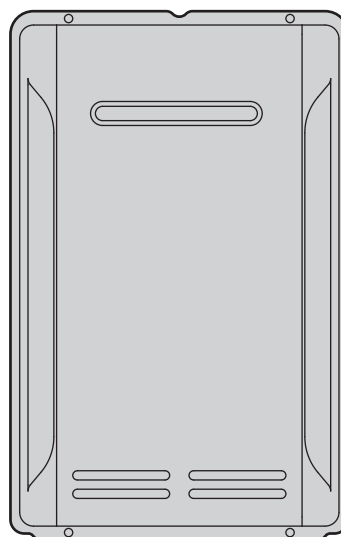


SERVICE MANUAL

**Model: 26NG50C/26LP50C
26NG60C/26LP60C**



**GAS CONTINUOUS FLOW
WATER HEATERS**

(Residential Outdoor Unit)

**TO BE USED BY A LICENSED
PLUMBER ONLY**

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1. General Outline of Appliance

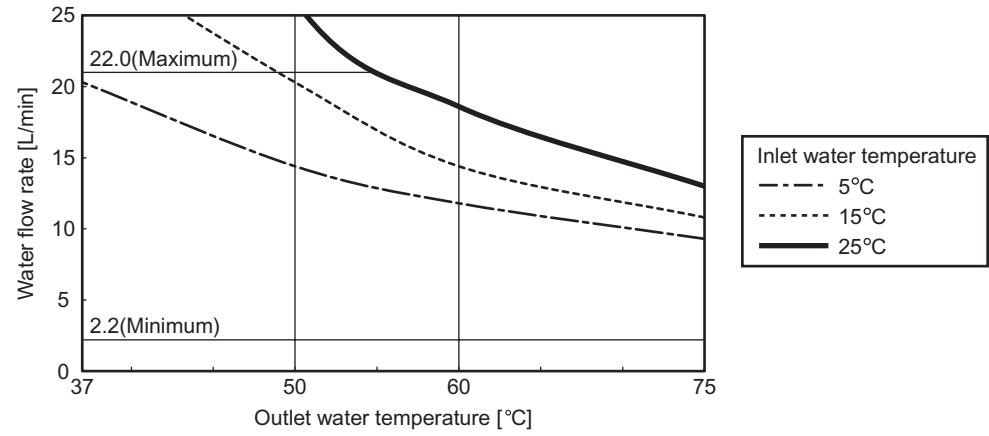
1-1 Specifications

MODEL		26
Nominal hourly gas consumption by proportional electronic gas control	MJ/h	173
Minimum gas supply pressure (Natural Gas)	kPa	1.13
Maximum gas supply pressure (Natural Gas)	kPa	5.0
Minimum gas supply pressure (Propane)	kPa	2.75
Maximum gas supply pressure (Propane)	kPa	7.0
Test point pressure High (Natural Gas)	kPa	0.84
Test point pressure Low (Natural Gas)	kPa	0.16
Test point pressure High (Propane)	kPa	1.27
Test point pressure Low (Propane)	kPa	0.21
Water heating capacity raised 40°C	L/min	16.25
Minimum working pressure	kPa	115
Maximum working pressure	kPa	1200
Gas injectors diameter (Natural Gas)	mm	1.00 / 1.50
Gas injectors diameter (Propane)	mm	0.7 / 1.0
Input voltage single phase 50Hz	V	240
Maximum output current	A	0.66
Inlet gas connection male thread		R3/4" (20mm)
Cold water connection male thread		R3/4" (20mm)
Hot water connection male thread		R3/4" (20mm)
Relief valve pressure setting	kPa	1400
Weight dry	kg	20.5
Dimensions (DxWxH)	mm	205 x 366 x 573

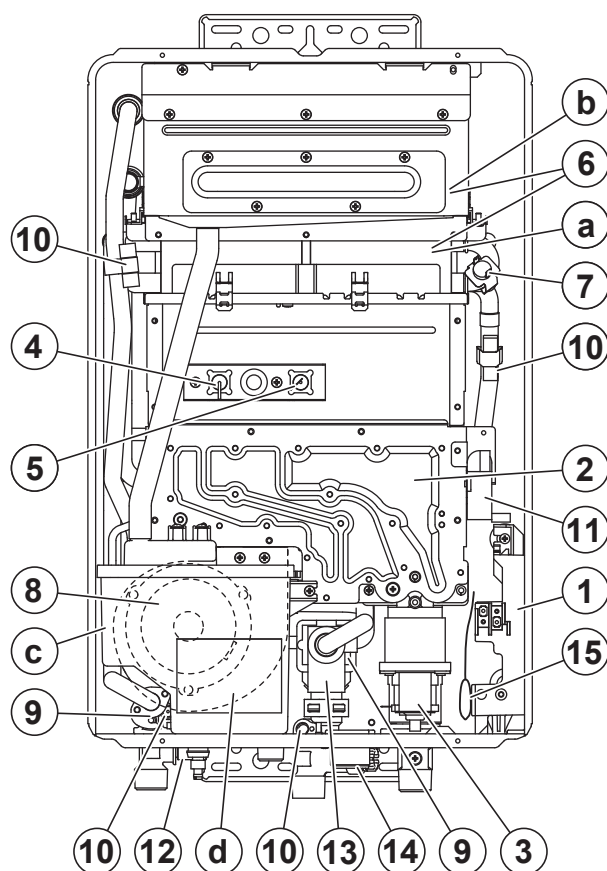
IAPMO Approval certificate no. GMK10408. Watermark Certificate of compliance WM-000506

1-2 Performance

Performance-Capacity characteristic curves.



1-3 General Construction (Parts Names)

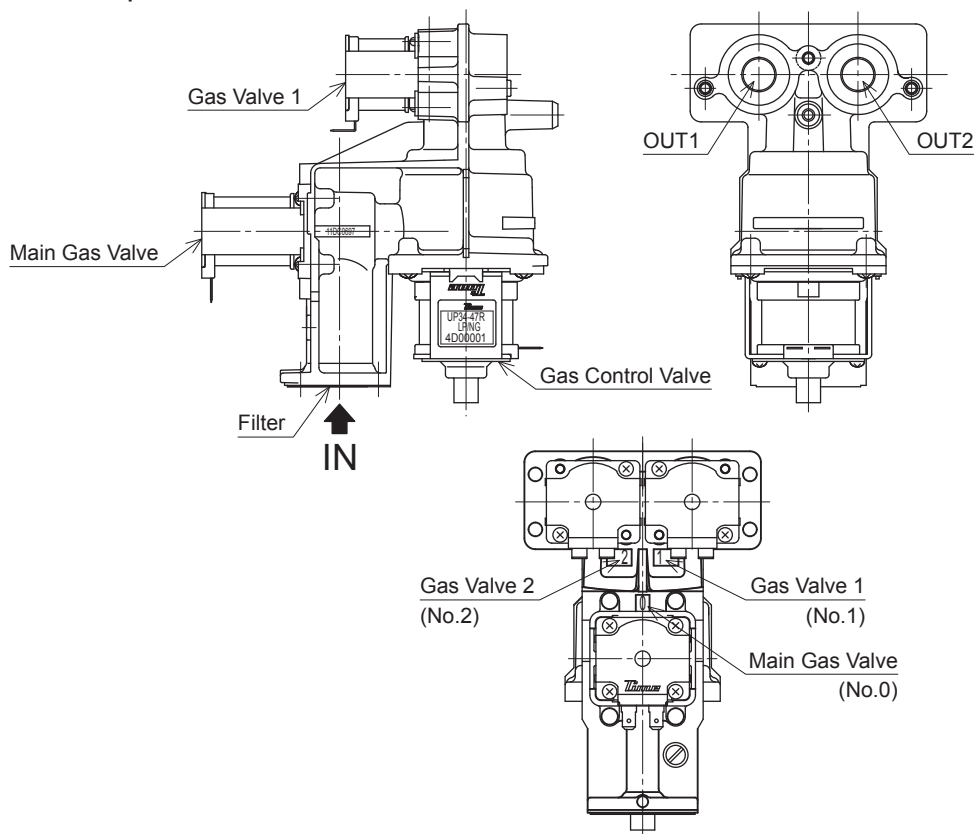


No.	PARTS NAME	No.	PARTS NAME
1	PCB(Natural Gas) PCB(Propane)	8	Fan Motor
2	Manifold Assy(Natural Gas) Manifold Assy(Propane)	9	Temperature Sensor
3	Gas Control Valve	10	Anti-Frost Heaters
4	Electrode	11	Ignitor
5	Flame Rod	12	Pressure Relief Valve
6	Heat Exchanger Assy	13	Water Flow Control Valve(with Sensor)
a	Primary Heat Exchanger Assy	14	Water Filter
b	Secondary Heat Exchanger Assy	15	Ambient Temperature Sensor
7	Over Heat Thermostat	16	Neutralizer Assy
		c	Neutralizer
		d	Anti-Frost Heater for Neutralizer

1-4 Main Component Structures

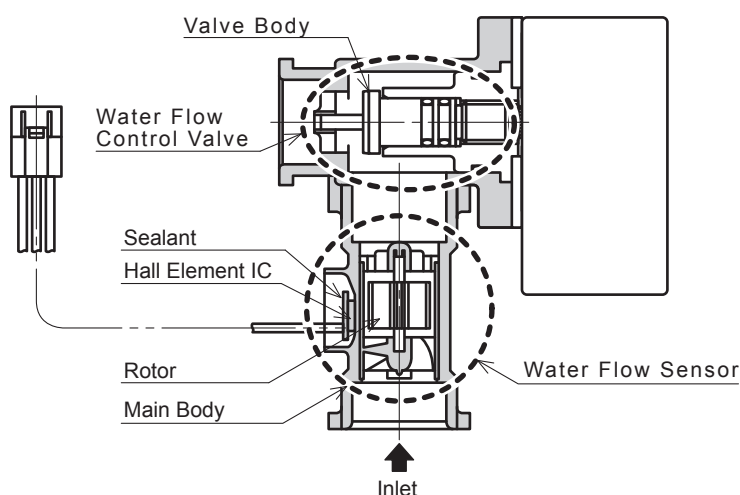
1. Gas Control Valve

- Feeds the necessary amount of gas to heat water to a set temperature, based on the amount of water flowing in through the inlet measured by the Water Flow Sensor and the water temperature calculation.



2. Water Flow Control Valve with Sensor

- * Measures the water flow as its rotor (bladed wheel) spins with the passing water. The rotation of the rotor is detected by the sensor rotor (blade equipped with a magnet) of the wheel and the Hall element which calculates the water quantity.
- * When water flows more than water heater capacity, hot water temperature becomes lower than the setting. The Water Flow Control Valve automatically reduces the water flow to prevent such temperature drops.



3. Combustion Control of Rich and Lean Burners

1) Ignition start

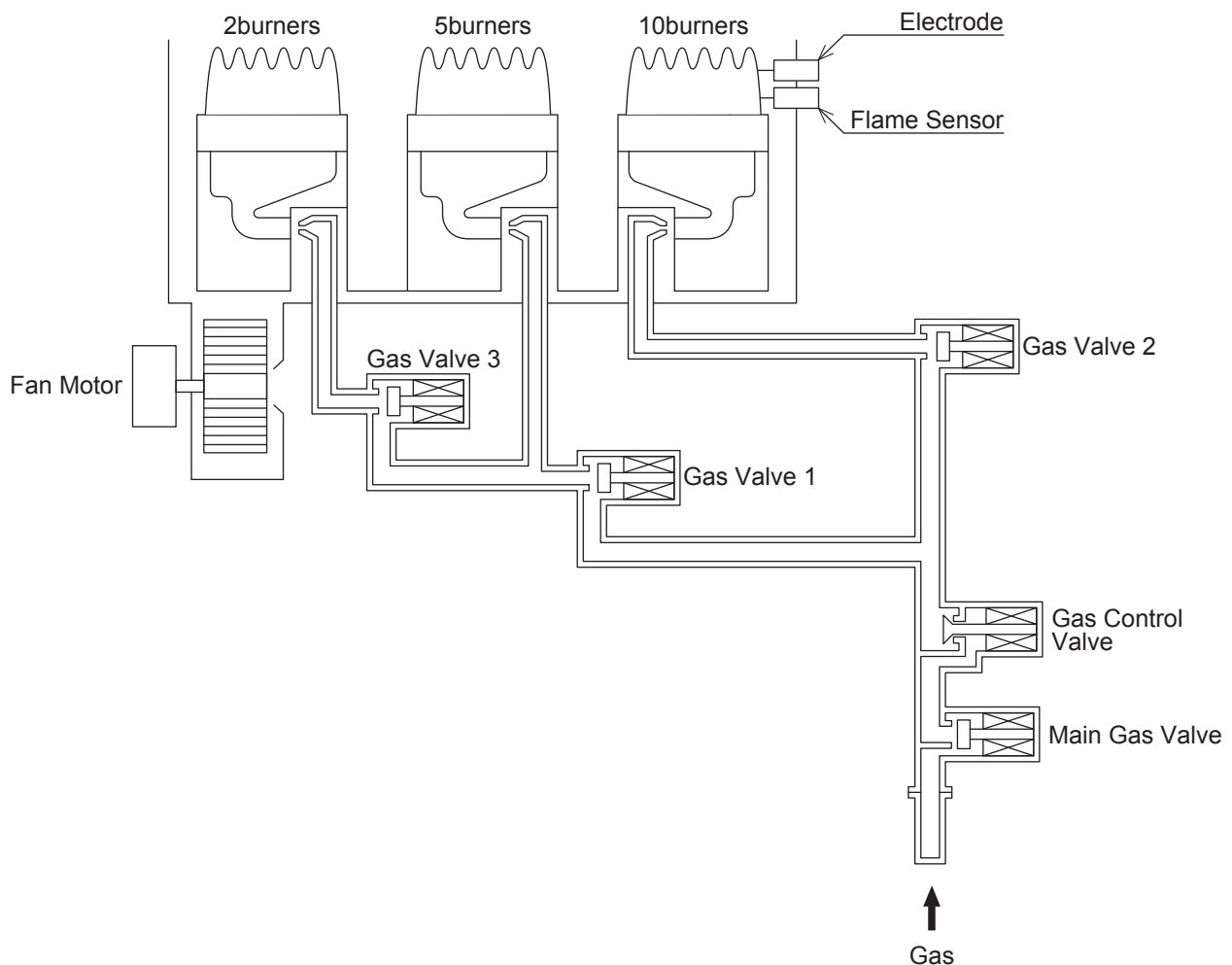
After the Main Gas Valve, Gas Valve 1, Gas Valve 2 open respectively as required, the Gas Control Valve, being held at the slow ignition position (with gas supply at a constant rate), operates to ignite Burners.

2) During combustion

Depending on the required heating capacity, each Gas Valve opens or closes.

The combinations are below,

Gas valve 1&2&3 open	↑ Higher
1&2	
2	
1	↓ Lower



1-5 Main Safety Devices

1. Water Flow Sensor (Boil-dry protection)

When the Water Flow Sensor detects the flow rate is set for starting ignition (ignition water flow) or higher, the water heater starts operation.

Ignition water flow : 2.7 L/min.

Extinction water flow : 2.2 L/min.

2. Flame Sensor (Flame failure detection)

Electric signals are transmitted to the flame detection circuit to confirm the normal combustion when the Flame Sensor detects the rectification of normal combustion flame. Therefore, if the combustion of the Burners is not normal, the signals are not sent via the Flame Sensor. The gas control assemblies are closed without the signals and the error code "111" or "121" is displayed on the remote controllers.

3. Thermal Fuse (Over-temperature protection system)

The Thermal Fuse is placed around the Primary Heat Exchanger Assembly. If the ambient temperature inside the water heater becomes extremely high, the fuse will melt down to break the power circuit. In such a case, as no power is supplied to the gas control assemblies, the gas supply is stopped and the combustion is stopped. (The system is activated to blow the fuse at 169°C.)

4. Over Heat Thermostat (residual)

Even if the Primary Heat Exchanger Assembly is over heated by no-water combustion, every gas path is closed to avoid risks. At this time, the error code "141" is displayed on the remote controllers.

(The switch is provided with a auto-restoration function and turns OFF at 100°C.)

5. Fan Revolution Detection Device (Hall IC)

The device detects the fan revolution speed to control the air supply necessary for normal combustion. If the fan revolution is out of the preset standard range, the gas control assemblies are closed to stop the combustion before combustion failure occurs. In this case, the error code "611" is displayed on the remote controllers.

6. Freeze Protection System (Anti-Frost Heaters)




To prevent freezing in the hot water supply circuit, Anti-Frost Heaters are provided at major points of water flow paths in the unit. The heaters are activated by the Ambient Temperature Sensor in the unit.

(The system turns ON at 3°C and OFF at 13°C.)




2. Installation and Related Work


2-1 Installation Instructions

- The cases shown below are classified by the degree of risk and damage.
Be sure to follow the instructions for your safety.

 Danger	“Danger” indicates that serious injuries or even death may result from the improper installation due to negligence of following the instructions.
 Warning	“Warning” indicates the possibility that serious injuries or even death may result from the improper installation due to negligence of following the instructions.
 Caution	“Caution” indicates the possibility that some injuries or material damage may result from the improper installation due to negligence of following the instructions.

Each mark indicates:

	General prohibited
	Never fail to do.
	Ground

 Danger
Never install the unit indoors as it is exclusively for outdoor use. Do not install it in the bathroom. Electric shock or leakage may result.

Installation requirements

The Water Heater must be installed in accordance with the following:

1. These instructions.
2. National Construction Code and Local authority regulations.
3. AS/NZS 3500.4 Plumbing and Drainage - Heated Water Services.
4. The Australian standard for gas installations AS/NZS 5601.
5. Any other statutory regulation that may apply.
6. A notice of intention to install shall be lodged with the relevant local Gas Authority prior to installation.

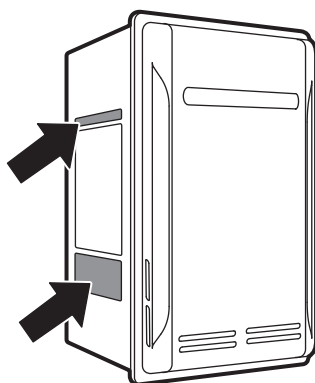
INSTALLATION MUST BE CARRIED OUT ONLY BY AN AUTHORISED AND
APPROPRIATE LICENSED PERSON

Before installation.

Verification of the unit.

Warning

- Make sure the unit to be installed suits the intended use and application.
- Do not use any gas other than specified on the sticker.
- Do not operate with any power source (voltage/frequency) other than specified on the sticker.



Location of the unit.

Decide where to install the unit by considering customer's request and clearances.

Warning

Ventilation

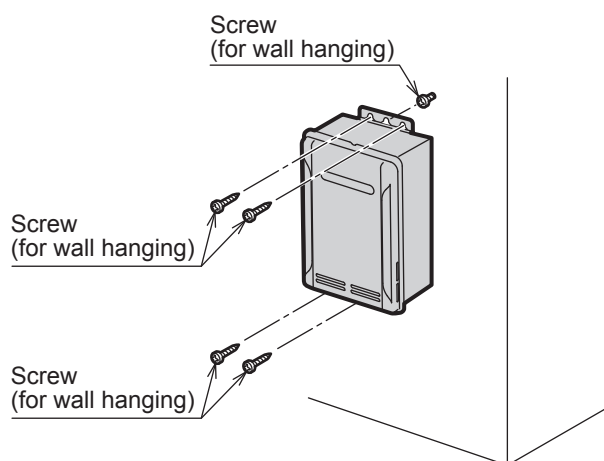
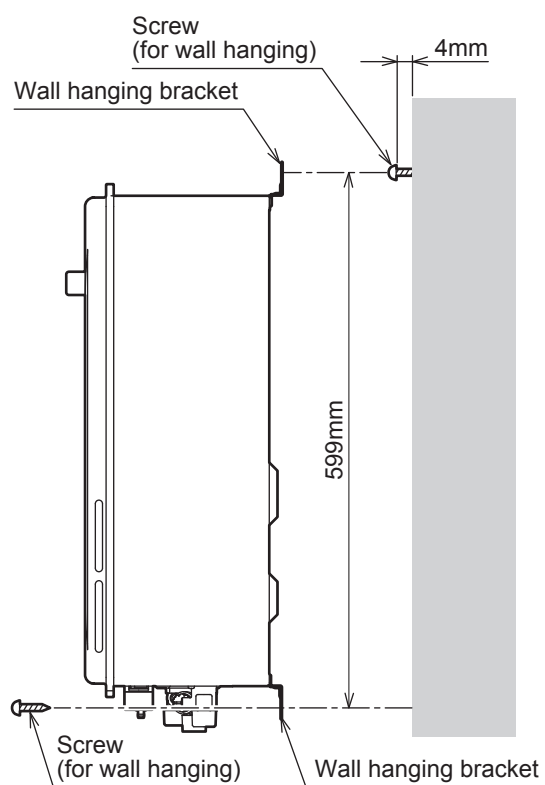
- Install the unit where there is enough space for ventilation.
- Do not install the unit where flammables such as gasoline, benzene, and adhesive are handled.
- This unit does not allow the use of extended exhaust pipes.
- Install the unit as far as possible, away from anything in front or above even if it is non-combustible in order to prevent exhaust gas recirculation, and staining of surfaces.
- Take preventive measures against snow drifts for air inlet and exhaust outlet to stay unaffected in case there is a possibility that they may be blocked by snow fall.

Installation.

Caution

- Reinforce the wall if necessary as this unit weighs about 20.5kg.

1. Fix 1 screw (for wall hanging) into the wall leaving about 4mm length to hook on.
2. Hook the center hole of the wall hanging bracket onto the screw and securely fix the unit with 4 screws.



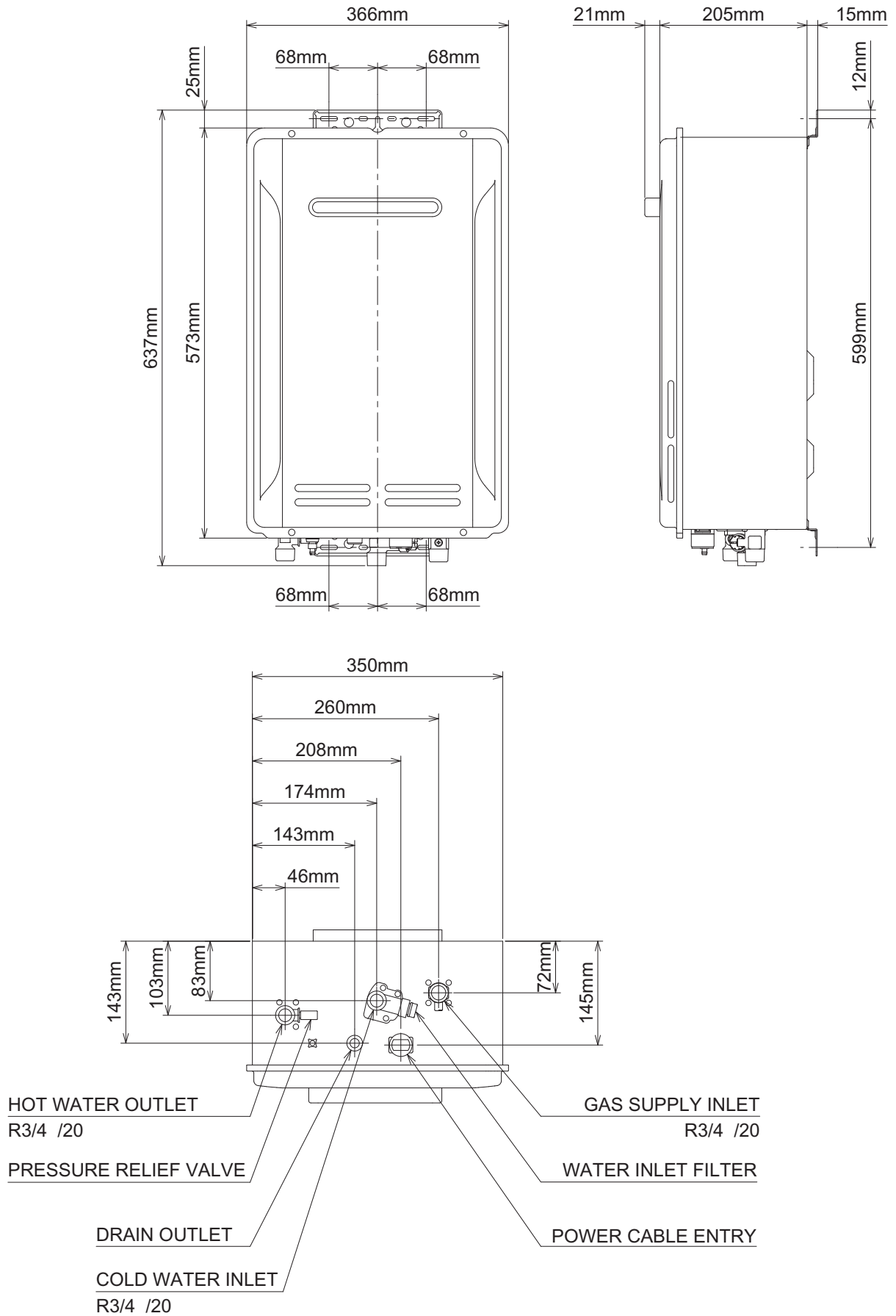
Caution

- Check if adjacent wall or ceiling is fire resistant and allows safe distance for fire prevention.
- This water heater is suitable for residential water (potable) heating only. Do not use this water heater for space heating, combination space heating/domestic water heating, or commercial water heating applications.
- The Water Heater is not suitable for use in pool or spa applications.
- Maintain proper space around the unit for proper servicing and operation. Minimum clearances from combustible materials are listed below.

Top of heater	30cm
Front of heater	60cm
Sides of heater	15cm
Back of heater	0cm
Floor	30cm

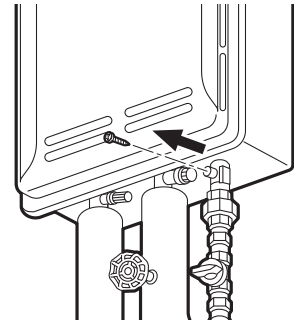
- Secure enough space so that the inspection and repairs can be done easily.
- Secure space not only in front but also under the unit.
- Do not install the unit over other combustion appliances.
Oil residue and dust in the air can adhere to the Burner and the Primary and Secondary Heat Exchanger resulting in deformation, loss of efficiency, or damage to electronic components.
- Do not install the exhaust outlet near the outlets of the other appliances.
Install the air inlets away from the wind path as the wind may cause imperfect combustion.
- Do not install the unit where commercial chemicals are used.
Those chemicals are ammonia, sulfur, chloride, ethylene compound and acids which are used at beauty shop, laundry, factory and so forth.
- Do not install the unit over food or dishes.
- Pipe pressure relief to a drain or outside environment, or within 100mm of the floor.
Pipe pressure relief discharge to a drain or outside environment.
- The appliance should be located in an area where leakage from the unit or connections will not result in damage to the area adjacent to the appliance or to lower floors of the structure. When such locations can not be avoided, it is recommended that a suitable drain pan, adequately drained, be installed under the appliance. The pan must not restrict combustion airflow.

2-2 Dimensions



2-3 Gas Piping

- Install the manual gas valve in the gas inlet connection of the Water Heater.
- A union should be used to connect the unit and the gas pipe.
- Check the gas type and the gas inlet pressure before connecting.
- Remove the screw from the test plug before checking the gas inlet pressure. Connect the manometer to the plug with the silicon tube and measure the gas inlet pressure and confirm from the rating label on the appliance.
- Put the screw back in the test plug and fasten tightly.
- Make sure to conduct gas leakage test before operating the Water Heater.



2-4 Water Piping

- Install a manual water valve in the water inlet connection of the Water Heater.
- A union should be used on both the hot and cold water supply lines for connection.
- Purge the water lines to remove all debris and air.
- Make sure both the hot and cold water supply lines are connected correctly.
- A filter is placed at the water supply inlet to remove debris. Clean the filter regularly. Do not operate the unit without the filter in place. In areas of heavy debris, such as with some wells, install a whole house water filter in line before the unit.

2-5 Condensate Drain Piping

This unit generates condensate continuously at a rate of up to 5 litres per hour as a by-product of the highly efficient gas burner system.

This condensate must be drained via a pipe to a suitable point of discharge. As the condensate is a by-product of gas combustion, it is mildly acidic.

For this reason, copper tube and fittings **MUST NOT** be used, as they will corrode.

The unit has an in-built condensate neutralizer to make the condensate safe for discharge.

It is recommended to use DN15 high pressure PVC pipe and fittings for the condensate drain line.

IMPORTANT CONSIDERATIONS FOR THE CONDENSATE DRAIN PIPE

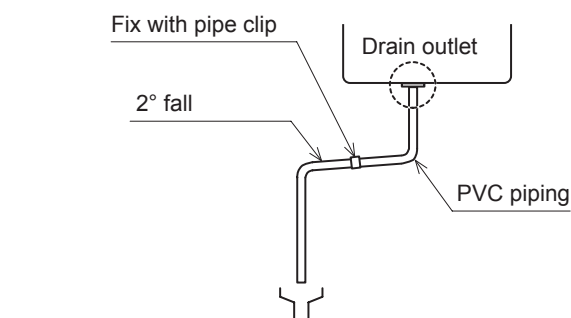
The content of AS/NZS 3500 'Temperature/Pressure Relief and Expansion Control Valve Drain Lines' has been used as a guide in preparing these considerations.

Drainage of condensate water

Condensate drain outlet connection, R1/2" (15mm) BSP male nylon.

Note: the white plastic shipping cap **MUST BE** removed from the condensate drain outlet prior to water heater operation. In the case that white-ish stone pieces (calcium carbonate) comes out of the neutralizer when the cap is removed, they should be discarded.

The condensate drain line must have a continuous fall (of at least 2°) from the water heater to the discharge point. Lengths and bends must be in accordance with 'Length and changes of direction' diagram below.



Lengths and changes of direction

Max relief drain length (m)	9	8	7	6
Max numbers of changes of direction (greater than 45°)	3	4	5	6

Installation

1. The drain line **MUST NOT** discharge onto electrical connections, earth stakes, copper pipes, concrete paths or into a pond.
2. The point of discharge from each drain line shall be located so that the release of condensate does not cause a nuisance, is readily discernable and incurs no risk of damage to the building.

In view of (1) and (2), suitable points of discharge are deemed to be drains or sewers.

3. There shall be no tap, valve, or other restrictions in any line.
4. The drain line shall fall continuously to the approved point of discharge.
5. Where discharging over a tundish or gully trap, drain lines shall have an air gap of a size at least twice the diameter of the drain line.

Interconnection of condensate drain lines

Condensate drain lines from multiple water heaters may be joined together provided they conform with the 'Installation requirements' on page 9.

Common stack discharge

Where individual water heaters are installed in a multi-story building, the condensate drain line may discharge into a common stack, subject to the following:

- (a) The discharge from the common stack is to a tundish, having a discharge line that is not less than the size of the common stack, directly connected to a fixture trap, and installed in connection with any adjacent soil or waste stack.
- (b) The discharge point of the common stack is such that any discharge is readily visible and not cause any nuisance.
- (c) The common stack is vented by extending the pipe upwards above the roof level.

Tundish drain lines

The drain line from any tundish shall not be less than DN20 or less than one size larger than that of the largest drain line discharging into the tundish. Tundish drain lines shall comply with the 'Installation requirements' on page 9.

PLEASE NOTE

The warranty will not cover any failures or operating difficulties due to the following:

- improper installation and maintenance (including but not limited to):
 - condensate damage or any other consequential loss either directly or indirectly
 - removal of the neutralizer
 - not replacing the neutralizer at the end of it's life

Areas subject to freezing

In areas where water pipes are prone to freezing, the drain pipe from any valve shall be insulated and not exceed 300mm in length. It shall discharge into a tundish through an air gap of not less than 75mm and not more than 150mm measured from the outlet of the drain pipe to the rim of the tundish.

2-6 Electrical Connection

Caution

- Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.
Verify proper operation after servicing.
Field wiring to be performed at time of appliance installation.
- Completely turn off the power before starting the work.
Do not turn the power on until the electric wiring is finished and all work is completed.
Otherwise electric shock or personal injury may result.

- The Water Heater requires 240V AC at 50Hz.
Disconnect the power supply if the unit is not in use for a long time.
- Remove residual water in the unit when the power supply is off because the freeze prevention in the unit will not activate, resulting in possible freezing damage.

2-7 Wiring Remote Controller

1. Number of controllers

One, two or three remote controllers can be installed as optional extras.

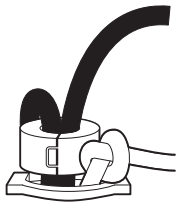
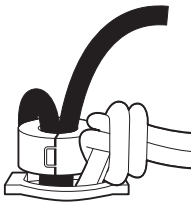
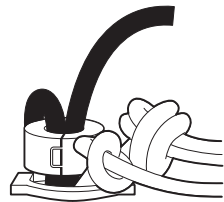
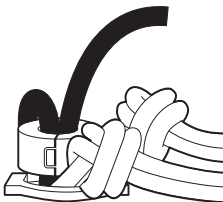


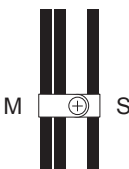
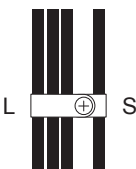
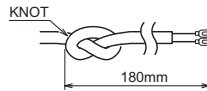
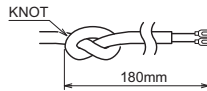
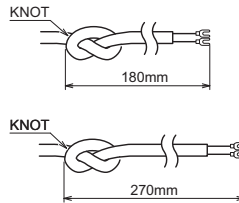
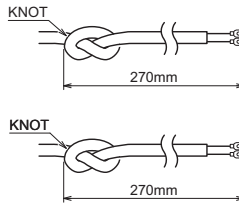
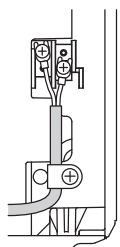
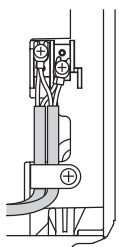
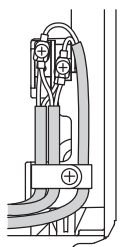
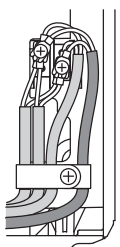
2. Remote Controller locations

The remote controllers allow the water temperature to be set from the various locations where they are installed at kitchen, laundry, bathroom and ensuite.

3. Connection of cable to the thermann unit

- (1) Remove the front cover from the unit.
- (2) Install the cable to the Thermann main unit using conduit or by concealing the cables in the wall cavity.
- (3) Install the cable into the cabinet through the conduit in accordance with the table in next page.
- (4) Based on "How to fix the cables", attach the cable to the plate adjacent to the terminal block, using the cable clamp provided.
- (5) Attach the cables to the terminals for the remote controllers.
- (6) Replace the front cover of the water heater.

How to fix the cables (Remote controller cable(s) and cascade cable)

Number of cable	1	2	3	4*
How to tie the cable(s) at the power cable entry	Make a knot	Tie two cables	Tie two cables and make a knot on the rest cable	Tie the cables two by two
				
Required cable clamp	Clamp (small)	Clamp (medium)	1 cable: clamp (small) 2 cables: clamp (medium)	1 cable: clamp (small) 3 cables: clamp (large)
How to fix the cable(s)				
The length between the knot and the cable terminal	180mm	180mm	1 cable: 270mm 2 cables: 180mm	2 cables: 270mm 2 cables: 180mm
				
How to connect the cable(s) to the terminal	Attach the cable to underside of terminal	Attach the cables to underside of terminal	Attach the cable(180mm) to underside of terminal Attach the cables(270mm) to upperside of terminal	Attach the cables(180mm) to underside of terminal Attach the cables(270mm) to upperside of terminal
				

* Up to three remote controller can be installed. In this case, three remote controller cables and one cascade cable shall be connected.

2-8 Testing Operation

- Follow the steps below, to ensure the Water Heater has been properly installed.

Preparation for testing operation.

1. Fully open the water supply main valve.
2. Flush out the water supply piping to clean out any installation debris, clean out filter.
3. Turn on power to unit and open gas supply valve.
4. Operate the remote controllers according to “**INITIAL SETTING REMOTE CONTROLLERS**” in the installation instructions.

Testing operation.

1. Operate the unit according to “**Operation of Remote Controller**” in the operating instructions.
2. Make sure the unit operates normally.
 - Does the Burner ignite and shut off properly? Check the combustion lamp on the PCB. The Burner may not ignite at first until the air in the gas supply pipe is driven out. Repeat the procedure until it ignites.
 - Is temperature setting workable? Check if the temperature can be adjusted as desired.

Procedure after testing operation.

- If the residence is not ready for habitation or the unit will not be used for an extended time, the residual water in the unit and the pipe may freeze and damage the unit, or the residual water in the Primary and Secondary Heat Exchanger may deteriorate. Be sure to remove the water in the unit and the pipe.
1. Close the gas supply main valve.
 2. Close the water supply main valve
 3. Take off the water filter and pressure relief valve (drain stopper), and remove the water. Take this procedure when the unit cools down after the testing operation.
 4. Disconnect the power, or turn off the power supply.
 5. Open the tap and shower tap (if any) and remove the water.
 6. Leave the unit in this condition until ready to use.

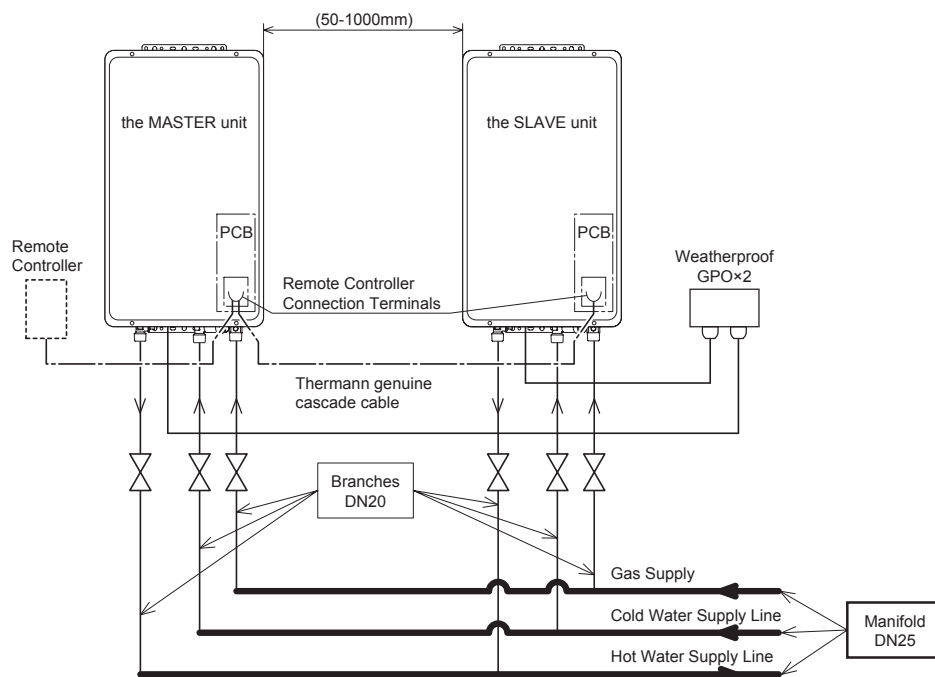
Explanation to customers.

Fill out the warranty form with the customer.

Explain the “ **Remote Controller** ” section of the operating instructions to the customer.

2-9 Cascade Installation

- This type of installation allows two units to operate together by connecting two units with a 2-wire cable and some simple programming.
- The units will operate in a range between 22 MJ/h and 346 MJ/h when two units are connected together.
- Depending on water flow and desired temperature, the system can automatically operate or stop either or both units.
- Thermann genuine cascade cable can be used to connect the two units.
- The distance between the two units must be in the range of 50 - 1000 mm.
- Water and gas pipe length should be the same to both units. Otherwise the temperature of the hot water at the tap can be unstable.
- If connecting optional remote controllers, they must be connected to one unit only. That unit will need to be set up as the MASTER unit for the system to operate correctly.
- All fittings, valves and branch lines should be matched sets to each of the water heaters.



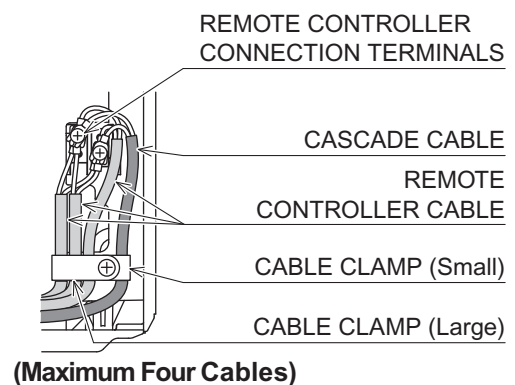
Recommendation

Manifold line size for cold, hot and gas pipes is DN25.

Branch line size for cold, hot and gas pipes is DN20.

(Refer to AS/NZS 5601 for gas pipe and AS/NZS 3500.4 for water pipe requirements).

- To connect the cascade cable, refer to "How to fix the cables" on page 19.



3. Service and Maintenance

3-1 Operation Principles

[Before operation]

- When ON/OFF Button (Power switch) on the remote controller is turned ON, the ON indicator illuminates (in the case of operation with a remote controller). Gas is supplied to the Gas Valve.

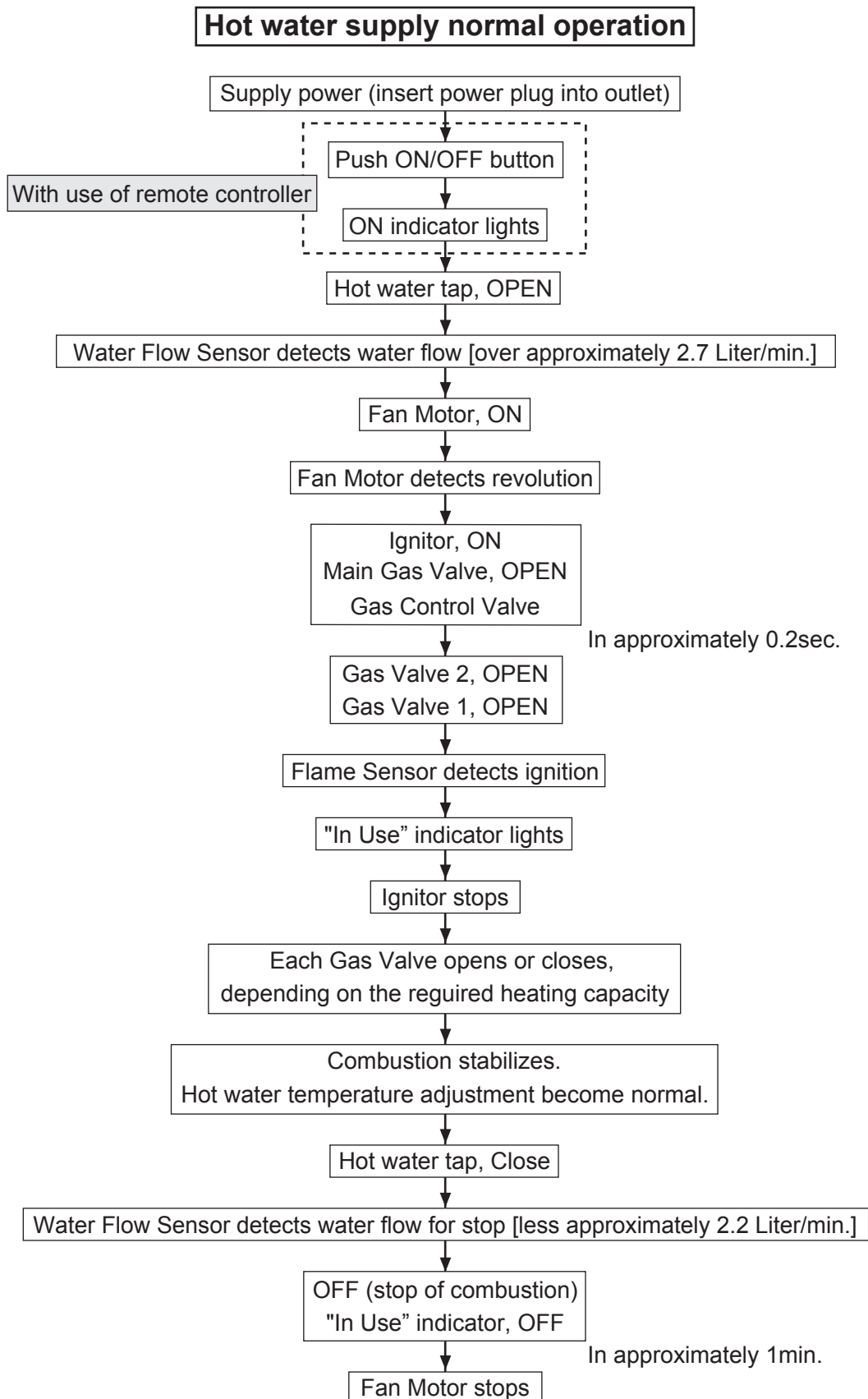
[During operation (when hot water is supplied)]

- When the hot water supply tap is opened, water flows through the Water Flow Control Valve (with sensor) into the Primary and Secondary Heat Exchanger Assembly. The water heated by the Heat Exchanger Assembly passes through the Outgoing Water Temperature Sensor to go to a hot water outlet. At this time, the Water Flow Sensor detects water flow. Then the PCB starts the Fan Motor, activating the electrode. The Main Gas Valve, Gas Valve 1 and Gas Valve 2 are opened simultaneously when the spark is emitted by the Electrode.
- The gas supply is set at the slow ignition level by the Gas Control Valve and goes to Burners. When Burners are ignited, the Flame Sensor detects the flame condition, the “**In Use**” Indicator lights and the sparking is stopped.
- The PCB detects the water flow rate based on the signal from the Water Flow Sensor, calculates the energy required to heat the water up to the set temperature, and adjusts the opening position of the Gas Control Valve and the Fan Motor rpm. After this, PCB maintains the combustion to keep the water at the set temperature by checking with the Outgoing Water Temperature Sensor, while controlling the Fan Motor rpm and gas supplied by the Gas Control Valve. (Feedforward feedback control)

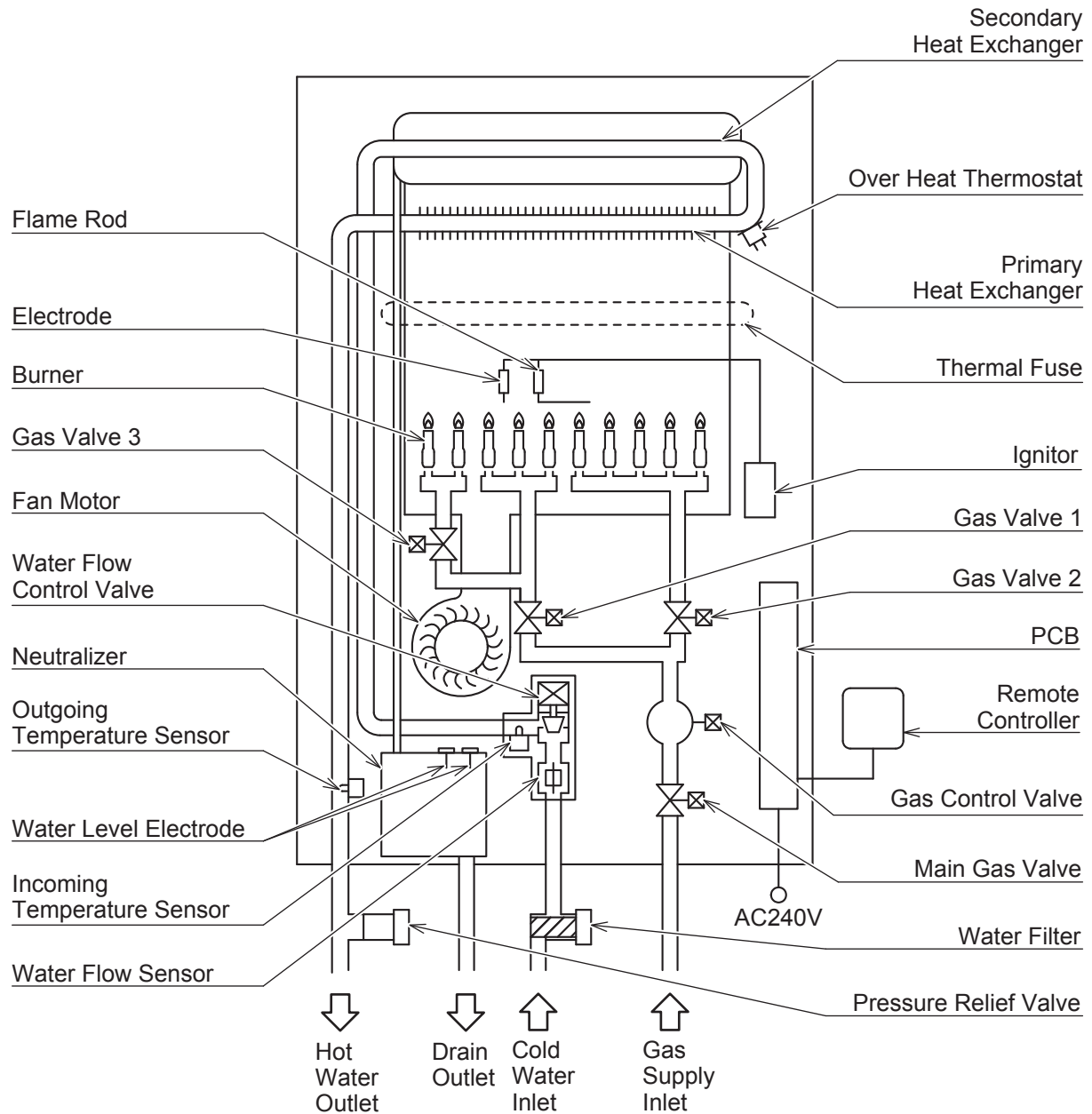
[Operation stop]

- When the hot water tap is closed, the Water Flow Sensor detects no water flow. In response to this, PCB closes all the Gas Valves and the Fan Motor stops after running for 65 seconds. (Post purge)

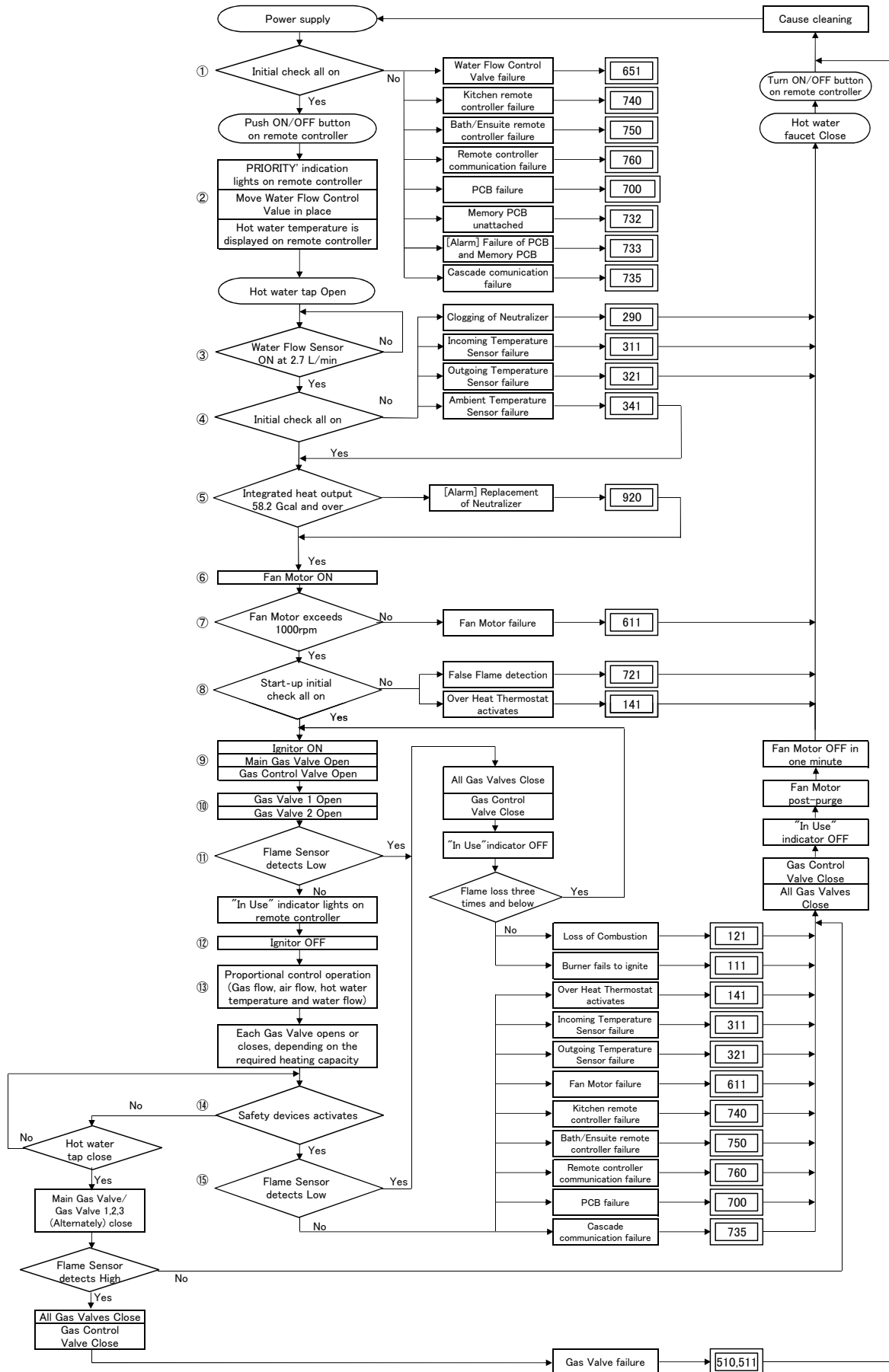
Operational flow chart



3-2 Schematic Diagram



3-3 Flow Charts



3-4 Fault Findings and Error Code

Error code

ERROR CODE ON REMOTE CONTROL	CONDITION OF LED IN PCB	NUMBER OF FLASHING	PHENOMENON	SYMPTOM	CAUSE	CHECK METHOD	CORRECT VALUE	REFER FIGURE		
-	NOT FLASHING	-	NOTHING STARTS AND REMOTE'S DISPLAY DOES NOT INDICATE		FUSE DEFECT	CHECK THE CONTINUITY OF FUSE ON PCB	0Ω	Fig.1		
			NOTHING STARTS, ONLY REMOTE'S DISPLAY INDICATES SWITCH ON		WATER INLET FILTER CLOG UP. WATER FLOW SENSOR DEFECT	VISUAL CHECK AND CLEAN IT. VISUAL CHECK. AS NEXT STEP, PULL OUT CONNECTOR(4), CHECK FAN MOTOR IS ROTATED WHEN CONNECTION WITH TWO PINS OF THE BOTTOM.		Fig.2		
111	FLASHING	1	GAS BURNER FAILS TO IGNITE	NO IGNITION, THEN LED STARTS FLASHING AFTER 30 SECS.	IGNITOR DEFECT	CHECK AC VOLTAGE BETWEEN BLACK AND BLACK AT CONNECTOR (9) IN IGNITION	AC240V	Fig.3		
					BROKEN INSULATOR AT IGNITOR TERMINAL	VISUAL CHECK OF IGNITOR TERMINAL				
					THERMAL FUSE ACTIVATED. (BREAKING OF THE WIRE)	CHECK THE CONTINUITY IN TRANSMISSION CONNECTOR (YELLOW) FOR FUSE SIDE.	0Ω	Fig.4		
					GAS VALVE DEFECT	CHECK FOR DC VOLTAGE AT CONNECTOR (8) IN IGNITION OR CHECK FOR CONTINUITY IN GAS VALVE RESPECTIVELY.	Table 1	Fig.5		
					GAS CONTROL VALVE DEFECT	CHECK FOR DC VOLTAGE AT CONNECTOR (4) IN IGNITION OR CHECK FOR CONTINUITY IN GAS VALVE RESPECTIVELY.	Table 1	Fig.6		
					LOSS OF GAS SUPPLY	CHECK GAS INLET PRESSURE	Table 2			
						INGNITES, THEN LED STARTS FLASHING AFTER 30 SECS.	FLAME ROD INSULATOR FAILURE, BREAKING OR SHORT CIRCUIT	VISUAL CHECK OF FLAME ROD INSULATION		
							EARTH CABLE	CHECK FOR BREAKING OR LOOSE CONNECTIONS AT TERMINAL.		
							NOZZLE HOLDER	VISUAL CHECK OF NOZZLE HOLE'S BLOCKAGE.		
				721						
121		3	LOSS OF COMBUSTION	COMBUSTION STOPS AND LED STARTS FLASHING	LOSS OF GAS SUPPLY INSUFFICIENT PRESSURE ADJUSTMENT AT MANIFOLD PRESSURE	CHECK GAS INLET PRESSURE CHECK FOR MANIFOLD PRESSURE	Table 2 Table 2			
141		4	OVER HEAT THERMOSTAT CUT OFF	COMBUSTION STOPS AND LED STARTS FLASHING	OVER HEAT THERMOSTAT CUT OFF DEFECT	CHECK THE CONTINUITY BETWEEN THE TERMINALS OF THE DEVICE.	0Ω	Fig.7		
321		5	TEMPERATURE SENSOR WIRE BREAKING (OUTGOING)	LED FLASHES IMMEDIATELY	TEMPERATURE SENSOR WIRE BREAKING	CHECK THE RESISTANCE IN TRANSMISSION CONNECTOR FOR SENSOR SIDE.	Table 3	Fig.8		
001		6	POWER FAILURE DETECTION	COMBUSTION STOPS AND LED STARTS FLASHING IMMEDIATELY	POWER FAILURE OR INTERRUPTION OCCURS DURING COMBUSTION	CLOSE WATER TAP AND OPEN IT AGAIN.				
611		7	FAN MOTOR FAILURE	NO IGNITION, LED STARTS FLASHING AFTER 10 SECS.	FAN MOTOR DEFECT	EXCHANGE FAN MOTOR.				
740 750	NOT FLASHING	-	NOTHING OPERATES AND THE ERROR CODE DISPLAYS IN 1 MINUTE.		PCB DEFECT	TURN OFF AND ON. IF NOT RECOVERY, REPLACE PCB.				
740	FLASHING	8	COMMUNICATION FAILURE WITH MAIN REMOTE CONTROLLER	NO COMBUSTION OR COMBUSTION STOPS, COMBUSTION INDICATOR FLASHES IMMEDIATELY	REMOTE CONTROLLER FAILURE	WHEN OPENING HOT WATER TAP WITHOUT CONNECTING REMOTE CONTROLLER, IF NORMAL COMBUSTION STARTS, REPLACE REMOTE CONTROLLER.				
750			COMMUNICATION FAILURE WITH BATH/ENSUITE REMOTE CONTROLLER							
760			COMMUNICATION FAILURE		WIRE BREAKAGE OF REMOTE CONTROLLER CABLE, SHORT-CIRCUITED	VISUAL CHECK OF WIRE AND REMOTE CONTROLLER CONNECTIONS				
651		9	WATER FLOW CONTROL VALVE FAILURE	LED FLASHES IMMEDIATELY	WATER FLOW CONTROL VALVE DEFECT	EXCHANGE WATER FLOW CONTROL VALVE				
341		11	TEMPERATURE SENSOR WIRE BREAKING (AMBIENT)		TEMPERATURE SENSOR WIRE BREAKING	CHECK THE RESISTANCE IN TRANSMISSION CONNECTOR FOR SENSOR SIDE.	Table 3			
735		15	CASCADE COMMUNICATION FAILURE		WIRE BREAKAGE OF CASCADE CABLE	VISUAL CHECK OF WIRE AND PCB CONNECTIONS		Installation instructions		
					CASCADE SET UP MISTAKE	CHECK THE SETTING OF DIP SWITCH2 ON PCB				
510		16	MAIN GAS VALVE FAILURE		GAS VALVE DEFECT	EXCHANGE GAS CONTROL VALVE.				
511		17	GAS VALVE FAILURE (NOT MAIN)							
311			18		TEMPERATURE SENSOR WIRE BREAKING (INCOMING)		TEMPERATURE SENSOR WIRE BREAKING	CHECK THE RESISTANCE IN TRANSMISSION CONNECTOR FOR SENSOR SIDE.	Table 3	Fig.8

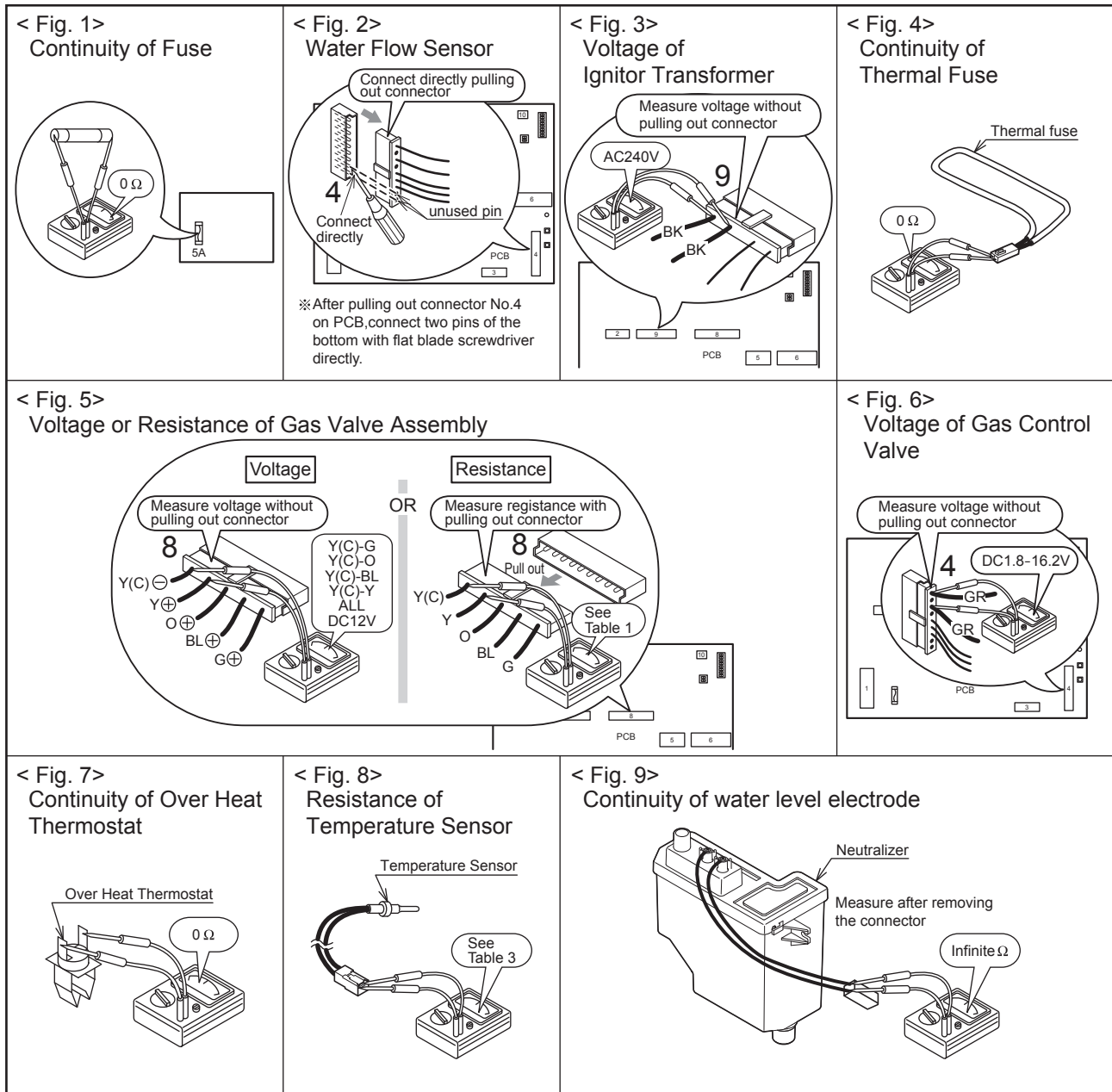
ERROR CODE ON REMOTE CONTROL	CONDITION OF LED IN PCB	NUMBER OF FLASHING	PHENOMENON	SYMPTOM	CAUSE	CHECK METHOD	CORRECT VALUE	REFER FIGURE
920	FLASHING	20	NEUTRALIZER NEED TO BE REPLACED (WARNING)	-	CLOSE TO END-OF-LIFE NEUTRALIZER	REPLACE MEMORY PCB AND NEUTRALIZER AT THE SAME TIME		Page30
290	FLASHING	21	ABNORMAL WATER LEVEL IN NEUTRALIZER	COMBUSTION STOPS AND LED STARTS FLASHING	CLOGGING OF NEUTRALIZER	REMOVE CLOGGING OF DRAIN PIPING OR NEUTRALIZER AND DIRT OF WATER LEVEL ELECTRODE	Infinite Ω	Fig.9
700	FLASHING	22	PCB FAILURE	LED FLASHES IMMEDIATELY	PCB DEFECT	EXCHANGE PCB.		Page29
732	FLASHING	23	MEMORY PCB UNATTACHED	COMBUSTION STOPS AND LED STARTS FLASHING	ATTACHMENT FAILURE OF MEMORY PCB	VISUAL CHECK		
733	FLASHING	24	FAILURE OF PCB AND MEMORY PCB	COMBUSTION STOPS AND LED STARTS FLASHING	DEFECT OF PCB AND MEMORY PCB	REPLACE PCB, MEMORY PCB AND NEUTRALIZER AT THE SAME TIME		Page30
-	LIGHTING UP	-	HOT WATER TEMPERATURE CAN NOT BE REACHED PRESET TEMPERATURE	PRESSURE OF GAS SUPPLY	CHECK GAS INLET PRESSURE(SUFFICIENT GAS INLET PRESSURE AT MAX. COMBUSTION).	Table 2		
				WATER INLET FILTER CLOG UP.	VISUAL CHECK AND CLEAN IT.			
				GAS CONTROL VALVE	CHECK MANIFOLD PRESSURE.	Table 2		
				TEMPERATURE SENSOR DEFECT (OUTGOING/INCOMING)	CHECK THE RESISTANCE IN TRANSMISSION CONNECTOR FOR SENSOR SIDE.	Table 3	Fig.8	
				REMOTE CONTROLLER DEFECT	OPERATE WATER HEATER WITHOUT REMOTE CONTROLLER AND CHECK HOT WATER 48°C/60°C/70°C			

* ABOVE CHECK METHOD IS JUST ONLY FOR CHECKING PURPOSE. DO NOT USE JUST AS ABOVE CHECKING METHOD INTACT IS IN NORMAL OPERATION.

Displays on each remote controller in communication failure.

Case	Kitchen	Bath	Ensuite
Kitchen failure	740	760	760
Bath failure	760	750	760
Ensuite failure	760	760	750
PCB failure	740	750	750

Fault findings



< Table 1 >
Resistance of Gas Valve Assembly

Lead wire	Resistance (Ω)
Yellow(C)-Orange Gas valve 1	Approx. 33
Yellow(C)-Blue Gas valve 2	Approx. 33
Yellow(C)-Green Gas valve 3	Approx. 33
Yellow(C)-Yellow Main gas valve	Approx. 26
Grey-Grey Gas control valve	Approx. 65

< Table 2 >
Gas Pressure (kPa)

Gas type	Gas supply pressure	Manifold pressure	
		Maximum	Minimum
Propane	2.75-7.0	1.20	0.210
Natural Gas	1.13-5.0	0.84	0.160

< Table 3 >
Resistance of Temperatuer Sensor

Temperature (°C)	Resistance (kΩ) (Incoming,Outgoing)	Resistance (kΩ) (Ambient)
10	Approx. 15.8	Approx. 20.5
20	Approx. 10.4	Approx. 12.6
35	Approx. 5.9	Approx. 8.0
40	Approx. 4.9	Approx. 5.2
50	Approx. 3.5	Approx. 3.5

Abbr. of color :

Y : Yellow R : Red G : Green
O : Orange BK : Black GR : Grey
BL : Blue W : White

3-5 Replacement of PCB

CAUTION

The new PCB does not have the Memory PCB.

The Memory PCB has the life-record of Neutralizer.

The Memory PCB mounted on the original PCB should be moved to the new PCB.

If not, the error code “732” (Memory PCB unattached) is displayed on the remote controller and the unit cannot be operated.

Procedure

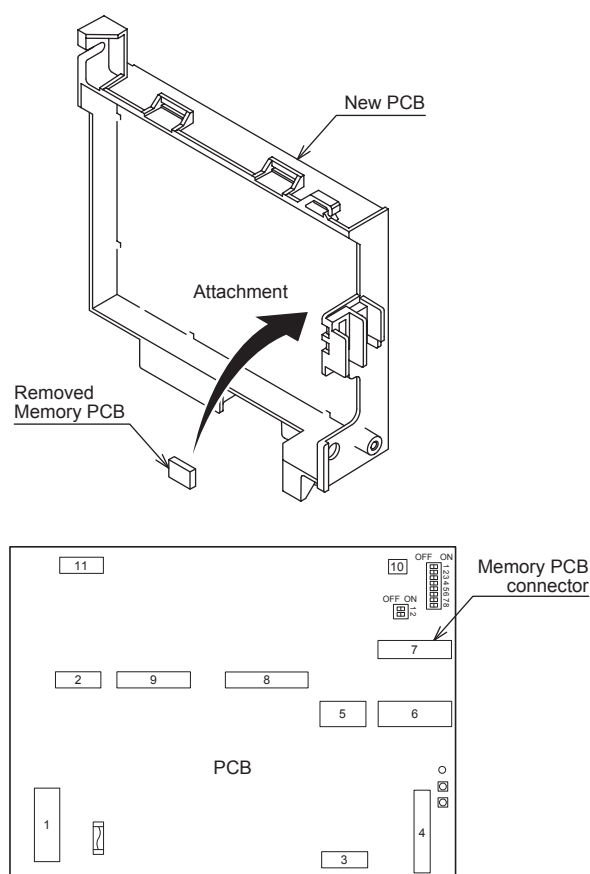
1. Unplug power supply cable.
2. Remove the PCB.
(See “Removing PCB” in page 38)
3. Remove the Memory PCB from the Memory PCB connector.
4. The Memory PCB in step 3 should be attached on the Memory PCB connector of the new PCB.
5. Replace the new PCB and insert the each connector to the new PCB.
6. Plug power supply cable.
7. Run water to the unit and check the normal combustion. Then, adjust the Gas. secondary pressure.

In case that hot water is not supplied and the error code “732” (Memory PCB unattached) is displayed, check that the Memory PCB is attached correctly. Then, unplug power supply cable and plug it again.

Note:

-Make sure to unplug power supply cable when the Memory PCB is removed from the PCB and is attached on the PCB. It can cause the damage of the data in the Memory PCB.

-The data for setting of the unit is stored in the Memory PCB. Be careful to keep it from being affected by humidity, impact or static electricity.



3-6 Replacement of Neutralizer

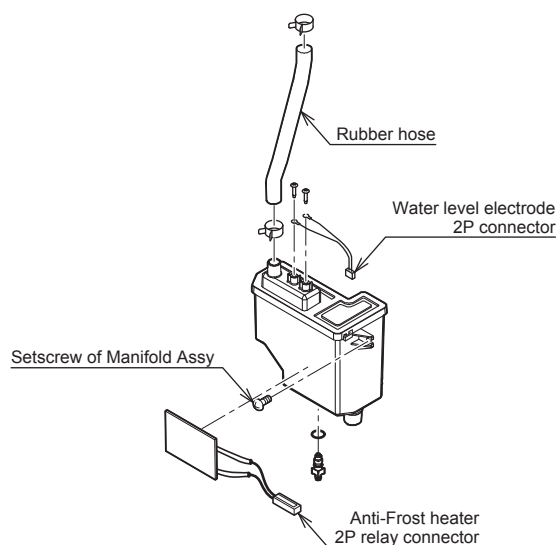
CAUTION

In replacing the Neutralizer, the Memory PCB must be replaced at the same time. The Memory PCB has the life-record of Neutralizer.

Procedure

[Replacement of neutralizer]

1. Unplug power supply cable.
2. Disconnect the drain pipe at the bottom of the Water Heater.
3. Unhook the lead wires.
4. Disconnect the Water level electrode 2P connector, the Anti-Frost heater 2P relay connector and the outgoing temperature sensor connector.
5. Pull out the rubber hose from the Neutralizer removing the hose band.
6. Remove the setscrew of Manifold Assy.
7. Pull up and remove the Neutralizer.
8. Attach the new Neutralizer.
9. Put the setscrew of Manifold Assy and the rubber hose back into place.
10. Reconnect the connectors disconnected at "Step 4" and hang the lead wires on the hook of Neutralizer.



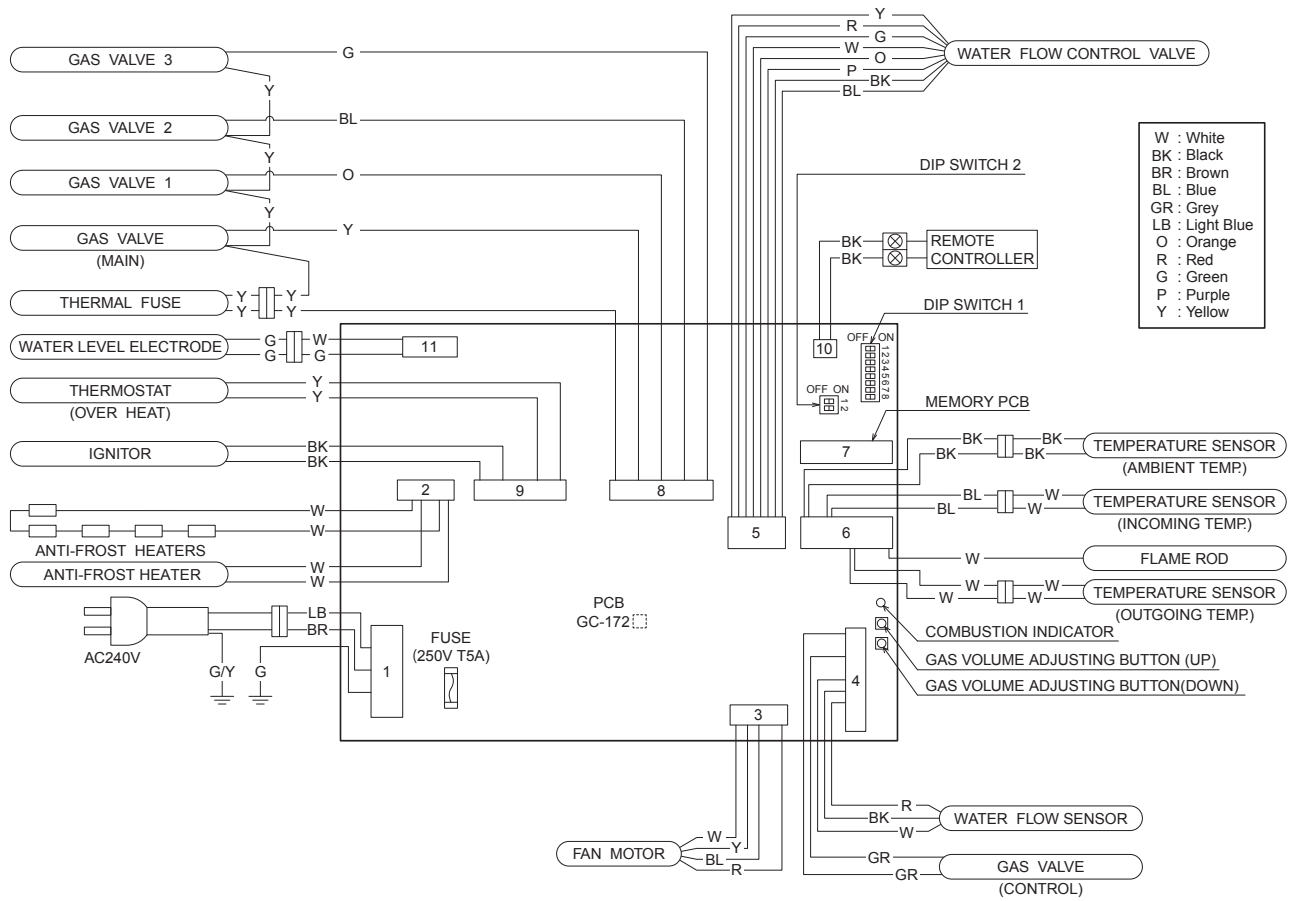
[Replacement of Memory PCB]

1. Unhook the lead wires from the PCB claw and then, remove the setscrew fixing the PCB case.
2. Pull the PCB forward. (It's not necessary to remove it.)
3. Remove the Memory PCB from the PCB and attach the new Memory PCB (MC-31) on the PCB.
4. Put the PCB back into place. Fix the PCB case with setscrew and hang the lead wires on the claw.
5. Plug power supply cable.
6. Run water to the unit and check the normal combustion.

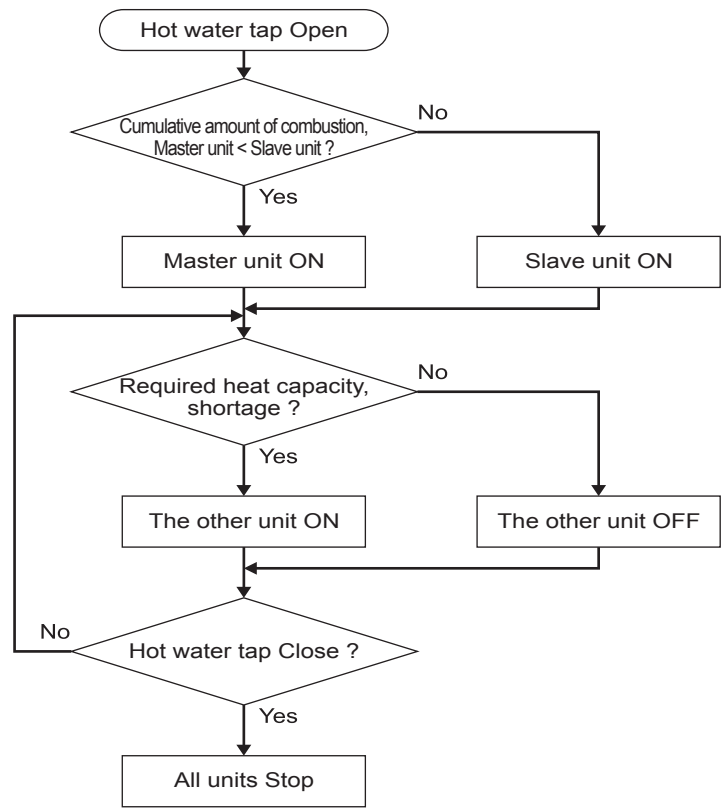
Note:

-Make sure to unplug power supply cable when the Memory PCB is removed from the PCB and is attached on the PCB. It can cause the damage of the data in the Memory PCB.
-The data for setting of the unit is stored on the Memory PCB. Be careful to keep it from being affected by humidity, impact or static electricity.

3-7 Wiring Diagram



3-8 Cascade Flow Charts



3-9 Manifold Gas Setting Procedure

1. Preparation

- (1) Make sure the appliance is not in operation. Then, remove the screw from the pressure check hole.
- (2) Connect the hose of the manometer to the pressure check hole.

2. Adjusting nozzle pressure settings <Minimum pressure should be set before setting the maximum pressure.>

- (1) Make sure that “Dip Switch” No. 1 on PCB is set to the position for the appropriate gas type. If installation is a cascade type, change the dip switch block No.2 to all OFF and remove wires from Remote controller Connection Terminals.
- (2) After igniting for combustion by opening the hot water supply valve, set “Dip Switch” No. 5 to ON position to set the combustion at a minimum capacity level. By pressing the Gas Volume Adjusting Button under the “Remote Controller Connection Terminals”, set the gas amount for the minimum capacity level.
- (3) Shut the hot water supply valve. Open the valve again for combustion. Repeat the steps (2) to check that the settings are correct.
- (4) With the combustion going on, set “Dip Switch” No.6 to ON position to set the combustion at a maximum capacity level. At this time, a substantial amount of water should be supplied. (As the maximum capacity is forced, if the water inlet temperature is high, the heated water may reach boiling point.)
- (5) Set the gas amount for the maximum capacity level by pressing the Gas Volume Adjusting Button.
- (6) Shut the hot water supply valve. Open the valve again for combustion. Repeat the steps (5) to check that the settings are correct.
- (7) Set “Dip Switch” No. 5 and 6 to OFF.
- (8) Shut the hot water supply valve to stop combustion. Disconnect the rubber hose of the manometer from the pressure check hole. Seal the hole by installing and tightening the screw. After tightening the screw, make sure there is no gas leak.
- (9) In the event that is connected to cascade type, follow the “CASCADE SET UP” in the installation instructions.(page21)
- (10) For minimum and maximum manifold pressures please refer to Gas Pressure Table.

Gas Pressure (kPa)

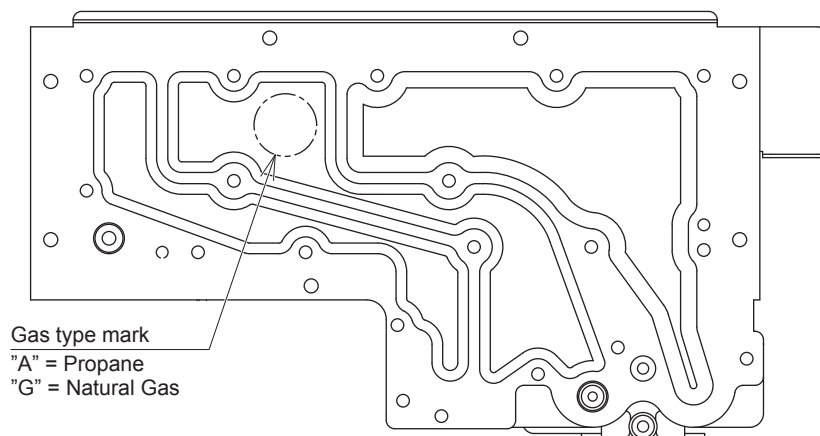
Gas type	Gas supply pressure	Manifold pressure	
		Maximum	Minimum
Propane	2.75-7.0	1.20	0.210
Natural Gas	1.13-5.0	0.84	0.160

3-10 Combustion Specification, Various Combination Setting

Combustion specifications

Gas type	Gas consumption [MJ/h]	Manifold Assy			Gas type Dip Switch on PCB
	Maximum	Gas type mark	Nozzle diameter (mm)		
			Rich [Top side]	Lean [Bottom side]	
Propane	173	A	Φ0.70×17 pcs	Φ1.00×17 pcs	DipSw. No.1 : OFF
Natural Gas		G	Φ1.00×17 pcs	Φ1.50×17 pcs	DipSw. No.1 : ON

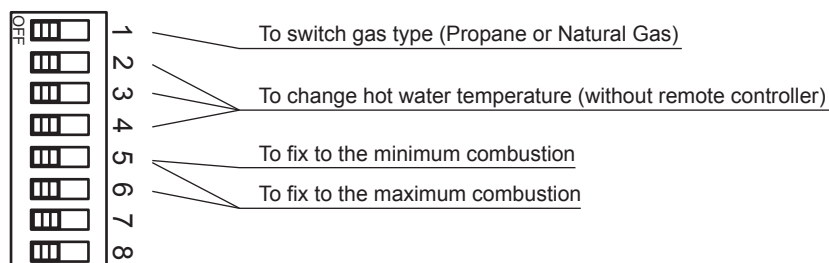
Manifold Assy



Comfort Dip Switch Setting Pattern(Various Combination Setting)

<Dip Switch>

(The illustrated switch settings show the factory settings for the Propane and 60°C preset.)



• Switching gas type

Dip SW setting for gas type	Applicable gas type
No. 1	
OFF	Propane
ON	Natural Gas

• Changing hot water temperature (when the remote controller is not connected, the hot water temperature setting can be changed by selecting one of these settings.)

Dip SW settings for different temperature			Temperature (°C)
No. 2	No. 3	No. 4	
OFF	ON	OFF	48
OFF	OFF	OFF	60
OFF	OFF	ON	70

- * Setting change after the power is turned on is ineffective.
- * The system recognizes the settings and makes them effective before power is turned on.
- * When the remote controller is connected, the Dip SW settings become ineffective.
- * Instructions for delivery temperature adjustment for 50°C preset model are located in the pocket inside the appliance front cover.

■ Delivery Temperature Adjustment for 50°C Preset Model

This instruction must be read in conjunction with the Operating & Installation instructions and the caution sheet “Instructions for units supplied set at 50°C to comply with AS 3498” which are supplied with the appliance.

Application

This instruction applies only to appliances labelled “50°C Preset” on the front cover.

Background

“50°C preset” appliances are “Factory Set” to deliver a maximum temperature not exceeding 50°C. However, they have an incremental adjustment mechanism that allows the installer to increase the appliance delivery temperature incrementally from the “Factory Set” value to temperatures exceeding 50°C. This is intended to enable compensation for temperature losses in the pipework between the water heater and any outlets and achieve the required temperature at the outlet.

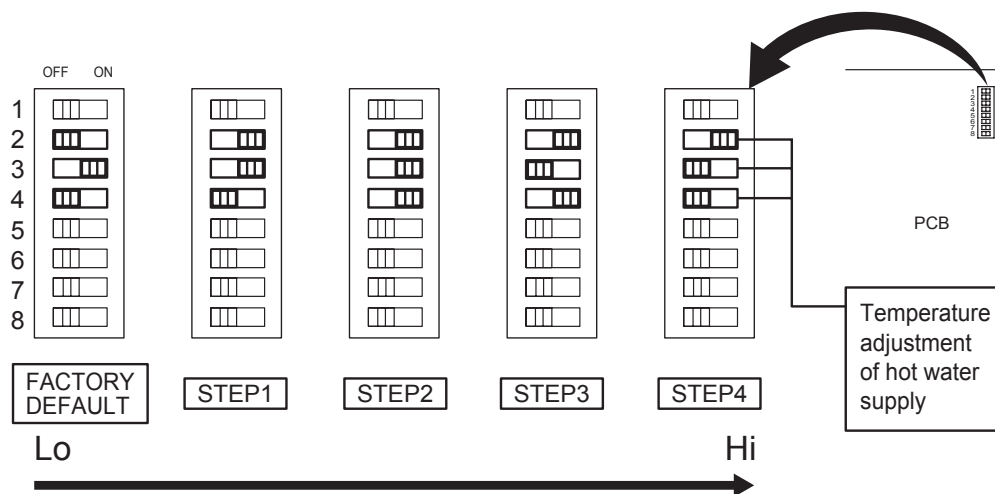
This instruction contains the procedure steps for carrying out such adjustment.

Procedure Steps - Delivery Temperature Adjustment

Measure the maximum hot water temperature from the sanitary fixture used primarily for the purposes of personal hygiene that is closest to the hot water heater (for example, a shower outlet in the bathroom closest to the water heater) as follows.

1. Unplug power supply cable to the unit.
2. Move up one notch on dip switch from the existing step. (Factory preset mode is “FACTORY DEFAULT”. See Table 1 Dip Switch setting (page 37))
3. Plug power supply cable to the unit.
4. Open the tap. When flow rate and temperature become stable, measure the stabilised hot water temperature. (It should be 48°C)
5. If the temperature is less than the appropriate temperature (refer to 4), return to 1 and adjust again.

Table 1 Dip Switch Setting



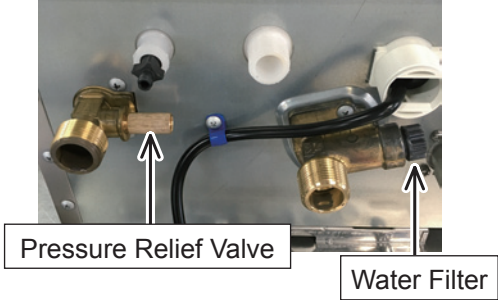
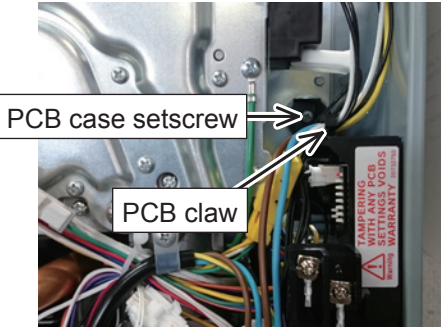
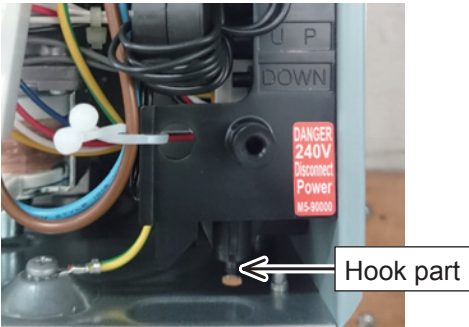
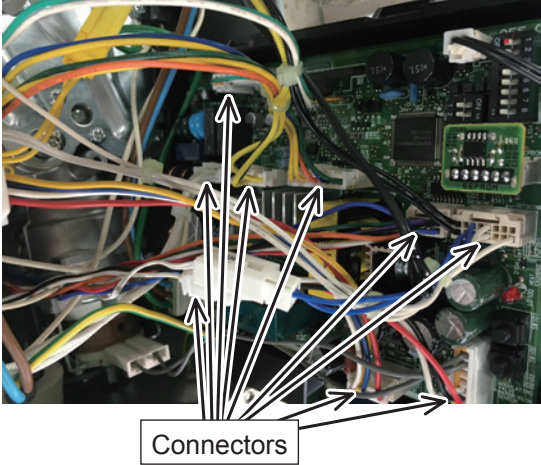
⚠ Warning

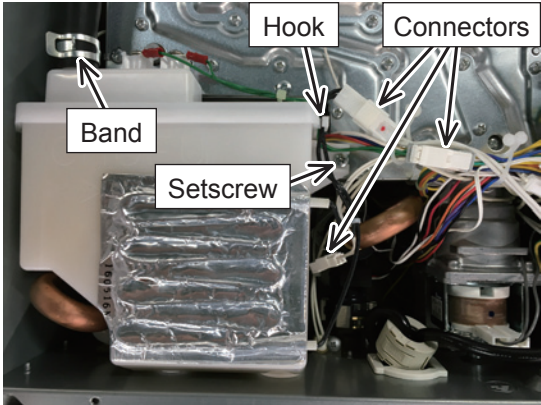
- Ensure building occupants do not have access to any hot water outlets during this procedure.
- If the hot water temperature from ANY outlets used primarily for the purposes of personal hygiene exceed 48°C after temperature adjustment in step has been performed, check your work and repeat the temperature delivery adjustment procedure as required. Temperatures exceeding 48°C from any outlets primarily used for the purposes of personal hygiene do not comply with AS3500 and may contravene local regulations.

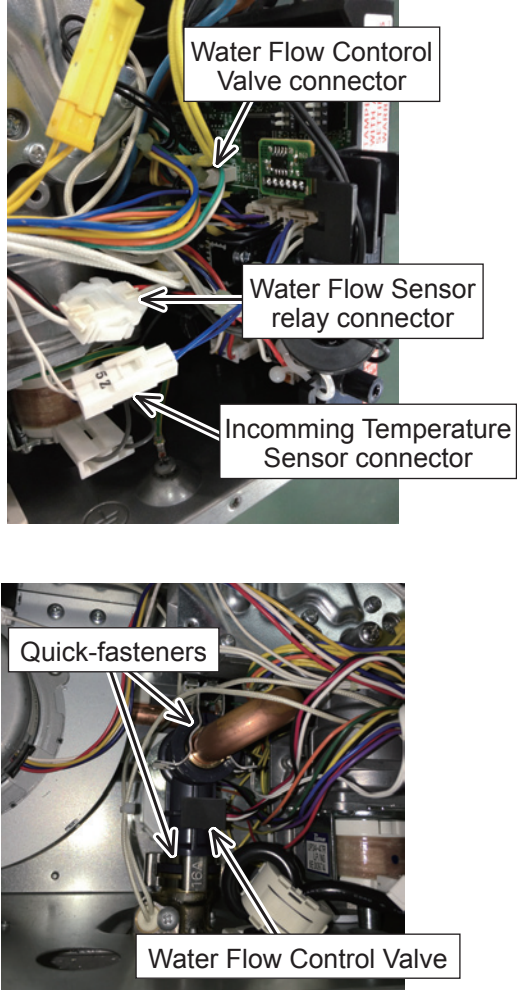
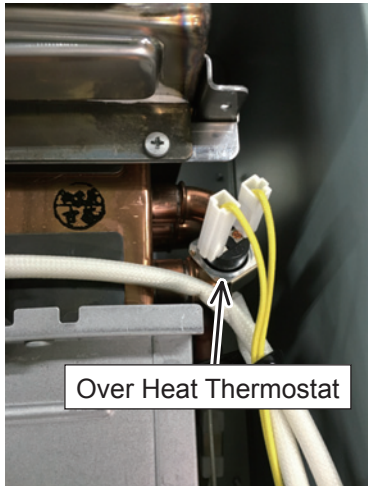
Guidance Note for Table 1 “Dip Switch Setting”

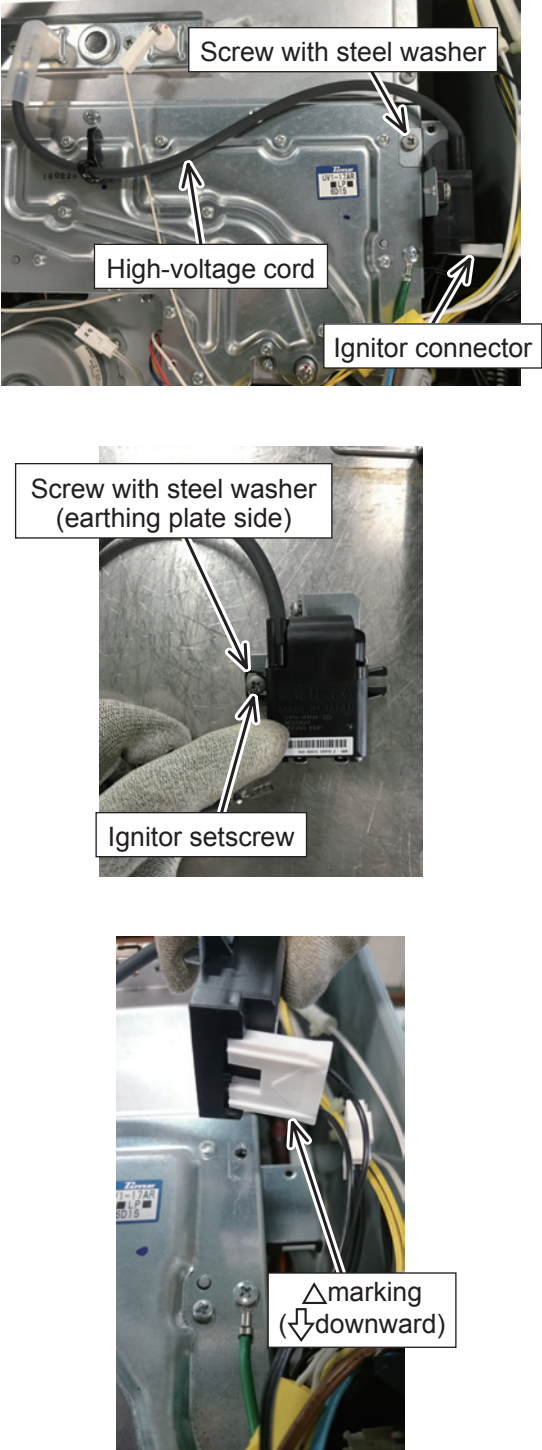
For a given installation, temperature loss is typically greatest in winter when ambient air and water temperatures are lowest. Conversely, temperature loss is typically lowest in summer when these ambient temperatures are highest. It follows that the delivery temperature of water flowing through outlets is typically higher in summer than it is in winter. The installer is to take into consideration the effects of these seasonal variations in ambient temperatures when carrying out temperature adjustments.

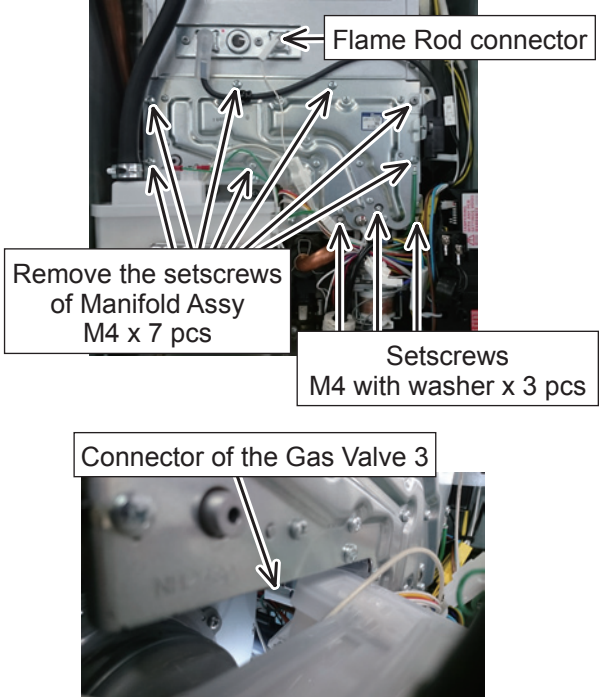
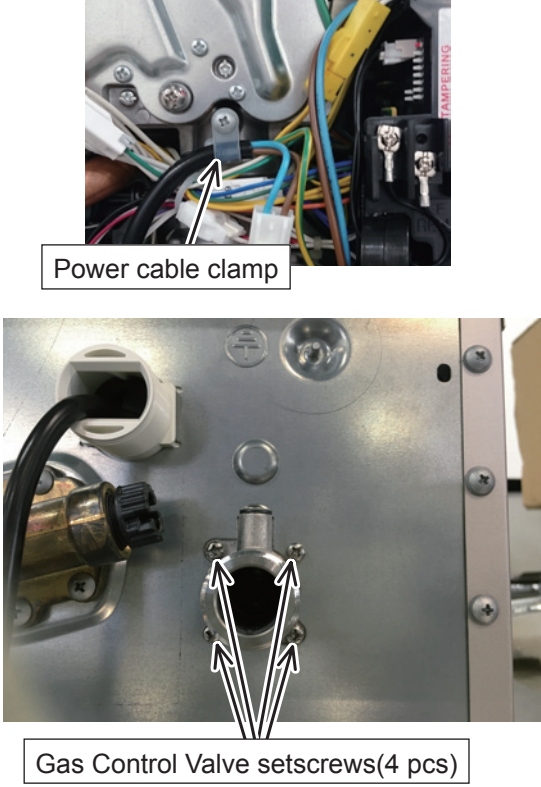
3-11 Disassembling/Assembling Parts

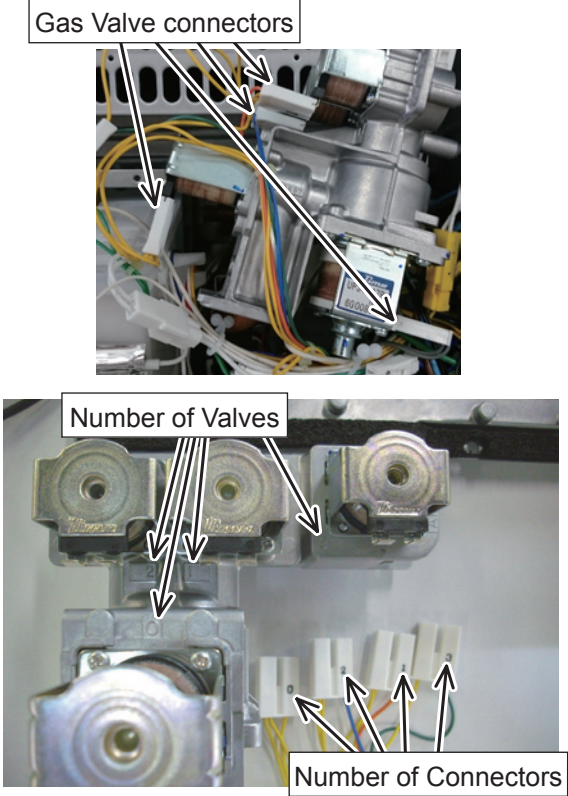
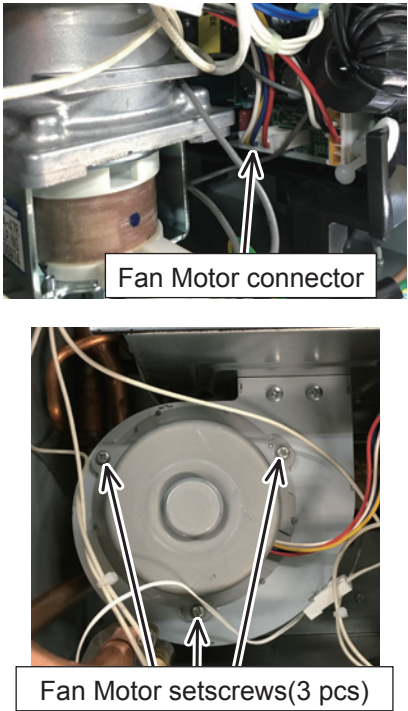
Procedure	Illustration
<p>When the unit is disassembled or assembled, turn off the power and drain water.</p>	 <p>Pressure Relief Valve</p> <p>Water Filter</p>
<p>Removing PCB</p> <p>(1) Remove the setscrew fixing the PCB case and lead wires from the PCB claw. To remove the hook part of the PCB case from the bottom panel, lift the case up slightly and pull it out.</p> <p>(2) Disconnect the connectors (9 pcs) from the PCB.</p> <p>(3) If remote controllers are connected, disconnect the remote controller cables.</p>	 <p>PCB case setscrew</p> <p>PCB claw</p>  <p>Hook part</p>  <p>Connectors</p>

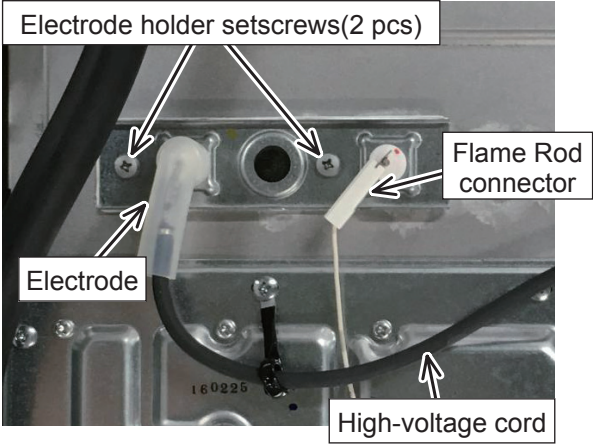
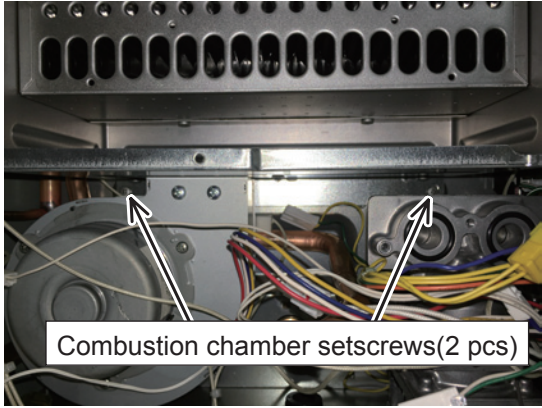
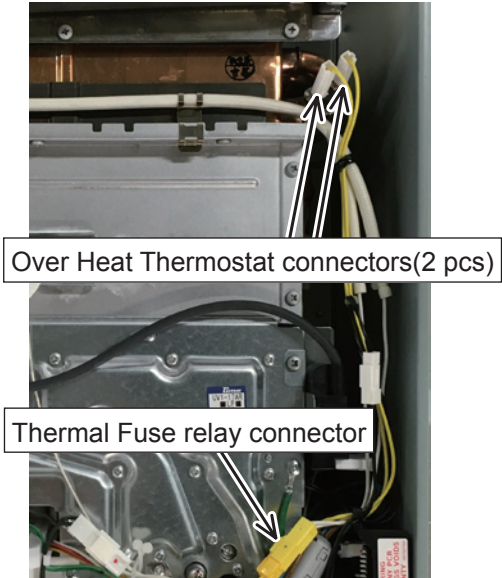
Procedure	Illustration
<p>Removing Neutralizer.</p> <p>(1) Disconnect the drain pipe at the bottom of the Water Heater.</p> <p>(2) Unhook the lead wires.</p> <p>(3) Disconnect Water Level Electrode 2P connector, Anti-Frost Heater 2P relay connector and Outgoing Temperature Sensor connector.</p> <p>(4) Pull out the rubber hose from the Neutralizer removing the band.</p> <p>(5) Remove the setscrew of Manifold Assy.</p> <p>(6) Pull up and remove the Neutralizer.</p>	

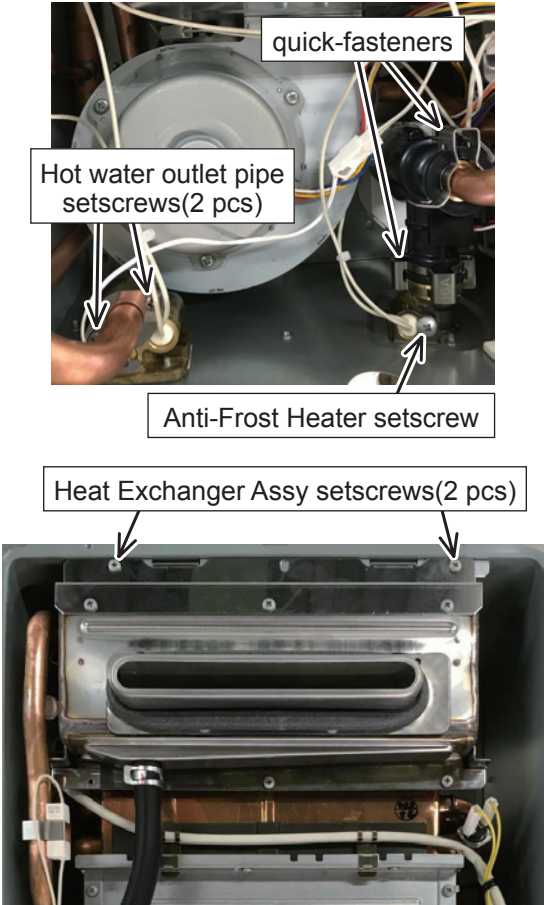
Procedure	Illustration
<p>Removing Water Flow Control Valve.</p> <p>(1) Remove the setscrew fixing the PCB case. Lift the case up and pull it out.</p> <p>(2) Disconnect Water Flow Control Valve 8P connector(on PCB side), Water Flow Sensor 3P relay connector and Incoming Temperature Sensor connector.</p> <p>(3) Remove the 2 quick-fasteners and take out Water Flow Control Valve.</p>	 <p>Water Flow Control Valve connector</p> <p>Water Flow Sensor relay connector</p> <p>Incomming Temperature Sensor connector</p> <p>Quick-fasteners</p> <p>Water Flow Control Valve</p>
<p>Removing Over Heat Thermostat</p> <p>(1) Disconnect the Over Heat Thermostat connectors (2 pcs).</p> <p>(2) Pull the Over Heat Thermostat forward.</p>	 <p>Over Heat Thermostat</p>

Procedure	Illustration
<p>Removing Ignitor</p> <p>(1) Disconnect the high-voltage cord. Remove the setscrew retaining the Ignitor from Manifold Assy. (Screw with steel washer is used for Ignitor earthing.)</p> <p>(2) Pull out the Ignitor.</p> <p>(3) Disconnect the Ignitor 2P connector.</p> <p>(4) Remove the setscrew retaining the Ignitor.</p> <p>(Attention) When inserting the connector to the Ignitor, Δ marking should face downward like the illustration. If reverse side, it can be disconnected.</p>	 <p>The illustration consists of three photographs showing the removal of the ignitor from the manifold assembly.</p> <ul style="list-style-type: none"> The top photograph shows the ignitor mounted on the manifold. Labels point to the 'Screw with steel washer' used for earthing, the 'High-voltage cord', and the 'Ignitor connector'. The middle photograph shows the ignitor being pulled out. Labels point to the 'Screw with steel washer (earthing plate side)' and the 'Ignitor setscrew'. The bottom photograph shows the 2P connector being disconnected. A label points to the 'Δ marking (↓downward)', indicating the correct orientation for the connector.

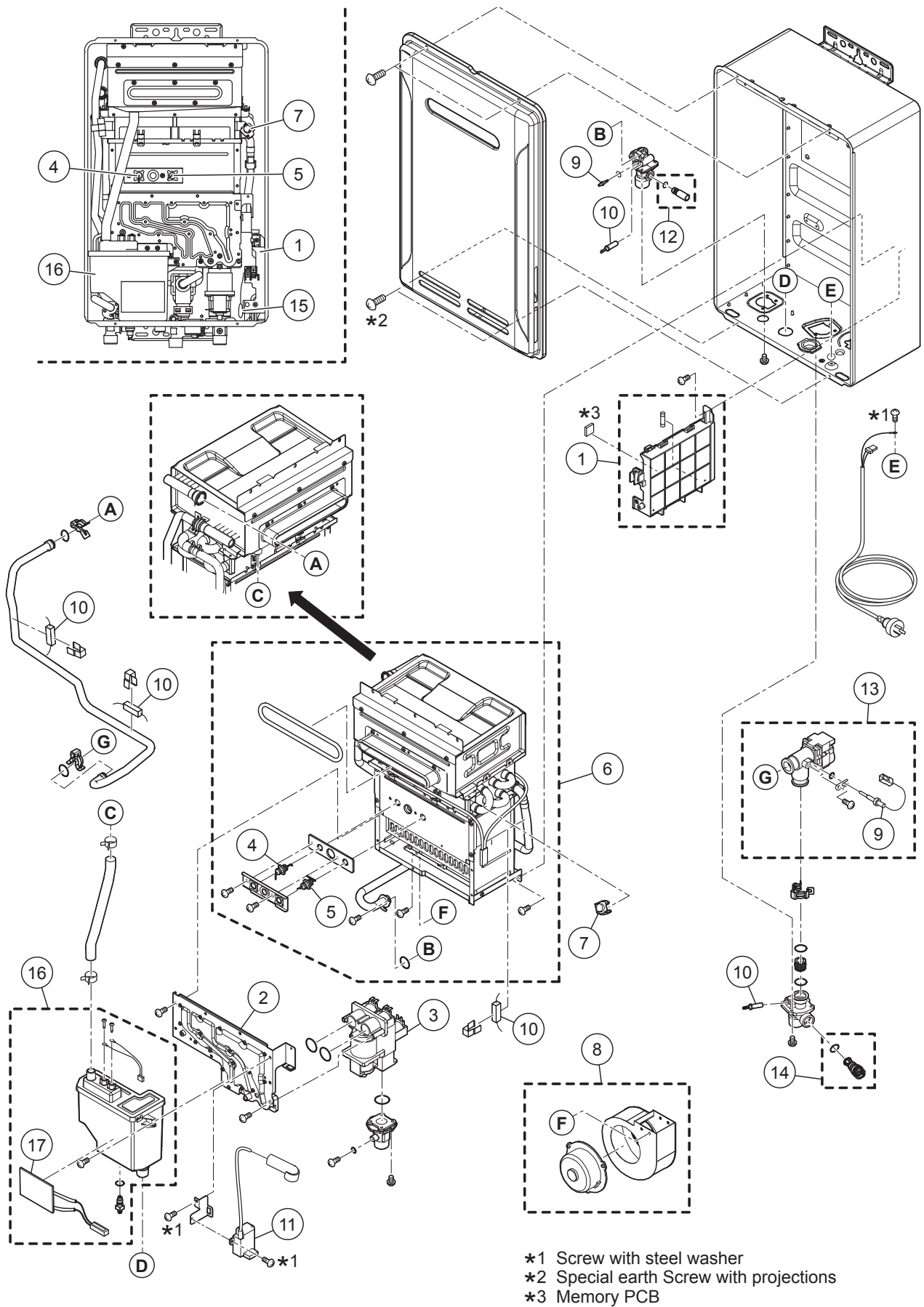
Procedure	Illustration
<p>Removing Manifold Assy</p> <p>(1) Disconnect Flame Rod connector.</p> <p>(2) Remove Ignitor. (see previous step)</p> <p>(3) Remove the setscrew fixing the PCB case. Lift the case up and pull it out.</p> <p>(4) Remove the setscrews fixing the Manifold Assy (M4 x 7 pcs, M4 with washer x 3 pcs).</p> <p>(5) Pull the connector of the Gas Valve 3.</p>	 <p>Flame Rod connector</p> <p>Remove the setscrews of Manifold Assy M4 x 7 pcs</p> <p>Setscrews M4 with washer x 3 pcs</p> <p>Connector of the Gas Valve 3</p>
<p>Removing Gas Control Valve</p> <p>(1) Remove Manifold Assy. (see previous step)</p> <p>(2) Remove setscrew of Power cable clamp.</p> <p>(3) Remove setscrews(4 pcs).</p>	 <p>Power cable clamp</p> <p>Gas Control Valve setscrews(4 pcs)</p>

Procedure	Illustration
<p>(4) Pull the Gas Control Valve out and disconnect from the Gas Valves (4 pcs) and remove them as one unit.</p> <p>(Attention) When connecting, the number of connectors should match with the one of valves marked on Manifold Assy.</p>	 <p>Gas Valve connectors</p> <p>Number of Valves</p> <p>Number of Connectors</p>
<p>Removing Fan Motor</p> <p>(1) Remove Neutralizer. (see previous step)</p> <p>(2) Remove the setscrew fixing the PCB case. Lift the case up and pull it out.</p> <p>(3) Disconnect the connector for Fan Motor from the PCB.</p> <p>(4) Remove the setscrews (3 pcs) fixing the Fan Motor to pull it out forward.</p>	 <p>Fan Motor connector</p> <p>Fan Motor setscrews(3 pcs)</p>

Procedure	Illustration
<p>Removing Electrode and Flame Rod</p> <p>(1) Disconnect high-voltage cord and Flame Rod connector.</p> <p>(2) Remove setscrews (2 pcs) fixing the Electrode holder to pull the holder out.</p>	
<p>Removing Heat Exchanger Assy.</p> <p>(1) Remove Neutralizer and Manifold Assy. (see previous step)</p> <p>(2) Remove setscrews (2 pcs) fixing the combustion chamber.</p> <p>(3) Remove the setscrew fixing the PCB case. Lift the case up and pull it out.</p> <p>(4) Disconnect the following connectors:</p> <ol style="list-style-type: none"> 1. Thermal Fuse (front) 2P relay connector. 2. Anti-Frost Heaters 2P connector from the PCB. 3. Fan Motor 4P connector from the PCB. 4. Over Heat Thermostat connectors (2 pcs) and other connected items. 	 

Procedure	Illustration
<p>(5) Remove setscrews (2 pcs) retaining the hot water outlet pipe.</p> <p>(6) Remove the 2 quick-fasteners and setscrew fixing the Anti-Frost Heater.</p> <p>(7) Remove setscrews (2 pcs) retaining the Heat Exchanger Assy.</p> <p>(8) Pull the Heat Exchanger Assy forward to take it out.</p> <p>Note : If any gaskets or seals are damaged or torn during disassembling, they must be replaced.</p>	 <p>The illustration consists of two photographs. The top photograph shows a close-up of the water heater's internal components. Arrows point to 'quick-fasteners' (two), 'Hot water outlet pipe setscrews (2 pcs)' (two), and an 'Anti-Frost Heater setscrew' (one). The bottom photograph shows the heat exchanger assembly being pulled forward. Arrows point to 'Heat Exchanger Assy setscrews (2 pcs)' (two).</p>

3-12 Exploded View



3-13 Parts List

No.	PARTS NAME	No.	PARTS NAME
1	PCB(Natural Gas)	9	Temperature Sensor
	PCB(Propane)	10	Anti-Frost Heaters
2	Manifold Assy(Natural Gas)	11	Ignitor
	Manifold Assy(Propane)	12	Pressure Relief Valve
3	Gas Control Valve	13	Water Flow Control Valve(with Sensor)
4	Electrode	14	Water Filter
5	Flame Rod	15	Ambient Temperature Sensor
6	Heat Exchanger Assy	16	Neutralizer Assy *
7	Over Heat Thermostat	17	Anti-Frost Heater for Neutralizer
8	Fan Motor		

*For spare parts, the Neutralizer Assy includes the Memory PCB.