



Heat Pump Water Heater

CAHP-80/120/120C



User Guide

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1 Important Safety Information

Please read all of the instructions thoroughly before the installation and operation of the water heater. Please keep this manual for future reference.

- Under no circumstance will A.O.SMITH Company be held liable for any damage that caused by failure to comply with the installation and operation instructions outlined in this manual. Only qualified persons authorized by the manufacturer can perform the installation, the service and the maintenance of the water heater.
- Keep necessary space for water heater installation. Failure to comply with the requirements of installation can affect the performance of the water heater.
- Please perform inspection and necessary maintenance regularly after the installation and operation of the water heater. If you find the water heater operating abnormally, stop the operation of the unit immediately, and call service phone to service the unit at once to ensure the normal, safe and reliable operation of the water heater.
- Do not insert fingers or other stuff into the fan guard to avoid hurt or damage. Do not touch the fan motor surface to avoid high temperature hurt.
- Please inspect and replace the anode regularly because it is a consumable part. It is recommended that the replacement change interval be 2 to 3 years. You can call service phone to reserve buying and replacing a new anode, which will extend the life of the water heater.
- The water heater has the risk of causing severe scalds. Please mix hot water with cold water before bathing or showering.
- If the water heater is subjected to dry fire, it will produce steam or hot water with high temperature, which is in risk of causing severe scalds. The water heater should be fully filled with water. If it is subjected to dry fire, please disconnect the power supply, shut off the water supply and stop the operation of the unit immediately, and call service phone to contact a qualified person to inspect and service the unit.
- If any component of the water heater has been immersed in water, it should be inspected or serviced by a qualified person before being employed.
- For the water heater provided with a power cord, the power cord replacement should be performed by a service department or a person qualified by the manufacturer if it is damaged. Electrical insulation and thermal insulation have been provided for the important components of the water heater.
- The water heater is provided with a temperature and pressure relief valve, whose installation location should not be changed privately and whose outlet should not be blocked for the security of utilization. The temperature and pressure relief valve should be connected to an adequate discharge line, which is continuously downward without any knot, and the discharge line should be terminated at a floor drain directly.
- The outlet water (including the hot water with high temperature) of the water heater should not be provided as potable water.
- The water heater should be connected to a separate branch circuit. Please check the electricity meter, the circuit breaker and the wire size to make sure that they comply with the rated current of the water heater. Call a qualified electrician to check them in case of

need.

- The power supply socket should be mounted in dry places where there is no moisture, and please do not touch the electrical parts with wet hands. Failure to do so can result in electric shock, injury and the equivalent.
- Damaged wires or ageing, loosening or unfastened power supply plug should not be used. Failure to do so can result in electric shock, short circuit or fire. It should be confirmed that the power supply plug contacts with the receptacle tightly.
- In order to reduce the operation cost, the hot water outlet tubes should be properly insulated.
- Disconnect the power supply before performing any maintenance or service. Only qualified persons authorized by the manufacturer can perform the maintenance and service.
- The manufacturer or seller of the water heater will not be liable for any damage caused by unauthorized installation. These damages include but not limited to leakage of coils, dropping of the unit, the abnormal operation and poor performance caused by improper installation, adverse effect and damage of water heater, and all relevant losses.

A.O.SMITH WATER HEATER COMPANY LTD. reserves the rights of final interpretation of the above terms.

CAUTION: Failure to comply with the requirements of this manual can result in fire, property loss, injury or death.

WARNING: The power supply should be grounded reliably before energizing the unit, and it is forbidden to operate the water heater without reliable grounding! The water heater must be provided with floor drain with good drainage nearby, and located in an area where leakage of the water heater or a connection will not result in damage to the area adjacent to the water heater or to lower floors of the structure.

2 Physical and Technical Specifications

2.1 CAHP-80 Physical and Technical Specifications

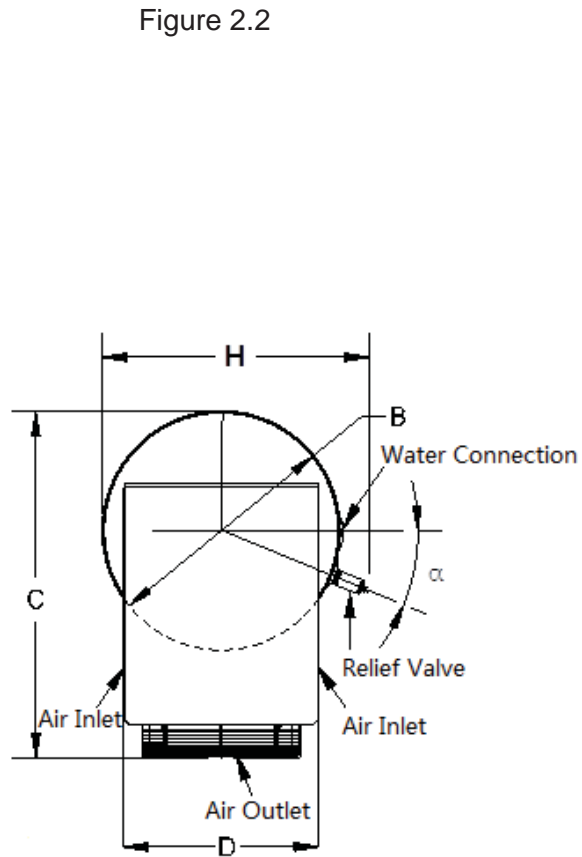
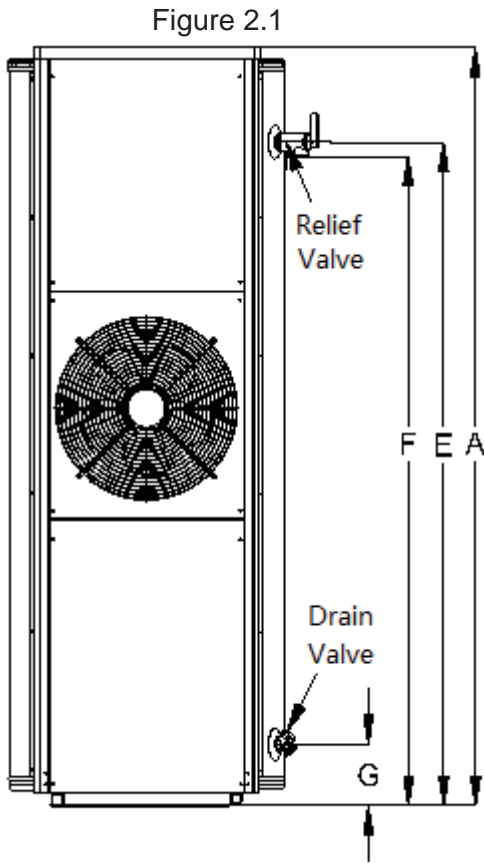


Table 2.1 Physical Dimensions

Total Height A (mm)	Tank Diameter B (mm)	Maximum Depth C (mm)	Service Panel Width D (mm)	Relief Valve Height E (mm)	Water Outlet Height F (mm)	Water Inlet Height G (mm)	Relief Valve Angle α (°)	Maximum Width H (mm)
1670	610	901	503	1457	1427	135	22	686

Table 2.2 Technical Specifications

Model Number			CAHP-80-6	CAHP-80-8	CAHP-80-10	CAHP-80-12
Model Type		/	Outdoor Integrated Heat Pump Water Heater			
HP Rated Power ⁽¹⁾	380V/3N/60Hz	kW	1.25			
	220V/1N/60Hz	kW	1.25			
	400V/3N/50Hz	kW	0.98			
	230V/1N/50Hz	kW	0.98			
HP Rated Heating Capacity ⁽¹⁾	380V/3N/60Hz	kW	4.13			
	220V/1N/60Hz	kW	4.13			
	400V/3N/50Hz	kW	3.5			
	230V/1N/50Hz	kW	3.5			
Unit Maximum	380V/3N/60Hz	kW	9.7 (5.9) ⁽²⁾	12.3 (7.2)	14.8 (8.5)	17.4 (9.7)

Power	220V/1N/60Hz	kW	9.7 (5.9) ⁽²⁾	12.3 (7.2)	14.8 (8.5)	17.4 (9.7)
	400V/3N/50Hz	kW	9.3 (5.5) ⁽²⁾	11.9 (6.8)	14.4 (8.1)	17.0 (9.3)
	230V/1N/50Hz	kW	9.3 (5.5) ⁽²⁾	11.9 (6.8)	14.4 (8.1)	17.0 (9.3)
Unit Maximum Heating Capacity	380V/3N/60Hz	kW	10.13 (7.13)	12.13 (8.13)	14.13 (9.13)	16.13 (10.13)
	220V/1N/60Hz	kW	10.13 (7.13)	12.13 (8.13)	14.13 (9.13)	16.13 (10.13)
	400V/3N/50Hz	kW	9.5 (6.5)	11.5 (7.5)	13.5 (8.5)	15.5 (9.5)
	230V/1N/50Hz	kW	9.5 (6.5)	11.5 (7.5)	13.5 (8.5)	15.5 (9.5)
Maximum Operation Current	380V/3N/60Hz	A	15.8	21	26.3	31.5
	220V/1N/60Hz	A	41.6 (25.8)	52 (31)	62.6 (36.3)	73 (41.5)
	400V/3N/50Hz	kW	15.8	21	26.3	31.5
	230V/1N/50Hz	A	39.1 (23.3)	49.5 (28.5)	60.1 (33.8)	70.5 (39)
Refrigerant		/	R134a			
Refrigerant Charge Quantity	50Hz	g	1000			
	60Hz	g	1100			
Electrical Heating Capacity		kW	6 (3)	8 (4)	10 (5)	12 (6)
Tank Capacity		L	300			
Hot Water Delivering Rate / Efficiency	380V/3N/60Hz	L/h	89	89	89	89
	220V/1N/60Hz	L/h	89	89	89	89
	400V/3N/50Hz	L/h	75	75	75	75
	230V/1N/50Hz	L/h	75	75	75	75
Hot Water Delivering Rate / High Demand	380V/3N/60Hz	L/h	218 (153.5)	261 (175)	304 (196.5)	347 (218)
	220V/1N/60Hz	L/h	218 (153.5)	261 (175)	304 (196.5)	347 (218)
	400V/3N/50Hz	L/h	204 (139.5)	247 (161)	290 (182.5)	333 (204)
	230V/1N/50Hz	L/h	204 (139.5)	247 (161)	290 (182.5)	333 (204)
Max. Water Temperature In Efficiency Mode		°C	65			
Operation Temperature Range		°C	35~82			
Ambient Temperature for HP		°C	5~48			
Ambient Temperature for Unit		°C	-15~50			
Unit Operation Noise ⁽³⁾		dB(A)	52 (50Hz) / 57 (60Hz)			
Air Outlet Noise ⁽³⁾		dB(A)	58 (50Hz) / 60 (60Hz)			
Dimensions (L×W×H)		mm	901×686×1670			
Net Weight		kg	165			
Operation Weight		kg	465			
Anode		/	Aluminum Rod, Magnesium Rod			
Control Mode		/	LCD Wire Display (Standard 10m, Optional Maximum 30 m)			
Operation Mode		/	Efficiency, High Demand			
Other Control Functions		/	Timer, Anti freezing, Fault Alarming, Water Pump Controlling			
Power Supply Specification		/	220V/1N/60Hz&380V/3N/60Hz&230V/1N/50Hz&400V/3N/50Hz			
Connection Size	Water Inlet	/	NPT 3/4 (Female Thread)			
	Water Outlet	/	NPT 3/4 (Female Thread)			
	T&P Relief Valve	/	NPT 3/4 (Female Thread)			
	Drain Valve	/	NPT 3/4 (Female Thread)			

- (1) Heat pump performance is the mean performance under condition “20 (dry bulb) / 15 (wet bulb) °C ambient temperature and 15°C to 55°C water temperature”.
- (2) The parameters in parentheses are for one heating element operation mode.
- (3) Sound Pressure Level@1m.

2.2 CAHP-120 Physical and Technical Specifications

Figure 2.3

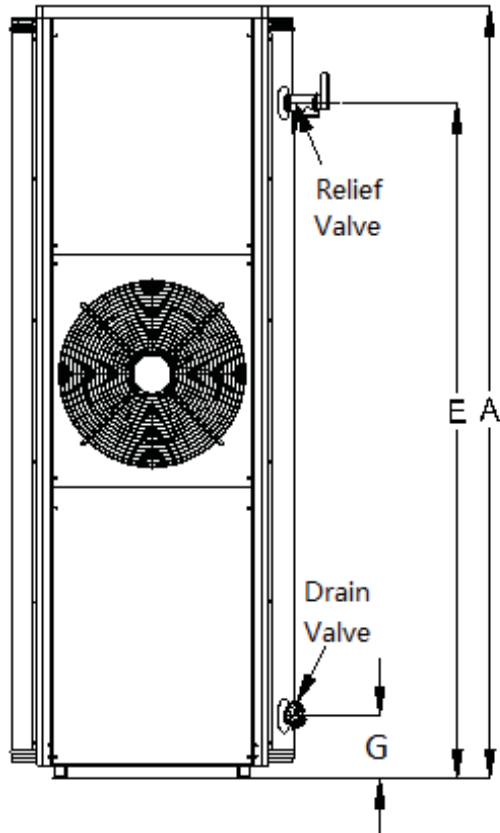


Figure 2.4

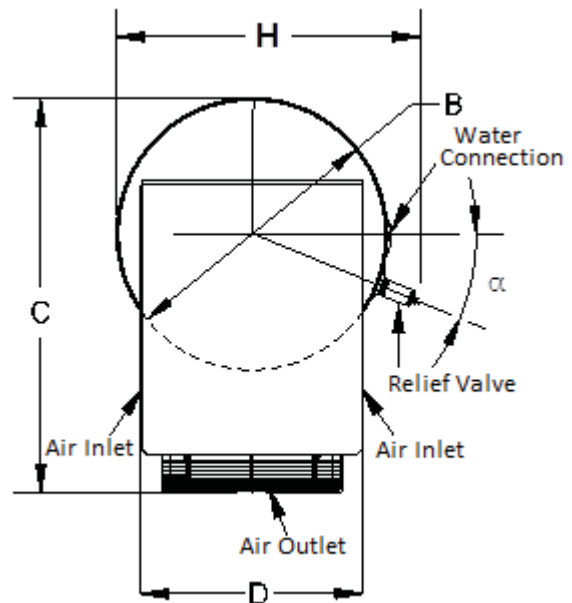


Table 2.3 Physical Dimensions

Total Height A (mm)	Tank Diameter B (mm)	Maximum Depth C (mm)	Service Panel Width D (mm)	Relief Valve and Water Outlet Height E (mm)	Drain Valve and Water Inlet Height G (mm)	Relief Valve Angle α (°)	Maximum Width H (mm)
1700	711	1002	503	1467	144	22	770

Table 2.4 Technical Specifications

Model Number		CAHP-120-6	CAHP-120-8	CAHP-120-10	CAHP-120-12
Model Type		/ Outdoor Integrated Heat Pump Water Heater			
HP Rated Power ⁽¹⁾	380V/3N/60Hz	kW		1.25	
	220V/1N/60Hz	kW		1.25	
	400V/3N/50Hz	kW		0.98	
	230V/1N/50Hz	kW		0.98	
HP Rated	380V/3N/60Hz	kW		4.13	

Heating Capacity ⁽¹⁾	220V/1N/60Hz	kW	4.13			
	400V/3N/50Hz	kW	3.5			
	230V/1N/50Hz	kW	3.5			
Unit Maximum Power	380V/3N/60Hz	kW	9.7 (5.9) ⁽²⁾	12.3 (7.2)	14.8 (8.5)	17.4 (9.7)
	220V/1N/60Hz	kW	9.7 (5.9) ⁽²⁾	12.3 (7.2)	14.8 (8.5)	17.4 (9.7)
	400V/3N/50Hz	kW	9.3 (5.5) ⁽²⁾	11.9 (6.8)	14.4 (8.1)	17.0 (9.3)
	230V/1N/50Hz	kW	9.3 (5.5) ⁽²⁾	11.9 (6.8)	14.4 (8.1)	17.0 (9.3)
Unit Maximum Heating Capacity	380V/3N/60Hz	kW	10.13 (7.13)	12.13 (8.13)	14.13 (9.13)	16.13 (10.13)
	220V/1N/60Hz	kW	10.13 (7.13)	12.13 (8.13)	14.13 (9.13)	16.13 (10.13)
	400V/3N/50Hz	kW	9.5 (6.5)	11.5 (7.5)	13.5 (8.5)	15.5 (9.5)
	230V/1N/50Hz	kW	9.5 (6.5)	11.5 (7.5)	13.5 (8.5)	15.5 (9.5)
Maximum Operation Current	380V/3N/60Hz	A	15.8	21	26.3	31.5
	220V/1N/60Hz	A	41.6 (25.8)	52 (31)	62.6 (36.3)	73 (41.5)
	400V/3N/50Hz	kW	15.8	21	26.3	31.5
	230V/1N/50Hz	A	39.1 (23.3)	49.5 (28.5)	60.1 (33.8)	70.5 (39)
Refrigerant		/	R134a			
Refrigerant Charge Quantity	50Hz	g	1000			
	60Hz	g	1100			
Electrical Heating Capacity		kW	6 (3)	8 (4)	10 (5)	12 (6)
Tank Capacity		L	455			
Hot Water Delivering Rate / Efficiency	380V/3N/60Hz	L/h	89	89	89	89
	220V/1N/60Hz	L/h	89	89	89	89
	400V/3N/50Hz	L/h	75	75	75	75
	230V/1N/50Hz	L/h	75	75	75	75
Hot Water Delivering Rate / High Demand	380V/3N/60Hz	L/h	218 (153.5)	261 (175)	304 (196.5)	347 (218)
	220V/1N/60Hz	L/h	218 (153.5)	261 (175)	304 (196.5)	347 (218)
	400V/3N/50Hz	L/h	204 (139.5)	247 (161)	290 (182.5)	333 (204)
	230V/1N/50Hz	L/h	204 (139.5)	247 (161)	290 (182.5)	333 (204)
Max. Water Temperature In Efficiency Mode		°C	65			
Operation Temperature Range		°C	35~82			
Ambient Temperature for HP		°C	5~48			
Ambient Temperature for Unit		°C	-15~50			
Unit Operation Noise ⁽³⁾		dB(A)	52 (50Hz) / 57 (60Hz)			
Air Outlet Noise ⁽³⁾		dB(A)	58 (50Hz) / 60 (60Hz)			
Dimensions (L×W×H)		mm	1002×770×1700			
Net Weight		kg	198			
Operation Weight		kg	653			
Anode		/	Aluminum Rod, Magnesium Rod			
Control Mode		/	LCD Wire Display (Standard 10m, Optional Maximum 30 m)			
Operation Mode		/	Efficiency, High Demand			
Other Control Functions		/	Timer, Anti freezing, Fault Alarming, Water Pump Controlling			

Power Supply Specification		/	220V/1N/60Hz&380V/3N/60Hz&230V/1N/50Hz&400V/3N/50Hz
Connection Size	Water Inlet	/	NPT 3/4 (Female Thread)
	Water Outlet	/	NPT 3/4 (Female Thread)
	T&P Relief Valve	/	NPT 3/4 (Female Thread)
	Drain Valve	/	NPT 3/4 (Female Thread)

- (1) Heat pump performance is the mean performance under condition “20 (dry bulb) / 15 (wet bulb)°C ambient temperature and 15°C to 55°C water temperature”.
- (2) The parameters in parentheses are for one heating element operation mode.
- (3) Sound Pressure Level@1m.

2.3 CAHP-120C Physical and Technical Specifications

Figure 2.5

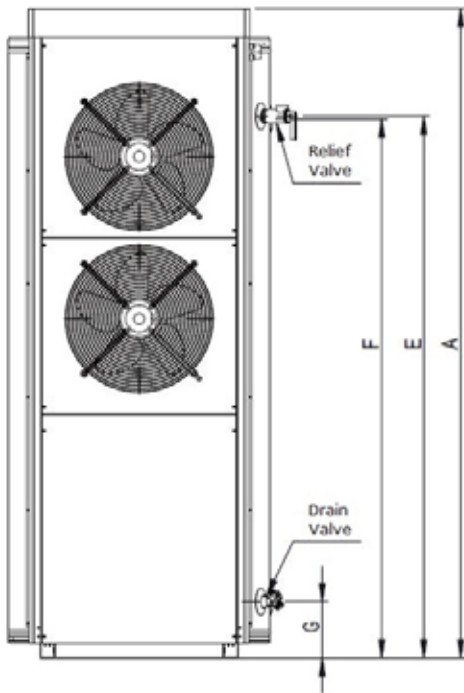


Figure 2.6

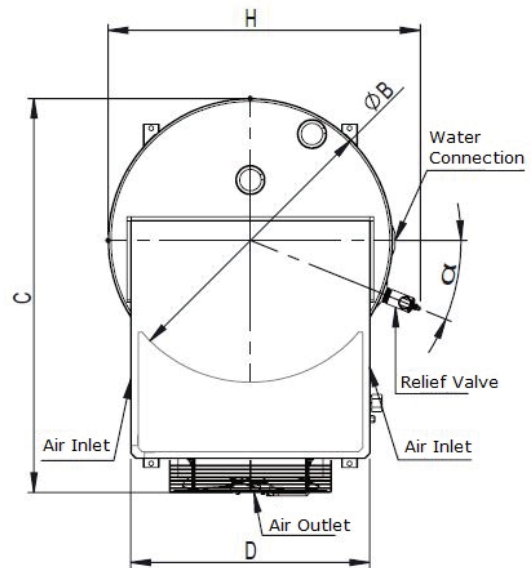


Table 2.5 Physical Dimensions

Total Height A (mm)	Tank Diameter B (mm)	Maximum Depth C (mm)	Service Panel Width D (mm)	Relief Valve Height E (mm)	Water Outlet Height F (mm)	Water Inlet Height G (mm)	Relief Valve Angle α (°)	Maximum Width H (mm)
1770	711	1002	600	1476	1468	153	22	770

Table 2.6 Technical Specifications

Model Number		CAHP120C06	CAHP120C08	CAHP120C10	CAHP120C12
Model Type	/	Outdoor Integrated Heat Pump Water Heater			
HP Rated Power ⁽¹⁾	kW	2.25			
HP Rated Heating Capacity ⁽¹⁾	kW	8.5			
Unit Maximum Power	kW	11.1 (7.3) ⁽²⁾	13.7 (8.6)	16.2 (9.9)	18.8 (11.1)

Unit Maximum Heating Capacity		kW	14.5 (11.5) ⁽²⁾	16.5 (12.5)	18.5 (13.5)	20.5 (14.5)
Maximum Operation Current	400V/3N/50Hz	A	15.8	21	26.3	31.5
	230V/1N/50Hz	A	47.1 (31.3)	57.5 (36.5)	68.1 (41.8)	78.5 (47)
Refrigerant		/	R134a			
Refrigerant Charge Quantity		g	2100			
Electrical Heating Capacity		kW	6 (3)	8 (4)	10 (5)	12 (6)
Tank Capacity		L	430			
Hot Water Delivering Rate	Efficiency	L/h	182	182	182	182
	High Demand	L/h	310 (246)	353 (267)	396 (289)	439 (310)
Max. Water Temperature In Efficiency Mode		°C	65			
Operation Temperature Range		°C	35~82			
Ambient Temperature for HP		°C	0~48			
Ambient Temperature for Unit		°C	-15~50			
Unit Operation Noise ⁽³⁾		dB(A)	59			
Air Outlet Noise ⁽³⁾		dB(A)	62			
Dimensions (LxWxH)		mm	1002x770x1770			
Net Weight		kg	264			
Operation Weight		kg	694			
Anode		/	Aluminum Rod			
Control Mode		/	LCD Wire Display (Standard 10m, Optional Maximum 30 m)			
Operation Mode		/	Efficiency, High Demand			
Other Control Functions		/	Timer, Anti freezing, Fault Alarming, Water Pump Controlling			
Power Supply Specification		/	230V/1N/50Hz & 400V/3N/50Hz			
Connection Size	Water Inlet	/	NPT 3/4 (Female Thread)			
	Water Outlet	/	NPT 3/4 (Female Thread)			
	T&P Relief Valve	/	NPT 3/4 (Female Thread)			
	Drain Valve	/	NPT 3/4 (Female Thread)			

(1) Heat pump performance is the mean performance under condition “20 (dry bulb) / 15 (wet bulb)°C ambient temperature and 15°C to 55°C water temperature”.

(2) The parameters in parentheses are for one heating element operation mode.

(3) Sound Pressure Level@1m.

3 Installation Instructions

WARNING: If the water heater is installed in the places where it would be easily subjected to lightning strike, such as on the roof top of buildings, lightning-protection is necessary.

CAUTION: Do not power off the water heater when the ambient temperature is lower than 5°C. If it has to be, please drain out water completely in advance; otherwise the manufacturer will not be liable for any of the damages of the unit or the property loss caused by that. If the water heater is connected to circulation system, the circulation line should be well insulated and provided with applicable temperature control so that the line will not be frozen; otherwise the manufacturer will not be liable for any of the damages of the line and the unit or property loss caused by that.

CAUTION: Put the water heater aside for at least 30 minutes after the unit is located, and then connect it to the power supply.

CAUTION: *The water heater is heavy, please use a forklift or have three or more people are necessary to move and install the water heater. Failure to do so can result in injury.
*Please transport the water heater as it leaves the factory; do not move the water heater with inclined angle more than 30°. Keep the water heater stored in a standing position. Do not remove the package or install the water heater privately.

3.1 Location Requirements

- The water heater should be located in the place which is near power supply, water supply system and drainage line.
- The water heater should be located in the place which is free from the following: oil smoke, severe electromagnetic waves, big voltage fluctuation, acid steam or alkaline steam.
- The water heater should be located on the floor, which must be able to withstand the total weight of the water heater filled with water.
- When the water heater is located in a basement, indoor or in any other limited space, the airflow surrounding of the unit must be unrestricted.
- The water heater should be located on a flameproof floor that has the height no less than 100 mm and there should be a floor drain around, which should have adequate drainage capability and could suffer temperature (100°C), so that the leakage of the water heater or the water tubes will not result in damage to any other equipment.
- The base support of the water heater should be fixed to prevent the unit from dumping with outsource force.
- Please determine the installation location with principle that the unit operation sound would have no influence on you and your neighbors.

- It is necessary to increase the installation height in locations which might have snow to avoid damage to the unit. Make sure the floor height to be higher than average snow thickness of the location.
- Do not install the heater under the eave except some solution is taken to avoid the rain dropping on the unit.
- Open the top cover and the center spud on the top of the tank could be used to lift the unit.

3.2 Space Requirements for Installation and Maintenance

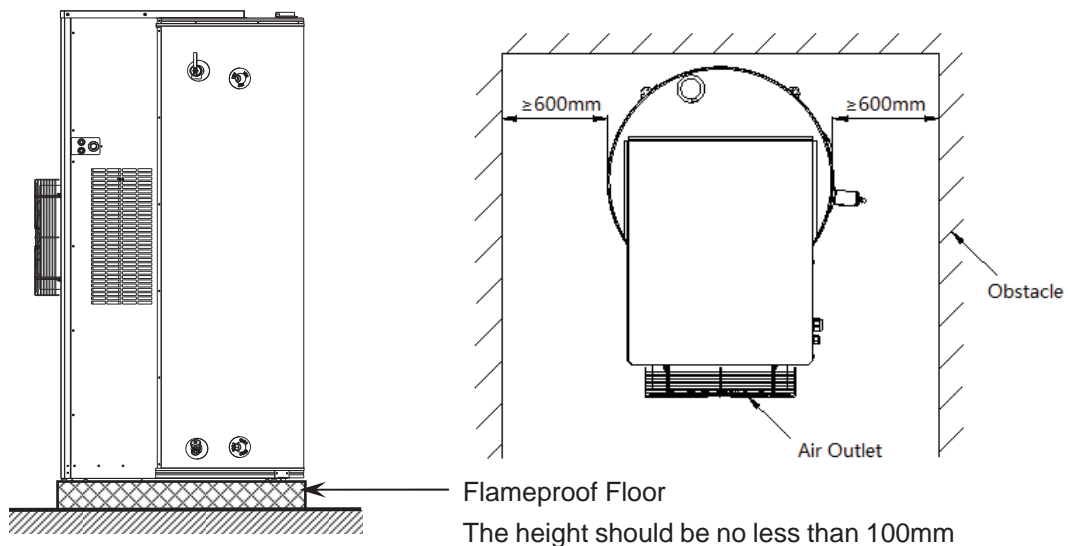
Keep the space specified in figure 3.1 and figure 3.2 before water heater installation.

Keep the distance specified between the obstacle and the air outlet no less than 800 mm.

Leave 1200 mm free space on the top of the unit for the anode maintenance.

Figure 3.1

Figure 3.2



CAUTION: In order to reduce the operation cost, the hot water outlet pipes should be properly insulated. If the water heater is subjected to freezing temperature that is less than 0°C, the cold water inlet pipes should also be insulated.

CAUTION: In order to reduce the operation cost, please select PP-R tube with good insulation performance. According to water temperature, working pressure, tube life and the equivalent, the wall thickness of PP-R pipes is rated for the following six series by pressure, PN1.0, PN1.25, PN1.6, PN2.0, PN2.5 and PN3.2. For hot water pipe and fittings, the minimum pressure rating is PN2.0; for cold water pipe and fittings, the minimum pressure rating is PN1.0.

CAUTION: There is a tube at the hot outlet connection of the water heater. Please do not remove or damage it during installation process. As the threaded joints are screwed in, the tube would be installed into right depth.

3.3 Water Supply Connections

Refer to figure 3.3 for typical installation. The installation of flexible couplings is recommended on the hot and cold water connections so that the water heater may be easily disconnected for servicing if necessary. The HOT and COLD water connections are 3/4" NPT on all models.

CAUTION: Please install a check valve with pressure relief function in the cold water line to avoid possible damage to the heater or other related parts caused by water pressure variation. Please call our service call to get details on the valve in case of need.

It is also recommended to install an expansion tank in the cold water line between the water heater and the check valve to avoid the possible damage caused by thermal expansion.

Install a stop valve in both the cold and hot water lines as the location indicated in figure 3.3. This will enable easier service or maintenance of the unit later.

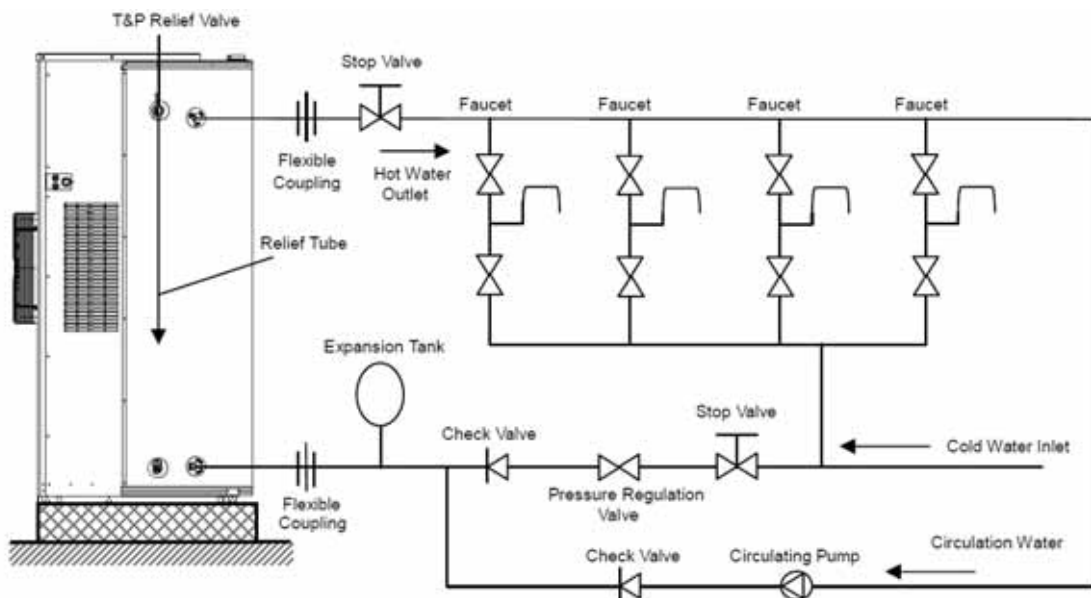
Install a pressure regulation valve in the cold water line to control the water pressure if the water supply pressure exceeds the maximum water pressure listed on the nameplate.

Install a mixing valve to mix the hot water delivered by the water heater to avoid possible hurt caused by high water temperature.

It's recommended to insulate the hot water to reduce the heat loss.

3.4 Piping Connection Diagram

Figure 3.3



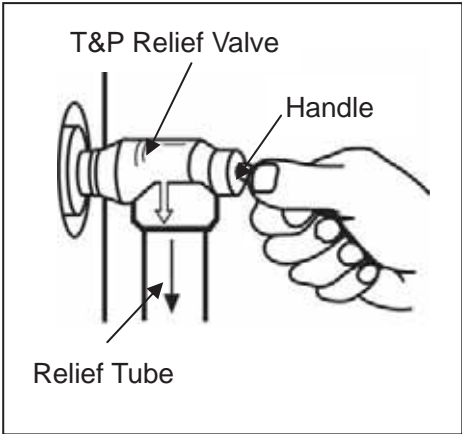
3.5 Temperature and Pressure Relief Valve

Install a relief tube with connection size of NPT 3/4 (Male Thread) at the relief port of the temperature and pressure relief valve, and the relief tube should be terminated at a floor drain. The relief tube should be downward and installed in a frost-free space. Do not install any shut off devices in the relief tube.

The temperature and pressure relief valve should be inspected every month to ensure it

is in effective operation. Please pull the handle of the relief valve several times to ensure the valve can switch freely. Please pull the handle of the relief valve once every month, and discharge 4~8L water, which can prevent scaling inside of the relief valve.

Figure 3.4



WARNING: The relief tube must not be blocked in any case. The relief tube exit should be communicated with atmosphere. Please make sure the hot water released should not result in any injury or property loss.

WARNING: Insulate around the T&P relief valve and the relief tube to prevent freezing in winter which can result in safety accident.

3.6 Circulating Pump Selection

CAUTION: Please select the circulating pump which is special for hot water application. The maximum temperature rating needs to be higher than 90°C.

It is recommended to select the circulating pump based on the information listed in table 3.1. If the flow rate of the water circulating pump is much larger than the listed flow rate, the energy consumption would increase.

Table 3.1 Parameters for Circulating Pump Selection

Piping Length (m)	Power (W)	Water Flow Rate (m ³ /h)	Piping Pressure Drop (kPa)
25~50	25	0.2 — 0.3	11

The recommended water circulating pump is the high water temperature water pump, Grundfos Pumper UP15-14BT, which has nominal water flow rate 0.3 cubic meters and lift 1m. If other pump is used, adjust the pump according to actual condition for proper water supply.

4 Electrical Connection Instructions

4.1 Important Information

Only special power supply applies to the water heater, and the maximum fluctuated voltage value should be within the range of 90% to 110% of nominal voltage.

The conductor arrangement should be performed by a qualified electrician and comply with the requirement of electrical safety.

The water heater and power supply should be properly grounded. Otherwise it can result in fire or electric shock.

Keep the power cord and the signal wires tidy and rational. Separate the wires of hazardous voltage electrical circuits from the wires of extra-low-voltage circuits, and they should not disturb each other. Keep all the cables and wires free from the piping and valves.

The power cord outside the unit should be isolated properly to prevent people contacting them, or ensure the touch would not result in electric shock (touchable double insulation cable could be used or add insulation to normal power cord).

4.2 Power Cord Connection

1. Select power cord for CAHP80/120 units according to the unit model and the power supply with reference to table 4.1. Select power cord for CAHP120C units according to table 4.2.

Table 4.1 Power Supply Specification for CAHP80/120

Unit Model	Power Supply	Cable Size (mm ²) (Plastic Insulation and Conduit)						Air Breaker Capacity (A)		Current Leakage Protection
		Two Elements Working Mode			One Element Working Mode			Two Elements	One Element	
		Phase Wire	Neutral Wire	Ground Wire	Phase Wire	Neutral Wire	Ground Wire			
CAHP-80-6 CAHP-120-6	380V 3N~60Hz	≥2.5	≥2.5	≥2.5	≥2.5	≥2.5	≥2.5	25	25	30mA Less than 0.1s
	220V~ 1N~60Hz	≥10	≥10	≥10	≥6	≥6	≥6	50	30	
	400V 3N~50Hz	≥2.5	≥2.5	≥2.5	≥2.5	≥2.5	≥2.5	25	25	
	230V~ 1N~50Hz	≥10	≥10	≥10	≥6	≥6	≥6	50	30	
CAHP-80-8 CAHP-120-8	380V 3N~60Hz	≥4	≥2.5	≥4	≥4	≥2.5	≥4	30	30	
	220V~ 1N~60Hz	≥10	≥10	≥10	≥10	≥10	≥10	60	40	
	400V 3N~50Hz	≥4	≥2.5	≥4	≥4	≥2.5	≥4	30	30	
	230V~ 1N~50Hz	≥10	≥10	≥10	≥10	≥10	≥10	60	40	

CAHP-80-10 CAHP-120-10	380V 3N~60Hz	≥6	≥4	≥6	≥6	≥4	≥6	40	40
	220V~ 1N~60Hz	≥16	≥16	≥16	≥10	≥10	≥10	80	50
	400V 3N~50Hz	≥6	≥4	≥6	≥6	≥4	≥6	40	40
	230V~ 1N~50Hz	≥16	≥16	≥16	≥10	≥10	≥10	80	50
CAHP-80-12 CAHP-120-12	380V 3N~60Hz	≥6	≥4	≥6	≥6	≥4	≥6	40	40
	220V~ 1N~60Hz	≥16	≥16	≥16	≥10	≥10	≥10	100	50
	400V 3N~50Hz	≥6	≥4	≥6	≥6	≥4	≥6	40	40
	230V~ 1N~50Hz	≥16	≥16	≥16	≥10	≥10	≥10	100	50

Table 4.2 Power Supply Specification for CAHP120C

Unit Model	Power Supply	Cable Size (mm ²) (Plastic Insulation and Conduit)						Air Breaker Capacity (A)		Current Leakage Protection
		Two Elements Working Mode			One Element Working Mode			Two Elements	One Element	
		Phase Wire	Neutral Wire	Ground Wire	Phase Wire	Neutral Wire	Ground Wire			
CAHP120C06	400V 3N~50Hz	≥2.5	≥2.5	≥2.5	≥2.5	≥2.5	≥2.5	25	25	30mA Less than 0.1s
	230V~ 1N~50Hz	≥10	≥10	≥10	≥10	≥10	≥10	50	30	
CAHP120C08	400V 3N~50Hz	≥4	≥2.5	≥4	≥4	≥2.5	≥4	30	30	
	230V~ 1N~50Hz	≥16	≥16	≥16	≥10	≥10	≥10	60	40	
CAHP120C10	400V 3N~50Hz	≥6	≥4	≥6	≥6	≥4	≥6	40	40	
	230V~ 1N~50Hz	≥16	≥16	≥16	≥16	≥16	≥16	80	50	
CAHP120C12	400V 3N~50Hz	≥6	≥4	≥6	≥6	≥4	≥6	40	40	
	230V~ 1N~50Hz	≥16	≥16	≥16	≥16	≥16	≥16	100	50	

2. Access to the connection terminal for CAHP-80/120 units with following steps.

① Remove the top service panel with reference to figure 4.1;

② Remove the cover of control box with reference to figure 4.1;

③ Screw out the cable connector with reference to figure 4.2.

3. Run the main power cord through the cable connector with reference to figure 4.3.

Figure 4.1

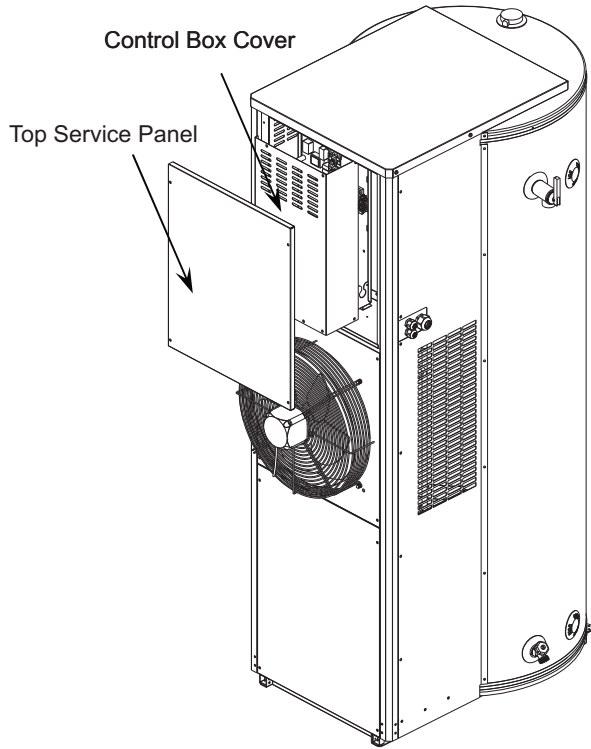


Figure 4.2

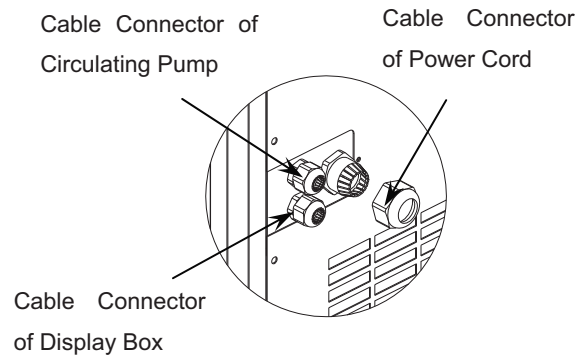


Figure 4.3

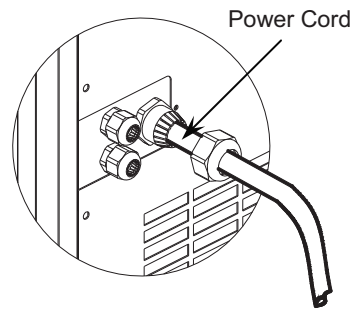


Figure 4.4

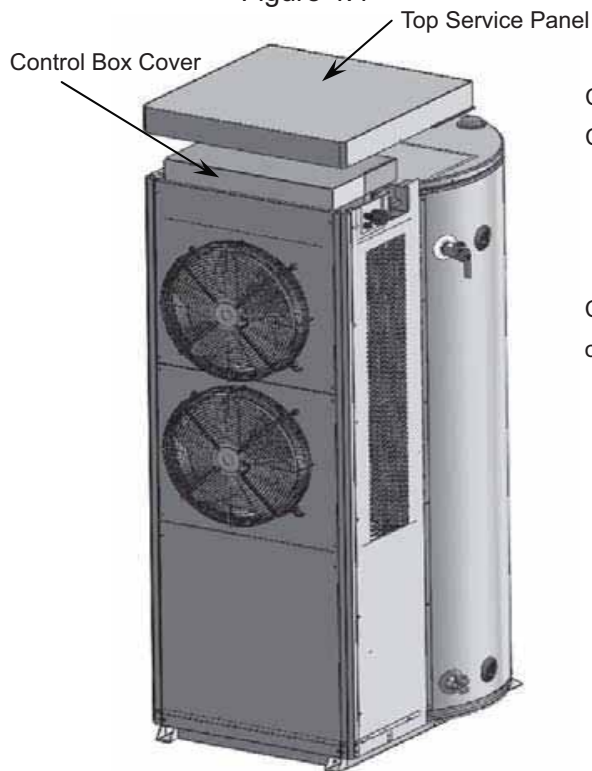


Figure 4.5

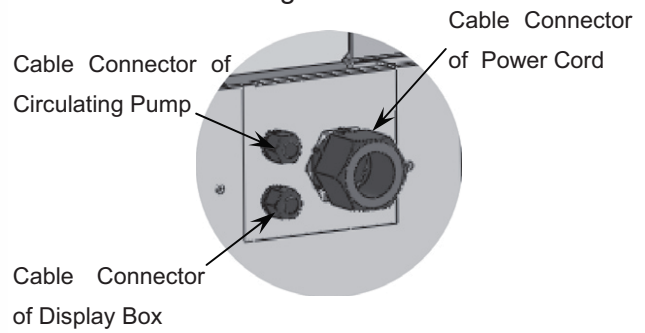
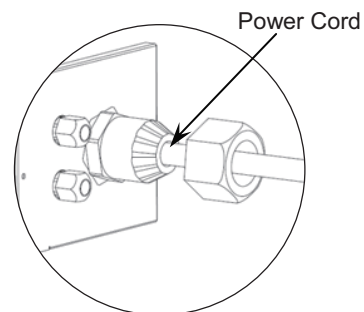


Figure 4.6



4. Access to the connection terminal for CAHP-120C units with following steps.
 - ① Remove the top service panel with reference to figure 4.4;
 - ② Remove the cover of control box with reference to figure 4.4;
 - ③ Screw out the cable connector with reference to figure 4.5.
5. Run the main power cord through the cable connector with reference to figure 4.6.

WARNING: *An air breaker and an appropriate current leakage protector must be installed outside the water heater as the requirement of power supply specification table for your security.

*The water heater must be grounded permanently. Otherwise, it can result in electric shock, injury or death.

6. Connect the terminal block with wires with reference to figure 4.7 or figure 4.8.

Figure 4.7

Wire Connection for Voltage of
380V/3N/60Hz & 400V/3N/50Hz

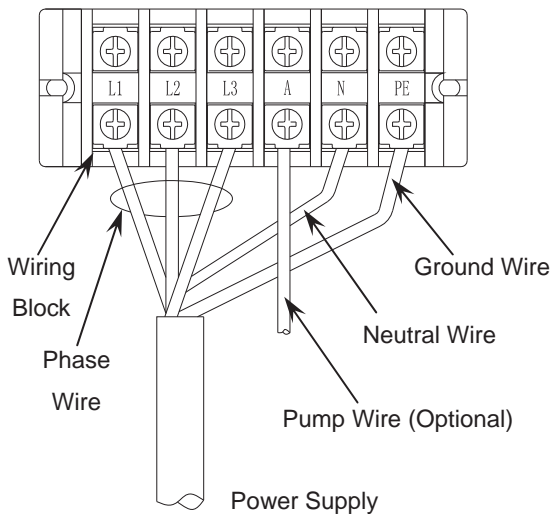
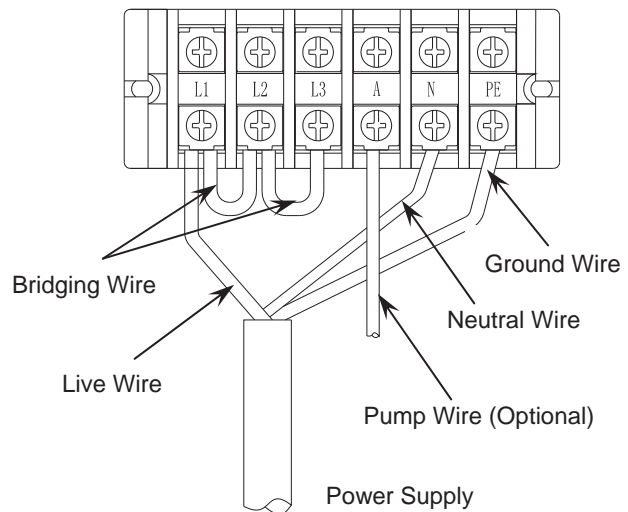


Figure 4.8

Wire Connection for Voltage of
220V/1N/60Hz & 230V/1N/50Hz



When connect to the power supply of 220V 1N~60Hz or 230V 1N~50Hz, the size of bridging wire on the terminal block should be as follows:

CAHP-80/120-6/8	6 mm ²
CAHP-80/120-10/12	10 mm ²

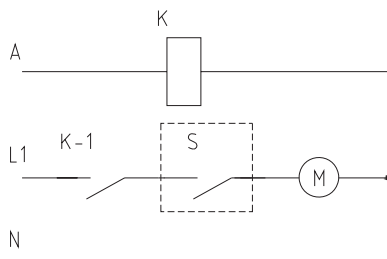
WARNING: *Do not connect the water heater to the power supply, unless the tank has been completely filled with water and a T&P valve has been installed.

*Water temperature over 50°C can cause severe burns instantly or death from scalds. Children, the disabled and elderly are at highest risk of being scalded. Feel water temperature before bathing or showering.

4.3 Water Circulating Pump Connection

1. You can decide whether a water circulating pump is necessary based on your need.
2. The power supply of controlling wire output of a water circulating pump is rated 220V 1N~60Hz or 230V 1N~50Hz. If a water circulating pump is employed, and its power is 120W or less than 120W, the connecting wire of the pump on the terminal block can be used as the power cord of the pump; if its power is more than 120W, the connecting wire should be used only as the control wire, other than the power supply.
3. The contactor of the pump can be installed either inside or outside of the control box on the water heater.
4. Water circulating pump connection is illustrated in figure 4.9.

Figure 4.9



- A: Outlet Terminal of Pump Controlling Wire on the Terminal Block
- L1: Terminal of Pump's Main Power
- N: Terminal of Neutral Wire
- K: Coil of Contactor
- K-1: Contact of Contactor
- M: Water Circulating Pump
- S: Temperature Switch (Optional)

4.4 Display Box Installation

1. Important Information

- The display box should not be located in an area where the combustible gas may leak. Once the gas leaks and remains around the display box, it can result in fire.
- The display box should be located in an area that is free from oil, vapor or sulfur. Otherwise it can result in product deformation causing fault.
- The display box should be located in an area that is well ventilated and dry and avoid storage in direct sunlight.
- Protect the display box during installation process and keep it away from dust. Do not touch electrical parts. Otherwise the display box would be damaged.
- The display box is connected in low voltage circuit, and contact with high voltage circuit that is rated more than 220V is forbidden. The communication cable of display box should not in the same conduit with voltage lines, and the distance between conduits should be 300~500mm or larger.
- The inner diameter of communication cable conduit should be larger than 20mm.
- Excessive connection or lengthening connection is forbidden in the connecting wire of the display box.
- Do not check the display box for electrical insulation with a megger after installation.
- The dimensions of the display box are: 162×122×23 with frame and 146×106×23 without a frame.
- If the display box can be installed without running the communication cable through the conduit, please ignore the following installation process for communication cable. If the communication cable must be removed from the display box or from the main control board before being fixed, refer to the following installation process.

2. Communication Cable Connection

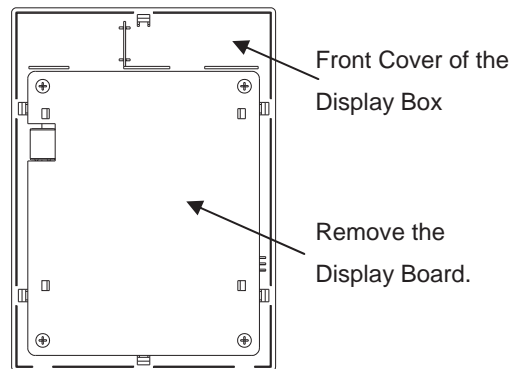
Remove the front cover of display box and remove the display board with reference to figure 4.10 and figure 4.11.

Figure 4.10



Remove the front cover upward with a straight screwdriver during installation.

Figure 4.11



Remove the four connecting wires from the display board. The communication wire is completely removed from the display box now. Then run the communication cable through the prepared conduit. Complete the fixing of communication cable before performing the following process.

The communication cable runs through the back cover of the display box and the hole in the front cover with reference to figure 4.12 and figure 4.13.

Figure 4.12

Keep one knockout hole while install stripped wire.

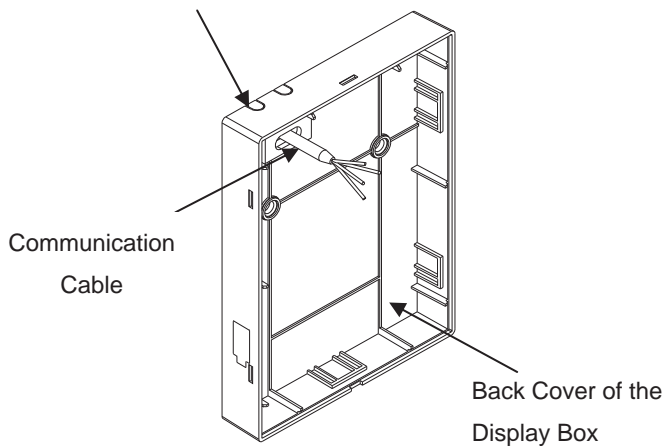
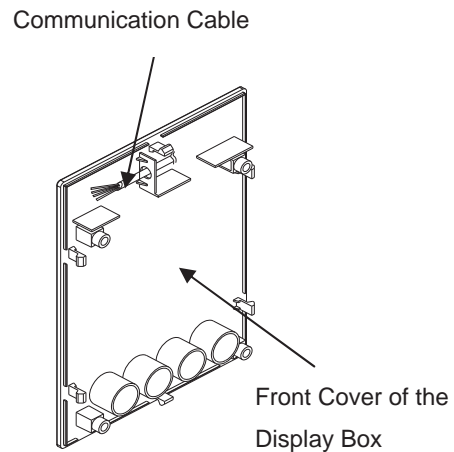
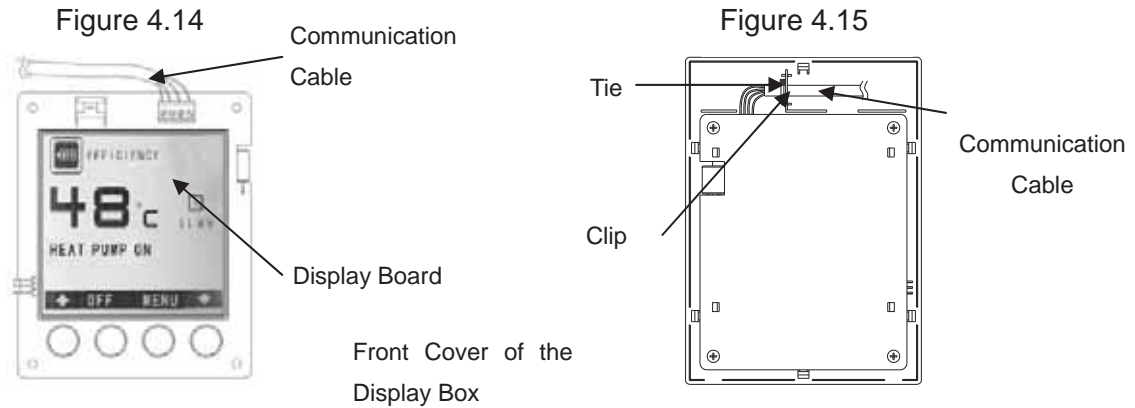


Figure 4.13

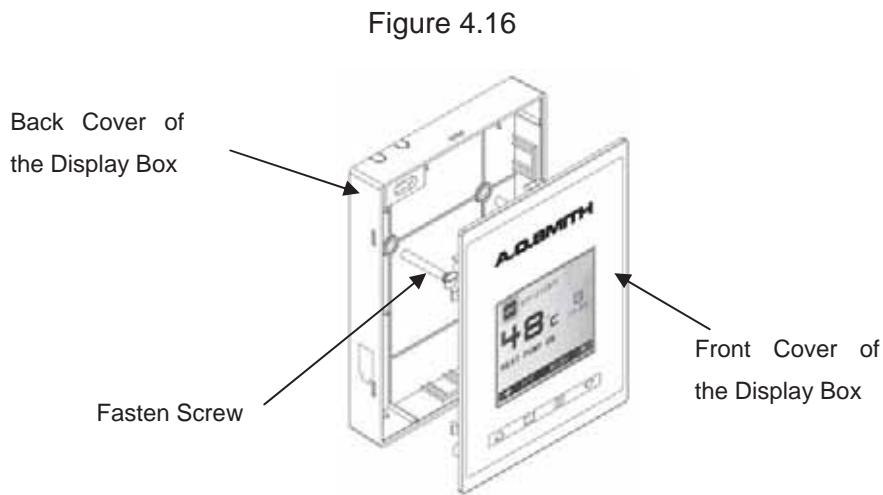


Install the communication cable on the terminal block on the right of display board (keep the label of wire corresponding to letters in terminal block) as illustrated in figure 4.14. Keep the display board without dust. Install the display board on the front cover of display box again after installing the communication cable, and tie the communication cable at the clip with reference to figure 4.15.

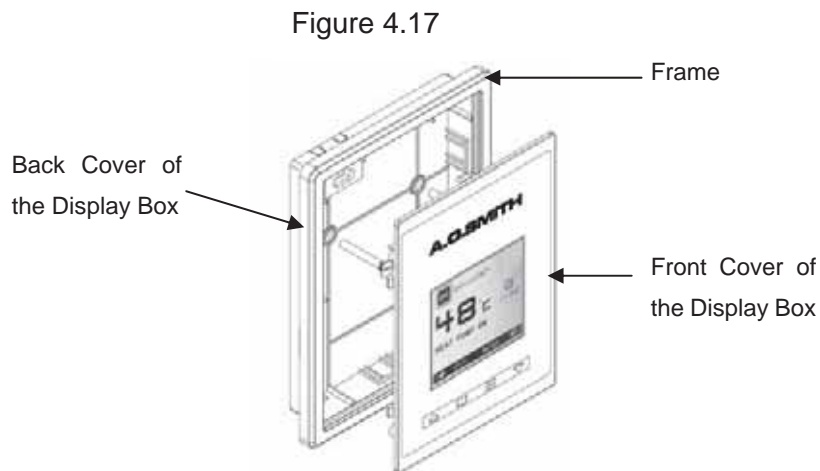


3. Display Box Installation

The installation of display box is classified revealed installation and concealed installation. The revealed installation is illustrated in figure 4.16.



When perform the concealed installation, first install the frame on the back cover of display box and then install the front cover after fixing the back cover on the wall.



4. Communication Cable Installation of Water Heater

Keep the main control board accessible as illustrated in figure 4.18 before connecting the communication cable to the water heater. Connect the connector of communication cable to

one connector in the main control board. There are two connectors applicable for display board and select one for connection.

Figure 4.18

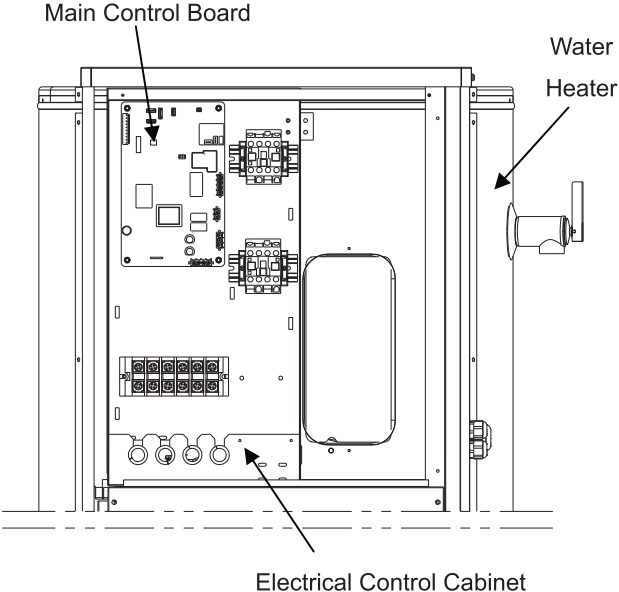
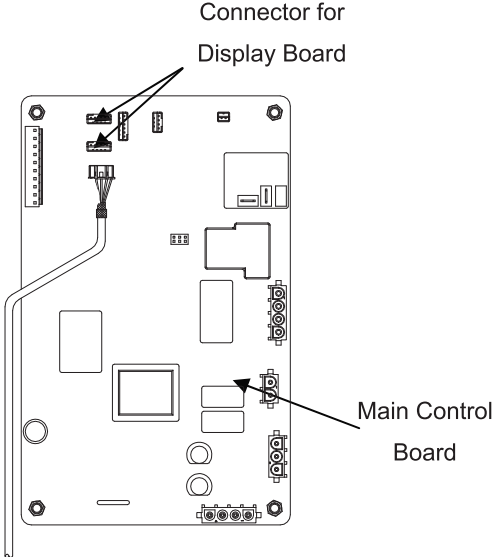


Figure 4.19



5 Operation Instructions

The water heater has an adjustable thermostat to control water temperature. The hot water for automatic dishwashers and washing machines can cause severe injury or death from scalds. Temperature that causes injury varies from age of people and contact time. Disabled persons are at higher risk of being scalded for slow reflection. Do not let children use the faucet alone, or take bath or shower by themselves. Do not let children or the disabled stay in the bathtub or under the spray nozzle alone.

Setting water heater temperature at 49°C will decrease the risk of scald injury.

It shows the scald time for skins of most people in table 5.1. For a small amount of water is heated repeatedly in short time resulting from it is used continually many times, water outlet temperature can be higher than setting temperature by 11°C. On this condition, please adjust the lower setting temperature to decrease the risk of being scalded.

Table 5.1 Scald Time for Skins

Setting Temperature	Scald Time for 2 nd & 3 rd Degree Burns
82°C	Instant
77°C	Instant
71°C	About 1/2 second
65°C	About 1-1/2 seconds
60°C	Within 5 seconds
54°C	About 30 seconds
49°C	More than 8 minutes

5.1 Water Charge

1. Keep the water heater disconnected from the power supply.
2. Turn the handle to the right (clockwise) to shut off the drain valve of the water heater.
3. Open the nearest hot water faucet and purge the air from the system.
4. Open cold water inlet valve fully and fill the water tank and pipes with water.
5. Close the hot water outlet faucet when water flows. Then connect the water heater to the power supply and turn on the unit.

5.2 Water Drainage

The water heater should be drained completely when the unit is inspected and serviced or does not operate for a long time under freezing temperatures in winter as the following steps:

1. Turn off the water heater and disconnect the power supply of the water heater.
2. Close the cold water inlet valve of the water heater.
3. Connect a soft tube at the drain valve outlet and put the other end to a floor drain.
4. Open the nearest hot water faucet and the drain valve of the water heater.
5. If the water heater does not operate for a long time after drainage, keep the drain valve open all the time.

5.3 Display Operations

1. User Interface and homepage Instructions

If the water heater is connected to power supply, press the button of ON to turn on the

unit. The overall look of user interface is illustrated in figure 5.1. Refer to figure 5.2 for the overall look of homepage.

Figure 5.1

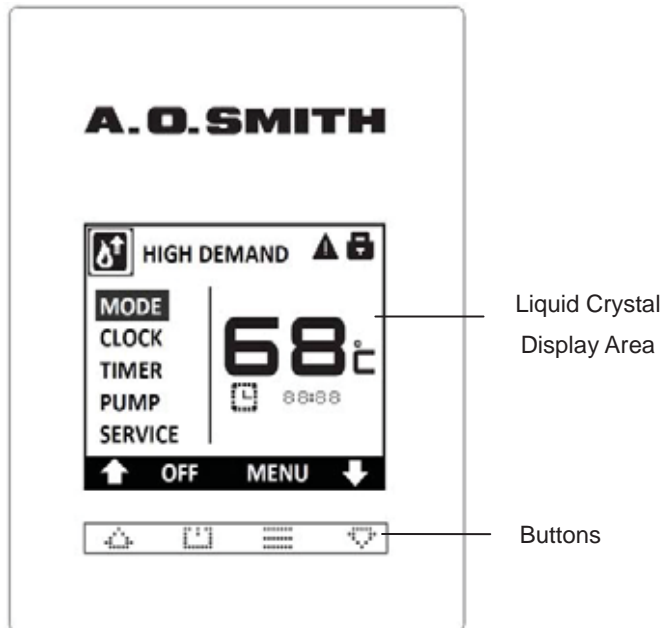
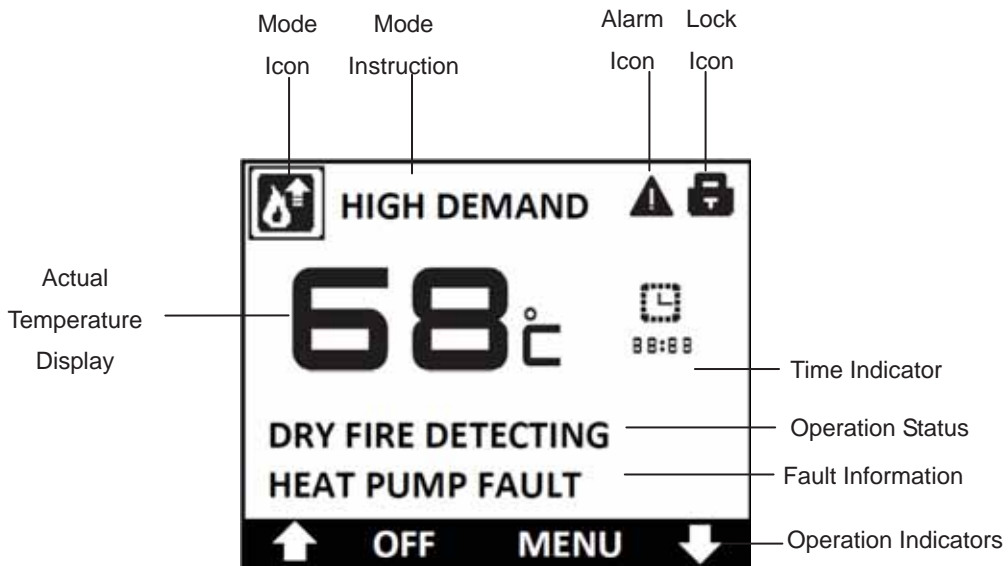




Figure 5.2



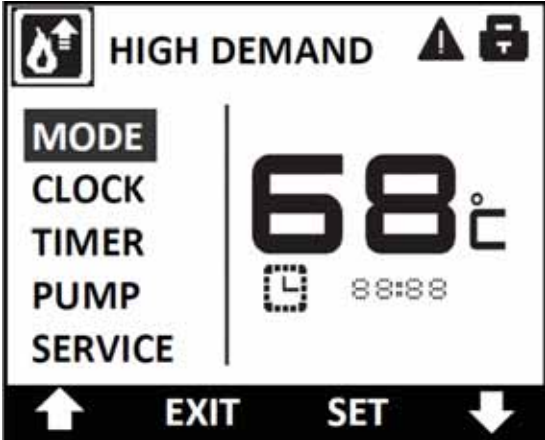
Press the button of  or  on the homepage to enter the temperature setting. The temperature range is from 35°C to 82°C. The default setting temperature in fault mode is 54°C. Press the button of OFF on the homepage to turn off the water heater.

The buttons will be locked automatically if there is no operation within three minutes. When the water heater is connected to the power supply, the buttons are locked by default. Press and hold the button of UNLOCK for 5 seconds to unlock it.

2. Main Menu Instructions

Press the button of MENU on the homepage to enter the main menu interface illustrated in figure 5.3. The five lines that cursor stops are menu details. Refer to the display on the right for the details of selected sub menu.

Figure 5.3



3. Mode Setting

Press the button of **▲** or **▼** to select the sub menu of MODE on the main menu interface, and then press the button of SET to enter the menu of mode setting. There are two modes for option, efficiency and high demand. In efficiency mode, the water heater will operate with energy conservation. In high demand mode, the water will be heated as quickly as possible. The factory default mode is efficiency. Press the button of **▲** or **▼** to select the operation mode. Press the button of OK to confirm the mode selection and there is a “✓” icon close to the selected mode. Press the button of EXIT to return to the last menu interface.

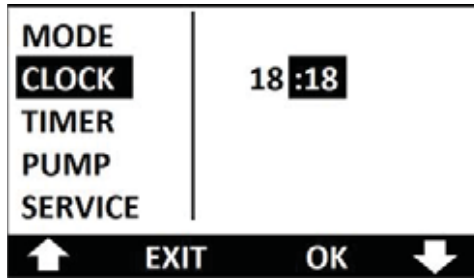
Figure 5.4



4. Clock Setting

Press the button of **▲** or **▼** to select the sub menu of CLOCK on the main menu interface, and then press the button of SET to enter the menu of clock setting. Press the button of **▲** or **▼** to change the hour or the minute as illustrated in figure 5.5. Press the button of OK to confirm the clock setting. It will return to the main menu interface after confirming the minute setting automatically.

Figure 5.5

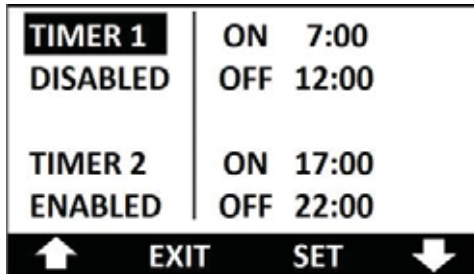


5. Timer Setting

Press the button of **▲** or **▼** to select the sub menu of TIMER on the main menu interface, and then press the button of SET to enter the menu of timer setting illustrated in figure 5.6. There are two timer intervals, timer 1 and timer 2. Each timer has two statuses, disabled and enabled.

Press the button of **▲** or **▼** to select the sub menu of TIMER 1 on the sub menu interface of timer setting and then press the button of SET to set the time on the right of TIMER 1. Press the button of **▲** or **▼** to change the hour and the minute of on time. Press the button of OK to confirm the setting of on time. Off time setting is the same as on time setting.

Figure 5.6



Press the button of **▲** or **▼** to select the sub menu of status below TIMER 1 on the sub menu interface of timer setting and press the button of MODIFY to change the status of the timer 1. If the status below TIMER 1 is ENABLED, the function of timer 1 is valid. Otherwise it is invalid.

Timer 2 is the same as timer 1. Press the button of EXIT to return to the main menu interface.

For example, if the timer setting menu interface is illustrated as figure 5.6, the water heater will operate from 17:00 to 22:00. If the timer setting menu interface is illustrated as figure 5.7, the water heater will operate from 7:00 to 22:00. If the timer setting menu interface is illustrated as figure 5.8, timer 1 and timer 2 are both invalid, and the water heater will operate from 00:00 to 23:59.

Figure 5.7

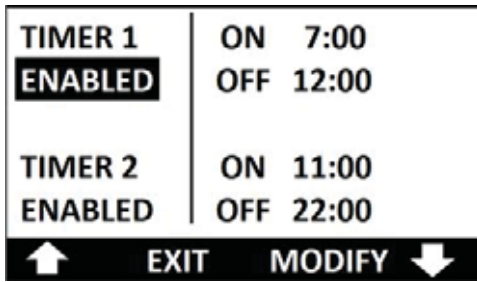
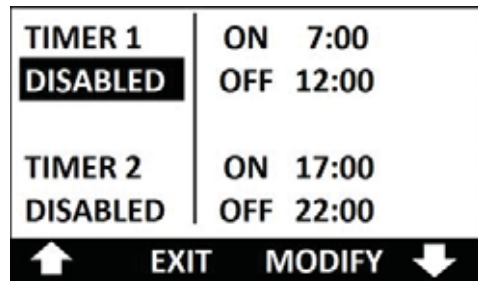


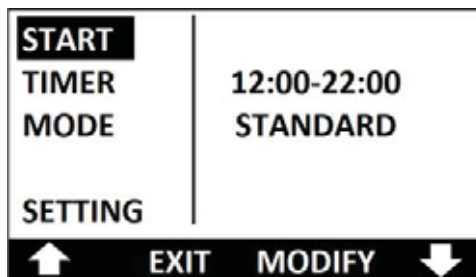
Figure 5.8



6. Water Circulating Pump Setting

Press the button of **▲** or **▼** to select the sub menu of PUMP on the main menu interface, and then press the button of SET to enter the pump parameters setting interface. Press the button of **▲** or **▼** to select the sub menu of START/STOP on the pump setting menu interface. The factory default setting of pump is stop. Press the button of MODIFY to select START if necessary as illustrated in figure 5.9, which means turn on the water circulating pump.

Figure 5.9



Press the button of **▲** or **▼** to select the sub menu of TIMER on the pump parameters setting interface as illustrated in figure 5.10. Press the button of SET to enter the timer setting interface illustrated in figure 5.11. There are two options in sub menu interface of timer, start and stop. Press the button of **▲** or **▼** to select the sub menu of START and then press the button of SET to set the hour and the minute. Press the button of **▲** or **▼** to change the hour and the minute of start. Press the button of OK to confirm the start time. The stop time setting is the same as the start time. Press the button of EXIT to return to the pump parameters setting interface.

Figure 5.10

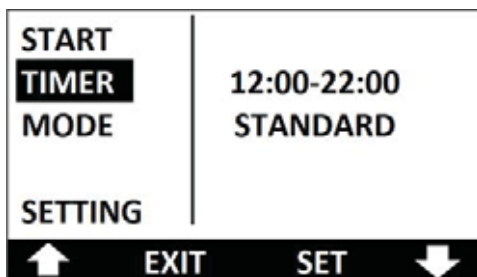
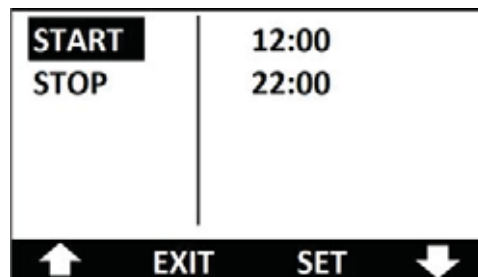


Figure 5.11



Press the button of **▲** or **▼** to select the sub menu of MODE on the pump parameters setting interface as illustrated in figure 5.12. Press the button of SET to enter the sub menu of water circulating pump operation mode selection illustrated in figure 5.13. The sub menu has



two options, smart and standard. In smart mode, it will calculate the pump operation time automatically by the parameters defined by setting menu in figure 5.15. In standard mode, the pump will operate according to setting time. Press the button of  or  to select the mode. Press the button of OK to confirm the mode selection. There is a “√” icon close to the selected mode. Press the button of EXIT to return to the pump parameters setting interface.

Figure 5.12

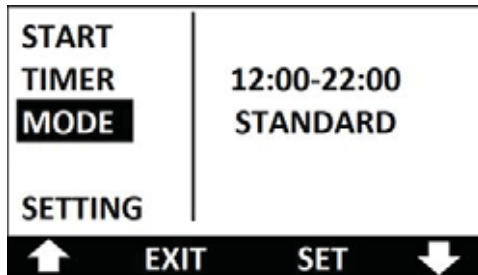
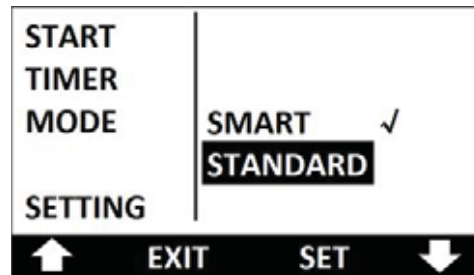


Figure 5.13











Press the button of  or  to select the sub menu of SETTING on pump parameters setting interface and then press the button of SET to enter the menu of pump operation mode selection. Press the button of  or  to select the sub menu of SMART as illustrated in figure 5.14 and then press the button of SET to enter the pump parameters setting interface in smart mode as illustrated in figure 5.15. Press the button of  or  to select PIPE DIA as illustrated in figure 5.15 and then press the button of SET to change pipe outside diameter value. Press the button of  or  to select proper pipe outside diameter value and the button of OK to confirm the selection. Other four sub menus could be operated in the same way.

Figure 5.14

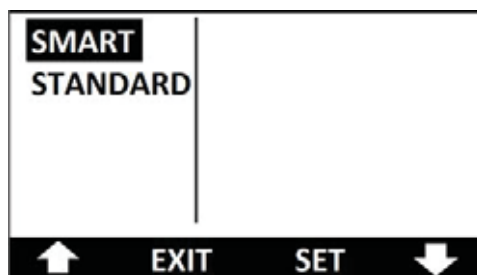


Figure 5.15



PIPE DIA (water circulating pipe outside diameter) has five options, DN 20, DN25, DN32, DN40 and DN50. The default pipe outer diameter is 25mm.

PIPE LEN (water circulating pipe length) has the length range from 10 meters to 250 meters. The default pipe length is 50 meters.

INSULATE (insulation outside the water circulating pipe) has two options, yes and no. The default status is no.

ON ADJ (pump operation time correction value) has the range from 30% to 300%. The default value is 100%. The pump operation time would increase with the correction value.

OFF ADJ (pump operation interval time correction value) has the range from 30% to 300%. The default value is 100%. The pump operation interval time would increase with the correction value.

The range of water circulating pump operation time is from 30 seconds to 600 seconds. The range of water circulating pump operation interval time is from 5 minutes to 60 minutes.

Press the button of OK to confirm the water circulating parameters setting. Press the button of EXIT to return to the last menu interface illustrated in figure 5.14.

Press the button of **▲** or **▼** to select the sub menu of STANDARD as illustrated in figure 5.16 and then press the button of SET to enter the pump parameters setting menu interface in standard mode illustrated in figure 5.17. Press the button of **▲** or **▼** to select the sub menu of ON TIME as illustrated in figure 5.17. Press the button of SET to enter the time setting on the right. Press the button of **▲** or **▼** to select the on time and the button of OK to confirm the on time setting. Off time setting is the same as on time setting. Press the button of EXIT to the last menu interface.

Figure 5.16

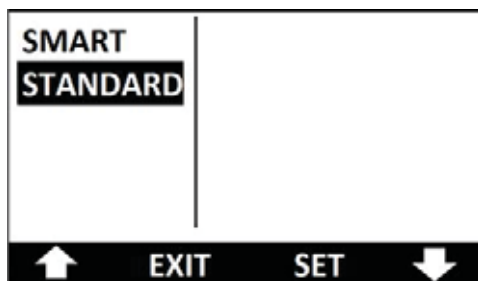
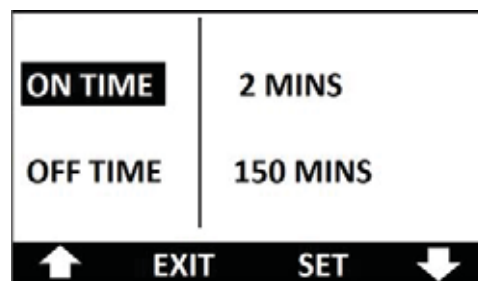


Figure 5.17



7. Maintenance Menu

Maintenance menu operation must be performed by a qualified person authorized by the manufacturer or the supplier.

For CAHP80/120 units, perform as the following instructions.

Press the button of **▲** or **▼** to select the sub menu of SERVICE on the main menu interface and then press the button of SET to enter the maintenance menu. Press the button of **▲** or **▼** to select the sub menu of SYSTEM on the maintenance menu as illustrated in figure 5.18. Press the button of VIEW to inspect the system parameters illustrated in figure 5.19. Five temperatures are displayed on the interface, ambient temperature, upper tank water temperature, lower tank water temperature, discharge temperature and suction temperature. Press the button of EXIT to return to the last menu interface.

Figure 5.18

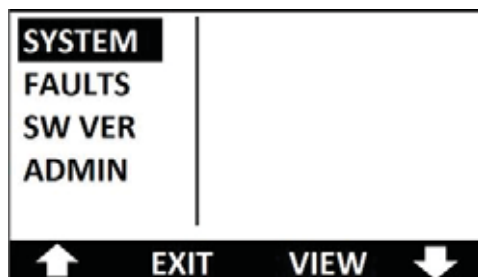
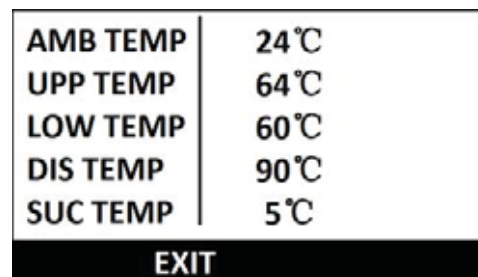


Figure 5.19



Press the button of **▲** or **▼** to select the sub menu of FAULTS on the maintenance menu interface as illustrated in figure 5.20. Press the button of VIEW to inspect the faults record. Four faults would be recorded in the interface as illustrated in figure 5.21.

Figure 5.20

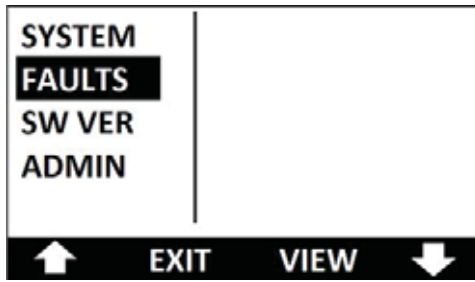
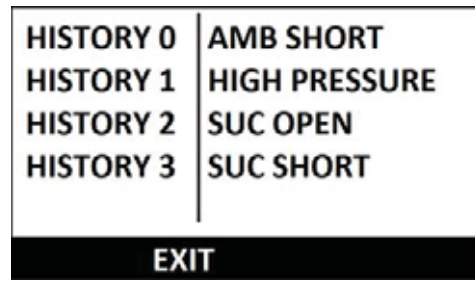
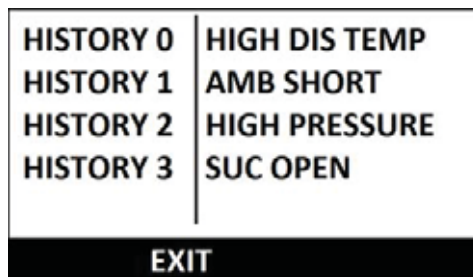


Figure 5.21



The faults are recorded in historical order. If there has been four faults recorded, the new fault will be added to HISTORY 0 and meanwhile all the faults serial number plus one, that means HISTORY 1 changes to HISTORY 2, and HISTORY 3 is deleted. When the fault of HIGH DIS TEMP is added to figure 5.21, the faults record will be changed to figure 5.22. Press the button of EXIT to return to the last menu interface illustrated in figure 5.20.

Figure 5.22



Press the button of **↵** or **⏏** to select the sub menu of SW VER on the maintenance menu as illustrated in figure 5.23. Press the button of VIEW to inspect the software versions and check codes of main control board and display board illustrated in figure 5.24. Comparing with the released check codes can confirm if the software is disturbed or if it is the latest version. By the way, A.O. Smith reserves the right to change the version numbers and the codes at any time without notice. Press the button of EXIT to return to the last menu interface.

Figure 5.23

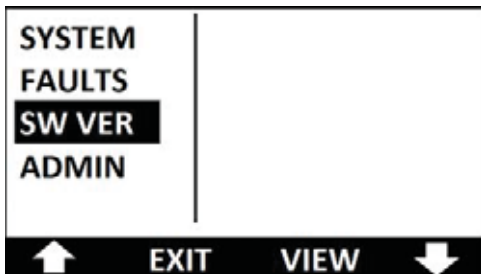
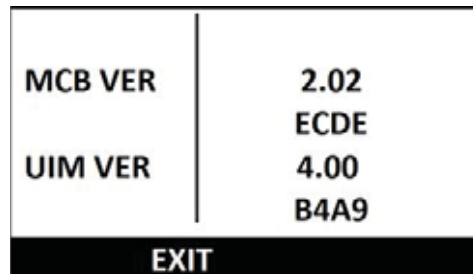


Figure 5.24



Press the button of **↵** or **⏏** to select the sub menu of ADMIN on the maintenance menu as illustrated in figure 5.25. Press the button of OK to enter the maintenance menu interface. For the parameters' setting is involved in the admin authority, password (the password is 9527) is necessary with reference to figure 5.26. Press the button of **↵** or **⏏** to select each number and the button of OK to confirm the number.

Figure 5.25

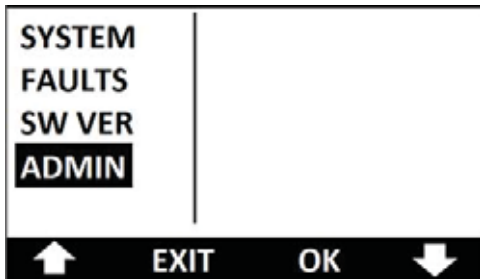
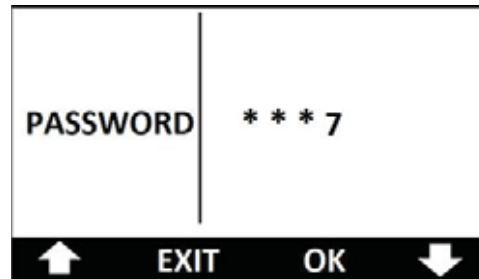
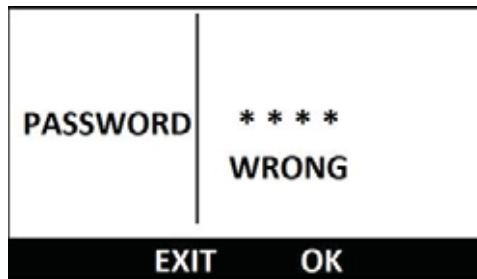


Figure 5.26



If the password is wrong, it will show WRONG as illustrated in figure 5.27. Press the button of OK to input the correct password again. Press the button of EXIT to return to the main menu interface and other buttons are invalid.

Figure 5.27

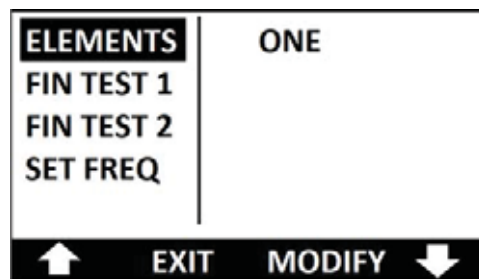


If the password is right, the interface would be changed to figure 5.28. If high demand mode is necessary, keep two heating elements as the factory default. Press the button of MODIFY to select ONE as illustrated in figure 5.29 if necessary. Press the button of EXIT to return to the last menu interface.

Figure 5.28



Figure 5.29





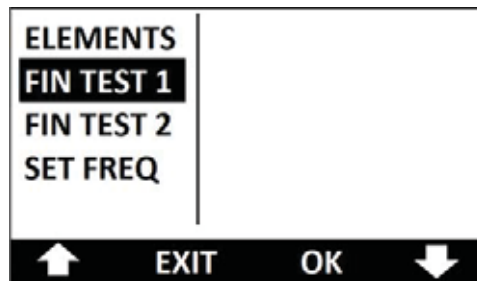
Press the button of  or  to select the sub menu of FIN TEST 1 on the maintenance menu as illustrated in figure 5.30. Press the button of OK to begin the final check program. Press the button of EXIT to return to the main menu interface. If all faults disappear after a complete final test 1, it means that all history faults have been deleted. The operation of FIN TEST 2 is the same as fin test 1. Final test 2 could be used to check the installation of the upper and the lower sensors. The faults will not disappear after a complete final test 2.

Figure 5.30



Press the button of **↑** or **↓** to select the sub menu of SET FREQ on the maintenance menu as illustrated in figure 5.31. Press the button of SET to select the power frequency. There are two power frequencies for option. The factory defaults are different for different areas. Press the button of **↑** or **↓** to change the frequency if necessary. Press the button of OK to confirm the frequency selection and there is a “✓” icon close to the selected frequency. Press the button of EXIT to return to the main menu interface.

Figure 5.31

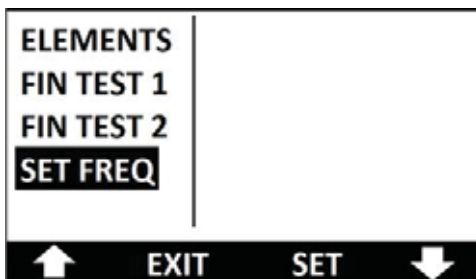


Figure 5.32



For CAHP120C unit, perform as the following instructions.

Press the button of **↑** or **↓** to select the sub menu of SERVICE on the main menu interface and then press the button of SET to enter the maintenance menu. Press the button of **↑** or **↓** to select the sub menu of SYSTEM on the maintenance menu as illustrated in figure 5.33. Press the button of VIEW to inspect the system parameters illustrated in figure 5.34 and figure 5.35. Five temperatures are displayed on the interface of figure 5.34, ambient temperature, upper tank water temperature, lower tank water temperature, discharge temperature and suction temperature. Press the button of **↓** to inspect the other two parameters, coil temperature and electronic expansion valve step. Press the button of EXIT to return to the last menu interface.

Figure 5.33

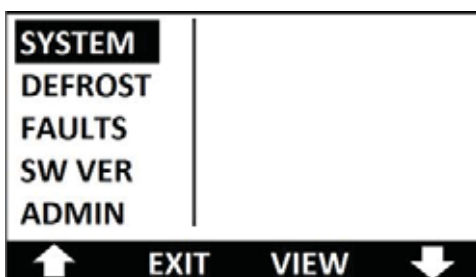


Figure 5.34

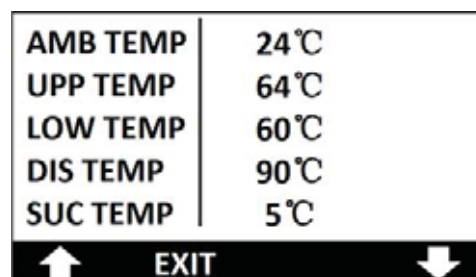
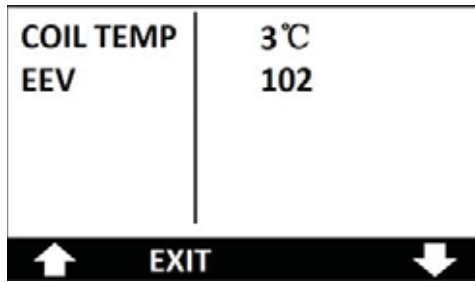


Figure 5.35



Press the button of or to select the sub menu of SYSTEM on the maintenance menu as illustrated in figure 5.36. Press the button of OK on the interface, the unit will perform manual defrost.

Figure 5.36



Press the button of or to select the sub menu of FAULTS on the maintenance menu interface as illustrated in figure 5.37. Press the button of VIEW to inspect the faults record. Compare with CAHP80/120 units, CAHP120C unit can record ten faults as illustrated in figure 5.38 and figure 5.39.

Figure 5.37

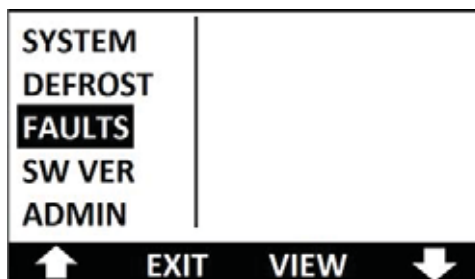


Figure 5.38

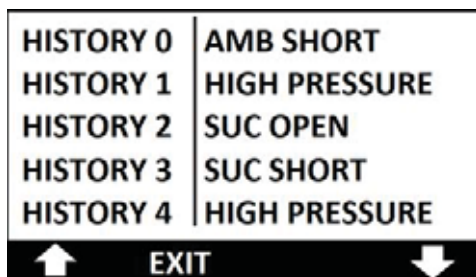
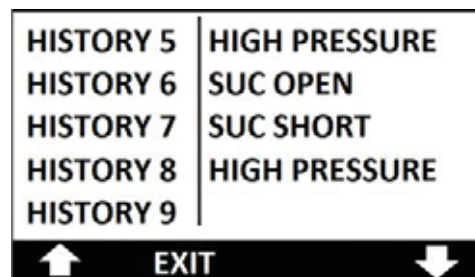


Figure 5.39



Press the button of or to select the sub menu of SW VER on the maintenance menu as illustrated in figure 5.40. Press the button of VIEW to inspect the software versions and check codes of main control board and display board illustrated in figure 5.41. Comparing with the released check codes can confirm if the software is disturbed or if it is the latest version. Press the button of EXIT to return to the last menu interface.

The version numbers will change once the software is updated. A.O. Smith reserves the

right to change the version numbers and the codes at any time without notice.

Figure 5.40

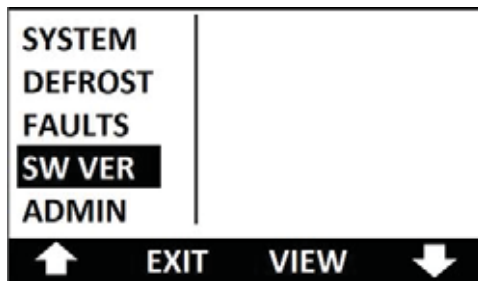
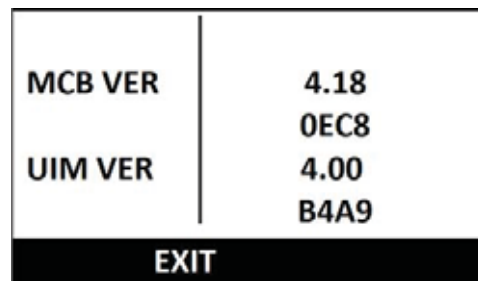


Figure 5.41

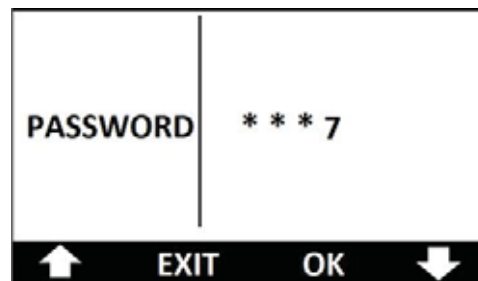


Press the button of or to select the sub menu of ADMIN on the maintenance menu as illustrated in figure 5.42. Press the button of OK to enter the maintenance menu interface. For the parameters' setting is involved in the admin authority, password (the password is 9527) is necessary with reference to figure 5.43. Press the button of or to select each number and the button of OK to confirm the number.

Figure 5.42

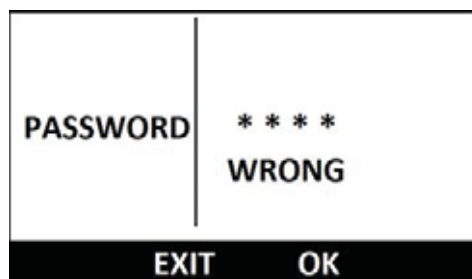


Figure 5.43



If the password is wrong, it will show WRONG as illustrated in figure 5.44. Press the button of OK to input the correct password again. Press the button of EXIT to return to the main menu interface and other buttons are invalid.

Figure 5.44



If the password is right, the interface would be changed to figure 5.45. If high demand mode is necessary, keep two heating elements as the factory default. Press the button of MODIFY to select ONE as illustrated in figure 5.46 if necessary. Press the button of EXIT to return to the last menu interface.

Figure 5.45

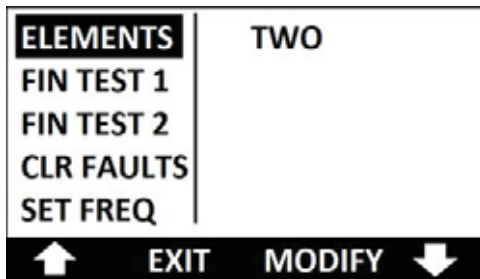
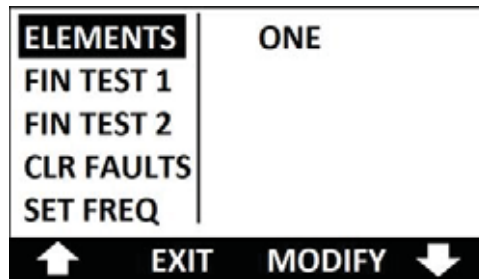


Figure 5.46





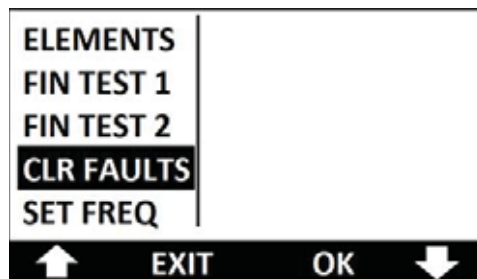
FIN TEST 1, FIN TEST 2 and SET FREQ are the same with CAHP80/120 units. Press the button of  or  to select the sub menu of CLR FAULTS on the maintenance menu as illustrated in figure 5.47. Press the button of OK to clear all the recorded faults.

Figure 5.47



6 Maintenance Instructions

CAUTION: This water heater should be maintained by a qualified person. Failure to follow these instructions can result in severe injury or property loss.

WARNING: Disconnect the power supply to the water heater before maintaining the water heater.

6.1 General

1. The maintenance of the water heater includes cleaning the tank and cleaning up the scales on the heating elements, especially in the area with harder water. It is recommended that the tank to be cleaned every month. Check the scales on the inner surface of the tank and the surface of the elements to determine whether cleaning is necessary, and the cleaning of heating elements should be performed by local supplier. It is normal if there is a hissing during the cleaning.
2. The temperature and pressure relief valve should be inspected every month to ensure it is in effective operation. Pull the handle of the relief valve several times to ensure the valve can switch freely. Please pull the handle of the relief valve once every month, and discharge 4~8L water, which can prevent scaling inside of the relief valve.
3. The water heater is equipped with an anode to protect the enamel water tank from corrosion through electrolysis. When the material of the anode is consumed completely, the water tank would lose this protection. The anode should be checked once every year to determine the consumption of the material or change the new one. When the anode diameter is less than 1 cm, change it for a new one. Higher water temperature and softer water can accelerate the consumption of the anode, so the anode should be checked more frequently. Anode is a consumptive part and is charged for replacement as it is not covered by guarantee.
4. The water heater is recommended to operate in the surrounding that is free from too much dust.

CAUTION: When inspecting the T&P relief valve, the water outlet temperature of the valve might be high and it could cause severe scalds, so be careful.

6.2 Cleaning the Water Heater

The drain valve of the water heater should be opened regularly to prevent precipitation on the bottom of the tank.

1. Disconnect the power supply to the water heater.
2. Connect a soft tube at the drain valve outlet and put the other end to a floor drain. Turn the handle of the drain valve to the left (anti-clockwise) to open the drain valve. Drain the water completely. If there is no water flowing out after opening the drain valve, perform according to the instruction of cleaning the precipitation.

3. Complete the cleaning. Close the drain valve and remove the soft tube. Connect the water heater to the power supply.

6.3 Cleaning the Precipitation

The sandy particles which are included in the impurities of water will deposit on the bottom of the tank and produce precipitation. If the precipitation is not cleaned up in time, it will get to the heating elements and cause a fault.

For convenience the cleaning of precipitation on the bottom of the tank and lime scale on the surface of the heating elements should be performed simultaneously as the following instruction.

6.4 Cleaning the Lime Scale (Perform once at least half a year)

It is a normal phenomenon that lime scale occurs on the surface of the heating elements and it is normal to all immersion heating elements. The factors which affect the amount of lime scale include:

1. The amount of hot water heated. More lime scale will occur along with the amount increase of hot water.
2. Water temperature. More lime scale will form on the surface of the heating elements along with the rising of the water temperature.
3. Water quality. No matter whether the water has been treated, the heating elements should be checked regularly.

There may be noise during the operation after the lime scale is cleaned.

The damage of this water heater caused by too much scale accumulation will make the quality guarantee become invalid.

It is recommended that the heating elements be removed to inspect regularly. If there is scale, remove all the heating elements for cleaning. If there is precipitation on the bottom of the tank, clean it.

The method of cleaning the lime scale is immersing the heating elements in UN.LIME cleaning media or other cleaning media permitted by A.O.SMITH to dissolve the lime scale. UN.LIME cleaning media is a non-chlorine cleaning media and can be bought from the engineering service department. Whether it is under guarantee, the user should pay the cost of material, labor and other relevant for cleaning the lime scale.

Performing Process

1. Disconnect the power supply to the water heater.
2. Drain the water in the tank completely according to the "Water Drainage" instruction.
3. Open the top and bottom service panels.
4. Remove the cover of the heating elements and disconnect the wire of the heating elements. Do not mess the wires and it will be easy for connecting the wires again.
5. Screw out heating elements.
6. Remove heating elements from the openings. If the diameter of the heating element with scale is more than that of the hole, screw the heating element and pull it out. Clean the scale on the surface of the heating elements with a brush.
7. If cleaning the lime scale, immerse the section with scale of the heating element in UN.LIME cleaning media to dissolve the lime scale. Do not let the electrical terminal of the heating element contact with the cleaning media or water. If cleaning other scales, silicate, sulfate and alumina should be cleaned by shaving or other mechanical means. These scales may occur sometimes and cannot be cleaned by cleaning media of lime scale.

8. After finish dissolving or cleaning, wash the section of the heating element with water.
9. Clean the precipitation and the scale on the bottom of the tank from the hole of the heating elements or the drain valve. Open the cold water inlet valve and the drain valve to help the cleaning.
10. Clean the residual PTFE tape and sealant on the connection of the heating elements.
11. Wrap the heating elements with PTFE tape at the thread joints, paint sealant at the thread joints of the tank, and then screw the heating elements into the tank.
12. Reconnect the wires of the heating elements to the original positions.
13. Recover the hot water supply according to “Water Charge” instruction. Check the tank for leaks around the heating elements and determine the normal operation of the heating elements. Install the covers of the heating elements and the service panels.

ADVICE: When the hot water is too much, it is recommended adjusting the setting temperature to a lower value for it can prevent the loss of heat and producing scale. This will result in energy conservation and extend the life of the water heater.

CAUTION: 1. If the water heater is subjected to power failure and any of the following situation occurs, please disconnect the power supply and then drain out all of the water from the tank in time.

- (1) Ambient temperature is lower than 0°C for 48 hours.
- (2) Ambient temperature is lower than -10°C for 24 hours.
- (3) Ambient temperature is lower than -20°C for 12 hours.

2. If there is a need to stop the operation of the water heater for a long time in low ambient conditions (< 5°C), please cut off the power supply and then drain out all of the water from the tank in time.

7 Trouble Shooting Instructions

7.1 General

Perform the following inspections, try to find the reasons of the faults and correct them before asking the service for the water heater.

Perform as this check list before asking for service for the water heater, the hot water supply would probably be recovered quickly and it may be unnecessary to call for service. Please disconnect the power supply before checking the water heater.

7.2 No hot water or insufficient hot water

1. Check whether there is a trip on the air break.
2. If the water has been superheated and is cold now, the high temperature limit may trip. Open the top service panel and the door of upper element and then press the “reset” button. If the high temperature limit trips repeatedly, ask the supplier to check it.
3. The hot water has a higher demand and it may beyond the hot water supply capability of the heater.
4. If the water inlet temperature is lower, it may need longer time to heat the water to the setting temperature.
5. Check the water heater or the hot water outlet tube for the leakage.
6. The precipitation and the scale in the tubes can affect the operation of the water heater. More details refer to “Maintenance Instructions”.

7.3 Noise from the water heater

1. When there is precipitation or lime scale on the surface of the heating elements, a hissing sound would occur during the operation of the water heater. The noise is normal, but the scale on the bottom of the tank or on the surface of the heating elements should be cleaned. More details refer to “Maintenance Instructions” instruction.
2. It is normal that noise will occur from some electrical components of the water heater. When the heating elements start or stop operation, a click will be heard from the contactor. A drone sound will occur from the transformer or the relay on the control board.
3. It is normal that noise will occur from the heat pump system. A whirl sound will be heard when the fan motor operates. Noise will occur from the compressor. When the compressor starts or stops the operation, a sound will occur and it is from the refrigerant flow inside tubes of heat pump.

7.4 Water leakage

1. Check the drain valve of the water heater for closing completely.
2. If the T&P relief valve outlet has leakage, it can be that:
 - a) The water temperature is too high.
 - b) The T&P relief valve is damaged.
 - c) The water pressure is too high.
3. Too high water pressure is the most common reason of the leakage of T&P relief valve. It is usually caused by “closed system”. The check valve in the water inlet tube cannot balance the expanded hot water pressure and the pressure inside the main tube. The water must be

drained by the T&P relief valve, or otherwise the water heater or the tube system will be damaged.

For this condition, refer to the local code or consult with the inspection agency to determine which system can be accepted in the area. This includes:

- a) Install the second T&P relief valve and set the pressure lower than the pressure setting of the first T&P relief valve.
 - b) Install an expanded tank with appropriate pressure to relief the heat expansion.
4. Check the heating elements for leakage. If you cannot find the reason by yourself,
- a) Please disconnect the power supply to the heater.
 - b) Close the water supply valve of the water heater.
 - c) Contact with the supplier.

7.5 Diagnostic Codes

Table 7.1

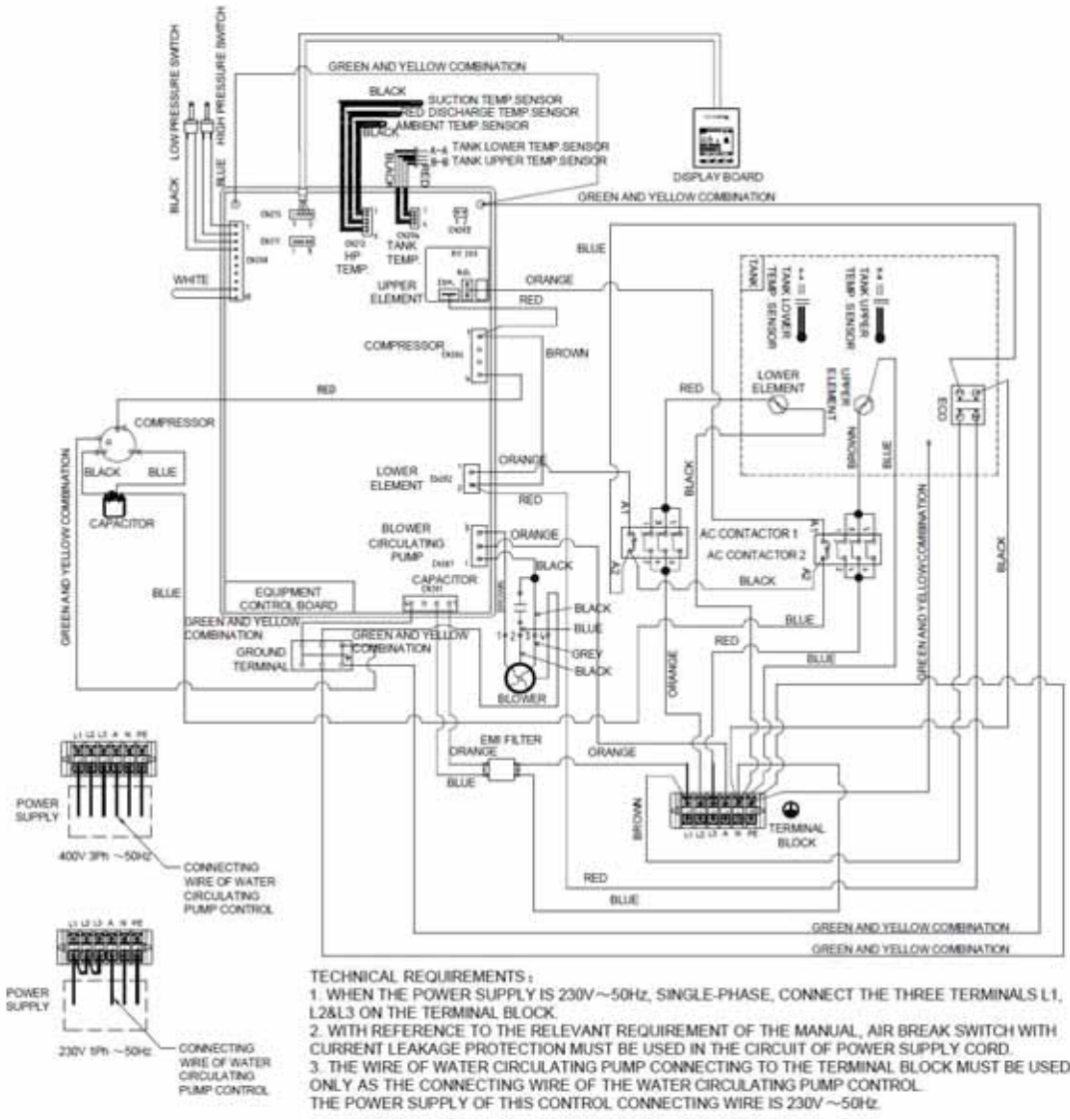
DISPLAY	INDICATES	CORRECTIVE ACTION
AMB SHORT	Ambient temperature sensor is short.	Call the service phone.
AMB OPEN	Ambient temperature sensor is open.	Call the service phone.
AMB AD ERR	Ambient temperature AD channel is error.	Call the service phone.
DIS SHORT	Discharge temperature sensor is short.	Call the service phone.
DIS OPEN	Discharge temperature sensor is open.	Call the service phone.
DIS AD ERR	Discharge temperature AD channel is error.	Call the service phone.
HIGH PRESSURE	Compressor is protected for high pressure.	If it cannot recover within one hour, call the service phone.
LOW PRESSURE	Compressor is protected for low pressure.	If it cannot recover within one hour, call the service phone.
HIGH DIS TEMP	Compressor is protected for high discharge temperature.	If it cannot recover within one hour, call the service phone.
FAN LOST	Fan motor is unconnected.	Call the service phone.
COMPRES LOST	Compressor is unconnected.	Call the service phone.
SUC SHORT	Suction temperature sensor is short.	Call the service phone.
SUC OPEN	Suction temperature sensor is open.	Call the service phone.
SUC AD ERR	Suction temperature AD channel is error.	Call the service phone.
COND OVER FLOW	Condensate water flow out of the drain pan.	Call the service phone.
LOW VOLTAGE	Low voltage alarms.	It will recover automatically.
HIGH VOLTAGE	High voltage alarms.	It will recover automatically.
COIL BLOCKED	Heat exchanger is blocked.	Call the service phone.
LOW WATER	Water level in tank is low.	Disconnect the power and charge enough water, and then connect the power supply.
ECO	ECO is error.	Call the service phone.
UPPER SHORT	Upper tank temperature sensor is short.	Call the service phone.
UPPER OPEN	Upper tank temperature sensor is open.	Call the service phone.
UPPER AD ERR	Upper tank temperature AD channel is error.	Call the service phone.
CRYSTAL ERR	Crystal is error.	Call the service phone.
RAM EER	RAM memory is error.	Call the service phone.
ROM EER	ROM memory is error.	Call the service phone.
VERY LOW VOLT	Extra low voltage alarming.	It will recover automatically.

UP ELEMNT LOST	Upper element is unconnected.	Call the service phone.
ST MACH ERR	State machine redundant failed.	Call the service phone.
LOW SHORT	Lower tank temperature sensor is short.	Call the service phone.
LOW OPEN	Lower tank temperature sensor is open.	Call the service phone.
LOW AD ERR	Lower tank temperature AD channel is error.	Call the service phone.
COIL SHORT	Coil temperature sensor is short.	Call the service phone.
COIL OPEN	Coil temperature sensor is open.	Call the service phone.
COIL AD ERR	Coil temperature AD channel is error.	Call the service phone.
EEPROM FAULT	EEPROM is fault.	Call the service phone.
COIL DIRTY	Too much dust in evaporator assembly.	Turn off the unit and clean the evaporator.
LOW ELEMNT LOST	Lower element is unconnected.	Call the service phone.

8 APPENDIX

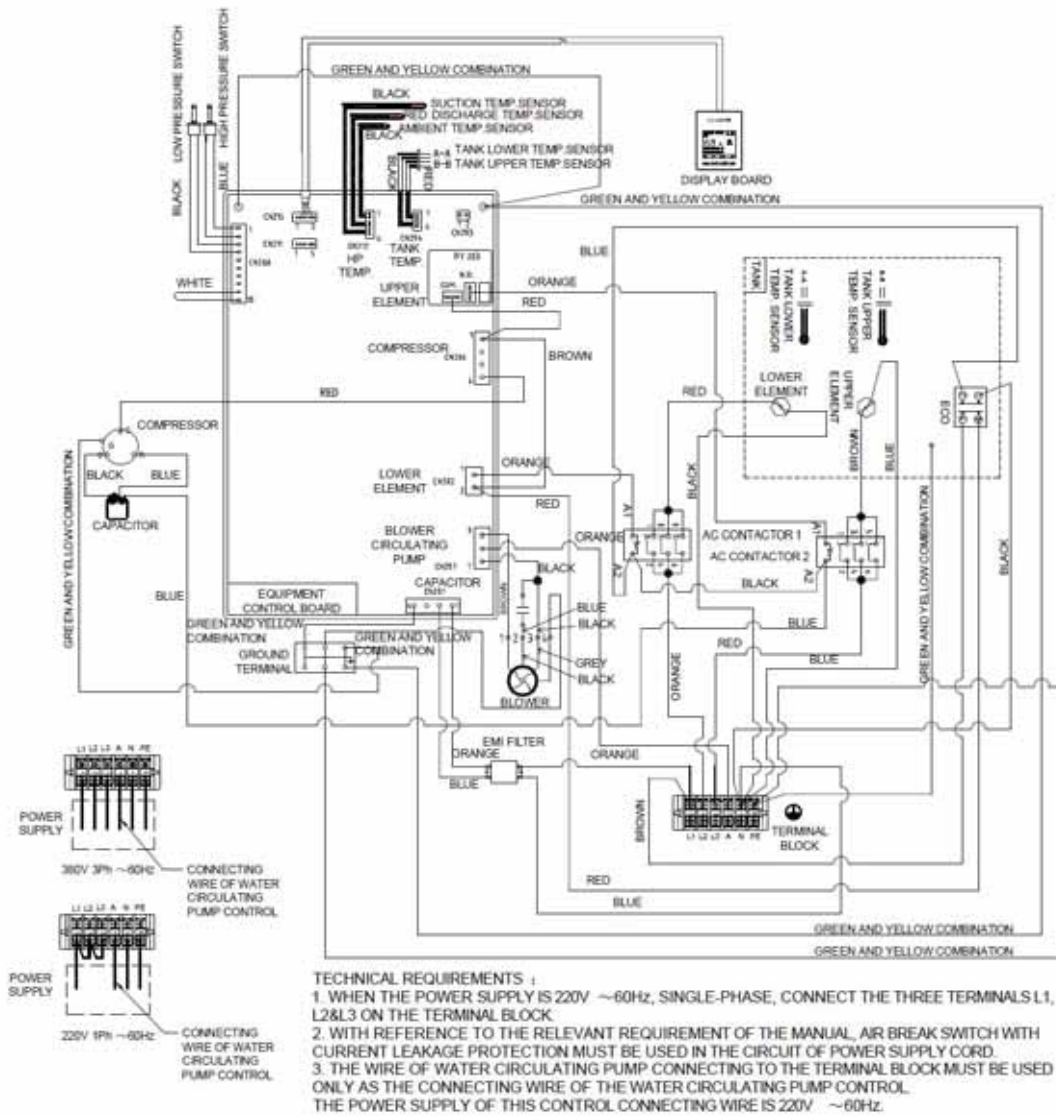
8.1 CAHP-80/120I Wiring Diagram

HEAT PUMP WATER HEATER WIRING DIAGRAM



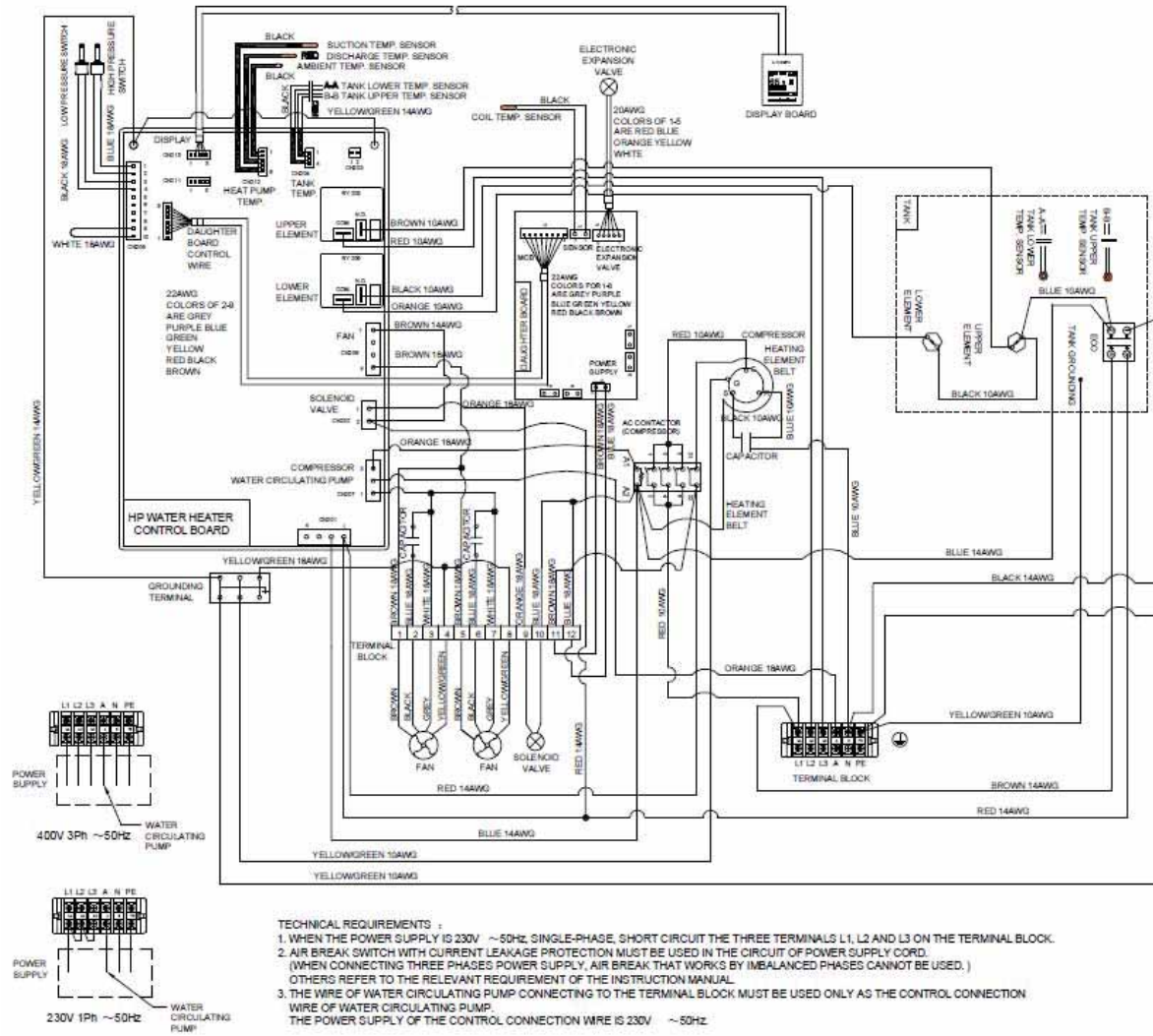
8.2 CAHP-80T/120T Wiring Diagram

HEAT PUMP WATER HEATER WIRING DIAGRAM



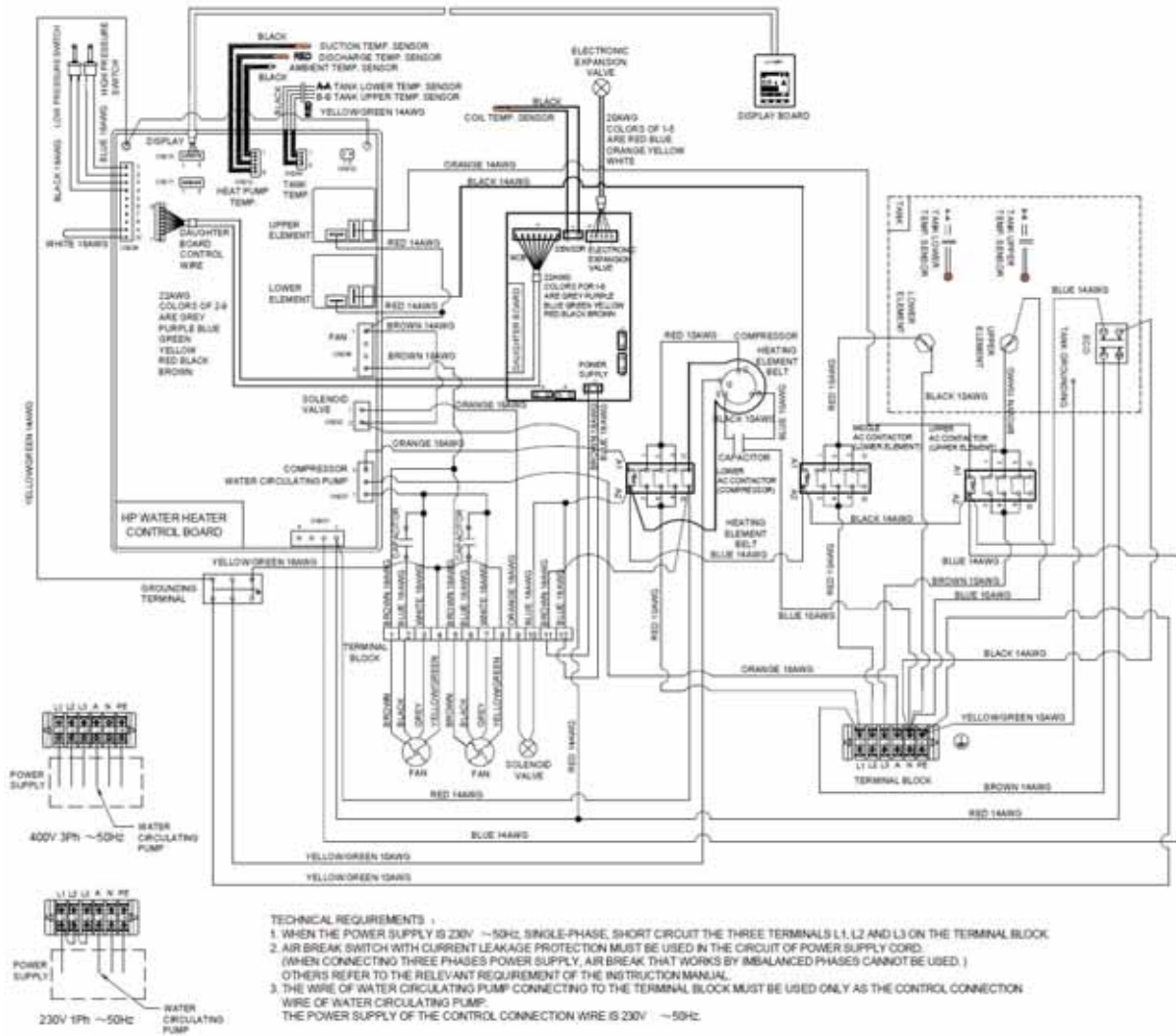
8.3 CAHP120C/3KW Wiring Diagram

HEAT PUMP WATER HEATER WIRING DIAGRAM



8.4 CAHP120C/4KW/5KW/6KW Wiring Diagram

HEAT PUMP WATER HEATER WIRING DIAGRAM





A.O.SMITH WATER HEATER CO., LTD

