KD NAVIEN
The Leader in Condensing Technology

Service Manual

NFC Condensing Boilers

Model | NFC-175
NFC-200

Keep this manual near this boiler for future reference whenever maintenance or service is required.

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.

Revisions

Version	Description of changes	Date
1.0	First Issue	December / 2018

Contents

Requirements for the State of Massachusetts

NOTICE BEFORE INSTALLATION

This appliance must be installed by a licensed plumber or gas fitter in accordance with the Massachusetts Plumbing and Fuel Gas Code 248 CMR Sections 4.00 and 5.00.

IMPORTANT: In the State of Massachusetts (248 CMR 4.00 & 5.00)

For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. INSTALLATION OF CARBON MONOXIDE DETECTORS. No installation or replacement of a vented gas appliance shall be permitted unless a battery powered or electrically hard wired carbon monoxide detector is present on the same floor as the appliance or on the next adjacent floor when the appliance is located in a crawl space unless the appliance is located in a detached, uninhabitable garage. For all residential dwellings, a carbon monoxide detector must also be present on each habitable level of the dwelling. These requirements shall not be deemed to waive any additional requirements imposed by M.G.L. c. 148 §26F1/2.

2. APPROVED CARBON MONOXIDE DETECTORS. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3. SIGNAGE. Whenever any through-the-wall vent is installed less than seven feet above the finished grade, a metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight feet above grade directly in line with the exhaust vent terminal. The sign shall read, in print size no less than 0.5 inches in size,**"GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS"**.

4. INSPECTION. The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.09 and 5.12.

Navien Warranty

Warranty Period

Navien products come with a limited warranty covering labor, parts and the heat exchanger. The following warranty periods begin to run from the date of original installation. The date of original installation must be provided to Navien, and upon request, proof of the original installation date must also be provided to Navien. When the product is installed in a new construction, the commencement date shall be dated upon which the end-user takes title to the property.

Warranty Period

Coverage Table for Labor and Parts Only			
Residential*		Commercial	
Labor	1 year	Labor	1 year
Parts	5 years	Parts	3 years

* Applies only to single family, residential locations.

Coverage Table for Heat Exchangers Only		
Residential*		Commercial
Years	Percentage Paid by Customer	Years
1 to 12	0 %	10
13	50 %	
14	60 %	
15	70 %	

* Applies only to single family, residential locations.

Effective

This 10/15 year limited pro-rated warranty on heat exchangers, 3/5 year limited warranty on parts, and 1 year limited-labor warranty ("Warranty") covers defects in materials or workmanship when the Navien NFC Boiler ("Product") is installed by a properly licensed plumber or contractor and operated in strict compliance with the Installation & Operations manual procedures, subject to the terms within this Warranty document. Improper installation or use will void this Warranty. This Warranty runs from date of installation and extends to the original purchaser and subsequent owners, but only while the Product remains at the site of the original installation. This Warranty includes both a limited and pro-rated warranty as set forth below.

What is Covered?

Subject to the foregoing terms, Navien will repair or replace the covered Product or any part or component that is defective in materials or workmanship for a period of five (5) years in regard to parts and up to twelve (12) years in regard to the heat-exchanger.

Navien will pay labor charges for the repair subject to Navien's prior written approval and in accordance with Navien's schedule of approved labor allowances for a period of one (1) year from the date of installation. All repair parts must be genuine Navien parts. All repairs and replacements must be performed by an individual or servicing company that is properly licensed to do the type of repair.

When the Product is or has ever been used for anything other than single family residential application (hereinafter "Commercial") then the parts warranty will be reduced to three (3) years and the heat exchanger warranty to ten (10) years.

During the applicable warranty period, replacement of the Product or components may be authorized by Navien only. Navien does not authorize any person or company to assume for it any obligation or liability in connection with the replacement of the Product or its components. If it is determined that repair or replacement of a part, under warranty, is not possible, the Product will be replaced with a new Product having at least the same BTU capacity as the product at issue. The replacement component or product will be warranted only for the unexpired portion of the applicable warranty period for the original component or Product.

The heat exchanger is covered by Navien's pro-rated limited residential Warranty for defects in material and workmanship at a cost to the customer equal to a percentage of the Manufacturer's Suggested Retail Price (MSRP), at the time the warranty claim is approved by Navien, as indicated in the following Coverage Table for Heat Exchangers Only. This pro-rated warranty only applies to the replacement of the heat exchanger and does not include labor, shipping, other parts, delivery or installation. In order to obtain this warranty, the customer must pay the applicable pro-rated amount as indicated in the following Coverage Table for Heat Exchangers Only. Once the customer pays the pro-rated amount, then Navien will ship the heat exchanger directly to the service provider.

Warranty Claim Procedures

To obtain warranty repair service, the end user or homeowner must contact the original installer of your Navien product. If the original installer cannot be identified, the end user or homeowner may contact Navien's Technical Administration Department at **1-800-519-8794**. Proof of purchase is required to obtain warranty service.

Warranty Service

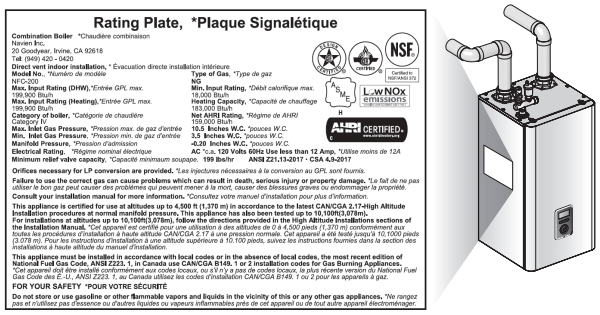
At its option, Navien will replace the defective component (part(s) or heat exchanger), in accordance with the terms of this Limited Warranty, if it fails in normal use and service during the Applicable Warranty Period identified above. The replacement component must be Navien original factory component. Navien, at its sole discretion, may replace the product with a new or refurbished product of comparable quality and design. The replacement component or product will be warranted only for the unexpired portion of the original component's Applicable Warranty Period. Payment for labor in completing the warranty service is subject to Navien's prior written approval and shall be subject to Navien's schedule of approved labor allowances.

Warranty Exclusions

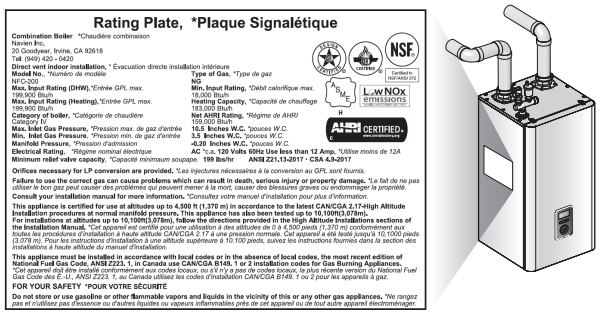
Navien's Limited Warranty shall be void in the event of an occurrence of any of the following:

- Improper installation, failure to install in strict compliance with the Installation Manual procedures, installed by a non-licensed installer, and installation in violation of applicable rules, laws or building codes.
- Product purchased through the internet, other e-commerce channels, or any installer that obtained the Product from a supplier or distributor not authorized by Navien.
- Failure to perform regular maintenance, misuse, operation at settings other than those recommended or specified, non-compliance with instructions or guidelines set forth in the User's Operation Manual.
- Modification or alteration of the Product in any manner, including but not limited to, removal of any component or part, addition of any non-approved components, relocating or moving the Product from its original installation site, or any accidental or intentional damage to the Product.
- Installation for non-recommended uses.
- Any damage caused by local adverse conditions including but not limited to hard water deposits, lime or mineral build-up, operating in corrosive atmospheric elements.
- Damage caused by gas flow issues, electrical surges, flooding, fire, abnormal external temperature, and any other cause of damage not directly caused by a manufacturing defect.
- Installer's failure to fully comply with the Warranty Service and Return Policy procedures previously provided to Installer and as is available on Navien's website. Such policies include but are not limited to the Installer's failure to first contact Navien Technical Support while in front of the product for purposes of trouble shooting the identified problem or issue.
- Performance problems caused by improper sizing of the boiler, the gas supply line, the venting connection, combustion air openings, electric service voltage, wiring, fusing or any other components, parts or specifications.
- Improper 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 boiler.
- Any damage, malfunction or failure caused by abuse, negligence, alteration, accident, fire, flood, freezing, wind, lightning and other acts of God.
- Operating, using or storing the boiler in a corrosive or contaminated atmosphere or environment.
- Operating the boiler at water temperatures outside the factory calibrated temperature limits and/or exceeding the maximum setting of the high limit control.
- Operating the boiler when it is not supplied with potable water at all times.
- Subjecting the heat exchanger to pressures or firing rates greater or lesser than those shown on the rating plate.
- Installation at any location outside the United States and Canada.
- Removal or alteration of the rating plate.

NFC-175



NFC-200



Other Terms: This Limited Warranty is subject further to the terms and conditions set forth herein and as may be further specified in the Terms and Conditions page located on Navien's website at www.navien.com. WITH THE EXCEPTION OF THIS LIMITED WARRANTY, NAVIEN DISCLAIMS ANY OBLIGATION OR LIABILITY WITH RESPECT TO THE PRODUCTS OR THEIR SALE AND USE, AND NAVIEN NEITHER ASSUMES NOR AUTHORIZES THE ASSUMPTION OF, ANY OBLIGATION OR LIABILITY IN CONNECTION WITH THE PRODUCTS. THIS DISCLAIMER INCLUDES ANY OTHER WARRANTIES, EXPRESS, IMPLIED OR STATUTORY RESPECTING THE PRODUCTS OR ANY PARTS OR COMPONENTS THEREOF, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Navien's total liability for any claim arising hereunder shall not exceed the purchase price which you paid for the Product. NAVIEN SHALL NOT IN ANY EVENT BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL OR LIQUIDATED DAMAGES OR PENALTIES, INCLUDING CLAIMS FOR LOST REVENUE, PROFITS OR BUSINESS OPPORTUNITIES, EVEN IF NAVIEN HAD OR SHOULD HAVE HAD ANY KNOWLEDGE, ACTUAL OR CONSTRUCTIVE, OF THE POSSIBILITY OF SUCH DAMAGES.

Abbreviations and Definitions

Abbreviation	Definition
NFC	General name of NFC-175, NFC-200
NG	Natural Gas
LP	Propane Gas
AP	Air Pressure
APS	Air Pressure Sensor
DHW	Domestic Hot Water
FM	Fan Motor
GPM	Gallons Per Minute
MGV	Main Gas Valve
RPM	Revolutions Per Minute
PCB	Printed Circuit Board
EMI	Electromagnetic Interface
HTL	High Temperature Limiter
LWCO	Low Water Cut Off

1. Safety Information

1.1 Safety Definitions

The following safety symbols are used in this manual. Read and follow all safety instructions in this manual precisely to avoid unsafe operating conditions, fire, explosion, property damage, personal injury, or death.

1.2 Safety Symbols

DANGER

Indicates an imminently hazardous situation which, if not avoided, could result in severe injury or death.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in injury or death.

CAUTION

Indicates a potentially hazardous situation that, if not avoided, could result in property damage.

1.3 Symbols Used in the Instructions

IMPORTANT

Warns of a risk of damage and environmental pollution

Note Indicates additional information that is important but not related to personal injury or property damage.

1.4 Safety Precautions

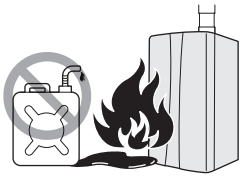
DANGER

FLAMMABLE MATERIALS

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

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

DANGER



If you smell gas:

- Do not try to light any appliance.
- Do not touch any electrical switches or use landline phones.
- From a neighbor's phone, call your gas provider and follow their instructions.
- If you cannot reach your gas provider, call the fire department.
- Do not return to your home until authorized by your gas supplier or the fire department.

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

- The boiler has a main burner flame that can turn on at any time and can ignite flammable vapors. Vapors from flammable liquids can explode and catch fire, causing death or severe burns.
- Vapors cannot be seen and are heavier than air. They can travel long distances along the ground and can be carried from other rooms to the boiler's main burner flame by air current.
- Keep all flammable products far away from the boiler and store them in approved containers. Keep the containers closed tightly and out of the reach of children and pets.

DANGER

COMPROMISED VENTING SYSTEM

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

DANGER

WHAT TO DO IF YOU SMELL GAS

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

DO NOT OPERATE THE BOILER.

DO NOT OPERATE ANY FAUCETS.

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

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

DANGER

INSTALLATION REQUIREMENTS

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

DANGER

IMPORTANT SAFETY PREAUTIONS

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

WARNING

GAS TYPE and AC VOLTAGE

This boiler is configured for Natural Gas from the factory. If conversion to Propane Gas is required, the conversion kit supplied with the boiler must be used.

- Be sure to use 120 VAC, 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

The conversion kit shall be installed by a qualified service agency* in accordance with Navien's instructions and all applicable codes and requirements of the authority having jurisdiction. The information in these instructions must be followed to minimize the risk of fire or explosion or to prevent property damage, personal injury or death. The qualified service agency is responsible for the proper installation of this kit. The installation is not proper and complete until the operation of the converted appliance is checked as specified in the manufacturer's instructions supplied with the kit.

*** A qualified service agency is any individual, firm, corporation or company which either in person or through a representative is engaged in and is responsible for the connection, utilization, repair or servicing of gas utilization equipment or accessories; who is experienced in such work, familiar with all precautions required, and has complied with all of the requirements of the authority having jurisdiction.**

In Canada: The conversion shall be carried out in accordance with the requirements of the provincial authorities having jurisdiction and in accordance with the requirements of the CAN-B149.1 and CAN1-B149.2 Installation Code.

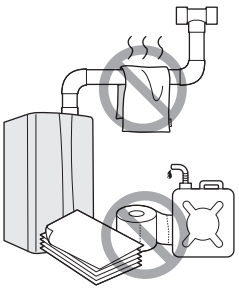
Navien Inc. is not liable for any property damage and/or personal injury resulting from unauthorized conversions.

California law requires the following Prop 65 warning to be provided:

WARNING

This product can expose you to chemicals including lead, lead compounds, and carbon bisulfide which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.

WARNING



- **Shut off the gas supply if the boiler is damaged.**
  Have your installer or plumber show you the location of the gas shut off valve and demonstrate how to close the valve. If the boiler is damaged as a result of overheating, fire, flood, or any other reason, close the manual shut off valve and do not operate the boiler again until it has been inspected by a qualified technician.
- **Do not store or use gasoline or other flammable liquids near this boiler.**
  Doing so may result in fire or explosion.
- **Do not place combustibles, such as newspapers or laundry, near the boiler or venting system.**
  Doing so may result in a fire.
- **Do not place or use hair sprays, spray paints, or any other compressed gases near the boiler or venting system, including the vent termination.**
  Doing so may result in fire or explosion.
- **Do not operate the boiler with the front cover opened.**
  Doing so may result in fire or carbon monoxide (CO) poisoning, which may result in property damage, personal injury, or death.
- **Do not operate this boiler without proper venting.**
  Doing so may result in fire or carbon monoxide (CO) poisoning, which may result in property damage, personal injury, or death. Inspect the vent termination and air intake supply annually to ensure proper operation of the boiler. Turn off and discontinue use of the boiler if any of the vent pipes, vent elbows, or intake pipes are damaged in any way, separated at a joint, or show evidence of corrosion, rusting, or melting.
- **Do not touch the power cord or internal components of the boiler with wet hands.**
  Doing so may result in electric shock.

CAUTION

- **Do not attempt to repair or replace any part of the boiler, unless it is specifically recommended in this manual.**
  For all other service, contact an authorized technician or licensed professional. Improper adjustments, alterations, service, or maintenance may lead to property damage, personal injury, or death and will void your warranty.
- **Do not operate the boiler if you feel something is wrong with it.**
  Doing so may result in product damage or personal injury.
- **Do not allow children to operate or access the boiler.**
  Doing so may result in product damage or personal injury.
- **Do not attempt to change the water temperature while the boiler is being used.**
  Doing so may result in personal injury.
- **Do not turn on the boiler unless the water and gas supplies are fully opened.**
  Doing so may damage the boiler.
- **Do not turn on the water if the cold water supply shut-off valve is closed.**
  Doing so may damage the boiler.
- **Do not use this boiler for anything other than its intended purpose, as described in this manual.**
- **Do not remove the front cover unless the power to the boiler is turned off or disconnected.**
  Failure to do so may result in electric shock.
- **When servicing the controls, label all wires prior to disconnecting them.**
  Failure to do so may result in wiring errors, which can lead to improper or dangerous operation.
- **Do not use unapproved replacement or accessory parts.**
  Doing so may result in improper or dangerous operation and will void the manufacturer's warranty.
- **Do not place anything in or around the vent terminals, such as a clothes line, that could obstruct the air flow in or out of the boiler.**
- **This boiler has been approved for use in the USA and Canada only.**
  Using the boiler in any other country will void the manufacturer's warranty.
- **Should overheating occur or the gas supply fail to shut off, turn off the manual gas valve to the appliance.**

2. Product Information

2.1 Product Information Items

Navien features the NFC Series gas boiler. This appliance is fully modulating and provides central heating. Depending on the heat capacity, each model is divided into two types; 175 and 200.

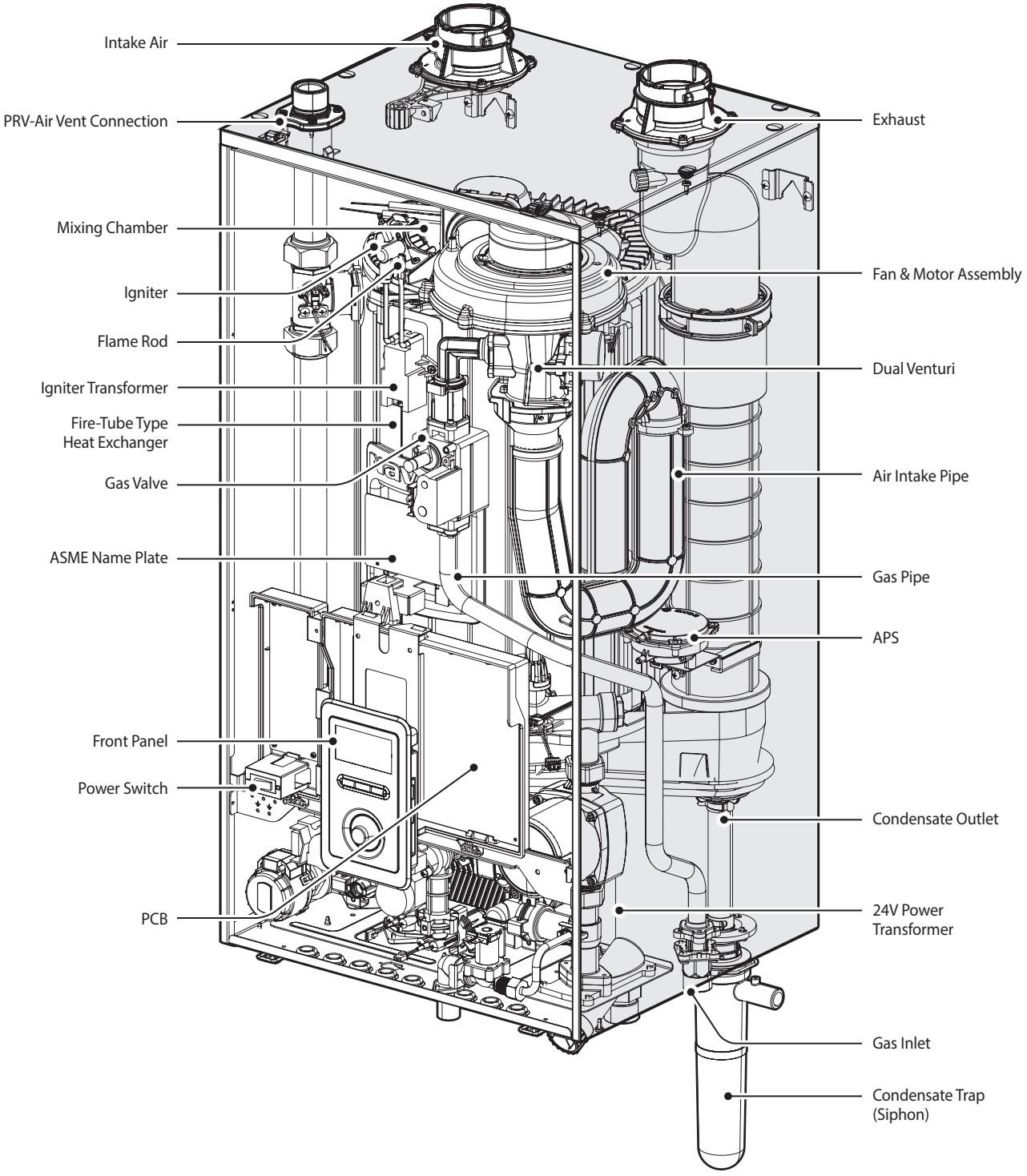
Model	Maximum Space Heating Input
NFC-175	175,000 BTU/h
NFC-200	199,000 BTU/h

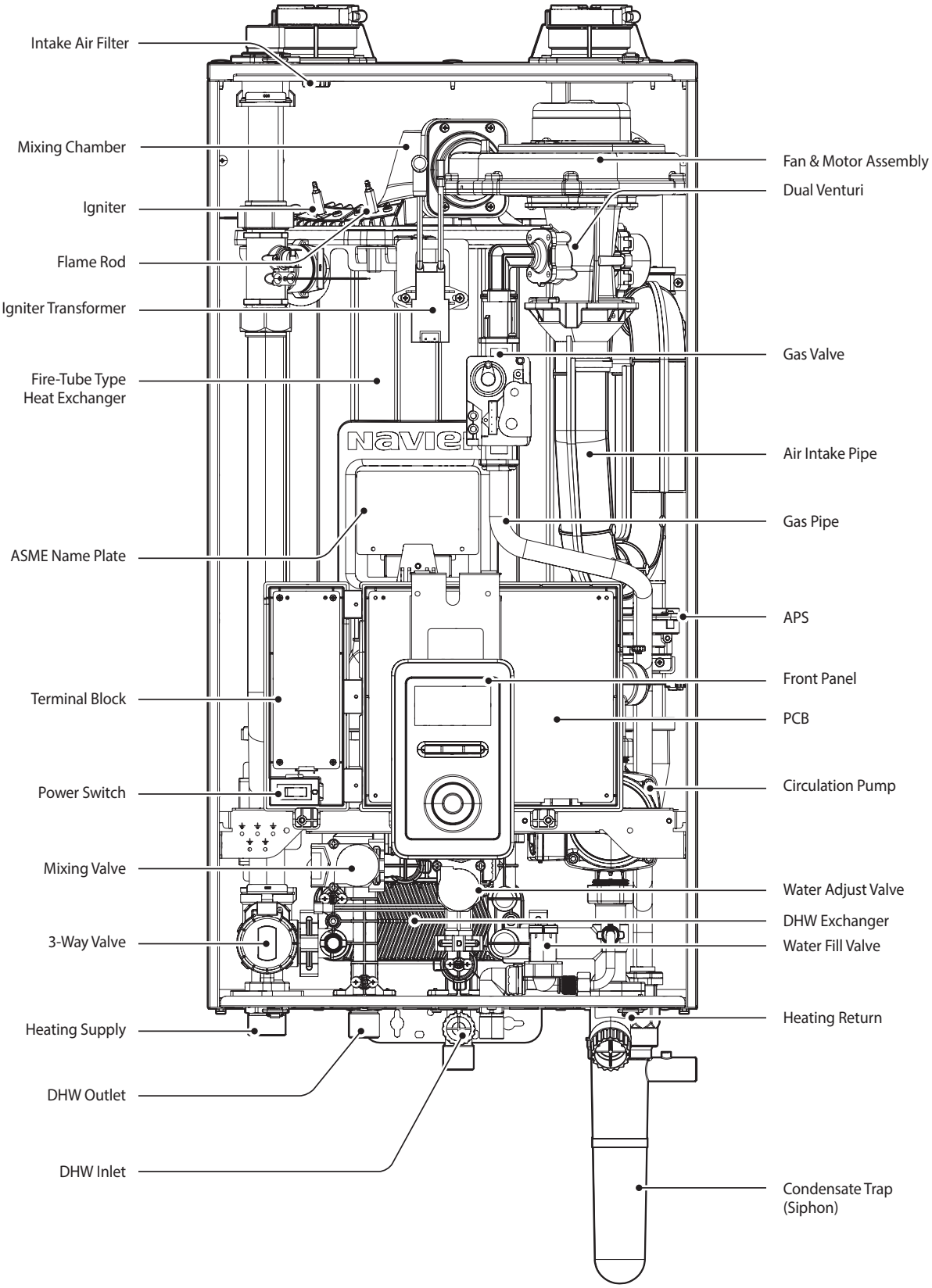
A separate heating expansion vessel is required.

Internal freeze protection and an electronic control unit are incorporated within the boiler. Any standalone room thermostat or set of contacts can be used with the boiler.

2.2 Components

The following diagram shows the key components of the boiler. Component assembly diagrams and particular parts lists are included in the Appendixes.





3. Technical Data

3.1 Specifications

The following tables list the specifications for the boiler. Additional specifications for water, gas, electricity, and vent connections are provided in the Installation section.

Space Heating Specifications

Navien Condensing Boiler Space Heating Ratings						Other Specifications		
Model Number[1]	Heating Input (MBH)		Heating Capacity[2] (MBH)	Net AHRI Rating Water[3] (MBH)	AFUE[2] (%)	Water Pressure	Water Connection Size (Supply, Return)	Water Volume
	Min	Max						
NFC-175	18	175	161	140	95	12–80 psi	1 in NPT	4.5 gallons
NFC-200	18	199	183	159	95			

Note

1. Ratings are the same for natural gas models converted to propane use.
2. Based on U.S. Department of Energy (DOE) test procedures.
3. The net AHRI water ratings shown are based on a piping and pickup allowance of 1.15. Consult Navien before selecting a boiler for installations having unusual piping and pickup requirements, such as intermittent system operation, extensive piping system, etc.

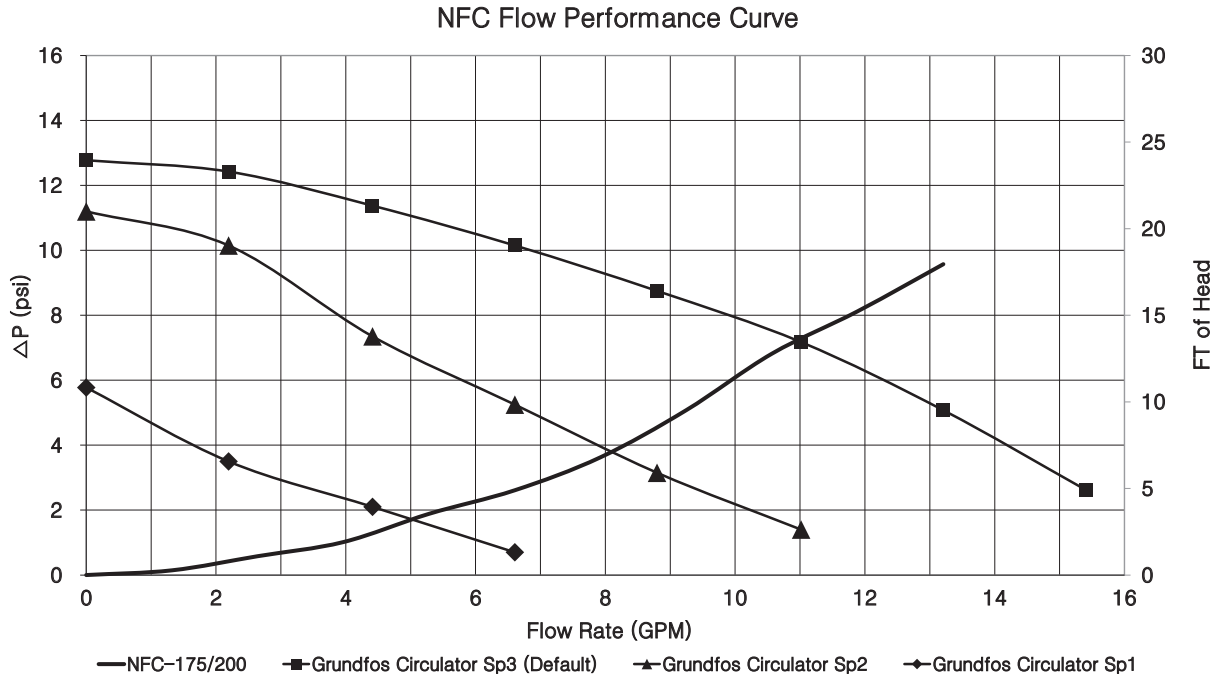
Domestic Hot Water Specifications

Item		NFC-175	NFC-200
Input Ratings	Min	18,000 BTU/H	18,000 BTU/H
	Max	199,900 BTU/H	199,900 BTU/H
Water Pressure		15-150 psi	
Minimum Flow Rate		0.5 GPM (1.9 L/m)	
Flow Rate 45°F (25°C) Temp. Rise		7.9 GPM	
DHW Supply Connection Size		3/4 in NPT	
Cold Water Input Connection Size		3/4 in NPT	

NFC Internal Pump

The NFC boiler is equipped with an internal circulation pump. The following table provides detailed information on the pump used for the boiler and the performance curve.

Item	Pump Model
NFC-175/200 Internal Recirculation Pump	Grundfos UPS 15-78 CIL2 (Part Number: 30021636A)



General Specifications

Item		NFC-175	NFC-200
Dimensions		17.3 in (W) x 17.3 in (D) x 33.5 in (H)	
Boiler Weight		145 lb (66 kg)	
Boiler Weight with Water		183 lb (83 kg)	
Installation Type		Indoor Wall-Hung	
Venting Type		Forced Draft Direct Vent	
Ignition		Electronic Ignition	
Natural Gas Supply Pressure (from source)		3.5 in–10.5 in WC	
Propane Gas Supply Pressure (from source)		8.0 in–13.5 in WC	
Natural Gas Manifold Pressure		-0.05 to -0.47 in WC	-0.05 to -0.20 in WC
Propane Gas Manifold Pressure		-0.10 to -0.45 in WC	-0.10 to -0.45 in WC
Flow Rate (DHW)	35°F (19°C) Temp Rise	10.4 GPM (39.5 L/m)	
	45°F (25°C) Temp Rise	7.9 GPM (30.0 L/m)	
	67°F (37°C) Temp Rise	5.4 GPM (20.3 L/m)	
Gas Connection Size		3/4 in NPT	
Power Supply	Main Supply	120V AC, 60Hz	
	Maximum Power Consumption	Less than 15 amperes	
Materials	Casing	Cold-rolled carbon steel	
	Heat Exchangers	Stainless Steel	
Venting	Exhaust	2 in or 3 in PVC, CPVC, approved polypropylene* 2 in or 3 in Special Gas Vent Type BH (Class III, A/B/C) 2 in or 3 in Stainless Steel	
	Intake	2 in or 3 in PVC, CPVC, polypropylene 2 in or 3 in Special Gas Vent Type BH (Class III, A/B/C) 2 in or 3 in Stainless Steel	
	Vent Clearance	0 in to combustibles	
Safety Appliances		Flame Rod, APS, Ignition Operation Detector Water Temperature High Limit Switch, Exhaust Temperature High Limit Sensor, Water Pressure Sensor	

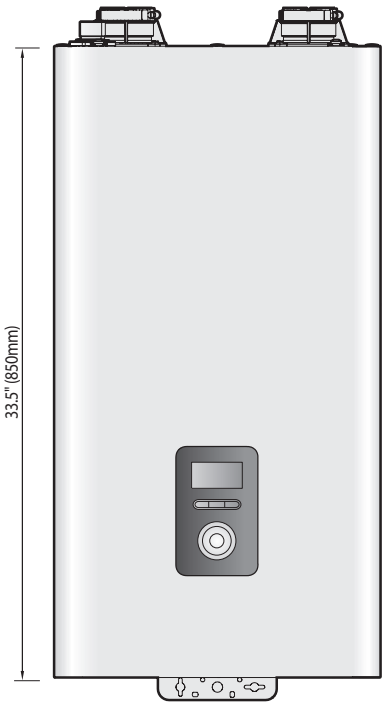
Temperature Setting Range

Item		Temperature Setting Range	Remarks
Space Heating	Supply	77–194°F (25-90°C)	Actual supply and return temperatures vary depending on the selected outdoor reset curve.
	Return	68–158°F (20-70°C)	
DHW		89°F-140°F (30°C-60°C)	

Note For more information about the space heating temperature setting range, refer to "4.8.3 Setting the Space Heating Operation" on page 37.

3.2 Dimensions

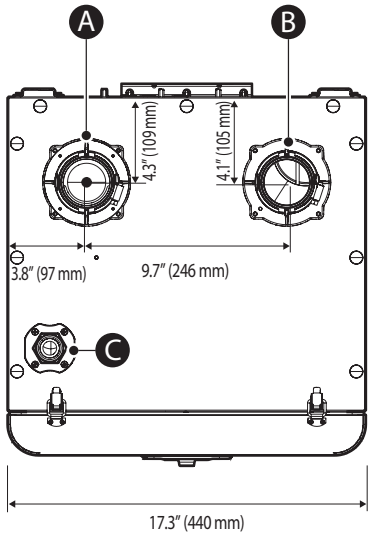
The following diagrams show the dimensions of the boiler and the table lists the supply connections.



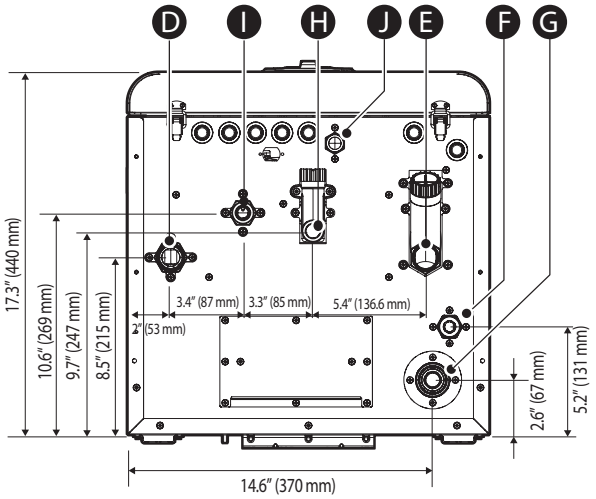
Supply Connections

	Description	Diameter
A	Air Intake	2 in
B	Exhaust Gas Vent	2 in
C	Air Vent Connection	3/4 in
D	Heating Supply	1 in
E	Heating Return	1 in
F	Gas Connection	3/4 in
G	Condensate Outlet	1/2 in
H	Cold Water Inlet (DHW)	3/4 in
I	Hot Water Outlet (DHW)	3/4 in
J	Auto Feeder Inlet (Make-up Water)	1/2 in

Overhead View



Supply Connections



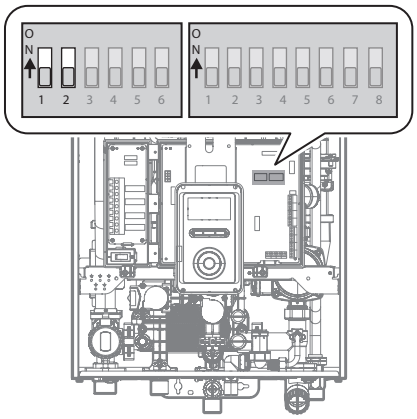
4. System Details

> **CAUTION**
>
> **Do not remove the front cover unless the power to the boiler is turned off or disconnected.** Failure to do so may result in electric shock.

The boiler has 2 sets of DIP switches on the main circuit board (PCB). DIP switches are used to control the functionality of the boiler. Set the DIP switches appropriately, based on the installation environment.

4.1 DIP Switch 1 (6 switch unit)

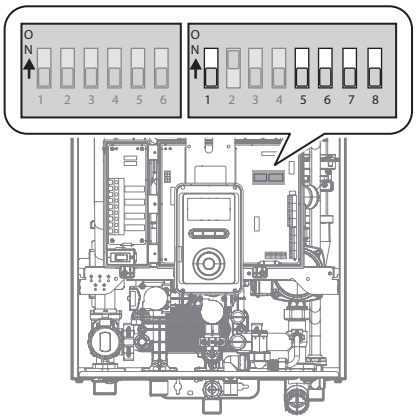
The DIP SW 1 on the circuit board configures the operation status and model/capacity settings.



Switch	Function	Setting	
1 & 2	Operation Status	Normal Operation	1-OFF, 2-OFF
		2-stage MAX	1-ON, 2-OFF
		1-stage MIN	1-OFF, 2-ON
		1-stage MAX	1-ON, 2-ON
3 & 4	Reserved	-	-
5 & 6	Model	NFC-200	5-OFF, 6-OFF
		NFC-175	5-ON, 6-OFF

4.2 Dip Switch 2 (8 switch unit)

The DIP SW 2 on the circuit board configures the gas type, temperature control modes, country, and enables or disables the space heating thermostat.



Switch	Function	Setting		Comment
1	Gas Type	Natural Gas	1-OFF	Refer to Table 1 in "4.4 Gas & High Altitude Conversion" on page 25
		Propane Gas	1-ON	
2 & 3	High Altitude	0-1,999 ft (0-609 m)	2-OFF, 3-OFF	
		2,000-5,399 ft (610-1,645 m)	2-ON, 3-OFF	
		5,400-7,699 ft (1,646-2,346 m)	2-OFF, 3-ON	
		7,700-10,100 ft (2,347-3,078 m)	2-ON, 3-ON	
4	Well Pump	Used	4-ON	-
		Unused	4-OFF	-
5 & 6	Country	US/Canada	5-OFF, 6-OFF	-
7	Space Heating Thermostat	Used	7-OFF	-
		Unused	7-ON	-
8	Exhaust Temperature Control	Used	8-OFF	-
		Unused	8-ON	-

Note

- When PCB DIP switch 2 #8 is set to On, ensure that CPVC, polypropylene, or stainless steel is used for exhaust venting.
- This unit may be installed at elevations up to 10,100 ft (3,078 m) for use with natural gas and propane. To use the unit at a specific altitude, the DIP switches should be set as described above.
- High Altitude: Above 2,000 ft (610 m), the unit will de-rate by 3% for each 1,000 ft (305 m) of altitude gain.
- For NG, if you install the unit at above 5,400 ft (1,646 m), it is required to change the Gas Orifice for high altitude. Be careful not to confuse it with the LP Gas Orifice. Refer to "4.4 Gas & High Altitude Conversion" on page 25 for details.
- Common vent installations for use with natural gas and propane are only approved for up to 4,500 ft.

CAUTION

Ensure that the High Altitude setting reflects the actual location of the boiler. If not, it may cause personal injury or malfunction of the boiler.

4.3 Measuring the Inlet Gas Pressure

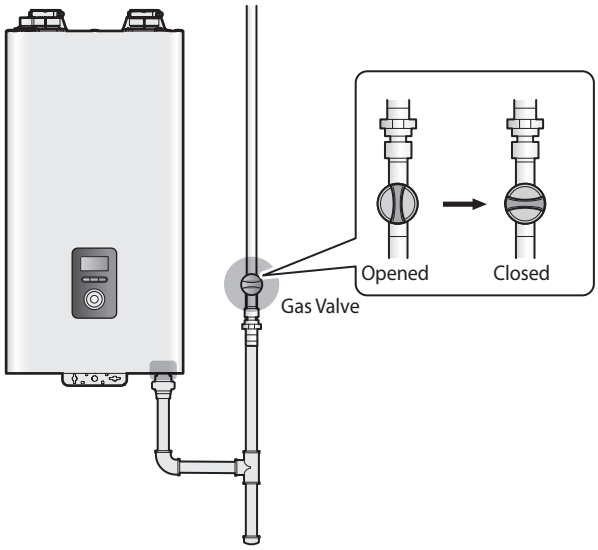
WARNING

The boiler cannot function properly without sufficient inlet gas pressure. Measuring the inlet gas pressure should be performed by a licensed professional only.

- The inlet gas pressure must be maintained between 3.5 in and 10.5 in WC for natural gas and between 8.0 in and 13.5 in WC for liquefied propane.
- The appliance and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of $^1/_2$ psi (3.5 kPa).
- The appliance must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than $^1/_2$ psi (3.5 kPa).

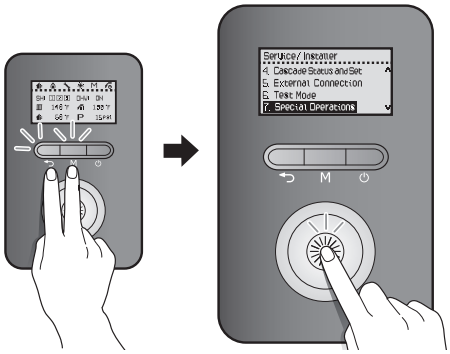
To measure the inlet gas pressure:

1. Shut off the manual gas valve on the gas supply line.

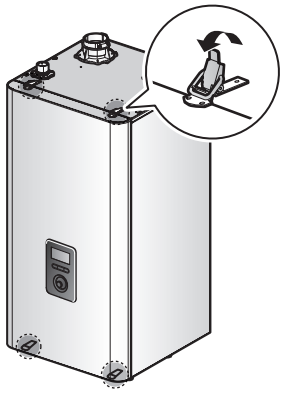


2. Turn on the boiler. On the front panel, press the Back button (↩) and the Menu button (M) simultaneously for 3 seconds, and then rotate the Command dial (◎) to move to "7. Special Operations".

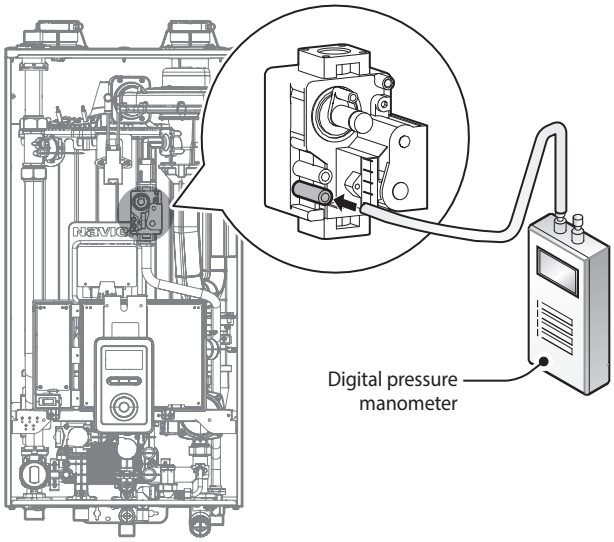
3. Press the Command dial (⊛) to enter special operation mode.



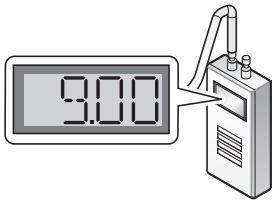
4. Rotate the Command dial (⊛) to move to **7. SH 2nd MAX**, and then press the Command dial (⊛) to select the operation mode.
5. Press the Back button (⮌) twice to return to normal operation mode.
6. Run space heating. The gas in the gas supply line will be purged.
7. Leave the boiler on until the boiler shuts down due to a lack of gas supply, and then turn off the boiler.
8. Unfasten the 4 latches (2 at the top and 2 at the bottom) to remove the front cover and gain access to the internal components.



9. Loosen the screws indicated in the figure below and connect a manometer to the pressure port. Reset the manometer to zero before use.



10. Re-open the manual gas valve and check for leaks.
11. Activate multiple zones to ramp the boiler up to its maximum firing rate.
12. When the boiler reaches its maximum firing rate, check the inlet gas pressure reading on the manometer. The gas pressure must fall within the ranges specified on page 18.



4.3.1 Gas Pipe Sizing Tables

The following tables are referenced from the 2012 National Fuel Gas Code and are for reference only. Please consult the gas pipe manufacturer for actual pipe capacities.

Maximum Natural Gas Delivery Capacity

In Cubic Feet (ft^3) per Hour (0.60 Specific Gravity; 0.5 in WC Pressure Drop). Contact your gas supplier for BTU/ft^3 ratings. Use 1,000 BTU/ft^3 for simplified calculations. This table is recommended for supply pressures less than 6 in WC.

Pipe Size	Length (including fittings)										
	10 ft (3 m)	20 ft (6 m)	30 ft (9 m)	40 ft (12 m)	50 ft (15 m)	60 ft (18 m)	70 ft (21 m)	80 ft (24 m)	90 ft (27 m)	100 ft (30 m)	125 ft (38 m)
3/4 in	360	247	199	170	151	137	126	117	110	104	92
1 in	678	466	374	320	284	257	237	220	207	195	173
1 1/4 in	1,390	957	768	657	583	528	486	452	424	400	355
1 1/2 in	2,090	1,430	1,150	985	873	791	728	677	635	600	532
2 in	4,020	2,760	2,220	1,900	1,680	1,520	1,400	1,300	1,220	1,160	1,020
2 1/2 in	6,400	4,400	3,530	3,020	2,680	2,430	2,230	2,080	1,950	1,840	1,630
3 in	11,300	7,780	6,250	5,350	4,740	4,290	3,950	3,670	3,450	3,260	2,890
4 in	23,100	15,900	12,700	10,900	9,660	8,760	8,050	7,490	7,030	6,640	5,890

In Cubic Feet (ft^3) per Hour (0.60 Specific Gravity; 3.0 in WC Pressure Drop). Contact your gas supplier for BTU/ft^3 ratings. Use 1,000 BTU/ft^3 for simplified calculations. This table is recommended for supply pressures of 6 in WC or greater.

Pipe Size	Length (including fittings)										
	10 ft (3 m)	20 ft (6 m)	30 ft (9 m)	40 ft (12 m)	50 ft (15 m)	60 ft (18 m)	70 ft (21 m)	80 ft (24 m)	90 ft (27 m)	100 ft (30 m)	125 ft (38 m)
1/2 in	454	312	250	214	190	172	158	147	138	131	116
3/4 in	949	652	524	448	397	360	331	308	289	273	242
1 in	1,787	1,228	986	844	748	678	624	580	544	514	456
1 1/4 in	3,669	2,522	2,025	1,733	1,536	1,392	1,280	1,191	1,118	1,056	936
1 1/2 in	5,497	3,778	3,034	2,597	2,302	2,085	1,919	1,785	1,675	1,582	1,402
2 in	10,588	7,277	5,844	5,001	4,433	4,016	3,695	3,437	3,225	3,046	2,700
2 1/2 in	16,875	11,598	9,314	7,971	7,065	6,401	5,889	5,479	5,140	4,856	4,303
3 in	29,832	20,503	16,465	14,092	12,489	11,316	10,411	9,685	9,087	8,584	7,608
4 in	43,678	30,020	24,107	20,632	18,286	16,569	15,243	14,181	13,305	12,568	11,139

Maximum Liquefied Propane Delivery Capacity

In Thousands of BTU/H (0.5 in WC pressure drop)

Pipe Size	Length (including fittings)												
	10 ft (3 m)	20 ft (6 m)	30 ft (9 m)	40 ft (12 m)	50 ft (15 m)	60 ft (18 m)	80 ft (24 m)	100 ft (30 m)	125 ft (38 m)	150 ft (45 m)	175 ft (53 m)	200 ft (60 m)	250 ft (76 m)
1/2 in	291	200	160	137	122	110	101	94	89	84	74	67	62
3/4 in	608	418	336	287	255	231	212	197	185	175	155	140	129
1 in	1,150	787	632	541	480	434	400	372	349	330	292	265	243
1 1/4 in	2,350	1,620	1,300	1,110	985	892	821	763	716	677	600	543	500
1 1/2 in	3,520	2,420	1,940	1,660	1,480	1,340	1,230	1,140	1,070	1,010	899	814	749
2 in	6,790	4,660	3,750	3,210	2,840	2,570	2,370	2,200	2,070	1,950	1,730	1,570	1,440

4.4 Gas & High Altitude Conversion

This boiler is configured for Natural Gas at the factory.

- If conversion to Propane Gas is required by the boiler, use the LP CONVERSION KIT supplied with the boiler.
- If the boiler is installed at a high altitude (above 5,400 ft) for NG, use the HIGH ALTITUDE CONVERSION KIT supplied with the boiler.

Note

- For NG high altitude conversion, use the HIGH ALTITUDE CONVERSION KIT.
- For LP high altitude conversion, use the LP CONVERSION KIT. Note that the Gas Orifice from the LP CONVERSION KIT covers the boiler's installation at an altitude of 0 to 10,100 ft.

WARNING

This conversion kit must be installed by a qualified service agency* in accordance with Navien's instructions and all applicable codes and requirements of the authority having jurisdiction. The information in these instructions must be followed to minimize the risk of fire or explosion or to prevent property damage, personal injury or death. The qualified service agency is responsible for the proper installation of this kit. The installation is not proper and complete until the operation of the converted appliance is checked as specified in the manufacturer's instructions supplied with the kit.

* A qualified service agency is any individual, firm, corporation or company which either in person or through a representative is engaged in and is responsible for the connection, utilization, repair or servicing of gas utilization equipment or accessories; who is experienced in such work, familiar with all precautions required, and has complied with all of the requirements of the authority having jurisdiction.

In Canada: The conversion shall be carried out in accordance with the requirements of the provincial authorities having jurisdiction and in accordance with the requirements of the CAN-B149.1 and CAN1-B149.2 Installation Code.

Tools Required:

- Phillips Screwdriver
- Flathead Screwdriver
- $^{5}/_{32}$ in or 4 mm Allen Wrench
- Combustion Analyzer or Dual Port Manometer
- Gas Leak Detector

Included Items:

- Gas Orifice (Table 1)
- Gas Pressure and Conversion Kit Number Labels

NFC-175/200 Orifice Identification

Gas Type	NG		LP
Altitude	0-5,399 ft	5,400-10,100 ft	0-10,100 ft
Orifice	 Factory Installed	 For High altitude	 For LP
Orifice Size	Ø6.1/Ø6.6	Ø6.3/Ø6.8	Ø4.5/Ø4.9

Table 1. Orifice Size

WARNING

- Be careful not to confuse the LP CONVERSION KIT and HIGH ALTITUDE CONVERSION KIT. Do NOT use the HIGH ALTITUDE CONVERSION KIT for NG when converting to LP gas.
- Make sure that the conversion is completed with the proper orifice. If the installed orifice does not conform to the specifications in Table 1, incomplete combustion may occur, resulting in personal injury or property damage.

Procedure:

Note The procedure below can be applied to both LP conversion and High Altitude conversion. Distinguish the kit supplied with the boiler before installing.

1. Turn off both gas and water supply to the boiler.
2. Unfasten the 4 latches (2 at the top and 2 at the bottom) to remove the front cover and gain access to the internal components. See Figure 1 for illustration of the front cover clamps.

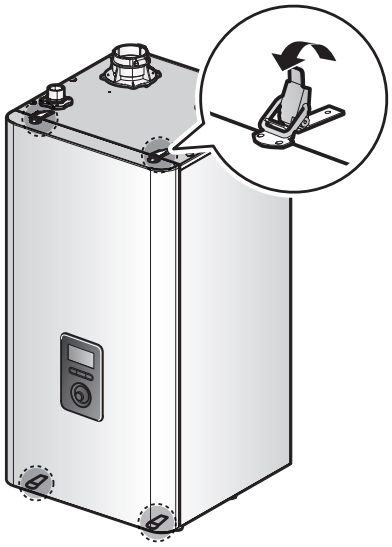


Figure 1. NFC Series Front cover

3. Remove the front cover and place it in a safe location to prevent accidental damage.
4. With the internal components exposed, locate the gas inlet pipe and the gas valve, as shown in Figure 2.

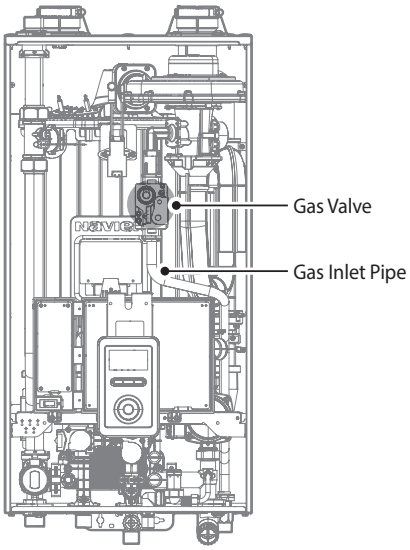


Figure 2. NFC Series Internal Components

5. Remove the clip at location A – the connection above the gas valve where it connects to the gas valve outlet adapter. See Figure 3 for reference.
6. Find location B - the connection above the gas valve where it is attached to the fan motor assembly. Carefully remove the four screws using a Phillips-head screwdriver and pull the gas valve outlet adapter away from the fan assembly to access the gas orifice.

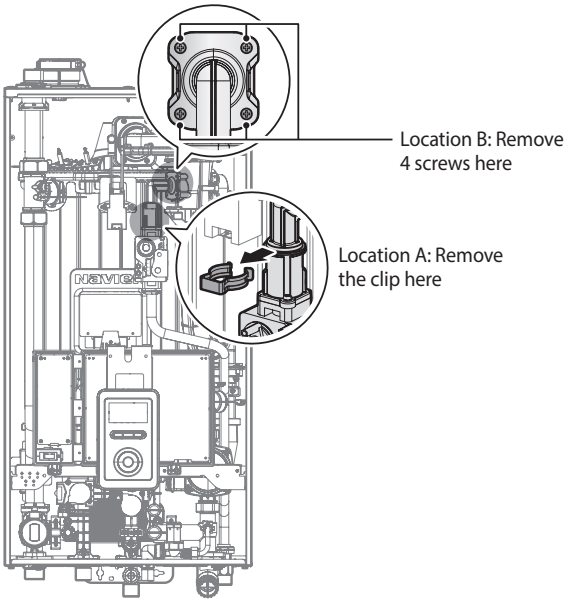


Figure 3. Detaching the Gas Valve Outlet Adapter from the Gas Valve and Fan Motor Assembly

7. Once the Gas Orifice is exposed, remove the two screws that hold the part in place. Remove the Gas Orifice from its housing and prepare the new Gas Orifice for the LP or High Altitude conversion for installation.

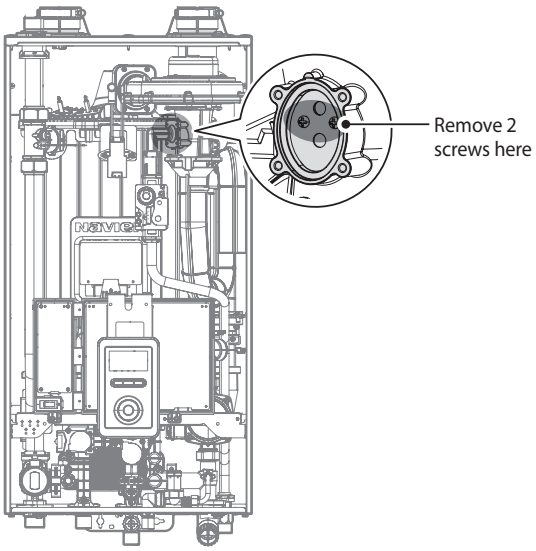


Figure 4. Access to Gas Orifice in Fan Assembly

WARNING

- DO NOT adjust or attempt to measure gas valve outlet pressure. The gas valve is factory-set for the correct outlet pressure. This setting is suitable for natural gas and propane, requiring no field adjustment.
- Attempting to alter or measure the gas valve outlet pressure could result in damage to the valve, causing potential severe personal injury, death or substantial property damage. Navien NFC boilers are shipped ready to fire natural gas ONLY.

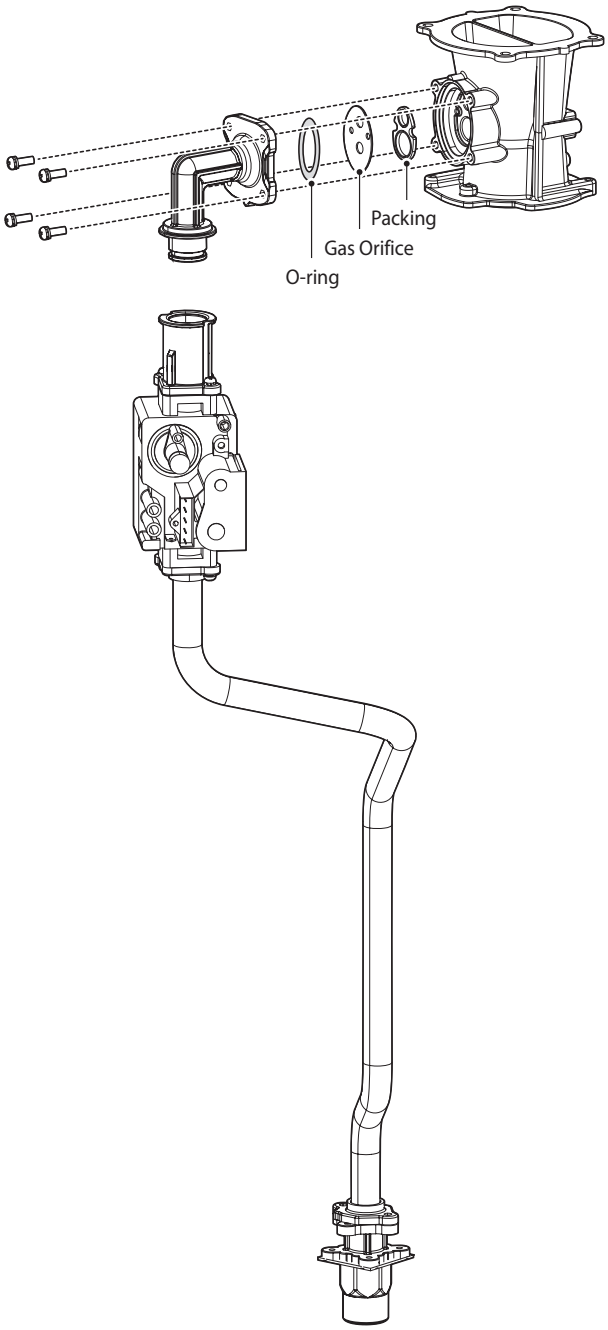
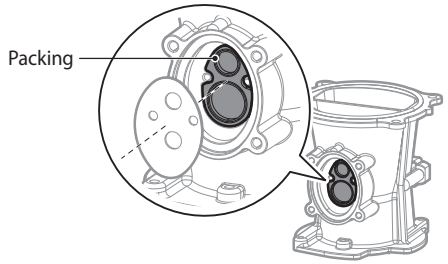


Figure 5. Exploded View of Gas Pipe Assembly

8. Remove the Gas Orifice, ensure that the packing is properly seated inside the port, and then install the new Gas Orifice for use with LP gas. Ensure that the Orifice is properly seated on the packing inside the port before proceeding to the next step.



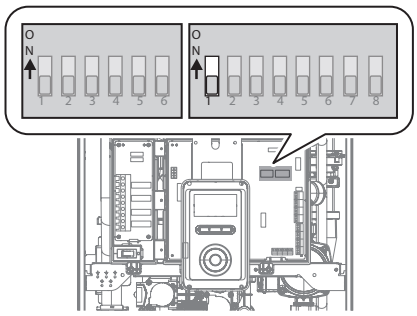
9. Replace the gas valve outlet adapter to its original position and use all screws to secure all connections.

Note Do not overtighten as this may damage or crack the components.

10. Set the PCB DIP switch to change the gas type. For LP, set Dip Switch 2 #1 to ON. For NG, set DIP SW2 #1 to OFF.

WARNING

Ensure that you have turned off the power to the boiler before accessing the DIP switches.



Switch	Function	Setting		Comment
1	Gas Type	Natural Gas	1-OFF	Refer to Table 1 on page 25.
		Propane Gas	1-ON	
2&3	High Altitude	0-1,999 ft (0-609m)	2-OFF, 3-OFF	
		2,000-5,399 ft (610-1,645m)	2-ON, 3-OFF	
		5,400-7,699 ft (1,646-2,346m)	2-OFF, 3-ON	
		7,700-10,100 ft (2,347-3,078m)	2-ON, 3-ON	

When applying the Gas Orifice for high altitude, set the PCB DIP switches by altitude according to the table above.

Note

- This unit may be installed at elevations up to 10,100 ft (3,078 m) for use with natural gas and propane. To use the unit at a specific altitude, the DIP Switches should be set as described above.
- High Altitude: Above 2,000 ft (610 m), the unit will de-rate by 3% for each 1,000 ft (305 m) of altitude gain.
- For NG, if you install the unit at above 5,400 ft (1,646 m), it is required to change the Gas Orifice for high altitude. Be careful not to confuse it with the Gas Orifice for LP.
- Note that the Gas Orifice from the LP CONVERSION KIT covers the boiler's installation at an altitude of 0 to 10,100 ft.

CAUTION

Ensure that the High Altitude setting reflects the actual location of the boiler. If not, it may cause personal injury or malfuction of the boiler.

DANGER

- When conversion is required, be sure to set the PCB DIP switch 2 #1 according to the supply gas type.
- For NG, use the Gas Orifice for high altitude when the boiler is installed at above 5,400 ft, and be careful not to confuse it with the Gas Orifice for LP.
- For High Altitude conversion, check the DIP switches setting value by altitude before setting.
- Failure to properly set the DIP switches could cause carbon monoxide poisoning, resulting in severe personal injury or death.

11. Turn on the gas and water supply to the boiler.

12. Measure and adjust the gas/air ratio.

Option 1. Using Combustion Analyzer (recommended)

a. Loosen the screw, rotate the plate and remove the gasket to access the emissions monitoring port as shown in Figure 6.

b. Insert the analyzer into the port (Figure 6).

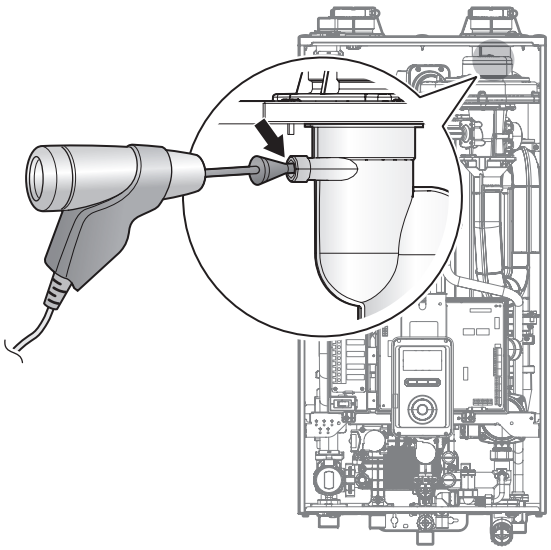
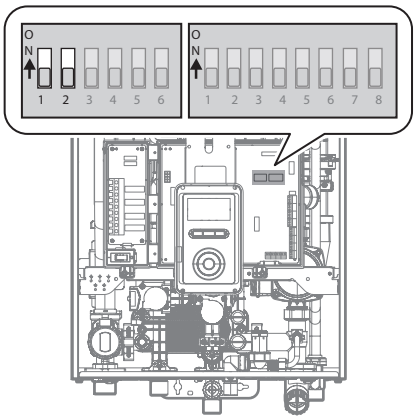


Figure 6. Insert the Analyzer

The DIP SW 1 on the circuit board configures the operation status and model/capacity settings.



Switch	Function	Setting	
1 & 2	Operation Status	Normal Operation	1-OFF, 2-OFF
		2-stage MAX	1-ON, 2-OFF
		1-stage MIN	1-OFF, 2-ON
		1-stage MAX	1-ON, 2-ON
3 & 4	Reserved	-	-
5 & 6	Model	NFC-200	5-OFF, 6-OFF
		NFC-175	5-ON, 6-OFF

Model	Altitude	Fuel	High fire	Low fire
			$\%CO_2$	$\%CO_2$
NFC-175 NFC-200	0-5,399 ft	NG	8.9	9.5
		LP	10.2	10.8
	5,400-10,100 ft	NG	8.5	9.5
		LP	10.2	10.8

Table 2. CO_2 value
(CO_2 values must be within 0.5% of the values listed.)

c. Activate multiple zones and set the boiler to operate at 1-stage MIN mode.

Note For operation mode selection, refer to "4.9.7 Setting the Special Operation Modes" on page 48.

Measure the CO_2 value at low fire.
If the CO_2 value is not within 0.5% of the value listed in Table 2, the gas valve set screw will need to be adjusted. If adjustment is necessary, locate the set screw as shown in Figure 7. Using a $^5/_{32}$ in or 4 mm Allen wrench, turn the set screw no more than $^1/_4$ turn clockwise to raise or counterclockwise to lower the CO_2 value.

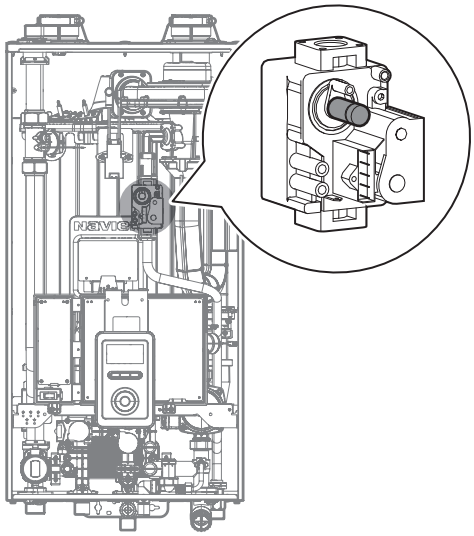


Figure 7. Set Screw Location

Note The set screw is located behind the screw-on cover. This must be removed first.

d. Activate multiple zones and set the boiler to operate at 2-stage D. MAX mode (refer to "4.9.7 Setting the Special Operation Modes" on page 48). Measure the CO_2 value at high fire.

If the CO_2 values do not match Table 2 at high fire, do not adjust the gas valve. Check for the proper Gas Orifice.

DANGER

Improper gas valve settings can cause severe personal injury, death or substantial property damage.

Option 2. Using Digital Manometer

a. Open the offset pressure port by loosening the screw two turns as shown in Figure 8.

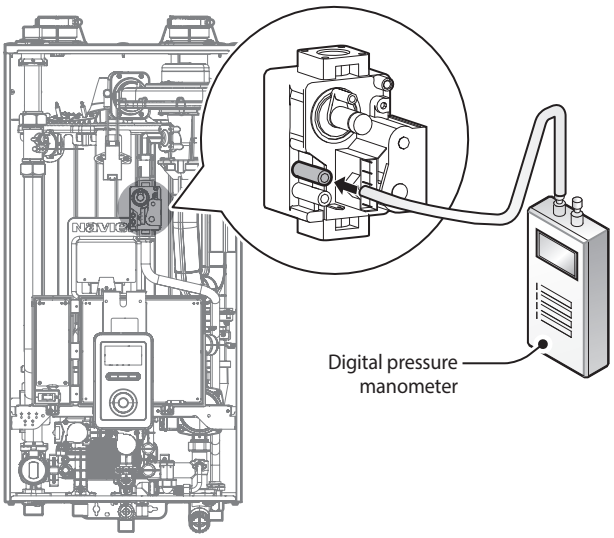


Figure 8. Connect Digital Pressure Monometer

b. Connect a manometer to the offset pressure port. For dual port manometers, use the positive pressure side.

Model	Altitude	Kit Part No.	Gas Type	Offset
NFC-175 NFC-200	0-5,399 ft	NAC-N200	NG	-0.04 in ±0.01 in
	5,400-10,100 ft	NAC-NCH200		
	0-10,100 ft	NAC-LC200	LP	-0.02 in ±0.01 in

Table 3. Offset value for low fire

c. Activate multiple zones and set the boiler to operate at 1-stage MIN mode (refer to "4.9.7 Setting the Special Operation Modes" on page 48). Measure the offset value at low fire and compare it to the values in Table 3. If the offset value is out of range, the gas valve set screw will need to be adjusted.

If adjustment is necessary, locate the set screw as shown in Figure 9. Using a $^{5}/_{32}$ in or 4mm Allen wrench, turn the set screw no more than $^{1}/_{4}$ turn clockwise to raise or counterclockwise to lower the offset value.

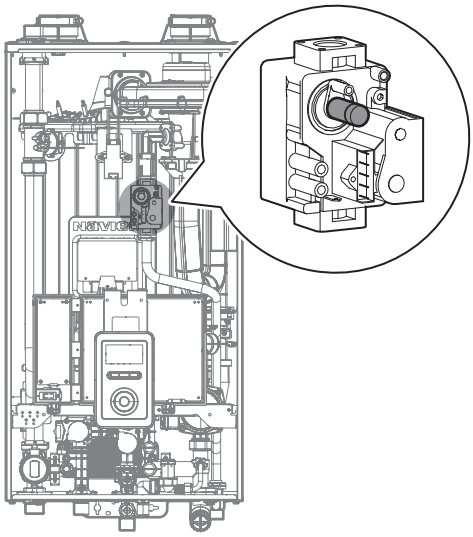


Figure 9. Set Screw Location

Note The set screw is located behind the screw-on cover. This must be removed first.

d. At high fire, do not check the offset value and never adjust the gas valve.

DANGER

Improper gas valve settings can cause severe personal injury, death or substantial property damage.

13. Once the CO_2 or offset values have been confirmed, apply the included conversion stickers to show that the appliance has been converted to Propane Gas or High Altitude. Place these labels adjacent to the rating plate as shown in Figure 10.

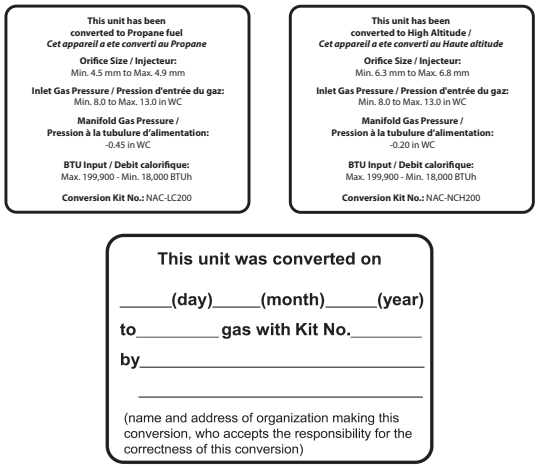


Figure 10. Proper Placement of Gas Conversion Labels

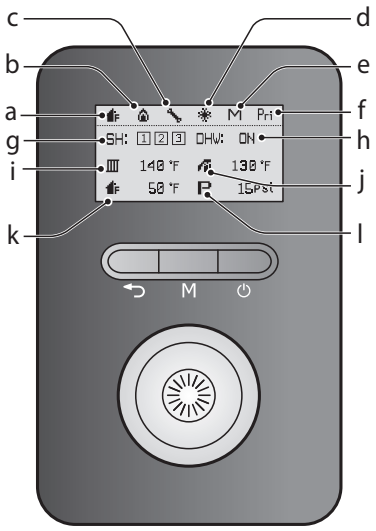
Note The gas conversion rating plate varies depending on the model. Check the conversion kit number before attaching the labels.

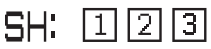
4.5 The Front Panel

The front panel allows you to adjust the temperature and view the operating status or error codes. Remove the protective sheet from the front panel before using it.

4.5.1 Icons and Digital Display

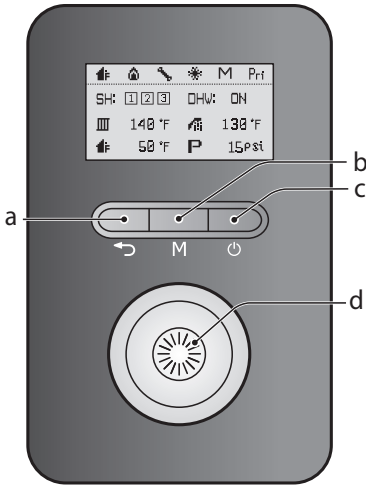
The icons and digital display on the front panel provide important information required for the boiler's operation. Refer to the following table for detailed information.

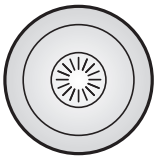


a		**Outdoor reset** Displayed when the Outdoor Reset feature is enabled.	b		**Combustion** Displayed when the burner is combusting.
c		**System fault** Displayed when a system fault is detected.	d		**Anti-freeze** Displayed when the boiler is operating in anti-freeze mode.
e		**Cascade/Main mode** Flashes when configuring a cascade system. Turns on solid if the boiler is set as the Master unit in a cascade system.	f		**DHW priority** Displayed when the DHW Priority feature is enabled.
g		**Space heating demand** Indicates the space heating demands from thermostats 1, 2, and 3.	h		**DHW demand** Indicates that DHW demand is present.
i		**Space heating set temperature** Displays the currently set space heating temperature.	j		**DHW set temperature** Displays the currently set DHW temperature.
k		**Outdoor temperature** Displays the outdoor temperature.	l		**System pressure** Displays the internal water pressure of the boiler system.

4.5.2 Buttons and Command dial

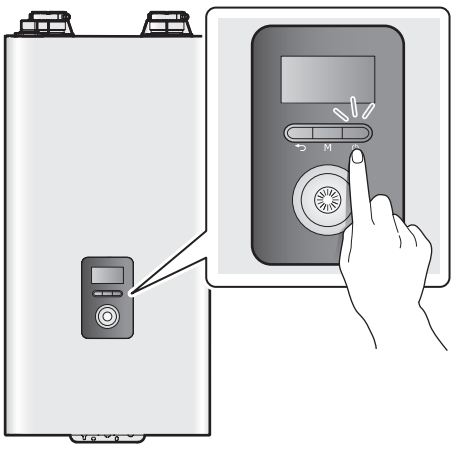
Using the buttons and the Command dial on the front panel, you can turn on or off the boiler, monitor the current operation status, and set the values required for the boiler's operation, such as space heating and DHW supply temperatures. Refer to the following table for detailed information.



a		**Back button** Return to the previous menu or screen.	b		**Mode button** Enter the boiler's main menu.
c		**Power button** Turn on or off the boiler.	d		**Command dial** Rotate to switch between menu items, or to increase/decrease values. Press to make a selection or to confirm changes.

4.6 Turning the Boiler On or Off

To turn the boiler on or off, press the Power button for 0.3 seconds.



When the power is on, the boiler automatically enters normal operation mode, and the boiler's operating conditions are displayed on the screen.

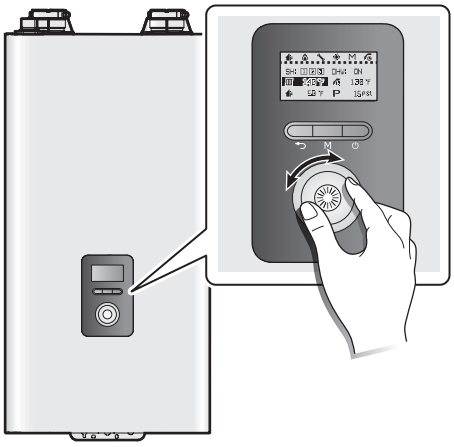
Note The boiler status icons remain displayed when the boiler is turned off.

4.7 Adjusting the Temperature

4.7.1 Adjusting the Space Heating Temperature

To adjust the heating temperature:

1. In normal operation mode, rotate the Command dial (⊛) . The space heating temperature(▥) is highlighted on the screen.



2. Press the Command dial (⊛) to select the space heating temperature. The highlighted section will flash.

3. Rotate the Command dial (⊛) to the right or left to increase or decrease the temperature.
4. Press the Command dial (⊛) to confirm the new temperature.
5. Press the Back button (⮌) to return to normal operation mode, or rotate the Command dial (⊛) to adjust other operation conditions.

You can adjust the temperature while the highlighted section is flashing. Once the flashing stops, the current temperature setting is stored.

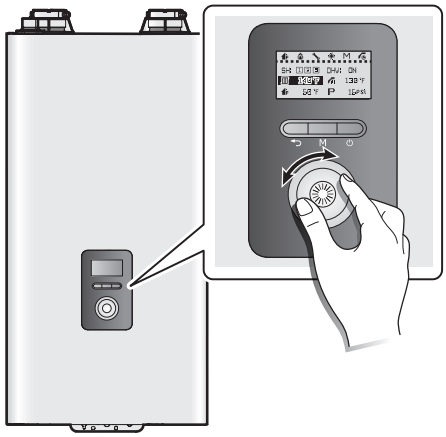
Note

- The space heating temperature cannot be adjusted when the Outdoor Reset Control is used.
- The space heating temperature cannot be adjusted if the boiler is operating as a sub unit in a cascade system. The main unit's set temperature will be displayed on the screen.
- In case of outdoor reset sensor malfunction, the boiler will operate at this set temperature.
- Take note of the original heating temperature in case you want to restore it to the default.
- The default space heating supply water temperature range is 104°F (40°C, Absolute MIN) to 180°F (82°C, Absolute MAX).
- The default space heating return water temperature range is 86°F (30°C, Absolute MIN) to 149°F (65°C, Absolute MAX).
- You can adjust the temperature ranges in the parameter settings menu.
- The boiler will retain your settings during a power outage.

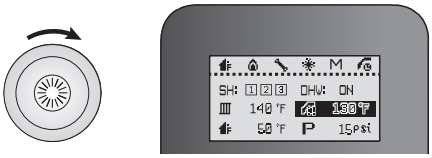
4.7.2 Adjusting the DHW Temperature

To adjust the water temperature:

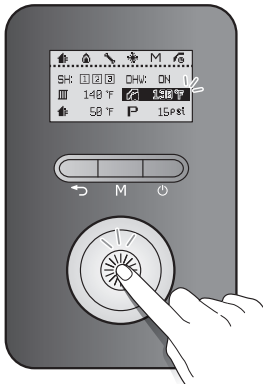
1. In normal operation mode, rotate the Command dial (). The space heating temperature() is highlighted on the screen.



2. Rotate the Command dial () to the right to select the DHW temperature.



3. Press the Command dial () to select the DHW temperature (). The highlighted section will flash.



4. Rotate the Command dial () to the right or left to increase or decrease the temperature.

5. Press the Command dial () to confirm the new temperature.

6. Press the Back button () to return to normal operation mode, or rotate the Command dial () to adjust other operation conditions.

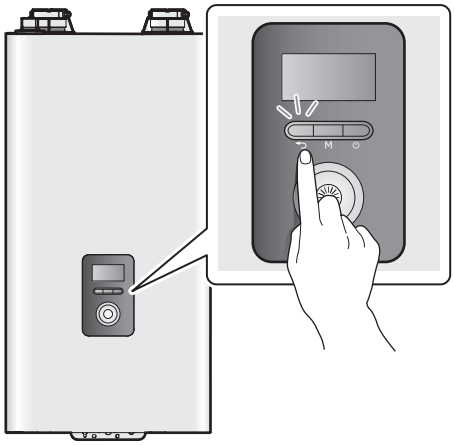
You can adjust the temperature while the display is flashing. Once the display stops flashing, the current temperature setting is stored.

Note

- The default DHW temperature range is 86°F (30°C) to 140°F (60°C).
- You can adjust the temperature ranges in the parameter settings menu.
- The boiler will retain your settings during a power outage.

4.7.3 Resetting the Boiler

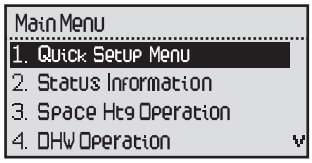
If an error message appears during boiler operation, reset the boiler to resolve the problem. Press the Back button () on the front panel to reset the boiler.



If resetting the boiler does not solve the problem, refer to the Troubleshooting section of this manual or contact Technical Support at 1-800-519-8794.

4.8 Accessing Basic Menu Items

In the Main Menu screen, you can view the boiler's operating conditions, configure the space heating and DHW temperatures, and review error history. Press the Menu button (M) to enter the Main Menu screen.



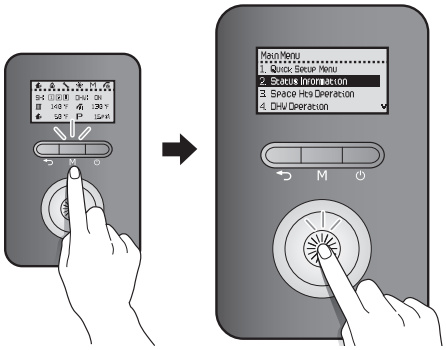
4.8.1 Quick Setup Menu

The Quick Setup Menu is designed to help configure the boiler settings after installation is complete. To enter the Quick Setup Menu, press the Menu button (M), and select "1.Quick Setup Menu". Press the Back button (⮌) to return to the previous screen.

Item	Description
1. Outdoor Reset ON/OFF	Set the Outdoor Reset Control settings.
1-1. Outdoor Reset Curves	Set the Outdoor Reset Curve when the Outdoor Reset is used.
1-2. Outdoor High Temp Set	Set the maximum value for the Outdoor Reset Control when the Outdoor Reset is used.
1-3. Outdoor Low Temp Set	Set the minimum value for the Outdoor Reset Control when the Outdoor Reset is used.
1-4. WWSD Temp	Set the WWSD temperature.
2. Auto-Fill Pressure	Set the Auto-Fill Pressure.
3. Time Setting	Set the system clock (RTC). • Display format: YYYY.MM.DD / HH:MM:SS
4. DHW Recirculation	Set the DHW Recirculation type setting.

4.8.2 Viewing Basic Information

To view information about the boiler, press the Menu button (M), and then select "2. Status Information".



Rotate the Command dial (◎) to switch between the information items. Press the Command dial (◎) to select an item and view the information.

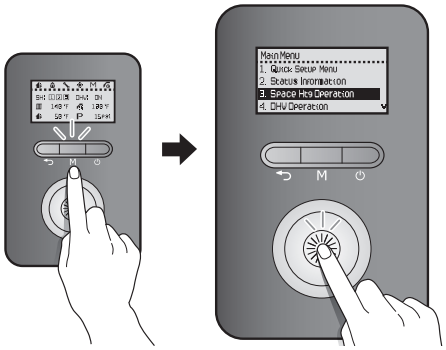
Press the Back button (⮌) to exit information view mode.

Item	Description
1. Operation State	Current Operation State
2. Heat Capacity	Heat Capacity (%)
3. SH Set Temp	Space heating set temperature (°F)
4. DHW Set Temp	DHW set temperature (°F)
5. Supply Temp	Heating supply temperature (°F)
6. Return Temp	Boiler return temperature (°F)
7. Sys Supply Temp	System supply temperature (°F)
8. Sys Return Temp	System return temperature (°F)
9. Outlet 1 Temp	Heat exchanger outlet temperature (°F)
10. Outlet 2 Temp	Outlet temperature (°F)
11. Inlet Temp	Inlet temperature (°F)
12. Outdoor Temp	Outdoor temperature (°F)
13. Approx. Boiler Flow	SH flow rate (GPM)
14. DHW Flow	DHW flow rate (GPM)
15. Water Press	Water pressure (psi)

Item	Description
16. Flame Value	Flame detector AD value • Flame On: 8bit AD values equal to or lower than 70 • Flame Off: 8bit AD values equal to or higher than 175
17. Fan Target RPM	Set fan speed (RPM)
18. Fan Current RPM	Fan speed (RPM)
19. Fan Target APS	Set APS voltage (V)
20. Fan Current APS	APS voltage (V)
21. Flow control valve status	100 - Close state
22. Mixing valve status	0 - Close state
23. Exhaust Temp	Exhaust temperature (°F)
24. Outdoor Reset	Outdoor reset status (Enable / Disable)
25. Outdoor Reset Curve	Outdoor reset curve load type (displayed when the outdoor reset option "20. Outdoor Reset" is enabled) 1: Finned Tube Baseboard 2: FAN Coil 3: Cast Iron Baseboard 4: Low Mass Radiant 5: High Mass Radiant 6: Radiator 7: Custom (set by installer)
26. Boost Interval Time	Boost interval set time (min)
27. High Altitude	Sea Level (0 - 2,000 ft)
	Level 1 (2,000 - 5,400 ft)
	Level 2 (5,400 - 7,700 ft)
	Level 3 (7,700 - 10,100 ft)
28. Well pump	Well pump status OFF - Unused, ON - Used
29. Model	Model type
30. Gas	Fuel type (NG/LPG)
31. Main F/W Ver	Main firmware version
32. Panel F/W Ver	Controller panel firmware version

4.8.3 Setting the Space Heating Operation

To set the boiler's space heating operation, press the Menu button (M), and then select "3. Space Htg Operation".



Rotate the Command dial (◎) to switch between the list items or to increase/decrease setting values. Press the Command dial (◎) to select an item or to confirm after making changes.

Press the Back button (↩) to return to the previous screen or menu.

Item	Description
1. SH Set Temp	Set space heating target temperature (°F). • Setting range: 104–180°F (40–82°C) • Default: 180°F (82°C) This option is available only when "1. Space Htg ON/OFF" is set to "Enabled".
2. Outdoor Reset ON/OFF	Default: Disable
2-1. Outdoor Reset Curves*	Select a heatload type of the Outdoor Reset Control. 1: Finned Tube Baseboard 2: FAN Coil 3: Cast Iron Baseboard 4: Low Mass Radiant 5: High Mass Radiant 6: Radiator 7: Custom (set by installer) This option is available only when "2. Outdoor Reset ON/OFF" is set to "Enabled".
2-2. Outdoor High Temp Set**	Set the maximum temperature for the Outdoor Reset Control. • Setting range: [MIN Set-point + 9°F (5°C)] – 104°F (40°C) • Default: 70°F (21°C)

Item	Description
2-3. Outdoor Low Temp Set**	Set the maximum temperature for the Outdoor Reset Control. • Setting range: -4°F (-20°C) – [MAX Set-point – 9°F (5°C)] • Default: 14°F (-10°C)
2-4. WWSD Temp	Set the Warm Weather Shut-down temperature. • Setting range: OFF, 50°F (10°C) – 104°F (40°C) • Default: OFF
2-5. WWSD On Diff	Set the differential temperature to deactivate the Warm Weather Shut-down. • Setting range: 0°F (0°C) – 36°F (20°C) • Default: 5°F (3°C)
2-6. Boost Interval Time***	Set the boost interval time. • Setting range: 0 – 120 min • Default: 0 min
3. Navien zone cont.	Enable or disable heating zones utilizing the Navien Zone Controller. • Setting range: Enabled/Disabled • Default: Disabled
4. SH Control Method	Select a heating control type. 1: Supply Temperature 2: Return Temperature 3: Sys Supply Temperature 4: Sys Return Temperature • Default: Supply Temperature

* A preset or user defined temperature range is set automatically based on the curve selected. Refer to the settings table for details.

Heat Load	Supply Set Point Range	Return Set Point Range	Remarks
1. Finned Tube Baseboard	120–180°F (48.5–82°C)	101–147°F (38–63.5°C)	Default
2. Fan Coil	140–180°F (60–82°C)	116–147°F (46.5–63.5°C)	
3. Cast Iron Baseboard	100–170°F (37.5–76.5°C)	86–139°F (30–59°C)	
4. Low Mass Radiant	80–140°F (26.5–60°C)	70–116°F (21–46.5°C)	
5. High Mass Radiant	80–120°F (26.5–48.5°C)	70–101°F (21–38°C)	
6. Radiators	120–170°F (48.5–76.5°C)	101–139°F (38–59°C)	
7. Custom	104–180°F (40–82°C)	86–149°F (30–65°C)	User-defined

Heat loads 1-6 show the preset temperature ranges based on the load type selected, while heat load 7 provides a custom temperature range. When the custom temperature range is in use, the boiler operates based on the user–defined "Absolute Min" and Absolute Max" temperature settings.

** Available only when "2. Outdoor Reset ON/OFF" is set to "Enabled".

*** The boost interval time may be set to prevent interruption in space heating while using the Outdoor Reset Control mode, due to changes in heat load conditions. With the boost interval time enabled, the boiler increases the space heating supply temperature by 9°F (5°C) and the return temperature by 5°F (3°C) after a set time elapses.

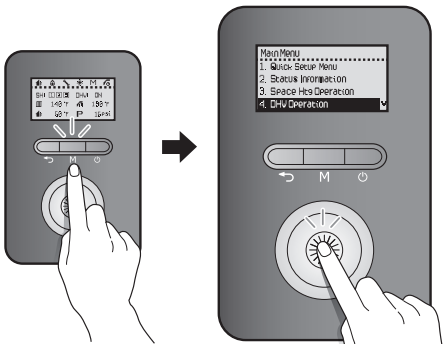
CAUTION

An outdoor sensor error may occur if the Outdoor Reset Control mode is enabled without the outdoor sensor installed

Note In the Outdoor Reset Control mode, the boiler's water temperature is regulated according to the outdoor temperature to maximize boiler efficiency and reduce energy usage. This mode must remain enabled and the outdoor sensor must be installed to comply with federal efficiency regulations. The Outdoor Reset mode cannot be used when using the DHW mode.

4.8.4 Setting the DHW Operation

To set the boiler's DHW operation, press the Menu button (M), and then select "4. DHW Operation".



Rotate the Command dial (⊛) to switch between the list items or to increase/decrease setting values. Press the Command dial (⊛) to select an item or to confirm after making changes.

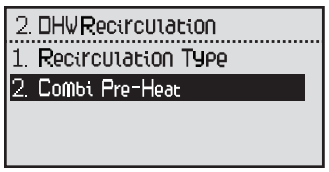
Press the Back button (⮌) to return to the previous screen or menu.

Item	Description
1. DHW Set Temp	Set the hot water temperature(°F). • Setting range: 86 - 140°F (30 - 60°C) • Default: 122°F (50°C)
2. DHW Recirculation	When only one NFC boiler is connected: Set the Recirculation type and Schedule settings (if there is only one boiler). • Recirculation type - No Recirculation - Combi Pre-Heat - External **Note** Depending on the recirculation type, you can select combi pre-heat or external recirculation. When the cascade system is installed: Set the Recirculation On/Off, Recirculation type, and Schedule settings. • Recirculation On/Off (Default: ON (Use)) - OFF (Not in Use): Recirculation - ON (Use): Recirculation • Recirculation type (Default: Always On) - Always On - Weekly - Aquastat - Manual **Note** You can only select external recirculation when using the Cascade system.

When installing only one NFC boiler, refer to "3.6.4 System Application - Air Handler System" and Chapters 3.6.6, 3.6.7 in the Installation & Operation Manual on connecting system applications.

Combi Pre-Heat

When using the combi pre-heat feature, you can choose commands in the menu to preheat according to the set DHW temperature.



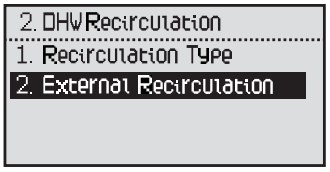
Item	Description
1. Always on	Set to repeat DHW Recirculation (default).
2. Intelligent*	Set to detect DHW usage for a week and repeat the detected cycle.
3. Weekly*	The user can choose commands for DHW Recirculation on a weekly basis. 1. 1 Day: schedule a command for the week. 2. 3 Day: schedule commands for Weekdays, Saturdays, and Sundays. 3. 7 Day: schedule commands for each day of the week.

* To choose this option you must set up the Time settings in the Configuration menu.

Note If there is a SH Demand signal during combi pre-heat, the space heating will take priority.

External Recirculation

When using the External Recirculation feature, you can choose commands in the menu to preheat according to the set DHW temperature.



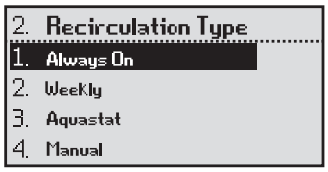
Item	Description
1. Always on	Set to repeat DHW Recirculation.
2. Intelligent*	Set to detect DHW use for a week and repeat the detected cycle.
3. Weekly*	The user can choose commands for DHW Recirculation on a weekly basis. 1. 1 Day: schedule a command for the week. 2. 3 Day: schedule commands for Weekdays, Saturdays, and Sundays. 3. 7 Day: schedule commands for each day of the week.
4. Aquastat	Set to use an aquastat for DHW Recirculation.
5. HotButton (Manual)	Set to use additional installations (HotButton) for Recirculation.

* To choose this option you must set up the Time settings in the Configuration menu.

Note If there is a SH Demand signal during external recirculation, pre-heating will take priority, and space heating will start afterwards.

When Installing the Cascade System

When using the recirculation feature in the cascade system , you can choose commands in the menu to preheat according to the set DHW temperature. (Refer to "8.2 Cascade System - Recirculation System Application Example" in the Installation & Operation Manual for details on installing.)

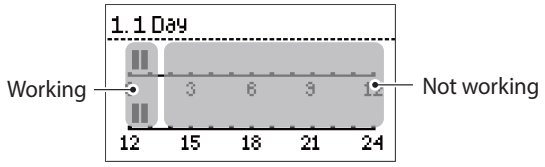


Item	Description
1. Always on	Set to repeat DHW Recirculation (default).
2. Weekly*	The user can choose commands for DHW Recirculation on a weekly basis. 1. 1 Day: Schedule a command for the week. 2. 3 Day: Schedule commands for Weekdays, Saturdays, and Sundays. 3. 7 Day: Schedule commands for each day of the week.
4. Aquastat	Set to use an aquastat for DHW Recirculation.
5. Manual	Set to use additional installations (HotButton, On-demand kits) for Recirculation.

* To choose this option you must set up the Time setting in the Configuration menu.

Set the Weekly Schedule

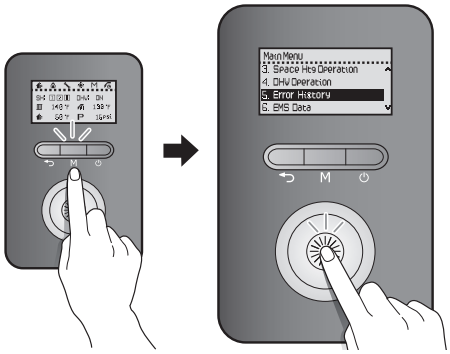
When setting up the Weekly option, select 'Weekly,' and select between 1 Day, 3 Day, and 7 Day to go to the Schedule menu.



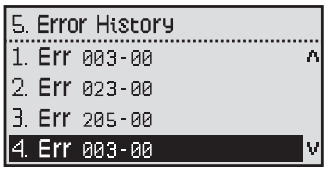
Rotate the Command Dial (⊛) to choose the scheduled time. You can choose the time in 30 minutes intervals. To finalize the weekly schedule settings, press and hold the Command dial (⊛) for more than 2 seconds.

4.8.5 Viewing Error History

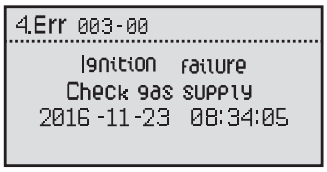
To view the error history, press the Menu button (M), and then select "5. Error History".



A list of 10 recent errors are displayed on the screen, with the most recent error displayed at the top of the list.



Rotate the Command dial (⊛) to switch between the list of errors. Press the Command dial (⊛) to select an error to view detailed information.



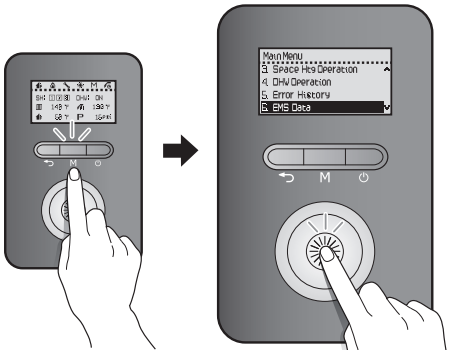
Press the Back button (⮌) to return to the previous screen or menu.

Note

- The front panel display flashes in red and the error icon is displayed (flashing) when a level 1 error is detected. You can press the Command dial (⊛) to enter error display mode. Boiler operation is maintained during a level 1 error.
- A level 1 error is automatically cleared when the problem is resolved.
- You can press the power button to clear a level1 error. Then the error is cleared if the problem has been resolved.

4.8.6 Viewing Other System Information

To view the miscellaneous system information, press the Menu button (M), and then select "6. EMS Data".



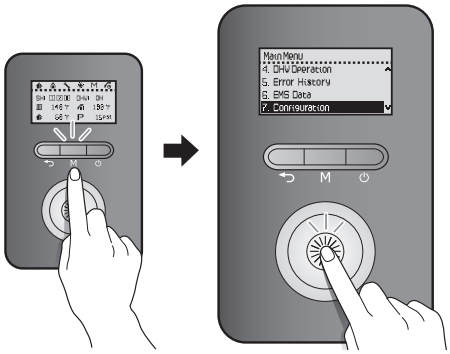
Rotate the Command dial (⊛) to switch between the information items. Press the Command dial (⊛) to select an item and view the information.

Press the Back button (⮌) to return to the previous screen or menu.

Item	Description
1. SH Operation Time	View monthly space heating operation logs.
2. DHW Operation Time	View monthly DHW operation logs.
3. Gas Consumption	View monthly gas consumption.

4.8.7 Setting the Display Options

To set the front panel display options, press the Menu button (M), and then select "7. Configuration".



Rotate the Command dial (⊛) to switch between the list items or to increase/decrease setting values. Press the Command dial (⊛) to select an item or to confirm after making changes.

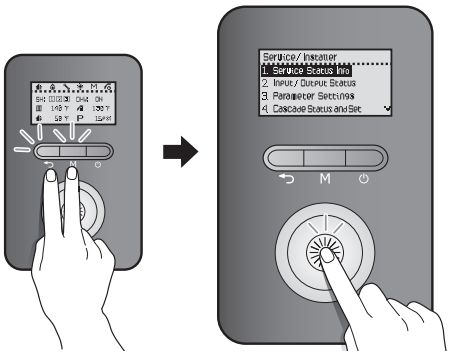
Press the Back button (⮌) to return to the previous screen or menu.

Item	Description
1. Language	Select a display language. 1. English 2. French • Default: English
2. °C/°F Setting	Select a temperature unit. 1. Celsius (°C) 2. Fahrenheit (°F) • Default: Fahrenheit (°F)
3. PSI/BAR Setting	Select a water pressure unit. 1. PSI 2. BAR • Default : PSI
4. Time Setting	Set the system clock (RTC). • Display format: YYYY.MM.DD / HH:MM:SS
5. Backlight Time Setting	Set the Backlight On time. • Setting range: 0 – 60 sec • Default: 2 sec

4.9 Accessing Advanced Menu Items

4.9.1 Viewing Service Information

To view service information about the boiler, press the Back button (⮌) and the Menu button (M) simultaneously for 3 seconds, and then select "1.Service Status Info".



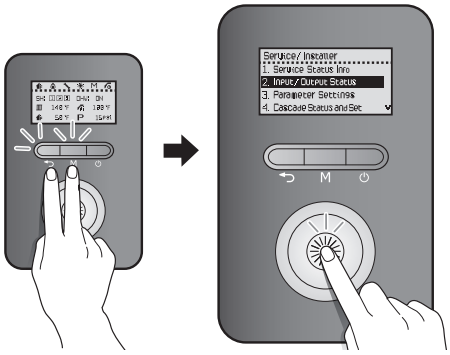
Rotate the Command dial (⊛) to switch between the information items. Press the Command dial (⊛) to select an item and view the information.

Press the Back button (⮌) to return to the previous screen or menu.

Item	Description
1. Elapsed Time After Install	Elapsed time since installation
2. HEX Overheat - No. of Times	Number of times the heat exchanger overheat protection has activated
3. Flame Loss - No. of Times	Number of times a flame loss/misfire has occurred
4. 2nd ignition - No. of Times	Number of second ignition attempts
5. 3rd ignition - No. of Times	Number of third ignition attempts
6. 4th ignition - No. of Times	Number of fourth ignition attempts
7. 5 ~10th ignition - No. of Times	Number of tenth ignition attempts
8. Δ T Limit - No. of times	Number of times supply return temperature limit control has activated.
9. Supply Limit - No. of times	Number of times Recirculation supply temperature limit control has activated.
10. Δ T High - No. of times	Number of times combustion stopped due to supply return temperature.

4.9.2 Viewing Input and Output Status

To view the boiler's input and output status, press the Back button (⮌) and the Menu button (M) simultaneously for 3 seconds, and then select "2. Input/Output Status".



Rotate the Command dial (⊛) to switch between the information items. Press the Command dial (⊛) to select an item and view the information.

Press the Back button (⮌) to return to the previous screen or menu.

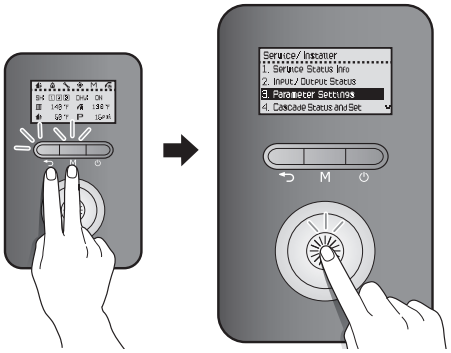
Item	Description
1. SH1 Themostat Status	Space heating thermostat 1 input status
2. SH2 Themostat Status	Space heating thermostat 2 input status
3. SH3 Themostat Status	Space heating thermostat 3 input status
4. Recirc. Input Status	External Recirculation thermostat input status
5. Boiler Pump Status	Boiler pump output status
6. Zone1 Pump Status	Zone 1 pump output status
7. Zone2 Pump Status	Zone 2 pump output status
8. Zone3 Pump Status	Zone 3 pump output status
9. 3 way V/V Status	3 way V/V output status
10. Fill Valve Status	AWS V/V output status
11. Ext Recirc. Pump Status	External Recirculation pump output status
12. HTL Input Status	HTL input status
13. Dual Venturi Status	Dual Venturi output status
14. LWCO Input Status	LWCO input status
15. Air Handler Interface Output Status	Air Handler Interface output status

4.9.3 Setting the Operation Parameters

To set the boiler's operation parameters, press the Back button (⮌) and the Menu button (M) simultaneously for 3 seconds, and then select "3. Parameter Settings".

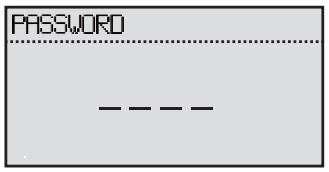
⚠ CAUTION

Parameters must be set by a qualified professional with an extensive understanding of the boiler system. Setting parameters improperly may lead to property damage or injury.



In the password screen, rotate the Command dial (⊛) to change numbers and places, and press the Command dial (⊛) to enter the password.

The factory default password is "1234".



After entering the parameter setting screen, rotate the Command dial (⊛) to switch between the parameters or to increase/ decrease setting values. Press the Command dial (⊛) to select a parameter or to confirm after making changes.

Press the Back button (⮌) to return to the previous screen or menu.

Item	Description
1. Supply MIN Set-point	Set the space heating supply minimum temperature. • Setting range: 77°F (25°C) – [MAX Set-point – 36°F (20°C)] • Default: 104°F (40°C)
2. Supply MAX Set-point	Set the space heating supply maximum temperature. • Setting range: [MIN Set-point + 36°F (20°C)] – 194°F (90°C) • Default: 180°F (82°C)
3. Return MIN Set-point	Set the space heating return minimum temperature. • Setting range: 68°F (20°C) – [MAX Set-point – 18°F (10°C)] • Default: 86°F (30°C)
4. Return MAX Set-point	Set the space heating return maximum temperature. • Setting range: [MIN Set-point + 18°F (10°C)] – 158°F (70°C) • Default: 149°F (65°C)
5. SH Burner Off Diff	Set the temperature range to turn off space heating. • Setting range: 2°F (1°C) – 54°F (30°C) • Default: 4°F (2°C)
6. SH Burner On Diff	Set the temperature range to turn on space heating. • Setting range: - 2°F (1°C) – 54°F (30°C) • Default: 5°F (3°C)
7. SH Min Limit	Set space heating minimum heat capacity limit. • Setting range: Space heating Min capacity (%) – [space heating min capacity limit -20]) % • Default: Boiler's minimum heat capacity
8. SH Max Limit	Set space heating maximum heat capacity limit. • Setting range: (Space heating Min capacity limit +20) % – 100% • Default: 100%
9. SH Min Burning Time	Set the low-load combustion time at initial operation. • Setting range: 1 – 20 min • Default: 1 min
10. Burning Acceleration Time	Set the time to reach the maximum space heating capacity after initial operation. • Setting range: 0 – 20 min • Default: 1 min
11. Anti Fast Cycling Time*	Set the anti-fast cycling time. • Setting range: 0 – 20 min • Default: 3 min
12. DHW Min Limit	Set the DHW supply minimum temperature. • Setting range: DHW minimum capacity (%) – [DHW MAX capacity limit - 20] % • Default: Boiler's minimum heat capacity
13. DHW Max Limit	Set the DHW supply maximum temperature. • Setting range: [DHW Min capacity limit + 20] % – 100% • Default: 100%
14. Freeze protection	Set the pump freeze protection temperature. • Setting range: 43°F (6°C) – 50°F (10°C) • Default: 50°F (10°C) **Note** The system freeze protection temperature is set based on the pump freeze protection temperature.
15. Auto-Fill Pressure	Set the Auto-Fill Pressure. • Setting range: 12 - 50 psi • Default: 12 psi
16. High Sys Pressure	Set the high system water pressure. • Setting range: 40 – 80 psi • Default: 50 psi
17. Boiler Pump Delay**	Set the space heating pump over-run time. • Setting range: 3 – 40 min • Default: 40 min

Item	Description
18. DHW Wait Time	Set the DHW wait time. • Setting range: 0 – 20 min • Default: 3 min
19. Recirc. Interval Time	Set the recirculation or HotButton operation time. • Setting range: 1 – 120 min • Default: 20 min
20. Recirc. Sampling Time	Set the recirculation interval time. • Setting range: 1 – 120 min • Default: 30 min
21. Recirc. Off Diff. Temp	Set the temperature range to turn off recirculation or HotButton operation. • Setting range: 5°F (3°C) – 54°F (30°C) • Default: 9°F (5°C)
22. Fixture Dist. (HotButton)	Set On-Demand recirculation to activate according to pipe length when HotButton is installed, and Thermal Bypass and external surface thermometer is disabled. • Setting range: 15 ft (4.5 m) – 660 ft (198 m) (5 ft (1.5 m)intervals) • Default: 30 ft (9 m)
23. Service Notif Time	Set the time for service notification. • Setting range: 30 – 3650 days (10 years) • It can be set in 10 day increments. • Default: 1820 days (5 years)
24. Service Notif Cycl	Set the service notification according to the operating times. • Setting range: 300 – 36500 cycles • It can be set in 100 cycle increments. • Default: 18200 cycles
25. Service contact #	View the service contact information.
26. Factory Reset	Initialize all parameter settings (panel and main controller) to factory default.
27. P/W Change	Change the parameter setting password. Rotate the Command dial (⊛) to change numbers and places, and press the Command dial (⊛) to save the new password.

Note

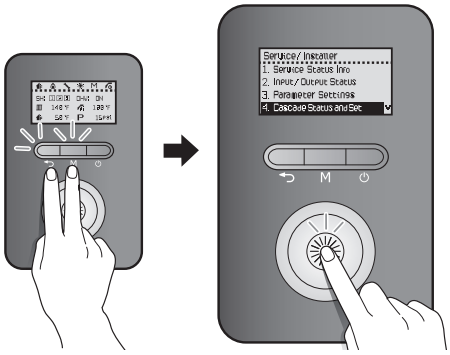
- If you enter an incorrect password 10 times or no input from the front panel display for 5 minutes, the boiler will return to Normal mode.
- To return to the previous mode, press the Reset button.
- The Factory default password is "1234".
- If you make no inputs for 10 seconds in the Parameter Edit mode, the current parameter value will be saved automatically.
- Press and hold the Back button (⮌) in Parameter Edit mode for 5 seconds to reset individual parameters to their default values.
- When you reset one of the following parameters, the corresponding parameter will be reset automatically:
  - Supply Min or Max capacity limit
  - Return Min or Max capacity limit

* The anti-fast cycling time is the duration that the boiler stops its space heating operation when the space heating supply or return temperatures reach the set values for boiler operation stop temperatures. The boiler will not resume space heating until the duration elapses, even when the space heating supply or return temperatures return to within the set ranges.

**Boiler Pump Delay is the duration the circulation pump continues to run between the space heating supply or return temperature reaching the set point and the burner turning off. If the space heating supply or return temperature remains outside of the boiler operation temperature range for a set period, the pump stops for 10 mins, runs again for 5 mins, and then repeats the cycle.

4.9.4 Configuring a Cascade System

To view and configure the cascade settings, press the Back button (↩) and the Menu button (M) simultaneously for 3 seconds, and then select "4. Cascade Status and Set".



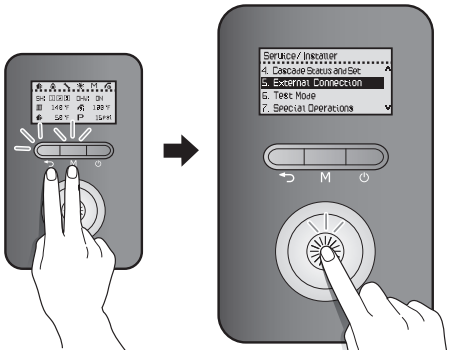
Rotate the Command dial (◎) to switch between the parameters or to increase/decrease setting values. Press the Command dial (◎) to select a parameter or to confirm after making changes.

Press the Back button (↩) to return to the previous screen or menu.

Item	Description
1. Cascade System Setting	• To enter the Cascade Main setting mode, select Start. • The setting mode is entered and the IDs of all boilers that can communicate with the Main via the RS485 communication line are initialized. • The boilers whose IDs are initialized by the Main are set to <Sub setting mode>, if you press the OK button for 2 seconds or more, the Main gives you the ID and it is displayed on the screen. • The Main periodically checks the RS485 communication, and when there is an ID request from the Sub, the ID is sequentially incremented and added to the Sub (1 to 16). • Select OK in the Main to complete the cascade setting, and the Main and the assigned Sub IDs will return to <Normal operation mode> and turn into CASCADE ON state. At this time, the Main icon on the Main panel lights up. • If the cascade setting is idle for more than 1 hour, it returns to <Normal operation mode> and reverts to CASCADE OFF state automatically.
2. Cascade System Removal	Select this option on the Main unit of a cascade system to end cascade operation. • Enter Cascade system setting mode to reassign IDs and begin a cascade system again. • If a Sub unit has a network communication problem, select this option on the Sub unit to exclude the individual unit from the cascade system.
3. Cascade Init-operation Unit	Set the initial number of activated boilers. • Setting range: 0 – 16 • Default: 0
4. Cascade Protocol	Set the cascade protocol. • NPE or NR • Default : NPE
5. Number of Oper-Unit	The number of units currently operating in the cascade system.
6. Cascade Info.	View the operating status of individual units in the cascade system.
7. Vent Type Setting	Set the type of ventilation. • Default: Common vent

4.9.5 Setting the External Connection (for NaviLink)

To view and configure the external network connection, press the Back button (⮌) and the Menu button (M) simultaneously for 3 seconds, and then select "5. External Connection".



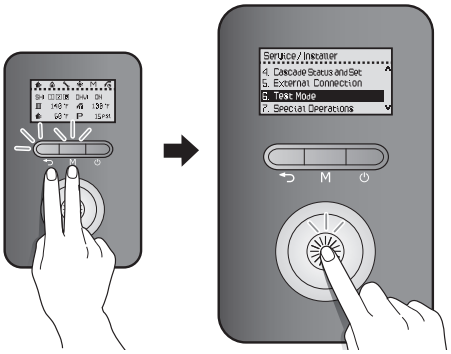
Rotate the Command dial (⊛) to switch between the parameters or to increase/decrease setting values. Press the Command dial (⊛) to select a parameter or to confirm after making changes.

Press the Back button (⮌) to return to the previous screen or menu.

Item	Description
1. NaviLink Connect	Turn on or turn off the remote control capabilities via the NaviLink connection. • Setting range: On/Off • Default: Off

4.9.6 Diagnosing the Boiler System

To run a series of test procedures for a system diagnosis, press the Back button (⮌) and the Menu button (M) simultaneously for 3 seconds, and then select "6. Test Mode".



Rotate the Command dial (⊛) to switch between the test procedures. Press the Command dial (⊛) to run a test procedure.

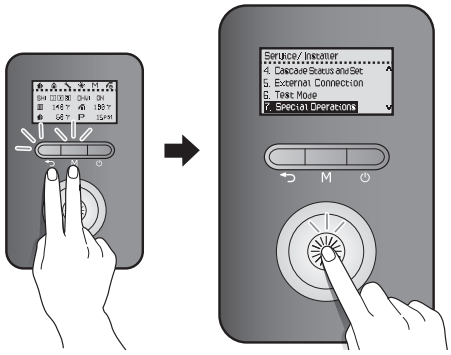
Press the Back button (⮌) to return to the previous screen or menu.

Item	Description
1. Fan Motor	Test the fan operation by manually changing the fan speed. • From a stopped state, the fan speed gradually increases and reaches the top speed, and then the fan speed decreases until the fan stops operating. • Rotate the Command dial (⊛) to run or stop the fan test.
2. Boiler Pump	Test the boiler pump operation. • The boiler pump is turned on as soon as you enter the test mode. • Press the Command dial (⊛) to toggle the pump operation (On -> Off / Off -> On).
3. Zone 1 Pump	Test the Zone 1 pump operation. • The Zone 1 pump is turned on as soon as you enter the test mode. • Press the Command dial (⊛) to toggle the pump operation (On -> Off / Off -> On).

Item	Description
4. Zone 2 Pump	Test the zone 2 pump operation. • The zone 2 pump is turned on as soon as you enter the test mode. • Press the Command dial (⊛) to toggle the pump operation (On -> Off / Off -> On). • This option is available only when the "Zone Pump System" is active.
5. Zone 3 Pump	Test the Zone 3 pump operation. • The Zone 3 pump is turned on as soon as you enter the test mode. • Press the Command dial (⊛) to toggle the pump operation (On -> Off / Off -> On).
6. 3 Way Valve Output	Test the 3 Way valve operation. • The 3 Way valve is turned on as soon as you enter the test mode. • Press the Command dial (⊛) to toggle the valve operation (On -> Off / Off -> On).
7. Flow Control Valve Output	Test the Flow control valve operation. Rotate the valve from its current position to fully open (0%), then fully closed (100%) and then back to the starting position while checking feedback. • Display of the valve close ratio % • Display of "FEEDBACK" when detecting the feedback
8. Mixing Valve Output	Test the Mixing valve operation. Rotate the valve from its current position to fully open (0%), then fully closed (100%) and then back to the starting position while checking feedback. • Display of the valve close ratio % • Display of "FEEDBACK" when detecting the feedback
9. Dual Venturi	Test the dual venturi operation. • The dual venturi is turned on as soon as you enter the test mode. • Press the Command dial (⊛) to toggle the dual venturi operation (On -> Off / Off -> On).
10. Recirc. Pump	Test the recirculation pump. • The recirculation pump is turned on as soon as you enter the test mode. • Press the Command dial (⊛) to toggle the recirculation pump (On -> Off / Off -> On).

4.9.7 Setting the Special Operation Modes

To operate the boiler in special operation modes, press the Back button (↩) and the Menu button (M) simultaneously for 3 seconds, and then select "7. Special Operations".



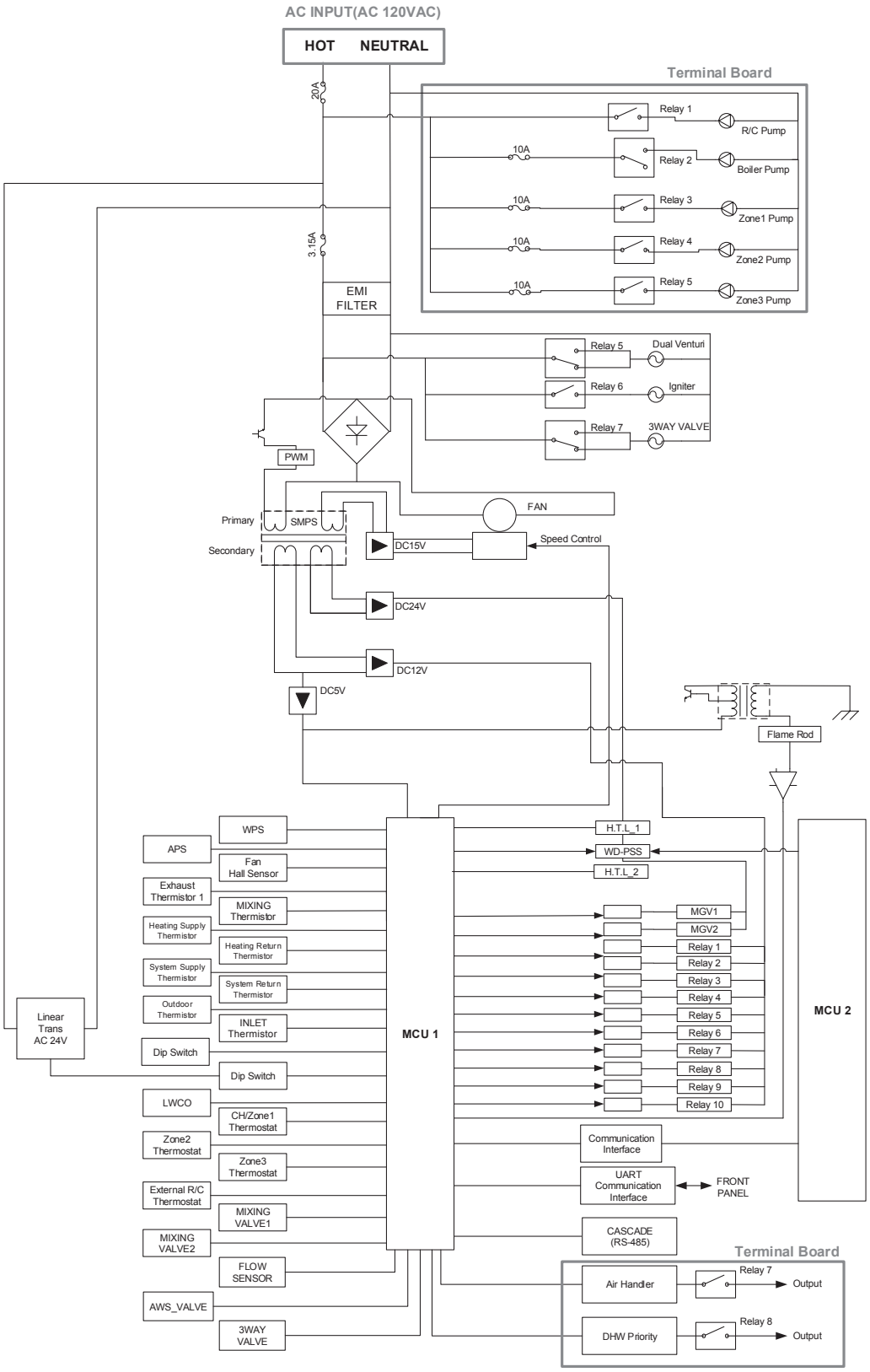
Rotate the Command dial (⊛) to switch between the operation modes. Press the Command dial (⊛) to select an operation mode.

The boiler resumes operation in normal operation mode if no input is detected for 3 hours.

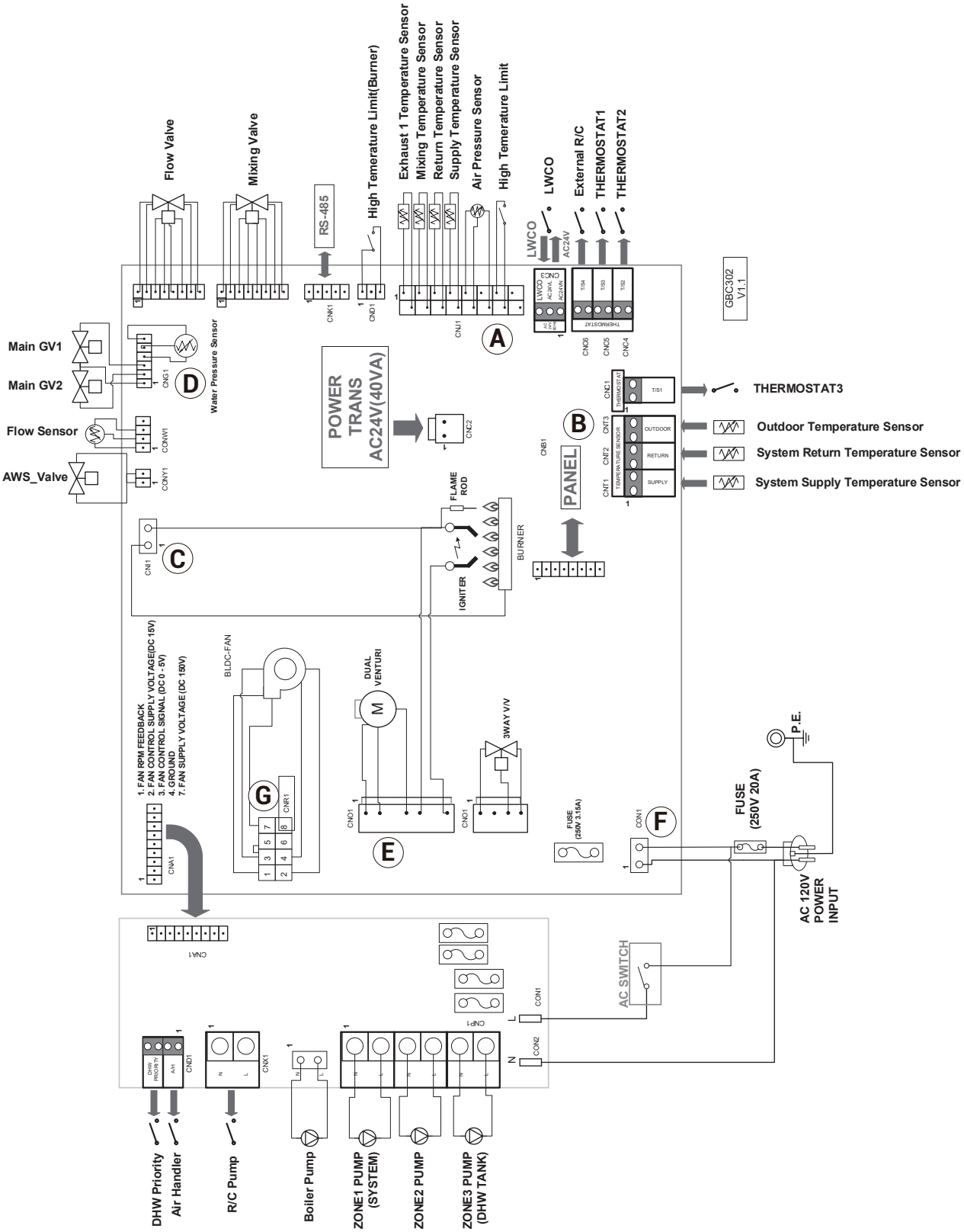
Press the Back button (↩) to return to the previous screen or menu.

Item	Description
1. Normal	Set the boiler to run in Normal operation mode.
2. 1st MIN	Set the boiler to run in 1st stage minimum operation mode.
3. DHW 1st MAX	Set the boiler to run in DHW 1st maximum operation mode.
4. 2nd MIN	Set the boiler to run in 2nd stage minimum operation mode.
5. DHW 2nd MAX	Set the boiler to run in DHW 2nd maximum operation mode.
6. SH 1st MAX	Set the boiler to run in SH 1st maximum operation mode.
7. SH 2nd MAX	Set the boiler to run in SH 2nd maximum operation mode.

4.10 Ladder Diagram



4.11 Wiring Diagram

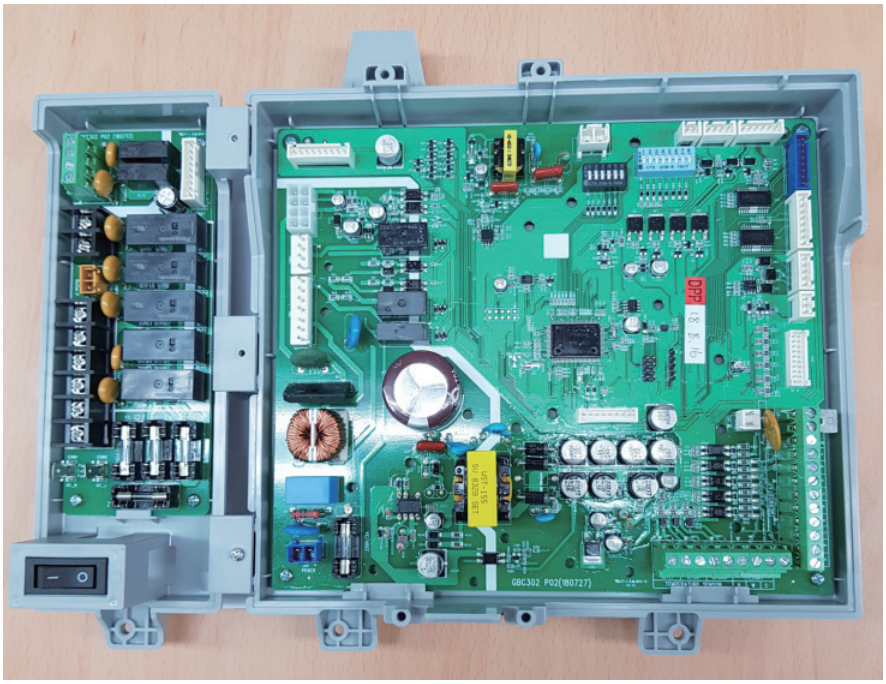


Point	Function	CN No.	Wire Color	Normal Value	Check
A	Exhaust Thermistor	CNJ1 1-2	BLUE-BLUE	DC 0-5V	Voltage changes according to temperature
	Heating Return Temperature Sensor	CNJ1 5-6	BLUE-BLUE	DC 0-5V	Voltage changes according to temperature
	Heating Supply Temperature Sensor	CNJ1 7-8	BLUE-BLUE	DC 0-5V	Voltage changes according to temperature
	High Temperature Limit Switch	CNJ1 13-14	BLACK-BLACK	DC 0V	Normally Shorted. Confirm RMS voltage
	APS	CNJ1 9-10-12	RED-BLACK-WHITE	DC 5V	
B	Outdoor Thermostat	CNT3	BLUE-BLUE	DC 0-5V	Voltage changes according to temperature
C	Flame Rod	CNI1 2	BLACK	DC 10uA	Measure the current when the burner is operating.
	Ground Wire	CNI1 1	GREEN / YELLOW		Check for properly grounded wire
D	Water Pressure Sensor	CNG1 4-5-6	RED-BLACK	DC 0-5V	
	Gas Valve	CNG1 2-3	WHITE-YELLOW	DC 22-24V	Confirm voltage as the Main Gas Valve 1 is operating.
		CNG1 1-2	WHITE-RED	DC 22-24V	Confirm voltage as the Main Gas Valve 2 is operating.
E	Dual Venturi	CNO1 1-2-4	BROWN-BLACK-BLUE	ON : AC 95-120V OFF : 0V	Confirm voltage relative to operation
	Igniter	CNO1 5-7	BLUE-BROWN	ON : AC 97-138V OFF : 0V	Confirm voltage when the unit is igniting.
F	Power Input	CON1 1-2	WHITE-BLACK	AC 97-138V	Confirm appropriate power source. Confirm the fuse. Confirm the circuit breaker
G	Fan Motor	CNR1 4-7	BLACK-RED	DC 127-184V	Confirm steady voltage
		CNR1 2-4	BLACK-YELLOW	DC 15V	Confirm steady voltage
		CNR1 3-4	BLACK-ORANGE	DC 0-7.5V	Voltage changes relative to fan operation
		CNR1 1-4	BLACK-WHITE	0-6,700rpm	Check pulse

4.12 Key Components Description

4.12.1 PCB

Part	Check Point
Function	Controls each component and monitors the overall performance of the unit.
Failure Event	Malfunctioning PCB.
Effects	A component may not operate within the unit and could produce an error code. In most cases of PCB failure, the whole unit will not operate until the problem is resolved.
Error Code	E515, E615
Diagnostic	Visual inspection: Check wire connections are secure and inspect for wire damage, and/or PCB heat damage.
Color / Number of wires	Refer to page 50-51

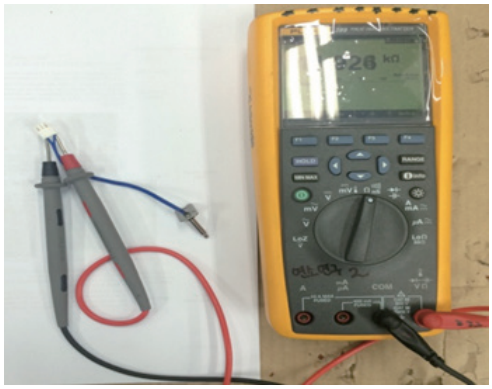


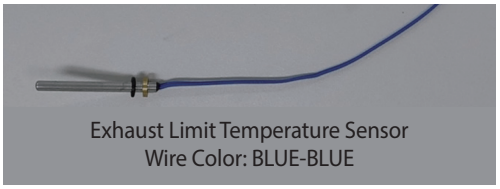
4.12.2 High Limit Switch

Part	Check Point
Function	1. Overheat prevention switch. 2. If the unit detects extremely high temperatures, it will automatically trip and shut down the unit. 3. Excessively high water temperatures (more than 230 °F or 110 °C) in heat exchanger will activate the high limit switch.
Failure Event	Unable to detect excessively high water temperature if switch fails.
Effects	Unable to shut down the boiler if the water temperature from the heat exchanger exceeds 230 °F (110 °C).
Error Code	E016, E046
Diagnostic	1. Visual inspection: Check wire connections are secure. 2. Resistance check: Check range of resistance shown below.
Testing/inspection information	Resistance range: < 1.0 Ω

4.12.3 Thermistor

Part	Check Point
Function	Measure Hot water, Cold water, Space heating outlet and inlet temperatures in the boiler.
Failure Event	Unable to properly measure water temperature within the boiler.
Effects	1. If any of the thermistors fail, an error code appears before starting operation. 2. If resistance values are off, the boiler will produce temperature fluctuations in hot water.
Error Code	E047, E205, E218, E278, E279
Diagnostic	1. Visual inspection: Check wire connections are secure. 2. Check the resistance of the sensor (Stop operating and lower the temperature before checking).
Testing/inspection information	Resistance range : Please refer to the table below





Check if the hot water temperature sensor is open (Error type : MΩ Open)

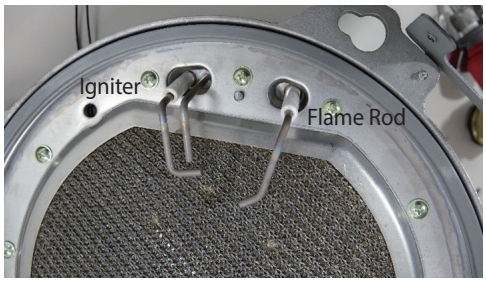
Temp(°F)	Thermistor(kΩ)	Exhaust Limit Temperature Sensor(kΩ)
32~40	17.9~25.4	113.6~180.7
40~50	14.5~20.3	89.2~139.5
50~60	11.4~16.4	67.5~108.5
60~70	9.4~12.8	51.5~81.1
70~80	7.5~10.4	41.5~61.3
80~90	6~8.2	32.2~48.9
90~100	5.1~6.6	26.3~37.6
100~110	4.1~5.7	20.83~30.4

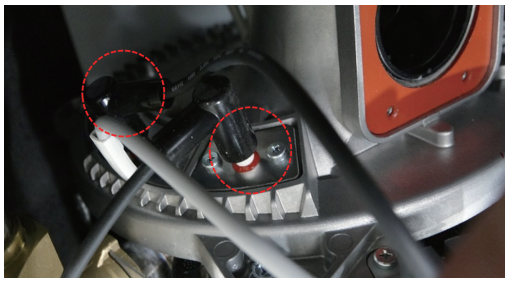
4.12.4 Fan Motor

Part	Check Point
Function	Provides combustion air into the burner and purges exhaust flue gas. Maintains the gas input with a long vent run, the fan operates with APS for ideal combustion.
Failure Event	1. Fan speed failure: the fan RPM is around 0 RPM. 2. The fan assembly screw is loose and/or the fan is disassembled. 3. Disconnected or defective fan connection terminal assembly.
Effects	1. Unstable combustion condition. 2. Unit vibrating and noise. 3. The boiler is not operating properly.
Error Code	E109, E110
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	• Black-Red: DC 127 V ~ 184 V • Black-Yellow: DC 15 V • Black-Orange: DC 0 ~ 7.5 V • Black-White: 0 ~ 6,700 RPM
	

4.12.5 Flame Rod Assembly

Part	Check Point
Function	Continuously discharges a high voltage spark to the main burner until gas ignites.
Failure Event	1. Unable to ignite during the ignition process. 2. Produces multiple unsuccessful attempts to ignite.
Effects	1. The unit cannot ignite during the ignition process and "E003" or "E004" error codes will display. 2. Durability of the igniter wears down
Error Code	E003, E004, E012
Diagnostic	Visual inspection: Check wire connections are secure.
Testing/inspection information	BLACK: 0~10 uA



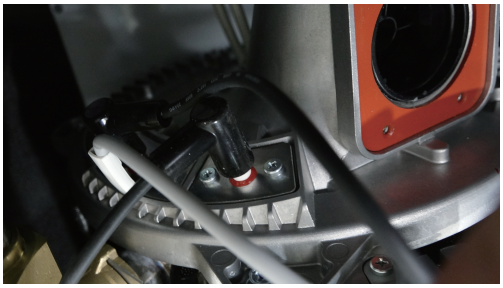


Ignite gap distance : 3.5~4.5mm (1/8")

4.12.6 Ignition Transformer

Part	Check Point
Function	Continuously provides a high voltage to flame rod until gas ignites.
Failure Event	1. Unable to ignite during the ignition process. 2. Produces multiple unsuccessful attempts to ignite.
Effects	1. The unit cannot ignite during the ignition process and "E003" or "E004" error codes will display. 2. Durability of the igniter wears down.
Error Code	E003, E004
Diagnostic	1. Visual inspection: Check wire connections are secure. 2. Voltage check: Check range of voltage shown below.
Testing/inspection information	Blue • On : AC 97 ~ 138 V • Off : 0 V

Input Voltage	Output Voltage	Output Current
AC 120 V, 60 Hz	19 kV ±3 kV	11 mA (min.)

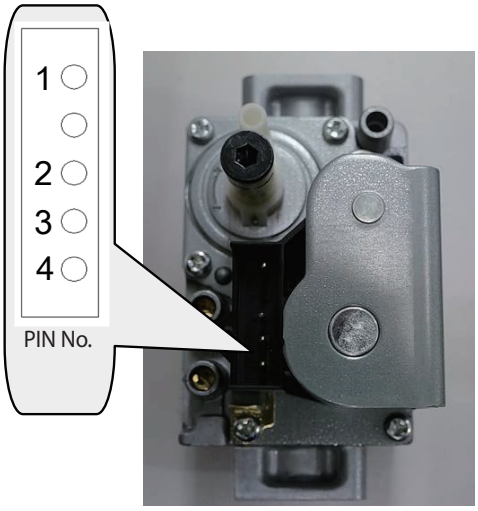


4.12.7 APS

Part	Check Point
Function	Detects the air pressure in the combustion system.
Failure Event	1. Combustion noise occurs. 2. Imperfect and/or abnormal flame occurs. 3. Occurs when APS does not detect proper voltage.
Effects	1. The boiler is not operating. 2. Produces excessive carbon monoxide emissions.
Error Code	E110
Diagnostic	1. Visual inspection: Check wire connections are secure. 2. Voltage check: Check range of voltage shown below. 3. Check the exhaust duct for obstruction or blockages. 4. Check the condensate trap and drain piping for obstruction or blockages. 5. Check for decreased hot water output.
Color / Number of wires	• RED-BLACK: DC 5 V • WHITE-BLACK: DC 0.3 ~ 4.5 V
	

4.12.8 Main Gas Valve

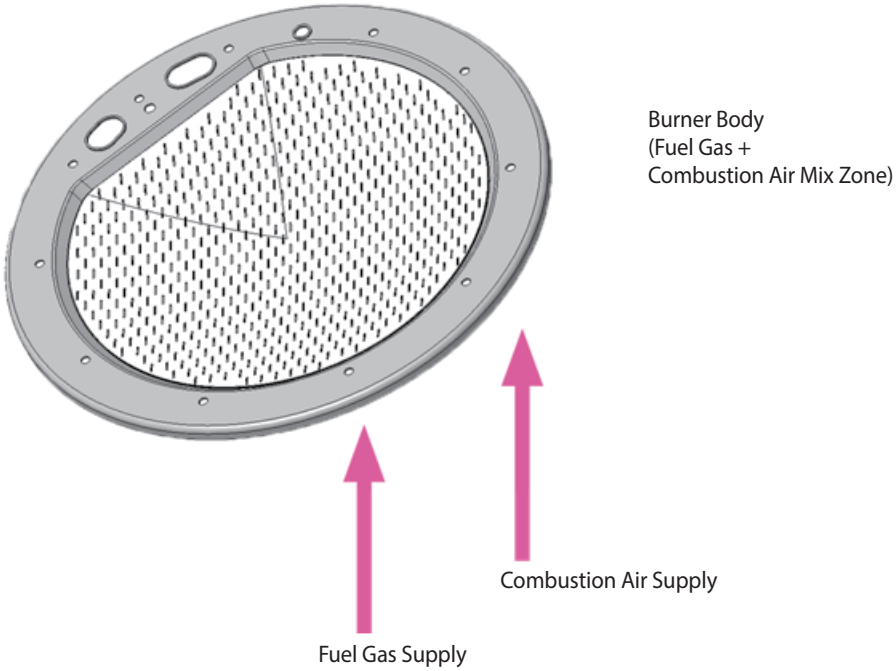
Part	Check Point
Function	1. To control the amount of gas supplied to the burner based on fan speed. 2. When the unit experiences abnormal combustion, it shuts off the gas valve automatically and prevents unsafe situations.
Failure Event	Unable to open/close
Effects	1. No flames. 2. No operation of the unit.
Error Code	E003, E012
Diagnostic	1. Visual inspection: Check wire connections are secure. 2. Check if the solenoid valve of Main Gas Valve works properly. • Resistance check: Check range of resistance shown below. • Voltage check: Check range of voltage shown below.
Color / Number of wires	• RED-WHITE / Connector Pin No. 1&3 : over 100-1000 Ω • RED-YELLOW / Connector Pin No. 3&4 : over 100-1000 Ω



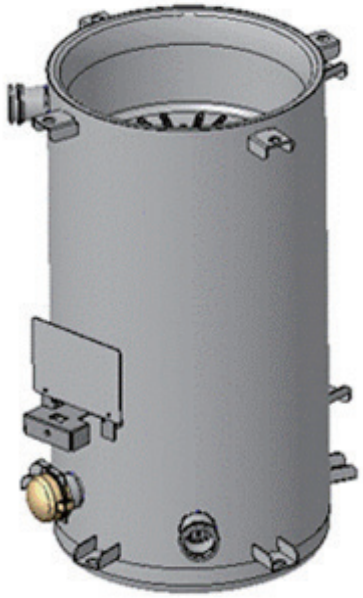
Resistance range : 100~1,000 Ω

4.12.9 Burner

Part	Check Point
Function	1. Pre-Mix system reduces emissions and increase efficiency. 2. The burner facilitates the air/gas mixture necessary to produce the proper heat during combustion.
Failure Event	1. Unable to initialize/sustain combustion. 2. Dust or soot deposit on the burner surface 3. Possible gas leakage from burners.
Effects	1. Abnormal combustion. 2. Unstable flame conditions and/or flame loss. 3. Ignition failure.
Error Code	E003, E004, E012
Diagnostic	Visual inspection: Excessive deposits on the burner surface and/or unstable flame conditions during operation.



4.12.10 Heat Exchanger Assembly

Part	Check Point
Function	1. Main part for heat transfer from the burner. 2. There are multiple paths of water pipes on the heat exchanger surface as well as inside the combustion chamber which 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 the heat exchanger to boil due to possible scale formation.
Effects	1. Exhaust gas leakage. 2. Excessive heating of the water that produces boiling noises.
Error Code	E016, E030, E047
Diagnostic	1. Visual inspection: Check if there is a crack on the surface of heat exchanger. 2. Sound inspection: Check if boiling occurs inside the unit.
Color / Number of wires	N / A
	

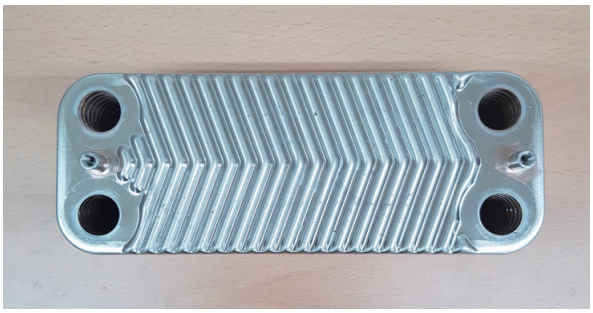
4.12.11 Water Pressure Sensor

Part	Check Point
Function	Detects water pressure in the heating system.
Failure Event	Unable to detect or measure changes in water pressure.
Effects	1. No operation of the unit. 2. Pressure readings are abnormal.
Error Code	E302, E352, E353
Diagnostic	1. Visual inspection: Check the water pressure sensor connection wire. 2. Voltage check: Check range of voltage shown below.
Testing/inspection information	Black-Red : DC 0~5V
	

4.12.12 Dual Venturi

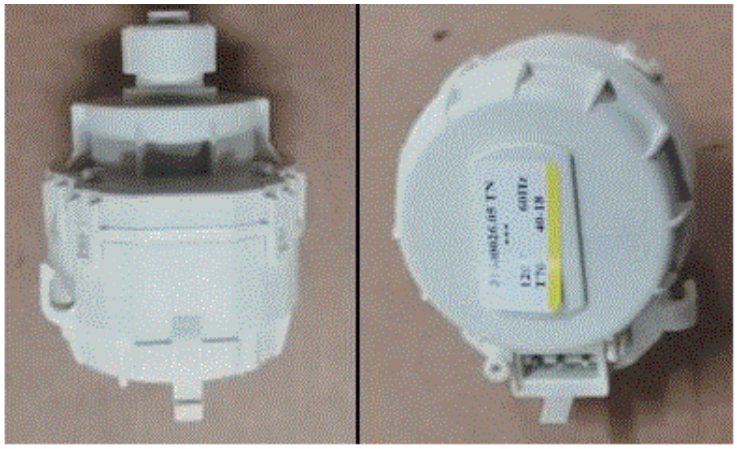
Part	Check Point
Function	Controls the amount of mixed gas to modulate heating input. It uses synchronous motor to control the amount of mixed gas by stage 1 and 2.
Failure Event	1. Blade not closing 2. Blade not opening 3. Gas plunger does not disengage.
Effects	1. Frequent On / Off due to excessive heat 2. Fail to reach the set temperature due to lack of heat 3. Loss of flame during higher modulation stage 2 operation
Error Code	E012, E060
Diagnostic	1. Voltage check : Checking the voltage of synchronous motor (Approximately after 2 sec of Open / Close operation, the motor turns off.) 2. Checking operation in MIN2
	

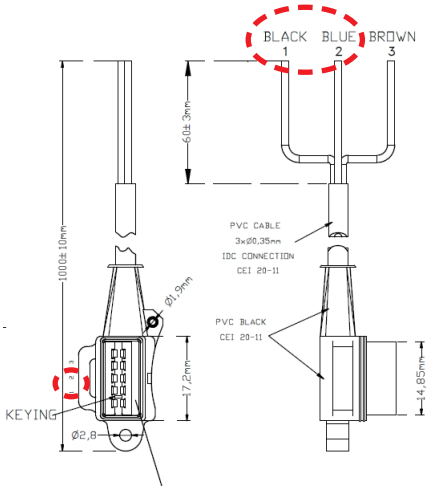
4.12.13 DHW Heat Exchanger

Part	Check Point
Function	Water heated in the primary/secondary heat exchanger is circulated to the plate heat exchanger, where the heat of hot water and tap water are exchanged so that hot water is available.
Failure Event	1. Water leakage through a crack. 2. Improper heat transfer can cause the heat exchanger to produce cold water.
Effects	Temperature fluctuations in the hot water outlet and/or leakage.
Error Code	E016, E030, E353
Diagnostic	The plate heat exchanger filters out impurities within the space heating pipes to prevent heating problems caused by impurities. The leak in plate heat exchanger will cause pressure in the space heating side to increase to tap water pressure level.
	

4.12.14 3-Way Valve

Part	Check Point
Function	Divert the water from the space heating system to the DHW plate heat exchanger and back based on input from DHW flow sensor and PCB.
Failure Event	1. No hot water in the space heating mode. 2. No domestic hot water in the DHW mode.
Effects	In the case that the temperature of space heating is lower than the set temperature, the water flow path for domestic hot water will start blocking so that heating water can flow through space heating pipes.
Error Code	E016
Diagnostic	1. Visual inspection: Check the 3-Way Valve connection wire. 2. Voltage check: Check range of voltage shown below.
Color/Number of wires	Black(1)-Blue(2) : ON 102-138 V, OFF 0V * Confirm voltage as the 3-Way Valve operating





5. Troubleshooting

5.1 Error code classification

Classification	Error Code	Error Level	Function	Self-diagnostic / Action
Combustion System	E001	3 2	Overheating of heat exchanger	Manual RESET Auto RESET
	E003	3	Ignition failure	Manual RESET
	E004	2	False flame detection	Auto RESET
	E012	3	Flame loss	Manual RESET
	E016	3	Overheating of heat exchanger	Manual RESET
	E030	3 1	Exhaust Overheat: exhaust limit switch shuts down the unit when the flue temperature exceeds 230°F(110°C) for more than 10 seconds.	Manual RESET Alarm
	E031	3	Overheating of burner	Manual RESET
	E046	2	Abnormal heat exchanger thermistor	Auto RESET
	E047	3 2	Abnormal exhaust thermistor	Manual RESET Auto RESET
	E060	1	Abnormal Dual Venturi Limit Switch	Auto RESET
	E407	-	Abnormal Hot water outlet 1 sensor (After mixing valve)	-
	E421	-	Abnormal Cold water intake sensor	-
	E434	-	Abnormal operation: Water adjust valve	-
	E439	-	Abnormal operation: flow sensor	-
	E441	-	Hot water outlet 2 (before mixing valve)	-
	E445	-	Abnormal operation: Bypass mixing valve	-
	E480	-	Abnormal operation: water tank thermistor	Contact technical support at 1-800-519-8794.
Air supply System	E109	3	Abnormal FAN motor activity	Manual RESET
	E110	3	Exhaust blockage	Manual RESET
	-	-	Abnormal APS (open, short, initial value or no answer)	No error display
CH System	E205	2	Abnormal H / E outlet : thermistor open or short	Auto RESET
	E218	1	Abnormal H / E inlet : thermistor open or short	Alarm
	E278	1	Abnormal system supply thermistor	Alarm
	E279	1	Abnormal system return thermistor	Alarm
	E291	3	Supply / Return inversion limit	Manual RESET
Water supply System	E302	3	Abnormal water pressure (Low pressure)	Manual RESET
	E351	-	Abnormal Auto feeder valve	Manual RESET
	E352	2	Abnormal water pressure (High pressure)	Auto Reset
	E353	2	Abnormal water pressure sensor	Auto Reset

Classification	Error Code	Error Level	Function	Self-diagnostic / Action
Controller	E515	3	Abnormal PCB	Manual RESET
	E517	3	Abnormal DIP switch setting	Manual RESET
	E594	1	Abnormal communication in parts of PCB	Alarm
	E615	3	Abnormal input & memory	Manual RESET
Installation System	E736	1	Abnormal cascade communication	Alarm
	E740	1	Abnormal outdoor sensor	Alarm
	E777	2	Abnormal LWCO	Auto RESET
	E782	1	Abnormal Main-Panel communication	Alarm
	E784	1	Abnormal Zone controller communication	Alarm

5.2 Error code classification

Error Code	Sub Code	Function / Cause	Self-diagnostic / Action
E001	1 2	Overheating of Heat exchanger	1. Clean the strainer. 2. Check the pump for proper voltage from PCB(120VAC). 3. Check for proper flow rate and circulation(external) through the heating line. 4. Check the heat exchanger ; flush with a cleaning solution.
E003	0	Ignition failure	1. Check to see if the main gas supply valve is open. 2. Verify that gas pressure is within operating range. 3. Check gas system and orifice. 4. Check Dual Venturi for restrictions in the gas ports. 5. Check for proper DIP switch settings (see page 20). 6. Verify proper grounding and ground wire connections to PCB lower bracket.
E004	0	False flame detection	1. Ensure ground wire is connected. 2. Check the igniter for spark.
E012	0	Flame loss	1. Check the main gas line. (Is the valve open?) 2. Verify gas pressure is within operating range. 3. Check gas meter for proper BTU capacity. 4. Check flame rod and verify #14 value in the Status Information menu (see page 36). 5. Check intake air filter. 6. Check ground wire. 7. Check power supply. 8. Verify proper grounding and ground wire connections to PCB lower bracket. 9. Adjust anti-fast cycle time referring to #11 value in the Operation Parameters (see page 43).
E016	0	Overheating of heat exchanger	1. Turn OFF the system for at least 30 minutes then restart. 2. Ensure all valves and filters on the boiler loop are open and clean. 3. Check for proper DIP switch settings (see page 19-20) and PCB. 4. Check the heat exchanger; a flush may be necessary. 5. Verify that all air elimination devices are operational. Perform a manual air purge the heating piping.

Error Code	Sub Code	Function / Cause	Self-diagnostic / Action
E030	0	Exhaust Overheat : exhaust limit switch shuts down the unit when the flue temperature exceeds 230 °F (110 °C) for more than 10 minutes.	1. Turn OFF the system for at least 30 minutes then restart. 2. Ensure all valves and filters on the boiler loop are open and clean. 3. Check exhaust thermistor and verify #19 value in the Status Information menu (see page 36). 4. Check for proper DIP switch settings. 5. Check the heat exchanger; a flush may be necessary.
E031	0	Overheating of burner	Check the fuse of burner.
E046	2	Abnormal heat exchanger High Limit Switch (short)	1. Check heat exchanger High Limit Switch connection. 2. Check for proper connection to the PCB.
E047	1	Abnormal exhaust thermistor (open)	Check the exhaust thermistor connection. Check for proper connection to the PCB.
	2	Abnormal exhaust thermistor (short)	
E060	1	Abnormal Dual Venturi Limit Switch operation (ON)	Check the Dual Venturi connection. Test Dual Venturi for proper operation using TEST mode. Check gas orifice for obstructions.
	2	Abnormal Dual Venturi Limit Switch operation (Close OFF)	
	3	Abnormal Dual Venturi Limit Switch operation (Open ON)	
E407	-	Abnormal Hot water outlet 1 sensor (After mixing valve)	1. Check for disconnections between the Hot water outlet 1 sensor and the controller. 2. Check for any shortages in the Hot water outlet 1 sensor.
E421	-	Abnormal Cold water intake sensor	1. Check for disconnections between the Cold water intake sensor and the controller. 2. Check for any shortages in the Cold water intake sensor.
E434	-	Abnormal operation: Water adjust valve	1. Check for disconnections between the water adjust valve. 2. Check PCB voltage.
E439	-	Abnormal operation: flow sensor	1. Check for debris within the water adjust valve harness. 2. Check for disconnections in the flow sensor. 3. Check for flow sensor operation.
E441	-	Hot water outlet 2 (before mixing valve)	1. Check for disconnections between the mixing valve and controller harness. 2. Check PCB voltage.
E445	-	Abnormal operation: Bypass mixing valve	1. Check for disconnections between the bypass mixing valve and the harness. 2. Check for PCB voltage.
E109	0	Abnormal fan motor activity	1. Check and clean the intake air filter. 2. Check and clean the fan motor. 3. Check for proper voltage from PCB. Replace fan if PCB voltage is normal.

Error Code	Sub Code	Function / Cause	Self-diagnostic / Action
E110	1	Exhaust blockage (checking the FAN)	1. Check the exhaust pipe for obstructions. 2. Check and clean the intake air filter. 3. Remove exhaust pipe if possible to verify vent blockage. 4. Check the condensate trap and drain piping for obstruction or blockages.
	2	Exhaust blockage (Using hot water)	
	3	Exhaust blockage (using space heating)	
E205	1	Abnormal Heating supply thermistor (open)	1. Check the thermistor. 2. Check the pump connection.
	2	Abnormal Heating supply thermistor (short)	
E218	1	Abnormal Heating return thermistor (open)	Check the thermistor.
	2	Abnormal Heating return thermistor (short)	
E278	1	Abnormal operation: system supply thermistor (open)	Check the thermistor.
	2	Abnormal operation: system supply thermistor (short)	Check the thermistor.
E279	1	Abnormal operation: system return thermistor (open)	Check the thermistor.
	2	Abnormal operation: system return thermistor (short)	Check the thermistor.
E291	0	Supply / Return inversion limit	Check if the supply water outlet piping of heating piping and return inlet piping are mutually changed.
E302	0	Low water pressure	Check incoming water pressure and any activity at PRV.
E351	-	Abnormal Auto feeder valve	1. Check auto feeder valve voltage. 2. Check direct water supply filter. 3. Check for faults with the front panel voltage.
E352	0	High water pressure	Check incoming water pressure and any activity at PRV.
E353	1	Abnormal water pressure sensor (Open)	Check the water pressure sensor.
	2	Abnormal water pressure sensor (Short)	
E515	1-7	Abnormal internal communication of PCB	Check the PCB.
	8	Abnormal communication between PCB and Igniter	1. Check the PCB connection. 2. Check the Igniter.
	9	Abnormal communication between PCB and FAN	1. Check the PCB connection. 2. Check the Fan.
	10	Abnormal monitoring device of PCB	1. Check the PCB connection.
	11-12	Abnormal communication between PCB and Dual Venturi	1. Check the PCB connection. 2. Check the Dual Venturi.
E517	0	Abnormal DIP switch setting	Check the DIP switch settings on the PCB.
E594	0	Abnormal operation: EEPROM	Check the PCB.

Error Code	Sub Code	Function / Cause	Self-diagnostic / Action
E615	1	Abnormal input data from High limit switch of Heat Exchanger	Check the PCB.
	3	Abnormal input data from flame rod	1. Check the flame rod wiring connection. 2. Check the flame rod.
	4-5	Abnormal memory of PCB	Check the PCB.
E736	0	Abnormal cascade communication	1. Check the cascade wiring connection. 2. Check the PCB.
E740	1	Abnormal outdoor temperature sensor (Open) (appears only when the outdoor reset curve is enabled).	1. Ensure that the outdoor reset curve is configured properly. 2. Check the outdoor temperature sensor wiring connection.
	2	Abnormal outdoor temperature sensor (Short) (appears only when the outdoor reset curve is enabled).	
E777	0	Abnormal operation: LWCO (external device)	1. Check the LWCO wiring connection. 2. Ensure that the system water level is appropriate. 3. Add make-up water to the system if necessary. 4. Check for proper voltage from connector (24VAC).
E782	0	Abnormal Main-Panel communication	Check the PCB.
E784	0	Abnormal operation: zone controller communication (external device)	1. Check the zone controller wiring connection. 2. Check the zone controller PCB. 3. Check the Main and Panel PCB.

If any of the above solutions do not resolve the problem with the Boiler, contact Navien's Technical department at 1-800-519-8794.

There will be error codes displayed on the front panel and recorded on the PCB board (within the unit) of any problems or failures that occur with the Boiler.

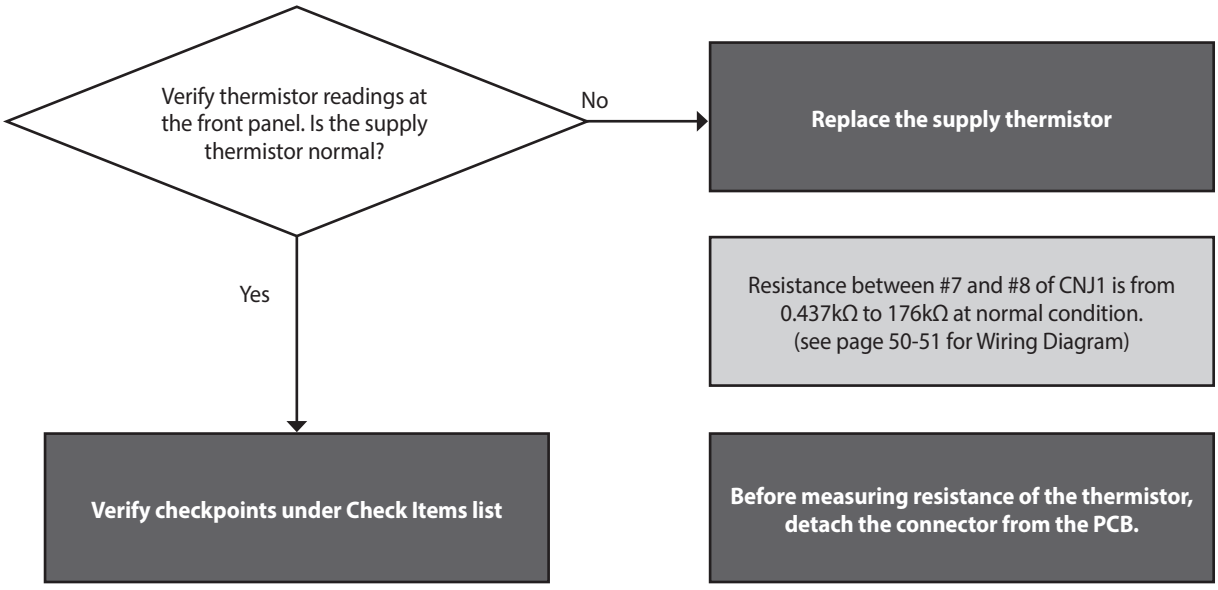
IMPORTANT

To reset the Boiler, either press the [Reset] button on the front panel or disconnect, then reconnect electrical power to the boiler.

5.2.1 001Error

Error occurrence conditions and check items

Error	Description
E001 Overheating of Heat Exchanger	1. In order to prevent boiling in the heat exchanger, if the space heating water temperature is higher than 216°F(102°C), E001 will be displayed on the front panel. 2. If the space heating water temperature decreases below than 216°F(102°C), E001 will be automatically reset and the unit will repeat the combustion cycle. 3. If overheating occurs three (3) times consecutively, E001 will be displayed and must be manually reset.
Check items	1. Check the circulation pump (external) operating status. Run Pump Test Mode. 2. Check if the strainer of the heating piping is clogged. 3. Check if the main heat exchanger is clogged. 4. Check the heating inlet / outlet valve and distribution piping for any obstructions. 5. Check the PCB DIP S / W capacity setting. 6. Check if the PCB is operating properly.



Check method

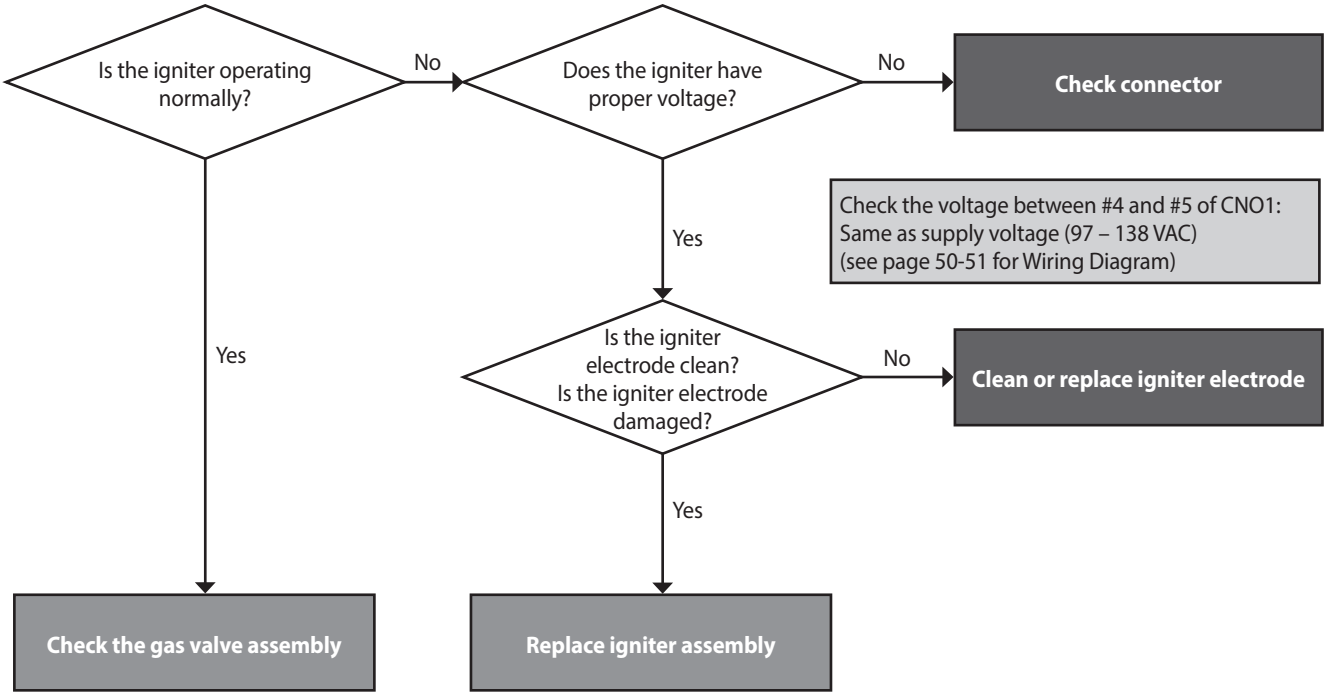
<table>
<tr><th>Failure mode</th><th>Cause</th><th>Check method</th></tr>
<tr><td rowspan="4">Abnormal circulation</td><td>Defective circulation pump(external)</td><td>If the unit is in error condition, the circulation pump and fan run continuously.
In the event the unit is not in error condition, enter Test mode for the connection (see page 43, Diagnosing the Boiler System).</td></tr>
<tr><td>The heating strainer is clogged</td><td>1. Check if the strainer is clogged with debris.
2. Check the cause of debris if the strainer is clogged (Aluminium distributor oxidized steel, etc.)</td></tr>
<tr><td>The main heat exchanger is clogged.</td><td>Separate the inlet / outlet pipe from the main heat exchanger, and blow air through the heat exchanger to check if the pipe is clogged.</td></tr>
<tr><td>Valve closed</td><td>Check heating inlet / outlet valve and heating manifold piping.
At least one valve on the heating manifold must always be open.</td></tr>
<tr><td rowspan="2">Other potential issues</td><td>Capacity setting</td><td>Sudden increase of temperature due to PCB DIP S / W model setting error or max setting.
<table>
<tr><th rowspan="2">Capacity</th><th colspan="2">DIP S / W No.</th></tr>
<tr><th>1-5</th><th>1-6</th></tr>
<tr><td>175,000 BTU (NFC-175)</td><td>ON</td><td>OFF</td></tr>
<tr><td>199,000 BTU (NFC-200)</td><td>OFF</td><td>OFF</td></tr>
</table></td></tr>
<tr><td>Defective PCB</td><td>If the trouble continues despite the checking of above items, replace the PCB.</td></tr>
</table>

5.2.2 003Error

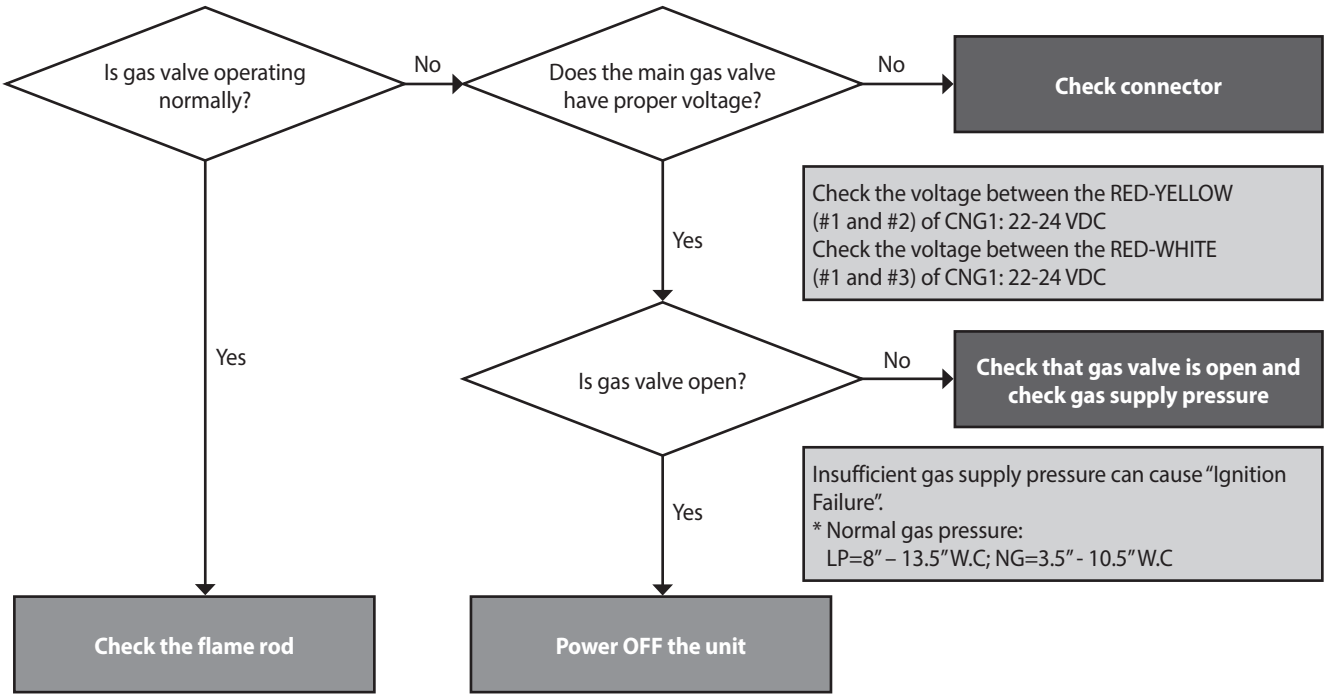
Error occurrence conditions and check items

Error	Description
E003 Ignition failure	In the case of an ignition failure, the boiler will attempt ignition 10 times. If no flame is detected, the system displays the error message 003E (manually cleared) on the Front Panel.
Check items	1. Check if the gas supply valve is open and use a manometer to verify proper supply pressure. 2. Check the electrode gap, electricity discharge, or deformation of the flame rod. 3. Check the operation of the ignition transformer (ignition state, input power (AC 120 V). 4. Check the operation of the gas control valve (DC 22~24 V, coil short circuit, solenoid valve). 5. Check the flame rod, wiring and grounding. 6. Check if the air pressure hose is broken or clogged. 7. Check if the air pressure sensor works properly. 8. Check the PCB DIP switch settings. 9. Adjust the offset pressure (see page 29-30). 10. Check the gas orifice plate for the proper gas type. 11. Check the flue and air supply for any collected water (for vertical vent installations). 12. If the issues continue despite checking the items above, replace the PCB.

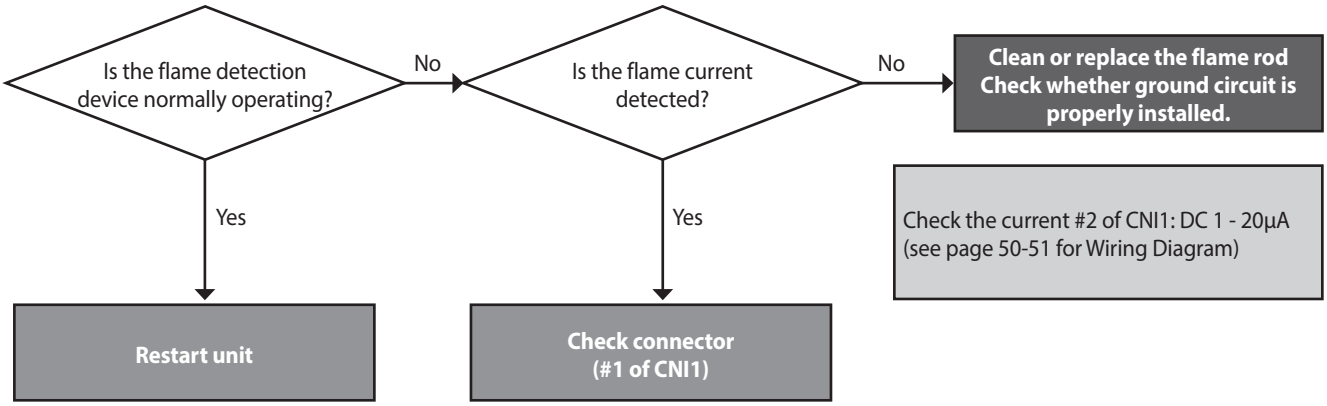
Scenario1



Scenario2

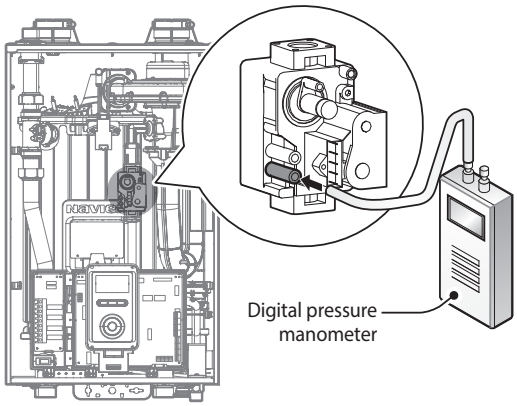


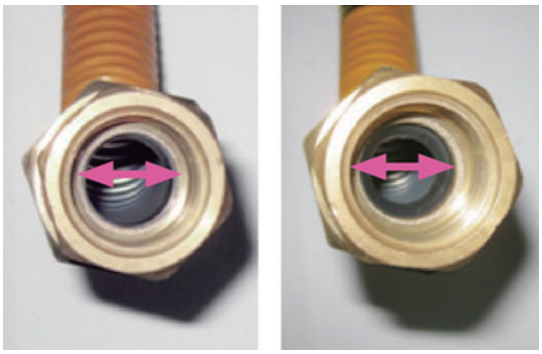
Scenario3

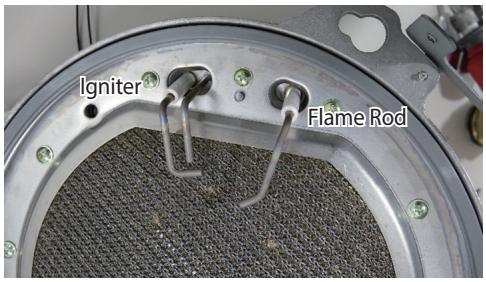


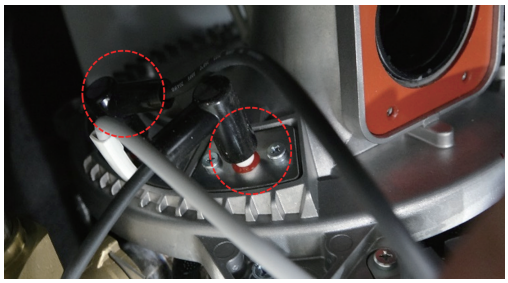
Access the Status Information menu to check Item #14 for Flame State (see page 36).

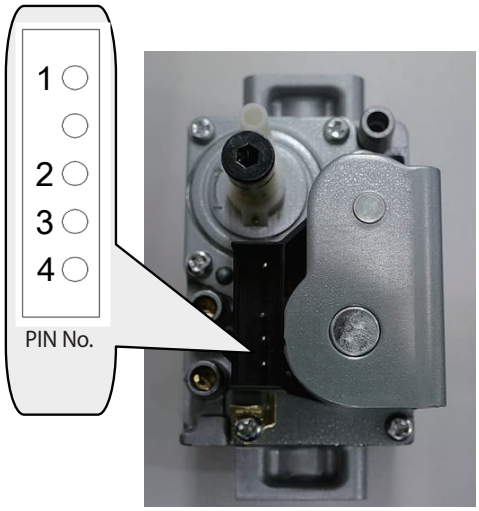
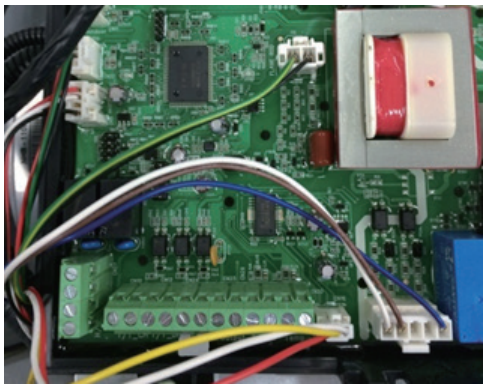
Check method

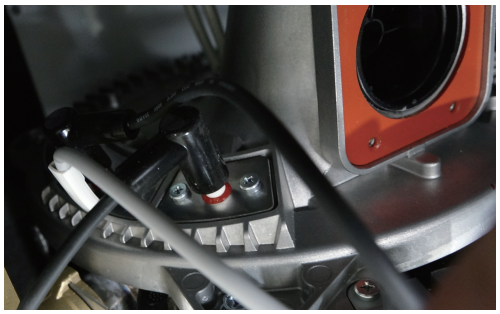
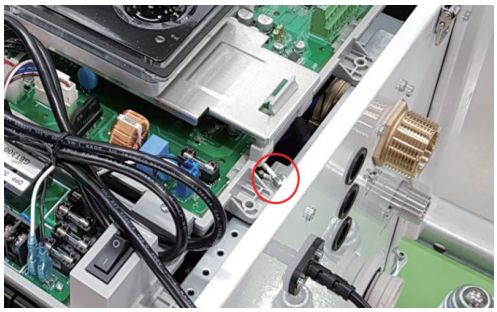
<table>
<tr><th>Failure mode</th><th>Cause</th><th>Check method</th></tr>
<tr><td rowspan="3">Ignition failure</td><td>Gas supply error</td><td>1. Check if the main gas valve is open.
2. Check the gas supply pressure.
• NG: 3.5″ - 10.5″W.C, LP: 8″ – 13.5″W.C
• LP pressure drop occurs frequently in the winter.
3. Check the flexible pipe diameter for compatibility with the boiler.
4. While the static pressure is normal, the use of another gas appliance may cause a possible drop in gas pressure to the unit. Therefore, it is required to check the dynamic pressure.
• Static pressure: Check the gas pressure at standby mode.
• Dynamic pressure: Check the gas pressure at max combustion. (2nd stage MAX combustion setting: DIP S / W 1-1 ON)
5. If a CSST connector has been used, check to ensure that it is not been over tightened resulting in the seal obstructing gas flow.
6. Check the meter class. (Example)
• Gas meter Boiler Furnace Domestic gas stove
• 425 CFH (Gas Meter) ≥ 195 CFH (Boiler)+ 58.8 CFH (Furnace) + 63.7 CFH (Domestic gas stove)
CFH = 1,020 BTU/h</td></tr>
<tr><td colspan="2"> 

Check gas supply pressure (refer to page 21).
 
A shifted seal narrows the inner diameter of CSST connector</td></tr>
<tr><td>Defective electrode gap and shape</td><td>Defective electrode gap and shape disables ignition.
• Appropriate electrode gap: approx. 3~4mm(1/8″) (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><th>Failure mode</th><th>Cause</th><th>Check method</th></tr>
<tr><td rowspan="3">Ignition failure</td><td colspan="2"> 


Ignite gap distance : 3.5~4.5mm (1/8″)</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 burner.
• Ensure that the insulating gasket is installed between the electrode and burner casing.
• Check the input power to the ignition transformer (AC 96 ~ 138 V).
• If there is sufficient power to the ignition transformer, replace the ignition transformer.
• Replace the PCB if there is no power or insufficient power supplied to the ignition transformer.
• Check the insulator boots on the spark wires for cracks / holes.</td></tr>
<tr><td colspan="2"> 
Ignition transformer</td></tr>
</table>

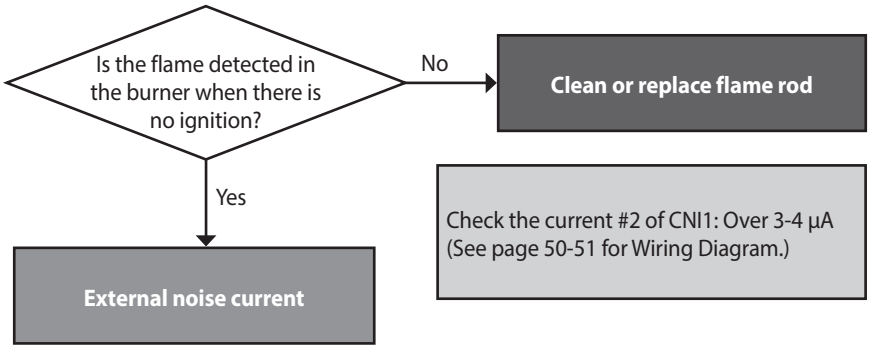
Failure mode	Cause	Check method
Ignition failure	Main gas valve	1. Check the primary/secondary power supply to the main gas valve. • Check, with a multi-meter, between the RED-YELLOW and WHITE-RED wires to verify that the input power is DC 22-24V. 2. Replace the PCB if power is not supplied. 3. If power supply is normal, check if the coil is open. • Check the resistance. 4. Check if the solenoid valve works properly. • Feel or hear a click.
		 Check if the coil is open (Proper resistance range : 100~1,000 Ω)  Check the voltage of the solenoid valve / Red-Yellow, White-Red

<table>
<tr><th>Failure mode</th><th>Cause</th><th>Check method</th></tr>
<tr><td rowspan="2">Repeated ignition-out</td><td>Flame sensing error</td><td>1. Check the location of the flame, if there is any deformation or foreign substance, repair or replace the part.
2. Check the flame rod wire for proper connection and/or damage.
3. Check the grounding to the boiler case to verify proper grounding at the outlet.
• If the ground wire is improperly connected or not making a good connection, remove and reattach the ground wire ensuring good contact with the case.
• Or use a multi-meter to measure the flame sensing current (normally over 3~4 μA).</td></tr>
<tr><td colspan="2"> 
Measuring flame current
 
Grounding wire position</td></tr>
<tr><td>Flame loss and noise occurs at ignition</td><td>Check if there are any blockages in the gas orifice plate.</td><td>Ignition failure will occur if the gas orifices are clogged.
• Remove the gas inlet pipe and check the orifice plate.</td></tr>
<tr><td>Improper intake air supply</td><td>Rainwater intrusion</td><td>Check if rainwater has collected inside the unit from an improperly installed air intake pipe.</td></tr>
<tr><td>Other trouble</td><td>Defective PCB</td><td>If the issue continues despite checking above items, replace the PCB.</td></tr>
</table>

5.2.3 004Error

Error occurrence conditions and check items

Error	Description
E004 False-flame detection	1. Pre ignition false-flame If a flame signal is detected continuously for 3 seconds before combustion (stand-by, pre-purge, pre-ignition), a false-flame error 004E (automatically cleared) is displayed on the front panel and the system performs continuous post-purge and operates the pump. 2. Post purge false-flame If a flame signal is detected continuously for 3 seconds when the system performs post-purge as fuel supply is stopped, a false-flame error 004E (automatically cleared) is displayed on the front panel and the system performs continuous post-purge and operates the pump.
Check items	1. Check if gas leaks due to defective seals on the main gas valve. 2. Check if proper spark is discharged from the electrode. 3. Check if gas is supplied within the proper pressure range. 4. Check the PCB and replace if defective.



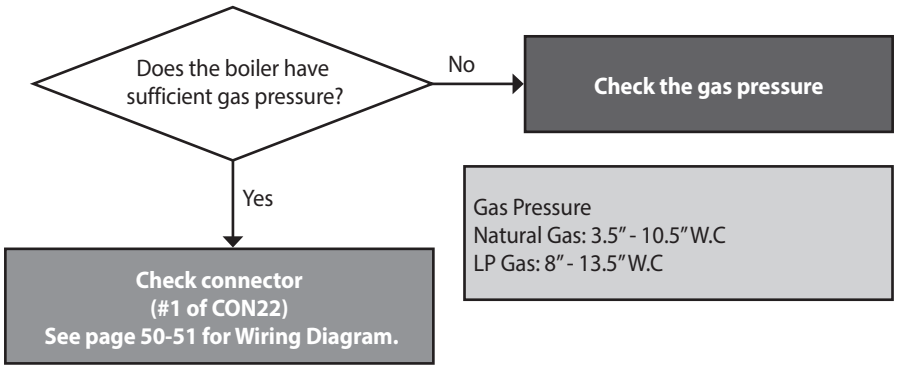
Check method

Failure mode	Cause	Check method
Flame before / after combustion	Leakage from main gas valve	Replace the gas valve 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.
	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: 3.5″ - 10.5″W.C, LP: 8″ - 13.5″W.C • If the gas pressure is too high, notify the gas supplier about the issue, and if necessary, replace the gas valve. • If there is a gas leak, close the gas supply valve and repair the unit before using the system.
Other trouble	Defective PCB	If the issue continues despite the checking of items above, replace the PCB.

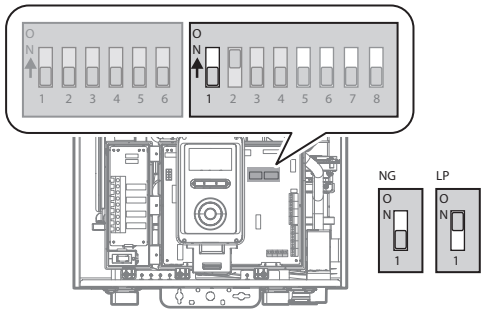
5.2.4 012Error

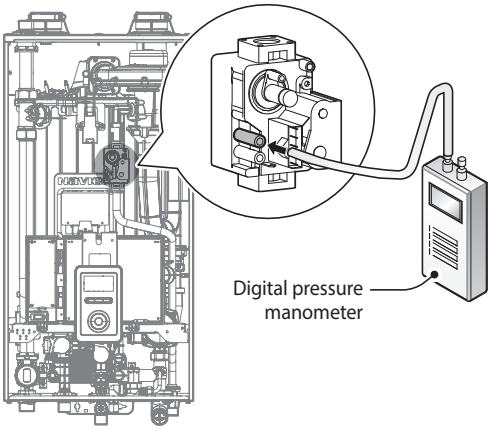
Error occurrence conditions and check items

Error	Description
E012 Flame loss	If the system detects loss of flame during combustion, the system stops supplying fuel, attempts to restart, counts the incidents of flame loss, and if the incident occurs 20 times consecutively displays 012E (manually cleared) on the front panel.
Check items	1. Measure, with a manometer the gas supply pressure (NG: 3.5″ - 10.5″W.C, LP: 8″ - 13.5″W.C). 2. Check the gas meter capacity. 3. Check if the gas orifice is clogged. 4. Check if the PCB is working properly. 5. Check the offset of the gas control valve and CO2.



Check method

Fault	Possible Causes	Check method
Flame loss and noise occurs after ignition	Low gas supply pressure	1. Check if a gas valve is opened or not. 2. Check the gas supply pressure. • NG: 3.5″ - 10.5″W.C, LP: 8″ - 13.5″W.C • LP pressure drop occurs frequently in the winter. 3. While the static pressure is normal, the use of another gas appliance may cause a possible drop in gas pressure to the unit. Therefore, it is required to check the dynamic pressure. 4. Check the static pressure at stand by. Check the dynamic pressure at MAX combustion (2nd stage MAX combustion setting: DIP S / W 1-1 ON). 5. Check the gas pipe connector. • If a CSST connector has been used, check to ensure that it is not been over tightened resulting in the seal obstructing gas flow. 6. Check the gas meter capacity. (Example) • Gas meter Boiler Furnace Domestic gas stove 425 CFH (Gas Meter) ≥ 195 CFH (Boiler)+ 58.8 CFH (Furnace) + 63.7 CFH (Domestic gas stove) CFH = 1,020 BTU/h 7. If too much pressure is exerted on the nut component while installing the gas pipe may reduce the gas supply due to packing push-out and Teflon blockage, etc.
Flame loss and noise occurs after ignition	PCB DIP switch setting error	Check the PCB DIP switch settings (refer to page 20). 
	Offset pressure adjustment error	Low fire (1-stage Min) offset adjustment error • Use the Front Panel to set the unit at “1st MIN” (refer to page 48). • Open the offset pressure port on the gas valve and connect a manometer. Use the positive pressure side on a dual port manometer. • Adjust the offset pressure by turning the adjustment screw on the gas valve with a 5/32″ or 4mm Allen wrench, if the pressure value is out of range.

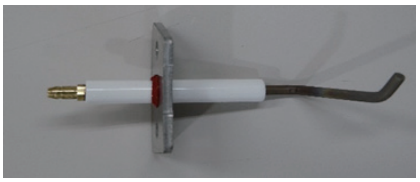
<table>
<tr><th>Fault</th><th>Possible Causes</th><th>Check method</th></tr>
<tr><td rowspan="4">Flame loss and noise occurs after ignition</td><td colspan="2"> 

Check the offset values for Min fire

<table>
<tr><th>Model</th><th>Altitude</th><th>Kit Part No.</th><th>Gas Type</th><th>Offset</th></tr>
<tr><td rowspan="3">NFC-175
NFC-200</td><td>0-5,399 ft</td><td>NAC-N200</td><td rowspan="2">NG</td><td rowspan="2">-0.04 in
±0.01 in</td></tr>
<tr><td>5,400-10,100 ft</td><td>NAC-NCH200</td></tr>
<tr><td>0-10,100 ft</td><td>NAC-LC200</td><td>LP</td><td>-0.02 in
±0.01 in</td></tr>
</table>

Offset value for low fire</td></tr>
<tr><td colspan="2">

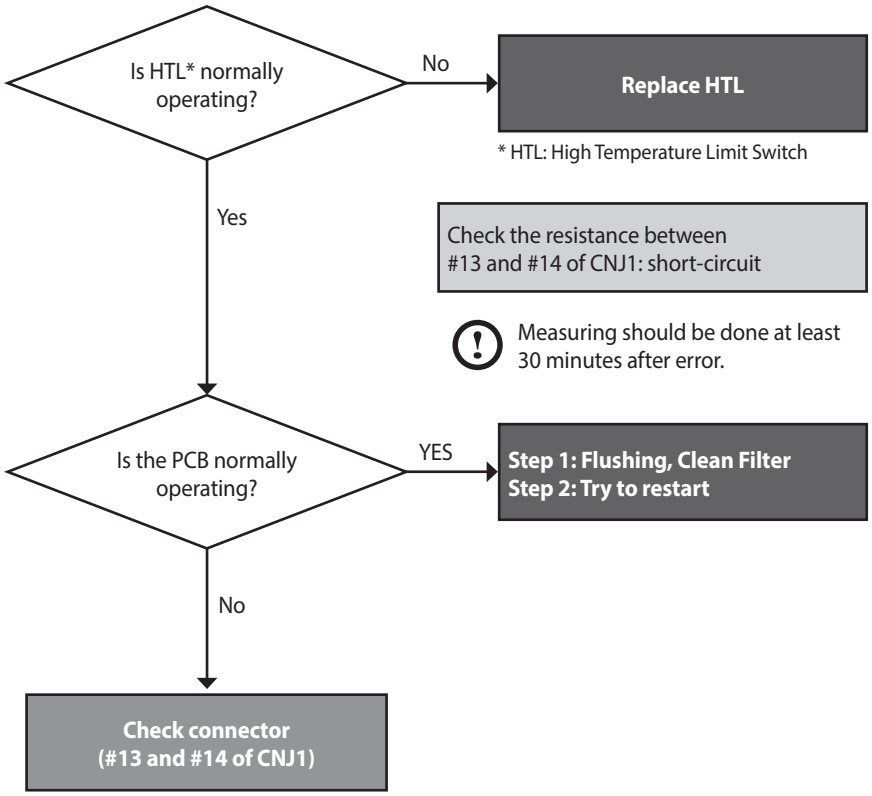
<table>
<tr><th rowspan="2">Model</th><th rowspan="2">Altitude</th><th rowspan="2">Fuel</th><th>High fire</th><th>Low fire</th></tr>
<tr><th>%CO_2</th><th>%CO_2</th></tr>
<tr><td rowspan="4">NFC-175
NFC-200</td><td rowspan="2">0-5,399 ft</td><td>NG</td><td>8.9</td><td>9.5</td></tr>
<tr><td>LP</td><td>10.2</td><td>10.8</td></tr>
<tr><td rowspan="2">5,400-10,100 ft</td><td>NG</td><td>8.5</td><td>9.5</td></tr>
<tr><td>LP</td><td>10.2</td><td>10.8</td></tr>
</table>

CO_2 value</td></tr>
<tr><td>Flame Rod
(Electrode)</td><td>Replace the electrode or clean the fire detecting electrode.
- Cause: Due to the properties of the electrode, the oxide film is created due to long-term exposure to the high temperature; therefore, errors may be caused in detecting the fires.
- Check-up: Use sandpaper to clean the fire detecting electrode covered with oxide film or replace it.
  </td></tr>
<tr><td>Defected metal fiber</td><td>1. Check the presence of debris in the metal fiber.
2. Check the sagging of the metal fiber and then the gaps with the electrode.
[Gap between the electrode and metal fiber: 12mm]</td></tr>
<tr><td>Flame loss during 2nd stage</td><td>Blockage in the gas orifice plate.</td><td>Flame loss will occur if the gas orifices in the Dual Venturi are clogged.
• Remove the gas inlet pipe and check for debris inside the Dual Venturi; remove and clean the orifice plate if necessary.</td></tr>
<tr><td>Other trouble</td><td>Defective PCB</td><td>If the issue continues despite checking above items, replace the PCB.</td></tr>
</table>

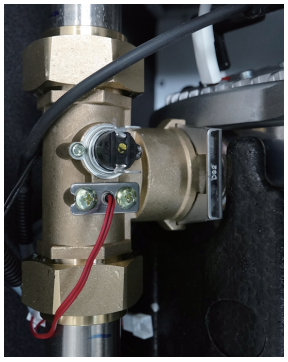
5.2.5 016Error

Error occurrence conditions and check items

Error	Description
E016 Bimetal overheated	If the overheat controller on the heat exchanger is initiated during combustion/standby of the boiler, the system displays the 016E (manually cleared) message on the front panel. The boiler switches into Lock-Out, and performs post-purge continuously and operates the pump.
Check items	1. Check if the overheat controller is working properly. * Check resistance value or continuity (refer to page 53). 2. Check the hot water temperature sensor (refer to page 54). 3. Check for proper power supply(120 VAC) to the pump(external). 4. Check for proper resistance at the pump(external). 5. Check if Air Purge is fully done in the system. (If Air Vent is opened?)



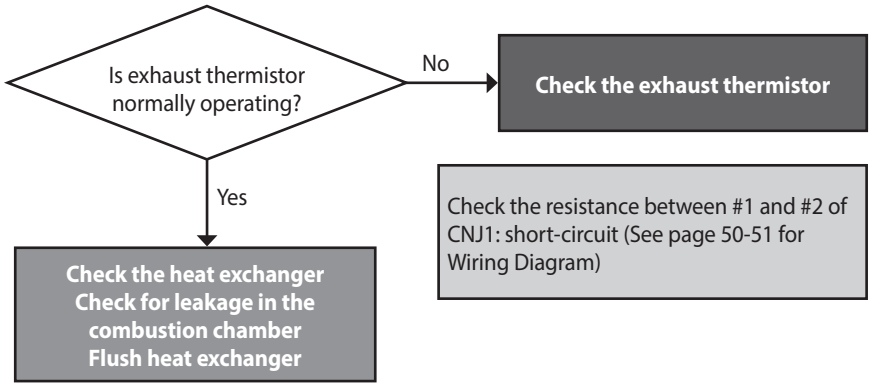
Check method

<table>
<tr><th>Fault</th><th>Possible Causes</th><th>Check method</th></tr>
<tr><td rowspan="2">Defective safety device</td><td>Defective overheat controller</td><td>Check if the contact point of the overheat controller is defective.
• Use a multi-meter to see if the resistance is normal (0.3Ω) or abnormal (∞).</td></tr>
<tr><td colspan="2"> 
Overheat controller
 
Check if the overheat controller wire is disconnected (Normal resistance : 0.3Ω)</td></tr>
<tr><td>Temperature sensor error</td><td>Defective hot water output temperature sensor</td><td>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 output temperature displayed on the front panel.
2. Measure the temperature sensor resistance, and determine if the sensor is defective.</td></tr>
<tr><td rowspan="3">Other potential issues</td><td>Capacity setting</td><td>1. If the Max switch #1 of 1-1 is on,
Set the switch to the normal operation position.
2. A PCB DIP S/W capacity setting error can suddenly increase the space heating water temperature (refer to page 16).</td></tr>
<tr><td>Heat exchanger assembly overheated</td><td>The surface temperature rises due to heavy scale deposits in the heat exchanger assembly.
• Flush the heat exchanger assembly.</td></tr>
<tr><td>Defective PCB</td><td>If the issue continues despite checking the items above, the PCB is defective.</td></tr>
</table>

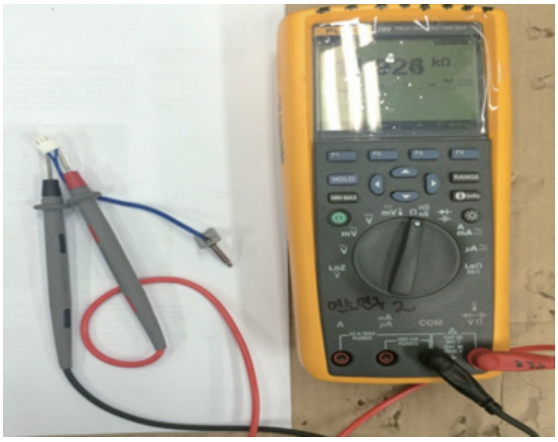
5.2.6 030Error

Error occurrence conditions and check items

Error	Description
E030 Exhaust gas temperature error	If the temperature sensor on the bottom right of the exhaust duct is initiated, the system displays the exhaust overheat message 030E (cleared manually) on the front panel. The boiler switches into Lock-Out, and performs post-purge continuously and operates the pump. Overheating controller operates when the temperature exceeds 230°F (110°C) for 10 minutes or over. 1. When the controller detects the exceeding temperature of 230°F (110°C) for 10 minutes or over, "E030" error code will display and perform post-purge. → Automatically cleared. 2. When the controller detects the exceeding temperature of 140°F (60°C) while performing post-purge. → Manually cleared. 3. When the controller detects the exceeding temperature of 230°F (110°C) for 10 seconds or over three times or more after the error is automatically cleared. → Manually cleared.
Check items	1. Check if the overheat controller operates normally. 2. Check if the PCB works properly.

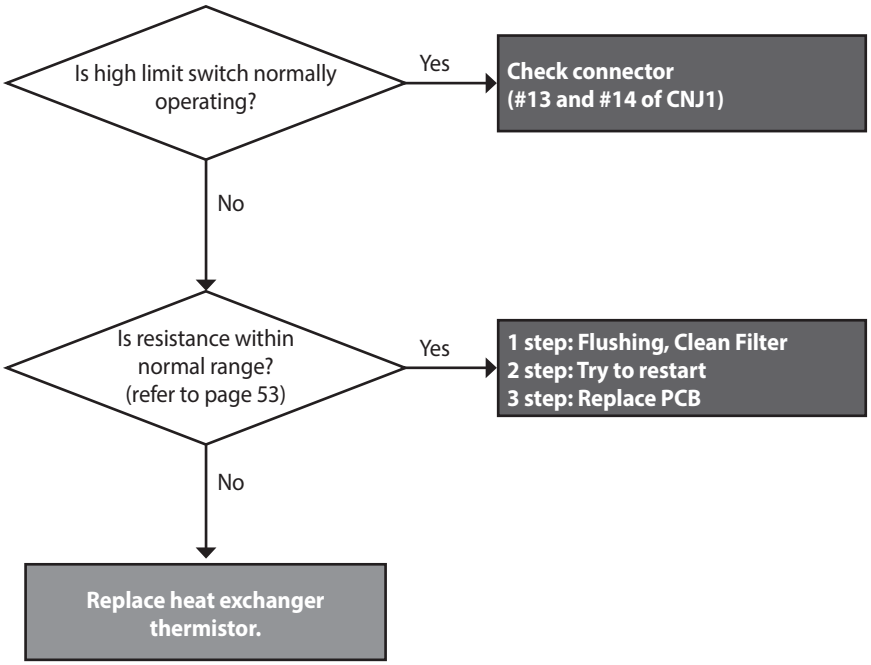


Check method

<table>
<tr><th>Fault</th><th>Possible Causes</th><th>Check method</th></tr>
<tr><td>Heat exchanger overheated</td><td>Damaged or clogged heat exchanger</td><td>1. The error occurs due to high exhaust gas temperature caused by a damaged or clogged heat exchanger.
2. Flush the heat exchanger to remove scale deposits.
3. Replace the heat exchanger if it is damaged or cannot be unclogged.</td></tr>
<tr><td rowspan="2">Defective part</td><td>Defective temperature sensor</td><td>Defective contact point of the exhaust gas overheat controller 230°F (110°C) Max
• Check connection of the overheat controller.
• If the resistance is abnormal, replace the temperature sensor (refer to page 54).
• Check the output temperature displayed on the PCB.</td></tr>
<tr><td colspan="2"> 
Check if the heating water temperature sensor is open (Error type : MΩ Open)</td></tr>
<tr><td>Other trouble</td><td>Defective PCB</td><td>If the issue continues despite checking the items above, replace the PCB.</td></tr>
</table>

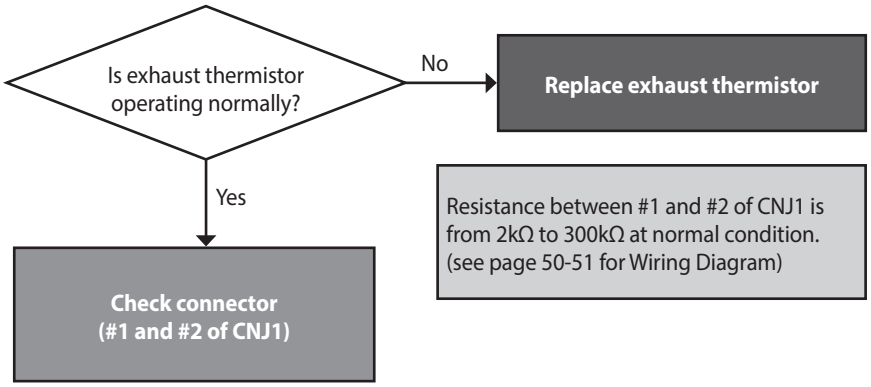
5.2.7 046Error

Error occurrence conditions and check items



5.2.8 047Error

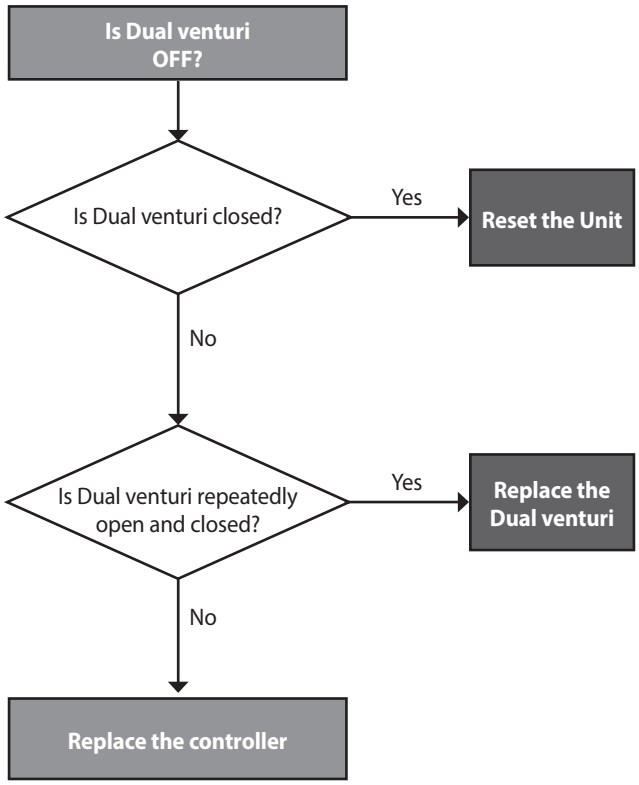
Error occurrence conditions and check items



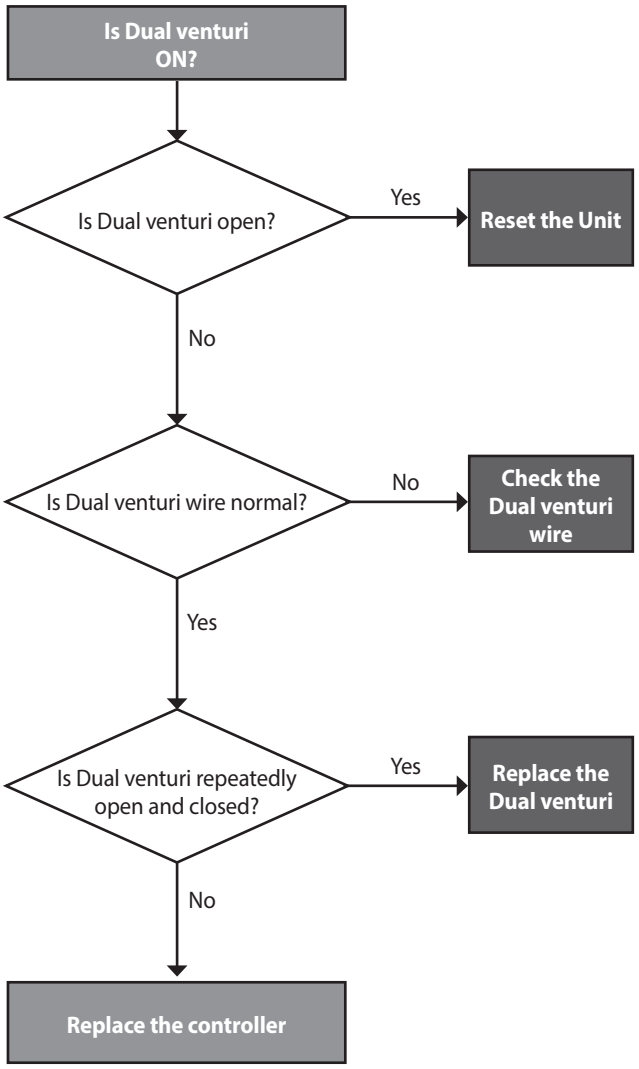
5.2.9 060Error

Error occurrence conditions and check items

Error	Description
E060 Dual Venturi error	This error message is displayed on the front panel if the wiring is disconnected or the Dual Venturi malfunctions. The boiler switches into Lock-Out, and performs post-purge continuously and operates the pump.
Check items	1. Check that the Dual Venturi is operating correctly. Run the Dual Venturi Test Mode. 2. Check that the wiring harness is connected correctly and the cables are not damaged.



Dual venturi OFF



Dual venturi ON

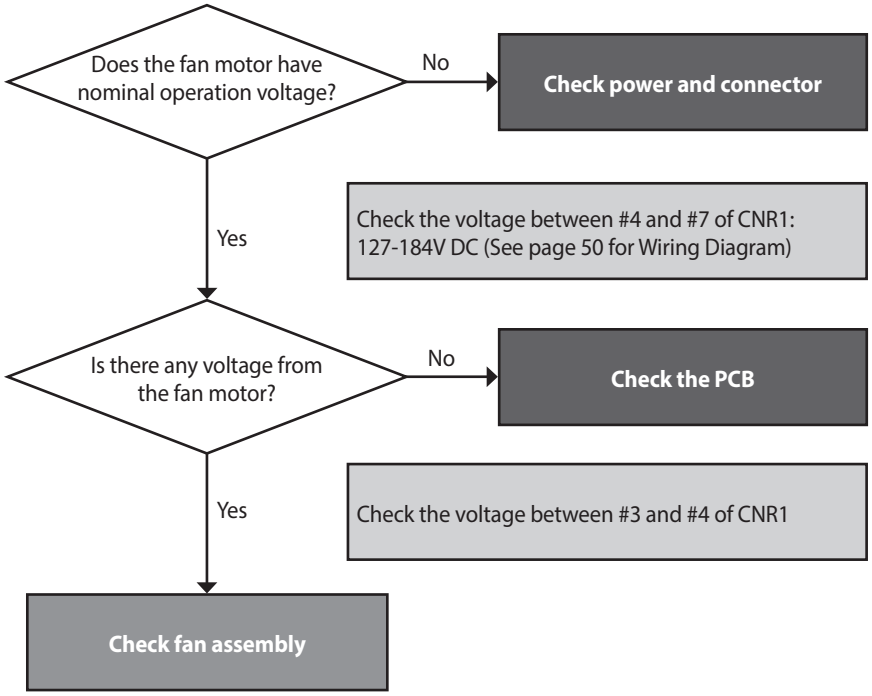
Check method

Fault	Possible Causes	Check method
Dual Venturi action error	Defective Dual Venturi cable or harness	1. Disconnect all cables from the Dual Venturi. 2. Using a multi-meter, test the Dual Venturi electrical wiring.
	Dual Venturi not operating	1. Turn off the power to the unit using the main power switch (do not use the front panel power button) and wait for 10 seconds. 2. Turn on the power. 3. Wait until Fan Auto Adjusting is complete. 4. Enter the Dual Venturi Test Mode and perform a test. 1) Repeat the test at least twice. Turning the unit ON and OFF once makes one test cycle. ON → OFF → ON → OFF → …… is the minimum sequence. 2) Confirm that the Dual Venturi is operating correctly. a. Listen to the Dual Venturi while it is running and check for operational noise (clicks at unit ON and unit OFF). b. If operational noise cannot be heard because of ambient noise, disassemble the Dual Venturi and perform a visual inspection. 5. If error message (E060) occurs, replace the Dual Venturi. 6. If a Dual Venturi error does not occur, replace the APS.

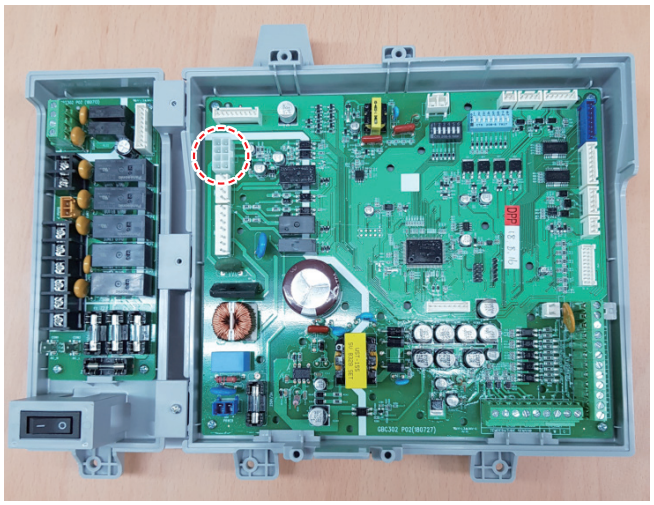
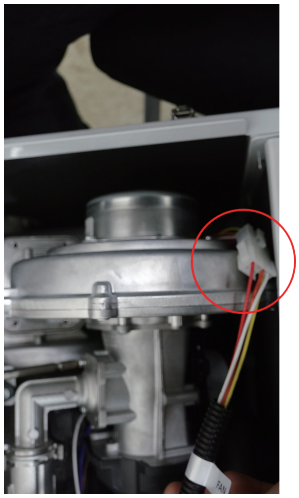
5.2.10 109Error

Error occurrence conditions and check items

Error	Description
E109 Fan motor RPM error	The system checks the RPM signal after the fan starts to run, and displays the error message 109E (cleared manually) in the following cases: 1. If the RPM remains low or close to 0, the system determines RPM error, and the boiler switches into Lock-Out (gas valve and ignition transformer locked). (However, the air pressure sensor should be normal.) 2. If the RPM signal of low or close to 0, is detected for 3 seconds during combustion, the system stops combustion, and the boiler switches into Lock-Out. (However, the air pressure sensor should be normal.)
Check items	1. Check if the fan motor works normally using the component test mode (refer to page 43). 2. Check the power supply to the fan (Black + Red, approx. DC 127~184 V). 3. If RPM is significantly low while the fan works and the power supply is normal, replace the fan motor. 4. If the fan connector is wet due to any reason including leakage, take corrective action by powering the unit OFF, then drying the components completely before continuing operation. 5. Check for loose connection of white connector that attaches the fan motor to the PCB.



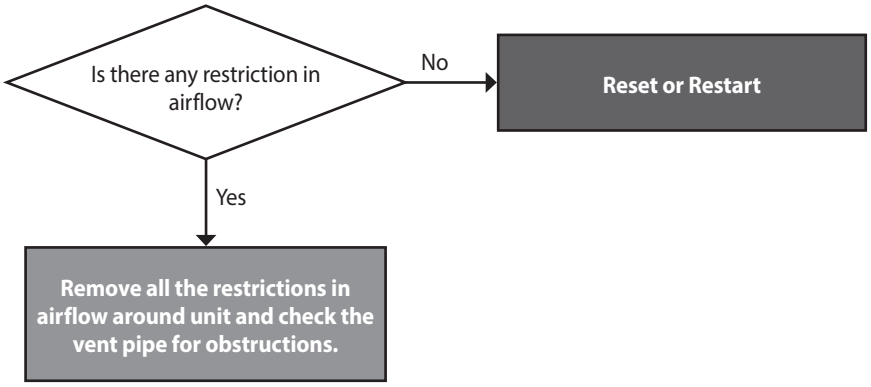
Check method

<table>
<tr><th>Fault</th><th>Possible Causes</th><th>Check method</th></tr>
<tr><td rowspan="2">Fan action error</td><td>No fan operation</td><td>1. Check the power supply to the blower.
• Black + Red, approx. DC 127~184 V
2. Replace the PCB if voltages are abnormal. (When replacing the PCB, turn off the unit and then wait for at least 10 seconds before proceeding.)
3. If the issue continues despite the checking the items above, replace the fan motor.</td></tr>
<tr><td colspan="2">  
Check if the fan motor wire is disconnected</td></tr>
<tr><td>Fan motor RPM error</td><td>Defective rotator</td><td>1. If RPM is significantly low while the fan is operating and the power supply is normal. Follow the instructions listed below and replace the fan.
1) Unplug the power cable to the unit and then wait for 10 seconds until the remaining SMPS voltage completely discharges.
2) Disconnect the fan cable and then re-connect it.
3) Plug the power cable and turn on the unit.
4) Fan Auto Adjusting verifies error conditions for error code E109. If an E109 error occurs, enter the Fan Test Mode and verify fan RPM and APS input voltage.(Display: ex. H.320 = 3200 RPM)
5) If RPM is low or there is a sensor circuit error, replace the fan. Indicates an imminent hazardous situation which, if not avoided, may result in minor or moderate injury.
2. If the issue continues despite checking the items above, replace the PCB.</td></tr>
</table>

5.2.11 110Error

Error occurrence conditions and check items

Error	Description
E110 Air pressure error	The system senses the air volume and the RPM signal, and displays 110E on the front panel in the following cases: 1. When the initial fan auto-adjust is not performed. 2. When the unit capacity reaches up to 95% of the maximum heat during combustion, and APS is not up to the standard value.
Check items	1. Check if the condensation drain line or the drain is clogged. 2. Check the flue and exhaust to verify proper installation and clearances. (Circulation of exhaust gas generates noise.) 3. Check if the air supply/exhaust flue is clogged (rainwater may collect inside from an improperly installed air supply/exhaust pipe). 4. Defective air pressure sensor or PCB. 5. Make sure that venting is sloped downwards towards the unit for proper condensate drainage. 6. Make sure that internal damper is moving freely with no obstructions.



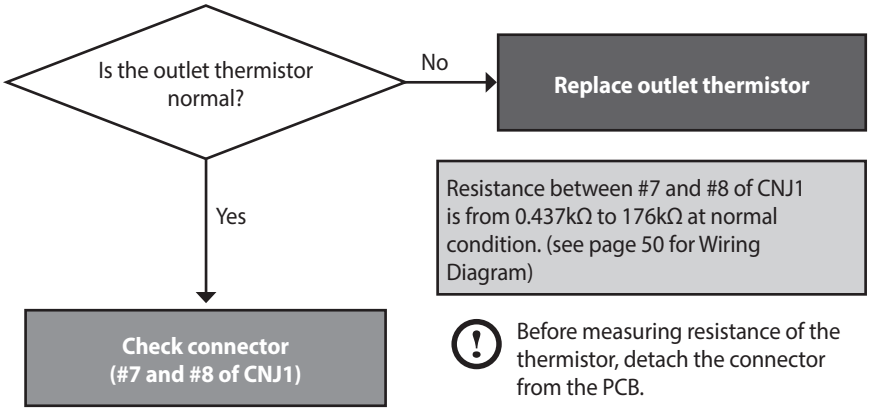
Check method

Fault	Possible Causes	Check method
110E Exhaust blockage	Abnormal flow of intake air supply / exhaust	1. If 110E occurs intermittently during ignition or combustion, compare the standard RPM with the current RPM at Min / Max combustion (DIP switch 1-1&1-2). If the current RPM is higher than normal, check the following: • Air supply / exhaust vent for any blockages. • Blocked condensate drain • If the air pressure sensor hose is broken or clogged. 2. Replace the old PCB with the latest version.
Condensate drain error	Condensate drain error	Exhaust air is blocked due to condensate drain error. • Check if the condensate hose or the siphon is frozen. • Check if the condensate hose is kinked. • Remove bottom of trap and verify it is not blocked.
Defective air supply / exhaust flue	Deformed or clogged flue	1. Check the exterior of the flue for damage and obstructions. 2. Check if rainwater is collected due to vertical installation of the air intake pipe.
	Exhaust gas flows in through the supply pipe	If the exhaust gas enters into the air supply pipe, abnormal combustion may cause E110. • Check the installation of the flue.

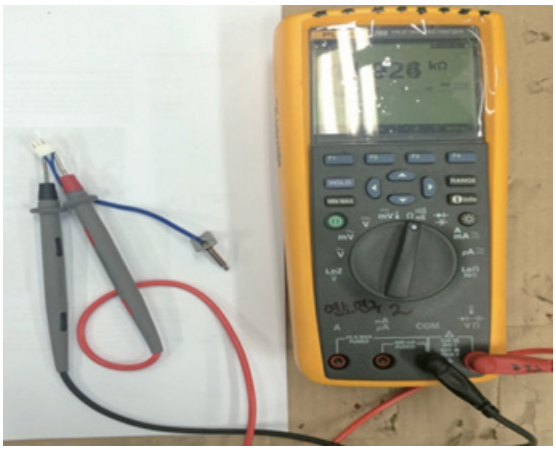
5.2.12 205Error

Error conditions and Check Items

Error	Description
E205 Heat exchanger output temperature sensor open	If an error (open: 14°F (-10°C) or lower) in the heat exchanger input temperature sensor is detected, the system displays the 205E error on the front panel. If this occurs, the boiler initiates shutdown.
Check items	1. Check if the heat exchanger output temperature sensor connector is wet due to any reason, including leakage. 2. Replace the defected heat exchanger output temperature sensor. 3. Check circulation pump (external type) operating status and for proper flow through the space heating line. 4. Check the voltage on the PCB to verify proper power to the pump. If there is no voltage, replace PCB. Otherwise, bleed out air from the system before resetting the unit. If issue persists, replace the pump.



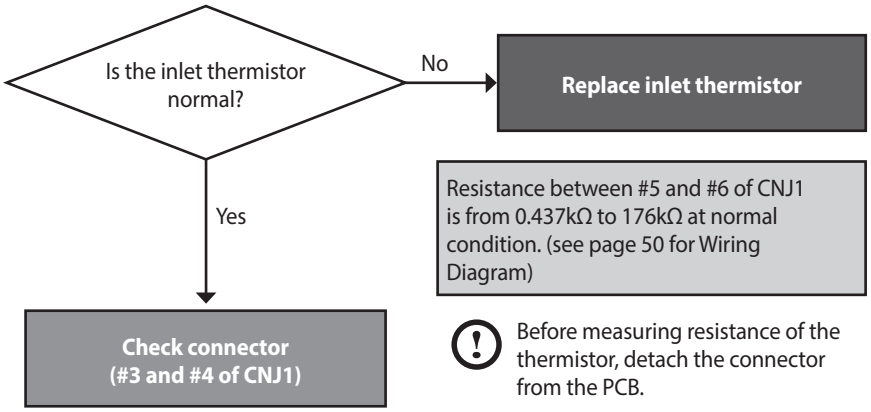
Check method

Fault	Possible Causes	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. (refer to page 54). • Check the temperature displayed on the front panel. (refer to page 36).
Possible Issues	Defective circulation pump(external)	Check power supply to the circulation pump(AC 120V)
	Defective PCB	If the issues continue despite checking the items above, replace the PCB.
	 <Heat exchanger output temperature sensor / connector>  <Check if Heat exchanger output temperature sensor is open Error type : MΩ Open>	

5.2.13 218Error

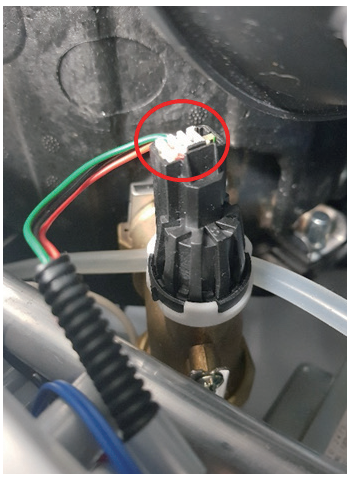
Error conditions and Check Items

Error	Description
E218 Heat exchanger input temperature sensor open	If an error (open: MΩ) in the heat exchanger input temperature sensor is detected, the system displays the 218E error on the front panel. If this occurs, the boiler initiates shutdown.
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 controller.

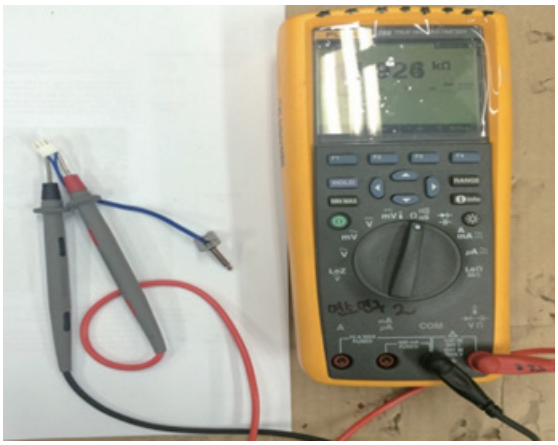


Check method

Fault	Possible Causes	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 (refer to page 54). • Check the temperature displayed on the front panel (refer to page 36).
Possible Issues	Defective PCB	If the issues continue despite checking the items above, replace the PCB.



<Heat exchanger output temperature sensor / connector>

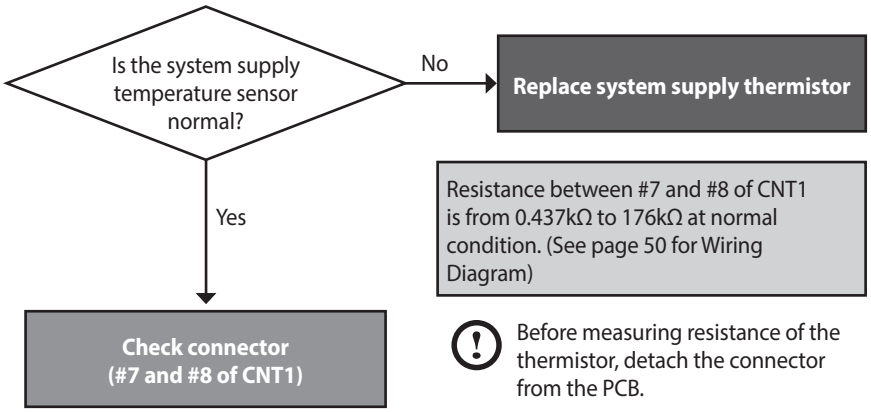


Check if Heat exchanger output temperature sensor is open (Error type : MΩ Open)

5.2.14 278Error

Error conditions and Check Items

Error	Description
E278 System supply temperature sensor open	If an error (open: MΩ) in the system supply temperature sensor is detected, the system displays the 278E error on the front panel. If this occurs, the boiler initiates shutdown.
Check items	1. Check if the system supply temperature sensor connector is wet due to any reason, including leakage. 2. Replace the defected system supply temperature sensor. 3. Check circulation pump operating status and for proper flow through the space heating line. 4. Check the voltage on the PCB to verify proper power to the pump. If there is no voltage, bleed out air from the system before resetting the unit. If issue persists, replace the pump.



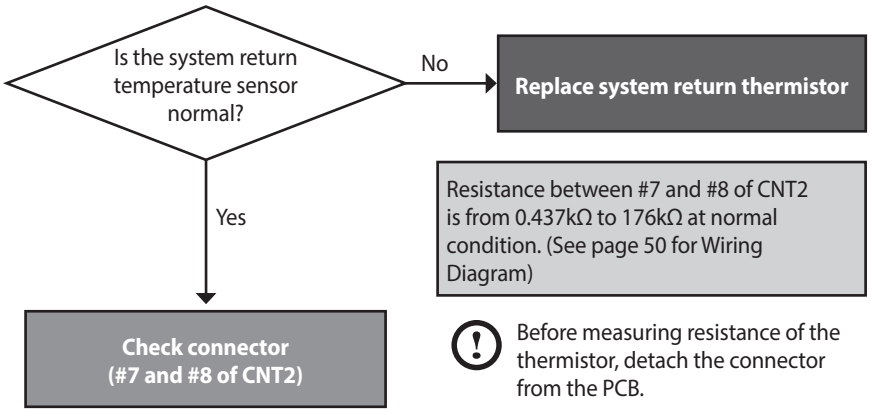
Check method

Fault	Possible Causes	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 197kΩ or higher) • Replace the temperature sensor if the resistance value is abnormal. • Check the temperature displayed on the front panel.
Possible Issues	Defective circulation pump(external)	Check power supply to the circulation pump(AC 120V)
	Defective PCB	If the issues continue despite checking the items above, replace the PCB.
	Incorrect setting	Ensure SH Control Method is set for the correct mode (refer to page 37).

5.2.15 279Error

Error conditions and Check Items

Error	Description
E279 System return temperature sensor open	If an error (open: MΩ) in the system return temperature sensor is detected, the system displays the 279E error on the front panel. If this occurs, the boiler initiates shutdown.
Check items	1. Check if the system return temperature sensor connector is wet due to any reason, including leakage. 2. Replace the defected system return temperature sensor. 3. Check circulation pump operating status and for proper flow through the space heating line. 4. Check the voltage on the PCB to verify proper power to the pump. If there is no voltage, bleed out air from the system before resetting the unit. If issue persists, replace the pump.



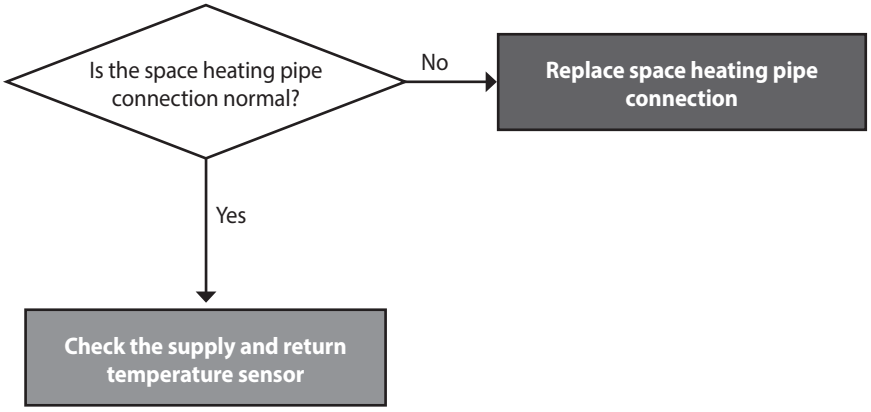
Check method

Fault	Possible Causes	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 197kΩ or higher) • Replace the temperature sensor if the resistance value is abnormal. • Check the temperature displayed on the front panel.
Possible Issues	Defective circulation pump	Check power supply to the circulation pump(AC 120V)
	Defective PCB	If the issues continue despite checking the items above, replace the PCB.
	Incorrect setting	Ensure SH Control Method is set for the correct mode (refer to page 37).

5.2.16 291Error

Error conditions and Check Items

Error	Description
E291 Supply / Return inversion limit	If the return temperature is higher than "supply temperature + 10°F (5.5°C)", the system stops operation and displays error code (E291) on the front panel.
Check items	1. Check whether the space heating pipe connection is inversed. 2. Check the supply temperature sensor connection. 3. Check the return temperature sensor connection.



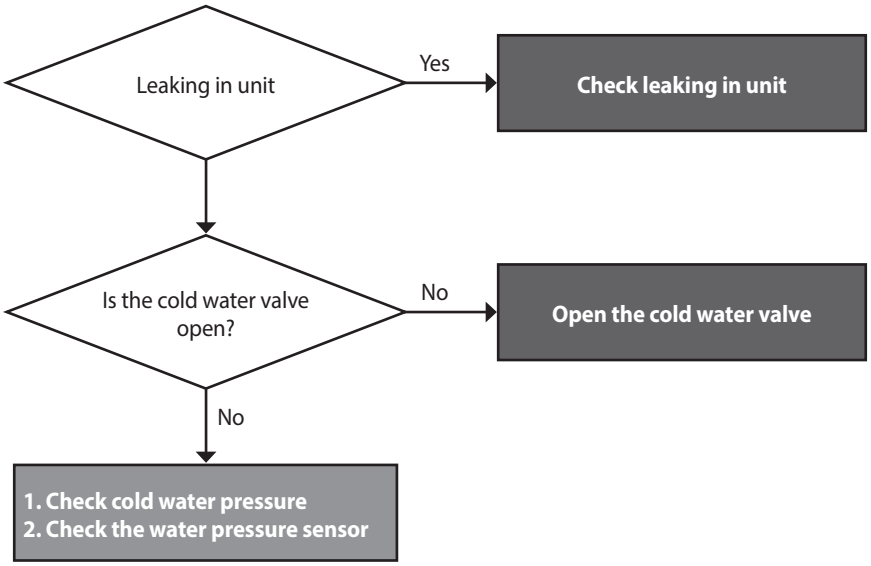
Check method

Fault	Possible Causes	Check method
Space heating pipe connection	Defective connection	Check whether the space heating pipe connection is inversed.
	Temperature sensor	1. Check the supply temperature sensor connection. 2. Check the return temperature sensor connection.

5.2.17 302Error

Error conditions and Check Items

<table>
<tr><th>Error</th><th>Description</th></tr>
<tr><td>E302
Low water</td><td>If the automatic water pressure sensor detects that the water pressure is lower than [the standard water pressure] for more than three seconds consecutively, the system determines that there is no water in the boiler and piping and an error message of low water pressure (“302,” manually cleared) is displayed.
However, if a malfunction occurs when the water pressure sensor is in the Open or Short status, the low water pressure error will not be determined.
The standard water pressure over the low water pressure can be set on the panel, and the setting method is shown as below.
<table>
<tr><th>Parameter Setting No.</th><th>Setting range</th><th>Default</th></tr>
<tr><td>Low Sys Pressure (15)</td><td>4-17 psi (0.3-1.2 bar)</td><td>6 psi (0.4 bar)</td></tr>
</table>
</td></tr>
<tr><td>Check items</td><td>1. Check if water leaks from the heating pipe.
2. Check if the water supplied pipe open.
3. Check the water pressure sensor.</td></tr>
</table>

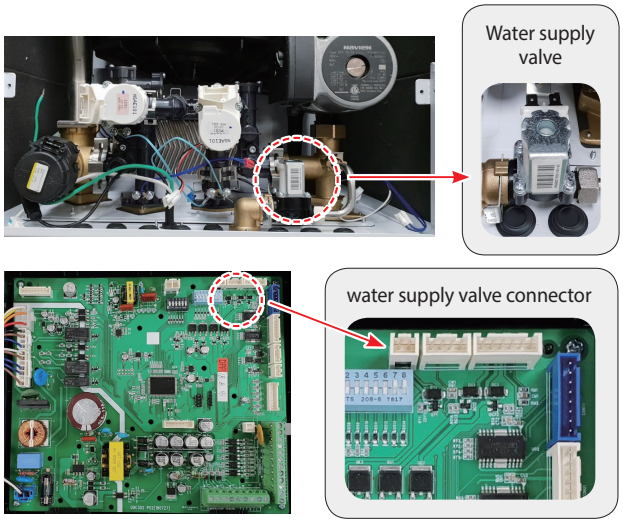


Check method

- If the error occurs during combustion, stop the combustion and perform post-purge 1 and switch to Lock-out.
- If the error occurs while the combustion is stopped, keep the combustion stopped and switch to Lock-out.
- Keep all pumps (the boiler, zone pumps) stopped (other than when running Pump Test Mode).
- However, when setting the zone valve system, ensure that all pumps (the boiler, system, hot water) and the zone valves are stopped (other than when running Pump Test Mode).
- Error releasing condition: The error is cleared when the water pressure has been detected as higher than [the standard water pressure + 2 psi (0.13 bar)] consecutively for more than three seconds and manual reset is performed. However, in the case of water pressure malfunctions, the error is cleared when manual reset is performed regardless of the detected water pressure.

5.2.18 351Error

Error Condition and Check Items

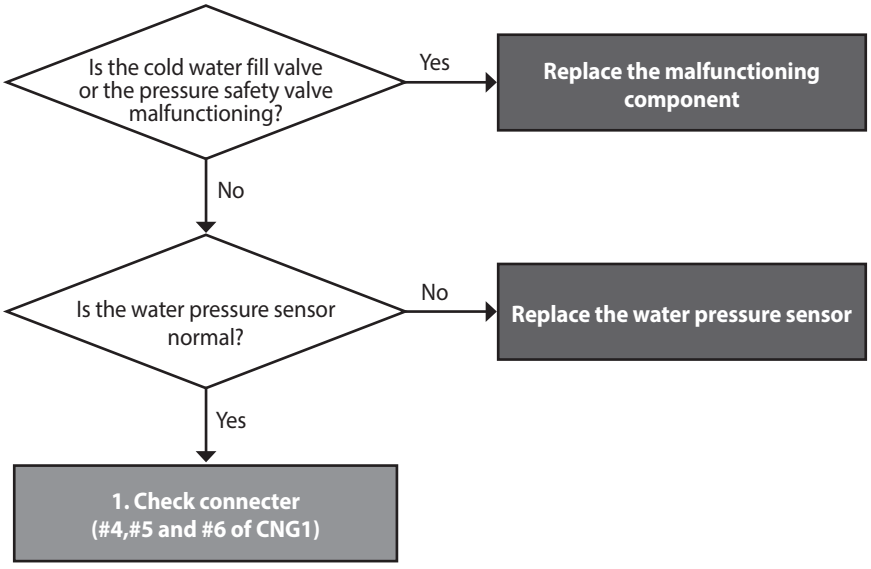
Error	Description
E351	Abnormal Auto feeder valve
Check Items	1. Check for leaks within the boiler interior. • Leaks disrupt from securing target pressure. 2. Check pressure in direct water supply valve connection. • Errors occur if water does not enter during the water supply function. Check if exterior direct water supply valves are open. 3. Check auto feeder valve harness. • If the problem persists after completing (1) and (2) check with circuit tester whether there is a disconnection between harness sockets. 4. Change auto feeder valve • If the problem persists after completing (1), (2), and (3), change the auto feeder valve. 5. Check panel pressure. • If the problem persists after completing (1), (2), (3), and (4) check the panel pressure to check whether the pressure sensor is working properly. 6. Check pressure sensor harness. • Check for pressure sensor harness disconnection if unable to check panel pressure. 7. Change pressure sensor • If the problem persists after completing (6) change the pressure sensor. 8. Change PCB • If the problem persists after completing all the actions above, change the PCB.
	

5.2.19 352Error

Error conditions and Check Items

Error	Description
E352 High water pressure	If the automatic water pressure sensor detects that the water pressure is higher than [the standard water pressure] for more than three seconds consecutively, the system stops operation of the boiler and a high water pressure error message ("352," automatically cleared) is displayed. However, if a malfunction occurs when the water pressure sensor is in the Open or Short status, the high water pressure error will not be determined. The standard water pressure over high water pressure can be set on the panel, and the setting method is shown as below.
Check items	1. Check if the cold water pipe input water pressure sensor is wet due to any reason, including leakage. 2. Check the controller.

Parameter Setting No.	Setting range	Default
High Sys Pressure (16)	40-80 psi (2.7-5.5 bar)	50 psi (3.4 bar)



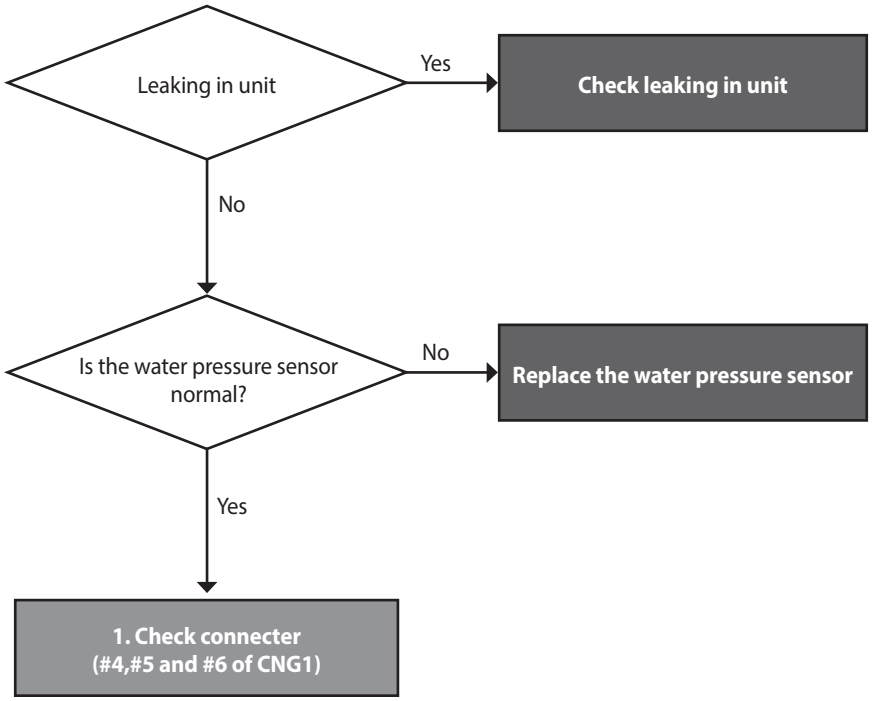
Check method

- If the error occurs during combustion, stop the combustion and perform post-purge 1 and switch to Safety Shut-down (gas valve and ignition transformer locked).
- If the error occurs while the combustion is stopped, keep the combustion stopped and switch to Safety Shut-down (gas valve and ignition transformer locked).
- Keep all pumps (the boiler, zone pumps) stopped (other than when running Pump Test Mode).
- However, when setting the zone valve system, ensure that all pumps (the boiler, system, hot water) and the zone valves are stopped (other than when running Pump Test Mode).
- Error releasing condition: The high water pressure error is automatically cleared when the water pressure has been detected as lower than [the standard water pressure – 13 psi (0.9 bar)] consecutively for more than three seconds.

5.2.20 353Error

Error conditions and Check Items

Error	Description
E353 Abnormal water pressure sensor	If an error (under 0.3V or over 2.8V) in the water pressure sensor is detected continuously for 3 seconds, The system displays the error message E353 on the front panel. If this occurs, the boiler initiates shutdown.
Check items	1. Check if the cold water pipe input water pressure sensor is wet due to any reason, including leakage. 2. Replace the water pressure sensor. 3. Check the controller.



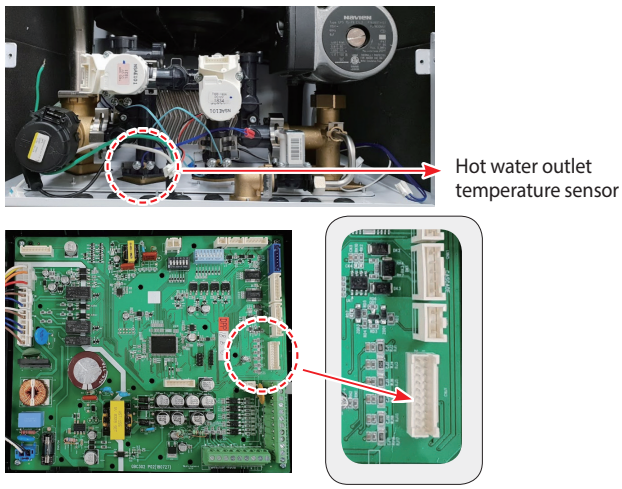
Check method

Fault	Possible Causes	Check method
Abnormal water pressure sensor	Defective water pressure sensor	1. Check the sensor is frozen during the winter. 2. Check the output voltage. (Normal state : 0.3~2.8V) 3. Replace the PCB if power is not supplied.

5.2.21 407Error

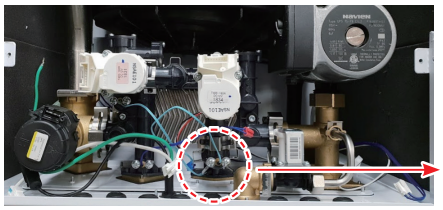
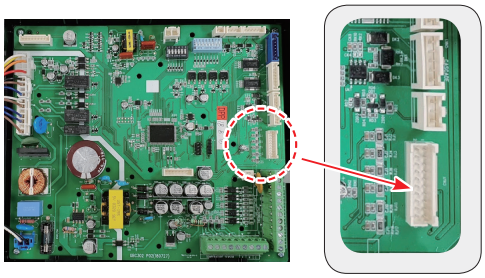
Error Condition and Check Items

Error	Description
E407	Abnormal Hot water outlet 1 sensor (After mixing valve)
Check Items	1. Check for controller harness disconnection. • Check for any disconnections between the hot water outlet 1 temperature sensor (after mixing) harness. 2. Change hot water outlet 1 temperature sensor (after mixing) • If the problem persists after completing (1) close the external direct water supply valve and purge water within water pipes. Change hot water outlet 1 temperature sensor (after mixing). 3. Change PCB • If the problem persists after completing all the actions above, change the PCB.



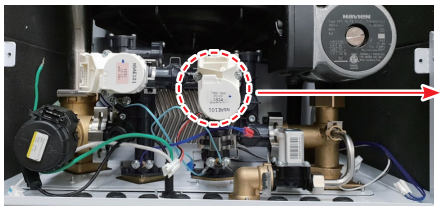
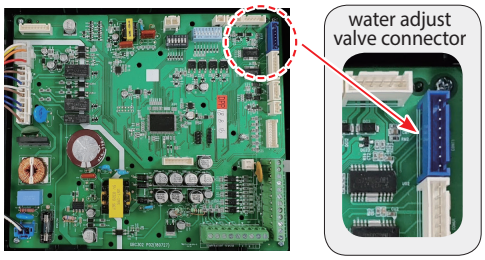
5.2.22 421Error

Error Condition and Check Items

Error	Description
E421	Abnormal Cold water intake sensor
Check Items	1. Check for disconnection in controller harness. • Check for disconnections between harness connecting controller and water intake temperature sensor. 2. Change water intake temperature sensor. • If the problem persists after completing (1), close external water intake supply valve and purge water pipes of residual water. Change water intake temperature sensor. 3. Change PCB • If the problem persists after completing all the actions above, change the PCB.
 	

5.2.23 434Error

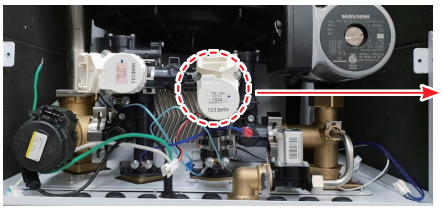
Error Condition and Check Items

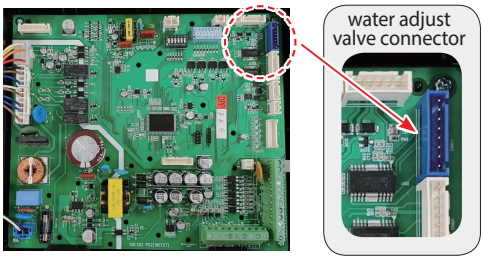
Error	Description
E434	Abnormal operation: Water adjust valve
Check Items	1. Check for water adjust valve harness disconnection. • Check for harness disconnection in case no feedback signal. 2. Change water adjust valve • If the problem persists after completing (1), close external water intake supply valve and purge water pipes of residual water. Change water adjust valve. 3. Change PCB • If the problem persists after completing all the actions above, change the PCB.
 	

5.2.24 439Error

Error Condition and Check Items

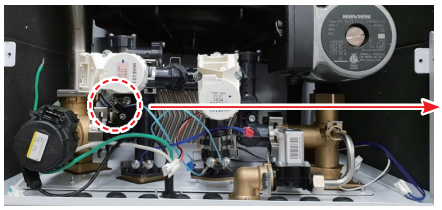
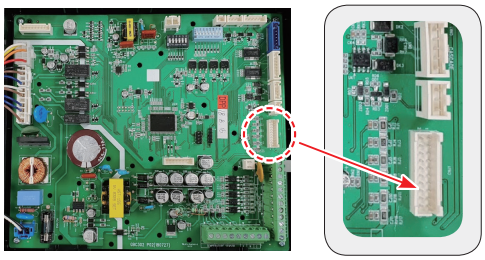
Error	Description
E439	Abnormal operation: flow sensor
Check Items	1. Check for water adjust valve harness disconnection. • Check for disconnections between harness connecting controller and water adjust valve. 2. Change water flow sensor. • If the problem persists after completing change the water flow valve. (water adjust sensor and valve are connected) 3. Change PCB • If the problem persists after completing all the actions above, change the PCB.





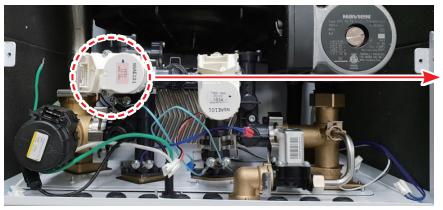
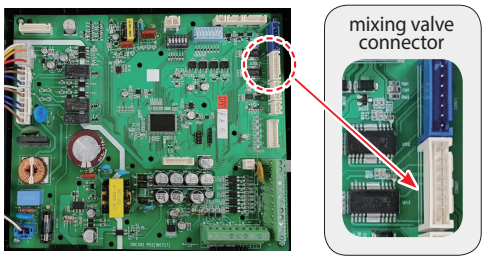
5.2.25 441Error

Error Condition and Check Items

Error	Description
E441	Hot water outlet 2 (before mixing valve)
Check Items	1. Check for disconnections in controller harness • Check for disconnection in the harness between hot water outlet 2 temperature sensor and the controller. 2. Change hot water outlet 2 temperature sensor • If the problem persists after completing close external water supply valve and purge water pipes of residual water. Change hot water outlet 2 temperature sensor. 3. Change PCB • If the problem persists after completing all the actions above, change the PCB.
 	

5.2.26 445Error

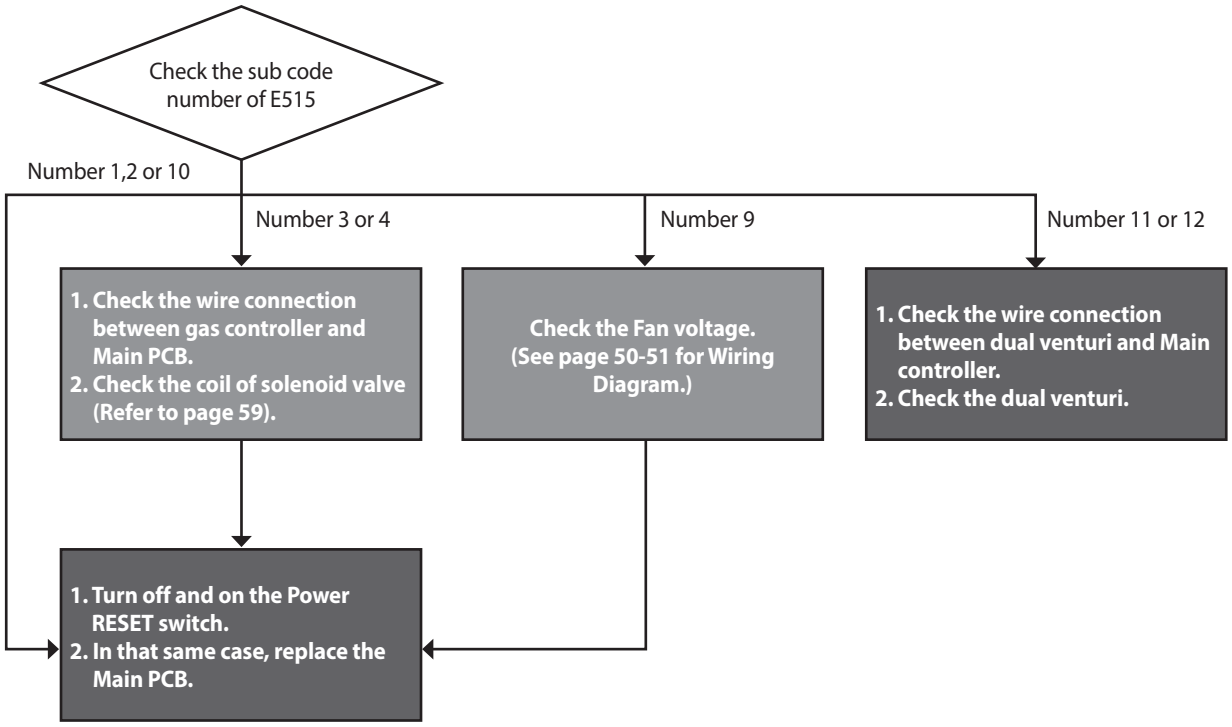
Error Condition and Check Items

Error	Description
E445	Abnormal operation: Bypass mixing valve
Check Items	1. Check for mixing valve harness disconnections • If there is no feedback signal check for disconnections that may cause this error. 2. Change mixing valve • If the problem persists after completing, close external water supply valve and purge water pipes of residual water. Change mixing valve. 3. Change PCB • If the problem persists after completing all the actions above, change the PCB.
 	

5.2.27 515Error

Error occurrence conditions and check items

Error	Description
E515 error	If an error occurs in the internal circuit of the PCB (e.g., resistance, transistor or relay fault), the system displays 515E (cleared manually) on the PCB.
Check items	1. Defective PCB. 2. Check with a multi-meter if the PCB is supplied with the proper voltage (AC 102~132 V). 3. Check the wire connection. 4. Disconnect the ground wire, then check the PCB.

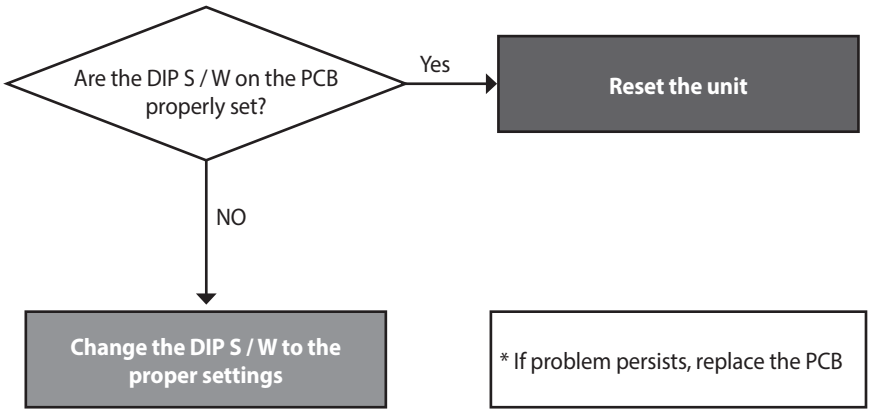


Check method

Fault	Possible Causes	Check method
PCB or Electrical supply	Defective PCB	Replace the PCB if there is an error with the PCB internal circuit.
	Power supply error	Check with a multi-meter if the PCB is supplied with the proper voltage. • Check with a multi-meter if the voltage at the electrical outlet is AC 102~132 V.
	Power supply grounding noise	Power supply grounding noise causes malfunction. • Disconnect ground from the grounding terminal inside the unit, and check if the PCB is operating normally.

5.2.28 517Error

Error occurrence conditions and check items



5.2.29 594Error

Error occurrence conditions and check items

Error	Description
E594 error	If the communication is abnormal in parts of PCB, the system displays E594 on the PCB.
Check items	Check the PCB.

Error occurrence conditions and check items

Fault	Possible Causes	Check method
E594 Error	Abnormal communication by PCB	1. Click the Reset button on Front panel. 2. Turn the POWER to the unit OFF then ON. Disconnect then reconnect power if necessary. 3. If the system still displays E594, replace the main PCB.

5.2.30 615Error

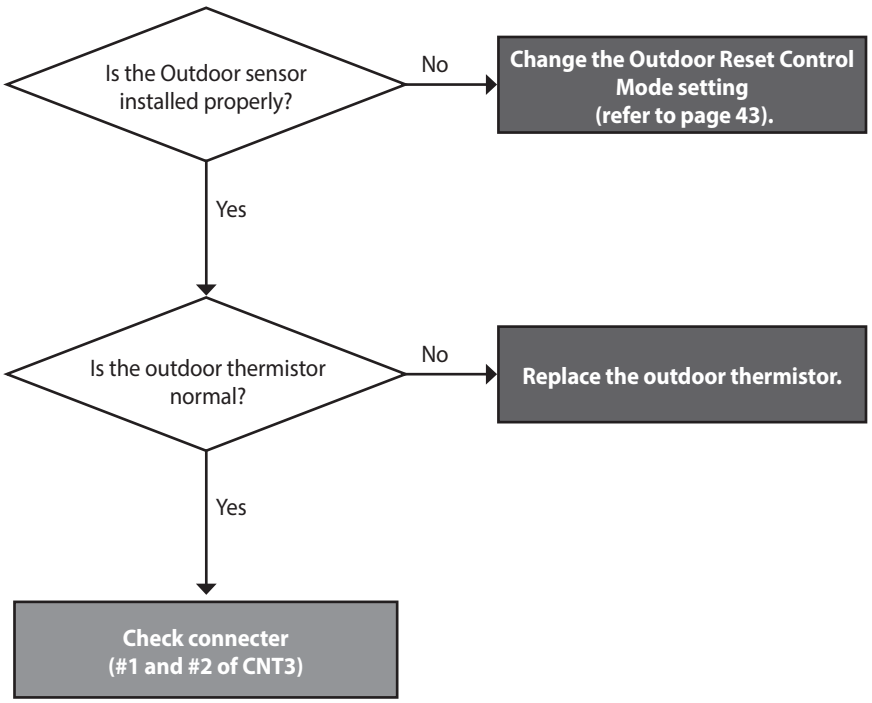
Error occurrence conditions and check items

Error	Description
E615 error	Abnormal signal input by PCB.
Check items	1. Turn the POWER RESET switch OFF then ON (or unplug and replug the power supply. 2. If the system still displays E615, replace the main PCB.

5.2.31 740Error

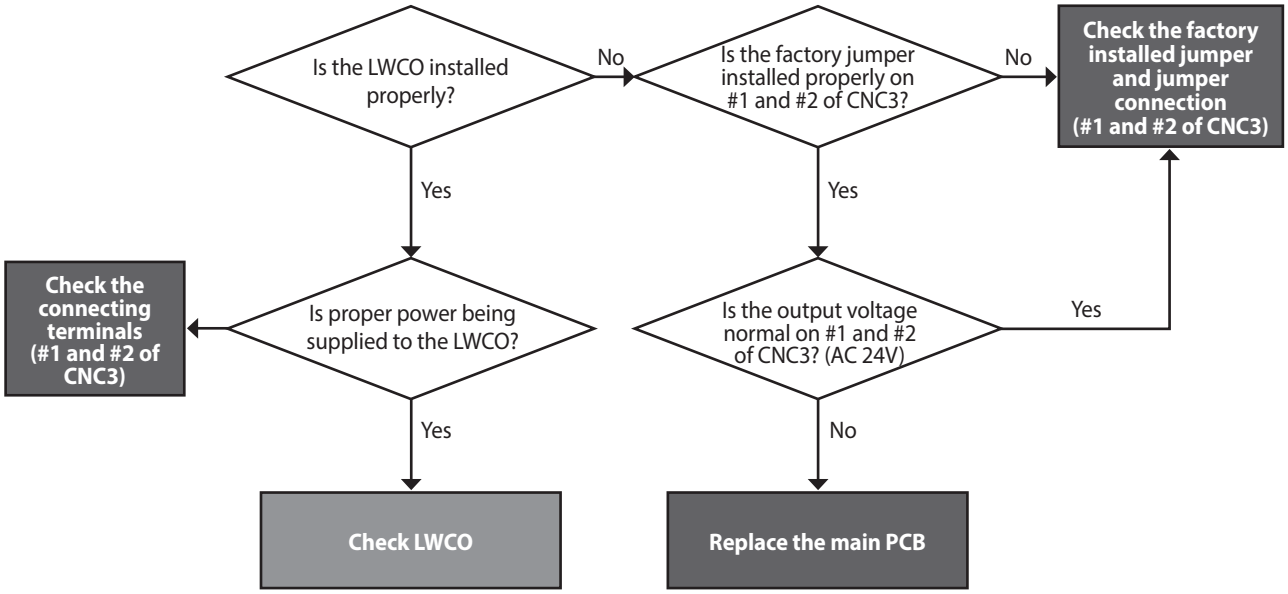
Error conditions and Check Items

Error	Description
E740 Abnormal outdoor sensor	If an error (under 2.2kΩ or over 122.2kΩ) in the outdoor sensor is detected continuously for 3 seconds, The system displays the error message E740 on the front panel. If this occurs, the boiler changes the control mode from Reset Curve Mode to Normal Mode.
Check items	1. Check the parameter setting (refer to page 43). 2. Check the outdoor sensor.

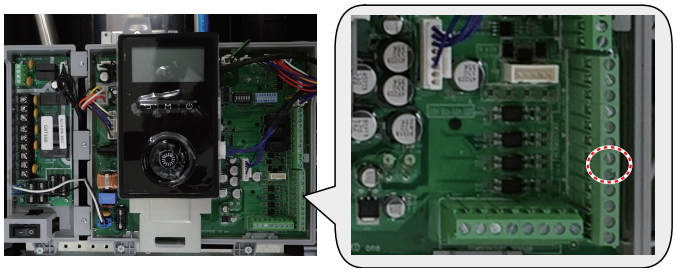
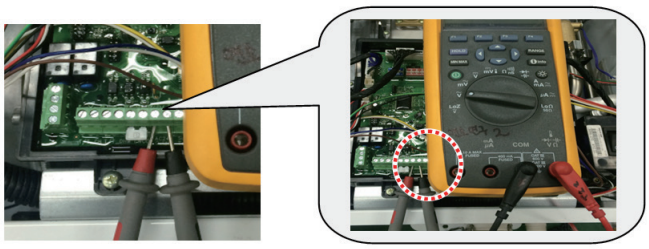


5.2.32 777Error

Error conditions and Check Items

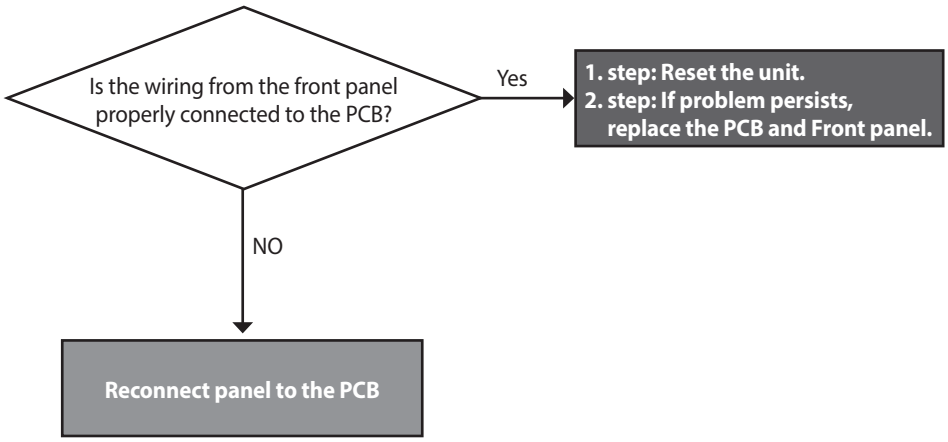


Check method

Fault	Possible Causes	Check method
E777	Abnormal factory installed jumper	1. Check the factory installed jumper and jumper connection.  2. Check the output voltage normal.  Check the output voltage (Normal voltage : AC 24V)

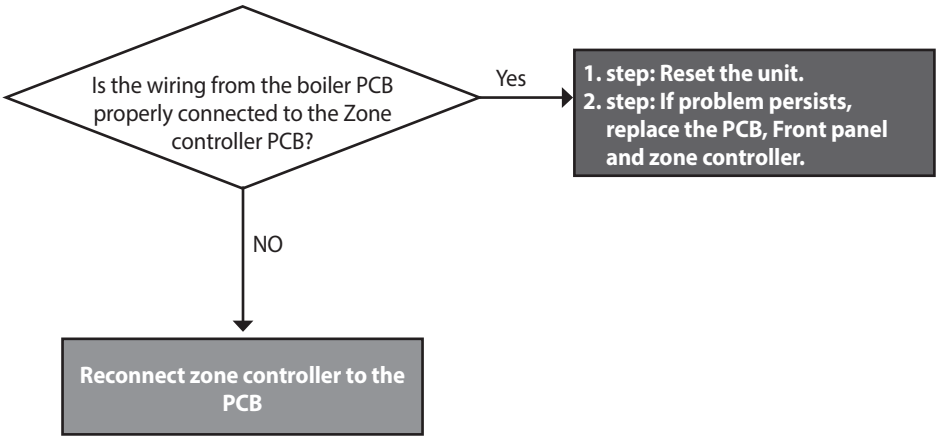
5.2.33 782Error

Error occurrence conditions and check items

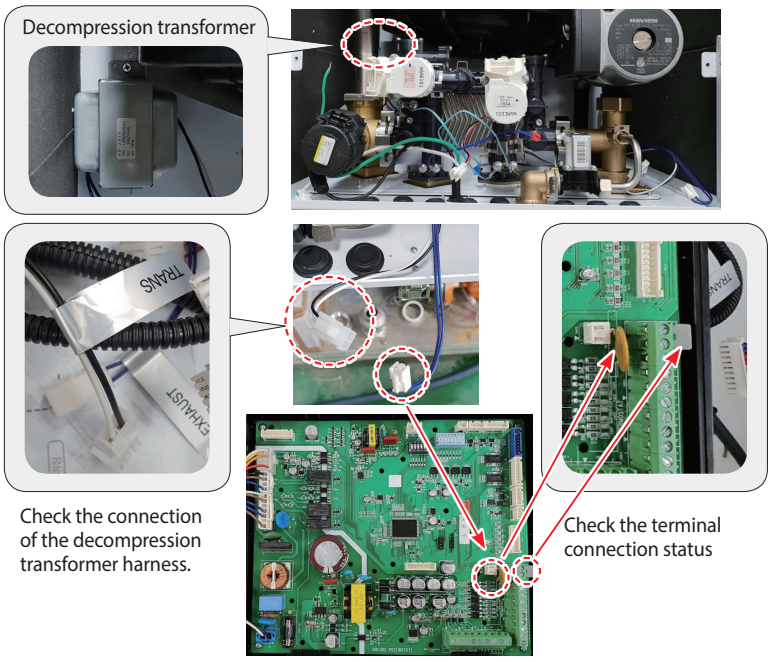


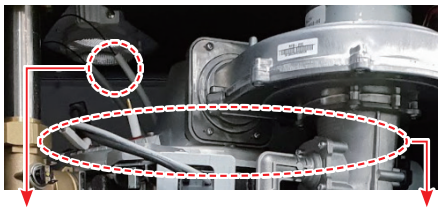
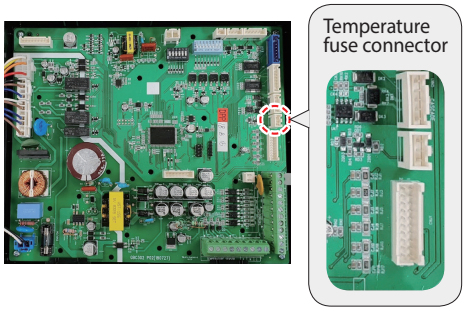
5.2.34 784Error

Error occurrence conditions and check items



5.2.35 777 & 031Error

No.	Error code	Cause	Check method
8	777 LWCO (Decompression transformer error)	When LWCO signal is detected to Open more than five seconds, the system determines that there is no water in the boiler and piping, stops the ignition and pump, and outputs a LWCO error message.	1. If a LWCO sensor is not equipped, (1) Check the controller connection terminal. When a LWCO sensor is not equipped, there is a terminal connecting the two holes in the controller. An error can occur if the terminal is not connected completely. (2) Check the decompression transformer harness. If the problem persists after completing (1), check if the settlement of the controller connector is right or it is disconnected. (3) Change the decompression transformer. If the problem persists after completing (1) and (2), change the decompression transformer. (4) Change the PCB. If the problem persists after completing all the actions above, change the PCB. 2. If a LWCO sensor is equipped, (1) Check pipe leakage. If decompression failed, an error occurs. Check if there is a leakage in the heating line. (2) Check if the LWCO sensor harness is disconnected. If the problem persists after completing (1), check if the LWCO sensor harness is disconnected. (3) Change the LWCO sensor. If the problem persists after completing (1) and (2), change the LWCO sensor. (4) Change the decompression transformer. If the problem persists after completing (1), (2), and (3), change the decompression transformer. (5) Change the PCB. If the problem persists after completing all the actions above, change the PCB. 

No.	Error code	Cause	Check method
9	031 Burner overheating prevention	When the burner overheating fuse has been opened for one second and it has been detected consecutively for more than 0.5 seconds, overheating of the burner occurs.	1. Check damage to the burner. An error occurs due to overheating of the burner. Separate the mixing chamber, check the burner, and, if necessary, change it to a new one. Detail observation is needed to discover a problem such as the burner's drooping, tearing, or scraping. Change to a new one if the current burner has a problem. Or, move on to the next step below. 2. Check if the temperature fuse harness is disconnected. If the problem persists after completing "1" (when it has been assured that there is no problem with the burner and the burner has been reconnected), check if the temperature fuse harness is disconnected. 3. Change the temperature fuse. If the problem persists after completing "1" and "2," change the temperature fuse. 4. Change the PCB. If the problem persists after completing all the actions above, change the PCB.  Temperature fuse Mixing chamber assembly 

5.3 Troubleshooting guide by symptom

5.3.1 Noise

Error type	Cause	Check method
Vibration noise	Defective installation	Incorrect mounting to the wall or in an improper location. • Check for improper installation and reinstall the unit if necessary.
	Fan vibration noise	Vibration caused due to defective blower. • Check the blower. If vibration is significant, replace the fan. • If intermittent noise occurs during operation, check the fan for debris. • If vibration noise occurs during operation of the product, and stops when the case lid is removed, check the fan.
Regular noise	Malfunction of pump(external)	Noise due to repeated operation of pump (external) due to a defective PCB.
Noise at ignition	Air differential pressure error (Pop, Beep, Explosive ignition)	1. Offset pressure adjustment error (refer to page 30) • Adjust offset pressure with the pressure adjusting screw on the main gas valve. • Set the PCB DIP switch1 to 1-OFF,2-ON (low fire) or use the Front Panel to set the unit at "1st MIN" (refer to page 48). • If noise occurs at standard value, adjust setting above/below the standard. 2. Gas supply error due to defective air pressure sensor. 3. If the same error is repeated, it is due to a defective PCB.
Noise during combustion	Boiling noise	• How to check boiling: • Boiling occurs if the water temperature quickly rises to 149°F ~167°F(65°C~75 °C). • The heat exchanger is clogged partially due to scale deposits. Flush the main heat exchanger to remove scale. • Replace the heat exchanger if the error occurs from the start of the installation.
	Whirring	Exhaust gas that is recirculated into the boiler through the air inlet could produce abnormal combustion noises. • Check the distance between intakes and exhaust (at least 12" (300mm)). • Check the distance between flues if two or more units are installed (at least 12" (300mm)). • Check if there are any obstructions near the flue.
	Low gas pressure (whirring)	1. Noise occurs due to low gas pressure. • Check the gas supply pressure (dynamic pressure) 2. Low gas supply due to offset pressure error (refer to page 30). • Set the PCB DIP switch1 to 1-OFF,2-ON (low fire) or use the Front Panel to set the unit at "1st MIN" (refer to page 48).
		Noise due to defective air pressure sensor. • Replace the air pressure sensor.
	Noise during combustion	• Noise due to damaged air pressure hose. • Noise may be intermittent depending on the size of the damage.

5.3.2 Water Temperature Issue

Error type	Cause	Check method
Boiler is not operating properly.	Front panel power off	Hot water does not run if the front panel is switched off.
	Defective heating supply thermistor	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 boiler. • The cold water temperature sensor may not work be working properly.
Low hot water temperature	Hot water setting error	Check the hot water temperature setting on the front panel.
	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 piping at the hot water faucet.
No hot water from the valve	Check the pipe	1. The cold water valve is closed. 2. Check if the cold water filter (external) is clogged with foreign substance. 3. Check if the cold water / hot water pipes are frozen during the winter. 4. The main heat exchanger is clogged (by scale). 5. Low inlet water pressure
Cold water flows temporally	Pre-heating does not work	The system initiates the external circulation preheating when a recirculation mode is selected on the front panel DIP switches. Confirm the DIP switch settings.

6. Replacement of Parts

6.1 Replacement Procedure

CAUTION

1. When performing maintenance and/or servicing the boiler, always turn off the electric power, gas and water shut-off valve. Wait for the boiler to become cool. Be careful to avoid injury to your fingers on sharp edges.
2. Drain all water from the boiler when removing the waterway components.
3. Before any disassembly, make sure that all issues and error codes are properly diagnosed.
4. Handle all parts carefully.
5. When reassembling, prevent any foreign substance, i.e. dust, etc. from entering back into the boiler.
6. After reassembling, check for gas and water leakage. Then, test for proper ignition. Make sure that there is no gas leakage from the gas connections by testing with soap bubble solution. Bubbles indicate a gas leak that must be corrected.
7. Check the performance and operation after the boiler has been serviced.

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

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

6.2 Components Replacement Instructions

6.2.1 PCB

1. Turn off the gas supply to the unit.
2. Disconnect the unit from the power supply.
3. Turn off the water supply to the unit.
4. Disconnect wiring connector from the Front Panel.

Figure 1

5. Disconnect all wiring connectors from the PCB and remove the 4 screws from bottom PCB bracket and upper PCB bracket.

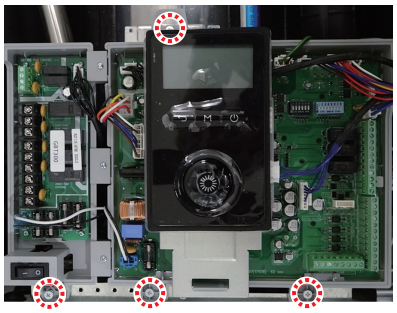


Figure 2

6. Remove the old PCB and replace it with the new part.
7. Reattach all wiring connectors to the PCB.
8. Set the proper DIP S / W settings on the PCB.
9. Reinstall the PCB and Front Panel using the 7 screws previously removed.
10. Turn on the water and gas supplies, then reconnect the power supply to the unit.

Note All wiring harness connections to the PCB should match in color and pin types. Do not use excessive force when removing the connectors as this may cause damage to the PCB.

6.2.2 Fuse

1. Turn off the gas supply to the unit.
2. Disconnect the unit from the power supply.
3. Locate damaged fuse housings in Figure 3 below.

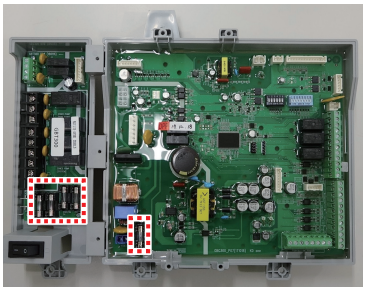


Figure 3

4. Replace the old fuse with the new part.
5. Ensure that the new fuse is of an equivalent rating and that it is properly fixed inside the housing.
6. Turn on water supply, power supply, and gas supply to the unit.

6.2.3 Fan (Combustion Air)

1. Turn off the gas supply to the unit.
2. Disconnect the unit from the power supply.
3. Remove the Front Panel and Controller.
4. Remove the 4 screws from the Gas Pipe.

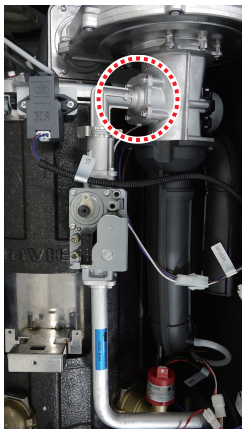


Figure 4

5. Disconnect wiring connectors of Fan and Venturi.

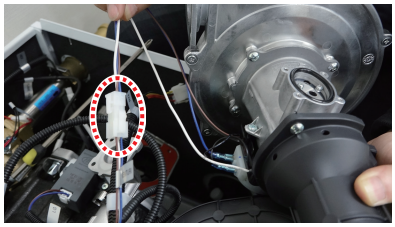


Figure 5

6. Remove the 4 fan screws from the Mixing Chamber.

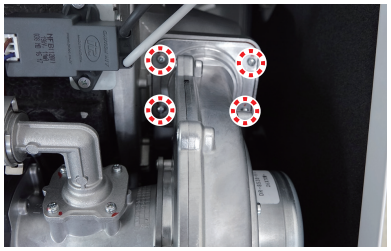


Figure 6

7. Remove hose of APS from Intake Pipe and lift up Fan Ass'y.

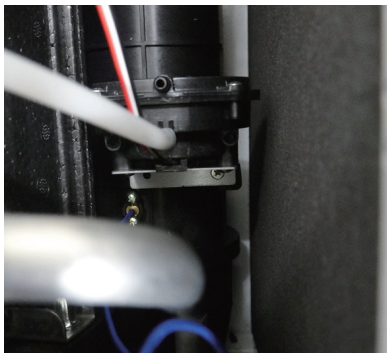


Figure 7

8. Remove the 6 screws from Intake Pipe and Venturi.

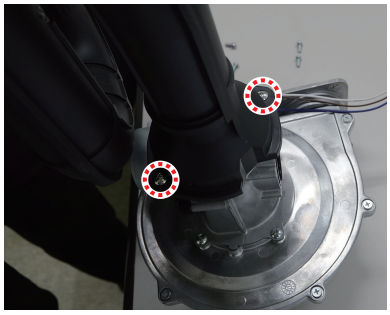


Figure 8

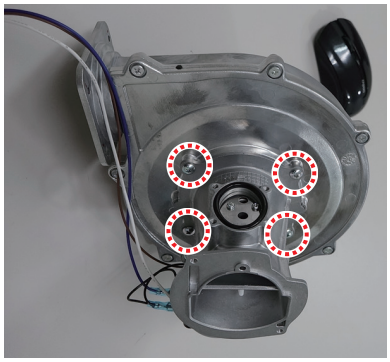


Figure 9

9. Replace Fan Ass'y to the original position and reconnect the wiring connector from the Fan and Venturi.
10. Turn on water supply, power supply, and gas supply to the unit.

Note Do not over-tighten the screws for the fan motor replacement with high torque drill. This may cause damage to the part(s).

6.2.4 Flame Rod

1. Turn off the gas supply to the unit.
2. Disconnect the unit from the power supply.
3. Turn off the water supply to the unit.
4. Remove the Ignition Transformer insulated cables.
5. Remove the 4 screws from the flame rod as shown in Figure below.

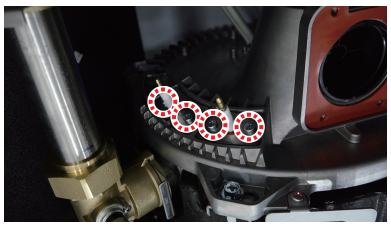


Figure 10

6. Remove the flame rod wiring connector.
7. Remove the flame rod from the burner assembly and replace with the new part.
8. Reconnect the 2 ignition transformer insulated cables to the new flame rod.
9. Place the new flame rod back onto the burner assembly and secure it by using the 2 screws from Figure .
10. Turn on water supply, power supply, and gas supply to the unit.

Note Always use new factory gaskets included with the flame rod when replacing the part onto the burner assembly.

6.2.5 Ignition Transformer

1. Turn off the gas supply to the unit.
2. Disconnect the unit from the power supply.
3. Turn off the water supply to the unit.
4. Remove the Ignition Transformer insulated cables from the igniter probe connectors.

5. Disconnect the wiring connector from the Ignition Transformer.

Figure 11

6. Remove the 2 screws from the Ignition Transformer.

Figure 12

7. Pull out the Ignition Transformer.
8. Replace the old Ignition Transformer with the new part, and then use the 2 screws to secure the part.
9. Reconnect the Ignition Transformer insulated cables to the igniter probe connectors.
10. Reattach the wiring connectors from the Ignition Transformer.
11. Turn on water supply, power supply, and gas supply to the unit.

Note Verify that the Ignition Transformer insulated cables are firmly connected to the igniter probe connectors.

6.2.6 APS

1. Turn off the gas supply to the unit.
2. Disconnect the unit from the power supply.
3. Turn off the water supply to the unit.
4. Remove the air pressure sensor wiring connector (Figure 13).

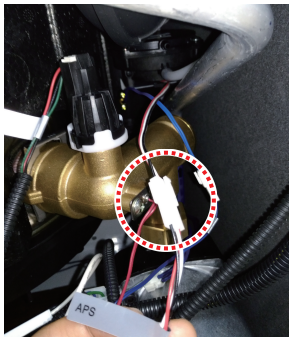


Figure 13

5. Remove the hose from the air pressure sensor.

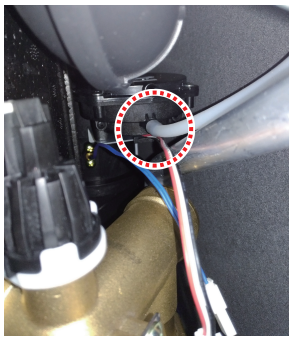


Figure 14

6. Remove the 2 screws that attach the air pressure sensor to the burner assembly.
7. Pull out the air pressure sensor.
8. Replace the old air pressure sensor with the new part.
9. Reattach the air pressure sensor hose.
10. Connect the air pressure sensor wiring connector.
11. Place the front panel back onto the unit and secure it using the 4 screws.
12. Turn on water supply, power supply, and gas supply to the unit.

Note Confirm that the new air pressure sensor is in the proper position before turning the unit back on.

6.2.7 Main Gas Valve

1. Turn off the gas supply to the unit.
2. Disconnect the unit from the power supply.
3. Turn off the water supply to the unit.
4. Disconnect the wiring connector and remove the four screws marked in the image below.

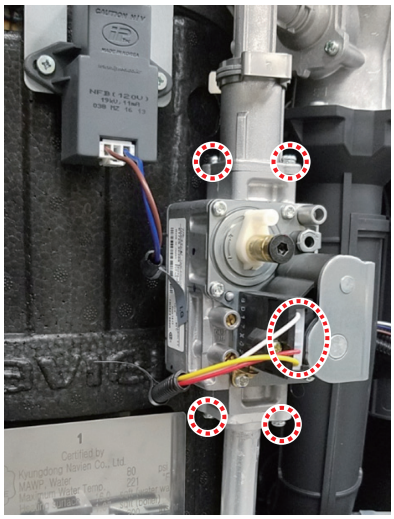


Figure 15

6.2.8 Water Pressure Sensor

1. Turn off the gas supply to the unit.
2. Turn off the 120V power supply to the unit.
3. Turn off the water supply to the unit. Drain all water from the appliance.
4. Disconnect the water pressure sensor wire housing.

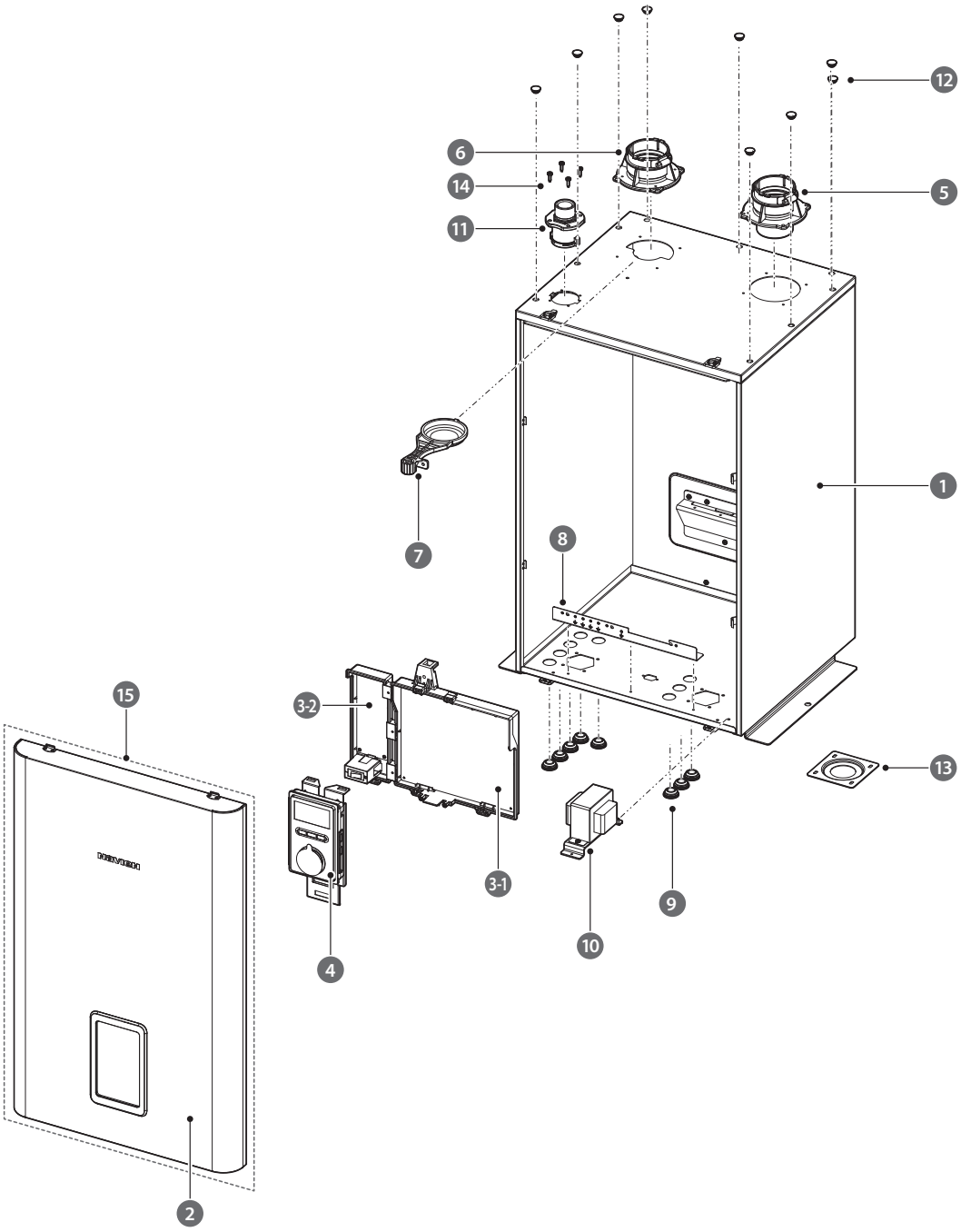
Figure 22

5. Pull out the water pressure sensor.
6. Replace with new water pressure sensor.
7. Connect the water pressure sensor wire housing.

Note Always use proper O-rings at the water pressure valve connection to ensure tight seals.

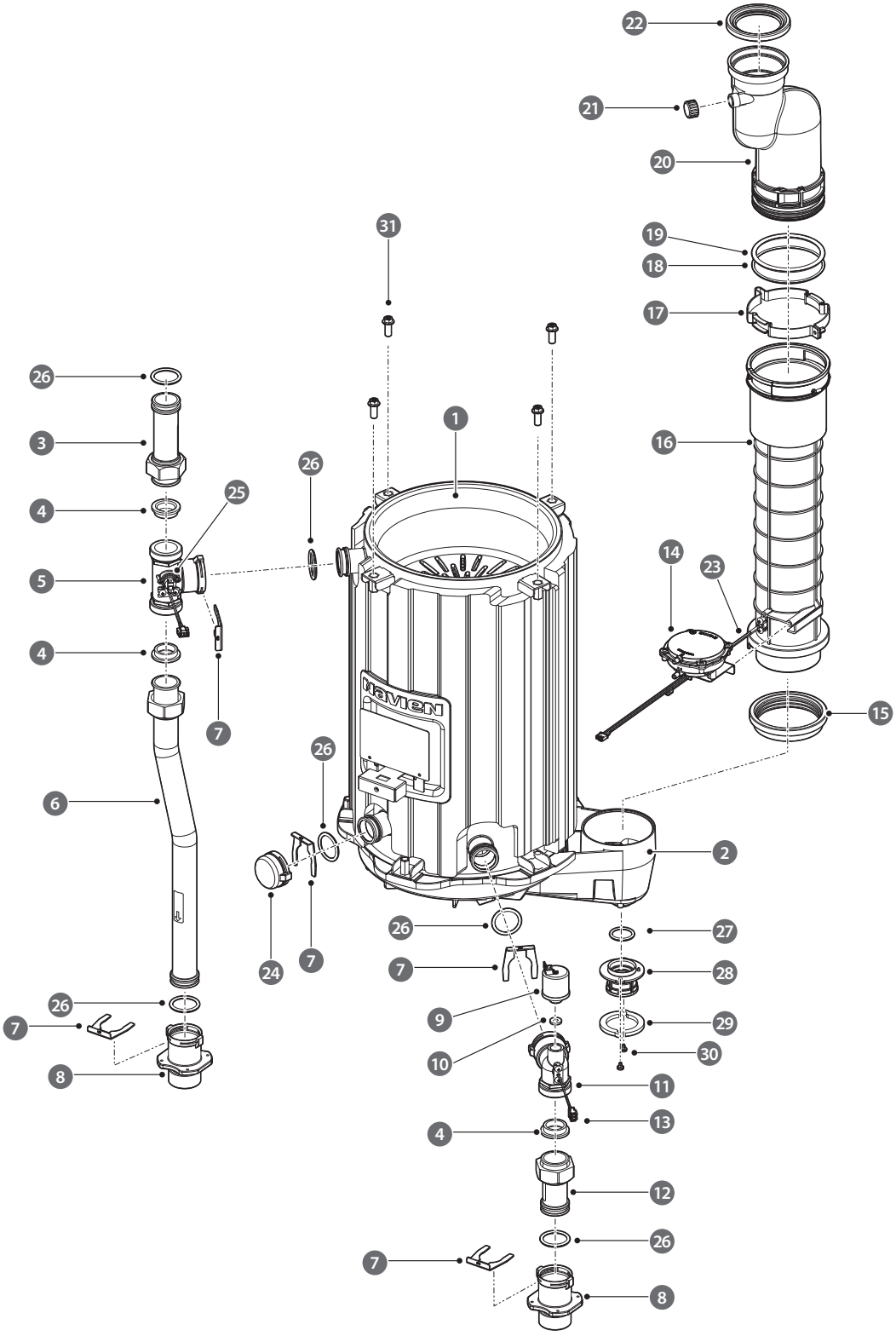
7. Components Diagram and Part List

7.1 Case Assembly



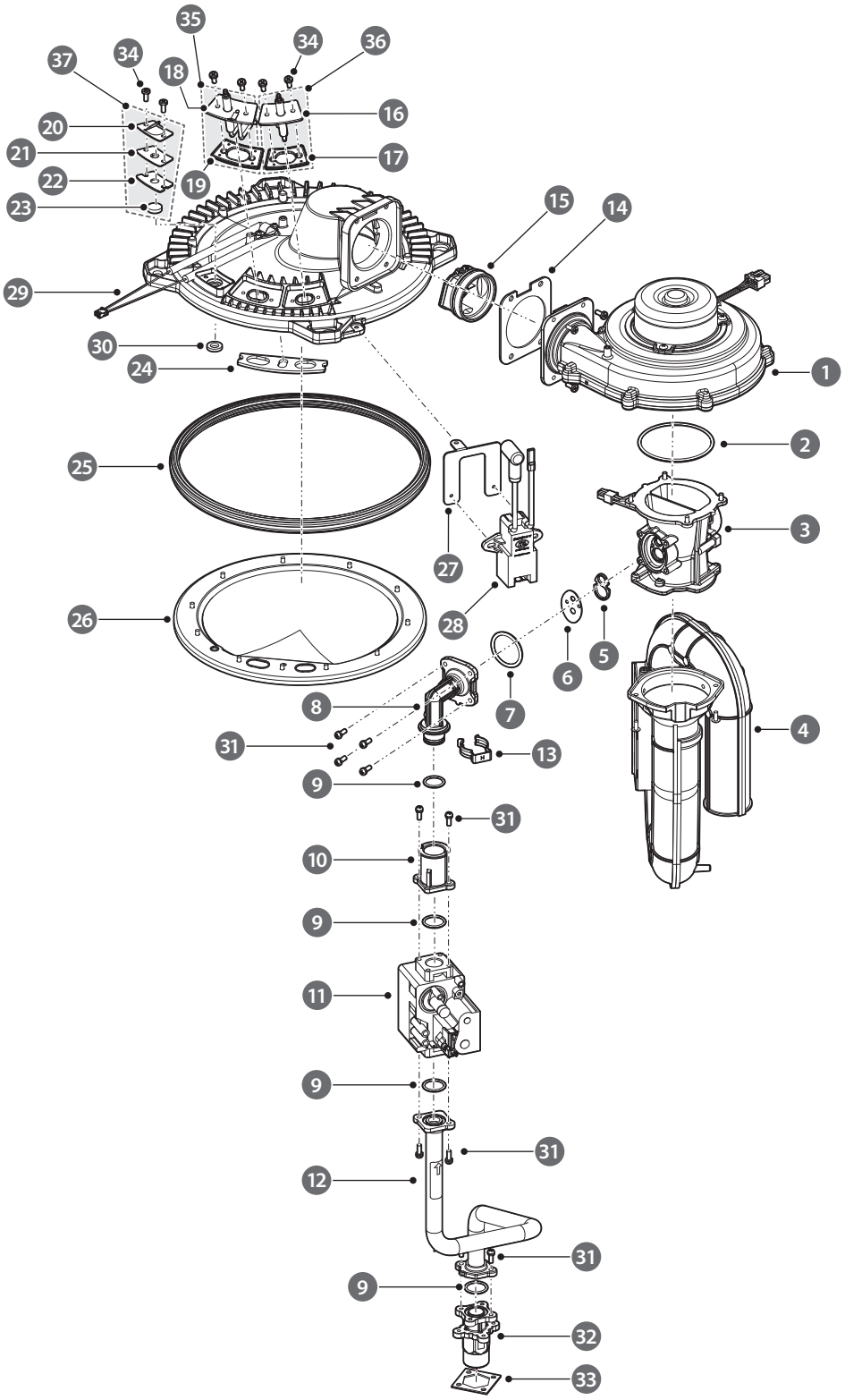
#	Description	Part #	Remark
1	Case Upper	20041092A	
	Case Middle	20041094A	
	Case Lower	20041096A	
2	Cover	30019181A	
3-1	Main PCB	30019689A	
3-2	Terminal PCB	30019951A	
4	Front Panel	30019664A	
5	Exhaust Duct Assembly	30008673A	
6	Intake Air Duct Assembly	30008662B	
7	Intake Air Filter	20007667A	
8	PCB Lower Bracket	20041079A	
9	Rubber Ring	20029318A	
10	24 V Power Transformer	30019981A	
11	Air Vent Adapter	20040245A	
12	Base Packing	20041078A	
13	Drain Pan Adapter Lower Bracket	20043489A	
14	Screw (M4X14)	20038754A	
15	Cover	30021654A	SERVICE KIT

7.2 Heat Exchanger and Waterway Assembly



#	Description	Part #	Remark
1	Heat Exchanger Assembly	30019155A	NFC-200
		30019724A	NFC-175
2	Drain Pan Assembly	30019173A	
3	Supply Pipe (Upper)	30019177A	
4	Packing (P27)	20041401A	
5	Heat Exchanger Outlet Adapter	30019645A	
6	Supply Pipe (Lower)	30019176A	
7	Fastener	20040255A	
8	Heating Supply Adapter	20040244A	
9	LWCO (Pressure Sensor)	30013223A	
10	LWCO (Pressure Sensor) Packing	20006873A	
11	Heat Exchanger Inlet Adapter	30019648A	
12	Return Pipe	30019175A	
13	Thermistor	30012907A	
14	Air Pressure Sensor	30015811A	
15	Drain Pan Packing	20040241A	
16	Exhaust Duct (Lower)	20040242A	
17	Exhaust Duct Clip	20042741A	
18	Exhaust Duct Packing (G90)	20027350A	
19	Exhaust Duct Packing (P85)	20042823A	
20	Exhaust Duct (Upper)	20040727B	
21	Exhaust Duct Cap	20029712A	
22	Exhaust Duct Packing (Upper)	20024690A	
23	Thermistor (Exhaust)	30009478A	
24	Heat Exchanger Drain Cap	20042237A	
25	High Limit Switch	30002558A	
26	O-ring (V32)	20041403A	
27	O-ring (P26)	20032409A	
28	Drain Pan Adapter	20041181A	
29	Packing (Drain Pan Adapter)	20041449A	
30	Screw (M4X6)	20038752A	
31	Screw (M8X20)	20042814A	

7.3 Combustion Parts Assembly



#	Description	Part #	Remark
1	Fan Assembly	30019668A	NFC-200
		30019106A	NFC-175
2	Venturi Packing	20018079A	
3	Dual Venturi	30017402A	
4	Intake Pipe	30019120A	
5	Orifice Packing	20022660A	
6	Gas Orifice	20041039A	NFC-200 (NG)
		20041037A	NFC-175 (NG)
		20041040A	NFC-200 (LP)
		20041038A	NFC-175 (LP)
7	O-ring (P34)	20019090A	
8	Gas Connector (Upper)	20042238A	
9	O-ring (P20)	20006934A	
10	Gas Connector Adapter	20042238A	
11	Gas Valve	30011586A	
12	Gas Pipe	30019180A	
13	Fastener	20007878A	
14	Fan Packing	20042399A	
15	Fan Damper	30008825A	
16	Flame Rod	30019166A	
17	Flame Rod Packing	20040230A	
18	Igniter	30019165A	
19	Igniter Packing	20040229A	
20	Flame Inspection Window (Upper)	20040231A	
21	Flame Inspection Window (Lower)	20040232A	
22	Flame Inspection Window (Graphite Packing)	20043399A	
23	Flame Inspection Window (Glass)	20040236A	
24	Packing (Graphite)	20040233A	
25	Burner Packing	20040228A	
26	Burner	20040226A	
27	Ignition Transformer Bracket	20041154A	
28	Ignition Transformer	30019980A	
29	Burner Temperature Fuse	30020776A	
30	Packing (Graphite)	20040234A	
31	Screw (M4X12)	20006390A	
32	Gas Inlet Adapter	20042244A	
33	Packing (EVA)	20023581A	
34	Screw (M4X10)	20038758A	
35	(SET) Igniter	30021275A	Includes Igniter and Packing
36	(SET) Flame Rod	30021274A	Includes Flame Rod and Packing
37	(SET) Flame Inspection Window	30021277A	Includes Upper/Lower/Glass and Packing

8. Inspection and Maintenance Schedule

8.1 Annual Servicing

In order to maintain its safe and efficient operation, it is recommended that the boiler is serviced annually.

> **CAUTION**
>
> Servicing must be performed by a qualified service agency or gas supplier.

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 PCB and Panel

Maintenance

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

8.2 Maintenance Report

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

8.3 Maintenance Schedules

Owner maintenance	
Daily	• Check boiler area • Check pressure / temperature gauge
Monthly	• Check vent piping • Check air piping (if installed) • Check air and vent termination screens • Check relief valve • Check condensate drain • Check air vents
Periodically	• Test low water cut-off (if used) • Reset button (low water cut-off)
Every 6 months	• Check boiler piping (gas and water) for leaks Operate relief valve
End of season months	• Shut boiler down (unless boiler used for domestic hot water)

8.4 Inspection Report

Inspection Items	References	Date:	Date:
Visual Inspection for General Signs of Corrosion	YES / NO		
Checking & 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 front panel.	YES / NO		

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Service Manual

NFC Condensing Boilers

Getting Service

If your boiler requires service, you have several options for getting service:

- Contact Technical Support at 1-800-519-8794 or on the website: www.navien.com.
- For warranty service, always contact Technical Support first.
- Contact the technician or professional who installed your boiler.
- Contact a licensed professional for the affected system (for example, a plumber or electrician).

When you contact Technical Support, please have the following information at hand:

- Model number
- Serial number
- Date purchased
- Installation location and type
- Error code, if any appears on the front panel display.

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