure, cover the blower inlet hole with a hand at the ignition stage. If a flame occurs, check the gas supply system.
<div data-bbox="508 1176 750 1527" data-label="Diagram"> </div>	<div data-bbox="1049 1181 1261 1464" data-label="Image"> </div> <p data-bbox="1024 1464 1289 1491"><Adjust gas pressure at Min></p> <p data-bbox="751 1498 1122 1525"><Check the differential gas pressure></p>
Check if there is any debris in the nozzle.	<p data-bbox="656 1576 1208 1604">Ignition failure occurs if there is debris in the nozzle.</p> <ul data-bbox="656 1608 1315 1636" style="list-style-type: none"> ✓ Disassemble the manifold and check the nozzle (Stage 1).

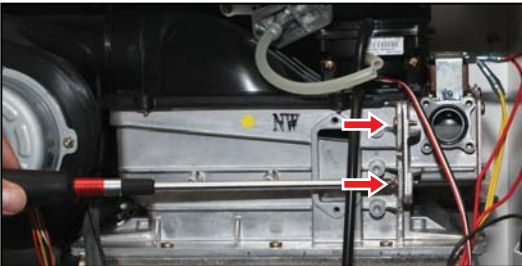
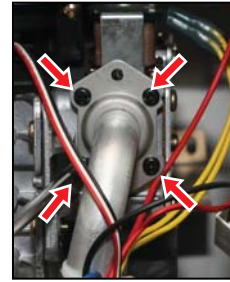
※ Mainfold disassembly procedure



1. Remove 4 screws and remove the ignition transformer and the venturi.



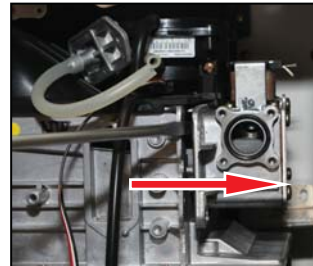
2. Remove 6 screws (2 under and 4 upper).



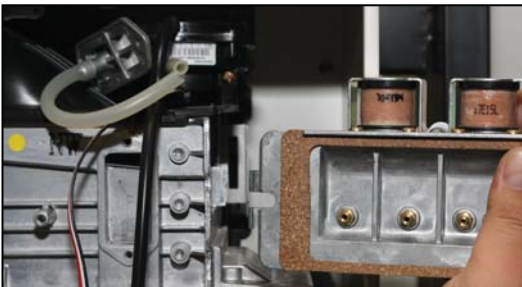
3. Remove 2 manifold fixing screws.



4. Remove multi-stage valve.



5. Use a screw driver to remove the valve.



6. Disassemble the manifold.



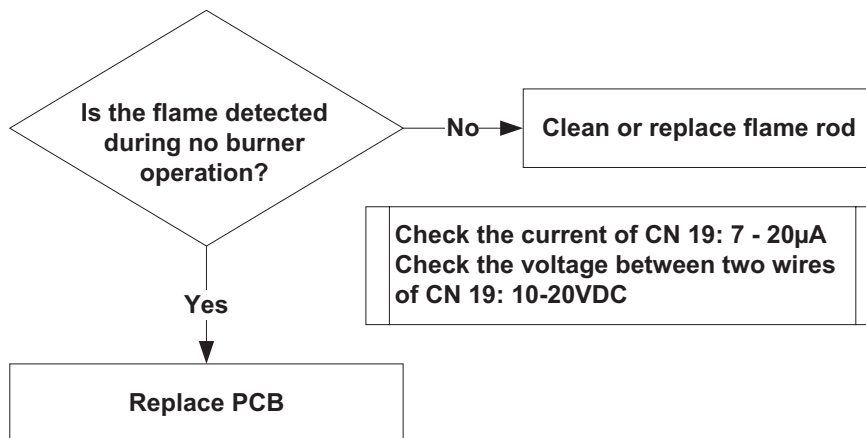
7. Check the nozzles

Defective air supply	Defective air supply	Check if rainwater is collected due to downward air intake.
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

5.5. 04Error

Error conditions and check items

Error	Description
04E False-flame detection	<p>1. Pre ignition false-flame If a flame signal is detected before combustion (standby, prepurge, preignition), a false-flame error 04E (automatically cancelled) is displayed on the indoor thermostat, and the system performs continuous postpurge.</p> <p>2. Post purge false-flame If a flame signal is detected when the system performs post-purge as fuel supply is stopped, a false-flame error 04E (automatically cancelled) is displayed on the indoor thermostat, and the system performs continuous postpurge.</p>
Check items	<p>1. Check if gas leaks due to defective sealing of the main gas valve.</p> <p>2. Check if electricity is discharged from the electrode.</p> <p>3. Check if gas is supplied at higher pressure than the standard gas pressure.</p> <p>4. Defective PCB.</p>



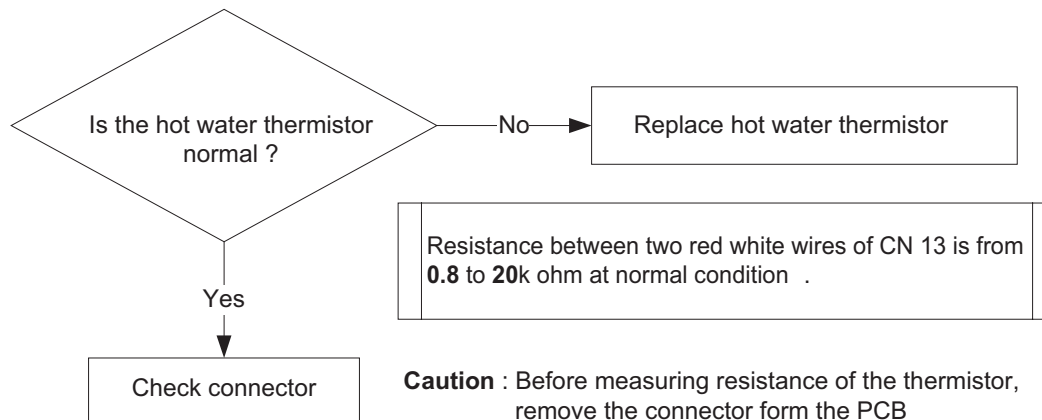
Check method

Error type	Cause	Check method
Flame before/after combustion	Leakage from main gas valve	Replace the main gas valve if flame occurs before combustion or if there is remaining flame after combustion is stopped.
Thudding noise caused by minimum flow	Discharge of electricity from electrode	Spark discharges from electrode to flame rod at ignition. ✓ Replace or correct location of flame rod.
	Gas block	Gas may leak as the gas block is pushed by the gas supply over the standard pressure. ✓ Check the supply pressure - NG:6 ~ 10.5 inch WC ✓ If the gas pressure is too high, transfer the problem to the gas orifice, and replace the main gas valve. ✓ If gas leaks, close the main gas valve and repair the unit before using the system.
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

5.6. 05Error

Error conditions and Symptoms Analysis

Error	Description
05E Disconnection of supply temperature sensor	Check the supply temperature sensor. If a problem (open: 14°F or lower) is detected for 3 seconds, the system displays the error message 05E on the indoor thermostat.
Check items	<ol style="list-style-type: none"> 1. Check if the supply temperature sensor is open and if the connector is connected properly. 2. Replace the defective heating temperature sensor. 3. Replace the PCB.



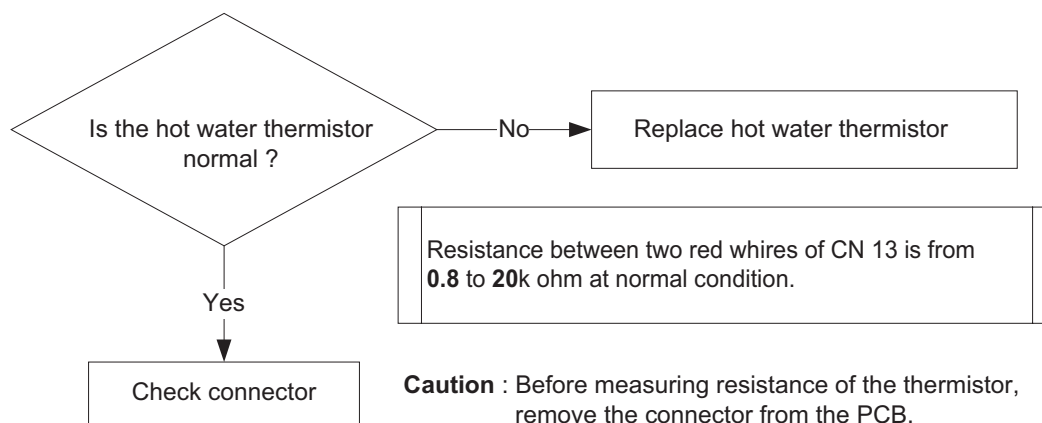
Check method

Fault	Possible Causes	Check method
Sensor error	Defective temperature sensor connector	Check if the supply temperature sensor is open and if the connector is connected properly.
	Temperature sen-sor	<ol style="list-style-type: none"> 1. Measure the resistance of the temperature sensor. 2. If the resistance is abnormal, replace the temperature sensor.
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

5.7. 06Error

Error conditions and Symptoms Analysis

Error	Description
06E Shortcircuit of heating temperature sensor	Check the supply temperature sensor. If a problem (short-circuit: 248°F or higher) is detected for 3 seconds, the system displays the error message 06E on the indoor thermostat.
Check items	<ol style="list-style-type: none"> 1. Check if the supply temperature sensor connector is wet due to any reason, including leakage. 2. Replace the defective supply temperature sensor. 3. Replace the PCB.



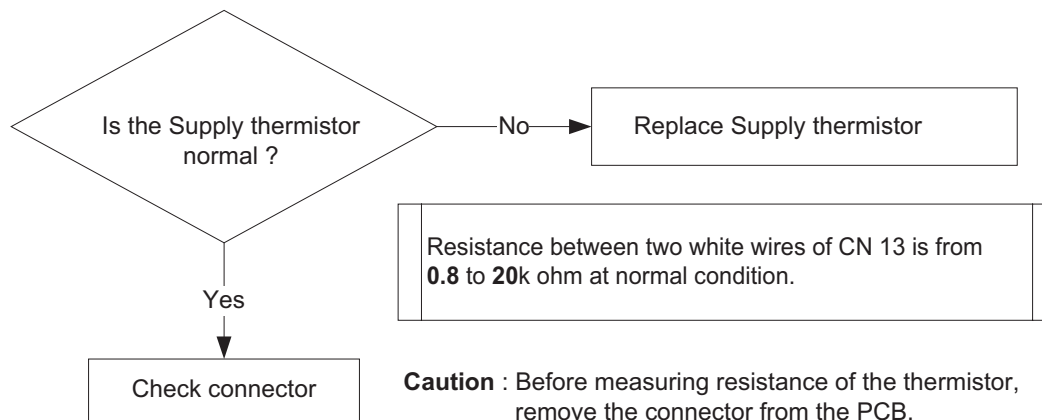
Check method

Fault	Possible Causes	Check method	Remark
Sensor error	Defective temperature sensor connector	Check if the hot water temperature sensor connector or the PCB harness terminal is wet due to any reason, including leakage. ✓ Check the current heating temperature on the display.	0Ω Shortcircuit
	Temperature sensor	Measure the temperature sensor resistance, if the value is 0Ω, replace the temperature sensor	
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.	

5.8.07Error

Error conditions and Symptoms Analysis

Error	Description
07E Hot Water Outlet thermistor open Error	Check the hot water temperature sensor. If a problem (open: 14°F or lower) is detected for 3 seconds, the system displays the error message 07E on the indoor thermostat.
Check items	<ol style="list-style-type: none"> 1. Check if the hot water temperature sensor is open and if the connector is connected properly. 2. Replace the defective hot water temperature sensor. 3. Replace the PCB



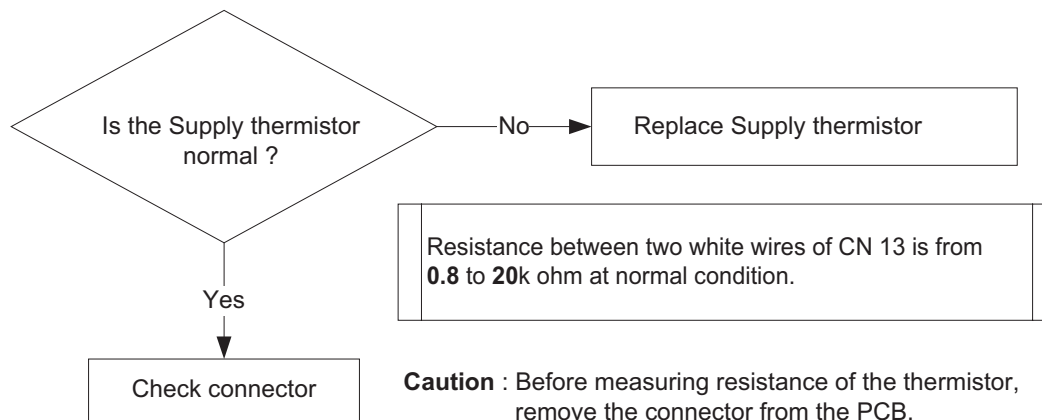
Check method

Fault	Possible Causes	Check method
Sensor error	Defective temperature sensor connector	Check if the heating temperature sensor is open and if the connector is connected properly.
	Temperature sensor	<ol style="list-style-type: none"> 1. Measure the resistance of the temperature sensor. 2. If the resistance is abnormal, replace the temperature sensor.
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

5.9. 08Error

Error conditions and Symptoms Analysis

Error	Description
08E Hot Water outlet thermistor short	Check the hot water temperature sensor. If a problem (short-circuit: 248°F or higher) is detected for 3 seconds, the system displays the error message 06E on the indoor thermostat.
Check items	<ol style="list-style-type: none"> 1. Check if the hot water temperature sensor connector is wet due to any reason, including leakage. 2. Replace the defective hot water temperature sensor. 3. Replace the PCB.



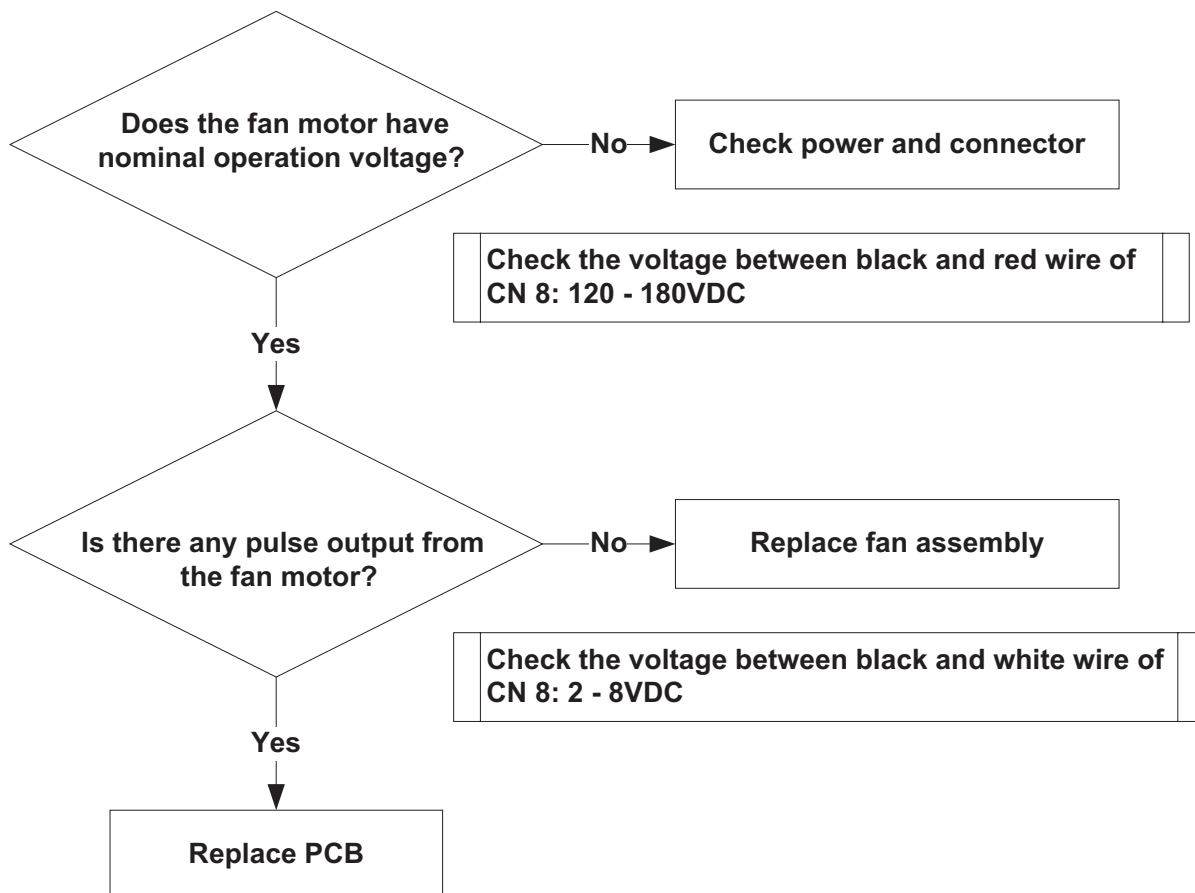
Check method

Fault	Possible Causes	Check method
Sensor error	Defective temperature sensor connector	Check if the hot water temperature sensor connector or the PCB harness terminal is wet due to any reason, including leakage. ✓ Check the current heating temperature on the display.
	Temperture sensor	Measure the temperature sensor resistance, if the value is 0Ω, replace the temperature sensor
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.


5.10. 09Error

Error conditions and Symptoms Analysis

Error	Description
09E Fan Motor RPM error	<p>The system checks the RPM signal after the blower starts to run, and displays the error message 09E in the following cases:</p> <ol style="list-style-type: none">1. If the RPM signal is 400 or lower at pre- purge, the system repeats pre-purge 10 times. If the RPM remains 400 or lower, the system determines RPM error, and the boiler switches into Lock-Out (gas valve and ignition transformer locked). (However, the air volume sen-sor should be normal.)2. If the RPM signal of 400 or lower is detected for 3 seconds during combustion, the system stops combustion, and the boiler switches into Lock-Out. (However, the air volume sensor should be normal.)3. If the pre-purge RPM signal of 400 or lower is detected, and the voltage of the air vol-ume sensor is lower than the standard voltage (ignition voltage), the system determines RPM error, and the boiler switches into Lock-Out.
Check items	<ol style="list-style-type: none">1. Check if the blower works normally. If it does not work normally, check the power supply to the blower (Black + Red, approx. DC 180V).2. Replace the PCB if there is a problem in power supply.3. If the trouble continues despite the checking of above items, replace the blower.4. If RPM is significantly low while the blower works and the power supply is normal, replace the blower.5. If the blower connector is wet due to any reason including leakage, take the corrective action.6. Check for loose connection of white tower on PCB



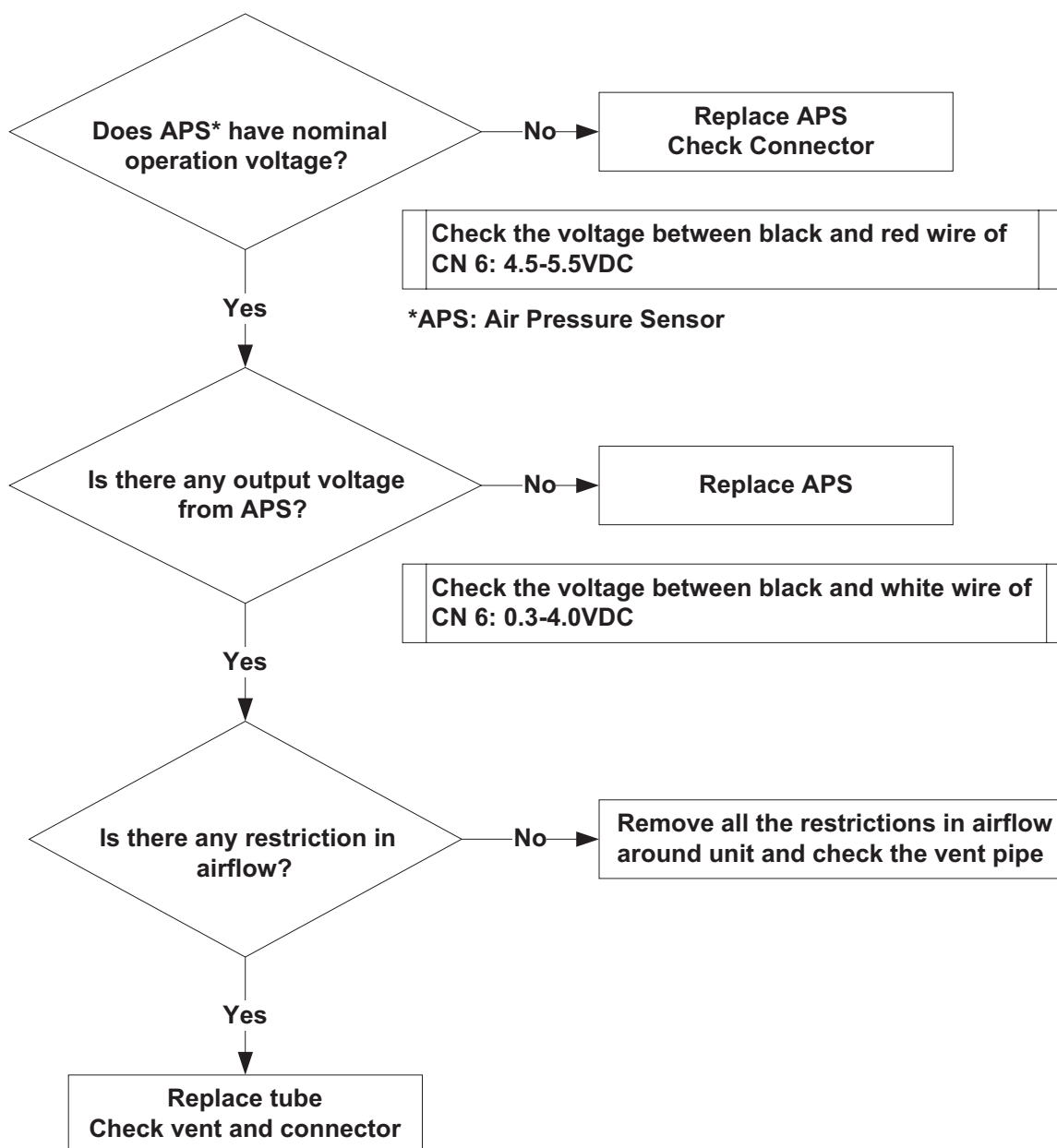
Check method

Fault	Possible Cause	Check method
Blower action error	No blower action	<ol style="list-style-type: none"> 1. Check the power supply to the blower. ✓ Black+Red, approx. DC 127~184V 2. Replace the PCB if power is not supplied normally. 3. Replace the PCB if power is supplied normally. 4. If the trouble continues despite the checking of above items, replace the blower.
		 <p><Check the blower operation voltage></p>
Blower RPM error	Defective rotator	<ol style="list-style-type: none"> 1. If RPM is significantly low while the blower works and the power supply is normal, replace the blower. 2. If RPM is low or there is a sensor circuit error, replace the blower. 3. If the trouble continues despite the checking of above items, replace the PCB.

5.11. 10Error



Error conditions and Symptoms Analysis

Error	Description
10E Air pressure Sensor error	<p>The system senses the air volume and the RPM signal, and displays 10E on the indoor thermo-stat in the following cases:</p> <ol style="list-style-type: none">1. During prepurge If the air volume sensor voltage fails to reach the standard voltage (ignition voltage), while the FAN RPM signal is sensed, the system retries pre-purge. If the air volume sensor voltage fails to reach the standard voltage after 5 pre-purge processes, the system determines the wind pressure error (or the wind pressure hose error), and the boiler switches into Lock-Out.2. During combustion of boiler If the current RPM is higher than the standard RPM by 1,000 or higher, the system determines the wind pressure error (excessive wind pressure), and stops the combustion process. The boiler switches into Safety-Shutdown, and runs the fan continuously. If the current RPM becomes within the standard RPM ± 500, the system cancels the error, and returns to the standby mode.
Check items	<ol style="list-style-type: none">1. Check the air pressure hose (visual inspection on tear and hole, and water remained in the hose after installation).2. Check if the venture (burner) hole is clogged.3. Check if the condensed water hose or the drain is clogged.4. Check the flue and exhaust environment. (Inflow of exhaust gas generates noise.)5. Check if the air supply/exhaust flue is clogged (rainwater collected due to dent or downward installation).6. Check the flue environment (inflow of exhaust gas).7. Defective air pressure sensor or PCB.



Check method

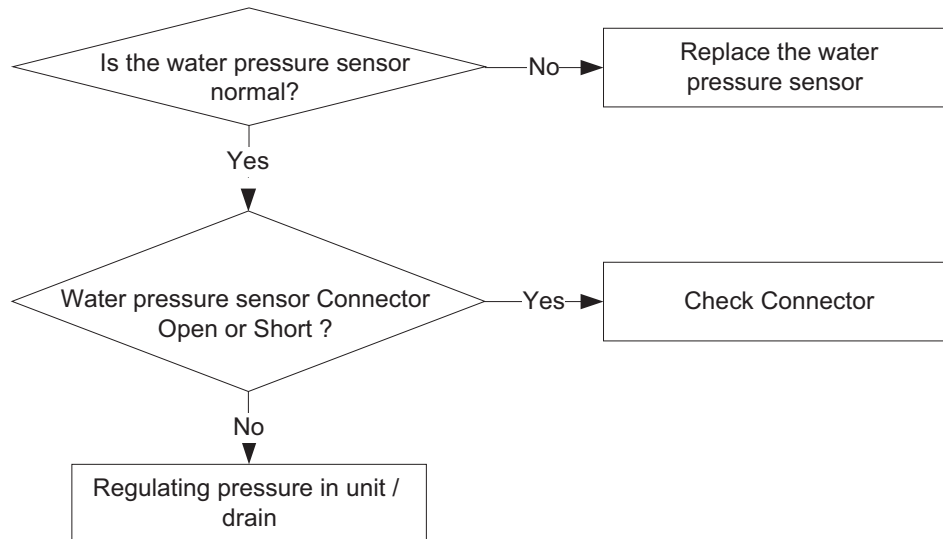
Fault	Possible Causes	Check method
Air pressure sensor error	Air pressure hose error, venturi clogged	<ol style="list-style-type: none"> The air pressure hose is clogged. ✓ Check if the hose is clogged with water remained from installation. Check if the venturi (burner) hole is clogged with soot or debris. ✓ Blow air with mouth through the air pressure hose. Check if the air pressure hose is torn. ✓ Increased RPM may cause blowout and noise. ✓ 03E can occur due to the same trouble.

	 <div style="display: flex; justify-content: space-around; margin-top: 5px;"> <Check if the venturi is clogged.> <Defective wind pressure hose> </div>	
Condensed water drain error	Condensed water drain error	Exhaust air is locked out due to condensed water drain error. ✓ Check if the condensed water hose or the siphon is frozen. ✓ Check if the condensed water hose is folded. ✓ Remove bottom of trap and verify it is not plugged
		
Air pressure error	Defective blower	Replace the blower if the blower RPM is considerably low.
Defective air supply/exhaust flue	Deformed or clogged flue	1. Check the exterior of the flue, including dent. 2. Check if rainwater is collected due to downward installation of air supply pipe.
	Exhaust gas flows in through the supply pipe	If the exhaust gas flows in through the air supply pipe, imperfect combustion may cause 10E due to noise and unstable APS and RPM. ✓ Check the installation of flue and if the standard flue is used.
Detection error	Air pressure sensor controller	If the same trouble continues after reviewing of the above items, 1. replace the air pressure sensor, or 2. replace the PCB.

5.12. 11Error

Error conditions and Symptoms Analysis

Error	Description
11E Water pressure sensor error	Upon receiving a signal from the water pressure sensor, the system displays the following error. 1. E11 High water level. ✓ igh water level error if the water level of 56.6PSI or higher continues 3 seconds. Error is cancelled if water level is 43.5PSI or lower.
Check items	1. E11(Room controller) + E11(main) ✓ Check the pressure increase conditions (high water pressure of 3.9 bar or higher). 2. E11 (Room controller) + SEE ("SEE" on the main display → Sensor Error) ✓ Check if the water pressure sensor is frozen during the winter. Replace the defective water pressure sensor.



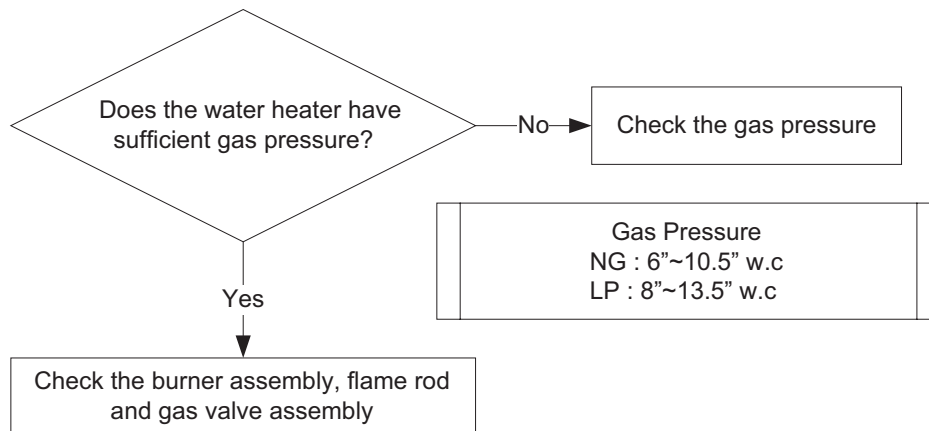
Check method

Fault	Possible Causes	Check method
E11+E11	High water pressure	Check the pressure increase conditions (high water pressure of 3.9 bar or higher). ✓ Defective expansion tank ✓ Excessive forceful water refilling. ✓ Check if the safety valve is stuck.
E11 + SEE	Defective water pressure sensor	1. Check if the water pressure sensor is frozen during the winter. 2. Replace the defective or opened water pressure sensor.

5.13. 12Error

Error conditions and Symptoms Analysis

Error	Description
12E Flame loss	If the system detects loss of flame during combustion, the system stops supplying fuel, repeats restart, counts the loss of flame incidents, and if the incident occurs 20 times in series, displays 12E (manually cancelled) on the indoor thermostat.
Check items	<ol style="list-style-type: none"> 1. Measure, with a meter, the gas supply pressure (NG: 6"~10.5"W.C, LP: 8"~13.5"W.C) 2. Check the Gas meter Capacity. 3. Check the Gas Pipe Diameter (3/4" or wider). 4. Check the PCB DIP S/W capacity setting. 5. 3-stage MIN differential gas pressure adjustment error. 6. Defective air pressure sensor. 7. Check if the nozzle is clogged. 8. Defective multi-stage valve. 9. Defective proportional valve in the main gas valve. 10. Check if the PCB works properly.



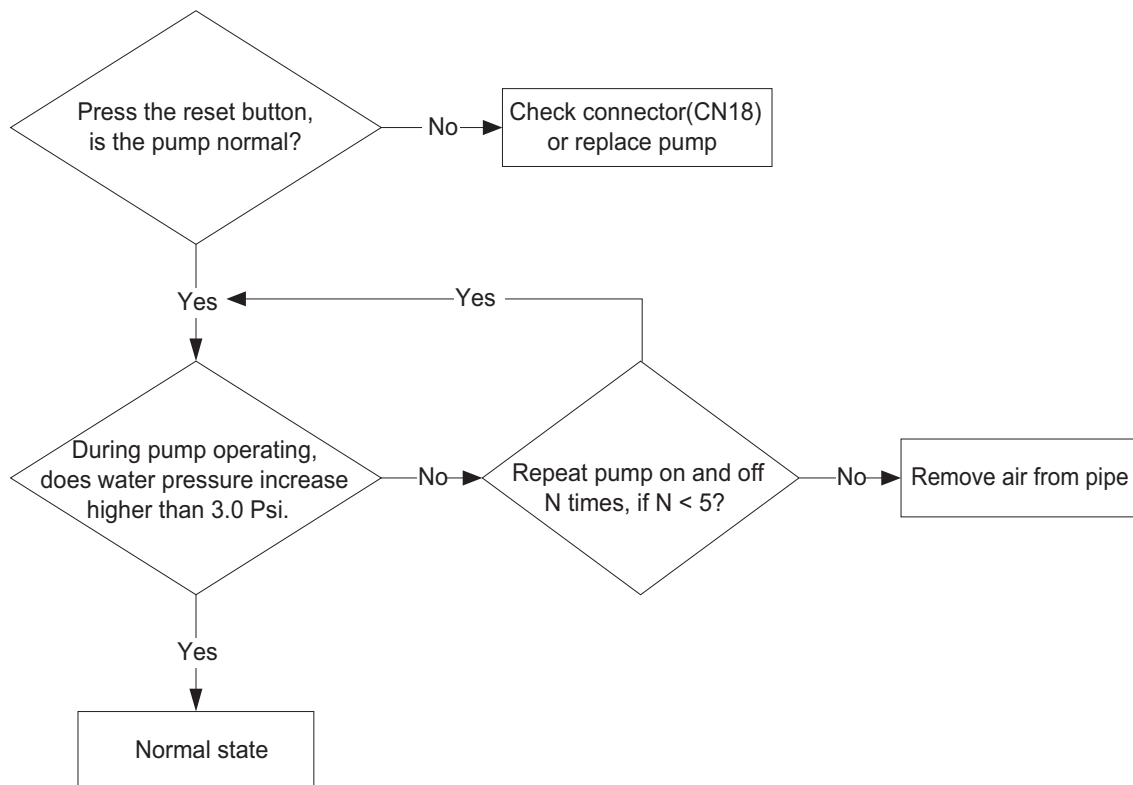
Check method

Fault	Possible Causes	Check method
Thudding noise caused by minimum flow	Defective circulation pump	1. Check the gas supply pressure. ✓ NG: 6"~10.5"W.C, LP: 8"~13.5"W.C ✓ LPG pressure drop occurs frequently in the winter. 2. Check the Gas Pipe Diameter. (3/4" or wider) 3. While the static pressure is normal, a large difference of dynamic pressure may cause drop of gas pressure. Therefore, it is required to check the dynamic pressure. 4. Check the gas pipe connector. ✓ Excessive force in fastening nuts at installation of gas pipe may move the packing and block the Teflon sealing, causing a drop of gas supply pressure. 5. Check the Gas meter Capacity.
	PCB capacity setting error	Check the PCB DIP S/W capacity setting.
Flame blowout and noise occurs after ignition	Differential gas pressure adjustment error	3. stage MIN differential gas adjustment error. ✓ Adjust PCB DIP S/W 1,2 ON in the main gas valve. ✓ Turn the adjusting screw under the main gas valve ½ turn, and check the combustion.
	Defective air pressure sensor	Excessive air volume occurs if the air pressure is higher than the standard value. ✓ Replace the air pressure sensor
Off at switch of stage	Debris in the nozzle	The flame is extinguished due to foreign substance in the nozzle. ✓ Defective stage-1 nozzle causes accidental fire at ignition. ✓ Flame may be blown out if the stage is switched when the nozzles of stages 2 and 3 are in trouble. ✓ Disassemble the manifold and clean the nozzle.
	Defective multistage valve	Flame may be blown out if the stage is switched when the multistage valve is defective.
Flame blowout and noise	Defective proportional valve in the main gas valve	A defective proportional valve of the main gas valve causes trouble in air supply during combustion. ✓ Low gas pressure causes blowout of flame. ✓ Thick flame causes noise and accidental fire.
Other trouble	PCB	If the trouble continues despite the checking of above items, replace the PCB.

5.13. 13Error

Error conditions and Symptoms Analysis

Error	Description
13E Pump error	The system receives change of pressure from the water pressure sensor. If no change of pressure is made for 7 seconds after starting of the pump, the system stops/restarts the pump 3 times. If the pressure is remained unchanged, the system determines a trouble of the pump, and displays the 13E (manually cancelled) error message on the remote controller.
Check items	Check if the pump works normally. If the pressure remains unchanged after the pump is started, replace the pressure sensor. Pressure sensor error. The pump can be stuck from time to time due to debris in the heating water.



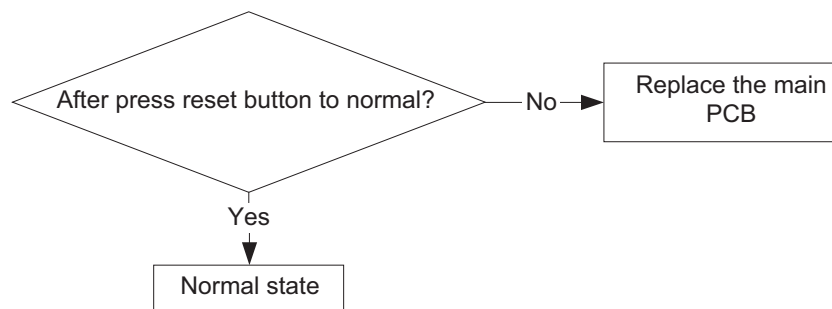
Check method

Fault	Possible Causes	Check method
Thudding noise caused by minimum flow	Pump malfunction	1. Check if the pump works normally. ✓ If the pump is stuck at trial, turn the shaft forcefully with a regular screw driver, and check if it works normally. 2. Check the power supply to the pump. ✓ If power supply is normal, check the charging/discharging of starting condenser. ✓ Check if the pump coil is open. 3. If power supply is abnormal, replace the PCB
	Defective pressure sensor	If the pressure remains unchanged while the pump works, ✓ replace the pressure sensor, and/or ✓ replace the PCB.
The pump is restarted normally	Debris in the heating water	The pump can be temporarily stuck due to contaminated heating water. ✓ Replace the pump after cleaning the heating pipe.

5.15. 15Error

Error conditions and Symptoms Analysis

Error	Description
15E PCB error	If an error occurs in the internal circuit of the PCB (e.g., resistance, transistor or relay fault), the system displays 15E PCB error message.
Check items	<ol style="list-style-type: none"> 1. Defective PCB 2. Check, with a tester, if the PCB is in the rated voltage (AC 97V~138V). 3. Disconnect the grounding wire, and check the PCB.



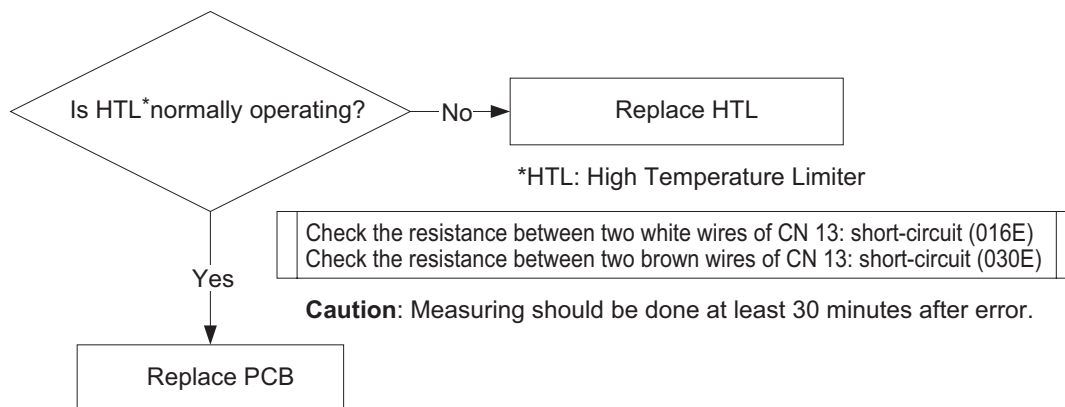
Check method

Fault	Possible Causes	Check method
15E PCB error	Defective PCB	Replace the PCB if there is an error in the PCB internal circuit.
	Power supply error	Check, with a tester, if the PCB is in the rated voltage. ✓ Check, with a tester, if the voltage at the receptacle is 97V~138V.
	Power supply grounding noise	Power supply grounding noise causes malfunction. ✓ Disconnect ground by applying a tape on the grounding terminal in the receptacle, and check if the PCB works normally.


5.16. 16Error



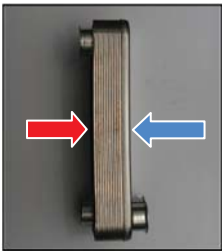
Error occurrence conditions and check items

Error	Description
16E High Limit Switch Cut-off	If the high limit switch cutoff on the heat exchanger is sensed to be 197°F or higher continuously for 1 second at combustion/stop of the boiler, the system displays the 16E (manually cancelled) heat exchanger high limit switch cut-off message on the remote controller. The boiler switches into Lock-Out, and performs post-purge continuously.
Check items	<ol style="list-style-type: none"> 1. Check the heating supply/return valve. 2. Check if the heating strainer is clogged. 3. Check the circulation pump operating status. 4. Check if the high limit switch is defective. 5. Check if the thermal fuse is disconnected. 6. Check the heating supply temperature sensor. 7. Check if the heat exchanger or the DHW heat exchanger is clogged. 8. Check if the heat exchanger is defective.



Check method

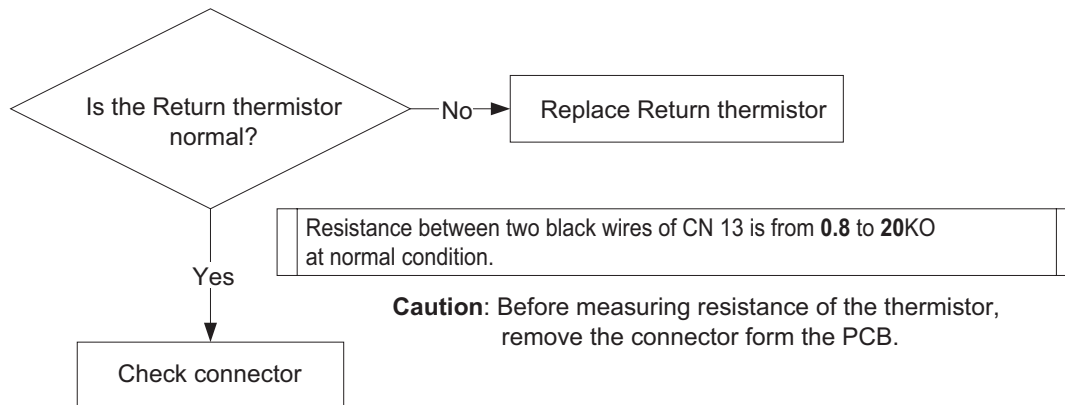
Error type	Cause	Check method	Remark
Heating water not circulated	Valve is closed.	Check if the heating supply/return valve is closed.	
	The strainer is clogged.	Check if the heating strainer is clogged with debris. ✓ Cleaning debris, and analyze the cause, and take the preventive action.	
	Defective circulation pump	1. Check if the pump works normally. ✓ If the pump is stuck at trial, turn the shaft forcefully with a driver (-), and check if it works normally. 2. Check the power supply to the pump. If power supply is normal, use a multi-tester to ✓ Check if the condenser is defective. ✓ Check if there is disconnection of the pump coil. 3. If power supply is abnormal, replace the PCB.	
Defective safety device	Defective high limit switch	Check if the contact point of the overheating PCB is defective. ✓ Use a tester to see if the resistance is normal (0Ω) or abnormal (∞).	
	 <p><Check short-circuit of the high limit switch></p>		
Abnormal safety device	The thermal fuse is disconnected.	Check, with a multi-tester, if the thermal fuse is disconnected. ✓ If the fuse is disconnected, replace the part and check the cause of cutoff.	

	<div>   </div> <div> <p><Location of thermal fuse></p> <p><Check if the thermal fuse is disconnected.></p> </div>		
Abnormal thermistor	Abnormal space heating supply thermistor	<p>This trouble occurs if the heating supply thermistor senses the temperature lower than that of the actual heating water temperature.</p> <p>✓ Replace the heating supply thermistor.</p>	
No circulation	The heat exchanger is clogged.	<p>1. Check if the heat exchanger is clogged.</p> <p>✓ Separate supply/return pipe of the heat exchanger, and blow air with mouth to check if the pipe is clogged.</p> <p>✓ If the 16 Error occurs when hot water is used only, check if the DHW heat exchanger is clogged.</p>	
			
Other trouble	heat exchanger overheated	<p>The surface temperature rises due to defective heat exchanger.</p> <p>✓ Replace the heat exchanger.</p>	
	Defective PCB	<p>If the trouble continues despite the checking of above items, replace the PCB.</p>	

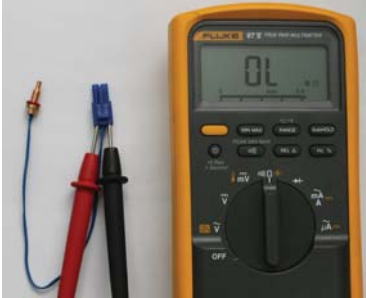
5.17. 18Error

Error occurrence conditions and check items

Error	Description
18E Space heating return thermistor open	If an error (open: 14°F or lower) in the space heating return thermistor is detected continuously for 3 seconds, the system displays the 18E error message. The boiler maintains the Safety-Shutdown status, and if the heating temperature is sensed normally, stops postpurge, and returns to the standby mode.
Check items	<ol style="list-style-type: none"> 1. Check if the thermistor is open and if the connector is connected properly. 2. Check if the thermistor is defective. 3. Defective PCB.



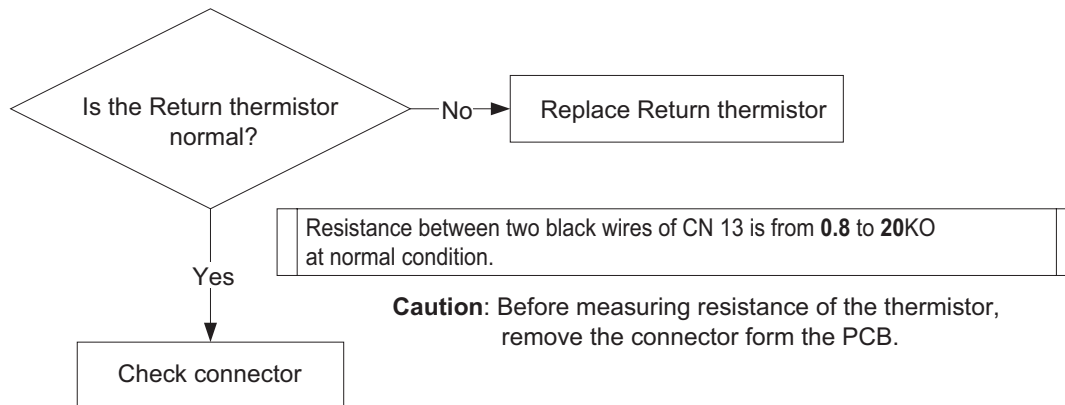
Check method

Error type	Cause	Check method	Error type
Defective sensor	Defective thermistor	Check if the thermistor is open and if the connector is connected properly.	
	Thermistor	If the same phenomenon, replace the thermistor.	
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.	
	 <p><Check if the thermistor is open></p>		MΩ Open


5.18. 19Error

Error occurrence conditions and check items

Error	Description
19E Short-circuit of space heating return thermistor	If an error (short-circuit: 248°F or higher) in the space heating return thermistor is detected continuously for 3 seconds, the system displays the 19E error message. The boiler maintains the Safety-Shutdown status, and if the heating temperature is sensed normally, stops postpurge, and returns to the standby mode.
Check items	<ol style="list-style-type: none"> 1. Check if the thermistor connector is wet due to any reason, including leakage. 2. Replace the defected thermistor. 3. Replace the PCB.



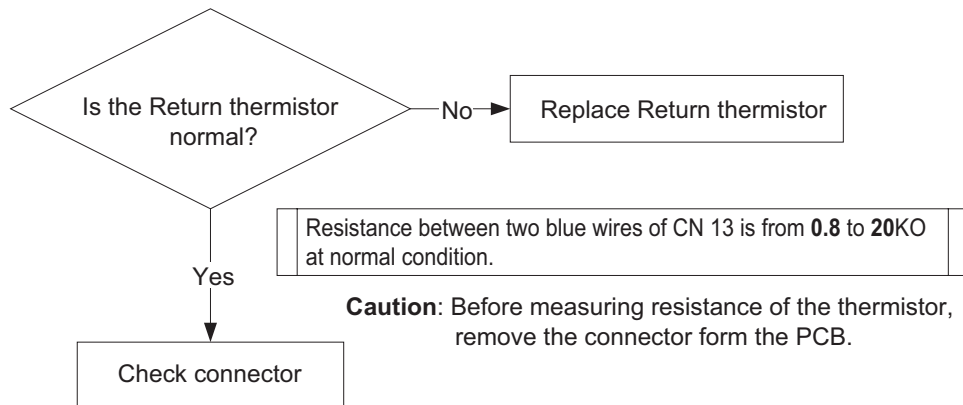
Check method

Error type	Cause	Check method	Remark
Defective thermistor	Defective thermistor connector	Check if the thermistor connector or the harness terminal is wet due to any reason, including leakage.	
	Thermistor	If the same phenomenon, replace the thermistor.	
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.	
	 <p>< Check short-circuit of the space heating return thermistor ></p>		0kΩ Defect

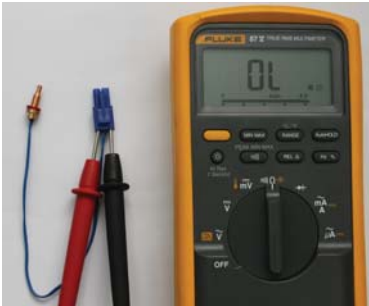
5.19. 21Error

Error occurrence conditions and check items

Error	Description
21E Cold water inlet thermistor open	If an error (open: 14°F or lower) in the cold water inlet thermistor is detected continuously for 3 seconds, the system displays the 21E error message on the remote controller. The boiler maintains the Safety-Shutdown status.
Check items	1. Check if the thermistor is open and if the connector is connected properly. 2. Check the defect of the thermistor. 3. Defective PCB.



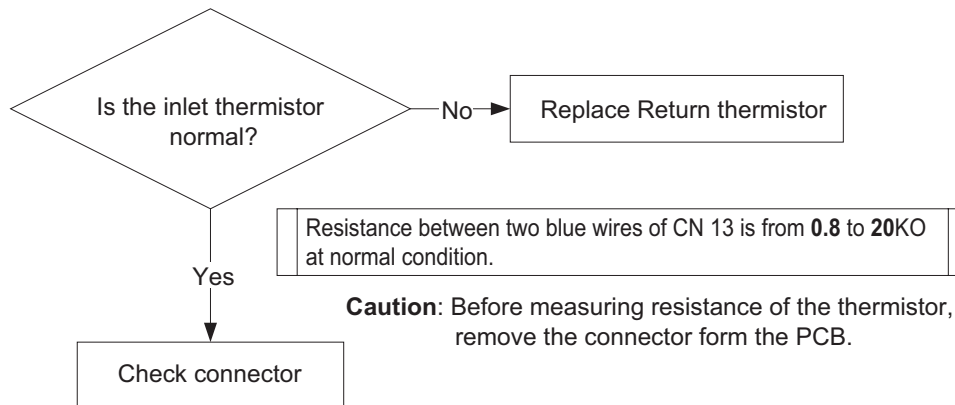
Check method

Error type	Cause	Check method	Error type
Abnormal sensor	Defective thermistor connector	Check if the thermistor is open and if the connector is connected properly.	
	Temperature sensor	Replace the cold water inlet thermistor.	
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.	
	 <p>< Check short-circuit of the cold water inlet thermistor ></p>		MΩ Open


5.20. 22Error

Error occurrence conditions and check items

Error	Description
22E Shortcircuit of cold water inlet thermistor	If an error (short-circuit: 248°F or higher) in the cold water inlet thermistor is detected continuously for 3 seconds, the system displays the 22E error message on the remote controller. The boiler maintains the Safety-Shutdown status.
Check items	<ol style="list-style-type: none">1. Check if the cold water inlet thermistor connector is wet due to any reason, including leakage.2. Replace the defected cold water inlet thermistor.3. Replace the PCB.



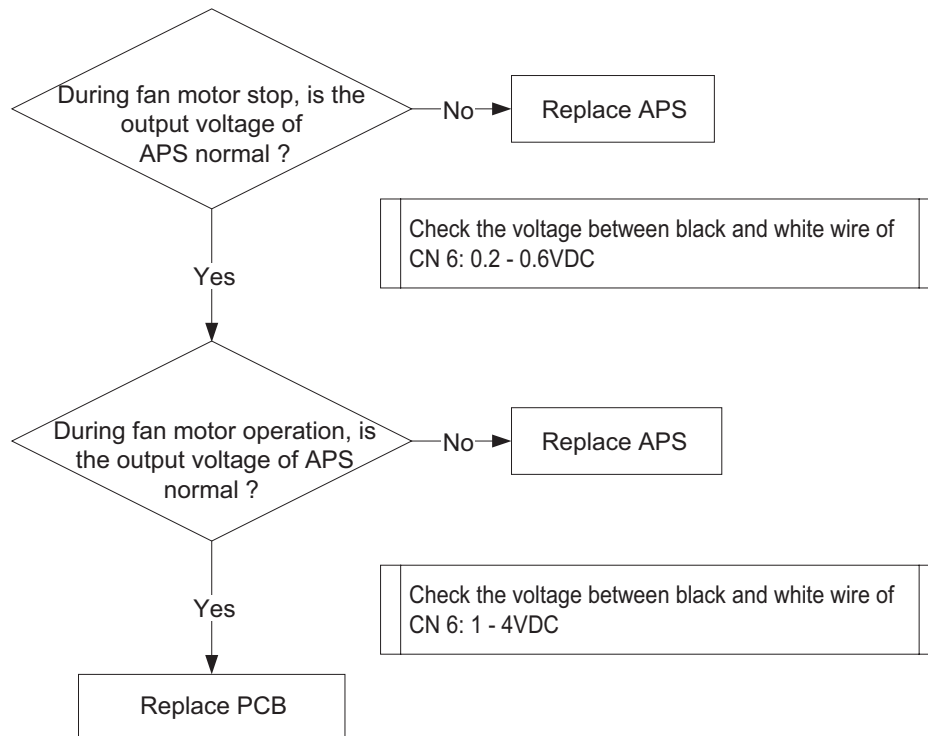
Check method

Error type	Cause	Check method	Remark
Abnormal thermistor	Defective thermistor connector	Check if the cold water inlet thermistor connector or the harness terminal is wet due to any reason, including leakage.	
	Temperture sensor	If the same phenomenon, replace the thermistor.	
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.	
	 <p><Check short-circuit of the cold water inlet thermistor></p>		

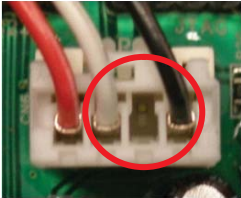
5.21. 27Error

Error occurrence conditions and check items

Error	Description
27E Abnormal air pressure sensor error	If an error (open: $0.1 \pm 0.1V$ or lower / short-circuit: $4.5 \pm 0.2V$ or higher) in the air pressure sensor is detected continuously for 3 seconds, or if the air pressure sensor voltage of $1.20V$ is detected before pre-purge, the system displays the error message 27E on the remote controller.
Check items	Check the assembly of the connector of the air pressure sensor. Check the voltage of the air pressure sensor.



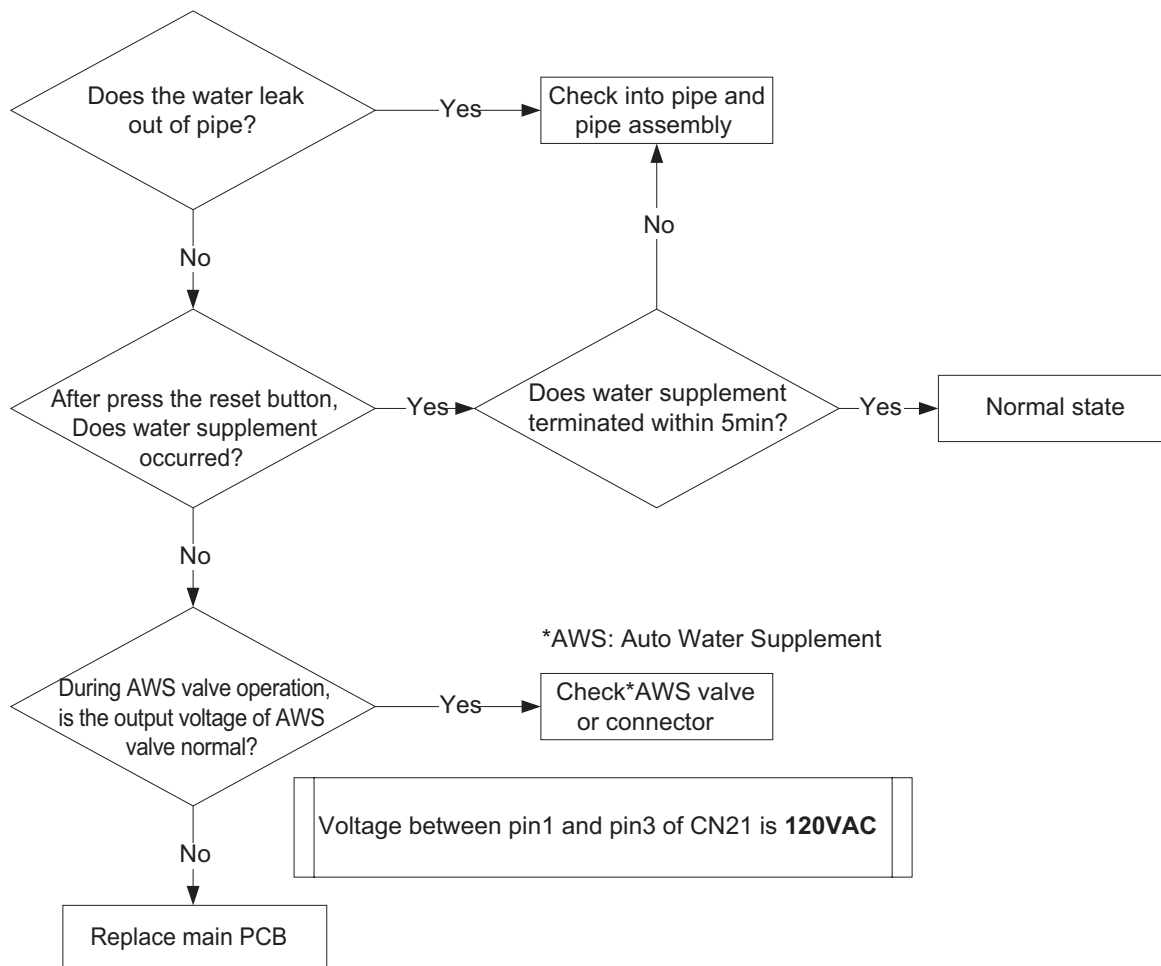
Check method

Error type	Cause	Check method	Remark
Abnormal sensor	Disconnecter	Check connector assembly and contact of the air pressure sensor.	
	Abnormal air pressure sensor	1. Black + White ✓ Operating voltage: 5V 2. Black + Red ✓ Sensor output ✓ Open: $0.1 \pm 0.1V$ or lower ✓ Short-circuit: $4.5 \pm 0.2V$ or higher ✓ An error occurs if the air pressure sensor voltage of 1.20V is detected before prepurge.	
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.	
	 <p><Check the voltage of the air pressure sensor></p>		



5.22. 28Error

Error occurrence conditions and check items

Error	Description
28E Leakage	<ol style="list-style-type: none"> 1. Space heating water pressure of 7.3 psi or lower is maintained for over 5 minutes, the system displays 28E (regardless of initial power supply). 2. If the space heating water pressure of 7.3 psi or lower is detected, and becomes 7.3 psi or lower in 2 hours after water refilling, the system displays 28E. (The error is not displayed until 72 hours is passed after the power is connected initially.)
Check items	<ol style="list-style-type: none"> 1. Check the water pressure sensor. 2. Check if the boiler is installed in a low water pressure area.



Check method


Error type	Cause	Check method	Remark
Leakage	Defect Unit, Leakage	1. Check if there is leakage inside the boiler. 2. Check if there is leakage in the heat exchanger. ✓ Select the trial mode (DIP S/W 2-2 ON), and if drain continues through the condensed water hose, the system determines the heat exchanger defective.	
		 <p><Check if condensed water is generated in the trial mode></p>	
No water refilling / delay	Defective the auto feeder valve	1. If water is not refilled, check the filter in auto feeder valve. ✓ Check if water is not refilled or delayed due to clogging of the auto feeder valve. ✓ Drain heating water through the drain cork on the bottom of the pump, and try refilling again. 2. Check the operating voltage (120V). ✓ If power is supplied normally, replace the auto feeder valve. ✓ If power is not supplied, replace the PCB.	
		 <p><Check the filter and the valve terminal.></p>	
Water pressure sense error	Water pressure sense error	Abnormal the Water pressure sensor. Abnormal display.	
	Suspension	Suspension of cold water supply or the cold water frozen.	
	PCB	If the trouble continues despite the checking of above items, replace the PCB.	

5.23. 30Error

Error occurrence conditions and check items

Error	Description
30E Exhaust high limit error	If the system senses the signal continuously for 1 second from the exhaust high limit switch installed at the top of the exhaust duct when the boiler burns/stopped, the system displays the 30E (automatically cancelled) heat exchanger exhaust high limit switch message on the remote controller. The boiler switches into Lock-Out, and performs post-purge continuously. Exhaust high limit switch operating temperature: 149°F (65°C)
Check items	1. Check if the exhaust high limit switch operates normally. 2. Check if the switch works properly.

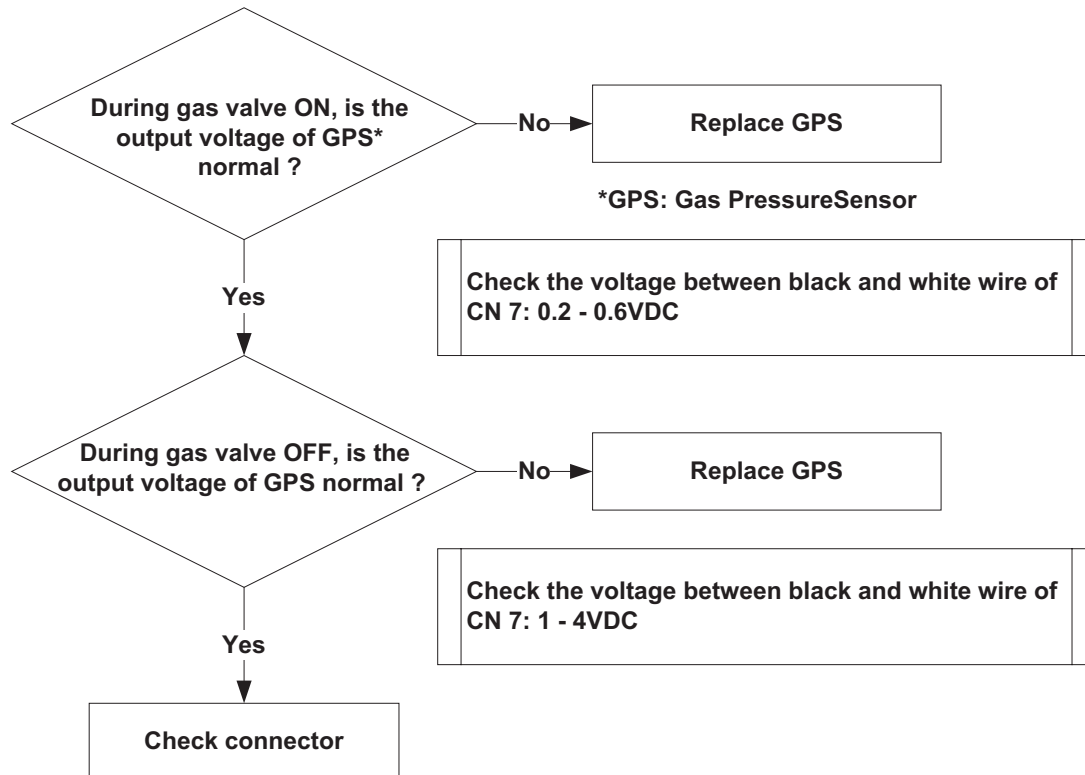
Check method

Error type	Possible Causes	Check method	Remark
Abnormal sensor	Abnormal the exhaust high limit switch	Abnormal contact point of the exhaust high limit switch 149°F (65°C). ✓ Remove the switch and check, with a multitester, the resistance (MΩ defect).	
	 <p><Check the exhaust high limit switch.></p>		
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.	

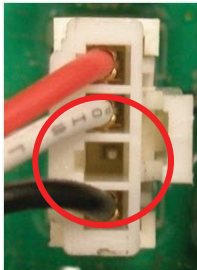
5.24. 35Error

Error occurrence conditions and check items

Error	Description
35E Gas pressure sensor error	The GPS output voltage of 0.1 VDC or 4.5 VDC is detected for 5 seconds, the system displays the 35E error message.
Check items	<ol style="list-style-type: none"> 1. Check if the gas is supplied normally. 2. Check if the GPS hose is bent or torn. 3. Check the GPS parts. 4. Check the PCB parts.



Check method

Error type	Cause	Check method	Remark																	
	No gas is supplied.	Check if the valve is closed or if there is a problem in the gas meter.																		
	GPS hose	Check if the GPS hose is bent or torn.																		
	Defective GPS part	Check the output voltage.																		
	<div></div> <p><Check the harness.></p> <table><tr><th colspan="2">Gas Pressure Sensor</th><th>Target</th><th>Range</th></tr><tr><td rowspan="3">F</td><td>CN7</td><td>Black-Red (Input)</td><td>DC 5V</td><td>DC 4.5~5.5V</td></tr><tr><td></td><td>Black-White (Output while in Standby)</td><td>DC 0.2~0.6V</td><td>DC 0.3~4.5V</td></tr><tr><td></td><td>Black-White (Output while Operating)</td><td>DC 1~4V</td><td>DC 0.3~4.5V</td></tr></table>			Gas Pressure Sensor		Target	Range	F	CN7	Black-Red (Input)	DC 5V	DC 4.5~5.5V		Black-White (Output while in Standby)	DC 0.2~0.6V	DC 0.3~4.5V		Black-White (Output while Operating)	DC 1~4V	DC 0.3~4.5V
Gas Pressure Sensor		Target	Range																	
F	CN7	Black-Red (Input)	DC 5V	DC 4.5~5.5V																
		Black-White (Output while in Standby)	DC 0.2~0.6V	DC 0.3~4.5V																
		Black-White (Output while Operating)	DC 1~4V	DC 0.3~4.5V																
Other trouble	Defective PCB	Check the output If the trouble continues despite the checking of above items, re-place the PCB.																		

5.25. 36Error

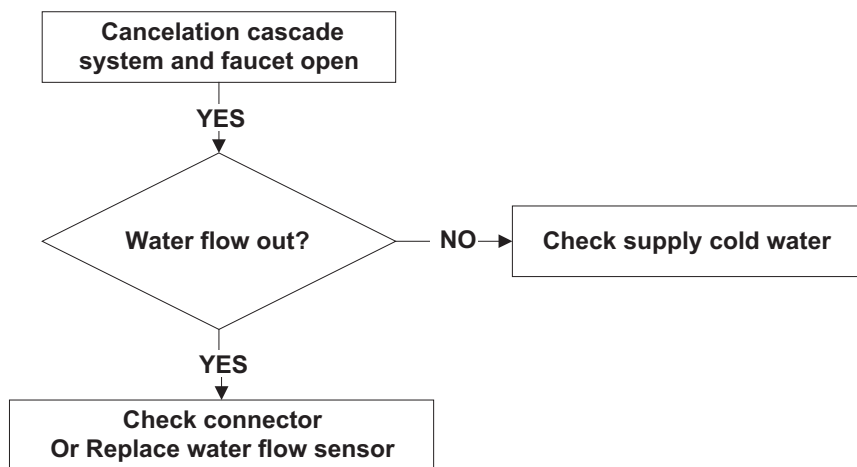
Error occurrence conditions and check items

Error	Description
36E Communi- cation error	If no response is made during communication between the mast unit and the slave units, the system displays the 36E error message.
Check items	<ol style="list-style-type: none">1. Check if power supply to a boiler unit is off.2. Check if the communication cable is damaged or disconnected.3. Check if the dip switch setting is correct.4. Check if the cascade setting is correct.

5.26. 39Error

Error occurrence conditions and check items

Error	Description
39E Flow sensor error	As one more units are operating in the cascade system.The system displays 39E (cleared manually) on the remote controller and the PCB, and switches into the Lock-out mode.(gas valve and ignition transformer locked).
Check items	1. Check the supply of cold water. (Frozen / locked valve) 2. Defective flow sensor 3. Defective PCB.



5.27. 40Error

Error occurrence conditions and check items

Error	Description
40E Short-circuit of outdoor temperature sensor	While the boiler power is ON, the system checks the out temperature, and displays 40E error message if the temperature is 122°F (50°C) or higher.
Check items	<ol style="list-style-type: none">1. Check if the outdoor temperature sensor is disconnected, and if the connector is connected properly.2. Check if the outdoor temperature sensor is defective.3. Defective PCB.

5.28. Troubleshooting guide by symptom



5.28.1. Noise

Error type	Cause	Check method
Vibration noise	Defective of installation	Incorrect level setting or fixing error ✓ Check the fixing state, and reinstall the unit.
	Fan motor vibration noise	Vibration caused due to defective the fan motor balance. ✓ Touch the fan. If vibration is significant, replace the fan motor. ✓ If intermittent noise occurs during operation, check the fan motor. ✓ If vibration noise occurs during operation of the product, and stops when the case lid is removed, check the fan motor.
Regular noise	Noise from operation of 3-way valve	Regular noise occurs. Noise of motor running continuously due to defective 3-way valve MICRO s/w. Motor rotation noise. Replace the 3-way valve.
Noise at ignition	Gas and air differential pressure error (Pop~, Beep~, Explosive ignition)	Incorrect setting of Gas differential pressure. Adjust differential pressure with the pressure adjusting screw on the main gas valve. DIP S/W 1,2 ON (Stage 3 MIN), 17±1 mmH ₂ O (210/240 model) If noise occurs at standard value, adjust setting above/below the standard. Excessive gas supply due to defective proportional valve on the main gas valve. Replace the main gas valve. Gas supply error due to defective air pressure sensor. Defective PCB.
Noise during combustion	Boiling noise (Beep~)	How to check boiling noise: Raise the water temperature to 158°F (70°C), and check the noise.
	Low gas pressure (whirring~)	Exhaust gas flown into the boiler through the air intake makes combustion noise. Check the distance between intake and exhaust. Check the distance between exhaust pipes if two or more units are installed. Check if there is any obstacle near the exhaust pipe.
		Noise occurs due to flame lifting when gas pressure is low. Check the gas supply pressure. Low gas supply due to incorrect setting differential pressure.
	Noise from burner stage switch	Disassemble the nozzle and check if the hole is narrowed due to debris. Set DIP S/W 1, 2 to ON (3-stage MIN), and check the flame. Compare flame of Burner at combustion section of stages 1, 2 and 3. Check the nozzle if there is a comparatively unbalanced burner section.
		Noise due to defective air pressure sensor. Replace the air pressure sensor.
	Noise during combustion	Noise due to torn air pressure hose. Noise may be intermittent depending on the size of the damage.

5.28.2. Hot water

Error type	Cause	Check method
Cold water from hot water pipe	Improper plumbing	Hot water pipe and direct water pipe are inverted.
	Abnormal flow sensor	Abnormal rotating flow sensor Disassembly-cleaning is possible as a temporary measure. The priority should be given to replacement of the part.
	Abnormal 3-way valve	Switching from heating to hot water fails. If the hot water temperature does not rise while the boiler is running, check the heating outlet pipe. Check the power supply to the 3-way valve (Blue + Black AC120V) 120V) Replace the PCB if power is not supplied.
	Defective space heating supply thermistor	Current thermistor sensing error. If no hot water is acquired while the remote controller is in the hot water mode, and displays high hot water temperature, it is due to the defective space heating supply thermistor. Replace the thermistor.
Low hot water temperature	Defective DHW heat exchanger	The hot water temperature is low while the boiler burns and operates normally. Direct water is mixed with hot water due to defective internal shape of hot water inlet/outlet of the DHW heat exchanger. Replace the DHW heat exchanger.
	Hot water setting error	Check the hot water temperature setting on the remote controller.
	High water pressure	Water pressure is too high for the boiler capacity. Install a reducing valve, and adjust water pressure with an intermediate valve. Refer to the hot water supply capacity on the rating plate. EX) CH-210 / Water Temperature+77°F=4.5GPM
	Defective flow sensor	In the speed hot water function, the boiler operates with the pre-heating function. It is impossible to switch the hot water mode from the room controller, but the pre-heat lamp flickers only. Lukewarm water is acquired. Replace the flow sensor.
	Circulation error due to foreign substance	An error in internal circulation of the boiler due to debris caused by aging of pipe. Check if the space heating strainer is clogged. Check if the DHW heat exchanger is clogged with debris. To check if the DHW heat exchanger is clogged, touch both sides of the DHW heat exchanger, and check if there is substantial difference of temperature.
	Water mixed with cold water	The temperature of hot water at the tap is low while the temperature is high at the hot water outlet. The hot water pipe is installed such that hot water is mixed with cold water. Cold water and hot water are mixed due to improper installation of the tap.
No hot water from the faucet	Check the pipe	The boiler cold water valve is closed. Check if the cold water filter is clogged with debris. Check if the cold water / hot water pipes are frozen during the winter.

Check method

Error type	Cause	Check method	Remark
No space heating, while the boiler runs	The space heating strainer is clogged.	Check if the space heating strainer is clogged with debris. Check the cause of debris if the space heating strainer is clogged. (Aluminum distributor oxidized steel, etc.)	Combustion ON/OFF is repeated if the heating circulation flow is low.
	<div><div></div><div></div></div> <div><Location of space heating strainer> <Check the space heating strainer></div>		
	Defective circulation pump	Low circulation due to defective circulation pump impeller Low circulation pump RPM Replace the pump	
	Defective circulation in distributor and pipe	Check if the distributor room valve is open. Low heating circulation flow as the distributor or aged pipe is clogged. If only 1 valve of the distributor is open, heating is delayed or is not done due to low circulation of space heating water. If heating is not done evenly, adjust the distributor valves to make the circulation even.	
No combustion of boiler	Defective thermistor	Heating is not done due to defective supply thermistor or return thermistor. If the temperature is sensed higher than the actual temperature, replace the thermistor.	
	Detect DHW flow	Continuous heating is not provided due to 5-min waiting function when there is small leakage from DHW pipe. Water flow is detected according to the change of direct water pressure. ✓ Continuous heating may not be provided due to 5-min waiting function when water flow is detected at the site where a direct water pressurizing pump is used. ✓ Remove the water flow sensor connector, operate the heating function, and check if temperature changes. Normal if the water flow value is "00" when the boiler is not operating.	
Warm floor when heating function is not used.	Defective 3-way valve	When hot water flows in the heating line as the 3-way valve is not switched to heating for preheating for hot water or due to defective packing. Replace the 3-way valve.	

Error type	Cause	Check method	Remark
Circuit breaker operation	Power supply	The circuit breaker operates immediately as soon as the power cord is plugged in the receptacle. Check the sheath of power cord, or if there is short-circuit. Check the devices in the order of the power transformer and the PCB.	
	Defective part assembly	If the circuit breaker operates after a repairing work, check the wiring of each part. Mind the direction when assembling the ignition transformer. Be careful that wire is not pressed down when assembling the main gas valve. Check if the wire is fixed and well adjusted on the main side of the heat exchanger.	
	Circuit breaker operates while the boiler is running	If circuit breaker operates during the operation of the boiler, check the order of operation, and replace the concerned part. e.g., The circuit breaker operates at switchover to burner stage 3 after ignition. ► Replace the gas manifold valve.	
Remote controller power	Check the wire	Check the power supply to the remote controller terminal. (DC 19V or higher) If there is a problem in power supply, check the output voltage of the PCB, and take the action separately for wiring error and defective PCB, respectively. If the power supply is normal, replace the remote controller.	

6. Inspection

6.1. Preparing the Boiler for Inspection

- Precautions on security before working
- Inspection items and entire procedures
- Tools required when inspection
 - Volt/Ohm/Amp meter with test probes
 - Digital manometer or U tube type manometer with 14 inch water column (w. c.) scale, a hose and two 1/8 inch taps
 - Assorted screw drivers
 - Leak solution or leak detector
 - Teflon tape

6.2. Measuring Gas Pressure Setting

6.2.1. How to Check Inlet Gas Pressure

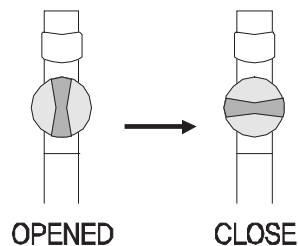
All Safety messages will refer to potential hazards. Precisely follow the instructions to avoid the risk of injury.

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

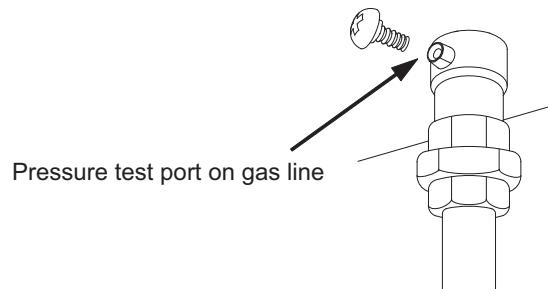
THIS SECTION IS ONLY TO BE DONE BY A LICENSED PROFESSIONAL

Procedure to measure the inlet gas pressure:

1. Shut off the manual gas valve on the supply gas line.
2. Open a hot faucet. The unit should turn on and the gas in the gas pipe line should purge. Leave the faucet on to keep the unit running until the unit shuts down due to lack of gas supply. Then shut off the hot faucet.



3. Remove the screw for the pressure port located on the gas inlet of the boiler.



4. Connect a manometer to the pressure port and reset it to zero.
5. Re-open the manual gas valve. Check to see that there are no gas leaks.
6. Open multiple fixtures that have high flow rates (bathtub, showers, kitchen sink) to ramp the boiler up to its maximum burn.
7. When the Navien boiler is at maximum burn, check the inlet gas pressure reading on the manometer; it should read between 6.0"~10.5" W.C for Natural gas between 8.0"~13.5" W.C for Liquid Propane.
8. The maximum inlet gas pressure must not exceed the value specified by the manufacturer and that the minimum value listed is for the purposes of input adjustment.

6.2.2. Adjusting the Gas-Air Ratio

The Navien water heater cannot operate properly without suitable gas-air pressure. Below are instructions on how to check the gas-air pressure.

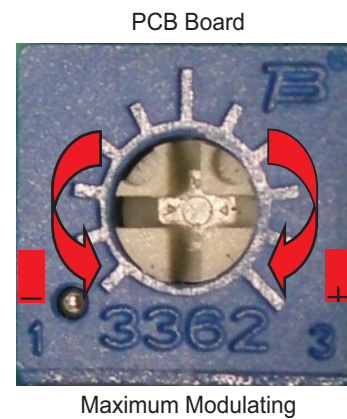
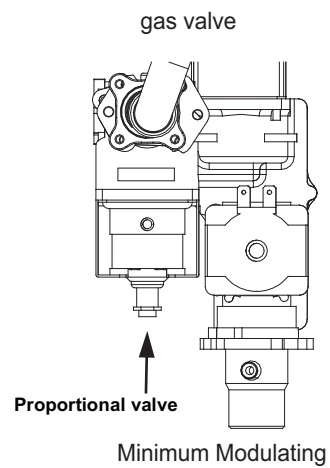
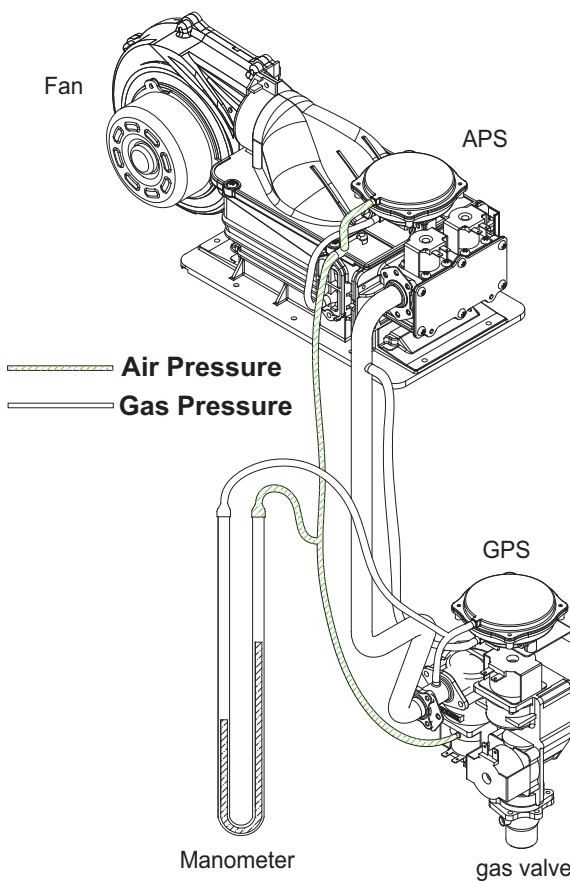
THIS SECTION IS ONLY TO BE DONE BY A LICENSED PROFESSIONAL

Procedure to Adjusting the Gas-Air Ratio:

1. Close the gas shut off valve on the supply gas line.
2. Remove four screws securing the front panel. Remove front panel
3. Connect a manometer or pressure gauge to the gas pressure sensor tube (high pressure) and the air pressure sensor tube (low pressure) like following picture in next page.
4. Re-open the gas shut off valve. Check to see that there are no gas leaks.
5. Set the DIP switches for the 3rd stage minimum operation mode (#1: ON, #2: ON). Open a hot faucet.
6. When the Navien boiler is burning at the 3rd stage minimum, check the gas-air pressure difference reading on the manometer. Compare the gas-air pressure difference with FACTORY setting chart in bottom page. When the gas-air pressure difference is out of standard range, adjust the pressure difference by rotating the proportional valve. (refer to the following picture in next page)
7. Shut off the hot faucet after checking and adjusting the gas-air pressure difference.
8. Set the DIP switches for the 3rd stage maximum operation mode (#1: ON, #2: OFF). Open a hot faucet that has high flow to ramp the boiler up to its maximum burn.
9. When the Navien Boiler is burning at the 3rd stage maximum, check the gasair pressure difference reading on the manometer. Compare the gasair pressure difference with FACTORY setting chart in bottom page. When the gasair pressure difference is out of standard range, adjust the pressure difference by rotating the variable resistance on the PCB board (Controller).
10. Shut off the hot faucet after checking and adjusting the gas-air pressure gap. Close the gas shut off valve. Set the DIP switches for normal mode and replace tubes.

Standard Setting Chart of the Gas-Air Pressure

Model	Type	Gas-Air Pressure Difference	
		3 Stage Min. Burn	3 Stage Max. Burn
CH-180	Natural Gas	0.86" \pm 0.04" W.C	2.68" \pm 0.08" W.C
CH-210	Natural Gas	0.63" \pm 0.04" W.C	1.61" \pm 0.08" W.C
CH-240 CH-240 ASME	Natural Gas	0.63" \pm 0.04" W.C	2.13" \pm 0.08" W.C



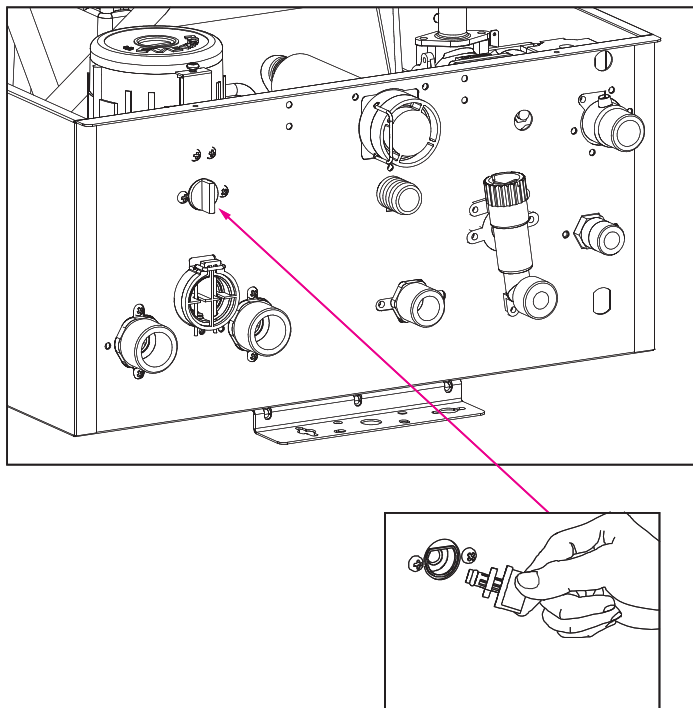
7. Maintenance

Describe precautions before maintenance, and show tools required when maintenance.

7.1. Draining the Combination Water Heater / Boiler

Procedure to drain the unit (figure below). You will need to prepare a bucket to collect some of the water to be drained.

1. Turn off the power to the unit.
2. Close the gas valve
3. Close the water supply valve on the space heating return to the unit. If there is no valve, turn off the water supply valve at the water meter.
4. Open the pump drain plug on the pump and allow the water to drain.
5. Open the pump drain plug at hot outlet side, open the drain valve inside the unit, open the drain valve at the pump and remove the filter from the space heating return side.
6. When the water is completely drained, return the pump drain plug and the inlet filter and close the pump drain plug inside the unit.

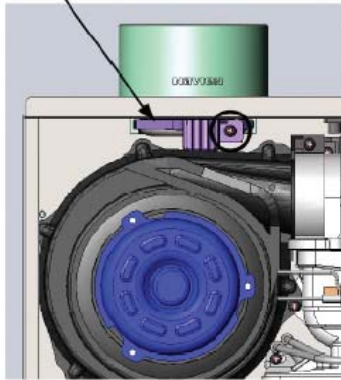


7.2. Cleaning the Intake Air Filter

Clean the intake air filter just above the fan and under the air intake pipe in the top left corner of the boiler as the following.

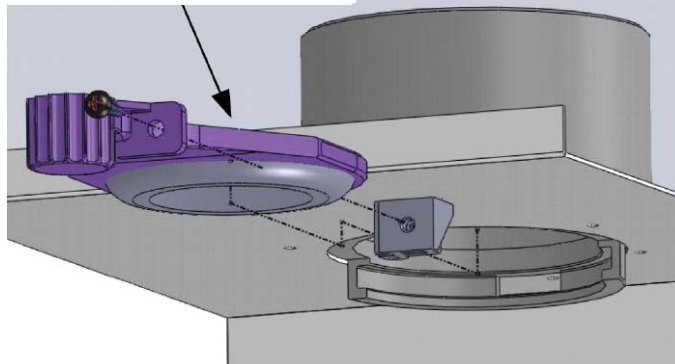
1. Remove the screw is located in the circled areas in the figure.

Intake Air Filter



2. Remove the intake air filter from the bottom of the intake pipe by pulling it out towards the front.

Intake Air Filter



3. Remove the filter from the plastic assembly.
4. Clean it with a toothbrush and water.
5. Re-fit the screen in to the plastic assembly and fit the filter.
6. Frame onto the bottom of the air intake pipe.
7. Once the filter is back on the intake pipe, reset the fan back to its original position.

Insert the fan on an angle into the back corner of the case and then move it into its correct position,

8. Replace the screws.

8. Replacement of Parts

8.1. Replacement Procedure



DANGER

1. When performing maintenance and/of servicing the combination boiler, always turn off the electric power, gas and water shut-off valve. Wait for the boiler to become cool. Be careful to avoid injury to your fingers on sharp edges.
2. Drain all water from the boiler when removing the water parts.
3. Before any disassembly, make sure you have a good diagnosis.
4. Handle all parts carefully.
5. When reassembling, prevent any foreign substance, i.e. dust, etc. from being introduced into the boiler.
6. After reassembling, check for gas and water leakage. Then, test ignition. Make sure that there is no gas leakage in connections by testing with soap bubble solution. Bubbles indicate a gas leak that must be corrected.
7. Check the performance and operation after servicing.

To remove and replace any parts on this unit, you will need a magnetic tip screwdriver that is at least 8 ~ 10 inches long. A flashlight and magnetic tip reach are also handy. Navien recommends the use of a parts tray or bowl to hold small parts and screws. All of the hardware is essential to the proper operation of the unit upon re-assembly.

NOTICE

When disassembling and reassembling the combination boiler, refer to the components diagram & parts list.

8.2. Components Replacement Instructions

8.2.1. PCB

1. Turn off the gas supply
2. Turn off the 120V power supply
3. Turn off the water supply
4. Remove the four screws securing the front panel. Remove front panel.
5. Remove the all connecting housing into the PCB.



Figure 1

6. Loosen the PCB 2 screw from bottom PCB bracket.

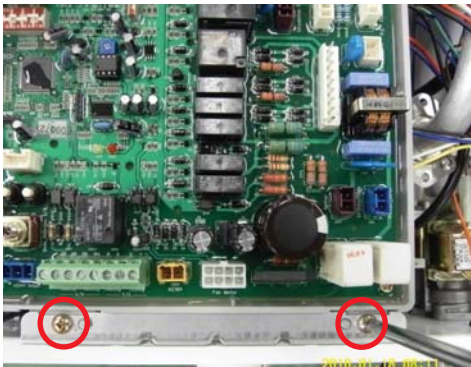


Figure 2

7. Loosen the PCB upper 1 screw from PCB bracket.

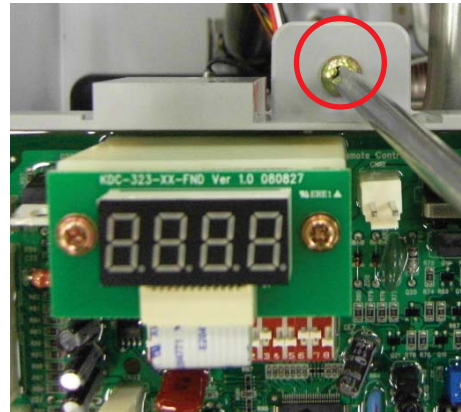


Figure 3

8. Pull out the PCB.
9. Attach the new PCB tighten screws.
10. Connect the all connecting housing into the PCB.
11. Install front panel using 4(four) screws.
12. Turn on water supply, power supply, and gas supply.
13. Perform the measuring of gas pressure setting procedure.

NOTE

Connecting ports must be right color and place.

8.2.2. Fuse

1. Turn off the gas supply
2. Turn off the 120V power supply
3. Turn off the water supply
4. Remove the four screws securing the front panel. Remove front panel.
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Remove the capsule (A)'s B/C connected to the power cable.
7. Pull out the fuse.
8. New fuse into the part C and assemble B/C.
9. Replace the PCB. (refer to 8.2.1 PCB)
10. Fix the PCB screw from PCB bracket.
11. Install front panel using 4(four) screws.
12. Turn on water supply, power supply, and gas supply.

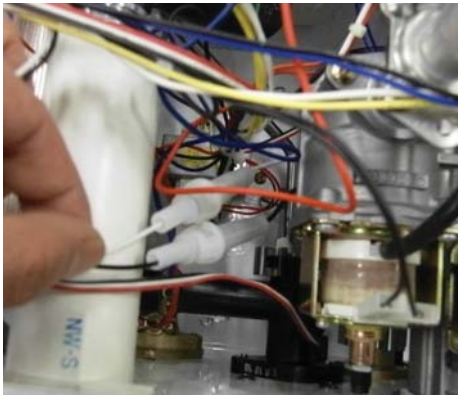


Figure 4

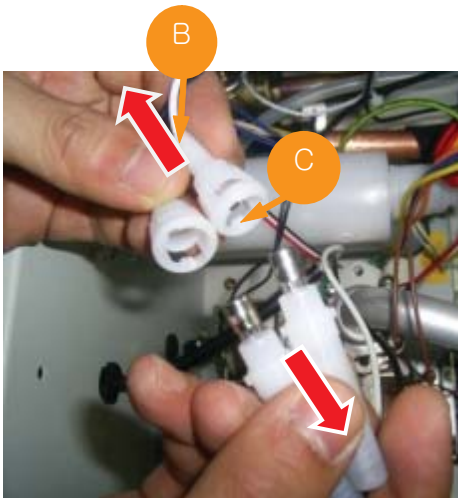


Figure 5

NOTE

Before remove, press the part B into part C and put together as removing the capsule.

8.2.3. Transformer

1. Turn off the gas supply.
2. Turn off the 120V power supply.
3. Turn off the water supply.
4. Remove the four screws securing the front panel. Remove front panel.
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Loosen the 2 screws from power transformer.

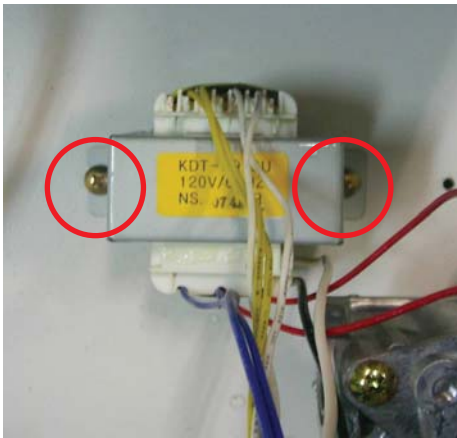


Figure 6

7. Pull out the power transformer.
8. Replace with new power transformer.
9. Tighten the 2 screws from power transformer.
10. Replace the PCB. (refer to 8.2.1 PCB)
11. Install front panel using 4(four) screws.
12. Turn on water supply, power supply, and gas supply.

8.2.4. Fan Motor(Combustion Air)

1. Turn off the gas supply
2. Turn off the 120V power supply
3. Turn off the water supply
4. Remove the four screws securing the front panel. Remove front panel.
5. Loosen three fixing screws from the fan assembly

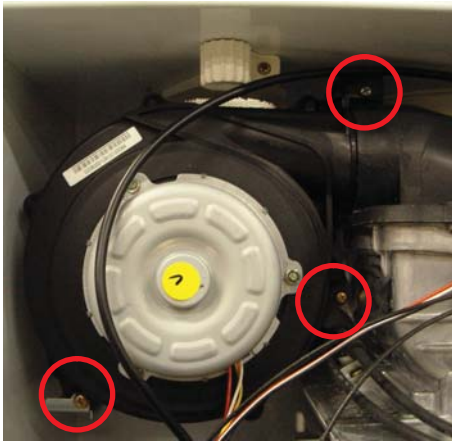


Figure 7

6. Disconnect the harness housing at the fan assembly.



Figure 8

7. Pull out the fan assembly.



Figure 9

8. Attach the fan to be replaced.
9. Fix the three screws of the fan.
10. Attach the harness housing to the fan assembly
11. Install front panel using 4(four) screws.
12. Turn on water supply, power supply, and gas supply.

NOTE

1. Don't over tight screws with high torque drill. It will damage to fan housing.
2. Confirm whether the screws tighten enough or not.
3. Confirm whether there are unnecessary noises after reinstalled fan.

8.2.5. Flame Rod

1. Turn off the gas supply
2. Turn off the 120V power supply
3. Turn off the water supply
4. Remove the four screws securing the front panel. Remove front panel.
5. Pull out the fan assembly (refer to 8.2.4 Fan Motor)
6. Remove the Ignition Transformer Cable.



Figure 10

7. Remove the flame rod cable

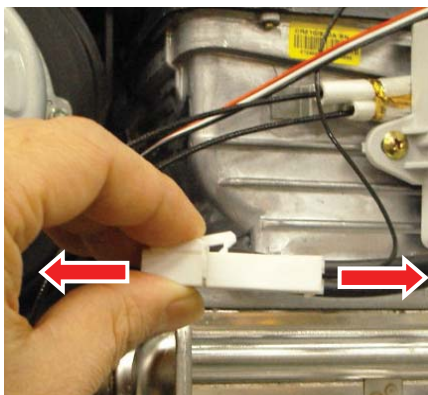


Figure 11

8. Loosen the 2 ignition electrode screws.

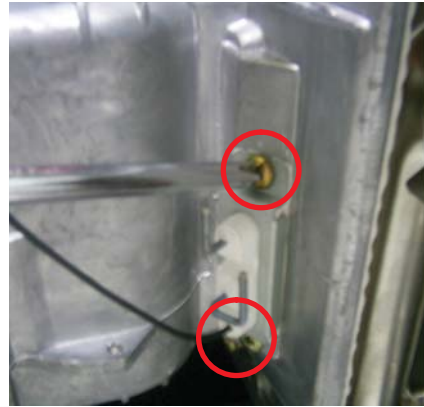


Figure 12

9. Pull out the igniter
10. Attach the new ignition electrode and tighten screws.
11. Connect the trans cable and flame rod cable into the ignition electrode and flame rod.
12. Attach the fan to be replaced. (refer to 8.2.4 Fan Motor)
13. Install front panel using 4(four) screws.
14. Turn on water supply, power supply, and gas supply.

NOTE

Always use factory seal packing between the electrode and burner assembly.

8.2.6. Ignition Transformer

1. Turn off the gas supply
2. Turn off the 120V power supply
3. Turn off the water supply
4. Remove the four screws securing the front panel. Remove front panel.
5. Pull out the fan assembly (refer to 8.2.4 Fan Motor)
6. Remove the Ignition Transformer Cable. (refer to 8.2.6 Ignition Transformer)
7. Remove the igniter connecting housing into the PCB.

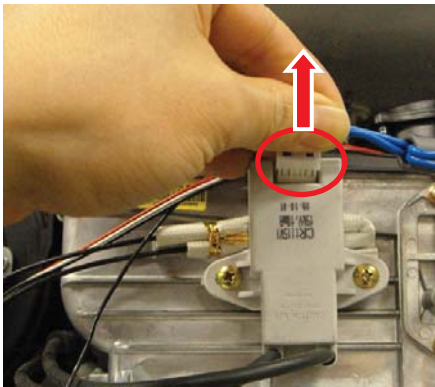


Figure 13

8. Loosen the two igniter screws.

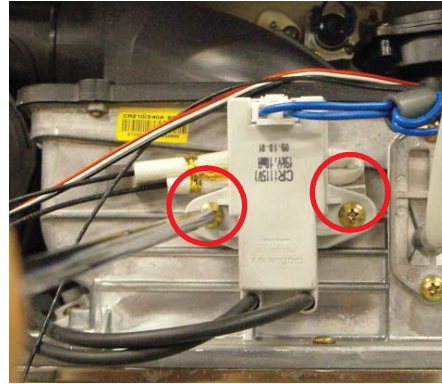


Figure 14

9. Pull out the Ignition Transformer.
10. Attach the new ignition transformer tighten screws.
11. Connect the Ignition transformer cable into the ignition electrode.
12. Connect the igniter connecting housing into the PCB.
13. Install front panel using 4(four) screws.
14. Turn on water supply, power supply, and gas supply.

NOTE

1. Check up whether fixing exactly done.
2. Check up the connecting terminal.

8.2.7. APS

1. Turn off the gas supply
2. Turn off the 120V power supply
3. Turn off the water supply
4. Remove the four screws securing the front panel. Remove front panel.
5. Remove the air pressure sensor connecting housing into the PCB.

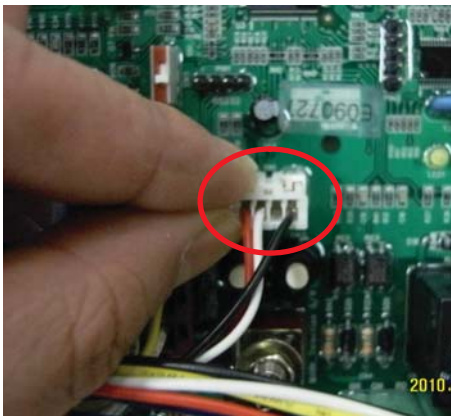


Figure 15

6. Remove the air pressure sensor tube into the burner assembly.

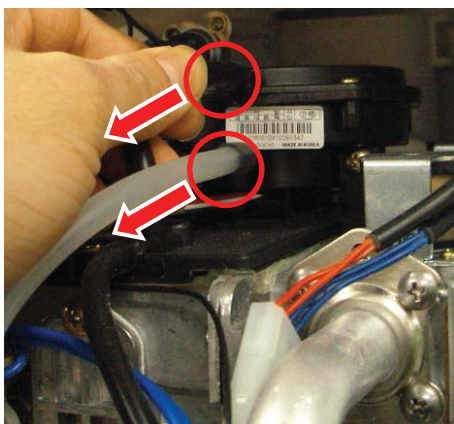


Figure 16

7. Loosen the air pressure sensor low erside 2-screw from burner assembly.

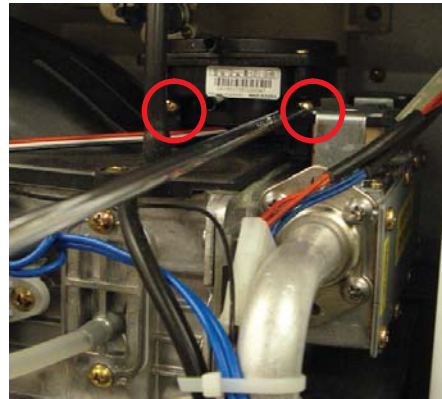


Figure 17

8. Pull out the air pressure sensor.
9. Attach the new air pressure sensor tighten screws.
10. Connect the air pressure sensor tube.
11. Connect the air pressure sensor connecting housing into the PCB.
13. Install front panel using 4(four) bscrews.
14. Turn on water supply, power supply, and gas supply.

NOTE

As reassemble the air pressure sensor, careful with right size and direction.

8.2.8. Manifold

1. Turn off the gas supply
2. Turn off the 120V power supply
3. Turn off the water supply
4. Remove the four screws securing the front panel. Remove front panel.
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Loosen the gas pipe from main gas valve.(lower) and Manifold.(upper)

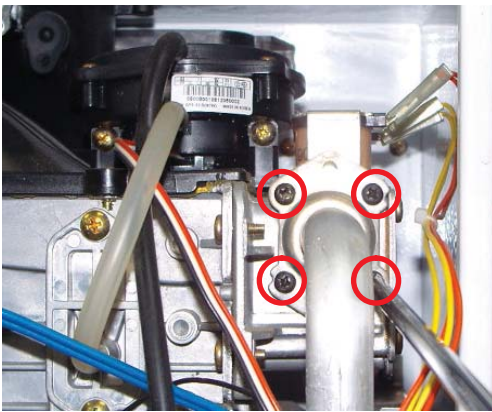


Figure 18



Figure 19

7. Pull out the gas pipe.

8. Loosen the 2 manifold fixing screws.

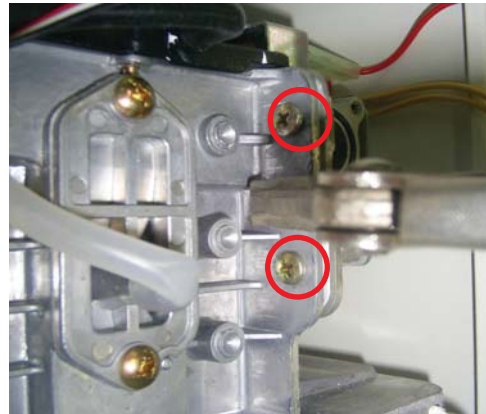


Figure 20

9. Remove the wire harness from the 2 solenoids.

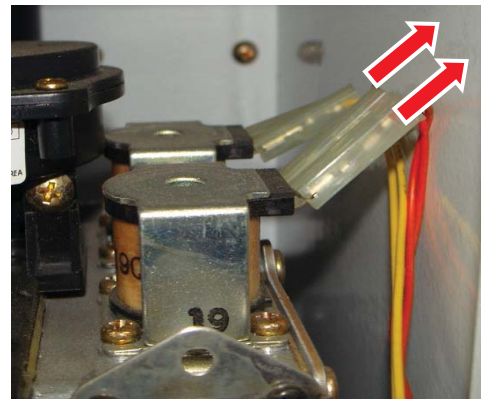


Figure 21

10. Pull out the manifold assembly.
11. Reinstall gas valve wires into the manifold to be replaced.
12. Attach the manifold and secured with screws.



WARNING

Failure to correctly assemble the components according to these instructions

13. Replace the gas pipe. Replace the Oring where the assembly attaches to the gas connection. Make sure the old Oring removed and discarded.
14. Replace the PCB. (refer to 8.2.1 PCB)
15. Install front panel using 4(four) screws.
16. Turn on water supply, power supply, and gas supply.
17. Perform the measuring of gas pressure setting procedure.
18. Check for gas leaks.

NOTE

1. Always replace with new gasket.
2. Wiring should be in right position.
3. Always use right part(Oring) and right size and place to pipe

8.2.9. Main Gas Valve

1. Turn off the gas supply
2. Turn off the 120V power supply
3. Turn off the water supply
4. Remove the four screws securing the front panel. Remove front panel.
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Pull out the gas pipe. (refer to 8.2.8 Manifold)
7. Detach the air pressure feedback tube, gas pressure sensor tube.

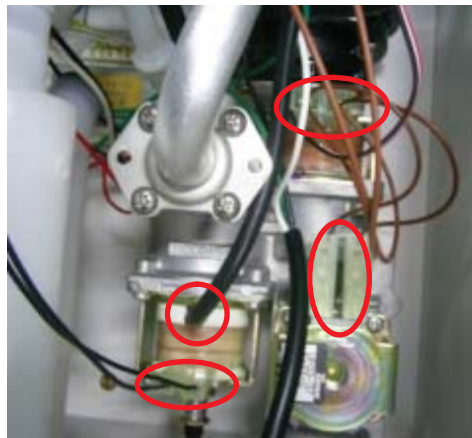


Figure 22

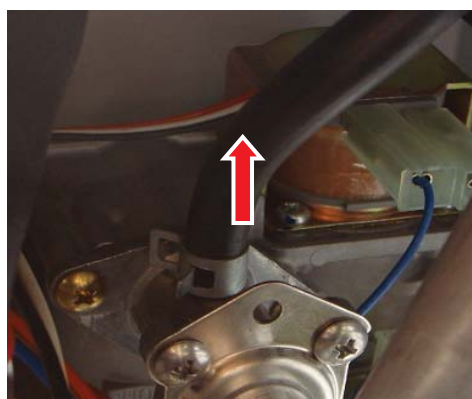


Figure 23

Figure 21

8. Remove the wire harness connector from the 2 solenoid valve and modulating valve.

8.2.8. Manifold

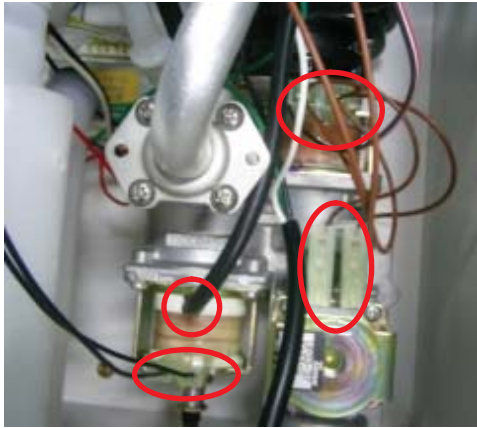


Figure 24

9. Remove the main gas valve screws from the gas adapter.



Figure 25

10. Pull out the main gas valve.
11. Positioned main gas valve.
12. Attach the main gas valve and secured with screws.
13. Assemble the air pressure feedback tube, gas pressure sensor tube and wire harness connector.

14. Replace the gas pipe. Replace the Oring where the assembly attaches to the gas connection. Make sure the old Oring removed and discarded.



WARNING

Failure to correctly assemble the components according to these instructions may result in a gas leak or explosion.

Figure 20

15. Replace the PCB. (refer to 8.2.1 PCB)
16. Install front panel using 4(four) screws.
17. Turn on water supply, power supply, and gas supply.
18. Perform the measuring of gas pressure setting procedure.
19. Check for gas leaks.

NOTE

1. Always replace with new gasket.
2. Wiring should be in right position.
3. Always use right part(Oring) and right size and place to pipe

8.2.10. GPS

Turn off the gas supply

2. Turn off the 120V power supply
3. Turn off the water supply
4. Remove the four screws securing the front panel. Remove front panel.
5. Remove the gas pressure sensor connecting housing into the PCB.

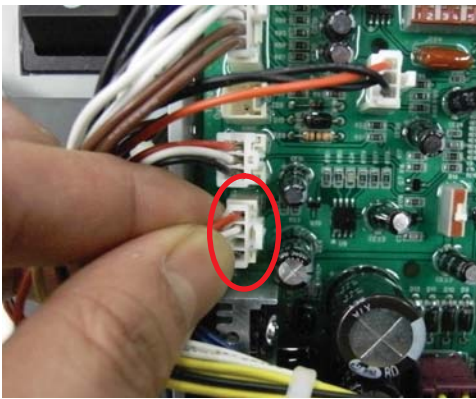


Figure 26

6. Pull out the PCB. (refer to 8.2.1 PCB)
7. Loosen the gas pressure sensor lowerside 2 screws from base.

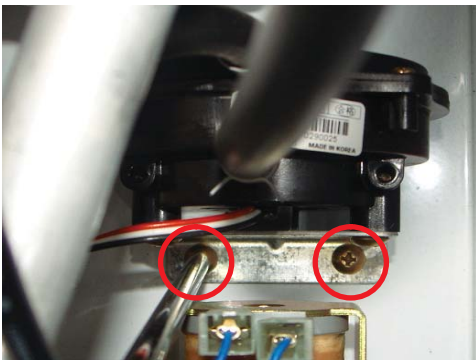


Figure 27

8. Remove the gas pressure sensor 2 tube into the gas pressure sensor.

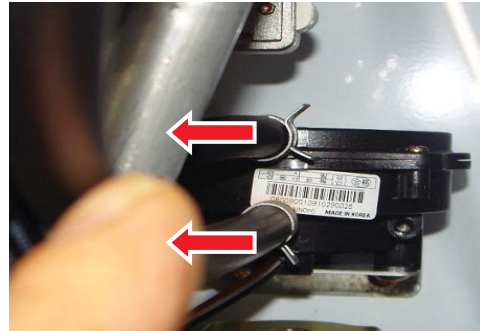


Figure 28

9. Replace with new gas pressure sensor.
10. Assemble the gas pressure sensor 2 tube.
11. Attach the gas pressure sensor and secured with 2 screws.
12. Replace the PCB. (refer to 8.2.1 PCB)
13. Install front panel using 4(four) screws.
14. Turn on water supply, power supply, and gas supply.

NOTE

Always use right type of tube and right place.

8.2.11. Condensation Trap

1. Turn off the gas supply
2. Turn off the 120V power supply
3. Turn off the water supply.
4. Remove the four screws securing the front panel. Remove front panel.
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Remove the Pin(A). Drain Condensate water from the trap.

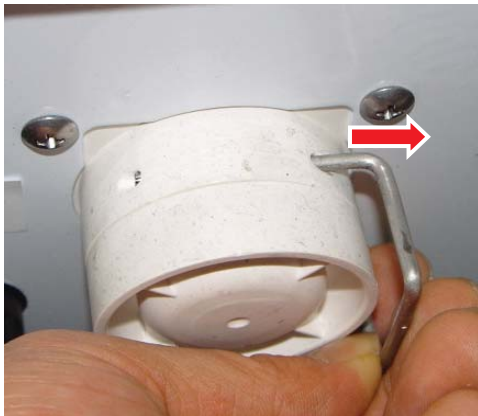


Figure 29

7. Loosen the three condensation trap screws.



Figure 30

8. Remove the condensation trap connecting hose.

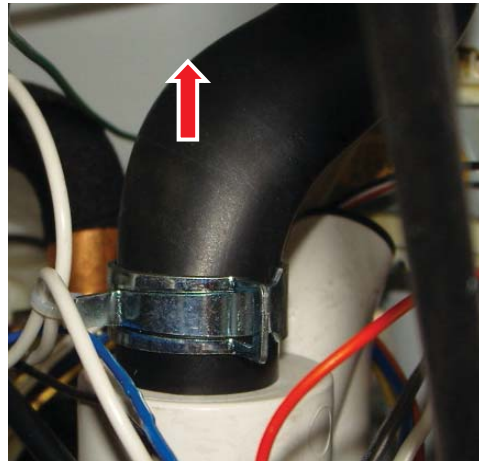


Figure 31

10. Pull out the Condensation trap.
11. Replace with new condensation trap.
12. Connects the condensation trap hose.
13. Attach the condensation trap and secured with three screws.
14. Replace the PCB. (refer to 8.2.1 PCB)
15. Install front panel using 4(four) screws.
16. Turn on water supply, power supply, and gas supply.

NOTE

1. Always make sure pin on right direction and secure.
2. When installed the condensation trap connecting hose, it should be installed from the secondary heat exchanger drain port first and then to trap.

8.2.12. Flow Sensor

1. Turn off the gas supply
2. Turn off the 120V power supply
3. Turn off the water supply. Drain all water from the appliance.
4. Remove the four screws securing the front panel. Remove front panel.
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Remove the fastener "C" and the heating water inlet pipe .

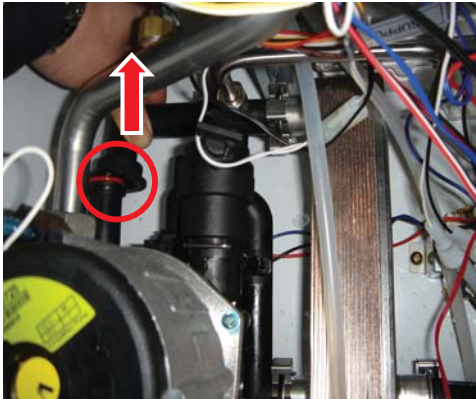


Figure 32

7. Loosen the domestic cold water inlet adaptor 2 screws.



Figure 33

8. Remove the fastener "A" and water flow sensor from bottom base , domestic hot water exchanger.

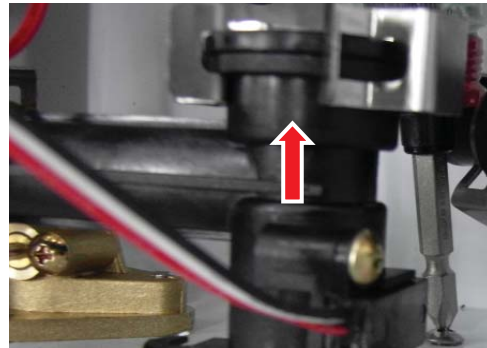


Figure 34

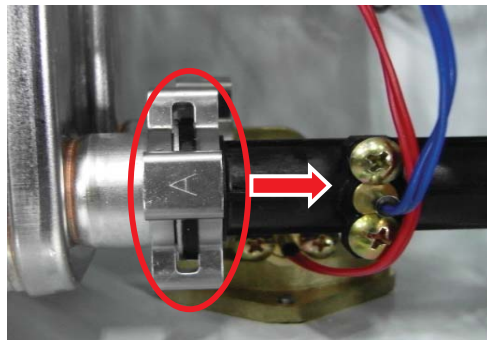


Figure 35

9. Replace the Oring (in service parts) included remove parts.
10. Reseat the water flow sensor from the domestic cold water inlet adaptor and domestic hot water exchanger.
11. Replace the fastener "A".
12. Tighten the cold water inlet adaptor 2 screw.
13. Replace the heating water inlet pipe and fastener "C".
14. Replace the PCB. (refer to 8.2.1 PCB)
15. Install front panel using 4(four) screws.

16. Turn on water supply, power supply, and gas supply.
17. Open a hot water tap and ensure there are no leaks at the boiler.

NOTE

1. When it drained, might be water temperature still high.
2. Use right size of O-ring
3. When it drained, careful to wet other electrical components.

8.2.13. Circulation Pump

1. Turn off the gas supply.
2. Turn off the 120V power supply.
3. Turn off the water supply. Drain all water from the appliance.
4. Remove the four screws securing the front panel. Remove front panel.
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Remove the drain plug on the pump.
7. Open the drain plug on the pump.
8. Loosen the screw from bottom base.

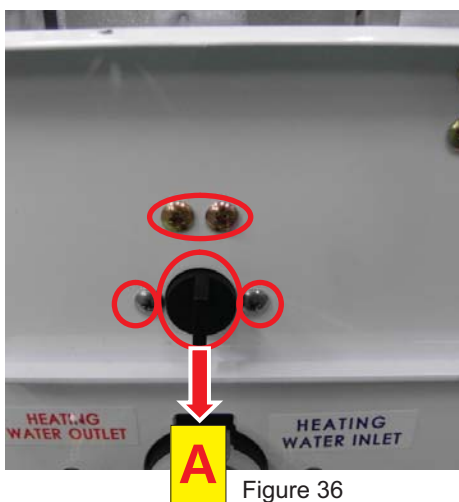


Figure 36

9. Remove the stainless clip.

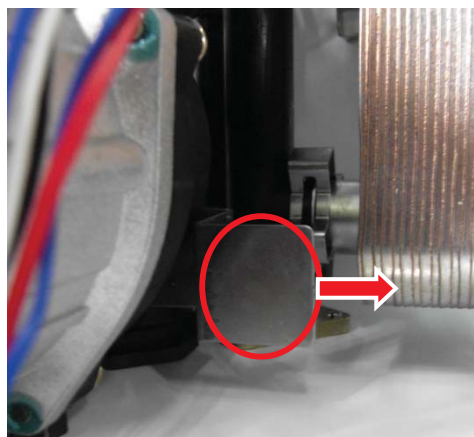


Figure 37

10. Remove the stainless nut from the circulation pump.

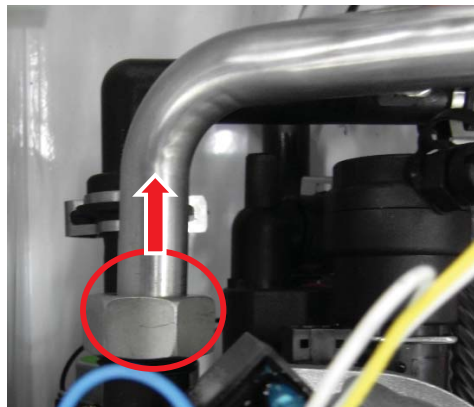


Figure 38

11. Pull out the circulation pump.
12. Pull out the circulation pump.
13. Replace the O-ring & packing. (in service parts)
14. Replace with new circulation pump.
15. Replace the stainless clip.
16. Reseat the non-threaded end of circulation pump into the stainless fitting. At this time, be watchful the black gasket ring(packing).

17. Tighten the 4 screw from bottom base.
18. Close the drain plug.
19. Replace the PCB. (refer to 8.2.1 PCB)
20. Install front panel using 4(four) screws.
21. Turn on water supply, power supply, and gas supply.
22. Check the operating circulation pump and ensure there are no leaks at the space heating piping system inside the unit.
23. Open air vent on top of pump to release air

NOTE

1. Always use right part(O-ring) and right size and place to pipe
2. Place black gasket ring on top of the circulation pump and screw on the stainless nut; be sure not to cross thread; over tightening may damage gasket

8.2.14. 3-way Valve

1. Turn off the gas supply.
2. Turn off the 120V power supply.
3. Turn off the water supply. Drain all water(include heating water) from the appliance.
4. Remove the four screws securing the front panel. Remove front panel.
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Pull out the circulation pump. (refer to 8.2.13 Circulation Pump)
7. Loosen the heating water inlet pipe II screw from 3-way valve.

8. Remove the stainless clip. (fastener “L-1”)



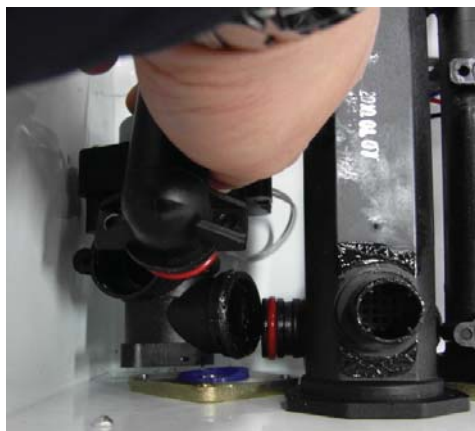
Figure 39

9. Loosen the heating adaptor 2 screw from bottom base.



Figure 40

10. Pull out the 3-way



11. Replace with new 3-way valve.
12. Tighten the heating adaptor 2 screw from bottom base.
13. Tighten the heating water inlet pipe II screw
14. Replace the stainless clip. (fastener “L-1”
12. Install front panel using 4(four) screws.
13. Turn on water supply, power supply, and gas supply.
14. Open a hot water tap and ensure there are no leaks at the boiler.

8.2.15. Water Pressure Sensor

1. Turn off the gas supply.
2. Turn off the 120V power supply.
3. Turn off the water supply. Drain all water(include heating water) from the appliance.
4. Remove the four screws securing the front panel. Remove front panel.
5. Disconnect the water pressure sensor wire housing from the PCB.

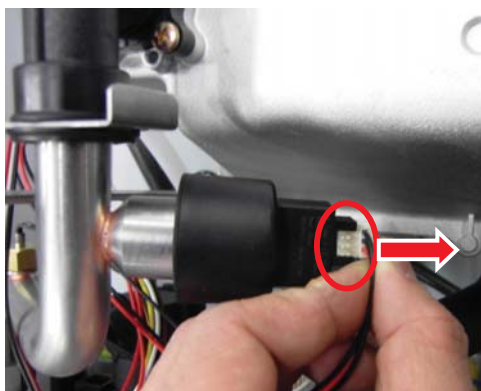


Figure 42

6. Loosen the water pressure sensor.
7. Pull out the water pressure sensor.

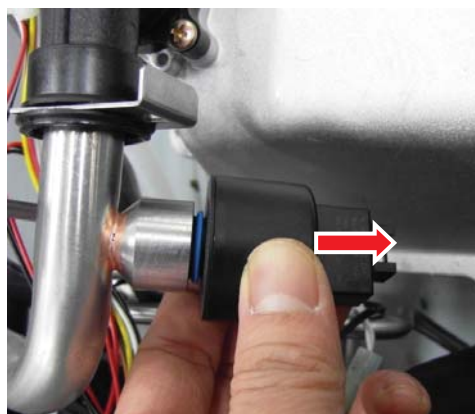


Figure 43

8. Replace with new water pressure sensor.
9. Connect the water pressure sensor wire housing into the PCB.
10. Install front panel using 4(four) screws.
11. Turn on water supply, power supply, and gas supply.
12. Open a hot water tap and ensure there are no leaks at the boiler.

NOTE

1. Always use right part(O-ring) and right size and place to pipe

8.2.16. Space Heating Strainer (Filter Cleaning or Strainer Replace)

1. Turn off the gas supply.
2. Turn off the 120V power supply.
3. Turn off the water supply. Drain all water(include heating water) from the appliance.
4. Removing the stainless from the space heating strainer body.

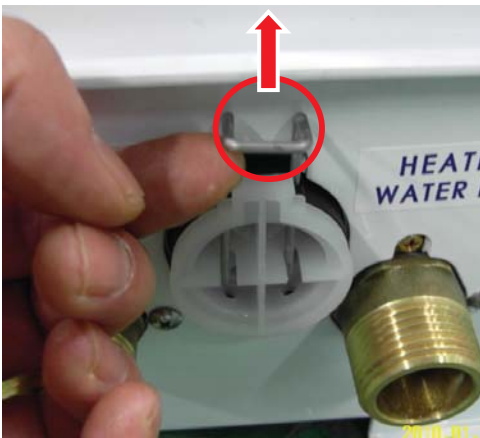


Figure 44

5. Pull out the space heating strainer.

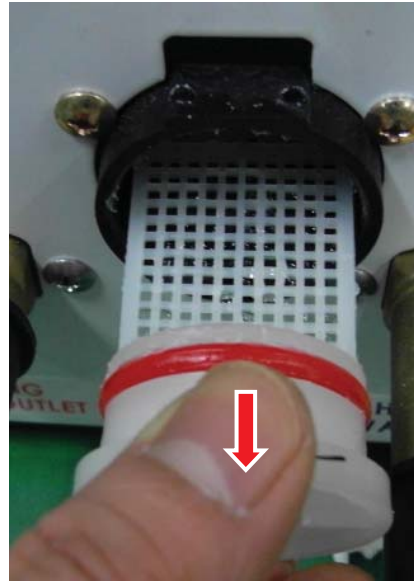


Figure 45

6. Replace with new strainer filter
7. Turn on water supply, power supply, and gas supply.
8. Open a hot water tap and ensure there are no leaks at the boiler.

NOTE

1. Always use right part(O-ring) and right size and place to pipe

8.2.17. Auto Feeder Valve

1. Turn off the gas supply.
2. Turn off the 120V power supply.
3. Turn off the water supply. Drain all water(include heating water) from the appliance.
4. Remove the four screws securing the front panel. Remove front panel.
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Pull out the main gas valve. (refer to 8.2.9 Main Gas Valve.)
7. Remove the stainless nut from the auto feeder valve body.

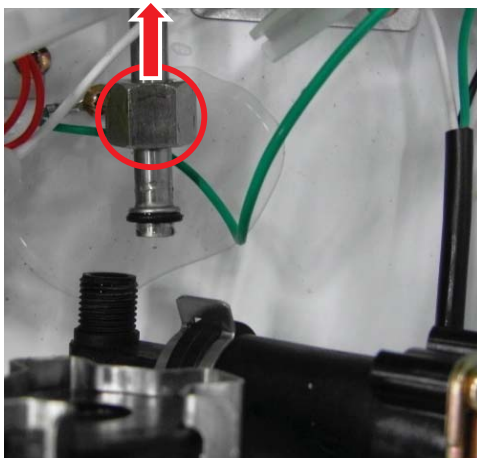


Figure 46

8. Loosen the auto feeder valve adap for 2 screw from bottom base.



Figure 47

9. Remove the fastener "D" pull out the auto feeder valve.

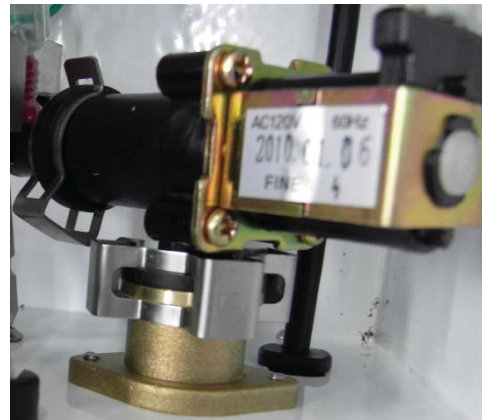


Figure 48

10. Replace with auto feeder valve.
11. Tighten the auto feeder valve adap for 2 screw from bottom base.
11. Reseat the non-threaded of auto feeder valve into the stainless fitting.
12. Replace the main gas valve.
13. Replace the PCB.
12. Install front panel using 4(four) screws.
13. Turn on water supply, power supply, and gas supply.
14. Open a hot water tap and ensure there are no leaks at the boiler.

NOTE

1. Always use right part(O-ring) and right size and place to pipe

8.2.18. Domestic Hot Water Exchanger

1. Turn off the gas supply.
2. Turn off the 120V power supply.
3. Turn off the water supply. Drain all water(include heating water from the appliance.
4. Remove the four screws securing the front panel. Remove front panel.
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Pull out the flow sensor. (refer to 8.2.12 Flow Sensor.)
7. Pull out the domestic hot water outlet collar. (refer to 8.2.19 DHW outlet collar)
8. Remove the stainless clip. (fastener "A")
9. Remove the stainless clip.

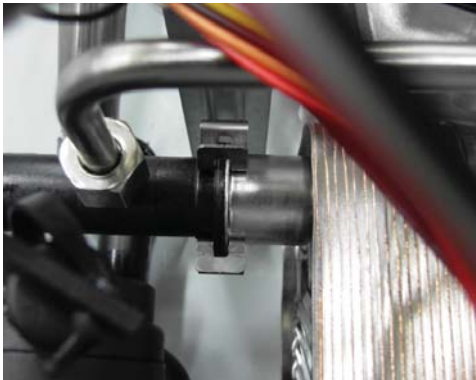


Figure 49

10. Pull out the domestic hot water exchanger.

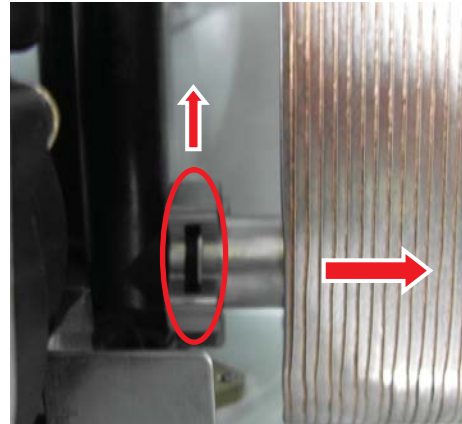


Figure 50

11. Replace the new domestic hot water exchanger.
12. Replace the 2 stainless clip.
13. Replace the domestic hot water outlet collar.
14. Replace the water flow sensor.
15. Replace the domestic hot water outlet collar.
16. Install front panel using 4(four) screws.
17. Turn on water supply, power supply, and gas supply.
18. Open a hot water tap and ensure there are no leaks at the boiler.

8.2.19. Domestic Hot Water Outlet Collar

1. Turn off the gas supply.
2. Turn off the 120V power supply.
3. Turn off the water supply. Drain all water from the appliance.
4. Remove the four screws securing the front panel. Remove front panel.
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Pull out the flow sensor. (refer to 8.2.12 Flow Sensor.)
7. Remove the stainless clip. (fastener "A")

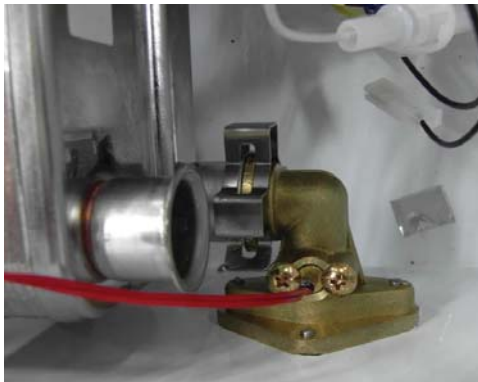


Figure 51

8. Loosen the domestic hot water outlet adaptor 2 screw from bottom base.



Figure 52

9. Pull out the domestic hot water outlet collar.

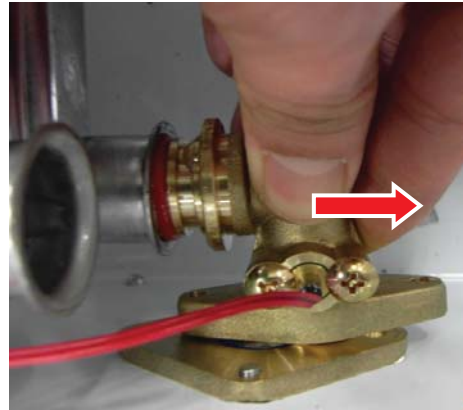
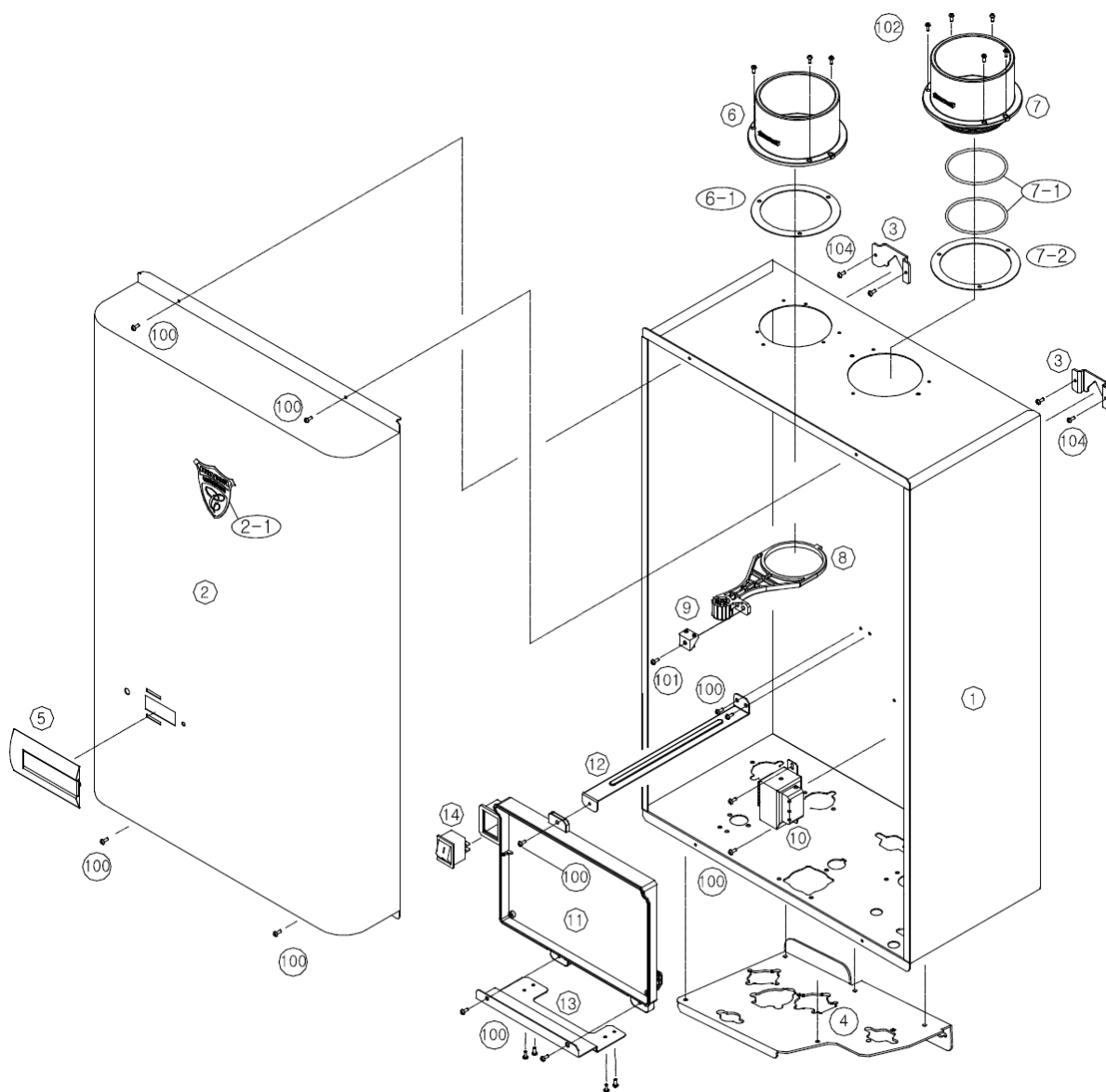


Figure 53

10. Replace with new domestic hot water outlet collar secured it.
11. Tighten the domestic hot water outlet adaptor 2 screw from bottom base.
12. Replace the stainless clip. (fastener "A")
13. Replace the flow sensor. (refer to 8.2.12 Flow Sensor)
14. Replace the PCB. (refer to 8.2.1 PCB)
16. Install front panel using 4(four) screws.
17. Turn on water supply, power supply, and gas supply.
18. Open a hot water tap and ensure there are no leaks at the boiler.

9. Components Diagram and Part List

9.1. Case Disassemble



NO	Description	Navien Part No.	Remark
1	Case	BBK05011089	
2	Cover	BBR15012136	
2-1	Emblem	BH2603008A	
3	Case Upper Bracket	BH2505277A	
4	Case Lower Bracket	BBK05197001	
5	Deco	BH2602012A	Pressure Indicator
6	Intake Air Duct Ass'y	BH2505400B	
6-1	Intake Air Duck Packing	-	No.6 Ass'y
7	Exhaust Pipe Ass'y	BH2505401B	
7-1	Exhaust Pipe O-Ring	-	No.7 Ass'y
7-2	Exhaust Pipe Packing	-	No.7 Ass'y
8	Intake Air Filter	BH2505416A	
9	Intake Air Filter Support	BH2505417A	
10	Transformer	BH1205011C	
11	PCB Board	NACR1GS32301	
12	PCB Board Bracket(Upper)	BH2505413A	
13	PCB Board Bracket(Lower)	BH2505414A	
14	Power Switch	BH1426002A	
100	Screw D4 x 8L	BH1705007A	
101	Bolt M4 x 16L	BH1603009A	
102	Screw D4 x 12L	BH1612005A	
104	Bolt D4 x 10L (STS)	BH1611006A	

This is a detailed exploded view diagram of a mechanical assembly, likely a pump or engine component. The diagram shows various parts and sub-assemblies arranged in their relative positions, with lines indicating assembly paths. The parts are numbered as follows:

- 1**: Small circular component at the top left.
- 2**: Small circular component below 1.
- 3**: Small circular component below 2.
- 4**: Small circular component below 3.
- 5**: Small circular component below 4.
- 6**: Small circular component below 5.
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- 110**: Small circular component below 109.
- 111**: Small circular component below 110.

NO	Description	Navien Part No.	Remark
17	Fan Motor	NAFA9GSFB002	
18	Flame rod ass'y	PH1603058D	NG
		PH1603059D	Propane
18-1	Flame rod	BH2501679A	NG
		BH2501680A	Propane
18-2	Flame rod packing A	BH2405054A	
18-3	Flame rod packing B	BH2405051A	
18-4	Flame rod bracket	BH2501681A	
20	Air Pressure Sensor	NASS9EX00009	
22	Burner	PABNCN30KDBN_004	180 NG
		PABCR180ABN_003	180 Propane
		PABNCW48KDBN_003	210/240 NG
		PABCR210/240ABN_003	210/240 Propane
24	Burner Bracket (L)	BH2501444C	
26	Manifold	PABCR180AMF_001	180 NG
		PABNR/NP180AMF_001	180 Propane
		PABCC210AMF_001	210/240 NG
		PABCC210AMF_002	210/240 Propane
26-1	Solenoid valve	PH0905028A	
27	APS venturi	BH2501413A	
28	APS venturi packing	BH2405031A	
29	Thermal fuse	BH1419012A	180
		BH1419013A	210/240
30	Ignition transformer	BH1201045A	
31	Fan motor bracket	BH2501605A	180
		BH2501604A	210/240
33	Gas Pipe	BH2546020A	180NG
		BH2546024A	180 Propane
		BH2546021A	210/240 NG
		BH2546025A	210/240 Propane
34	GPS venturi	BH2507663A	180NG
		BH2507733A	180 Propane
		BH2507664A	210/240 NG
		BH2507732A	210/240 Propane
34-1	GPS venturi tube	BH2203002A	
39	Gas pressure sensor	NASS9EXGPS01	
40	GPS bracket	BH2507346A	
43	Main gas valve	BH0901018A	
44	Gas inlet adapter	BH2507714A	

NO	Description	Navien Part No.	Remark
79	Tube	BH2202022A	180
		BH2202025A	210/240
80	Tube	BH2202023A	180
		BH2202024A	210/240
82	Tube (550L)	BH2203001A	
83	Tube	BH2202036A	180
		BH2202041A	210/240
86	O-Ring	BH2421008A	
100	Screw D4 x 8L	BH1705007A	
103	Screw D4 x 6L	BH1612004A	
104	Bolt D4 x 10L (STS)	BH1611006A	
105	Screw D4 x 14L	BH1701031A	
107	Screw D4 x 14L	BH1708006A	
111	Bolt M4 x 12L (STS)	BH1603007A	
113	Screw D4 x 25L	BH1701030A	
116	Fan Motor Damper	BH2505403C	
117	O-Ring	BH2421003A	
123	Screw D4 x 4L	BH1710001A	

This exploded view diagram illustrates the assembly of a kitchen range hood. The components are numbered as follows:

- 32-1**: Main range hood body.
- 32-2**: Filter assembly.
- 32-3**: Back panel.
- 35**: Mounting bracket.
- 36**: Mounting screw.
- 37**: Mounting plate.
- 38**: Mounting bracket.
- 39**: Mounting screw.
- 40**: Mounting bracket.
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- 199**: Mounting bracket.
- 200**: Mounting bracket.

The diagram also includes assembly labels A, B, C, and D, which indicate the sequence and location of component installation.

NO	Description	Navien Part No.	Remark
15	High Limit Switch	BH1401022A	
16	High Limit Switch Bracket	BH2501541A	
21	WPS Packing	BH2406054A	
23	H/E Bracket R	BH2501704B	
24	H/E Bracket L	BH2501703B	
25	Inlet Water Filter	BH1303013A	
32	Heat Exchanger Ass'y	BBM20341007	180
		BBM20341008	210/240
41	Exhaust Duct	BH2544007D	
42	Exhaust Duct Packing	BH2406050A	
45	Exhaust Limit Switch	BH1401031A	
46	Primary H/E Inlet Adapter	BH2501558A	
47	Primary H/E Outlet Adapter	BH2507602A	
49	H/E Outlet Pipe	BH2507556A	180
		BH2507555A	210/240
50	H/E Middle Pipe	BH2507531A	
51	Auto Feeder Pipe	BH2507552A	
52	SPH Inlet Pipe 1	BH2507367B	
53	SPH Inlet Pipe 2	BH2507366B	
54	H/E Inlet Pipe	BH2507554A	180
		BH2507553A	210/240
55	Auto Feeder Valve	BH0904011A	
56	Auto Feeder Packing	BH2406063A	
57	Auto Feeder Cover	BH0712006A	
58	3-Way Valve	AAVC9EX00009A	
59	S/H Return Adapter	BH2507551A	
60	DHW Inlet Adapter	BH2507560C	
61	DHW Flow Sensor	AASS9EXFS002B	
63	DHW Outlet Pipe Ass'y	BH2507590A	
64	DHW Outlet Adapter	BH2507558A	
65	DHW Heat Exchanger	PAS30KHE_005	180
		PAS40KHE_003	210/240
66	S/H Strainer	BH1301020C	
67	S/H Return Pipe	BH2507550A	
69	S/H Pipe 2	BH2507372B	
70	S/H Pipe 1	BH2507373A	
71	Siphon	BH2501442C	
72	Siphon Hose	BH2204047A	

NO	Description	Navien Part No.	Remark
73	Water Pressure Sensor	BH2507535A	
74	Secondary H/E Inlet Adapter	BH2501602A	180
		BH2501603A	210/240
75	Circulation Pump	NAPU9GLPCT10	
76	Pump Drain Plug	BH2505314A	
77	Pump Bracket	BH2501447A	
78	Pump Packing	BH2406039A	
81	Fastener C	BH2507018B	
87	O-Ring (φ17.5x2.7t)	BH2422026A	
88	O-Ring (P16)	BH2422017A	
89	Back-up Ring	BH2507308A	
90	Packing Ring (3/4")	BH2406025A	
92	Pump Fastener	BH2507445A	
93	Clip A	BH2507013A	
94	Clip C	BH2507345A	
95	Screw D4 x 16L	BH1708004A	
97	O-Ring (φ24.8x φ17.8t)	BH2423058A	
98	Fastener B	BH2507016A	
99	Fastener D	BH2507402B	
100	Screw D4 x 8L	BH1705007A	
101	Bolt M4 x 16L	BH1603009A	
104	Bolt D4 x 10L (STS)	BH1611006A	
106	Bolt M4 x 12L	BH1612007A	
110	Screw D4 x 14L	BH1701003A	
114	Bolt M4 x 8L	BH1603015A	
119	H/E Packing	BH2406048A	
120	O-Ring (P16)	BH2422017A	
121	Fastener A	BH2507400B	

10. Inspection and maintenance Schedule

10.1. Annual Servicing

For reasons of safety and economy, it is recommended that the boiler is serviced annually.



DANGER

Servicing must be performed by a qualified service agency or gas supplier

Services performed once a year are shown below.

• Inspection

- Visual inspection for general signs of corrosion
- Checking and adjusting the gas/air ratio
- Checking Flue Gas
- Carrying Out a Water Leak Test in Operation
- Carrying out a gas leak test in operation
- Checking Hot Water Temperature and Flow
- Checking Noise
- Checking venting systems
- Checking the remote controller

• Maintenance

- Draining the boiler and cleaning the inlet water filter
- Cleaning the Return Filter
- Cleaning the intake air filter
- Flushing the heat exchanger
- Replacement of parts

10.2. Inspection Report

Inspection Items	References	Date	Date
Visual Inspection for General Signs of Corrosion	YES / NO		
Checking and Adjusting the Gas/Air Ratio	YES / NO		
Checking Flue Gas	YES / NO		
Carrying Out a Water Leak Test in Operation	YES / NO		
Carrying Out a Gas Leak Test in Operation	YES / NO		
Checking Hot Water Temperature and Flow	YES / NO		
Checking Noise	YES / NO		
Checking Venting Systems	YES / NO		
Checking the Remote Controller	YES / NO		

10.3. Maintenance Report

Inspection Items	References	Date	Date
Draining the Boiler and Cleaning the Inlet Water Filter	YES / NO		
Cleaning the Return Filter	YES / NO		
Checking the Intake Air Filter	YES / NO		
Flushing the Heat Exchanger	YES / NO		
Replacement of Parts			

Memo



Memo



Memo



