NAVIEN Condensing Combi Boiler

Service Manual

Service Support

Options for service support include:

- Technical Assistance Service (TAS). A list of official TAS providers is available at http://www.navienuk.com. Contact a TAS for all warranty claims.
- The technician or company that installed your boiler.
- A registered service provider.

When you contact a TAS, please have the following information available.

- Model number
- Serial number
- Date of purchase
- Installation location and type
- Error code information from the front display panel if available

Version: 1.0 (Oct. 19. 2015)

KD NAVIEN KD Navien Co.,Ltd

NAVIEN Condensing Combi Boiler

Service Manual

Model

NCB-24LSWE
NCB-28LSWE
NCB-34LSWE
NCB-40LSWE

Keep this manual near the boiler for future reference.

⚠ WARNING

The safety information contained in this manual is important. Not following the safety precautions may cause a fire or explosion and result in property damage, injury, or death.

- **Do not store or use gasoline or other flammable liquid or vapour near this or any other appliance.**
- **WHAT TO DO IF YOU SMELL GAS**
  - Do not use any appliances.
  - Do not turn on any electrical devices or circuits. Do not use a phone inside the building.
  - Call your gas supplier from a phone outside the building. Follow the gas supplier's instructions.
  - If you cannot reach your gas supplier, call the fire service.
- **Installation and service must be performed by a qualified installer, service agency or the gas supplier.**

KD NAVIEN

Revisions

Version	Description of changes	Date
1.00	First issue	Mar. 12, 2015

Contents

Navien Warranty

Warranty Period

Navien products come with a limited warranty covering. The warranty covers labour, parts, and the heat exchanger. The warranty period starts from the date of original installation. The date of original installation must be advised to Navien, and if requested, proof of the original installation date must also be provided to Navien. When the product is installed in a new installation, the warranty period will start from the date the end-user takes responsibility for the property.

Product	Warranty Period
NCB Series Boiler (Residential use, single dwelling)	3 years

Warranty Claim Procedure

To obtain warranty repair service, the end user or homeowner must contact the original installer of the Navien product. If the original installer is unknown, the end user or homeowner can contact the Navien Technical Department at **0844–332-2323**. 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 labour in completing the warranty service is subject to Navien's prior written approval and shall be subject to Navien's schedule of approved labour 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 authorised 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 in commercial or multi-unit dwelling applications or 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 or 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 flue 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.
- Removal or alteration of the rating plate.

Abbreviations and Definitions

Abbreviation	Definition
NCB-CE	General name for NCB-24LSWE, NCB-28LSWE, NCB-34LSWE, and NCB-40LSWE products
NG	Natural Gas
LP	Propane Gas
AP	Air Pressure
APS	Air Pressure Sensor
DHW	Domestic Hot Water
FM	Fan Motor
GARC	Gas Air Ratio Control
LPM	Litre Per Minute
MGV	Main Gas Valve
RPM	Revolutions per Minute
PCB	Printed Circuit Board
EMI	Electromagnetic Interference
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 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 potential hazardous situation which, if not avoided, could result in injury or death.

CAUTION

Indicates an imminent hazardous situation which, if not avoided, may result in minor or moderate injury.

1.3 Instructional Symbols

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

⚠ DANGER

FLAMMABLE VAPOUR

Vapours from flammable liquids can explode and cause fire resulting in death or severe burns.

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

- Store flammable products far away from the boiler in approved containers, with the lid tightly closed, and out of the reach of children.
- The boiler's main burner ignites automatically at various intervals and may ignite flammable vapours.
- Flammable vapour is invisible, is heavier than air, and can travel long distances at floor level. Dangerous concentrations of flammable vapour can be moved by air flow from other rooms towards the main burner flame.

⚠ DANGER

WHAT TO DO IF YOU SMELL GAS

It is important that these instructions are followed exactly to avoid fire or explosion, property damage, personal injury, or loss of life.

DO NOT OPERATE THE BOILER.

DO NOT CREATE ANY SOURCES OF IGNITION

DO NOT OPERATE ANY FAUCETS.

Smell around the appliance area for gas. Ensure to smell close to the floor because gas is heavier than air and will settle on the floor.

- Do not smoke.
- Extinguish all open flames.
- Do not use appliances of devices that generate sparks.
- Do not operate light switches or use electrical equipment.
- Do not use a phone inside the building.
- Open the windows and doors.
- Keep people away from the danger zone.
- Close the gas shutoff valve.
- Observe the gas supplier's safety instructions posted on the gas meter.
- As soon as possible call the gas supplier from outside of the building. Follow the gas supplier's instructions.
- If you cannot contact your gas supplier, call the emergency services. Notify your plumbing or heating contractor when you are outside of the building.

⚠ DANGER

HOT WATER TEMPERATURE SETTING

- Water temperatures at or above 52°C can cause instant severe burns or scalding that can result in serious injury or death.
- Households with small children, or disabled or elderly people, may require a temperature setting of 49°C or lower for a safer water temperature.

TO PREVENT BURNS

- Use the lowest operating temperature setting that provides a comfortable water temperature.
- If the household has children, or elderly or disabled residents, use a lower temperature setting.
- Read all instructions in this manual carefully before changing the temperature setting.
- Check the water temperature before allowing children, or elderly or disabled people to use it.
- Contact a registered plumber or your local plumbing authority for more information.

- For your safety and comfort, the default water temperature setting is 49°C. Increasing the temperature increases the risk of accidental burns or scalds. Water temperature at or above 52°C can cause instant scalding, severe burns, or death. Before you change the temperature setting, read the following table carefully.

Water Temperature	Time for a young child to receive full thickness (third degree) burns
70 ℃	Less than 1 second
60 ℃	1 second
55 ℃	10 second
49 ℃	10 minutes
37 ℃	Very low risk of scalding

⚠ DANGER

INSTALLATION REQUIREMENTS

- Installation method may affect how the boiler is serviced. Read all related information in the “Installation Manual”.

DANGER

IMPORTANT SAFETY PREAUTIONS

- Read the safety information before operating or servicing Navien boilers.
- Confirm the location of the gas shut-off valve. During servicing, close the manual shut-off valve if the boiler overheats or is subjected to fire, flood, physical damage or other similar conditions.
- DO NOT turn on the boiler unless the water and gas supplies are connected and supplied.
- DO NOT turn on the boiler if the main water supply valve is closed.
- Ensure the boiler's power supply is isolated before removing the front cover.
- Label all wires prior to disconnection. Wiring errors can cause improper and dangerous operation. Test and verify that the boiler operates safely and correctly after it is serviced or repaired.
- Incorrect adjustments, modifications, servicing or maintenance can cause property damage, personal injury, or death.
- To prevent scalding, always check the hot water temperature when servicing is completed.
- DO NOT change the water temperature while the boiler is in use.
- DO NOT use parts other than those specified for the boiler.
- DO NOT allow children to operate or handle the unit.

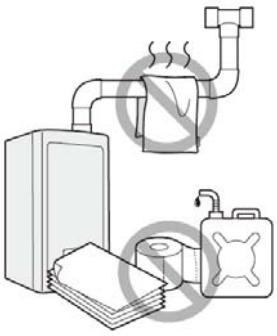
WARNING

GAS TYPE and POWER SUPPLY

- This default gas supply configuration for this boiler is Natural Gas. If it is converted to Propane Gas, the conversion kit supplied with the boiler must be used.
- The power supply must be 230 VAC, 50 Hz. Voltages that are abnormally high or low may affect operation and reduce the life of the boiler.

If the gas or power supplies do not match the specifications do not connect the boiler. Contact Navien for assistance.

⚠ WARNING



- **Isolate the gas supply if the boiler is damaged.**
  Identify the location of the gas shut off valve and ask a qualified technician to demonstrate how to close the valve. If the boiler is damaged due to overheating, fire, flood, or any other reason, close the shut off valve and do not operate the boiler until it has been inspected by a qualified technician.
- **DO NOT store or use gasoline or other flammable liquids near the boiler.**
  Doing so may result in fire or explosion.
- **DO NOT place combustibles, such as newspapers or laundry, near the boiler or flue system.**
  Doing so may result in a fire.
- **DO NOT place or use hair spray or paint aerosols, or any other compressed gases near the boiler or flue system, including the flue termination.**
  Doing so may result in fire or explosion.
- **DO NOT operate the boiler with an open front cover.**
  Doing so may result in fire or carbon monoxide (CO) poisoning and may result in property damage, personal injury, or death.
- **DO NOT operate this boiler without proper flue system.**
  Doing so may result in fire or carbon monoxide (CO) poisoning and may result in property damage, personal injury, or death. Inspect the flue termination and air intake supply at least annually to ensure proper operation of the boiler. Turn off and discontinue using the boiler if any of the flue pipes, flue elbows, or intake pipes are damaged, have loose connections, or has signs of corrosion or heat damage.
- **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 repairs not covered in this manual, contact a qualified technician or a licensed professional. Incorrect adjustments, modifications, servicing, or maintenance may cause property damage, personal injury, or death and will void the warranty.
- **Do not allow children to operate or access the boiler.**
  Doing so may result in property damage or personal injury.
- **Do not 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 connected and supplied Doing so may damage the boiler.**
- **DO NOT use hot water inside the installation when the main water supply shut-off valve is closed.**
  Doing so may damage the boiler.
- **DO NOT use the boiler for purposes other than those 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 control circuits, label all wires prior to disconnecting them.**
  Failure to do so may result in wiring errors and lead to improper or dangerous operation.
- **Do not use unauthorised replacement parts or accessories.**
  Doing so may result in improper or dangerous operation and will void the manufacturer's warranty.
- **Do not place anything in or around the flue terminals, such as a clothes line, that can obstruct the air flow in or out of the boiler.**
- **If the boiler overheats or the gas supply fails to shut off, isolate the gas at the boiler's main valve.**
- **Do not use this appliance if any part has been covered by water.**
  Contact a qualified service technician to inspect the appliance to verify the boiler is safe to operate and to replace any damaged parts.

General Installation Guidelines

Navien guarantees that no harmful substances or materials have been used in the manufacture of this product.

All current and local laws and regulations must be observed when the boiler. The boiler must be installed in an adequately ventilated area.

The boiler must be installed by registered installers. Commissioning of the boiler must be performed by a Navien authorised TAS.

The requirements included in the following regulations must be observed on installing the boiler:

- Gas installation regulations.
- Technical building codes.
- Building heating installation regulations.
- Electrical regulations.

The latest version of the regulations and codes of practice must be applied to the installation methods.

The installation must also comply with the European Standards listed in the table below:

Standard	Description
UNE-EN 13831:2008	Closed expansion vessels with diaphragm.
UNE-EN 1856	Metal chimneys
UNE-EN 13384	Chimneys
UNE-EN 13779	Ventilation
UNE-EN ISO 16484	Building control systems.
UNE-EN 14336	Heating systems in buildings.
UNE-EN 15502-1	Gas-fired heating boilers Part 1: General Requirements and
UNE-EN 15502-2-1	Gas-fired heating boilers Part 2-1: Specific standard for type C appliances and type B2, B3 and B5 appliances of a nominal heat input not exceeding 1000kW
UNE-EN 13203:2007	Domestic Hot Water
UNE-EN 303-7:2008	Heating boilers.

EC Conformity Declaration

CE 0051

Navien, hereby declares that the boiler models:

NCB-24LSWE, NCB-28LSWE, NCB-34LSWE, NCB-40LSWE

to which this declaration refers, conform to and comply with the essential requirements of the following applicable European

Standards and Directives.

Gas appliances: Directive 2009/142/EC Standards EN 437 and EN 15502

Boiler Efficiency: Directives 92/42/EEC and 93/68/EEC Standards EN 15502

Low voltage: Directives 73/23/EEC and 93/68/EEC Standard EN 60335-1, EN 60335-2-30, EN 60335-2-51, EN 50165

Electro-magnetic Compatibility: Directive 2004/108/EC Standards EN 55014

Pressure Vessels: Directive 97/23/EEC

Navien, manufactures its products using a Quality Assurance system in compliance with Standard EN-ISO 9001:2000.

2. Product Information

2.1 Product Information

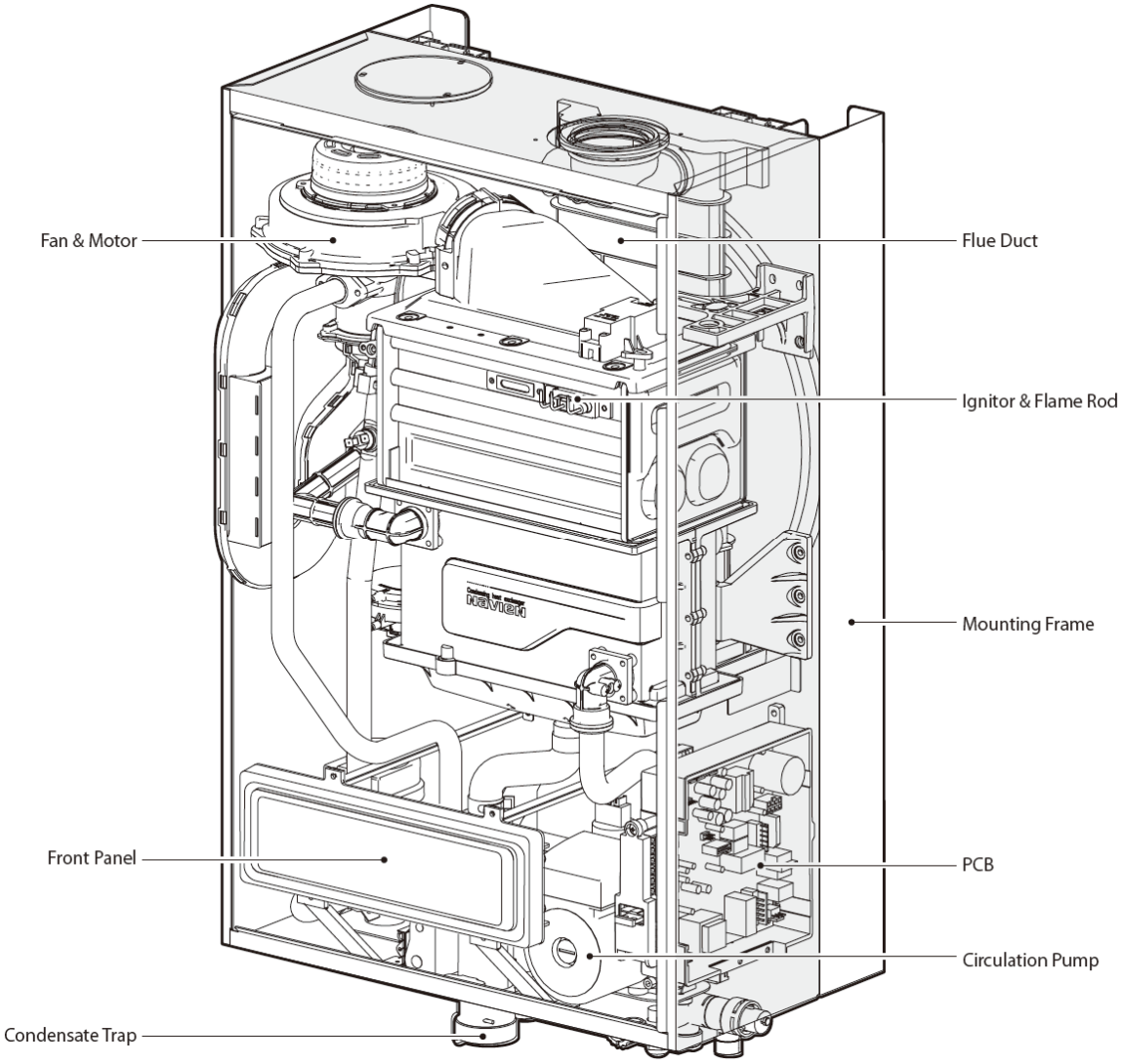
The NCB series gas boiler is a fully modulating gas appliance which has a built-in circulation pump and air vent. It provides central heating and domestic hot water. Depending on the heat capacity, three models are available with different ratings: 24 kW, 28 kW, 34kW, and 40 kW.

Model	Maximum Space Heating Input	Maximum DHW INPUT
NCB-24LSWE	20.0 kW	24.0 kW
NCB-28LSWE	24.0 kW	28.0 kW
NCB-34LSWE	29.0 kW	34.0 kW
NCB-40LSWE	34.0 kW	40.0 kW

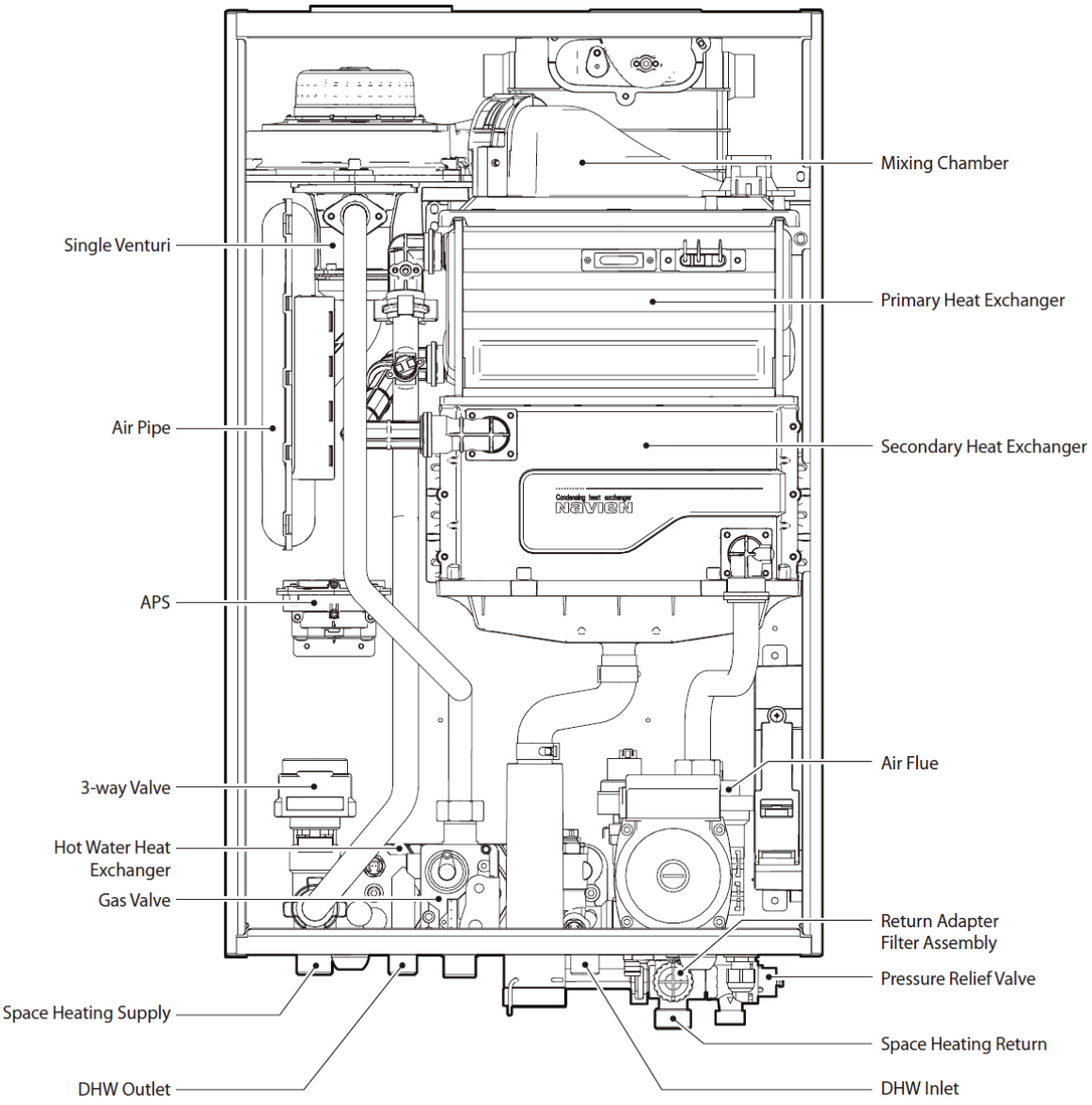
- By default, the boiler assigns system priority to DHW supply.
- The NCB Series boiler has a built-in circulation pump, 3-way valve assembly, flow sensor, DHW plate heat exchanger and, a safety valve (or relief valve). A separate heating expansion vessel is required.
- Internal freeze protection and an electronic control unit are incorporated inside the boiler. The boiler is compatible with all brands of standalone room thermostats and various sets of relay contacts can be used with the boiler.

2.2 Components

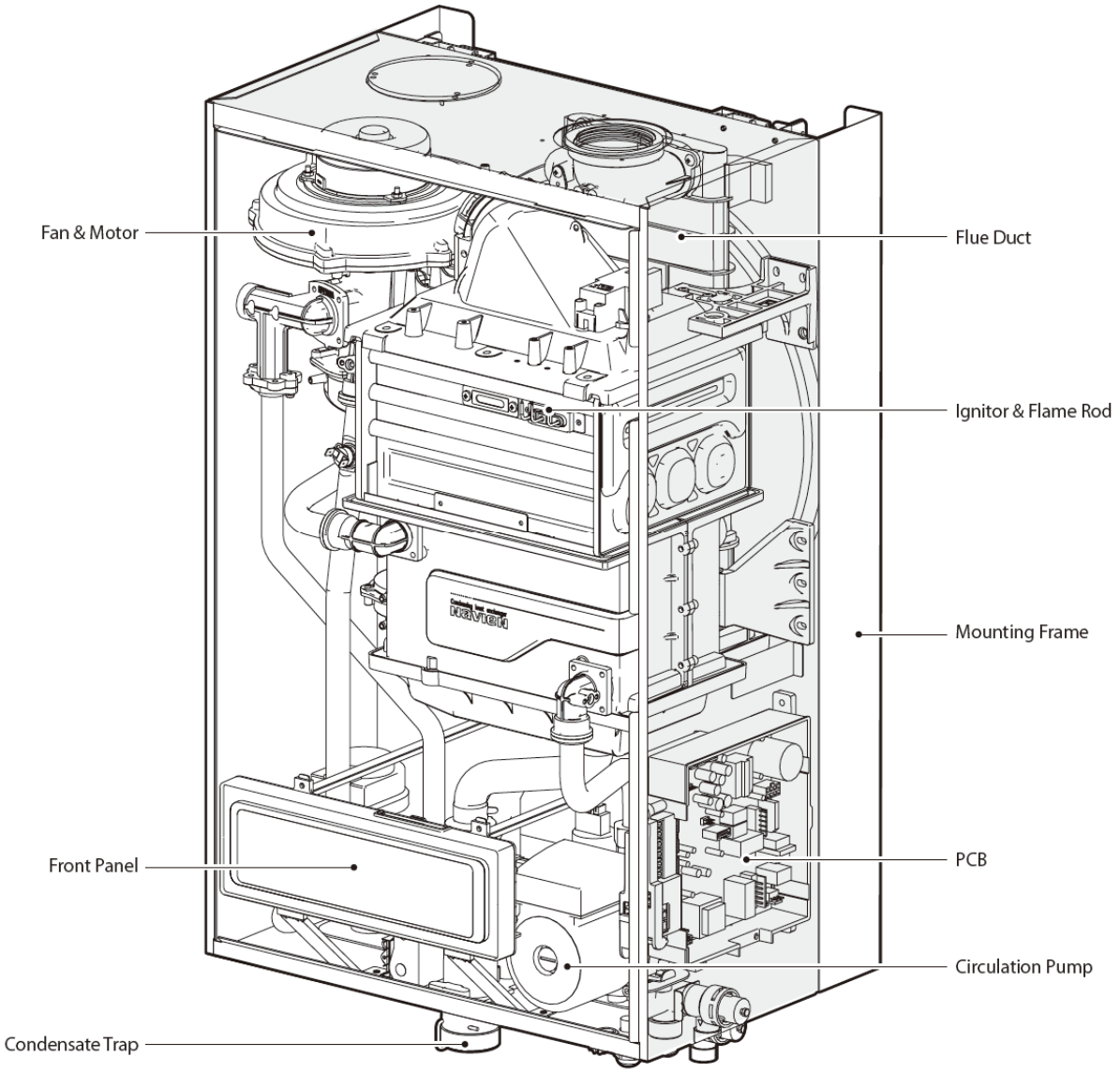
The following diagram shows the key components of the boiler. Component assembly diagrams and particular parts lists are included in the appendices.



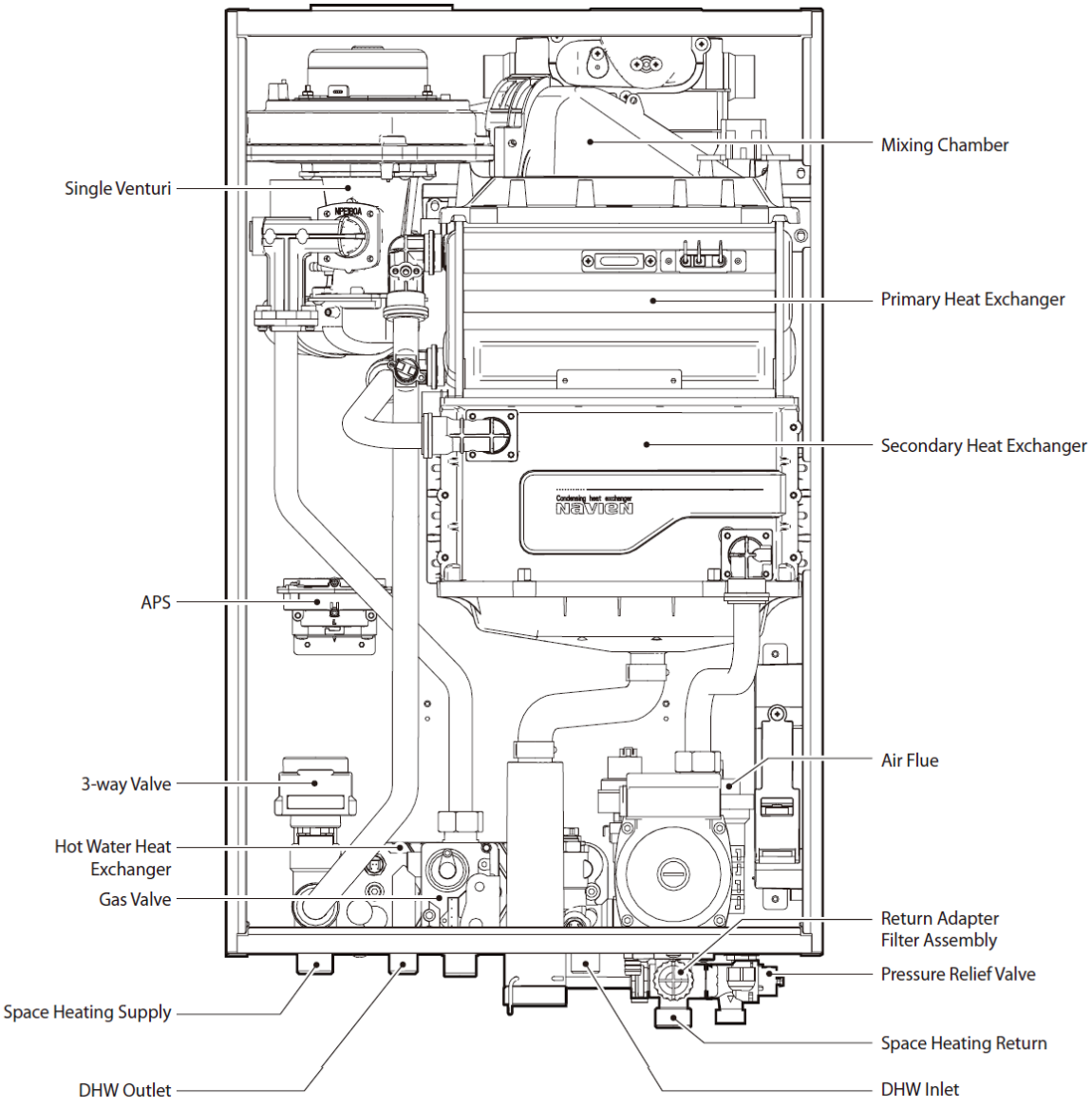
NCB-24/28/34LSWE



NCB-24/28/34LSWE


Fan & Motor
Flue Duct
Ignitor & Flame Rod
Mounting Frame
Front Panel
PCB
Circulation Pump
Condensate Trap

NCB-40LSWE


Mixing Chamber
Single Venturi
Primary Heat Exchanger
Secondary Heat Exchanger
APS
Air Flue
3-way Valve
Hot Water Heat Exchanger
Gas Valve
Return Adapter Filter Assembly
Pressure Relief Valve
Space Heating Supply
Space Heating Return
DHW Outlet
DHW Inlet

NCB-40LSWE

3. Technical Data

3.1 General Specifications

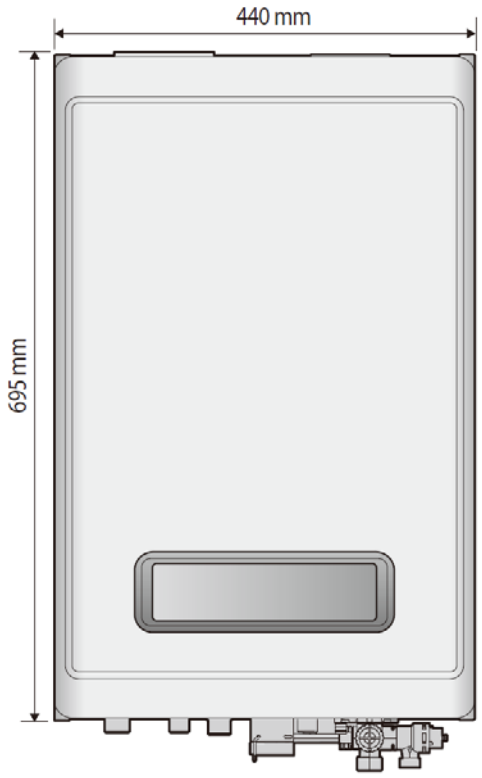
The table below lists the boiler's general specifications.

Specification	Unit	NCB-24LSWE	NCB-28LSWE	NCB-34LSWE	NCB-40LSWE
Heating capacity (max/min)	kW	20.0/4.2	24.0/4.2	29.0/5.1	34.0/4.0
DHW heat capacity (max/min)	kW	24.0/4.2	28.0/4.2	34.0/5.1	40.0/4.0
Heating output (max/min) at 80/60°C	kW	19.5/4.0	23.3/4.2	28.4/4.9	33.2/3.8
DHW output (max/min)	kW	20.0/4.0	24.0/4.0	34.0/5.0	40.0/4.0
Condensing heating output (max/min) at 50/30°C	kW	21.4/4.5	25.5/4.5	31.1/5.5	36.2/4.3
Full output load efficiency (max/min), at 80/60°C	%	97.7/96.4	97.2/96.4	97.9/96.4	97.5/95.8
Full output load efficiency (max/min), at 50/30°C (condensation)	%	106.9/107.8	106.3/107.8	107.3/107.9	106.6/107.9
Partial load (30%) efficiency, at 30°C return temperature	%	108.3	108.3	108.6	108.8
Heat Loss via the casing with burner switched on	%	0.1	0.1	0.1	0.1
Heat Loss via the chimney with burner switched on	%	1.6	1.8	1.5	1.9
Seasonal efficiency rate (SEDBUK rating)	-	A			
NOx class	-	5			
Category	-	II2H3P			
Type	-	Heating and instantaneous hot water production			
Heating output adjustment	-	Adjustable over entire max/min output range			
Type of heating installation	-	Closed circuit			
Maximum heating pressure	bar	2.5			
Maximum heating temperature	°C	90			
Adjustable heating temperature range	°C	40-90			
Expansion vessel volume	l	6. 0			
Expansion vessel pre-load	bar	1			
Minimum DHW pressure	bar	1.0	1.2	1.4	1.4
Minimum DHW flow	l/min	2.0			
Maximum DHW pressure	bar	10			
Adjustable DHW temperature range	°C	30–65			
Specific flow (ΔT=25°C)	l/min	13.8	16.1	19.5	22.9
Specific flow (ΔT=30°C)	l/min	11.5	13.4	16.2	19.1

Specification		Unit	NCB-24LSWE	NCB-28LSWE	NCB-34LSWE	NCB-40LSWE
Specific flow for kitchens (ΔT=45°C)		l/min	7.6	8.9	10.8	12.7
Electrical supply		-	230 V / 50 Hz			
Nominal current		A	0.6		0.62	
Electrical maximum rating		W	130			
Electrical protection		-	IP X5D			
Boiler mounting method		-	Wall-mounted			
Flue exhaust/Air intake system types		-	B23-B33-B53-C13-C33-C43-C53-C63-C83			
Flue exhaust/Air intake system diameters		mm	Coaxial Ø60/100 and Ø80/125–Dual duct Ø80/80			
Max. horizontal coaxial pipe length Ø60/100		m	20			
Max. vertical coaxial pipe length Ø60/100		m	21			
Equivalent elbow length at 90° Ø60/100		m	1.3			
Equivalent elbow length at 45° Ø60/100		m	1			
Max. horizontal coaxial pipe length Ø80/125		m	68			
Max. vertical coaxial pipe length Ø80/125		m	70			
Equivalent elbow length at 90° Ø80/125		m	2.2			
Equivalent elbow length at 45° Ø80/125		m	1			
Equivalent length of adapter Ø60/100 => Ø80/125		m	0.5			
Max. dual duct length Ø80-Ø80		m	110			
Equivalent elbow length at 90° Ø80		m	2.2			
Equivalent elbow length at 45° Ø80		m	1.4			
Hydraulic connection diameter	Heating	mm	22			
	DHW	mm	15			
	Gas inlet	mm	22			
Dimensions (width x depth x height)		mm	440 x 350 x 695		440 x 380 x 695	
Weight		kg	38		42	

3.2 Dimensions

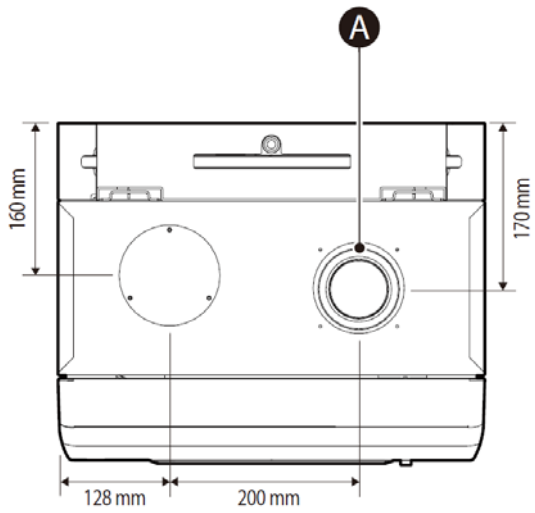
The following diagrams show the dimensions of the boiler. The table below lists the pipe diameters for various connection points.



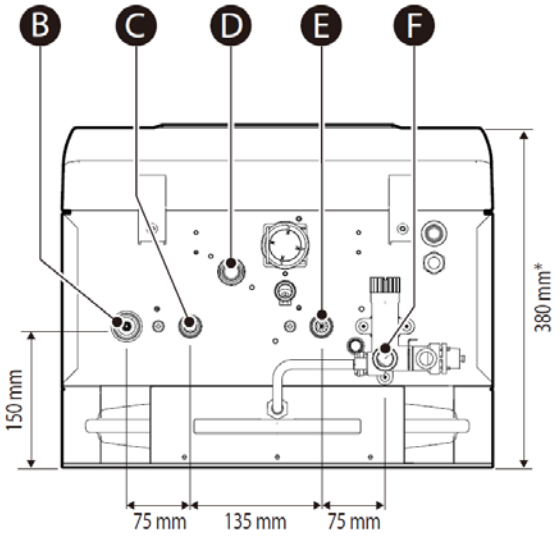
Supply Connection Pipe Diameters

Re	Description	Diameter
A	Flue exhaust/Air intake	60 mm/100 mm, 80 mm/125 mm
B	Space heating supply	22 mm
C	Hot water outlet (DHW)	15 mm
D	Gas supply inlet	22 mm
E	Cold water inlet (DHW)	15 mm
F	Space heating return	22 mm

Overhead View



Supply Connections



* NCB-24LSWE/28LSWE: 350 mm
NCB-34LSWE/40LSWE: 380 mm

4. System Details

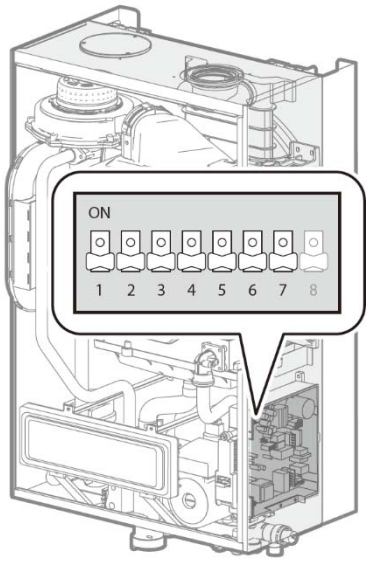
4.1 Setting the DIP Switches

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

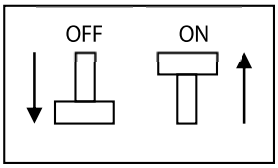
The boiler has two sets of DIP switches on the main circuit board (PCB) and two sets of DIP switches on the front panel. DIP switches are used to control the boiler's functions. Set the DIP switches as required based on the installation.

4.1.1 PCB DIP Switches

Setting the Circuit Board DIP Switches (8-way)



The DIP switches on the circuit board configure the boiler's model and gas settings. These configurations are set at the factory and should not be changed. The following tables describe the functions of the DIP switches and their settings.



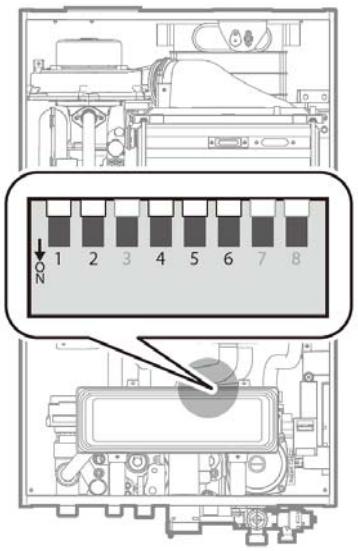
Eg.) DIP Switch On/Off

Switch	Function	Setting		
1 & 2	Operation status	Normal operation		1-OFF, 2-OFF
		24/28/34 LSWE	DHW MAX	1-ON, 2-OFF
		40LSWE	DHW 2-stage MAX	
		24/28/34 LSWE	MIN	1-OFF, 2-ON
		40LSWE	1-stage MIN	
		24/28/34 LSWE	Heating MAX	1-ON, 2-ON
		40LSWE	Heating 2-stage MAX	
3 & 4	Capacity	24LSWE		3-OFF, 4-OFF
		28LSWE		3-ON, 4-OFF
		34LSWE		3-OFF, 4-ON
		40LSWE		3-ON, 4-ON
5	Burner type	Bekaert		5-ON
		Alantum		5-OFF
6 & 7	Region	Europe		6-OFF, 7-OFF

4.1.2 Front Panel DIP Switches

Setting the Front Panel DIP Switches

The DIP switch on the front panel configures the fuel selection, source of the heat demand, and the temperature control standard.



Switc	Function	Setting	
1 & 2	Fuel selection	G20 (LNG)	1-OFF, 2-OFF
		G25, G27(LNG)	1-OFF, 2-ON
		G30 (LPG)	1-ON, 2-OFF
		G31 (LPG)	1-ON, 2-ON
4 & 5	Heat demand	Panel	2-OFF, 3-OFF
		OpenTherm Remote Control	2-ON, 3-OFF
		Thermostat	2-OFF, 3-ON
		Panel	4-ON, 5-ON
6	Temperature control standard	Supply Water	1-OFF
		Return Water	1-ON

4.2 Measuring the Incoming Gas Pressure

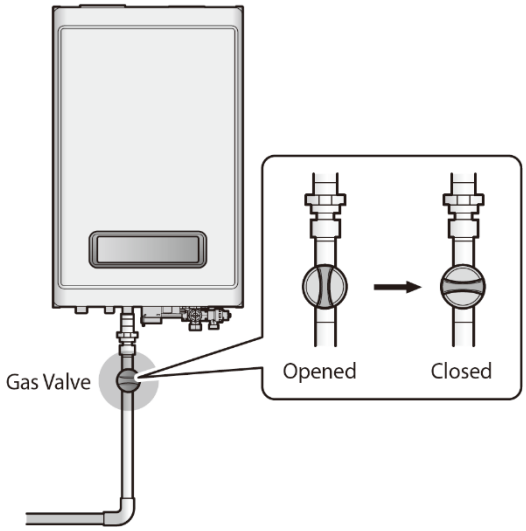
⚠ WARNING

The boiler does not function correctly if there is insufficient incoming gas pressure. Measuring the inlet gas pressure should be performed by a registered technician only.

* The incoming gas pressure must be between 17 mbar and 25 mbar for natural gas and between 25 mbar and 35 mbar for liquefied propane.

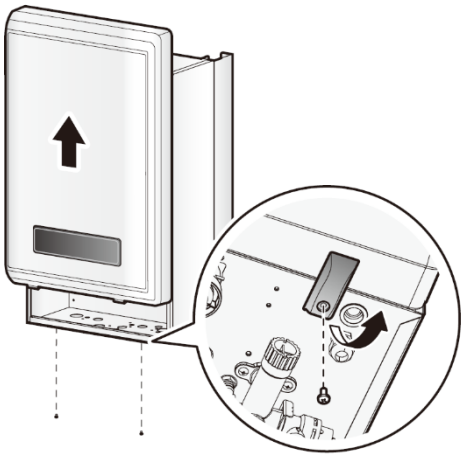
To measure the incoming gas pressure:

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



2. Open a hot water tap. The boiler should turn on and the gas in the gas supply line will be purged.
3. Leave the faucet on until the boiler shuts down due to the absence of gas, and then turn off the hot water tap.

4. Remove the boiler's front cover by loosening the 4 Phillips head screws securing it to the case.

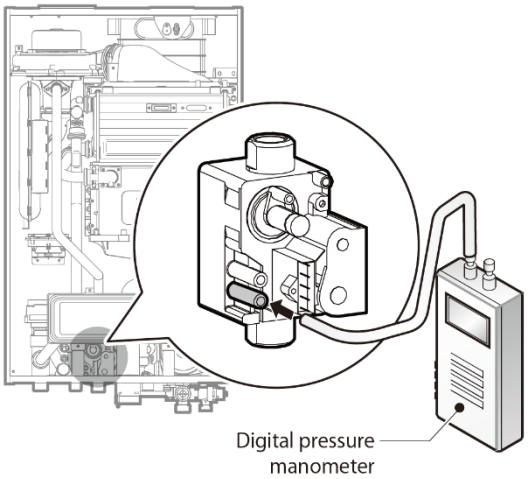


CAUTION

Ensure that no cables obstruct the PCB assembly before inserting it in position. If the assembly is stuck, do not force it. Doing so may damage the cables and result in serious malfunction.

Check again to ensure that no cables or any other parts obstruct the PCB before proceeding.

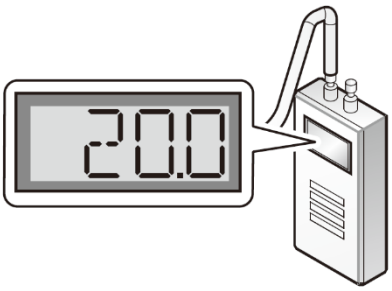
5. Loosen the screw indicated in the figure below and connect a manometer to the pressure port. Reset the manometer to zero before use.



6. Re-open the manual gas valve and check for leaks.

7. Open multiple hot water outlets that that have high flow rates, such as bathtub taps and shower mixers, to allow the boiler to operate at its maximum firing rate.

8. When the boiler reaches the maximum firing rate, check the inlet gas pressure reading on the manometer. The gas pressure must be within the operating range listed in the specifications on page 17.



4.3 Gas Conversion

This default gas supply configuration for this boiler is Natural Gas. If it is converted to Propane Gas, the conversion kit supplied with the boiler must be used.

⚠ WARNING

This conversion kit must be installed by a qualified service agent*. All conversions must be performed in accordance with all applicable laws and regulations. The information in these instructions must be followed to minimise the risk of fire or explosion and to prevent property damage, personal injury, or death. The service agent is responsible for the correct installation of the kit. The conversion 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 agent is any individual, firm, corporation or company who either in person or through a representative is engaged in and is responsible for the connection, installation, repair, or servicing of gas equipment or accessories. Qualified service agents are experienced in gas appliance work, familiar with all safety precautions, and has comply with all applicable laws and regulations.

Tools required:

- Phillips screwdriver
- Flathead screwdriver
- 4 mm (5/32 in) Allen wrench
- Combustion analyzer or dual port manometer
- Gas leak detector

Included Items:

- Gas orifice specifications

Model	NG	LP
NCB-24LSWE	Ø5.7	Ø4.5
NCB-28LSWE	Ø5.7	Ø4.5
NCB-34LSWE	Ø5.9	Ø4.55
NCB-40LSWE	Ø4.8/Ø6.05	Ø3.8/Ø4.7

Table 1. Orifice sizes

- Gas pressure and conversion kit labels

Procedure:

1. Turn off the gas and water supplies to the boiler.
2. Use a Phillips screwdriver to remove the two screws (one at the left bottom and one at the right bottom) from the front cover assembly to gain access to the internal components. Refer to Figure 1 for an illustration of the front cover on the unit.

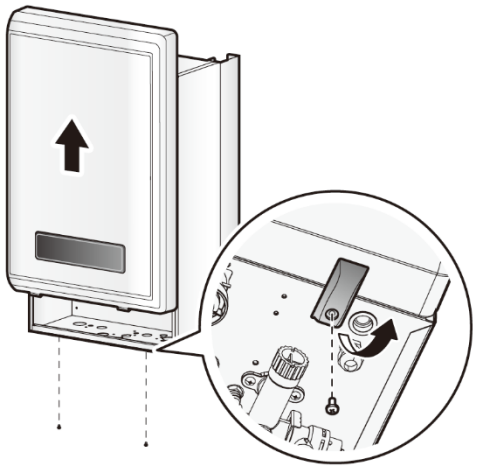
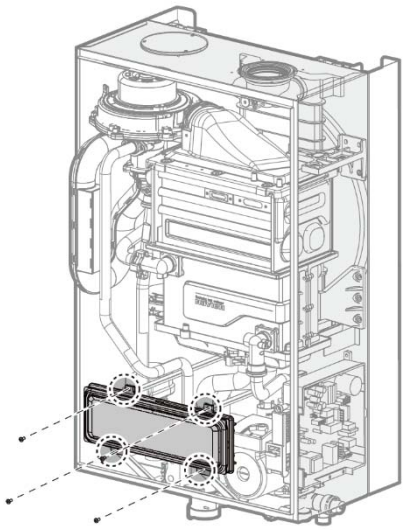


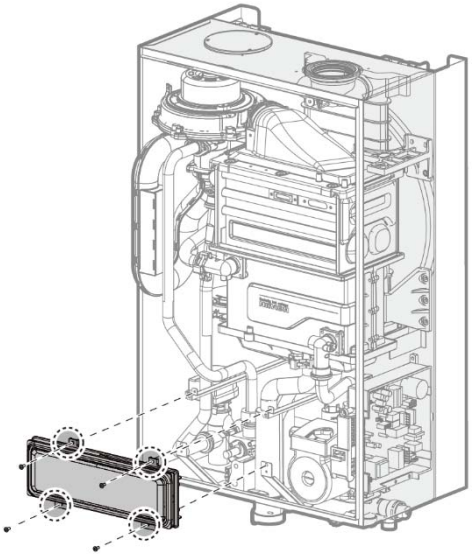
Figure1. B LSWE Series front cover

3. Remove the front cover and place it in a safe location to prevent accidental damage.
4. Label all of the PCB wires.
5. Disconnect all wires from the PCB.

6. Loosen the four screws indicated in the illustration below.



7. Remove the PCB assembly.



8. With the internal components exposed, locate the gas inlet pipe and the gas valve in the middle of the unit as shown in Figure 2-1 and Figure 2-2.

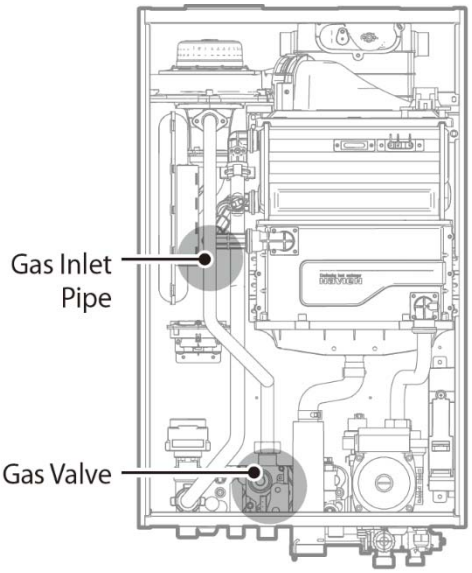


Figure 2-1. NCB-24/28/34LSWE Internal Components

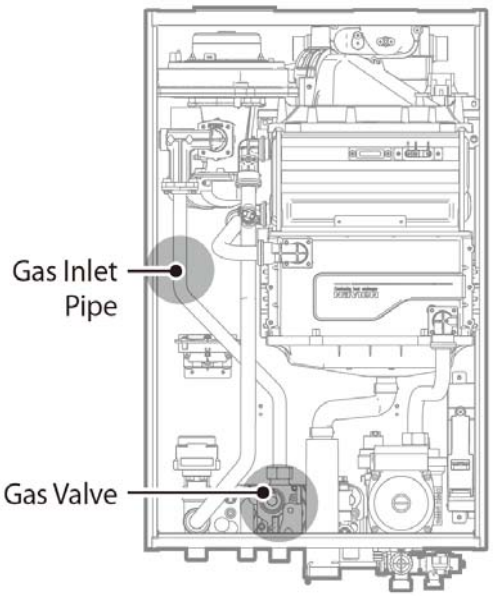


Figure 2-2. NCB-40LSWE Internal Components

9. Loosen the hex nut at location A - the connection above the gas valve where it connects to the pipe (refer to Figure 3-1 and Figure 3-2). When the hex nut is loosened, carefully separate the pipe from the gas valve.

10. Detach the gas inlet pipe from the gas valve and locate B - the connection above the gas valve where it is attached to the fan motor assembly. Carefully remove the two screws (four screws for NCB-40LSWE) using a Phillips screwdriver. Then, pull the gas inlet pipe out from the fan assembly to access the gas orifice.

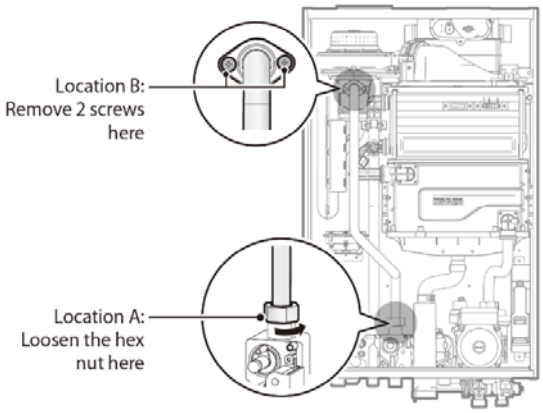


Figure 3-1. Detaching Gas Inlet Pipe from
Gas Valve and Fan Motor Assembly (NCB-24/28/34LSWE)

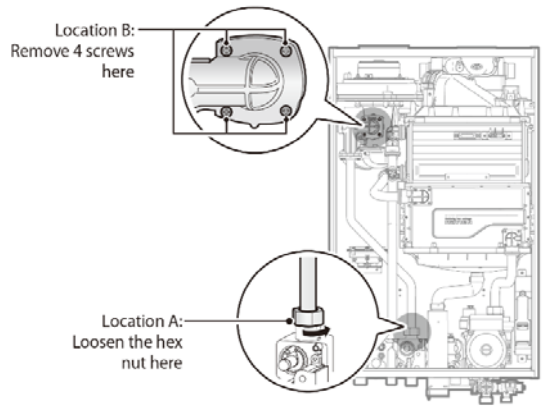


Figure 3-2. Detaching Gas Inlet Pipe from
Gas Valve and Fan Motor Assembly (NCB-40LSWE)

When the gas orifice is exposed, remove the two screws that hold it in place. Remove the orifice from its housing and prepare the new LP orifice for installation.

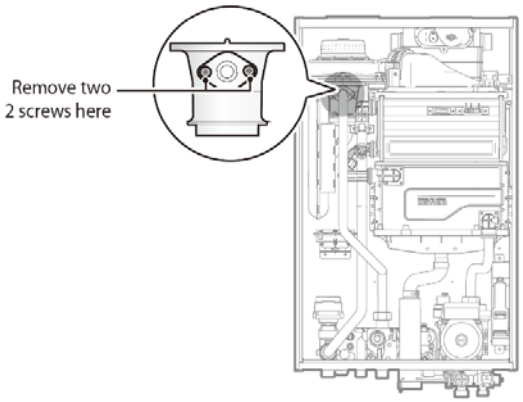


Figure 4-1. Access to Gas Orifice in Fan Assembly
(NCB-24/28/34LSWE)

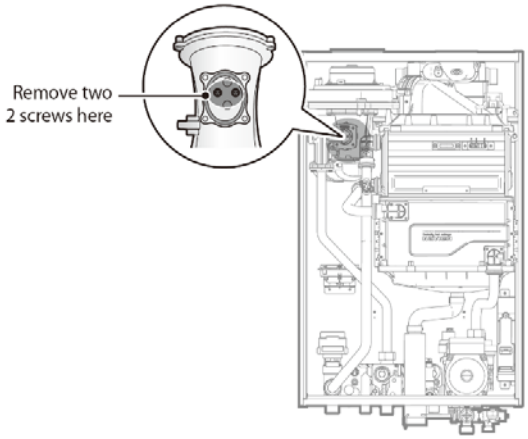


Figure 4-2. Access to the gas orifice in fan assembly
(NCB-40LSWE)

⚠ WARNING

- DO NOT adjust or attempt to measure the outgoing gas pressure. The gas valve is factory-set for the correct outlet pressure. This setting is suitable for natural gas and propane and does not require field adjustment.
- Attempting to adjust or measure the gas valve outlet pressure could result in damage to the valve or other property, serious personal injury, or death. Navien NCB LSWE boilers are shipped configured for natural gas installations ONLY.

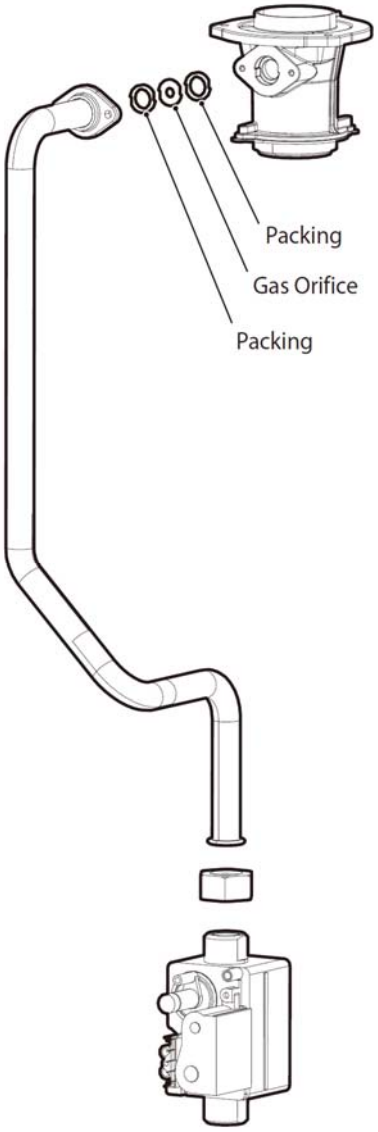


Figure 5-1. Exploded View of Gas Pipe Assembly (NCB-24/28/34LSWE)

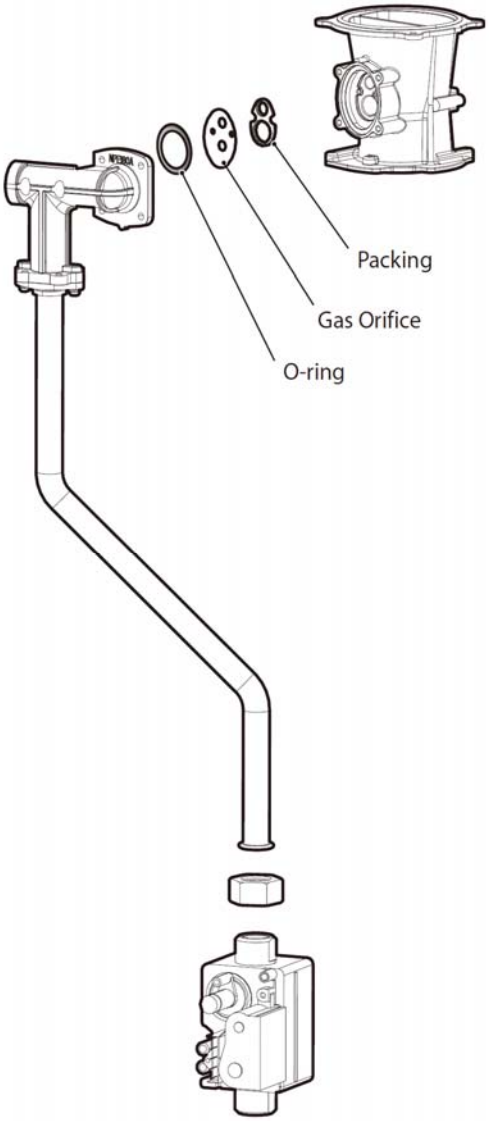


Figure 5-2. Exploded View of Gas Pipe Assembly (NCB-40LSWE)

DANGER

See Figure 5-1. Inspect the O-ring each time the connection between the venturi and gas valve inlet adapter is disassembled. The O-ring must always be installed and also must not be damaged. A missing O-ring will cause a gas leak and can result in serious personal injury or fatality.

Replace the orifice with the new LP gas orifice. Ensure that the orifice is seated properly inside the port before proceeding to the next step.

11. Reinstate the gas inlet pipe to its original position and replace all of the screws and ensure all connections are secure.

    Note DO NOT over tighten the screws as components may be damaged or cracked.

12. Refer to the labels carefully and then connect all the wires.

13. Change the front panel Dip Switch settings for the new gas type.

> **⚠ WARNING**
>
> Ensure that you have turned off the power to the boiler before opening the front cover and accessing the DIP switches

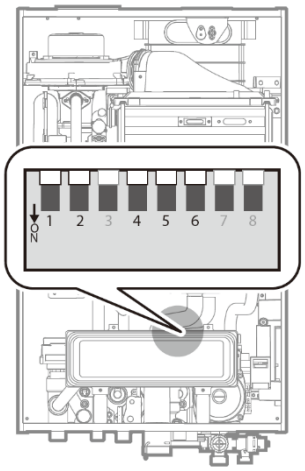


Figure 6. Set the DIP switches

Switch	Function	Setting	
1 & 2	Gas type	G20 (LNG)	1-OFF, 2-OFF
		G25, G27(LNG)	1-OFF, 2-ON
		G30 (LPG)	1-ON, 2-OFF
		G31 (LPG)	1-ON, 2-ON
		G20 (LNG)	1-OFF, 2-OFF

Table 1. The DIP Switch Setting by Fuel Selection

> **⚠ DANGER**
>
> - When a gas conversion is performed, ensure the front panel DIP switches are set for the correct gas type.
> - Failure to properly set the DIP switches can cause carbon monoxide poisoning and result in serious personal injury or death.

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

15. Measure and adjust the gas/air ratio.

Option 1. Combustion analyser (recommended)

a. Loosen the screw, rotate the plate, and then remove the gasket to access the emissions monitoring port as shown in Figure 8.
b. Insert the analyser into the port (Figure 8).

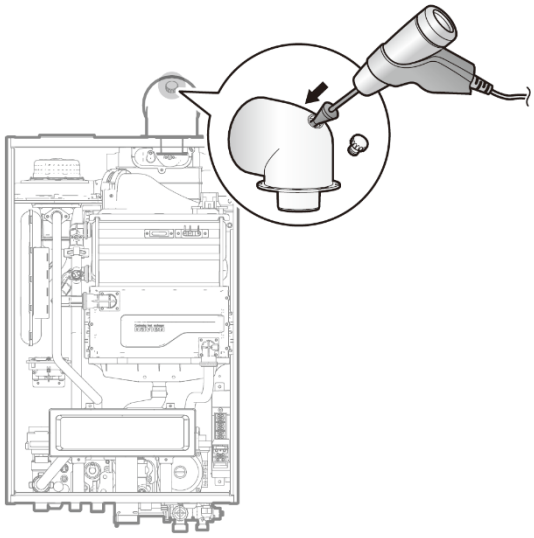


Figure 7. Insert the Analyser

Model	Gas Type	Max % CO	Min % CO
NCB-24LSWE	G20	9.27%	8.78%
	G31	10.40%	10.00%
NCB-28LSWE	G20	9.20%	8.65%
	G31	10.42%	10.00%
NCB-34LSWE	G20	9.10%	8.50%
	G31	10.30%	9.90%
NCB-40LSWE	G20	9.20%	8.70%
	G31	10.50%	10.40%

Table 2. CO_2 Value
(CO_2 values at high flame settings must be within 0.5% and CO_2 values for low flame settings must be within 0.3% of the values listed.)

c. Fully open several hot water outlet fittings and set the boiler to operate at Stage 1MIN mode.

Note Refer to page 55 for information about selecting operating modes.

Measure the CO_2 value at the low flame setting. If the CO_2 value is not within 0.5% of the value listed in Table 2, adjust the gas valve set screw. If set screw adjustment is required, locate the screw as shown in Figure 9. Use a 4 mm (5/32 in) Allen wrench and turn the set screw no more than 1/4 turn clockwise to increase or anticlockwise to decrease the CO_2 value.

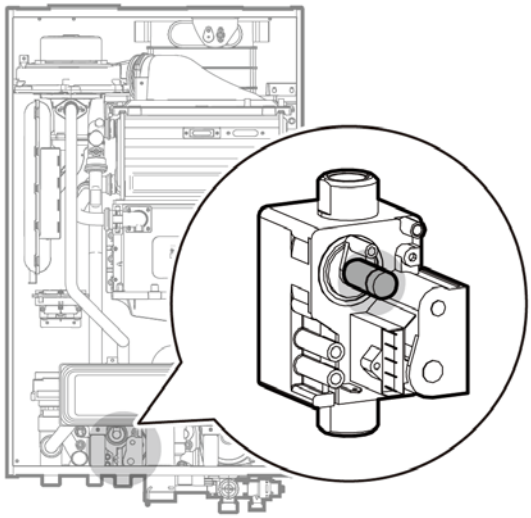


Figure 8. Set screw location

Note The set screw is located behind a removable cover. To access the set screw, loosen the screws and remove the cover.

d. Fully open several hot water outlet fittings and set the boiler to operate at 2-stage MAX mode (refer to page 55). Measure the CO2 value at a high flame setting. If the CO2 value does not match the values listed in Table 2 at a high flame setting, do not adjust the gas valve. Check that the orifice is the correct specification.

DANGER

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

Option 2. Digital manometer

a. Open the offset pressure port by loosening the screw two turns. The location of the offset port is shown in Figure 10.

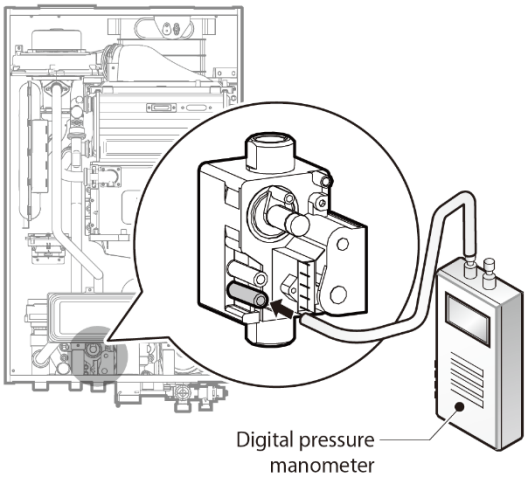


Figure 9. Digital pressure manometer connection

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

Model	Gas Type	Minimum Offset Pa
NCB-24LSWE	G20	8 ± 1
	G31	4 ± 1
NCB-28LSWE	G20	8 ± 1
	G31	4 ± 1
NCB-34LSWE	G20	8 ± 1
	G31	4 ± 1
NCB-40LSWE	G20	8 ± 1
	G31	4 ± 1

Table 3. Minimum offset values

Model	Gas type				G20	G31
					[20 mbar]	[37 mbar]
	Output			Consumption	Gas flow	Gas flow
	Load	Kcal/h	kW	kW	m³/h	m³/h
NCB-24LSWE	Max.	16,770	19.5	20.0	2.142	0.804
	Min.	3,552	4.1	4.2	0.450	0.169
NCB-28LSWE	Max.	20,124	23.4	24.0	2.570	0.964
	Min.	3,522	4.1	4.2	0.450	0.169
NCB-34LSWE	Max.	24,317	28.3	29.0	3.106	1.165
	Min.	4,276	5.0	5.1	0.546	0.205
NCB-40LSWE	Max.	28,509	33.2	34.0	3.641	1.366
	Min.	3,354	3.9	4.0	0.428	0.161

c. Fully open a hot water outlet fitting and set the boiler to operate at 1-stage MIN mode (refer to table 2 for information about setting modes). Measure the offset value at a low flame setting and compare it to the values in Table 3. If the offset value is outside the range, adjust the gas valve set screw. If set screw adjustment is required, locate the set screw as shown in Figure 11. Use a 4mm (5/32 in) Allen wrench to turn the set screw no more than a 1/4 turn clockwise to increase or anticlockwise to decrease the offset value.

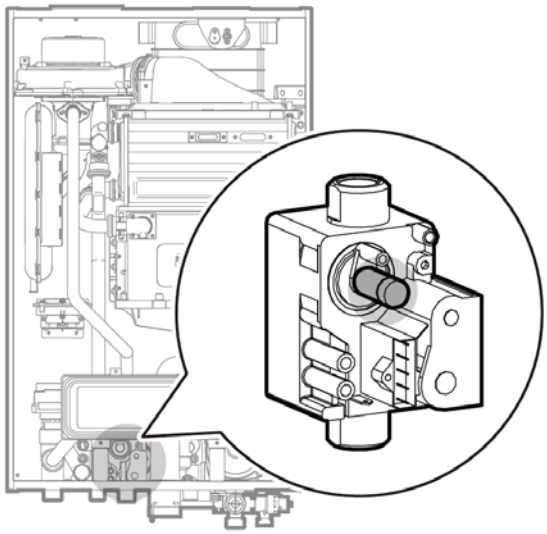


Figure 11. Set screw location

Note The set screw is located behind a removable cover. To access the set screw, loosen the screws and remove the cover.

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

DANGER

Improper gas valve settings can cause property damage, serious personal injury, or fatality.

4.4 The Front Panel

The front panel enables users to adjust the water temperature and view the operating status and error codes. Remove the protective sheet from the front panel before using it.

4.4.1 LCD Display

Display	Function	Remarks
 Space Heating mode	Space heating mode is activated.	
 DHW mode	DHW mode is activated.	
 outdoor reset	Outdoor reset in progress.	
 ECO mode	Quick DHW in progress.	
 Digital display	Visual display.	
 Return water control	Return water control status.	
 Freeze Protection	Freeze protection activated.	
 Combusting	Burner operating.	
 Error	Display current error condition and error code.	
 Summer mode	Summer mode activated, only DHW operates.	
 Winter mode	Winter mode activated, DHW and heating operate simultaneously.	
 LPM	Water flow in litres per minute.	
 Bar	Water pressure in bar.	

Segment Status Display	Function	Remarks
WAIT	System is waiting for a response from the main controller when the boiler performs an error test or an error history report.	
RST	Error reset	
CLR	Deleting the error history and parameters.	
INIT	Factory reset	
TEC	Maintenance alarm	
RC	OT remote controller in use	

4.4.2 Buttons

Short Key	Function	Remarks
[Reset]	Error code release and cancellation	
[ECO]	Quick DHW activated	Accessible from <Normal operation mode> only.
[Summer/Winter]	Summer and Winter mode selection	
[Space Heating]	Space heating temperature adjustment	
[DHW]	DHW temperature adjustment	
[Plus]	Option movement and value increase	
[Minus]	Option movement and value decrease	

Long Key Combination	Function	Remarks
[Power] long key (300 msec)	Power ON / OFF	
[ECO] + [Space Heating] long key (2 sec)	Displays error history	Accessible from <Normal operation mode> or <Error display mode> only.
[Eco] long key (2 sec)	Displays user parameters	Accessible from <Normal operation mode> only.
[ECO] + [Summer/Winter] long key (5 sec)	Parameter setting mode	Available only when power is OFF.
[ECO] + [DHW] long key (5 sec)	Displays service information	Accessible from <Normal operation mode> or <Error display mode> only.
[Summer/Winter] + [Space Heating] long key (5 sec)	Displays service status information	
[ECO] + [Summer/Winter] + [Space Heating] long key (5 sec)	Enters test information menu	
[ECO] + [Summer/Winter] + [Space Heating] + [DHW] long key (5 sec)	Factory reset	Available only when power is OFF.
[RESET] + [+] long key (5 sec)	Displays version information	

※ All buttons with LED illumination will turn on at maximum brightness when the button is pressed. After the button is released, LED brightness will reduce to medium brightness after 5 seconds and the LED will gradually reduce over a 5 to 10 second period before it turns off.

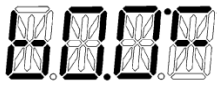
※ Short Key button press is defined as a single press of a button for more than 50 msec and then releasing the button.

※ If the button is pressed until the Long Key reference time from initial pressing, then it will be recognised as a Long Key at the time the conditions are met.

4.4.3 Turning the Boiler ON or OFF

To turn the boiler ON or OFF, press the [Power] button.

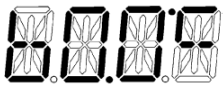
If the boiler is in an error condition, the error code will continue to be displayed on the front panel even when the boiler is OFF.

Item	Description	Display
Power ON	Press to start Normal operation mode	Current outgoing hot water temperature is 60°C 
Power OFF	Press to turn OFF the boiler	All displays turn off except for status icons for currently active functions.

※ When power is first applied, turn on the panel segments and icons on for 3 seconds and check the LCD for any defects.

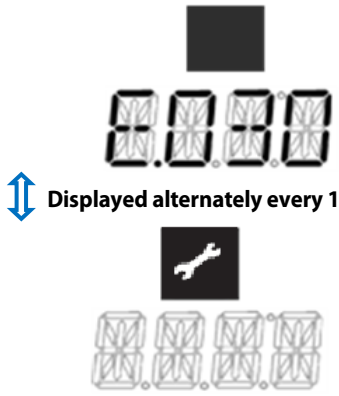
4.4.4 Normal Operation

1. When the boiler is OFF, start <Normal Operation mode> by pressing the [Power] button.
2. The current supply or return water temperature is displayed depending on the selected heating mode (supply or return temperature mode).
3. If a Level1 error occurs, the error icon flashes in 1 second intervals, and the error code and the current water temperature is alternately displayed for 1 second.
4. If a Level1 error is automatically released or if the [Reset] button is pressed after the error condition is resolved, "RST" is displayed for 3 seconds and the error is released.
5. If the heat demand option is set to "OT-Room Controller" at the DIP switch, "RC" is displayed for 2 seconds each time the Space heating, DHW, Summer/Winter, or ECO button is pressed. This indicates that the boiler is controlled by the OT-Room Controller.
6. Access to <Error history mode> is available via <Normal operation mode>.

Item	Description	Display
1. Normal status	Boiler ON in <Normal operation mode>	The current water temperature and the space heating icon are displayed. In this example, the current water temperature (60°C) is displayed. 
2. Level1 Error	A Level 1 error has occurred	The current water temperature and the space heating icon, and the error code are alternately displayed for a second. In this example, the current water temperature (60°C) and the error code (error 218) are displayed.  Alternately displayed information
3. OT Room Control	Activated by pressing the Space Heating, DHW, Summer/Winter, or ECO buttons.	"RC" is displayed for 2 seconds, and then the display returns to the previous screen.  "RC" is displayed for 2 seconds

4.4.5 Displaying and resetting errors

1. When an error higher than Level 2 occurs, the Boiler may stop operating or have only basic functions. The boiler will enter <Error display mode> directly from <Normal operation mode> or <Power off mode>.
2. When an error occurs in other modes, only the Error icon flashes. The boiler enters <Error display mode> after closing the current mode.
3. The Error icon and error code flash alternately at 1 second intervals in <Error display mode>.
4. The error code consists of 3 digits.
5. Service information, error history, and special parameter modes are available from <Error display mode>.
6. Press the [Reset] button while the error code is displayed and 'RST' is displayed for 3 seconds. If the boiler's status meet predefined conditions, the error is released. If the error cannot be released, the error code will be redisplayed every 3 seconds.
7. If an error occurs in power off, test, or parameter setting modes and if the error is released by pressing the [Reset] button or it is automatically released in <Error display mode>, the Boiler returns to <Power off mode>.

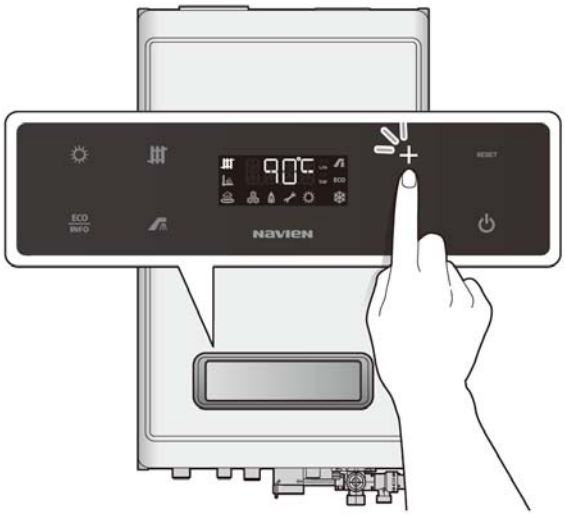
Display


4.4.6 Adjusting the Space Heating Temperature set point

To adjust the heating temperature set point:

1. Press the Space heating button. The space heating temperature will flash.

2. Press the + (Up) or – (Down) buttons until the desired temperature appears on the display.



The temperature can be adjusted while the display is flashing. If no buttons are pressed for 5 seconds or if the ECO button is pressed, the current temperature setting will be stored automatically.

NOTE

- Record the original heating temperature setting in case you want to restore it to the default.
- The default space heating supply water temperature range is 40°C to 90°C.
- The boiler will retain its settings during a power outage.

4.4.7 Adjusting the DHW Temperature

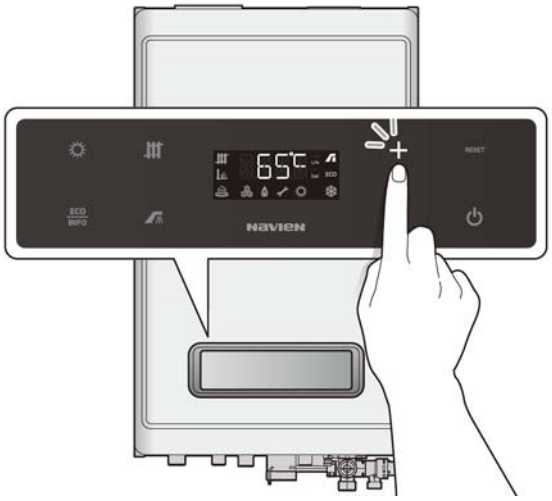
WARNING

Before adjusting the water temperature, carefully read "To prevent burns:" on page 5. Water temperatures above 52°C can cause instant scalding, severe burns, or fatality.

To adjust the water temperature:

1. Ensure that all hot water taps are closed and that all internal and external circulation pumps are off.
2. Press the DHW button. The DHW temperature will flash

3. Press + (Up) or – (Down) buttons until the desired temperature appears on the display.



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

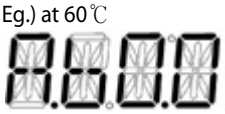
NOTE

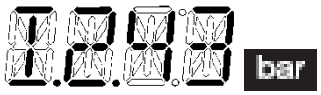
Record the original DHW temperature setting in case you want to restore it to the default.

- The default DHW temperature range is 30°C to 65°C.
- The boiler will retain its settings during a power outage.

4.4.8 Viewing Basic Information

① To enter <Basic information mode>, press [ECO] for > 2 seconds from <Normal operation mode>.
② Press [+] or [-] to navigate through the user parameters.
③ The current parameter setting has a letter prefix followed by 3 digits.
④ Press [Reset] once to return to <Normal operation mode>.
⑤ If no changes are detected for 5 minutes, the system automatically returns to <Normal operation mode>.

Item	Description	Display
(A) Space heating water temperature	The current outgoing space heating water temperature is displayed.	Eg.) at 60℃ 
(B) Space heating return water temperature	The current space heating return water temperature is displayed.	Eg.) at 60℃ 
(C) Domestic hot water outlet temperature	The current outgoing water temperature is displayed.	Eg.) at 60℃ 
(D) Domestic cold water inlet temperature	The current incoming water temperature is displayed.	Eg.) at 15℃ 

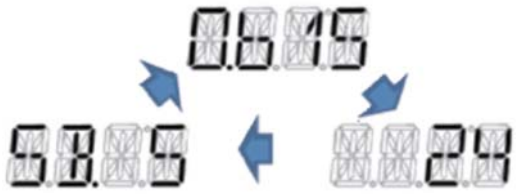
Item	Description	Display
(E) Flow rate	The current flow rate (LPM) is displayed.	A flow rate sensor is used to detect flow in the system. Eg.) 10.2LPM 
(F) Outdoor air temperature	The current outdoor temperature is displayed.	An optional thermostat is used to detect the outdoor temperature in degrees Celsius (℃). Eg.) at 15℃ 
(G) Outdoor reset control curve	Outdoor reset control can be configured for various types of heating systems. 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)	Eg.) Finned tube baseboard is set as the heating system for outdoors reset control. 
		If outdoor reset control is not used. 
(H) Boost interval time	The boost interval duration is displayed.	If the boost interval duration is 30 minutes. 
(I) Space heating water pressure	The current water pressure is displayed.	A pressure sensor detects the pressure. Eg.) 2.43 bar 

4.4.9 Displaying Error History

1. In <Normal operation mode> or <Error history mode>, press [ECO] and [Space Heating] for > 2 seconds to access the error history mode. The most recent error will be displayed first.
2. Press [+] or [-] to search for the error. A total of 10 errors are stored in memory and are labelled from 0 to 9 with 0 being the most recent error.
3. Each time [ECO] is pressed, the previous errors' duration (maximum time 9,999 hours) and the sub error code is sequentially displayed.
4. Press [Reset] for 5 seconds while in the <Error history mode>, when "CLR" is displayed all of the error history is deleted.
5. Press [Reset] again to return to <Normal operation mode>.
6. If no buttons are pressed for 5 minutes, the system automatically returns to <Normal operation mode>.

NOTE

- In <Error history mode>, the first digit indicates the order of the record in the history with "0" the most recent. The remaining three digits indicate the error code. If there is no error history, "0" will be displayed.
- Expired time display: The time between the currently displayed error and the previously generated error is displayed in one hour units.
- Eg.) If the most recent error code is 615, the sub error code is 5, and 24 hours have passed since the error was generated.

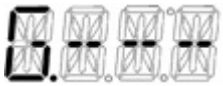
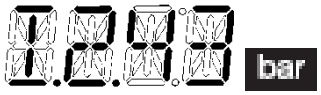
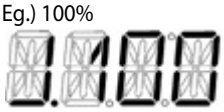
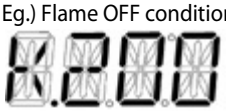


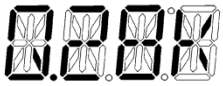
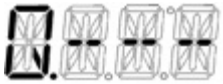
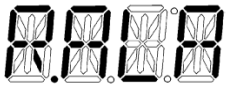
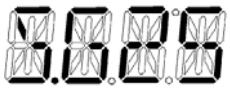
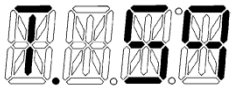
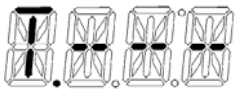
- When the sub error code is "0" , there is no sub error code displayed

4.4.10 Displaying Service Information

1. In <Normal operation mode> or <Error display mode>, press [ECO]+[DHW] at the same time for 5 sec to access service information.
2. Press [+] or [-] to navigate through the user parameters.
3. The current data stored for each service item has a letter prefix followed by 3 digits of configuration data.
4. Press [Reset] once to return to <Normal operation mode>.
5. If no buttons are pressed for 1 hour, the system automatically returns to <Normal operation mode>.

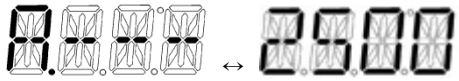
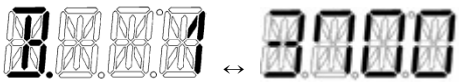
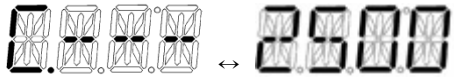
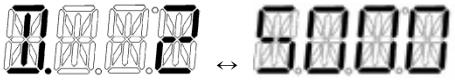
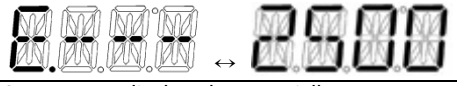
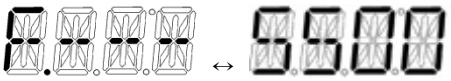
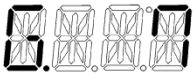
Item	Description	Display
(A) Space heating supply water temperature	The current outgoing space heating water temperature is displayed/	Eg.) at 60℃ 
(B) Space heating return water temperature	The current incoming space heating water temperature is displayed.	Eg.) at 60℃ 
(C) Domestic hot water outlet temperature	The current outgoing water temperature is displayed.	Eg.) at 60℃ 
(D) Domestic cold water inlet temperature	The current incoming water temperature is displayed.	Eg.) at 15℃ 

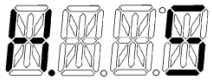
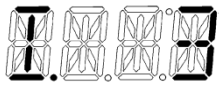
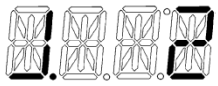
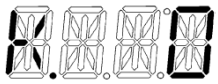
Item	Description	Display
(E) Flow rate	The current flow rate (LPM) is displayed.	A flow rate sensor is used to detect flow in the system. Eg.) 10.2LPM 
(F) Outdoor air temperature	The current outdoor temperature is displayed.	Eg.) at 15℃ 
(G) Outdoor reset curve	Outdoor reset control can be configured for various types of heating systems. 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)	Eg.) Finned tube baseboard is set as the heating system for outdoors reset control:  Eg.) If outdoor reset control is not used. 
(H) Boost interval time.	The boost interval duration is displayed.	If the boost interval duration is 30 minutes. 
(I) Space heating water pressure	The current water pressure (bar) is displayed.	A pressure sensor detects the pressure. Eg.) 2.43 bar 
(J) Heat Capacity	The current heat capacity (%) is displayed.	The heating capacity is displayed as a percentage. Eg.) 100% 
(K) Flame State	The currently detected flame value (AD) is displayed. Flame ON: < 70 Flame OFF: > 175	Displays the detected AD value (0-255). Eg.) Flame OFF condition (200) is displayed. 
(L) Target RPM	The target fan speed (rpm) is displayed.	Displays speed (rpm) without the last digit. Eg.) 3,600 rpm 
(M) Current RPM	The current fan speed (rpm) is displayed.	Displays speed (rpm) without the last digit. Eg.) 3,600 rpm 

Item	Description	Display
(N) Target APS	The target APS voltage (V) is displayed.	Displays the APS voltage value to one decimal place. Eg.) 3.2 V 
(O) Current APS	The current APS voltage (V) is displayed.	Displays the APS voltage value to one decimal place. Eg.) 3.2 V 
(P) Exhaust Gas Temperature	The current exhaust gas temperature (℃) is displayed.	Eg.) 60℃ 
(Q) Model and Capacity	The currently set model and capacity is displayed.	Eg.) Capacity 28 K 
		Eg.) Model or capacity setting error. 
(R) Burner Type	The currently set burner type is displayed. ALA: Alantum BEK: Bekaert	Eg.) The setting for Alantum. 
(S) Gas Type	The current gas type is displayed: G20, G25/G27, G30, or G31.	Eg.) G25/G27 setting 
(T) Last maintenance activity	The number of days since the last maintenance activity is displayed. To reset the day count: - Press [Reset] for 5 seconds. - Clear the day count.	Eg.) 59 days since the last maintenance activity. 
		Eg.) Maintenance activity count is disabled. Set to "0". 

4.4.11 Service Status Information

1. From <Normal operation mode> or <Error display mode>, press and hold [Summer/Winter] and [DHW] simultaneously for > 5 seconds to enter <Service status mode>.
2. Press [+] or [-] to navigate through the service status information items.
3. The current service status information item is identified with a letter prefix followed by 3 digits of related data.
4. Press [Reset] once to return to <Normal operation mode>.
5. If no buttons are pressed for 1 hour, the system automatically returns to <Normal operation mode>.

(A) Duration since installation	The number of days elapsed since the boiler was installed is displayed.	Messages are displayed sequentially at 1 sec intervals. Eg.) 2,500 days are have elapsed since the boiler's installation. 
(B) Number of Space heating cycles	The number of space heating cycles is displayed.	Messages are displayed sequentially at 1 sec intervals. Eg.) The boiler has performed 13,700 space heating cycles. 
(C) Total Space heating duration	The total time (hours) space heating has operated is displayed.	Messages are displayed sequentially at 1sec intervals. Eg.) The boiler has been operating in Space heating mode for 2,500 hours since it was installed. 
(D) Number of DHW cycles	The number of DHW cycles is displayed.	Messages are displayed sequentially at 1sec intervals. Eg.) The boiler has performed 2,500 DHW cycles. 
(E) Total DHW duration	The total time (hours) DHW has operated is displayed.	Messages are displayed sequentially at 1 sec intervals. Eg.) The boiler has operated in DHW mode for 2,500 hours. 
(F) Number of on-demand DHW cycles	The number of on-demand DHW cycles is displayed.	Messages are displayed sequentially at 1 sec intervals. Eg.) The boiler has performed 5,500 on-demand DHW cycles. 
(G) Number of misfires	The number of misfires is displayed.	Eg.) Seven misfires have occurred. 

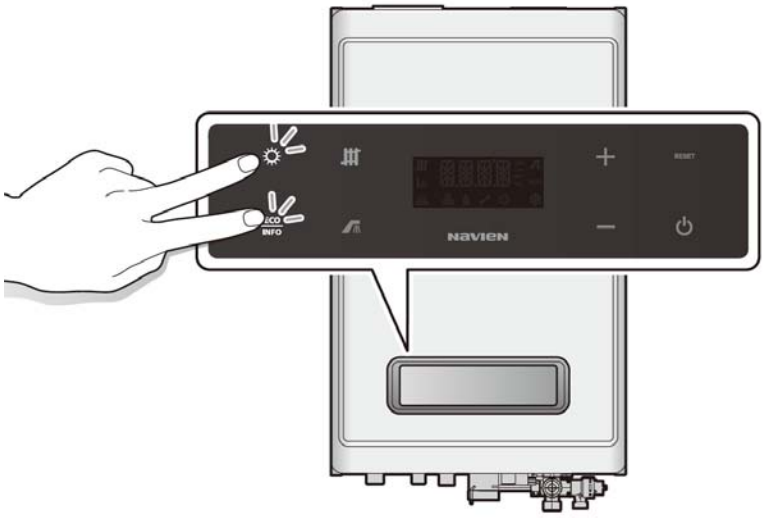
(H) Successful second ignition	The number of successful second ignitions is displayed.	Eg.) Five successful second ignitions have occurred. 
(I) Successful third ignition	The number of successful third ignitions is displayed.	Eg.) Three successful third ignitions have occurred. 
(J) Successful fourth ignition	The number of successful fourth ignitions is displayed.	Eg.) Two successful fourth ignitions have occurred. 
(K) Successful fifth ignition	The number of successful fifth ignitions is displayed.	Eg.) No successful fifth ignitions have occurred. 

4.4.12 Parameter Setting Mode

Parameter settings can be modified for boiler operations in different operating conditions, such as the space heating and DHW temperature ranges. Follow the instructions below to access special parameter mode and change the available settings.

> **CAUTION**
>
> Parameters must be set by a qualified technician with extensive knowledge of the boiler system. Setting parameters improperly may cause property damage or injury.

1. Press and hold [Power] to turn off the boiler.
2. Press and hold [ECO] and [Summer/Winter] at the same time for 5 sec to enter <Password setting mode>.



3. "PASS" is displayed when the user is in <Password setting mode>. Press [ECO] to go to Password input mode. "0000" is displayed. The display returns to <Power off mode> if no activity is detected for 5 minutes.
4. Enter the password to enter <Parameter setting mode>. Refer to "Password Setting Mode" for information about setting passwords.

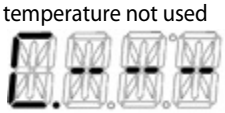
Entering the Password

A. When "PASS" is displayed, press [ECO]. The display enters <Password input mode> and "0000" is displayed.
B. In <Password input mode> ("0000"), the first digit flashes at 500 msec intervals.
C. Press [Summer/Winter] to change number positions. The digit in the new position flashes at 500 msec intervals.
D. Press [+] or [-] to increase or decrease the number.
E. After the password is entered, press [ECO] to confirm the password. If the password is correct, <Parameter setting mode> is displayed. If the password is incorrect, <Password input mode> ("0000") is displayed again.
F. The display returns to <Power off mode>, if no activity is detected for 5 minutes.
G. If incorrect passwords are entered more than 10 consecutive times, the display returns to <Power off mode>. Also, if [POWER] is pressed for >300 msec in <Password input mode>, the display returns to <Power off mode>.
H. The factory default password is "1234."

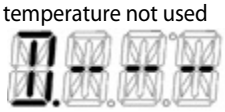
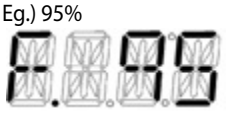
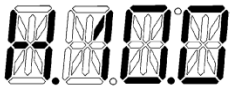
Entering Parameter Setting Mode

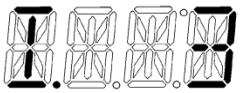
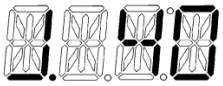
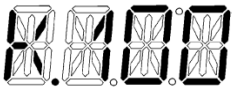
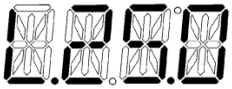
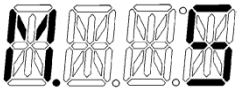
1. Press [+] or [-] to navigate through the parameter setting items.
2. Parameter setting items are identified with a letter prefix followed by three digits of related data.
3. The display goes into <Power off mode> if no activity is detected for 5 minutes.
4. Press [ECO] to enter <Parameter setting mode> and modify parameter settings. The four digits on the display flash at 500 msec intervals. To initialise individual parameter, press and hold [RESET] for 5 sec while the selected parameter is displayed.
5. In <Parameter setting mode>, press [+] or [-] to increase or decrease the parameter setting value.
6. After making changes to parameter settings, press [ECO] to save the changes and exit <Parameter setting mode>. The display returns to <Parameter setting display mode>.
7. In <Parameter setting mode>, if no activity is detected for 10 sec, the currently displayed value is saved as the setting and the display returns to <Parameter setting display mode>.
8. If [RESET] is pressed in <Parameter setting mode>, the current setting value is not saved and the display returns to <Parameter setting display mode>.
9. If either the minimum or maximum outdoor temperature parameters are initialised, the other parameter is automatically initialised as well.
10. If either the minimum or maximum set points for supply absolute, return absolute, DHW or space heating limit, is initialised, the other parameter is automatically initialised as well.

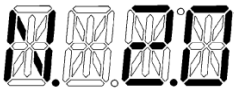
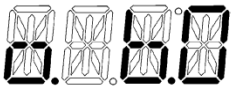
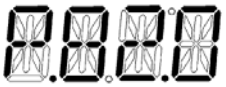
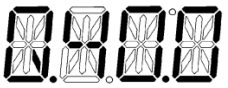
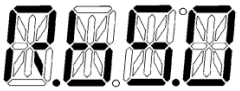
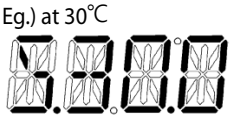
<table>
<tr><th>Item</th><th>Description</th><th>Display</th></tr>
<tr><td>(A) Outdoor Reset</td><td>This mode is used to configure the Outdoor Reset Control.
By default, the mode is disabled.</td><td>Outdoor reset in use
 
Outdoor reset not in use
  </td></tr>
<tr><td>(B) Heating System outdoor reset control</td><td>This mode is used to configure the type of heating system that Outdoor Reset Control mode is used with.
A preset or user-defined temperature range is automatically selected based on the selected heating system.
<table><tr><th>Heating system</th><th>Supply CH set point range</th><th>Return CH set point range</th><th>Remarks</th></tr><tr><td>1. Finned tube baseboard</td><td>48.5-82.0℃</td><td>38.0-63.5℃</td><td>Default</td></tr><tr><td>2. Fan coil</td><td>60.0-82.0℃</td><td>46.5-63.5℃</td><td></td></tr><tr><td>3. Cast iron baseboard</td><td>37.5to76.5℃</td><td>30.0 to 59.0℃</td><td></td></tr><tr><td>4. Low mass radiant</td><td>26.5to 60.0℃</td><td>21.0 to 46.5℃</td><td></td></tr><tr><td>5. High mass radiant</td><td>26.5 to 48.5℃</td><td>21.0 to 38.0℃</td><td></td></tr><tr><td>6. Radiator</td><td>48.5 to 76.5℃</td><td>38.0 to 59.0℃</td><td></td></tr><tr><td>7. Custom</td><td>CH supply control, absolute min/max set points</td><td>CH return control absolute min/max set points</td><td>User-defined</td></tr></table>
Heating systems 1-6 use a preset temperature range based on the selected system. The temperature range for System 7 can be customised. When a customised temperature range is used, the boiler operates based on user-defined “Absolute Min” and “Absolute Max” temperature settings.</td><td>Outdoor reset heat system type 1
 
Outdoor reset heating system not selected
  </td></tr>
<tr><td>(C) Lowest outdoor temperature</td><td>This mode is used to configure the lowest outdoor temperature setting. The boiler will operate at the highest setting in the supply or return temperature setting range for that temperature.

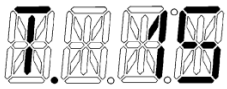
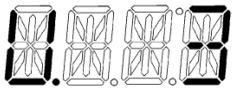
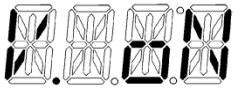
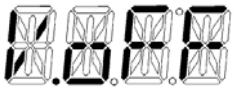
Outdoor Low Temperature Setting Range
<table><tr><th>Range</th><th>Default</th></tr><tr><td>-20℃ to (Outdoor high temperature set point - 5℃)</td><td>-10℃</td></tr></table></td><td>Lowest outdoor temperature (℃)
 
Lowest outdoor temperature not used
  </td></tr>
</table>

<table>
<tr><th>Item</th><th>Description</th><th>Display</th></tr>
<tr><td>(D) Highest outdoor temperature</td><td>This mode is used to configure the highest outdoor temperature setting. The boiler will operate at the highest setting in the supply or return temperature setting range for that temperature.

Outdoor High Temperature Setting Range
<table><tr><th>Range</th><th>Default</th></tr><tr><td>(Outdoor low temperature set point + 5℃) to 40℃</td><td>21℃</td></tr></table></td><td>Highest outdoor temperature (℃)
 
Highest outdoor temperature not used
  </td></tr>
<tr><td>(E) Boost Interval time</td><td>The boost interval time is used to prevent interruptions to space heating when there are changes in heating system conditions in Outdoor Reset Control mode. When boost interval time is enabled and a set time elapses, the boiler increases the space heating supply temperature by 5℃ (41℉) and the return temperature by 3℃(37 ℉).
<table><tr><th>Setting</th><th>Range</th><th>Default</th></tr><tr><td>Boost Interval Time</td><td>0 to120 min (0: OFF)</td><td>OFF (0)</td></tr><tr><td rowspan="2">Boost Temperature</td><td>Supply fixed value: 5℃</td><td>None</td></tr><tr><td>Return fixed value: 3℃</td><td>None</td></tr></table></td><td>Boost interval time set at 30 minutes
  </td></tr>
<tr><td>(F) Maximum heating capacity</td><td>This menu configures the desired space heating capacity. When the boiler operates in <Normal operation mode>, the space heating capacity is limited to the set value (%)
<table><tr><th>Range</th><th>Default</th></tr><tr><td>(Space heating capacity minimum set point + 20%) to 100%</td><td>100%</td></tr></table></td><td>Maximum heating capacity (%)
Eg.) 95%
  </td></tr>
<tr><td>(G) Minimum heating capacity</td><td>This menu configures the desired space heating capacity. When the boiler operates in <Normal operation mode>, the minimum space heating capacity is limited to the set value (%).
<table><tr><th>Range</th><th>Default</th></tr><tr><td>Space heating capacity to (space heating capacity maximum set point - 20%)</td><td>Space heating minimum capacity (%)</td></tr></table></td><td>Minimum heating capacity (%)
Eg.) 30%
  </td></tr>
<tr><td>(H) Pump freezing temperature</td><td>This menu configures the freeze protection temperature for the circulation pump. When the space heating supply temperature remains below the set value for more than 10 seconds, the boiler runs the circulation pump to prevent damage from freezing. The pump runs for 10 minutes, and then stops for 1 minute.
<table><tr><th>Range</th><th>Default</th></tr><tr><td>6 to 10℃</td><td>10℃</td></tr></table></td><td>Eg.) 10℃
  </td></tr>
</table>

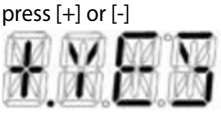
<table>
<tr><th>Item</th><th>Description</th><th>Display</th></tr>
<tr><td>(I) Anti-fast cycling time</td><td>The anti-fast cycling time is the duration that the boiler stops space heating when the supply or return temperatures reach the set temperatures. The boiler will not resume heating until the duration elapses even if the space heating supply or return temperatures return to within the set range.
<table><tr><th>Range</th><th>Default</th></tr><tr><td>0 to 20 minutes</td><td>3 minutes</td></tr></table></td><td>Eg.) Anti-fast cycling set at 3 minutes
  </td></tr>
<tr><td>(J) CH Pump overrun time</td><td>The pump overrun time is the duration that the circulation pump will continue to run when the space heating supply or return temperatures reach the set values. The boiler stops operating, the burner turns off, and the circulation pump runs. If the space heating supply or return temperature is outside the boiler's operating temperature range after the set time, the circulation pump stops for 10 minutes, runs again for 5 minutes, and then repeats the cycle.
<table><tr><th>Range</th><th>Default</th></tr><tr><td>3 to 40 minutes</td><td>40 minutes</td></tr></table></td><td>Eg.) CH pump overrun set at 40 minutes
  </td></tr>
<tr><td>(K) Maximum DHW capacity</td><td>This menu configures the desired DHW capacity. When the boiler operates in <Normal operation mode>, the maximum DHW capacity is limited to the set value (%).
<table><tr><th>Range</th><th>Default</th></tr><tr><td>(DHW minimum temperature set point + 20%) to 100%</td><td>100 %</td></tr></table></td><td>If maximum DHW capacity is 100%.
  </td></tr>
<tr><td>(L) Minimum DHW capacity</td><td>This menu configures the desired DHW capacity. When the boiler operates in <Normal operation mode>, the minimum DHW capacity is limited to the set value (%).
<table><tr><th>Range</th><th>Default</th></tr><tr><td>DHW minimum heat capacity to (DHW maximum heat capacity - 20%]</td><td>DHW minimum capacity (%)</td></tr></table></td><td>If minimum DHW capacity is 25%.
  </td></tr>
<tr><td>(M) DHW wait time</td><td>The DHW wait time is the duration that the boiler continues to operate in DHW supply mode after DHW demand has been supplied. When DHW wait time is enabled, a faster DHW time may be available if there is subsequent demand for DHW. The boiler adjusts the 3-way valve for to space heating mode when the set time elapses.
<table><tr><th>Range</th><th>Default</th></tr><tr><td>0 to 20 minutes</td><td>5 minutes</td></tr></table></td><td>If DHW wait time is set at 5 minutes.
  </td></tr>
</table>

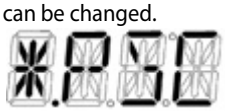
<table>
<tr><th>Item</th><th>Description</th><th>Display</th></tr>
<tr><td>(N) CH burner OFF temp</td><td>During heating, the boiler turns off the burner when the supply temperature meets or exceeds the burner OFF temperature.
<table><tr><th>Range</th><th>Default</th></tr><tr><td>0 to 30℃</td><td>2℃</td></tr></table></td><td>Eg.) at 2℃
  </td></tr>
<tr><td>(O) CH burner ON temp</td><td>During heating, the boiler turns on the burner when the supply temperature is below the burner ON temperature.
<table><tr><th>Range</th><th>Default</th></tr><tr><td>1-30℃</td><td>3℃</td></tr></table></td><td>Eg.) at 6℃
  </td></tr>
<tr><td>(P) Supply absolute MAX set point</td><td>This menu changes the maximum supply temperature range when Supply Control mode is used. When configuring Custom mode in Outdoor Reset Control mode, the supply temperature changes based on the supply absolute MAX temperature range.
<table><tr><th>Range</th><th>Default</th></tr><tr><td>(Minimum set point + 20℃) to 90℃</td><td>90℃</td></tr></table></td><td>Eg.) at 82℃ (in Supply control mode)
  </td></tr>
<tr><td>(Q) Supply absolute MIN set point</td><td>This menu changes the minimum supply temperature range when Supply Control mode is used. When configuring Custom mode in Outdoor Reset Control mode, the supply temperature changes based on the supply absolute MIN temperature range.
<table><tr><th>Range</th><th>Default</th></tr><tr><td>25℃ to (Maximum point - 20℃)</td><td>40℃</td></tr></table></td><td>Eg.) at 40℃
  </td></tr>
<tr><td>(R) Return absolute MAX set point</td><td>This menu changes the maximum return temperature range when the Return Control mode is used. When configuring Custom mode in Outdoor Reset Control mode, the return temperature changes based on the return absolute MAX temperature range.
<table><tr><th>Range</th><th>Default</th></tr><tr><td>(Minimum set point + 10℃] to 70℃</td><td>65℃</td></tr></table></td><td>Eg.) at 65℃
  </td></tr>
<tr><td>(S) Return absolute MIN set point</td><td>This menu changes the maximum return temperature range when the Return Control mode is used. When configuring Custom mode in Outdoor Reset Control mode, the return temperature changes based on the return absolute MIN temperature range.
<table><tr><th>Range</th><th>Default</th></tr><tr><td>20℃ to (Maximum set point - 10℃)</td><td>30℃</td></tr></table></td><td>Eg.) at 30℃
  </td></tr>
</table>

<table>
<tr><th>Item</th><th>Description</th><th>Display</th></tr>
<tr><td>(T) Low burner time</td><td>This menu sets the burner to operate at a low flame setting during initial heating.<table><tr><th>Range</th><th>Default</th></tr><tr><td>0 to 20 min</td><td>1 min</td></tr></table></td><td>If low burner time is set at 15 minutes.
  </td></tr>
<tr><td>(U) Burner acceleration time</td><td>This menu sets the burner's acceleration time.<table><tr><th>Range</th><th>Default</th></tr><tr><td>0 to 20 min</td><td>3 min</td></tr></table></td><td>If burner acceleration time set at 3 minutes.
  </td></tr>
<tr><td rowspan="2">(V) LCB backlight</td><td rowspan="2">This menu sets the status of the LCD backlight.
(Default: ON)</td><td>LCD back light set to ON maintains minimum display brightness.
  </td></tr>
<tr><td>LCD backlight is set to OFF when no buttons are pressed.
  </td></tr>
</table>

<table>
<tr><th>Item</th><th>Description</th><th>Display</th></tr>
<tr><td>(W) Maintenance time</td><td>This menu sets the maintenance time.
<table><tr><th>Range</th><th>Default</th></tr><tr><td>0 to 999 days</td><td>0</td></tr></table></td><td>Maintenance time
  </td></tr>
<tr><td>(+) Reset all parameters</td><td>This menu resets all boiler parameters to the default settings. To reset:

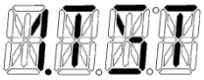
1. Press [+] or [–] to change the display to “YES”.
2. Press [ECO].

When “No” appears on the display, all parameters have been reset.</td><td>In <Parameter initializing mode>,
 
press [+] or [-]
 
or
  </td></tr>
<tr><td>(*) Change password</td><td>This menu sets a new password for <Parameter setting mode>.
To set a new password:
1. Move to [*.PSC] and press [ECO]. The current password is displayed and the first digit flashes.
2. Press [+] or [–] to change the value.
3. Press [Summer/Winter] to change position.
4. When the new password is entered, press [ECO] to save it. The new password is displayed on the front panel for three seconds and then the boiler returns to <Parameter setting mode>.

NOTE
If you do not press [ECO] for 10 sec after entering the new password, the new password is automatically saved and [*.PSC] is displayed on the front panel.</td><td>In <Password setting mode>, the password is displayed. The password characters flash at 500 msec intervals when they can be changed.
  </td></tr>
</table>

Entering Test Information Mode

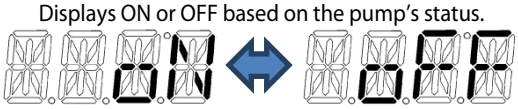
1. In <Normal operation mode> or <Error display mode>, press [ECO]+[Summer/Winter]+[S.H] for > 5 sec to access <Test information mode>
2. Press [+] or [-] to navigate through the test information mode items.
3. Press [ECO] once to access the currently displayed mode.

Item	Description	Display
Error checking mode	Test that each device is operating normally.	
Operation condition setting mode.	Test the operational status of the DHW system.	

Entering Error Checking Mode

1. In <Test Information mode>, press [+] or [-] and then press [ECO] once. <Error checking mode> opens and "1.TST" is displayed on the front panel.
2. In <Error checking mode>, ensure the boiler and water circulation has stopped.
3. Change the component's values by pressing [+] or [-] to increase or decrease the settings.
4. Press [ECO] once. When "WAIT" is displayed start the component checks for the relevant item and then return to <Error checking mode> after the checks end (3-way valve and dual venturi tests are excluded).
5. During the component checks, the tests are performed automatically (3-way valve and dual venturi tests are excluded).
6. The 3-way valve and dual venturi tests perform an ON / OFF operation by pressing [+] and [-]. If [Reset] is pressed or there is no button activity for five minutes, the system returns to <Test information mode>.
7. Press [Reset] once to return to <Test information mode> or to the "1. TST" display.
8. If there is no button activity for five minutes, the system automatically returns to <Test information mode>.

Component	Description	Display
Fan motor	Fan motor test menu	
Pump	Pump test menu	
3-way valve	3-way valve test menu	
Dual venturi	Dual venturi test menu	

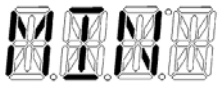
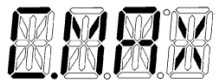
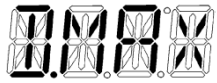
Component	Test performed	Display
Fan motor	Gradually increases the fan motor speed from 0 rpm to full speed and then decreases the speed to 0 rpm.	The current APS value and the current speed (rpm) are displayed alternately at two second intervals. 
Pump	Turns ON the pump for 10 sec and then OFF for 5 sec. The cycle is repeated five times for a total of 75 sec.	Displays ON or OFF based on the pump's status. 
3-way valve	Turn ON the 3-way valve when the test mode opens. By pressing [+] or [-] converts the valve's state from On -> Off or Off -> On.	When [+] or [-] is pressed, the condition toggles from On -> Off or Off -> On. 
Dual venturi	Turn ON the dual venturi when the test mode opens. By pressing [+] or [-] converts the component's state from On -> Off or Off -> On.	When [+] or [-] is pressed, the condition toggles from On -> Off or Off -> On. 

※ <Error checking mode> returns to <Normal operation mode> after the automatic test is completed.

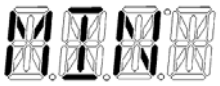
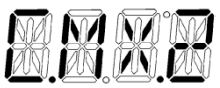
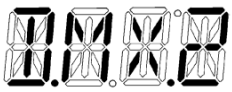
Setting Operational Conditions

1. In <Test information mode>, press [+] or [-] until "2. OPR" is displayed on the front panel. Then, press [ECO] once.
2. <Normal operation mode> cannot be accessed if the boiler is in an error condition.
3. When <Normal operation mode> opens, either Summer mode or Winter mode is automatically selected depending on the season.
4. When [+] or [-] is pressed, it increases or decreases the operational condition values and the value flashes at 500 msec intervals. If the value is not changed for 3 seconds, the currently displayed value is saved and used.
5. If [Reset] is pressed once, the system returns to <Test information mode>. (The previously entered item at "2. OPR" is displayed.)
6. If there is no button activity for 3 hours, the system automatically returns to <2. OPR >.

[24K/28K/34K models]

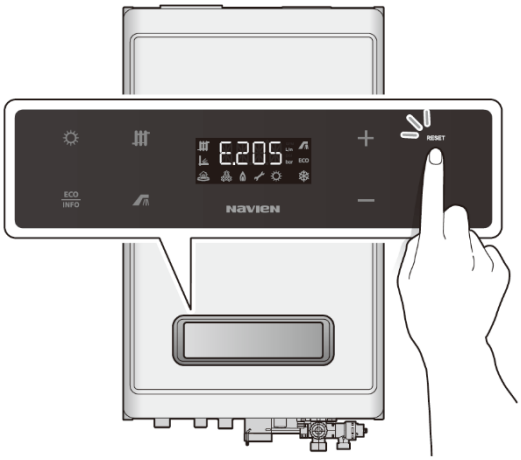
Mode	Description	Display
(a) NORMAL operational condition	Operates in Normal operation mode	
(b) MIN operational condition	Operates in MIN operation mode	
(c) CH MAX operational condition	Operates in CH MAX operation mode	
(d) DHW MAX operational condition	Operates in DHW MAX operation mode	

[40K model]

Mode	Description	Display
(a) NORMAL operational condition	Operates in Normal operation mode	
(b) MIN operational condition	Operates in MIN operation mode	
(c) Stage 1 MAX operational condition	Operates in Stage 1 MAX operation mode	
(d) Stage 2 MIN operational condition	Operates in Stage 2 MIN operation mode	
(e) Stage 2 CH MAX operational condition	Operates in Stage 2 CH MAX operation mode	
(f) Stage 2 DHW MAX operational condition	Operates in Stage 2 DHW MAX operation mode	

4.4.13 Resetting The Boiler (Factory Reset)

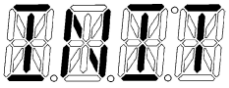
To resolve some error conditions, reset the boiler by pressing [Reset].



If the problem is unresolved after resetting the boiler, refer to the Troubleshooting section of this manual or contact a TAS.

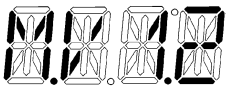
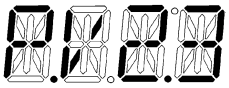
1. In <Power off mode>, press and hold [ECO]+[Summer/Winter]+[S.H]+[DHW] buttons for more than 5 sec to initialise the system to the factory default settings. The boiler will display 'INIT' for 5 sec and then start in <Normal operation mode>..

2. Reset Value:

Command	Description	Display
Factory Reset	Displays for 5 sec	

4.5 Version Display

Press [RESET]+[+] for more than 5 sec in <Power Off mode>. Then, the Main Controller firmware version and the Panel firmware version will each be displayed for 3 seconds before the system returns to <Power Off mode>.

Item	Description	Display
(a) Main Controller F/W Version	Displays for 3 sec Eg.) Version 1.2	
(b) Panel F/W Version	Displays for 3 sec Eg.) Version 2.3	

4.6 Heat Demand

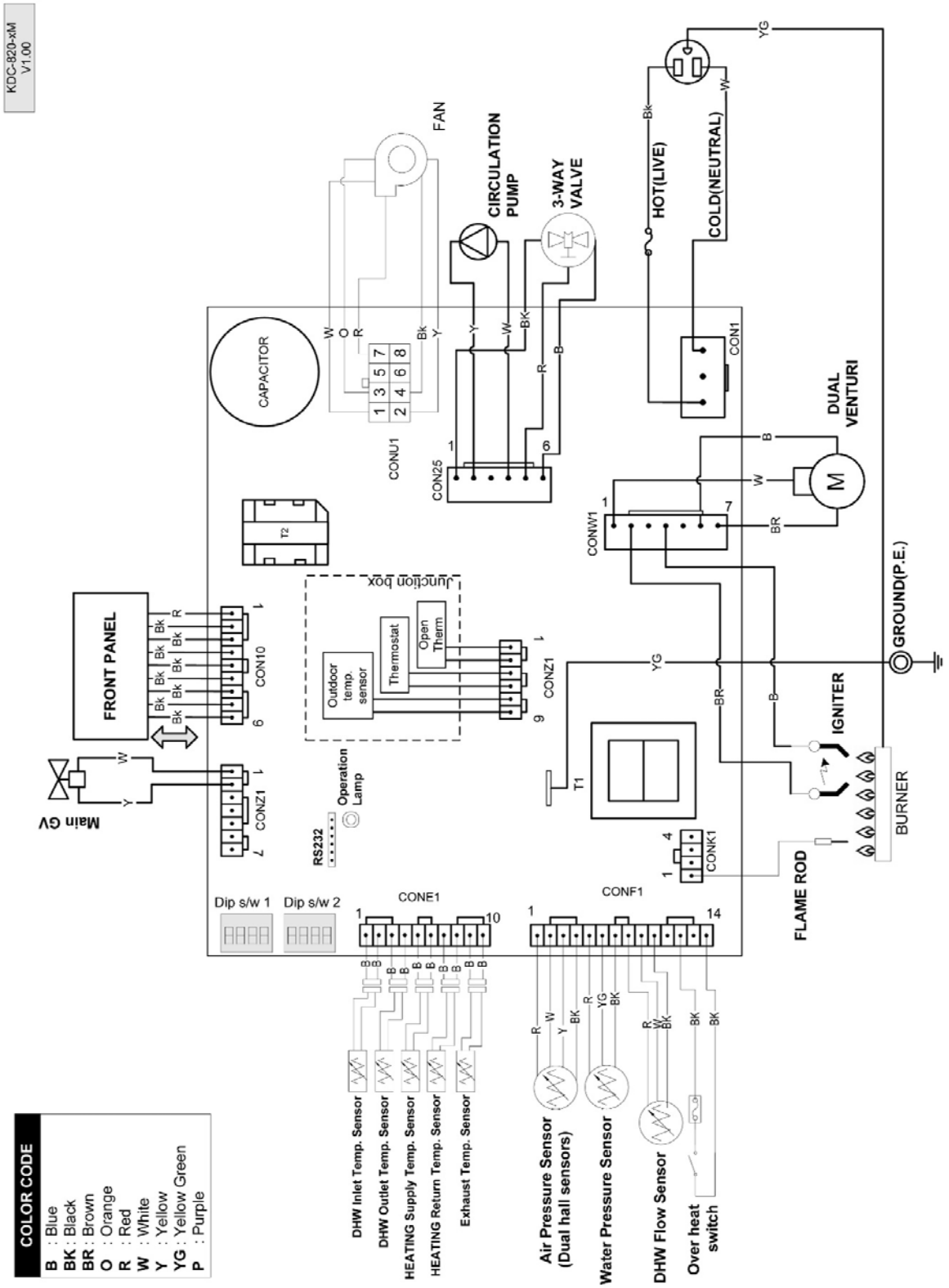
1. If OT-Room control mode is selected, it overrides the boiler's Summer/Winter mode settings and the, space heating and DHW temperature settings. The boiler operates based on OT-room control settings as long as the room controller is connected to the main controller and is operating properly.
2. In <Normal operation mode>, if the boiler is operating via OT-Room control, "RC" is displayed when [Summer/Winter], [Space heating], [DHW], or [ECO] are pressed to indicate that their functions are disabled.

Heat Demand	DIP S/W	
	4	5
Panel	OFF	OFF
OT-Room thermostat	ON	OFF
Thermostat	OFF	ON
Panel	ON	ON

4.7 Error Codes

Error	Code	Conditions
Panel communication error	E.782 (Level 1)	① Displayed when the controller does not respond for more than 60 sec. The error condition is released when a normal connection is re-established. ② Displayed when a panel communication error occurs regardless of the error level. All errors are displayed because the level of controller errors is unknown when the panel malfunctions.
Maintenance alarm	"TEC" is displayed	① After the boiler starts, the boiler counts the power-on duration in days. ② If the day count value is greater than the value set at "W.Maintenance time" an alarm is generated. ③ The alarm is released if the maintenance time is adjusted or if the power-on time is initialised. ④ The day count is automatically initialised when the maintenance time is reset. ⑤ The alarm function is disabled if the maintenance time is set to "0."

4.8 Electrical Diagnostic Contacts and Wiring Diagram



Section	Test points	Colour coding			Readings	Remarks
		Terminals	Wires			
High voltage	Input voltage	CON1 (1,3)	BLUE BROWN	2P	AC 230 V	3.15 A fuse is connected to the BROWN cable.
		CON17	GREEN YELLOW	1P	Earth	
	Ignition transformer	CONW1 (2,4)	BROWN - BLUE 2P		AC 230 V	Input voltage
	Circulation pump	CON25 (2,4)	YELLOW - WHITE 2P		AC 230 V	
	3-way valve	CON25 (1,5,6)	RED	3P	AC 230 V	Space heating: RED + WHITE = AC 230 V
			PURPLE			DHW: RED + PURPLE = AC 230 V
			WHITE			
	Blower (DC-FAN)	CONU1 (3-4)	BLACK - YELLOW 2P		Max allowable voltage: V 325 DC Vsp: DC 2.6 V to 5.6 V	Vsp voltage via PWM regulation
	Dual venturi	CONW1 (1,6,7)	BLUE	3P	AC 230 V	Applicable to 40K only. OFF(Low load): BLUE, WHITE ON (High load): BLUE, BROWN
			BROWN			
			WHITE			
	Flame detector	CONK1 (1)	BLACK 1P		1to15uA (Combustion) 0uA (Stand-by)	Open the circuit before measuring.
Low voltage	Gas valve	CONZ1 (1,2)	WHITE - YELLOW 2P		DC 24 V	Voltage is applied only when the valve is operating.
	APS1	CONF1 (1,2,4)	RED	3P	RED + BLACK: DC 5 V	RED + BLACK: DC 5 V, constant
			WHITE		Feedback: WHITE	WHITE + BLACK: DC 0.3 to 3.5 V, variable
			BLACK			
	APS2	CONF1 (1,3,4)	RED	3P	RED + BLACK: DC 5 V Feedback: YELLOW	RED + BLACK: DC 5 V, constant YELLOW + BLACK: DC 0.3 to 3.5 V, variable
			YELLOW			
			BLACK			
	Panel	CON10 (1-9)	RED	9P	RED + BLACK (1,8) : DC 5 V BLACK + BLACK (7,8) : DC 12 V BLACK + BLACK (9,8) : DC 24 V	BLACK + BLACK (5,8) : communication signal voltage – not to be measured BLACK + BLACK (6,8) : communication signal voltage – not to be measured
			BLACK			
	Water pressure sensor	CONF1 (5,6,7)	RED	3P	variable	DC 0.24 V (0.5bar) to DC 4.93 V (3.9bar)
			BLACK			
			GREEN			
	Overheating sensor	CONF1 (12,14)	BLACK - BLACK 2P		DC 24 V	Normal: DC 24 V, Error: 0 V
	Flow sensor	CONF1 (8,9,10)	RED	3P	Pulse	No pulse is measured.
			WHITE			
			BLACK			
	DHW temperature sensor	CONE1 (3,4)	BLUE - BLUE 2P		Resistance by temperature range	Refer to temperature sensor data table.
Optional junction box	Room thermostat	COND1 (3,4)	WHITE - WHITE 2P		DC 12 V	OPEN: 0 V SHORT: DC 12 V
	Open thermostat	COND1 (1,2)	RED – RED 2P		Not to be measured	Communication pulse signal
	Outdoor temperature sensor	COND1 (5,6)	BLUE – BLUE 2P		Resistance by temperature range	Refer to temperature sensor data table.

4.9 Key Component Descriptions

4.9.1 PCB

Item	Description
Function	Controls each component and monitors the overall performance of the unit.
Fault	PCB malfunction.
Symptoms	A system component may not operate and generate an error code. In most PCB failures, the boiler will not operate until the fault is resolved.
Error codes	E515, E615
Diagnostics	Visual inspection: Check wire connections are secure and inspect for wire damage, and/or PCB heat damage.
Testing/inspection information	

4.9.2 High Temperature Limit Switch

Item	Description
Function	1. Overheat prevention switch. 2. If the switch detects extremely high temperature, the boiler will automatically trip and shut down. 3. Excessive high water temperatures (> 105°C) in the heat exchanger will activate the high limit switch.
Fault	Unable to detect high water temperature conditions if the switch malfunctions.
Symptoms	Unable to shut down the boiler if the water temperature from the heat exchanger exceeds 105°C.
Error codes	E016, E046
Diagnostics	1. Visual inspection: Check wire connections are secure and inspect for wire damage. 2. Resistance test: Confirm that the resistance is within the specification shown below.
Testing/inspection information	Resistance range: < 1.0 Ω
	

4.9.3 Thermistor

Item	Description
Function	Measure hot and cold water temperature at the boiler's space heating outlet and inlet connections.
Fault	Inaccurate water temperatures from inside the boiler.
Symptoms	1. If a thermistor fails, an error code is displayed before the boiler operates. 2. If resistance values are outside the allowable range, there will be hot water temperature fluctuations.
Error codes	E047, E205, E218, E407, E421
Diagnostics	1. Visual inspection: Check wire connections are secure and inspect for wire damage. 2. Test the resistance of the sensor. Before testing, shut down the boiler and allow it to cool.
Testing/inspection information	Resistance range: Refer to the table below

Wire colour: BLUE-BLUE
Inlet, Outlet

Exhaust limit temperature sensor
Wire colour: BLUE-BLUE

Test for an open hot water temperature sensor (Test result: MΩ open)

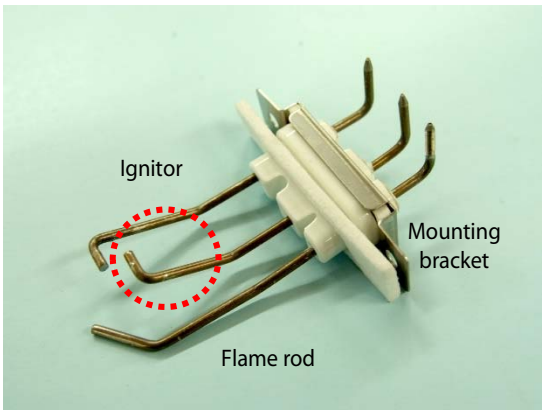
Temp (℃)	Thermistor (kΩ) [Space heating line]	Thermistor (kΩ) [DHW line]	Exhaust Limit Temperature Sensor (kΩ)
0-5	23.4-19.1	27.5-22.2	162.3-125.9
6-10	18.3-15.5	21.2-18.0	119.8-98.5
11-15	14.8-12.6	17.3-14.7	93.8-77.6
16-20	12.1-10.7	14.2-12.1	74.0-61.6
21-25	10.3-8.5	11.6-10.0	58.8-49.2
26-30	8.2-7.0	9.6-8.3	47.1-39.5
35-40	6.8-4.9	8.0-6.9	37.9-32.0

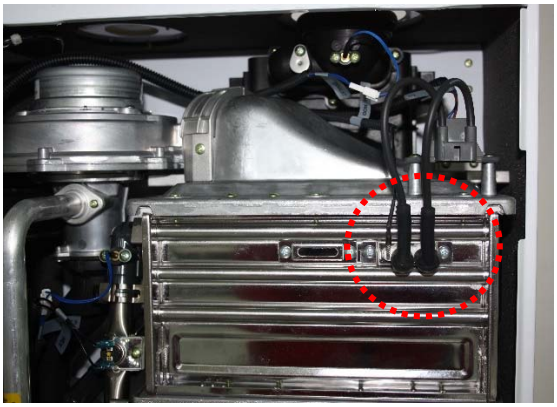
4.9.4 Fan Motor

Item	Description
Function	Supplies combustion air for the burner and purges exhaust flue gas. To maintain gas input over long flue runs, the fan use APS to provide ideal combustion levels.
Fault	1. Fan speed failure: When fan speed is approximately 0 rpm. 2. A fan assembly screw is loose and/or the fan is disassembled. 3. Disconnected or defective fan connection terminal assembly.
Symptoms	1. Erratic combustion. 2. Vibration and noise coming from the boiler. 3. The boiler does not operate correctly.
Error codes	E109, E110
Diagnostics	1. Visual inspection: check the fan's wiring connections and mounting. 2. Voltage test: Test the fan voltage for the specified voltage shown below.
Testing/inspection information	Black - Yellow: DC 340 V
	

4.9.5 Flame Rod Assembly

Item	Description
Function	Repeatedly discharges a high voltage spark at the main burner until the gas ignites.
Fault	1. Unable to ignite the gas. 2. Results in multiple unsuccessful ignition attempts.
Symptoms	1. The boiler does not ignite and error code “E003” or “E004” is displayed. 2. The durability of the igniter reduces.
Error codes	E003, E004, E012
Diagnostics	Visual inspection: Check wire connections are secure and inspect for wire damage.
Testing/inspection information	BLACK: 0-10 µA



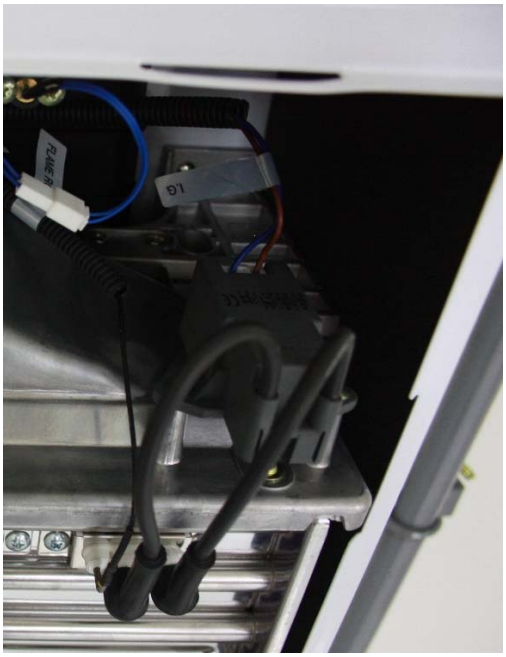


Ignition gap: 3.5 -4.5 mm (1/8”)

4.9.6 Ignition Transformer

Item	Description
Function	Provides voltage for the igniter for gas ignition purposes.
Fault	1. The igniter is unable to ignite the gas. 2. Results in multiple unsuccessful ignition attempts to.
Symptoms	1. The boiler does not ignite and error code “E003” or “E004” is displayed. 2. Durability of the transformer wears down.
Error codes	E003, E004
Diagnostics	1. Visual inspection: Check wire connections are secure and inspect for wire damage. 2. Voltage test: Test the voltage meets the specifications shown below.
Testing/inspection information	BROWN - BLUE • On: AC 230 V • Off: 0 V

Input Voltage	Output Voltage	Output Current
230 V, 50 Hz	±20 kV	10 mA, ±2 mA



4.9.7 APS

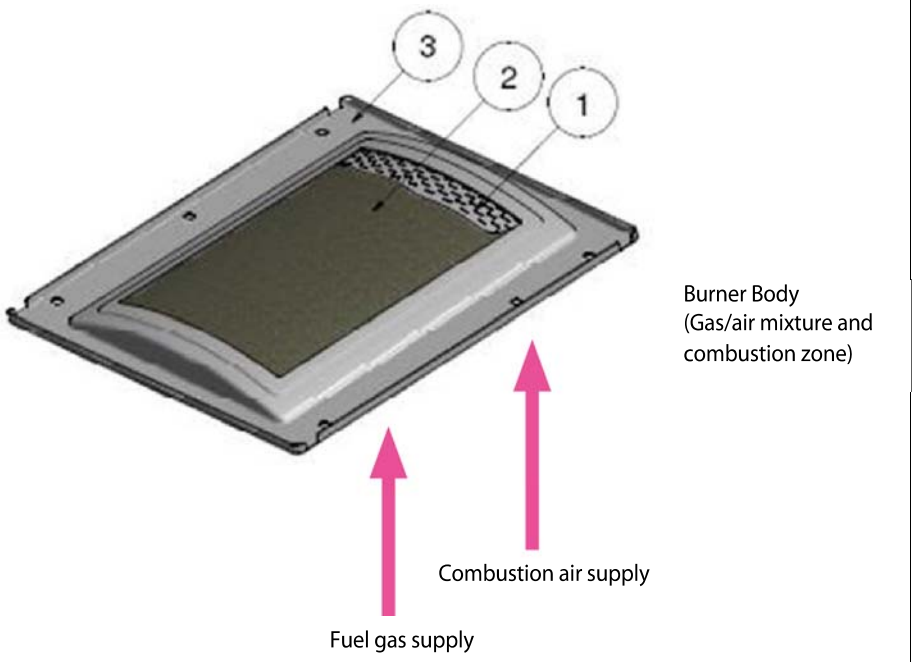
Item	Description
Function	Measures the air pressure entering the burner system.
Fault	1. Noises occur during combustion. 2. Imperfect and/or abnormal gas flame. 3. Incorrect voltage at the APS.
Symptoms	1. The boiler does not operate. 2. Excessive carbon monoxide emissions are generated.
Error codes	E110
Diagnostics	1. Visual inspection: Check wire connections are secure and inspect for wire damage. 2. Voltage test: Test the voltage meets the specifications shown below. 3. Check the exhaust duct for obstructions or blockages. 4. Check the condensate trap and drain pipes for obstructions or blockages. 5. Check that hot water temperature is normal.
Testing/inspection information	APS (1): RED - BLACK: DC 5 V WHITE - BLACK: DC 0.3 to 3.5 V APS (2): RED – BLACK: DC 5 V WHITE - YELLOW: DC 0.3 to 3.5 V
	

4.9.8 Main Gas Valve

Item	Description
Function	1. Controls the amount of gas supplied to the burner based on fan speed. 2. When the unit experiences abnormal combustion, it automatically shuts off the gas supply to prevent unsafe situations.
Fault	Unable to open/close
Symptoms	1. No flame. 2. The boiler does not operate.
Error codes	E003, E012
Diagnostics	1. Visual inspection: Check wire connections are secure and inspect for wire damage. 2. Check that the solenoid valve of Main Gas Valve works properly. • Voltage test: Test the voltage meets the specifications shown below.
Testing/inspection information	• WHITE - YELLOW/Connector Pin 1 and 5: DC 24 V

4.9.9 Burner (to be revised)

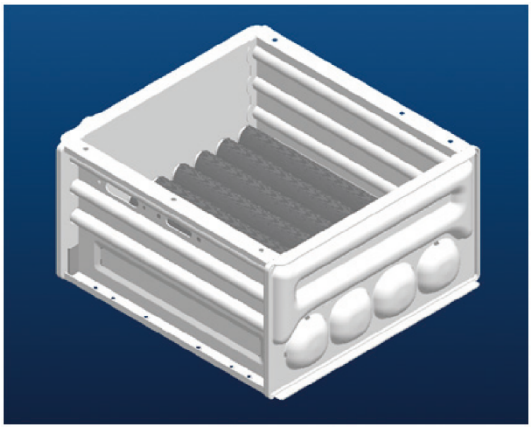
Item	Description
Function	1. Pre-mixes air and gas to reduce emissions and increase efficiency. 2. The burner produces the optimum air/gas mixture required to produce the correct level of heat during combustion.
Fault	1. Unable to initiate or sustain combustion. 2. Dust or soot deposits form on the burner's surface. 3. Gas leakage from the burner.
Symptoms	1. Abnormal combustion. 2. Unstable flame conditions and/or flame loss. 3. Ignition failure.
Error codes	E003, E004, E012
Diagnostics	Visual inspection: Check for deposits forming on the burner surface and/or unstable flame conditions during operation.



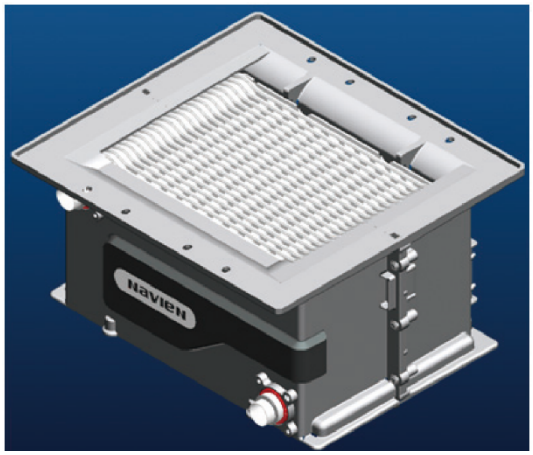
4.9.10 Flow Sensor (to be revised)

Item	Description
Function	To detect water flow in LPM (litres per minute) to provide a steady hot water temperature.
Fault	1. Unable to detect or measure water flow rate. 2. Damage to and/or leakage from the water flow sensor.
Symptoms	1. Ignition does not start. 2. Boiler operation stops when water leakage is detected.
Error codes	E439
Diagnostics	1. Visual inspection: Check wire connections are secure and inspect for wire damage. 2. Visual Inspection: Check for sensor damage and for scale forming on the sensor.
	

4.9.11 Primary Heat Exchanger

Item	Description
Function	1. Main component used in the boiler for heat transfer. 2. Multiple pipes on surface of the heat exchanger and inside the combustion chamber are used to minimise heat loss.
Fault	1. Water and/or exhaust gas leaks. 2. Scale deposits in the heat exchanger can cause water in the boiler to bubble.
Symptoms	1. Exhaust gas leaks. 2. Overheating of water causes bubbling noises.
Error codes	E016, E030, E047
Diagnostics	1. Visual inspection: Check for surface cracks on the heat exchanger. 2. Audible inspection: Listen for bubbling noises from inside the boiler.
	

4.9.12 Secondary Heat Exchanger

Item	Description
Function	1. Secondary component used in the boiler for heat transfer. 2. There are multiple paths of water pipes on the heat exchanger as well as inside the combustion chamber which minimises heat loss.
Fault	1. Water and/or exhaust gas leaks. 2. Scale deposits in the heat exchanger can cause water in the boiler to bubble.
Symptoms	1. Exhaust gas leaks. 2. Overheating of water causes bubbling noises.
Error codes	E016, E030, E047
Diagnostics	1. Visual inspection: Check for surface cracks on the heat exchanger. 2. Audible inspection: Listen for bubbling noises from inside the boiler.
	

4.9.13 DHW Heat Exchanger

Item	Description
Function	Heat transfer between space heating and DHW water. Water heated in the primary and secondary heat exchangers is circulated to the plate heat exchanger. Also, the plate heat exchanger filters the water in the space heating system to prevent faults in other parts of the heating system.
Fault	1. Water leaks. 2. Low temperature water in the heat exchanger.
Symptoms	DHW leaks and/or temperature fluctuations at hot water outlets.
Error codes	E016, E030, E353
Diagnostics	A leaking plate heat exchanger causes the space heating side system pressure to rise to the tap water pressure level. Check the pressure in the space heating system.

4.9.14 Circulation Pump

Item	Description
Function	1. Provides internal or external water circulation. 2. Internal circulation minimises the effects of temperature fluctuations. External circulation quickly delivers hot water to taps and results in water conservation.
Fault	Unable to detect or measure water flow.
Symptoms	1. Water inside the boiler system freezes. 2. Water temperature fluctuations when the boiler is set to internal recirculation. 3. Hot water takes a long time to be available at taps when the boiler is set to external recirculation.
Error codes	-
Diagnostics	1. Visual inspection: Check the circulation pump connection wire. 2. Check the water filter for obstructions. 3. Voltage test: Test the voltage meets the specifications shown below.
Testing/inspection information	YELLOW-WHITE • ON: AC 230 V • OFF: 0 V
	

4.9.15 3 Way Valve

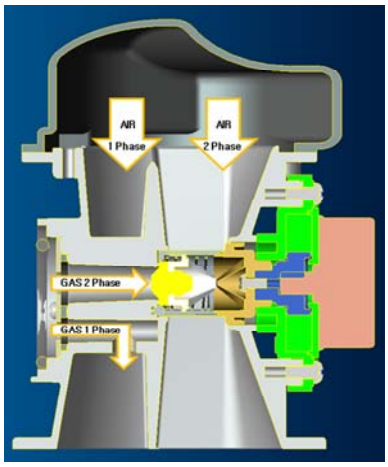
Item	Description
Function	Uses a DHW flow sensor and PCB to cycle water between the space heating system and the DHW heat exchanger.
Fault	1. No hot water in space heating mode. 2. No domestic hot water in DHW mode.
Symptoms	DHW supply stops and flow continues in the space heating system when the space heating water temperature is lower than the set point.
Error codes	E016
Diagnostics	1. Visual inspection: Check the 3-way valve wiring connections. 2. Voltage test: Test the voltage meets the specifications shown below.
Testing/inspection information	SPACE HEATING: RED + WHITE: ON AC 230 V, OFF 0 V DHW: RED + PURPLE: ON AC 230 V, OFF 0 V ※ Confirm voltage as the 3-Way Valve operating
	

4.9.16 Water Pressure Sensor

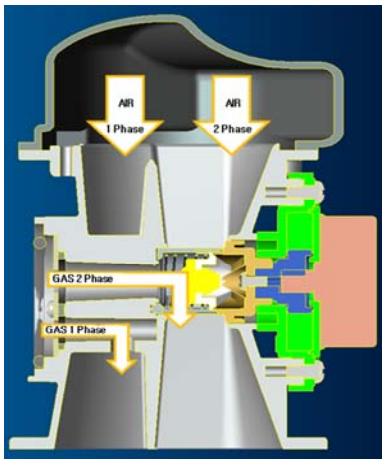
Item	Description
Function	Analysis of heating system water pressure ratios.
Fault	Unable to detect or measure changes of water pressure.
Symptoms	The water top-up system does not operate automatically.
Error codes	E351, E352, E353
Diagnostics	1. Visual inspection: Check the circulation pump's wiring connections. 2. Voltage test: Test the voltage meets the specifications shown below.
Testing/inspection information	Black-Red: DC 0 -5 V
	

4.9.17 Dual venturi

Item	Description
Function	Controls the TDR by adjusting the gas/air mixture rate. A synchronous motor is used to provide two control phases for mixing gases.
Fault	1. Blades will not close. 2. Blades will not open.
Symptoms	1. Boiler operation starts and stops frequently because of excessive heat supply. 2. Set point temperature is not reached because of insufficient heat.
Error codes	E060
Diagnostics	Voltage test: Test the voltage at the synchronous motor. (After approx. 2 sec the blade opening or closing, the motor turns off.)



<Closed>



<Open>

4.9.18 Expansion tank

Item	Description
Function	1. Removes air from the system during heating. 2. Relieves system pressure caused by expansion as the water temperature increases. 3. Uses a built-in low level water sensor to maintain the water in the boiler at a consistent volume.

5. Troubleshooting

5.1 Error Code Classification

Classification	Error Code	Error Level	Function	Diagnosis/Actions
Combustion system	E001	3 2	Heat exchanger overheating	Manual reset
	E003	3	Ignition error	Manual reset
	E004	2	False flame detection	Auto reset
	E012	3	Flame loss	Manual reset
	E016	3	Heat exchanger overheating	Manual reset
	E030	3	Exhaust overheat: exhaust limit switch stops the boiler when the flue temperature exceeds 110℃ (230℉) for more than 10 sec.	Manual reset Auto reset
	E046	2	Heat exchanger thermistor error	Auto reset
	E047	3 2	Exhaust thermistor error	Manual reset Auto reset
	E060	2	Dual venturi limit switch error	Auto reset
Air supply system	E109	3	Fan motor activity error	Manual reset
	E110	3	Exhaust blockage	Manual reset
	E127	2 3	APS error (open, short, initial value or no response)	Auto reset Manual reset
CH system	E205	2	H/E outlet error: thermistor open or short	Auto reset
	E218	1	H/E inlet error: thermistor open or short	Alarm
Water supply system	E302	2	Low water pressure error	Auto reset
	E352	2	High water pressure error	Auto reset
	E353	2	Water pressure sensor error	Auto reset
DHW system	E407	1	Hot water outlet 1: thermistor open or short	Alarm
	E421	2	Cold water inlet 1: thermistor open or short	Auto reset
Controller	E515	3	PCB error	Manual reset
	E517	3	DIP switch setting error	Manual reset
	E594	1	Partial PCB communication error	Alarm
	E615	3	Input and memory error	Manual reset
Hardware	E740	2	Outdoor sensor error	Auto reset
	E782	1	Main panel communication error	Auto reset
	E783	1	OT-remote controller error	Auto reset
	E787	2 3	Device reset error	Manual reset

5.2 Error Code List and Actions

Error Code	Sub Code	Function	Diagnosis/Actions
E001	0	Heat exchanger overheat	1. Clean the strainer. 2. Check voltage via PCB at the pump 3. (AC 230 V) 4. Check that the flow rate is correct 5. Check if water is circulating in the heating lines. 6. Check the heat exchanger and flush it with cleaning solution if necessary.
E003	0	Ignition failure	1. Check the main gas supply 2. Check if the manual gas valve is open. 3. 2. Check if the igniter is sparking. 4. 3. Tighten the ground terminals on the heat exchanger.
E004	0	False flame detection	1. Ensure that the ground wire is connected. 2. Check if the igniter is sparking.
E012	0	Flame loss	1. Check if the main gas valve is open and verify the incoming gas pressure. 2. Check the intake air filter. 3. Check the ground wire. 4. Check the power supply. 5. Tighten the ground terminals on the heat exchanger. 6. Adjust the anti-short cycle time.
E016	0	Heat exchanger overheat	1. Turn OFF the boiler, wait at least 30 min, and then restart the boiler. 2. Clean the inlet water filter and strainer. 3. Check the high limit switch and PCB. 4. Check the 3-way valve. 5. Check the heat exchanger and flush it if required.
E030	0	Exhaust overheat: exhaust limit switch stops the boiler when the flue temperature exceeds 110 °C (230 °F) for more than 10 min.	1. Turn OFF the boiler, wait at least 30 min, and then restart the boiler. 2. Clean the strainer. 3. Check the heat exchanger and flush it if required.
E046	2	Heat exchanger thermistor short error	Check the heat exchanger thermistor connection.
E047	1	Exhaust thermistor open error	Check the exhaust thermistor connection.
	2	Exhaust thermistor short error	
E060	1	Dual venturi limit switch error (ON)	Check the dual venturi connection.
	2	Dual venturi limit switch error (Closed OFF)	
	3	Dual venturi limit switch error (Open ON)	

Error Code	Sub Code	Function	Diagnosis/Actions
E109	0	Fan motor activity error	1. Check and clean the air intake filter. 2. Check and clean the fan motor. 3. Test the voltage from the PCB to ensure that it is correct. Replace fan if PCB voltage is normal.
E110	1	Exhaust blockage (fan)	1. Check the exhaust pipe for obstructions. 2. Check and clean the intake air filter. 3. If possible, remove the exhaust pipe to ensure that the flue is clear.
	2	Exhaust blockage (DHW)	
	3	Exhaust blockage (space heating)	
E205	1	Heating supply thermistor open error	1. Check the thermistor. 2. Check pump wiring connections.
	2	Heating supply thermistor short error	
E218	1	Heating return thermistor open error	Check the thermistor.
	2	Heating return thermistor short error	
E302	0	Low water pressure	1. Check the feeder valve. 2. Check the incoming water pressure and activity at the PRV.
E352	0	High water pressure	1. Check the feeder valve. 2. Check the incoming water pressure and activity at the PRV.
E353	1	Water pressure sensor open error	Check the water pressure sensor.
	2	Water pressure sensor short error	
E407	1	Hot water outlet thermistor open error	1. Check the thermistor. 2. Replace the thermistor.
	2	Hot water outlet thermistor short error	
E421	1	Cold water inlet thermistor open error	1. Check the thermistor. 2. Replace the thermistor.
	2	Cold water inlet thermistor short error	
E515	1-7	PCB internal communication error	Check the PCB.
	8	PCB to igniter communication error	1. Check the PCB connection. 2. Check the igniter.
	9	PCB to fan communication error	1. Check the PCB connection. 2. Check the fan.
	10	PCB monitoring device error	1. Check the PCB connection.
	11-12	PCB to dual venturi communication error	1. Check the PCB connection. 2. Check the dual venturi.
	13-14	PCB to 3-way valve communication error	1. Check the PCB connection. 2. Check the 3-way valve.

Error Code	Sub Code	Function	Diagnosis/Actions
E517	0	Dip switch setting error	Check the dip switches on the front panel and the PCB.
E594	0	EEPROM operation error	Check the PCB.
E615	0	Heat exchanger 1, high limit switch input data error	Check the PCB.
	1	Exhaust sensor input data error	1. Check the exhaust sensor wiring connections. 2. Check the exhaust sensor.
	2	Flame rod input data error	1. Check the flame rod wiring connections. 2. Check the flame rod.
	3-14	PCB memory error	Check the PCB.
	15-16	Pressure sensor input data error Sub code 15: < the range Sub code 16: > the range	1. Check the pressure sensor wiring connections. 2. Check the pressure sensor's output voltage.
E740	1	Outdoor temperature sensor open error (appears only when outdoor reset is enabled).	1. Ensure that outdoor reset curve is correctly configured. 2. Check the outdoor temperature sensor's wiring connections.
	2	Outdoor temperature sensor short error (appears only when the outdoor reset is enabled).	
E782	0	Main panel communication error	Check the PCB.

If the actions contained in the table above do not resolve the boiler fault, contact the Navien technical support team on 1-800-519-8794.

To assist with fault resolution, error codes are displayed on the front panel and saved on a PCB board in the boiler providing a record of the faults and failures that occur.

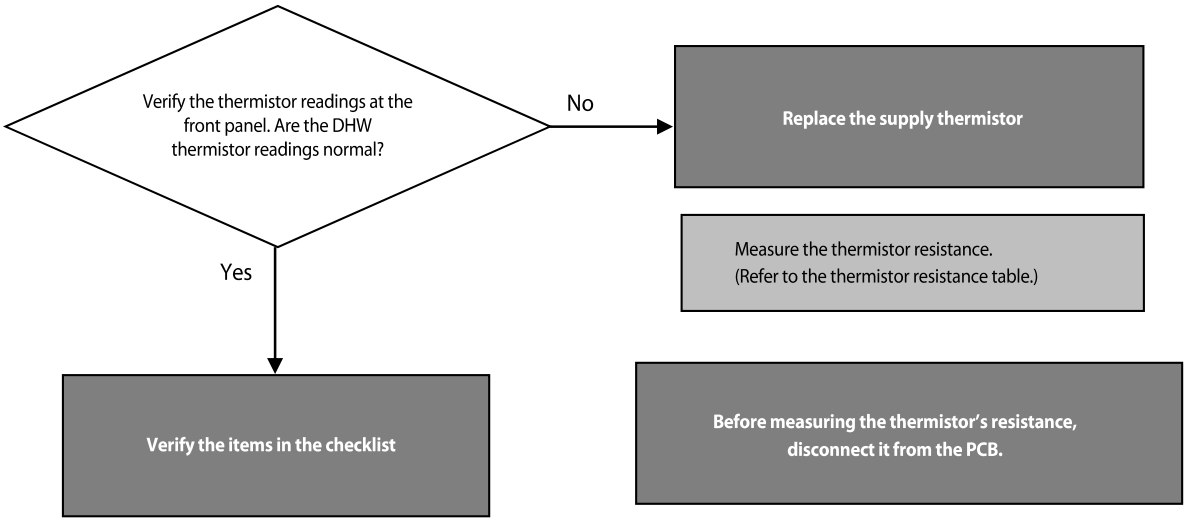
IMPORTANT

To reset the boiler, either press [Reset] on the front panel or turn off the boiler's power supply and then turn it on again.

5.2.1 Error 001

Error Conditions and Checklist

Error	Description
E001 Heat exchanger overheat	1. If the space heating water temperature is higher than 105℃, E001 will be displayed on the front panel to warn users of high temperature conditions. 2. If the space heating water temperature decreases below 105℃, E001 will automatically reset and the boiler will repeat the combustion cycle. 3. If the overheat error is repeated consecutively three times, E001 will be displayed until the boiler is manually reset.
Checklist	1. Check the operation of the circulation pump. Run it in test mode. 2. Check the operation of the 3-way-valves. Run it in test mode. 3. Check if the heating strainer is obstructed. 4. Check if the main heat exchanger or the DHW heat exchanger is obstructed. 5. Check the heating inlet/outlet valve and distribution piping for obstructions. 6. Check the PCB DIP switch settings. 7. Check the PCB is operating properly. 8. If the fault condition remains after these checks, replace the PCB.



Testing methods

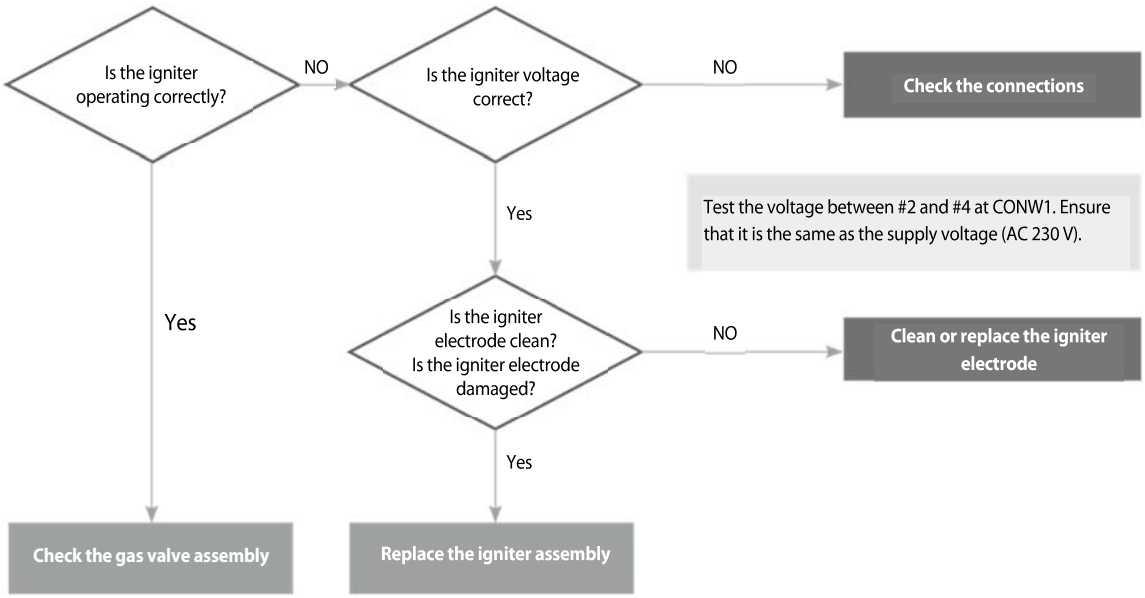
<table>
<tr><th>Error type</th><th>Cause</th><th>Testing method</th></tr>
<tr><td rowspan="5">Circulation errors</td><td>Circulation pump fault</td><td>The circulation pump and fan run continuously in the error condition,
1. Check the power supply to the circulation pump (AC 230 V).
2. Replace the PCB if power is not available at the pump.</td></tr>
<tr><td>3-way valve fault</td><td>Check that the 3-way valve is operating correctly in DHW mode.
If there is no temperature change in temperature;
· RED + WHITE (AC 230 V): Heating
· RED + PURPLE (AC 230 V): Hot water
· 3-way valve is faulty if the voltage is normal.
· PCB fault is the voltage is not available at the 3-way valve.</td></tr>
<tr><td>Heating strainer is obstructed</td><td>1. Check if the strainer is obstructed by debris.
2. Identify the type of debris caught in the strainer (aluminium, oxidised steel, etc.) to help identify the cause of the obstruction.</td></tr>
<tr><td>Heating or DHW heat exchanger is obstructed.</td><td>1. Disconnect the inlet and outlet pipes from the main heat exchanger. Blow air through the heat exchanger to check if the pipes are obstructed.
2. If Error 001 occurs in DHW, check if the DHW heat exchanger is obstructed.</td></tr>
<tr><td>Valve closed</td><td>Check the heating inlet and outlet valves and the heating manifold pipes.
At least one valve on the heating manifold must always be open.</td></tr>
<tr><td rowspan="2">Other faults</td><td>Model settings</td><td>Sudden temperature increases due to PCB DIP switch setting errors or exceeding maximum settings.
<table>
<tr><th rowspan="2">Model</th><th colspan="2">DIP Switch Settings</th></tr>
<tr><th>3</th><th>4</th></tr>
<tr><td>NCB-CE 24LSWE</td><td>OFF</td><td>OFF</td></tr>
<tr><td>NCB-CE 28LSWE</td><td>ON</td><td>OFF</td></tr>
<tr><td>NCB-CE 34LSWE</td><td>OFF</td><td>ON</td></tr>
<tr><td>NCB-CE 40LSWE</td><td>ON</td><td>ON</td></tr>
</table></td></tr>
<tr><td>PCB faults</td><td>If the error condition remains after checking these items, replace the PCB.</td></tr>
</table>

5.2.2 Error 003

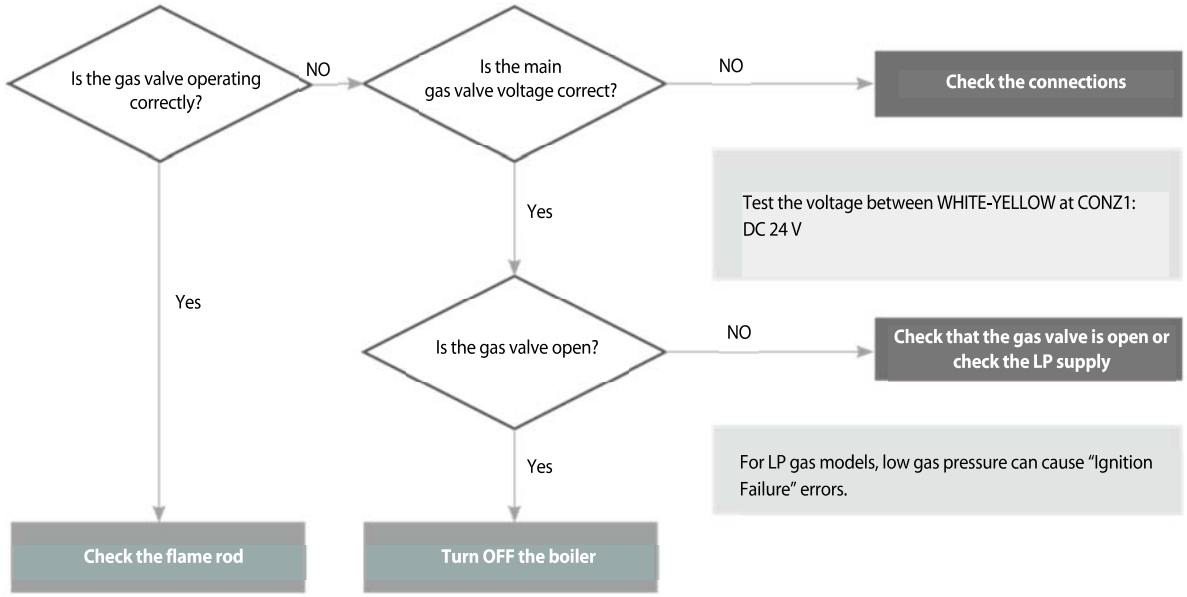
Error Conditions and Checklist

Error	Description
E003 Ignition fault	When ignition faults occur, the boiler will attempt ignition 5 times. If a flame does not start, the system displays '003E' on the front panel. This error code can be cleared manually.
Checklist	1. Check the gas supply valve is open and use a manometer to verify the supply pressure is correct. 2. Check the ignition gap, spark intensity, and flame rod deformation. 3. Check the operation of the ignition transformer (ignition state, input power (AC 230 V) 4. Check the operation of the gas control valve (DC 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 obstructed. 7. Check if the air pressure sensor is operating correctly. 8. Check the PCB DIP switch settings. 9. Adjust the offset pressure (refer to page 21). 10. Check that the gas orifice used is for the correct gas type. 11. Check the flue and air intake for accumulated water (for vertical flue installations). 12. Tighten the ground connection screws on the heat exchanger. 13. If the error conditions remain after checking these items, replace the PCB.

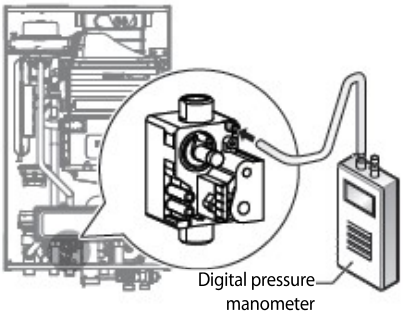
Scenario1

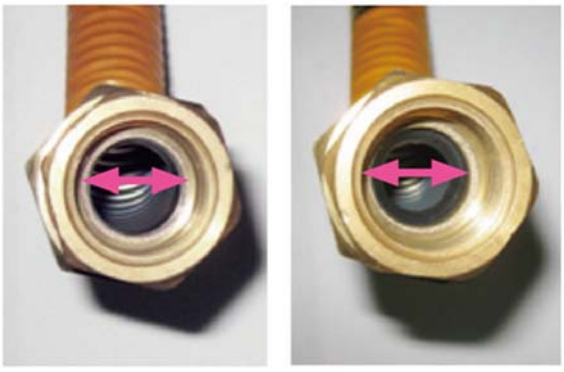


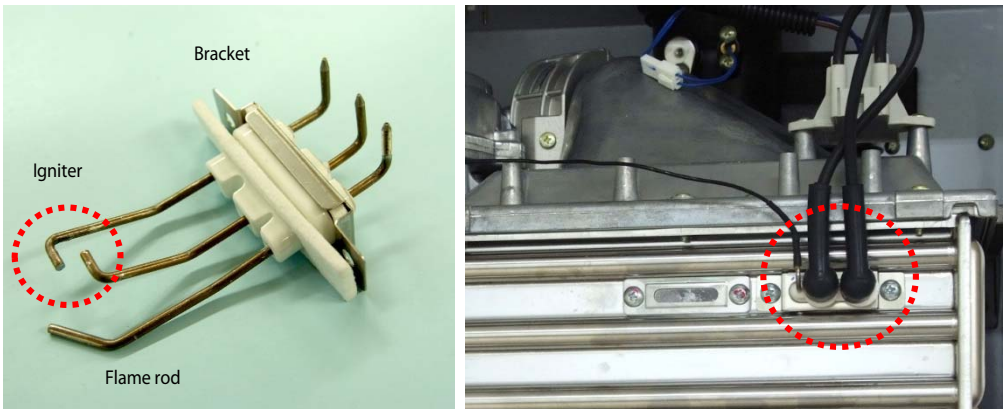
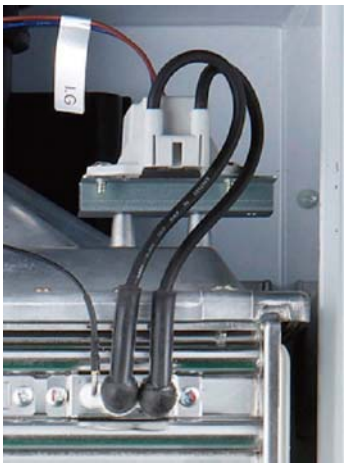
Scenario2

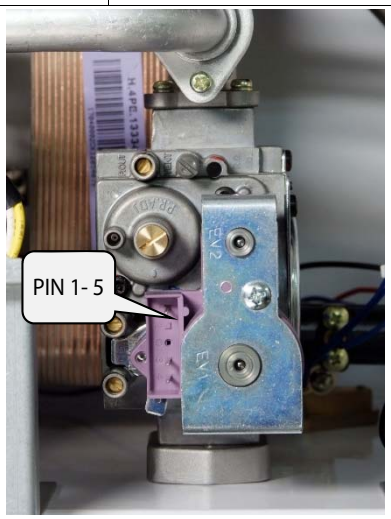

Is the gas valve operating correctly?
NO
Is the main gas valve voltage correct?
NO
Check the connections
Test the voltage between WHITE-YELLOW at CONZ1: DC 24 V
Yes
Yes
Is the gas valve open?
NO
Check that the gas valve is open or check the LP supply
For LP gas models, low gas pressure can cause "Ignition Failure" errors.
Yes
Check the flame rod
Turn OFF the boiler

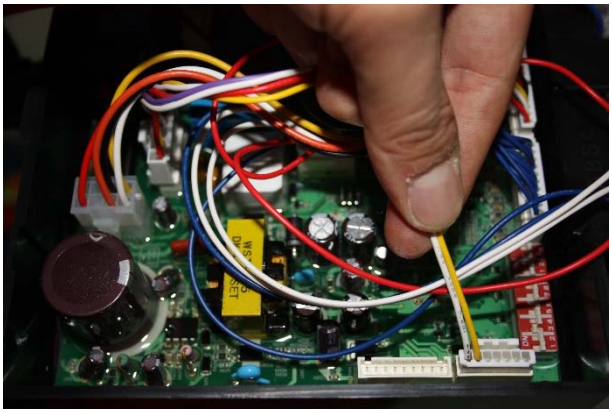
Testing method

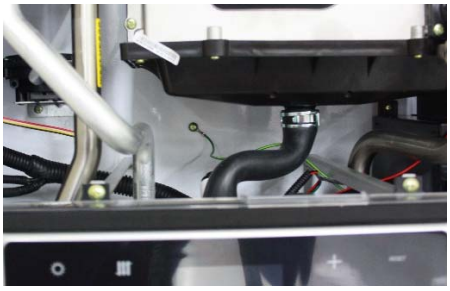
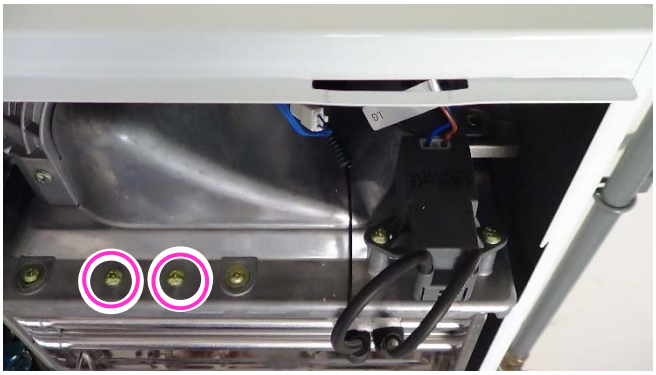
<table>
<tr><th>Error</th><th>Cause</th><th>Testing method</th></tr>
<tr><td rowspan="3">Ignition failure</td><td>Gas supply fault</td><td>1. Check that the main gas valve is open.
2. Check the gas supply pressure.
• NG: 17 - 25 mbar, LP: 25 – 35 mbar
• LP pressure drops can occur during winter.
3. Check the diameter of the flexible pipe to ensure it is compatible with the boiler.
4. If a CSST connector is used, ensure that it has not been overtightened. An overtight connection can deform the seal and obstruct the flow of gas.
5. Check the class of pressure meter.</td></tr>
<tr><td colspan="2"> 

Check gas supply pressure
 
Deformed seal can obstruct the internal diameter of CSST connectors</td></tr>
<tr><td>Electrode gap and shape faults</td><td>Insufficient electrode gap and deformed electrodes can prevent ignition.
• Recommended gap: approx. 3-4 mm (1/8"). Replace electrode if defective.
• Ignition can fail due to improper gap even if the discharge appears normal in the flame monitoring window. Disassemble to gain access to the electrode and inspect the gap.</td></tr>
</table>

Failure mode	Cause	Check method
Ignition failure	 Ignition gap: 3.5-4.5 mm (1/8″)	
	No spark from the electrode	When no discharge is seen at the electrode during ignition: • Remove the electrode and check for cracks in the insulator. • Adjust the gap if discharge is visible. • Ensure that the insulating gasket is fitted between the electrode and burner casing. • Check the input voltage at the ignition transformer (AC 230 V). • If the voltage is correct, replace the ignition transformer. • If there is no or low voltage at the ignition transformer, replace the PCB. • Check the insulator boots on the spark leads for cracks or holes.
	 Ignition transformer	

<table>
<tr><th>Error</th><th>Cause</th><th>Testing method</th></tr>
<tr><td rowspan="2">Ignition failure</td><td>Main gas valve</td><td>1. Test the primary and secondary voltages at the main gas valve.
• Use a multimeter, between the YELLOW - WHITE wires and verify the voltage is DC 24 V
2. If there is no voltage, replace the PCB.
3. If the voltage is correct, check if the coil is open.
• Check the resistance (refer to page 67). Check if the solenoid valve works correctly.
• Feel or listen for a click.</td></tr>
<tr><td colspan="2"> 

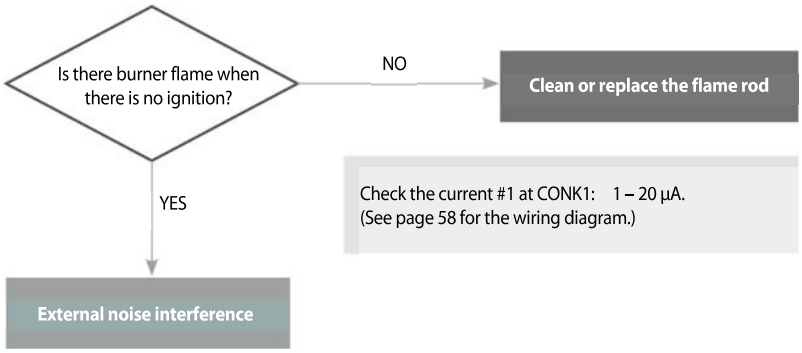
Check that the coil is open (Correct resistance range: 100 – 1,000 Ω)
 
Check the voltage at the solenoid valve / Yellow - White</td></tr>
</table>

<table>
<tr><th>Error</th><th>Cause</th><th>Testing method</th></tr>
<tr><td rowspan="2">Repeated ignition failure</td><td>Flame error</td><td>1. Inspect the flame area for deformation or foreign deposit. Repair or replace the part.
2. Check that the flame rod wiring connections are secure and free from damage.
3. Check the boiler case grounding connection is connected and secure.
• If the ground wire not adequately connected, remove and reattach the ground wire to ensure there is good contact with the case.
• Use a multimeter to test the spark current (normally 3—4 μA).</td></tr>
<tr><td colspan="2"> 
Test the spark current connectors
 
Ground connection</td></tr>
<tr><td>Flame loss and noise occurs at ignition</td><td>Check for obstructions in the gas orifice plate.</td><td>Ignition failure can occur if the gas orifice is obstructed.
• Remove the gas inlet pipe and check the orifice plate.</td></tr>
<tr><td>Improper air intake air supply</td><td>Rainwater ingress</td><td>Check if rainwater has accumulated inside the unit boiler through an incorrectly installed air intake pipe.</td></tr>
<tr><td rowspan="2">Other faults</td><td>Loose screws</td><td>Tighten the ground connection screws on the heat exchanger.
  </td></tr>
<tr><td>PCB fault</td><td>If the error condition continues after checking these items, replace the PCB.</td></tr>
</table>

5.2.3 Error 004

Error Conditions and Checklist

Error	Description
E004 False-flame detection	1. Pre ignition false-flame 2. If a flame signal is detected continuously for 3 sec before combustion (stand-by, pre-purge, pre-ignition), a false-flame error 004E (automatically cleared) is displayed on the front panel. The system performs a continuous post-purge and starts the circulation pump. 3. Post purge false-flame 4. If a flame signal is detected continuously for 3 sec when the system performs post-purge after the gas supply closes, a false-flame error 004E (automatically cleared) is displayed on the front panel. The system performs a continuous post-purge and starts the circulation pump.
Checklist	1. Check for gas leaks and defective seals on the main gas valve. 2. Check if a spark of sufficient intensity is discharged by the electrode. 3. Check if gas is supplied within the correct pressure range. 4. Check the PCB and replace if faulty.

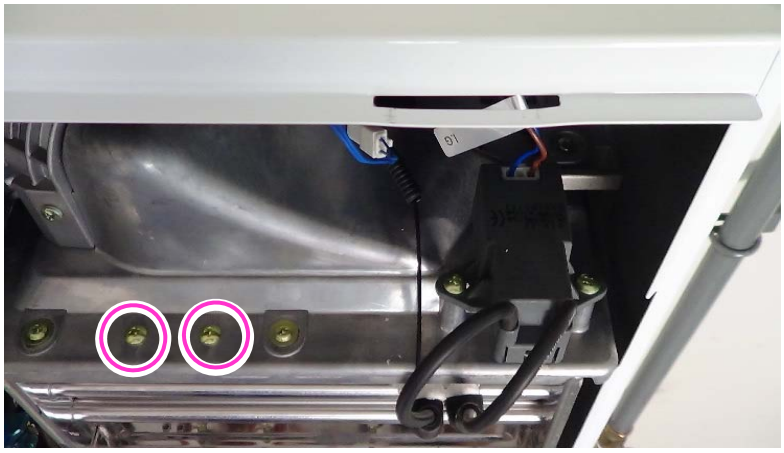


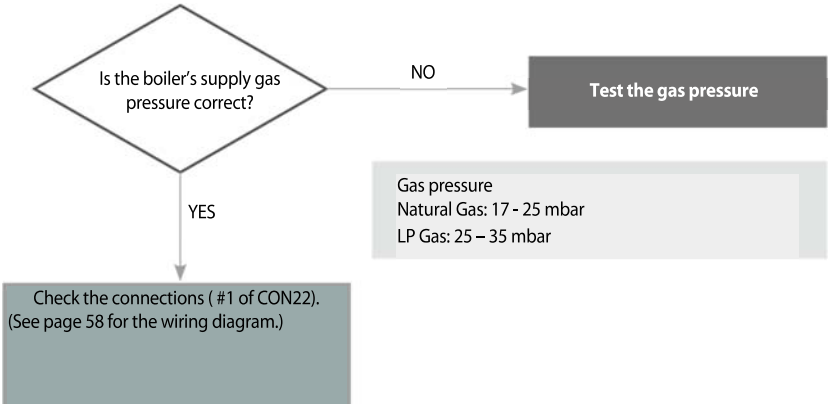
Testing method

Error	Cause	Testing method
Flame before/after combustion	Main gas valve leak	If flame occurs before ignition or if gas continues to burn after combustion stops, replace the flame rod.
Error before/after combustion	Electrode level of discharge	Spark discharges from electrode to flame sensor at ignition. • Replace or correct the position of the flame rod.
	Gas valve	Gas may leak from the main gas valve if the gas supply pressure exceeds the boiler specifications. • Check the supply pressure: NG: 17 - 25 mbar, LP: 25 – 35 mbar • If gas pressure is too high, notify the gas supplier 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 faults	PCB fault	If the error condition continues after checking these items, replace the PCB.

5.2.4 Error 012

Error Conditions and Checklist

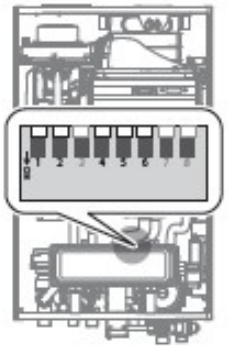
Error	Description
E012 Loss of flame	If the system detects a loss of flame during combustion, the system stops the gas supply and attempts to restart. Then, the system adds the instance to the flame loss count. If flame loss occurs 20 times consecutively, error code '012E' is displayed (manually cleared) on the front panel.
Checklist	1. Use a manometer to measure the gas supply pressure (NG: 17 - 25 mbar, LP: 25 – 35 mbar) 2. Check the gas meter rating. 3. Tighten the ground connection screws on the heat exchanger.  * * Test the resistance of flame detection AD to confirm it is correct. (Refer to pages 42-43) 4. Check if the gas orifice is obstructed. 5. Check if the PCB is working correctly.

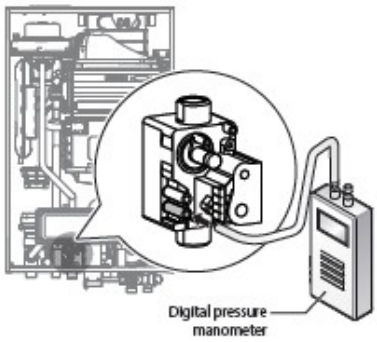


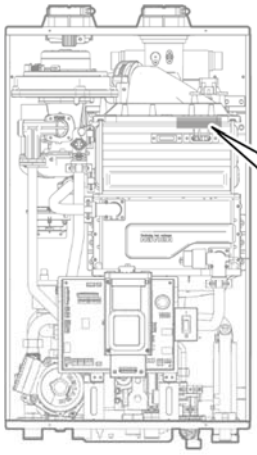
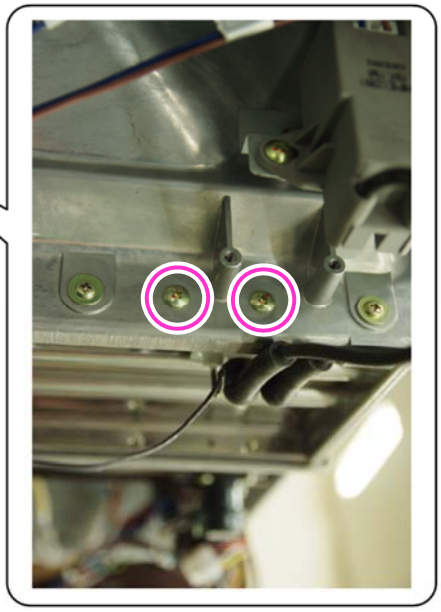
Testing method

<table>
<tr><th>Fault</th><th>Possible causes</th><th>Testing method</th></tr>
<tr><td>Flame loss and noise occurs after ignition</td><td>Low gas supply pressure</td><td>1. Check the gas supply pressure.
• NG: 17 - 25 mbar, LP: 25 – 35 mbar
• LP pressure drop occurs frequently during winter.
2. When static pressure is normal, the use of other gas appliances may cause the boiler's gas pressure to drop. Check the dynamic pressure.

Check the static pressure: Gas supply pressure in standby mode.
Check the dynamic pressure: Gas supply pressure at maximum combustion.

3. Check the gas pipe connections.
• If a CSST connector has been used, ensure that it has not been overtightened. An overtight connection can deform the seal and obstruct the flow of gas.
4. Check the gas meter rating.</td></tr>
<tr><td rowspan="2">Flame loss and noise occurs after ignition</td><td>PCB DIP switch setting errors</td><td>Check the PCB DIP switch settings.
 
<table><tr><th>Switch</th><th>Function</th><th colspan="2">Settings</th></tr><tr><td rowspan="4">1 & 2</td><td rowspan="4">Gas type selection</td><td>G20 (LNG)</td><td>1-OFF, 2-OFF</td></tr><tr><td>G25, G27 (LNG)</td><td>1-OFF, 2-ON</td></tr><tr><td>G30 (LPG)</td><td>1-ON, 2-OFF</td></tr><tr><td>G31 (LPG)</td><td>1-ON, 2-ON</td></tr></table></td></tr>
<tr><td>Offset pressure adjustment error</td><td>Low fire (Stage 1- minimum) offset adjustment error
• From the front panel to set the unit at "MIN.1" (refer to page 55).
• Open the offset pressure port on the gas valve and connect a manometer. Use the positive pressure side on a dual port manometer.
• If the pressure is outside of the range, adjust the offset pressure by turning the adjustment screw on the gas valve with a 4 mm (5/32")Allen wrench.</td></tr>
</table>

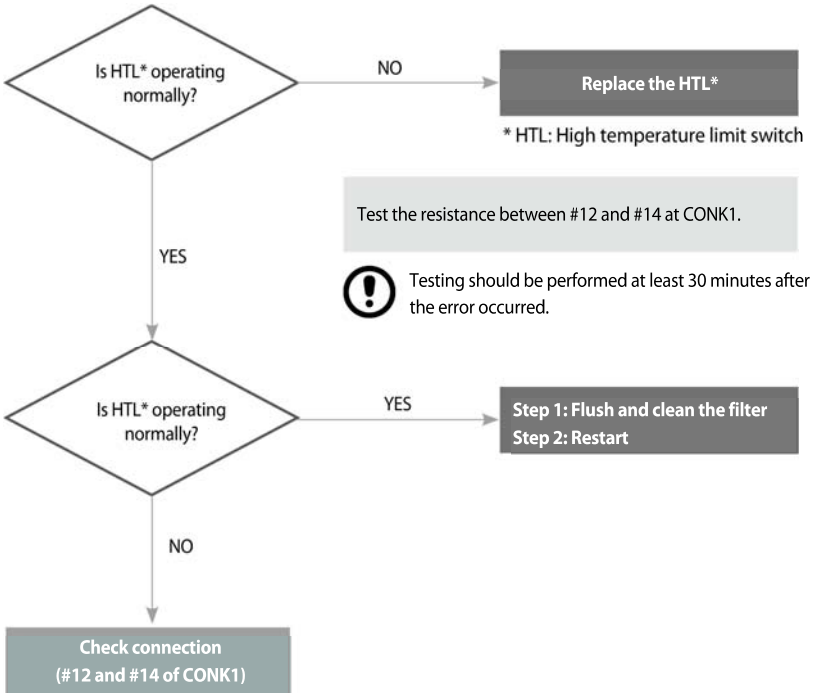
<table>
<tr><th>Fault</th><th>Possible causes</th><th>Testing method</th></tr>
<tr><td>Flame loss and noise occurs after ignition</td><td colspan="2">


Check the minimum offset values
<table>
<tr><th>Model</th><th>Gas type</th><th>Offset</th></tr>
<tr><td rowspan="2">NCB-24LSWE</td><td>G20</td><td>8±1</td></tr>
<tr><td>G31</td><td>4±1</td></tr>
<tr><td rowspan="2">NCB-28LSWE</td><td>G20</td><td>8±1</td></tr>
<tr><td>G31</td><td>4±1</td></tr>
<tr><td rowspan="2">NCB-34LSWE</td><td>G20</td><td>8±1</td></tr>
<tr><td>G31</td><td>4±1</td></tr>
<tr><td rowspan="2">NCB-40LSWE</td><td>G20</td><td>8±1</td></tr>
<tr><td>G31</td><td>4±1</td></tr>
</table>
Minimum offset values
</td></tr>
<tr><td>Flame loss during Stage 2</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 rowspan="2">Other faults</td><td>PCB DIP switch setting errors</td><td>Check the PCB DIP switch settings (refer to page 20).
 
* Check the correct resistance for flame detection AD (refer to page 42-43).
  </td></tr>
<tr><td>PCB fault</td><td>If the error conditions continue after checking these items, replace the PCB.</td></tr>
</table>

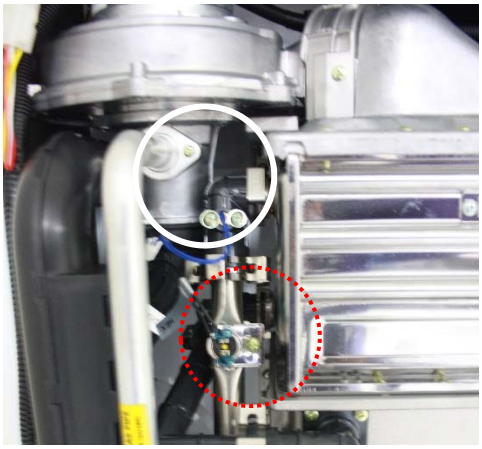
5.2.5 Error 016

Error Conditions and Checklist

Error	Description
E016 Bi-metal overheated	If the overheat controller on the heat exchanger is initiated during boiler combustion or standby, the system displays '016E' (manually cleared) on the front panel. The boiler switches to Lock-out mode and performs a continuous post-purge and starts the circulation pump.
Checklist	1. Check the overheat controller is working correctly. * Test the resistance or continuity (refer to page 62). 2. Check the hot water temperature sensor (refer to page 62). 3. Test the circulation pump's supply voltage (AC 230 V). 4. Test the resistance at the pump.



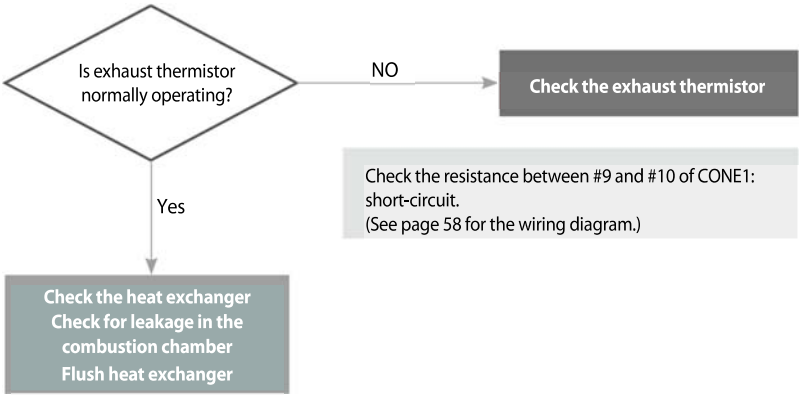
Testing method

<table>
<tr><th>Fault</th><th>Possible Cause</th><th>Testing method</th></tr>
<tr><td rowspan="2">Defective safety device</td><td>Defective overheat controller</td><td>Check if the overheat controller's contacts are faulty.
• Use a multimeter to test the resistance. Normal resistance is 0.3Ω and a fault condition would be infinity (∞).</td></tr>
<tr><td colspan="2"> 
Overheat controller
 
Check if the overheat control wiring is disconnected (normal resistance: 0.3 Ω)</td></tr>
<tr><td>Temperature sensor error</td><td>DHW output temperature sensor error</td><td>1. If the hot water temperature is measured at levels lower than it actually is, test to confirm if the temperature sensor is faulty.
• Check the output temperature displayed on the front panel.
2. Measure the temperature sensor resistance, and determine if the sensor is faulty.</td></tr>
<tr><td rowspan="3">Other potential issues</td><td>Capacity setting</td><td>1. If the Max switch is ON, change the switch to the normal operating position.
2. PCB DIP switch capacity setting errors can result in sudden increases to DHW temperature.</td></tr>
<tr><td>Primary heat exchanger overheat</td><td>The surface temperature rises due to heavy scale deposits in the primary heat exchanger.
• Flush the primary heat exchanger.</td></tr>
<tr><td>PCB fault</td><td>If the error condition continues after checking these items, replace the PCB.</td></tr>
</table>

5.2.6 Error 030

Error occurrence conditions and check items

Error	Description
E030 Exhaust gas temperature error	If the overheat controller on the top of the exhaust duct is initiated, the system displays the heat exchanger bimetal 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 110°C for 10 minutes or over. 1. When the controller detects the exceeding temperature of 110°C for 10 minutes or more "E030" is displayed and a post-purge will be performed. → Automatically cleared. 2. When the controller detects the exceeding temperature of 60°C while performing post-purge. → Manually cleared. 3. When the controller detects the exceeding temperature of 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.

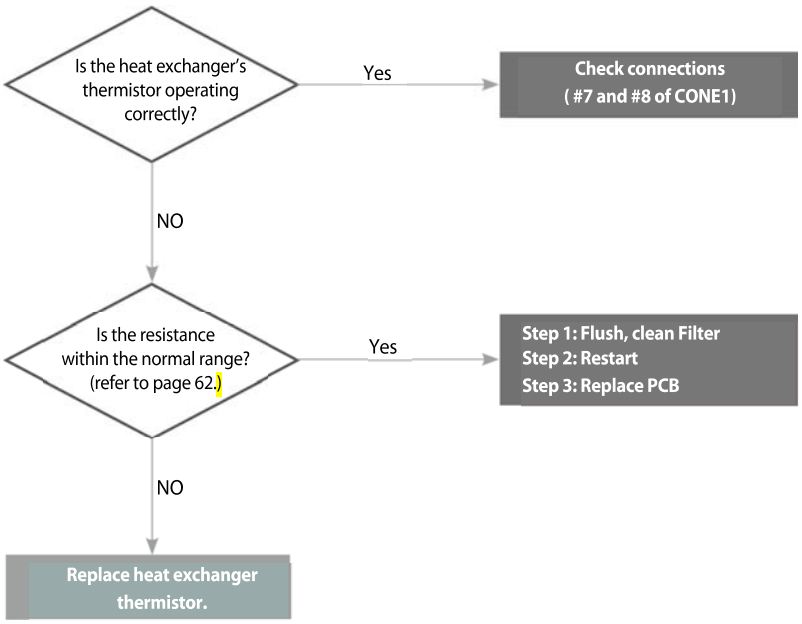


Testing method

Fault	Possible causes	Testing method
Heat exchanger overheat	Damaged or obstructed heat exchanger	1. High exhaust gas temperatures can cause damage to or obstruct the heat exchanger. 2. Flush the heat exchanger to remove scale deposits. 3. Replace the heat exchanger if it is damaged or cannot be unclogged.
Defective part	Defective overheat controller	Faulty terminals on the exhaust gas overheat controller (110°C max) • Check the overheat controller's wiring connections. • If the resistance is incorrect, replace the temperature sensor (refer to page 62). • Check the output temperature displayed on the PCB.
	 Test if the hot water temperature sensor is open (error result: MΩ open)	
Other faults	PCB fault	If the error condition continues after checking these items, replace the PCB.

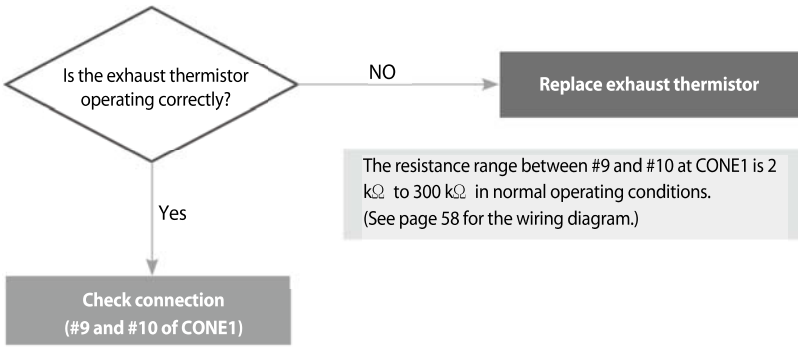
5.2.7 Error 046

Error Conditions and Checklist



5.2.8 Error 047

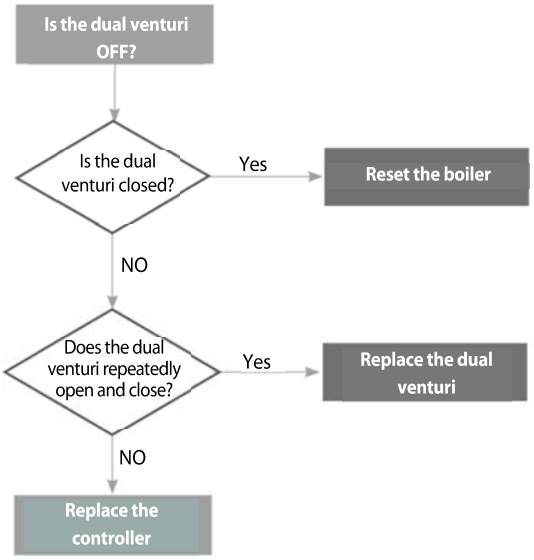
Error Conditions and Checklist



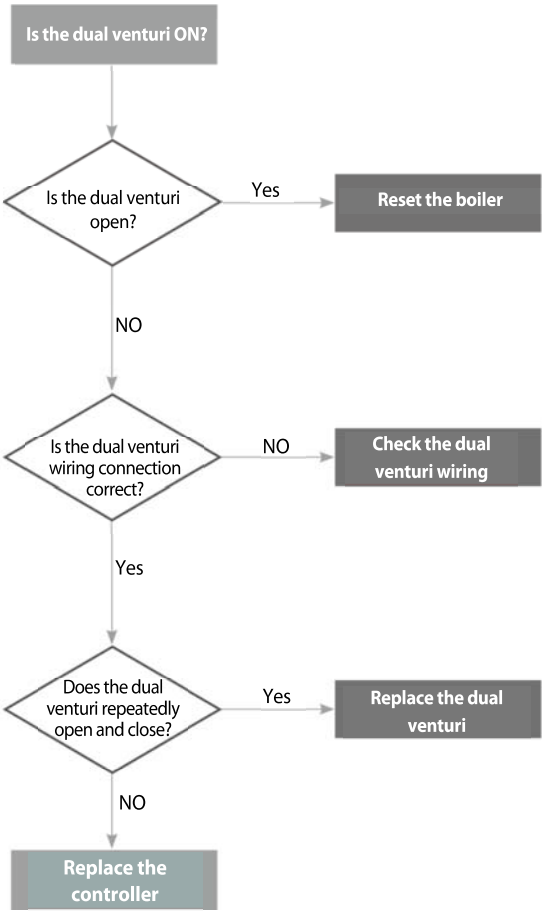
5.2.9 Error 060

Error Conditions and Checklist

Error	Description
E060 Dual venturi error	Dual venturi wiring is disconnected or the dual venturi malfunctions. The boiler switches to Lock-out mode, performs a continuous post-purge continuously, and starts the circulation pump.
Checklist	1. Check that the dual venturi is operating correctly. Run in 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

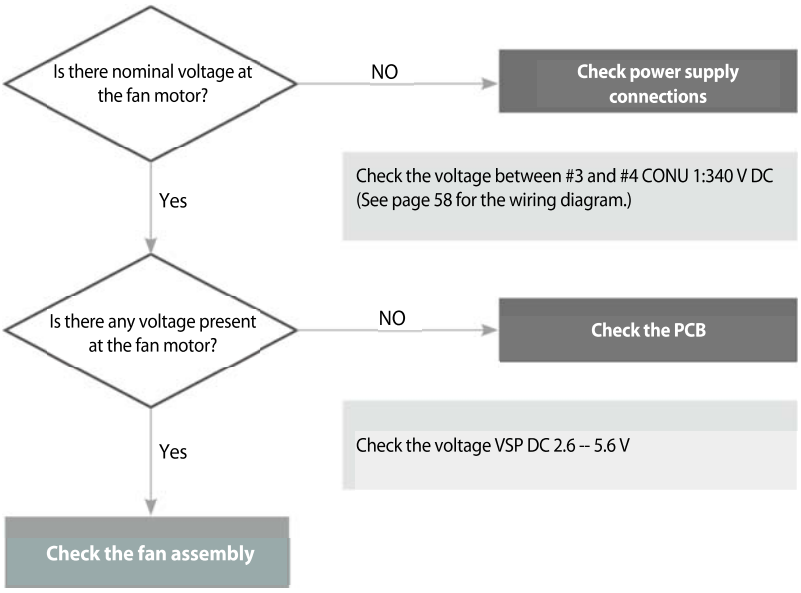
Testing method

Fault	Possible causes	Testing method
Dual venturi action error	Defective dual venturi cable or harness	1. Disconnect all cables from the dual venturi. 2. Use a multi-meter to test the dual venturi's electrical wiring.
	Dual venturi not operating	1. Turn off the power to the boiler at the main power switch (not the front panel power button) and wait for 10 sec. 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 is 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 (an audible click is heard at boiler ON and boiler 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' is displayed, replace the dual venturi. 6. If a dual venturi error does not occur, replace the APS.

5.2.10 Error 109

Error occurrence conditions and check items

Error	Description
E109 Fan motor speed error	The system checks the fan speed signal when the fan starts. The error message 109E (cleared manually) is displayed in the following cases: 1. If fan speed is low or close to 0, the system detects a speed error and the boiler switches to Lock-out mode (gas valve and ignition transformer locked). The air pressure sensor should be normal. 2. If a low speed signal or one that is close to 0 is detected for 3 sec during combustion, the system stops combustion and the boiler switches to Lock-out mode. The air volume sensor should be normal.
Checklist	1. Check if the fan motor works normally using the component test mode (refer to page 55). 2. Test the power supply to the fan (Black + Yellow, DC 340 V) 3. If the speed is very low while the fan operates and the power supply is normal, replace the fan motor. 4. If the fan connector is wet for any reason, turn off the boiler, prevent further water ingress and dry the components completely before resuming operation. 5. Check that the connection between the fan motor and the PCB is secure.



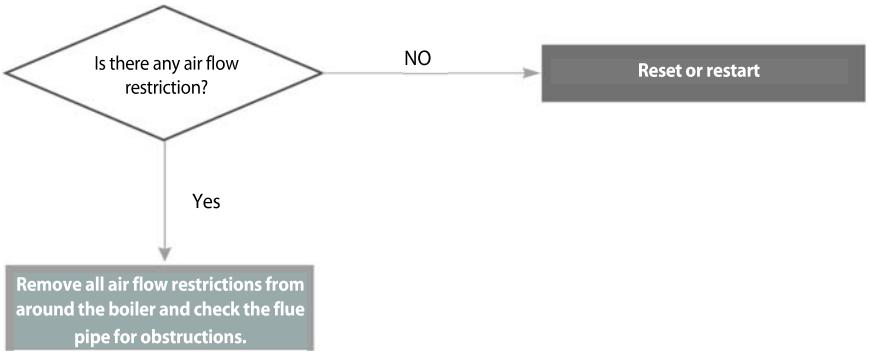
Testing method

<table>
<tr><th>Fault</th><th>Possible Causes</th><th>Testing method</th></tr>
<tr><td rowspan="2">Fan action error</td><td>No fan operation</td><td>1. Check the voltage at the fan.
• Black + Yellow, DC 340 V
2. Replace the PCB if the voltage is not present. When replacing a PCB, turn off the boiler and wait for at least 10 sec before proceeding.
3. If the error condition continues after checking these items, replace the fan motor.</td></tr>
<tr><td colspan="2"> 
Check the fan motor's wiring connection</td></tr>
<tr><td>Fan motor speed error</td><td>Rotation fault</td><td>1. If fan speed is very and the power supply is normal, follow the instructions below to replace the fan.
1) Unplug the boiler's power cable and wait 10 sec for all remaining SMPS voltage to completely discharge.
2) Disconnect the fan cable and then re-connect it.
3) Reconnect the power cable and turn on the boiler.
4) Fan Auto Adjusting verifies error conditions for error code E109. If an E109 error occurs, enter Fan test mode and verify fan speed and the APS input voltage. (Eg. The display will show H.320 indicating 3,200 rpm)
5) If fan speed is low or there is a sensor circuit error, replace the fan. This condition indicates an imminently hazardous situation which, if not avoided, may result in minor or moderate injury.
2. If the error condition continues after checking these items, replace the PCB.</td></tr>
</table>

5.2.11 Error 110

Error Conditions and Checklist

Error	Description
E110 Air pressure error	The system detects the air pressure and the fan speed and displays 110E on the front panel in the following cases: 1. When the initial fan auto-adjustment is not performed. 2. When boiler reaches 95% of maximum heating capacity during combustion and the APS is not rated at the standard value.
Checklist	1. Check the venturi (burner) hole for obstruction. 2. Check the condensation drain line and drain for obstruction. 3. Check the flue and exhaust are installed correctly and have adequate clearance. (The circulation of exhaust gas generates noise.) 4. Check if the air supply/exhaust flue is obstructed (rainwater may accumulate inside incorrectly installed air supply/exhaust pipes). 5. Check for a faulty air pressure sensor or PCB. 6. Ensure that the vents slope downwards towards the unit for proper condensate drainage. 7. Ensure the internal damper moves freely and is not obstructed.



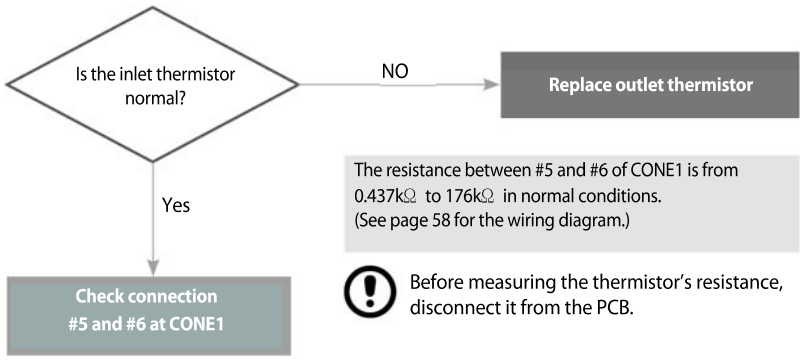
Testing method

Fault	Possible causes	Testing method
110E Exhaust blockage	Intake air supply / exhaust flow error	1. If 110E occurs intermittently during ignition or combustion, compare the standard speed with the current speed at min/max combustion. If the current speed is higher than normal, check the following: • Air supply / exhaust pipes for blockage. • Blocked condensate drain • Broken or blocked air pressure sensor hose. 2. Replace the old PCB with the latest version.
Condensate drain error	Condensate drain error	Exhaust air is blocked due to condensate drain faults. • Check if the condensate hose or the siphon is frozen. • Check if the condensate hose is kinked. • Remove the bottom of the trap and verify it is not blocked.
Defective air supply/exhaust flue	Deformed or blocked flue	1. Check the exterior of the flue for damage and obstructions. 2. Check if rainwater has accumulated in vertically installed sections of the air intake.
	Exhaust gas enters the air supply pipe	If exhaust gas enters the air supply pipe, combustion faults may cause E110. • Check the installation of the flue.

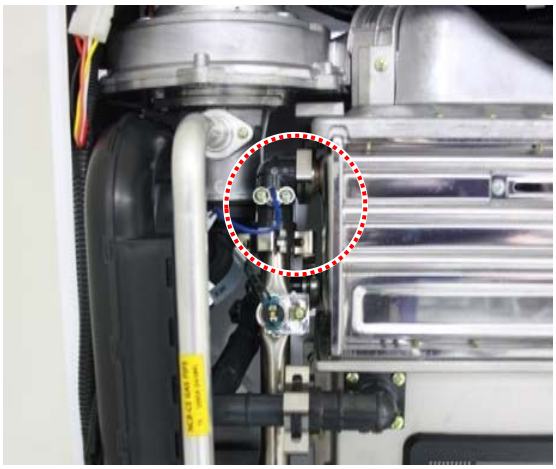
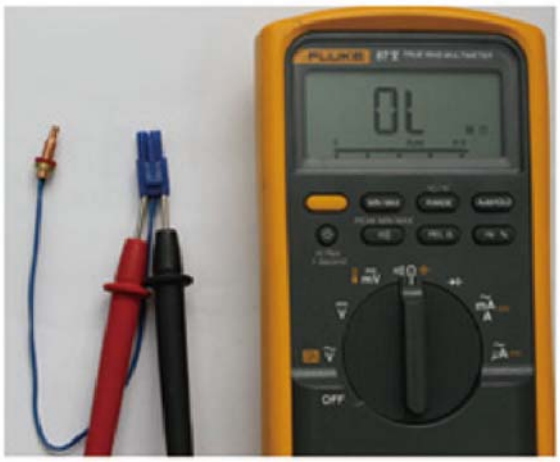
5.2.12 Error 205

Error conditions and checklist

Error	Description
E205 Heat exchanger output temperature sensor open	If an error (open: -10°C or lower) in the heat exchanger input temperature sensor is detected, the system displays '205E' on the front panel. If this occurs, the boiler shuts down.
Checklist	1. Check if the heat exchanger output temperature sensor connector is wet due to any reason, including leakage. 2. Replace the defective heat exchanger output temperature sensor. 3. Check the circulation pump's operating status and the flow rate in the space heating lines. 4. Test the voltage at the PCB to verify the correct voltage at the pump. If there is no voltage, bleed the air from the system before resetting the unit. If the error condition persists, replace the pump.



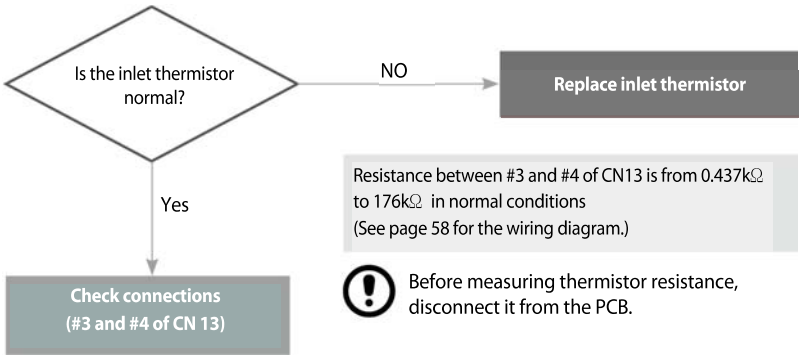
Check method

Fault	Possible causes	Testing method
Faulty sensor	Temperature sensor connection fault	Check if the temperature sensor is open and if the connector is connected properly.
	Temperature sensor fault	Test the resistance of the temperature sensor. The sensor is faulty if the resistance is 30 kΩ or higher. • Replace the temperature sensor if the resistance value is abnormal. • Check the temperature displayed on the front panel.
Possible issues	Circulation pump fault	Test the voltage at the circulation pump (AC 230 V).
	PCB fault	If the error condition continues after checking these items, replace the PCB.
	 <Heat exchanger output temperature sensor / connector>  Test to confirm if the secondary water temperature sensor is open. Error: MΩ open circuit.	

5.2.13 Error 218

Error conditions and checklist

Error	Description
E218 Open heat exchanger input temperature sensor	If an open (-10°C or lower) heat exchanger input temperature sensor is detected, the system displays '218E' on the front panel. If this occurs, the boiler initiates shutdown.
Checklist	1. Check if the heat exchanger input temperature sensor connector is wet due to any reason, including leakage. 2. Replace the defective heat exchanger input temperature sensor. 3. Replace the controller.



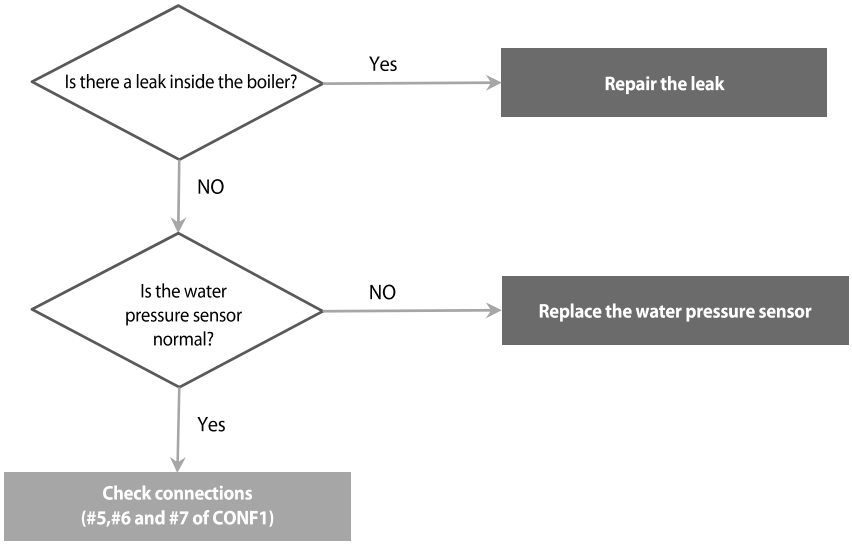
Testing method

Fault	Possible causes	Testing method
Defective sensor	Temperature sensor connection fault	Check if the temperature sensor is open and if the connector is connected properly.
	Temperature sensor fault	Check the resistance of the temperature sensor. The sensor is faulty if the resistance is 30kΩ or higher) • Replace the temperature sensor if the resistance value is abnormal (refer to page 62). • Check the temperature displayed on the front panel. (refer to page 37).
Possible Issues	PCB fault	If the error condition continues after checking these items, replace the PCB.
	 <Heat exchanger input temperature sensor / connector>  Test to confirm if the hot water temperature sensor is open. Error: MΩ open circuit.	

5.2.14 Error 302

Error conditions and checklist

Error	Description
E302 Low water pressure	Low pressure faults are monitored by a water pressure sensor and when a fault is detected the system displays 'E302' Low water level error is generated if water pressure is 0.5 bar or less for 3 sec. The error is automatically cancelled if water pressure returns to 0.5 bar or above.
Checklist	1. Check if the input water pressure sensor is wet for any reason, including leakage. 2. Check the auto feeder. 3. Check the controller



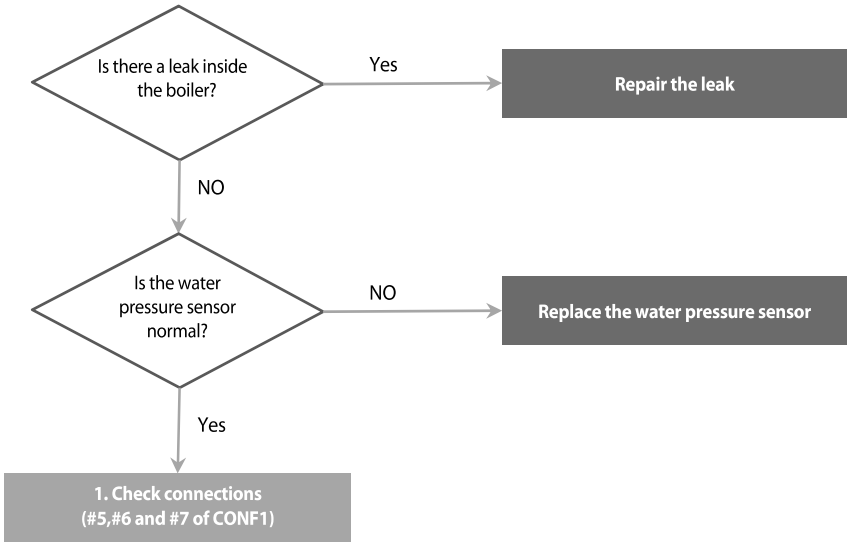
Testing method

Fault	Possible causes	Testing method
E302	Low water pressure	Check the water supply pressure (0.5 bar or lower is the error state). Check if the safety valve is stuck.
Low water pressure sensor	Water pressure sensor fault	1. Check the output voltage. (Normal state: 0.25-- 4.93 V) 2. Replace the faulty or open water pressure sensor.

5.2.15 Error 352

Error conditions and checklist

Error	Description
E352 High water pressure	If an error signal is received from the water pressure sensor, the system displays the 'E352' on the front panel. High water pressure errors occur if the water pressure is 3.9 bar or higher for 3 sec. The error is automatically cancelled if the water pressure returns to 3.9 bar or lower.
Checklist	1. Check if the input water pressure sensor is wet for any reason, including leakage. 2. Check the controller



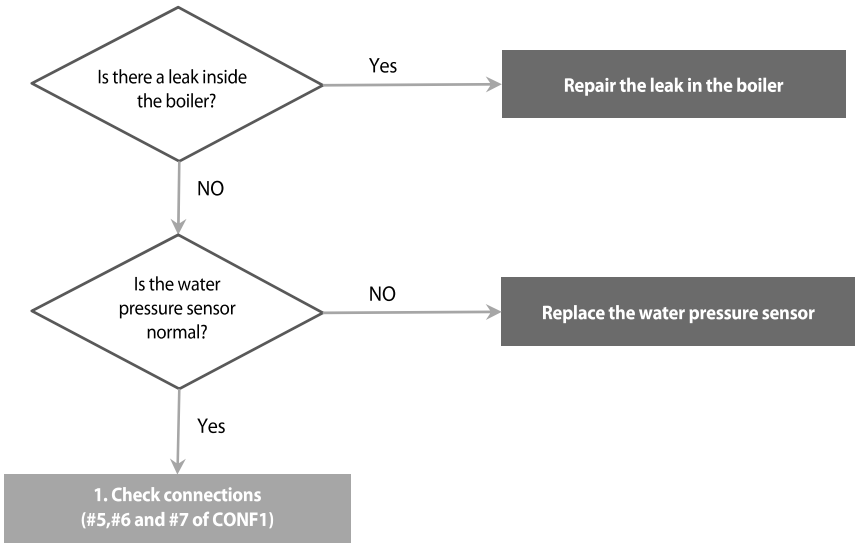
Testing method

Fault	Possible Causes	Check method
E352	High water pressure	Check the water supply pressure. (3.9 bar or higher is the error state) Check if the safety valve is stuck. Check the Auto feeder valve.
High water pressure sensor	Water pressure sensor fault	1. Check the output voltage. (Normal state: 0.25-- 4.93 V) 2. Replace the faulty or open water pressure sensor.

5.2.16 Error 353

Error conditions and checklist

Error	Description
E353 Water pressure sensor fault	If a voltage error (< 0.3 V or > 5 V) at the water pressure sensor is detected continuously for 3 sec, the system displays 'E353'. When this error occurs, the boiler shuts down.
Checklist	1. Check if the input water pressure sensor is wet due to any reason, including leakage. 2. Replace the water pressure sensor 3. Check the controller



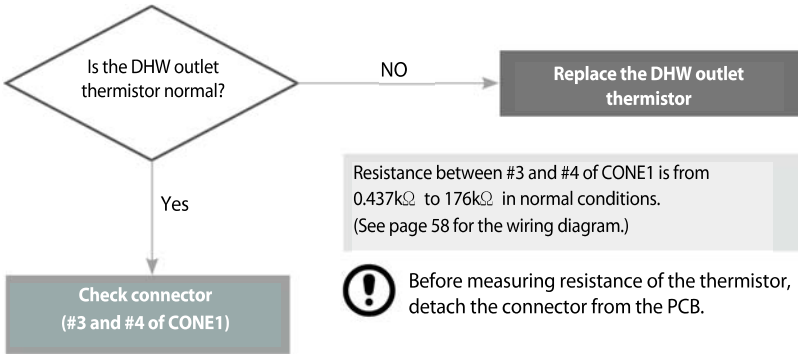
Testing method

Fault	Possible causes	Testing method
Water pressure sensor fault	Water pressure sensor fault	1. Check if the sensor is frozen. 2. Check the output voltage. (Normal state: 0.25-- 4.93 V) 3. Replace the PCB if the voltage is not correct.

5.2.17 Error 407

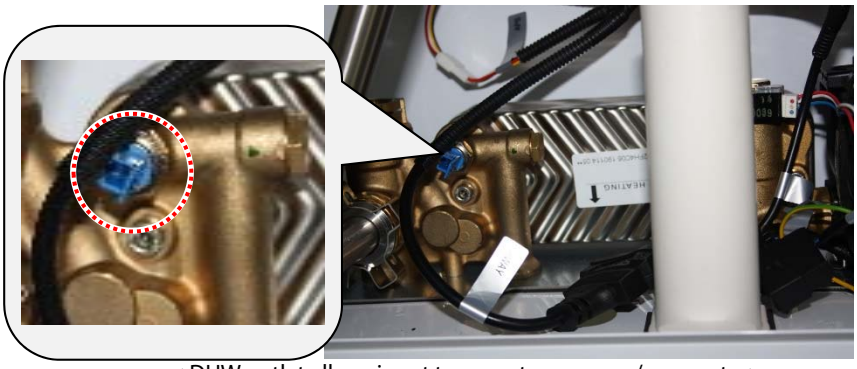
Error conditions and checklist

Error	Description
E407 Hot water outlet thermistor open or short	If an error (open: -10°C or lower) in the DHW Outlet Elbow input temperature sensor is detected, the system displays the 407E error on the front panel.
Check items	1. Check if the hot water temperature sensor connector is wet due to any reason and if the connector is connected properly. 2. Check if the temperature sensor is open or short



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 62). • Check the temperature displayed on the front panel. (refer to page 37).
Possible Issues	Defective PCB	If the issues continue despite checking the items above, replace the PCB.



< DHW outlet elbow input temperature sensor / connector>

NOTE

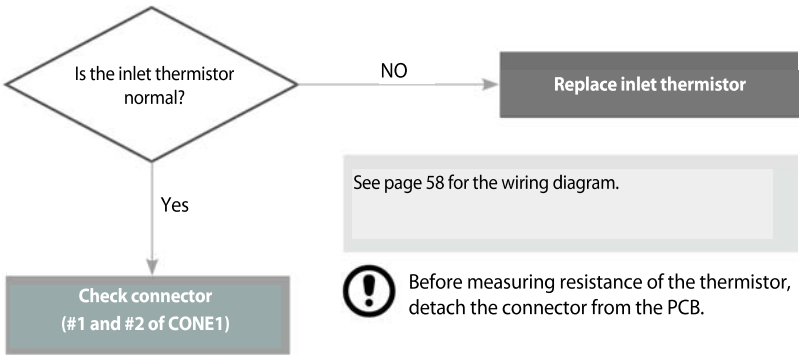
Be careful the incorrect connection. Before connecting the thermistor up to wire terminal, please check the label of end of the harness.

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

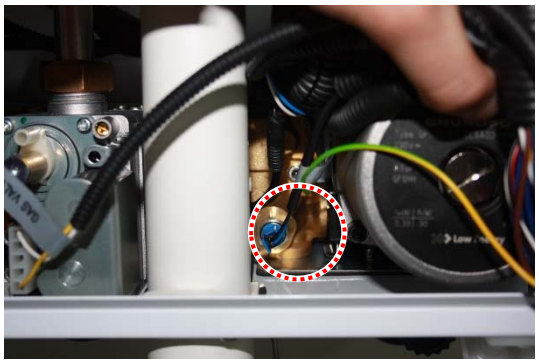
5.2.18 421Error

Error conditions and Check Items

Error	Description
E421 Cold water inlet thermistor open or short	If an error (open: -10°C or lower) in the DHW Outlet Elbow input temperature sensor is detected, the system displays the 421E error on the front panel.
Check items	1. Check if the cold water temperature sensor connector is wet due to any reason and if the connector is connected properly. 2. Check if the temperature sensor is open or short



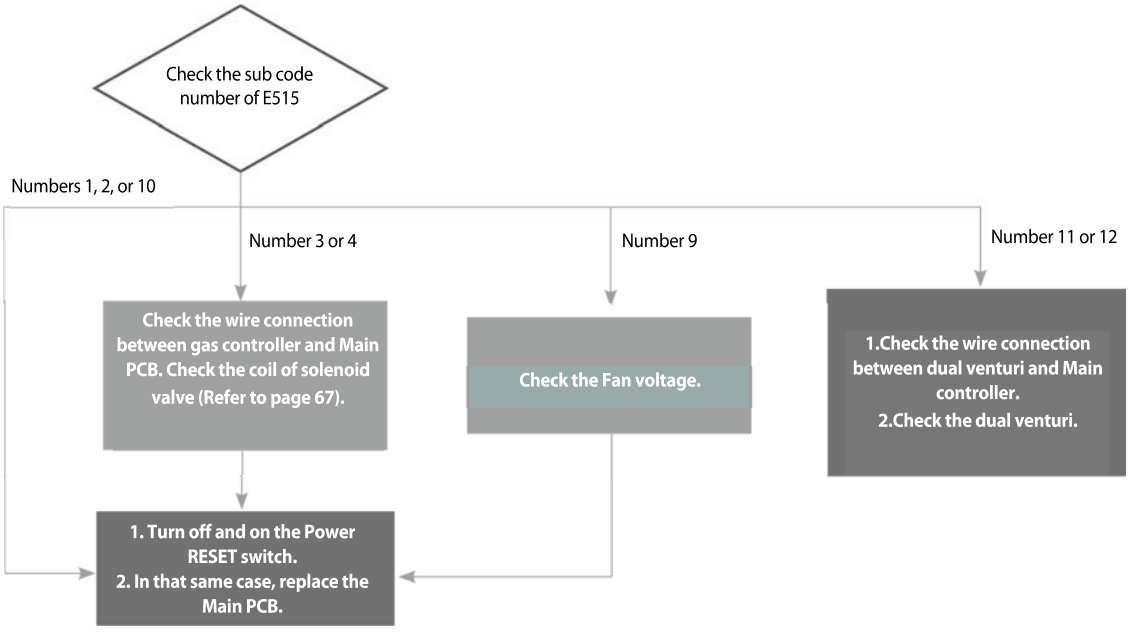
Check method

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 40kΩ or higher) • Replace the temperature sensor if the resistance value is abnormal (refer to page 62). • Check the temperature displayed on the front panel (refer to page 37).
Possible Issues	Defective PCB	If the issues continue despite checking the items above, replace the PCB.
	 <DHW Flow sensor input temperature sensor / connector>  Check if the hot water temperature sensor is open (Error type: MΩ Open)	

5.2.19 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 multimeter if the PCB is supplied with the proper voltage (AC 230 V). 3. Check the wire connection. 4. Disconnect the ground wire, then check the PCB

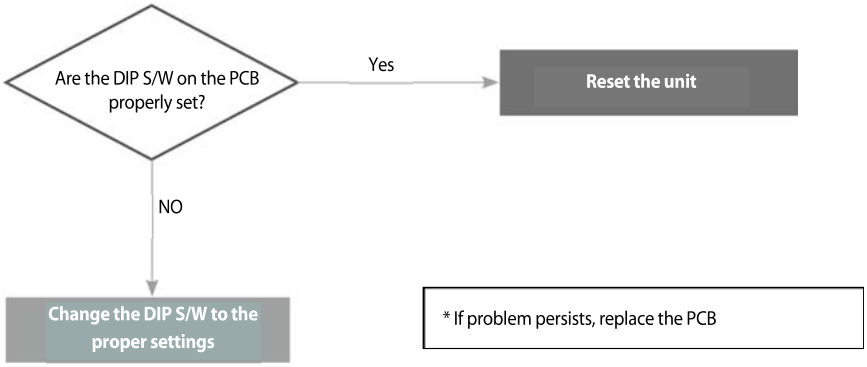


Check method

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 230 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.

5.2.20 517Error

Error occurrence conditions and check items



5.2.21 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 communicatio n 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.

5.2.22 615Error

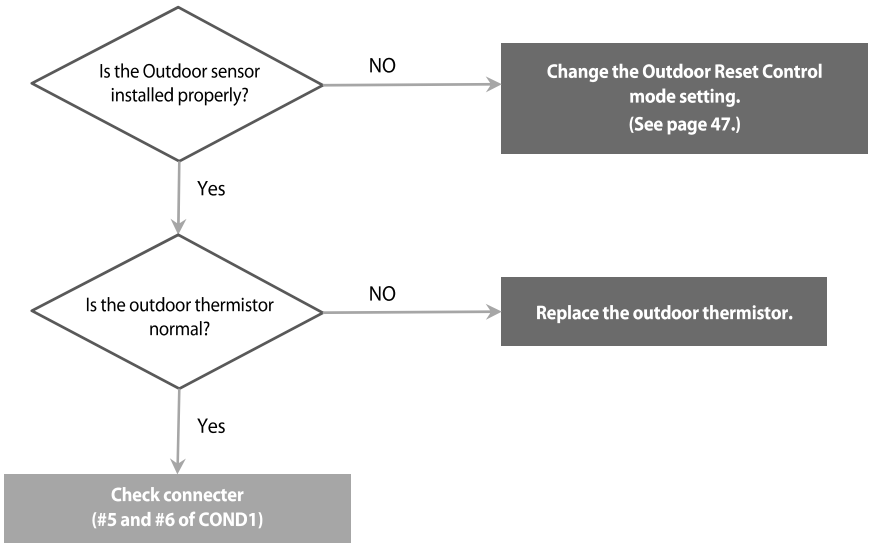
Error occurrence conditions and check items

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

5.2.23 740Error

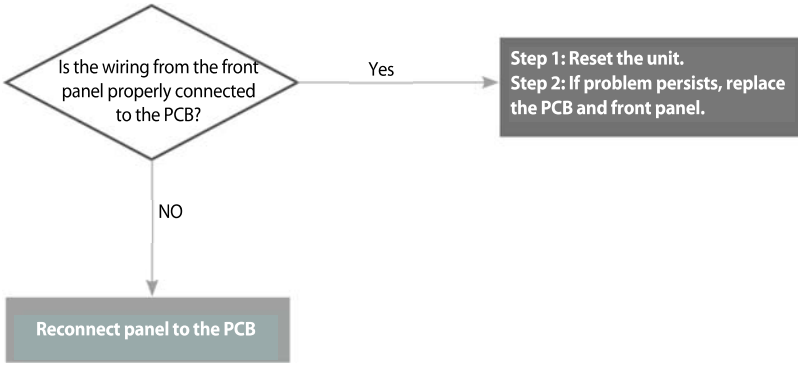
Error conditions and Check Items

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 47). 2. Check the outdoor sensor



5.2.24 782Error

Error occurrence conditions and check items



5.3 Troubleshooting guide by symptom

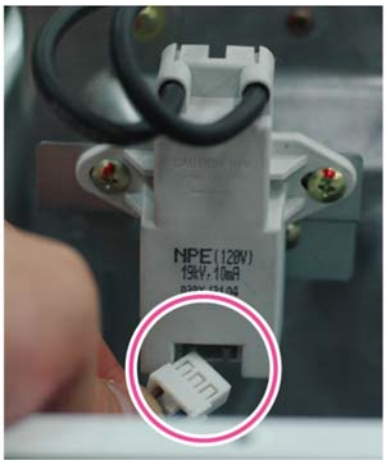
5.3.1 Noise

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	Defective flow sensor	Rotating noise due to debris caught in the flow sensor.
	Malfunction of the 3-way valve	Noise due to repeated operation of the 3-way valve due to a defective PCB.
Noise at ignition	Gas and air differential pressure error (Pop, Beep, Explosive ignition)	1. Offset pressure adjustment error (refer to page 21). • Adjust offset pressure with the pressure adjusting screw on the main gas valve. • Use the Front Panel to set the unit at "MIN.1" (refer to page 55). • 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: • 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 intake 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 21). • Use the Front Panel to set the unit at "MIN.1" (refer to page 55).
		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 flow sensor	The boiler does not work due to the defective flow sensor. • The flow sensor impeller will not rotate if it contains excessive scale or debris. Clean out the flow sensor if possible. • If the impeller rotates normally, replace the flow sensor back into the boiler. • The sensor may be reused temporarily after cleaning, but replacement is recommended.
	Defective hot water temperature sensor	The temperature is sensed higher than the actual temperature due to a defective hot water (cold water) sensor. • Hot water temperature is low although hot water is recognised by the boiler. • The cold water temperature sensor may not 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 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 internal/external circulation preheating when a recirculation mode is selected on the front panel DIP switches. Confirm the DIP switch settings.

5.3.3 Circuit breaker operation

<table>
<tr><th>Error type</th><th>Cause</th><th>Check method</th></tr>
<tr><td rowspan="4">Circuit breaker trips</td><td>Power supply</td><td>The circuit breaker trips immediately as soon as the power cord is plugged in the receptacle.
Check the sheath of power cord, or if there is short-circuit.
Check the components in order from the power transformer to the PCB.</td></tr>
<tr><td>Defective part assembly</td><td>If the circuit breaker operates after repairs check the wiring of each part.
Maintain proper direction when assembling the ignition transformer.
Be careful that wire is not compressed when assembling the main gas valve
Check if the wire is fixed and properly attached on the main side of the heat exchanger.</td></tr>
<tr><td colspan="2"> 
Normal assembly
 
Short-circuit due to defective assembly
 
Wiring near the heat exchanger</td></tr>
<tr><td>Circuit breaker operates while the boiler is running</td><td>If circuit breaker trips during the operation of the boiler, check the order of operation, and replace the concerned part.
e.g., The circuit breaker operates at switchover to burner stage 2 after ignition.
► Replace the dual venturi.</td></tr>
<tr><td>Remote controller power</td><td>Check the wire</td><td>Check the power supply to the remote controller terminal.
If there is a problem in power supply, check the output voltage of the PCB, and take the action separately for wiring error and defective PCB, respectively.
If the power supply is normal, replace the remote controller.</td></tr>
</table>

6. 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. Remove the 2 screws from bottom PCB bracket and upper PCB bracket.

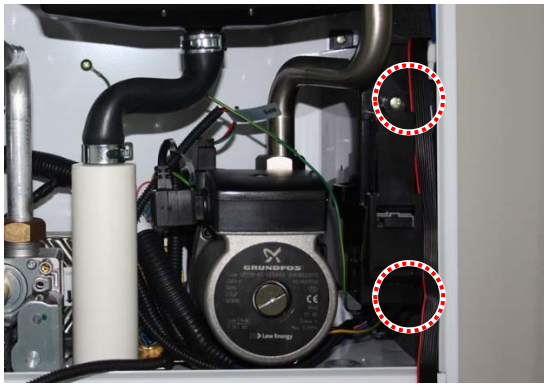


Figure 1

5. Disconnect all wiring connectors from the PCB

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 (refer to page 20).
9. Reinstall the PCB and Front Panel using the 2 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 colour 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 the fuse housing shown in the figure below. Open the housing to expose the fuse.

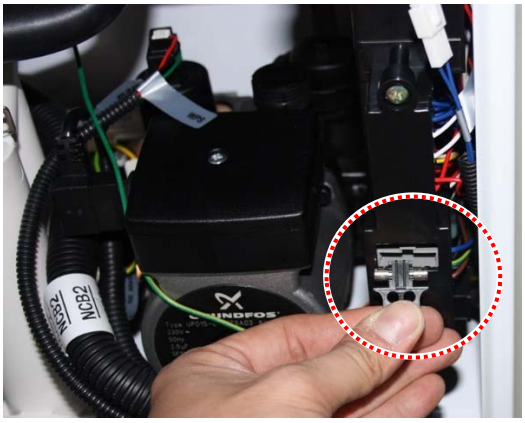


Figure 3

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. Close the fuse housing.
7. Turn on water supply, power supply, and gas supply to the unit.

6.2.3 Fan Motor (Combustion Air)

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 mounting screw from the fan assembly as shown in Figure 4 below.
5. Remove the fan assembly bracket with the attached intake port.

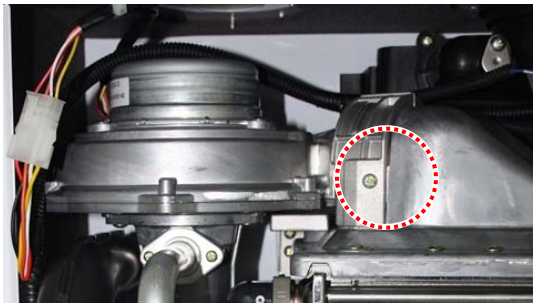


Figure 4

6. Disconnect the wiring connector from the fan assembly, and then remove the 2 screws from the gas valve connection as shown in figure 5 below.

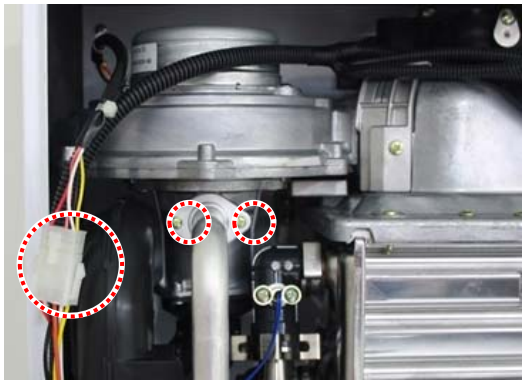


Figure 5

7. Pull out the fan assembly and remove the 2 screws that secure the air intake port to the fan assembly.
8. Remove the four screws from the bottom of the fan assembly.

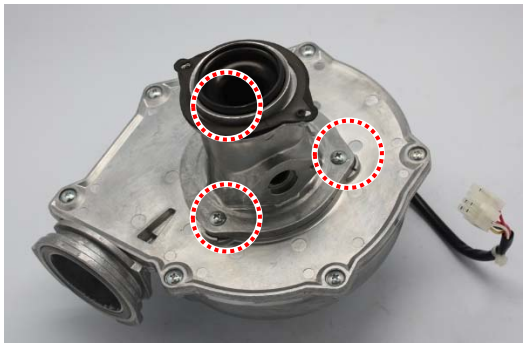


Figure 6

9. Detach the fan motor from the assembly and replace it with the new part.
10. Replace the 3 screws used to attach the fan motor to the assembly.
11. Reinstall the fan assembly to the bracket by using the mounting screw.
12. Attach the gas valve connection back to the fan assembly by using the 3 screws as shown in figure 6.
13. Reconnect the wiring connector from the fan assembly.
14. 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 2 screws from the flame rod as shown in figure 7 below.

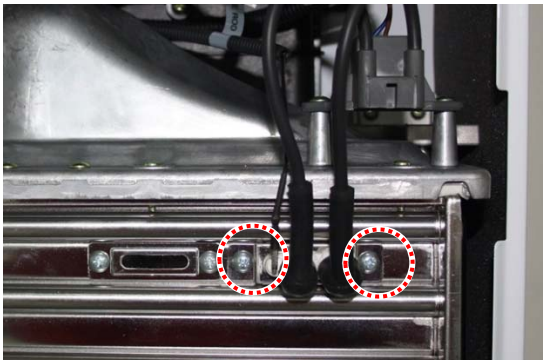


Figure 7

6. Remove the flame rod wiring connector.

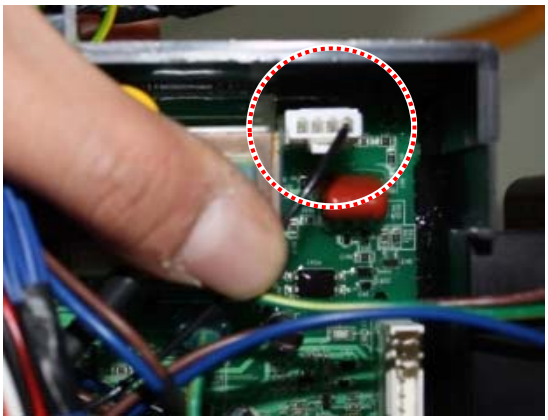


Figure 8

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 7.
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 flame rod.
5. Refer to figure 9 and disconnect the wiring connector from the Ignition Transformer.

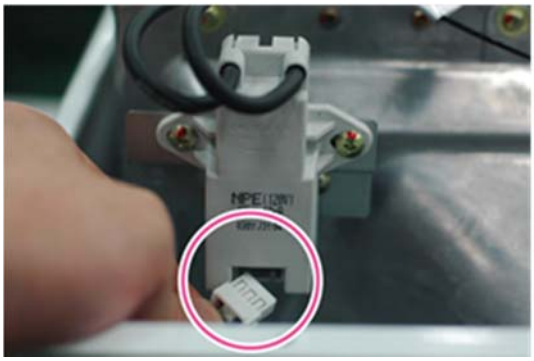


Figure 9

6. Remove the 2 screws from the Igniter Transformer.

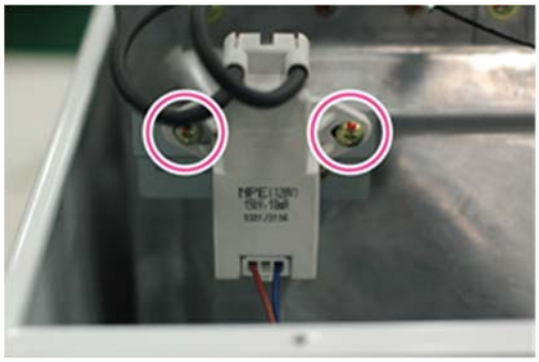


Figure 10

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 flame rod.
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 flame rod.

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. Refer to figure11 and remove the air pressure sensor wiring connector.

Figure 11

5. Remove the hose from the air pressure sensor.

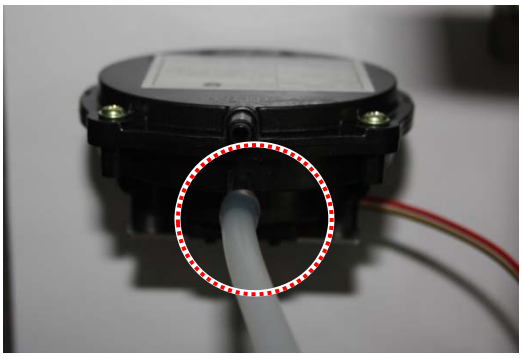


Figure 12

6. Remove the 2 screws that mount the air pressure sensor on 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.
   - -Remove the 4 screws from bottom front panel bracket and upper front panel bracket.

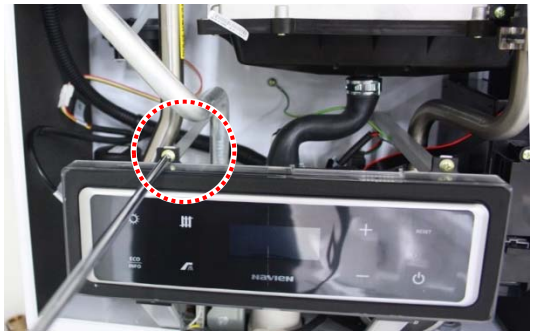


Figure 13
Disconnect wiring connector from the main PCB.

4. Remove the 2 screws and disconnect the wiring connector at the gas valve.

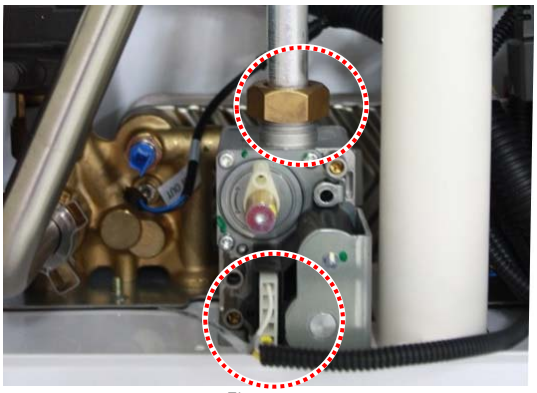


Figure 13

5. Remove the 2 screws located at the bottom of the unit that are attached to the gas valve.

Figure 14

6. Replace the old gas valve with the new part
7. Reconnect the gas valve assembly to the unit by using the 2 screws at the boiler.
8. Reattach the gas valve wiring connector.

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

9. Check that all gas connections are tightly sealed to ensure that no gas leaks are present.
10. Turn on water supply, power supply, and gas supply to the unit.
11. Verify the gas pressures to the unit with the values provided in this Service Manual.

6.2.8 Condensate Trap

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 pin that secures the condensate drain cap and then remove the cap. Use a bucket to collect the condensate.

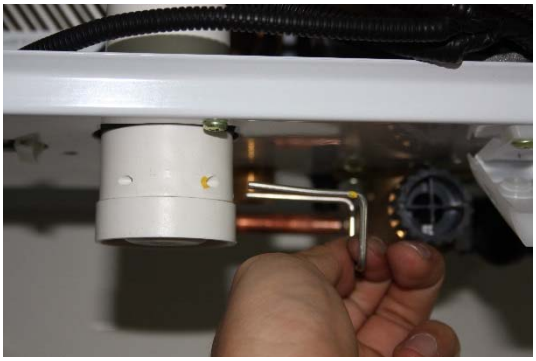


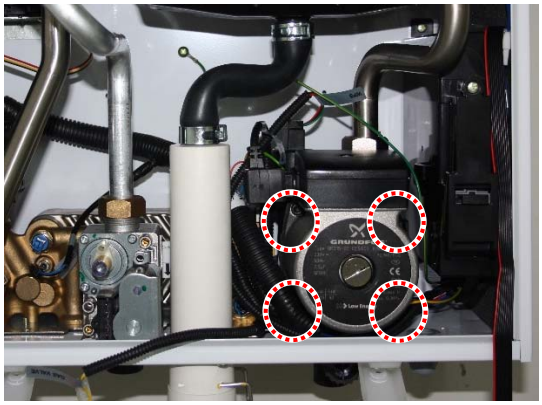
Figure 15

5. Detach the condensate piping from the unit.
6. Remove the 2 screws located at the bottom of the unit that are attached to the condensate trap.
7. Loosen the clip that secures the hose to the condensate trap, and then pull off the hose.
8. Remove the old condensation trap and replace it with the new part.
9. Reconnect the hose to the condensate trap.
10. Reattach the condensation trap to the unit and secure it using the 5 screws.
11. Replace the front panel to its original position.
12. Turn on the water supply, power supply, and gas supply to the unit.

> **NOTE**
>
> Ensure that the condensate drain trap is completely inserted into the condensate fitting to eliminate leaking. Use the pin to secure the cap to the fitting.

6.2.9 Circulation Pump

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. Open the drain plug on the pump and Remove the 4 screws from circulation pump.



5. Replace with the new circulation pump
6. Place the new pump back into its original position and ensure that all connections are tightly sealed.
7. Reinstall the pump drain plug at the bottom of the unit.
8. Reconnect the wiring connector at the pump.
9. Install the Front panel back onto the unit by using the four screws.
10. Turn on water supply, power supply, and gas supply to the unit.
11. Open a hot water tap and ensure that there are no leaks at the pump connections.
12. Open the air vent on top of pump to release air within the system.

6.2.10 Flow Sensor

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. Drain all water from the appliance.
4. Remove the Circulation Pump
5. Detach the 3 wire connectors that connect the flow sensor.

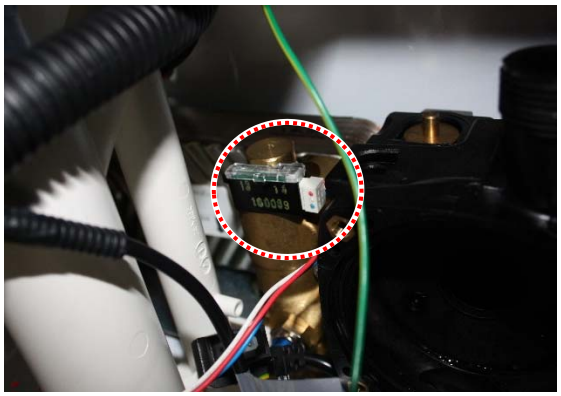


Figure 22

6. Remove the flow sensor.

Figure 23

7. Replace with old flow sensor with the new part.
8. Turn on water supply, power supply, and gas supply to the unit.
9. Carefully open a hot water tap and ensure there are no leaks at the flow sensor connections.

6.2.11 3-way Valve

1. Turn off the gas supply to the unit.
2. Turn off the 230V power supply to the unit.
3. Turn off the water supply to the unit. Drain all water from the appliance.
4. Remove the Circulation Pump (see page 128).
5. Remove the clip on the 3-way valve.

Figure 30

6. Replace with old 3-way valve with the new part.
7. Connect the 3-way valve wire housing.
8. Turn on water supply, power supply, and gas supply to the unit.

6.2.12 Water Pressure Sensor

1. Turn off the gas supply to the unit.
2. Turn off the 230V 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 32

5. Remove the clip on the WPS valve.

6. Replace with new water pressure sensor.
7. Connect the water pressure senor wire housing.

NOTE

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

6.2.13 DHW Heat exchanger

1. Turn off the gas supply to the unit.
2. Turn off the 230V power supply to the unit.
3. Turn off the water supply to the unit. Drain all water from the appliance.
4. Remove the gas supply unit.
5. Remove the two screws at the DHW exchanger.

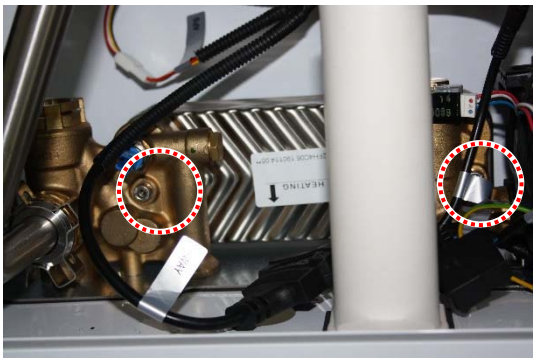
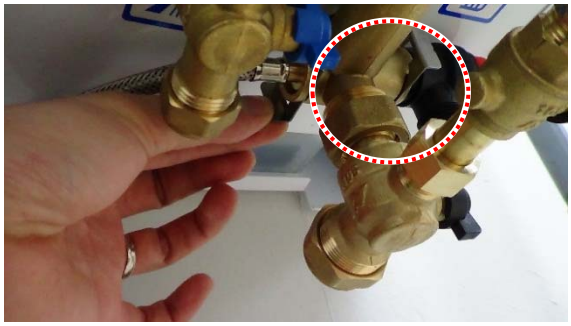


Figure 16

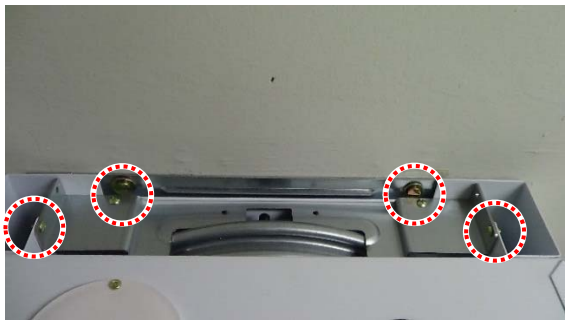
6. Replace with the new DHW Exchanger.

6.2.14 Expansion tank

1. Turn off the gas supply to the unit.
2. Turn off the 230V power supply to the unit.
3. Turn off the water supply to the unit. Drain all water from the appliance.
4. Disconnect the expansion tank connection from the bottom of the boiler.



5. Remove the four bolts from the top of the boiler.

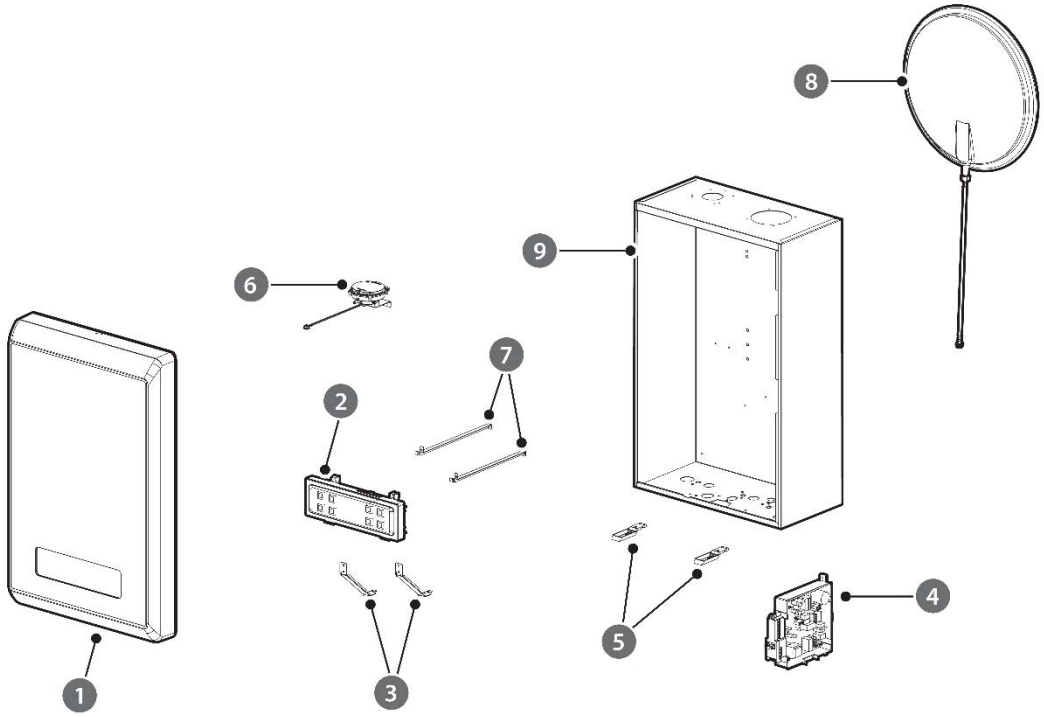


6. Replace the old expansion tank with a new one.

7. Install the 4 bolts and reverse the steps to re-connect the connections and operate the boiler.

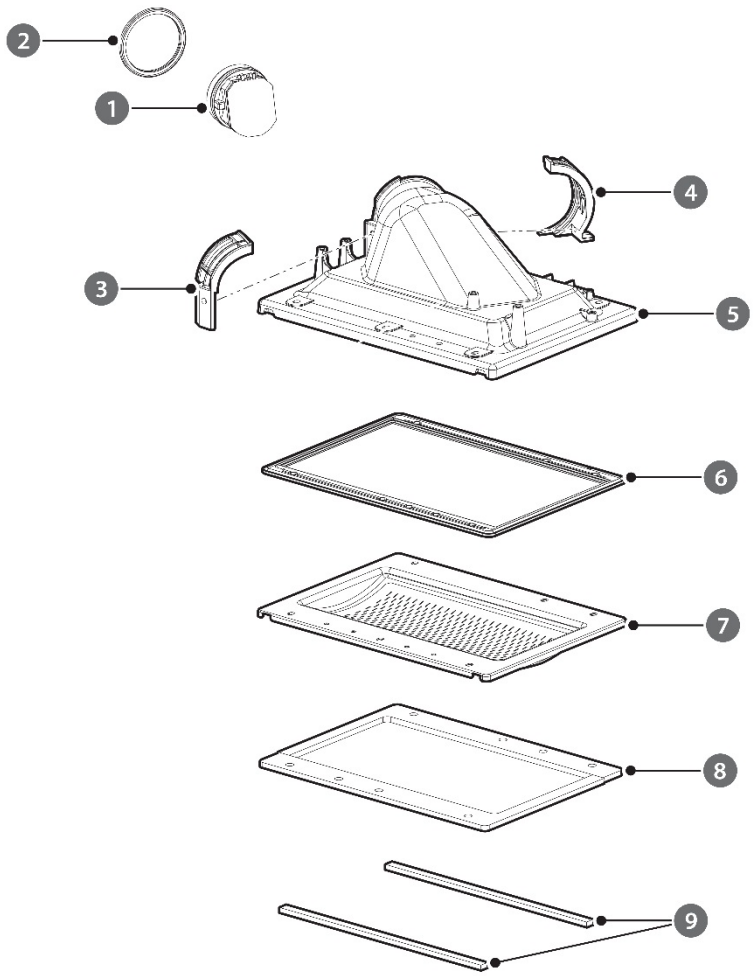
7. Components Diagram and Part List

7.1 Case Assembly



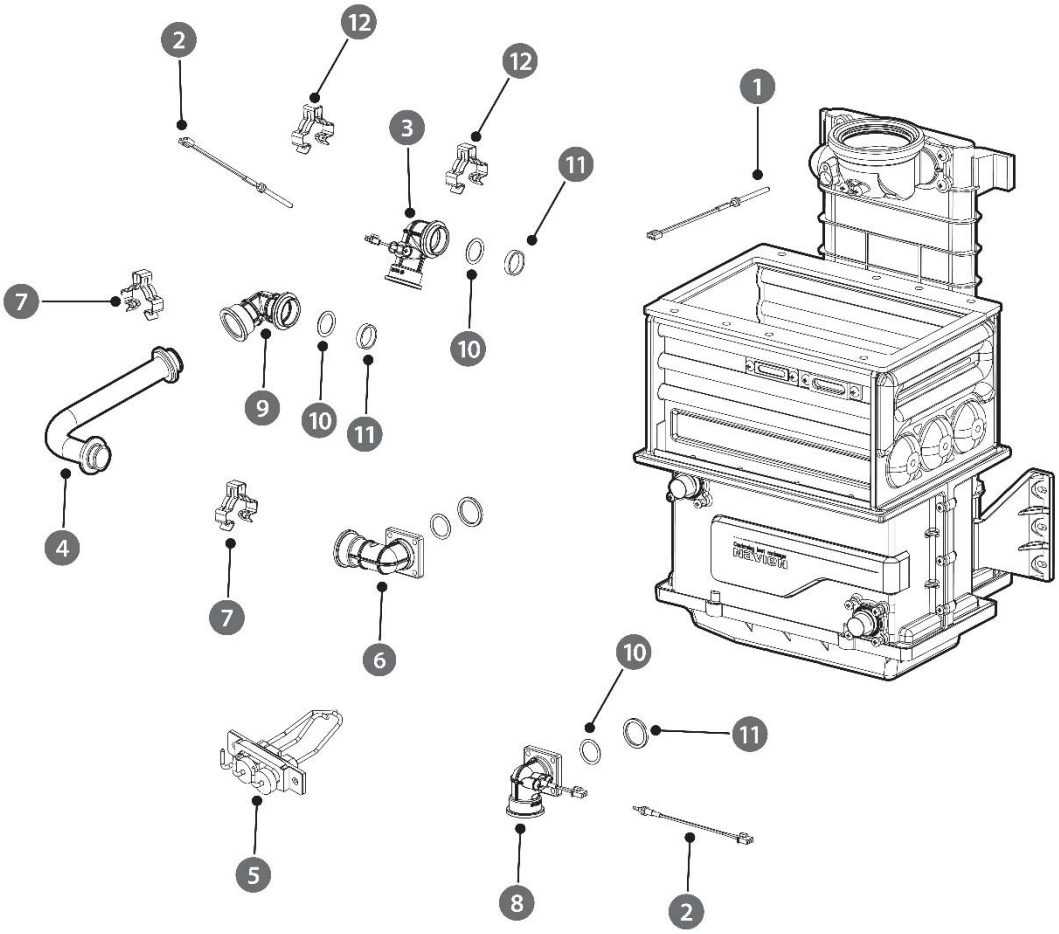
#	Description	Part #	Remark
1	Front Cover ass'y	30014038A	
2	Panel KDC-820-1P NCB-CE, PANEL	30013543A	
3	Panel Bracket, Top	20030440A	34, 40K NG
		20030321A	24, 28K NG
4	PCB KDC-820-XM NCB-CE, MAIN	30013542A	
5	Base Clamp	20030601A	
6	Air Pressure Sensor(APS) , APS-03-B	30013812A	
7	Panel Bracket, Bottom	20030322A	
8	EXPANSION TANK, 6LITER/ZILIO	30013993A	
9	Base	20030359A	34, 40K NG
		20030358A	24, 28K NG

7.2 Burner Assembly



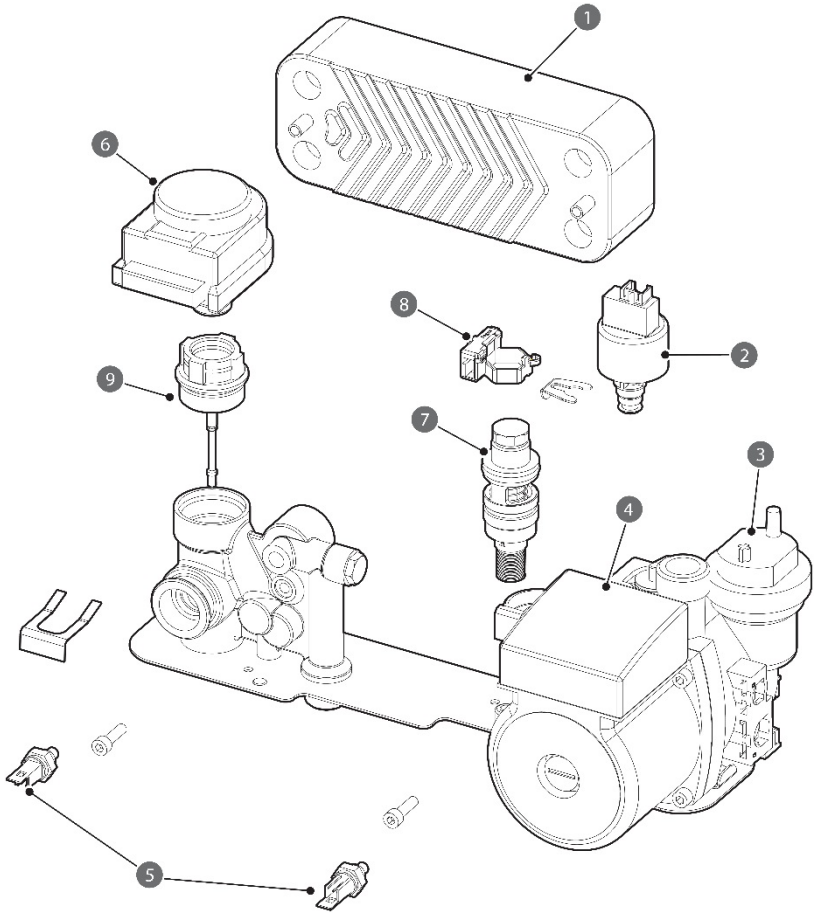
#	Description	Part #	Remark
1	FAN DAMPER	30008825A	
2	FAN PACKING	20022744A	
3	FAN B/K, FRONT	20022095A	
4	FAN B/K, BACK	20022096A	
5	Mixing Chamber	20033575A	24, 28K NG
		20031254A	34, 40K NG
6	Mixing Chamber Packing	20027108A	24, 28K NG
		20022743A	34, 40K NG
7	Burner	30011854A	24, 28K NG
		30010246A	34K NG
		30010246B	40K NG
8	Packing BURNER	20027105A	24, 28K NG
		20027145A	34, 40K NG
9	COOLING GUIDE PACKING	20023346A	

7.3 H-Ex Assembly



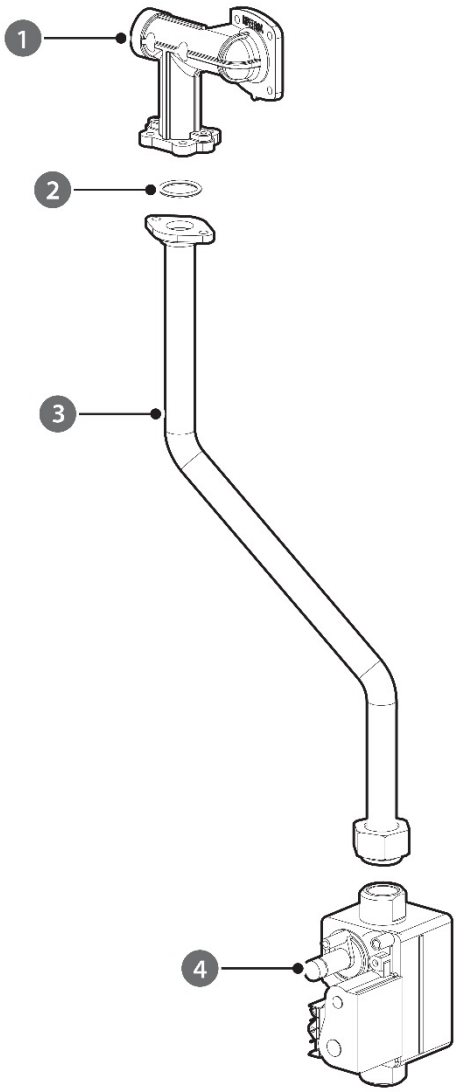
#	Description	Part #	Remark
1	EXHAUST THERMISTOR	30009478A	
2	THERMISTOR	30008366A	
3	Adapter SC OUT	20030566A	
4	H/E MIDDLE PIPE	30013744A	24, 28K NG
		30011916A	34, 40K NG
5	FLAME ROD ASS'Y	30014183A	24, 28K NG
		30012226A	34, 40K NG
6	Adapter COND OUT	20030564A	
7	FASTENER, F	20007853A	
8	adapter COND IN	30013743A	
9	Adapter SC IN	20030565A	
10	Backup-Ring	20018745B	
11	H/E IN/OUT PACKING	20006868A	
12	Fastener	20017726A	

7.4 Waterway Assembly



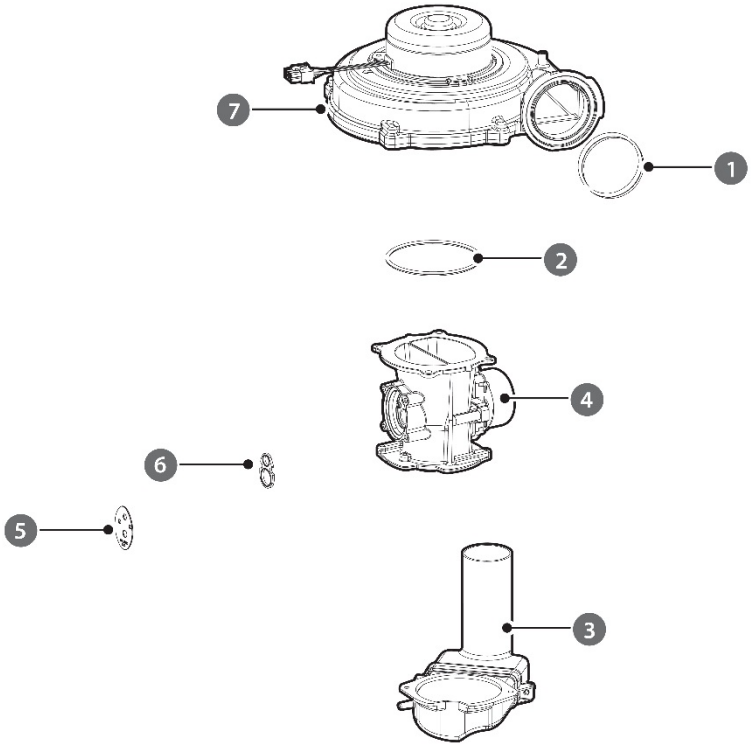
#	Description	Part #	Remark
1	DHW H/E	30014535A	24K NG
		30014536A	28K NG
		30014537A	34K NG
		30014538A	40K NG
2	Water Pressure Sensor(WPS) HUBA, TIPO 505	30014542A	
3	Air Vent Ass'y	30014543A	
4	CIR Pump GRUNDFOS, UP015-60, CESAO3	30014554A	
5	THERMISTOR	30008366A	
6	Motor(3way-valve), 220/240V 50HZ	30014546A	
7	Flow Sensor Rotor Module	30014541A	
		30015231A	
		30015232A	
8	Flow Sensor	30015255A	
9	3 Way GARTRIDGE, A/S	30015234A	

7.5 Gas Assembly



#	Description	Part #	Remark
1	VENTURY INLET ADP	30009921A	40K NG
2	O-RING	20006934A	40K NG
3	Gas Pipe Ass'y	30013571A	24, 28K NG
		30013592A	34K NG
		30013604A	40K NG
4	GAS VALVE, ET76S Time	30013623A	

7.6 Fan Assembly



#	Description	Part #	Remark
1	FAN PACKING	20022744A	
2	O-RING	20018079A	40K NG
		20007001A	24, 28, 34K NG
3	Inlet Pipe(FAN)	30013553A	24, 28K NG
		30013554A	34K NG
		30015141A	40K NG
4	Single Venturi	30014044A	24, 28, 34K NG
	DUAL Venturi	20022118A	40K NG
5	Orifice NOZZLE	20031101A	40K NG
		20031096A	34K NG
		20031095A	24, 28K NG
6	PACKING NOZZLE	20030893A	24, 28, 34K NG
		20022660A	40K NG
7	FAN	30014557A	24, 28, 34K NG
		30014558A	40K NG

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 flue systems
- Checking the remote controller

Maintenance

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

8.2 Maintenance Report

Inspection Items	Record	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			

8.3 Maintenance Schedules

Owner maintenance	
Daily	• Check boiler area • Check pressure / temperature gauge
Monthly	• Check flue piping • Check air piping (if installed) • Check air and flue termination screens • Check relief valve • Check condensate drain • Check air ducts
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 heating season	• Shut boiler down (unless boiler used for domestic hot water)

8.4 Inspection Report

Inspection Items	Record	Date:	Date:
Visual Inspection for General Signs of Corrosion	YES / NO		
Checking and Adjusting the Gas/Air Ratio	YES / NO		
Checking Flue Gas	YES / NO		
Carrying Out a Water Leak Test in Operation	YES / NO		
Carrying Out a Gas Leak Test in Operation	YES / NO		
Checking Hot Water Temperature and Flow	YES / NO		
Checking Noise	YES / NO		
Checking Flue Systems	YES / NO		
Checking the front panel.	YES / NO		

Memo

Memo

Memo

Memo

Memo