Service Manual

NAVIEN
Condensing 98%
Tankless Gas Water Heater
Ver. 2.00

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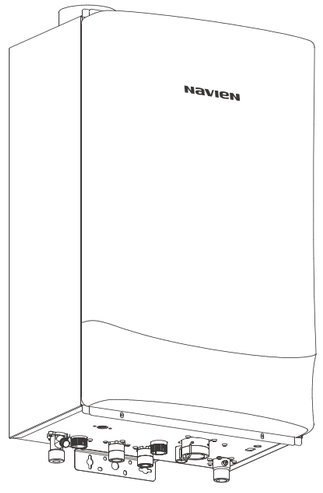
NAVIEN Service Manual NR/NP | Tankless Gas Water Heater

Service Manual



NAVIEN
Condensing 98%
Tankless Gas Water Heater

NR/NP Series

MODEL			
NR-180	NP-180	NR-180A	NP-180A
NR-210	NP-210	NR-210A	NP-210A
NR-240	NP-240	NR-240A	NP-240A

⚠ WARNING

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

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

2nd Edition - July 2010
No. 20A-GT-001

KD NAVIEN

Contents

Revisions

Version	Description of changes	Date
1.00	First Issue	04/27/10
2.00	Format Revision	July/20/10

Navien Warranty

CAUTION

This product warranty is valid only used in the America and Canada but automatically be voided for the other counties (for America and Canada unit standard only).

GENERAL

Navien America, Inc. (Navien) warrants this Navien Water Heater 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 unexpired portion of the original component part's Applicable Warranty Period.

APPLICABLE WARRANTY PERIODS (* DHW means Domestic Hot Water)

Period of Coverage			
Heat Exchanger		All other Parts and Components	
NR & NP Series Residential *DHW use only	NP Series Commercial use Or Residential Space Heating use	NR & NP Series Residential DHW use only	NP Series Commercial use Or Residential Space Heating use
15 years	**10 years**	**5 years**	**3 years**

IMPORTANT

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 water heater, if properly registered.

HEAT EXCHANGER WARRANTY

The Applicable Warranty Period for a NR & NP series Heat Exchanger failure installed in a Residential DHW application (including domestic recirculation) is **Fifteen (15)** years from the Effective Date. The Applicable Warranty Period for a NP series Heat Exchanger failure installed in a Commercial application or Residential "Combi (DHW and Space heating)" application is **Ten (10)** years from the Effective Date. For any Commercial application or Residential Combi application, a NP series unit is recommended. If a NR series unit is used in any Commercial application or Residential Combi application, the Applicable Warranty for a Heat Exchanger failure will be voided.

PARTS WARRANTY (excluding heat exchanger)

The Applicable Warranty Period for a NR & NP series Part(s) failure installed in a Residential DHW application (including domestic recircualtion) is Five(5) years from the Effective Date. The Applicable Warranty Period for a NP series Part(s) failure installed in a Commercial application or Residential Combi application is Three(3) years from the Effective Date. IF a NR unit is used in any Commercial application or Residential Combi application, the Applicable Warranty for a Part(s) failure will be voided.

WATER HEATER SHOULD NOT BE USED FOR SPACE HEATING.(Only NR-(A) Series)

The NR Series Water Heater should not used for space Heating and other heating. If NR Series Water Heater is used for space Heater and other heating, the applicable warranty will be voided.

LABOR ALLOWANCE

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

TRANSFERABLILITY

This warranty is offered to the original and subsequent owners of the water heater but is limited to the original address registered with the warranty only. The warranty will be void if the water heater 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 water heater 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 water heater in accordance with the manufacturer's instructions provided.
- Performance problems caused by improper sizing of the water heater or the gas supply line, the venting connection, combustion air openings, electric service voltage, wiring or fusing.
- Damages, malfunctions or 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 water heater.
- Damages, malfunctions or failures caused by operating the water heater 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 water heater in a corrosive or contaminated atmosphere.
- Damages, malfunctions or failures 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 water heater 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 water heater should not be operated if the rating plate has been removed.
- Damage due to freezing.

Product Disposal Measures

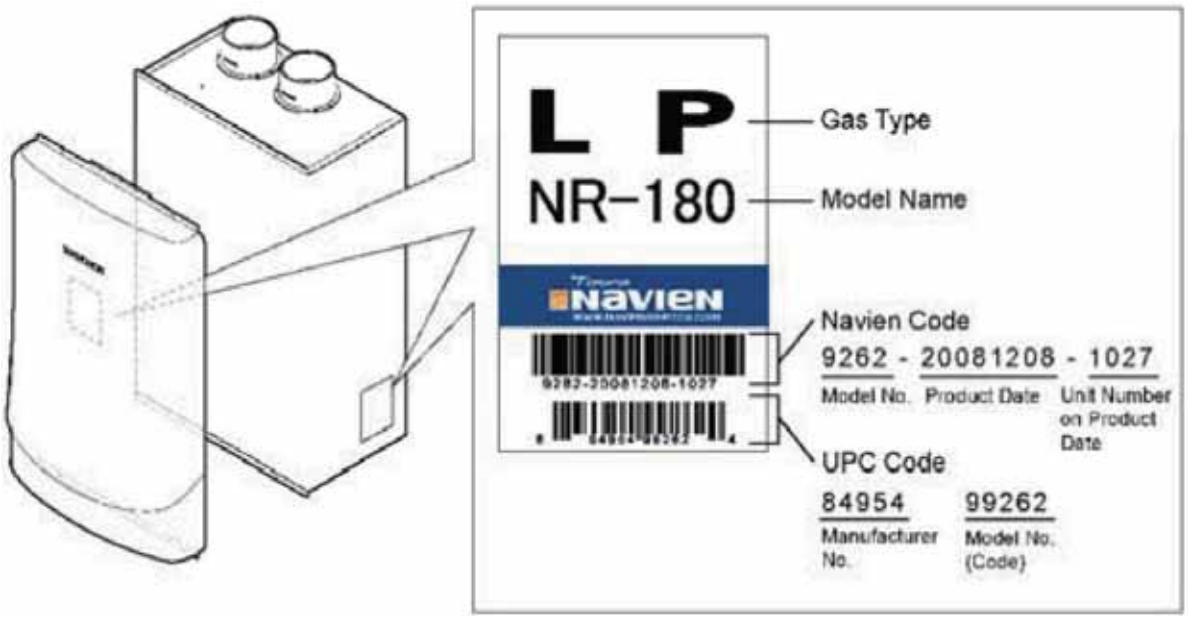
Dispose of components of the heating system that require replacement in an environmentally responsible manner.

Make sure that condensate disposal method is in accordance with local regulations.

Handling of This Manual

Scope

- This Service Manual is applicable to Navien Tankless Water Heater NR/NP 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 Water Heater.

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	Definition
NR-A	General name of NR-180A, NR-210A, and NR-240A
NP-A	General name of NP-180A, NP-210A and NP-240A
NR	General name of NR-180, NR-210, and NR-240
NP	General name of NP-180, NP-210, and NP-240
“A” Series	General name of NR-A, and NP-A
“Non-A” Series	General name of NR, and NP
NG	Natural Gas
LP	Propane 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
WAV	Water Adjustment Valve
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 water heater clear and free from flammable materials.

- DO NOT place flammable liquids such as oils or gasoline, etc. near the water heater.
- DO NOT place combustibles such as newspapers and laundry etc. near the water heater or the venting system.
- DO NOT place or use hair spray, spray paint or any other type of spray can near the water heater 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 water heater 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 water heater

Keep flammable products:

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

Water heater 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 unsafe operation of this water heater. To avoid the risk of fire, explosion of asphyxiation from carbon monoxide, never operate the water heater 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 water heater.
- Immediately turn off and do not use the water heater if any of the vent pipes, vent elbows and/or the water heater.

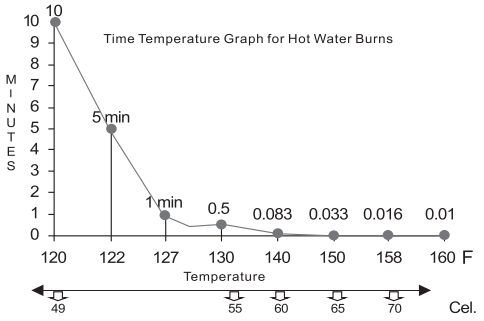
  i. damaged in any way,
  ii. have separated at a joint,
  iii. are cracked or show evidence of corrosion, rusting or melting.

DANGER

HOT WATER TEMPERATURE SETTING

- Water temperature over 125℉ can cause severe burns instantly or death from scalds.
- Households with small children, disabled, or elderly persons may require 120℉ or lower temperature setting to prevent contact with “HOT” water.
- To prevent scalding, check water temperature after servicing.
- If the proposed water heater outlet temperature is above 125℉, 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.
- This Navien Water Heater is factory se at 120℉ (NP Series: 140℉) for your safety and comfort. Increasing the set temperature increases the risk of accidental scalding. Consult the chart below before you decide to adjust the set temperature.

Water Temperature	Time in which a young child can suffer a ful thickness (3rd degree) burn*
70℃ (160℉)	Less than 1 second
60℃ (140℉)	1 second
55℃ (130℉)	10 seconds
49℃ (120℉)	10 minutes
37℃ (100℉)	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 WATER HEATER.
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 Water Heater.
- This manual must remain with the Navien Water Heater.
- Confirm the location of the gas shut-off valve. Close the manual shut-off valve if the Navien Water Heater over becomes subjected to overheating, fire, flood, physical damage or any other such damaging condition during servicing.
- DO NOT turn on the water heater unless water and gas supplies are fully opened.
- DO NOT turn on the water heater if cold water supply shut-off valve is closed.
- Make certain power to water heater 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 afterservicing.
- DO NOT attempt to change the water temperature while someone is using the water heater.
- DO NOT use parts other than those specified for this equipment.
- DO NOT operate the water heater 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 “Condensing Water Heater Manual”.
- The Navien Water Heaters 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 water heater 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 Water Heater to ensure the unit matches gas type, gas pressure, water pressure and electrical supply.

Be 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 Water Heater. Using different gas type will cause abnormal combustion and water heater 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

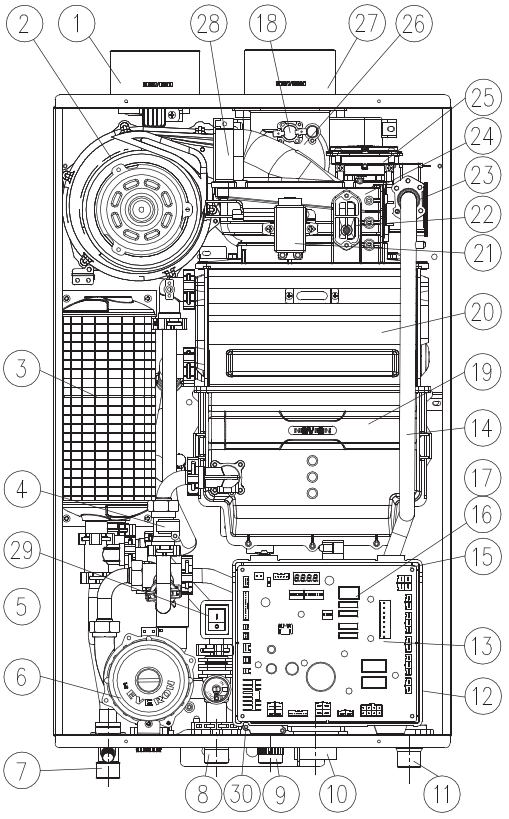
Navien offers two series of tankless gas water heater; Navien Regular (NR) as residential models and Navien Premium (NP) as commercial models. Each series in-cludes the “A” model with an optional built-in Circulation Pump and a Mini Buffer Tank. In addition, depending on the heat capacity, each model is divided into three types; 180,210,and240(*).

	NR		NP	
Items	“A” Series (180/210/240)	“Non-A” Series (180/210/240)	“A” Series (180/210/240)	“Non-A” Series (180/210/240)
Intended Use	DHW Only		DHW Space Heating Commercial Applications	
Built-in Circulation Pump and Mini Buffer Tank	Yes	No	Yes	No
Default Temperature	120℉ (49℃)		140℉ (60℃)	
Gas Type	NG, LP			

*.for details of the specifications, ▶{5.1 General Specifications}

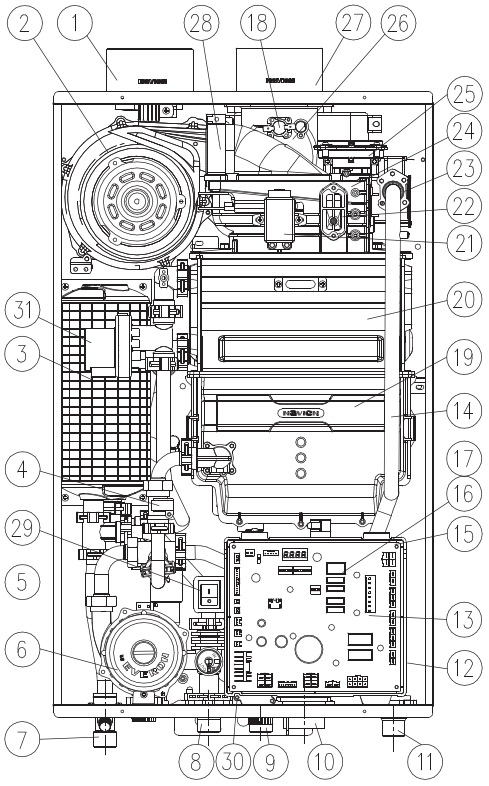
2.2. Layout and Key Components

2.2.1. NR-A Model



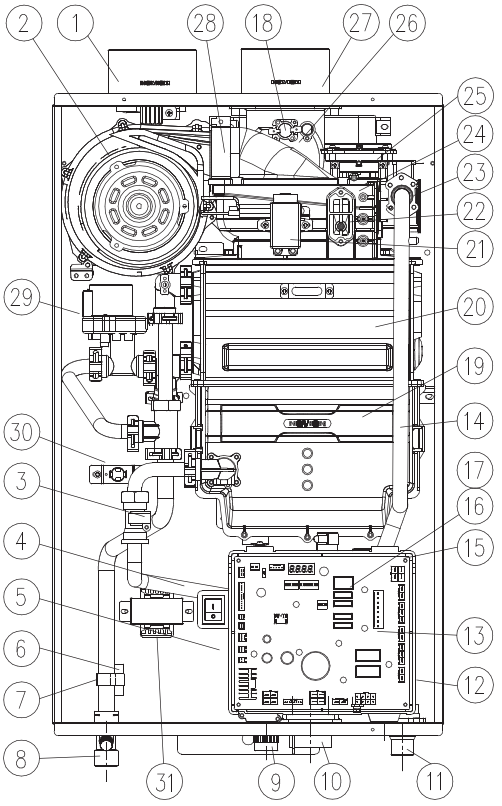
No	Description	Navien Part No.	No	Description	Navien Part No.
1	Intake Air Duct	BH2505400B	16	WAV	NCVM9EX00005
2	Fan Motor	NAFA9GLPCT01	17	Transformer	BH1205008A
3	Buffer Tank	PASNCWBFTANK_001	18	Exhaust Limit Switch	BH1401027A
4	Flow Sensor	BH1406004F	19	Secondary H/E	-
5	PCB Board	NACR1GS32410	20	Primary H/E	-
6	Circulation Pump	NAPU9GLPCT01	21	Ignition Transformer	BH1201041D
7	DHW Supply Adapter	BH2507348B	22	APS Venturi	BH2501413A
8	3-Way Valve	BH2507467C	23	Manifold	PABCR180AMF_001
9	DHW Inlet Adapter	BH2507469A	24	Burner	PABNCN30KDBN_003
10	Syphon	BH2507442C	25	APS	NASS9EX00009
11	Gas Inlet Adapter	BH2507396A	26	Exhaust Duct	BH2544004F
12	Main Gas valve	BH0901018A	27	Exhaust Pipe	BH2505401B
13	GPS Venturi	BH2507359B	28	Air Intake Guide	BH2543002C
14	Gas Pipe	BH2507509A	29	Power Switch	BH1426002A
15	GPS	NASS9EXGPS01	30	Water Leakage Detector	-

2.2.2. NP-A Model



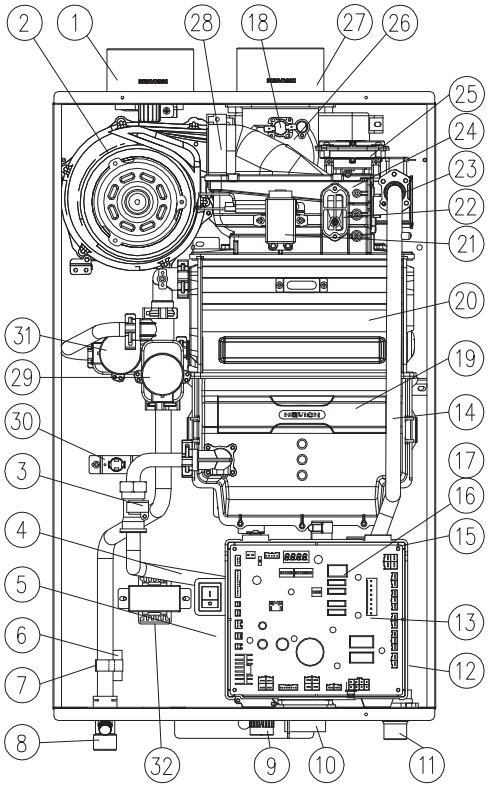
No	Description	Navien Part No.	No	Description	Navien Part No.
1	Intake Air Duct	BH2505400B	17	Transformer	BH1205008A
2	Fan Motor	NAFA9GLPCT01	18	Exhaust Limit Switch	BH1401027A
3	Buffer Tank	PASNCWBFTANK_001	19	Secondary H/E	-
4	Flow Sensor	BH1406004F	20	Primary H/E	-
5	PCB Board	NACR1GS32410	21	Ignition Trans	BH1201041D
6	Circulation Pump	NAPU9GLPCT01	22	APS Venturi	BH2501413A
7	DHW Supply Adapter	BH2507348B	23	Manifold	PABCR180AMF_001
8	3-Way Valve	BH2507467C	24	Burner	PABNCN30KDBN_003
9	DHW Inlet Adapter	BH2507469A	25	APS	NASS9EX00009
10	Syphon	BH2507442C	26	Exhaust Duct	BH2544004F
11	Gas Inlet Adapter	BH2507396A	27	Exhaust Pipe	BH2505401B
12	Main Gas valve	BH0901018A	28	Air Intake Guide	BH2543002C
13	GPS Venturi	BH2507359B	29	Power Switch	BH1426002A
14	Gas Pipe	BH2507351A	30	Water Leakage Detector	-
15	GPS	NASS9EXGPS01	31	WAV	NCVM9EX00005
16	2-Way Valve	BH0914002B			

2.2.3. NR Model



No	Description	Navien Part No.	No	Description	Navien Part No.
1	Intake Duct	BH2505400B	17	Transformer	BH1205008A
2	Fan Motor	NAFA9GLPCT01	18	Exhaust Limit Switch	BH1401027A
3	Flow Sensor	BH1406004F	19	Secondary H/E	-
4	Power Switch	BH1426003A	20	Primary H/E	-
5	PCB Board	NACR1GS32401	21	Ignition Trans	BH1201041D
6	Heater	BH1501047B	22	APS Venturi	BH2501413A
7	Heater Clip	BH2507447A	23	Manifold	PABCR180AMF_001
8	DHW Supply Adapter	BH2507348B	24	Burner	PABNCN30KDBN_003
9	DHW Inlet Adapter	BH2507469A	25	APS	NASS9EX00009
10	Syphon	BH2507452C	26	Exhaust Duct	BH2544004F
11	Gas Inlet Adapter	BH2507396A	27	Exhaust Pipe	BH2505401B
12	Main Gas valve	BH0901018A	28	Air Intake Guide	BH2543002C
13	GPS Venturi	BH2507359B	29	Bypass Mixing Valve	AAVC9EXMIX01
14	Gas Pipe	BH2507351A	30	Freeze Protect Switch	BH1402001A
15	GPS	NASS9EXGPS01	31	Mixing Trans	BH1205013A
16	WAV	NCVM9EX00005			

2.2.4. NP Model



No	Description	Navien Part No.	No	Description	Navien Part No.
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2	Fan Motor	NAFA9GLPCT01	18	Exhaust Limit Switch	BH1401027A
3	Flow Sensor	BH1406004F	19	Secondary H/E	-
4	Power Switch	BH1426003A	20	Primary H/E	-
5	PCB Board	NACR1GS32401	21	Ignition Trans	Bh1201041D
6	Heater	BH1501047B	22	APS Venturi	BH2501413A
7	Heater Clip	BH2507447A	23	Manifold	PABCR180AMF_001
8	DHW Supply Adapter	BH2507348B	24	Burner	PABNCN30KDBN_003
9	DHW Inlet Adapter	BH2507469A	25	APS	NASS9EX00009
10	Syphon	BH2507452C	26	Exhaust Duct	BH2544004F
11	Gas Inlet Adapter	BH2507396A	27	Exhaust Pipe	BH2505401B
12	Main Gas valve	BH0901018A	28	Air Intake Guide	BH2543002C
13	GPS Venturi	BH2507359B	29	WAV	NCVM9EX00005
14	Gas Pipe	BH2507351A	30	Freeze Protect Switch	BH1402001A
15	GPS	NASS9EXGPS01	31	Bypass Mixing Valve	AAVC9EXMIX01
16	2-Way Valve	BH0914002B	32	Mixing Trans	BH1205013A

3. Technical Data

3.1. General Specifications

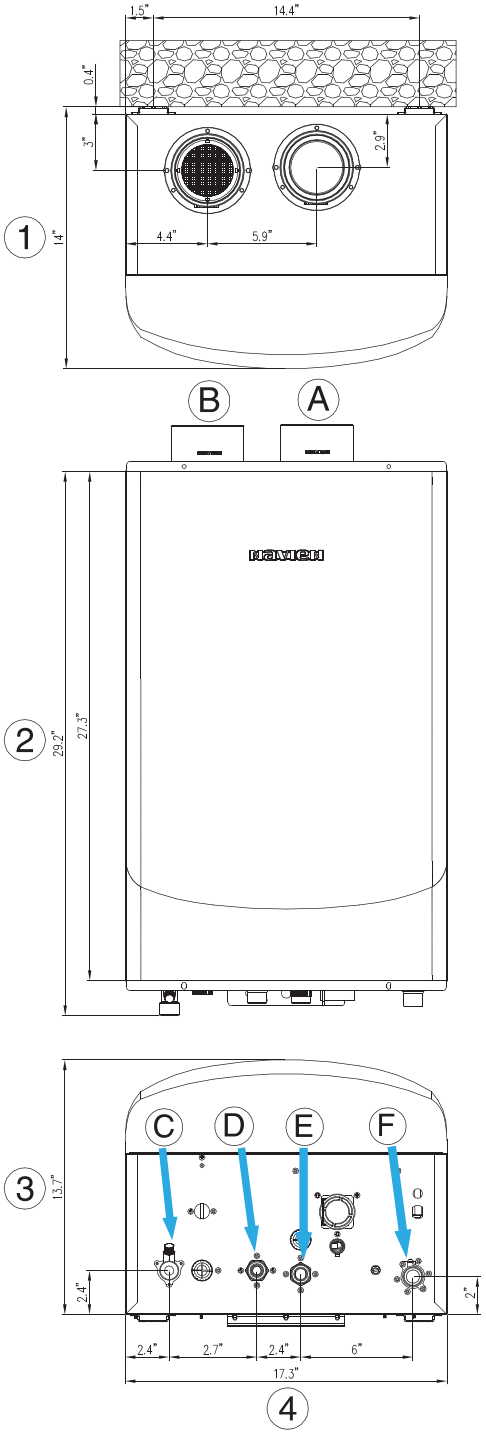
Item		NR,NP-180(A)	NR,NP-210(A)	NR,NP-240(A)
Heat Capacity (Input)	Natural Gas	Min: 15,000 Btuh Max: 150,000 Btuh	Min: 17,000 Btuh Max: 180,000 Btuh	Min: 17,000 Btuh Max: 199,000 Btuh
	LP Gas	Min: 15,000 Btuh Max: 150,000 Btuh	Min: 17,000 Btuh Max: 180,000 Btuh	Min: 17,000 Btuh Max: 199,000 Btuh
Heat 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	4.5 Gal/m	5.0 Gal/m
Dimensions		W17" x H28"x D14"	W17" x H28"x D15"	W17" x H28" x D15"
Weight NR/NP-A		77 lbs	86 lbs	86 lbs
Weight NR/NP		67 lbs	77 lbs	77 lbs
Installation Type		Indoor / Outdoor Wall-Hung		
Venting Type		Forced Draft Direct Vent		
Ignition		Electronic Ignition		
Water Pressure (min-max)		15 – 150 PSI		
Gas Supply Pressure	Min. ~ Max.	NG: 6"~10.5" W.C LP: 9"~13.5" W.C	NG: 5"~10.5" W.C LP: 8"~13.5" W.C	
Manifold Gas Pressure	Min.	NG: 0.4" W.C LP: 0.8" W.C	NG: 0.4" W.C LP: 0.8" W.C	NG: 0.6" W.C LP: 1.0" W.C
	Max.	NG: 4.9" W.C LP: 7.6" W.C	NG: 3.5" W.C LP: 5.9" W.C	NG: 3.7" W.C LP: 3.7" W.C
Minimum Flow Rate		0 GPM for "A" models (no minimum flow rate requirement); 0.5 GPM for Non-"A" models		

Connection Sizes Recirculation : "A" Model	Cold Water	Hot Water	Recircualation	Gas Supply
	3/4" NPT	3/4" NPT	3/4" NPT	3/4" NPT

Temperature Range (R/C)		98 ~ 140℉ (37 ~ 60℃)
		98 ~ 185℉ (37 ~ 85℃)
Thermisters Q'ty		3 Thermisters (In, Out 1, Out 2)
		4 Thermisters (In, Out 1, Out 2, Mixing)
Freeze Protection		Auto Firing System (Internal or External Recirculation)
		Ceramic Heaters

3.2. Dimensions

3.2.1. NR-A, NP-A Model



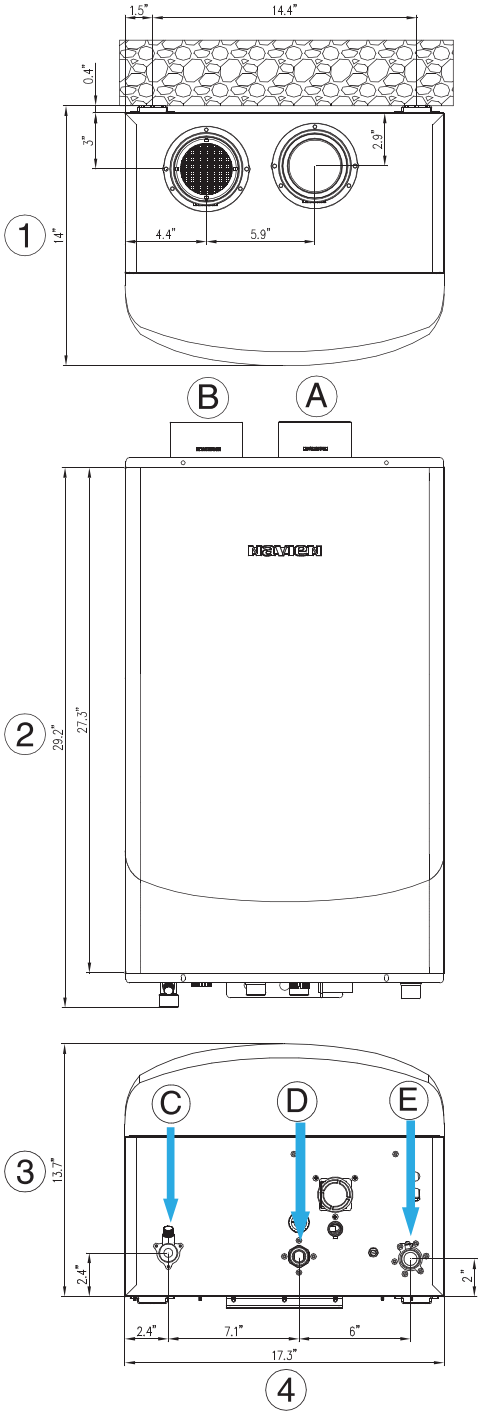
1) Connection Diameter

	Description	Diameter
A	Exhaust	3”
B	Air Intake	3”
C	Hot Water Outlet	3/4”
D	Recirculation Inlet	3/4”
E	Cold Water Inlet	3/4”
F	Gas Connection	3/4”

2) Dimensions

Model	①	②	③	④
180A	14”	29.2”	13.7”	17.3”
210A	15”	29.2”	14.9”	17.3”
240A	15”	29.2”	14.9”	17.3”

3.2.2. NR, NP Model



1) Connection Diameter

	Description	Diameter
A	Exhaust	3”
B	Air Intake	3”
C	Hot Water Outlet	3/4”
D	Cold Water Inlet	3/4”
E	Gas Connection	3/4”

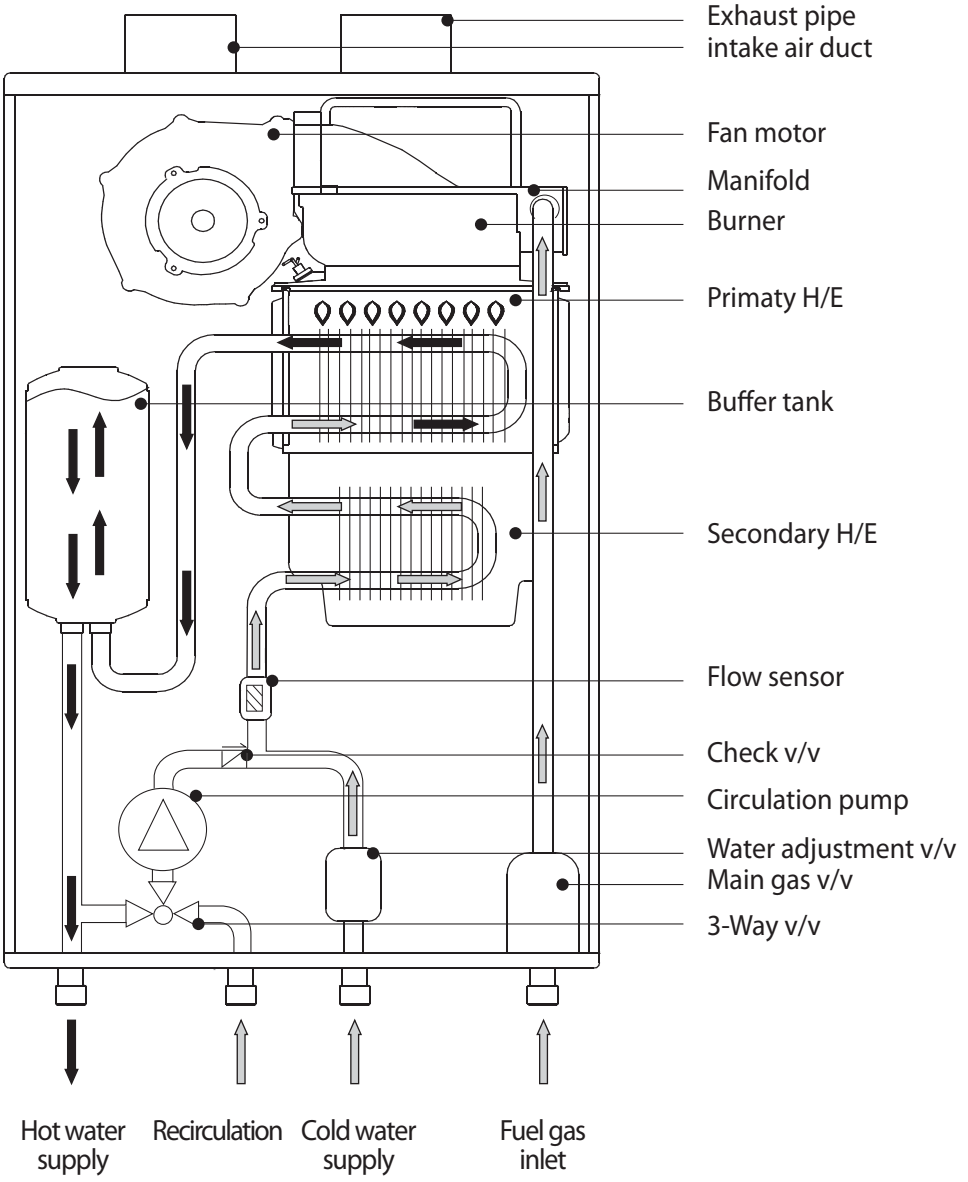
2) Dimensions

Model	①	②	③	④
180A	14”	29.2”	13.7”	17.3”
210A	15”	29.2”	14.9”	17.3”
240A	15”	29.2”	14.9”	17.3”

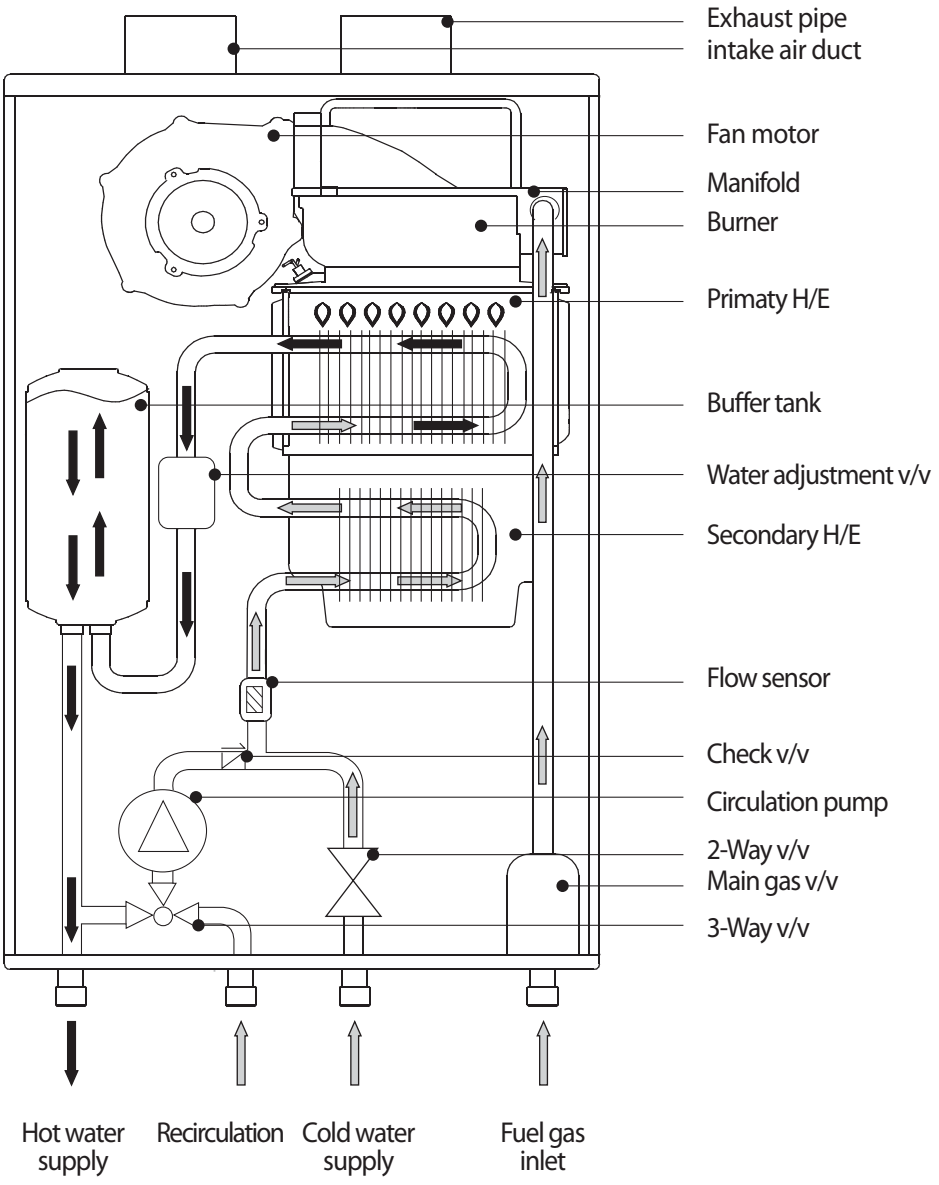
4. System Details

4.1. Schematic and Flow Diagram

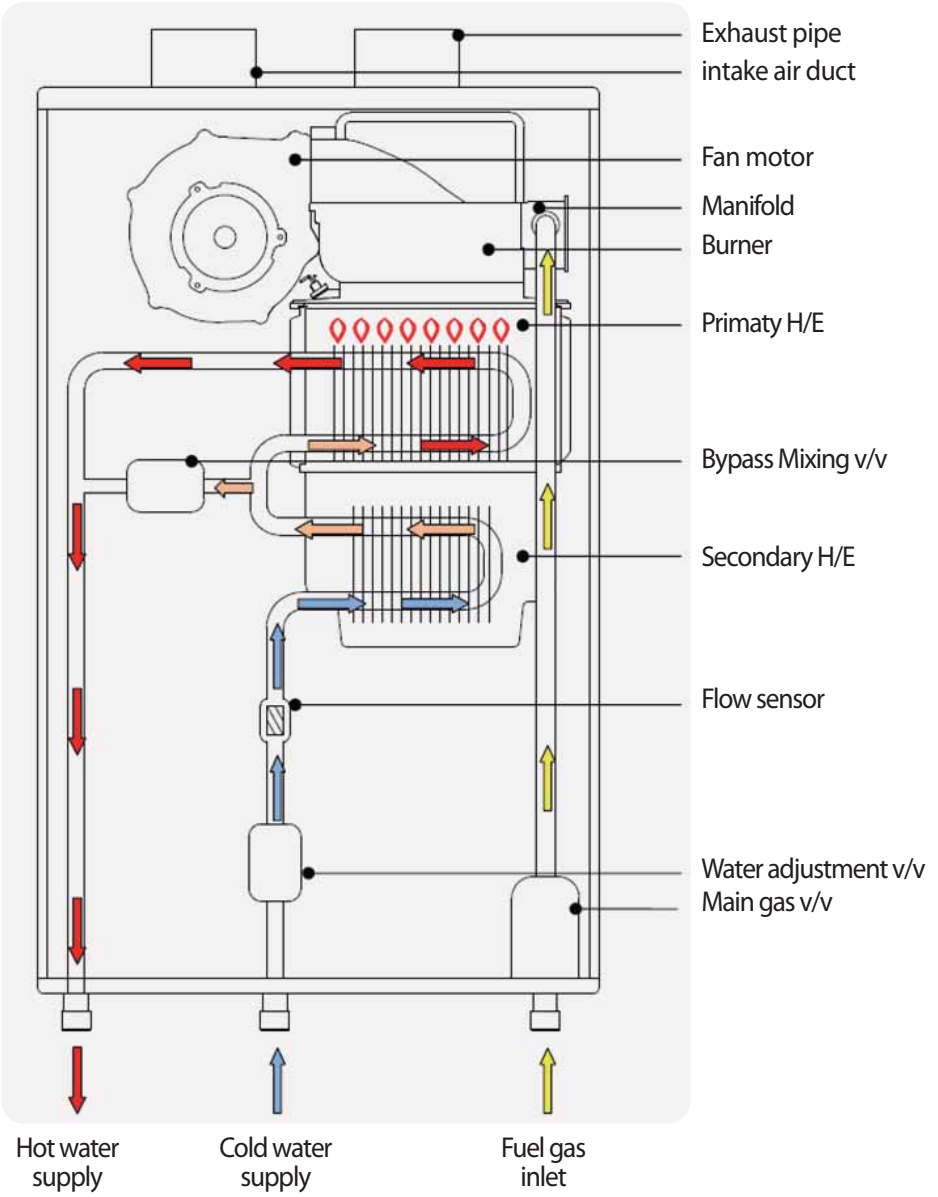
4.1.1. NR-A Model



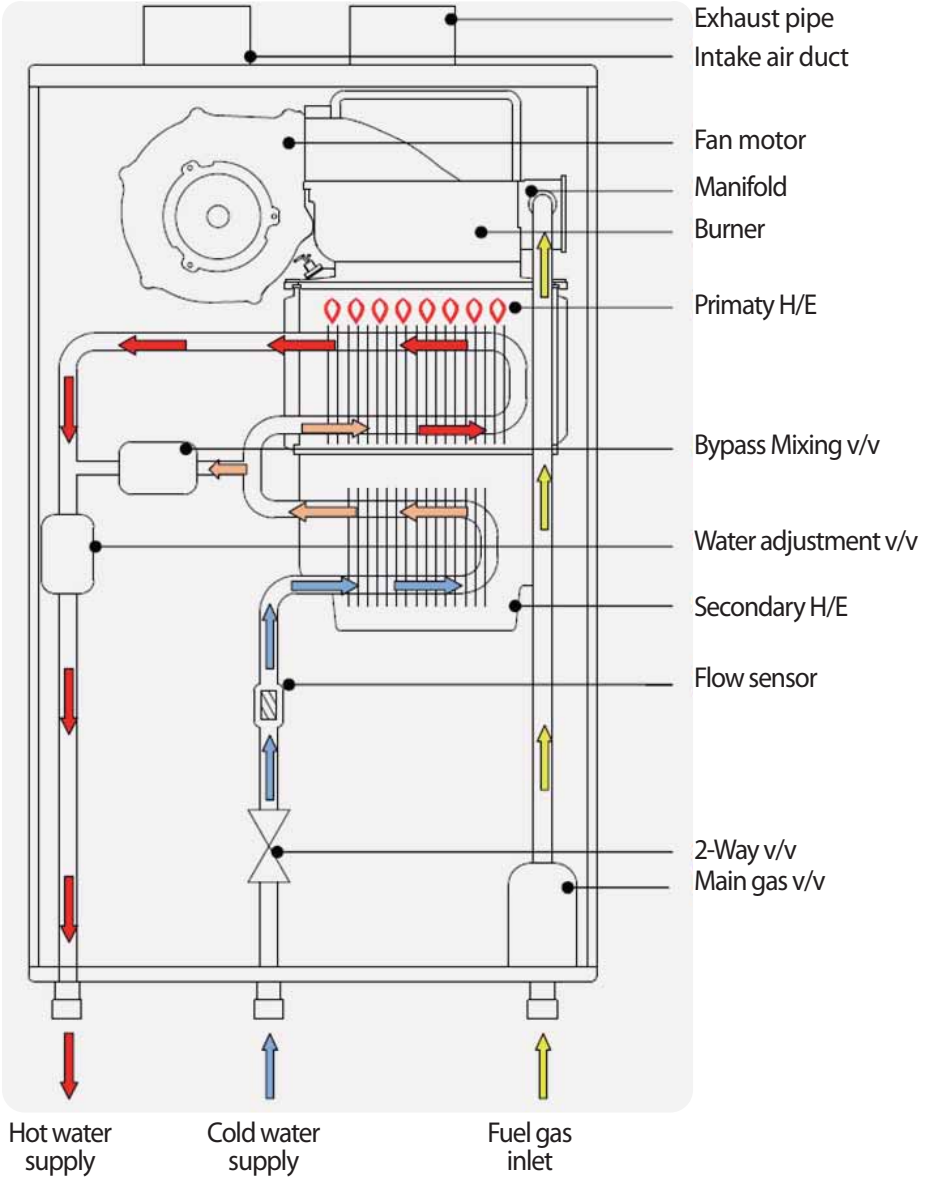
4.1.2. NP-A Model



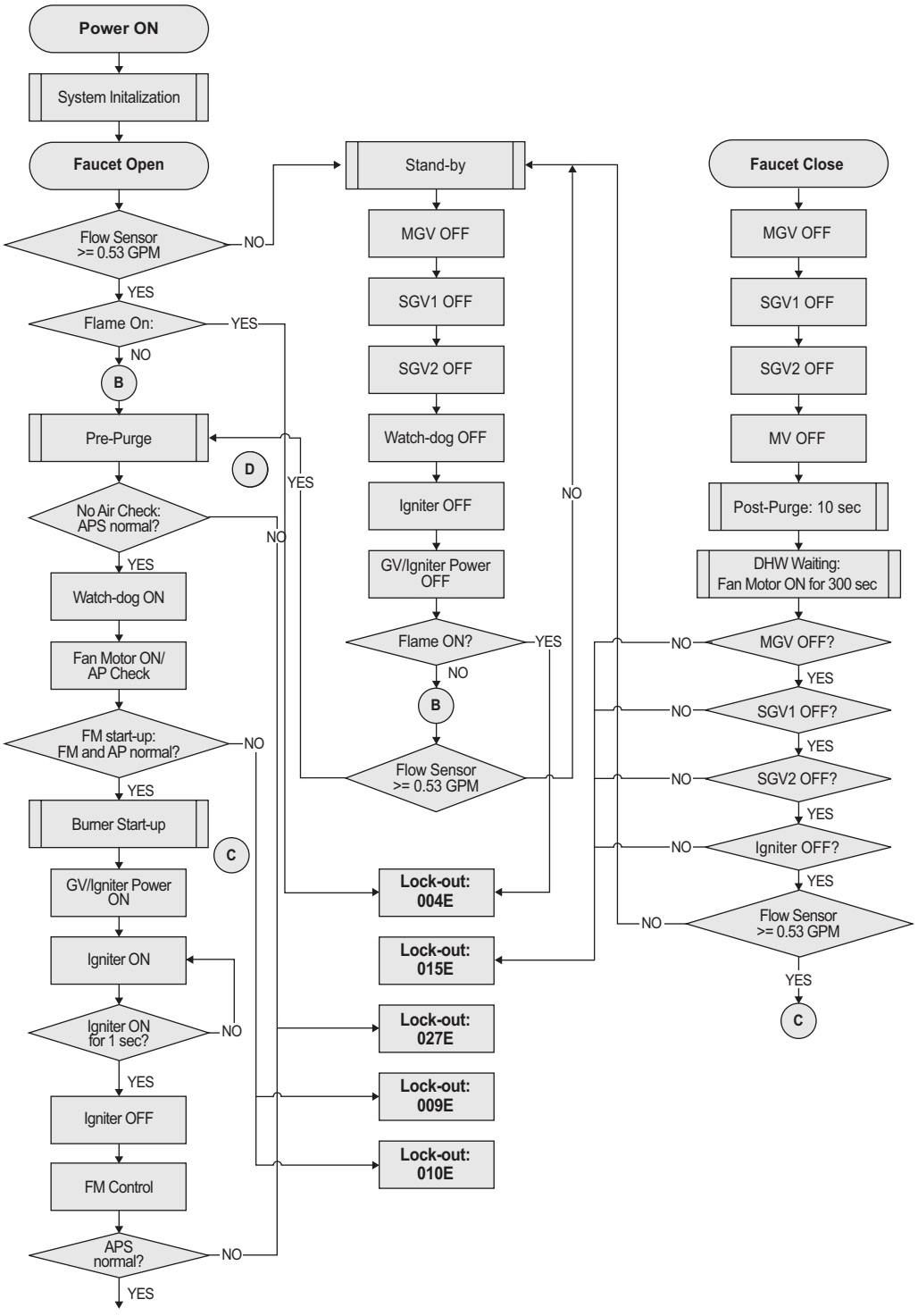
4.1.3. NR Model

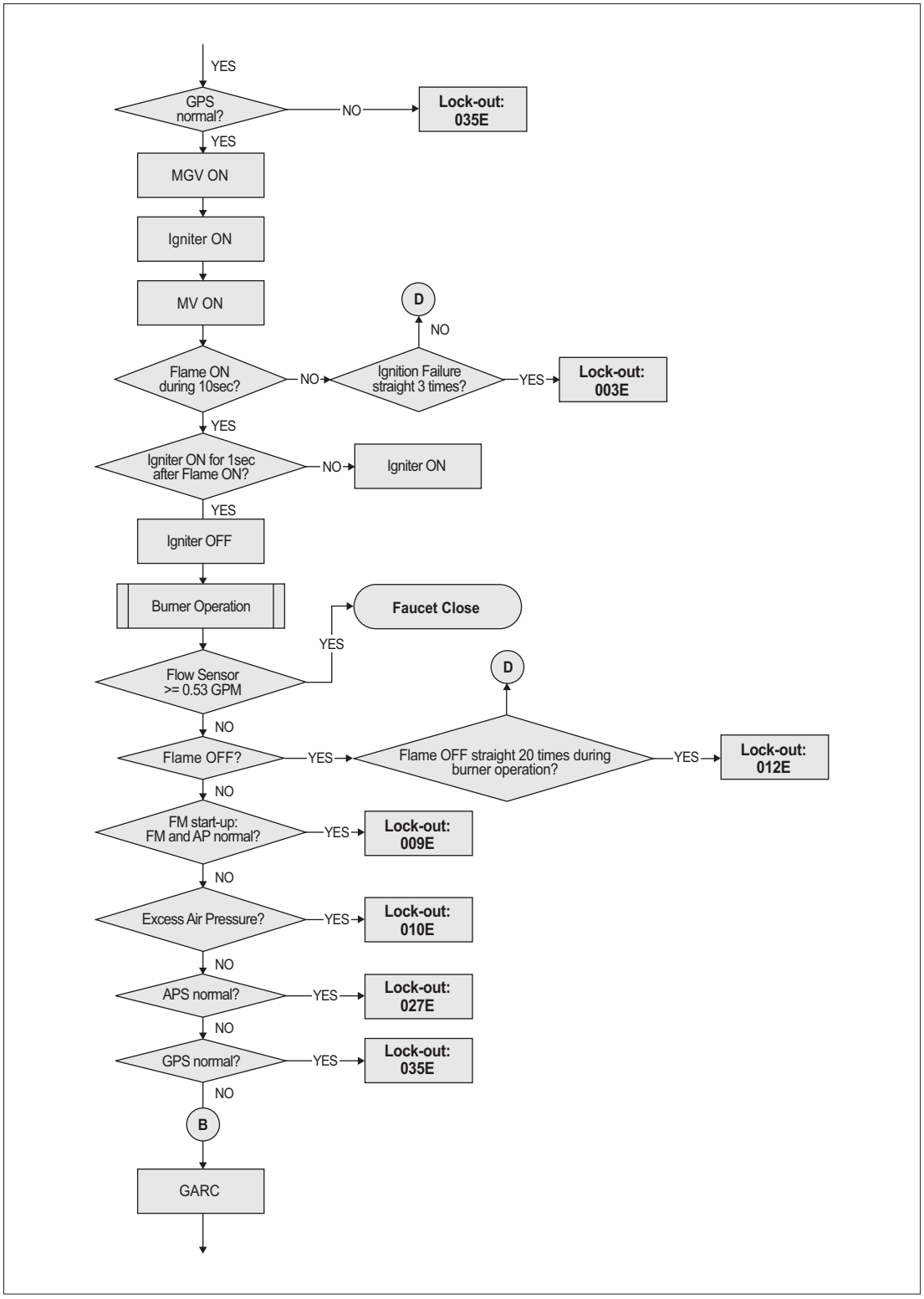

Exhaust pipe
intake air duct
Fan motor
Manifold
Burner
Primaty H/E
Bypass Mixing v/v
Secondary H/E
Flow sensor
Water adjustment v/v
Main gas v/v
Hot water supply
Cold water supply
Fuel gas inlet

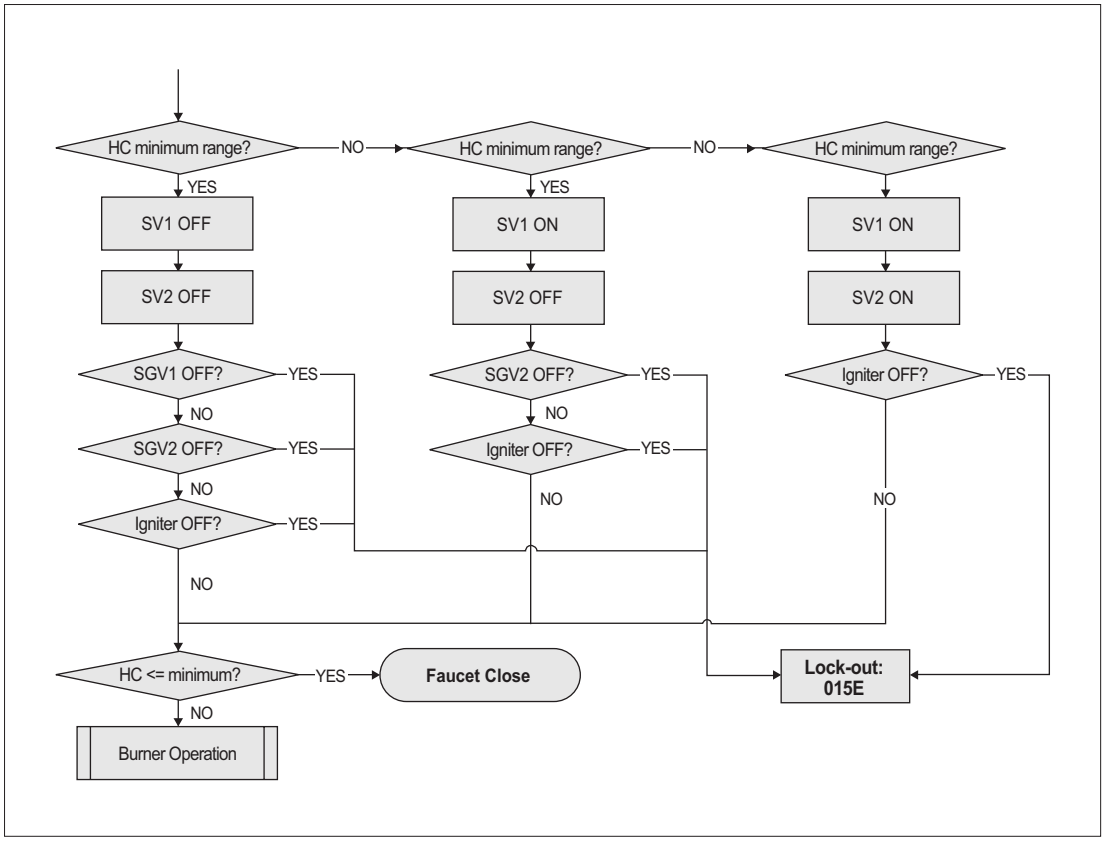
4.1.3. NR Model

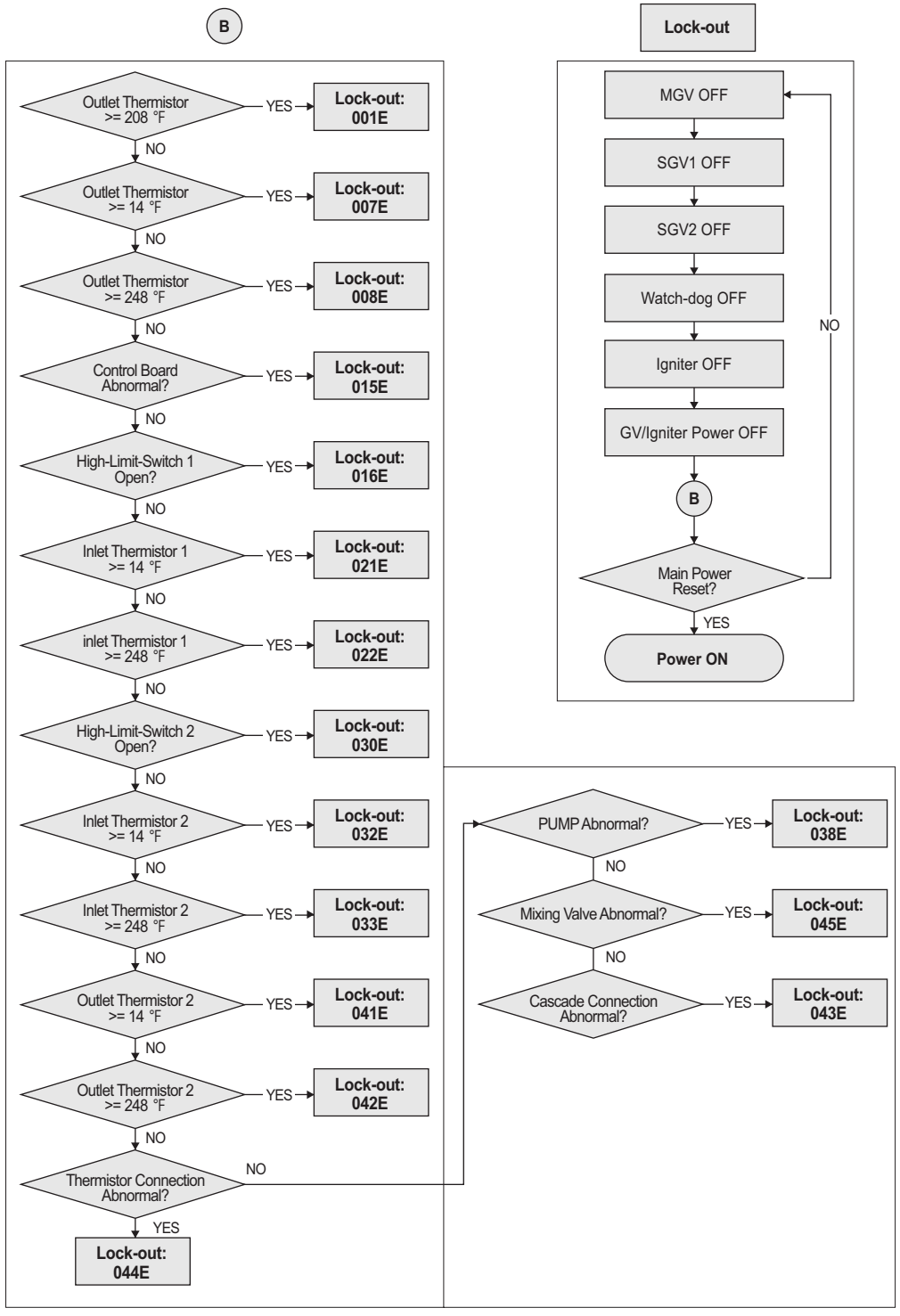

Exhaust pipe
Intake air duct
Fan motor
Manifold
Burner
Primaty H/E
Bypass Mixing v/v
Water adjustment v/v
Secondary H/E
Flow sensor
2-Way v/v
Main gas v/v
Hot water supply
Cold water supply
Fuel gas inlet

4.2. Operation Flow Chart




YES
GPS normal?
NO
Lock-out: 035E
YES
MGV ON
Igniter ON
MV ON
D
NO
Flame ON during 10sec?
NO
Ignition Failure straight 3 times?
YES
Lock-out: 003E
YES
Igniter ON for 1sec after Flame ON?
NO
Igniter ON
YES
Igniter OFF
Burner Operation
Faucet Close
YES
Flow Sensor >= 0.53 GPM
D
NO
Flame OFF?
YES
Flame OFF straight 20 times during burner operation?
YES
Lock-out: 012E
NO
FM start-up: FM and AP normal?
YES
Lock-out: 009E
NO
Excess Air Pressure?
YES
Lock-out: 010E
NO
APS normal?
YES
Lock-out: 027E
NO
GPS normal?
YES
Lock-out: 035E
NO
B
GARC


HC minimum range?
NO
HC minimum range?
NO
HC minimum range?
YES
YES
SV1 OFF
SV1 ON
SV1 ON
SV2 OFF
SV2 OFF
SV2 ON
SGV1 OFF?
YES
SGV2 OFF?
YES
Igniter OFF?
YES
NO
NO
SGV2 OFF?
YES
Igniter OFF?
YES
NO
NO
Igniter OFF?
YES
NO
NO
HC <= minimum?
YES
Faucet Close
Lock-out:
015E
NO
Burner Operation


B
Outlet Thermistor >= 208 °F
YES
Lock-out: 001E
NO
Outlet Thermistor >= 14 °F
YES
Lock-out: 007E
NO
Outlet Thermistor >= 248 °F
YES
Lock-out: 008E
NO
Control Board Abnormal?
YES
Lock-out: 015E
NO
High-Limit-Switch 1 Open?
YES
Lock-out: 016E
NO
Inlet Thermistor 1 >= 14 °F
YES
Lock-out: 021E
NO
inlet Thermistor 1 >= 248 °F
YES
Lock-out: 022E
NO
High-Limit-Switch 2 Open?
YES
Lock-out: 030E
NO
Inlet Thermistor 2 >= 14 °F
YES
Lock-out: 032E
NO
Inlet Thermistor 2 >= 248 °F
YES
Lock-out: 033E
NO
Outlet Thermistor 2 >= 14 °F
YES
Lock-out: 041E
NO
Outlet Thermistor 2 >= 248 °F
YES
Lock-out: 042E
NO
Thermistor Connection Abnormal?
NO
YES
Lock-out: 044E
PUMP Abnormal?
YES
Lock-out: 038E
NO
Mixing Valve Abnormal?
YES
Lock-out: 045E
NO
Cascade Connection Abnormal?
YES
Lock-out: 043E
Lock-out
MGV OFF
SGV1 OFF
SGV2 OFF
Watch-dog OFF
Igniter OFF
GV/Igniter Power OFF
B
Main Power Reset?
NO
YES
Power ON

※ Operation

1. Water Flow Begins
   - Water Flow Sensor sends pulses to the PCB.
   - PCB senses flow greater than 0.5 GPM (0 GPM for “A” Model) (approximate).
   - Firing Sequence begins.

2. Firing Sequence
   - PCB monitors Inlet / Outlet water temperature, temperature set point, and water flow rate.
   - Fan Motor energized. Purges combustion chamber.
   - Spark igniter begins sparking
   - Main Gas control valve opens to minimum fire rate.
   - Flame rod proves ignition.
   - Spark igniter stops sparking.

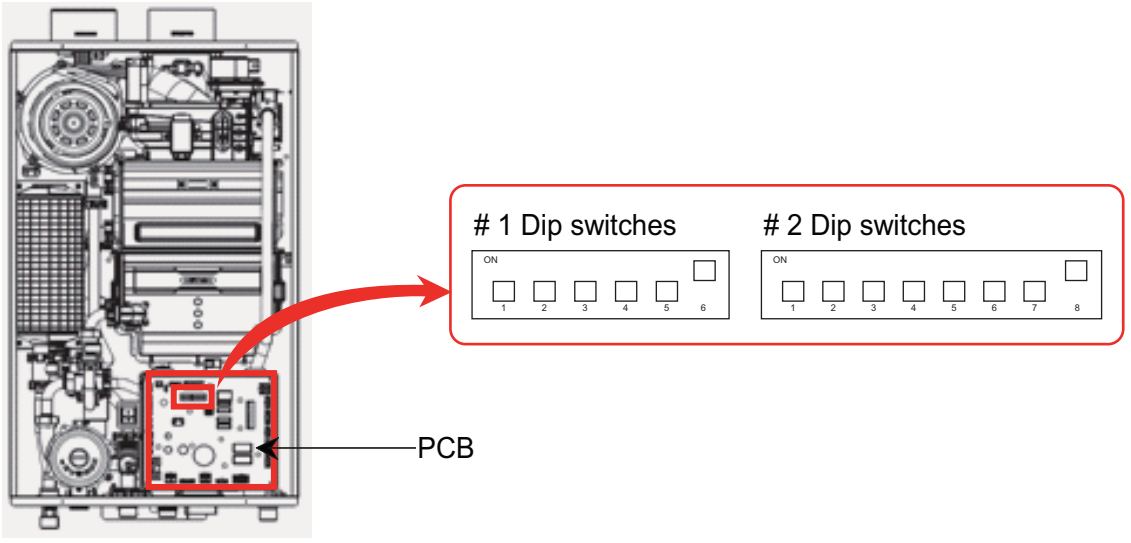
3. Normal Operation
   - PCB monitors flame rod, fan motor frequency, outlet water temperature, PCB temperature set point and water flow rate.
   - Main Gas control valve modulates gas input to required firing rate.
   - Combustion fan speed is adjusted for the required firing rate.
   - Water adjustment valve is adjusted as needed.

4. Shut-down Sequence
   - PCB senses flow rate less than 0.5 GPM (0 GPM for “A” Model) (approximate).
   - Main Gas Control valve closes.
   - Water adjustment valve resets to standby position.
   - Combustion fan runs for a short period of time at low speed.

5. Standby Mode
   - PCB monitors water temperature and remote controls.
   - Freeze protection is activated as needed.

4.3. Dip Switch Settings

There are two sets of Dip switches on the PCB.
One set has 6 switches and the other has 8 switches.



#1 Dip Switches

No	Function	ON	OFF
1	Burner Operation Mode selection	See 'Burner Operation Mode' below	
2			
3	Gas Type Selection	LP (Propame Gas)	NG (Natural Gas)
4	Vent Selection	Cascade Individual Vent	Cascade Common Vent
5	Model Selection	See 'Model Selection' below	
6			

Burner Operation Mode

Dip Switch No.	1	2
Normal Operation	OFF	OFF
Maximum Operation	ON	OFF
Minimum Operation	OFF	ON
3-Stage Minimum	ON	ON

Model Selection

Dip Switch No.	5	6
NR/NP-180, NR/NP-180A	OFF	OFF
NR/NP-210, NR/NP-210A	ON	OFF
NR/NP-180, NR/NP-180A	OFF	ON

#2 Dip Switches

Description			
No	**Function**	**ON**	**OFF**
1	Ready-Link Multi-System Selection	Ready-Link Multi-System Master	Single Unit Operation or Multi-System Slave
2	Location select	Korea	North America
3	X	X	X
4 5	Pump & Recirculation Selection	See “ Pump and Recirculation Modes Selection ”	
6	Model Select	Factory setting	
7 8	Temperature Select	See “ Temperature Selection ”	

Pump and Recirculation Modes Selection

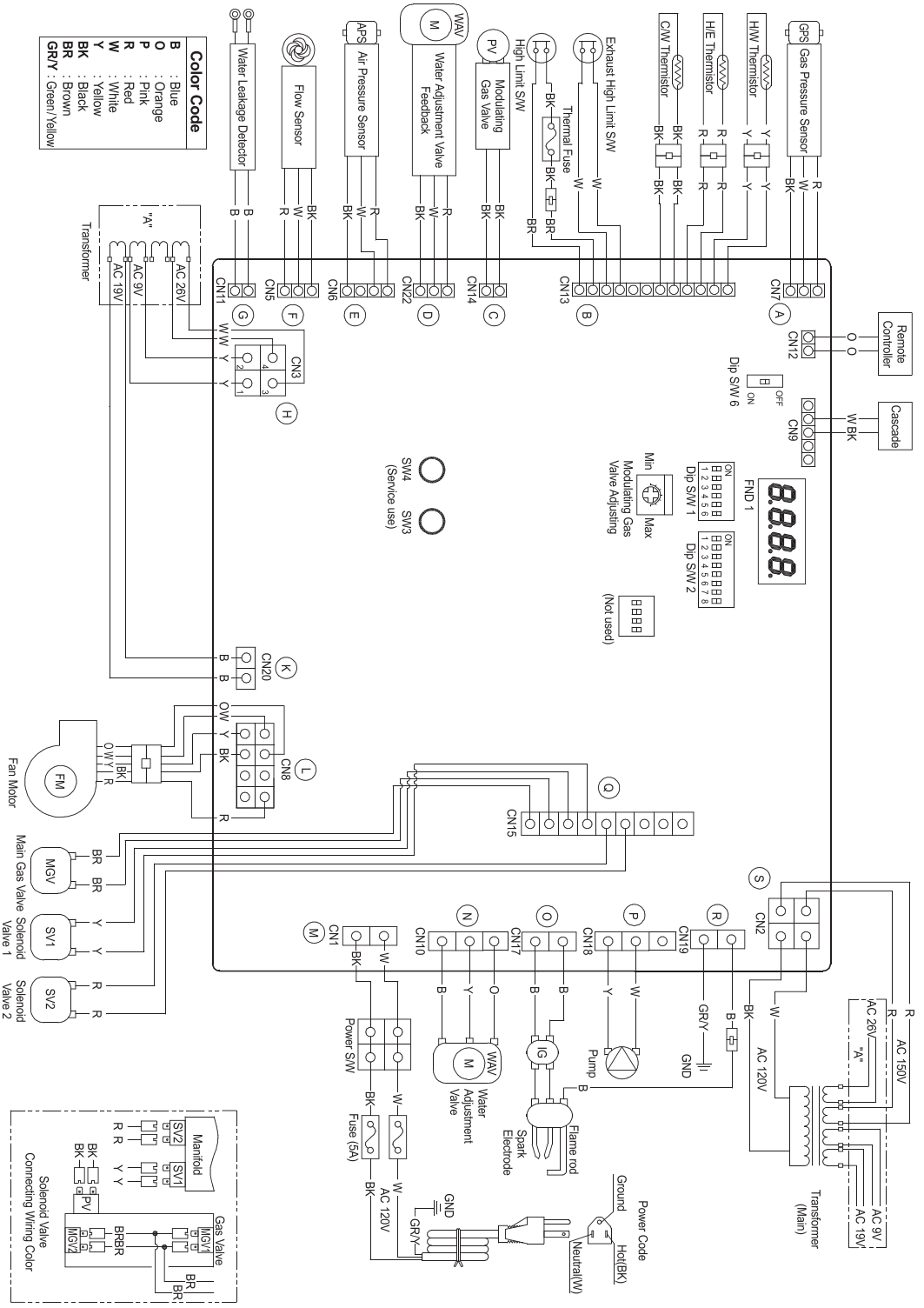
Description		**DIP Switch #**	
		4	5
With Pump (NR-180A, NR-210A, NR-240A, NP-180A, NP-210A, NP-240A)	No Recirculation	OFF	OFF
	External Recirculation	OFF	ON
	Internal Recirculation	ON	OFF
Without Pump (NR-180, NR -210, NR -240, NP-180, NP -210, NP -240)		ON	ON

Temperature Selection

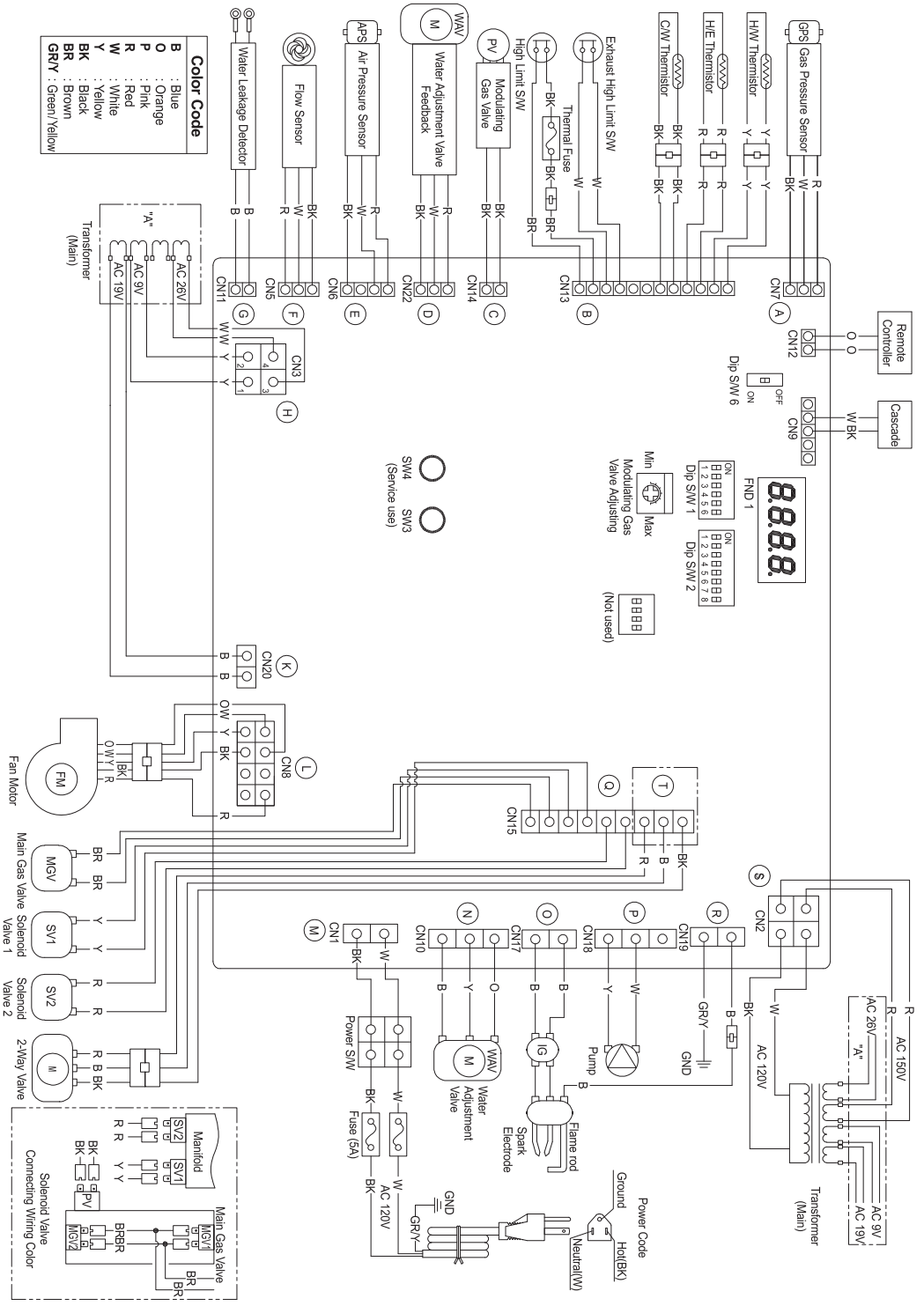
Temperatures		**DIP Switch #**	
With Pump (NR-180A, NR-210A, NR-240A, NP-180A, NP-210A, NP-240A)	Premium Models (NP,NP-A Series)		
˚F (˚C)	˚F (˚C)	7	8
110 (43)	120 (49)	OFF	OFF
120 (49)	140 (60)	OFF	ON
130 (54)	160 (71)	ON	OFF
140 (60)	185 (85)	ON	ON

4.4. Wiring Diagram

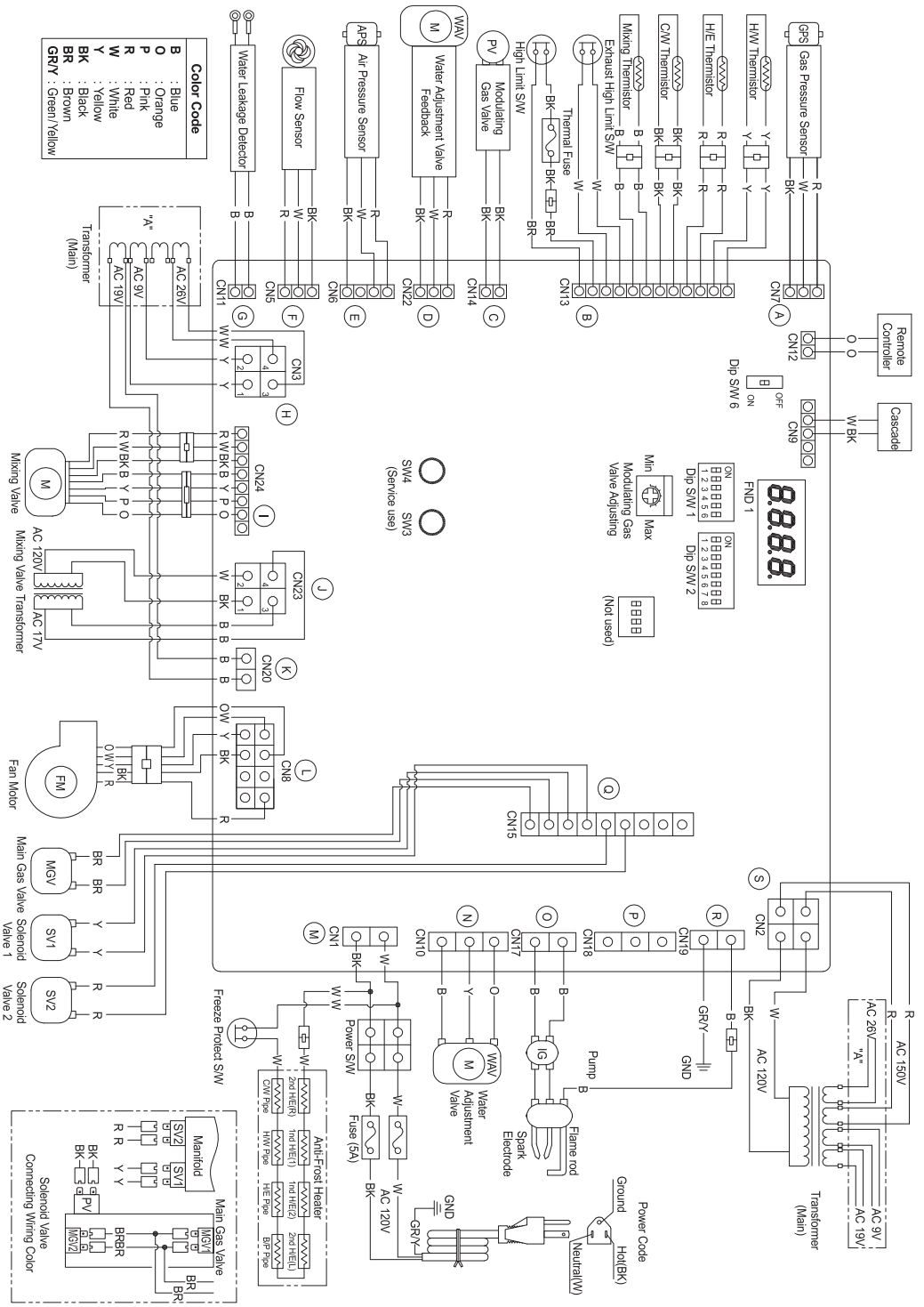
4.4.1. NR-A Model



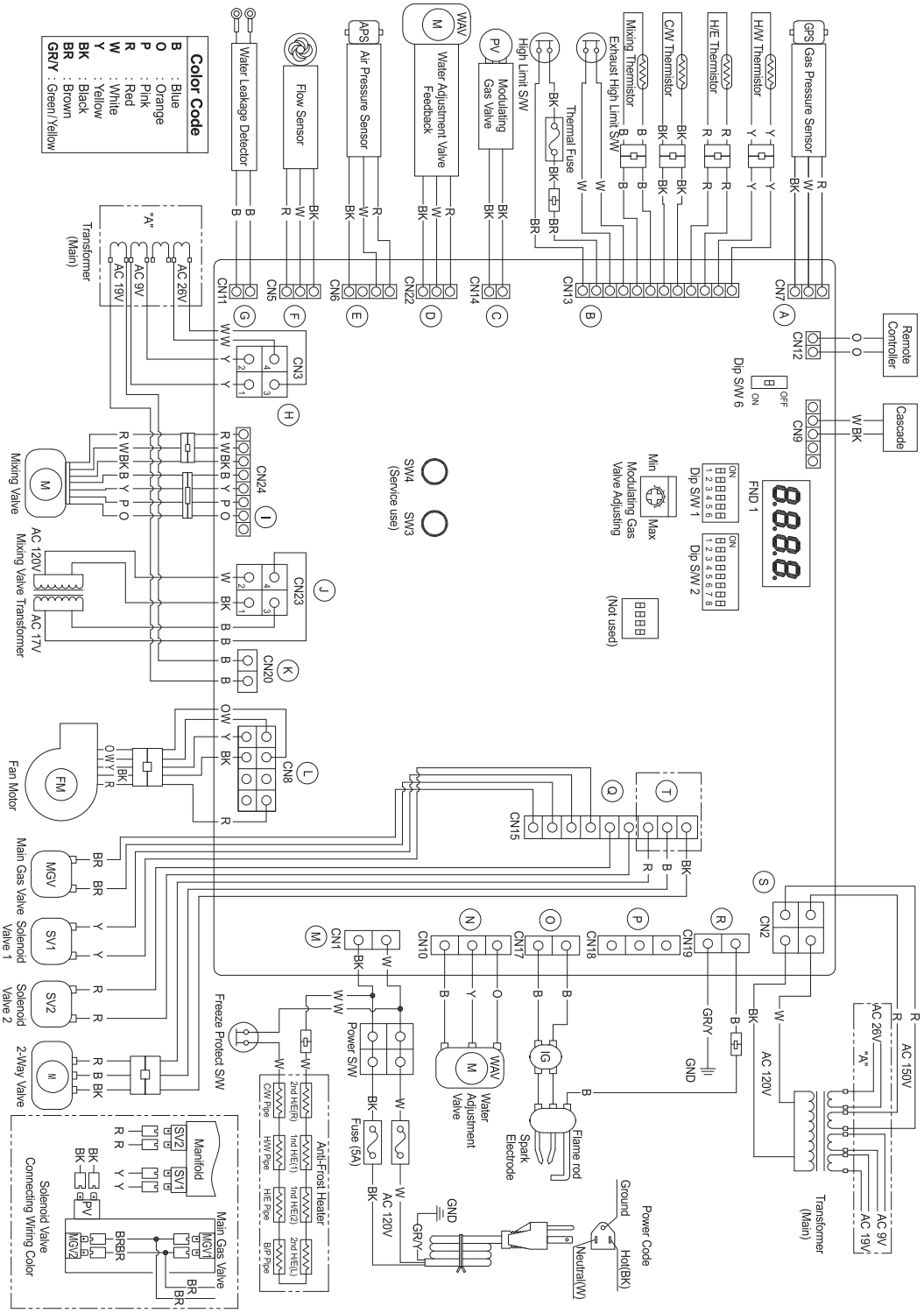
4.4.2. NP-A Model



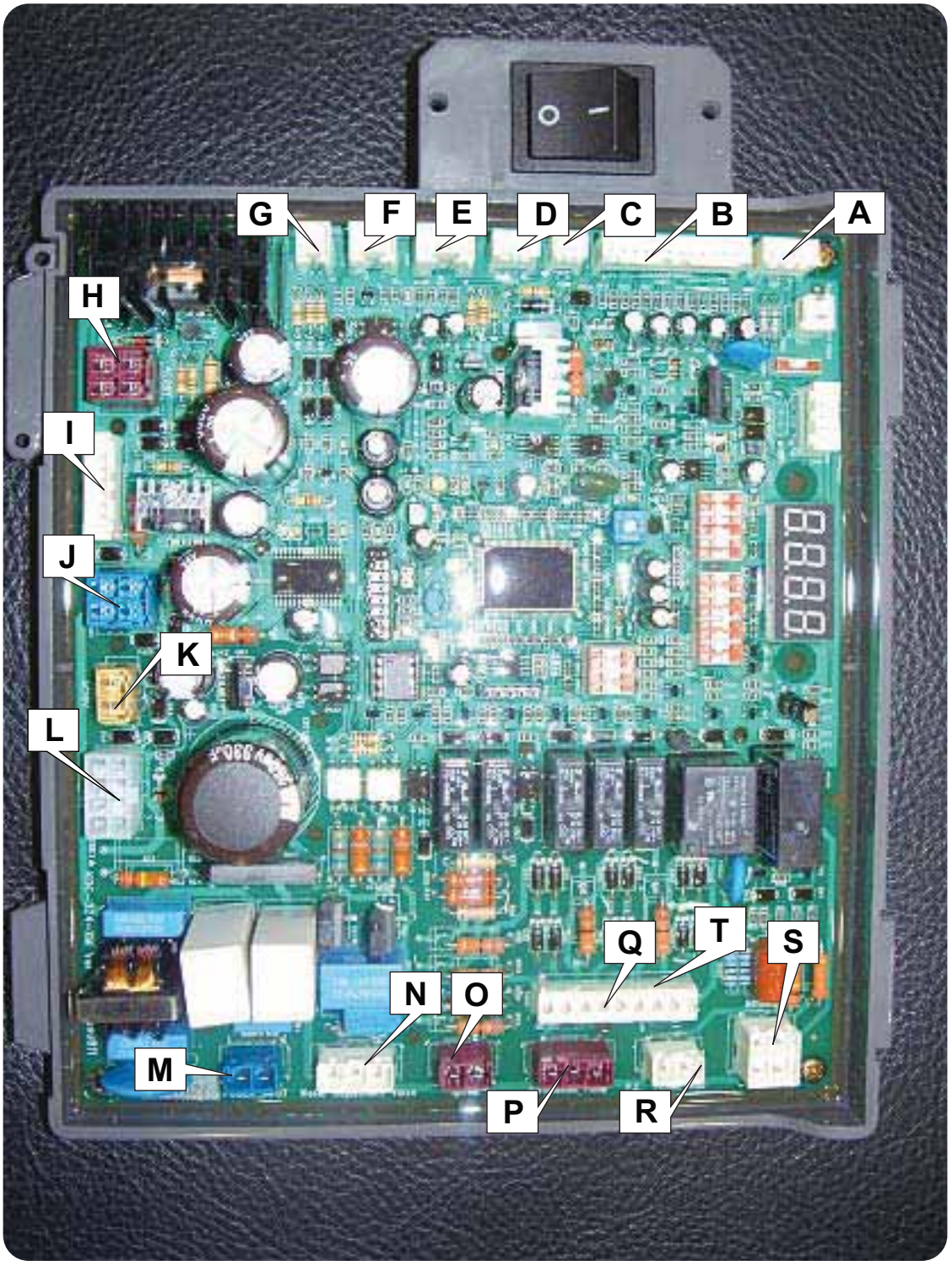
4.4.3. NR Model


Color Code
B : Blue
O : Orange
P : Pink
R : Red
W : White
Y : Yellow
BK : Black
BR : Brown
GR/Y : Green/Yellow
Water Leakage Detector
Flow Sensor
Air Pressure Sensor
Water Adjustment Valve Feedback
Modulating Gas Valve
High Limit S/W
Thermal Fuse
Exhaust High Limit S/W
Mixing Thermistor
C/W Thermistor
H/E Thermistor
H/W Thermistor
Gas Pressure Sensor
Remote Controller
Cascade
Dip S/W 6
Dip S/W 1
Dip S/W 2
FND 1
Min
Max
Modulating Gas Valve Adjusting
SW4 (Service use)
SW3
(Not used)
Transformer (Main)
AC 26V
AC 9V
AC 19V
AC 150V
AC 120V
AC 17V
Mixing Valve
Mixing Valve Transformer
Fan Motor
Main Gas Valve
Solenoid Valve 1
Solenoid Valve 2
Freeze Protect S/W
Power S/W
Fuse (5A)
Water Adjustment Valve
Pump
Spark Electrode
Flame rod
Power Code
Ground
Hot(BK)
Neutral(W)
Anti-Frost Heater
2nd H/E(R)
1nd H/E(1)
1nd H/E(2)
2nd H/E(L)
C/W Pipe
H/W Pipe
H/E Pipe
B/P Pipe
Manifold
Main Gas Valve
Solenoid Valve Connecting Wiring Color

4.4.4. NP Model


Color Code
B : Blue
O : Orange
P : Pink
R : Red
W : White
Y : Yellow
BK : Black
BR : Brown
GR/Y : Green/Yellow
Water Leakage Detector
Flow Sensor
Air Pressure Sensor
Water Adjustment Valve Feedback
Modulating Gas Valve
High Limit S/W
Thermal Fuse
Exhaust High Limit S/W
Mixing Thermistor
C/W Thermistor
H/E Thermistor
H/W Thermistor
Gas Pressure Sensor
Remote Controller
Cascade
Dip S/W 6
Dip S/W 1
Dip S/W 2
FND 1
Min
Max
Modulating Gas Valve Adjusting
SW4 (Service use)
SW3
(Not used)
Transformer (Main)
AC 19V
AC 9V
AC 26V
Mixing Valve
AC 120V
Mixing Valve Transformer
AC 17V
Fan Motor
Main Gas Valve
Solenoid Valve 1
Solenoid Valve 2
2-Way Valve
Freeze Protect S/W
Power S/W
Water Adjustment Valve
Spark Electrode
Flame rod
GND
Power Code
Ground
Hot(BK)
Neutral(W)
Transformer (Main)
AC 150V
AC 120V
Anti-Frost Heater
2nd H/E(R)
1nd H/E(1)
1nd H/E(2)
2nd H/E(L)
C/W Pipe
H/W Pipe
H/E Pipe
B/P Pipe
Fuse (5A)
Manifold
Main Gas Valve
Solenoid Valve Connecting Wiring Color

4.5. Electrical Diagnostic Points



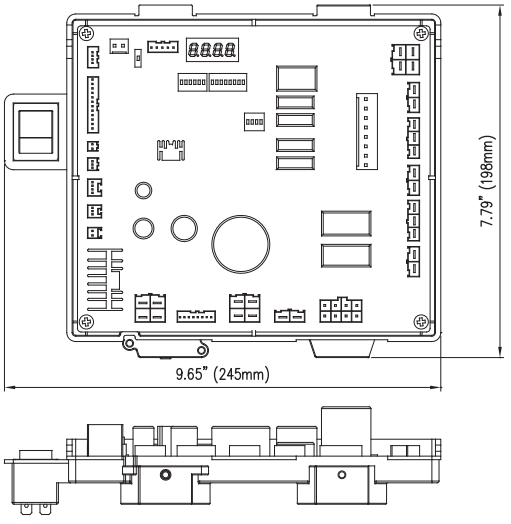
Point	Function	Wire Color	Normal Value	Check
A	GPS	RED-BLACK	DC 5 V	Confirm if voltage flows without any relations with the GPS operating
		WHITE-BLACK	DC 0.3~4.5 V	Voltage changes according to the GPS operating.
B	Hot Water	YELLOW-YELLOW	DC 0~5 V	Voltage change according to temperature
	H/E Water.	RED-RED	DC 0~5 V	Voltage change according to temperature.
	Mixing Water	BLUE-BLUE	DC 0~5 V	Voltage change according to temperature.
	Cold Water	BLACK-BLACK	DC 0~5 V	Voltage change according to temperature.
	Exhaust S/W	WHITE-WHITE	DC 4~6 V	Normally input pulse. Confirm rms voltage as measuring DC meter.
	High S/W	BROWN-BROWN	DC 4~6 V	Normally input pulse. Confirm rms voltage as measuring DC meter.
C	Modulating Valve	BLACK-BLACK	0~250 mA, DC 2~10 V	Currency changes as controlling gas volume after operating the gas valve.
D	WAV Feed-back	RED-BLACK	DC 5 V	Confirm if voltage flows without any relations with the WAV operating.
		WHITE-BALCK	DC 0~5 V	Voltage changes according to the WAV operating.
E	APS	RED-BLACK	DC 5 V	Confirm if voltage flows without any relations with theAPS operating.
		WHITE-BLACK	DC 0.3~4.5 V	Voltage changes according to the APS operating.
F	Flow Sensor	RED-BLACK	DC 7~13 V	Confirm if voltage flows without any relations with the flow sensor operating.
		WHITE-BLACK	PULSE	Check Pulse.
G	Water Detector	ORANGE-ORANGE	DC 0 V	Normally opened. Output pulse as sensing leakage.
H	AC9V	YELLOW-YELLOW	AC 7~11 V	Confirm output voltage.
		WHITE-WHITE	AC 22~33 V	Confirm output voltage.
I	AC26V Bypass Mixing Valve	RED-BLACK	DC 7~13 V	Confirm if voltage flows without any relations with the Mixing Valve operating.
		WHITE-BLACK	DC 0~13 V	Voltage changes according to the Mixing Valve operating.
		BLUE-YELLOW PINK-ORANGE	PULSE	Check Pulse.
J	AC 17 V	BLUE-BLUE	AC 14~20 V	Confirm output voltage.

Point	Function	Wire Color	Normal Value	Check
K	AC19V	BLUE-BLUE	AC 16~24 V	Confirm output voltage.
L	Fan Motor	BLACK-RED	DC 127V~184 V	Confirm if voltage flows without any relations with the fan operating.
		BLACK-YELLOW	DC 15 V	Confirm if voltage flows without any relations with the fan operating.
		BLACK-ORANGE	DC 0~7.5 V	Voltage changes as the fan operating.
		BLACK-WHITE	0 rpm~6500 rpm	Check PULSE.
M	Power Input	BLUE-BLACK	AC 97~138 V	Confirm approval of the 1st power resource. Confirm the FUSE. Confirm the circuit breaker.
N	Water Adjust Valve (CW)	BLUE-YELLOW	ON : AC 97~138 V OFF : 0V	Confirm voltage as operating.
	Water Adjust Valve (CCW)	BLUE-ORANGE	ON : AC 97~138 V OFF : 0V	Confirm voltage as operating.
O	Igniter	BLUE-BLUE	ON : AC 97~138 V OFF : 0V	Confirm voltage asignition operating.
P	Pump	BROWN-WHITE	ON : AC 97~138 V OFF : 0V	Confirm voltage as operating.
		BROWN-BLACK	ON : AC 97~138 V OFF : 0V	Confirm voltage as operating.
Q	Gas Valve	BROWN-BROWN	ON : DC 83~120 V OFF : 0V	Confirm voltage as the Main Gas Valve operating.
		YELLOW-YELLOW	ON : DC 83~120 V OFF : 0V	Confirm voltage as the Gas Solenoid Valve 1 operating.
		RED-RED	ON : DC 83~120 V OFF : 0V	Confirm voltage as the Gas Solenoid Valve 2 operating.
R	P.E	GREEN	Protect Earth	Same to the case earth Protect Earth.
	Flame Rod	BLACK	0~20 uA	Measure the currency as sensing flame.
S	Power trans AC150V	RED-RED	AC 123~177 V	Confirm output voltage.
	Power trans AC120V	WHITE-BLACK	AC 97~138 V	Confirm output voltage
T	Motorized 2-way Valve	BLACK-BLUE-RED	ON : AC 97~138 V OFF : 0 V	Confirm voltage as Motorized 2-way Valve operating.

4.6. Key Components Description

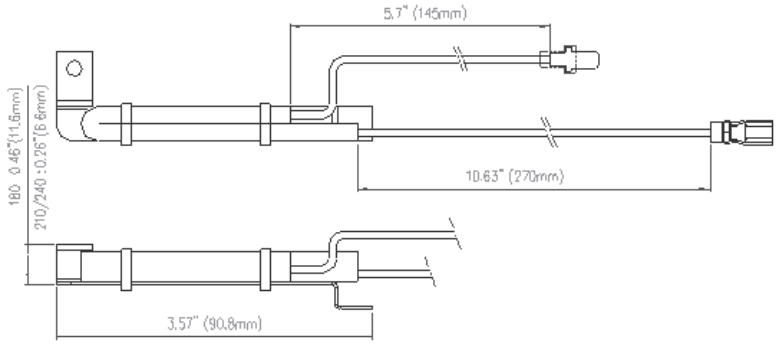
4.6.1. PCB

Navien Part No.	NACR1GS32401 NACR1GS32410	Check Point	N/A
Function	1. To control each component and performance unit.		
Failure Event	1. Malfunctioning PCB.		
Effects	1. A component may not operate within the unit. In most cases of PCB 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		
Color / Number of wires	N/A		



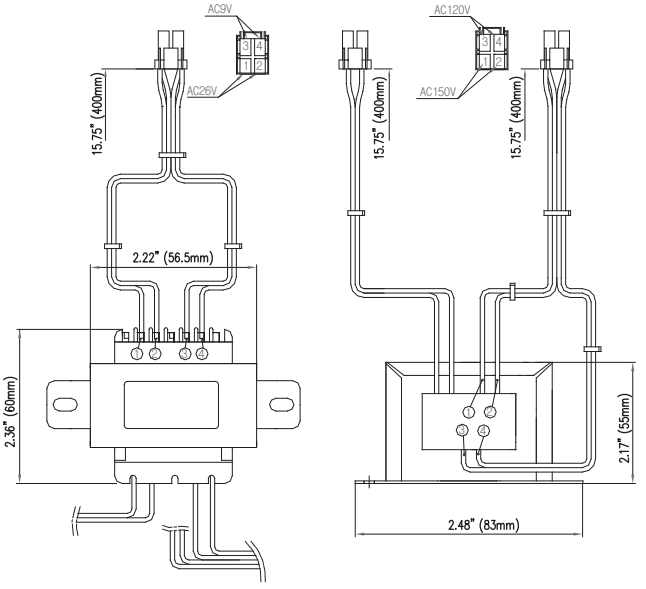
4.6.2. Thermal Fuse

Navien Part No.	BH1419012A BH1419013A	Check Point	N/A
Function	1. It protects over limited high temperature in burner due to abnormal operations. 2. The thermal fuse contains solder with a melting point of 383 ℉(195℃). 3. Detects excessive temperature within the unit, especially around the heat exchanger and combustion chamber. Upon detection, communication between the PCB and gas valves will sever, shutting down the unit instantly.		
Failure Event	1. Unable to detect the excessively high temperature within the unit		
Effects	1. Flames from burner may penetrate a ruptured/damaged heat exchanger. 2. The water heater is not operating.		
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		



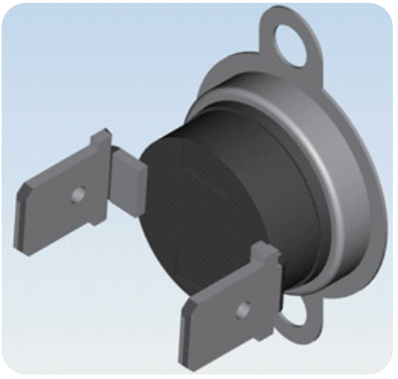
4.6.3. Transformer

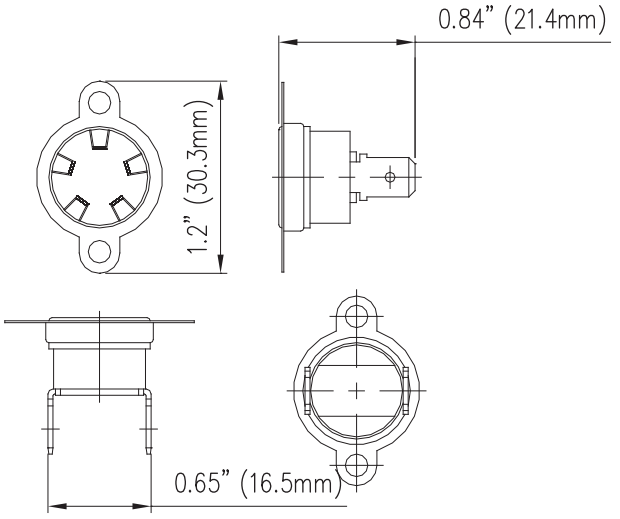
Navien Part No.	BH1419012A	Check Point	H, K, S
Function	1. To supply power to the main PCB board. 2. Every electrical component of the unit is designed to only work with a 120VAC power supply; therefore, the unit comes equipped with this transformer.		
Failure Event	1. There is no power coming from the transformer. 2. The voltage from the power supply cannot be converted to 120 VAC.		
Effects	1. 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	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	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 Switc

Navien Part No.	BH1401022A BH1401027A	Check Point	B
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℉ or 92℃) in heat exchanger. (BH1401022A) 4. Detects excessively high flue gas temperature (more than 149℉ of 65℃) 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 water heater if the water temperature from the heat exchanger exceeds 197.6℉(92℃). 2. Unable to shut down the water heater if the flue gas temperature from the exhaust duct exceeds 149℉ (65℃).		
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		

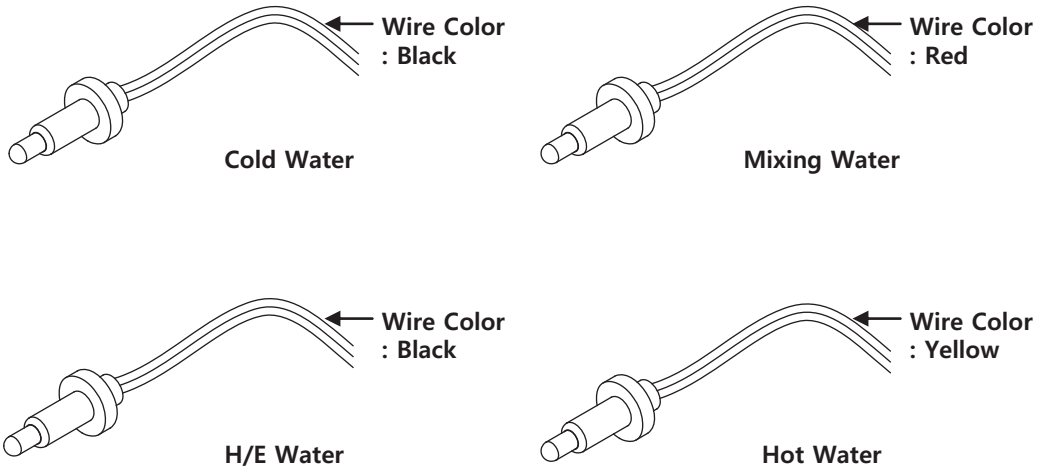




	OFF (OPEN)	ON (CLOSE)
Flue Gas	149±39.2°F (65±4℃)	104±39.2°F (40±4℃) (Autonatic Return)
Water	179.6±39.2°F (92±4℃)	170.6±39.2°F (77±4℃) (Autonatic Return)

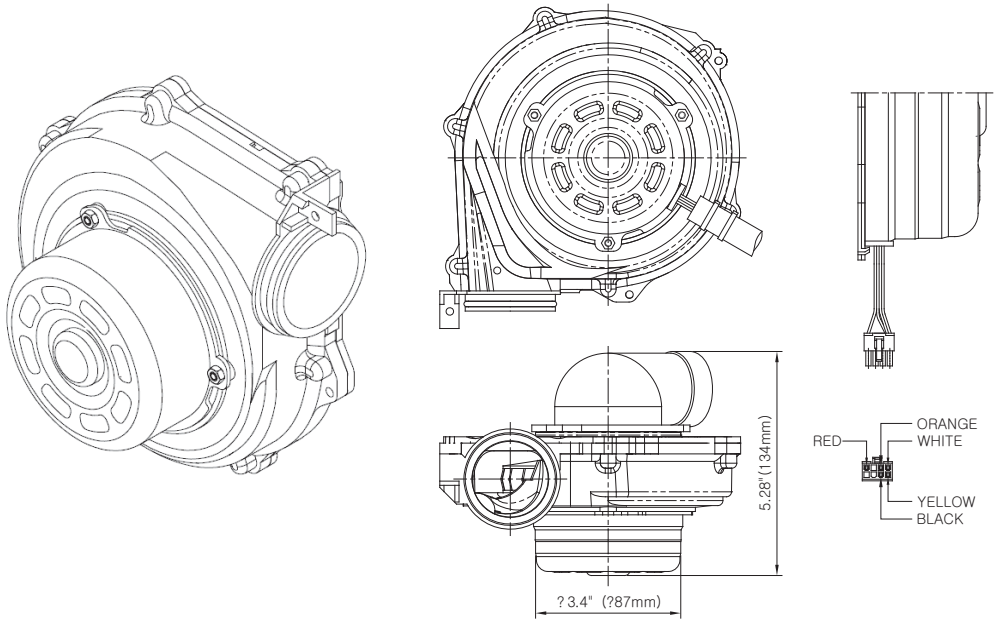
4.6.5. Thermistor

Navien Part No.	BH1403081A(Cold)	Check Point	B
	BH1403082A(Mixing)		
	BH1403083A(H/E)		
	BH1403084A(Hot)		
Function	Measure cold, mixing, H/E, hot water temperature in the water heater.		
Failure Event	Unable to properly measure water temperature within the water heater.		
Effects	1. Unable to shut down the water heater if the water temperature from the heat exchanger exceeds 197.6℉(92℃). 2. Unable to shut down the water heater if the flue gas temperature from the exhaust duct exceeds 149℉(65℃).		
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 =4.121㏀ at 113℉		



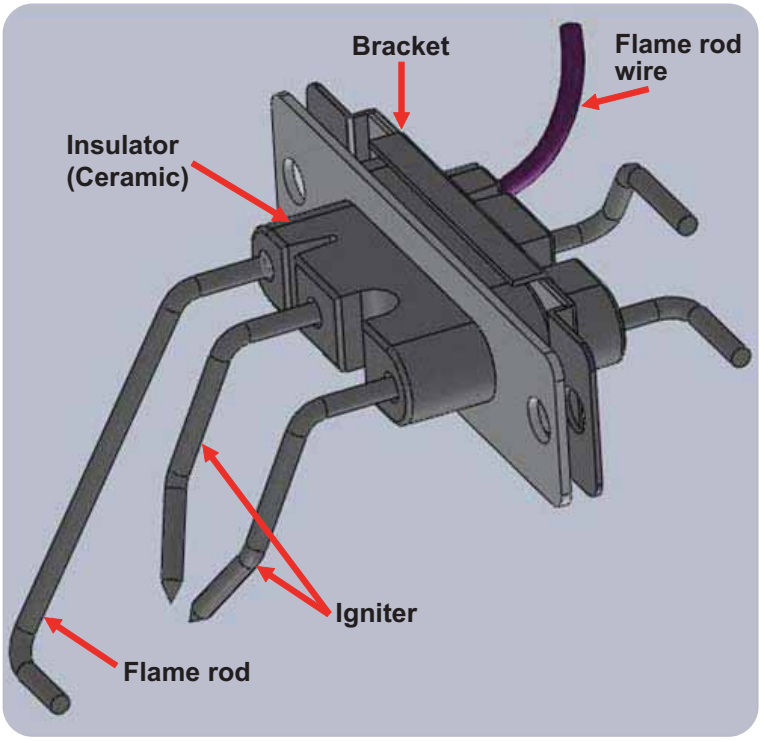
4.6.6. Fan motor

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 water heater 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		



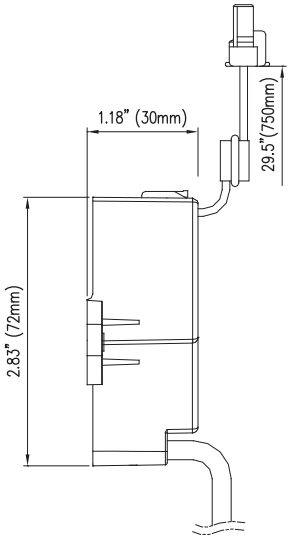
4.6.7. Flame Rod Ass'y

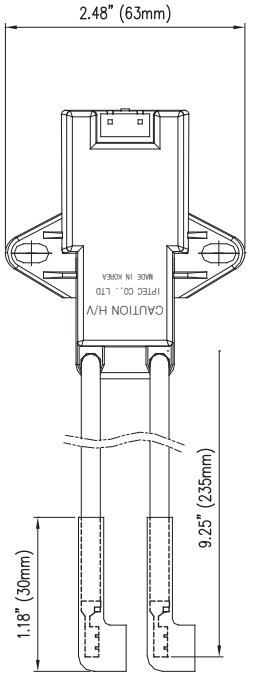
Navien Part No.	PH1603058D (NG) PH1603059D (LP)	Check Point	N/A
Function	1. To igniting gas by repeatedly discharging the high voltage spark to the main burner until igniting gas.		
Failure Event	1. Unable to ignite during the ignition process. 2. Makes attempts to ignite at all times.		
Effects	1. The 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	E009, E010, E027		
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		

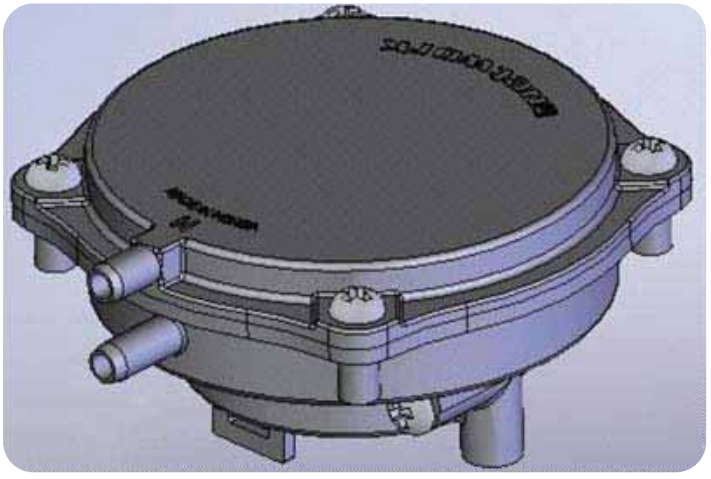


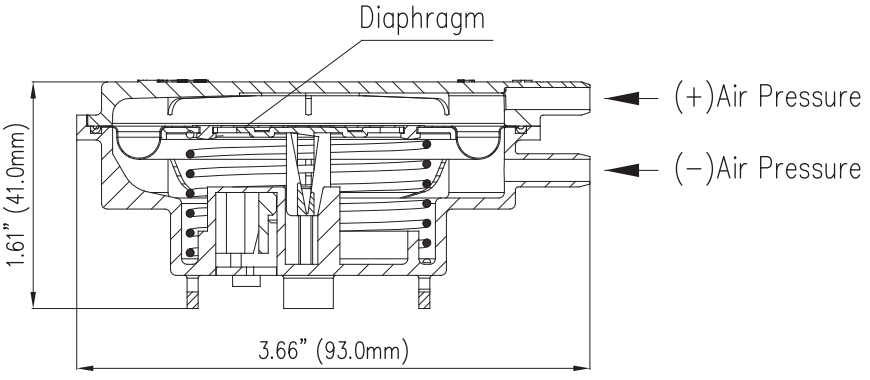


Input Voltage	Ouput Voltage	Ouput Voltage
115V, 60Hz	19KV ± 2KV	10mA ± 2mA

4.6.9. APS

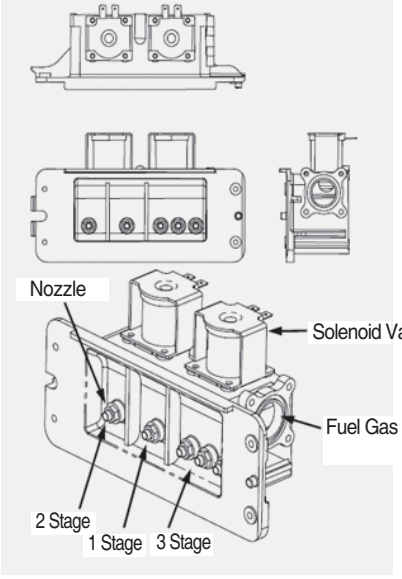
Navien Part No.	NASS9EX00009	Check Point	E
Function	1. Sensing the air-pressure for air velocity following gas supply. 2. APS device automatically controls the quantity of air supply operate with GPS.		
Failure Event	1. The combustion noise occurs. 2. Imperfect and/or lifting Flame occurs.		
Effects	1. The water heater is not operating. 2. Excess carbon monoxide emissions.		
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

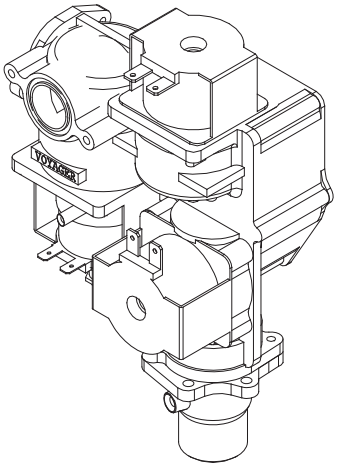
Navien Part No.	**PABCR180AMF_001** **PABNR/NP180AMF_001** **PABCC210AMF_001** **PABCC210AMF_002**	**Check Point**	**N/A**
Function	1. The manifold distributes gas from the gas valve to the burner. 2. To provide proper quantity of gas to burner in each stage. 3. There are 3 zones within the manifold, 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		

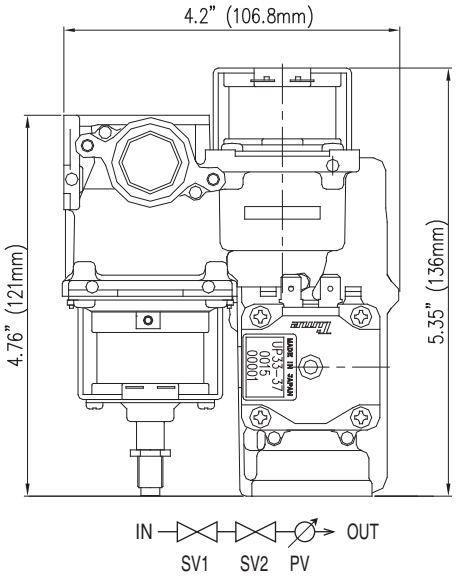


Model : 180		
	NG	PG
1-Stage	Φ 0.138" × 1	Φ 0.087" × 1
2-Stage	Φ 0.138" × 1	Φ 0.087" × 1
3-Stage	Φ 0.112" × 3	Φ 0.069" × 3
Model : 210/240		
	NG	PG
1-Stage	Φ 0.111" × 1	Φ 0.075" × 2
2-Stage	Φ 0.111" × 1	Φ 0.073" × 2
3-Stage	Φ 0.13" × 5	Φ 0.071" × 5

4.6.11. Manifold

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

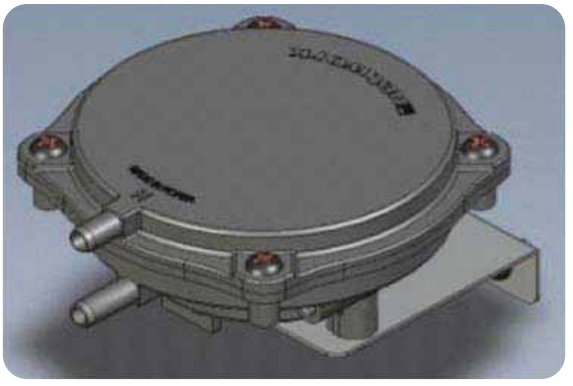


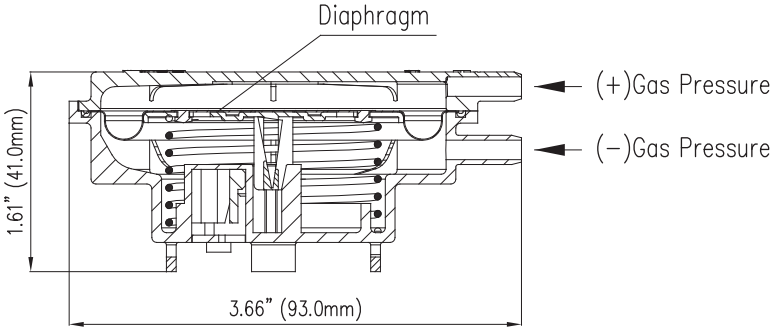


[Gas Flow Diragram]

4.6.12. GPS

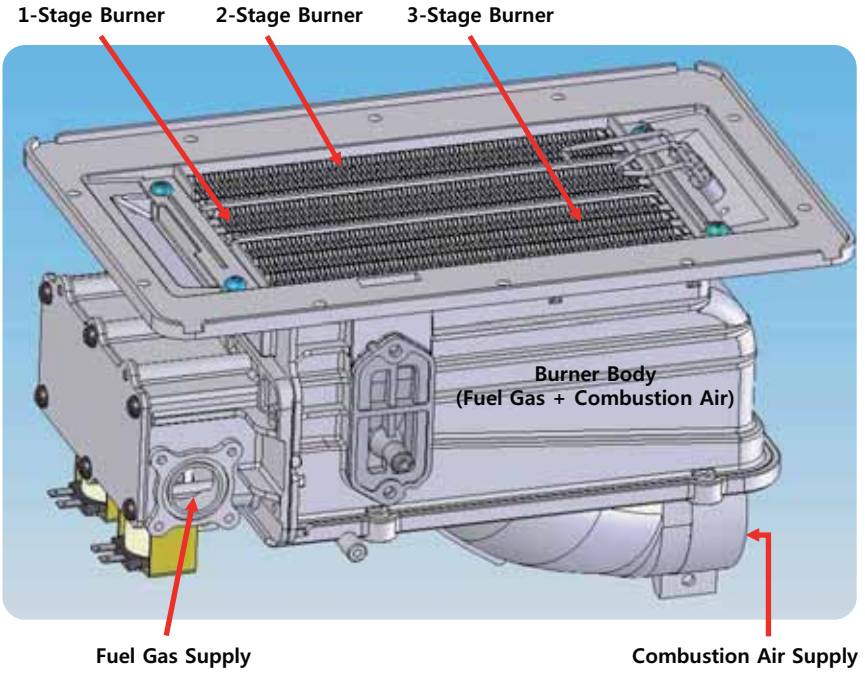
Navien Part No.	NASS9EXGPS01	Check Point	A
Function	1. Sensing the gas-pressure for gas velocity to control combustible air supply. 2. GPS device automatically detects the quantity of gas supply at all times for ideal combustion with proper air supply. 3. The unit is designed to operate properly even 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 LP 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		





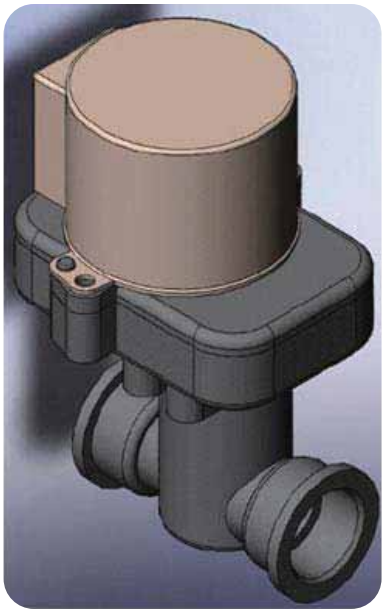
4.6.13. Burner

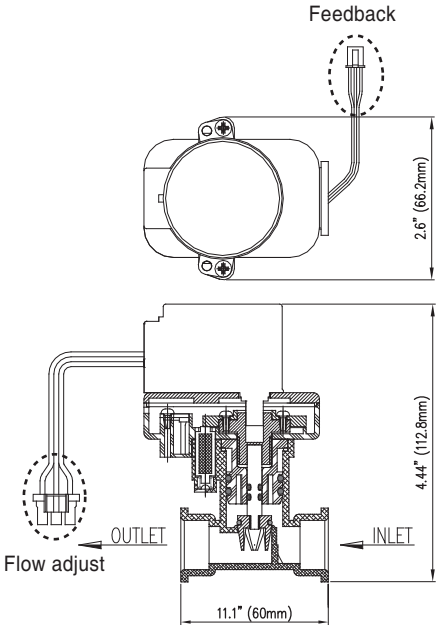
Navien Part No.	**PABNCN30KDBN_003** **PABCR180ABN_002** **PABNCW48KDBN_002** **PABCR210/240ABN_002**	**Check Point**	**N/A**
Function	1. Pre-Mixed burner. 2. Pre-Mix system reduces emissions and increase efficiency. 3. The burner facilitates the air/gas mixture necessary to produce the proper heat during 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		



4.6.14. Water Adjustment Valve

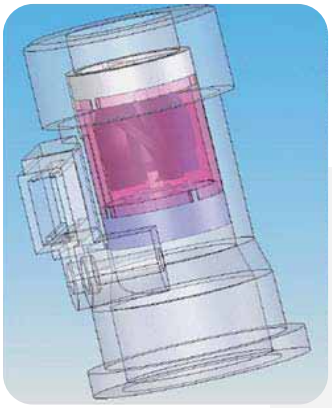
Navien Part No.	AAVC9EXFC003	Check Point	N, D
Function	1. To control the water flow for maintain steady hot water temperature.		
Failure Event	1. Water leakage from the automatic water adjustment valve. 2. The valve cannot modulate or make open/close positions.		
Effects	1. Stop operating once detecting water leakage. 2. No flames. 3. No operation of the unit. 4. Temperature fluctuations in the hot water outlet.		
Error Code	E034		
Diagnostic	1. Visual inspection: Connection and/or breakage of wires. Clean the Domestic cold water inlet filter. 2. Voltage check: Check range of voltage shown below.		
Color / Number of wires	Feedback (D) : Red – black : DC 7 ~ 13 V White – black : Pulse Water Adjust (CW)(N) : Blue – yellow : ON AC 97~138 V, OFF 0 V Water Adjust (CCW)(N) : Blue –orange : ON AC 97~138 V, OFF 0 V		

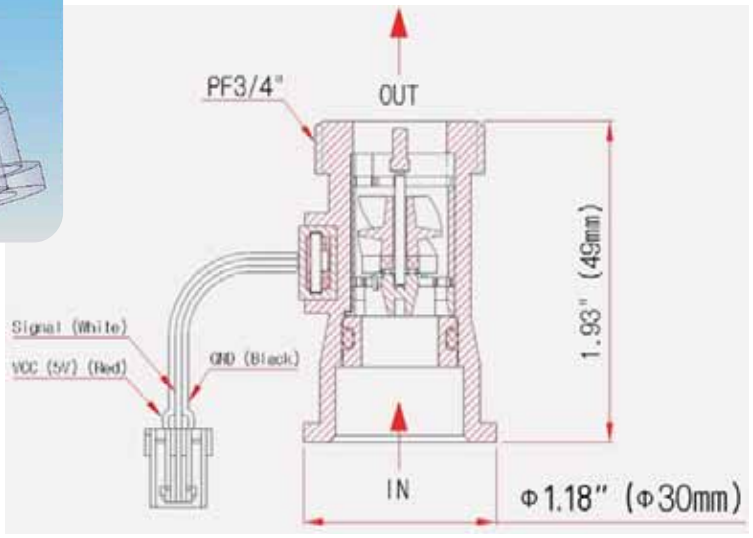




4.6.15. Flow Sensor

Navien Part No.	AASS9EXFS003	Check Point	F
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	E039		
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		

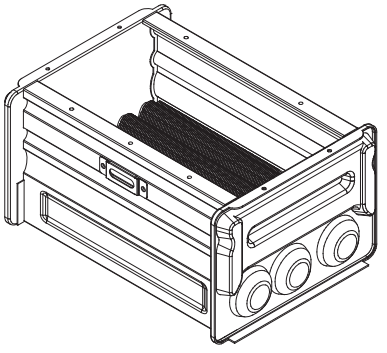


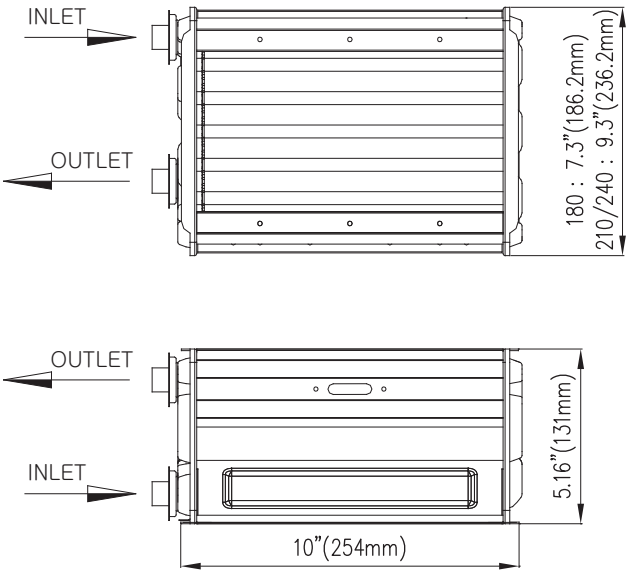


Flow Rate Range	0.5 ~8.0 GPM
Maximum Pressure	150 psi

4.6.16. Primary Heat Exchanger

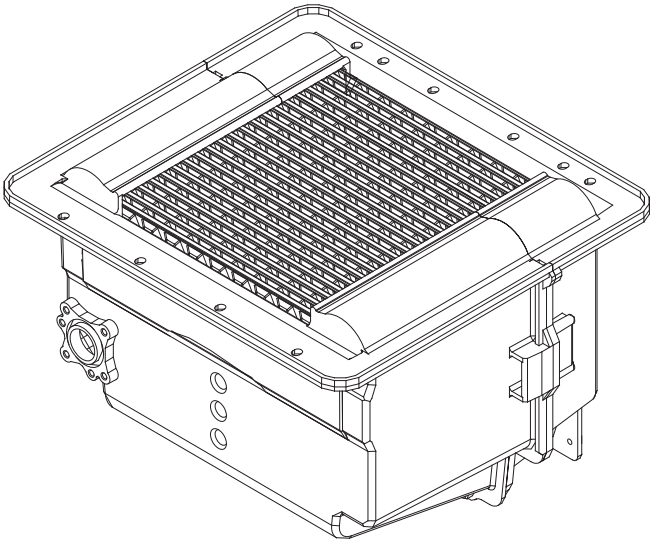
Navien Part No.	N/A	Check Point	N/A
Function	1. Main part for heat transfer from the burner. 2. There is additional path of water pipes on the heat exchanger surface as well as inside the combustion chamber and it minimizes the heat loss.		
Failure Event	1. Water and/or exhaust gas leakage through a 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		





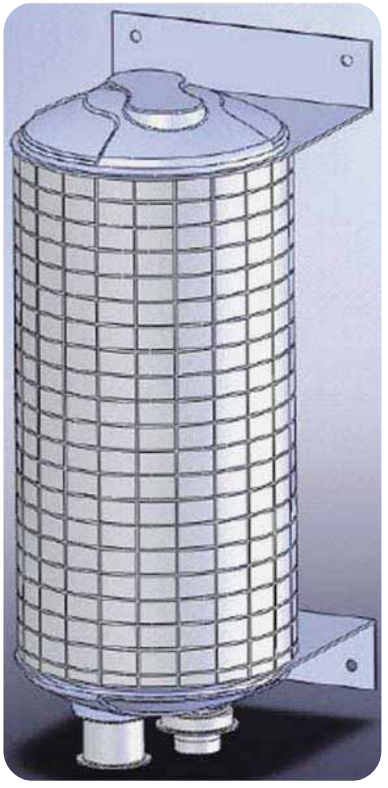
4.6.17. Secondary Heat Exchanger

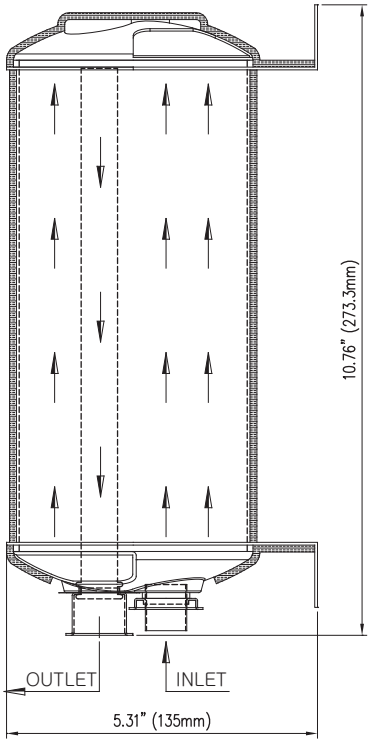
Navien Part No.	N/A	Check Point	N/A
Function	1. Main part for heat transfer from the burner. 2. There is additional path of water pipes on the heat exchanger surface as well as inside the combustion chamber and it minimizes the heat loss.		
Failure Event	1. Water and/or exhaust gas leakage through a 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		



4.6.18. Buffer Tank (“A” Series)

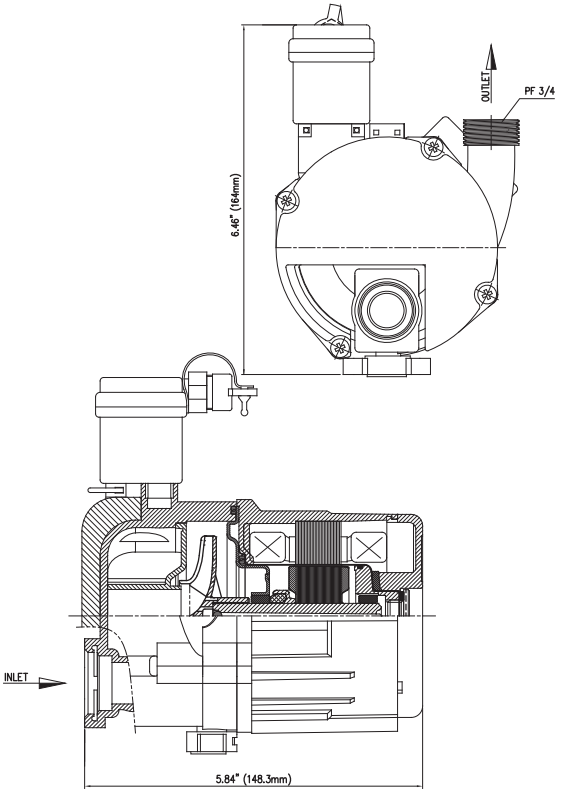
Navien Part No.	PBSNCWBFTANK_001	Check Point	N/A
Function	1. To provide hot water in steady temperature and to operate no minimum flow rate with internal circulator. 2. Applied to the types of NR-A and NP-A only.		
Failure Event	1. Water leakage from the mini buffer tank.		
Effects	1. Stop operating once detecting water leakage. 2. Temperature fluctuations in the hot water outlet.		
Error Code	E037		
Diagnostic	1. Visual inspection : check the mini buffer tank appearance crack		
Color / Number of wires	N/A		





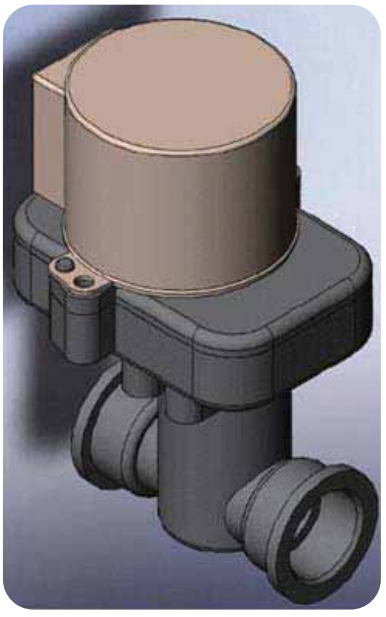
4.6.19. Circulation Pump (“A” Series)

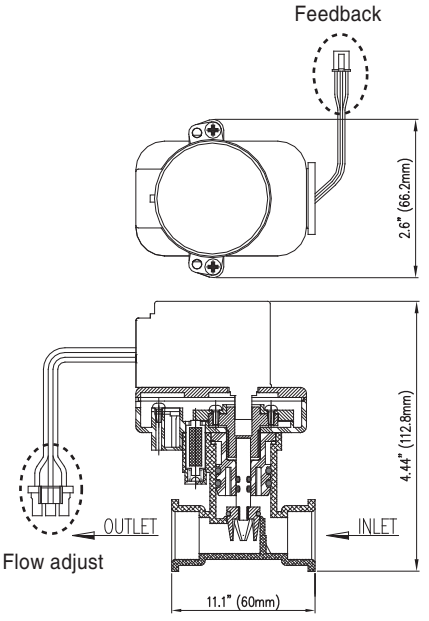
Navien Part No.	PBSNCWBFTANK_001	Check Point	P
Function	1. Pump operates for internal or external hot water circulation. 2. Internal circulation will avoid hot and cold water sandwich and external hot water circulation delivers hot water to fixtures quickly resulting in water conservation. 3. Applied to the model of NR-A and NP-A only.		
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	E038		
Diagnostic	1. Visual inspection: check the circulation pump connection wire. 2. Voltage check: Check range of voltage shown below.		
Color / Number of wires	N/A		



4.6.20. Bypass Mixing Valve (“Non-A” Series)

Navien Part No.	AAVC9EXMIX01	Check Point	I
Function	1. Mixes hot water from the heat exchanger with cold water from the water inlet in order to modulate and control outlet water temperature.		
Failure Event	1. Water leakage from the bypass mixing valve 2. The valve cannot modulate or make open/close positions.		
Effects	1. Stop operating once detecting water leakage. 2. Temperature fluctuations in the hot water outlet.		
Error Code	E045		
Diagnostic	1. Visual inspection: Connection and/or breakage of wires. Clean the Domestic cold water inlet filter. 2. Voltage check: Check range of voltage shown below.		
Color / Number of wires	1. Red – black : DC 7 ~ 13 V 2. White – black : DC 0 ~ 13 V 3. Blue – yellow : Pulse 4. Pink – orange : Pulse		





The physical appearance of the bypass mixing valve is similar to that of the water adjustment valve. However, their functions differ and cannot be substituted for each other.

5. TroubleshootingData

5.1. Error Code List

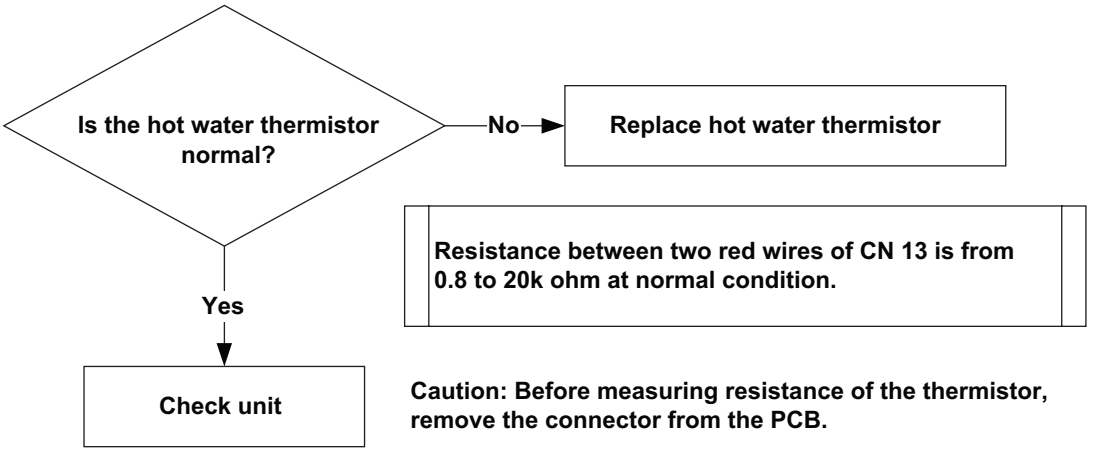
Error Code	Reason	Self-diagnostic / Action	Reset
E001	Water is boiling inside the heat exchanger	1. Clean the inlet water strainer (part #62); 2. Check the water adjustment valve (part #16); 3. Check the heat exchanger; flush with a cleaning solution	Manual
E003	Ignition failure	1. Check to see if the main gas supply valve is open. 2. Check the igniter for spark (part #18).	Manual
E004	False flame detection	1. Ensure ground wire is connected. 2. Check the igniter for spark.	Automatic
E007	Hot water outlet: Thermistor -open	1. Check the Thermistor. 2. Check for loose connection 3. 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 filter1 (part #10). 2. Check and clean the fan motor (part #21). 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 (part #10). 3. Check hoses and condensate drain	Manual
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
E015	Abnormal PCB	1. Check power supply. 2. Check the power switch.	Manual
E016	Overheating of heat exchanger	1. Turn OFF the system for at least 30 minutes then restart; 2. Clean the inlet water strainer (part #62). 3. Check the water adjustment valve(part #16) 4. Check the heat exchanger; flush with a cleaning solution	Manual

Error Code	Reason	Self-diagnostic / Action	Reset
E021	Cold water inlet: Thermistor 1–open	1. Check Thermistor. 2. Check for loose connection 3. Replace Thermistor.	Automatic
E022	Cold water inlet: Thermistor 1 -short	1. Check Thermistor. 2. Check for short or water in connection 3. Replace Thermistor.	Automatic
E027	Abnormal activity of the air pressure sensor	1. Check the vent pipe for obstructions. 2. Check and clean the air filter (part #10).	Automatic
E030	Exhaust Overheat: exhaust high limit switch shuts down the unit when the flue temperatures exceed 149°F (65°C)	1. Turn OFF the system for at least 30 minutes then restarts. 2. Clean the inlet water strainer (part #62) 3. Check the water adjustment valve (part #16) 4. Check the heat exchanger; flush with a cleaning solution	Automatic
E032	Cold water inlet: Thermistor 2 - Open	1. Check wire connection at computer board 2. Check wire connection black wire white connection 3. Check dip switches 4. Loose wire at connection	Automatic
E033	Abnormal the Water Adjustment Valve	1. Check to make sure wire connections are secure 2. Check black and white connection for water 3. Check inlet Thermistor for secure installation 4. Check dip switches	Automatic
E034	Abnormal activity of the gas pressure sensor	1. Check the water Adjustment valve.	Automatic
E035	Abnormal activity of the gas pressure sensor	1. Measure gas pressure drop 2. Check hose connection 3. Replace GPS.	Automatic
E036	Communication failure	1. Contact to Navien tech. dept.	Automatic
E037	Water Leak Inside unit	1. Close cold water main. 2. Replace leaking parts.	Manual
E038	Abnormal Circulation PUMP	1. Check the circulation PUMP. 2. Check the Flow sensor. 3. Check the Cold water main.	Automatic
E039	Abnormal the Flow Sensor	1. Check the flow sensor.	Manual
E041	Hot water outlet : Thermistor 2- open	1. Check the Thermistor. 2. Replace the Thermistor.	Automatic
E042	Hot water outlet : Thermistor 2- open	1. Check the Thermistor. 2. Replace the Thermistor.	Automatic
E043	Abnormal cascade connection	1. Check Model type (If residential and commercial are installed together : temperature cannot be above 140°F).	Automatic
E044	Abnormal Thermistors connection	1. Check Thermistors connection.	Manual
E045	Abnormal the Mixing Valve	1. Check the Mixing valve 2. Check mixing valve transformer	Automatic
E048	Abnormal LP Gas Pressure	1. Check the LP Gas. 2. Fill the LP Gas.	Manual

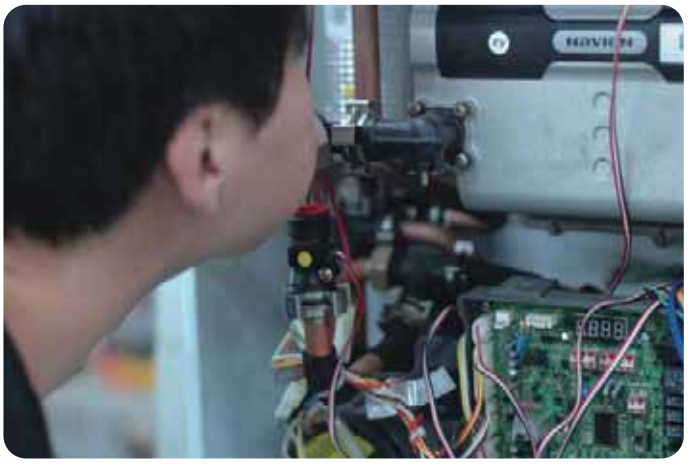
5.2. 01Error

Error occurrence conditions and check items

Error	Description
01E Boiling	In order to prevent boiling of the heat exchanger, if 208°F(98°C)or higher is sensed at the output of the heat temperature (or 194°F(90°C) at the input of the heat exchanger) for over 15 seconds, the system stops combustion. (In normal condition, the combustion is stopped by the output temperature of the heat exchanger.) If overheat is detected as the combustion is stopped, the system displays an error message, and does not start combustion until the temperature goes below 185 °F(85°C) (or 176°F(80°C) at the input of the heat exchanger). **(The error message "O1E" is cleared manually for the models before 324-5M.)**
Check items	1. Check if the main heat exchanger is clogged. 2. Check the hot water output/input temperature sensor. 3. Check the controller DIP S/W capacity setting. 4. Check if the controller works properly.



Check method

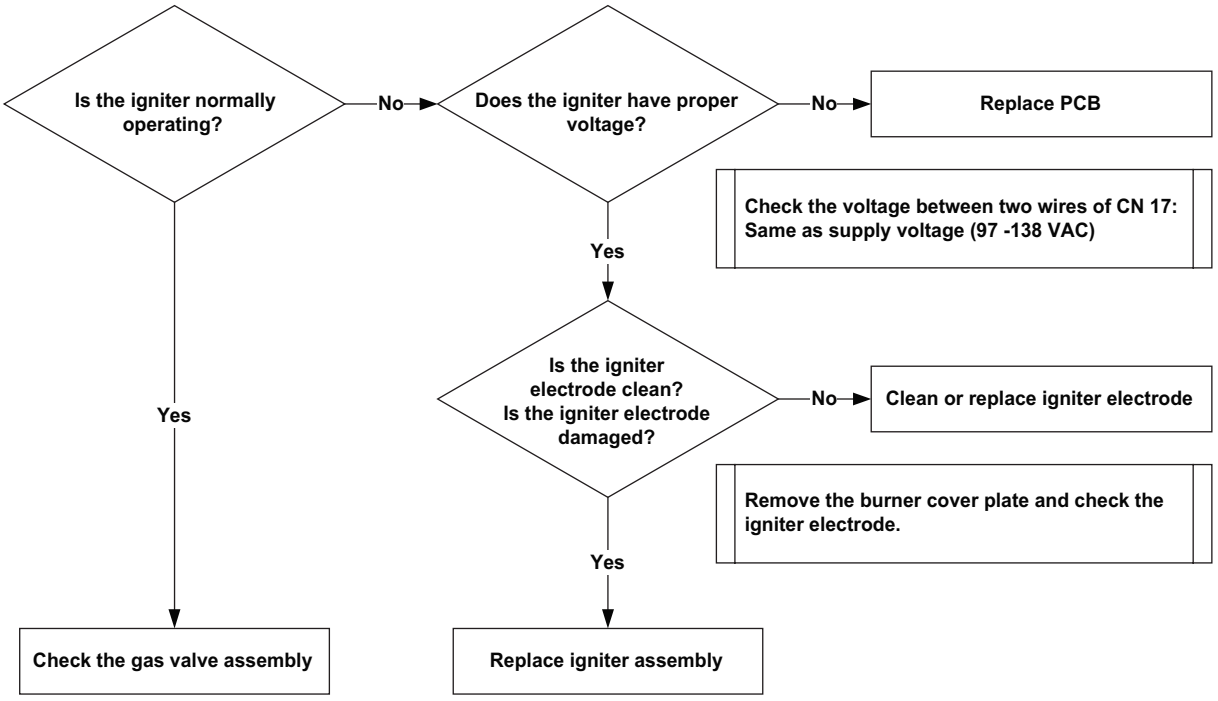
<table>
<tr><th>Error type</th><th>Cause</th><th colspan="4">Check method</th></tr>
<tr><td rowspan="3">Thudding noise caused by circulation error</td><td>The main heat exchanger is clogged.</td><td colspan="4">Separate inlet/outlet pipe of the main heat exchanger, and blow air with mouth to check if the pipe is clogged.</td></tr>
<tr><td colspan="5"> 
< Check if the main heat exchanger is clogged ></td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>Temperature sensor error</td><td>Defective hot water input / output temperature sensor</td><td colspan="4">1. The system recognizes the heating water temperature higher than it actually is due to a defective sensor.
Check if the deviation of temperature is large due to a defective temperature sensor.
2. Pull out the hot water output temperature sensor connector only, connect a normal temperature sensor or measure the sensor re-sistance, and check the difference with the current temperature.</td></tr>
<tr><td rowspan="6">Other trouble</td><td>Capacity setting</td><td colspan="4">1. If the maximum firing rate switch 1 is on,
Set the switch to the normal operation position.
2. Sudden increase of temperature due to PCB.
DIP S/W set-ting error.</td></tr>
<tr><td colspan="2" rowspan="2">Model</td><td rowspan="2">Capacity (Btu/h)</td><td colspan="2">DIP Switch</td><td rowspan="2">Remark</td></tr>
<tr><td>5</td><td>6</td></tr>
<tr><td colspan="2">NR-180(A)/NP-180(A)</td><td>150,000</td><td>OFF</td><td>OFF</td><td rowspan="3"></td></tr>
<tr><td colspan="2">NR-210(A)/NP-210(A)</td><td>180,000</td><td>ON</td><td>OFF</td></tr>
<tr><td colspan="2">NR-240(A)/NP-240(A)</td><td>199,000</td><td>OFF</td><td>ON</td></tr>
<tr><td>Defective PCB</td><td colspan="4">If the trouble continues despite the checking of above items, replace the PCB.</td></tr>
</table>

5.3. 03Error

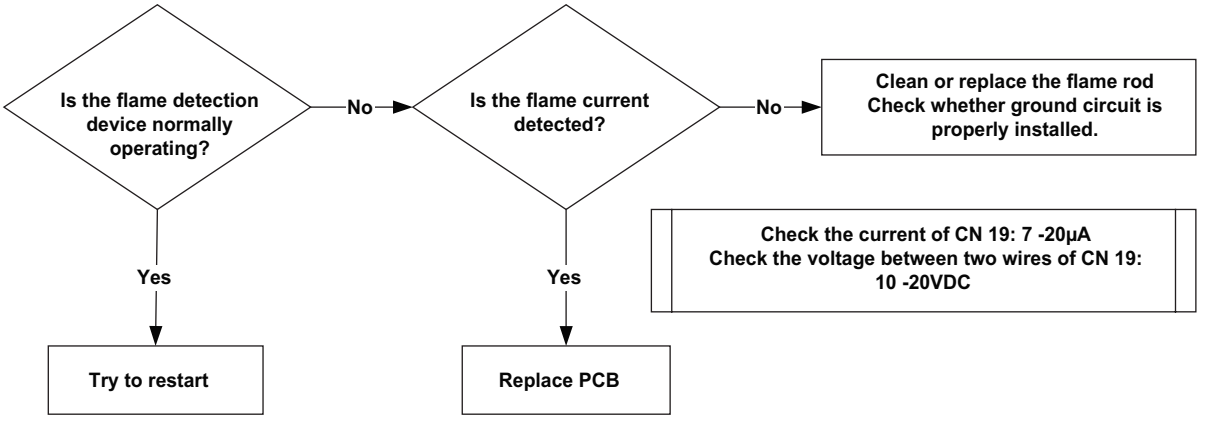
Error occurrence conditions and check items

Error	Description
03E Ignition fail	In case of an ignition fail, repeat restart 10 times. If no flame is detected, the system displays the error message 03E (manually cleared) on the remote controller.
Check items	1. Check the gas supply (check the gas valve and supply pressure). 2. Check the operation of the ignition transformer (ignition state, input power (AC 102~132 V)) 3. Check the operation of the gas control valve (DC 83~120 V, coil short circuit, solenoid valve). 4. Check the flame detecting rod, and wiring and grounding. 5. Check if the air pressure hose is broken or clogged. 6. Check if the air pressure sensor works properly. 7. Check the PCB DIP S/W capacity setting. 8. Adjust differential pressure to MIN between 3 stages with the gas detector. 9. Disassemble the manifold and check the nozzle. 10. Check the flue and air supply (downward installation / rainwater collected) 11. If the trouble continues despite the checking of above items, replace the PCB.

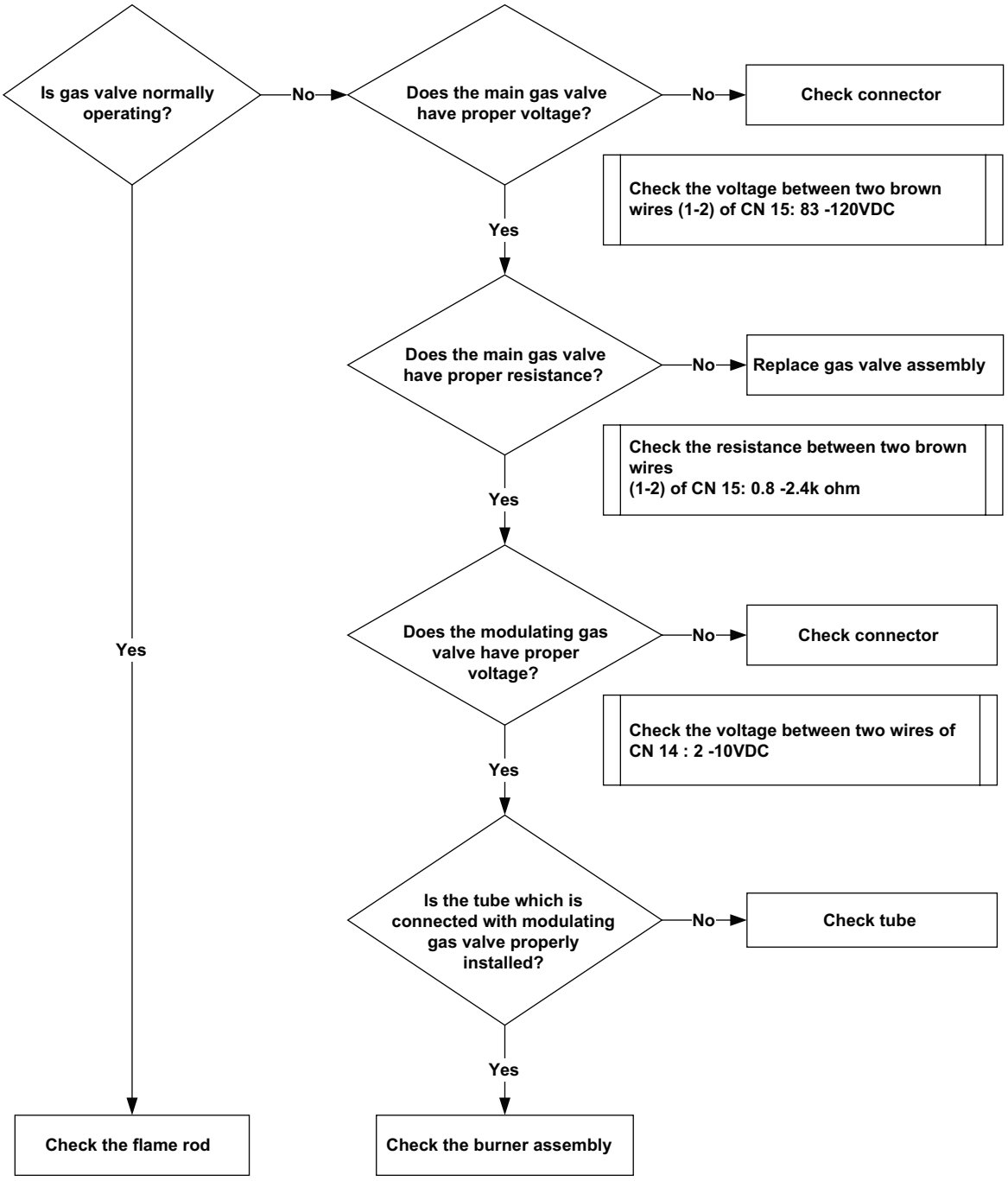
Scenario 1



Scenario 2

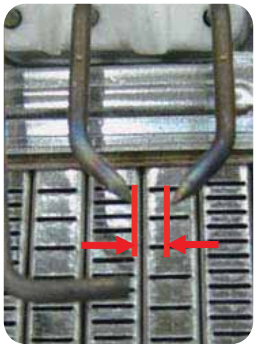


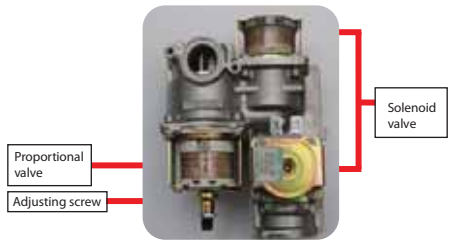
Scenario 3


Is gas valve normally operating?
No
Does the main gas valve have proper voltage?
No
Check connector
Check the voltage between two brown wires (1-2) of CN 15: 83 -120VDC
Yes
Does the main gas valve have proper resistance?
No
Replace gas valve assembly
Check the resistance between two brown wires (1-2) of CN 15: 0.8 -2.4k ohm
Yes
Does the modulating gas valve have proper voltage?
No
Check connector
Check the voltage between two wires of CN 14 : 2 -10VDC
Yes
Is the tube which is connected with modulating gas valve properly installed?
No
Check tube
Yes
Yes
Check the flame rod
Check the burner assembly

Check method

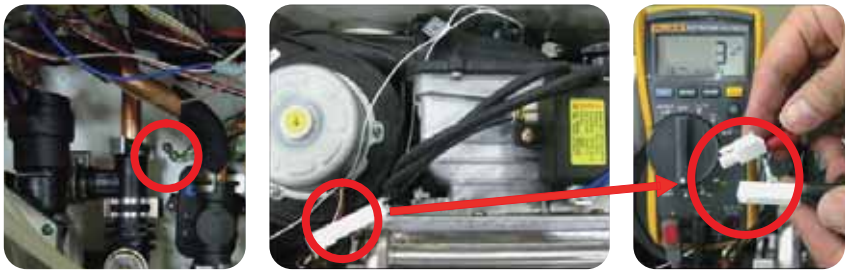
<table>
<tr><th>Error type</th><th>Cause</th><th>Check method</th></tr>
<tr><td rowspan="3">Ignition fail</td><td>Gas supply error</td><td>1. Check if the main gas valve is open.
2. Check the gas supply pressure.
✓ NG: 5″(6″ 180 MODEL) ~10.5″W.C, LP: 8″~13.5″W.C
✓ LP pressure drop occurs frequently in the winter.
3. Check the flexible pipe dia. (20mm)
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.
(3rd stage MAX combustion setting: DIP S/W1-1 ON)
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 meter class (Example)
Gas meter Water heater Furnace Domestic gas stove
425 CFH ≥ 195 CFH + 58.8 CFH + 63.7 CFH
* 1 CFH = 1,020 Btuh</td></tr>
<tr><td colspan="2">    
< Check gas supply pressure > < Moved packing narrows the inner diameter ></td></tr>
<tr><td>Defective electrode gap and shape</td><td>Defective electrode gap and shape disables ignition.
✓Appropriate electrode gap: approx. 3~4mm (replace if defective)
✓An ignition fail 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.</td></tr>
</table>

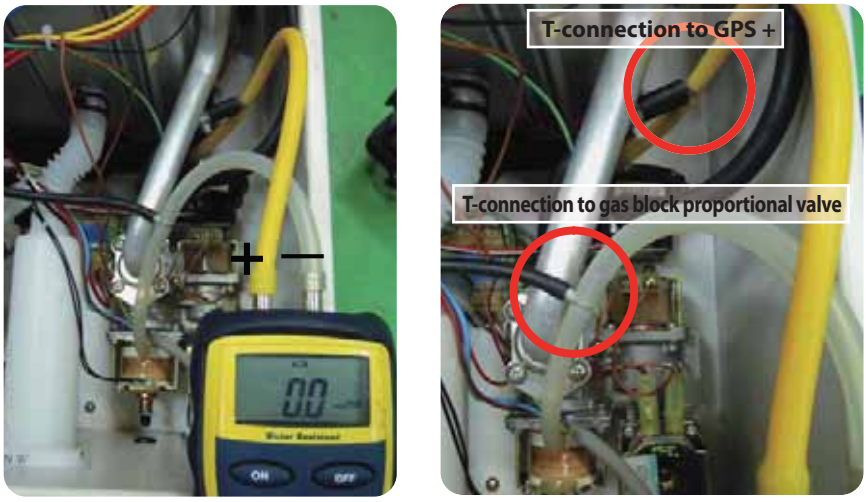
<table>
<tr><td rowspan="4">Ignition fail</td><td colspan="2">   
< Electrode gap 3~4mm > < Electrode gap error > <Flame detection rod gap 10~15mm></td></tr>
<tr><td>No spark from electrode</td><td>When no spark is made from the electrode at ignition:
✓ Remove the electrode and check if there is a crack 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 102 ~ 132 V).
✓ 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</td></tr>
<tr><td colspan="2">  
<Ignition transformer> <Ignition transformer line: Blue, Terminal: Brown></td></tr>
<tr><td>Main Gas Valve</td><td>✓ Check the primary/secondary power supply to the gas control valve.
✓ Check, with a tester, if the input power is DC 83~120 V.
✓ Replace the PCB if power is not supplied.
✓ If power supply is normal, check if the coil is open.
✓ Check if the solenoid valve works properly.
✓ Feel or hear a click.</td></tr>
</table>

<table>
<tr><td colspan="3"> 

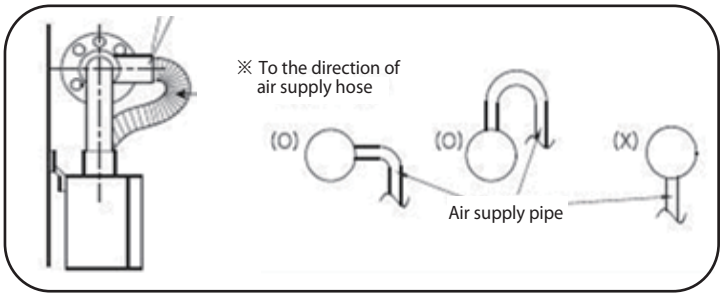
<Gas block>

<Check if the coil is open>

<Check the voltage of the solenoid valve / Brown 2P></td></tr>
<tr><td rowspan="2">Repeated ignition-out</td><td>Flame sensing error</td><td>1. Check the location of the flame detecting rod, if there is any deformation or foreign substance, and repair or replace the part.
2. Check the sheath of the fire detecting 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 exterior base. Therefore, remove the painting in the screw fastening part, and reconnect.
✓ Or use a tester to measure the flame sensing current. (normally 3~4 μA)</td></tr>
<tr><td colspan="2"> 
< Grounding wire fixing position >
< Measuring flame current ></td></tr>
<tr><td rowspan="3">Flame blo-wout and noise occurs at ignition</td><td>Defective air pressure hose</td><td>1. The air pressure hose is broken.
✓ Increased RPM may cause blowout and noise.
2. 10E may occur with the same trouble.</td></tr>
<tr><td>Air pressur sensor</td><td>The system works but combustion is not normal due to the defective air pressure sensor.</td></tr>
<tr><td colspan="2"> 
< Defective air pressure hose ></td></tr>
</table>

<table>
<tr><td></td><td>PCB
DIP S/W capacity setting error</td><td>Incorrect DIP S/W setting per capacity displayed on the PCB may cause a problem on ignition and combustion.</td></tr>
<tr><td rowspan="3">Flame blowout and noise occurs at ignition</td><td>Adjust gas pressure</td><td>Adjust differential pressure to MIN between 3 stages with the gas manometer.
✓ Turn the adjusting screw under the gas block 1/2 turn and restart.
✓ When an ignition fail 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.</td></tr>
<tr><td colspan="2"> 

< Check the differential gas pressure ></td></tr>
<tr><td>Check if there is any foreign substance in the nozzle.</td><td>Ignition fail occurs if there is foreign substance in the nozzle.
✓ Disassemble the manifold and check the nozzle (Stage 1).</td></tr>
<tr><td>Defective air supply</td><td>Defective air supply</td><td>Check if rainwater is collected due to downward air supply pipe.</td></tr>
</table>

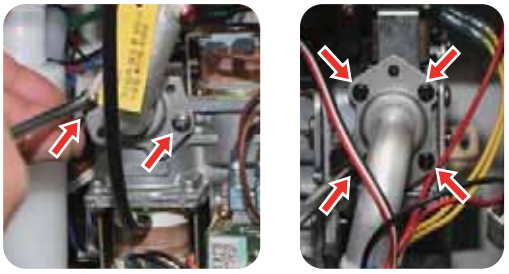


< Example of flue installation >

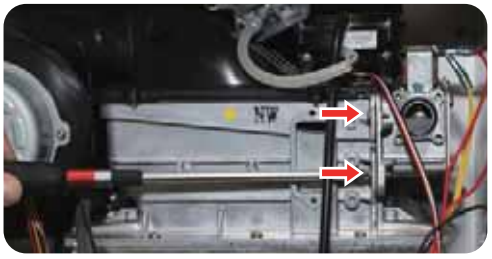
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

※ **Mainfold disassembly procedure**

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

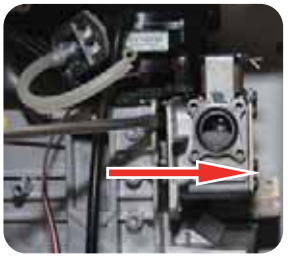


2. Remove 6 screws (2 under and 4 upper).



3. Remove 2 manifold fixing screws.

4. Remove multi-stage valve.



5. Use a screw driver to remove the valve.

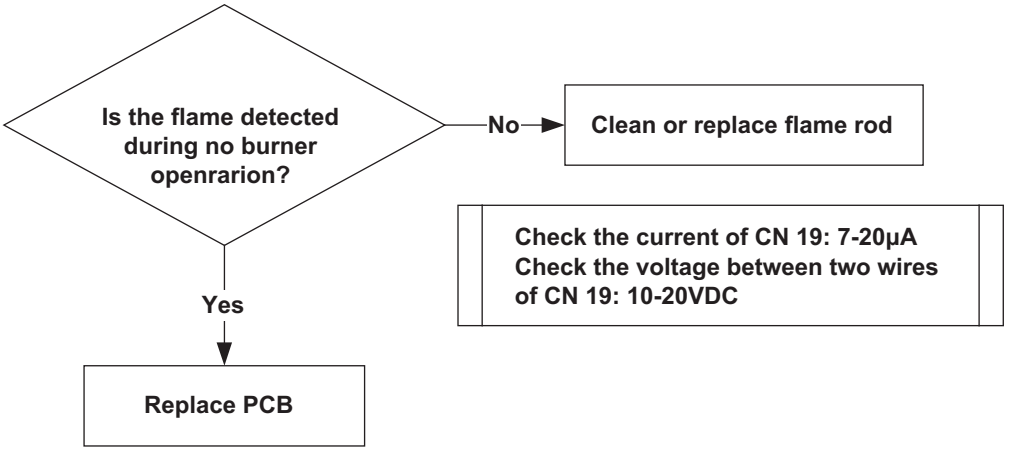
6. Disassemble the manifold.

7. Check the nozzles.

5.2. 04Error

Error occurrence conditions and check items.

Error	Description
04E False-flame detection	1. Pre ignition false-flame If a flame signal is detected continuously for 6 seconds before combustion (stand-by, pre-purge, pre-ignition), a false-flame error 04E (automatically cleared) is dis-played on the thermostat, and the system performs continuous post-purge and operates the pump. 2. Post purge false-flame If a flame signal is detected continuously for 6 seconds when the system performs post-purge as fuel supply is stopped, a false-flame error 04E (automatically cleared) is displayed on the thermostat, and the system performs continuous post-purge and operates the pump.
Check items	1. Check if gas leaks due to defective air sealing of the main gas valve. 2. Check if electricity is discharged from the electrode. 3. Check if gas is supplied at higher pressure than the standard gas pressure. 4. Defective PCB.



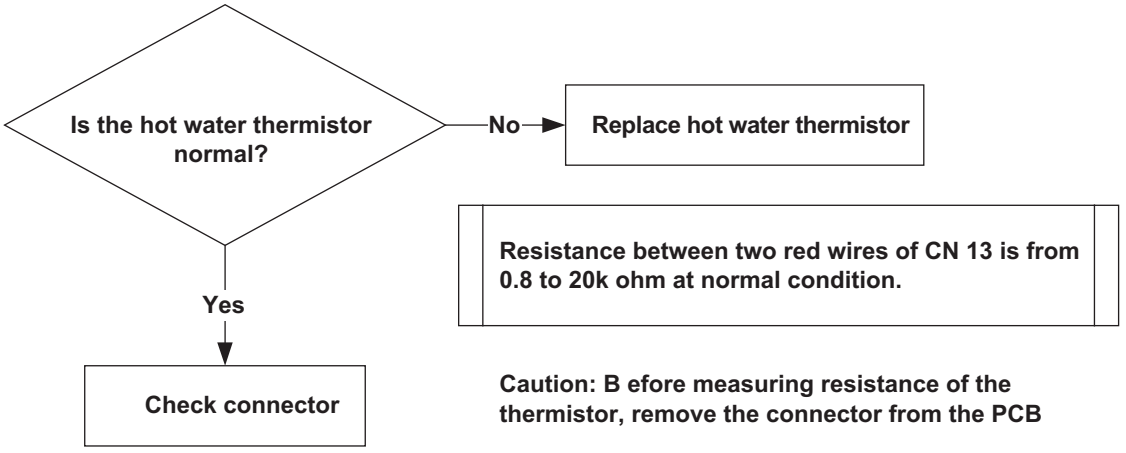
Check method

Error type	Cause	Check method
Flame before/ after combustion	Leakage from main gas valve	Replace the gas block if flame occurs before combustion or if there is remaining flame after combustion is stopped.
Error before after combustion	Discharge of electricity from electrode	Spark discharges from electrode to flame sensor at ignition. ✓ Replace or correct location of flame detecting rod.
	main gas valve	Gas may leak as the main gas valve is pushed by the gas supply over the standard pressure. ✓ Check the supply pressure: NG: 5″(6″ 180 model)~10.5″WC, LP: 8″(9″ 180 model) ~13.5″W.C ✓ If the gas pressure is too high, transfer the problem to the gas supplier, and replace the main gas valve. ✓ If gas leaks, close the main gas valve and repair the unit before usin the system.
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

5.2. 07Error

Error occurrence conditions and check items.

Error	Description
07E Hot water temperature sensor open	1. Pre ignition false-flame If a flame signal is detected continuously for 6 seconds before combustion (stand-by, pre-purge, pre-ignition), a false-flame error 04E (automatically cleared) is dis-played on the thermostat, and the system performs continuous post-purge and operates the pump. 2. Post purge false-flame If a flame signal is detected continuously for 6 seconds when the system performs post-purge as fuel supply is stopped, a false-flame error 04E (automatically cleared) is displayed on the thermostat, and the system performs continuous post-purge and operates the pump.
Check items	1. Check if gas leaks due to defective air sealing of the gas block. 2. Check if electricity is discharged from the electrode. 3. Check if gas is supplied at higher pressure than the standard gas pressure. 4. Defective PCB.



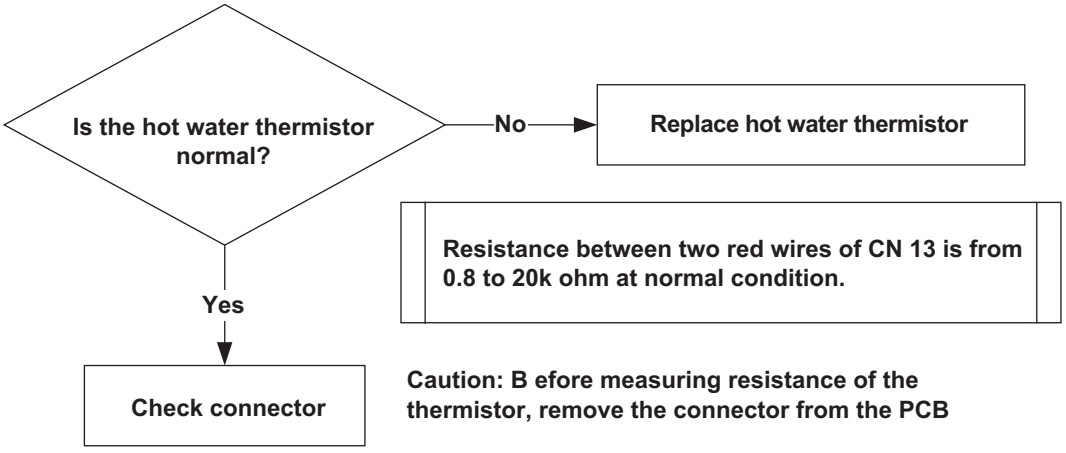
Check method

Error type	Cause	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	Measure the resistance of the temperature sensor. (Defective if it is 30 kΩ or higher) ✓ If the resistance is abnormal, replace the temperature sensor. ✓ Check the output temperature displayed on the PCB. (H.50.5→50.5°F).
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.
	 <Hot water temperature sensor / Red line 2P>	 <Check if the hot water temperature sensor line is open>

5.6. 08Error

Error occurrence conditions and check items.

Error	Description
08E Short-circuit of hot water temperature sensor	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 08E on the remote controller and the PCB. **(Hot water output temperature sensor)**
Check items	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.



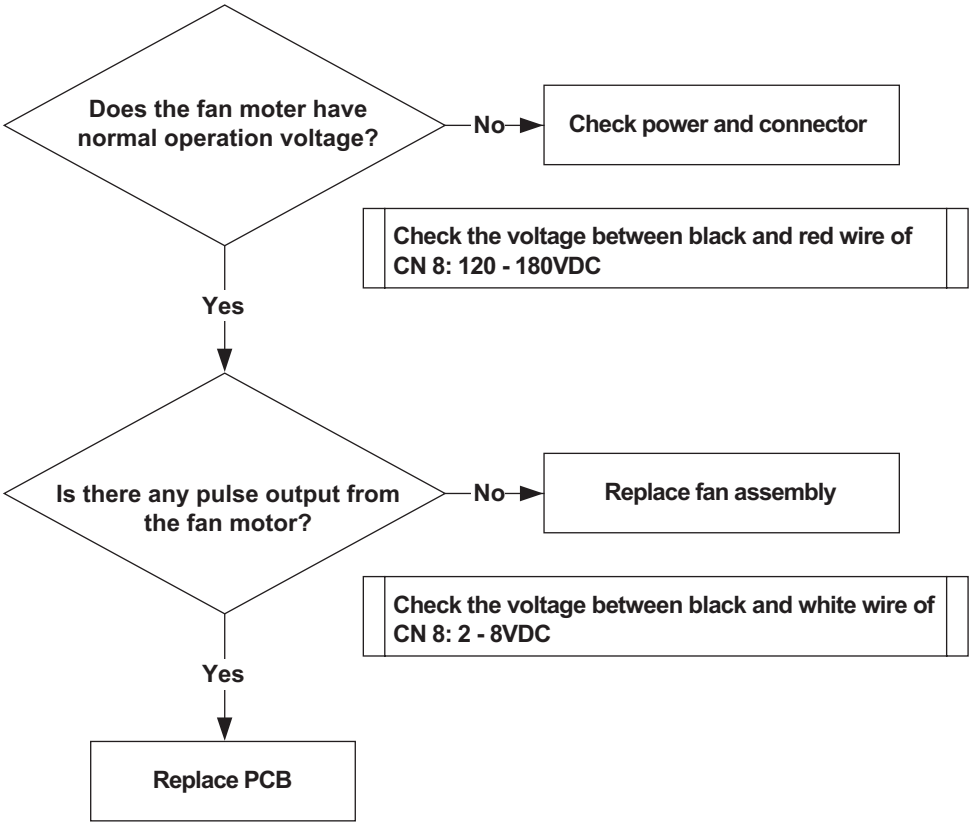
Check method

Error type	Cause	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.
	Temperature sensor	Use a tester to measure the temperature sensor resistance. ✓ If the resistance is abnormal, replace the temperature sensor (abnormal if it is lower than 0.5kΩ). ✓ Check the output temperature displayed on the PCB. (H.50.5→50.5°F)
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.
	 <Hot water temperature sensor / Red line 2P>	 <Check if the hot water temperature sensor line is open>

5.7. 09Error

Error occurrence conditions and check items.

Error	Description
09E Fan motor RPM error	The system checks the RPM signal after the blower starts to run, and displays the error message 09E (cleared manually) in the following cases: 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 sensor 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 volume sensor is lower than the standard voltage (ignition voltage), the system de-termines RPM error, and the boiler switches into Lock-Out.
Check items	1. Check if the blower works normally. 2. check the power supply to the blower (Black + Red, approx. DC 127~184 V) 3. If RPM is significantly low while the blower works and the power supply is normal, replace the blower. 4. If the blower connector is wet due to any reason including leakage, take the corrective action. 5. Check for loose connection of white tower on PCB


Does the fan moter have normal operation voltage?
No
Check power and connector
Check the voltage between black and red wire of CN 8: 120 - 180VDC
Yes
Is there any pulse output from the fan motor?
No
Replace fan assembly
Check the voltage between black and white wire of CN 8: 2 - 8VDC
Yes
Replace PCB

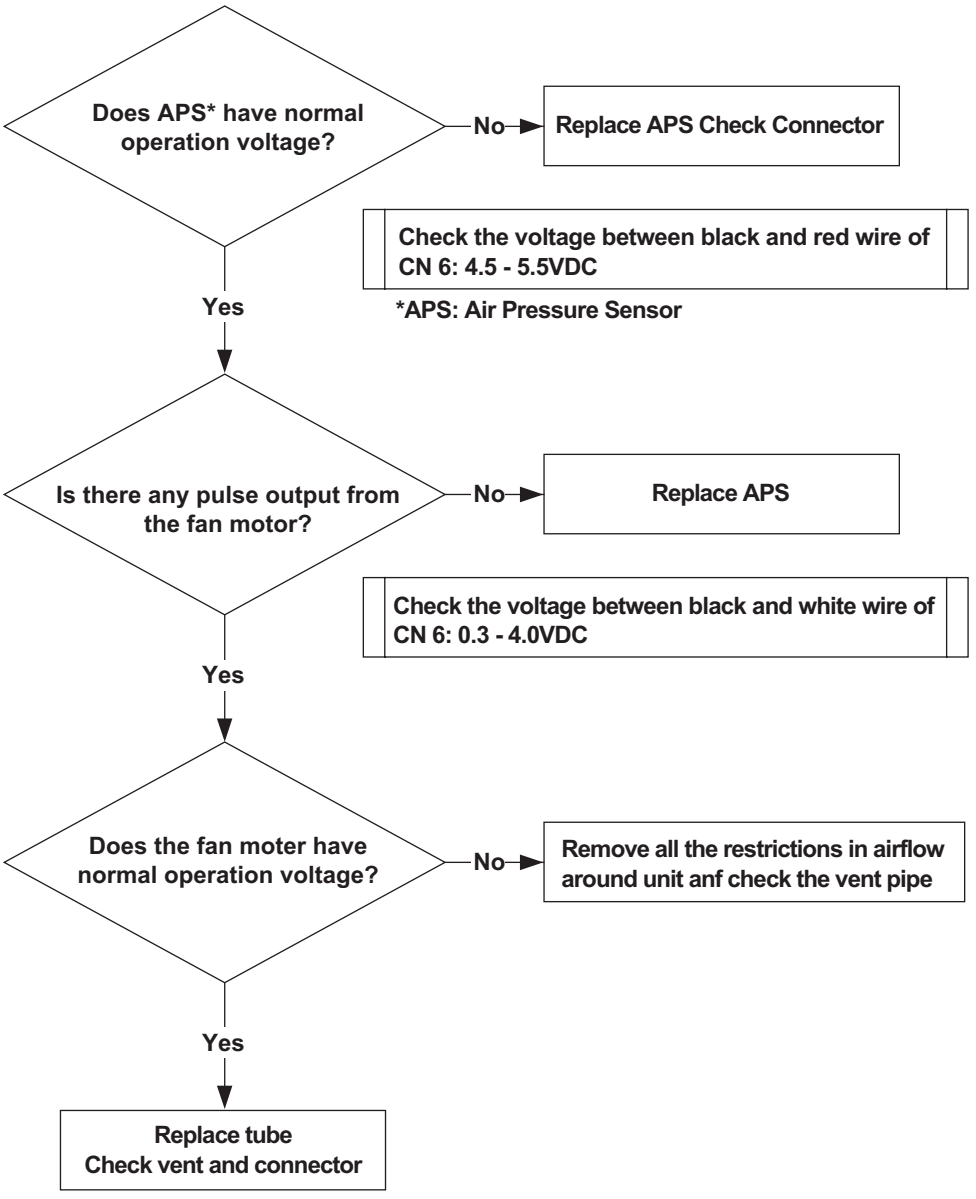
Check method

<table>
<tr><th>Error type</th><th>Cause</th><th>Check method</th></tr>
<tr><td rowspan="2">Blower action error</td><td>No blower action</td><td>1. Check the power supply to the blower.
✓ Black+Red, approx. DC 127~184 V
2. Replace the PCB if power is not supplied normally.
3. If the trouble continues despite the checking of above items, replace the blower.</td></tr>
<tr><td colspan="2"> 
<Blower connector>
 
<Check the blower operation voltage: Black+Red, approx DC 127~184 V ></td></tr>
<tr><td>Blower RPM error</td><td>Defective rotator</td><td>1. If RPM is significantly low while the blower works and the power supply is normal, replace the blower.
2. Check the blower RPM displayed on the PCB. (Display: r320→3200 RPM)
3. If RPM is low or there is a sensor circuit error, replace the blower.
4. If the trouble continues despite the checking of above items, replace the PCB.</td></tr>
</table>

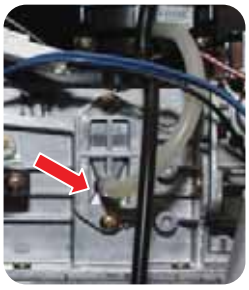
5.8. 10Error

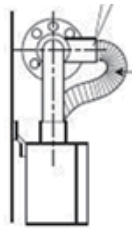
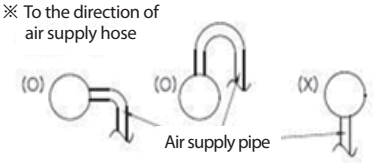
Error occurrence conditions and check items.

Error	Description
10E Air pressure error	The system senses the air volume and the RPM signal, and displays 10E on the indoor thermostat in the following cases: 1. During pre-purge 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 10 continuous prepurge actions, the system determines the air pressure error (or the air 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 air pressure error (excessive air 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	1. If the error occurs intermittently, replace the controller with a new model (324-7M). 2. Check the air pressure hose (visual inspection on tear and hole, and water remained in the hose after installation). 3. Check if the venture (burner) hole is clogged. 4. Check if the condensed water hose or the drain is clogged. 5. Check the flue and exhaust environment. (Inflow of exhaust gas generates noise.) 6. Check if the air supply/exhaust flue is clogged (rainwater collected due to dent or downward installation). 7. Defective air pressure sensor or PCB.


Does APS* have normal operation voltage?
No
Replace APS Check Connector
Check the voltage between black and red wire of CN 6: 4.5 - 5.5VDC
*APS: Air Pressure Sensor
Yes
Is there any pulse output from the fan motor?
No
Replace APS
Check the voltage between black and white wire of CN 6: 0.3 - 4.0VDC
Yes
Does the fan moter have normal operation voltage?
No
Remove all the restrictions in airflow around unit anf check the vent pipe
Yes
Replace tube
Check vent and connector

Check method

<table>
<tr><th>Error type</th><th>Cause</th><th>Check method</th></tr>
<tr><td>10E occurs intermittently</td><td>Air supply / exhaust close program is changed.</td><td>1. If 10E occurs intermittently during ignition or combustion, compare the stan-dard RPM (o.000) with the current RPM (r.000) at Min / Max combustion(dip switch 1-1&2). If the current RPM is near the excessive air pressure condition, check the follows:
✓ Air supply / exhaust
✓ Drainage of condensed water
✓ If the air pressure hose is broken or clogged.
2. Replace the old controller with a new one (change the program).</td></tr>
<tr><td rowspan="2">Air pressure sensor error</td><td>Air pressure hose error, venturi clogged</td><td>1. The air pressure hose is clogged.
✓ Check if the hose is clogged with water remained from installation.
2. Check if the venturi (burner) hole is clogged with soot or foreign substance.
✓ Blow air with mouth through the air pressure hose.
3. Check if the air pressure hose is torn.
✓ Increased RPM may cause blowout and noise.
✓ 03E can occur due to the same trouble.</td></tr>
<tr><td>Defective heat exchanger</td><td>The air pressure sensor error occurs due to heat leaked from the heat exchanger.
✓ Check if the error occurs continuously after the air volume sensor is replaced.
✓ After 5 min from the start of the boiler, put your hand near the air pressure sensor, and check if you can feel the heat.</td></tr>
<tr><td>Condensed water drain error</td><td colspan="2"> 
< Check if the venturi is clogged.>
  
< Defective air pressure hose ></td></tr>
<tr><td>Condensed water drain error</td><td>Condensed water drain error</td><td>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</td></tr>
<tr><td>Air pressure error</td><td>Defective blower</td><td>1. Replace the blower if the blower RPM is considerably low.
2. Check the blower rpm displayed on the controller. (r.320→3200 rpm)</td></tr>
</table>

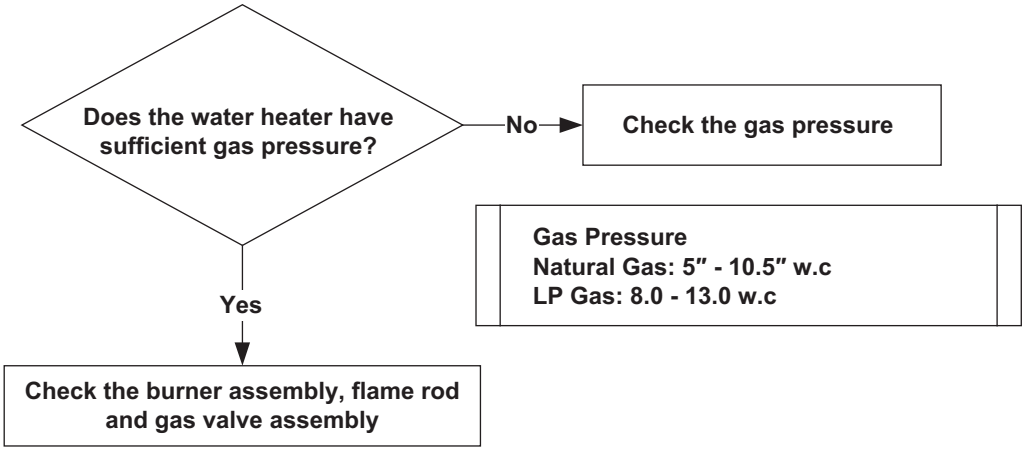
<table>
<tr><td rowspan="3">Defective air supply/exhaust flue</td><td>Deformed or clogged flue</td><td>1. Check the exterior of the flue, including dent.
2. Check if rainwater is collected due to downward installation of air supply pipe.</td></tr>
<tr><td colspan="2"> 


< Example of installation of air supply flue ></td></tr>
<tr><td>Exhaust gas flows in through the supply pipe</td><td>If the exhaust gas glows in through the air supply pipe, imperfect combustion may cause 10E due to noise and instable APS and RPM.
✓ Check the installation of flue and if the standard flue is used.</td></tr>
<tr><td>Other error</td><td>Defective PCB</td><td>If the same trouble continues after reviewing of the above items,
1. replace the air pressure sensor in case the air pressure sensing standard is abnormal, or
2. Replace the PCB.</td></tr>
</table>

5.9. 12Error

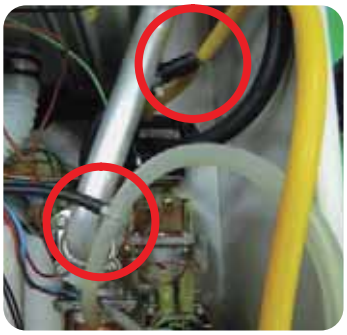
Error occurrence conditions and check items.

Error	Description
12E Loss of flame during combustion	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 a row, displays 12E (manually cleared) on the indoor thermostat.
Check items	1. Measure, with a meter, the gas supply pressure (NG: 5″(6″ 180 MODEL) ~10.5″W.C, LP: 8″(9″ 180 MODEL)~13.5″W.C) 2. Check the Gas meter Capacity. 3. Check the Gas Pipe Diameter (3/4″). 4. Check the controller 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

<table>
<tr><th>Error type</th><th>Cause</th><th>Check method</th></tr>
<tr><td rowspan="2">Flame blowout and noise occurs after ignition</td><td>Low gas supply pressure</td><td>1. Check the gas supply pressure.
✓ NG: 5″(6″ 180 MODEL) ~10.5″W.C, LP: 8″(9″ 180 MODEL)~13.5″W.C
✓ LP pressure drop occurs frequently in the winter.
2. Check the flexible pipe diameter.(3/4″)
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.
※ Check the static pressure: Gas supply pressure as the boiler is stopped. Check the dynamic pressure: Gas supply pressure at boiler MAX combustion
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 meter class (Example)
Gas meter Water heater Furnace Domestic gas stove
425 CFH ≥ 195 CFH + 58.8 CFH + 63.7 CFH
* 1 CFH = 1,020 Btuh</td></tr>
<tr><td>PCB capacity setting error</td><td>Check the PCB DIP S/W capacity setting.
<table>
<tr><th rowspan="2">Model</th><th rowspan="2">Capacity (Btu/h)</th><th colspan="2">DIP Switch</th></tr>
<tr><th>5</th><th>6</th></tr>
<tr><td>NR-180(A)/NP-180(A)</td><td>150,000</td><td>OFF</td><td>OFF</td></tr>
<tr><td>NR-210(A)/NP-210(A)</td><td>180,000</td><td>ON</td><td>OFF</td></tr>
<tr><td>NR-240(A)/NP-240(A)</td><td>199,000</td><td>OFF</td><td>ON</td></tr>
</table></td></tr>
<tr><td>Flame blowout and noise occurs after ignition</td><td>Differential gas pressure adjustment error</td><td>3-stage MIN differential gas adjustment error.
✓ Turn the adjusting screw under the main gas valve. ½ turn, and check the combustion.
✓ Adjust differential pressure with the meter after ignition.
✓ PCB DIP S/W 2,3 ON / Stage 3 MIN main gas valve.</td></tr>
</table>

<table>
<tr><td></td><td colspan="2">  
<Check the differential pressure></td></tr>
<tr><td></td><td>Defective air volume sensor</td><td>Flame blowout due to increased blower RPM caused by air pressure sensor standard value error.
✓ Replace the air pressure sensor.</td></tr>
<tr><td rowspan="2">Off at switch of stage</td><td>Foreign sub-stance in the nozzle</td><td>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.
(Remove efflo-rescence, if any, from inside wall of the nozzle)</td></tr>
<tr><td>Defective multistage valve</td><td>Flame may be blown out if the stage is switched when the multi-stage valve is defective.
✓ Check the power supply (DC 83~120 V).
✓ Check if the coil is disconnected.
✓ Yellow 2P : State 2 / Red 2P : Stage 3</td></tr>
<tr><td colspan="3">   
<Multi-stage valve> <Check the voltage (DC 200V)> <Check if the coil is disconnected- after plugging out the coil ></td></tr>
<tr><td>Flame blowout and noise</td><td>Defective blower</td><td>A defective proportional valve of the gas block causes trouble in air supply during combustion.
✓ Low gas pressure causes blowout of flame.
✓ Thick flame causes noise and accidental fire.</td></tr>
<tr><td>Other trouble</td><td>Defective PCB</td><td>If the trouble continues despite the checking of above items, replace the PCB.</td></tr>
</table>

5.10. 15Error

Error occurrence conditions and check items

Error	Description
15E MICOM error	If an error occurs in the internal circuit of the PCB (e.g., resistance, transistor or relay fault), the system displays 15E (cleared manually) on the remote controller and the PCB.
Check items	1. Defective PCB. 2. Check, with a tester, if the PCB is in the rated voltage (AC 102~132 V). 3. Disconnect the ground wire, and check the PCB.

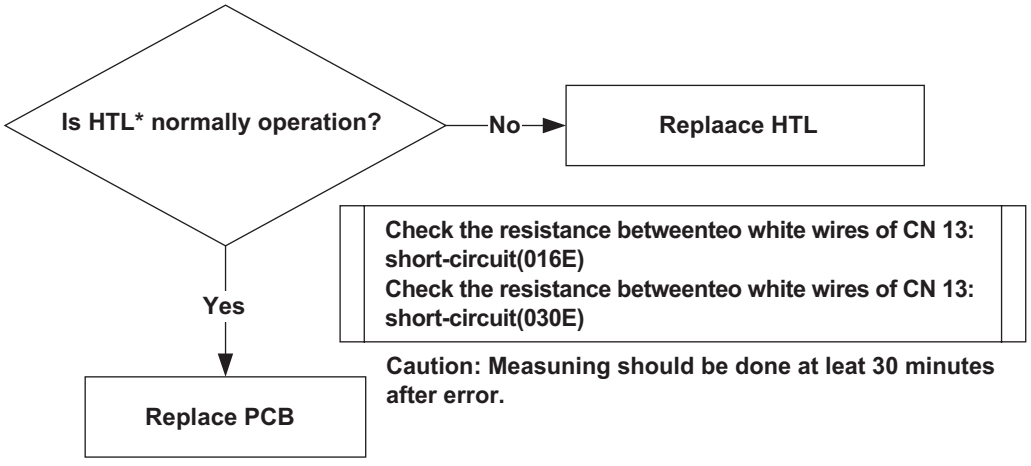
Check method

Error	Cause	Description
Gas warning	Defective PCB	Replace the controller 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 AC 102~132 V.
	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.

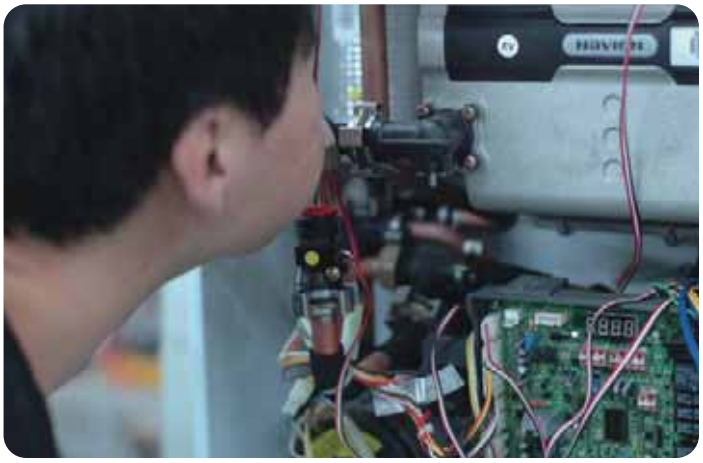
5.11. 16Error

Error occurrence conditions and check items.

Error	Description
16E Bimetal overheated	If the overheat controller on the heat exchanger operates during combustion stop of the boiler, the system displays the 16E (manually cleared) message on the remote controller and the PCB. The boiler switches into Lock-Out, and performs postpurge continuously and operates the pump. If the overheat sensor signal is detected within 10 min after the combustion is stopped, no error is displayed, and the system does not start combustion until the overheat sensor is returned to normal.
Check items	1. Check if the main heat exchanger is clogged. 2. Check if the overheat controller works properly. 3. Check the hot water output/input temperature sensor. 4. Check the PCB DIP S/W capacity setting. 5. Check if the PCB works properly.



Check method

<table>
<tr><th>Error type</th><th>Cause</th><th>Check method</th></tr>
<tr><td rowspan="3">Thudding noise caused by circulation error</td><td>The main heat exchanger is clogged.</td><td>Separate inlet/outlet pipe of the main heat exchanger, and blow air with mouth to check if the pipe is clogged.</td></tr>
<tr><td colspan="2"> 
<Check if the main heat exchanger is clogged.></td></tr>
<tr><td>Defective overheat PCB</td><td>Check if the contact point of the overheat PCB is defective.
✓ Use a tester to see if the resistance is normal (0 Ω) or abnormal (∞).</td></tr>
<tr><td>Defective safety device</td><td colspan="2"> 
<Overheat controller>

 
<Check if the overheat controller wire is disconnected.></td></tr>
<tr><td>Defective safety device</td><td>The temperature fuse is disconnected.</td><td>Check, with a tester, if the temperature fuse is disconnected.
✓ If the fuse is disconnected, replace the part and check the cause of overheating.</td></tr>
</table>

<table>
<tr><td></td><td colspan="3"> 
< Temperature fuse >
 
< Check if the temperature fuse is disconnected.></td></tr>
<tr><td>Temperature sensor error</td><td>Defective hot water output temperature sensor</td><td colspan="2">1. If the hot water temperature is sensed lower than it actually is due to a defective sensor, check if the deviation of temperature is large due to a defective temperature sensor.
Check the temperature displayed on the PCB (H.50.5→50.5℃).
2. Measure the temperature sensor resistance, and determine if the sensor is defective.</td></tr>
<tr><td rowspan="6">Other trouble</td><td>Capacity setting</td><td colspan="2">1. If the Max switch 1 is on,
Set the switch to the normal operation position.
2. Sudden increase of temperature due to PCB DIP S/W capacity setting error.</td></tr>
<tr><td colspan="3">Check the PCB DIP S/W capacity setting.
<table><tr><th rowspan="2">Model</th><th rowspan="2">Capacity (Btu/h)</th><th colspan="2">DIP Switch</th></tr><tr><th>5</th><th>6</th></tr><tr><td>NR-180(A)/NP-180(A)</td><td>150,000</td><td>OFF</td><td>OFF</td></tr><tr><td>NR-210(A)/NP-210(A)</td><td>180,000</td><td>ON</td><td>OFF</td></tr><tr><td>NR-240(A)/NP-240(A)</td><td>199,000</td><td>OFF</td><td>ON</td></tr></table></td></tr>
<tr><td>Main heat exchanger overheated</td><td colspan="2">The surface temperature rises due to defective main heat exchanger.
✓ Replace the main heat exchanger.</td></tr>
<tr><td>Defective PCB</td><td colspan="2">If the trouble continues despite the checking of above items, the PCB is defective.</td></tr>
</table>

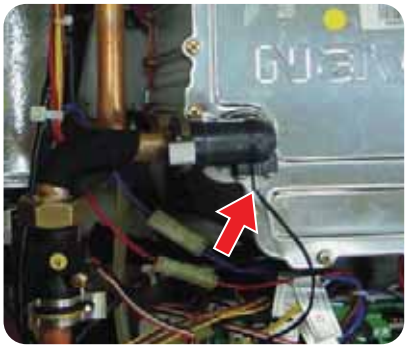
5.12. 21Error

Error occurrence conditions and check items.

Error	Description
21E Heat exchanger input temperature sensor open	If an error (open: -10℃ or lower) in the heat exchanger input temperature sensor is detected, the system displays the 21E error message on the remote controller and the PCB. The boiler maintains the Safety-Shutdown status.
Check items	1. Check if the heat exchanger input temperature sensor connector is wet due to any reason, including leakage. 2. Replace the defected heat exchanger input temperature sensor. 3. Replace the PCB.

Check method

Error	Cause	Check method
Defective sensor	Defective temperature sensor connector	Check if the temperature sensor is open and if the connector is connected properly.
	Temperature sensor	Check the resistance of the temperature sensor. (Defective if it is 30kΩ or higher) ✓ Replace the temperature sensor if the resistance value is abnormal. ✓ Check the temperature displayed on the PCB. (C.10.0→10.0℃).
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.



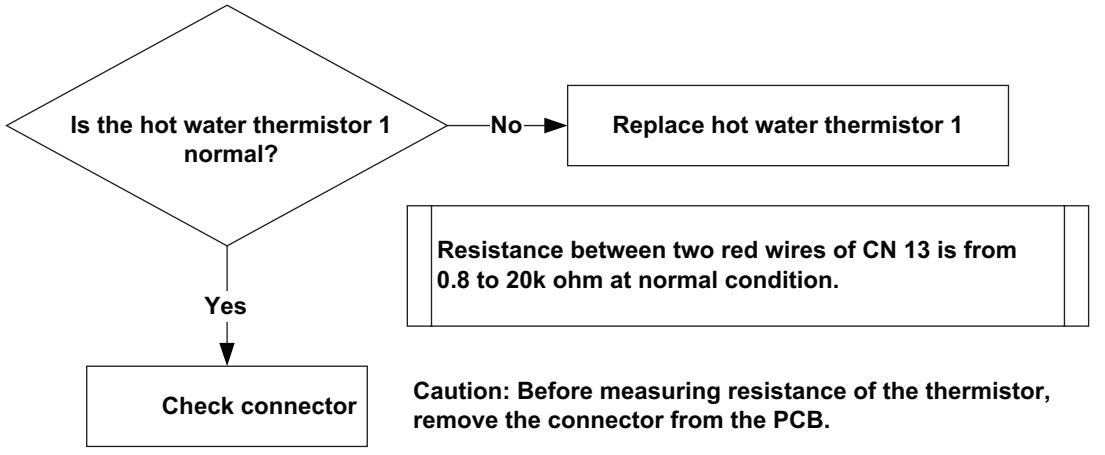
<Heat exchanger input temperature sensor / connector, Black 2P>

<Check if the hot water temperature sensor is open>
Error type : MΩ Open

5.13. 22Error

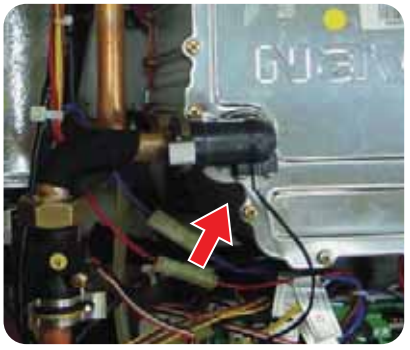
Error occurrence conditions and check items.

Error	Description
22E Heat exchanger input temperature sensor shortcircuit	If an error (short-circuit: 120℉ or higher) in the heat exchanger input temperature sensor is detected, the system displays the 22E error message (cleared automatically) on the remote controller and the PCB. The boiler maintains the Safety-Shutdown status.
Check items	1. Check if the heat exchanger input temperature sensor connector is wet due to any reason, including leakage. 2. Replace the defected heat exchanger input temperature sensor. 3. Replace the PCB.



Check method

Error	Cause	Check method
Defective sensor	Defective temperature sensor connector	Check if the temperature sensor connector or the PCB harness terminal is wet due to any reason, including leakage.
	Temperature sensor	Check the resistance of the temperature sensor. ✓ Replace the temperature sensor if the resistance value is abnormal. (Defective if it is 0.5㏀ or lower) ✓ Check the temperature displayed on the PCB(C.10.0→10.0°F).
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.



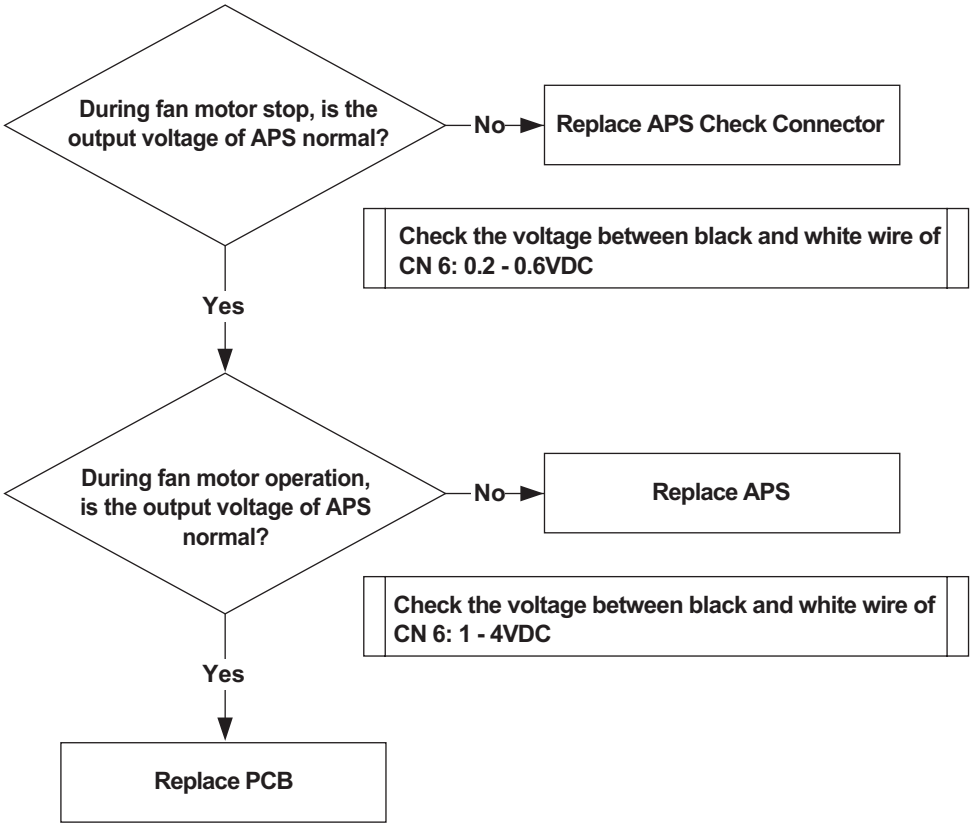
< Heat exchanger input temperature sensor / connector, Black 2P >

< Check if the hot water tem-perature sensor is open >

5.14. 27Error

Error occurrence conditions and check items.

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



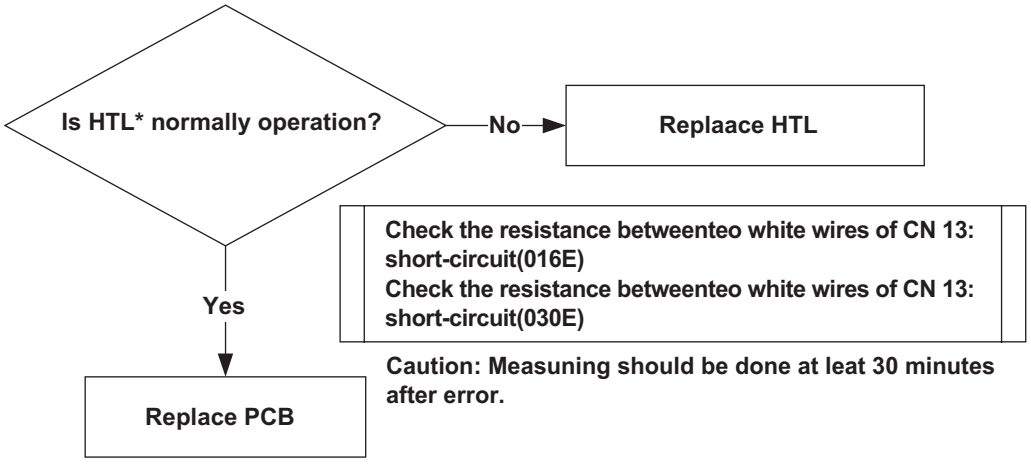
Check method

Error type	Cause	Check method
Defective sensor	Connector contact error	Check connector assembly and contact of the air volume sensor.
	Defective air volume sensor	1. Check the air volume sensor value displayed on the PCB. (AD value) (A.150 → 150) Check the value at min / max of the combustion specification table. Replace the air pressure sensor if an error occurs (standard value ±500 or higher). 2. Check the air volume sensor voltage. ✓ Operating voltage (Black+Red) : DC 5 V ✓ Sensor output voltage (Black+White) Open: DC 0.1±0.1 V or lower Short circuit: DC 4.5±0.2 V or higher An error occurs if the air volume sensor voltage of 1.20V is detected before pre-purge.
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.
		

5.15. 30Error

Error occurrence conditions and check items.

Error	Description
30E Exhaust gas temperature error	If the overheat controller on the top of the exhaust duct operates, the system displays the heat exchanger bimetal overheat message 30E (cleared manually) othe room controller and the PCB. (Overheat controller operating temperature: 149°F) The boiler switches into Lock-Out, and performs post-purge continuously and operates the pump.
Check items	1. Check if the overheat controller operates normally. 2. Check if the PCB works properly.



Check method

Error	Cause	Check method
Heat exchanger over-heated	Defective heat exchanger	1. The error occurs due to high exhaust gas temperature caused by the defective heat exchanger. 2. The error occurs due to high temperature due to the heat leaked from the heat exchanger. 3. Replace the heat exchanger.
	Defective overheat PCB	Defective contact point of the exhaust gas overheat controller (149°F) Check connection of the overheat controller. Remove the PCB and check, with a tester, the resistance (M Ω defect).
 < Check the overheat controller >		
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

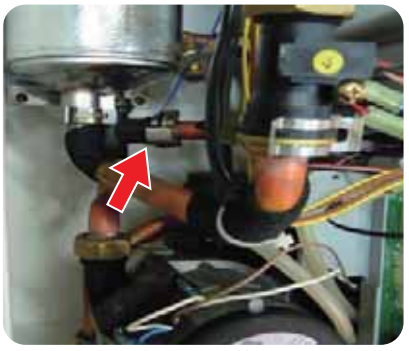
5.16. 32Error

Error occurrence conditions and check items.

Error	Description
32E Direct water temperature sensor open	If an error (open: -14℃ or lower) in the cold water temperature sensor is detected, the system displays the 32E (cleared automatically) error message on the room controller and the PCB. The boiler maintains the Safety-Shutdown status.
Check items	1. Check if the cold water temperature sensor is open and if the connector is connected properly. 2. Check the defect of the direct temperature sensor. 3. Defective PCB 4. Check dipswitch settings(Non-A/A Model)

Check method

Error	Cause	Check method
Defective sensor	Defective temperature sensor connector	Check if the cold water temperature sensor is open and if the connector is connected properly.
	Temperature sensor	Measure the temperature sensor resistance. (Defective if it is 30kΩ or higher) ✓ Replace the temperature sensor if the resistance is abnormal.
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.



<Heat exchanger input temperature sensor / connector, Black 2P>

<Check if the hot water temperature sensor is open>
Error type : MΩ Open

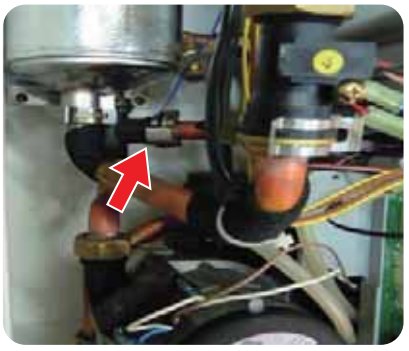
5.17. 33Error

Error occurrence conditions and check items.

Error	Description
33E Direct water temperature sensor short-circuit	If an error (open: 248°F or higher) in the cold water temperature sensor is detected, the system displays the 33E (cleared automatically) error message on the remote controller and the PCB. The boiler maintains the Safety-Shutdown status.
Check items	1. Check if the hot water temperature sensor connector is wet due to any reason, including leakage. 2. Replace the defected cold water temperature sensor. 3. Replace the PCB.

Check method

Error	Cause	Check method
Defective sensor	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.
	Temperature sensor	Measure the temperature sensor resistance. Replace the sensor if it is 0 Ω.
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.



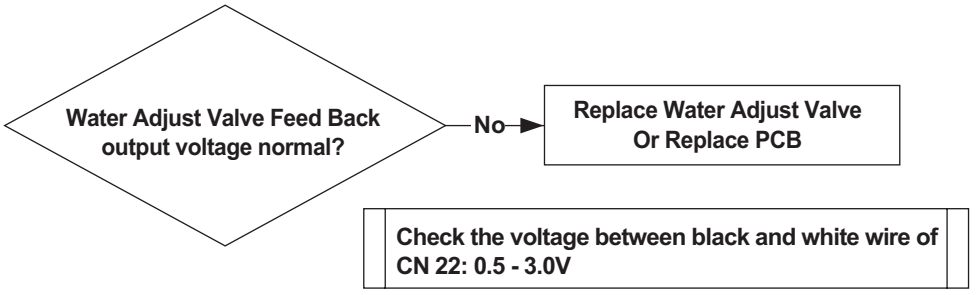
< Direct water temperature sensor / Blue 2P >

< Check the hot water temperature sensor >

5.18. 34Error

Error occurrence conditions and check items.

Error	Description
34E Water Adjutment valve error	If the water adjustment valve does not work properly due to a defective feedback sensor, water adjustment valve or PCB board, the system displays 34E (cleared automatically/manually), and switches into the Safety-Shutdown mode. ✓ Water adjustment valve close error – The system commands opening of the water adjustment valve, but the valve remains closed. [Check the feedback sensor.] (Cleared manually) ✓ If the Water adjustment valve sensor open/short-circuit is detected, the system displays an error message. If flow is sensed, the system clears the error automatically, provides the hot water. If open/short-circuit is detected after hot water is used, the system displays the error message.
Check items	If the 34 error occurs, connect the good Water adjustment valve to the PCB. valve must be kept open when the water heater does not work. If the PCB is defective, the motor keeps operating and the valve repeats open/close. 1. Defective water adjustment valve. 2. Defective PCB.



Check method

Error	Cause	Check method
Remote controller / PCB error	Malfunction of water adjustment valve Defective water adjustment valve	If an error occurs in the cascade system, disconnect communication, and check the system in the following procedure: 1. Connect a good water adjustment valve to the PCB The valve should remain open when the water heater is not operating. 2. If the PCB is defective, the motor keeps operating as the water adjustment valve is in OPEN or CLOSE status, or the valve repeats open/close. 3. Replace the flow control valve for other symptoms. 4. As a temporary measure, you can disassemble the water adjustment valve, open it manually, and separate the power cable of the water adjustment valve.
Water heater works but error occurs	Defective water adjustment valve sensor	1. Open or short-circuit of the flow control valve sensor. 2. Check the connector assembly and wiring state of the water adjustment valve feedback sensor. 3. Check the water adjustment valve output value (AD) displayed on the PCB. On the display, F.15 or lower means the valve is open, and F.240 or higher means the valve is closed

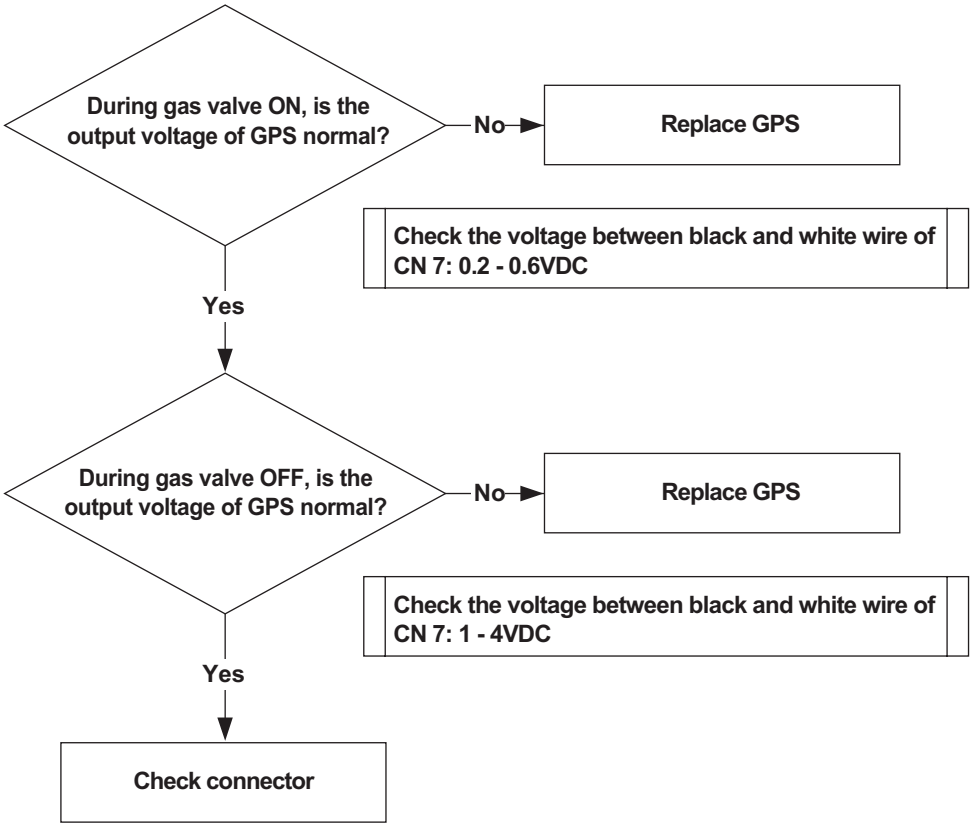
※ Emergency measures against closed flow control valve (manual open)

1. Switch off power, close the manual water valve, and drain water from the unit.
2. Remove the top/bottom clips of the water adjustment valve.
3. Disassemble the motor and open the lid.
4. Turn the water adjustment valve axis disk counterclockwise to the end.
5. Pull out the water adjustment valve power connector.
   (Keep the water adjustment valve feedback sensor connected.)
6. Plug the power cord, and start the unit while using hot water.

5.19. 35Error

Error occurrence conditions and check items.

Error	Description
35E Gas pres sure sensor error	Check the gas pressure sensor. If an error (Open: 0.1±0.1 V or lower / Short-circuit: 4.5±0.2 V or higher) is detected, or if the gas pressure (+) or (-) hose is pulled out, the system displays 35E (cleared automatically) on the remote controller and the PCB.
Check items	1. Measure the gas pressure sensor output voltage. 2. Check the connector. (defective contact or short-circuit caused due to moisture) 3. Check the gas pressure hose.



Check method

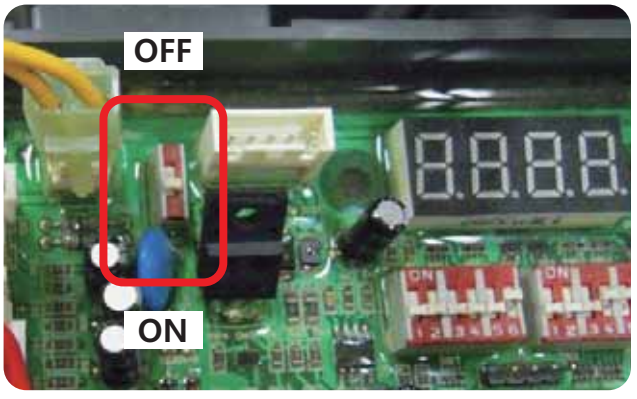
Error type	Cause	Check method
Defective sensor	Defective contact of the connector	Check the assembly and contact of the gas pressure sensor connector.
	Defective gas pressure sensor	Check the gas pressure sensor input/output voltage. Operating voltage (Black+Blue) : DC 5 V Sensor output voltage (Black+White) Open : DC 0.1±0.1 V or lower Short-circuit: DC 4.5±0.2 V or higher
	 <Check the GPS terminal>	
Gas pressure hose is pulled out	Gas pressure hose is pulled out	Check the assembly of the gas pressure (+) or (-) hose, and if there is any damage on the hose.
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

5.20. 36Error

Error occurrence conditions and check items.

Error	Description
36E Communication Error	If a master/slave communication error occurs under the cascade system, the system displays the 36E (cleared automatically) error message. 1. All other water heaters except the water heaters where the communication error has occurred operate normally. (The water heaters with the communication error maintain the Cascade ON mode, and operate normally when the flowmeter works.) 2. If a communication error occurs in the master water heater, all the slave water heaters operate individually.
Check items	1. Check the communication cable. 2. Check the external power supply (187~254V). 3. Check the communication switch on the PCB. 4. Check if the PCB works normally.

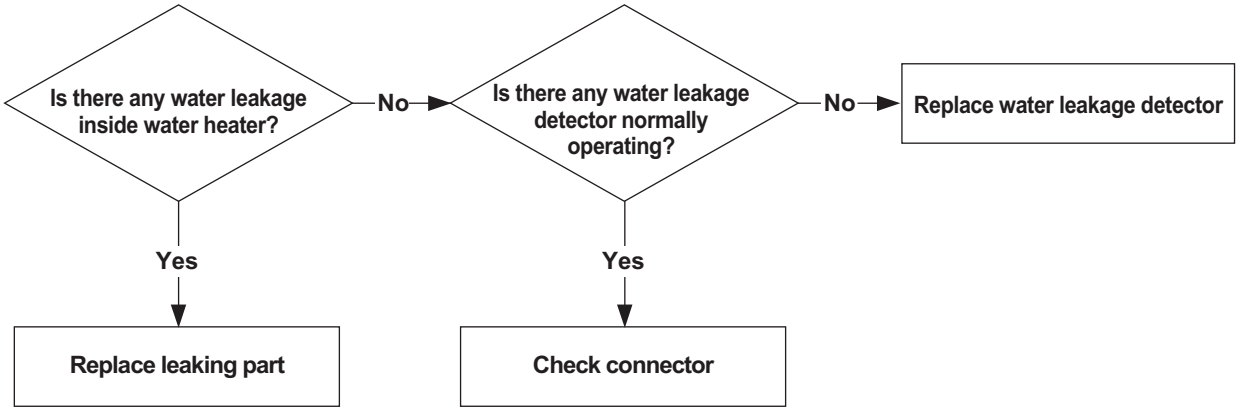
Check method

Error	Cause	Check method
Communication error	Defective power supply	Check the power supply to the water heater.
	Defective communication cable	Check the connection of the communication cable, and if the cable is disconnected.
Other trouble	Setting error	In the Cascade system, the controller communication switch (DIP S/W No. 6) must be set to ON for the first and the last systems, and OFF for the remaining systems.
	 < Communication switch (DIP S/W No. 6)>	
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, the PCB is defective.

5.21. 37Error

Error occurrence conditions and check items.

Error	Description
37E Internal water leak	If the water leak sensor signal is detected while the water heater is ON, the system displays 37E (cleared manually). The water heater enters the Lock-Out mode (gas valve and ignition transformer closed), and closes the flow control valve to prevent further water leak. ※ For the cascade system 1. If the water leak signal is sensed in one out of two units, the system blocks direct water of the all units to prevent water leak. 2. If three or more units are installed, the system blocks cold water for the concerned unit only. 3. To block the cold water, the system completely closes the water adjustment valve.
Check items	1. Visually check heat exchanger and piping for leaks. 2. Check if the PCB water level sensor works normally. 3. Check if the PCB works normally.



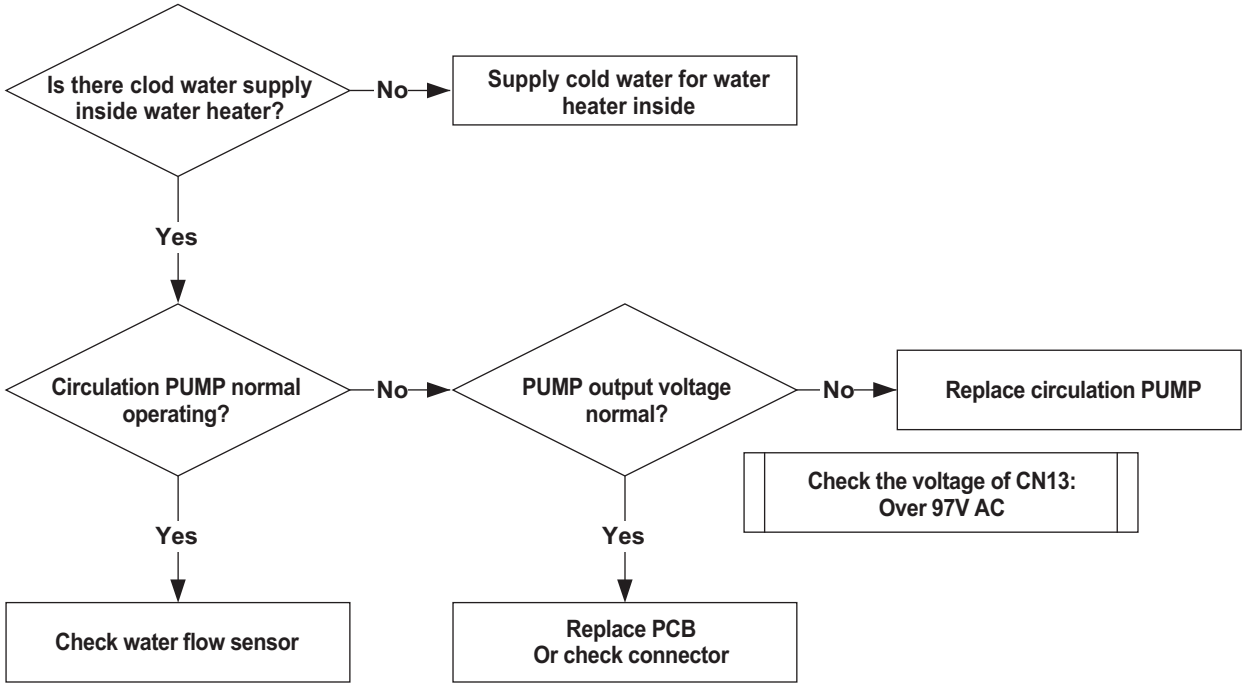
Check method

Error type	Cause	Check method
No internal water leak	Defective sensor	Check the contact between the water leak sensor wires and with the water heater enclosure base.
Internal water leak	Defective part	1. Check the leaking part, and repair the part. 2. Check molex connection on board for moisture
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, the PCB is defective. Check to make sure that the ends of the wires are both not contacting the cabinet.
	 < Water leak sensor wire : Blue 2P>	

5.22. 38Error

Error occurrence conditions and check items.

Error	Description
38E Pump error	Connect the power, start the pump, and check if the system senses the flow. If the flow is not sensed after the pump is started, the system displays 38E (cleared automatically) on the remote controller and the PCB.
Check items	1. Defective flow sensor. 2. Defective pump. 3. Defective PCB.



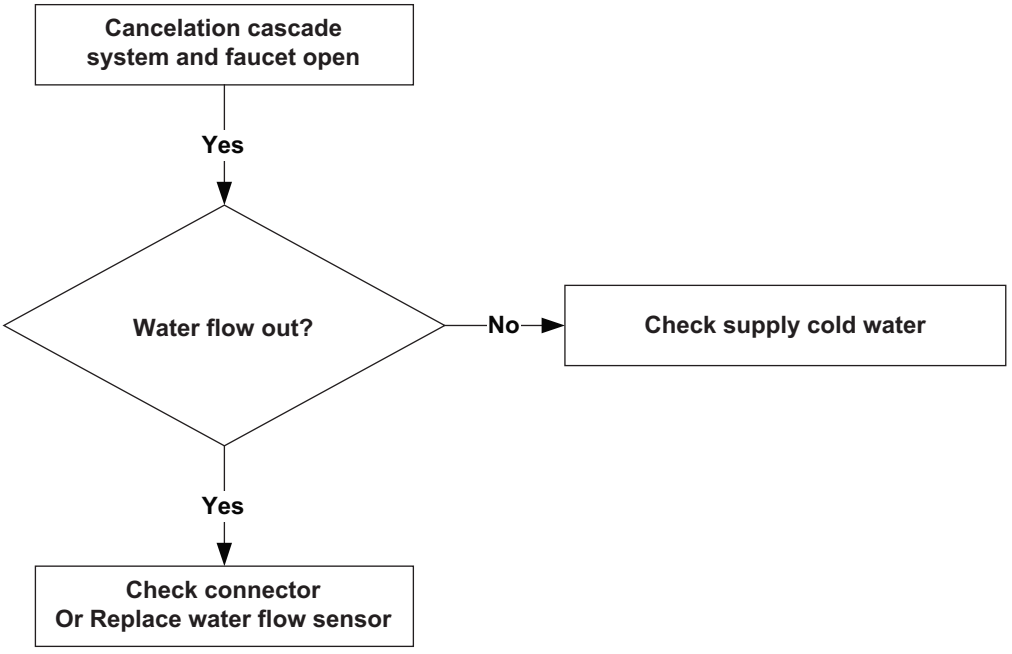
Check method

<table>
<tr><th>Error type</th><th>Cause</th><th>Check method</th></tr>
<tr><td>Malfunction</td><td>Defective flow sensor</td><td>Check the current flow displayed on the PCB (15.66→15.66 gal/min).
The flow sensor is defective if the water flow displayed is 00.0
when water is discharged from the hot water tap.</td></tr>
<tr><td></td><td colspan="2"> 
< Water leak sensor wire: Blue 2P></td></tr>
<tr><td rowspan="2">Defective pump</td><td>Defective pump</td><td>1. Check if the pump works normally.
2. Check the pump power cable connector and if the wiring is performed normally.
3. Check the power supply (AC 102~132 V).
4. Check for air in the system.</td></tr>
<tr><td colspan="2"> 
< Circulation pump >
 
< Circulation pump wire: Blue 2P ></td></tr>
<tr><td>Other trouble</td><td>Defective PCB</td><td>If the trouble continues despite the checking of above items,
the PCB is defective.</td></tr>
</table>

5.23. 39Error

Error occurrence conditions and check items

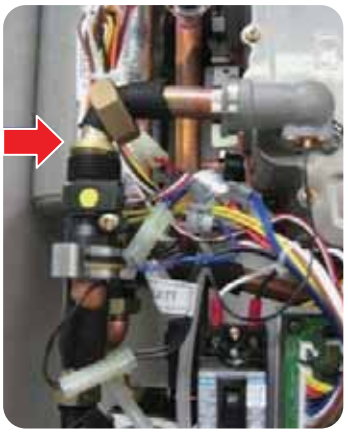
Error	Description
39E Flow sensor error	As one or more units are operating in the cascade system, if no flow is detected while the system opens the water adjustment valve, the system considers it as a defective flow sensor. The system displays 39E (cleared manually) on the remote controller and the PCB, 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.



Check method

Error type	Cause	Check method
No hot water flows	cold water supply error	1. Check if the system opens/closes the cold water valve and the hot water output valve properly. 2. Check if the cold water line is frozen. 3. Check if the cold water filter is clogged.
Water heater not working	Defective flow sensor	5. Check the current flow displayed on the PCB (15.66→15.66 gal/min). If the flow sensor is defective, the displayed flow value is 00.0 while water flows from the hot water tap. Disassemble the flow sensor, blow air with mouth. The hall sensor of the flow sensor is defective if the impeller rotates and display remains 0.00. 6. Check connector assembly and contact of the flow sensor. 7. Check the input voltage of the flow sensor. Operating voltage (Black+Red) : Defective PCB if DC 5 V is not supplied. 8. Replace the flow sensor if no flow is detected while the operating voltage is normal.
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, the PCB is defective

Emergency measures against defective flow sensor	**Replacement of part takes the priority if an error occurs in the flow sensor. If it is impossible to replace the part, take the following emergency measures** The CH flow sensor rotor is compatible with the NR/NP flow sensor. If the flow sensor rotor is stuck due to foreign substance Disassemble the flow sensor, blow with mouth to the right direction. If the impeller does not rotate, disassemble the impeller, and remove foreign substance before reassembling it. If the flow displayed on the PCB is 00.0, and the impeller rotates when you blow it, the hall sensor of the flow sensor is defective. The hall sensor is substituted by the CH flow sensor. >> Please clarify this procedure



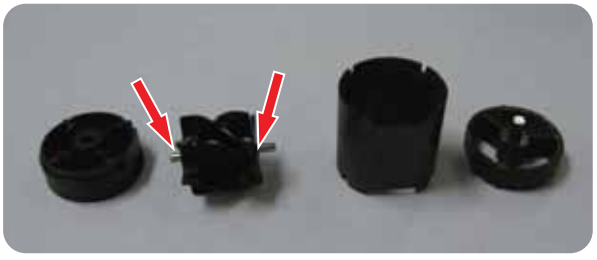
1. Drain water, and unfasten the upper nut of the flow sensor.

2. Remove the lower clip of the flow sensor.

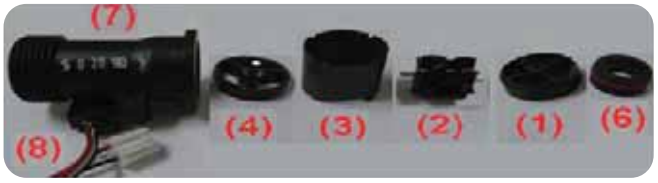
3. Blow the flow sensor. If the impeller rotates normally, replace the hall sensor.

4. If the impeller does not rotate, disassemble it by pushing the axis with a driver.

5. If you push the axis, the impeller housing is re-moved. This is compatible with the NCN flow sensor.



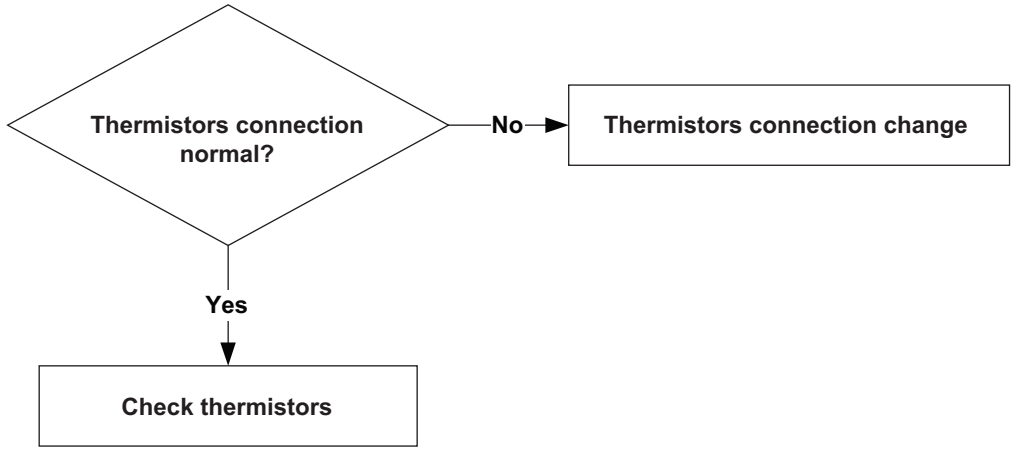
6. The impeller housing is disassembled as shown in the figure if you pull out the top/bottom caps. Clean the impeller axis.



5.24. 44Error

Error occurrence conditions and check items

Error	Description
44E Temperature sensor connection error	The system checks each temperature sensor, and if an abnormal temperature is detected, displays 44E (cleared manually), and switches into the Lock-Out mode (gas valve and ignition transformer locked). Heat exchanger input/output temperature sensor connection error: If the heat exchanger input temperature is higher than the hot water temperature by +5 °C, the system considers incorrect assembly of the hot water temperature sensor and the heat exchanger input temperature sensor, stops combustion and displays an error message. Heat exchanger output / cold water temperature sensor connection error: If the direct water temperature is higher than the hot water temperature by +5 °C, the system considers incorrect assembly of the hot water temperature sensor and the cold water temperature sensor, stops combustion and displays an error message.
Check items	1. Check the position of each temperature sensor. 2. Defective temperature sensor. 3. Defective PCB.



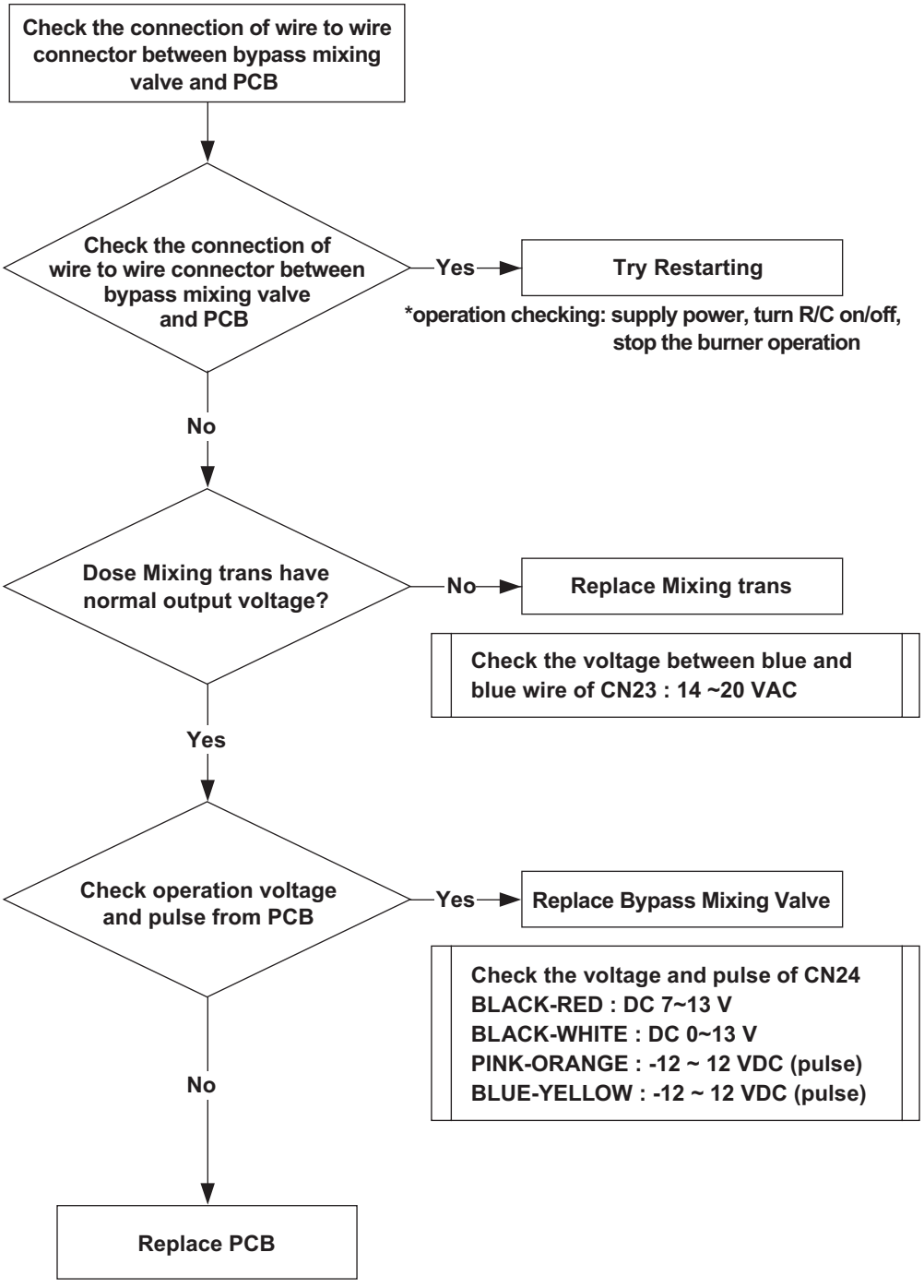
Check method

Error type	Cause	Check method
Defective sensor	Temperature sensor assembly error	Check the assembly of each temperature sensor connector.
	Defective temperature sensor	Measure the temperature sensor resistance. Replace the temperature sensor if the value is out of the standard resistance value.
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, the PCB is defective.

5.25. 45Error

Error occurrence conditions and check items

Error	Description
45E Bypass Mixing Valve error	In NR/NP type, check the condition of bypass mixing valve when supply power, turn R/C on/off, or stop burner operation. When bypass mixing valve is noticed in abnormal condition, display 45E. Display error code when bypass Mixing valve cannot close. (Display 16.01 at PCB – generally step motor of bypass mixing valve is in abnormal condition.) Display error code when bypass Mixing valve cannot open. (Display 16.02 at PCB – generally wire of mixing valve is disconnected or feedback sensor of bypass mixing valve is in abnormal condition.)
Check items	1. Check the connector is connected between bypass mixing valve and PCB. 2. Defective Mixing trans. 3. Defective Bypass Mixing valve 4. Defective PCB.


Check the connection of wire to wire connector between bypass mixing valve and PCB
Check the connection of wire to wire connector between bypass mixing valve and PCB
Yes
Try Restarting
*operation checking: supply power, turn R/C on/off, stop the burner operation
No
Dose Mixing trans have normal output voltage?
No
Replace Mixing trans
Check the voltage between blue and blue wire of CN23 : 14 ~20 VAC
Yes
Check operation voltage and pulse from PCB
Yes
Replace Bypass Mixing Valve
Check the voltage and pulse of CN24
BLACK-RED : DC 7~13 V
BLACK-WHITE : DC 0~13 V
PINK-ORANGE : -12 ~ 12 VDC (pulse)
BLUE-YELLOW : -12 ~ 12 VDC (pulse)
No
Replace PCB

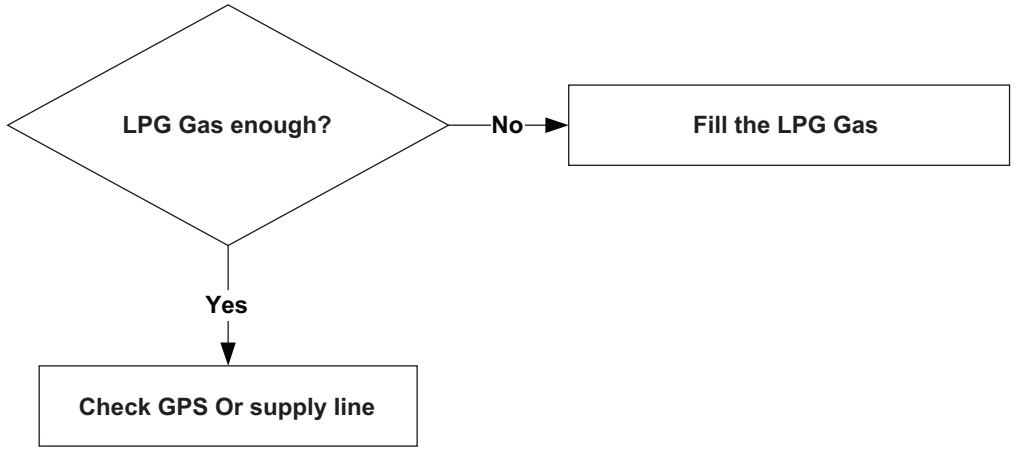
Check method

Error	Cause	Check method
Defective Bypass Mixing Valve	Connection of Wire ass'y in fault	Check the connection of wire to wire connector between bypass mixing valve and PCB
	Defective Feedback	Check the operation when connect the bypass mixing valve. (operation checking: supply power, turn R/C on/off, stop burner operation) ✓ Check the voltage of CN24 (BLACK-RED : DC 7~13V) - If voltage range is not in normal, check connection of wire, mixing trans and PCB. ✓ Output voltage of black-white wire of CN24(DC 0 ~13V) is not change, display 45E(16.02) during checking operation. - Check the connection of wire to wire connector and reconnect it - Check the disconnection of white wire - Check the operation condition of step motor of bypass mixing valve
	Defective Step Motor	✓ Check the connection of wire to wire connector and reconnect it. ✓ Check the mixing trans. ✓ Check the step motor during checking operation ✓ Check the output pulse of pink-orange wire and blue-yellow wire of CN24. (PINK-ORANGE : -12 ~ 12 VDC (pulse), BLUE-YELLOW : -12 ~ 12 VDC (pulse)
	Defective Mixing Trans	✓ Check the voltage between blue and blue wire of CN23 : (14 ~20VAC)
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

5.26. 48Error

Error occurrence conditions and check items

Error	Description
48E Gas pressure error	For an LP model, if a low-gas pressure is detected at high combustion (Stages 2-2 and 3), the system displays 48E (cleared manually). If fire breaks out 5 times or more and ignition fails during the combustion after the low-gas error is detected If the target APS is out of a specific value range during the combustion with the gas/air rate adjusted.
Check items	1. Check the gas supply pressure. LP : 8″(9″ 180 Model) ~13.5″ W.C (at dynamic pressure) 2. Check if the gas pressure sensor hose is damaged. 3. Check if the gas pressure sensor is defective. 4. Check if the PCB works normally.



Check method

Error	Cause	Check method
Combustion stops during the operation	Gas pressure error	Measure the main pressure. **LP : 8”(9” 180 Model) ~13.5” W.C** If the gas pressure is low, contact the gas supplier. Cause of low gas pressure: **1) Narrow gas pipe.** **2) Defective gas regulator.** **3) Lack of gas in the container.** **4) Clogged pipe (foreign substance)**
	Defective gas pressure sensor hose	1. Check if the gas pressure sensor hose is damaged. 2. Check if the gas pressure sensor hose is clogged. 3. Check if the gas venturi is clogged.
	Defective gas pressure sensor	1. Check the gas pressure sensor value (AD value) displayed on the controller. (P.100 → 100) Check the value at min / max of the combustion specification table. 2. Check the gas pressure sensor voltage Operating voltage (Black+Red) : DC 5 V Sensor output voltage (Black+White) : DC 0.3~4.0 V
Other trouble	Defective PCB	If the trouble continues despite the checking of above items, replace the PCB.

5.27. Troubleshooting guide by symptom

5.27.1. Noise

Error type	Cause	Check method
Vibration noise	Defective installation	Incorrect level setting or fixing error ✓ Check the fixing state, and reinstall the unit.
	Blower vibration noise	Vibration caused due to defective blower FAN balance. ✓ Touch the blower. If vibration is significant, replace the blower. ✓ If intermittent noise occurs during operation, check the blower. ✓ If vibration noise occurs during operation of the product, and stops when the case lid is removed, check the blower.
Regular noise	Defective flow sensor	Rotating noise due to foreign substance entered into the flow sensor.
	Malfunction of water adjustment valve	Noise due to repeated opening/closing of water adjustment valve due to a defective PCB.
Noise at ignition	Gas and air differential pressure error (Pop, Beep, Explo-sive ignition)	1. Gas differential pressure adjustment error ✓ Adjust differential pressure with the pressure adjusting screw on the main gas valve. ✓ DIP S/W 1,2 ON (S/W 3 MIN), ✓ If noise occurs at standard value, adjust setting above/ below the standard. 2. Excessive gas supply due to defective proportional valve on the main gas valve. ✓Check if the proportional valve wire is open, and if there is a problem, replace the main gas valve.. 3. Gas supply error due to defective air pressure sensor. 4. If the same error is repeated, it is due to a defective PCB.
Noise during combustion	Differential pressure setting error	Beep if the gas pressure is excessive due to defective adjustment of differential pressure between gas and air. ✓ Noise similar to the boiling noise ✓ Adjust Stage 3 MAX differential pressure by model on the specification table.
	Boiling noise	How to check the boiling noise: ✓ Boiling noise occurs if the water temperature rises to149℉ ~167℉ (65℃~75℃). 1. The heat exchanger is clogged partially due to defective welding. Replace the heat exchanger if the error occurs from the start of the installation. 2. The heat exchanger is clogged due to foreign substance. Clean the main heat exchanger by removing scale. ✓ Replace the main heat exchanger if the error continues after the cleaning.

	Whirring	Exhaust gas flow into the boiler through the air inlet makes combustion noise. ✓ Check the distance between inlet and outlet (at least 6”). ✓ Check the distance between flues if two or more units are installed (at least 24”). ✓ Check if there is any obstacle near the flue.
	Low gas pressure (whirring)	1. Noise occurs due to flame lifting when gas pressure is low. ✓ Check the gas supply pressure (dynamic pressure) 2. Low gas supply due to differential pressure error. ✓ Set DIP S/W 1, 2 to ON (3-stage MIN), 3. Noise due to clogged or damaged gas pressure sensor hose. 4. Check the failure of the gas pressure sensor (output voltage check).
	Noise from burner stage switch	Disassemble the nozzle and check if the hole is narrowed due to foreign substance. ✓ 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.

5.27.2. Hot water

Error	Cause	Check method
Water heater fails to work	Remote controller power off	Hot water does not run if the remote controller is switched off.
	Defective flow sensor	The water heater does not work due to the defective flow sensor. ✓ The impeller does not rotate, if the axis is stuck due to foreign substance. ✓ If the impeller rotates normally, replace the hall sensor of the flow sensor. ✓ The sensor may be reused temporarily after cleaning, but replacement must be considered preferentially.
	Defective hot water temperature sensor	The temperature is sensed higher than the actual temperature due to a defective hot water (cold water) sensor. ✓ Hot water temperature is low although hot water is recognized by the remote controller. ✓ The cold temperature sensor may not work without any symptom.
Low hot water temperature	Hot water setting error	Check the hot water temperature setting on the remote controller.
	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. ✓ Cold water and hot water are mixed due to improper pipe installation. ✓ Cold water and hot water are mixed due to improper installation of the tap.
No hot water from the valve	Check the pipe	1. The cold water valve is closed. 2. Check if the cold water filter is clogged with foreign substance. 3. The water adjustment valve is closed. **(Refer to E34.)** 4. Check if the cold water / hot water pipes are frozen during the winter. 5. The main heat exchanger is clogged (by lime) 6. Low inlet water pressure
Cold water flows temporally	Pre-heating does not work	For the A model, the system performs the internal/ external circulation preheating when 24-hour timer is set on the remote controller. Therefore, make sure to check the time setting

5.27.3. Circuit breaker operation

<table>
<tr><th>Error</th><th>Cause</th><th>Check method</th></tr>
<tr><td rowspan="4">Circuit breaker operates</td><td>Power supply</td><td>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.</td></tr>
<tr><td>Defective part assembly</td><td>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.</td></tr>
<tr><td colspan="2"> 
<Normal assembly>
 
<Short-circuit due to defective assembly>
 
<Wiring near the heat ex-changer></td></tr>
<tr><td>Circuit breaker operates while the boiler is running</td><td>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 3-stage valve.</td></tr>
<tr><td>Remote controller power</td><td>Check the wire</td><td>Check the power supply to the remote controller terminal.
(DC 19 V 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.</td></tr>
</table>

6. Inspection

Check and clean the heating system once a year.
We advise you to offer your customer an annual inspection

6.1. Preparing the Water heater 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

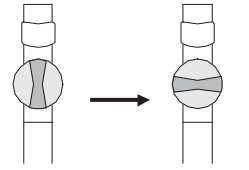
6.2.1. How to Check Inlet Gas Pressure

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.

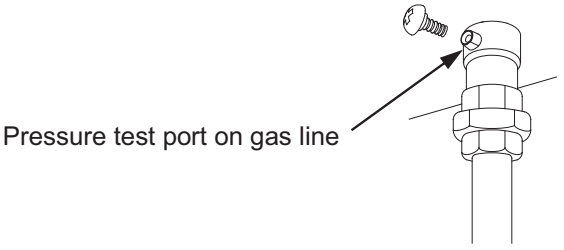
THIS SECTION IS ONLY TO BE DONE BY A LICENSED PROFESSIONAL

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 water heater.



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 water heater up to its maximum burn.
7. When the Navien water heater is at maximum burn, check the inlet gas pressure reading on the manometer; it should read between 5”(6” 180 model) ~10.5” W.C for Natural gas between 8.0” (9” 180 model) ~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.

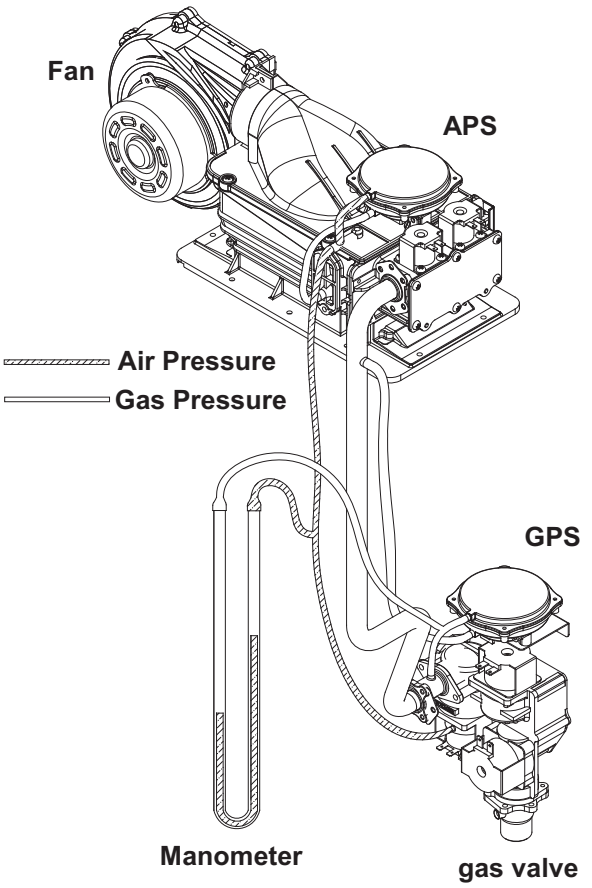
THIS SECTION IS ONLY TO BE DONE BY A LICENSED PROFESSIONAL

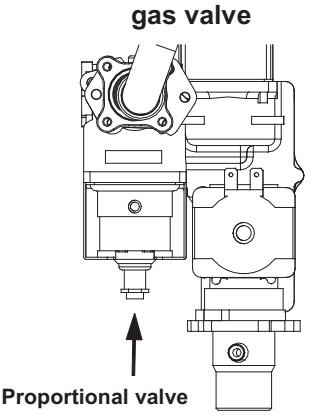
Procedure to Adjusting the Gas-Air Ratio:

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 of 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 water heater 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 water heater up to its maximum burn.
9. When the Navien Water Heater is burning at the 3rd stage maximum, 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 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
NR/NP-180(A)	Natural Gas	0.87″ ± 0.06″ W.C	2.68″ ± 0.08″ W.C
NR/NP-180(A)	Propane Gas	1.57″ ± 0.06″ W.C	4.60″ ± 0.08″ W.C
NR/NP-210(A)	Natural Gas	0.67″ ± 0.06″ W.C	1.73″ ± 0.08″ W.C
NR/NP-210(A)	Propane Gas	1.30″ ± 0.08″ W.C	3.19″ ± 0.08″ W.C
NR/NP-240(A)	Natural Gas	0.67″ ± 0.06″ W.C	2.20″ ± 0.08″ W.C
NR/NP-240(A)	Propane Gas	1.30″ ± 0.08″ W.C	3.86″ ± 0.08″ W.C





Minimum Modulating

PCB Board

Maximum Modulating

7. Maintenance

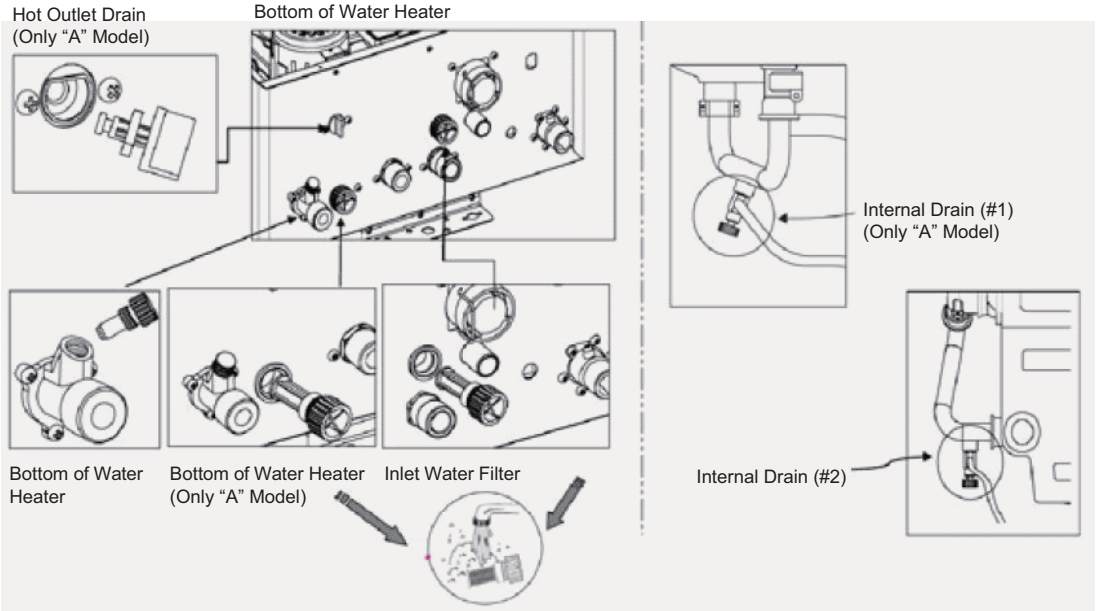
Describe precautions before maintenance, and show tools required when maintenance.

7.1. Draining the Water heater

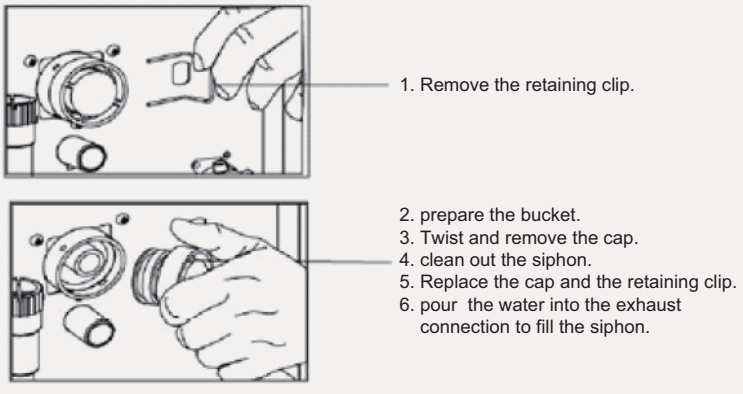
Draining the water in the waterway
Drain the water in the waterway according to the following figure. Also, clean the inlet water filter.

Before removing the inlet filter, ensure that the water supply has been turned off, and all pressure in the hot water system has been drained off by opening a hot water tap to ensure on water is flowing.

The filter assembly should hand tightened only.



Draining the condensate water in the siphon
According to the following figure, prepare the bucket to put the condensate water and remove the cap bottom of the siphon, and then drain the condensate water in the siphon.

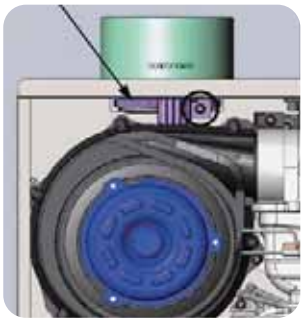


7.2. Cleaning the Intake Air Filter

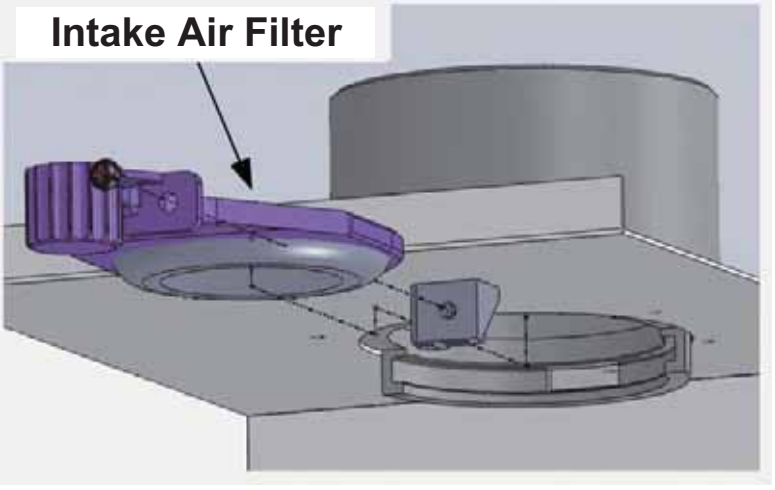
Clean the intake air filter just above the fan and under the air intake pipe in the top left corner of the water heater as the following.

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.

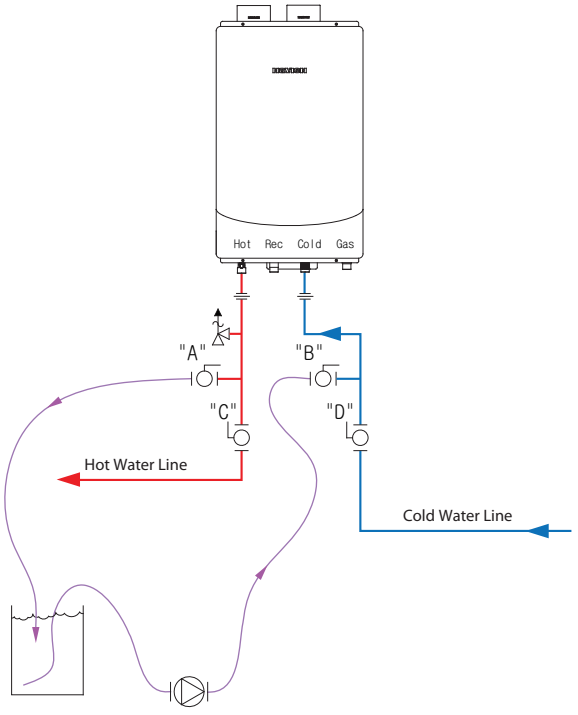


3. Remove the filter from the plastic assembly.
4. Clean it with a toothbrush and water.
5. Re-fit the screen in to the plastic assembly and fit the filter.
6. Frame onto the bottom of the air intake pipe.
7. Once the filter is back on the intake pipe, reset the fan back to its original position. Insert the fan on an angle into the back corner of the case and then move it into its correct position,
8. Replace the screws.

7.3. Flushing the Heat Exchanger

For proper operation, unit longevity and warranty adherence, water supply to the water heater meet National Secondary Drinking Water Regulations. In areas with hard water, a water softener or other conditioning may be needed. A periodic flushing procedure may also be required. Below is the proper flushing procedure:

1. Disconnect electrical power to the water heater.
2. Close the shut off valves (V3 and V4) on both the hot and cold water lines
3. Connect the pump outlet hose (H1) to the cold water line at the service valve (V2).
4. Connect the drain hose (H3) to service valve (V1).
5. Pour approximately 4 gallons of virgin, food grade, white vinegar or critic acid pail.
6. Place the drain hose (H3) and the hose (H2) to the pump inlet into the cleaning solution.
7. Open both service valves s(V1 and V2) on the hot and cold water line.
8. Operate the pump and allow the cleaning solution to circulate through the water heater for least 4 minutes.
9. Turn off the pump.



10. Rinse the cleaning solution from the water heater by:
    a. Remove the drain hose from the bucket
    b. Close service valve (V2) and open shutoff valve (V4).
       Do not open shutoff valve (V3).
    c. Allow water to flow through the water heater for 5 minutes.
    d. Close service valve (V1) and open shutoff valve (V3).
11. Disconnect all hoses.
12. Remove the inline filter at the cold water inlet and clean out any residue.
13. Place the filter back into the unit.
14. Restore electrical power to the water heater.

8. Replacement of Parts

8.1 Replacement Procedure

⚠ CAUTION

1. When performing maintenance and/of servicing the water heater, always turn off the electric power, gas and water shut-off valve. Wait for the water heater to become cool. Be careful to avoid injury to your fingers on sharp edges.
2. Drain all water from the water heater 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 water heater.
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 tankless 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 water heater, refer the components diagram & parts list.

8.2. Components Replacement Instructions

8.2.1. PCB

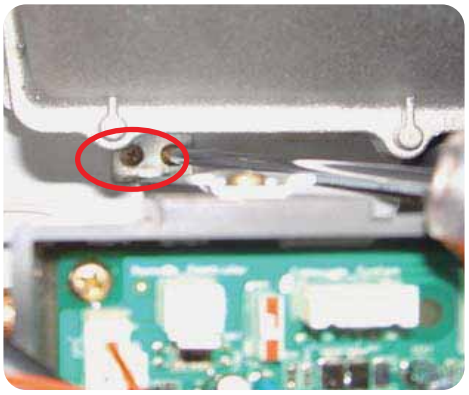
1. Turn off the gas supply
2. Turn off the 120V power supply
3. Turn off the water supply
4. Loosen the PCB right-side screw from bottom base.
5. Remove the all connecting housing into the PCB.

< Figure 1 >

6. Loosen the PCB 2 screw from bottom base.

< Figure 2 >

7. Loosen the PCB bracket 2 screws from base.



< 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

NOTE

Connecting ports must be right color and place.

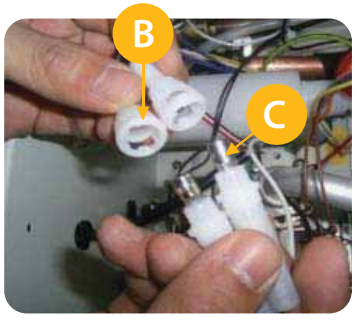
8.2.2. Fuse

Turn off the gas supply
2. Turn off the 120V power supply
3. Turn off the water supply
4. Loosen the PCB right-side screw from bottom base.

< Figure 4 >

5. Rotate the PCB to the left side.
6. Remove the capsule (A)'s B/C connected to the power cable.

< Figure 5 >



< Figure 6 >

7. Pull out the fuse.
8. New fuse into the part C and assemble B/C.
9. Rotate the PCB to the right side.
10. Fix the PCB right-side screw from bottom base.
11. Install front panel using 4(four) screws.
12. Turn on water supply, power supply, and gas supply.

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. Loosen the PCB 2 screw from bottom base.
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Loosen the 2 screws from transformer.

< Figure 7 >

7. Pull out the transformer.
8. Replace with new transformer.
9. Tighten the 2 screws from 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 8 >

6. Disconnect the harness housing at the fan assembly.

< Figure 9 >

7.Pull out the fan assembly

< Figure 10 >

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

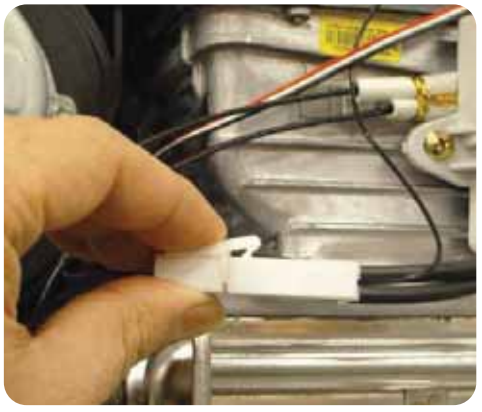
1. Don't over tight screws with high torque drill.
   It will be damaged to fan housing.
2. Confirm whether the screws tighten enough or not.
3. Confirm whether there are unnecessar noises after reinstalled fan.

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. Loosen the PCB right-side screw from bottom base.
5. Pull out the fan assembly (refer to 8.2.5 Fanmotor)
6. Remove the Ignition Transformer Cable.

< Figure 11 >

7. Remove the flame rod cable.



< Figure 12>

8. Loosen the 2 ignition electrode screws.

< Figure 13 >

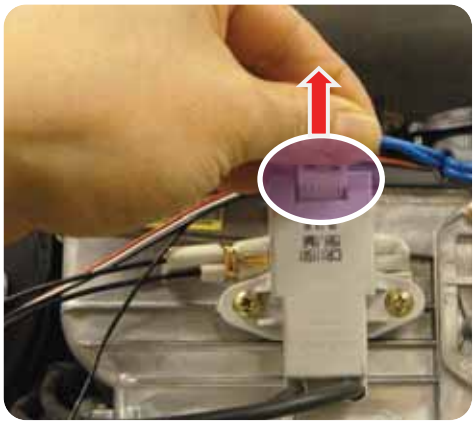
9. Pull out the igniter
10. Attach the new ignition electrode and tighten screws.
11. Connect the trans cable and flame rod cable into the ignition electrode and flame rod.
12. Attach the fan to be replaced. (refer to 8.2.5 Fan motor)
13. Install front panel using 4(four) screws.
14. Turn on water supply, power supply, and gas supply.

NOTE

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

8.2.6. gnition Transformer

1. Turn off the gas supply
2. Turn off the 120V power supply
3. Turn off the water supply
4. Loosen the PCB right-side screw from bottom base.
5. Pull out the fan assembly (refer to 8.2.5 Fan motor)
6. Remove the Ignition Transformer Cable. (refer to 8.2.6 Flame Rod)
7. Remove the igniter connecting housing into the PCB.



< Figure 14 >

8. Loosen the two igniter screws.

< Figure 15>

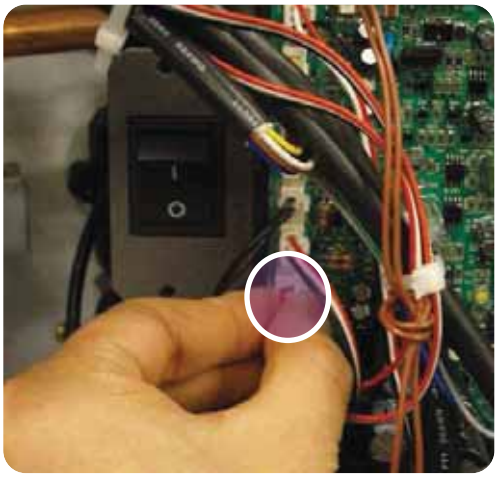
9. Pull out the Ignition Transformer.
10. Attach the new ignition transformer tighten screws.
11. Connect the Ignition transformer cable into the ignition electrode.
12. Connect the igniter connecting housing into the PCB.
13. Install front panel using 4(four) screws.
14. Turn on water supply, power 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. Loosen the PCB right-side screw from bottom base.
5. Remove the air pressure sensor connecting housing into the PCB.



< Figure 16 >

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

< Figure 17>

7. Loosen the air pressure sensor lowerside 2-screw from burner assemble.

< Figure 18 >

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 connecing housing into the PCB.
13. Install front panel using 4(four) screws.
14. Turn on water supply, power supply, and gas supply.

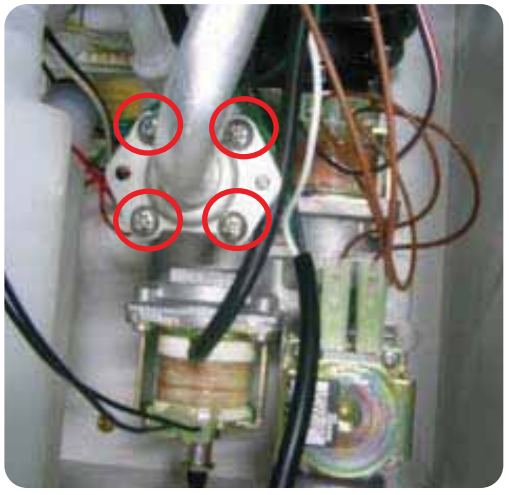
NOTE

As re-assemble the air pressure sensor, careful with right size and direction.

8.2.8. Manifold

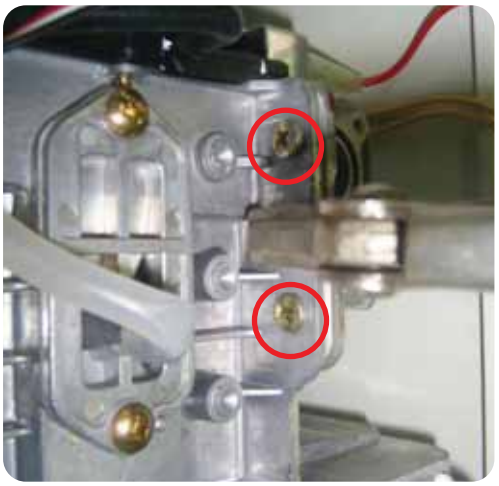
1. Turn off the gas supply
2. Turn off the 120V power supply
3. Turn off the water supply
4. Loosen the PCB right-side screw from bottom base
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Loosen the gas pipe from gas valve.(lower) and Manifold.(upper)

< Figure 19 >



< Figure 20>

7. Pull out the gas pipe.
8. Loosen the 2 manifold fixing screws.



< Figure 21 >

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 may result in a gas leak or explosion.

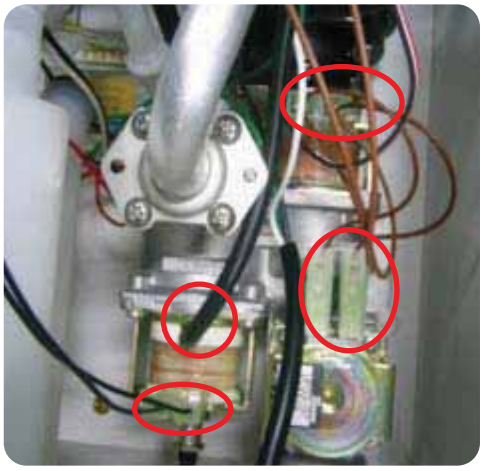
13. Replace the gas pipe. Replace the Oring where the assembly attaches to the gas connection. Make sure the old Oring removed and discarded.
14. Replace the PCB.
15. Install front panel using 4(four) screws.
16. Turn on water supply, power supply, and gas supply.
17. Perform the measuring of gas pressure 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. Loosen the PCB right-side screw from bottom base
5. Pull out the PCB. (refer to 8.2.8 PCB)
6. Pull out the gas pipe.
   (refer to 8.2.9 Manifold)
7. Detach the air pressure feedback tube and remove the wire harness connector from the 2 solenoid valve and modulating valve.



< Figure 23>

8. Detach the gas pressure sensor tube.

< Figure 24 >

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

< Figure 25 >

10. Pull out the gas valve.
11. Positioned gas valve.
12. Attach the 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 O-ring where the assembly attaches to the gas connection. Make sure the old O-ring removed and discarded.

WARNING

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

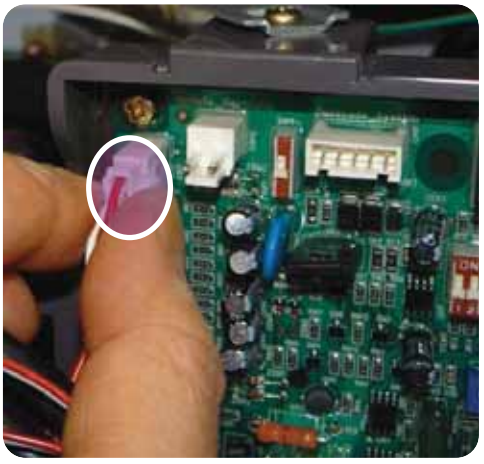
15. Replace the PCB .
16. Install front panel using 4(four) screws.
17. Turn on water supply, power supply, and gas supply.
18. Perform the measuring of gas pressure setting procedure.
19. Check for gas leaks.

NOTE

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

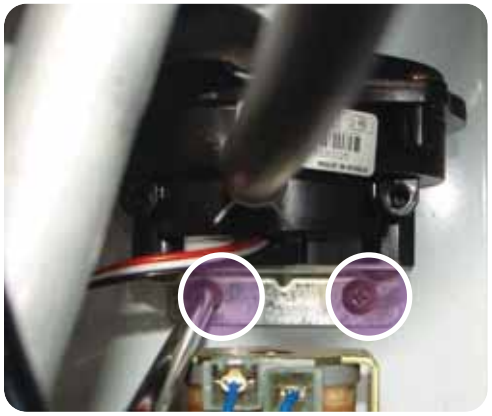
8.2.10. GPS

1. Turn off the gas supply
2. Turn off the 120V power supply
3. Turn off the water supply
4. Loosen the PCB right-side screw from bottom base
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 lower-side 2 screws from base.



< Figure 27 >

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

< Figure 28 >

9. Replace with new gas pressure sensor.
10. Assemble the gas pressure sensor 2 tubes.
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

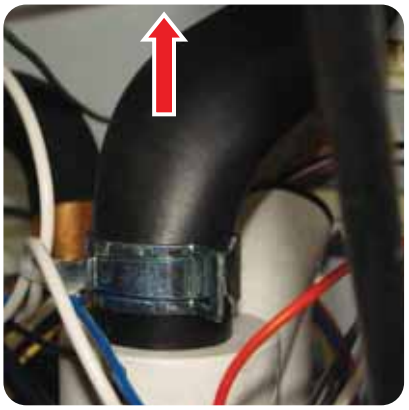
1. Turn off the gas supply
2. Turn off the 120V power supply
3. Turn off the water supply.
4. Loosen the PCB 2 screw from bottom base
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Remove the Pin (A). Drain Condensate water from the trap.

< Figure 29 >

7. Loosen the three condensation trap screws.

< Figure 30 >

8. Remove the condensation trap connecting hose



< Figure 31 >

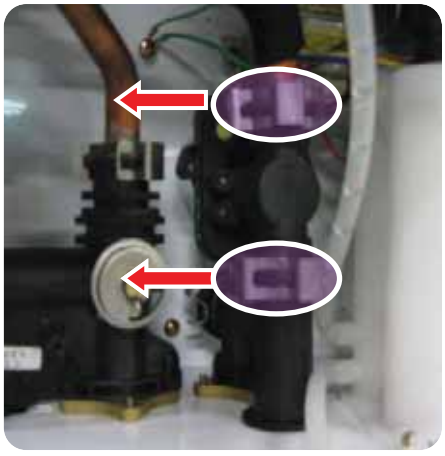
10. Pull out the Condensation trap.
11. Replace with new condensation trap.
12. Connects the condensation trap hose.
13. Attach the condensation trap and secured with three screws.
14. Replace the PCB. (refer to 8.2.1 PCB)
15. Install front panel using 4(four) screws.
16. Turn on water supply, power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

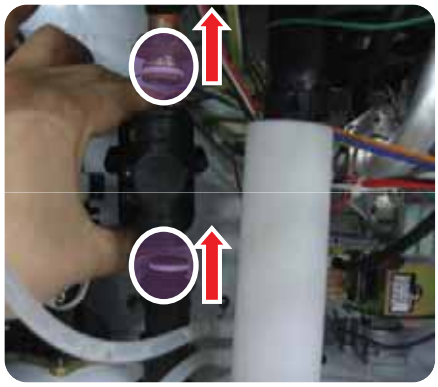
8.2.12. Water Adjustment Valve

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. Loosen the PCB 2 screw from bottom base.
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Remove the 2 stainless clips. (fastener “D”)



< Figure 32 >

7. Remove the water adjustment outlet pipe from the water adjustment valve.
8. Remove the water adjustment valve from the cold water inlet adapter.

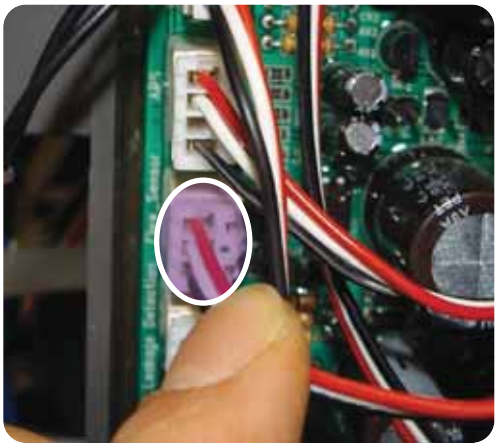


< Figure 33 >

9. Pull out the water adjustment valve.
10. Replace with new water adjustment valve.
11. Replace the water adjustment valve into the cold water inlet adapter.
12. Replace the water adjustment outlet pipe into the water adjustment valve.
13. Replace the 2 stainless clips.
14. Replace the 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 water heater.

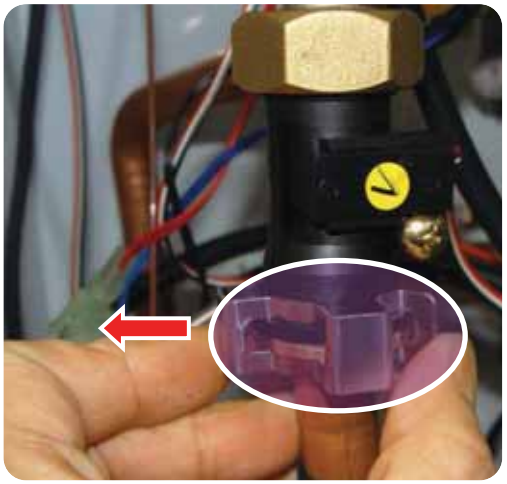
8.2.13. Flow Sensor

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. Loosen the PCB 2 screw from bottom base.
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Remove the 2 stainless clips. (fastener “D”)



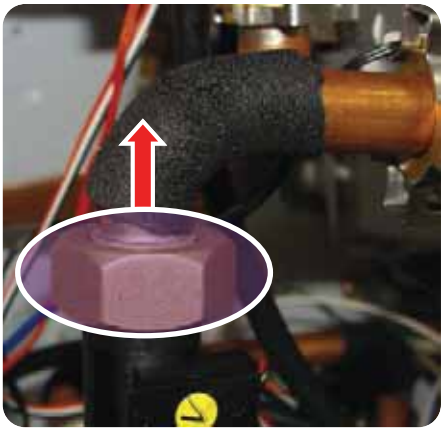
< Figure 34 >

5. Remove the stainless clip at the bottom of the flow sensor.



< Figure 35 >

6. Removing the brass (stainless) nut from the flow sensor.

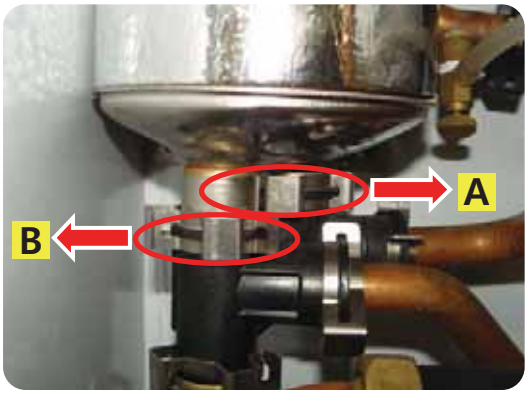


< Figure 36 >

7. Pull out the flow sensor.
8. Replace with new flow sensor.
9. Connect the flow sensor wire housing into the PCB.
10. Reseat the flow sensor into the cold water inlet pipe and reattach the stainless clip.
11. Reseat the non-threaded of flow sen-sor into the copper fitting.
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 water heater.

8.2.14. Buffer Tank (“A” Series)

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. Loosen the PCB 2 screw from bottom base.
5. Pull out the fan. (refer to 8.2.5 Fan motor)
6. Remove the fastener “A” (A) and fastener “F” (B).



< Figure 37 >

7. Loosen the 4 buffer tank screws.

< Figure 38 >

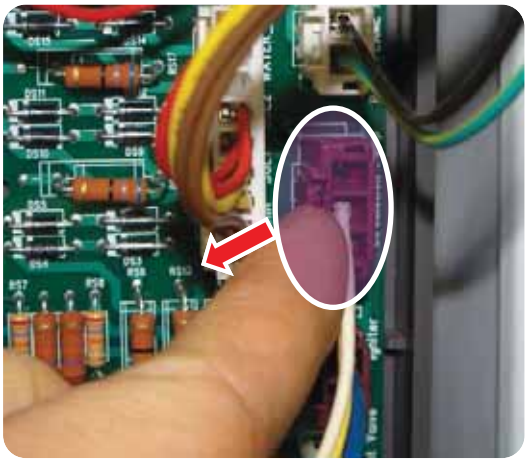
8. Pull out the buffer tank.
9. Replace the Oring. (in service parts) included the copper (stainless) pipe.
10. Replace the Oring (in service parts) included the buffer tank.
11. Reseat the buffer tank from the cop-per (stainless) pipe and plastic adapter.
12. Replace the fastener “A” (A) and fastener “F” (B).
13. Tighten the 4 buffer tank screws.
14. Replace the fan (refer to 8.2.5 Fan motor)
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 water heater.

NOTE

1. When draining, using caution with high water temperature in tank.
2. Use right size of Oring.
3. When draining, use caution not to wet electrical components.

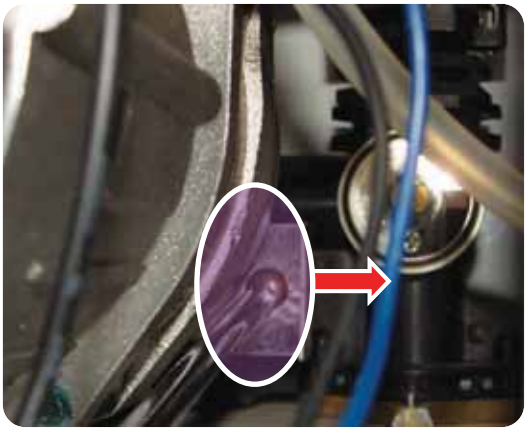
8.2.15. Circulation Pump (“A”Series)

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. Loosen the PCB 2 screw from bottom base.
5. Remove the pump connecting housing into the PCB.



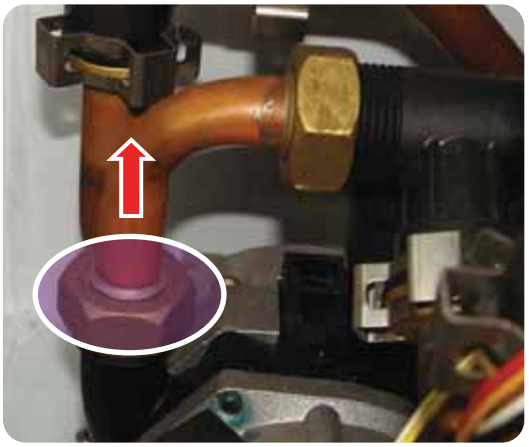
< Figure 39 >

6. Pull out the PCB. (refer to 8.2.1 PCB)
7. Open the drain plug on the pump.
8. Loosen the screw from the 3-way valve. Loosen the 3 screw from bottom base.
9. Remove the stainless clip.



< Figure 40 >

10. Loosen the screw from pump bracket.
11. Remove the brass (stainless) nut from the pump.



< Figure 41 >

12. Pull out the pump.

< Figure 42 >

13. Replace the O-ring (in service parts) included the 3-way valve.
14. Replace with new pump.
15. Connect 3-way valve and secure with stainless clip.
16. Tighten the screw from the 3-way valve and tighten screws bottom base.
17. Tighten the screw from pump bracket.
18. Reseat the non-threaded end of pump into the copper (stainless) fitting. At this time, be watchful the red gasket ring.
19. Close the drain plug and tighten screws from bottom base
20. Replace the PCB. (refer to 8.2.1 PCB)
21. Install front panel using 4(four) screws.
22. Turn on water supply, power supply, and gas supply.
23. Open a hot water tap and ensure there are no leaks at the water heater.
24. Open air vent on top of pump to release air.

NOTE

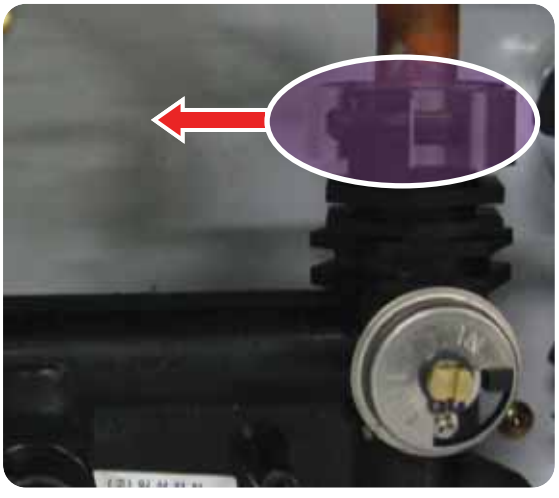
1. Always use right part(O-ring) and right size and place to pipe
2. Place red gasket ring on top of the circulation pump and screw on the brass (stainless) nut; be sure not to cross thread; over tightening may damage gasket.

8.2.16. 3-way Valve (“A” Series)

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. Loosen the PCB 2 screw from bottom base.
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Pull out the pump.
   (refer to 8.2.16 Circulation Pump)

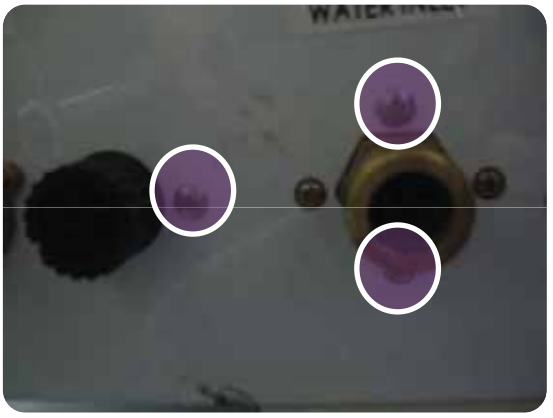
< Figure 43 >

7. Remove the stainless clip. (fastener “D”)



< Figure 44 >

8. Remove the pipe from 3-way valve.
9. Loosen the 3-way valve 3 screw from bottom base.



< Figure 45 >

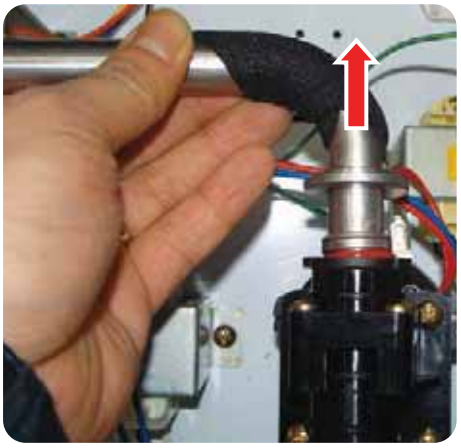
10. Pull out the 3-way valve.
11. Replace with new 3-way valve secured it.
12. Tighten the 3-way valve 3 screws from bottom base.
13. Replace the circulation pipe into the 3-way valve.
14. Replace the stainless clip. (fastener “D”)
14. Replace the pump.
15. Replace the PCB. (refer to 8.2.1 PCB)
16. Install front panel using 4(four) screws.
17. Turn on water supply, power supply, and gas supply.
18. Open a hot water tap and ensure there are no leaks at the water heater.

8.2.17. 2-way Valve (“NP-A” “NP” Series)

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. Loosen the PCB 2 screw from bottom base.
5. Pull out the PCB. (refer to 8.2.1 PCB)
6. Remove the 2 stainless clips. (fastener “D”)

< Figure 46 >

7. Remove the 2-way valve outlet pipe from the 2-way valve.



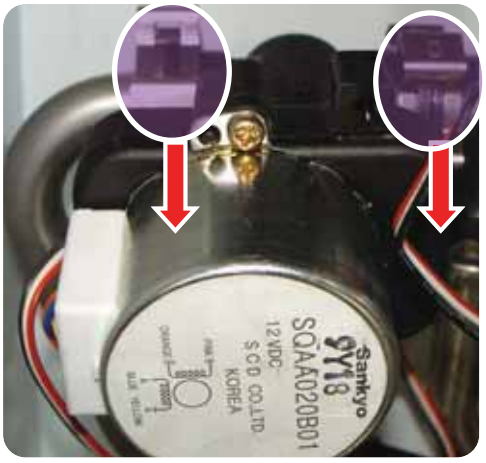
< Figure 47 >

< Figure 48 >

9. Pull out the 2-way valve.
10. Replace with new 2-way valve.
11. Replace the 2-way valve into the cold water inlet adapter.
12. Replace the 2-way valve outlet pipe into the 2-way valve.
13. Replace the 2 stainless clips.
14. Replace the 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 water heater.

8.2.18. Bypass Mixing Valve ("Non-A" Series)

1. Turn off the gas supply.
2. Turn off the 120V power supply.
3. Turn off the water supply. Drain all wa-ter from the appliance.
4. Disconnect the mixing valve wire housing from the PCB.
6. Remove the 2 stainless clips. (fastener "D")

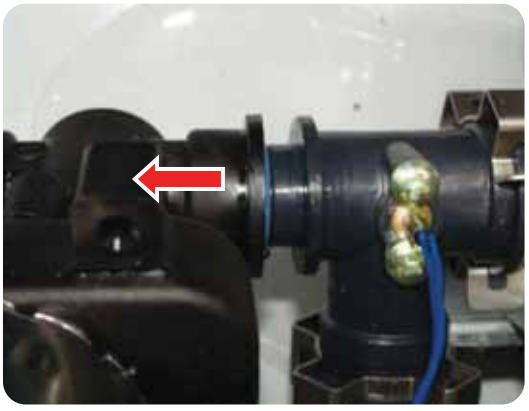


< Figure 49 >

7. Remove the mixing valve outlet pipe.

< Figure 50 >

8. Remove the Mixing valve from the primary H/E inlet adapter.

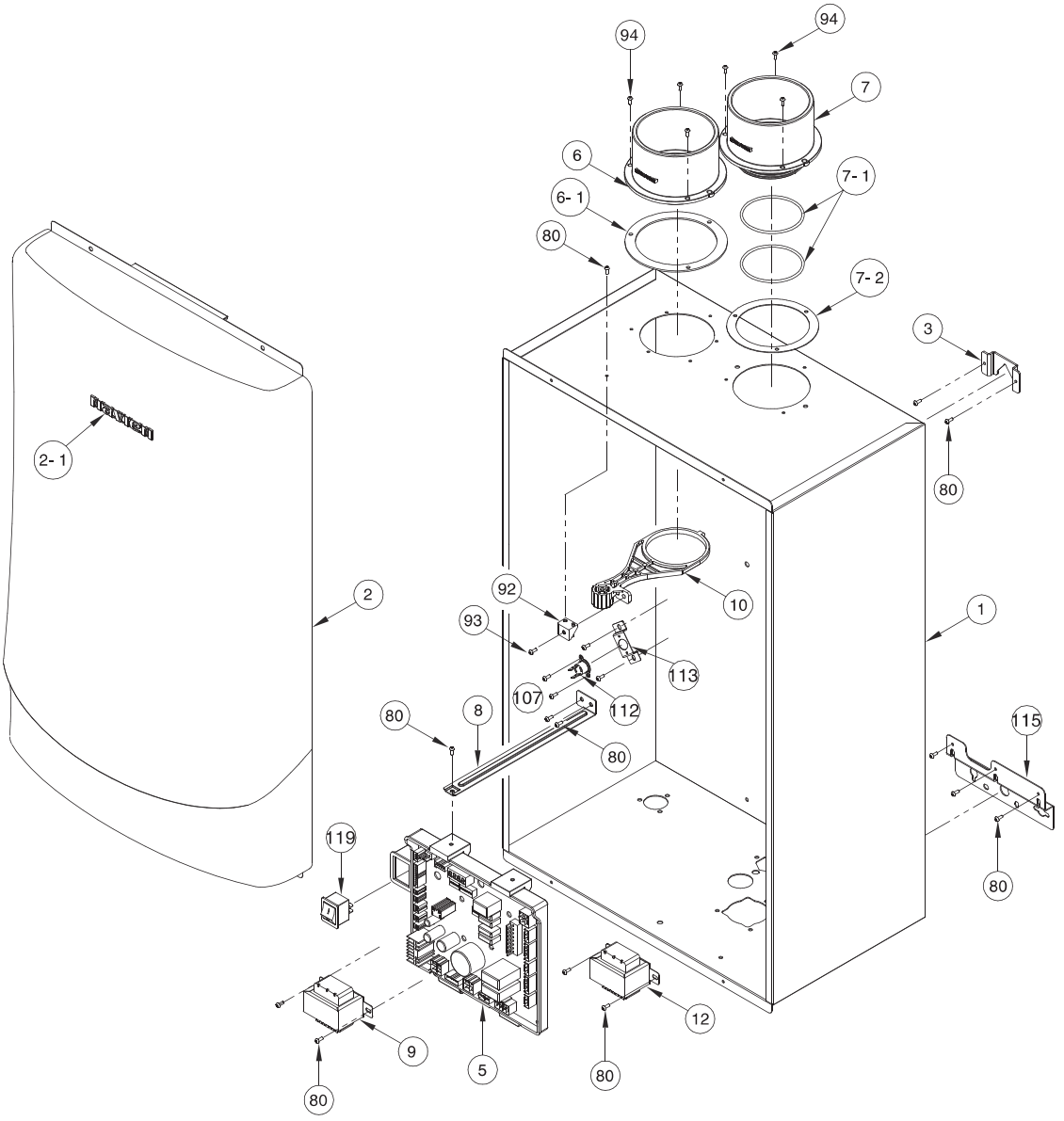


< Figure 51 >

9. Pull out the mixing valve.
10. Replace with new mixing valve.
11. Replace the mixing valve into the primary H/E inlet adapter.
12. Replace the mixing valve outlet pipe into the mixing valve.
13. Replace the 2 stainless clips.
14. Replace the 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 water heater.

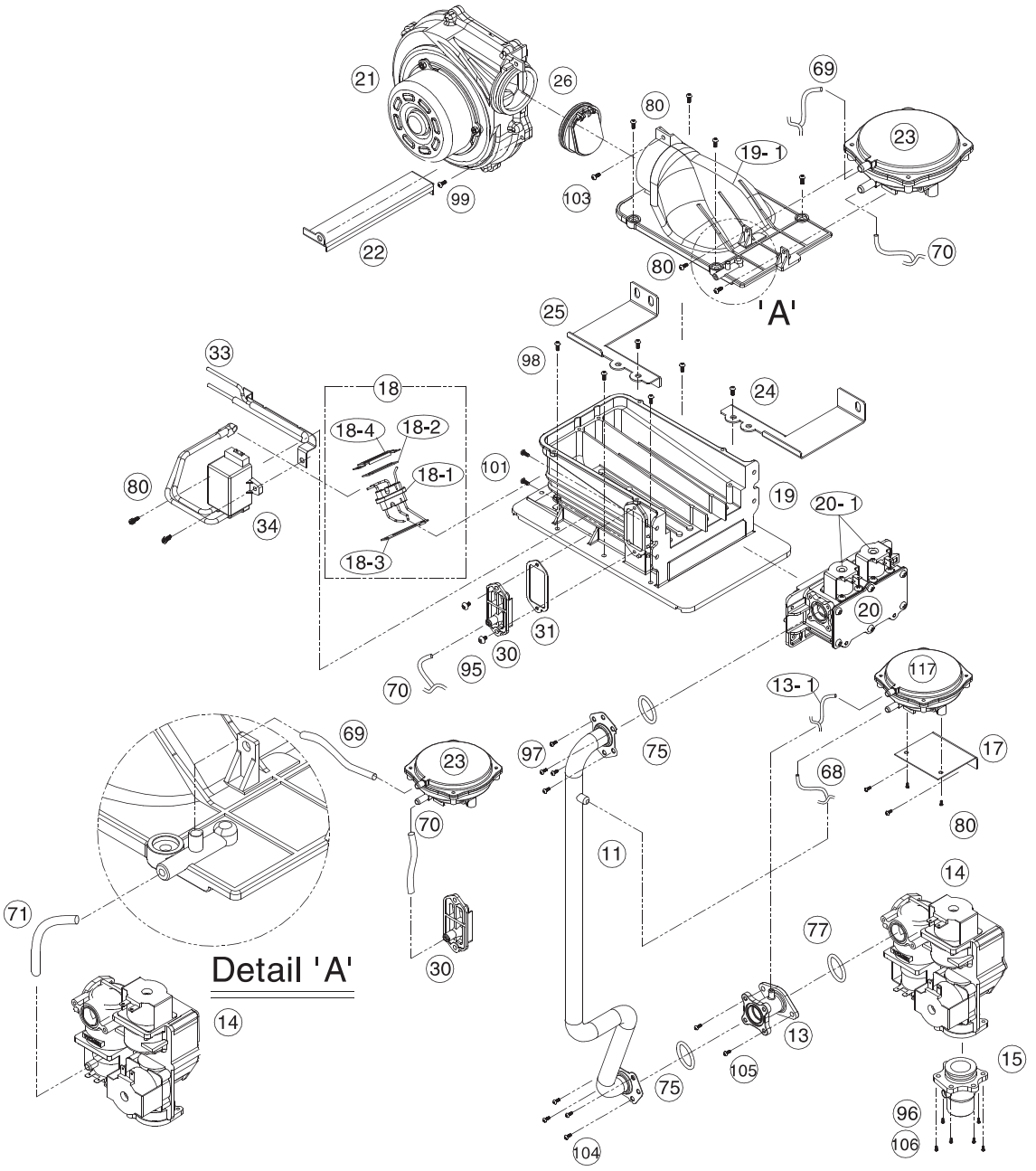
9. Components Diagram and Part List

9.1. Case Disassemble (NR/NP – A, NR/NP)



NO	Description	Navien Part No.	Remark
1	Case	BBK05011117	180 A
		BBK05011118	210/240 A
		BBK05011137	180
		BBK05011138	210/240
2	Cover	BBR15012151	
2-1	Navien Logo	BH2603009A	
3	Case upper bracket	BH2505277A	
115	Case lower bracket	BH2505348A	
5	PCB board	NACR1GS32401	
6	Intake air duct	BH2505400B	
6-1	Intake air duct packing	-	No.6 Ass'y
10	Intake air filter	BH2505416A	
92	Intake air filter support	BH2505417A	
7	Exhaust pipe	BH2505401B	
7-1	Exhaust pipe O-ring	-	No.7 Ass'y
7-2	Exhaust pipe packing	-	No.7 Ass'y
8	PCB board bracket	BH2505306A	180(A)
		BH2505402A	210/240(A)
9	Mixing valve transformer	BH1205013A	Only "Non-A"
12	transformer	BH1205008C	
119	Power switch	BH1426002A	"A" Series
		BH1426003A	"Non-A" Series
80	Screw (D4 x 8)	BH1705007A	
93	Bolt (M4 x 16)	BH1603009A	
94	Screw (D4 x 16)	BH1708004A	
112	Freeze protect switch	BH1402001A	Only "Non-A"
113	Freeze protect S/W bracket	BH2505423A	Only "Non-A"

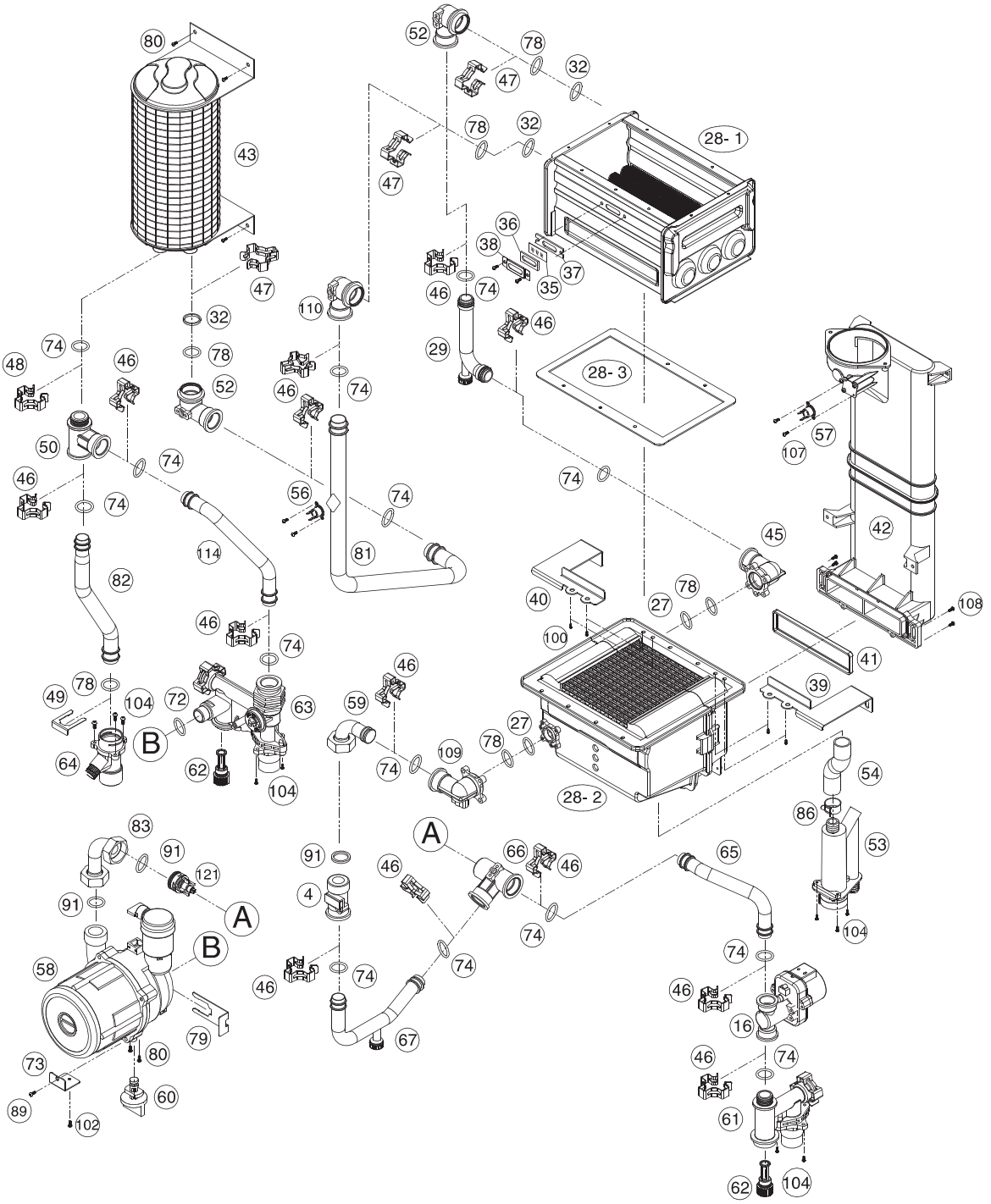
9.2. Burner Disassemble (NR/NP – A, NR/NP)



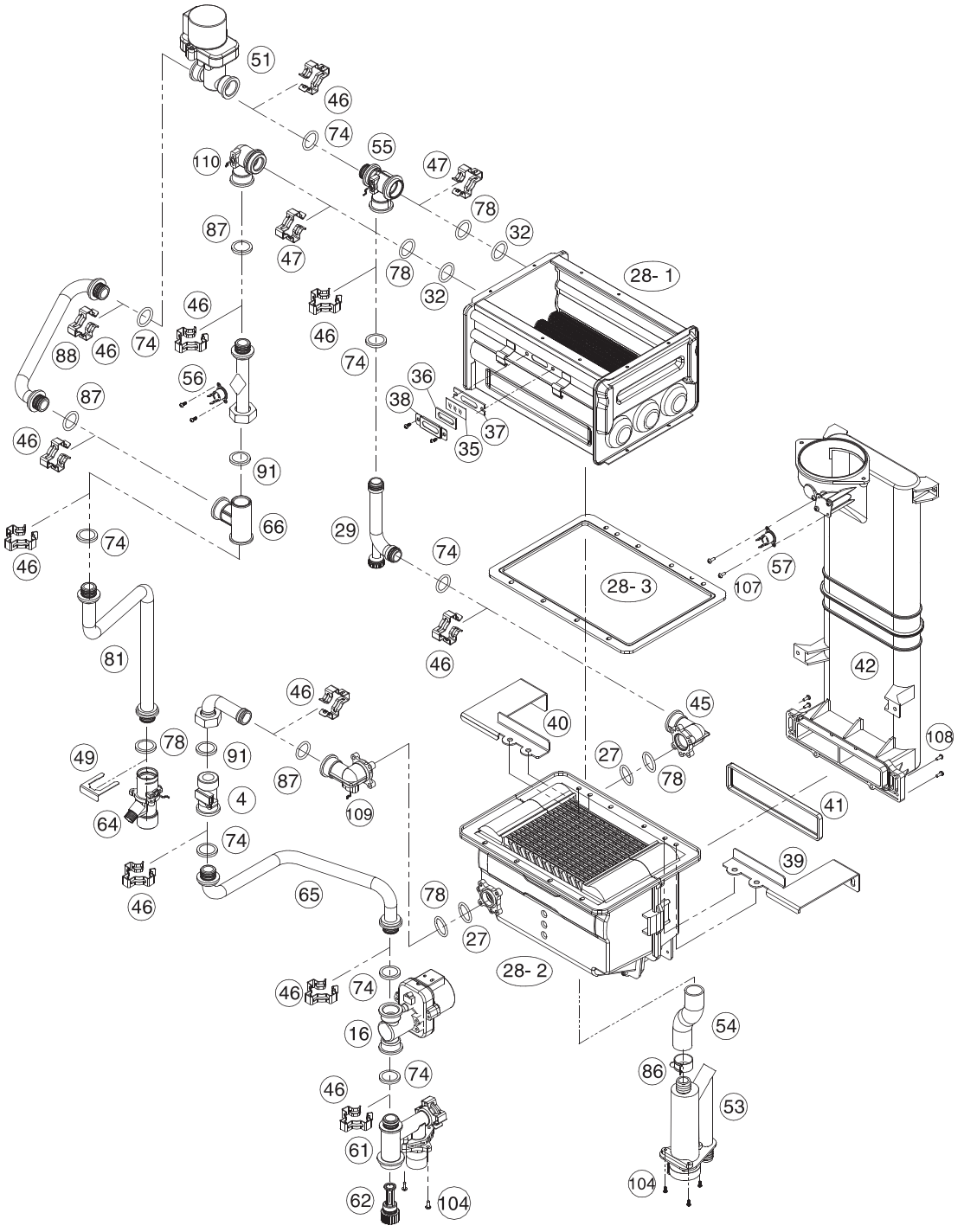
NO	Description	Navien Part No.	Remark
11	Gas pipe	BH2507510B	210/240 NG
		BH2507509B	180 NG
		BH2507512B	210/240 Propane
		BH2507511B	180 Propane
13	GPS venturi	BH2507359B	180 NG
		BH2507360B	210/240 NG
		BH2507409B	180 Propane
		BH2507422B	210/240 Propane
13-1	GPS venturi tube	BH2203002A	
14	Main gas valve	BH0901018A	
15	Gas inlet adapter	BH2507714A	
117	Gas pressure sensor	NASS9EXGPS01	
17	GPS bracket	BH2507346A	
18	Flame rod ass'y	PH1603058D	NG
		PH1603059D	Propane
18-1	Flame rod	BH2501679A	NG
		BH2501680A	Propane
18-2	Flame rod packing A	BH2505054A	
18-3	Flame rod packing B	BH2405051A	
18-4	Flame rod bracket	BH2505681A	
19	Burner	PABNCN30KDBN_004	180 NG
		PABNCW48KDBN_003	210/240 NG
		PABCR180ABN_003	180 Propane
		PABCR210/240ABN_003	210/240 Propane
19-1	Air flow guide	BH2543002E	180
		BH2543003E	210/240
20	Manifold	PABCR180AMF_001	180 NG
		PABCC210AMF_001	210/240 NG
		PABNR/NP180AMF_001	180 Propane
		PABCC210AMF_002	210/240 Propane
20-1	Solenoid valve	PH0905028A	
21	Fan motor	NAFA9GSFB002	
22	Fan motor bracket	BH2501605A	180
		BH2501604A	210/240
23	Air pressure sensor	NASS9EX00009	
24	Burner bracket R	BH2501443C	
25	Burner bracket L	BH2501444C	
26	Fan motor damper	BH2505403C	
30	APS venturi	BH2501413A	
31	APS venturi packing	BH2405031A	
33	Thermal fuse	BH1419012A	180
		BH1419013A	210/240
34	Ignition transformer	BH1201041D	

NO	Description	Navien Part No.	Remark
68	Tube	BH2203001A	
69	Tube	BH2202023A	180
		BH2202024A	210/240
70	Tube	BH2202022A	180
		BH2202025A	210/240
71	Tube	BH2202036A	180
		BH2202041A	210/240
75	O-ring	BH2421003A	
77	O-ring	BH2421008A	
80	Screw (D4 x 8L)	BH1705007A	
95	Screw (D4 x 10L)	BH1705001A	
96	Bolt (M4 x 12L)	BH1603006A	
97	Screw (D4 x 4L)	BH1710001A	
98	Screw (D4 x 12L)	BH1612005A	
99	Screw (D4 x 25L)	BH1701030A	
101	Screw (D4 x 12L)	BH1708003A	
103	Screw (D4 x 14L, STS)	BH1701031A	
104	Bolt (M4 x 10L, STS)	BH1611006A	
105	Bolt (M4 x 10L)	BH1611005A	
106	Bolt (M4 x 6L)	BH1611001A	

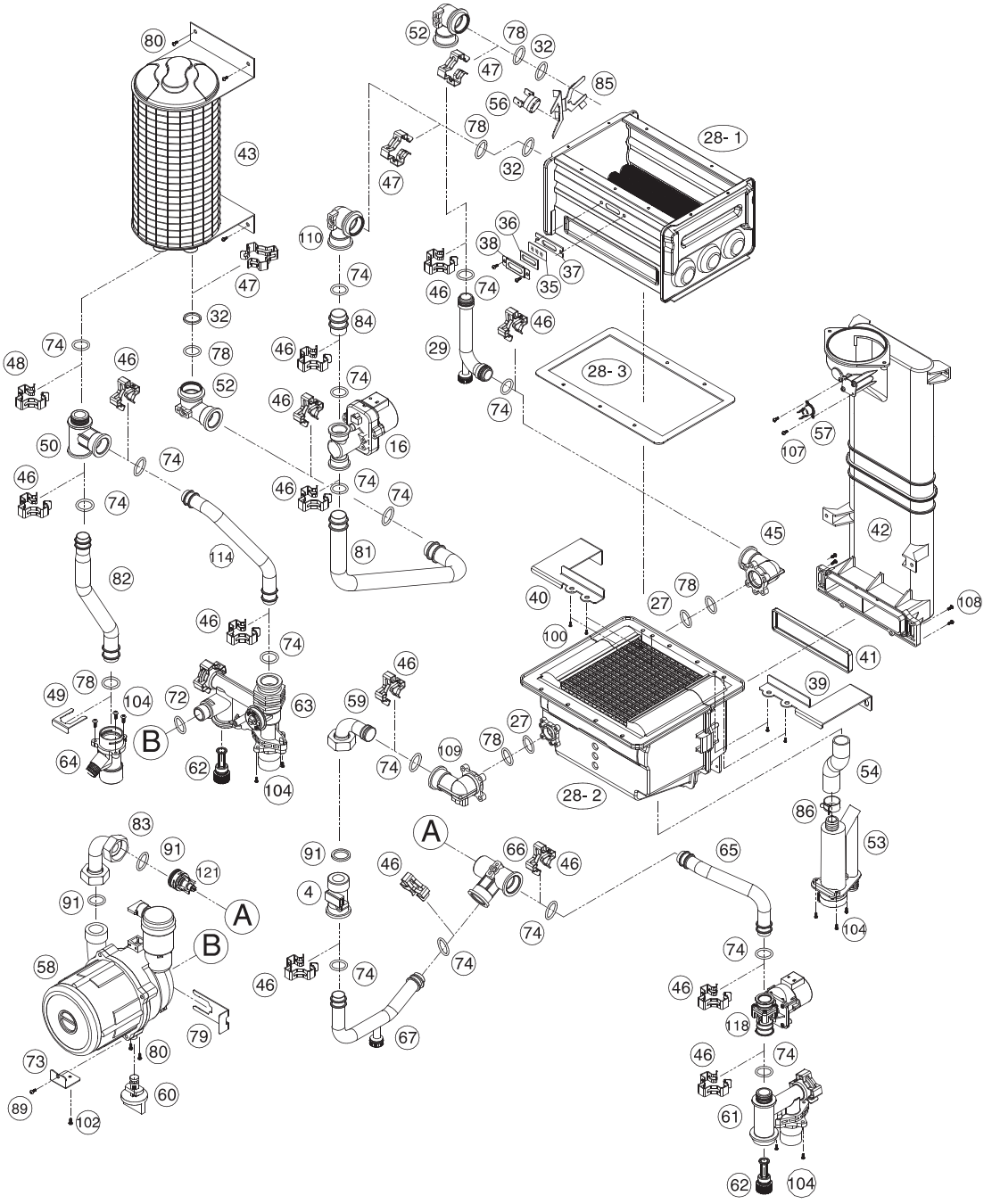
9.3. Water Way Disassemble (NR-A)



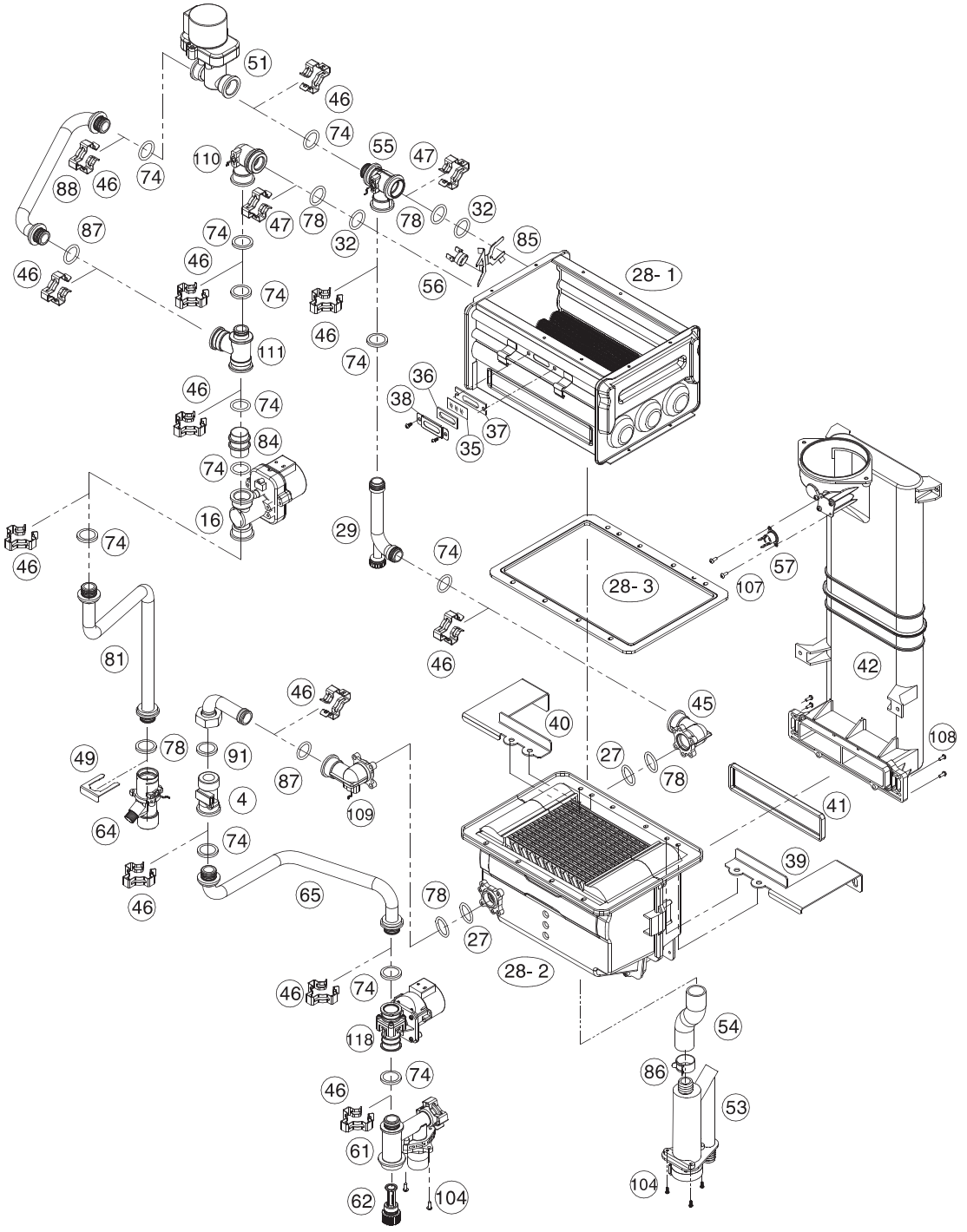
9.4. Water Way Disassemble (NR)



9.5. Water Way Disassemble (NP-A)



9.5. Water Way Disassemble (NP)



NO	Description	Navien Part No.	Remark
4	Flow sensor	AASS9EXFS003C	
16	Water adjustment valve	AAVC9EXFC003B	
27	Heat exchanger packing	BH2406048A	
28	Heat exchanger ass'y	BBM20341018	NR-180A
		BBM20341017	NR-210/240A
		BBM20341019	NP-180A
		BBM20341020	NP-210/240A
		BBM20341023	NR-180
		BBM20341024	NR-210/240
		BBM20341025	NP-180
		BBM20341026	NP-210/240
29	Heat exchanger middle pipe	BH2507576D	NR-A, NR
		BH2507617B	NP-A, NP
32	Back-up ring	BH2507308A	
35	H/E inspection glass	BH2501554A	
36	Inspection packing A	BH2405050A	
37	Inspection packing B	BH2405051A	
38	Inspection glass bracket	BH2501572A	
39	H/E bracket R	BH2501704B	
40	H/E bracket L	BH2501703B	
41	Exhaust duct packing	BH2406050A	
42	Exhaust duct	BH2544007D	
43	Buffer tank	PASNCWBFTANK_001	"A" Series
45	Secondary H/E outlet adapter	BH2507532B	
46	Fastener D	BH2507402B	
47	Fastener F	BH2507388B	
48	Fastener A	BH2507400B	
49	Clip C	BH2507345A	
50	Buffer tank adapter	BH2507520E	"A" Series
51	Bypass mixing valve	AAVC9EXMIX01B	"Non-A" Series
52	Primary H/E inlet adapter	BH2501562B	
53	Syphon	BH2501442C	"A" Series
		BH2501452C	"Non-A" Series
54	Syphon hose	BH2204041D	
55	Bypass T adapter	BH2501639B	"Non-A" Series
56	High limit wwitch	BH1401022A	
57	Exhaust limit switch	BH1401027A	
58	Circulation pump	NAPU9GLPCT30	"A" Series
59	Secondary H/E inlet pipe	BH2507527B	NR-A
		BH2507529C	NP-A
		BH2507573B	NR
		BH2507612B	NP
60	Pump drain coke	BH2505314B	"A" Series
61	Cold water inlet adapter	AAVC9EX00016B	

NO	Description	Navien Part No.	Remark
62	Inlet water filter	BH1303013A	
63	3-Way valve	AAVC9EX00012B	“A” Series
64	DHW Supply adapter	BH2507348B	“A” Series
65	Cold water inlet pipe	BH2507572A	“Non-A” Series
		BH2507528C	NR-A
		BH2507530C	NP-A
		BH2507574B	NR-180
		BH2507575B	NR-210/240
		BH2507614B	NP-180
		BH2507613B	NP-210/240
66	T-type adapter	BH2507526D	“A” Series
67	Flow sensor inlet adapter	BH2507522B	NR-180A
		BH2507521B	NR-210/240A
		BH2507524B	NP-180A
		BH2507525B	NP-210/240A
72	O-ring	BH2422027A	“A” Series
73	Circulation pump bracket	BH2501445A	“A” Series
74	O-ring	BH2422017A	
78	O-ring	BH2422026A	
79	Circulation pump fastener	BH2507475A	“A” Series
80	Screw D4 x 8L	BH1705007A	
81	DHW Outlet pipe	BH2507513C	NR-180A
		BH2507514C	NR-210/240A
		BH2507516C	NP-180A
		BH2507517C	NP-210/240A
		BH2507569B	NR-180
		BH2507570B	NR-210/240
		BH2507610B	NP-180
		BH2507611B	NP-210/240
82	Buffer tank outlet pipe	BH2507515B	NR-A
		BH2507518C	NP-A
83	Circulation pump outlet pipe	BH2507532A	NR-A
		BH2507533A	NP-A
84	DHW Outlet pipe C	BH2507519C	NR, NP-A
85	H-type clip	BH2501541A	NR, NP-A
86	Syphon hose clip	BH2507310A	
87	O-ring	BH2422025A	
88	Bypass pipe	BH2507577B	NR-180
		BH2507578B	NR-210/240
		BH2507615B	NP-180
		BH2507616B	NP-210/240
89	Bolt M4 x 8L	BH1603015A	
121	Check valve	BH0913004D	“A” Series

NO	Description	Navien Part No.	Remark
91	Packing ring (3/4")	BH2422036A	
100	Bolt M4 x 12L (STS)	BH1612007A	
102	Screw D4 x 6L	BH1705006A	
104	Bolt D4 x 10L (STS)	BH1611006A	
107	Bolt M3 x 5L	BH1603002A	
108	Bolt M4 x 14L (STS)	BH1612008A	
109	Water pipe adapter (A, Screw)	BH2507507E	
110	Water pipe adapter (A, Clip)	BH2507508D	
111	T-type adapter (clip)	BH2507474D	NP
112	Freeze protect switch	BH1402001A	“Non-A” Series
113	Freeze protect S/W bracket	BH2505423A	“Non-A” Series
114	3-Way valve inlet pipe	BH2507536C	NR-A
		BH2507537C	NP-A
118	Motorized 2-way valve	AAVC9EX00014A	NP, NP-A

10. Inspection and maintenance Schedule

10.1. Inspection Report

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

CAUTION

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 water heater 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. Maintenanc Report

Inspection Items	References	Date:	Date:
Draining the Water Heater and Cleaning the Inlet Water Filter	YES / NO		
	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

Memo

Memo