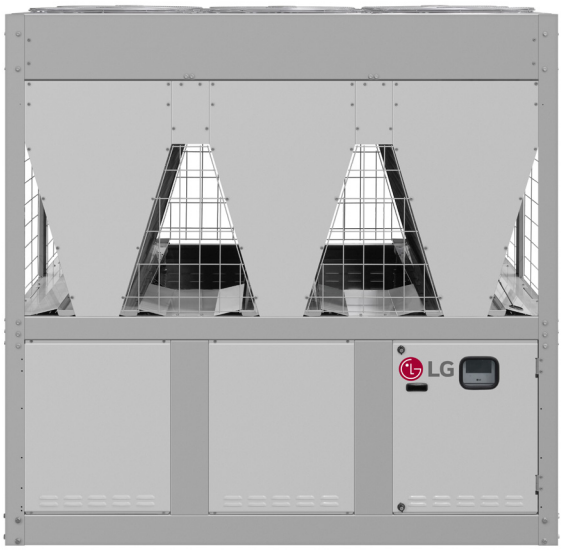
LG AIR-COOLED INVERTER SCROLL HEAT PUMP CHILLER

INSTALLATION AND OWNERS MANUAL



ACHH017VBAB, ACHH020VBAB, ACHH033VBAB, ACHH050VBAB, ACHH060VBAB: 208-230V/60Hz/3PH

ACHH017HBAB, ACHH020HBAB, ACHH033HBAB, ACHH050HBAB, ACHH060HBAB: 460V/60Hz/3PH

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⃠ Do not throw away, destroy, or lose this manual.
Please read carefully and store in a safe place for future reference.
Content familiarity is required for proper installation.

The instructions included in this manual must be followed to prevent product malfunction, property damage, injury, or death to the user or other people. Incorrect operation due to ignoring any instructions will cause harm or damage. The level of seriousness is classified by the symbols described by the summary list of safety precautions on page 4.

For more technical materials such as submittals, catalogs, engineering, owner's, best practices, and service manuals, visit www.lghvac.com.

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SAFETY PRECAUTIONS

The instructions below must be followed to prevent product malfunction, property damage, injury or death to the user or other people. Incorrect operation due to ignoring any instructions will cause harm or damage. The level of seriousness is classified by the symbols described below.

TABLE OF SYMBOLS

⚠DANGER	*This symbol indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.*
⚠WARNING	*This symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.*
⚠CAUTION	*This symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.*
Note:	*This symbol indicates situations that may result in equipment or property damage accidents only.*
⃠	*This symbol indicates an action that should not be performed.*

INSTALLATION

⚠DANGER

⃠ **Do not store or use flammable gas or combustibles near the chiller.**
There is risk of fire, explosion, and physical injury or death.

⃠ **Do not install the chiller in an environment with oil, steam, sulfuric smoke, etc.**
There is risk of fire, explosion, and physical injury or death.

⃠ **Do not supply power to the chiller until all wiring and piping are completed or reconnected and checked.**
There is risk of physical injury or death due to electric shock.

⚠WARNING

⃠ **The dealer or a trained technician must install the chiller.**
Improper installation will result in fire, explosion, electric shock, physical injury or death.

The information contained in this manual is intended for use by an LG trained service technician.
Failure to carefully read and follow all instructions will result in fire, electric shock, explosion, physical injury or death.

For replacement of an installed unit, always contact an LG trained service provider.
There is risk of fire, electric shock, explosion, and physical injury or death.

Wear protective gloves when handling equipment. Sharp edges will cause personal injury.

⃠ **Do not change the settings of the protection devices.**
If the protection devices have been bypassed or are forced to operate improperly, or parts other than those specified by LG are used, there is risk of fire, electric shock, explosion, and physical injury or death.

Replace all control box and panel covers.
If cover panels are not securely installed, dust, water, and animals will enter the outdoor unit, causing fire, electric shock, and physical injury or death.

Always check for system refrigerant leaks after the unit has been installed or serviced.
Exposure to high concentration levels of refrigerant gas will lead to illness or death.

If the chiller is installed in a small space, take measures to prevent the refrigerant concentration from exceeding safety limits in the event of a refrigerant leak.
Consult the latest edition of American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standard 15. If the refrigerant leaks and safety limits are exceeded, it could result in personal injuries or death from oxygen depletion.

Dispose of the packing materials safely.
- *Packing materials, such as nails and other metal or wooden parts, will cause puncture wounds or other injuries.*
- *Tear apart and throw away plastic packaging bags; there is a risk of suffocation and death.*

Install the chiller in a safe location where nobody can step on, fall onto it, or place objects on it.
It will result in an accident that causes physical injury or death.

When installing or if moving the chiller to another site, ⃠ do not charge it with a different refrigerant from the one specified.
If a different refrigerant is used, or if air is mixed with the original refrigerant, the refrigerant cycle may malfunction and the product may be damaged.

⚠WARNING

Properly install and insulate the drain piping to ensure water is drained away properly.
Improper installation can cause water to leak, generating a slippery surface that risks physical injury .

Install the unit considering the potential for strong winds or earthquakes.
Improper installation will cause the unit to fall over, resulting in physical injury or death.

⚠CAUTION

Be very careful when transporting the product. There is a risk of the product falling and causing physical injury.

- *Use appropriate moving equipment (forklift, spreader bar, etc.) to transport each chiller; ensure the equipment is of the correct material and capable of supporting the weights listed.*
- *Some products use polypropylene bands for packaging. ⃠ Do not use polypropylene bands to lift the unit.*
- *Support the chiller at specified positions to avoid slipping out of the rigging apparatus. Ensure that the load of the chiller is evenly distributed and level during the move.*
- ⃠ *Do not touch the heat exchanger fins during transport; there is a risk of physical injury.*

Note:

The Limited Warranty will be null and void, and LG Electronics will not be responsible and will have no liability to any customer or third party to the extent any of the following occur: acts, omissions, and conduct of any and all third parties including, but not limited to, the installing contractor and any repairs, service or maintenance by unauthorized or unqualified personnel.

The information contained in the manual is intended for use by a qualified service technician familiar with safety procedures and equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions in this manual can result in equipment malfunction, and / or property damage.

⃠ **Do not install the chiller where it is exposed directly to ocean winds.**
Sea salt in the air will cause the product to corrode. Corrosion, particularly on the condenser and evaporator fins, could cause product malfunction or inefficient operation.

⃠ **Do not install the chiller where there is an obstruction immediately above the unit. See installation clearances in this manual.**
If there is an obstruction immediately above the chiller, it can deflect the discharge air, where it can be re-circulated into the condenser coil inlet, causing operation malfunction.

Properly install and insulate the drain piping to ensure water is drained away properly.
Improper installation can cause water to leak, causing a slippery surface condition and / or water damage.

Always check for system refrigerant leaks after the unit has been installed or serviced.
Low refrigerant levels will cause product failure.

⃠ **Do not make refrigerant substitutions. Use only the refrigerant specified in this manual.**
If a different refrigerant is used, or air mixes with original refrigerant, the unit will malfunction and damage will occur.

⃠ **Do not store or use flammable gas/ combustibles near the unit.**
There is a risk of product failure.

⃠ **Do not install the chiller in an environment with oil, steam, sulfuric smoke, etc.**
There is risk of a reduction in performance, malfunction, and / or product damage.

Keep the chiller level / upright during installation to avoid vibration and / or water leaks.

When installing the chiller near a hospital, mechanical room, or similar electromagnetic field (EMF) sensitive environment, provide sufficient protection against electrical noise.
Inverter equipment, power generators, high-frequency medical equipment or radio communication equipment will cause the chiller to operate improperly. The chiller will also affect such equipment by creating electrical noise that disturbs medical treatment or image broadcasting.

⃠ **Do not touch the heat exchanger fins; there is a risk of product damage and malfunction.**

When connecting refrigerant piping, remember to allow for pipe expansion.
Improper piping installation will cause system malfunction.

⃠ **Do not install the chiller in a noise-sensitive area, or where hot air could damage surrounding structures.**

Install the chiller in a safe location where no one can step on or fall onto it. ⃠ **Do not install the unit on a defective stand.**
There is a risk of unit and property damage.

Install the drain hose to ensure adequate drainage.
There is a risk of water leakage and property damage.

SAFETY PRECAUTIONS

WIRING

⚠ DANGER

High voltage electricity is required to operate chiller. Adhere to the U.S. National Electric Codes (NEC) and these instructions when wiring.
Improper connections and inadequate grounding can cause accidental injury or death.

Always ground the unit following local, state, and NEC codes.
There is risk of fire, electric shock, and physical injury or death.

Turn the power off before servicing the chiller. Ensure the power is completely off and out of all components.
Electrical shock can cause physical injury or death.

⃠ **Do not supply power to the unit until all electrical wiring, controls wiring, and piping installation are completed.**
There is risk of fire, electric shock, and physical injury or death.
Properly size all circuit breakers, fuses and power wiring.
There is risk of fire, electric shock, explosion, physical injury or death if the electrical components are too small.

⃠ **Do not share the electrical circuit with other devices. Ensure the chiller(s) has/have dedicated circuit(s) and breaker(s).**
There is risk of fire, electric shock, and physical injury or death due to heat generation.

⃠ **Do not use damaged or loose power wiring.** ⃠ **Do not modify or extend the chiller's power wiring. Ensure that the power wiring will not be pulled nor weight be placed on the power wiring during operation.**
There is risk of fire, electric shock, and physical injury or death.

⚠ WARNING

The information contained in this manual is intended for use by an industry-qualified, experienced, trained electrician familiar with the NEC who is equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions in this manual can result in personal injury or death.

All field wiring and component installation must be performed by a licensed electrician and conform to local building codes or, in the absence of local codes, with the NEC, and the instructions and wiring diagrams given in this manual.
If the power source capacity is inadequate or the electric work is not performed properly, it will result in fire, electric shock, physical injury or death.

Refer to local, state, and federal codes, and use power wires of sufficient current capacity and rating.
Wires that are too small will generate heat and cause a fire, and physical injury or death.

Secure all field wiring connections with appropriate wire strain relief.
Improperly securing wires will create undue stress on equipment power connections. Inadequate connections will generate heat, cause a fire, and physical injury or death.

Ensure the system is connected to a dedicated power source that provides adequate power.
If the power source capacity is inadequate or the electric work is not performed properly, it will result in fire, electric shock, physical injury or death.

Properly tighten all power connections.
Loose wiring will overheat at connection points, causing a fire, physical injury or death.

⃠ **Do not change the settings of the protection devices.**
If the protection devices have been bypassed or is forced to operate improperly, or parts other than those specified by LG are used, there is risk of fire, electric shock, explosion, and physical injury or death.

Note:

⃠ **Do not supply power to the unit until all electrical wiring, controls wiring, and piping installation are completed.**
The system will malfunction.

The information contained in this manual is intended for use by an industry-qualified, experienced, trained electrician familiar with the NEC who is equipped with the proper tools and test instruments.
Failure to carefully read and follow all instructions in this manual can result in equipment malfunction and property damage.

OPERATION

⚠ DANGER

Service on this equipment is to be performed by an industry-qualified, experienced, trained technician familiar with operation, routine checks, maintenance, cleaning, safety hazards, and troubleshooting procedures.
Failure to follow all instructions can result in personal injury or death.

⃠ Do not allow unauthorized personnel to operate, clean, and maintain the chiller. Keep unauthorized and / or untrained personnel away from the chiller.
There is risk of fire, explosion, and physical injury or death.

⃠ Do not provide power to or operate the unit if it is flooded or submerged.
There is risk of fire, electric shock, physical injury or death.

Use a dedicated breaker for this product.
There is risk of fire, electric shock, physical injury or death.

⃠ Do not operate the disconnect switch with wet hands.
There is risk of fire, electric shock, physical injury or death.

Periodically verify that the equipment mounts or the installation area have not deteriorated.
If the mounts or area collapse, the chiller could fall and cause physical injury or death.

Use inert (nitrogen) gas when performing leak tests or air purges. ⃠ Do not use compressed air, oxygen, or flammable gases.
Using these substances will cause fire, explosion, and physical injury or death.

If refrigerant leaks, ventilate the area before operating the unit.
If the chiller is mounted in an enclosed, low-lying, or poorly ventilated area, and it develops a refrigerant leak, it will cause a fire, electric shock, explosion, physical injury or death.

⚠ WARNING

⃠ Do not allow water, dirt, or animals to enter the unit.
There is risk of fire, electric shock, physical injury or death.

⃠ Do not operate the chiller with the panel(s) or protective cover(s) removed; keep fingers and clothing away from moving parts.
The rotating, hot, cold, and high-voltage parts of the unit can cause physical injury or death.

⃠ Do not touch the refrigerant piping during or after operation, or when checking the valves.
It can cause burns or frostbite.

⃠ Do not open the inlet or touch the electrostatic filter (if so equipped) during operation.
There is risk of electric shock, physical injury or death.

⃠ Do not insert hands or other objects in the air inlets or outlets while power is supplied to the chiller.
Chiller has sharp and moving parts that will cause physical injury.

Qualified personnel must provide water circuit freeze protection. Follow industry standards and local, state, and federal when choosing and handling an antifreeze additive.
If the water circuit freezes, the piping may burst and cause physical injury or death.

⚠ CAUTION

To avoid physical injury, use caution when cleaning or servicing the chiller.
There is risk of electric shock, physical injury or death.

Note:

Service on this equipment is to be performed by an industry-qualified, experienced, trained technician familiar with operation, routine checks, maintenance, cleaning, safety hazards, and troubleshooting procedures.
Failure to follow all instructions can result in product malfunction.

Clean up the site after servicing is finished, and check that no metal scraps, screws, or bits of wiring have been left inside or surrounding the chiller.

⃠ Do not use the product for mission critical or special purpose applications such as preserving food, works of art, or other precision air conditioning applications. The equipment is designed to provide comfort cooling and heating.
There is risk of property damage.

⃠ Do not allow water, dirt, or animals to enter the unit.
There is risk of unit failure.

⃠ Do not open the inlet or touch the electrostatic filter (if so equipped) during operation.
There is risk of unit failure.

⃠ Do not operate the chiller with the panel(s) or protective cover(s) removed; keep fingers and clothing away from moving parts.
Non-secured covers can result in malfunction due to dust or water.

Provide power to the chiller at least six (6) hours before operation begins.
Starting operation immediately after turning on the main power switch will result in severe damage to internal components. Keep the power switch on during the operational season.

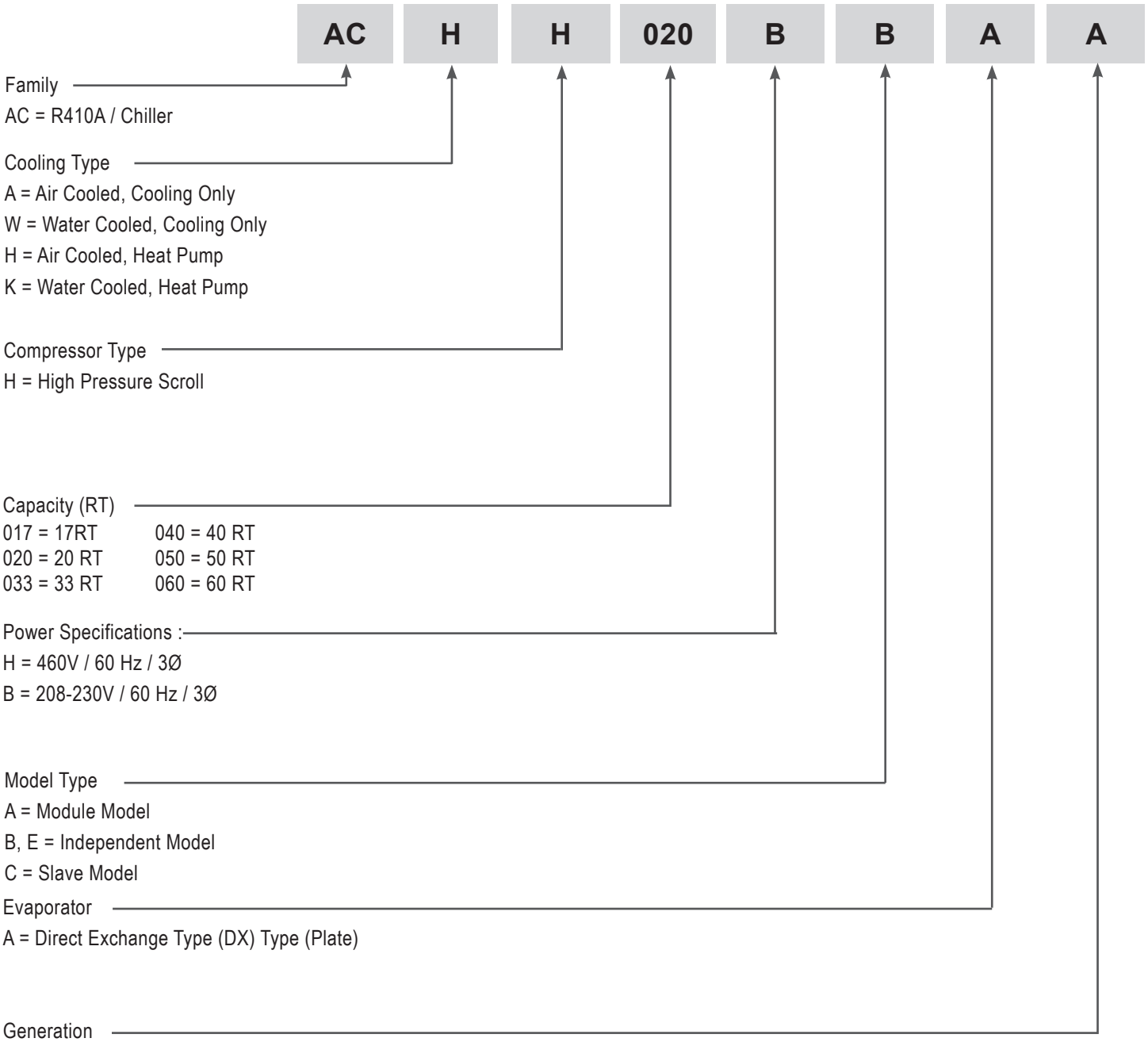
⃠ Do not turn off the main power switch immediately after operation has been stopped.
Wait at least five (5) minutes before turning off the main power switch, otherwise it will result in product malfunction and / or damage.

If re-operating the chiller after it has been in low temperature condition for an extended period, the touch function temporarily may not work. Wait, and after time, the product will function normally.

⃠ Do not block the inlet or outlet.
Chiller will malfunction.

Qualified personnel must provide water circuit freeze protection. Follow industry standards and local, state, and federal when choosing and handling an antifreeze additive.
If the water circuit freezes, it can cause product damage. Also, an improper antifreeze additive can damage copper piping.

UNIT NOMENCLATURE

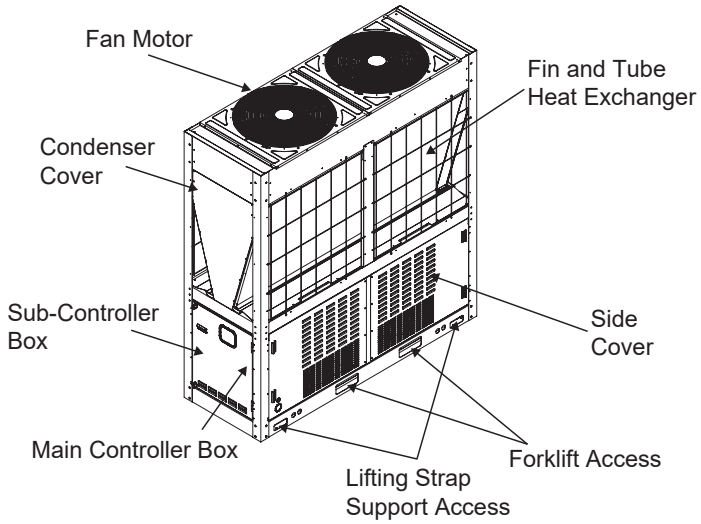


General Information

The LG Inverter Scroll Heat Pump Chiller provides both cold water and hot water for heating and cooling application. The ACHH Series Chiller is an air cooled R410A system with a wide range of approved air side and water side operating conditions. The ACHH is a single unit product produced in 3 frame sizes; a 20 ton (2-compressors), 40 ton (4 compressors) and 60 ton (6 compressors). This single unit is designed to be used in a modular concept to provide a much larger capacity.

The LG HMI (Human Machine Interface) or chiller control is capable of controlling up to 5 single units as one system. The ACHH Chiller is engineered by LG with inverter technology in its compressors and BLDC variable speed condenser fan motors that provide low noise operation and electronic expansion valves for precise load control. The ACHH system is designed with a plate type evaporator heat exchanger connecting to the water side and a fin in tube air cooled condenser coil design.

Figure 1: Example of an LG Chiller.



The ACHH basis of design is to provide independent refrigerant circuits per each 10 ton compressor and a shared evaporator on the water side only for each 20 tons of capacity. The ACHH is provided with LG's unique control logic to monitor and control necessary parameters providing improved operational efficiency. The load requirements will change due to flow, set point or ambient conditions and LG's greatest strength of design is the ability to match this the capacity that is required during operation to exactly what is needed. The LG ACHH Inverter Scroll Heat Pump Chiller is a commercial/industrial product.

Cooling and Heat Pump Heating Cycle

ACHH LG Inverter Scroll Heat Pump Chillers feature high-pressure shell type scroll compressors. The suction vapor area is separated from the high-pressure discharge area, and the motor is installed on the low-pressure vapor area. Space for the motor and storage for refrigerant is secured in the low-pressure vapor area to increase liquid compression reliability.

Inside the system, oil to lubricate the compressor is mixed with the refrigerant to discharge both the oil and refrigerant during operation. Because the oil discharged from the compressor can reduce the heat transfer efficiency when a thick layer builds up on interior walls of the condenser and evaporator, a device to prevent the refrigerant and oil to be discharged together is added to prevent this issue. This lubrication system ensures longer life for the compressor, improves the sealing of the compression space, and provides lower sound operation.

The heat exchanger is an air-cooled fin and tube type. The condenser is designed with a V-shaped heat exchanger, and an electronic expansion valve is used for efficient control in all load conditions. The controller used in the chiller is an LG exclusive, and monitors the different sensors installed to provide product protection.

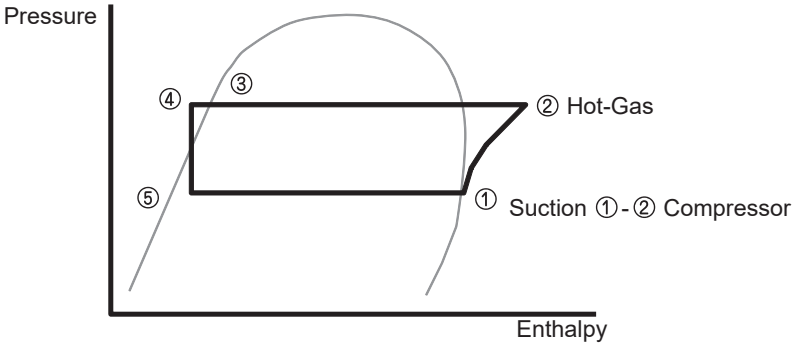
For continuous supply of cold and hot water, LG chillers are equipped with maximum continuous operation functions, and also provide precision control to supply the accurate targeted water temperature set points in heating and cooling modes.. Protection devices will immediately stop the chiller if the operation malfunctions, or a condition limit is reached. In case of an operation malfunction, the chiller controller will display error codes to the authorized LG service provider.

Error codes are available on site by looking at the HMI or available via 3rd party integration as a viewable point. The ACHH has a "Black Box" that a stores a run file that can be reviewed by the LGMV Service Software for a very detailed look providing key information on what caused the error.

INTRODUCTION

Refrigeration Cycle Description

Figure 2: LG Chiller Pressure-Enthalpy Diagram.



The cooling cycle of ACHH series can be described using the following pressure–enthalpy chart. ①, ②, ③, ④, and ⑤ in the following chart shows the conditions of the refrigerant. The refrigerant comes into the compressor and moves to the internal suction inlet section of the compressor. The oil inside the compressor seals the gap between the compressor scrolls and provides lubrication for the bearing to help the compression of the refrigerant. During this time, the refrigerant is compressed and is discharged to the air cooled condenser. (②) The compressed refrigerant passes through the air cooled condenser and exchanges the heat with the outdoor air. The condensed refrigerant then passes the condenser to be overcooled (② → ③ → ④). The refrigerant that passed through the condenser expands in the electronic expansion valve to flow to the evaporator (④ → ⑤). The refrigerant is evaporated in the shell and tube type heat exchanger, the evaporator (⑤ → ①). Liquid refrigerant of low temperature pressure passes through the evaporator to cool the water flowing into the evaporator and the refrigerant itself receives the heat to evaporate to gas condition. (①) The refrigerant continues to change the phase and continuously repeats the cooling cycle. For heating the refrigerant flow is in the reverse direction to provide hot water.

Lubrication System

Oil is efficiently separated inside the scroll compressor, and even when the cycle operates, most of the oil remains inside the scroll compressor. Only a part of the oil will be mixed with the refrigerant to be circulated within the cycle.

Partial Load Operation

Each cooling cycle operates independently; one (1) cooling cycle includes two (2) inverter compressors.

Two (2) inverter compressors increase the rpm after initial start to gradually increase the capacity. The end user will experience smooth operation of the LG ACHH chiller as the capacity required is matched to the required load. The LG ACHH will out perform staging systems and the variance in loop temperature is reduced with the liner performance of the ACHH compressors. LG ACHH chillers have efficient partial load performance.

Continuous operation at a capacity less than 20% of total capacity is not guaranteed. System could enter into a safety run mode and begin to cycle off compressors if the temperature difference between entering water and leaving water is less then 4 degrees Fahrenheit. The system will allow the difference in the entering water and leaving water to increase above 4 degrees Fahrenheit and then run at a minimum capacity at or above 20% of total capacity. If loop temperature is extremely critical and run conditions below 20% of total capacity are possible the engineer should provide enough storage and increase the total loop design to off set this potential.

Figure 3: Partial Load Operation Diagram.

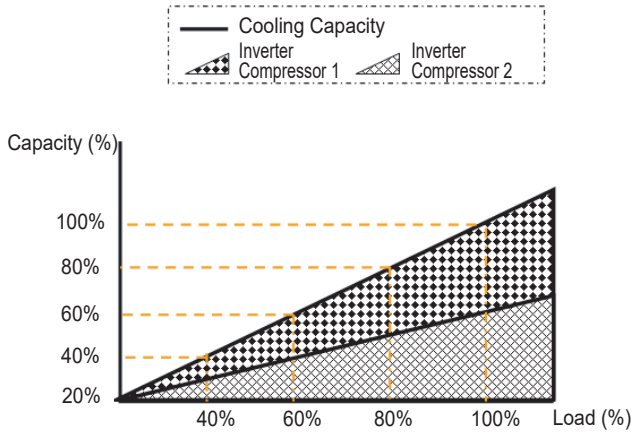


Table 1: Specification Data for 208-230V Heat Pump Chiller.

Inverter Scroll Chiller		Model	ACHH017VBAB H/P	ACHH020VBAB H/P	ACHH033VBAB H/P	ACHH040VBAB H/P
Power		Phase, Lines, V, Hz	3,3,208-230,60			
Capacity	Cooling	RT	16.2	18.5	32.42	37
		kBtuh/h	194.5	222	389	444
	Heating	kBtuh/h	204.5	239	409	478
Input Power	Cooling	kW	18.1	21.5	36.2	43.0
	Heating	kW	19.1	22.6	38.1	45.2
Efficiency	Cooling	EER (btuh/W)	10.75	10.33	10.75	10.33
	Heating (120˚F LWT,15 Δ, 47 F)	COP (W/W)	3.15	3.1	3.15	3.1
AHRI 550-590 Cooling Performance and Rating		IPLV (btuh/W)	19.46	19.46	19.46	19.46
Sound Power	Cooling	dB(A)	78	78	86	87
Sound Pressure 30'	Cooling	dB(A)	49	51	52	54
Sound Pressure 5'	Cooling	dB(A)	69	71	72	74
Sound Power	Heating	dB(A)	83	83	86	87
Sound Pressure 30'	Heating	dB(A)	49	51	52	54
Sound Pressure 5'	Heating	dB(A)	69	71	72	74
Compressor	Type		Inverter Scroll			
	No. of Compressors	EA	2	2	4	4
	Oil Type		PVE			
	Oil Charge Each Compressor	OZ/EA	33.8	33.8	33.8	33.8
Refrigerant	Type		410A			
	Amount of Charge EA Circuit	lbs/EA	15.4	15.4	15.4	15.4
Condenser Coil	Coated Aluminum Fin and Tube	10,000 HRS ASTMB-117	2	2	4	4
Evaporator	Type		Stainless Brazed Plate			
	Quantity	EA	1	1	2	2
	Pressure Drop	ftAq	2.7	3.1	2.7	3.1
	Operating Maximum Pressure (Refrigerant/Water)	psi	597/142	597/142	597/142	597/142
	Cooling Water Flow (10F Delta)	GPM	38.9	44.4	77.8	88.7
	Inlet/Outlet Water Connection	inches/flange	2"/150 lb	2"/150lb	2 1/2"/150lb	2 1/2"/150lb
	Total System Water Volume	GL	2.68	2.68	7.91	7.91
Fan Motor	Type		Variable BLDC			
	No. of Fan Motors	EA	2	2	4	4
	No. of Blades per Fan	EA	6	6	6	6
	Air Flow Rate	CFM	8684	8684	8684	8684
	Motor Power	W	900	900	900	900
Refrigerant Metering	Type		2000 Step Electronic Expansion Valve			
Weight		lbs	1162	1162	2218	2218
Dimensions	W	inches	30 1/8	30 1/8	60 5/8	60 5/8
	H	inches	86 5/8	86 5/8	86 5/8	86 5/8
	D	inches	84 13/16	84 13/16	84 13/16	84 13/16
Foot Print		ft2/RT	1.09	0.96	1.09	0.96
Exterior Panel		Epoxy Powder Coat	Rated at 450 HRS per ASTMB-117			
Protection Devices	High/Low Pressure	Electronic	Internal			
	Flow Switch	Paddle/ADJ.	Internal			
	Freeze Protection	On/Off Contact Only	Heat Trace Elements and Power by Others			
Remote Monitoring and Control		Type	Optional Bacnet Gateway and Modbus Control			
Supply Water Temperature Range	Cooling	F	14-68			
	Heating	F	86-131			
Approved Water Delta T	Cooling and Heating	F	04-20			
Ambient Temperature Operational Range	Cooling	F	5-122			
	Heating	F	-22-95			
Guaranteed Load Capacity Range		%	20-100			

1. Due to our policy innovations some specification may be changed without prior notification.
2. AHRI 550-590 Cooling Capacity Conditions: 95F Ambient Air, 54F EWT and 44F LWT.
3. AHRI 550-590 Medium Temp 120F LWT Heating Capacity Test Condition.
4. Sound Data Tested per ANSI/AHRI Standard 370-2015 (Based on individual systems)
5. The ACHH***VBAB models are certified by AHRI to AHRI Standard 550-590.
6. For the lattes version of Certified LATS ISC Selection Software go to, www.ahridirectory.org
7. Heating Performance Tested per the AHRI 550-590 procedure. Heating Performance is not in certification scope of AHRI 550-590.
8. This product contains (R410A, GWP:2087.5t-CO2 eq = F-gas (kg) x GWP / 1000)

SPECIFICATIONS

Table 1: Specification Data for 208-230V Heat Pump Chiller, page 2.

Inverter Scroll Chiller		Model	ACHH050VBAB	ACHH060VBAB
			H/P	H/P
Power		Phase, Lines, V, Hz	3, 3, 208-230,60	
Capacity	Cooling	RT	48.58	55.42
		kBtuh/h	583	665
	Heating	kBtuh/h	614	717
Input Power	Cooling	kW	54.3	64.6
	Heating	kW	57.1	67.7
Efficiency	Cooling	EER (btuh/W)	10.75	10.33
	Heating (120˚F LWT,15 Δ, 47 F)	COP (W/W)	3.15	3.1
AHRI 550-590 Cooling Performance and Rating		IPLV (btuh/W)	19.46	19.46
Sound Power	Cooling	dB(A)	88	88
Sound Pressure 30'	Cooling	dB(A)	54	56
Sound Pressure 5'	Cooling	dB(A)	74	76
Sound Power	Heating	dB(A)	88	88
Sound Pressure 30'	Heating	dB(A)	54	56
Sound Pressure 5'	Heating	dB(A)	74	76
Compressor	Type		Inverter Scroll	
	No. of Compressors	EA	6	6
	Oil Type		PVE	
	Oil Charge Each Compressor	OZ/EA	33.8	33.8
Refrigerant	Type		410A	
	Amount of Charge EA Circuit	lbs/EA	15.4	15.4
Condenser Coil	Coated Aluminum Fin and Tube	10,000 HRS ASTMB-117	6	6
Evaporator	Type		Stainless Brazed Plate	
	Quantity	EA	3	3
	Pressure Drop	ftAq	2.7	3.1
	Operating Maximum Pressure (Refrigerant/Water)	psi	597/142	597/142
	Cooling Water Flow (10F Delta)	GPM	116.7	133.1
	Inlet/Outlet Water Connection	inches/flange	2 1/2"/150lb	2 1/2"/150lb
	Total System Water Volume	GL	14.48	14.48
Fan Motor	Type		Variable BLDC	
	No. of Fan Motors	EA	6	6
	No. of Blades per Fan	EA	6	6
	Air Flow Rate	CFM	8684	8684
	Motor Power	W	900	900
Refrigerant Metering	Type		2000 Step Electronic Expansion Valve	
Weight		lbs	3208	3208
Dimensions	W	inches	90 13/16	90 13/16
	H	inches	86 5/8	86 5/8
	D	inches	84 13/16	84 13/16
Foot Print		ft2/RT	1.09	0.96
Exterior Panel		Epoxy Powder Coat	Rated at 450 HRS per ASTMB-117	
Protection Devices	High/Low Pressure	Electronic	Internal	
	Flow Switch	Paddle/ADJ.	Internal	
	Freeze Protection	On/Off Contact Only	Heat Trace Elements and Power by Others	
Remote Monitoring and Control		Type	Optional BACnet Gateway and Modbus Control	
Supply Water Temperature Range	Cooling	F	14-68	
	Heating	F	86-131	
Approved Water Delta T	Cooling and Heating	F	4-20	
Ambient Temperature Operational Range	Cooling	F	5-122	
	Heating	F	-22-95	
Guaranteed Load Capacity Range		%	20-100	

1. Due to our policy innovations some specification may be changed without prior notification.
2. AHRI 550-590 Cooling Capacity Conditions: 95F Ambient Air, 54F EWT and 44F LWT.
3. AHRI 550-590 Medium Temp 120F LWT Heating Capacity Test Condition.
4. Sound Data Tested per ANSI/AHRI Standard 370-2015 (Based on individual systems)
5. The ACHH***VBAB models are certified by AHRI to AHRI Standard 550-590.
6. For the lattes version of Certified LATS ISC Selection Software go to, www.ahridirectory.org
7. Heating Performance Tested per the AHRI 550-590 procedure. Heating Performance is not in certification scope of AHRI 550-590.
8. This product contains (R410A, GWP:2087.5t-CO2 eq = F-gas (kg) x GWP / 1000)

Table 2: Specification Data for 460V Heat Pump Chiller.

Inverter Scroll Chiller		Model	ACHH017HBAB H/P	ACHH020HBAB H/P	ACHH033HBAB H/P	ACHH040HBAB H/P
Power		Phase, Lines, V, Hz	3,3,460,60			
Capacity	Cooling	RT	16.2	18.5	32.42	37
		kBtuh/h	194.5	222	389	444
	Heating	kBtuh/h	204.5	239	409	478
Input Power	Cooling	kW	18.1	21.5	36.2	43.0
	Heating	kW	19.1	22.6	38.1	45.2
Efficiency	Cooling	EER (btuh/W)	10.75	10.33	10.75	10.33
	Heating (120˚F LWT,15 Δ, 47 F)	COP (W/W)	3.15	3.1	3.15	3.1
AHRI 550-590 Cooling Performance and Rating		IPLV (btuh/W)	19.46	19.46	19.46	19.46
Sound Power	Cooling	dB(A)	78	78	86	87
Sound Pressure 30'	Cooling	dB(A)	49	51	52	54
Sound Pressure 5'	Cooling	dB(A)	69	71	72	74
Sound Power	Heating	dB(A)	83	83	86	87
Sound Pressure 30'	Heating	dB(A)	49	51	52	54
Sound Pressure 5'	Heating	dB(A)	69	71	72	74
Compressor	Type		Inverter Scroll			
	No. of Compressors	EA	2	2	4	4
	Oil Type		PVE			
	Oil Charge Each Compressor	OZ/EA	33.8	33.8	33.8	33.8
Refrigerant	Type		410A			
	Amount of Charge EA Circuit	lbs/EA	15.4	15.4	15.4	15.4
Condenser Coil	Coated Aluminum Fin and Tube	10,000 HRS ASTMB-117	2	2	4	4
Evaporator	Type		Stainless Brazed Plate			
	Quantity	EA	1	1	2	2
	Pressure Drop	ftAq	2.7	3.1	2.7	3.1
	Operating Maximum Pressure (Refrigerant/Water)	psi	597/142	597/142	597/142	597/142
	Cooling Water Flow (10F Delta)	GPM	38.9	44.4	77.8	88.7
	Inlet/Outlet Water Connection	inches/flange	2"/150 lb	2"/150lb	2 1/2"/150lb	2 1/2"/150lb
	Total System Water Volume	GL	2.68	2.68	7.91	7.91
Fan Motor	Type		Variable BLDC			
	No. of Fan Motors	EA	2	2	4	4
	No. of Blades per Fan	EA	6	6	6	6
	Air Flow Rate	CFM	8684	8684	8684	8684
	Motor Power	W	1500	1500	1500	1500
Refrigerant Metering	Type		2000 Step Electronic Expansion Valve			
Weight		lbs	1162	1162	2218	2218
Dimensions	W	inches	30 1/8	30 1/8	60 5/8	60 5/8
	H	inches	86 5/8	86 5/8	86 5/8	86 5/8
	D	inches	84 13/16	84 13/16	84 13/16	84 13/16
Foot Print		ft2/RT	1.09	0.96	1.09	0.96
Exterior Panel		Epoxy Powder Coat	Rated at 450 HRS per ASTMB-117			
Protection Devices	High/Low Pressure	Electronic	Internal			
	Flow Switch	Paddle/ADJ.	Internal			
	Freeze Protection	On/Off Contact Only	Heat Trace Elements and Power by Others			
Remote Monitoring and Control		Type	Optional BACnet Gateway and Modbus Control			
Supply Water Temperature Range	Cooling	F	14-68			
	Heating	F	86-131			
Approved Water Delta T	Cooling and Heating	F	04-20			
Ambient Temperature Operational Range	Cooling	F	5-125			
	Heating	F	-22-95			
Guaranteed Load Capacity Range		%	20-100			

1. Due to our policy innovations some specification may be changed without prior notification.
2. AHRI 550-590 Cooling Capacity Conditions: 95F Ambient Air, 54F EWT and 44F LWT.
3. AHRI 550-590 Medium Temp 120F LWT Heating Capacity Test Condition.
4. Sound Data Tested per ANSI/AHRI Standard 370-2015 (Based on individual systems)
5. The ACHH***VBAB models are certified by AHRI to AHRI Standard 550-590.
6. For the lattes version of Certified LATS ISC Selection Software go to, www.ahridirectory.org
7. Heating Performance Tested per the AHRI 550-590 procedure. Heating Performance is not in certification scope of AHRI 550-590.
8. This product contains (R410A, GWP:2087.5t-CO2 eq = F-gas (kg) x GWP / 1000)

SPECIFICATIONS

Table 2: Specification Data for 460V Heat Pump Chiller, page 2.

Inverter Scroll Chiller		Model	ACHH050HBAB H/P	ACHH060HBAB H/P
Power		Phase, Lines, V, Hz	3,3,460,60	
Capacity	Cooling	RT	48.58	55.42
		kBtuh/h	583	665
	Heating	kBtuh/h	614	717
Input Power	Cooling	kW	54.3	64.6
	Heating	kW	57.1	67.7
Efficiency	Cooling	EER (btuh/W)	10.75	10.33
	Heating (120˚F LWT,15 Δ, 47 F)	COP (W/W)	3.15	3.1
AHRI 550-590 Cooling Performance and Rating		IPLV (btuh/W)	19.46	19.46
Sound Power	Cooling	dB(A)	88	88
Sound Pressure 30'	Cooling	dB(A)	54	56
Sound Pressure 5'	Cooling	dB(A)	74	76
Sound Power	Heating	dB(A)	88	88
Sound Pressure 30'	Heating	dB(A)	54	56
Sound Pressure 5'	Heating	dB(A)	74	76
Compressor	Type		Inverter Scroll	
	No. of Compressors	EA	6	6
	Oil Type		PVE	
	Oil Charge Each Compressor	OZ/EA	33.8	33.8
Refrigerant	Type		410A	
	Amount of Charge EA Circuit	lbs/EA	15.4	15.4
Condenser Coil	Coated Aluminum Fin and Tube	10,000 HRS ASTMB-117	6	6
Evaporator	Type		Stainless Brazed Plate	
	Quantity	EA	3	3
	Pressure Drop	ftAq	2.7	3.1
	Operating Maximum Pressure (Refrigerant/Water)	psi	597/142	597/142
	Cooling Water Flow (10F Delta)	GPM	116.7	133.1
	Inlet/Outlet Water Connection	inches/flange	2 1/2"/150lb	2 1/2"/150lb
	Total System Water Volume	GL	14.48	14.48
Fan Motor	Type		Variable BLDC	
	No. of Fan Motors	EA	6	6
	No. of Blades per Fan	EA	6	6
	Air Flow Rate	CFM	8684	8684
	Motor Power	W	1500	1500
Refrigerant Metering	Type		2000 Step Electronic Expansion Valve	
Weight		lbs	3208	3208
Dimensions	W	inches	90 13/16	90 13/16
	H	inches	86 5/8	86 5/8
	D	inches	84 13/16	84 13/16
Foot Print		ft2/RT	1.09	0.96
Exterior Panel		Epoxy Powder Coat	Rated at 450 HRS per ASTMB-117	
Protection Devices	High/Low Pressure	Electronic	Internal	
	Flow Switch	Paddle/ADJ.	Internal	
	Freeze Protection	On/Off Contact Only	Heat Trace Elements and Power by Others	
Remote Monitoring and Control		Type	Optional BACnet Gateway and Modbus Control	
Supply Water Temperature Range	Cooling	F	14-68	
	Heating	F	86-131	
Approved Water Delta T	Cooling and Heating	F	4-20	
Ambient Temperature Operational Range	Cooling	F	5-125	
	Heating	F	-22-95	
Guaranteed Load Capacity Range		%	20-100	

1. Due to our policy innovations some specification may be changed without prior notification.
2. AHRI 550-590 Cooling Capacity Conditions: 95F Ambient Air, 54F EWT and 44F LWT.
3. AHRI 550-590 Medium Temp 120F LWT Heating Capacity Test Condition.
4. Sound Data Tested per ANSI/AHRI Standard 370-2015 (Based on individual systems)
5. The ACHH***VBAB models are certified by AHRI to AHRI Standard 550-590.
6. For the lattes version of Certified LATS ISC Selection Software go to, www.ahridirectory.org
7. Heating Performance Tested per the AHRI 550-590 procedure. Heating Performance is not in certification scope of AHRI 550-590.
8. This product contains (R410A, GWP:2087.5t-CO2 eq = F-gas (kg) x GWP / 1000)

Table 3: Electrical Data for Single 460V 3 Wire Cooling Only Chiller.

Tons	Model No.	Voltage	(Hz)	(PH)	Voltage Tolerance (Min. ~ Max.)	Power Supply		System		Independent Circuits
						MCA	MFA	MSC	RLA	
17	ACHH017VBAB	208-230	60	3	187-253	77.3	80	20.4	66.8	1
20	ACHH020VBAB	208-230	60	3	187-253	78.2	80	20.4	67.7	1
33	ACHH033VBAB	208-230	60	3	187-253	146.1	150	40.8	133.6	1
40	ACHH040VBAB	208-230	60	3	187-253	147.9	150	40.8	135.4	1
50	ACHH050VBAB	208-230	60	3	187-253	77.3 | 146.1	80 |150	20.4 | 40.8	66.8 | 133.6	2
60	ACHH060VBAB	208-230	60	3	187-253	78.2 | 147.9	80 |150	20.4 | 40.8	67.7 | 135.4	2
17	ACHH017HBAB	460	60	3	414-506	46.8	60	9.7	39.8	1
20	ACHH020HBAB	460	60	3	414-506	48	60	9.7	40.8	1
33	ACHH033HBAB	460	60	3	414-506	88.6	100	19.5	79.6	1
40	ACHH040HBAB	460	60	3	414-506	90.8	100	19.5	81.6	1
50	ACHH050HBAB	460	60	3	414-506	130.4	150	29.2	119.4	1
60	ACHH060HBAB	460	60	3	414-506	133.6	150	29.2	122.4	1

Voltage Range: Power supplied to the chiller must fall within the voltage minimum to maximum range listed in the table above. The chiller will not operate normally if the power supply voltage falls below or above the tolerance range.

Maximum allowable voltage variance permitted between phases is 2%.

MCA: Minimum Circuit Ampacity (A) (Criteria used to select the wiring standard).

MFA: Maximum Fuse Amps (A) (Criteria used to select circuit breaker and ground error circuit breaker [electricity leakage circuit breaker]).

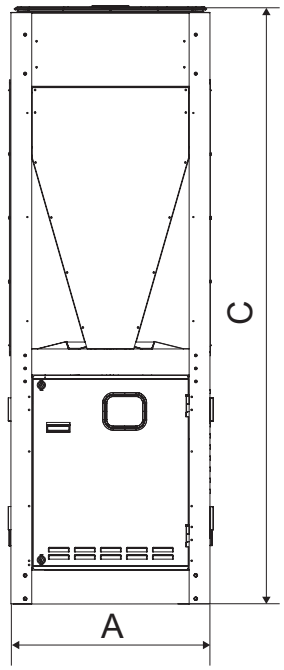
MSC: Maximum Start Current (A)

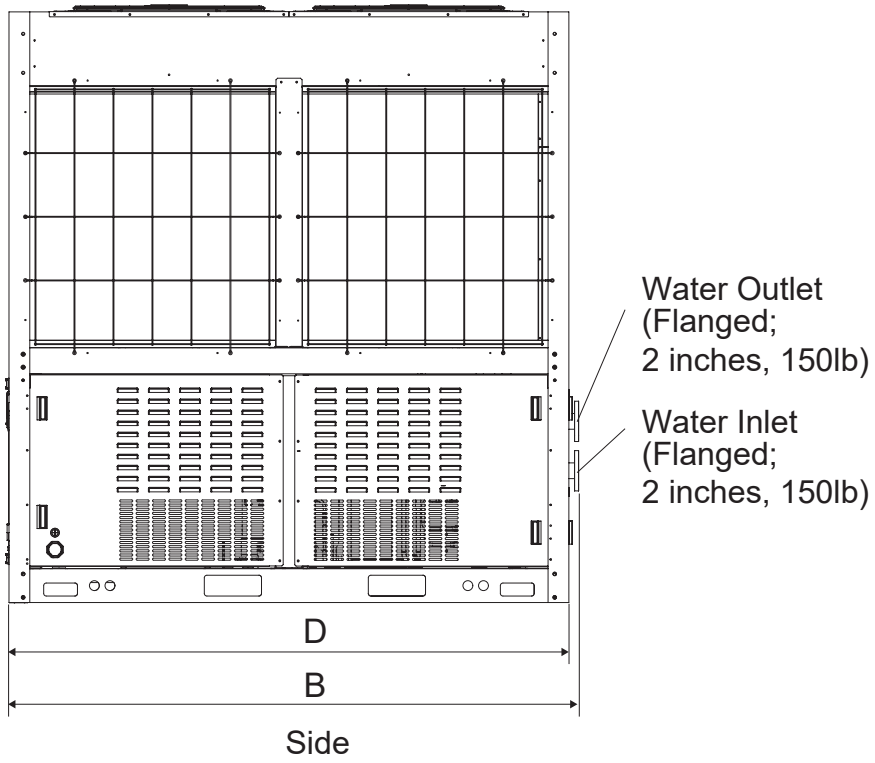
RLA: Rated Load Amps (A) (Current required when operating under the following conditions—Cooling: Outdoor Air Temperature: 8°1F DB / 66°F WB; Water Inlet / Outlet Temperature: 54°F / 44°F).

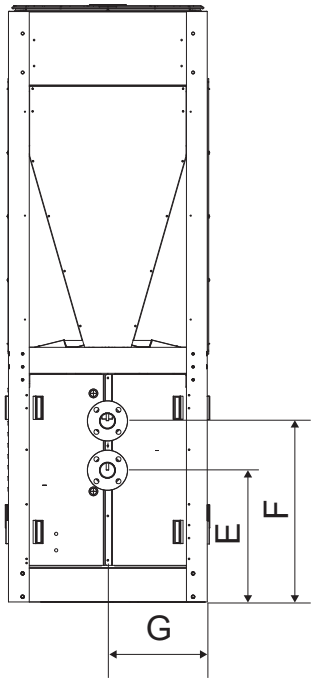
FLA: Full Load Amps (A).

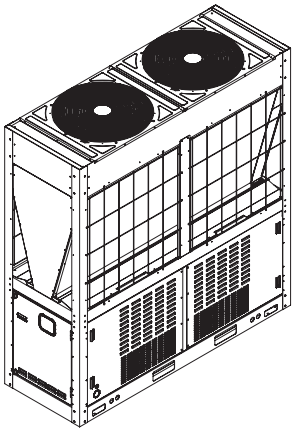
DIMENSIONS

Figure 4: Dimensions for Single Frame Chiller ACHH017VBAB, ACHH017HBAB, ACHH020VBAB, ACHH020HBAB.





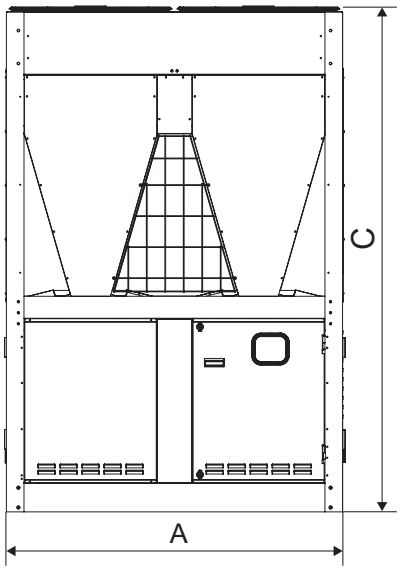




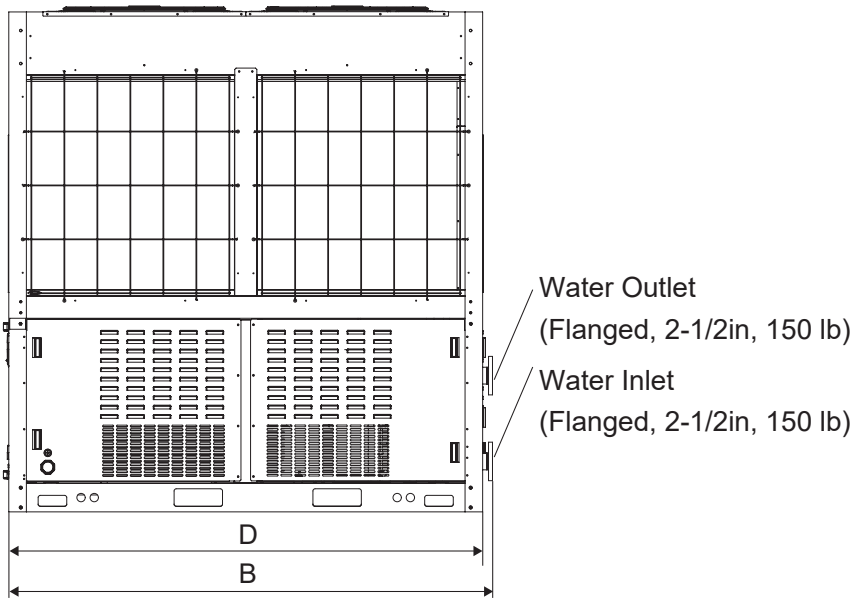
(Unit: Inch)

Label	Dimensions
A	30-1/8
B	86-17/32
C	86-5/8
D	84-13/16
E	19-31/32
F	27-9/16
G	15-1/8

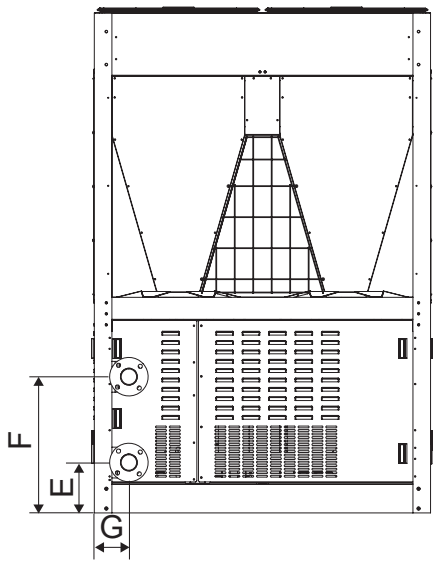
Figure 5: Dimensions for Double Frame Chiller ACHH033VBAB, ACHH033HBAB, ACHH040VBAB, ACHH040HBAB.



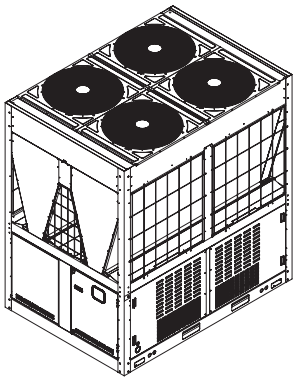
Front view



Side view



Rear view

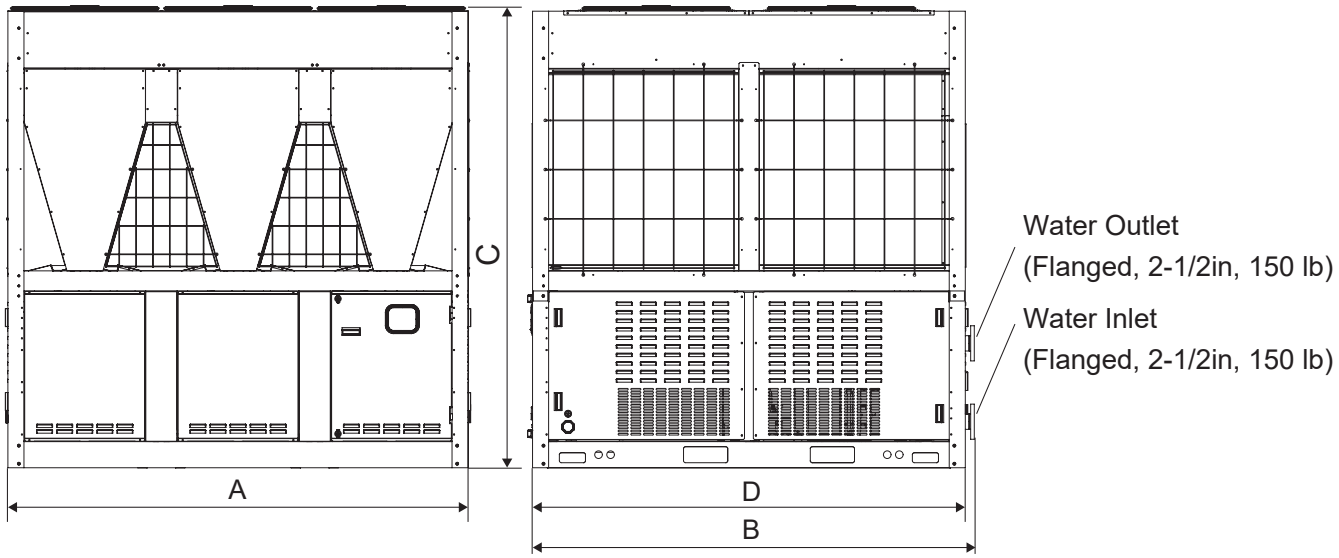


(Unit : inch)

Classification	Dimension
A	60-3/16
B	86-17/32
C	86-5/8
D	84-13/16
E	19-31/32
F	27-9/16
G	15-1/8

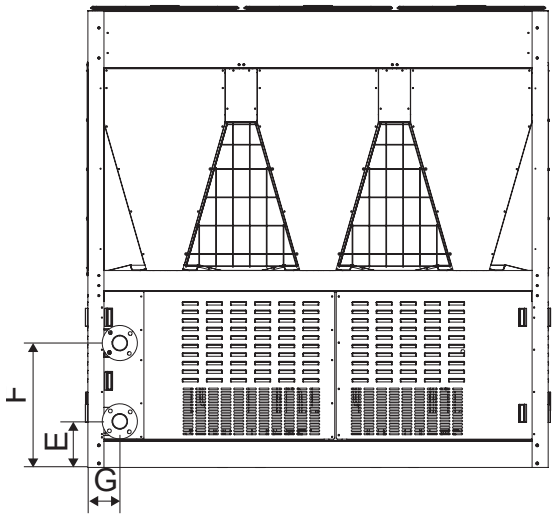
DIMENSIONS

Figure 6: Dimensions for Triple Frame Chiller ACHH050VBAB, ACHH050HBAB, ACHH060VBAB, ACHH040HBAB.

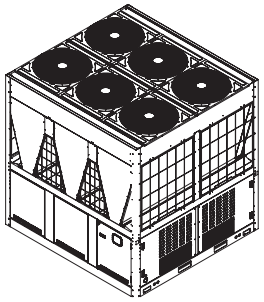


Front view

Side view



Rear view



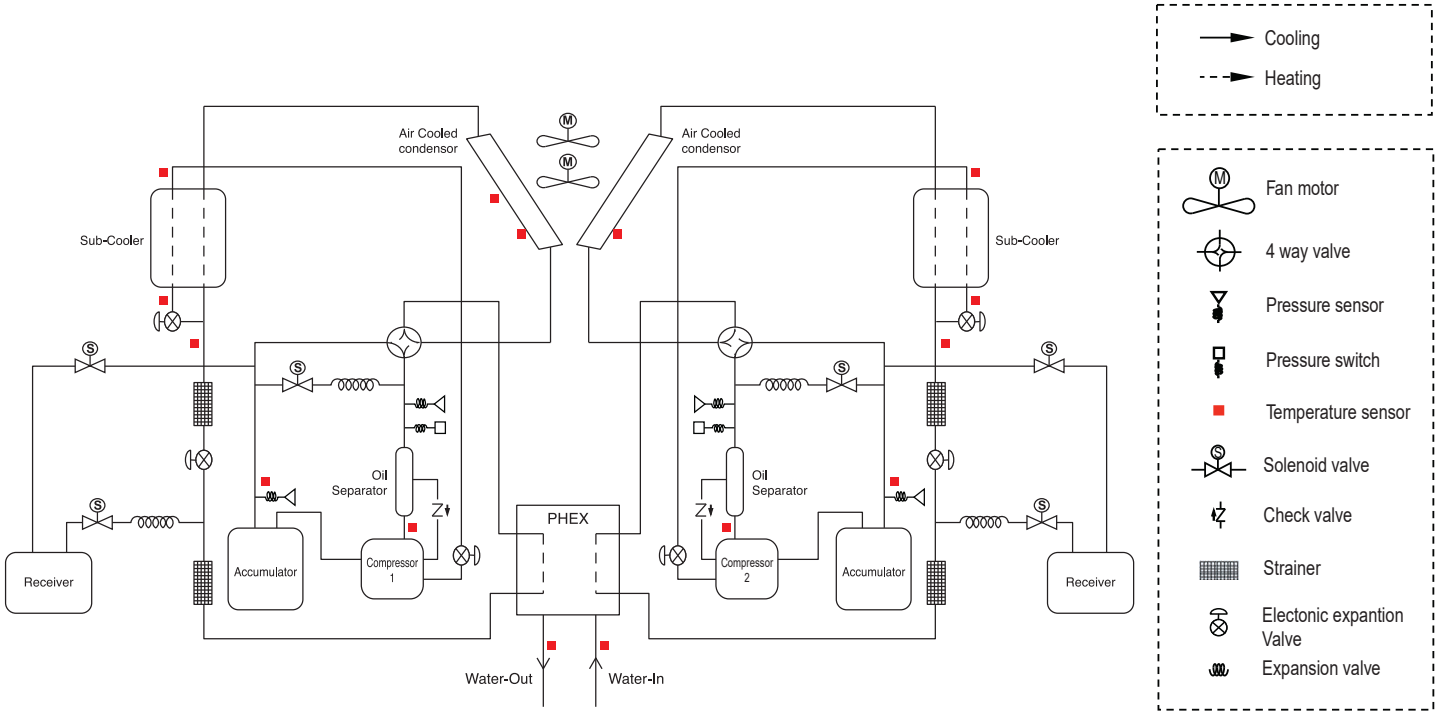
(Unit : inch)

Classification	Dimension
A	90-1/4
B	86-17/32
C	86-5/8
D	84-13/16
E	19-31/32
F	27-9/16
G	15-1/8

REFRIGERANT PIPING AND SENSOR DIAGRAM / OPERATION RANGE AND LIMIT

Refrigerant Piping and Sensor Diagram, Single Frame

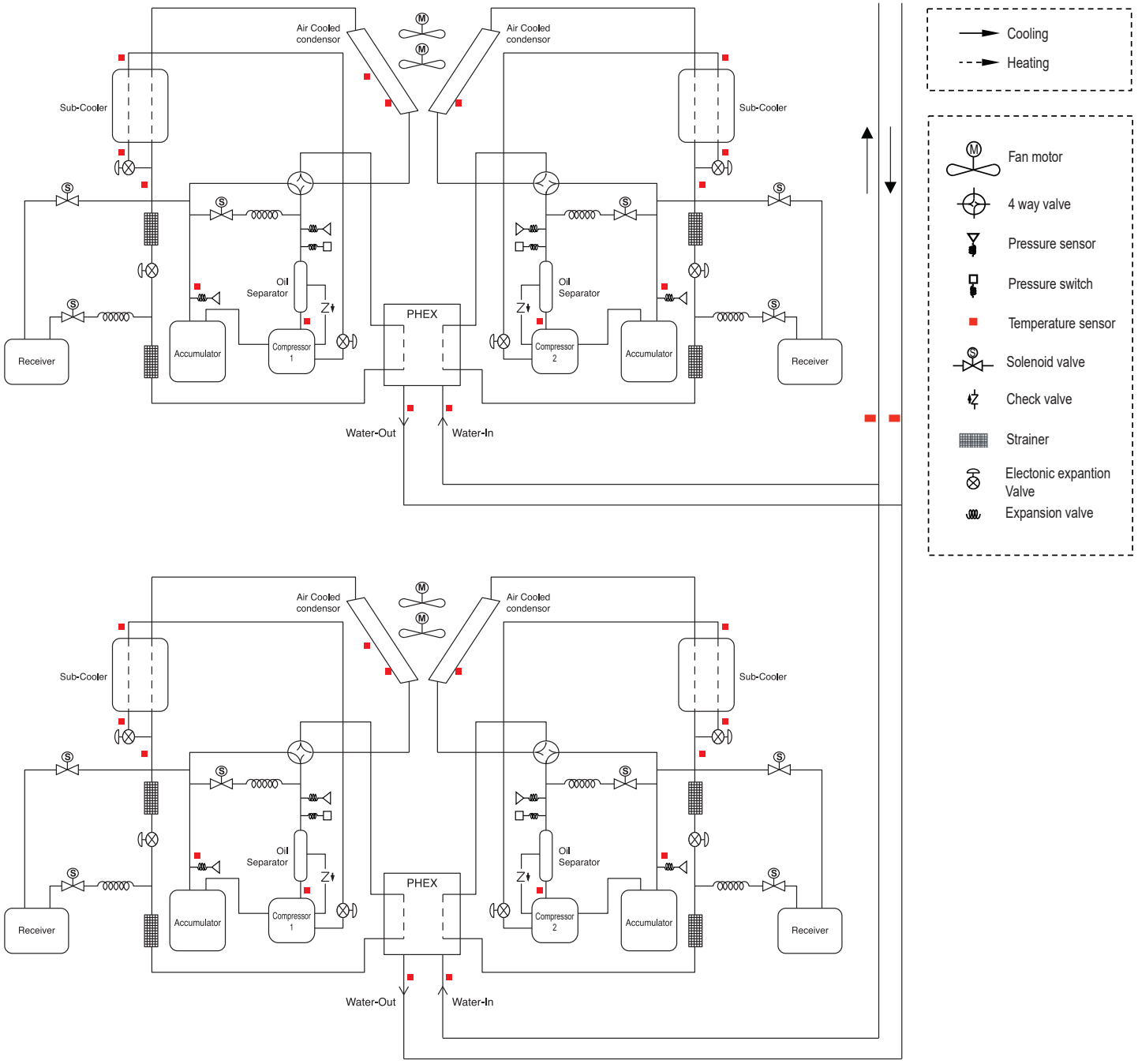
Figure 7: Single Frame Chiller Refrigerant Piping and Sensor Location Diagram.



REFRIGERANT PIPING AND SENSOR DIAGRAM / OPERATION RANGE AND LIMIT

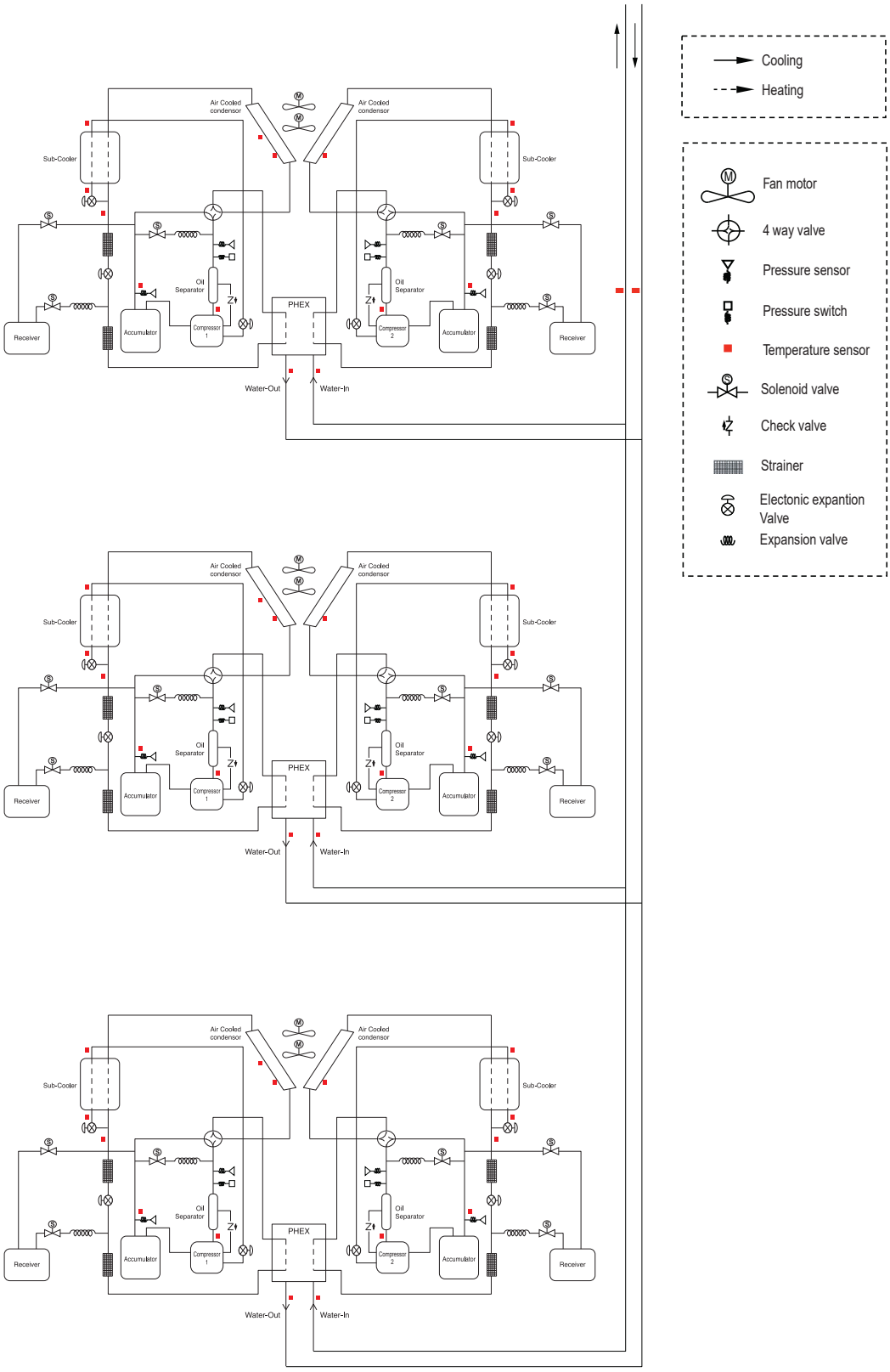
Refrigerant Piping and Sensor Diagram, Dual Frame

Figure 8: Dual Frame Chiller Refrigerant Piping and Sensor Location Diagram.



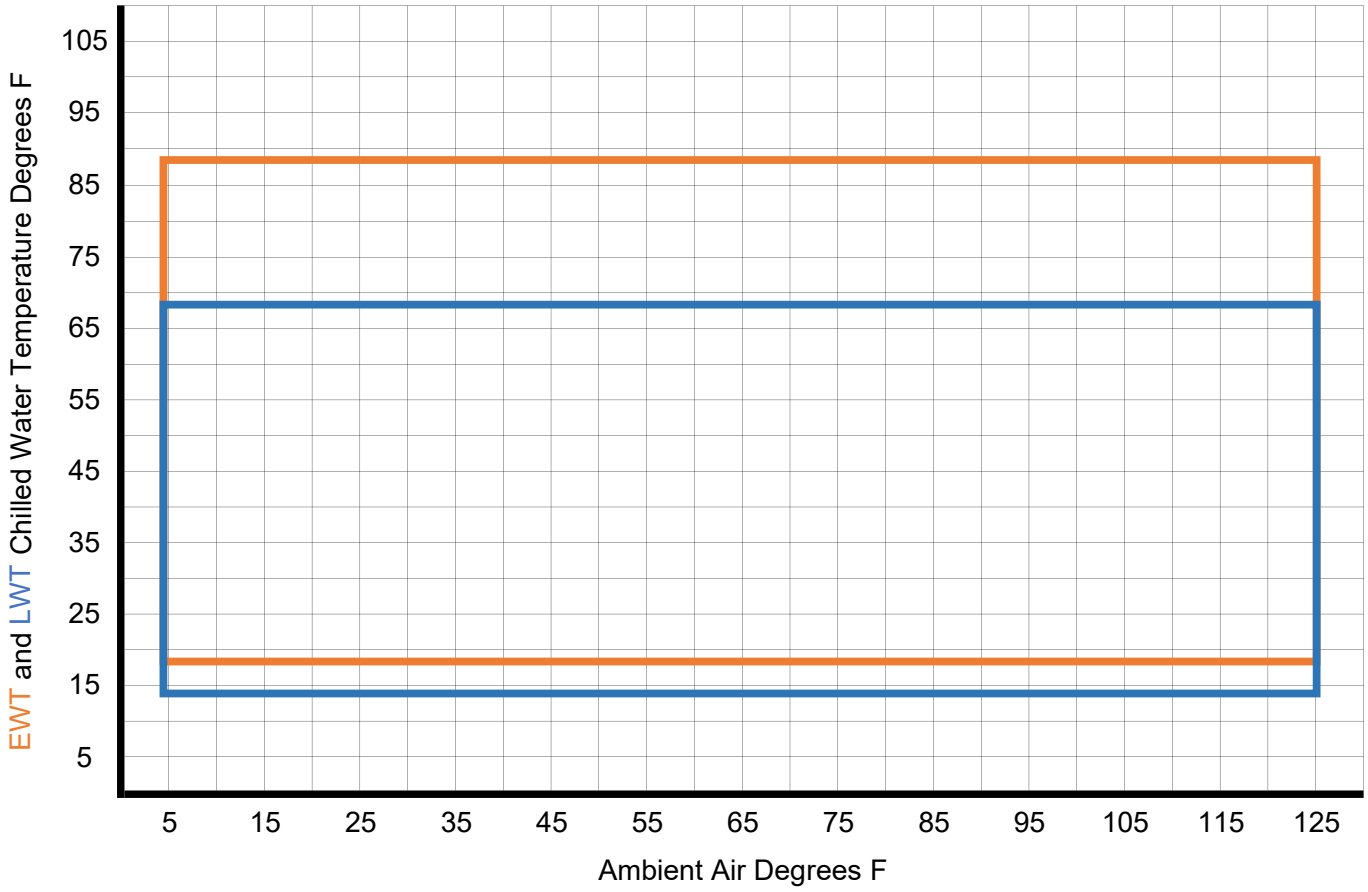
Refrigerant Piping and Sensor Diagram, Triple Frame

Figure 9: Tri;le Frame Chiller Refrigerant Piping and Sensor Location Diagram.



REFRIGERANT PIPING AND SENSOR DIAGRAM / OPERATION RANGE AND LIMIT

ACHH Chilled Water Operation Limits and Performance



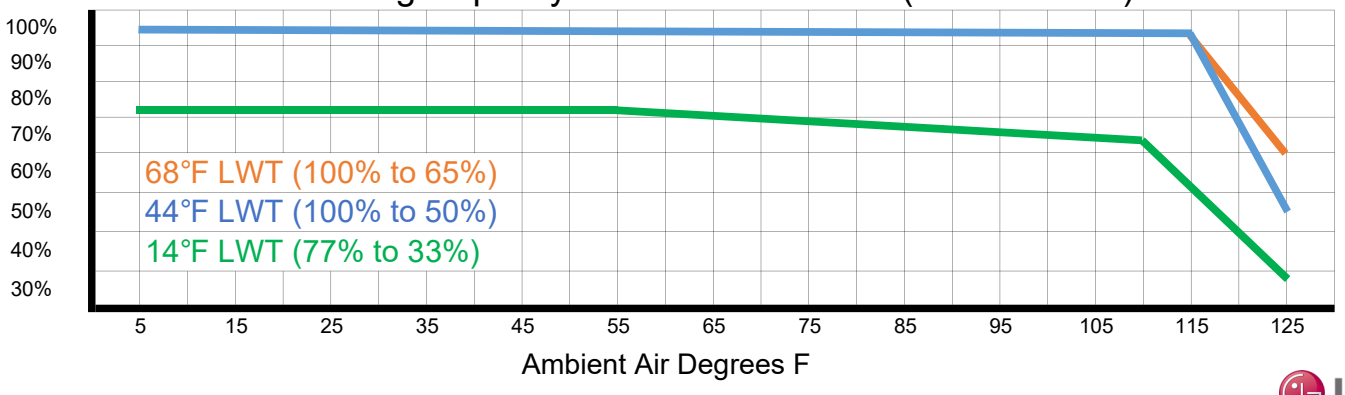
Operation Range	Cold Water Inlet Temperature F	18°F to 88°F
	Cold Water Outlet Temperature F	14°F to 68°F
	Ambient Range	5°F to 125°F*

*208-230V reduced to 122°F

Approved Δ between EWT and LWT is 4°F to 20°F

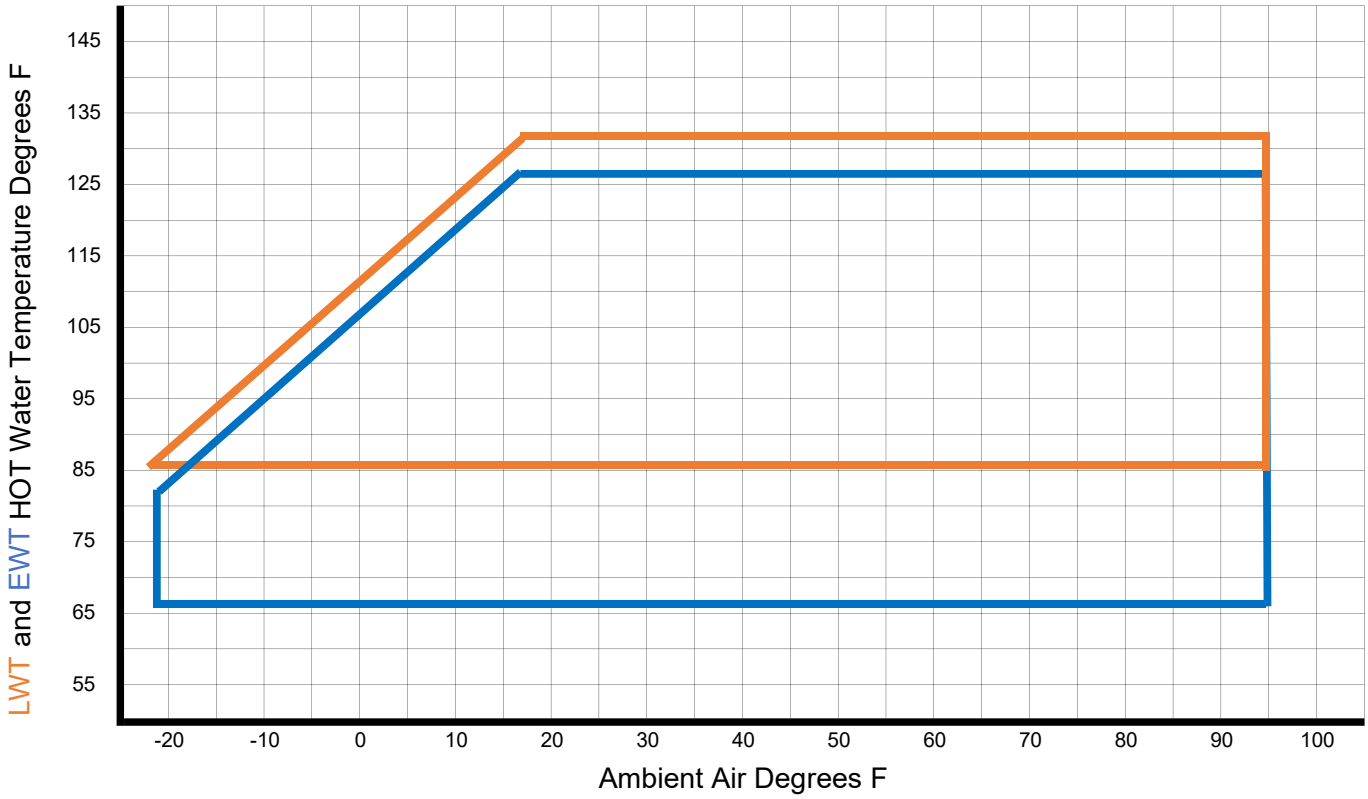
1. Proper Glycol Solution is required for LWT at or below 32°F.
2. Proper Glycol Solution is required for Ambient Operation at or below 41°F
3. Operation Limit Recommendation for 208-230V is 120°F.
4. LG LATS ISC Selection Software is to be used to confirm selection and performance.

Cooling Capacity Performance 10°ΔT (EWT to LWT)



REFRIGERANT PIPING AND SENSOR DIAGRAM / OPERATION RANGE AND LIMIT

ACHH Hot Water Operation Limits and Performance

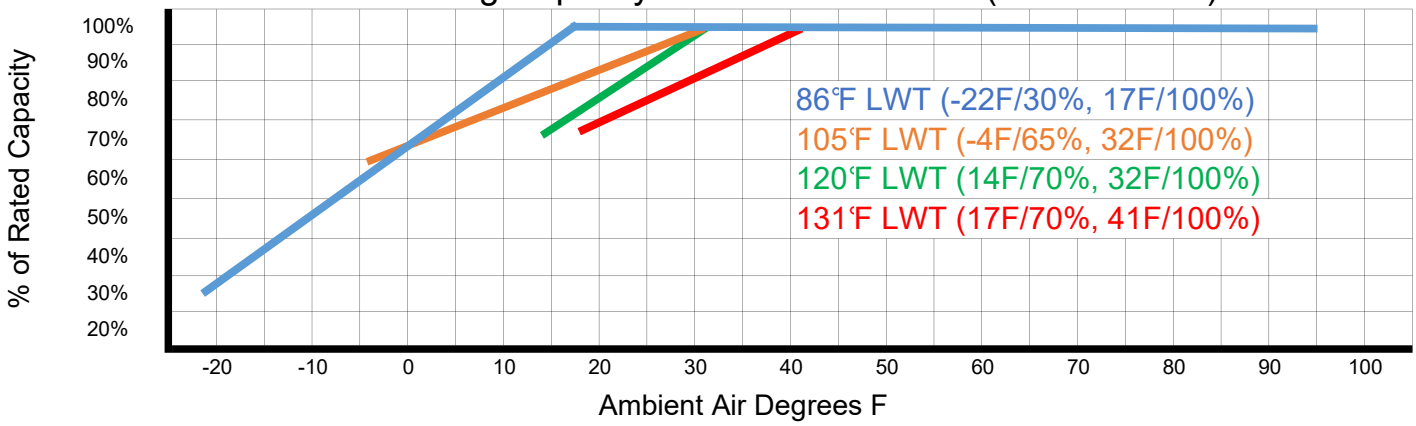


Operation Range	HOT Water Inlet Temperature F	66℉ to 127°F
	HOT Water Outlet Temperature F	86℉ to 131°F
	Ambient Range	-22℉ to 95°F

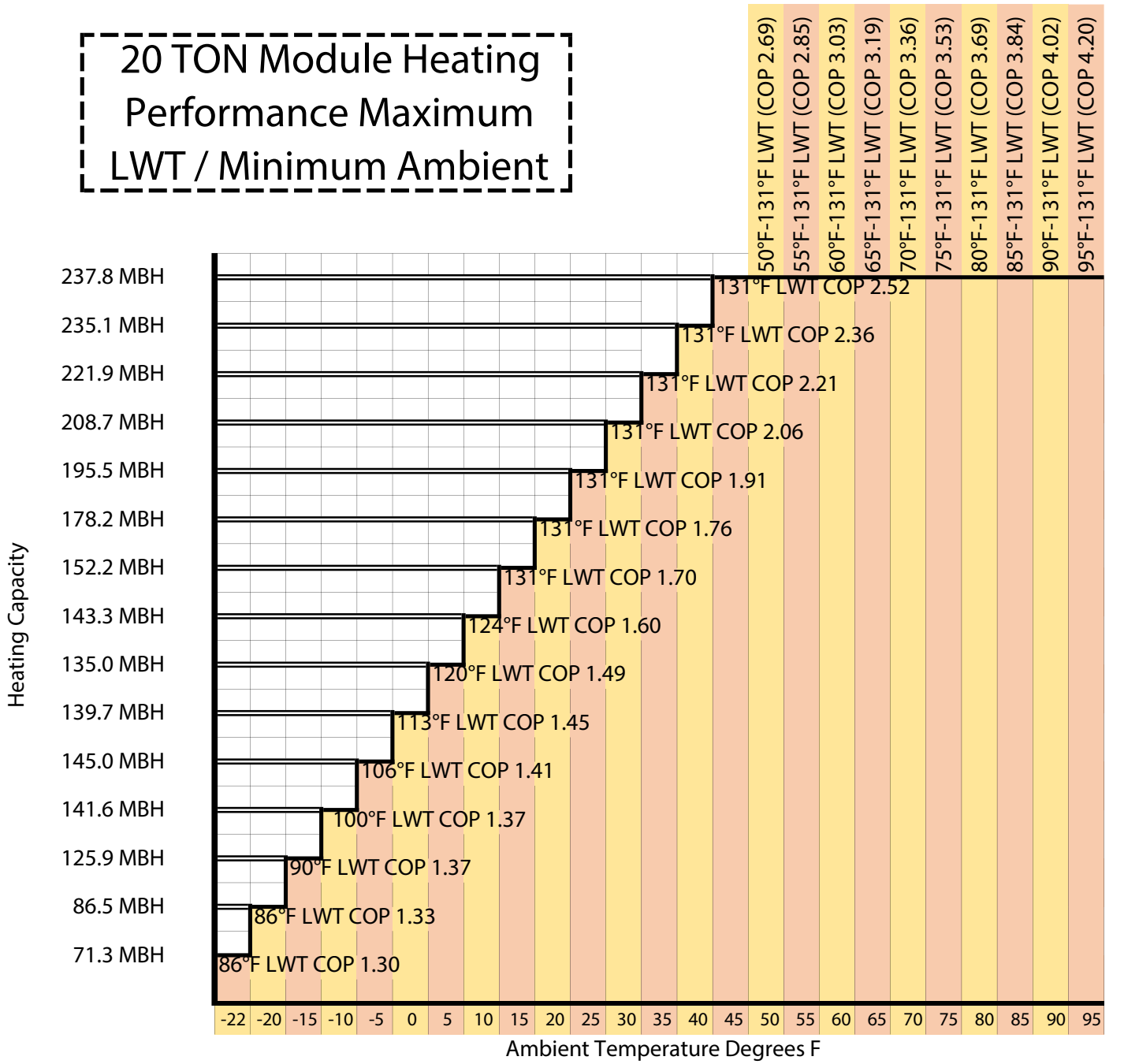
1. Proper Glycol Solution is required for Ambient Operation at or below 41°F
2. LG LATS ISC Selection Software is to be used to confirm selection and performance.

Approved Δ between EWT and LWT is 4°F to 20°F

Heating Capacity Performance 10°ΔT (EWT to LWT)



REFRIGERANT PIPING AND SENSOR DIAGRAM / OPERATION RANGE AND LIMIT



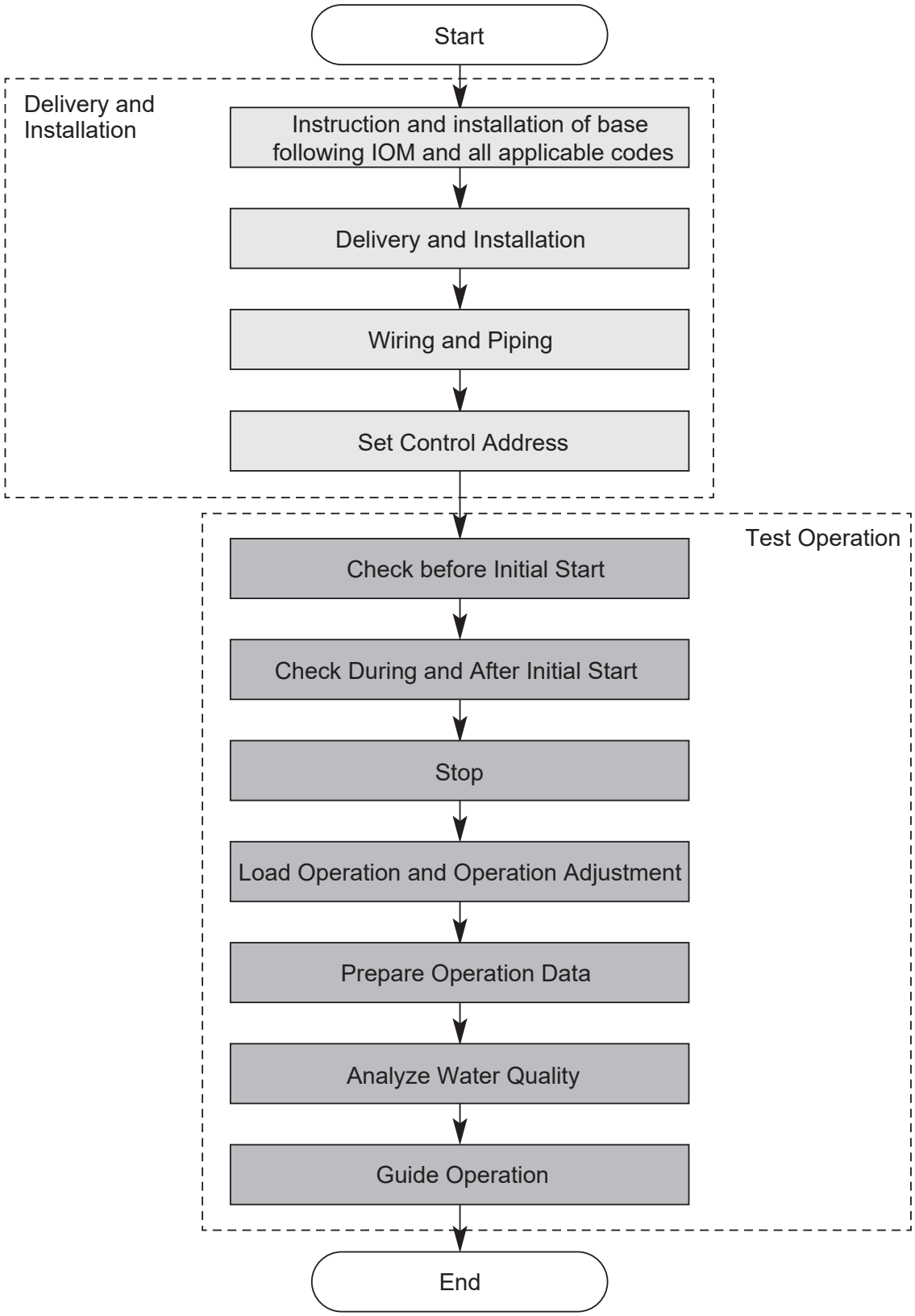
1. The performance chart above is based on a ACHH020*BAB operating at maximum allowable capacity for the specific conditions.
2. The 40 Ton ACHH040*BAB will provide 2X the capacity at the same conditions.
3. The 60 Ton ACHH060*BAB will provide 3X the capacity at the same conditions.
4. LATS ISC is a dynamic selection tool provided in support of the LG ACHH Series Inverter Scroll Heat Pump Chiller. Please refer to LATS for final and specific performance data.
5. The chart above is intended only to be used as a guide tool. Selection done in LATS.
6. LG reserves the right to alter performance values at any time.

List of Safety Devices and Settings

No.	Safety device	Setting	Function
1	High pressure switch	551 PSI	Stops operation of the module when the pressure is above the setting
2	Fuse	250 V 5 A (Main) 250 V 15 A (INV)	Disconnects current when it exceeds the normal value
3	Compressor circuit breaker	35 A	Measures and stops over-current per compressor
4	Fan motor circuit breaker	7 A	Measures and stops over-current per motor
5	Discharge temperature sensor	230°F	Stops compressor in stages
6	High pressure sensor	551 PSI	Starts protective operation control to reduce the cycle pressure
7	Low pressure sensor	32 PSI	Starts protective operation control to raise the cycle pressure
8	Water pipe temperature sensor	Off : 37.4°	Prevent evaporator from freezing. Not active if low temperature cooling is activated.
9	Reverse phase detector	Off	Compares the current of each phase and stops when it is in reverse phase
10	Liquid compressor prevention	Capacity Reduction	Discharge over-heating level goes up to prevent liquid compression
11	Compressor ratio limit	9 HTZ Step Reduction	Compressor frequency is reduced when operating at high compression ratio to prevent the internal parts within the compressor from being damaged

INSTALLATION TO TEST RUN FLOWCHART

Figure 10: Installation to Test Run Flowchart.



Selecting the Best Location for the Chiller

⚠DANGER

- ⃠ *Do not install the chiller in an area where oil, steam, or emulsified gas are present; these will cause bodily injury or death.*
- ⃠ *Do not install the chiller in an area where flammable gas could generate or flow; this condition could cause a fire, which will cause bodily injury or death.*
- ⃠ *Do not install the chiller in an area where corrosive gases could generate, flow, stagnate, or leak (coolant could leak from corroded pipes). These conditions could cause a fire, resulting in bodily injury or death.*
- ⃠ *Do not install the chiller in an area where high levels of carbon fiber or dust are present; these could cause a fire, resulting in bodily injury or death.*
- ⃠ *Do not install the chiller in an area where acidic or alkali solutions may be present; these could corrode the pipes if added to the water, causing antifreeze to leak, and resulting in bodily injury or death.*
- *Install the chiller where its weight is sufficiently supported, and where it will not fall over from strong winds or earthquakes. If the installation location is insufficient, the chiller could fall, causing physical injury or death.*

⚠WARNING

Install a fence or barricade around the chiller to prevent animals and / or unauthorized individuals from accessing it. Install a boundary or danger sign if necessary. Damage to the components could cause fire, explosion, physical injury, or death.

Do's

Select a location for installing the chiller that meets the following conditions:

- Where it is flat and there is enough strength to support the weight of and vibration from the chiller.
- In an area that allows for optimum airflow at both inlet and outlet sides; enough space for wiring, and piping; and is easily accessible for installation, inspection, maintenance, and service.
- If the chiller is installed in a highly humid environment (near an ocean, lake, etc.), ensure the site is well-ventilated with a lot of natural light (Example: Install on a rooftop).
- If the chiller is not going to operate during winter, add antifreeze to the water supply.

⃠ Do Not's

- ⃠ *Do not install the chiller where it will be subjected to direct thermal radiation from other heat sources, or in an area that would expose the chiller to heat or steam like discharge from boiler stacks, chimneys, steam relief ports, air conditioning units, kitchen vents, plumbing vents, and other sources of extreme temperatures.*
- ⃠ *Do not install the chiller in an area where high-frequency electrical noise / electromagnetic waves will impact operation.*
- ⃠ *Do not install the chiller in an area where its operating sound will disturb inhabitants of surrounding buildings.*
- ⃠ *Do not install the chiller in an area where it will be exposed to direct, strong winds. Verify that seasonal winds do not impact only one side of the chiller.*

PLACEMENT CONSIDERATIONS

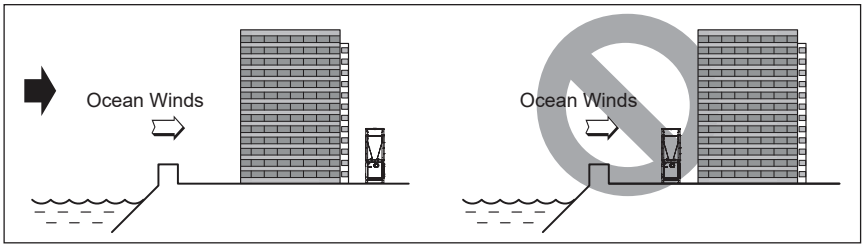
Oceanside Installation Precautions

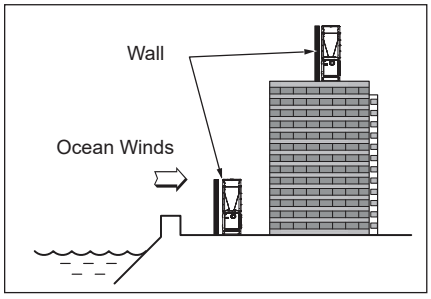
- ⃠ Avoid installing the chiller where it would be directly exposed to ocean winds.
- Install the chiller on the side of the building opposite from direct ocean winds (so the building can block the winds).
- Select a location with good drainage.

Note:

If the chiller is installed in an area where it would be directly exposed to ocean winds, additional anti-corrosion treatment will need to be applied to the chiller condenser. Ocean winds will cause corrosion, particularly on the condenser, which, in turn could cause product malfunction or inefficient performance.

If the chiller must be placed in a location where it would be subjected to direct ocean winds, install a concrete (or similar material) windbreaker. The windbreaker wall height and width must be at least one and a half (1-1/2) times wider than the chiller, and must provide at least 40 inches clearance to allow for airflow.





Clearance Requirements

Follow the ventilation (suction and discharge air flow) and service requirements as shown below and on the next page when choosing a chiller installation area. The system used in the diagrams is a single frame system. The clearances detailed are the same for all frame sizes.

Ventilation Clearance Requirements

Air-cooled chillers must be installed in an open space or must have appropriate ventilation. If the chiller must be installed near one wall or under a ceiling, there must be enough space for ventilation.

Installing Near One Wall

- If one side of the chiller is near a wall, and the height of the wall is less than 32 inches, the clearance space between the chiller and the wall must be a minimum of 32 inches.
- If one side of the chiller is near a wall, and the height of the wall is greater than 32 inches, the clearance space between the chiller and the wall must be a minimum of 32 inches plus half of h1 (difference between 32 inches and the total wall height).

Installing Under a Ceiling

- If the chiller is installed under a ceiling, the clearance space between the top of the chiller and the ceiling must be a minimum of 197 inches.
- If the front or back of the chiller is near a wall, the clearance space between the chiller and the wall must be a minimum of 32 inches.

Figure 11: Ventilation Clearance Requirements When Installing the Chiller Along One Wall.

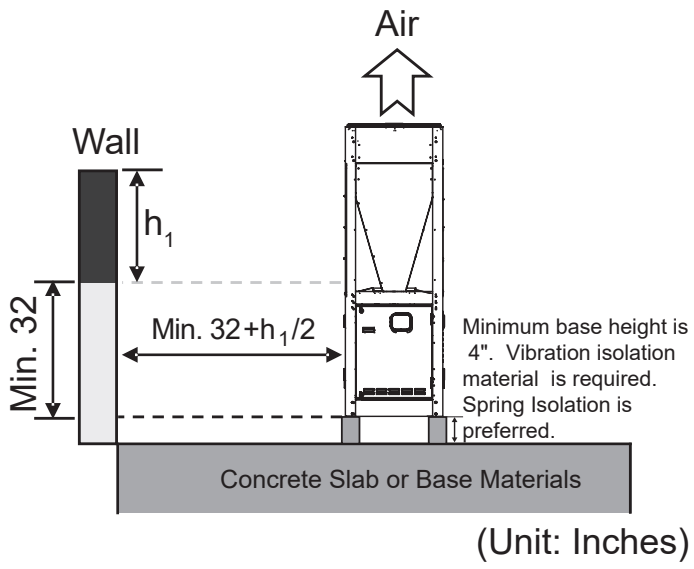
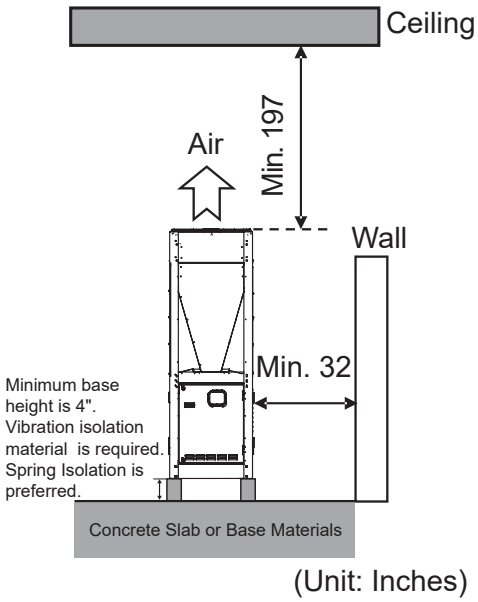


Figure 12: Ventilation Clearance Requirements When Installing the Chiller Under a Ceiling.



Note:

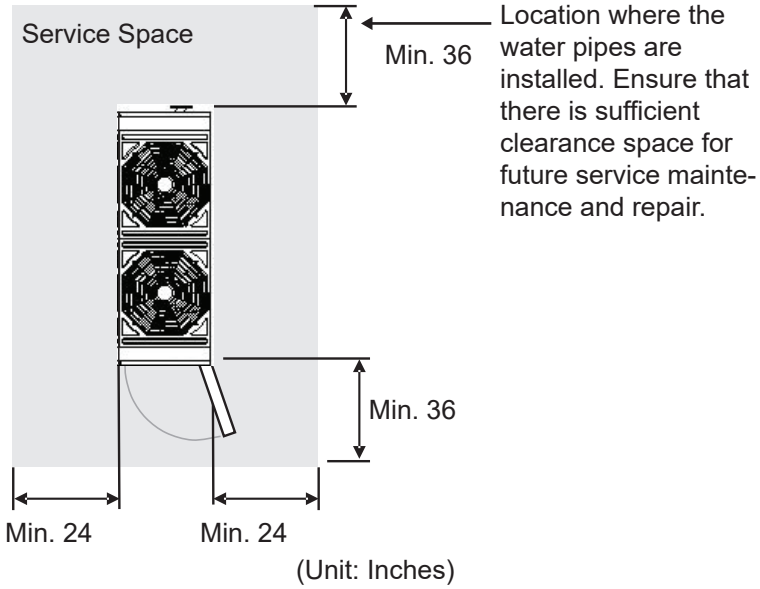
Minimum base height is 4 inches. Isolation material used shall be chosen and approved by the design engineer and be compliant with any and all applicable national, state and local codes. Chiller to be properly and securely mounted to the base and the base to the structure.

PLACEMENT CONSIDERATIONS

Service Clearance Requirements

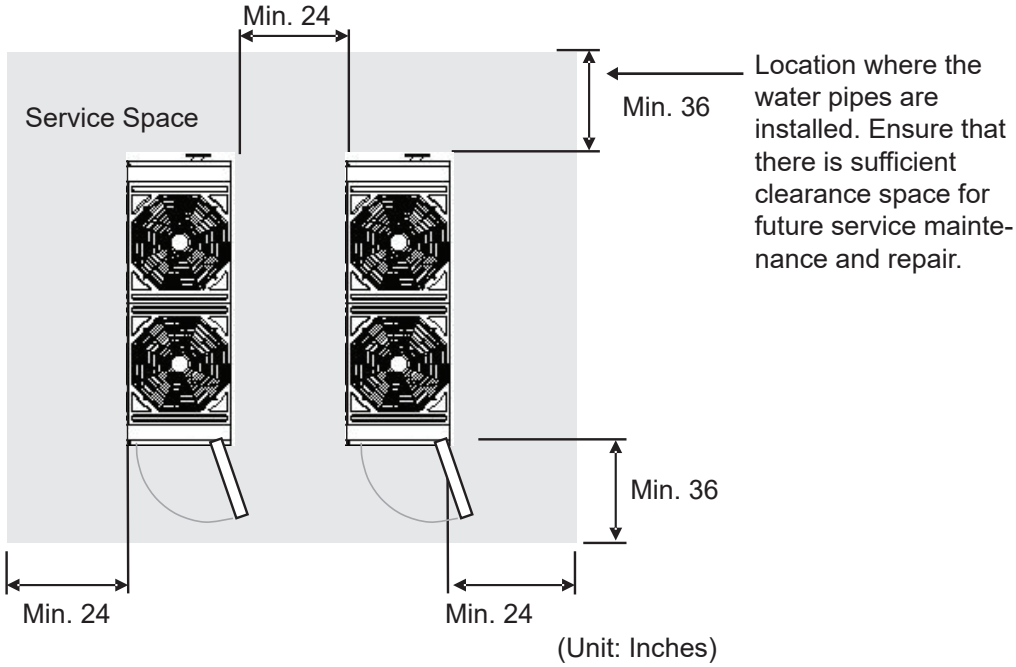
Ensure there is enough space around the chiller for maintenance and service. See the figures below for minimum dimensions. Clearances are the same for all three frame sizes.

Figure 13: Service Clearance Requirements for One Chiller.



Clearances are the same for all three frame sizes.

Figure 14: Service Clearance Requirements for Two Chillers.



Note:

See images above for minimum clearances, or increase clearance space based on NEC or other applicable service or safety codes.

Seasonal Wind and Winter Installation Precautions

To ensure the chiller operates properly, certain measures are required in locations where strong cold winds, heavy snowfall, and freezing temperatures could occur.

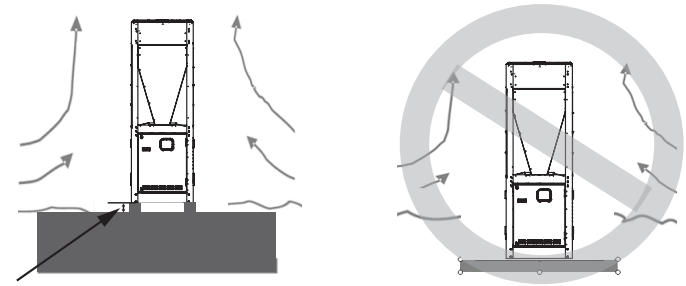
Note:

Consider chiller fan operation when installing in snow-prone areas. If the chiller fan is installed below a certain level, it could trigger a high pressure error within the circuit and cause operation malfunction.

1. Snow could access the air discharge outlet of the condenser and freeze inside the chiller; in areas with potentially high snowfall amounts, install a cover over the chiller to prevent snow accumulation on its top.

2. The interior of the chiller could freeze if the air inlet becomes clogged with snow. Install the chiller in such a way that snow drifts do not blow into the air inlet, and install a hood to block the unit from heavy snow. Clear the area of snow around the chiller heat exchanger.

Figure 15: Installing the Chiller on a High Base For Optimum Airflow.



3. Install the concrete slab or base materials including isolation component or material so that the chiller is a minimum of 4 inches (102 mm) higher than the accumulated snow (the chiller is to be installed 4 inches [102 mm] above the average accumulated snowfall for the geographical area).

4. If more than 4 inches (102 mm) of snow has accumulated on top of the chiller, remove the snow, and then operate the unit.

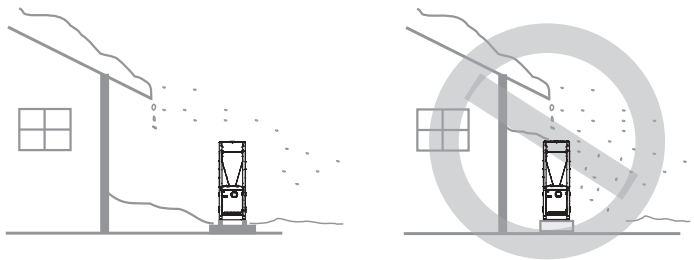
5. The base or pad size is to be larger than the chiller. Follow local and state requirement for final design.

6. ⃠ Do not install the chiller in an area where heavy snow accumulation could negatively impact chiller operation. Position the chiller in such a way that the side with the air heat exchanger does not face the direction of the snow (ensure the side with the air heat exchanger is parallel to snowfall direction). Add a wall high enough to prevent any snow accumulation from being drawn up into the coil side of the chiller (field installed).

7. If seasonal winds are strong and blow predominately from one direction, chiller capacity could be reduced or load imbalance could occur; therefore, install the chiller so that the product cycle is not impacted. If that isn't possible, install a windbreaker, hood, etc. In locations with strong seasonal winter winds (especially near coastal areas), install a hood, taking into consideration wind direction, that doesn't block the suction inlet of the chiller. If the chiller will be directly exposed to seasonal winter winds, field-install a wind baffle (in addition to the hood).

8. ⃠ Do not install the chiller near an edge of a rooftop or overhang. Snow can fall off the roof or overhang and into the chiller. ⃠ Do not allow snow to accumulate between the outside wall and the chiller. If snow accumulates in this location, chiller operation will malfunction due to reduced airflow.

Figure 16: Installing the Chiller Away from Rooftops and Overhangs.



TRANSPORTING / LIFTING

Transporting / Lifting

⚠WARNING

- *Take extreme care when transporting the chiller. Use a forklift or (required) spreader bar, and follow the directions in this manual. There is a risk of the product falling and causing physical injury or death.*
- ⃠ *Do not touch the heat exchanger with bare hands. It is very sharp and can cause physical injury.*
- *Tear apart and dispose the plastic (vinyl)r packaging so that children do not play and risk suffocation and death.*
- *Lift and support the chiller at specified locations (at least four [4]) points) to avoid slipping from the rigging apparatus, and the appropriate length (26.1 feet [8.7 yd.]) and number of lifting straps. There is a risk of the product falling and causing physical injury.*
- *Use caution when using forklift to transport the chiller..* ⃠ *Do not drop the unit when carrying it with a forklift. There is a risk of the product falling and causing physical injury.*

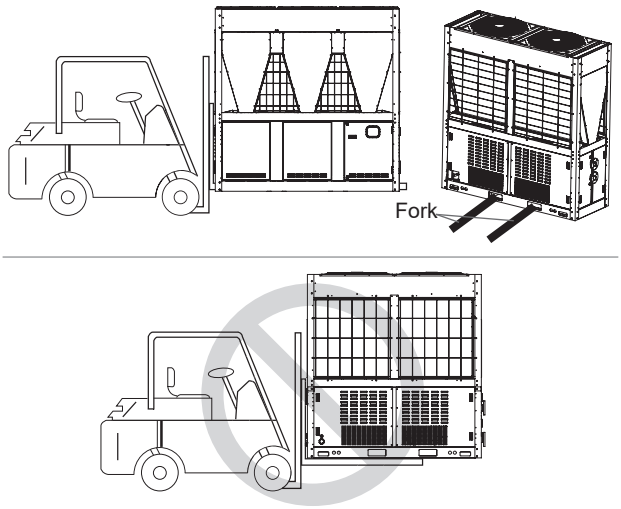
Precautions When Moving the Chiller With the Forklift

- Keep the chiller as level as possible.
- Verify the weight of the forklift, and make sure that the forklift has sufficient capacity to handle the weight.
- Measure the transportation grooves at the bottom of the chiller, and make sure to use a fork that fits the grooves.
- ⃠ The forklift cannot lift the chiller from the back. Always lift the chiller on the side where the transportation grooves are located.

⚠WARNING

Failure to follow precautions when transporting the chiller can result in physical injury or death.

Figure 17: Using the Forklift (For Illustrative Purposes Only; Appearances Will Vary Depending on Model).



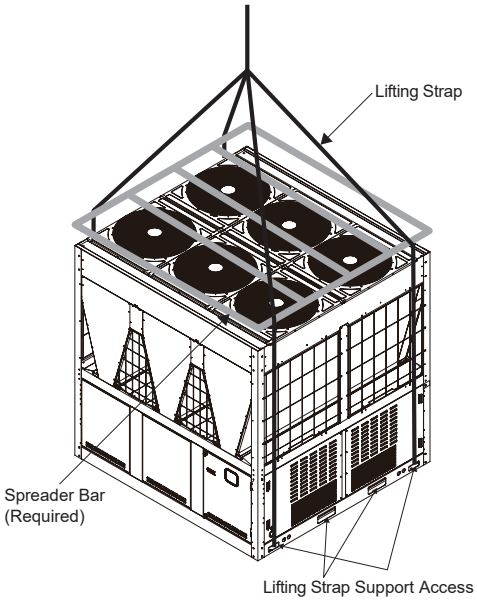
Precautions When Lifting the Chiller

- Keep the chiller as level as possible.
- ⃠ Do not tilt the chiller more than 15 degrees.
- Pass the lifting straps through the support access holes located at the bottom of the chiller.
- Always connect the straps to at least four (4) supports when lifting the chiller.
- Must use a steel spreader bar so that the straps do not transfer tension to, and / or damage, the chiller coil and the top of the frame. (Spreader bar must be wider that the size of the chiller and is field supplied).

Note:

⃠ *Do not allow the spreader bar to come in contact with the chiller. It can cause product damage.*

Figure 18: Lifting the Chiller (For Illustrative Purposes Only; Appearances Will Vary Depending on Model).



STORING THE CHILLER / INSTALLING ANTI-VIBRATION AND ANCHOR BOLTS

Storing the Chiller

If the chiller must be stored at the construction site before installation / operation, ⃠ do not allow dirt or moisture. Place a protective cover on the chiller until ready for installation.

Installation Considerations

- As soon as the chiller is delivered, check for any damages. If there are damages, immediately contact the shipping company; make notations on the shipping documentation when signing for the load.
- Install in a location where it is flat and there is enough strength to support the weight of and vibration from the chiller.
- Install in an area that allows for optimum airflow at both inlet and outlet sides; enough space for wiring, and piping; and is easily accessible for installation, inspection, maintenance, and service. See the specification table, dimensions, and wiring diagram for clearance requirements, net weight, etc.
- Inspect the field-installed base, and resolve any issues before installing the chiller.
- Install the chiller so that it will not fall over due to strong winds or earthquakes.
- If installing the chiller in a coastal area where it is impacted by ocean winds, additional anti-corrosive treatment must be applied to the condenser.
- If combining multiple chillers, it is best to ensure all are at the same level so that the water pipes can be easily connected.

⚠WARNING

Improper installation will cause the unit to fall over, resulting in physical injury or death.

Note:

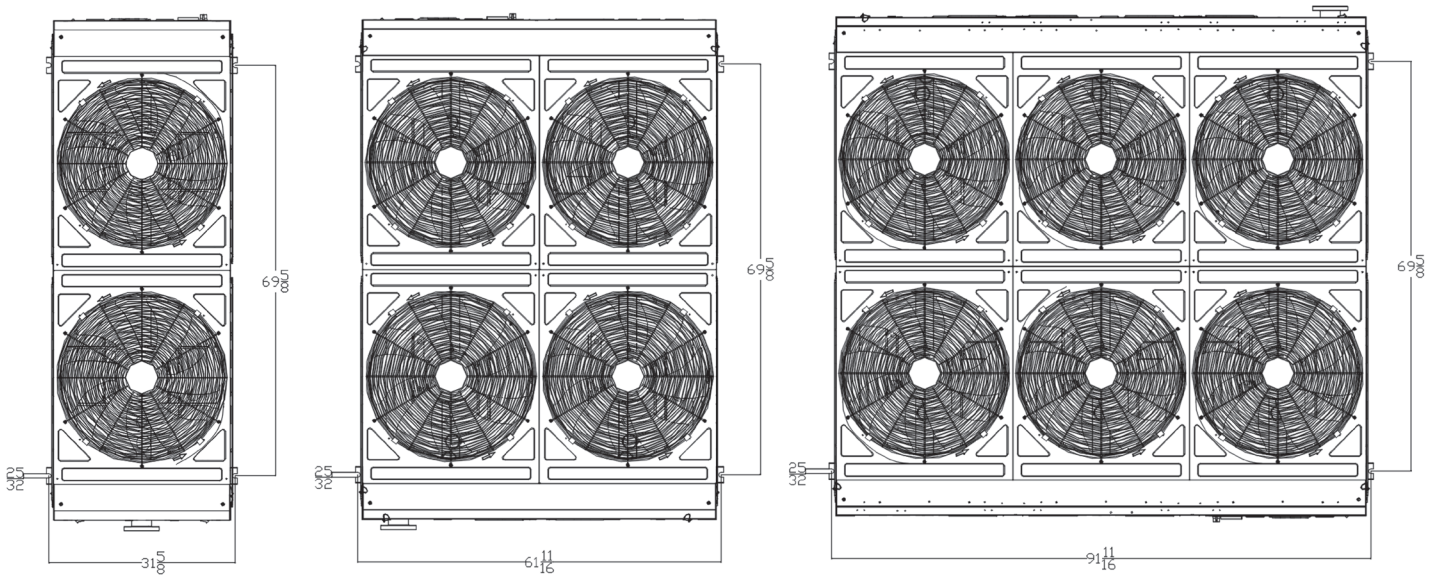
Improper installation can cause product malfunction and damage.

Installing Anti-Vibration and Anchor Bolts (Field-Supplied)

- Use field-supplied anti-vibration and install before placing the chiller on the base or its installation area.
- Anti-vibration is required and is to be specified and selected properly based on weight and local wind code requirements. All fasteners to be properly specified by a professional.
- See image for guidance on where to install the anti-vibration on the chiller.
- Anti-vibration is required and is to be specified and selected properly based on weight and local wind code requirements. All fasteners are to be properly specified by a professional.
- The wooden shipping pallet at the bottom of the chiller must be removed before installation and tightening the anchor bolts.
- Use anchor bolts to firmly attach the chiller to the installation area / base.
- Tighten the bolts so that the chiller does not fall over from strong winds or earthquakes. Must be engineered by local professional.
- Noise and operation vibration from the chiller can be transferred to the floor or wall of the installation area. Add anti-vibration material to reduce its impact.
- Follow all local, state, and federal codes for securing chiller and base design.
- Open the left / right panels of the chiller, find the anchor bolt locking points, check anchor bolt attachment hole, and lock the anchor bolts so the bolts are at right angles to the chiller.

STORING THE CHILLER / INSTALLING ANTI-VIBRATION AND ANCHOR BOLTS

Figure 19: ACHH Base Connection Location.



Water pipe system installation is an important part of the chiller system. Any defect in the water pipe system can lead to chiller malfunction. When designing the water pipe system, consider future service and maintenance, and install the field-supplied water pipe system components as detailed below.

Water Pipe System

Note:

Water circulation that has temperature difference of 4°F to 20°F between the outlet water temperature of the hot and cold water is required. If the water circulation temperature differential is insufficient or is too much, the chiller will malfunction, will not be able to operate properly, and product life will be reduced.

- Ensure that all installed components comply with the design water pressure (or higher).
- Ensure that the water circulation complies with product specifications. Even when the water circulation complies with the product specification, install a bypass circuit on the load side of the water piping system. If water flow is reduced during a low load, it can cause issues such as excessive and frequent compressor operation, and frozen components during cooling operation or if the operation stops.
- Maintain a constant water circulation flow as much as possible.

Expansion Tank

Expansion tanks receive and expel the excess water, and simultaneously remove air in the water pipe system. Choose an expansion tank with a capacity from 2 to 2-1/2 times of the water expansion amount. Generally, the expansion tank capacity is 3% to 5% of the entire water pipe system capacity. Check with local, state, and federal guidelines regarding expansion tank requirements and size. The ACHH Series Chiller does not have a minimum loop requirement. For applications that require a critical and stable loop temperature the design engineer should design the loop capacity. A common minimum loop design is 2 times the GPM of a 10 degree delta or standard rated GPM for the system.

Pipe Slope and Air Vent Valve

If air remains in the water pipes, water pipe system resistance increases, and / or the amount of circulating water is reduced significantly. If air remains in the pump during operation, it can result in chiller malfunction or shutdown. Install an air vent valve where there could be a chance of air remaining in the water pipe system. Include 1/200 of slope on the air vent valve side to reduce the likelihood of air remaining in the pipe.

Water Piping

- Install the water pipe system so that the connections to the chiller are correct, tight, and without leaks.
- Permitted water pressure resistance of the water pipe system is 145 psi.
- Add insulation to the water system pipes to prevent any external heat loss, or to prevent condensate from forming during cooling operation. Follow local, state, and federal guidelines on insulation.
- Add pressure gauges and thermometers on the water inlets and outlets to check chiller operation.
- Include a strainer with minimum 50 mesh on the water inlet to filter particles that could enter the heat exchanger. Install the strainer on a horizontal pipe.
- Before supplying water, clean inside the pipe system to remove particles that will damage the chiller.

Note:

If sand, debris, or rust are present in the water pipe system, these materials can corrode metallic parts and cause chiller operation failure.

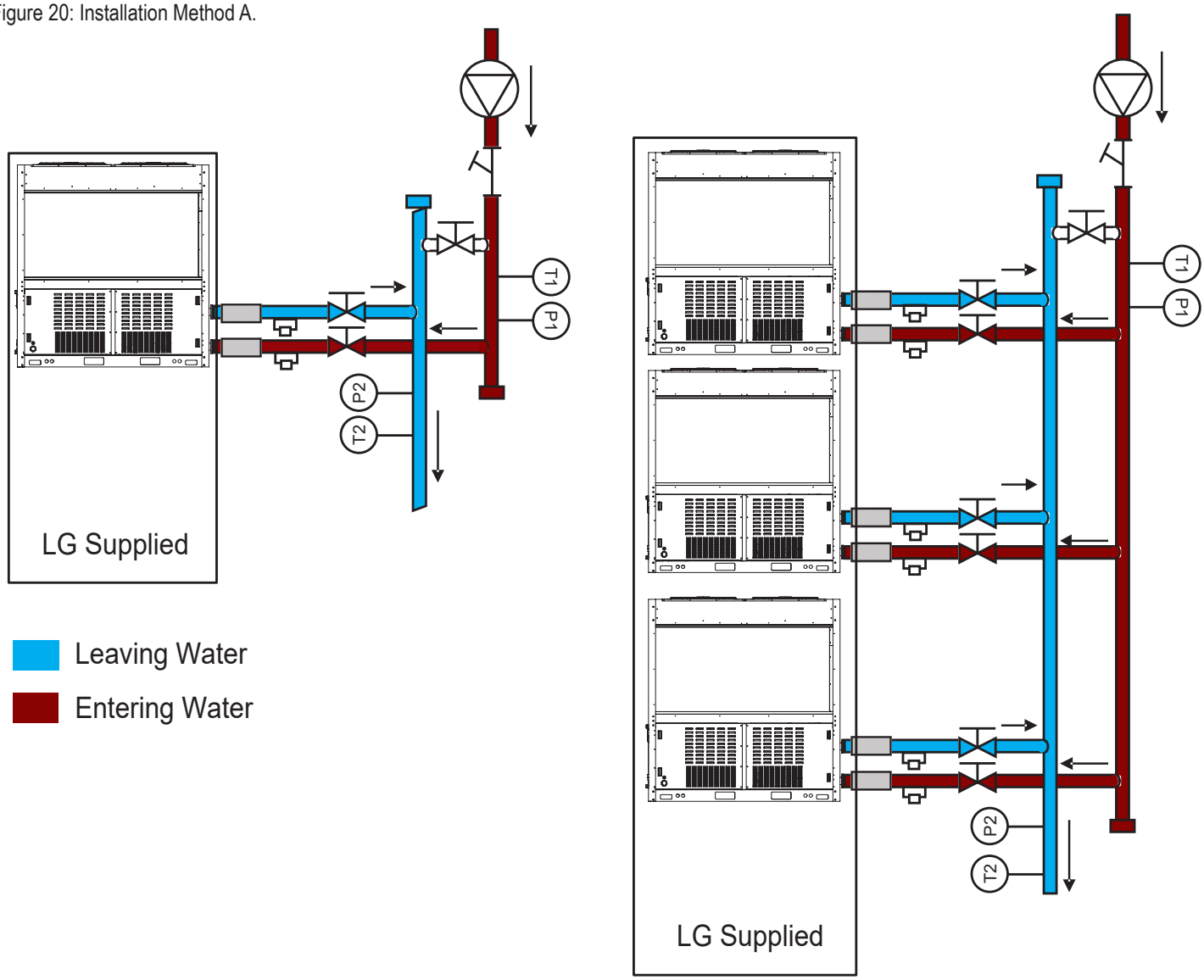
- Install the on / off valve on the cold water inlet / outlet and bypass pipe on the pipe direction on the device side.
  - Install a pipe system bypass on the initial segment of the chiller water pipe system. A bypass circuit can help when cleaning the pipes before chiller installation, and during annual water pipe system cleaning.
  - On / off valves can prevent water from backflowing into chillers that are not operating; also reduce power to the pump(s). Review site requirements for on / off valve installation.
- Include flexible joints at the inlet / outlet pipes that reduce any vibration imparted to the water pipe system and chiller. Flexible joints help prevent water leaks caused by operation vibration.

WATER PIPE SYSTEM / PIPING

Installation Method A (Recommended)

Independent product installation.

Figure 20: Installation Method A.



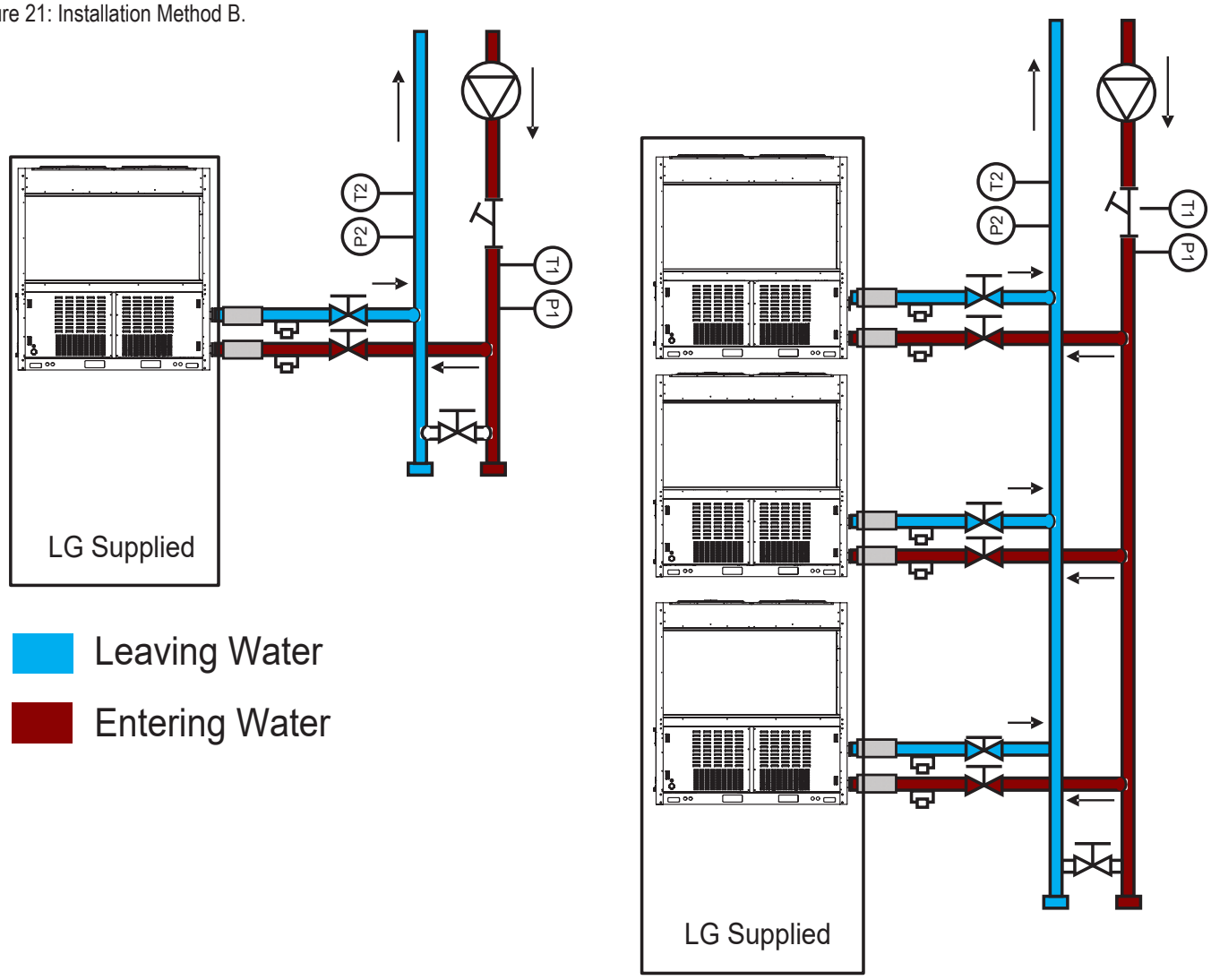
Symbol	Description	Symbol	Description (Provided by Others)
*	Valve (100% Flow)	T1 or T2	Optional Temperature Sensor (1: Inlet, 2: Outlet)
*	Strainer (50 Mesh)	P1 or P2	* Pressure Gauge (1: Inlet, 2: Outlet)
*	Flexible Joint		Water Pump (Pump Sized to Meet Minimum to Maximum Flow for LG Chiller)
*	Service Port for Cleaning		

* Required

Installation Method B

Independent product installation.

Figure 21: Installation Method B.



Symbol	Description	Symbol	Description (Provided by Others)
*	Valve (100% Flow)	T1 or T2	Optional Temperature Sensor (1: Inlet, 2: Outlet)
*	Strainer (50 Mesh)	P1 or P2	* Pressure Gauge (1: Inlet, 2: Outlet)
*	Flexible Joint		Water Pump (Pump Sized to Meet Minimum to Maximum Flow for LG Chiller)
*	Service Port for Cleaning		

* Required

FREEZING PRECAUTIONS

Freezing Precautions

Note:

Installing in Areas Where Winter Outdoor Ambient Air Temperatures Could Fall Below 32°F (≤0°C)

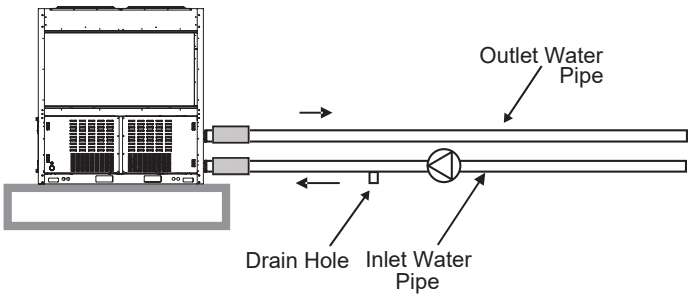
If winter outdoor ambient air temperatures could fall below 32°F (≤0°C), take the measurements detailed below to prevent the pipes from freezing, and help prevent damage to the heat exchanger.

- Circulation water can freeze if the outdoor ambient air temperature is low (≤32°F [≤0°C]), and the chiller is not operating. When the outdoor ambient air temperature is ≤32°F (≤0°C), turn the water pump on and circulate water.
- If the chiller will not be operating for an extended period during winter season, drain the circulation water out of the system.
- Add anti-freeze to prevent the circulation water from freezing during the winter season (if design temperature is below 41°F).
- Maintain water flow following design specifications to reduce damage from rusting, scaling, and corrosion.
- LG is not responsible for any chiller damage resulting from poor water quality management or improper water processes.

Inlet Water Pipe To Be Installed Level

The inlet water pipe is to be installed level so that no water remains in the pipe after draining through the drain hole. If it is not level, water will remain in the pipe, which could freeze and damage the pipe / chiller components. Add a drain hole at the bottom of the pipe.

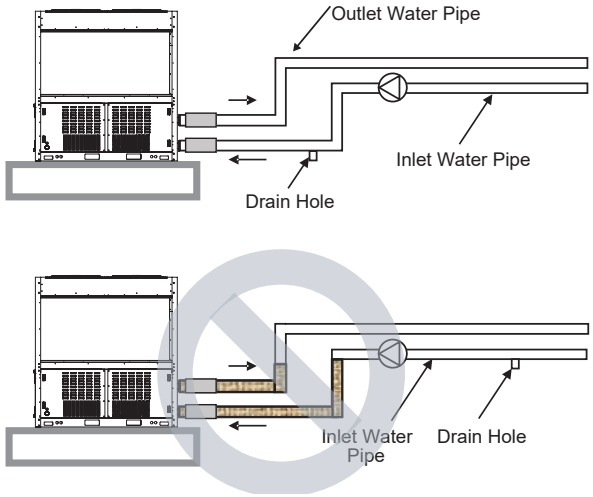
Figure 22: Inlet Water Pipe with Drain Hole.



Note:

If the leaving water line does not sufficiently drain into the entering water line, additional drain holes may be required.

Figure 23: Positioning the Drain Hole When Bends or Traps are Unavoidable.



WATER PIPE INSTALLATION / PUMP CONTROL / QUALITY MANAGEMENT

Water Pipe Installation

- Appropriate pressure of the pipe flange connection is ≤145 psi.
- Water pipe size must be the same or larger than that of the chiller. When multiple chillers are manifolded together, piping is to be properly sized and engineered by a licensed professional.
- To prevent the water pipe connections from sagging due to the load, install appropriate pipe supports.
- Position the water inlet pipe at the bottom of the water pipe system, and position the outlet pipe at the top of the water pipe system.
- If there is a risk of condensation, install insulation on the cold water outlet pipe (follow all applicable state and local energy and building codes).
- To prevent the connected pipe from freezing during winter season, install the drain valve at the bottom of the pipe system.

Water Pump Control

If the water pumps do not operate for an extended period, internal corrosion is more likely.

Water Quality Management

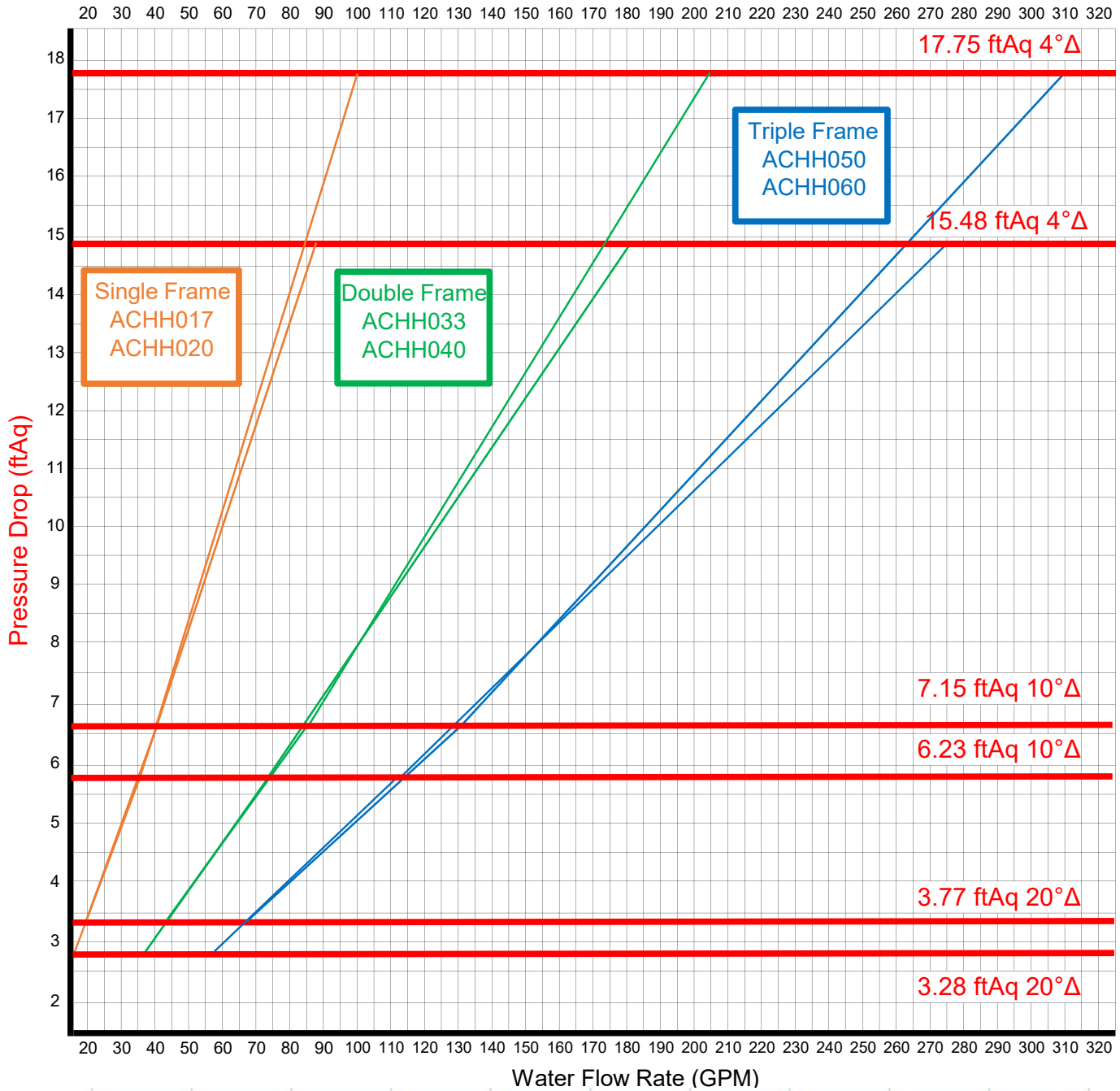
Impurities in the water can influence chiller performance and life expectancy. The water must be tested and treated using a local water treatment professional, and water quality must not fall below the standards listed in the table.

Table 4: Chiller Water Standards.

Particles	Water	
	Circulating Water	Cold Water
pH (77°F [25°C])	6.5 - 8.0	6.5 - 8.0
Conduction Rate (77°F [25°C] µs/cm)	500 or below	200 or below
Alkali Level (ppm)	100 or below	50 or below
Hardness (ppm)	100 or below	50 or below
Chlorine Ion (ppm)	100 or below	50 or below
Lactic Acid Ion (ppm)	100 or below	50 or below
Iron (ppm)	0.1 or below	0.3 or below
Sulfur Ion (ppm)	Must not be detected	Must not be detected
Ammonium Ion (ppm)	0.5 or below	0.2 or below
Silica (ppm)	50 or below	30 or below

OPERATING PRESSURE DROP / DESIGN FLOW

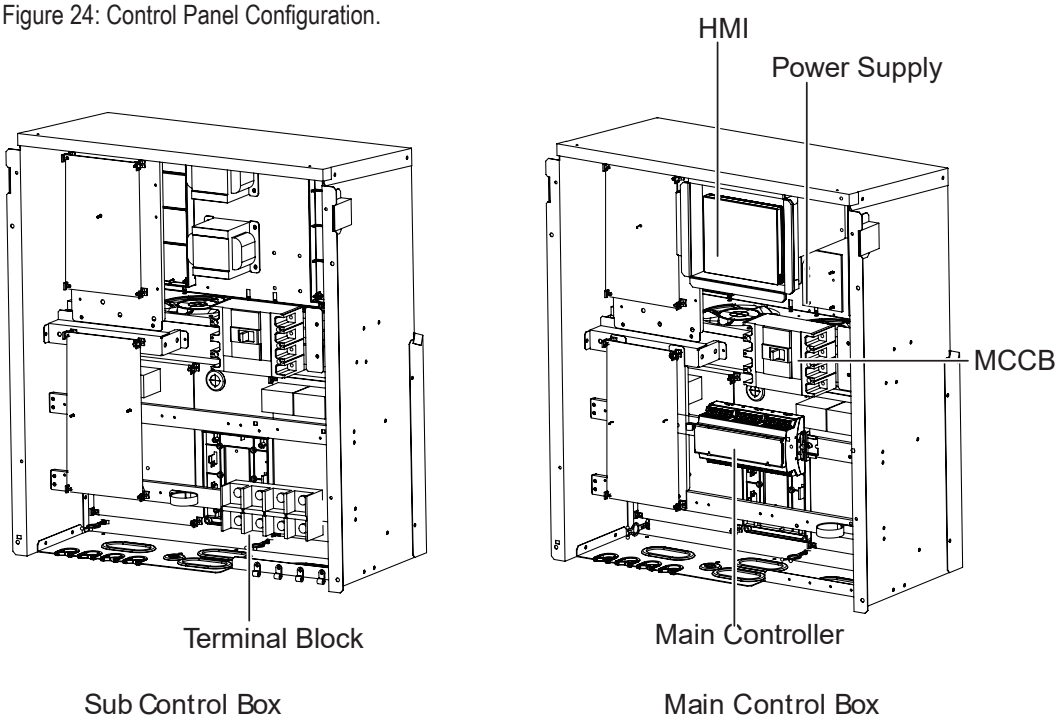
ACHH Pressure Drop Chart



ACHH Size	Ton	45°F LWT 4°Δ GPM	PD ftAq	Ton	45°F LWT 10°Δ GPM	PD ftAq	Ton	45°F LWT 20°Δ GPM	PD ftAq
17	15.4	93	15.48	16.21	39	6.23	17.6	21	3.28
20	17.7	105	17.75	18.48	44	7.15	20.1	24	3.77
33	30.8	186	15.48	32.42	78	6.23	35.2	42	3.28
40	35.4	210	17.75	36.96	89	7.15	40.2	48	3.77
50	46.2	279	15.48	48.62	117	6.23	52.8	63	3.28
60	53.1	315	17.75	55.45	133	7.15	60.3	72	3.77

Control Panel Configuration

Figure 24: Control Panel Configuration.



Human Machine Interface (HMI)

Use for basic product setting and commands; displays product information, and information for each cycle.

Main Controller

Controls the input / output port and communicates with each cycle.

Power Supply

Supplies power to the HMI.

MCCB (Molded Case Circuit Breaker (MCCB)

Shuts off the overcurrent.

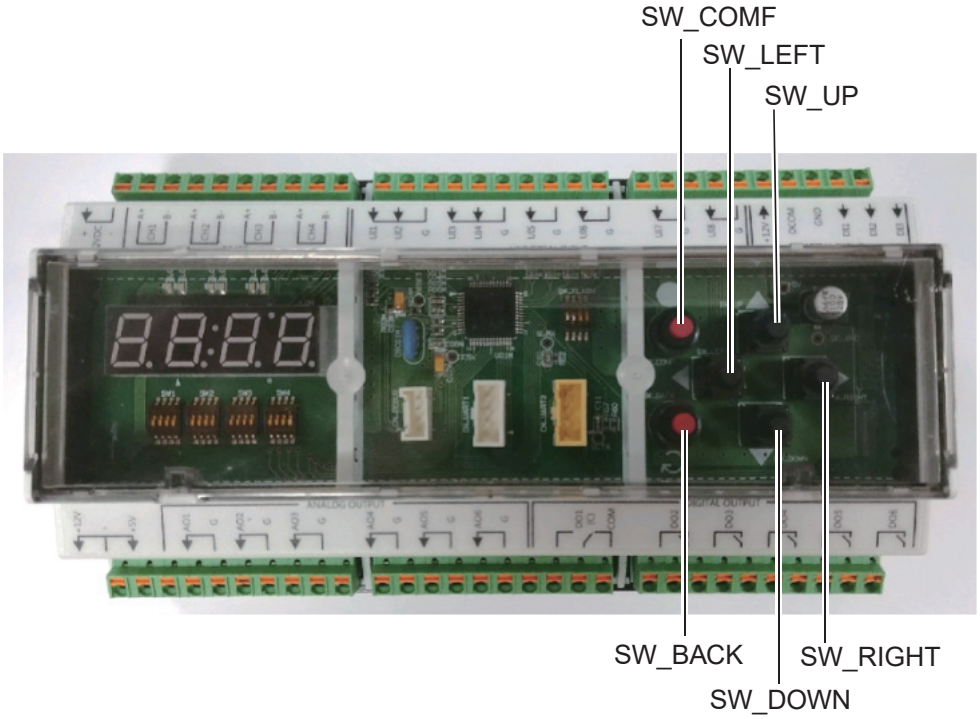
Line or High Voltage Terminal Block

The terminal block that receives the external main power.

BUTTON LOCATIONS AND FUNCTIONS

Chiller controller rotary, DIP switch setting

Switch location



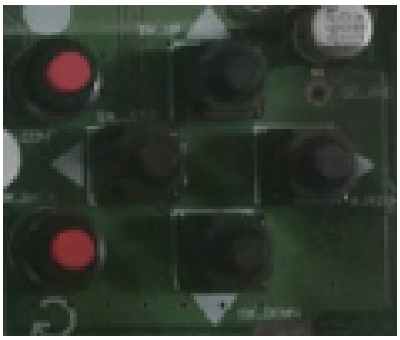
Name	Description
SW_RIGHT	Changes the setting.
SW_UP	Moves the screen.
SW_LEFT	Changes the setting.
SW_DOWN	Moves the screen.
SW_COMF	Sets the selected function.
SW_BACK	Moves to the previous step.

Chiller Controller includes the buttons described above so that the following functions are available for setting without HMI.

Option Setting

Press SW_COMF Button to move to O Level Setting Screen.

<Screen>



<Button>

Press Up or Down (▲▼) Button to go to a desired function.

If the desired function shows, press SW_COMF Button.

Then, the Screen moves to 1 Level Setting.

Press Left or Right ( ) Buttons to go to a desired function. And Press SW_COMF Button to set the function.

To go to the previous, press SW_BACK Button.

	Description	Screen Displays(0 Level)				Screen Displays(1 Level)			
1	Start/Stop	O	P	E	R		R	U	N
						S	T	O	P
2	Cooling/Heating	C	Y	C	L	H	E	A	T
						C	O	O	L
3	Cooling setpoint temperature	C	-	T	E				7
4	Heating setpoint temperature	H	-	T	E			4	5
5	Load outflow Temperature								
6	Control Mode	S	Y	S	1		L	O	C
						D	I	S	T
						S	C	H	E
7	Remote Mode	S	Y	S	2	C	O	N	T
							B	U	S
8	Central Control Address	A	D	D	R				1
9	Maximum Operation Frequency	H	I	-	R		1	1	0
10	Capacity of product	H	P	4	0				
		C	O	4	0				
11	Version			1	0				
		S	V	1	0				

OPTIONAL SETTINGS

Description	Screen Display (1 Level)	Detail Description
Start/Stop	RUN /STOP	Set RUN to operate the product and STOP to stop the operation.
Cooling/Heating	HEAT/COOL	Sets the product's Cooling/Heating Operation Mode. COOL selects Cooling Mode and HEAT selects Heating Mode.
Cooling setpoint temperature	7	Sets Cooling Target Temperature. (4 °C~ 20 °C)
Heating setpoint temperature	45	Sets Heating Target Temperature.(30 °C~ 55 °C)
Load outflow water Temperature	-	Shows the temperature value of Load outflow water. (Specified in 0 Level)
Control Mode	LOC/DIST/SCHE	Set's the product's Control Mode. In LOC, the product control is available with HMI and Chiller Controller. DIST refers Remote Control Mode. In SCHE, the product is controlled following the schedule set at HMI.
Remote Mode	CONT/BUS	Sets how to set in Remote Mode. CONT enables the product's operation mode by simple switch contacts. BUS enables the control on the entire product through communication from other communication devices.
Central Control Address	1	The product address can be set for communication with other communication devices. The address can be set by selecting values from 1-247.
Maximum Operation Frequency	110	Sets the Maximum Operation Frequency.(70 Hz~130 Hz)
Capacity of product	-	Shows the current Capacity of product. (Specifies in 0 Level)
Version	-	Shows the program information of Chiller Controller installed in the current product as Version. Version information is subjected to change for improvement of the product performance or the quality improvement. (Specifies in 0 Level)

Freezer address setting

Address setting of product should be set from HMI and Main Controller and if 2 addresses doesn't match each other, HMI communication error will occur.

- **Main Controller address setting**

  Press down direction and right direction button (▼) at the same time.

  When FN01 appears, press SW_CONF button.

  Select desired address using left and right button ( ) and address will be set if press SW_CONF button. If you don't want, please press SW_CONF button.

	Description	Screen Displays(0 Lever)				Screen Displays(1 Lever)			
1	Chiller Address	F	N	0	2				1

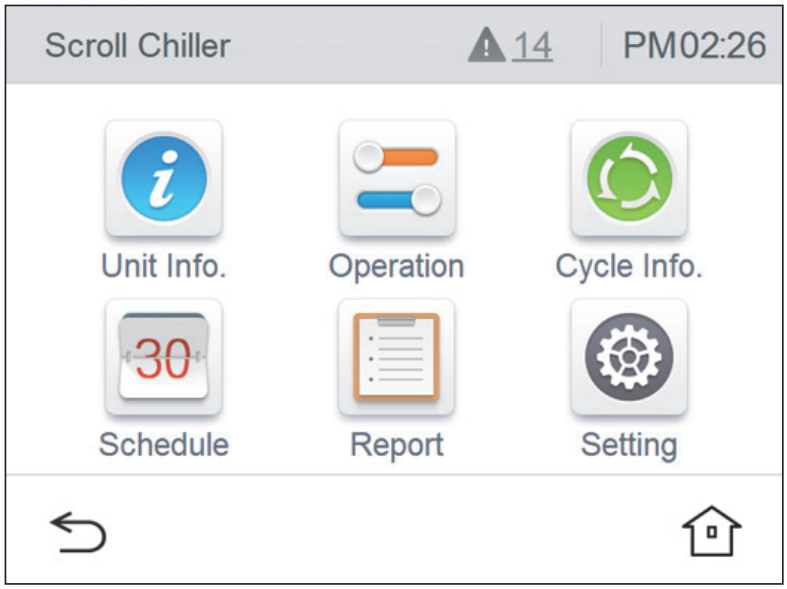
Note

- If Main Controller address doesn't match HMI address, Error will occur. (please refer to control>freezer interlocking control about HMI address setting)

HMI SCREENS

Logging in to HMI

This chapter will explain about the composition of each screen in HMI, detail functions, and operation methods. When power is applied to HMI, HMI automatically operates. When HMI starts, Home screen appears.



⚠ CAUTION

When HMI is installed indoors, the guaranteed communication distance is 500 m.

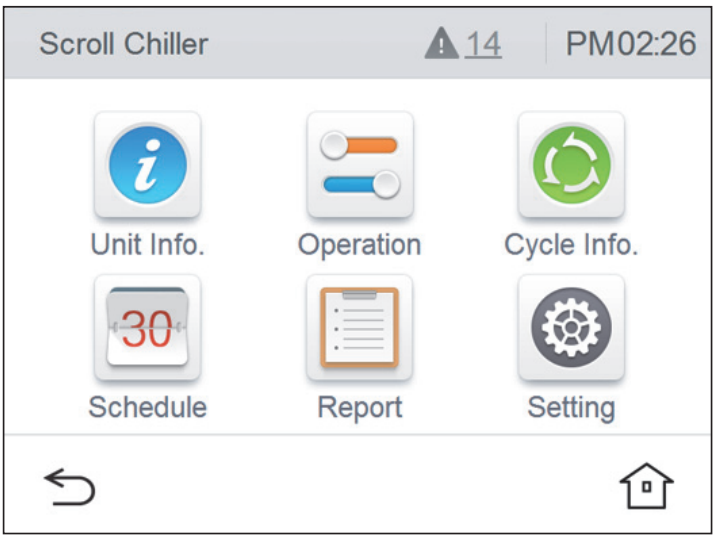
- Guaranteed communication distance of HMI: 500 m
  (But, when connected indoor, the end resistance (100-200 Ω) must be installed at the terminal connected to HMI for smooth communication. In this case, if the installation location of the Unit is different from that of HMI, the maximum permitted connection distance of the communication cable between the two locations is displayed.)

Introduction to HMI menu

This chapter describes the HMI menus to know to operate the product and how the screen is configured.

HMI main screen configuration

After logging in to HMI, the system view screen that shows the common information of the product is displayed as shown below.

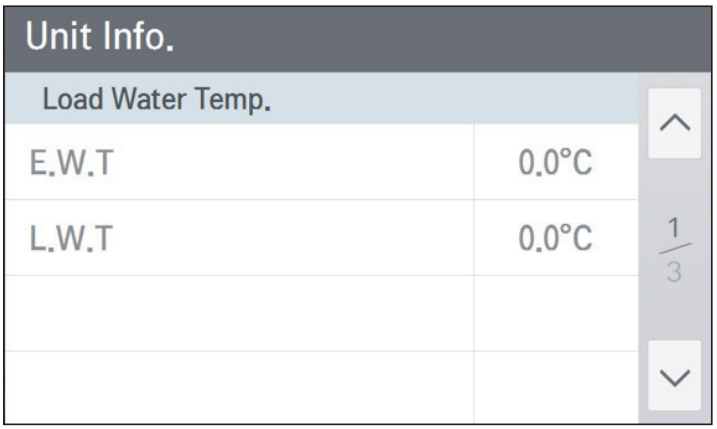


Icon	Description
	You can see the load water temperature, pump/flow amount status, and system information.
	It sets the Start/Stop, Set Temperature, Operation Mode (Only for Heatpump Model), control mode, max. operation frequency, and demand control ratio are set.
	It checks the individual cycle's operation information.
	It checks the set schedule.
	It checks the occurred error history.
	It sets the installer setting, screen setting, and system setting.
	It returns to the previous menu.
	Home screen appears.

View chiller information

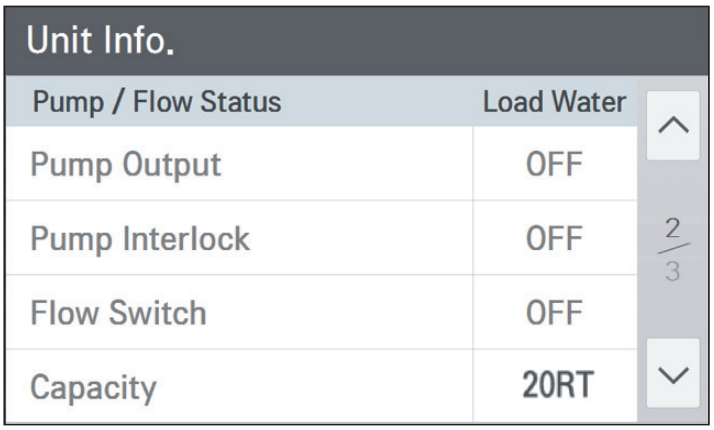
Chiller information is composed of the load water temperature, pump/flow amount status, and system information.

- **Load water temperature screen**



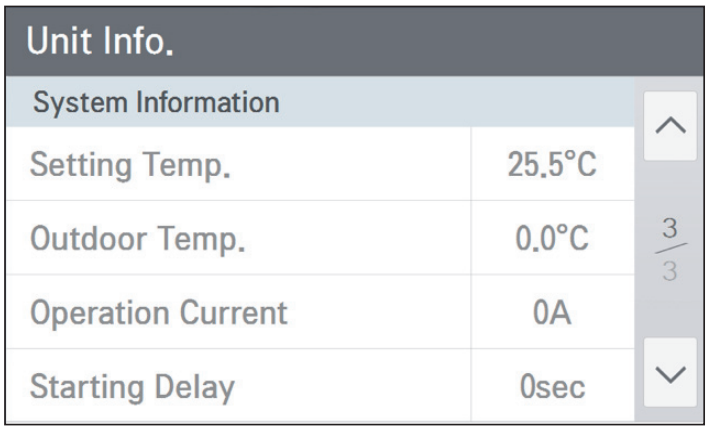
Icon	Description
E.W.T	It shows the common load entering water temperature value.
L.W.T	It shows the common load leaving water temperature value.

• **Pump/flow amount status screen**



Icon	Description
Pump Output	If it is in operation, it always maintains ON, and when the product operation is stopped, the freeze and burst mode is applied, and the freeze and burst prevention mode operates as follows. According to the outdoor air temperature condition, the load water pump repeats operation ON and OFF. Outdoor air temperature < 1 °C → always “ON” 1 °C ≤ outdoor air temperature < 5 °C → 2 min. operation and 18 min. stop Outdoor air temperature ≥ 5 °C → operation “OFF” The freeze and burst prevention mode is possible when the pump is connected, and to interface with the pump, Pump Output connect shall be connected, and to check whether the pump operates, Pump Interlock connector shall be connected. (For the connector connection method, refer to the connection diagram.)
Pump Interlock	It receives the status of the load water pump output through the external signal contact point of the pump. (When the product is in operation, the pump output shall maintain “ON” state, and otherwise, alarm will occur.)
Flow Switch	It shows the current load water’s flow amount switch status value. (When the product is in operation, the pump output shall maintain “ON” state, and otherwise, alarm will occur.)
Capacity	It shows the capacity of the device.

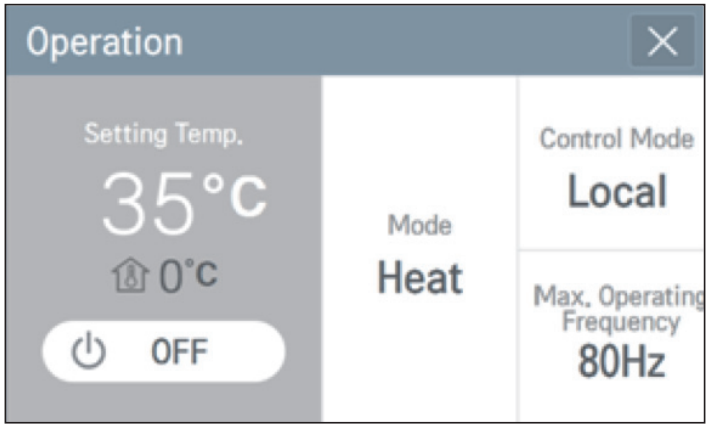
• System information screen



Icon	Description
Setting Temp.	It shows the set temperature for the current operation mode.
Outdoor Temp.	It shows the current outdoor air temperature value.
Operation Current	It shows the operation compressor's overall operation current value.
Starting Delay	It shows the time of the standby state before starting the product.

Chiller control

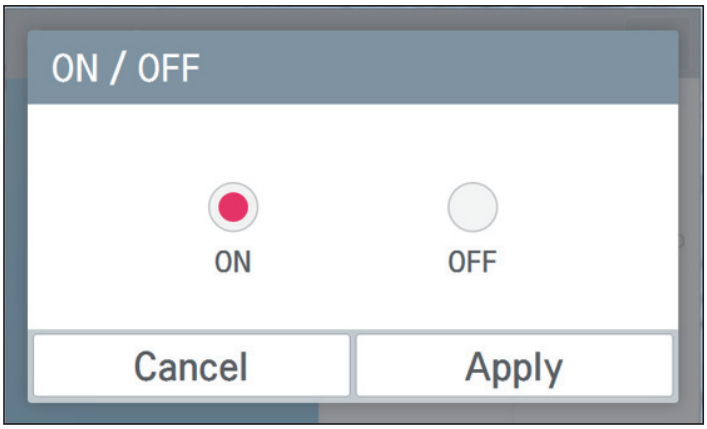
Chiller control sets the Start/Stop, Set Temperature, Operation Mode (Only for Heatpump Model), Control Mode, and Max. Operating Frequency.



Icon	Description
ON	It selects the start and stop signal command of the product.
Setting Temp.	It sets the target temperature value for the current operation mode. (Cooling: 4.0~20.0 °C, heating: 30.0~55.0 °C)
ON	It sets the cooling/heating operation mode.
Control Mode Local	It selects the control mode of the signal command method for the product control.
Max. Operating Frequency	Max. Operating Frequency is the feature to save the energy by limiting the operation capacity up to the frequency set by the user. (Setting Range : 70Hz ~ 130Hz) The standard set value for the Max. Operating Frequency is 120 Hz.
Demand-Control Ratio	The setting unit for the Max. Operating Frequency is 10 Hz. Demand control is a function that saves energy by limiting the operating capacity of the user. (0: unused, 50~100%)

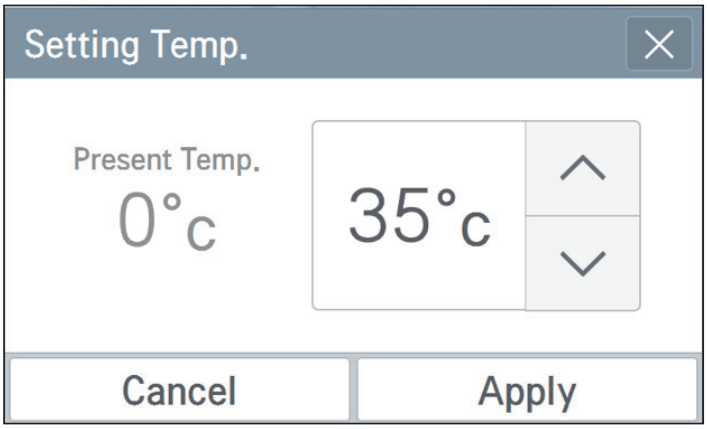
- **ON/OFF**

  When you touch the ON button, a popup window to select ON/OFF is displayed.

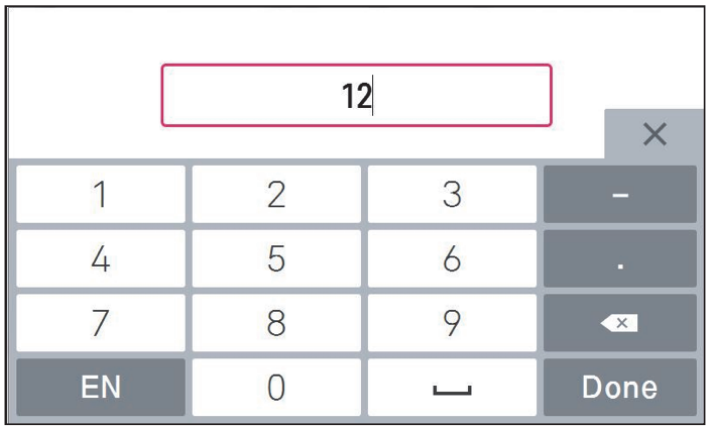


- **Setting temperature**

  If you touch the area where the chiller control's set temperature is displayed, a popup window to input the setting temperature is displayed.



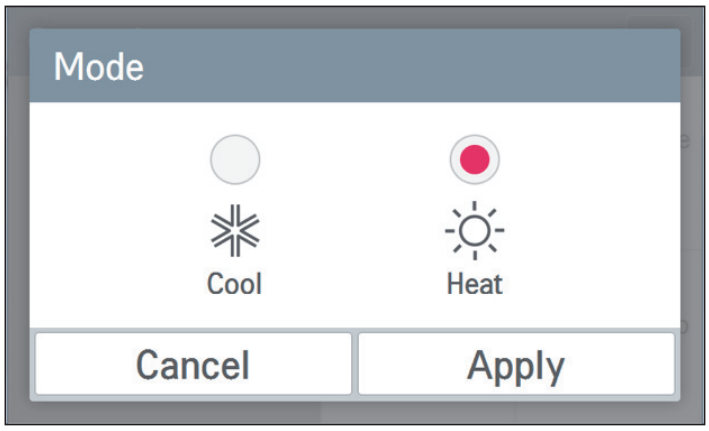
In the temperature setting popup window, you can change the temperature with up/down arrow input, and if you touch the temperature setting display area, you can input the setting temperature input with numeric keyboard.



After changing the temperature setting, if you press Apply, the set value is reflected, and if you press Cancel, the previous setting is maintained.

- **Operation mode**

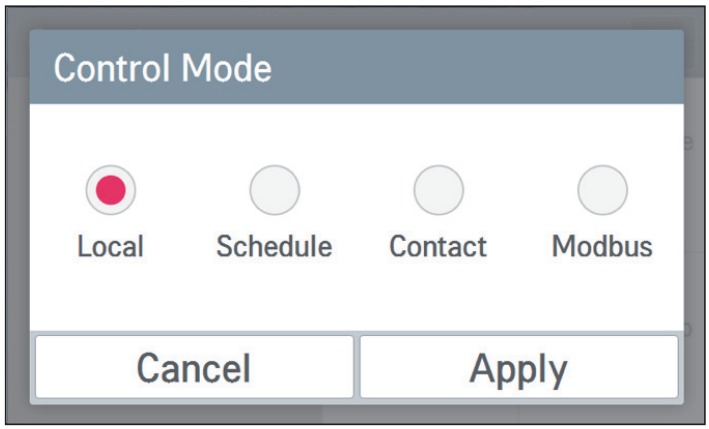
  If you touch the chiller control's operation mode area, a popup window to set the operation mode is displayed.



After changing the operation mode, if you press Apply, the set value is reflected, and if you press Cancel, the previous setting is maintained.

- **Control mode**

  If you touch the chiller control's control mode area, a popup window to set the control mode is displayed.



After selecting the desired control mode, if you press Apply, the selected control mode is applied, and if you press Cancel, the previous setting is maintained.

Icon	Description
Local	Manual control mode through HMI
Schedule	If the schedule mode is set, manual and remote control are not possible, and only the start/stop by the schedule is possible.
Contact	ON/OFF is only possible by the chiller controller's "Remote Start" signal.
Modbus	ON/OFF is only possible by the external MODBUS communication.

⚠ CAUTION

If the product enters the modbus remote mode, all the information can only be monitored via HMI, and the actual operation of starting/stopping or changing the set temperature can only be done through the external controller.
To make changes to control from HMI, change the control mode to “Local”.

⚠ CAUTION

CH10009 remote communication error will occur when the communication is disconnected between the two controllers. When the communication is recovered, it will automatically resume. If the remote modbus connection is not used, reset the power of the main PCB of the unit to cancel the alarm.

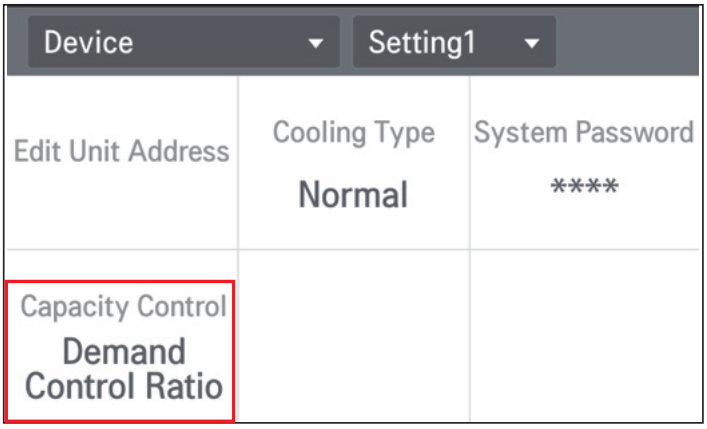
The protocol details provided for modbus interlock of external device are as follows.

- Physical Layer : RS-485 Serial Line
- Mode : MODBUS RTU Mode
- Baud Rate : 9 600
- Parity : None Parity
- 1 Stop Bit
- Applied Function Code

Function Code	Sub Function	Function Name	Start Address form Master Device
0x01	None	Read Coil Register	Address-1
0x02	None	Read Discrete Input	Register Address-10001
0x03	None	Read Holding	Register Address-40001
0x04	None	Read Input	Register Address-30001
0x05	None	Write Single Coil	Register Address-1
0x06	None	Write Single Holding	Register Address-40001
0xF1~FF	Reserved for Exception Code		

Refer to the modbus protocol in the Appendix for the protocols provided.

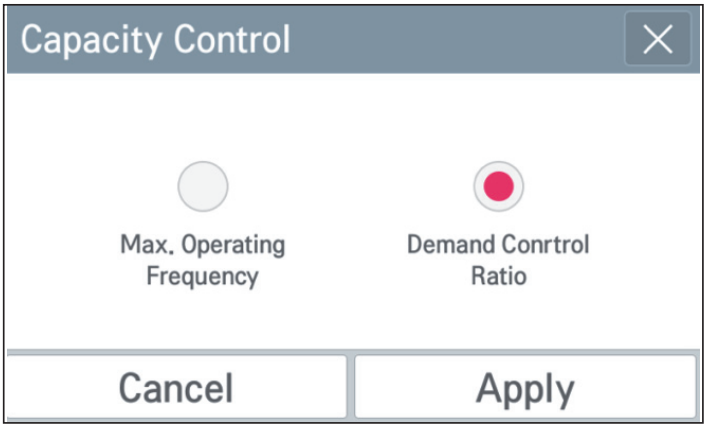
Select whether to use the max. operation frequency or demand control. The default setting is the max. operating frequency.



In the installer mode, if you press the capacity control setting for more than 5 seconds and enter the password, a pop-up window for setting the capacity control type appears. Select the wanted capacity control and click the Apply button. If you press the cancel, it keeps the previous settings.

- **Max. Operating Frequency**

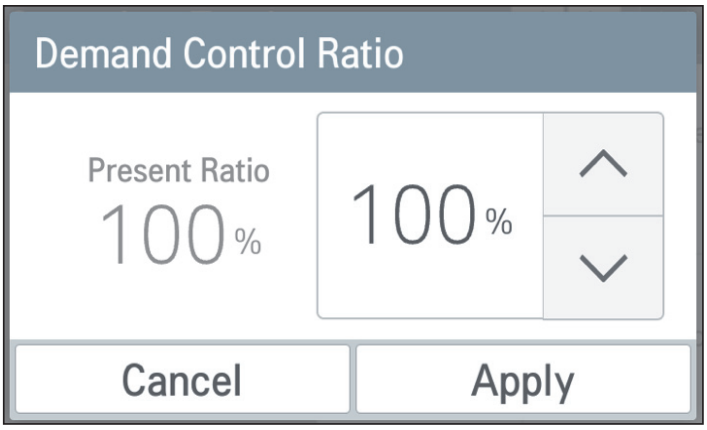
  If you touch the Max. Operating Frequency area, a popup window to input the Max. Operating Frequency is displayed.



The Max. Operating Frequency can be adjusted by pressing Up/Down arrows in the popup window for the Max. Operating Frequency.

- **Demand control ratio**

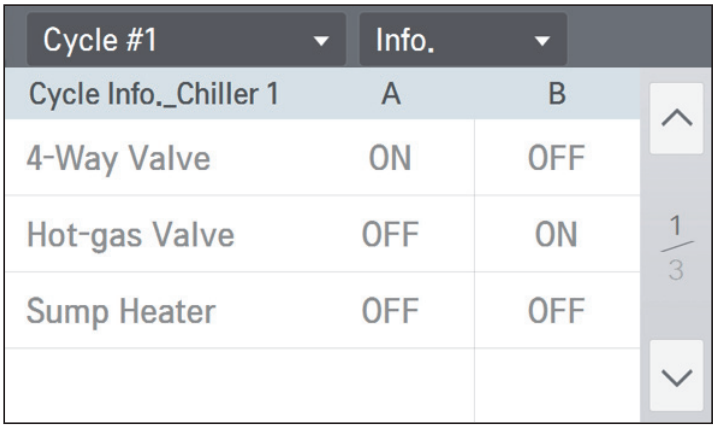
  If you touch the demand control ratio, a pop-up window appears where you can enter the operation rate.



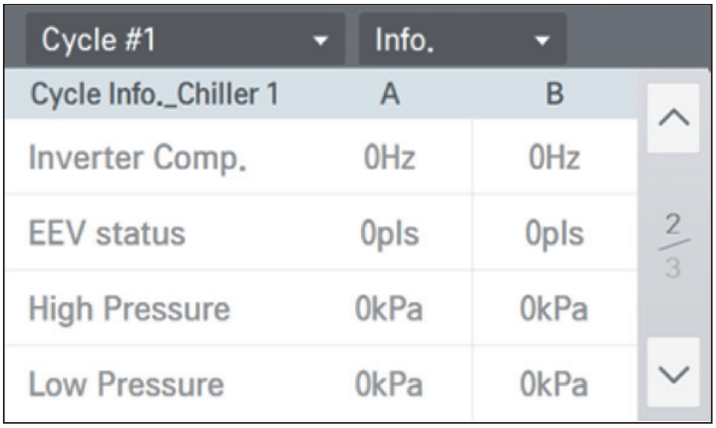
Demand Control ratio can be adjusted by inputting up/down arrows in the demand control ratio pop-up window.

Cycle information screen composition

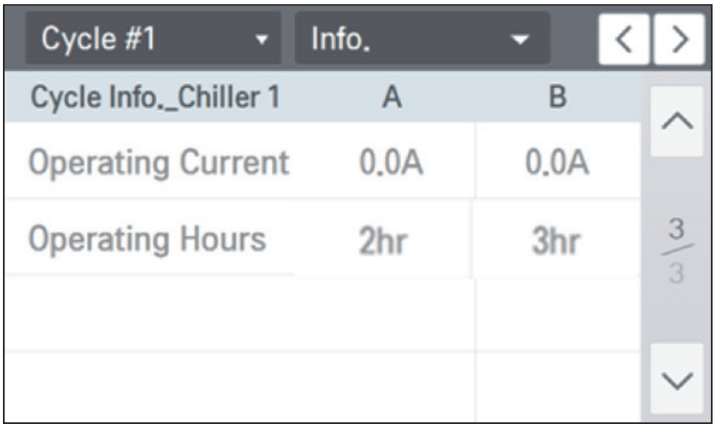
To enter the cycle information screen, press the cycle information button in Home screen.



Icon	Description
Cycle #1	It shows the currently selected cycle.
Info.	You can select the cycle information and the cycle temperature.
4-Way Valve	It shows the status value of the 4-way valve during the cooling/heating switching. (It is the item that is displayed only in the cooling/heating combined model.)
Hot-gas Valve	Show the status of hot gas valve.
Sump Heater	Show the status of sump heater.

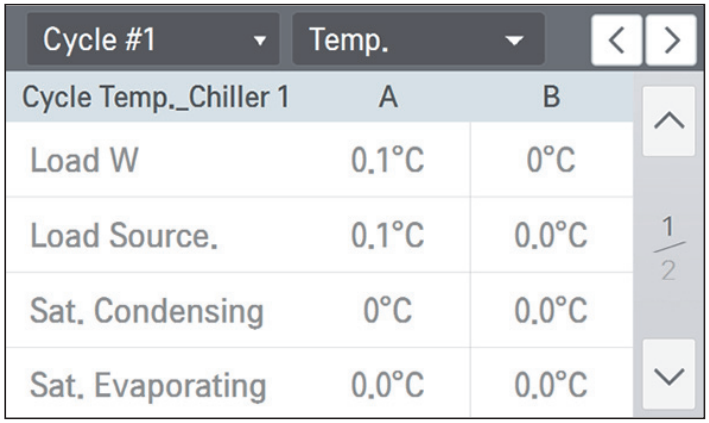


Icon	Description
Inverter Comp.	It shows the inverter compressor's operation frequency value.
EEV status	It shows the current EEV pulse signal value.
High Pressure	It shows the current high pressure value.
Low Pressure	It shows the current low pressure value.

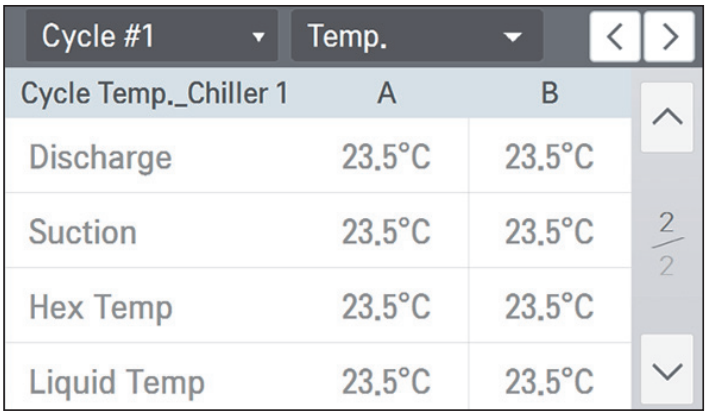


Icon	Description
Operating Current	Show the operation current value of operation compressor.
Operating Hours	Show operation time.

• Cycle temperature



Icon	Description
Load W	Show individual outlet temperature value of the cycle.
Load Source.	Show individual inlet temperature value of the cycle.
Sat. Condensing	Show condensation temperature value of the cycle.
Sat. Evaporating	Show Evaporation temperature value of the cycle.



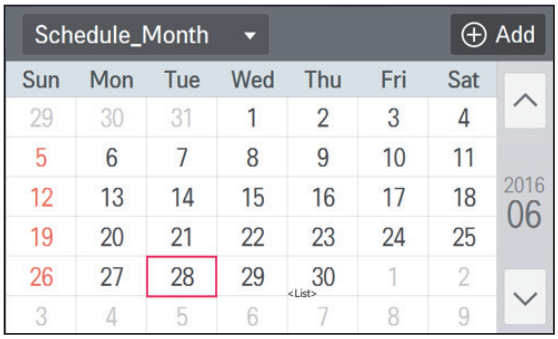
Icon	Description
Discharge	Show compressor discharge temperature value of the cycle.
Suction	Show compressor discharge temperature value of the cycle.
Hex Temp	Show HEX temperature value of the cycle.
Liquid Temp	Show liquid line temperature value of the cycle.

Introduction to schedule menu

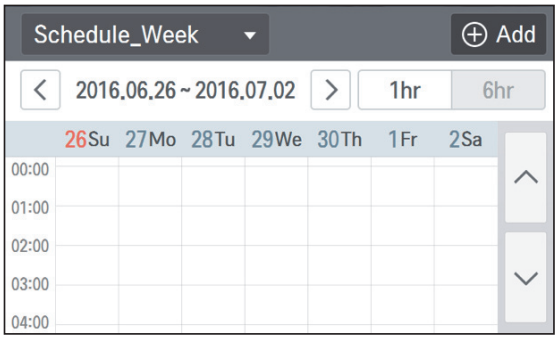
This chapter describes the schedule menu and screen composition that you need to know to operate the schedule of the product.

View schedule screen

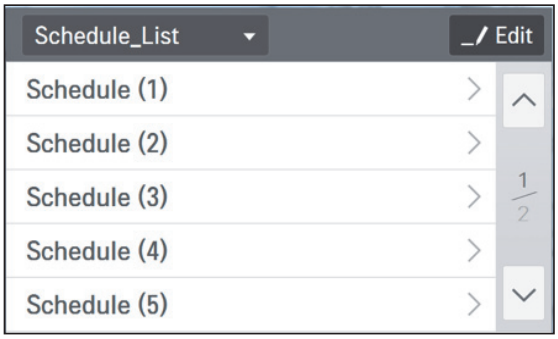
In Home screen, if you press the schedule icon, the schedule screen appears.



<Month>



<Week>

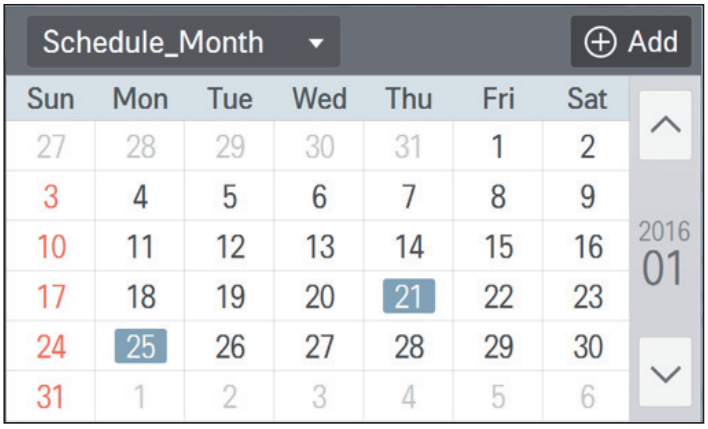


<List>

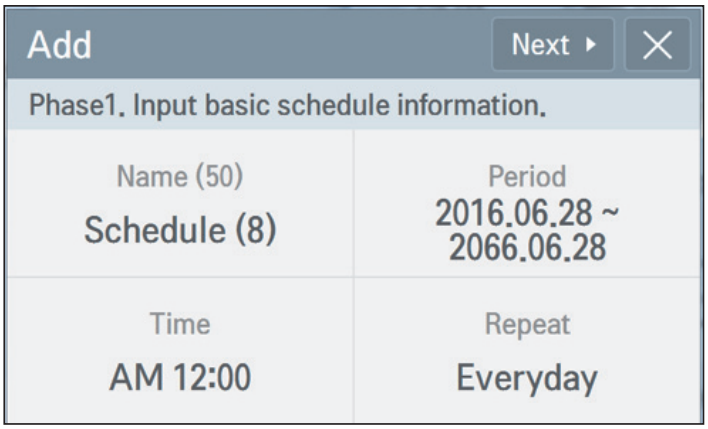
Icon	Description
Schedule_Month	You can check the monthly set schedule at a glance.
Schedule_Week	You can check the start time of the schedule and the set operation mode.
Schedule_List	You can check the set schedule in a list.

• **Add schedule**

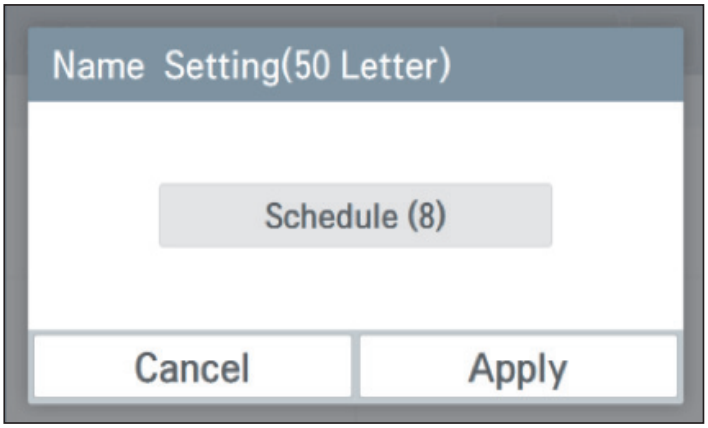
1. In the schedule viewing screen, press Schedule_Month button at the top right side.



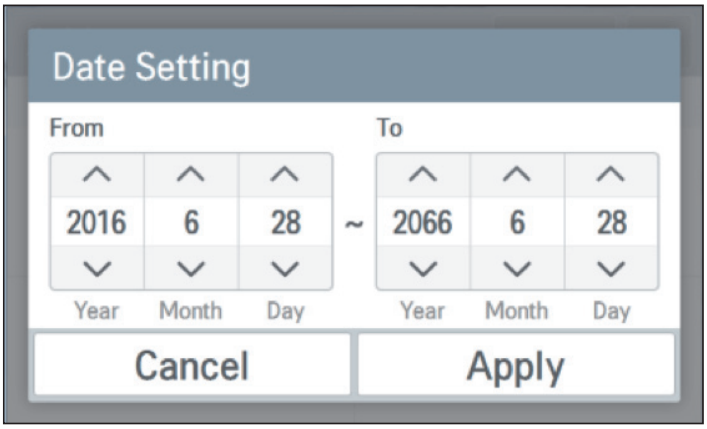
2. As follows, when Add screen appears, input the basic schedule information.



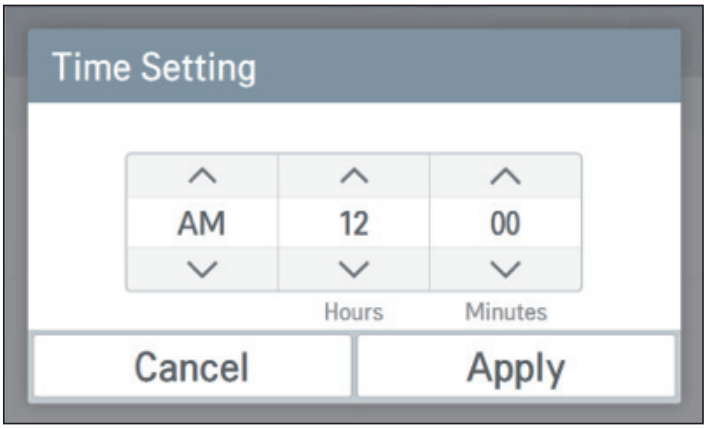
① When you press the name area, a popup window to input the schedule name is displayed. Input the name to use, and press Apply button. If Cancel button is pressed, the previous setting is maintained.



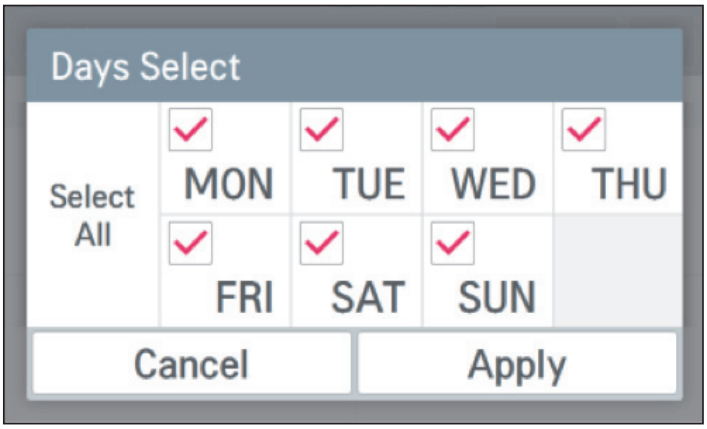
② When you press the date area, a popup window to set the date is displayed. Set the start date and end date to use the schedule operation, and press Apply button. If Cancel button is pressed, the previous setting is maintained.



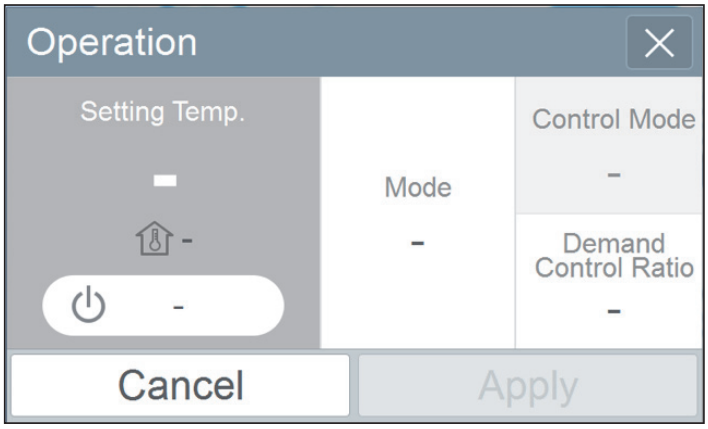
③ When you press the time area, a popup window to set the time is displayed. Set the time to use the schedule operation, and press Apply button. If Cancel button is pressed, the previous setting is maintained.



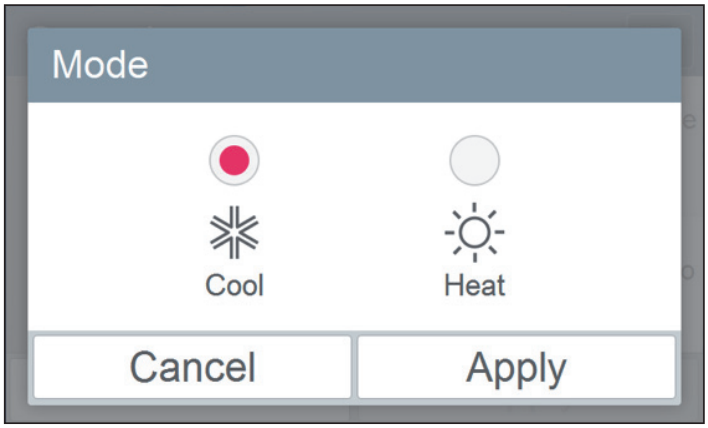
④ When you press the day of week selection area, a popup window to select day of week is displayed. Select the day of week to use the schedule operation, and press Apply button. If Cancel button is pressed, the previous setting is maintained.



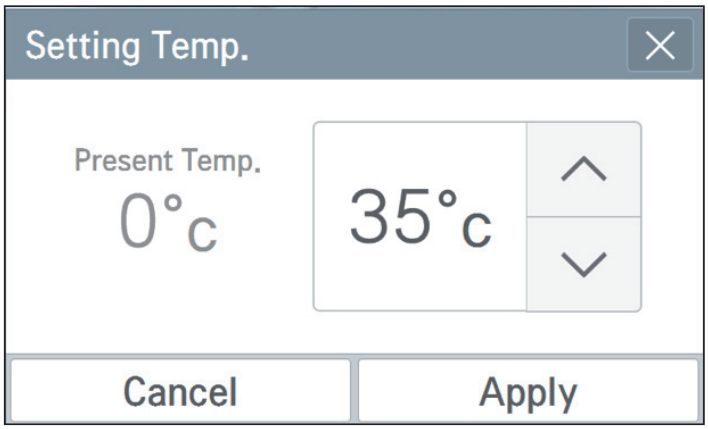
3. After the input of the basic information, if you press Next button, a screen to set the detail information is displayed.



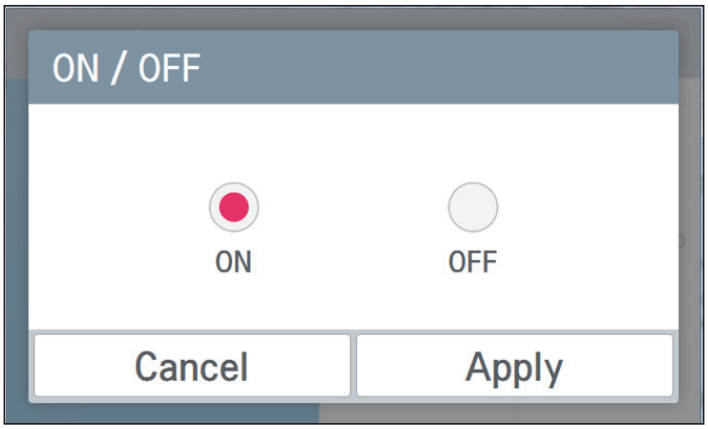
① When you press the mode area, a popup window to select the mode is displayed. Select the operation mode to use the schedule operation, and press Apply button. If Cancel is pressed, the previous setting is maintained.



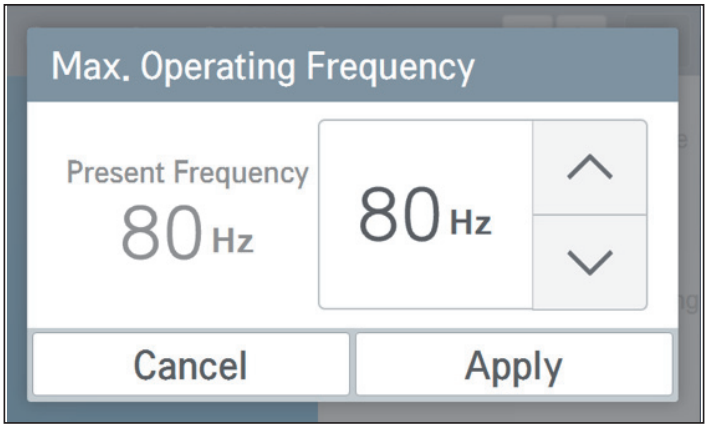
② When you press the area where the set temperature is displayed, a popup window to input the temperature setting is displayed. Set the temperature to use, and press Apply button. If Cancel is pressed, the previous setting is maintained.



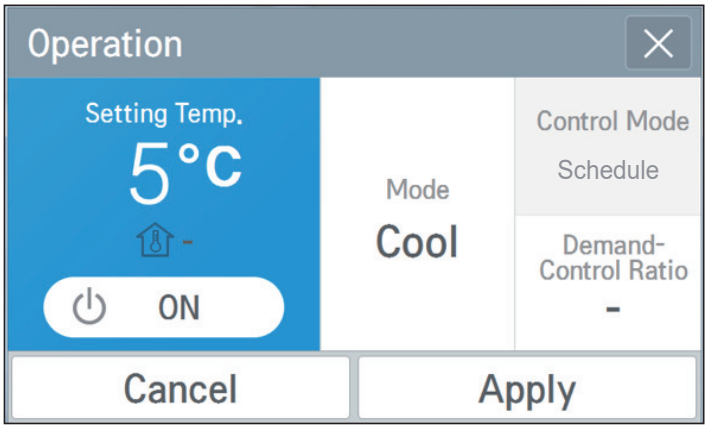
③ When you press the ON/OFF button, a popup window to select ON/OFF is displayed. Decide whether to ON or OFF the schedule operation to use, press the button to use, and press Apply button. If Cancel is pressed, the previous setting is maintained.



④ When the Max. Operating Frequency are is touched, the popup window to enter the Max. Operating Frequency opens.
After selecting a value to set, press Apply button. If cancel is pressed, the previous setting is remained.

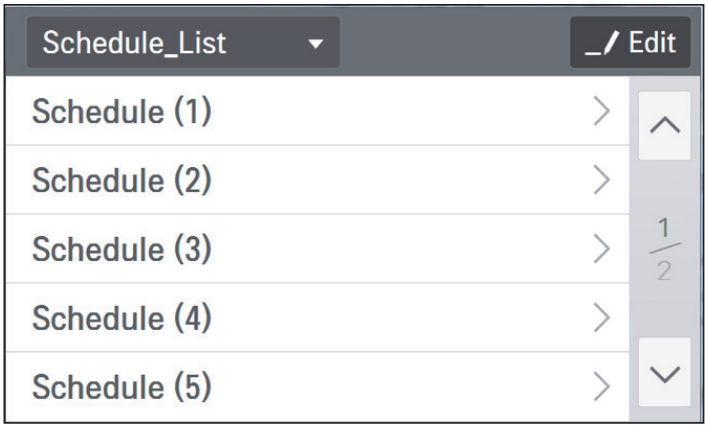


4. After the input of all detail information, when you press Apply button of the chiller control, the schedule addition is completed. If Cancel is pressed, the previous setting is maintained.
   It only works when control mode is changed from 'Local' to 'Schedule'.

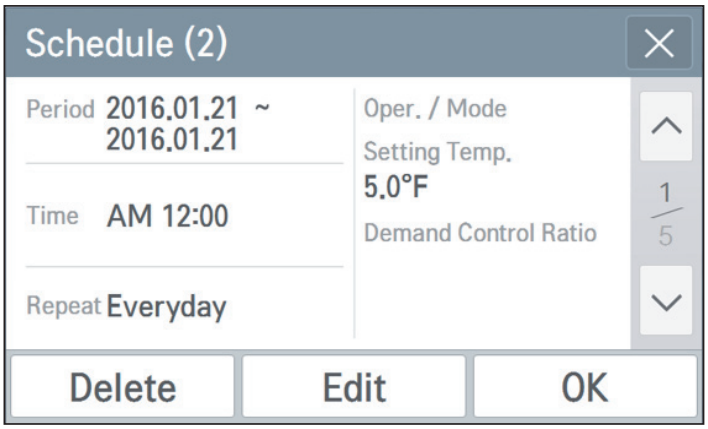


• **Edit schedule**

1. In View schedule _ List screen, select the schedule to edit.



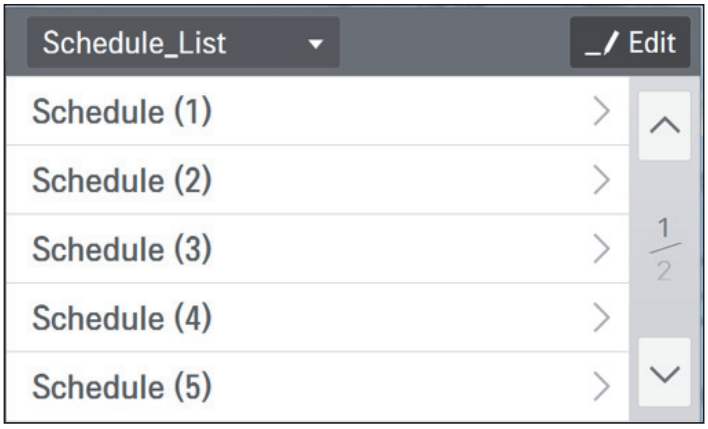
2. When the popup window of the selected schedule is displayed, press the button to work.



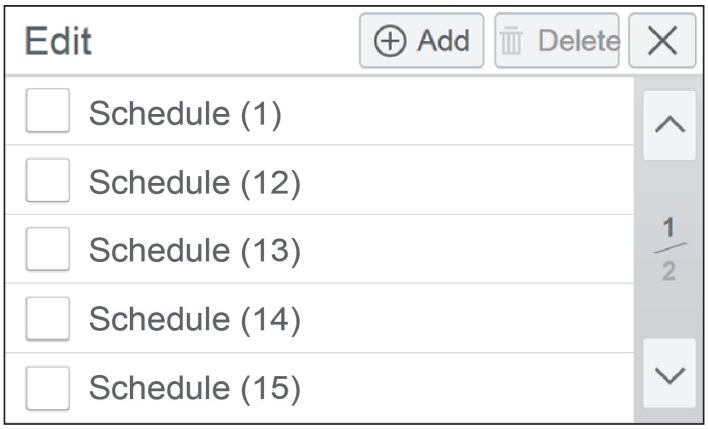
Icon	Description
Delete	Popup window saying “Do you want to delete the selected schedule?” is displayed, and when you press Apply button, it is deleted from the list.
Edit	A popup window to edit is displayed, and set with the same method as the schedule addition.
OK	It maintains the current setting, and the popup window disappears.

• **Schedule list edit**

1. In View schedule _ List screen, press Edit button at the top right side.



2. When the screen to edit the list appears, carry out the schedule addition and list deletion work.



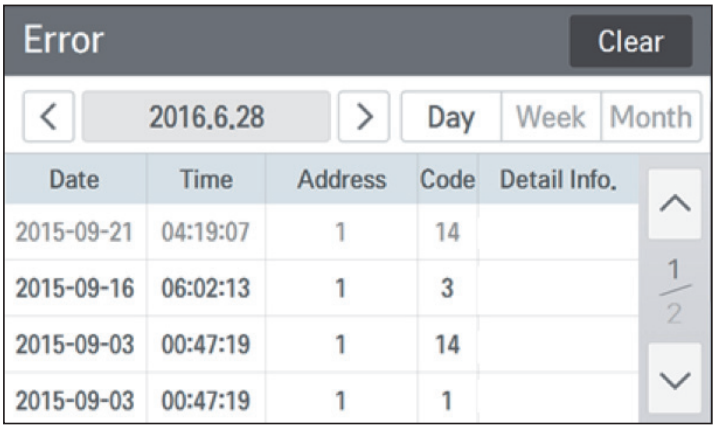
Icon	Description
Add	When Add button is pressed, it moves to the schedule addition screen.
Delete	When you select a list to delete, Delete button is activated, and when you press Delete button, the selected list is deleted.

Introduction to record menu

This chapter describes how to check the record of the events that triggers the alarm.

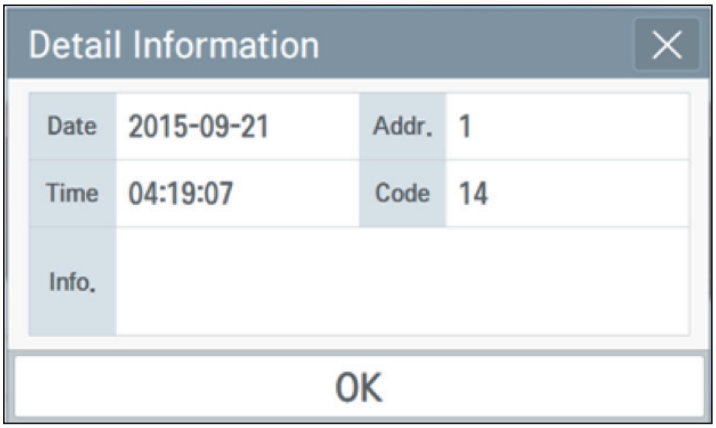
- **Error screen composition**

  The occurred error history is stored in the order of the occurred time, and according to the selection, you can check for day, week, and month.



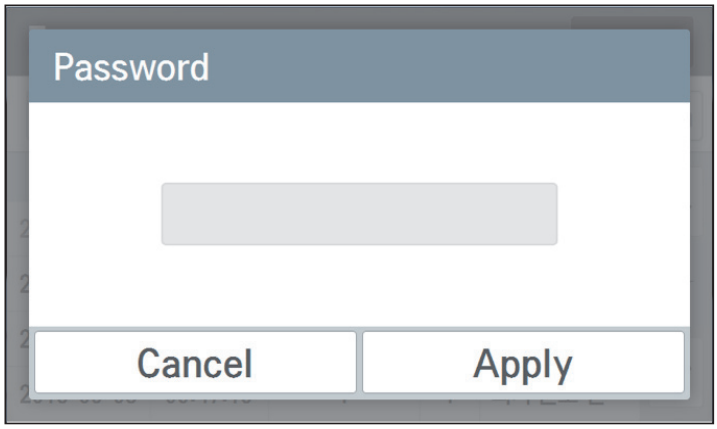
- **View detail information**

  When you select a history to view in detail, detail information popup window is displayed. It shows the error occurrence date, time, address, code, and the information of the error code. When you press Confirm, the popup window disappears.

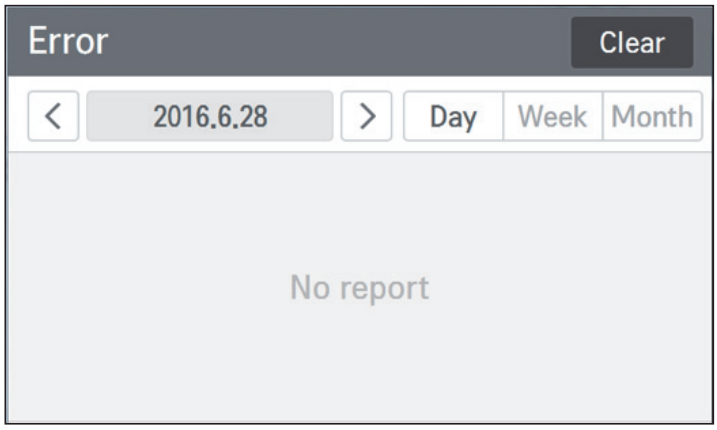


- **Delete history**

  When you press Clear button at the top right side of Error screen, a popup window to input password is displayed.



Input the password, and when you press Apply button, all error histories will be deleted.



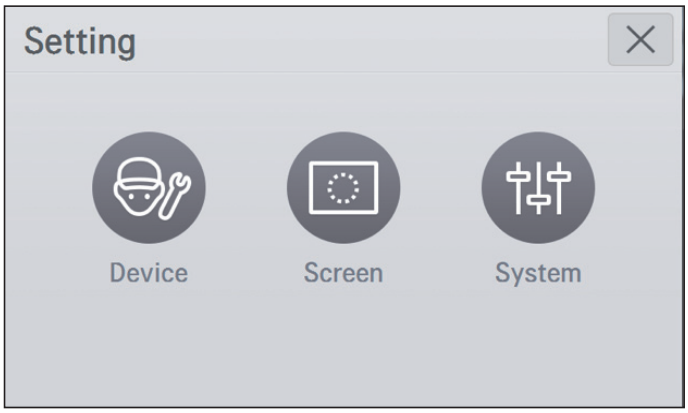
The clear function is for the service, and the password will not be provided to the customers.

View setting menu

This chapter describes the setting menu's screen and the setting method required for the operation of the product.

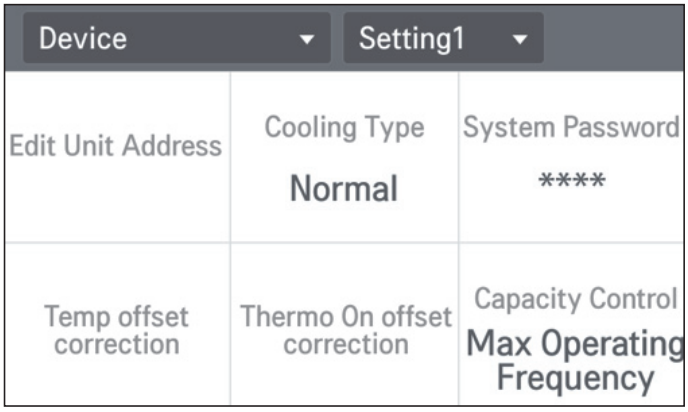
Setting screen composition

In Home screen, if you press Setting button, after password input, it enters Setting screen, and the following screen appears. (Initial password: digital21)



Device

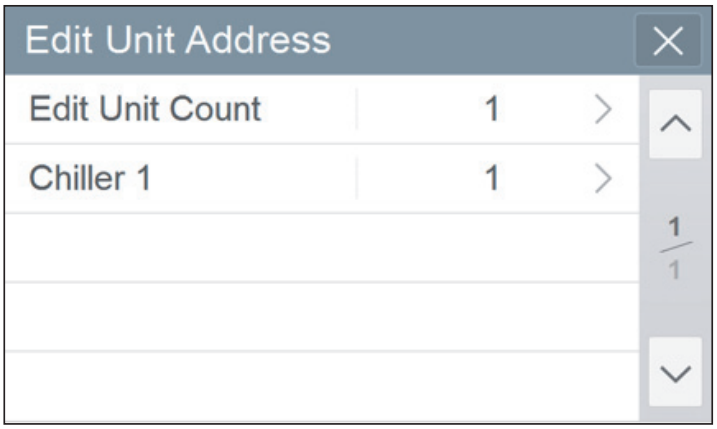
In the setting screen, when you press the device icon, device screen appears.



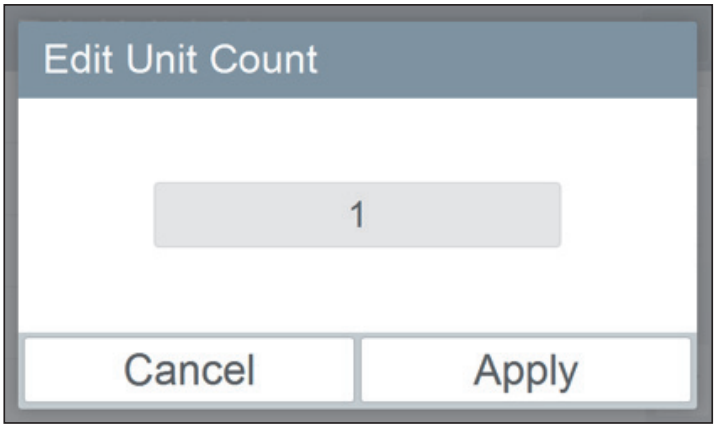
Icon	Description
Edit Unit Address	It sets chiller address and count of chiller units. Initial chiller address and count of chillers is 1. For automatic control (or ACP), MODBUS communication, and HMI interface, if chiller main PCB address is changed, HMI chiller address setting value shall be set as the same as main controller.
System Password	It selects whether to change and use password. (Initial password : digital21)
Common water out temperature offset correction	It is a function for the service and it is restricted.
Thermo On offset correction value	It is a function for the service and it is restricted.
Capacity control	Max. operation frequency mode / demand control ratio mode can be set.

- **Edit Unit Address**

  In the device mode, if you press Edit Unit Address area, the Edit Unit Assress window is displayed.



If you press Edit Unit Count area, a window to set count of chillers appears.
Select from 1 to 5, Count of chillers to interface, and press Apply button.
If Cancel is pressed, the previous setting is maintained.



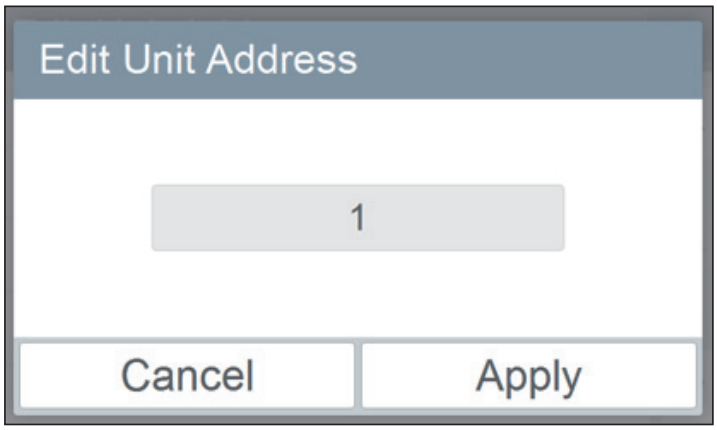
❊ Default value is 1, and you can set and use up to 5.

❊ Setting product address The product address must be in both main PCB of unit and HMI.
If the two addresses are not the same, there will be an error in HMI communication.

⚠ CAUTION

If you reset the address in HMI while the product is operating, it will cause a communication error and stop the product. Aiways reset the address after the product has stopped completely.

In Edit unit Address, if you press chiller 1 area, Edit Unit Address window appears. Input the desired address and press Apply button. If Cancel is pressed, the previous setting is maintained.

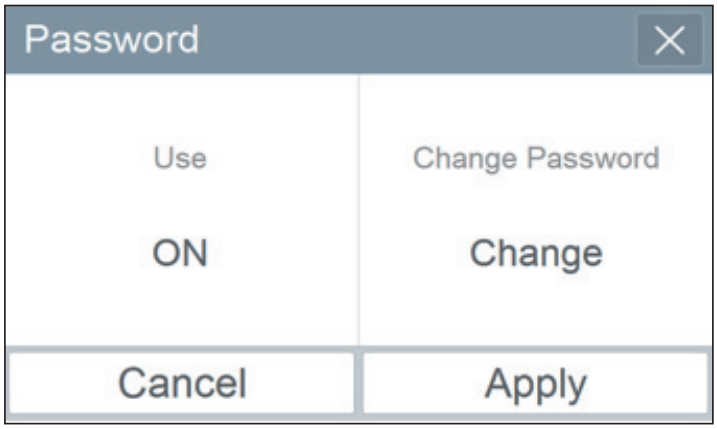


※ If you select 2 or more unit count, you need to input address for each unit.

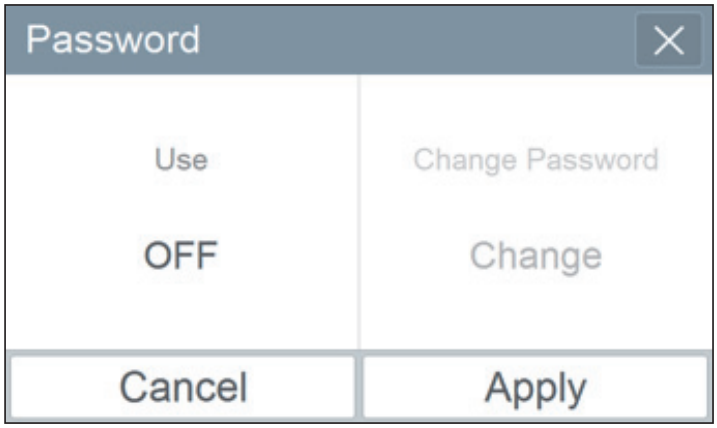
- **Password setting**

In the device mode, if you press System Password area, Pasword window is displayed.

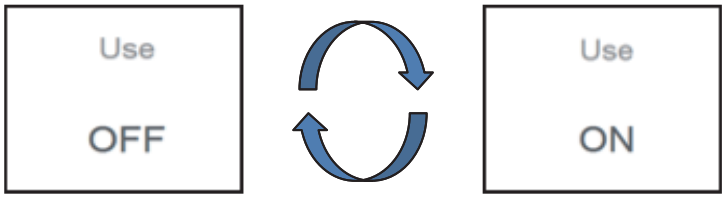
1. Do not use password



① If you press Use ON area, it is changed to Use OFF.

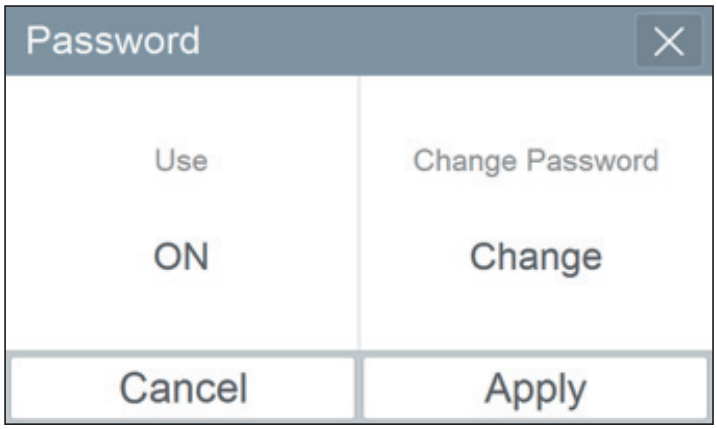


② Select Apply. If Cancel is pressed, the previous setting is maintained.



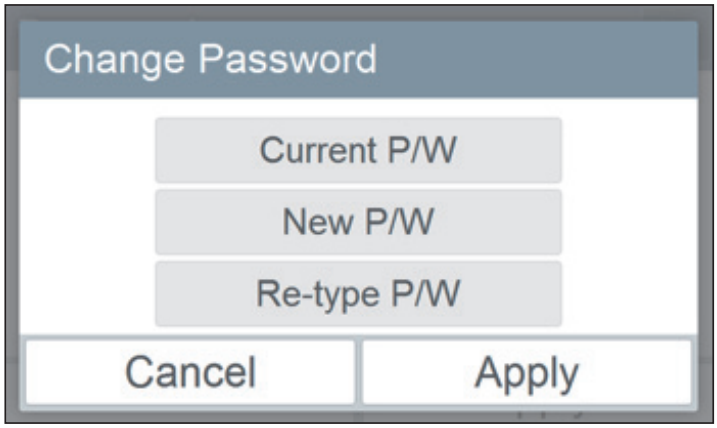
❊ Default is Use, and if you want to use again, you can press Use OFF, input password, and press Apply. (Initial password: digital21)

2. Password change



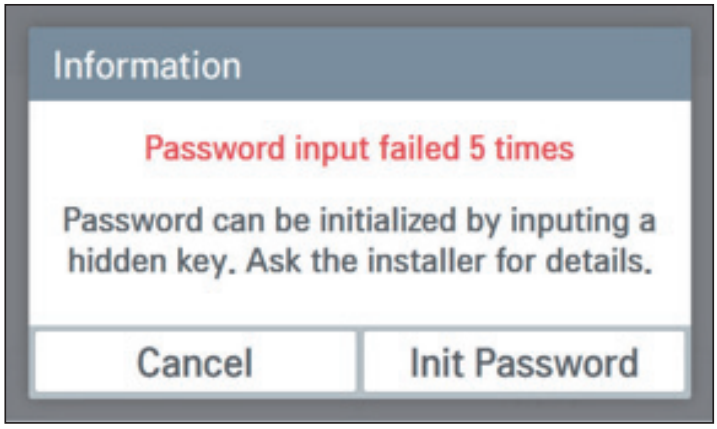
HMI SCREENS

① If you press Chang Password area, Change Password window appears.

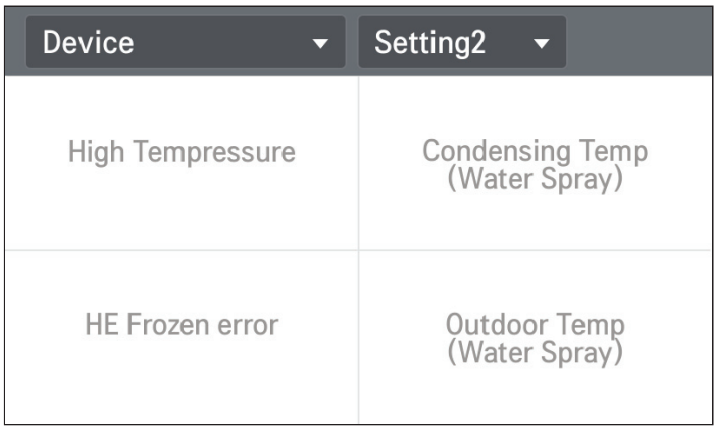


② Input Current P/W, New P/W, and Re-type P/W, and press Apply button.

❊ If you input wrong password for 5, it check whether to initialize the password. If you press Cancel button, password input screen appears again. For password initialization, please contact installation store or service center.



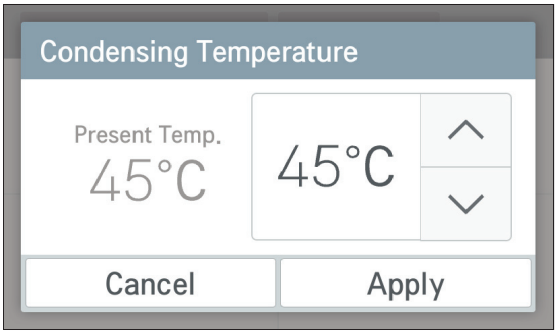
Select Setting 2 on the Setup_Installer Mode screen, and the following screen will appear.

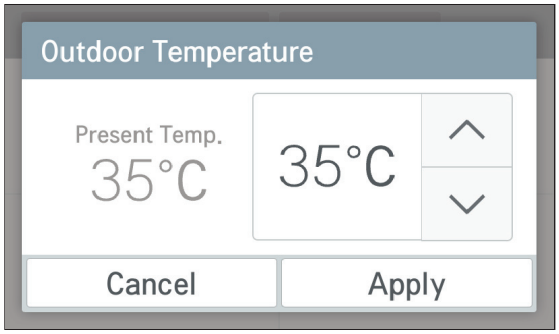


Icon	Description
High Tempressure	This function is used for on-site inspection only for models with a legal freezing capacity of 20RT or higher.
HE Frozen error	This function is used for on-site inspection only for models with a legal freezing capacity of 20RT or higher.
Condensing Temp (Water Spray)	Set the condensation temperature at which the spray function works.
Outdoor Temp (Water Spray)	Set the outdoor temperature at which the spray function works.

Press the condensation temperature (spray) or the OA temperature (spray) icon to display the following screen.

- Range of condensation temperature settings: 40 to 60 °C
- Range of OA temperature settings: 20 to 60 °C

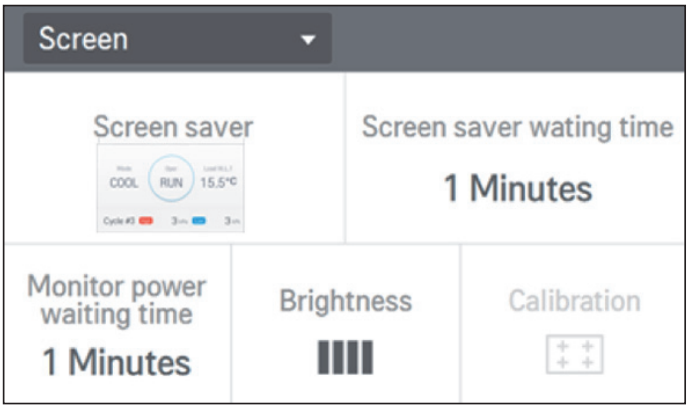


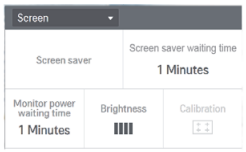


HMI SCREENS

Screen

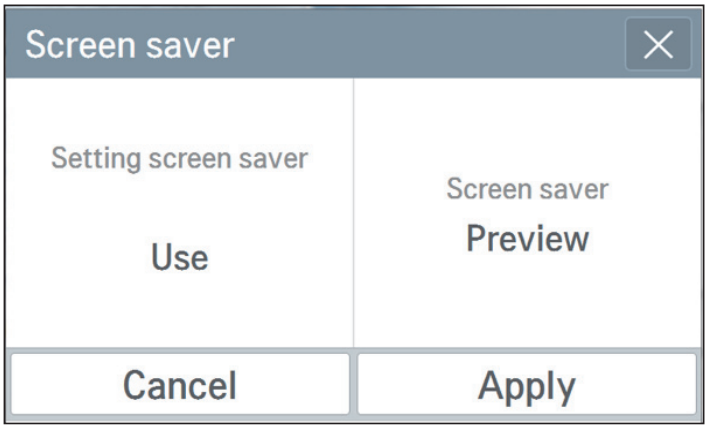
In the setting screen, when you press the screen icon, Screen appears.



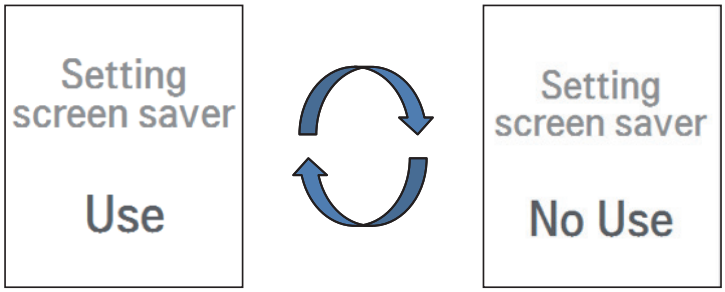
Icon	Description
	Select whether to use the screen saver.
Screen saver waiting time 1 Minutes	It sets the waiting time to display the screen saver.
Monitor power waiting time 1 Minutes	It sets the time to change to the minimum brightness of the screen when there is no touch input.
Brightness	It adjusts the screen brightness according to the ambient illumination intensity.

- **Screen saver**

  When you press the screen saver area, the screen saver window is displayed.



① Press the area indicating whether to use the screen saver. Whenever you press the area, the selected value is changed.

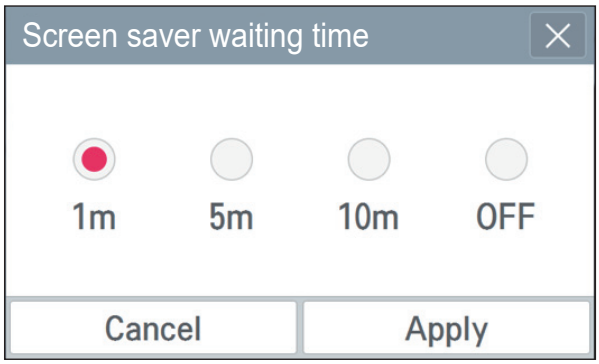


② When whether to use the screen saver is selected as Use, the screen saver preview is activated, and when you press the activated area, you can see the set screen saver in advance.

③ When you press Apply button of the screen saver, the selected setting is applied, and if Cancel is pressed, the previous setting is maintained.

- **Screen saver waiting time**

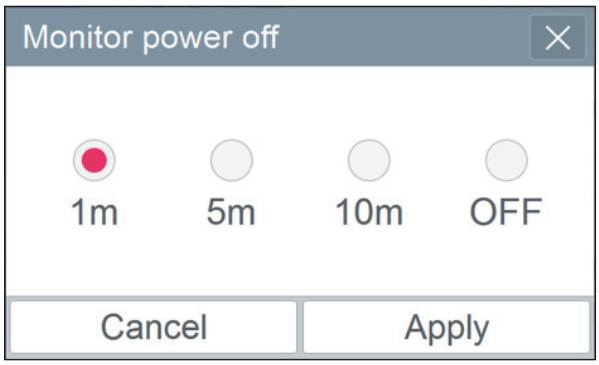
When you press the screen saver standby area, the screen saver standby window is displayed.



After selecting the time to apply, press Apply button. If Cancel is pressed, the previous setting is maintained.

- **Monitor power off**

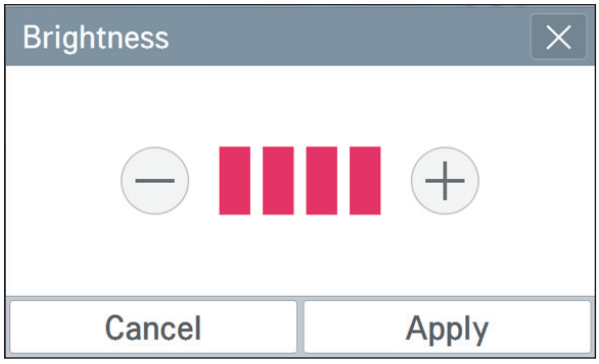
When you press the screen power saving area, the screen power saving window is displayed.



After selecting the time to apply, press Apply button. If Cancel is pressed, the previous setting is maintained.

- **Brightness**

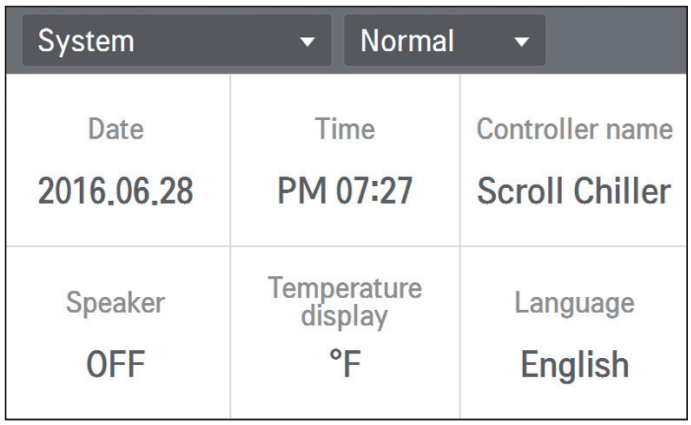
When you press the screen brightness area, the screen brightness window is displayed.



After setting the desired brightness by pressing the –and + button at the left/right, press Apply button. If Cancel is pressed, the previous setting is maintained. The screen brightness can be selected among 25 %, 50 %, 75 %, and 100 %.

System (Normal)

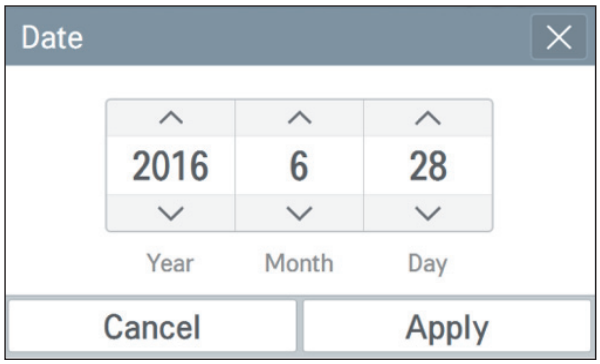
When you press the system icon, System screen appears. System is divided to normal and advance.



Icon	Description
Date 2016.06.28	It is the base value of the date recognized by the product, and the date display and the schedule interface date, etc. are operated based on the set date.
Time PM 07:27	It is the base value of the time recognized by the product, and the time display and the schedule interface time, etc. are operated based on the set time.
Controller name Scroll Chiller	Input and edit the controller's name, and the applied name is displayed at the top left side of Home screen.
Speaker OFF	It selects whether to use the touch sound.
Temperature display °F	It selects the unit of the temperature to be displayed on the controller. (°C or °F can be selected)
Language English	It selects the language displayed on the controller. (Korean or English can be selected)

- **Date**

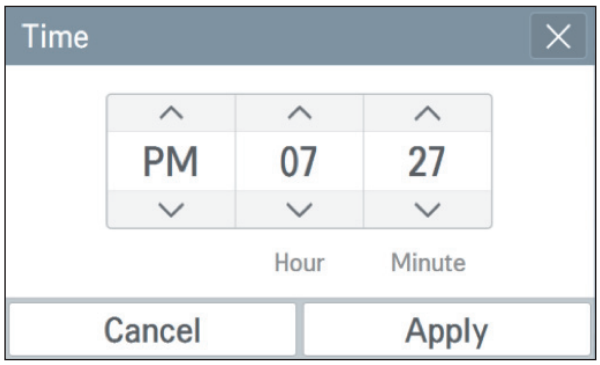
  In the System, when you press the date area, a window to set the date is displayed.



  After selecting the date to set by pressing up/down button, press Apply button. If Cancel is pressed, the previous setting is maintained.

- **Time**

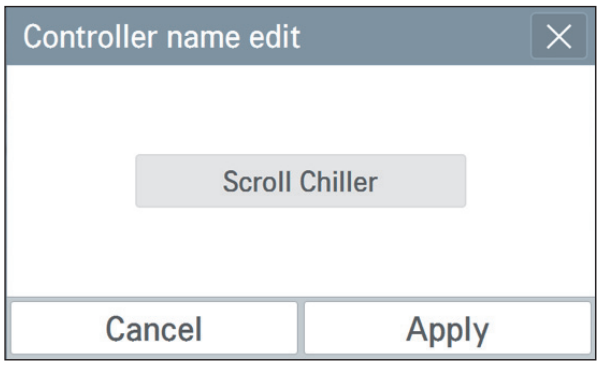
  In the System, when you press the time area, a window to set the time is displayed.



  After selecting the time to set by pressing up/down button, press Apply button. If Cancel is pressed, the previous setting is maintained.

- **Controller name edit**

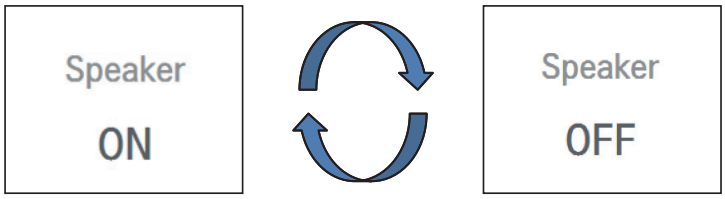
  In the System, when you press the controller name edit area, a window to edit the controller name is displayed.



  After the input of the desired name, press Apply button. If Cancel is pressed, the previous setting is maintained.

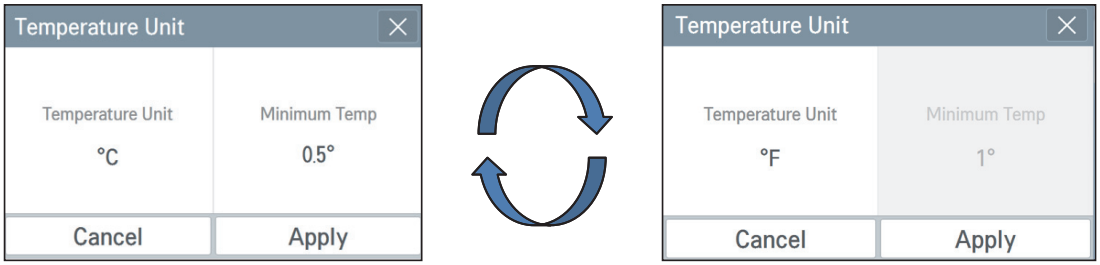
- **Speaker**

  In the System, whenever you press the touch speaker area, it toggles between Use and Do not use. There is no separate Apply button.



- **Temperature unit**

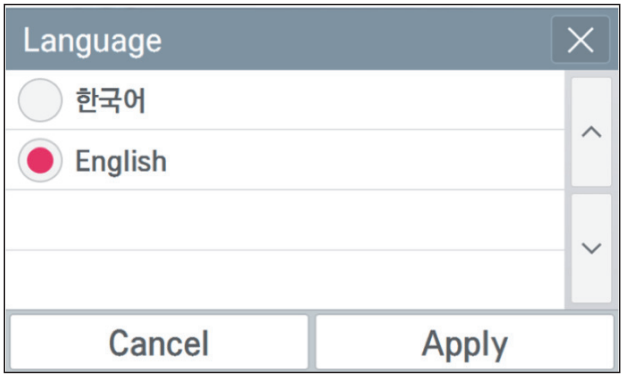
  In the System, when you press the temperature unit area, a window to change the temperature unit is displayed.



In the screen, when you press temperature unit area, the temperature unit is changed. In Celsius unit, the minimum temperature unit can be selected between 1 °C and 0.5 °C. When you press Apply, the setting is applied, and if Cancel is pressed, the previous setting is maintained.

- **Language**

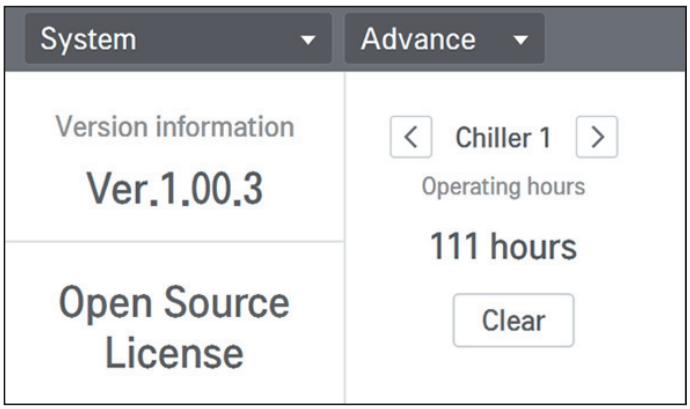
  In the System, when you press language setting area, the window to set the language is displayed.



Select the desired language, and press Apply button. If Cancel is pressed, the previous setting is maintained.

System(Advance)

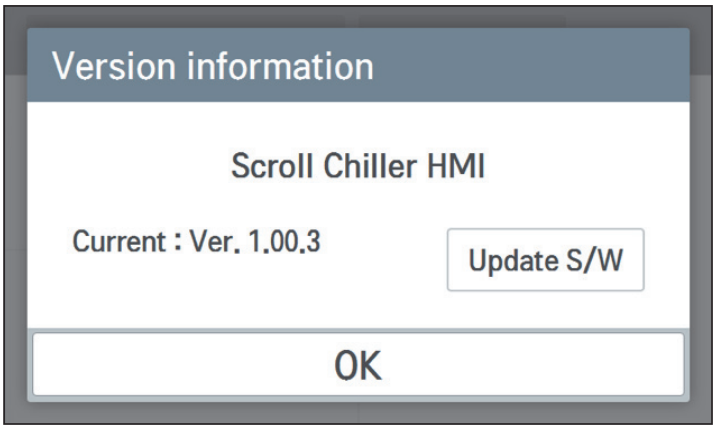
When you press the system icon, the System normal screen is displayed, and when you set Advance, the following screen appears.



Icon	Description
Version information Ver.1.00.3	It shows the software version of the controller.
Open Source License	It shows the contents of the open source
Operating hours 1 hours Clear	It shows the overall operation time of the product. The clear function is for the service, and the customer usage is restricted.

• **Version information**

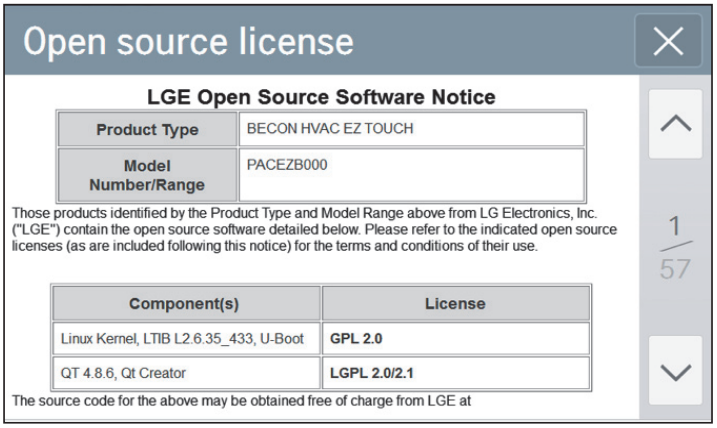
In the System advance screen, when you press Version information area, a popup window to check the version information is displayed.



Check the current version, and when you press OK button, the popup window disappears.

• **Open source license**

In the System advance screen, when you press Open source license area, you can check the contents of Open source license.



The clear function is for the service, and the password will not be provided to the customers.

❊ Customer information about open source licenses

Visit http://opensource.lge.com to obtain the open source codes developed under GPL, LGPL, MPL, or other open source licenses installed in this product.

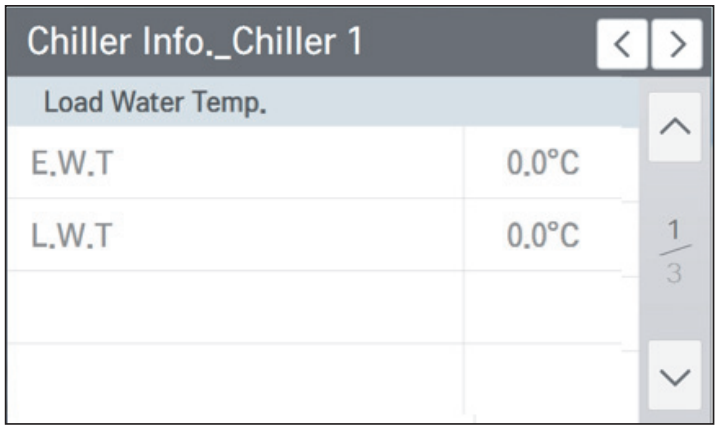
You can download the source code as well as the contents of all applicable licenses, copyright notice, and disclaimer of warranty. If you request the open source codes for the software installed in this product by sending an e-mail to opensource@lge.com within 3 years after the purchase of the product, the code will be provided on a CD-ROM for a minimum fee used to cover the costs of the material and shipping.

Chiller interface control

This chapter describes about HMI's product interface control.
HMI can control interface to up to 5 products, and you can control and monitor up to 5 products as if it is 1 product. In Device screen, when you enter Edit Unit Address setting, you can set Count of unit and address. For detail setting method, please refer to "Edit Unit Address".

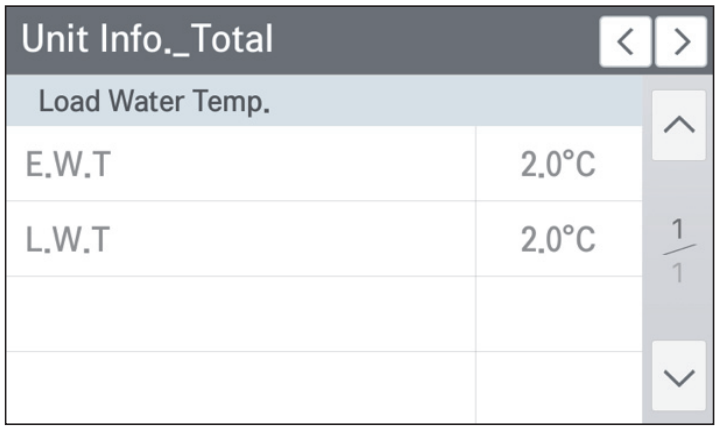
- **Unit information**

  If you press left/right direction button [<][>], you can check each interfaced chiller information.



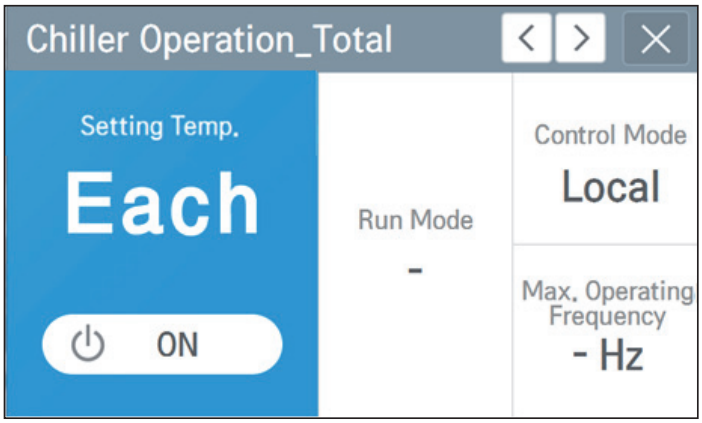
When connecting an external temperature sensor in the field in case of interface control, the temperature can be indicated as shown below.

*Refer to "How to connect external temperature sensor in case of interface control".

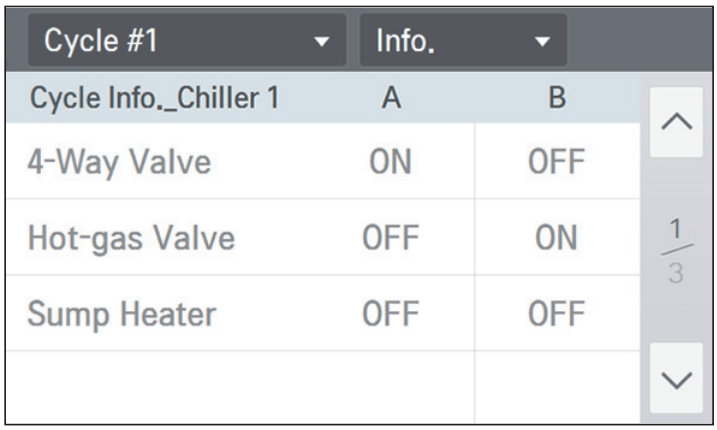


• **Operation**

In Chiller Operation_Total, you can set the same operation condition for all the chillers.
For individual control, you can press left/right direction button [< | >] for individual control.
But, in individual control, you cannot change Control Mode or Run Mode.

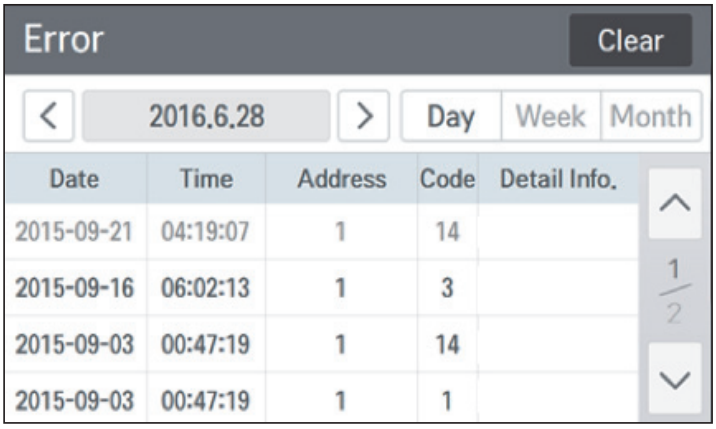


• **Cycle information**



• **Error**

You can check entire history _ error of the interfaced chillers.



❊ Individual schedule and setting are not supported.

How to connect external temperature sensor in case of interface control.

Connect the load inlet water temperature sensor to UI3,G.

Connect the load outlet water temperature sensor to UI4,G.

In case of interface control, if you select setting 2 on the device mode screen, the following screen appears.

Set the temperature according to the specification range of the external temperature sensor. Otherwise, the temperature may be displayed differently.

Note:

- The type of external temperature sensor to be connected is voltage type. (0 - 10 V)
- We are not responsible for abnormal operation of external temperature and error range of temperature range during installation on site.
- External water temperature sensor specification

  Power: 24 VAC

  Output Signal: DC 0 - 10 V

  Temperature range: 0 °F - 250 °F

ELECTRICAL

Specifications

General Precautions

⚠WARNING

- *All power wiring and communication cable installation must be performed by authorized service providers working in accordance with local, state, and National Electrical Code (NEC) regulations related to electrical equipment and wiring, and following the instructions in this manual. Failure to do so will lead to electric shock and bodily injury or death.*
- *Undersized wiring will lead to unacceptable voltage and will cause a fire, which will cause bodily injury or death.*
- *Ensure that all power wiring / communication cables are properly terminated and firmly attached. If power wires and communication cables are not properly terminated and firmly attached, there is risk of fire, electric shock, and physical injury or death.*
- ⃠ *Do not install the wiring in reversed phase or missed phase. Connect all wires appropriately. If the system operates in reversed phase or missed phase, it will result in a fire, electric shock, and will cause physical injury and / or death.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent could include some amount of direct current. Using an oversized breaker or fuse will result in electric shock, physical injury or death.*
- *Familiarize yourself with the location of the circuit breaker. Be sure that a circuit breaker or some other emergency power cutoff device is in place before any power wiring is done to the system. Failure to do so will cause bodily injury or death.*
- *Be sure that main power to the unit is completely off before proceeding. Follow all safety and warning information outlined at the beginning of this manual. Failure to do so will cause electric shock and bodily injury.*
- ⃠ *Never touch any power lines or live cables before all power is cutoff to the system. To do so, will cause bodily injury or death.*
- *Properly ground the / all chillers. Ground wiring must always be installed by a qualified technician. Ground wiring is required to prevent accidental electrical shock during current leakage, which will cause bodily injury or death.*
- *Properly ground the chillers.* ⃠ *Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Ground wiring must always be installed by a qualified technician. Failure to properly provide a NEC-approved earth ground can result in electric shock, physical injury or death.*

Note:

- *Properly ground the / all chiller/s. Ground wiring must always be installed by a qualified technician. Improperly ground wire can cause communication problems from electrical noise, and motor current leakage.*
- ⃠ *Do not install the wiring in reversed phase or missed phase. Connect all wires appropriately. If the system operates in reversed phase or missed phase, it will damage the compressors and other components.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent will include some amount of direct current. Using an oversized breaker or fuse will result in equipment malfunction and property damage.*
- ⃠ *Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Failure to properly provide a NEC-approved earth ground can result in property damage and equipment malfunction.*
- *Verify the power imbalance is no greater than 2% between phases at each unit. Power imbalances will damage the compressors and other components.*

Chiller Electrical Data

Table 5: Electrical Data for 460V 3 Wire Heat Pump Chiller.

Tons	Model No.	Voltage	(Hz)	(PH)	Voltage Tolerance (Min. ~ Max.)	Power Supply		System		Independent Circuits
						MCA	MFA	MSC	RLA	
17	ACHH017VBAB	208-230	60	3	187-253	77.3	80	20.4	66.8	1
20	ACHH020VBAB	208-230	60	3	187-253	78.2	80	20.4	67.7	1
33	ACHH033VBAB	208-230	60	3	187-253	146.1	150	40.8	133.6	1
40	ACHH040VBAB	208-230	60	3	187-253	147.9	150	40.8	135.4	1
50	ACHH050VBAB	208-230	60	3	187-253	77.3 | 146.1	80 |150	20.4 | 40.8	66.8 | 133.6	2
60	ACHH060VBAB	208-230	60	3	187-253	78.2 | 147.9	80 |150	20.4 | 40.8	67.7 | 135.4	2
17	ACHH017HBAB	460	60	3	414-506	46.8	60	9.7	39.8	1
20	ACHH020HBAB	460	60	3	414-506	48	60	9.7	40.8	1
33	ACHH033HBAB	460	60	3	414-506	88.6	100	19.5	79.6	1
40	ACHH040HBAB	460	60	3	414-506	90.8	100	19.5	81.6	1
50	ACHH050HBAB	460	60	3	414-506	130.4	150	29.2	119.4	1
60	ACHH060HBAB	460	60	3	414-506	133.6	150	29.2	122.4	1

Voltage Range: Power supplied to the chiller must fall within the voltage minimum to maximum range listed in the table above. The chiller will not operate normally if the power supply voltage falls below or above the tolerance range.

Maximum allowable voltage variance permitted between phases is 2%.

MCA: Minimum Circuit Ampacity (A) (Criteria used to select the wiring standard).

MFA: Maximum Fuse Amps (A) (Criteria used to select circuit breaker and ground error circuit breaker [electricity leakage circuit breaker]).

MSC: Maximum Start Current (A)

RLA: Rated Load Amps (A) (Current required when operating under the following conditions—Cooling: Outdoor Air Temperature: 8°1F DB / 66°F WB; Water Inlet / Outlet Temperature: 54°F / 44°F).

FLA: Full Load Amps (A).

ELECTRICAL

Access Holes / Paths

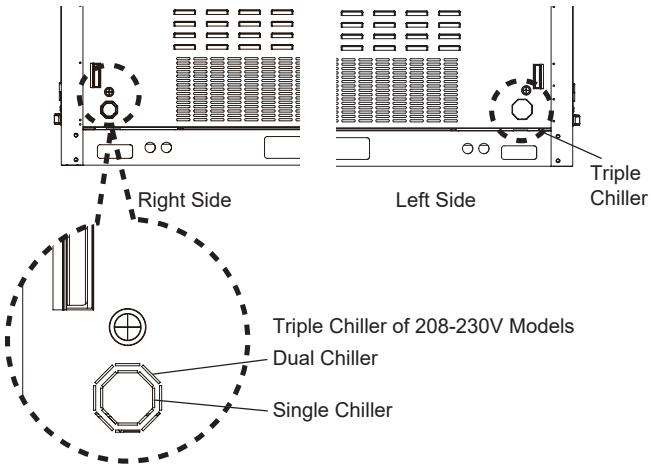
⚠WARNING

- *All power wiring and communication cable installation must be performed by authorized service providers working in accordance with local, state, and National Electrical Code (NEC) regulations related to electrical equipment and wiring, and following the instructions in this manual. Failure to do so will lead to electric shock and bodily injury or death.*
- *Undersized wiring will lead to unacceptable voltage at the unit and will cause a fire, which will cause bodily injury or death.*
- *Install appropriately sized breakers / fuses / overcurrent protection switches and wiring in accordance with local, state, and NEC regulations related to electrical equipment and wiring, and following the instructions in this manual. Generated overcurrent could include some amount of direct current. Using an oversized breaker or fuse will result in electric shock, physical injury or death.*

Access Holes / Paths

1. Power wiring and communication cable access holes and connections will be different depending on the chiller model and volume.
2. Single Chillers use the connection terminals located at the right (when viewing from the front).
3. Install the power wiring and communication cables separately so that communication is not impacted by electric noise (Use conduits for the power wiring and communication cable, but ⃠ do not pass through the same conduit.)

Figure 25: Chiller Wiring / Cable Access Holes.



⚠WARNING

- *Properly ground the chillers. ⃠ Do not connect ground wire to refrigerant, gas, or water piping; to lightning rods; to telephone ground wiring; or to the building plumbing system. Ground wiring must always be installed by a qualified technician. Ground wiring is required to prevent accidental electrical shock during current leakage, which will cause bodily injury or death.*
- *Install the power wiring only after the ring terminal is connected. Improper connections can generate a fire, electric shock, physical injury and / or death.*

Note:

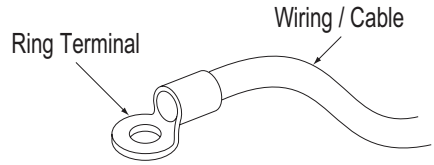
- *Install the power wiring only after the ring terminal is connected. Improper connections can damage electrical components.*
- *Verify the power imbalance is no greater than 2% between phases at each unit. Power imbalances will damage the compressors and other components.*

Wiring / Cable Connections

Best practice dictates using solderless ring or fork terminals at all power wiring and communication cable terminations. Use copper bearing ring or fork terminals; ⃠ do not use galvanized or nickle plate over steel. Use appropriate crimping tool to attach the ring or fork terminals at all power wiring and control cable terminations. To install:

- Firmly attach the wire; secure in a way to prevent external forces from being imparted to the terminal block.
- Use an appropriately sized screwdriver for tightening the terminals.
- ⃠ Do not overtighten the connections; overtightening will damage the terminals.

Figure 26: Close up of a Typical Ring Terminal.

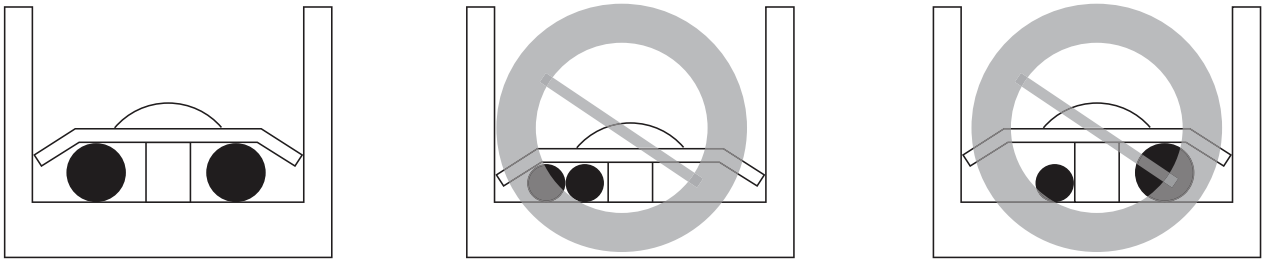


If ring terminals or fork terminals are not available, then:

- ⃠ Do not terminate different gauge wires to the power terminal block. (Slack in the wiring will generate heat.)
- When terminating wires of the same thickness, follow the instructions demonstrated in the figures below.

Figure 27: Proper and Improper Power Wiring Connections.

● :Copper Wire



Terminate multiple power wires of the same gauge to both sides.

⃠ Do not terminate two wires on one side.

⃠ Do not terminate different gauge wires to a terminal block.

⚠WARNING

If power wires are not properly terminated and firmly attached, there is risk of fire, electric shock, and physical injury or death.

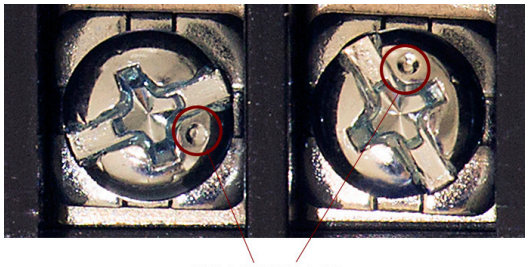
Note:

- ⃠ *Never apply line voltage power to the communications cable terminal block. If contact is made, the PCBs will be damaged.*
- *Always include some allowance in the wiring length when terminating. Firmly attach the wiring or cable, but provide some slack to facilitate removing the electrical panels while servicing, and to prevent external forces from damaging the terminal block.*

Terminal Connections

LG uses a "JIS" type of screw for all terminals; use a JIS screwdriver to tighten and loosen these screws and avoid damaging the terminal. ⃠ Do not overtighten the connections — overtightening will damage the terminals — but firmly and securely attach the wiring in a way to prevent external forces from being imparted to the terminal block.

Figure 28: JIS Screws.



Note:

- *The terminals labeled "GND" are NOT ground terminals. The terminals labeled ⏚ ARE ground terminals.*
- *Polarity matters. Always connect "A" to "A" and "B" to "B."*
- *Always create a wiring diagram that contains the exact sequence in which all the indoor units and heat recovery units are wired in relation to the outdoor unit.*
- ⃠ *Do not include splices or wire nuts in the communication cable.*

ELECTRICAL

Wiring / Cable Installation

Communication Cable Installation

1. Use 18 AWG two-conductor, twisted, stranded, shielded cable for communication. Ensure the communication cable shield is properly grounded to the Chiller chassis only. If one-conductor cable is used, it will result in poor communication quality.
2. Use only the regulated communication cable.

Note:

- ⃠ *Do not use multiple lines. It can cause communication errors.*
- ⃠ *Do not install the communication cable parallel to the power wiring. It can cause communication errors.*

Power Wiring / Installation

⚠WARNING

- *Power must be completely shut off during chiller installation. There is a risk of fire, electric shock, physical injury and / or death.*
- *.Because there may be more than one (1) cutoff switch, attach warning labels to all cutoff switch locations so that power is not turned on until all installation work is complete. There is a risk of fire, electric shock, physical injury and / or death.*
- *Power supplied to the chiller must fall within the voltage minimum to maximum range listed in the Electrical Data tables, and on the product nameplates. Refer to the electrical data tables, and the wiring diagrams for information. Improper power supply can cause fire, electric shock, physical injury and / or death.*

1. Power.

The power supply must be within the specifications of the chiller's nameplate. Supplied voltage must fall within listed minimum and maximum limits.

2. Power Wiring and Connections.

- For information on how to connect the power wiring, refer to the wiring diagrams in the technical manuals, or on the chiller access covers.
- Connect R, S, T, and N of the power wiring separately to the circuit breaker if installing one (1) chiller.
- All power wiring must comply with applicable federal, state, and local regulations.
- ⃠ Do not shut off the power unless the chiller will not be used or will not be operating for an extended period. Power must be turned on approximately six (6) hours before operating the chiller. If power is not provided to warm the oil on the bottom of the compressor, it can result in a damaged and / or an inoperable system.

3. Control Power.

Figure 29: R, S, T, and N Power Wiring and Connections.

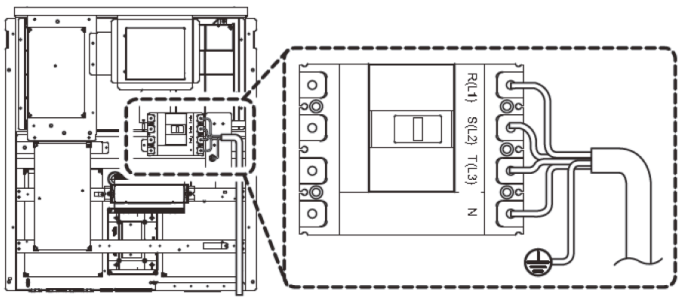


Table 6: Power Wiring Specifications.

Model No.	Tons	Power Wiring Specifications (AWG x No.)
		460V
ACAH020HETB	20	10 × 4

All control power used as a part of potential operation and approved internal bus wiring is provided inside the unit.

4. Additional Wiring / Cable Connections.

Refer to the wiring diagram for field-installed wiring. Only the main panel (HMI installed panel) requires wiring at the site. The control box is shipped fully wired from the factory.

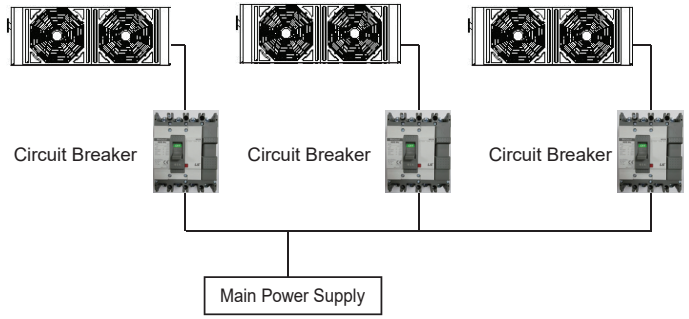
5. Circuit Breaker and Power Wiring Connections.

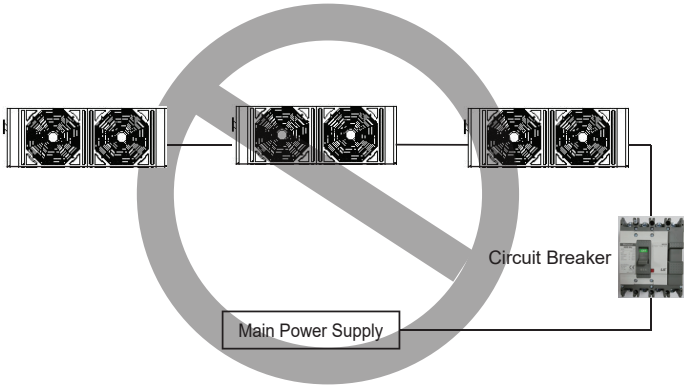
Table 8: Field-Installed Wiring / Cable Connections.

Index	Signal type	Location	Remarks
Power	DC Power	12 V DC	Necessary
Central control communication	Communication	CH2 A, B	Necessary
HMI communication	Communication	CH3 A, B	Necessary
Modbus	Communication	CH4 A, B	Optional (Field connection)
Ambient thermistor	DI	UI1, G	Necessary
Flow switch	DI	UI5, G	Necessary (Except H/P model)
Pump interlock	DI	UI6, G	Optional (Field connection)
Remote On/Off	DI	DI1, GND	Optional (Field connection)
Remote CO/HP	DI	DI2, GND	Optional (Field connection)
Remote alarm	DI	DI3, GND	Optional (Field connection)
Alarm status	DO	DO1, COM	Optional (Field connection)
On/Off status	DO	DO2	Optional (Field connection)
Pump output	DO	DO3	Optional (Field connection)
Heater output	DO	DO5	Optional (Field connection)
Water spray output	DO	DO6	Optional (Field connection)
Global water inlet sensor	AI	UI3, GND	Optional (Field connection)
Global water outlet sensor	AI	UI4, GND	Optional (Field connection)
Remote Target Temp	AI	UI7, GND	Optional (Field connection)
Remote Demand Limit	AI	UI8, GND	Optional (Field connection)

- Each chiller must have its own circuit breaker and direct power wiring.
- ⃠ Do not install one circuit breaker for multiple chillers. ⃠ Do not daisy chain the power wiring from the main power supply to multiple chillers.
- Always label each circuit breaker and its connected chiller.
- Refer to the specification and electrical data when selecting circuit breaker capacities. Follow all state, local, and NEC guidelines when choosing and installing circuit breakers and power wiring.

Table 7: Power Wiring System to Multiple, Grouped Chillers.





Setting the Control Box Address (Set Cycle PCB Address)

1. Select the address by turning DIP switches Nos. 5, 6, and / or 7 on SW01B at the top right corner of the PCB to ON / OFF.

• If there is only one (1) cycle PCB connected to the chiller's main controller, use only Cycle Address No. 1 (see table below).

2. After selecting the cycle address using the DIP switches, always press the Reset button to complete the setting.

Table 9: Setting the Control Box Address.

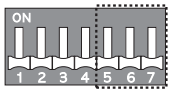
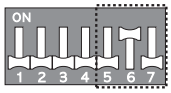
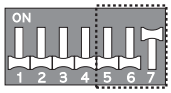
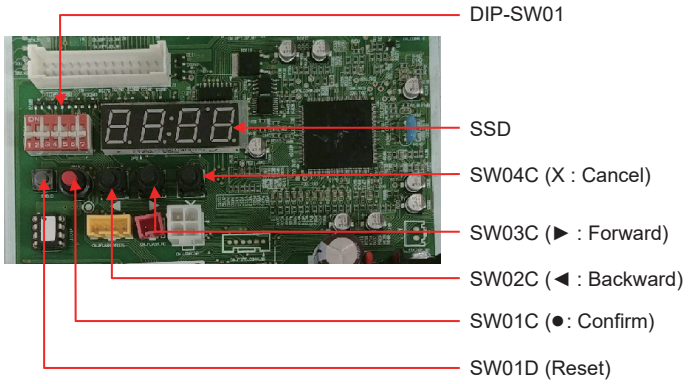
Cycle address: 1 (DIP switch: #6, #7 OFF)	SW01B 
Cycle address: 2 (DIP switch: #6 ON / #7 OFF)	SW01B 
Cycle address: 3 (DIP switch: #7 ON / #6 OFF)	SW01B 

Figure 30: Cycle PCB (Appearances May Differ).



Note:

- *If there is only one (1) cycle PCB connected to the chiller's main controller, Cycle Address No. 1 must be used or the chiller will not operate.*
- *When replacing the cycle PCB, always run the automatic address setting procedure again. Automatic address setting procedure must be performed with all connected cycle PCBs and HMI PCB connected. If it is not performed, it will result in operation error.*
- *When setting the address, check and change other control box PCB address within the chiller. PCB address for replacements is set to 1. If the control box PCB address is duplicated, the chiller will not operate.*
- *Control box PCB addresses are set to 1 as factory default.*

Installing the HMI Indoors

Note:

• The HMI can be installed on an interior wall. See below for instructions. Use a drill to add pilot holes before installing the screws.

• Communication cable for indoor installation is field-supplied. Communication cable from chiller to HMI is to be 18 AWG, 2-conductor, twisted, stranded, shielded. Ensure the communication cable shield is properly grounded to the chiller chassis only. ⃠ Do not ground the communication cable at any other point.

1. Choose the location in which to install the HMI. Verify that it is an appropriate location to connect the communication cable and power wiring to the HMI, and that its distance from the chiller falls below maximum wiring / cable length requirements.
2. Use the drier and the M4 screw on the top wall of the communication cable to attach the back panel of the HMI. See diagram at right. It can be attached as shown, depending on the installation location.
3. Pull the communication cable through the hole on the back of the panel.
4. Connect the cable to the communication port located on the back of the HMI.

⚠WARNING

• Different polarities exist on the communication cable; ⃠ do not mix! It will result in a fire, electric shock, and will cause physical injury and / or death.

• To prevent improper connections, mark "A" and "B" , it is recommended to mark A and B on the communication cable. Improper wiring will result in a fire, electric shock, and will cause physical injury and / or death.

• Use the ring or fork terminals to connect the communication cable to the control box terminals. See "Control Panel Configuration" for the location of the HMI control box. Improper wiring will result in a fire, electric shock, and will cause physical injury and / or death.

Note:

• Different polarities exist on the communication cable; ⃠ do not mix! It will result in a fire, electric shock, and will result in damage to the compressors and other components.

• To prevent improper connections, mark "A" and "B", it is recommended to mark A and B on the communication cable. Failure to do so will result in a communication malfunction.

• Use the ring or fork terminals to connect the communication cable to the control box terminals. See "Control Panel Configuration" for the location of the HMI control box.

5. Connect the factory-supplied power adapter to the power terminal located on the back of the HMI.
6. Assemble the main body of the HMI to the wall panel. Position the hole at the top of the main HMI unit on the top of the back panel. Push the bottom of the HMI to the back panel to lock into place.
7. Plug in the power adapter to the HMI and the power supply.

Figure 31: Attaching the Back Panel of the HMI to the Wall.

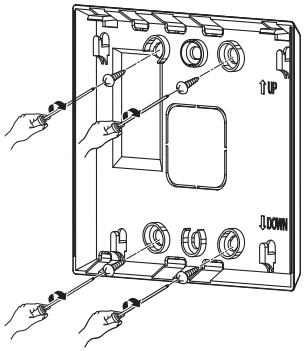


Figure 32: Pulling the Communication Cable Through the Back of the Panel.

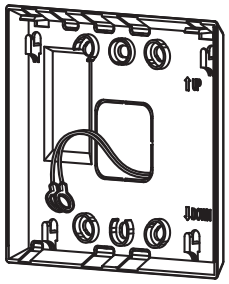


Figure 33: HMI Terminal.

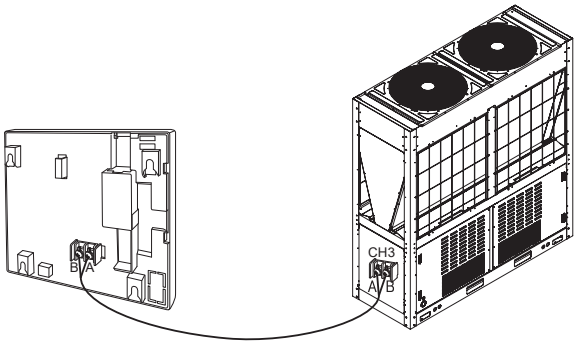
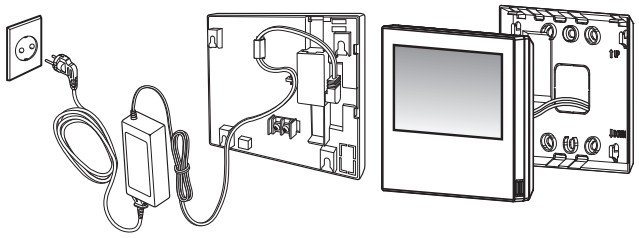


Figure 34: HMI Terminal.



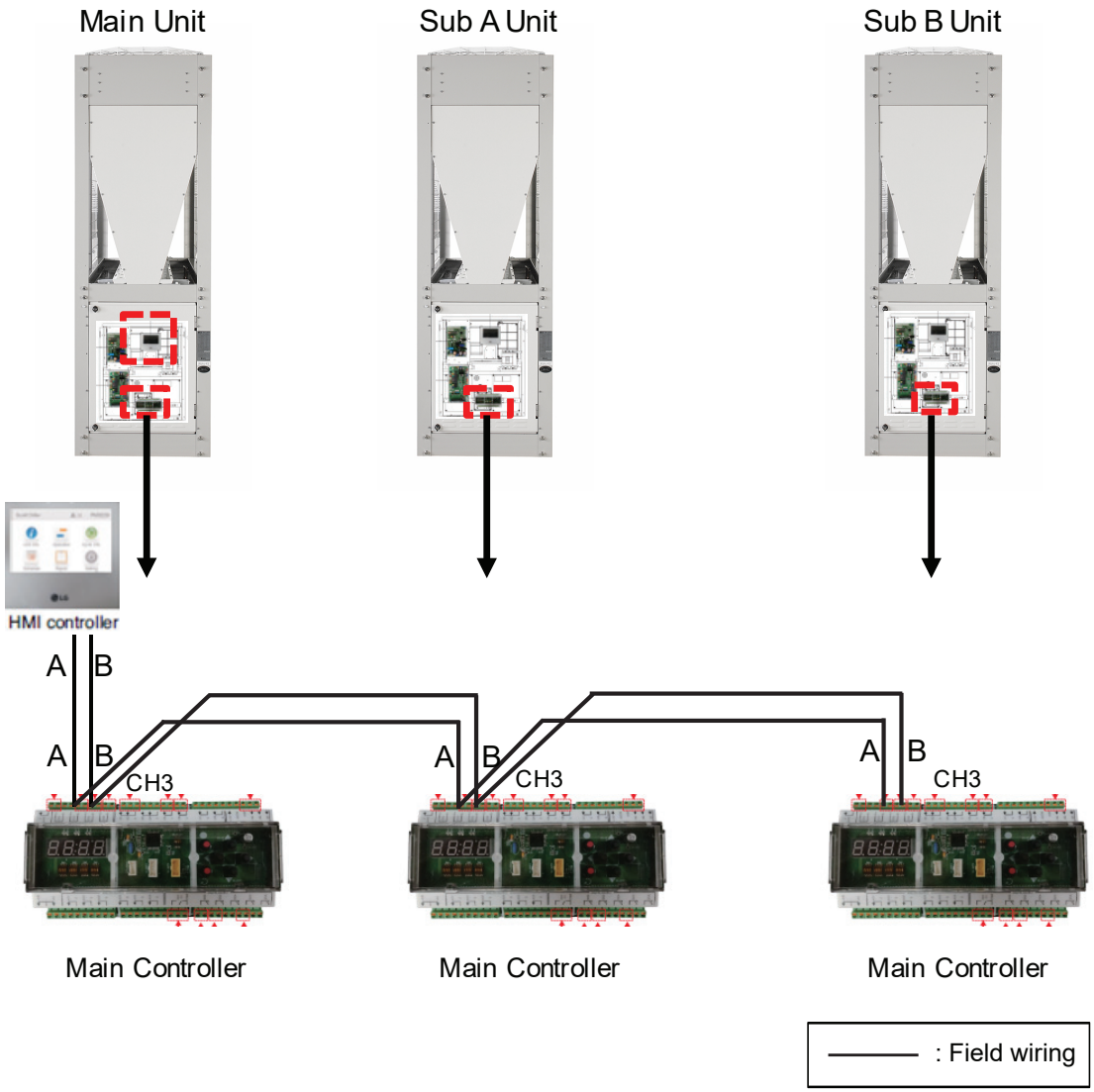
Note:

If the power adapter power cord and the HMI power wiring must be installed together, it is necessary to separate the power cable to the HMI from the communication cable to the HMI to avoid communication problems from electrical interference.

ELECTRICAL

Unit Combination Setup

Figure 35: Unit Combination Setup.



1. Communication cable is daisy chained from the Main Chiller Main Controller on CH3 to the Sub Chiller(s) Main Controller(s) on CH3 Always Match A to A, and B to B.
2. Communication cable is connected from the HMI Controller to the Main Controller. Always Match A to A, and B to B.
3. Communication cable from chiller to HMI is to be 18 AWG, 2-conductor, twisted, stranded, shielded. Ensure the communication cable shield is properly grounded to the chiller chassis only. ⃠ Do not ground the communication cable at any other point. Wiring must comply with all applicable local and national codes.
4. Install the communication cable and power wiring separately so that communication cable is not impacted by any electric noise generated from power wiring. ⃠ Do not install the power wiring and the communication cables in the same conduit.
5. Up to five (5) chillers can be combined using the A-B CH3 bus.

Note:

- *If the interlocked chiller number and address are not set from the HMI, a communication error will occur. (Refer to the Control > Freezer Interlock Control about HMI Address Settings in the Chiller Installation and Operation Manual.)*
- *If Main Controller address does not match the HMI address, a communication error will occur. (Refer to the Control > Freezer Address Setting about the Controller Address Settings in the Chiller Installation and Operation Manual.)*

Note:

If the chiller enters the Modbus remote mode, all the information can only be monitored through the HMI. Actual operation control (start / stop or changing the set temperature) can only be performed through the external controller. To control from the HMI, change the control mode to "Local".

Note:

Remote communication error CH10009 will occur when the communication is disconnected between the HMI and external controllers. When communication is recovered, it will automatically resume. If the remote Modbus connection is not used, reset the power of the main PCB of the chiller to cancel the alarm.

Modbus Interlock Protocol Details

The protocol details for Modbus interlock of external devices are:

- Physical layer: RS-485 serial line
- Mode: Modbus RTU mode
- Baud rate: 9,600
- Parity: None parity
- One (1) stop bit
- Applied function codes

Figure 36: Applied Function Codes.

Function Code	Sub-function	Function Name	Start Address From Main Device
0x01	None	Read Coil Register	Address-1
0x02	None	Read Discrete Input	Register Address-10001
0x03	None	Read Holding	Register Address-40001
0x04	None	Read Input	Register Address-30001
0x05	None	Write Single Coil	Register Address-1
0x06	None	Write Single Holding	Register Address-40001
0xF1~FF	Reserved for Exception Code	-	-

Note:

See the Modbus protocols in the following pages.

MODBUS PROTOCOL REGISTERS

Modbus protocol

Coil Register

Register Address	Meaning
1	0:Product Stop 1: Operation Start
2	Reserved
3	0: Status quo 1: Delete accumulated operating time
4~102	Reserved

Discrete Register

Register Address	Meaning
10001	Reserve
10002	0 : Load Water Flow Switch Off
	1 : Load Water Flow Switch On
10003	Reserve
10004	0 : Load Water Pump Output Off
	1 : Load Water Pump Output On
10005	Reserve
10006	0 : Load Water Pump Interlock Off
	1 : Load Water Pump Interlock On
10007~10104	Reserve
10105	0 : Cycle 1's 4 Way Valve 1 Off
	1 : Cycle 1's 4 Way Valve 1 On
10106	0 : Cycle 1's 4 Way Valve 2 Off
	1 : Cycle 1's 4 Way Valve 2 On
10107	0 : Cycle 1's Hot gas1 Off
	1 : Cycle 1's Hot gas1 On
10108	0 : Cycle 1's Hot gas2 Off
	1 : Cycle 1's Hot gas2 On
10109	0 : Cycle 1's Sump Heater 1 Off
	1 : Cycle 1's Sump Heater 1 On
10110	0 : Cycle 1's Sump Heater 2 Off
	1 : Cycle 1's Sump Heater 2 On
10111~10118	Reserve
10119	0 : Cycle 1's Inverter Compressor 1 Off
	1 : Cycle 1's Inverter Compressor 1 On
10120	0 : Cycle 1's Inverter Compressor 2 Off
	1 : Cycle 1's Inverter Compressor 2 On
10121~10208	Reserve

MODBUS PROTOCOL REGISTERS

Register Address	Meaning
10209	0 : Cycle 2's 4 Way Valve 1 Off
	1 : Cycle 2's 4 Way Valve 1 On
10210	0 : Cycle 2's 4 Way Valve 2 Off
	1 : Cycle 2's 4 Way Valve 2 On
10211	0 : Cycle 2's Hot gas1 Off
	1 : Cycle 2's Hot gas1 On
10212	0 : Cycle 2's Hot gas2 Off
	1 : Cycle 2's Hot gas2 On
10213	0 : Cycle 2's Sump Heater 1 Off
	1 : Cycle 2's Sump Heater 1 On
10214	0 : Cycle 2's Sump Heater 2 Off
	1 : Cycle 2's Sump Heater 2 On
10215~10222	Reserve
10223	0 : Cycle 2's Inverter Compressor 1 Off
	1 : Cycle 2's Inverter Compressor 1 On
10224	0 : Cycle 2's Inverter Compressor 2 Off
	1 : Cycle 2's Inverter Compressor 2 On
10225~10312	Reserve

Register Address	Meaning
10313	0 : Cycle 3's 4 Way Valve 1 Off
	1 : Cycle 3's 4 Way Valve 1 On
10314	0 : Cycle 3's 4 Way Valve 2 Off
	1 : Cycle 3's 4 Way Valve 2 On
10315	0 : Cycle 3's Hot gas1 Off
	1 : Cycle 3's Hot gas1 On
10316	0 : Cycle 3's Hot gas2 Off
	1 : Cycle 3's Hot gas2 On
10317	0 : Cycle 3's Sump Heater 1 Off
	1 : Cycle 3's Sump Heater 1 On
10318	0 : Cycle 3's Sump Heater 2 Off
	1 : Cycle 3's Sump Heater 2 On
10319~10326	Reserve
10327	0 : Cycle 3's Inverter Compressor 1 Off
	1 : Cycle 3's Inverter Compressor 1 On
10328	0 : Cycle 3's Inverter Compressor 2 Off
	1 : Cycle 3's Inverter Compressor 2 On
10329~10416	Reserve

MODBUS PROTOCOL REGISTERS

Input Register

Register Address	Meaning
30001	Chiller Controller Version
30002	Entire Operation Current
30003	External Air Temperature
30004	Common Load Water Output Temperature (Average Value of Individual Load Water Outputs)
30005	Common Load Water Input Temperature (Average Value of Individual Load Water Inputs)
30006~30007	Reserve
30008	Information of Refrigerator Failure (1~5)
30009	Cycle Failure Information (0 : Common System Error, 1~10 : Error of Corresponding Cycle)
30010	Failure Code
30011	Start Waiting Time
30012	Stop Waiting Time
30013	Product's Accumulated Operation Time Upper Level
30014	Product's Accumulated Operation Time Lower Level
30015~30016	Reserve
30017	External Load Inlet Water Temperature
30018	External Load outlet Water Temperature
30019~30100	Reserve
30101, 30102	Cycle 1's Load Water Output Temperature
30103, 30104	Cycle 1's Load Water Input Temperature
30105~30108	Reserve
30109	Cycle 1's Condensation Temperature (Left)
30110	Cycle 1's Condensation Temperature (Right)
30111	Cycle 1's Evaporation Temperature (Left)
30112	Cycle 1's Evaporation Temperature (Right)
30113	Inverter Compressor 1's Frequency of Cycle 1
30114	Inverter Compressor 2's Frequency of Cycle 1
30115	Cycle 1's High Pressure (Left)
30116	Cycle 1's High Pressure (Right)
30117	Cycle 1's Low Pressure (Left)
30118	Cycle 1's Low Pressure (Right)
30119	Cycle 1's Operation Current (Left)
30120	Cycle 1's Operation Current (Right)
30121	Main EEV's Status Value of Cycle 1 (Left)
30122	Main EEV's Status Value of Cycle 1 (Right)
30123~30124	Reserve
30125	Discharge Temperature of Cycle 1's Inverter Compressor1
30126	Discharge Temperature of Cycle 1's Inverter Compressor2

Register Address	Meaning
30127	Intake Temperature of Cycle 1's Inverter Compressor1
30128	Intake Temperature of Cycle 1's Inverter Compressor2
30129	Cycle 1's Liquid Pipe Temperature (Left)
30130	Cycle 1's Liquid Pipe Temperature (Right)
30131	Cycle 1's Hex Temperature (Left)
30132	Cycle 1's Hex Temperature (Right)
30133~30144	Reserve
30145	Accumulated Operation Time of Cycle 1's Inverter Compressor 1 (Upper Level)
30146	Accumulated Operation Time of Cycle 1's Inverter Compressor 1 (Lower Level)
30147	Accumulated Operation Time of Cycle 1's Inverter Compressor 2 (Upper Level)
30148	Accumulated Operation Time of Cycle 1's Inverter Compressor 2 (Lower Level)
30149~30200	Reserve
30201, 30202	Cycle 2's Load Water Output Temperature
30203, 30204	Cycle 2's Load Water Input Temperature
30205~30208	Reserve
30209	Cycle 2's Condensation Temperature (Left)
30210	Cycle 2's Condensation Temperature (Right)
30211	Cycle 2's Evaporation Temperature (Left)
30212	Cycle 2's Evaporation Temperature (Right)
30213	Inverter Compressor 1's Frequency of Cycle 2
30214	Inverter Compressor 2's Frequency of Cycle 2
30215	Cycle 2's High Pressure (Left)
30216	Cycle 2's High Pressure (Right)
30217	Cycle 2's Low Pressure (Left)
30218	Cycle 2's Low Pressure (Right)
30219	Cycle 2's Operation Current (Left)
30220	Cycle 2's Operation Current (Right)
30221	Main EEV's Status Value of Cycle 2 (Left)
30222	Main EEV's Status Value of Cycle 2 (Right)
30223~30224	Reserve
30225	Discharge Temperature of Cycle 2's Inverter Compressor1
30226	Discharge Temperature of Cycle 2's Inverter Compressor2
30227	Intake Temperature of Cycle 2's Inverter Compressor1
30228	Intake Temperature of Cycle 2's Inverter Compressor2
30229	Cycle 2's Liquid Pipe Temperature (Left)
30230	Cycle 2's Liquid Pipe Temperature (Right)
30231	Cycle 2's Hex Temperature (Left)
30232	Cycle 2's Hex Temperature (Right)
30233~30244	Reserve
30245	Accumulated Operation Time of Cycle 2's Inverter Compressor 1 (Upper Level)
30246	Accumulated Operation Time of Cycle 2's Inverter Compressor 1 (Lower Level)
30247	Accumulated Operation Time of Cycle 2's Inverter Compressor 2 (Upper Level)
30248	Accumulated Operation Time of Cycle 2's Inverter Compressor 2 (Lower Level)

MODBUS PROTOCOL REGISTERS

Register Address	Meaning
30249~30300	Reserve
30301, 30302	Cycle 3's Load Water Output Temperature
30303, 30304	Cycle 3's Load Water Input Temperature
30305~30308	Reserve
30309	Cycle 3's Condensation Temperature (Left)
30310	Cycle 3's Condensation Temperature (Right)
30311	Cycle 3's Evaporation Temperature (Left)
30312	Cycle 3's Evaporation Temperature (Right)
30313	Inverter Compressor 1's Frequency of Cycle 3
30314	Inverter Compressor 2's Frequency of Cycle 3
30315	Cycle 3's High Pressure (Left)
30316	Cycle 3's High Pressure (Right)
30317	Cycle 3's Low Pressure (Left)
30318	Cycle 3's Low Pressure (Right)
30319	Cycle 3's Operation Current (Left)
30320	Cycle 3's Operation Current (Right)
30321	Main EEV's Status Value of Cycle 3 (Left)
30322	Main EEV's Status Value of Cycle 3 (Right)
30323~30324	Reserve
30325	Discharge Temperature of Cycle 3's Inverter Compressor1
30326	Discharge Temperature of Cycle 3's Inverter Compressor2
30327	Intake Temperature of Cycle 3's Inverter Compressor1
30328	Intake Temperature of Cycle 3's Inverter Compressor2
30329	Cycle 3's Liquid Pipe Temperature (Left)
30330	Cycle 3's Liquid Pipe Temperature (Right)
30331	Cycle 3's Hex Temperature (Left)
30332	Cycle 3's Hex Temperature (Right)
30333~30344	Reserve
30345	Accumulated Operation Time of Cycle 3's Inverter Compressor 1 (Upper Level)
30346	Accumulated Operation Time of Cycle 3's Inverter Compressor 1 (Lower Level)
30347	Accumulated Operation Time of Cycle 3's Inverter Compressor 2 (Upper Level)
30348	Accumulated Operation Time of Cycle 3's Inverter Compressor 2 (Lower Level)
30349~39997	Reserve
39998	Product Group Info.
39999	Product Type Info.

Holding Register

Register Address	Meaning
40001	Setting for Demand control ratio (50% ~ 100%)
40002	Operation Mode Setting (0 : Cooling, 4 : Heating)
40003	Cooling Target Temperature Setting (5~20°C)
40004	Heating Target Temperature Setting (40~57°C)
40005	Control Mode Setting (On-site/Remote/Scheduled)
40006	Remote Mode Setting (Contact /Modbus)
40007	Cooling Type Setting (0 : Normal, 3 : Low Temperature)
40008	Max. Operating Frequency Setting (0 : 120, 1 : 130, 2 : 110, 3 : 100, 4 : 90, 5 : 80, 6 : 70)
40009~40022	Reserve

TEST RUN/ADDITIONAL FUNCTION

Test run

Checkpoint before test run

Start the chiller after checking the following.

- Before starting the chiller, check the supplementary devices such as cold water circulation pump, AHU or other devices. Refer to the directions from the manufacturer. If all equipped parts are installed on the device, check whether all parts are installed appropriately and accurately and check whether the wiring is done correctly. Refer to the wiring diagram of the product.
- Check the flow switch for appropriate operation of the product. Check whether the sensor is operating properly.
- For cooling, fill up cold water circuit with clean water or other non-corrosive liquid and purge the air so that there is no air remaining inside the cold water circuit. If the outdoor temperature is expected to drop below 0°C, add anti-freeze additive to the cold water circuit to prevent the water from freezing. Cold water circuit must be cleaned before connecting to the product.
- Check and inspect all water pipes. Check whether the direction of the water flowing is correct and whether properly connected to the evaporator. Open all flow valves to the evaporator side.
- Turn on the cold water pump and measure the overall water pressure reduction of evaporator to check whether the flow is accurate compared to the designed flow rate.
- Check all electric connections within the control panel and whether all parts are tightly assembled with good contact conditions. Though the connecting part is checked from the factory but it can be loosened during the transportation from the vibration.
- Check and inspect all fuses. All fuses within the power panel and control panel must be installed at appropriate location.

Starting procedure

The chiller can be started as follows.

- Check whether the load is operating on the air processing device or other device on the side of the water that supplies the water to the chiller. If the temperature of the cold water is too high, the start of the load device on the water side can be delayed.
- If auto control does not work from the chiller, check whether the water circulation pump is operating.
- Voltage variance must be within 10 % and check that the phase voltage imbalance does not exceed 5 % between phases. Check whether the power and capacity is appropriate for processing the load.
- Check the order of the power phase.
- Check and inspect the voltage monitoring meter within the power panel. The meter should not show any error code.
- Use the HMI device to check the cold water outlet temperature and cooling water output temperature setting.
- Set the start menu of HMI device to start the system. Water circulation flow must be within the permitted range to control the temperature appropriately.

Check during start

After the above procedure, start the chiller to check whether everything works normally.
If there is any issue, immediately stop the product and follow the “Troubleshooting” process.
Refer to the Appendix for the criteria of each detail.
Follow the below procedure for checkpoints when starting the chiller.

- Check the rotating direction of the condenser fan motor. Place newspaper or tissue to check whether the air flow is normal around the motor.
- Check whether the cold water outlet temperature is the same as the setting.
- Through HMI device, check whether all sensors show effective values. Temperature sensor detects the compressor discharge temperature, compressor suction temperature, condenser outlet temperature and cold water inlet/outlet temperature.
- Check whether the operating current, operating noise and vibration is the same as the product specification.

Stop

After completing to check based on the above procedure, stop the product.
After the above procedure, start the chiller to check whether everything works normally.
If there is any issue, immediately stop the product and follow the “Troubleshooting” process.
Refer to the Appendix for the criteria of each detail.
Follow the below procedure for checkpoints when stopping the chiller.

- Press the stop button from HMI.
- Measure the stopping time of the actual product after pressing the stop button.
- Stop the cold water pump.

Load operation and operation adjustment

After starting and stopping the product, check the product function by operating the load and adjusting the operation.
Adjust the cold water outlet temperature setting to adjust the load to check the product while changing the operating condition.

Prepare operation data

Always record the operating condition when operating the chiller to check whether it is operating normally compared to the specification.
Refer to ‘the standard operation record’ page of Appendix.

Analyze water quality of cold water

Analyze the water quality during the test run and secure the data.
Compare the water quality analysis result after a certain period of time (monthly check is recommended) against that of test run to decide the period to change the water.

Additional function

DIP switch setting

The DIP switch setting of the control box for additional function is as shown below.
Change the DIP switch setting of individual cycle control box PCB to select the functions in the following table.

TEST RUN

Night low noise function

This function judges the hottest day time during the cooling operation to reduce the fan noise of the outdoor unit at night time with low cooling load by running the outdoor unit fan at low RPM.

* How to set maximum RPM

Cycle Main PCB DIP S/W No. 5 ON

↓

Press the SW01D button until the Func is displayed.

↓

Continue to press the SW01C button until the Fn3 is displayed + press SW01D button 1 time to set the step.

↓

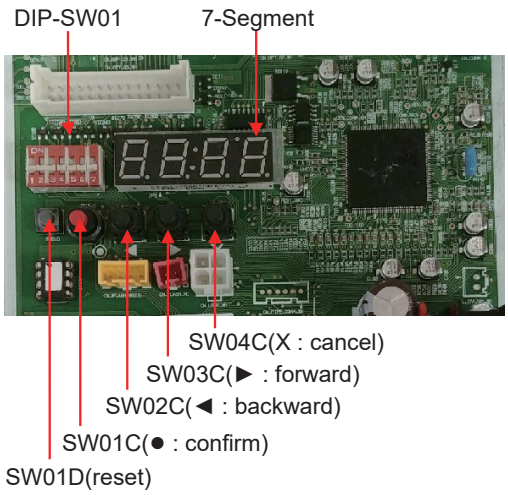
When Fn3 is on, press the SW10C or SW02C button until the applicable step is displayed.
① STEP 1-3Maximum RPM = 820
② STEP 4-6Maximum RPM = 750
③ STEP 7-8Maximum RPM = 720
Refer to right table for standby time/operating time by step

Start night low noise function
(When setting step 1)

After maximum chiller temperature is detected, it operates at 820 (Set) RPM after 8 hours (Standby time)

Stop night low noise function
(When setting step 1)

After running night low noise function, it is automatically canceled after 9 hours (Operation time)



* RPM/Time setting

Step		Maximum fan RPM	Standby time (Hr)	Operation time (Hr)
1	①	820	8	9
2			6.5	10.5
3			5	12
4	②	750	8	9
5			6.5	10.5
6			5	12
7	③	720	8	9
8			6.5	10.5
9			5	12
10	-	820	0	Continuous operation
11		750	0	Continuous operation
12		720	0	Continuous operation

Note:

- Reset the main board of the cycle control box before running this function.
- Request the function setting to the installation expert after installing the chiller.
- If the function is not used, turn the DIP switch OFF and reset the power.
- If chiller RPM is changed, the cooling capacity may be reduced.

SELF DIAGNOSIS FUNCTION

Self diagnosis function

This function self diagnose the product and displays the error type.
Error is displayed in the popup window as shown below in HMI and if the error is resolved, press the “Reset” button on HMI to close the error window.

- OK button

  This is the button to close the alarm popup window.
  Alarm popup window is closed for user convenience from the screen but the current alarm status is maintained.

- Error code

  Error code is configured as follows.

CH x x xxx

- xxx: This displays the alarm code
- x: This displays the alarm cycle number. (0-3)
  0: Common alarm
  1: Alarm of cycle 1
  2: Alarm of cycle 2
  3: Alarm of cycle 3
- x: This displays the unit number and current product is fixed to 1.

Process alarm (error)

- Common alarm (error)
  CH10XXX error basically stops the product

- Alarm (Error) by cycle
  When the alarm occurs by cycle, applicable cycle is maintained at stopped condition and normal cycles operate normally.

If the alarm from the cycle is canceled, it resumes normal operation.

Note:

When composed of 3 cycles, overall product condition maintains the operating condition even when 2 cycles are in error condition, and the overall product will stop only when all 3 cycles are in error condition.

HEAT SOURCE WATER MANAGEMENT

Heat source water management

- Maintain the supplied heat source water temperature in the boundary of 10 °C ~ 45 °C. Otherwise, it may cause product failure.
- The flow speed of the supplied heat source water shall be adjusted adequately. Otherwise, it may cause abnormal noise, pipe vibration, or pipe contraction or expansion by temperature. Use the heat source water pipe with the size of the same diameter of the product connection or bigger.
- Refer to the following table for the heat source water pipe gauge and flow speed. As the flow speed is faster, the noise, corrosion, and inflow of air bubbles increase.

Diameter (mm)	Speed Boundary (m/s)
< 50	0.6 – 1.2
50 - 100	1.2 – 2.1
100 <	2.1 – 2.7

- Caution is required for water quality management. Otherwise, it may cause heat source water pipe corrosion and product failure.
- If the water temperature is 40 °C or higher, corrosion may occur, so it is better to add anti-corrosion solution.
- Install the pipe, valve, gauge, and sensor where the maintenance is easy. Install the heat source water pipe valve at a low position for draining when it is necessary.
- Be careful not to have inflow of air. Air makes the flow speed unstable during the circulation of the heat source water and may degrade pump efficiency and generate heat source water pipe vibration. Therefore, install air purge at appropriate places where air generations are expected.
- Use the following methods to prevent freezing. Otherwise, there is a risk of freezing in the winter.
  * When the temperature drops, before the freezing, circulate the water with pump.
  * Operate boiler to maintain room temperature.
  * If it is not operated for a long period of time in the winter, drain the cooling tower water.
  * Use freezing prevention solution.
  * Refer to the following table for minimum addition amount of freezing prevention solution for each freezing temperature.

Types of freezing prevention solution	Minimum temperature (°C) to prevent freezing					
	0	-5	-10	-15	-20	-25
Ethylene glycol (%)	0	12	20	30	-	-
Propylene glycol (%)	0	17	25	33	-	-
Methanol (%)	0	6	12	16	24	30

* If freezing prevention solution is added, it may cause increased heat source water system pressure drop or product performance degradation.

Note:

• Sealed type cooling tower is recommended.

- If open type cooling tower is applied, use middle heat exchanger to make the heat source water supply system to be sealed type.
- If middle heat exchanger is not used and open type cooling tower is directly connected to the product, product may be severely damaged by foreign object, etc., and in such case, free repair will not be possible.

Heat source water quality management standard table

Water with a lot of foreign object causes corrosion or scale generation in the condenser and pipe and may affect the performance and lifespan.
Use heat source water suitable for [Environment Policy Basic Act Enforcement Ordinance Environment Standard].
If water other than tab water is used in the cooling tower water supply, make sure to have water quality inspection.
- Heat source water quality management shall follow the standard table below.
  If heat source water is not managed according to the water quality standard table, it may cause air conditioner performance degradation or severe product problem.

Category	Sealed type system		Influence	
	Heat source water	Supplementary water	Corrosion	Scale
Basic category				
pH [25 °C]	7.0~8.0	7.0~8.0	O	O
Electrical conductivity [25 °C](mS/m)	30 or less	30 or less	O	O
Chloride ion(mg Cl- /l)	50 or less	50 or less	O	-
Sulfate ion(mg SO_4^{2-}/l)	50 or less	50 or less	O	-
Acid consumption [pH 4.8] (mg $CaCO_3$/l)	50 or less	50 or less	-	O
Total hardness (mg $CaCO_3$/l)	70 or less	70 or less	-	O
Calcium hardness (mg $CaCO_3$/l)	50 or less	50 or less	-	O
Ion-silica (mg SiO_2/l)	30 or less	30 or less	-	O
Reference category				
Iron (mg Fe/l)	1.0 or less	0.3 or less	O	O
Copper (mg Cu/l)	1.0 or less	0.1 or less	O	-
Sulfate ion(mg S^{2}/l)	Shall not be detected	Shall not be detected	O	-
Ammonium ion(mg NH_4^+/l)	0.3 or less	0.1 or less	O	-
Remaining chlorine (mg Cl/l)	0.25 or less	0.3 or less	O	-
Free carbon dioxide (mg CO_2/l)	0.4 or less	4.0 or less	O	-
Stability index	-	-	O	O

[Reference]

(1) O mark in the corrosion and scale field means the possibility of generation.

(2) If the water temp. is 40 °C or higher, the iron without protective coating may have corrosion when it is exposed to water, and addition of anti-corrosion solution or air purge may have a good effect.

(3) In the sealed type circuit using sealed type cooling tower, coolant and supplementary water shall satisfy the water quality standard of the sealed type system in the table.

(4) You shall supply tab water, industrial water, or underground water, excluding purified water, neutral water, and soft water, for supplementary water and supplied water.

(5) The 15 categories in the table are the general causes of corrosion and scale generation

Water pipe side strainer

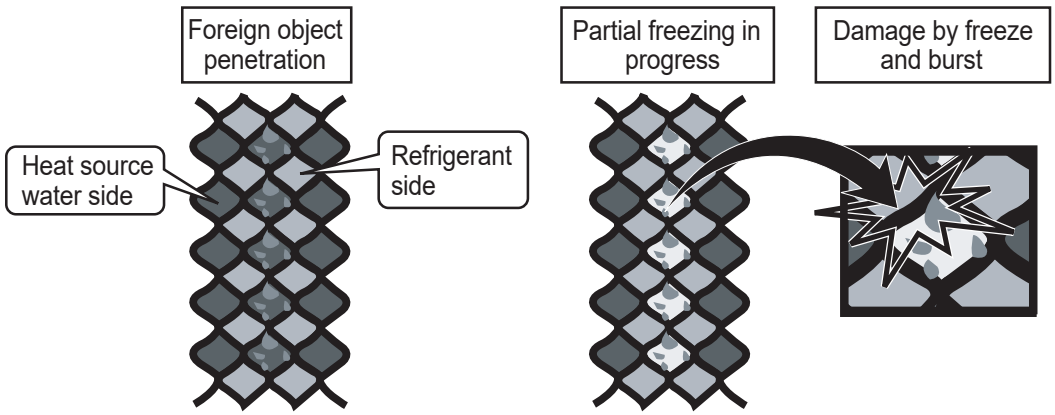
For the protection of the water cooling type product, make sure to install strainer of 50 Mesh or more in the heat source water side pipe.

Otherwise, heat exchanger may be damaged by the following conditions.

1 The heat source water side in the plate type heat exchanger is formed by several small flow paths.

2 If strainer of 50 Mesh or more is not used, foreign object may block some flow paths.

3 As a result of the heat exchanger damage by freeze burst, the refrigerant is mixed with the heat source water and the product becomes unusable.



Actions for problems in the test operation

Category	Status	Cause	Inspection and Action
Whether heat source water is supplied	CH 13	It is the error detected with regards to the heat source water during the flow switch connection, and heat source water does not flow, or flow amount is insufficient. (All operation conditions)	Check if heat source water supply pump works.
			Check blocking of the heat source water pipe. (Strainer cleaning, valve locked, valve problem, air in the pipe, etc.)
			Check flow switch problem. (Flow switch disorder, unauthorized handling, disconnection, etc.)
	CH 180	Heat source water does not flow, or flow amount is insufficient.	Check if heat source water supply pump works
			Check blocking of the heat source water pipe. (Strainer cleaning, valve locked, valve problem, air in the pipe, etc.)

Plate type heat exchanger maintenance

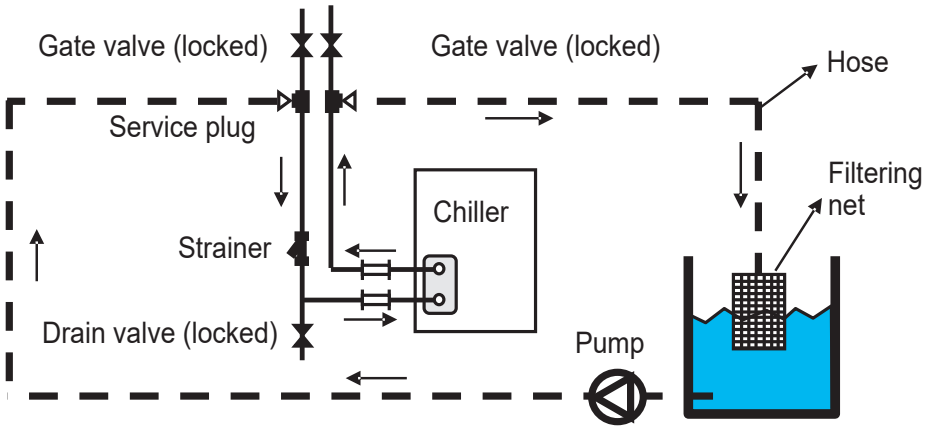
As scale generation is accumulated, plate type heat exchanger efficiency may be decreased or damage may occur by freeze and burst with decreased flow amount.

For such reasons, it is necessary to have periodical management to prevent scale generation.

1 Before entering the usage season, check the following items. (Period: 1 time per year)
   1) Perform water quality inspection to see if it is within the standard condition.
   2) Perform strainer cleaning.
   3) Check if the flow amount is adequate.
   4) Check if operation environment is adequate. (Pressure, flow amount, water outlet temperature, etc.)

2 To clean the plate type heat exchanger, follow the procedures below. (Period: 1 time per year)
   1) Check if service port is mounted on the water pipe for chemical solvent cleaning. 5% diluted formic acid, citric acid, oxalic acid(water acid), acetic acid, phosphoric acid, etc. are suitable as the chemical solvent for scale cleaning. (* Hydrochloric acid, sulfuric acid, nitric acid, etc. have corrosive property, so they may never be used.)
   2) During the cleaning, make sure if water inlet and outlet pipe gate valve and drain pipe valve are properly locked.
   3) Connect the pipe for chemical solvent cleaning through water pipe service plug, fill the cleaning solvent of about 50 °C ~ 60 °C in the plate type heat exchanger, and circulate with pump for about 2 ~ 5 hours. The circulation time may be different according to the cleaning solvent temperature or amount of scale. Therefore, closely observe the chemical solvent color changes to decide the circulation time for scale removal.
   4) After the solvent circulation work, completely drain the chemical solvent in the plate type heat exchanger, fill 1~2 % concentration sodium hydroxide (NaOH) or hydrocarbon sodium ($NaHCO_3$) and circulate for about, 15~20 min. to neutralize the heat exchanger.
   5) After the neutralization work is completed, clean inside the plate type heat exchanger with clean water. By measuring the pH concentration of the water, you can verify if the chemical solvent is properly removed.
   6) If you use other type of chemical solvent in the market, make sure to check if there is any corrosive property against stainless or copper in advance.
   7) Receive consultation from the experts in the relevant industry for details of cleaning chemical solvent.

3 After cleaning work is completed, operate the product to see if it works properly once again.



[Plate type heat exchanger cleaning]

Daily inspection management

1 **Water quality management**

Plate type heat exchanger does not have the structure for disassembly, cleaning, or parts replacement. To prevent corrosion or scale accumulation in the plate type heat exchanger, you have to take a special caution for water quality management. Water quality shall satisfy the minimum suggested water quality category standard. If corrosion prevention solution or corrosion restraining solution is added, you have to use ingredients with no corrosive property against stainless and copper. To prevent the contamination of the circulation water by external air, it is recommended to periodically drain the water inside the water pipe and fill water again even if the circulation water is not contaminated.

2 **Flow amount management**

If the flow amount is insufficient, freeze and burst may occur in the plate type heat exchanger.
Check if strainer is blocked or filled with air, and check whether flow amount is insufficient by checking the difference of temperature or pressure between the outdoor unit inlet and outlet water pipe. If there is a difference of temperature or pressure above appropriate level, it shows that the flow amount is decreased, so immediately stop the operation and remove the cause before the re-operation. (* If there is an air, make sure to perform purge work. The air inside water pipe hinders the heat source water circulation to cause flow amount insufficiency, and it may also cause freeze and burst.)

3 **Brine concentration management**

If Brine(antifreeze) is used in the heat source water, use the designated type and concentration.
Calcium chloride Brine causes corrosion of the plate type heat exchanger, so it may not be used.
If the antifreeze is left alone, it absorbs moisture from the air and the concentration will decrease and may lead to freeze and burst of the plate type heat exchanger, so minimize the contact area with air and periodically measure the concentration of Brine, and maintain the concentration of Brine by adding Brine as necessary.

WATER SYSTEM MAINTENANCE

Inspection category \ Period (year)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Product operation status	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Heat exchanger cleaning	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Strainer cleaning	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Water quality inspection	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Refrigerant leakage inspection	●														●

Note:

- The above inspection table sets the minimum period, and more frequent inspections are necessary according to installation environment, operation condition / water quality condition.
- During the heat exchanger cleaning, you have to take off the parts such as pressure gauge or lock the valve so that chemical solvent may not enter.
- During the cleaning, check the pipe connection parts in advance to prevent leakage of the chemical solvent.
- Start the cleaning work after the chemical solvent and water are sufficiently mixed.
- It is better to perform the heat exchanger cleaning work in the early stage, and when the scale accumulation becomes severe, it becomes difficult to remove them.
- In the region with poor water quality, periodical cleaning works are necessary.
- Chemical solvent has strong acidic property, so it shall be completely washed with water.
- To verify if the inside became clean, remove the hose and check inside the pipe.
- Make sure to perform the air purge to remove air inside water pipe.
- After the inspection, make sure to check if the heat source water properly flows before restarting the product.

TROUBLESHOOTING

General error

Note:

If the product stopped from the safety device, identify and resolve the root cause before restarting.

Before introducing the special warning, this introduces the general issues and how to troubleshoot the issues.

When the chiller is not operating, check the power, refrigerant, configuration and alarm setting of the chiller.

Check the voltage connected to the terminal block inside the power panel to check the power.

If there is no power, check whether the power circuit breaker is down.

If the power is properly connected, check the cycle pressure of the chiller to check whether it is within the normal range.

If the pressure exceeds the normal range, check for leakage by using the soap bubble.

Before starting the chiller, return to the default setting.

Lastly check the alarm setting. Alarm can be checked through the HMI device.

If the alarm is turned on, follow the troubleshooting method for specific alarm.

Symptom	Potential cause	Potential solution
Device does not start.	Check power of the device	Check over-current protection device Check if fuse is disconnected Resume power to device
	Incorrect or inaccurate device configuration	Check device configuration Check if wiring is incorrect
	Alarm is on	Check alarm condition Check for separate alarm troubleshooting process and resolve the issue Follow the direction Check the HMI input channel to check the alarm condition input
	Entering delay time	Check whether compressor entered start delay time

TROUBLESHOOTING GENERAL ERRORS

Symptom	Potential cause	Potential solution
Evaporation pressure is low and the product constantly stops.	Insufficient refrigerant	Check for leakage and refill refrigerant
	Insufficient cold water	Check cold water system (Ensure rated flow) - Is the valve of cold water system closed? - Is the pressure difference between inlet and outlet of cold water system appropriate? - Is the air of cold water system cold?
Condensation pressure is high and the product constantly stops.	Outdoor temperature is high	Check whether outdoor temperature is within operating range
	Alien particles accumulated on the condenser	Clean condenser
	Fan defect	Replace fan
Product vibrates loudly.	Fan-motor connecting bolt is loose	Check assembly condition and tighten bolt
	Motor-mount motor assembly is loose	Check assembly condition and tighten bolt
	Fan is not balanced	After checking fan rotation range, replace fan
	Compressor assembly bolt is loose	If the assembly bolt/nut is loose, tighten it.
	Frame assembly bolt is loose	Check assembly condition and tighten bolt
	Motor bearing is burnt	Check for abnormal noise in motor (Noise in multiple of RPM) and replace motor
Resonance sound	Rubber fixed condition of motor mount is defective	Replace motor mount
	Pipe vibration defect around compressor	Replace anti-vibration rubber attached on pipe
High frequency wave noise from front side of product	Defect in heat emitting fan in control box	Clean part around heat emitting fan
Constantly hunting for cold water temperature	Insufficient cold water	Check cold water system (Ensure rated flow) - Is the valve of cold water system closed? - Is the pressure difference between inlet and outlet of cold water system appropriate? - Is the air of cold water system cold? - Is the cooling load within appropriate range?
Evaporation pressure is high	Temporary rise in cold water temperature due to abnormal increase in load	It is not abnormal. But, check if it is within operating range.

Alarm

The description of the alarm is as follows.

Error code	Error name / Error condition	
	Control during error	Cancel condition
CHxx001	Outdoor temperature sensor error	
	Outdoor temperature sensor is open/short	
	Stop product	Automatically return to normal condition
CHxx003	HMI communication error	
	When communication between HMI and chiller controller is disconnected for more than 30 seconds	
	Stop product	Automatically return to normal condition
CHxx005	Cycle control box communication error	
	When communication between chiller controller and cycle control box is disconnected for more than 30 seconds	
	Stop product	Automatically return to normal condition
CHxx009	Remote communication error	
	When the modbus communication with the external device is not established for more than 30 seconds after the initial communication with the remote modbus condition is established	
	Stop product	Automatically return to normal condition
CHxx011	Load water pump interlock error	
	When the load water pump is turned off for 3 seconds when starting or during the operation for more than 3 times within 1 hour When turned off more than 9 seconds within 1 hour	
	Stop product	Press the HMI Reset button
CHxx013	Load water flow switch error	
	When the load water flow switch is turned off for 3 seconds when starting or during the operation for more than 3 times within 1 hour When turned off more than 9 seconds within 1 hour	
	Stop product	Press the HMI Reset button
CHxx015	Remote alarm	
	When the contact point signal of hardware wiring is short when entering the remote control mode	
	Stop product	Automatically return to normal condition

ERROR CODE TABLES

Error code	Error name	
	Error condition	
	Control during error	Cancel condition
CHxx021	Inverter compressor IPM fault	
	Inverter compressor drive IPM defect/Inverter compressor defect	
	Stop applicable cycle	Automatically return to normal condition
CHxx022	Inverter compressor input over-current	
	Inverter compressor input over-current	
	Stop applicable cycle	Automatically return to normal condition
CHxx023	Inverter compressor DC link low pressure	
	DC voltage charge defect	
	Stop applicable cycle	Automatically return to normal condition
CHxx024	Cycle high pressure switch operation	
	High pressure switch operates due to abnormal high pressure	
	Stop applicable cycle	Automatically return to normal condition
CHxx025	High/Low voltage of input voltage	
	Over/Under permitted voltage of input voltage, N	
	Stop applicable cycle	Automatically return to normal condition
CHxx026	Inverter compressor start failure error	
	Initial start failure from compressor defect	
	Stop applicable cycle	Automatically return to normal condition
CHxx028	Inverter DC link high voltage error	
	Defect from DC voltage and over-charge	
	Stop applicable cycle	Automatically return to normal condition
CHxx029	Inverter compressor over-current	
	Exceed limit	
	Stop applicable cycle	Automatically return to normal condition

Error code	Error name	
	Error condition	
	Control during error	Cancel condition
CHxx032	Surge in inverter #1,#2 compressor discharge temperature	
	Stop applicable cycle	Automatically return to normal condition
CHxx034	Surge in high pressure	
	Surge in high pressure side	
	Stop applicable cycle	Automatically return to normal condition
CHxx035	Surge in low pressure	
	Drop in low pressure side	
	Stop applicable cycle	Automatically return to normal condition
CHxx036	Low compression rate error	
	Low compression rate error	
	Stop applicable cycle	Automatically return to normal condition
CHxx040	Inverter compressor CT sensor error	
	Inverter compressor CT sensor is short/open	
	Stop applicable cycle	Automatically return to normal condition
CHxx041	Inverter compressor discharge temperature sensor error	
	Inverter compressor discharge temperature sensor is short/open	
	Stop applicable cycle	Automatically return to normal condition

ERROR CODE TABLES

Error code	Error name	
	Error condition	
	Control during error	Cancel condition
CHxx042	Low pressure sensor error	
	Low pressure sensor is short/open	
	Stop applicable cycle	Automatically return to normal condition
CHxx043	High pressure sensor error	
	High pressure sensor is short/open	
	Stop applicable cycle	Automatically return to normal condition
CHxx045	Heat exchanger temperature sensor error	
	Heat exchanger temperature sensor is short/open	
	Stop applicable cycle	Automatically return to normal condition
CHxx046	Suction temperature sensor error	
	Suction temperature sensor is short/open	
	Stop applicable cycle	Automatically return to normal condition
CHxx050	Chiller 3 phase power missing phase	
	Chiller 3 phase power missing phase	
	Stop applicable cycle	Automatically return to normal condition

Error code	Error name	
	Error condition	
	Control during error	Cancel condition
CHxx052	Communication error with inverter controller	
	Communication error with inverter controller	
	Stop applicable cycle	Automatically return to normal condition
CHxx053	Communication failure between Indoor and Outdoor Unit	
	Communication failure between Indoor and Outdoor Unit	
	Stop applicable cycle	Automatically return to normal condition
CHxx054	Reversed phase on Outdoor Unit's 3 phased power source (Reversed connection on RST)	
	Reversed phase on Outdoor Unit's 3 phased power source (Reversed connection on RST)	
	Stop applicable cycle	Automatically return to normal condition
CHxx057	Communication error with inverter controller	
	Communication error with inverter controller	
	Stop applicable cycle	Automatically return to normal condition
CHxx059	Installation Failure of Series Model Outdoor Unit	
	Installation Failure of Series Model Outdoor Unit	
	Stop applicable cycle	Automatically return to normal condition
CHxx060	Inverter PCB EEPROM error	
	Inverter PCB EEPROM error	
	Stop applicable cycle	Automatically return to normal condition
CHxx062	Surge in inverter board IPM temperature	
	Surge in inverter board IPM temperature	
	Correspond cycle stop	Automatic return to a normal condition
CHxx065	Inverter IPM temperature sensor error	
	Inverter IPM temperature sensor is short/open	
	Stop applicable cycle	Automatically return to normal condition
CHxx067	Fan lock	
	Fan locked	
	Stop applicable cycle	Automatically return to normal condition

ERROR CODE TABLES

Error code	Error name	
	Error condition	
	Control during error	Cancel condition
CHxx075	Fan CT sensor error	
	Fan CT sensor is short/open	
	Stop applicable cycle	Automatically return to normal condition
CHxx077	Fan over-voltage error	
	Fan over-voltage	
	Stop applicable cycle	Automatically return to normal condition
CHxx079	Fan start failure error	
	Fan start failure	
	Stop applicable cycle	Automatically return to normal condition
CHxx086	Main PCB EEPROM error	
	Main PCB EEPROM access error	
	Stop applicable cycle	Automatically return to normal condition
CHxx087	Fan PCB EEPROM error	
	Fan PCB EEPROM access error	
	Stop applicable cycle	Automatically return to normal condition

Error code	Error name	
	Error condition	
	Control during error	Cancel condition
CHxx090	Individual Inletwater temperature sensor error	
	Individual Inletwater temperature sensor is short/open	
	Stop applicable cycle	Automatically return to normal condition
CHxx091	Individual Outletwater temperature sensor error	
	Individual Outletwater temperature sensor is short/open	
	Stop applicable cycle	Automatically return to normal condition
CHxx104	Communication Error between Outdoor Unit	
	Communication Error between Outdoor Unit	
	Stop applicable cycle	Automatically return to normal condition
CHxx105	Fan board communication error	
	Fan board communication error	
	Stop applicable cycle	Automatically return to normal condition
CHxx106	Fan PCB IPM fault	
	Fan PCB IPM fault	
	Stop applicable cycle	Automatically return to normal condition
CHxx107	Fan DC link low voltage error	
	Fan DC link low voltage	
	Stop applicable cycle	Automatically return to normal condition
CHxx113	Liquid pipe temperature sensor error	
	Liquid temperature sensor is short/open	
	Stop applicable cycle	Automatically return to normal condition
CHxx114	Sub cooling Suction temperature sensor error	
	Sub cooling Suction temperature sensor Short/Open	
	Stop applicable cycle	Automatically return to normal condition
CHxx115	Sub cooling outlet pipe temperature sensor error	
	Sub cooling outlet pipe temperature sensor Short/Open	
	Correspond cycle stop	Automatic return to a normal condition

ERROR CODE TABLES

Error code	Error name	
	Error condition	
	Control during error	Cancel condition
CHxx145	Main Board - External Board communication Error	
	Main Board - External Board communication Error	
	Stop applicable cycle	Automatically return to normal condition
CHxx150	Liquid Compression Prevention Error	
	Liquid Compression Prevention Error	
	Stop applicable cycle	Automatically return to normal condition
CHxx151	Reversing valve switching failed	
	Mode switching failed	
	Stop applicable cycle	Automatically return to nomal condition
CHxx180	Plate type heat exchanger frozen	
	When the load outlet water temperature is maintained at 3 °C or below after the compressor started or if the low pressure is maintained at less than 660 kPA after the compressor started	
	Stop applicable cycle	Automatically return to normal condition
CHxx193	Surge in fan board heat emitting plate temperature	
	Surge in fan board heat sink temperature	
	Stop applicable cycle	Automatically return to nomal condition
CHxx194	Fan board heat emitting plate temperature sensor error	
	Fan board heat emitting plate temperature sensor is short/open	
	Stop applicable cycle	Automatically return to nomal condition

REMOTE DESIRED TEMPERATURE CONTACT POINTS

- Remote desired temperature contact point table

1. Chilled Water Set Point (2 ~ 10 V, 4 ~ 20 mA)
   : UI3 (Mode Cool)

Volt [V]	500Ω [mA]	Cool Set Point (-10 ~ 20) [°C]	Cool Set Point (14 ~ 68) [°F]	Etc
0.0	0.0	No Control (Disconnected)	No Control (Disconnected)	
0.2	0.4			
0.4	0.8			
0.6	1.2			
0.8	1.6			
1.0	2.0			
1.2	2.4			
1.4	2.8			
1.6	3.2			
1.8	3.6			
3.0	6.0	-10	14	(Low Temp. Type)
3.2	6.4	-9	15.8	(Low Temp. Type)
3.4	6.8	-8	17.6	(Low Temp. Type)
3.6	7.2	-7	19.4	(Low Temp. Type)
3.8	7.6	-6	21.2	(Low Temp. Type)
4.0	8.0	-5	23	(Low Temp. Type)
4.2	8.4	-4	24.8	(Low Temp. Type)
4.4	8.8	-3	26.6	(Low Temp. Type)
4.6	9.2	-2	28.4	(Low Temp. Type)
4.8	9.6	-1	30.2	(Low Temp. Type)
5.0	10.0	0	32	(Low Temp. Type)
5.2	10.4	1	33.8	(Low Temp. Type)
5.4	10.8	2	35.6	(Low Temp. Type)
5.6	11.2	3	37.4	(Low Temp. Type)
5.8	11.6	4	39.2	
6.0	12.0	5	41	
6.2	12.4	6	42.8	
6.4	12.8	7	44.6	
6.6	13.2	8	46.4	
6.8	13.6	9	48.2	
7.0	14.0	10	50	
7.2	14.4	11	51.8	
7.4	14.8	12	53.6	
7.6	15.2	13	55.4	
7.8	15.6	14	57.2	
8.0	16.0	15	59	
8.2	16.4	16	60.8	
8.4	16.8	17	62.6	
8.6	17.2	18	64.4	
8.8	17.6	19	66.2	
9.0	18.0	20	68	

REMOTE DESIRED TEMPERATURE CONTACT POINTS

2. Hot Water Set Point (2 ~ 10 V, 4 ~ 20 mA)
   : UI3 (Mode Heat)

Volt [V]	500Ω [mA]	Heat Set Point (30 ~ 70) [°C]	Heat Set Point (86 ~ 158) [°F]	Etc
0.0	0.0	No Control (Disconnected)	No Control (Disconnected)	
0.2	0.4			
0.4	0.8			
0.6	1.2			
0.8	1.6			
1.0	2.0			
1.2	2.4			
1.4	2.8			
1.6	3.2			
1.8	3.6			
2.0	4.0	30	86	
2.2	4.4	31	87.8	
2.4	4.8	32	89.6	
2.6	5.2	33	91.4	
2.8	5.6	34	93.2	
3.0	6.0	35	95	
3.2	6.4	36	96.8	
3.4	6.8	37	98.6	
3.6	7.2	38	100.4	
3.8	7.6	39	102.2	
4.0	8.0	40	104	
4.2	8.4	41	105.8	
4.4	8.8	42	107.6	
4.6	9.2	43	109.4	
4.8	9.6	44	111.2	
5.0	10.0	45	113	
5.2	10.4	46	114.8	
5.4	10.8	47	116.6	
5.6	11.2	48	118.4	
5.8	11.6	49	120.2	
6.0	12.0	50	122	
6.2	12.4	51	123.8	
6.4	12.8	52	125.6	
6.6	13.2	53	127.4	
6.8	13.6	54	129.2	
7.0	14.0	55	131	

3. Demand Limit (2 ~ 10 V, 4 ~ 20 mA)
: UI7

Volt [V]	500Ω [mA]	Demand (50 ~ 100) [%]	Etc
0.0	0.0	No Control (Disconnected)	
0.5	1.0		
1.0	2.0		
1.5	3.0		
3.0	6.0	50%	
4.0	8.0	60%	
5.0	10.0	70%	
6.0	12.0	80%	
7.0	14.0	90%	
8.0	16.0	100%	

Chiller Installation and Commissioning Check List, Page 1 of 2

1. Project Information

Content	Information
Project Name:	
Project Address:	
Installation Contractor:	
Commissioning/ Start-up Date:	
Commissioning Agent*:	

*LG does not offer commissioning service.

2. Model Information:

Product	Model	Serial Number	Compressor Model	Serial Cycle 1 L	Serial Cycle 1 R
Chiller 1					
				Serial Cycle 2 L	Serial Cycle 2 R
				Serial Cycle 3 L	Serial Cycle 3 R
Chiller 2				Serial Cycle 1 L	Serial Cycle 1 R
				Serial Cycle 2 L	Serial Cycle 2 R
				Serial Cycle 3 L	Serial Cycle 3 R
Chiller 3				Serial Cycle 1 L	Serial Cycle 1 R
				Serial Cycle 2 L	Serial Cycle 2 R
				Serial Cycle 3 L	Serial Cycle 3 R
Chiller 4				Serial Cycle 1 L	Serial Cycle 1 R
				Serial Cycle 2 L	Serial Cycle 2 R
				Serial Cycle 3 L	Serial Cycle 3 R
Chiller 5				Serial Cycle 1 L	Serial Cycle 1 R
				Serial Cycle 2 L	Serial Cycle 2 R
				Serial Cycle 3 L	Serial Cycle 3 R

3. Extended Warranty Purchased

Product	Warranty Model	Date	LG Invoice #	Description
Chiller 1				
Chiller 2				
Chiller 3				
Chiller 4				
Chiller 5				

Chiller Installation and Commissioning Check List, Page 2 of 2 (Each)

Chiller	Model	Serial Number

4. Preparation Checklist

Content	Check			
Is there any damage to the equipment?	YES		NO	
Does the line voltage power provided meet the independent protection required?	YES		NO	
Does the breaker or fuse size of the line voltage match the equipment name plate?	YES		NO	
Is the voltage for each leg of power between (187V-253V) for 208-230 volt chiller or is the voltage (414V-506V) for 460 volt equipment?	YES		NO	
Is the voltage variance between phases less than or equal to 2%?	YES		NO	
Is the equipment installed on a 4" minimum base (not to be installed flat on slab)?	YES		NO	
Have properly sized ring connectors been used on each line voltage connection?	YES		NO	
Is there a 24" clearance on the long side of chiller or between chillers?	YES		NO	
Is there 36" clearance on short ends of the chiller?	YES		NO	
Has a water test report been provided?	YES		NO	
Is there Glycol in the system and if yes does the percentage match the LATS ISC Report?	YES		NO	
Is the quality of the water compliant with specifications of page 39 of IOM for ACHH Chiller?	YES		NO	
Are ON/OFF full port isolation valves installed on the inlet and outlet water to the chiller? (Required)	YES		NO	
Is there a strainer on the inlet water to the chiller? (Required)	YES		NO	
Is the Mesh size of the strainer 50 or smaller? (Required)	YES		NO	
Is there flexible joints installed on the inlet and outlet connections? (Required)	YES		NO	
Are there service ports properly located for cleaning and maintenance on the inlet and outlet water connections at the chiller? (Required)	YES		NO	
Are there pressure gages on the inlet and outlet water connections? (Required)	YES		NO	
Has GPM and water flow been confirmed by a 3rd party or flow sensor connected to HMI?	YES		NO	
Is there an approved final LATS ISC Report provided for commissioning agent?	YES		NO	
Is the chiller in control of turning the water pump on and off?	YES		NO	
If chiller is not in control of the pump is there a closed contact reading from the pump that is connected to (UI6-G) on the ACHH main chiller PCB?	YES		NO	
Is the flow switch "CLOSED" at standard factory setting with flow provided from the pump?	YES		NO	
Is the water flow design constant volume?	YES		NO	
If flow design is variable, does the min and max design GPM meet specifications of page 40 of the ACHH Series Chiller?	YES		NO	
Does there appear to be any water leaks visible in the piping?	YES		NO	
Is the water pipe insulation complete at time of start-up?	YES		NO	
At the time of initial start up were there any errors?	YES		NO	
Is the chiller on local control from the HMI?	YES		NO	
Is the chiller on contact (Start-Stop) control using the ACHH main PCB?	YES		NO	
Is the chiller connected to a BMS?	YES		NO	
Is the BMS only viewing status and not offering control?	YES		NO	
Has LGMV recording file documented the initial start up and a minimum of 1 hour run time.	YES		NO	
If NO has been answered to any of the questions above please provide written explanation.				

5. Required Documentation for Standard and Extended Warranty.

1. Copy of LATS ISC file report used for the commissioning and start up of the chiller, 2 files provided. Initial engineered version and as-built final.
2. Copy of Checklist for each chiller and page 2 of 2 for each serial numbered product.
3. LGMV .csv run file (1 hour minimum- must gather initial start up data at first call to run).
4. All LG chillers are to be started and commissioned by a trained agent. Assisted start up is required if commissioning agent does not have proper training record available in LG Schoox system.

To access additional technical documentation, visit www.lghvac.com.

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IOM_Chiller_Heat_Pump_07_22
Supercedes: IOM_Chiller_Heat_Pump_05_22
IOM_Chiller_Heat_Pump_03_22
IOM_Chiller_Heat_Pump_02_22