Operation & Maintenance MANUAL

CHILLER

AIR-COOLED SCREW

Please read this manual carefully before operating your set and retain it for future reference.

MODEL: MCAW Series

P/No.: MKY30440401

Air cooled Screw Operation & Maintenance Manual

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Safety Precautions

Installing, starting up, and servicing this equipment can be hazardous due to system pressures, electrical components, and equipment location (roof, elevated structures, etc). Only trained, qualified installers and service technicians should install, start up, and service this equipment. When working on this equipment, observe precautions in the literature, and on tags, stickers, and labels attached to the equipment, and any other safety precautions that apply. Follow all safety codes. Wear safety glasses and work gloves. Be care of handing, rigging, and setting this equipment, and in handing all electrical components.

To prevent injury to the user or other people and property damage, the following instructions must be followed.

- Incorrect operation due to ignoring instruction of the manual will cause harm or damage.
  The seriousness is classified by the following indications.
- We do not have any responsibility for any failure caused by careless management and natural disaster, and power cord failure regardless of warranty period.
- The content in the manual could be changed for the improvement of product without notice.

WARNING This symbol indicates the possibility of death or serious injury.
CAUTION This symbol indicates the possibility of injury or damage to properties only.

- Meanings of symbols used in this manual are as shown below.

Be sure not to do.
Be sure to follow the instruction.

WARNING

All wiring must comply with local requirements and the instructions given in this manual.

- If the power source capacity is inadequate or electric work is performed improperly, electric shock or fire may result.

Ask the dealer or an authorized technician to install the chiller.

- Improper installation by the user may result in water leakage, electric shock, or fire.

Always ground the product.

- There is risk of fire or electric shock.

Always install dedicated circuit and breaker.

- Improper wiring or installation may cause fire or electric shock.

For re-installation of the installed product, always contact a dealer or an Authorized Service Center.

- There is risk of fire, electric shock, explosion, or injury.

Do not install, remove, or re-install the unit by yourself (customer).

- There is risk of fire, electric shock, explosion, or injury.

Do not store or use flammable gas or combustibles near the chiller.

- There is risk of fire or failure of product.

Use the correctly rated breaker or fuse.

- There is risk of fire or electric shock.

Do not install the product on a defective installation stand.

- It may cause injury, accident, or damage to the product.

When installing and moving the chiller to another site, do not charge it with a different refrigerant from the refrigerant specified on the unit.

- If a different refrigerant or air is mixed with the original refrigerant, the refrigerant cycle may malfunction and the unit may be damaged.

Do not reconstruct to change the settings of the protection devices.

- If the pressure switch, thermal switch, or other protection device is shorted and operated forcibly, or parts other than those specified by LGE are used, fire or explosion may result.

Ventilate before operating chiller when gas leaked out.

- It may cause explosion, fire, and burn.

Securely install the cover of control box and the panel.

- If the cover and panel are not installed securely, dust or water may enter the air-cooled unit and fire or electric shock may result.

If the chiller is installed in a small room, measures must be taken to prevent the refrigerant concentration from exceeding the safety limit when the refrigerant leaks.

- Consult the dealer regarding the appropriate measures to prevent the safety limit from being exceeded. Should the refrigerant leak and cause the safety limit to be exceeded, hazards due to lack of oxygen in the room could result.

Do not damage or use an unspecified power cord.

- There is risk of fire, electric shock, explosion, or injury.

Use a dedicated outlet for this appliance.

- There is risk of or electrical shock.

Be cautious that water could not enter the product.

- There is risk of fire, electric shock, or product damage.

Do not touch the power switch with wet hands.

- There is risk of fire, electrical shock, explosion, or injury.

When the product is soaked (flooded or submerged), contact an Authorized Service Center.

- There is risk of fire or electric shock.

Take care to ensure that nobody could step on or fall into the air-cooled unit.

- This could result in personal injury and product damage.

Follow the permitted pressure level

- Follow the regulated pressure for cold water, cooling water, refrigerant etc.
- It can cause electricity leakage or burn/frostbite eruption or leakage.

Be cautious of fire, earthquake and lightning

- If there is natural disaster such as fire or earth-quake, or risk of lightning , immediately stop operating the unit
- If you continue to operate the unit, it can cause a fire or electric shock.

Be careful of the rotating part

- Be careful not to put your finger or a stick in the rotating part of the fan or pump.
- Do not operating the fan with the protective net removed. It can cause body injury.

Use of undesignated refrigerant and oil is prohibited.

- Do not use undesignated refrigerant, freezer oil and brine.
- It can have a critical effect on the compressor and component defects.
- If you would like to use a substitute for the refrigerant, please contact the manufacturer.

Redesigning the control box is prohibited

- Lock the control box with possible locking device and if you need to open the control box inevitably, turn off the main power first.
- Do not touch the wiring or parts within the control box.
- It can cause electric shock, fire or defects.

Be careful of leakage

- If you find a leakage in the connected part such as pump, piping etc., immediately stop the operation.
- It can cause electric shock, leakage or defects.

Changing the set value is prohibited

- Do not change the set value of the safety device.
- If you operate the product with incorrectly set values, it can cause defect, fire or explosion.
- When you change the control setting value, please consult with the specialized expert.

Electric shock prevention

- When installing the freezer, always ground the wire.
- It can cause electric shock.

Follow all safety codes

- When working on this equipment, observe precautions in the literature, and on tags, stickers, and labels attached to the equipment, and any other safety precautions that apply.

Wear safety equipment

- Wear safety glasses and work gloves.
- Use care in handing, rigging, and setting this equipment, and in handling all electrical components.

Shut off all power to this equipment during installation and service.

- Electrical shock can cause personal injury and death.
- There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

Always run fluid through heat exchangers when adding or removing refrigerant charge.

- It prevents potential damage to heat exchanger tubes.
- Use appropriate brine solutions in cooler fluid loops to prevent the freezing of heat exchangers when the equipment is exposed to temperatures below 32℉ (0℃).

Do not vent refrigerant relief valves within a building.

- Outlet from relief valves must be vented outdoors in accordance with the latest edition of ANSI/ASHRAE (American National Standards Institute/American Society of Heating, Refrigeration and Air Conditioning Engineers) 15 (Safety Code for Mechanical Refrigeration).
- The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation.
- Provide adequate ventilation in enclosed or low overhead areas. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness or death. Misuse can be fatal. Vapor is heavier than air and reduces the amount of oxygen available for breathing. Product causes eye and skin irritation.

Do not attempt to umbrage factory joints when servicing this equipment. Cut lines with a tubing cutter as required when performing service.

- Compressor oil is flammable and there is no way to detect how much oil may be in any of the refrigerant lines.
- Use a pan to catch any oil that may come out of the lines and as a gage for how much oil to add to system.

Do not re-use compressor oil.

- It may cause damage to the product.

Do not leave refrigerant system open to air any longer than necessary.

- Seal circuits being serviced and charge with dry nitrogen to prevent oil contamination when timely repairs cannot be completed.

CAUTION

Always check for gas (refrigerant) leakage after installation or repair of product.

- Low refrigerant levels may cause failure of product.

Do not install the product where the noise or hot air from the air-cooled unit could damage the neighborhoods.

- It may cause a problem for your neighbors.

Keep level even when installing the product.

- To avoid vibration or water leakage.

Do not install the unit where combustible gas may leak.

- If the gas leaks and accumulates around the unit, an explosion may result.

Use power cables of sufficient current carrying capacity and rating.

- Cables that are too small may leak, generate heat, and cause a fire.

Do not use the product for special purposes, such as preserving foods, works of art, etc. It is a consumer chiller, not a precision refrigeration system.

- There is risk of damage or loss of property.

Keep the unit away from children.

- It can cause the injury, such as cutting the finger. Also the damaged fin may result in degradation of capacity.

When installing the unit in a hospital, communication station, or similar place, provide sufficient protection against noise.

- The inverter equipment, private power generator, high-frequency medical equipment, or radio communication equipment may cause the chiller to operate erroneously, or fail to operate. On the other hand, the chiller may affect such equipment by creating noise that disturbs medical treatment or image broadcasting.

Do not install the product where it is exposed to sea wind (salt spray) directly.

- It may cause corrosion on the product. Corrosion could cause product malfunction or inefficient operation.

Do not use the chiller in special environments.

- Oil, steam, sulfuric smoke, etc. can significantly reduce the performance of the chiller or damage its parts.

Make the connections securely so that the outside force of the cable may not be applied to the terminals.

- Inadequate connection and fastening may generate heat and cause a fire.

Be sure the installation area does not deteriorate with age.

- If the base collapses, the chiller could fall with it, causing property damage, product failure, or personal injury.

Be very careful about product transportation.

- When transporting the chiller, always consult with the specialized expert.
  When transporting the chiller, make sure to comply with the method regulated in the manual. If not, it can cause overturn, fall etc.

Safely dispose of the packing materials.

- Packing materials, such as nails and other metal or wooden parts, may cause stabs or other injuries.
- Tear apart and throw away plastic packaging bags so that children may not play with them. If children play with a plastic bag which was not torn apart, they face the risk of suffocation.

Turn on the power at least 12hours before starting operation.

- Starting operation immediately after turning on the main power switch can result in severe damage to internal parts. Keep the power switch turned on during the operational season.

Do not touch any of the refrigerant piping during and after operation.

- It can cause a burn or frostbite.

Do not operate the chiller with the panels or guards removed.

- Rotating, hot, or high-voltage parts can cause injuries.

Do not directly turn off the main power switch after stopping operation.

- Otherwise it may result in oil supply shortage or other problems.

Use a firm stool or ladder when cleaning or maintaining the chiller.

- Be careful and avoid personal injury.

Be careful of disposal

- When disposing the device, request to the specialized expert.

Be careful of high voltage

- Install separate wiring for the power and always install and use dedicated power supply and circuit breaker.
- It can cause electric shock or fire.

Be careful of high temperature

- Because the machine part can be hot, do not touch it with any part of your body.
- It can cause burns.

Be careful of restarting

- When the safety device of the product operates, resolve the cause before re-operating.
- If you repeat this arbitrarily, it can cause fire and defect.

Be careful of device installation

- Be careful of the clearance of the device during the installation and make sure there are no surrounding obstacles for the air cooling type and that it is well ventilated.

Be careful of sound or odor

- If you hear a weird sound or smell weird odor, immediately stop operating the unit and contact the service center.
- It can cause fire, explosion and injury.

Check

- Execute the periodic check. If an issue is found, stop operating the unit and contact the service center.
- Insufficient check can cause fire, explosion and defect.

It can cause an injury.

- Use appropriate tools used for the repair and make sure to calibrate the measuring devices precisely before use.
- If you use inappropriate tools etc, it can cause an accident.

Be careful of air cooling type heat exchanger

- Because the condenser of the air cooling type device is sharp, do not touch the condenser.
- Protective net must always be kept installed.
- It can cause an injury.

It can cause an injury.

- Check the safety label of the safety device.
- Follow upper precautions and labels. If not, it can cause injury or damage such as a fire etc.
- To prevent the generation of condensed water, the connecting pipe to the evaporator, as well as the evaporator itself, must be insulated.

Do not use jumpers or other tools to short out components, or to bypass or otherwise depart from recommended procedures

- Any short-to-ground of the control board or accompanying wiring may destroy the electronic modules or electrical components.

Do not attempt to bypass or alter any of the factory wiring.

- Any compressor operation in the reverse direction will result in a compressor failure that will require compressor replacement.

Consult a water treatment specialist for proper treatment procedures.

- Hard scale may require chemical treatment for its prevention or removal

Water must be within design flow limits, clean and treated.

- This makes it possible to ensure proper machine performance and reduce the potential of tubing damage due to corrosion, scaling, erosion, and algae.
- LG assumes no responsibility for chiller or condenser damage resulting from untreated or improperly treated water.

Harsh chemical, household bleach or acid cleaners should not be used to clean outdoor or indoors coils of any kind

- These cleaners can be very difficult to rinse out of the coil and can accelerate corrosion at the fin/tube interface where dissimilar materials are in contact. If there is dirt below the surface of the coil, use the Environmentally Sound Coil Cleaner.

Do not use high-pressure water or air to clean coils

- It may cause fin damage
- High Velocity Water or Compressed Air should never be used to clean a coil. The force of the water or air jet will bend the fin edges and increase airside pressure drop. Reduced unit performance or nuisance unit shutdown may occur.

Do not overcharge system

- Overcharging results in higher discharge pressure with higher cooling fluid consumption, possible compressor damage and higher power consumption.

Do not add oil at any other location

- It may cause improper unit operation

Compressor oil is pressurized.

- Use proper safety precautions when relieving pressure.

Turn controller power off before servicing controls.

- This ensures safety and prevents damage to controller.

Rig the unit from the top of heat exchanger only.

- Rigging from the bottom heat exchanger will cause the unit to be lifted unsafely.
- Personal injury or damage to the unit may occur

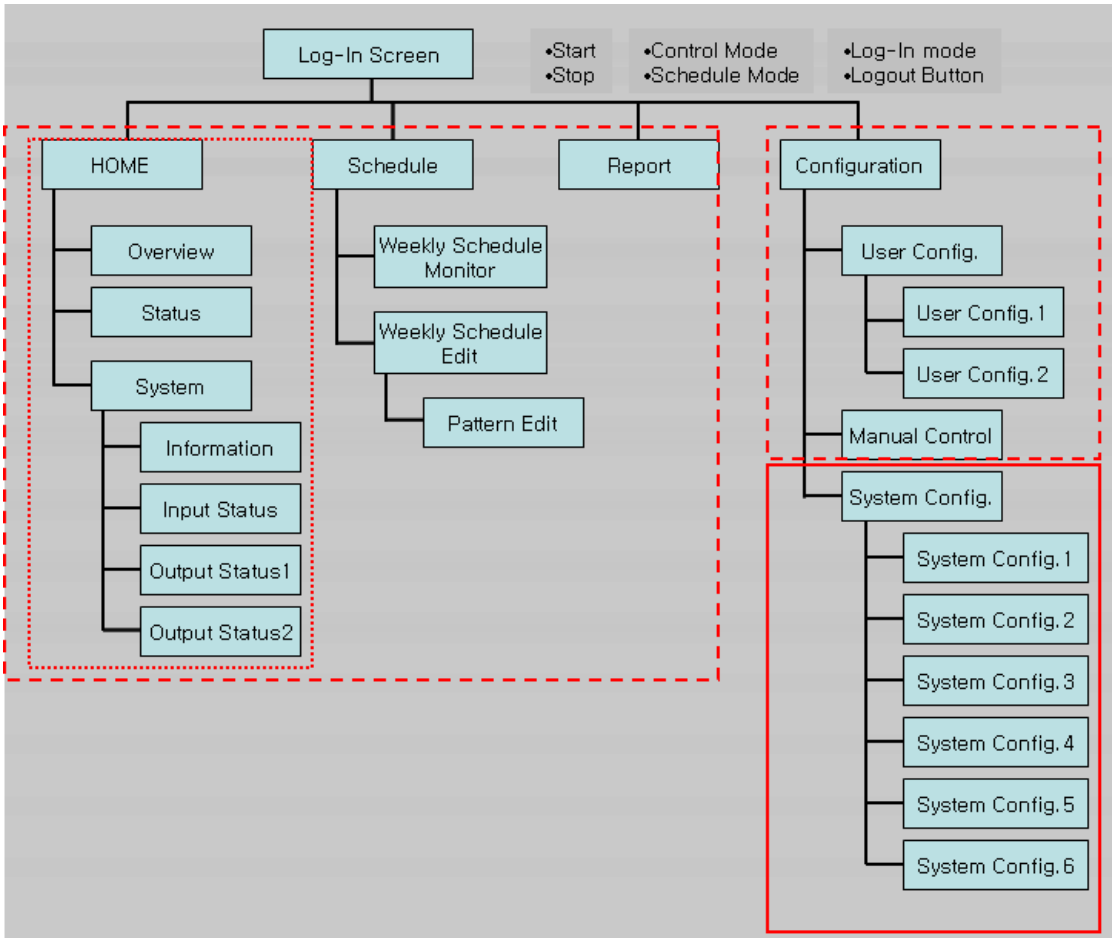
Welding is not recommended in the cooler heads or nozzles.

- In the event that welding must be performed, remove the chilled water flow switch and entering an leaving fluid thermistors before welding.
- Reinstall flow switch and thermistors after welding is complete. Failure to remove these devices may cause component damage.

GENERAL

This manual is composed of information on control, operation, start-up, service and troubleshooting of MCAW Air Cooled Chiller.

■ Manipulation of HMI (Human Machine Interface) Unit



: Can be accessed by User Mode Log-In

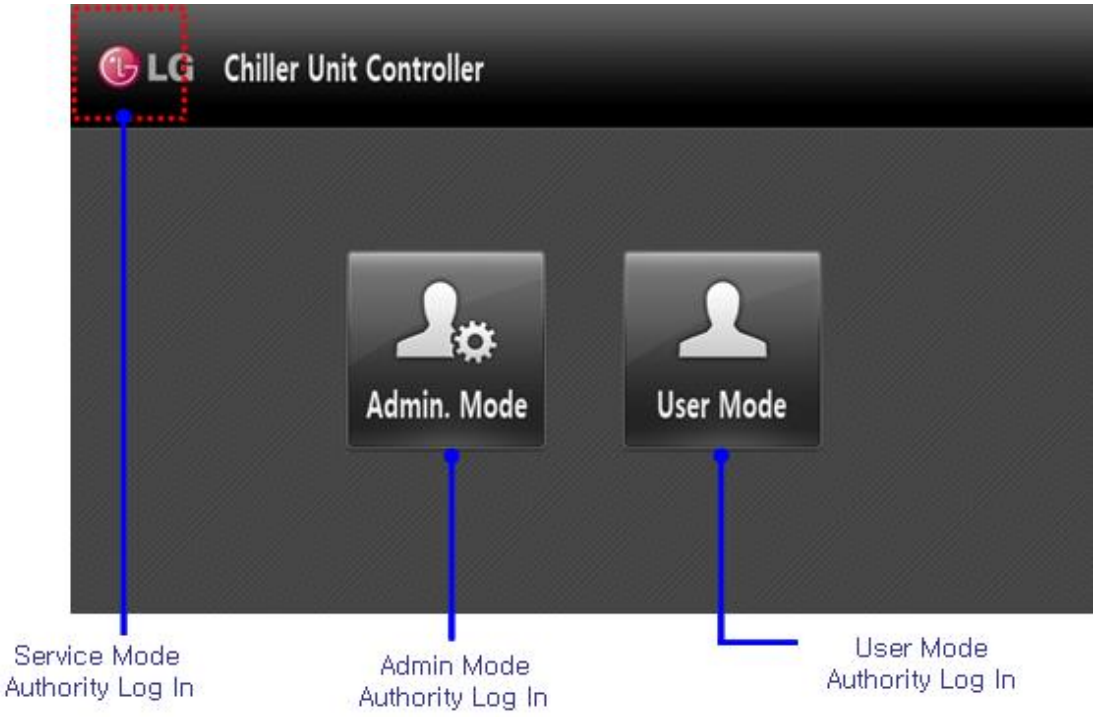
: Can be accessed by Admin. Mode Log-In

: Can be accessed by Service Mode Log-In

Main Menu

When power is applied to HMI, it operates automatically. As HMI starts to operate, LG logo screen first appears, and it changes to the following log in screen soon.

You can log in to HMI in 3 methods according to Service Mode, Admin Mode, and User Mode authorities as follows.



Service Mode Log In

When you log in as Service Mode, you can access to and use all functions of HMI.

Admin. Mode Log In

When log in as Admin. Mode, you can use all functions of HMI except System Config. of Configuration.

User Mode Authority Log In

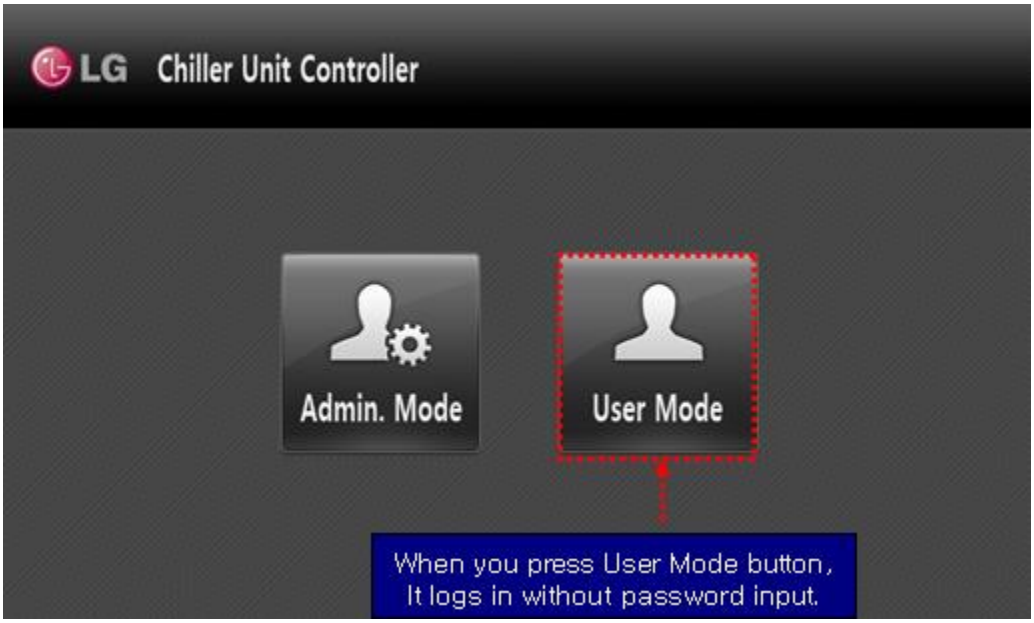
When you log in as User Mode, you can only access the functions in HMI HOME area, and cannot access other functions.

User Setting

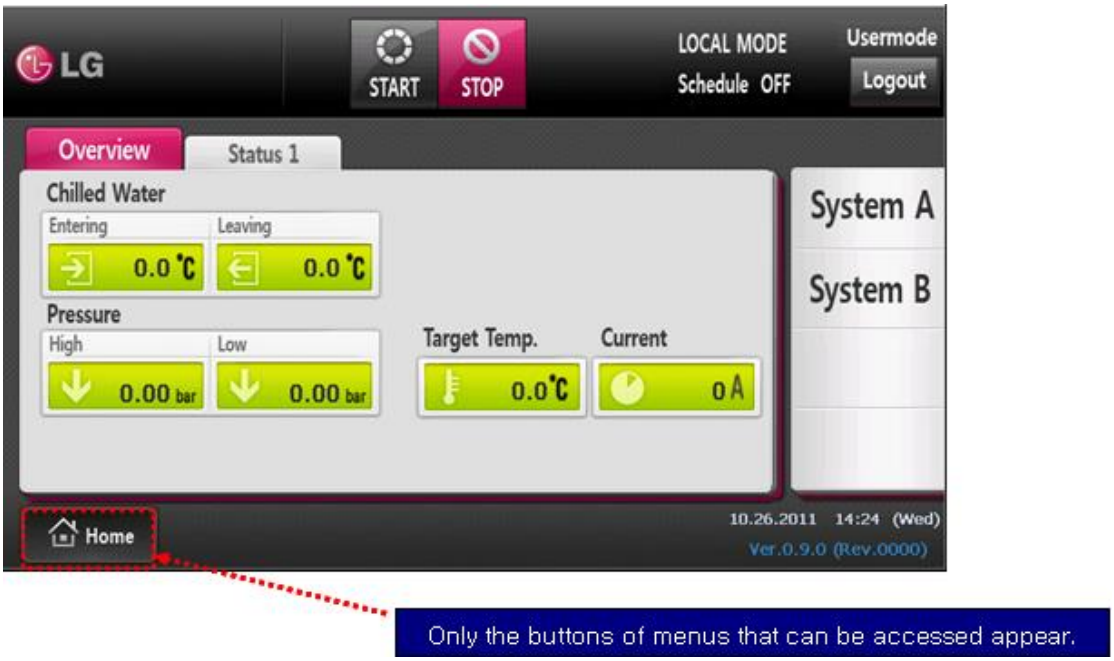
■ User Mode Authority Log In

Proceed with the following order to log in with User Mode authority.

1. When you press “User Mode” button, it logs in directly to HMI without password input procedure.



2. After log in, buttons of menu that cannot be accessed do not appear, and only the buttons of the menu that can be accessed appear as activated.



■ User Mode Authority Log Out

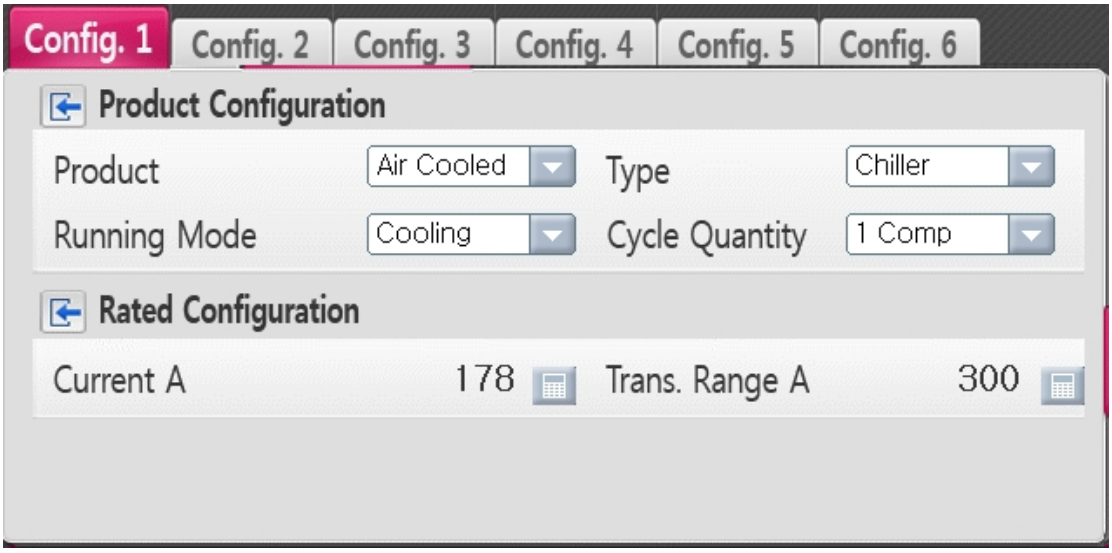
After Admin. Mode log in and User Mode log in, to log in with other mode, you need to log out as in the following order, and then you can log in to other modes.

1. After log in, if you press “Logout” button at top right of all screens, log out is carried out, and it moves to the initial log in screen.

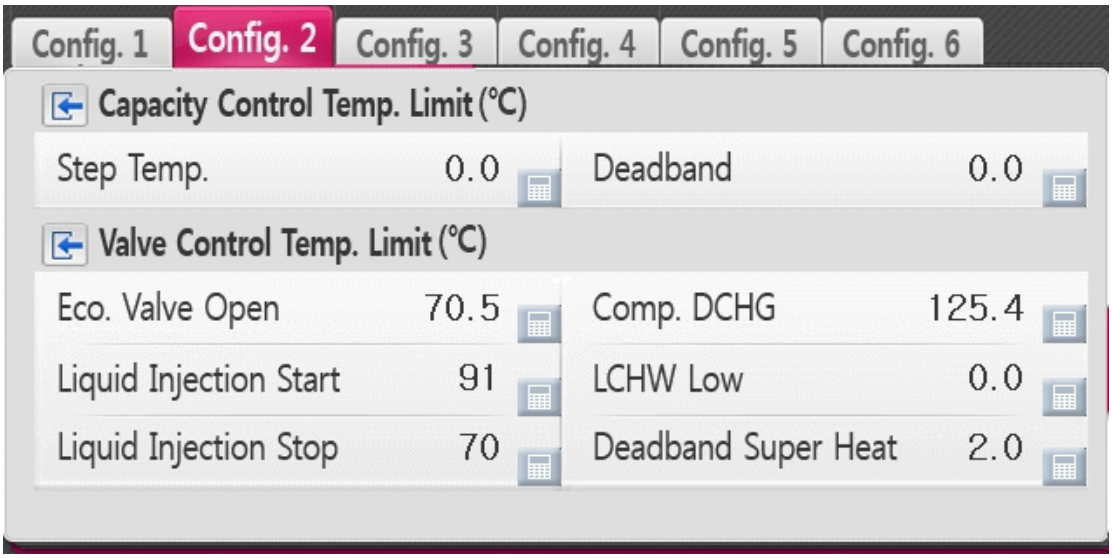
2. It moves to the initial log in screen.

Service Setting

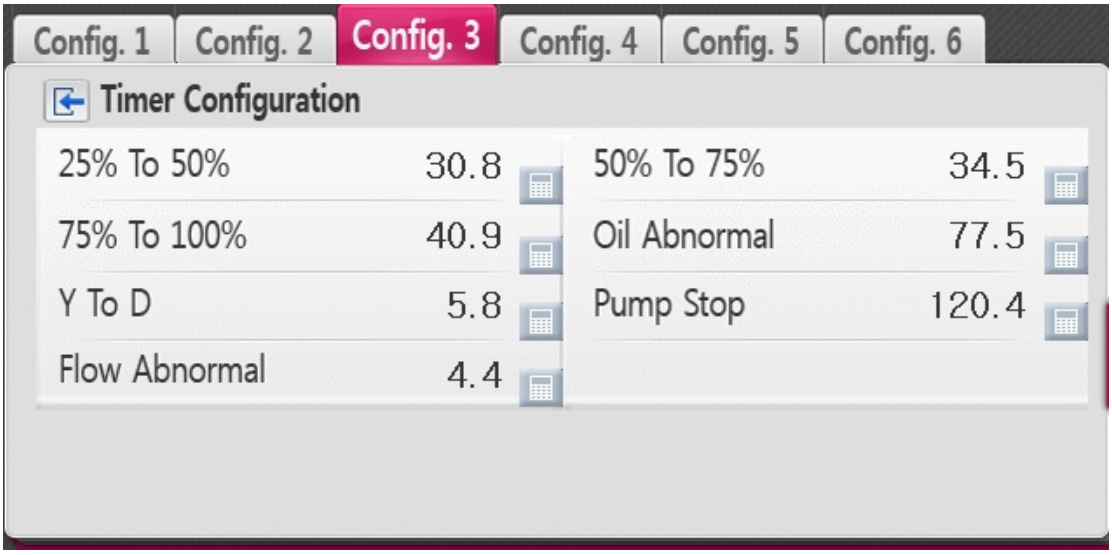
The detail information of Service setting screen are as follows.
System Configuration is an area that can be accessed after Service log in. It does not appear in User Mode or Admin. Mode log in.



Icon	Description
Config. 1	Pressing Tap button "Config.1" button will move to Config.1screen.
Product	It can set the installed product. Air Cooled, Water Cooled It is currently fixed as Air Cooled.
Type	It can set product type of the installed product. It is fixed as Chiller Type.
Running Mode	It can set the operation mode of the product. It is fixed as Cooling operation mode.
Cycle Quantity	It can select the number of the systems of the installed product.
Current A	It can input the rated current value of the installed product.
Trans. Range A	It can set and input current conversion ratio of the installed product.

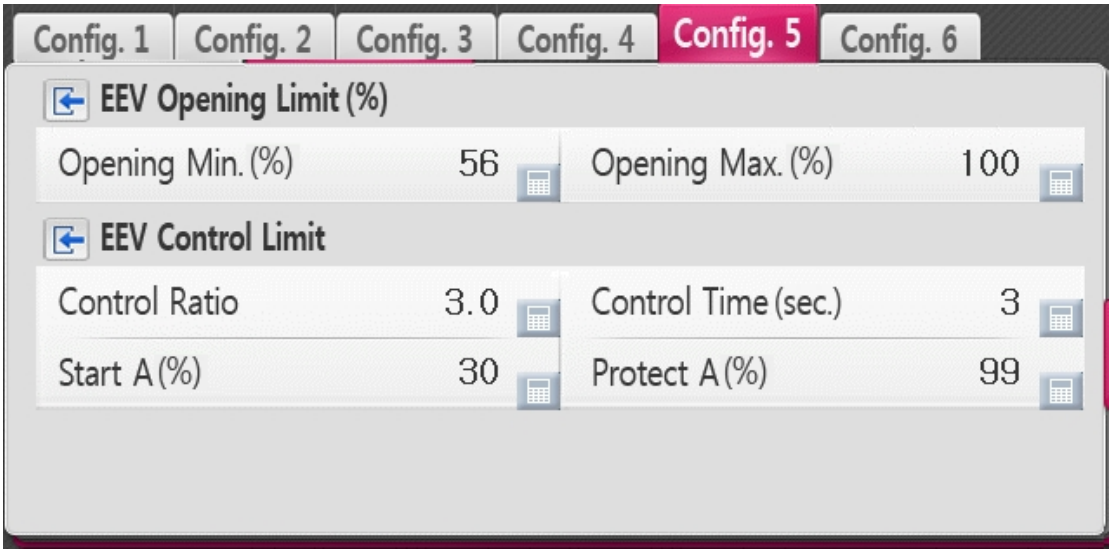


Icon	Description
Config. 2	Pressing Tap button "Config.2" button will move to Config.2 screen.
Step Temp.	It is the temperature setting value for increase and decrease of the capacity level.
Deadband	It is the error value setting of capacity increase and decrease setting.
Eco. Valve Open	It sets the Open temperature value of Economizer Valve.
Liquid Injection Start	It sets the Open Start temperature value of Liquid Injection Valve.
Liquid Injection Stop	It sets the Close Start temperature value of Liquid Injection Valve.
Comp. DCHG	It sets the upper limit temperature value of Comp. Discharge temperature value.
LCHW Low	It sets the lower limit temperature value of Chilled Water exit water temperature.
Deadband Super Heat	It sets the suction overheat degree of the compressor.

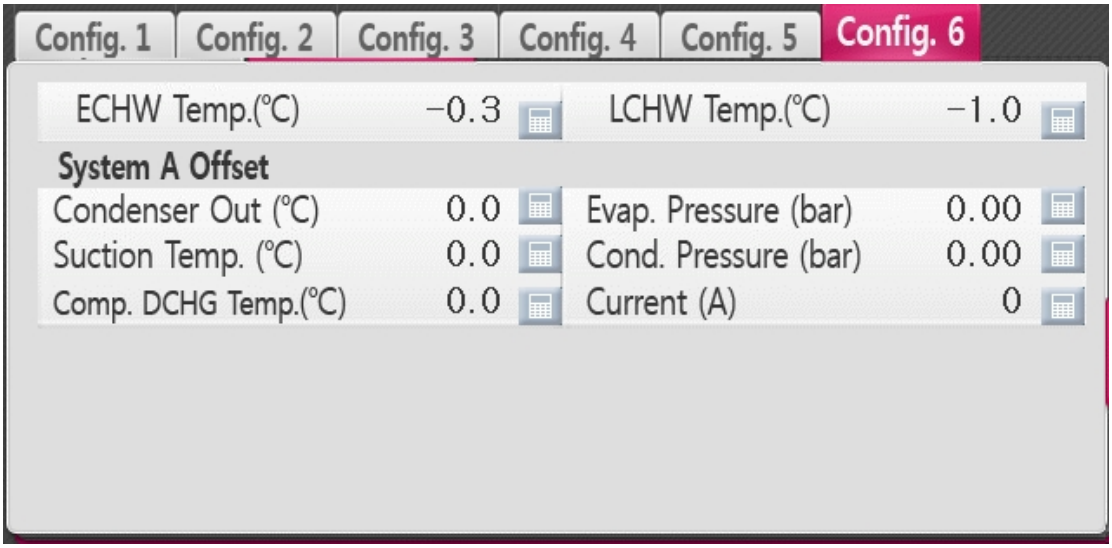


Icon	Description
Config. 3	Pressing Tap button "Config.3" button will move to Config.3 screen.
25% To 50%	It can set the delay time between 25% capacity to 50% capacity during the operation.
50% To 75%	It can set the delay time between 50% capacity to 75% capacity during the operation.
75% To 100%	It can set the delay time between 75% capacity to 100% capacity during the operation.
Oil Abnormal	It can set the delay time for Oil Switch error to be recognized.
Y To D	It can set the delay time for switching from Wve activation to Delta activation during the activation of Y-D.
Pump Stop	It can set the delay time from the stop of the product to the stop of the Chilled Water Pump.
Flow Abnormal	It can set the delay time to recognize flow switch error.

Icon	Description
Config. 4	Pressing Tap button "Config.4" button will move to Config.4 screen.
Operating Pressure	It can set the pressure value for Fan to operate.
Step Pressure	It can set the pressure unit to increase or decrease the number of Fan operations.
High Pressure	It can set the upper limit pressure value to protect the product.
Low Pressure	It can set the lower limit pressure value to protect the product.
Diff. Pressure	It can set the limit pressure difference value between high pressure and low pressure to protect the product.
EEV Protect	IT can set the pressure value to protect EEV.
Inhibit pressure	It can set Comp. Discharge pressure limit.



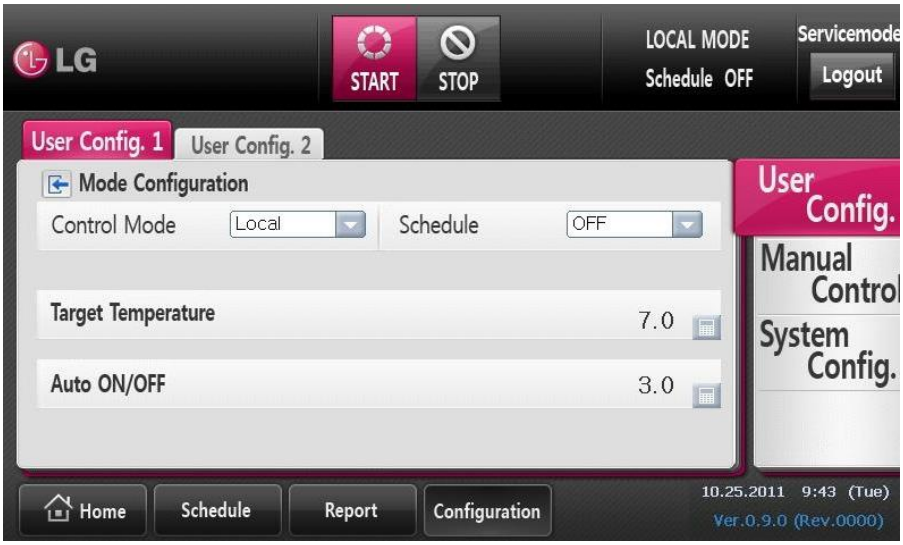
Icon	Description
Config. 5	Pressing Tap button "Config.5" button will move to Config.5 screen.
Opening Min. (%)	It can set the minimum open value of EEV.
Opening Max. (%)	It can set the maximum open value of EEV.
Control Ratio	It can set the change ratio during the opening and closing of the EEV open.
Control Time (sec.)	It can set the control period time of EEV.
Start A (%)	It can set the initial open value of EEV.
Protect A (%)	It can set limit value to limit open value to protect EEV.



Icon	Description
Config. 6	Pressing Tap button “Config.6” button will move to Config.6 screen.
ECHW Temp.(℃)	It can set offset value of Chilled Water Entering temperature value.
LCHW Temp.(℃)	It can set offset value of Chilled Water Leaving temperature value.
Condenser Out (℃)	It can set offset value of Condenser Out temperature value.
Suction Temp. (℃)	It can set offset value of Suction Temperature value.
Comp. DCHG Temp.(℃)	It can set offset value of Comp. Discharge Temperature value.
Evap. Pressure (bar)	It can set offset value of Evaporator Pressure value.
Cond. Pressure (bar)	It can set offset value of Condenser Pressure value.
Current (A)	It can set offset value of current value.

Parameter Setting

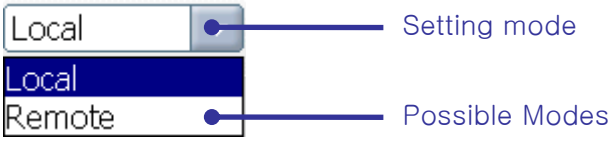
■ Setting User Config.1 screen



Control Mode Configuration

1) Press Select button as follows to set Control Mode.

2) If Select button is pressed, the control mode that can be selected appears as follows.



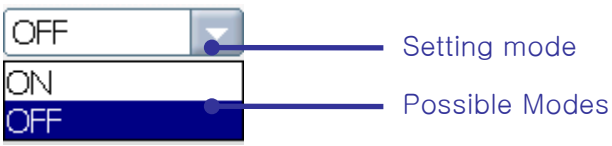
3) When a desired control mode is selected, setting mode setting is completed, and control mode is applied.

Schedule Mode Configuration

Schedule Mode can be set as follows.

1) Press Select button as follows to set Schedule mode.

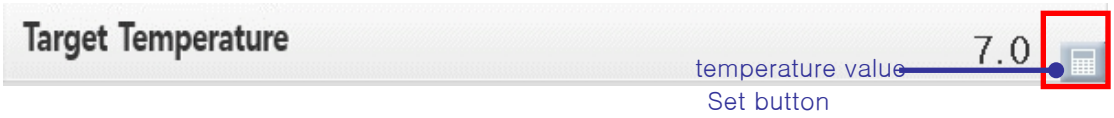
2) If Select button is pressed, whether to apply Schedule Mode can be selected as follows.



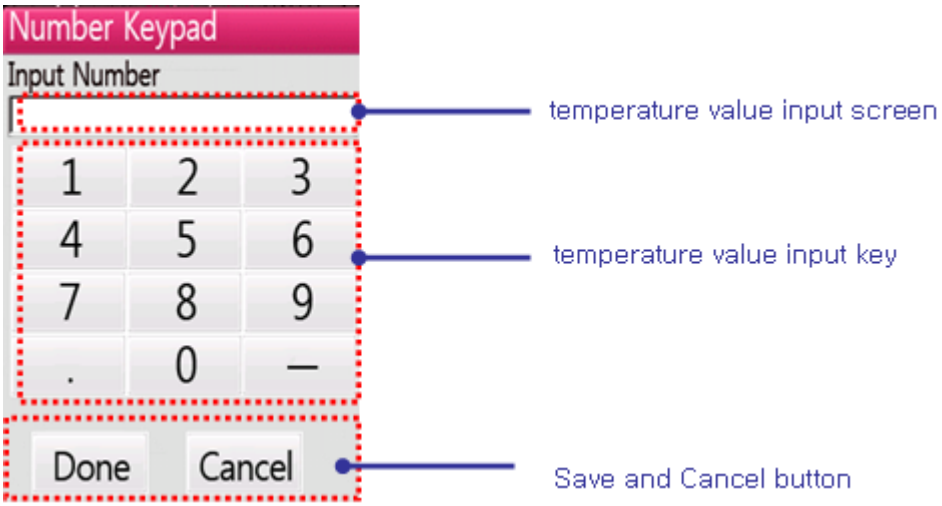
3) If whether to apply Schedule Mode is selected, Schedule Mode setting is completed.

Target Temperature Configuration

1) Press temperature value set button as follows to set target temperature.



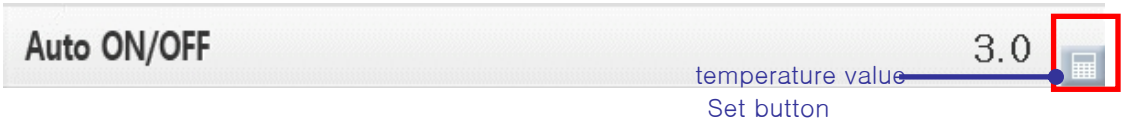
2) If you press Set button, input screen to set as follows appears.



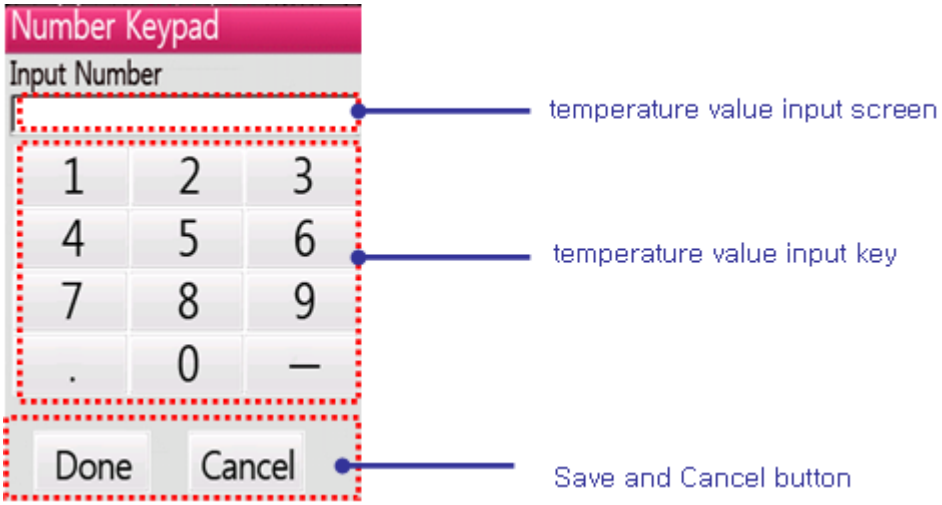
3) Cooling setting temperature difference boundary is 5.0~15.0℃.

Auto ON/OFF Temperature Configuration

1) Press temperature value set button as follows to set Auto ON/OFF.

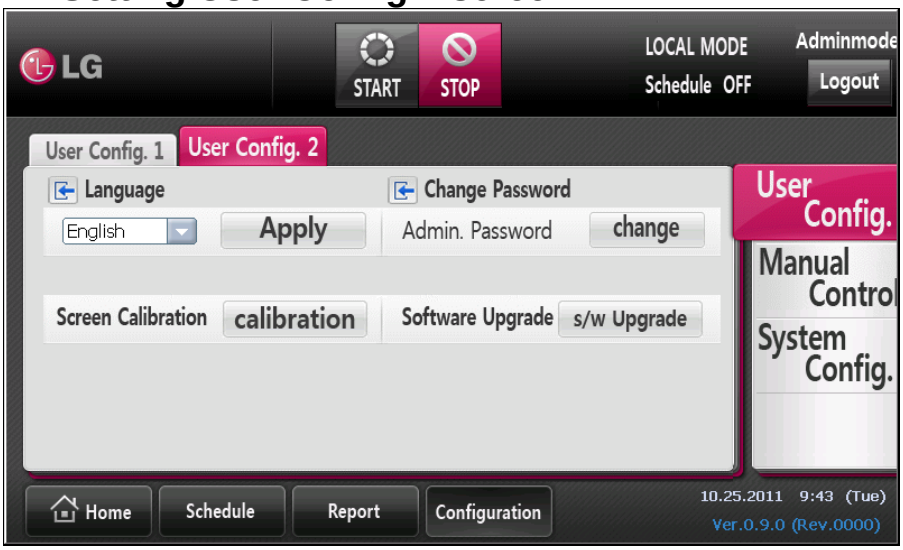


2) If you press Set button, input screen to set as follows appears.



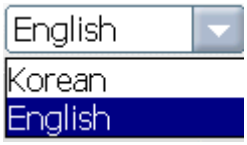
3) Cooling setting temperature difference boundary is 1.0~5.0℃.

■ Setting User Config.2 screen

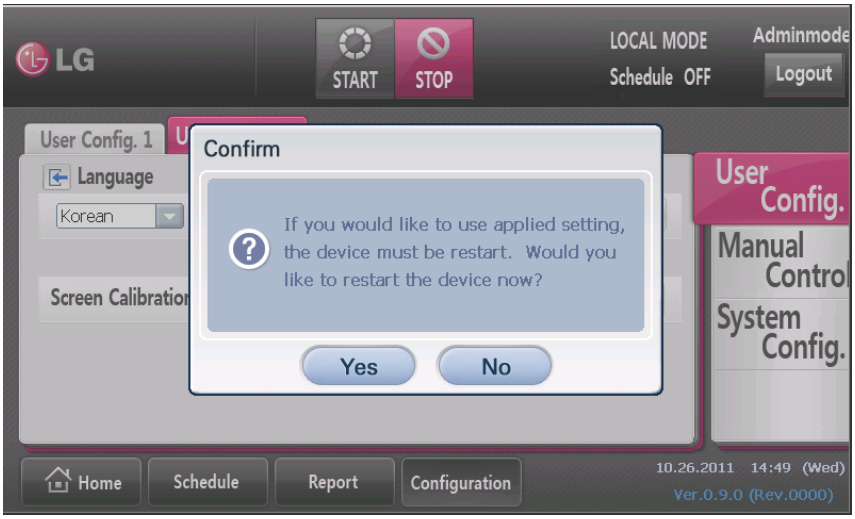


Selecting Language (It is currently fixed as English.)
HMI supports Korean and English, and it can be set as follows.

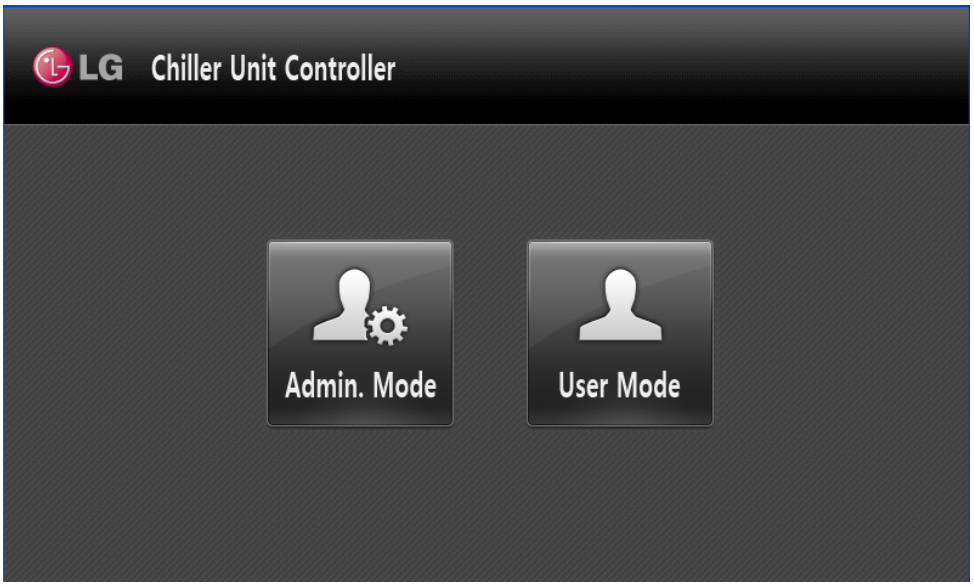
1) Pressing Set button will generate Language Selection Screen as follows.



2) Select a language to use, and pressing Apply button will generate notification window as follows.



3) When the system is rebooted, you will be able to see HMI with selected language applied.



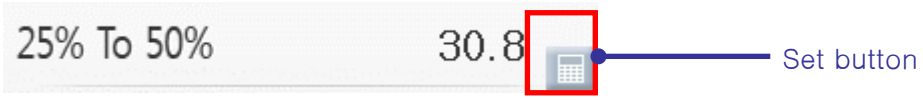
Delay Setting

Setting System Config.3 screen

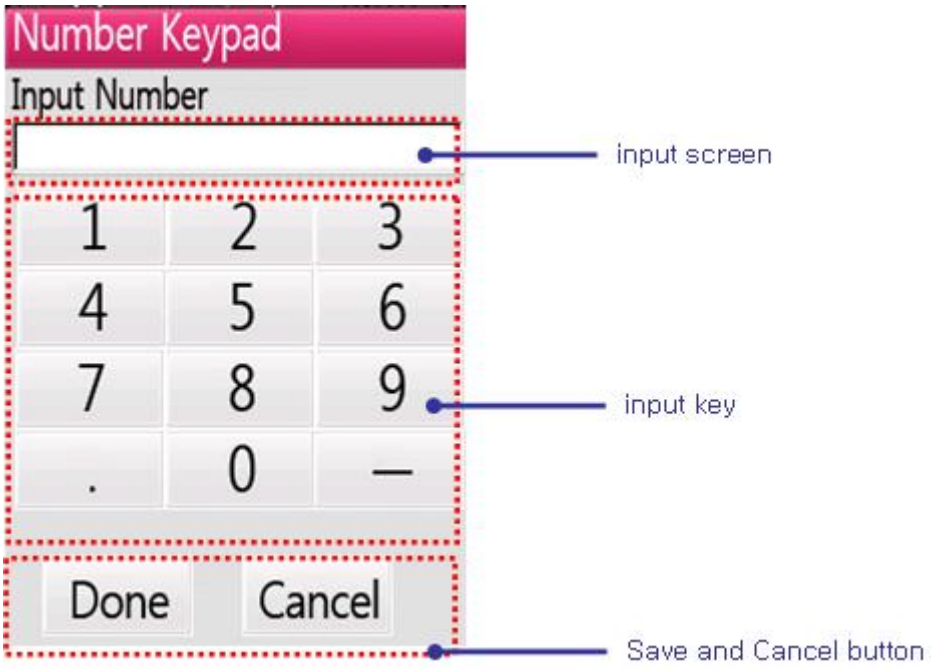
The methods to change each set value in System Config.3 screen are as follows.

Setting 25% To 50%

1) Press Set button as follows to set 25% To 50% delay time.



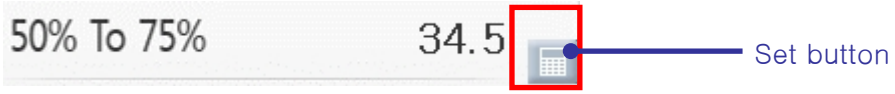
2) If you press Set button, input screen to set as follows appears.



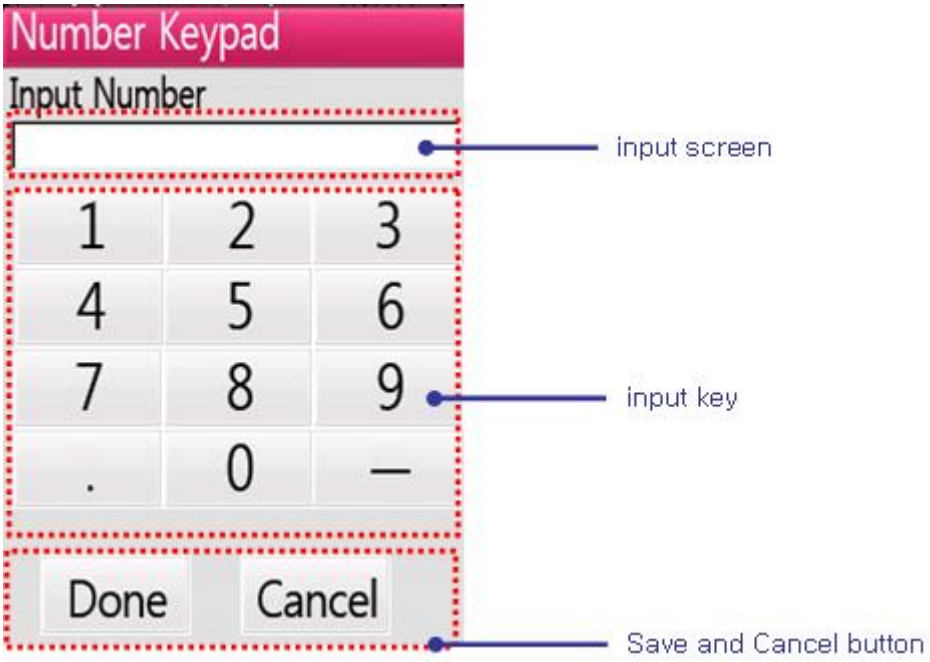
3) The boundary of delay time is 30s~600s. Default value is 30s.
4) If you press a value exceeding the input boundary, the following warning window appears.

Setting 50% To 75%

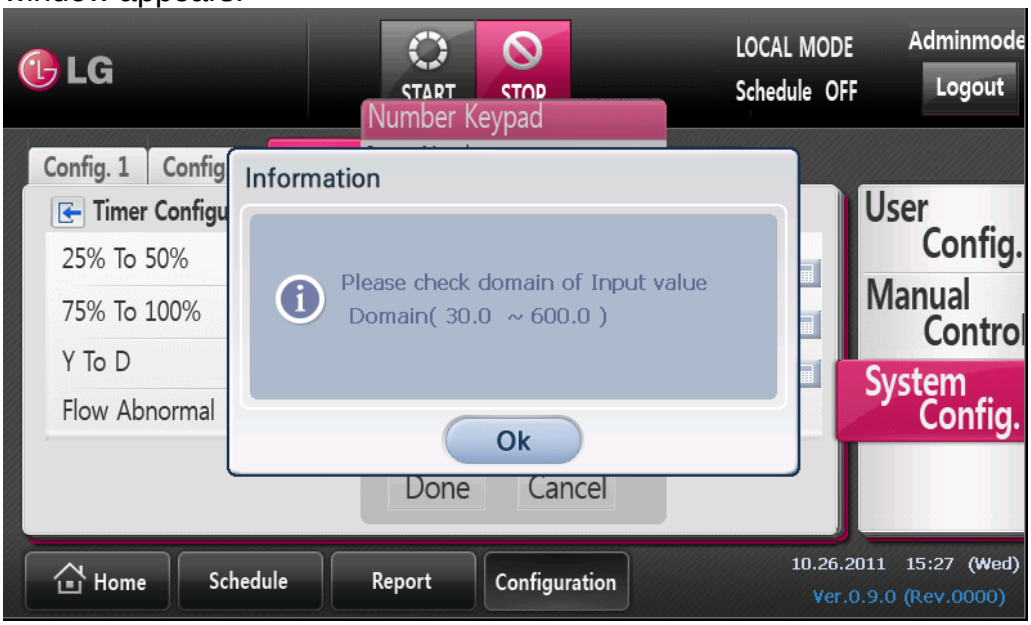
1) Press Set button as follows to set 50% To 75% delay time.



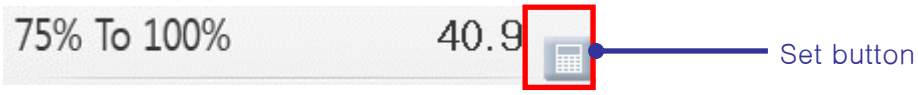
2) If you press Set button, input screen to set as follows appears.



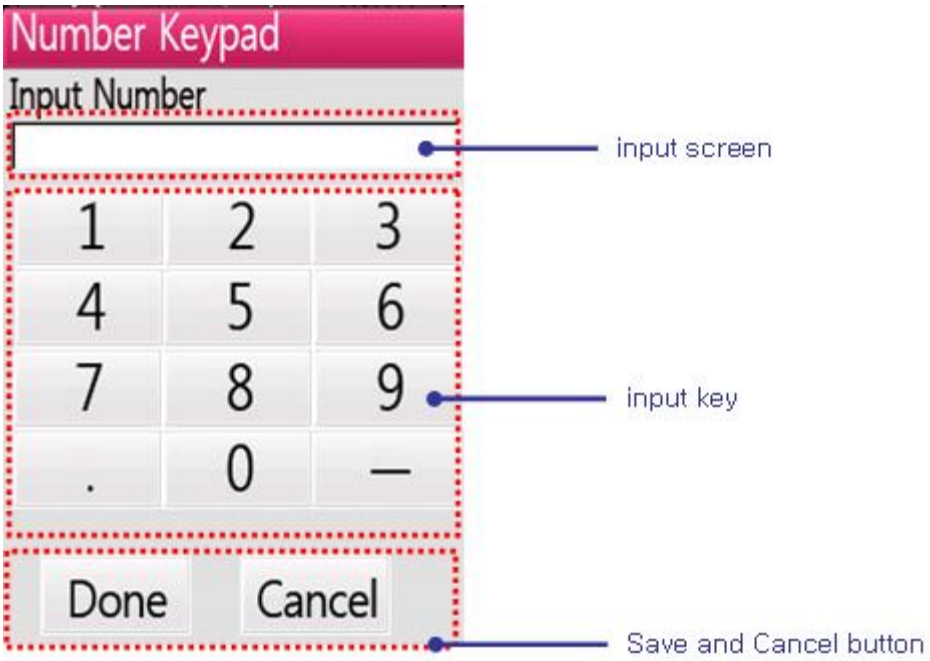
3) The boundary of delay time is 30s~600s. Default value is 60s.
4) If you press a value exceeding the input boundary, the following warning window appears.



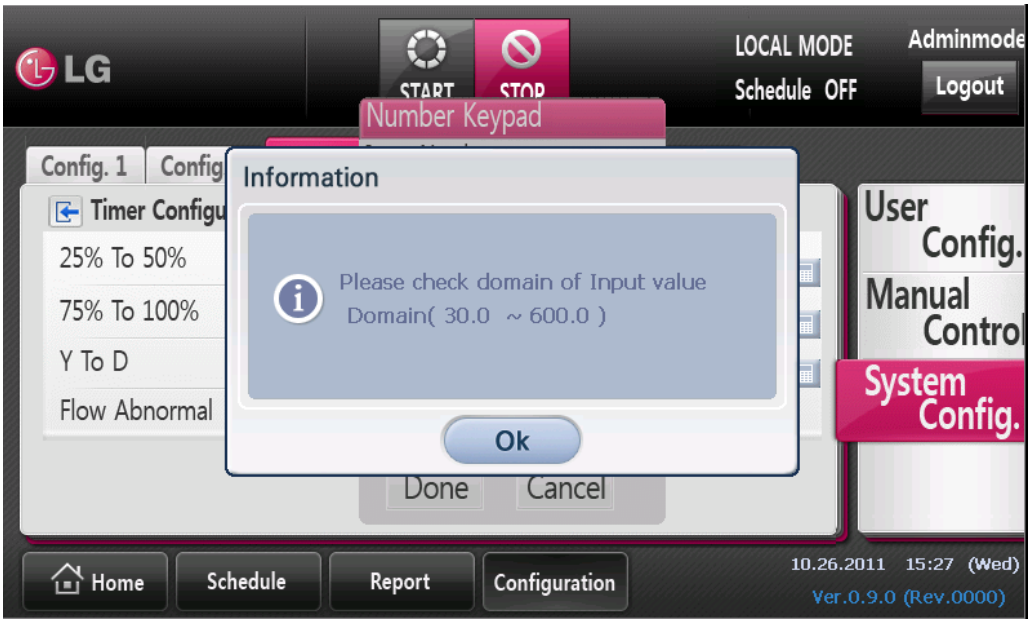
Setting 75% To 100%
1) Press Set button as follows to set 75% To 100% delay time.



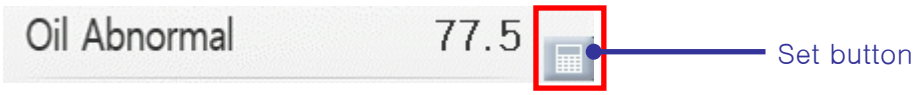
2) If you press Set button, input screen to set as follows appears.



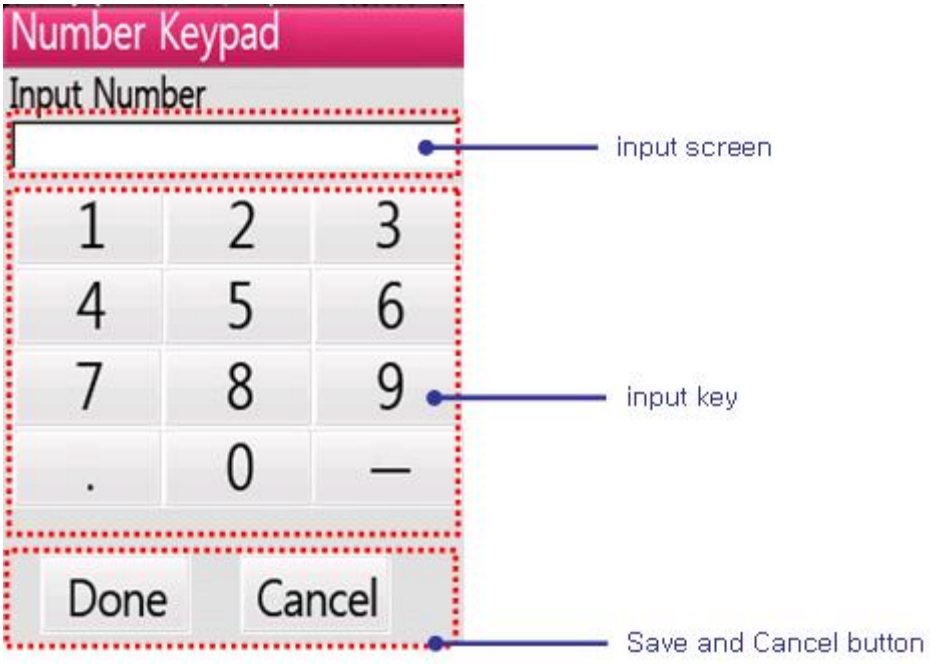
3) The boundary of delay time is 30s~600s. Default value is 60s.
4) If you press a value exceeding the input boundary, the following warning window appears.



Setting Oil Abnormal
1) Press Set button as follows to set Oil Abnormal delay time.

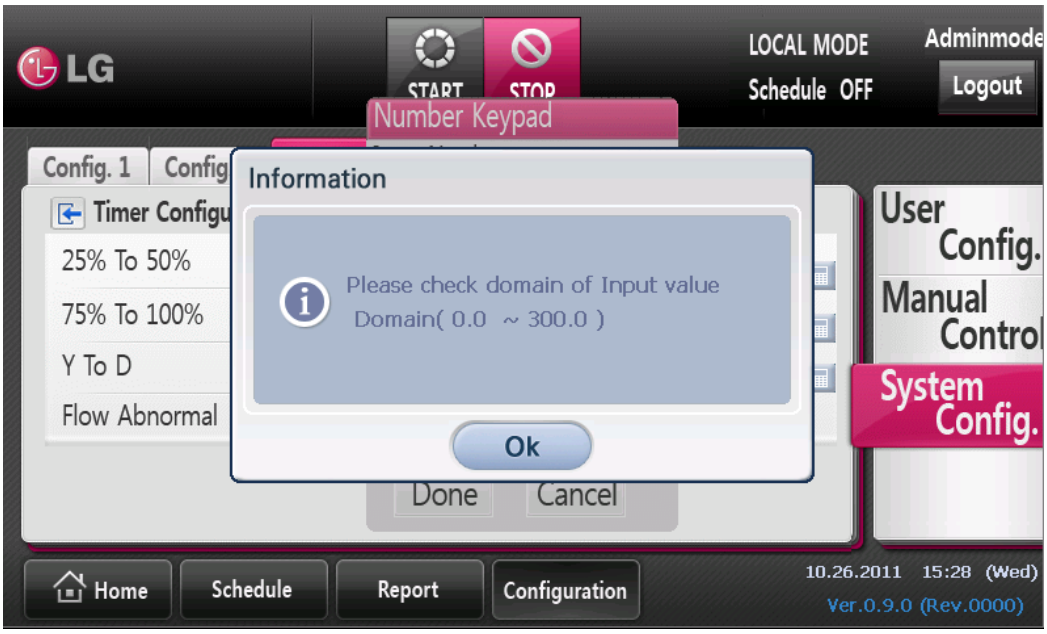


2) If you press Set button, input screen to set as follows appears.



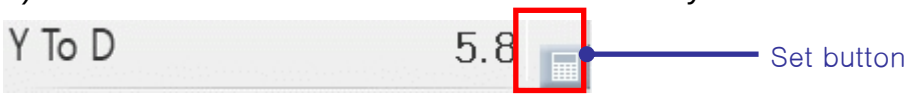
3) The boundary of delay time is 0s~300s. Default value is 80s.

4) If you press a value exceeding the input boundary, the following warning window appears.

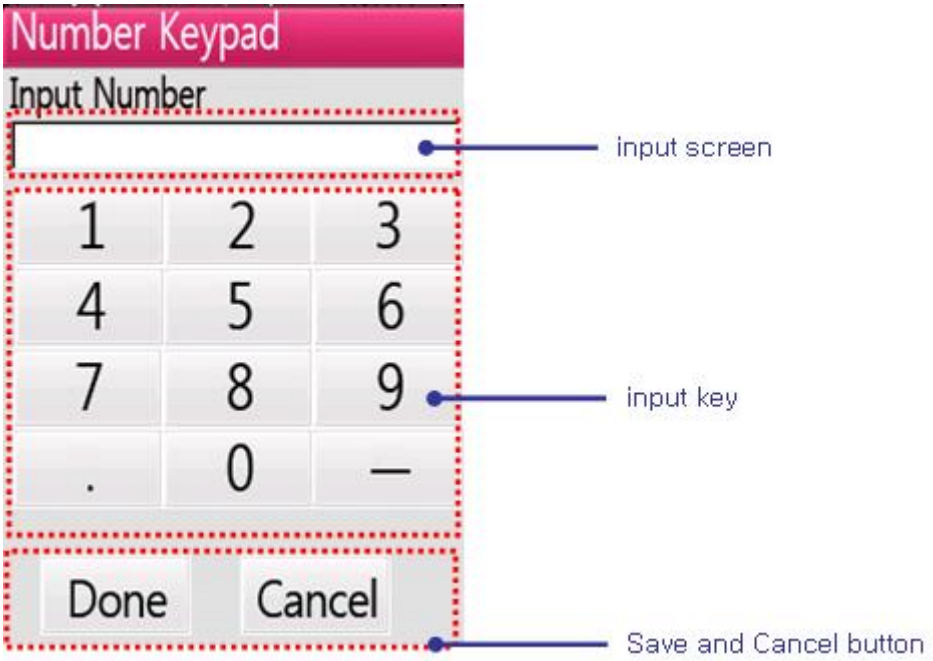


Setting Y To D

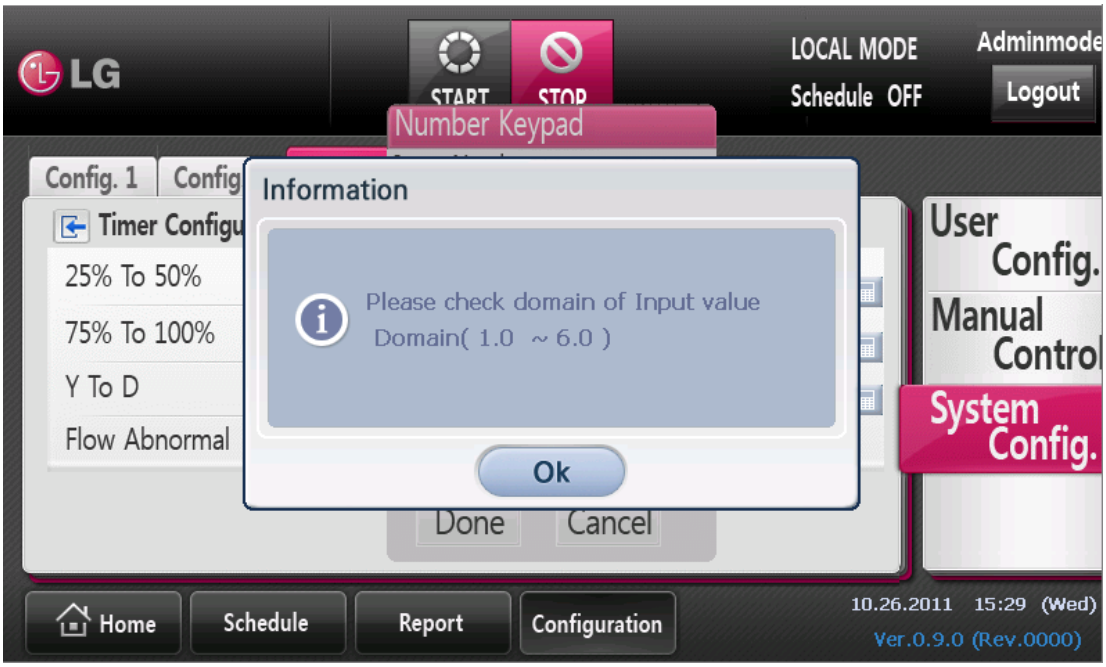
1) Press Set button as follows to set Y To D delay time.



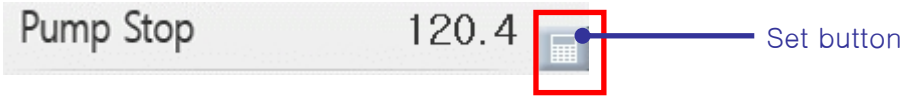
2) If you press Set button, input screen to set as follows appears.



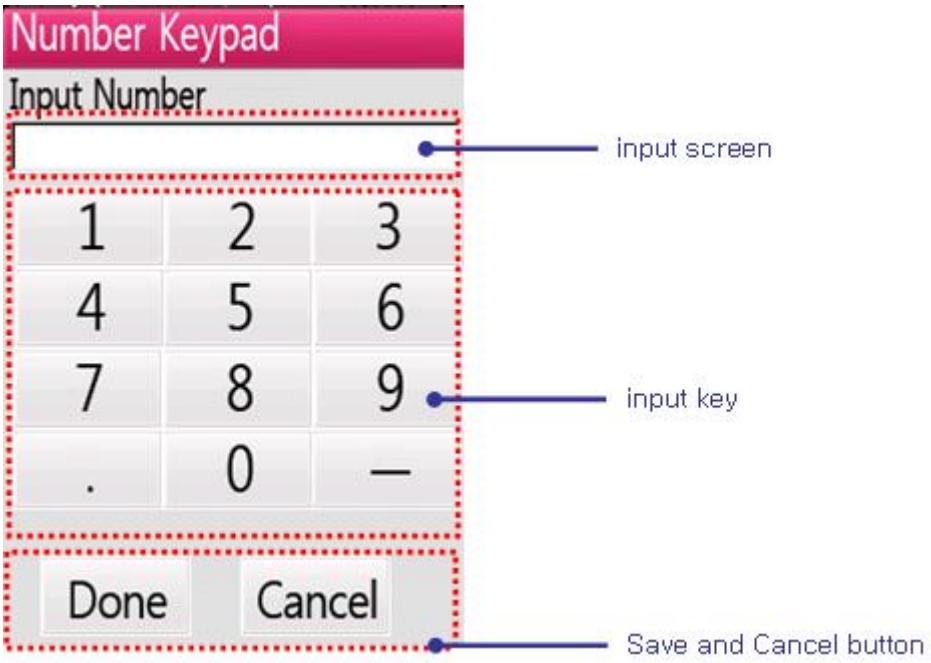
3) The boundary of delay time is 1s~6s. Default value is 4s.
4) If you press a value exceeding the input boundary, the following warning window appears.



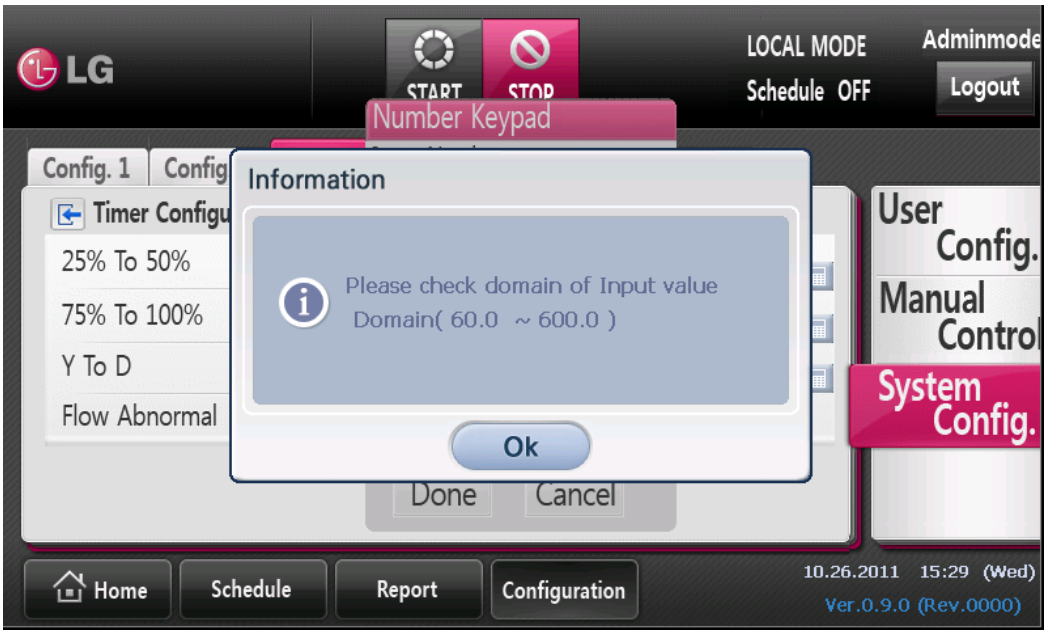
Setting Pump Stop
1) Press Set button as follows to set Pump Stop delay time.



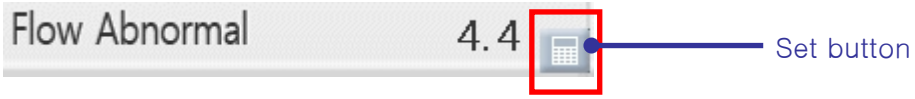
2) If you press Set button, input screen to set as follows appears.



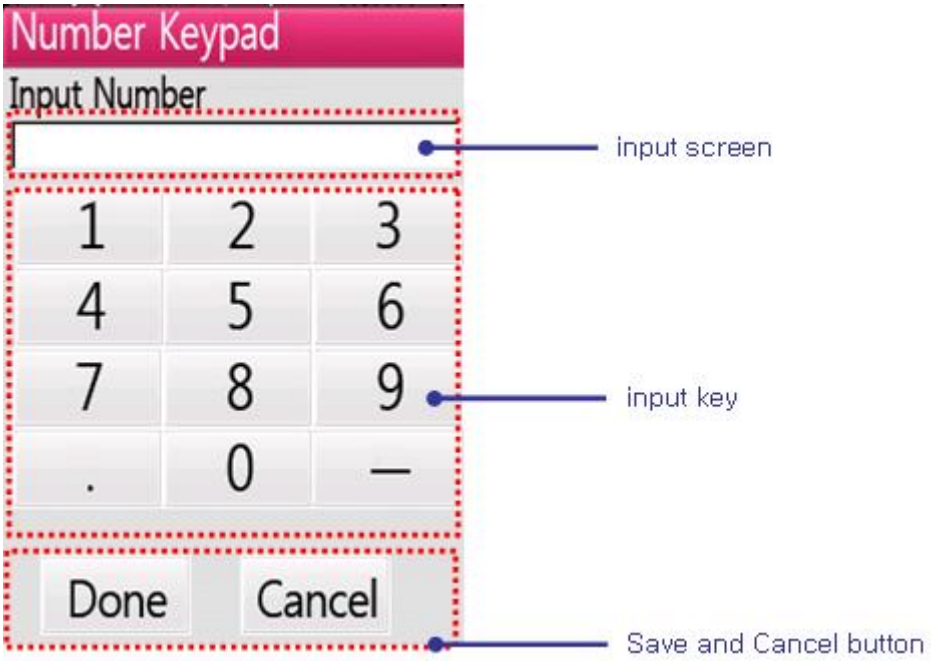
3) The boundary of delay time is 60s~600s. Default value is 180s.
4) If you press a value exceeding the input boundary, the following warning window appears.



Setting Flow Abnormal
1) Press Set button as follows to set Flow Abnormal delay time.



2) If you press Set button, input screen to set as follows appears.



3) The boundary of delay time is 0s~15s. Default value is 5s.
4) If you press a value exceeding the input boundary, the following warning window appears.

START-UP

■ Pre Start-Up

Do not attempt to start the chiller until the following checks have been completed.

• Check auxiliary facilities, such as the chilled water circulating pump, air-handling equipment, or other equipments to which the chiller supplies liquid are operational. Consult manufacturer's instructions. If the unit has field-installed accessories, be sure all are properly installed and wired correctly. Refer to unit wiring diagrams.

• Open compressor suction and discharge shutoff valves.

• Open liquid line, oil line, and economizer service valves.

• Fill the chiller fluid circuit with clean water (with recommended inhibitor added) or other non-corrosive fluid to be cooled. Bleed all air out of high points of system. An air vent is included with the cooler. If outdoor temperatures are expected to be below 32°F(0°C), sufficient inhibited propylene glycol or other suitable corrosion inhibited antifreeze should be added to the chiller water circuit to prevent possible freeze-up. The chilled water loop must be cleaned before the unit is connected.

• Check and inspect all water piping. Make sure flow direction is correct and that piping is made to the correct connection on evaporator and condenser. Open all water flow valves to the evaporator.

• Turn on the chilled water pump manually, measure the water pressure drop across the evaporator, and check that water flow is correct per the design flow rates.

• Check all electrical connections in control panel to be sure they are tight and provide good electrical contact. Connections are tightened at the factory, but can loosen enough in shipment to cause a malfunction.

• Check the actual line voltage to the unit to make sure it is the same as called for on the compressor nameplate, within + 10%, and that phase voltage unbalance does not exceed 5%. Verify that adequate power supply and capacity is available to handle load.

To determine percent voltage imbalance: The maximum voltage deviation is the largest difference between a voltage measurement across 2 legs and the average across all 3 legs.

• Verify power supply phase sequence. Fan motors are 3 phase. Check rotation of fans by using the quick test. Fan rotation is counterclockwise as viewed from top of unit. If fan is not turning counterclockwise, reverse 2 of the power wires at the main terminal block.

• Oil separator heaters must be firmly seated under the oil separator, and must be energized for 24 hours prior to start-up. The oil separator should be warm to touch.

• If wind velocity is expected to be greater than 8 km/h wind baffles and brackets must be field-fabricated.

■ Start-Up Procedure

Do not manually operate contactors. Serious damage to the machine may result. The following procedure should be followed.

• Be sure that water side load such as air-handling equipment, or other equipment to which the chiller supplies liquid are working. Starting of the water side load equipments can be delayed if the chilled water temperature is too high.

• Be sure that water circulating pump is operating if not on automatic control from the chiller.

• Check and inspect all fuses. All fuses inside of the power panel and control panel should be properly located and maintained.

• Switch on the unit circuit breaker and switch on the start switch installed on the door of control panel.

• Check and inspect the status of the LEDs of the CONTROLLER (Programmable Logic Controller) and the HMI (Haman Machine Interface) unit. The HMI unit should display welcome screen after switching on.

• Check and inspect the voltage monitoring relay inside of the power panel. The relay should not indicate any fault code.

• Using the HMI unit, configure chilled water leaving temperature setpoint.

• Start the system by setting the unit start menu on HMI Unit.

• After running the unit for a short time, check the oil level in each compressor, rotation of condenser fans and check for flashing in the refrigerant sight glass.

• Ambient temperature during unit operating must be within50°F ~ 129.2°F(10°C ~ 54°C).

• To obtain proper temperature control, water loop volume must be within allowable range of the volume. After the above procedure, allow unit to operate and confirm that everything is functional properly. Check to see that chilled water leaving temperature agrees with the setpoint. Additionally, check all sensors to have valid reading values through the HMI unit. The CONTROLLER uses 5 thermistors to sense temperatures and the thermistors include: Ambient, Condenser Refrigerant Leaving, Compressor Discharge, Chilled Water Entering, and Chilled Water Leaving.

■ Operation Limits

Temperature

Temperature
Temperature limits during the operation of the unit are as follows.
Maximum ambient temperature: 129.2°F(54°C)
Minimum ambient temperature: 41°F(5°C)
Maximum outlet water temperature: 59°F(15°C)
Minimum outlet water temperature: 41°F(5°C)

- Temperature of inlet water must not exceed 68°F(20°C) during continuous operation.

Voltage

Permitted maximum voltage and minimum voltage are displayed on PDB. And if you need other electric data, please refer to PDB.
When using the 3 phase voltage, never operate the motor of the compressor when the imbalance among the phases exceed 5%
The formula to calculate the voltage imbalance is as follows.
% Voltage Imbalance = 100 x (Max Voltage from average voltage / Average Voltage)
Max Voltage from average voltage is the absolute value of the maximum gap from the average voltage of the 2 phases.

Example)
Voltage source 400-3phase (1, 2, 3)-50Hz
12: 405V / 23: 394V / 31: 410V
Average voltage: (405 + 394 + 410) / 3 = 403
Difference between average voltage and each voltage:
Average – 12 = |403 – 405| = 2V
Average – 23 = |403 – 394| = 9V
Average – 31 = |403 – 410| = 7V
Maximum voltage compared to average voltage: 9V
% Voltage imbalance: 100 x (9 / 403) = 2.23%
Because the permitted range of the imbalance the voltage is less than 5%, the device can operate.

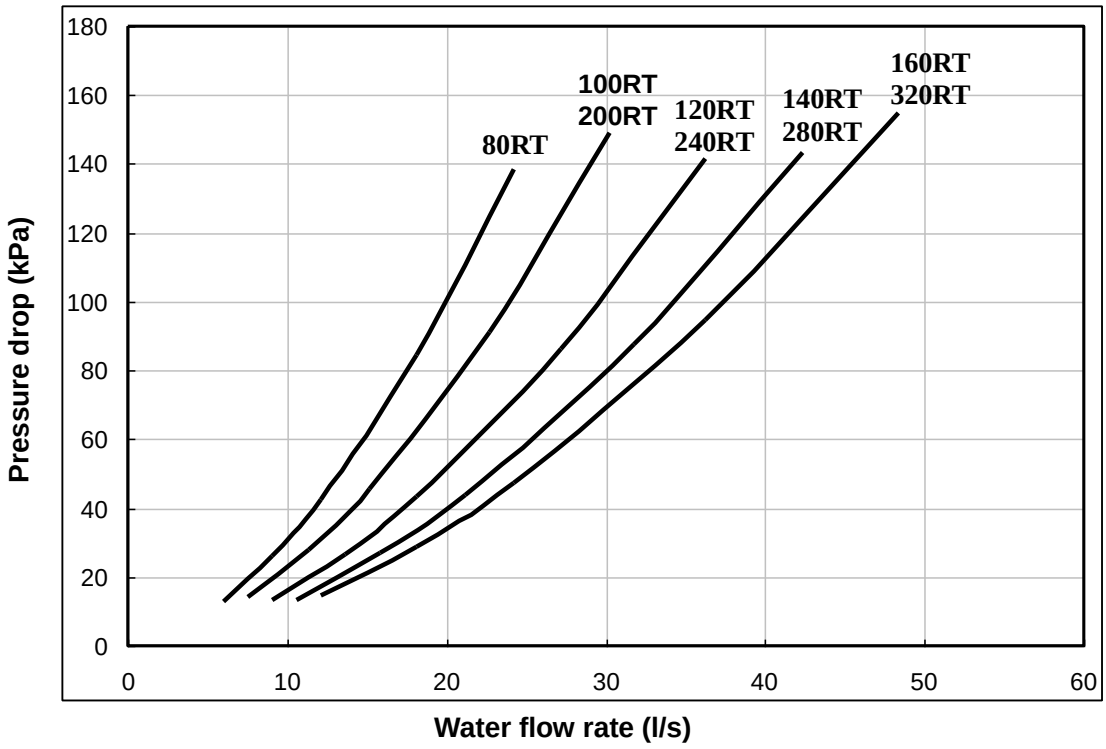
Flow Rate

The basic flow rate of the chiller must follow the values of the table showing the maximum, minimum and designed flow rate.
Higher or lower flow rates are permitted to make the lower or higher temperature rise.
In order to assure appropriate heat exchange and turbulent flow inside the evaporator, the flow rate must exceed the Minimum flow rate.

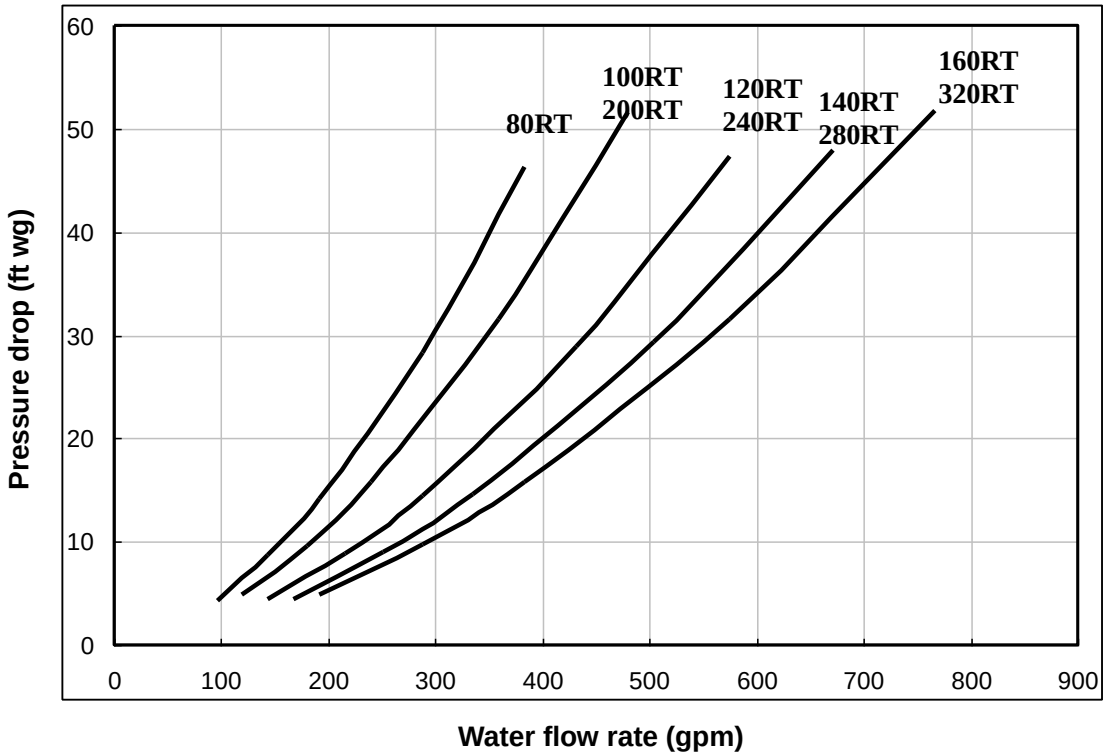
Model		Minimum		Nominal		Maximum	
		gpm	l/s	gpm	l/s	gpm	l/s
50Hz	MCAW008AA11	92.3	5.8	184.6	11.6	369.1	23.3
	MCAW010AA11	118.3	7.5	236.6	14.9	473.2	29.9
	MCAW012AA11	140.2	8.8	280.3	17.7	560.6	35.4
	MCAW014AA11	163.7	10.3	327.5	20.7	654.9	41.3
	MCAW016AA11	187.8	11.9	375.6	23.7	751.3	47.4
	MCAW020AA21	236.6	14.9	473.2	29.9	946.5	59.7
	MCAW024AA21	280.3	17.7	560.6	35.4	1121.2	70.7
	MCAW028AA21	327.5	20.7	654.9	41.3	1309.8	82.6
	MCAW032AA21	375.6	23.7	751.3	47.4	1502.6	94.8
60Hz	MCAW008AA11	88.5	5.6	176.9	11.2	353.8	22.3
	MCAW010AA11	112.5	7.1	225.0	14.2	449.9	28.4
	MCAW012AA11	142.3	9.0	284.6	18.0	569.2	35.9
	MCAW014AA11	168.6	10.6	337.2	21.3	674.4	42.6
	MCAW016AA11	185.1	11.7	370.1	23.4	740.2	46.7
	MCAW020AA21	225.0	14.2	449.9	28.4	899.9	56.8
	MCAW024AA21	284.6	18.0	569.2	35.9	1138.4	71.8
	MCAW028AA21	337.2	21.3	674.4	42.6	1348.8	85.1
	MCAW032AA21	370.1	23.4	740.2	46.7	1480.5	93.4

■ Pressure Drop

Chilled water pressure drop (SI Unit)



Chilled water pressure drop (English Unit)

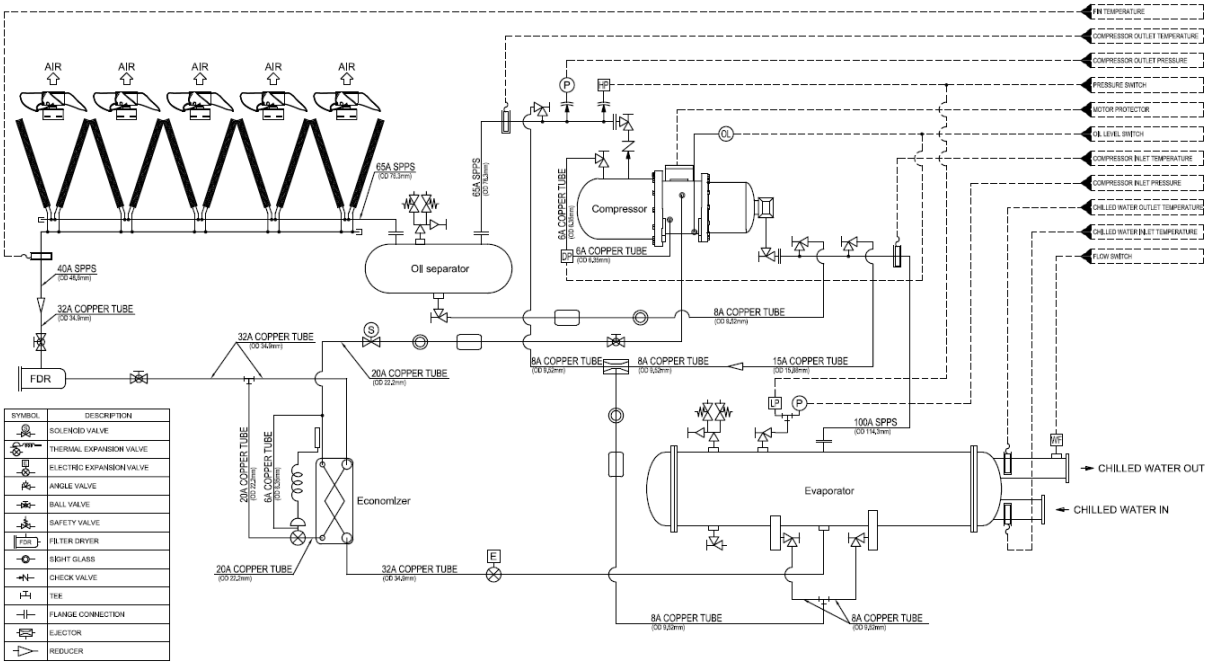


Note: For flow out of this range, consult LG.

SERVICE

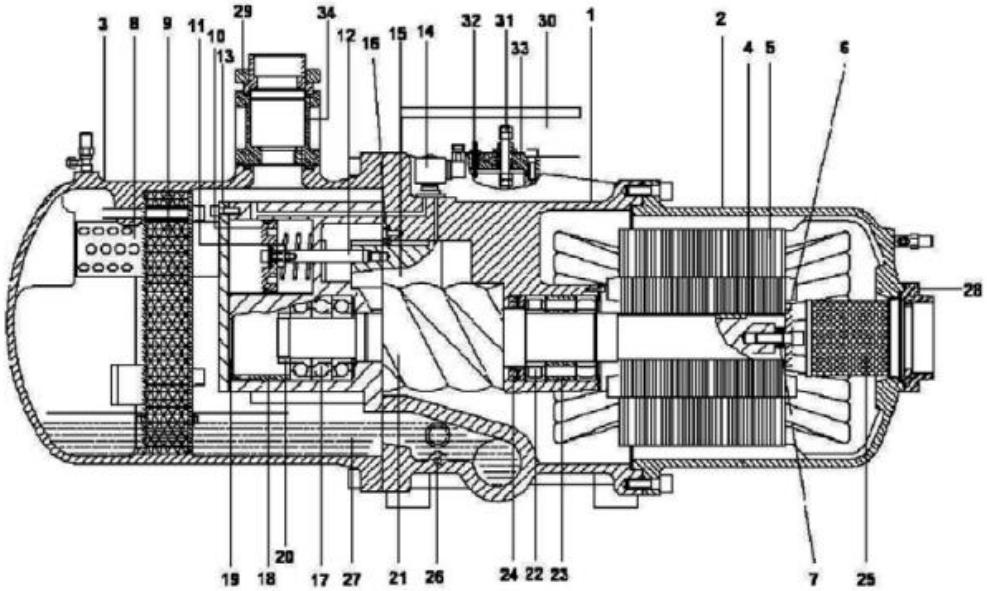
■ Cycle Components

The structure of the air-cooled cooling cycle is shown in the below.



Compressor

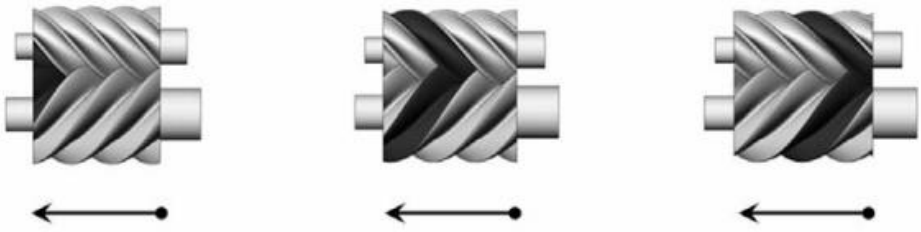
The unit is equipped with semi-hermetic screw compressor developed especially for applications in air-conditioning. The construction of the compressor is shown in the below.



Number	Description	Number	Description
1	Compressor casing	18	Discharge fixed ring
2	Motor casing	19	Disc spring
3	Oil separator	20	Bearing lock nut
4	Motor rotor assembly	21	Male rotor
5	Motor stator assembly	22	Suction bearings
6	Motor rotor washer	23	Suction bearings inner/outer spacer ring
7	Motor rotor spacer ring	24	Oil guiding ring
8	Oil separator baffle	25	Suction filter
9	Oil separator cartridge	26	Oil heater
10	Piston	27	Refrigeration Lubricant
11	Piston spring	28	Suction flange
12	Piston rod	29	Discharge flange
13	Bearing seatÅfs cover plate	30	Cable box
14	Modulation solenoid valve	31	Power bolt
15	Modulation slide valve	32	Thermostat terminals
16	Slide valve key	33	Motor cable cover plate
17	Discharge bearings	34	Discharge check valve

As shown in the below, during rotation of the rotors the meshing shifts from the suction side to the discharge side. The meshing rotors enclose a working space, which is continuously reduced as it moves in the axial direction. This causes a V-shaped lobe space to form between each of the male and female lobes. This lobe space increases to a maximum size (suction and sealing process). As the rotors rotate further, the new meshing on the suction side closes the V-shaped lobe space. The lobe space is then constantly reduced by continuing intermeshing of the lobes (compression process).

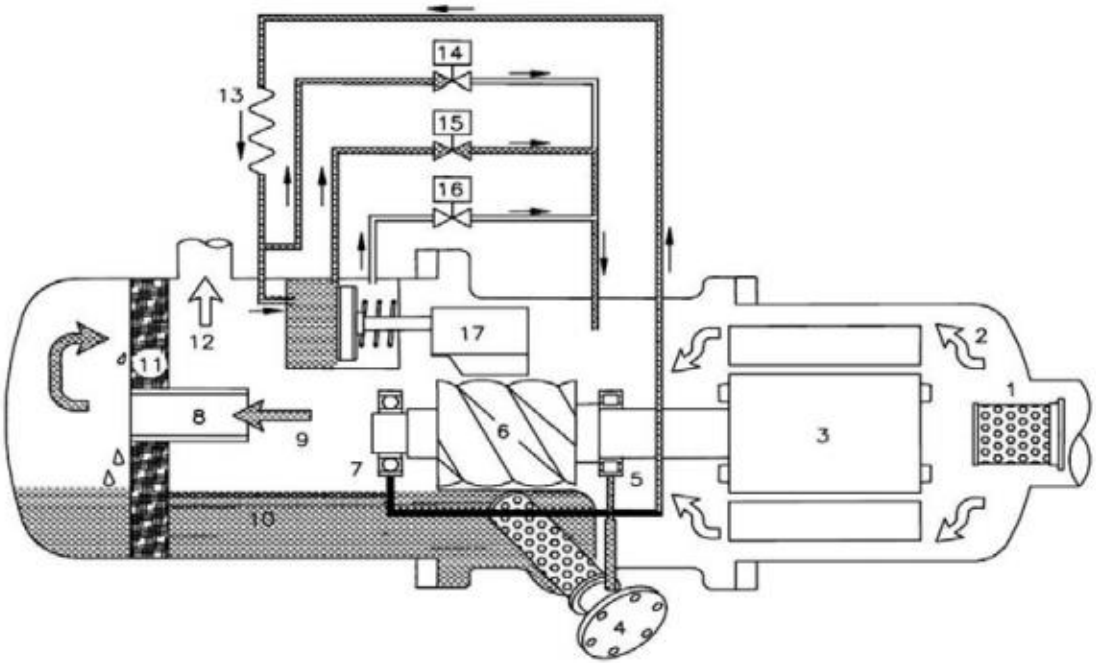
The reduction in lobe space takes place on the lower side of the rotors towards the discharge side. The volume is steadily reduced and it is thereby compressed in the sealed condition. As soon as the peaks of the rotor teeth are free to the outlet port, the vapor is discharge to the high-pressure side and flows to the oil separator where the high-pressure gas will be separated from the lubrication oil. The size and geometry of the discharge port determine the so called “internal volume ratio (Vi)” of the compressor. This ratio must have a defined relation-ship to operating pressure ratio to avoid losses in efficiency due to under or over compression.



(C) Discharge **(B) Compression** **(A) Suction and sealing**

The screw compressor is equipped with 4-step capacity control system. The capacity control system is consisting of a modulation slide valve, piston rod, cylinder, piston and piston rings. The slide valve and the piston are connected by a piston rod. The principle of operation is using the oil pressure to drive the piston in the cylinder. The positive pressure differential causes the piston to move toward the right side in the cylinder. When the slide valve moves toward the right side, the effective compression volume in the compression chamber increases.

This means the displacement of refrigerant gas also increases, as a result the refrigeration capacity also increases. However, when any of the step solenoid valve is energized, the high pressure oil in the piston cylinder bypasses to the suction port causing the piston and the slide valve to moved toward the left side, then some of the refrigerant gas by pass from the compression chamber back to the suction end. As a result, the refrigeration capacity decreases because of the reduction of displacement of refrigerant gas flowing in the system. The piston spring is used to push the piston back to its original position, i.e. minimum load position in order to reduce the starting current for the next starting-up. If the compressor started at full load capacity it may result in over current start. The capillary is used to maintain and restrain a suitable amount of oil flow into the cylinder. If the oil filter cartridge, capillary, or modulation solenoid valves are not working well in the capacity control system, this may result in the abnormality and ineffectiveness of the capacity control system.



The main functions of the lubrication oil in the screw compressor are lubrication, internal sealing, cooling and capacity control. The positive oil pressure in the cylinder pushes the piston and the slide valve that is connected by a piston rod to move forward and backward in the compression chamber. The design with positive pressure differential lubrication system in the screw compressor is available to omit an extra oil pump in the compressor like reciprocating compressor. However, in some special applications, it is still necessary to install an extra oil pump to the compressor for safety.

The bearings used in the compressor required a small but steady quantity of oil for lubrication; the oil injection into the compression chamber creates an oil sealing film in the compression housing for increasing the efficiency and absorbing a part of heat of compression. In order to separate the oil from the mixed refrigerant gas, an oil separator is required to ensure the least amount of oil carried into the system. Pay more attention to the oil temperature, which has a very significant factor to the compressor bearings' life. High oil temperature will reduce the oil viscosity and cause the poor lubrication and heat absorption in the compressor as well. The oil viscosity is recommended to keep over $10mm^2$ / s at any temperature. The oil temperature just keeps above system condensing temperature to avoid the refrigerant migration into system in the summer. There is high oil viscosity in the low ambient temperature circumstance, it could cause compressor in heavy duty to be started up resulting less oil pressure in oil line to load the compressor. The better solution is to have higher condensing temperature in a short time by warming up the oil.

The compressor is equipped two oil sight glasses as a standard, one is the oil high level sight glass, and the other is the oil low level sight glass. The normal oil level in the compressor oil tank should be maintained above the top of the low oil sight glass and in the middle level of high oil sight glass when compressor is running.

Condenser

■ Maintenance and cleaning of condenser coil

Periodically cleaning the surface of the coil is essential in maintaining the normal operation of the unit. By removing any contaminant or hazardous substance on the coil, you can extend the life of the coil and the unit. The following maintenance and cleaning method is recommended as part of the periodical maintenance activity to extend the life of the coil.

• **Remove fiber on surface:** Use the vacuum cleaner to clean any fiber or dust on the surface. If you cannot use the vacuum cleaner, use a soft non-metallic brush to clean the surface. When using both methods to clean the surface, clean in the same direction as the pin. Because the pin can bend very easily, you can bend the pin or scratch the protective coating on the surface by applying the cleaning utensil across the pin.

If you use a water hose to clean the coil, be careful as dust or fiber can get inside the coil. Completely remove any fiber or dust on the surface before cleaning it with clean water.

⚠ CAUTION

If you use a water hose to clean the coil, be careful as dust or fiber can get inside the coil. Completely remove any fiber or dust on the surface before cleaning it with clean water.

• **Periodical water cleaning:** Periodically cleaning the pin with water helps the maintenance of the coil installed on the coast or industrial site. But due to the fragility of the installed coil, you must rinse the coil with water at low speed in order to prevent any damage to the coil. It is recommended to clean once every one to two months.

⚠ CAUTION

Never use any type of cleaner such as chemical, bleach, acid or alkali cleaner etc. on the coil. These types of cleaners can accelerate the corrosion of the pin and tube, and make it difficult to rinse with water.

⚠ CAUTION

Never clean the coil using high speed water or pressured air. Doing so can bend the coil and increase the pressure drop on the air side of the condenser. This can result in performance deterioration or cause the product to stop operating.

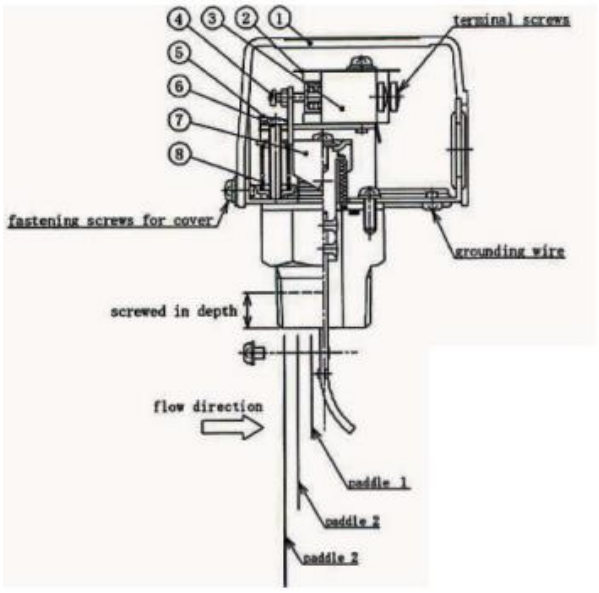
■ Condenser fan

The fan motor and the fan must be fixated firmly on the top plate of the condenser with the metallic bracket. Shroud protects the parts from the fan rotating in high speed. Assembly of the condenser fan is as shown in the picture as follows. Apply the grease on the exposed part of the motor to protect it from the rain. You have to apply the grease again on the fan axis and then reinstall the Shroud. Also there is an axis support on the fan axis of the fan motor, which must be inserted accurately at this location for maximum performance of the fan motor. And then the bolt must be firmly tightened.

Cooler

■ Flow switch

Flow Switch is installed on the water outlet nozzle for all units as factory setting. The following pictures show the Flow Switch in generally installed method.



No.	parts name	Qty
①	cover	1
②	insulation plate	1
③	microswitch	1
④	adjusting screw	1
⑤	metal fitting for flow adjusting screw	1
⑥	flow adjusting screw	1
⑦	actuating plate	1
⑧	adjusting spring	1

Table 17

Refrigerant Cycle

■ Leakage test

As described in the installation manual, the unit is sufficiently charged with R134a refrigerant as factory setting. If the refrigerant pressure is lower than the factory setting, you must check for leakage. If the pressure inside the unit has dropped, use the Nitrogen to do a leakage test. When repairing the leaking part, you must use good refrigeration practice. After the leakage is repaired, any water inside the chiller must be removed and vacuumed.

■ Charging / Remove the refrigerant

Connect coupling to the refrigerant charging port. In order to avoid the damage to the tube from residual water freezing within the evaporator, circulate the water in the evaporator (EVA) while charging or removing the refrigerant to the designated amount. For the amount of refrigerant to charge, refer to the installation manual or PDB.

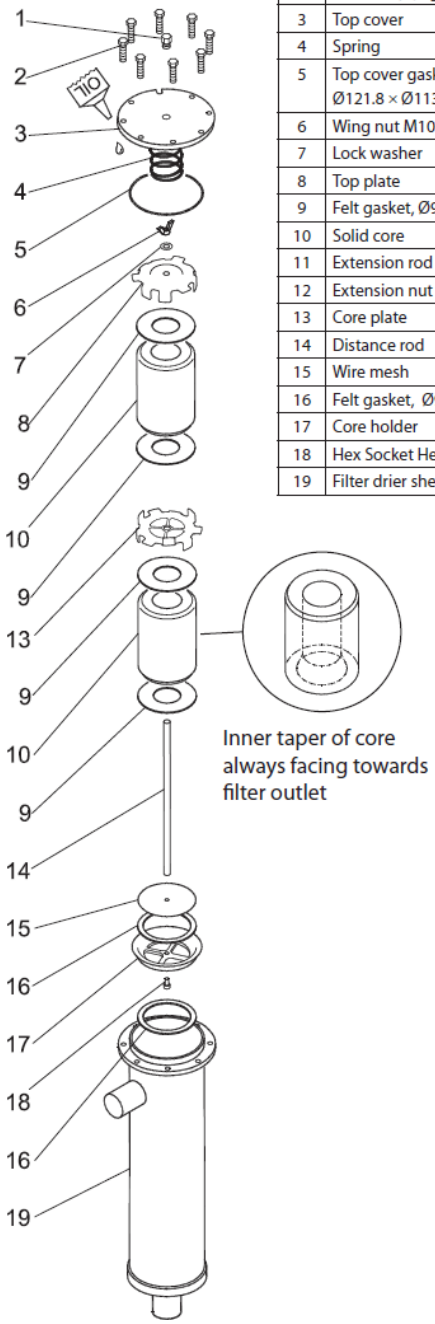
■ Charging / Remove the oil

Connect coupling in the oil port. In order to avoid the damage to the tube from residual water freezing within the evaporator, circulate the water in the evaporator (EVA) while charging or removing oil to the designated amount. Check whether the oil level is above in the Sight Glass window. Remove the coupling and insert the oil port cap. After inserting the oil, operate the product and check whether the oil level is above with the naked eye. If not, supplement the oil.

Refrigerant Cycle

■ Filter Drier

The filter drier is installed on the liquid line from condenser outlet to economizer. Differential pressure between the inlet and outlet of the filter drier must be checked periodically.



Pos.	Description
1	Plug , $^1/_4$ in. NPT
2	Top cover bolts M8 × 35 or M12 × 40, (high pressure)
3	Top cover
4	Spring
5	Top cover gasket Ø121.8 × Ø113.6 × 0.8mm
6	Wing nut M10 (torque max. 3 Nm)
7	Lock washer
8	Top plate
9	Felt gasket, Ø95.5 × Ø45.5 × 2 mm
10	Solid core
11	Extension rod
12	Extension nut
13	Core plate
14	Distance rod
15	Wire mesh
16	Felt gasket, Ø95.5 × Ø78 × 2 mm
17	Core holder
18	Hex Socket Head Screw M6
19	Filter drier shell

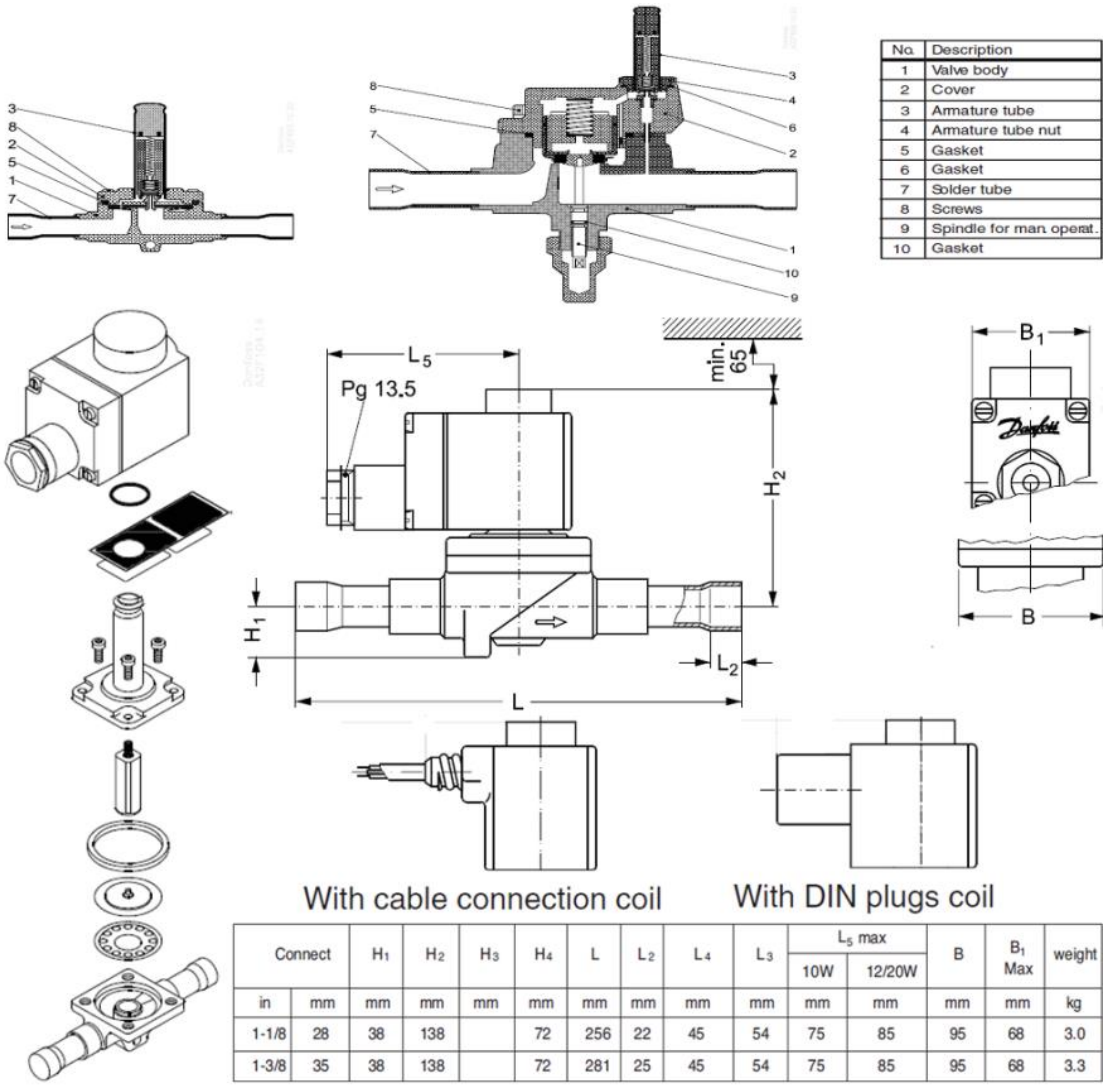
■ Oil Heater

The oil heater prevents poor lubrication due to too low viscosity. The oil heater is also installed on the oil separator. The 150W oil heater has 220VAC power input.

■ Solenoid Valve

One of the Solenoid Valve is installed between the Flash Gas Tank where the oil separator is installed and the other is installed between the oil filter and Flash Gas Tank. Valve on the compressor side is turned on during Full Load operation, and off during other operations. Valve on the oil filter side is turned on when the unit is operating to pass the oil to the compressor, and off when the operation stops to prevent the oil from back flowing.

■



No.	Description
1	Valve body
2	Cover
3	Armature tube
4	Armature tube nut
5	Gasket
6	Gasket
7	Solder tube
8	Screws
9	Spindle for man operat.
10	Gasket

Connect		H_1	H_2	H_3	H_4	L	L_2	L_4	L_3	L_5 max		B	B_1 Max	weight
										10W	12/20W			
in	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
1-1/8	28	38	138		72	256	22	45	54	75	85	95	68	3.0
1-3/8	35	38	138		72	281	25	45	54	75	85	95	68	3.3

■ Control System

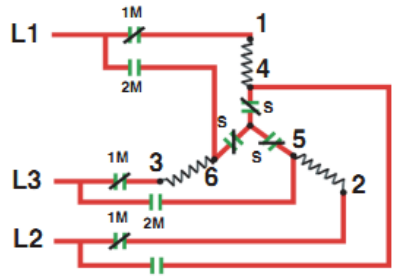
The structures of the power panel and control panel are shown in the below. The power panel in the left is composed of the electrical components related to main power, and the control in the right is composed of low-voltage components such as the CONTROLLER and the HMI unit.

Power Panel

On the left side of the power panel, terminal blocks for main power connection are prepared. The field supplied main power lines and neutral line for control power are connected to these terminal blocks.
There are three magnetic contactors for the wye-delta starting of the compressor and OCR (Over Current Relay) for the compressor. For wye-delta starting, there are three magnetic contactors installed inside of the power panel.

By the wye-delta starter, the starting inrush current is reduced by 1/3 of direct starting method. The line voltage(VL) of the both of wye and delta winding configuration is rate voltate, but the phase voltages(VP) of the wye winding configuration is reduced by 1/3 of the delta winding configuration. Additionally, the line current (IL) is also reduced by 1/3 of the delta winding configuration. Consequently, the current of the wye winding configuration is reduced by 1/3 of delta winding configuration. Using the principle, the compressor starts with the wye winding configuration. And the winding configuration is changed into delta configuration after few seconds for the normal operation of the compressor.

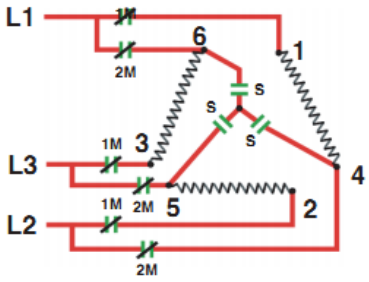
Wye Starting



$$V_P = \frac{V_L}{\sqrt{3}}$$

$$I_L = I_P$$

Delta Running

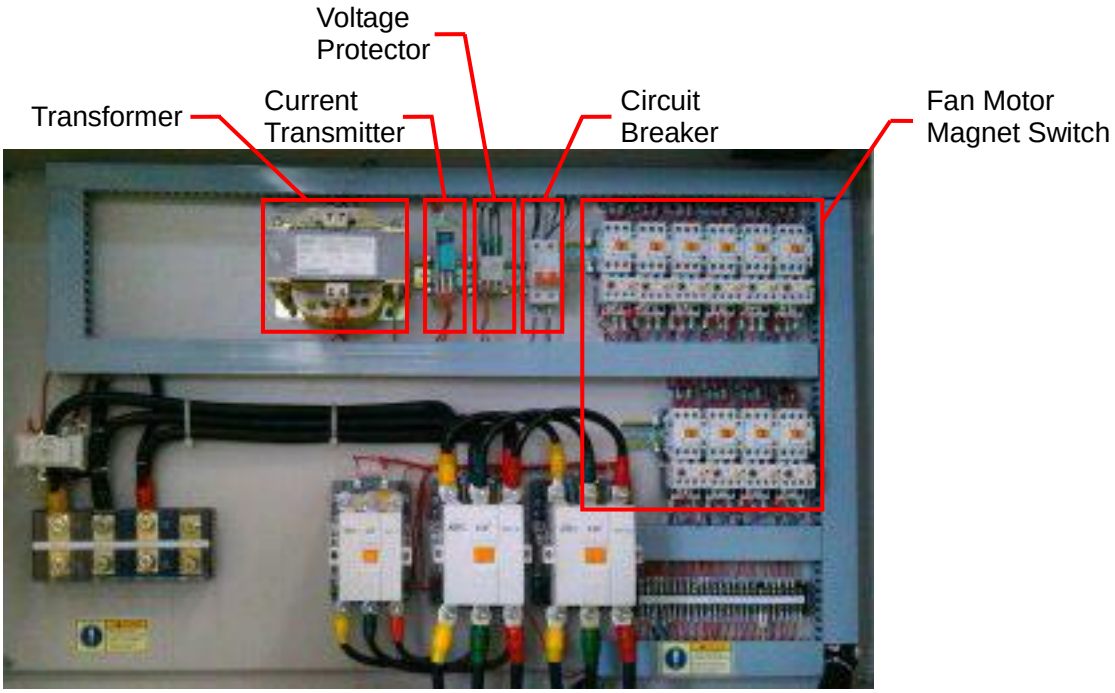


$$V_P = V_L$$

$$I_L = \sqrt{3} \times I_P$$

There is one magnetic contactor for each condenser fan.

On the right bottom side of the power panel, voltage monitoring relay is installed to monitor proper power input. There are three fuses installed for the power input to the voltage monitoring relay. The ventilation fan of the power panel is controlled by the thermostat. If the ambient temperature inside of the power panel is over 95°F(35°C), the ventilation fan runs.



■ Condenser Fan OCR

The condenser fan OCR is also thermal type and used to protect the condenser fan from overload condition. The OCR contact used for the control system is normally closed, and the OCR contact switch is to be opened if it detects excessive current.

The OCR needs manual reset by switch on the OCR to be recovered to normal after tripping. The tripping point ranges and factory settings are shown in the below table.

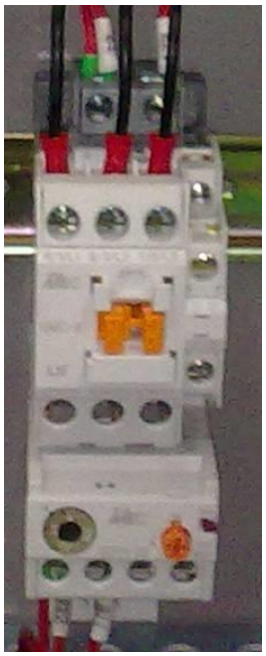
Model	Range(A)	Trip(A)
MCAW Series	2.5~4.0	4.0

■ Compressor Contactor

Compressor Contactor controls the start, stop and static range of the compressor motor when the product is operating.

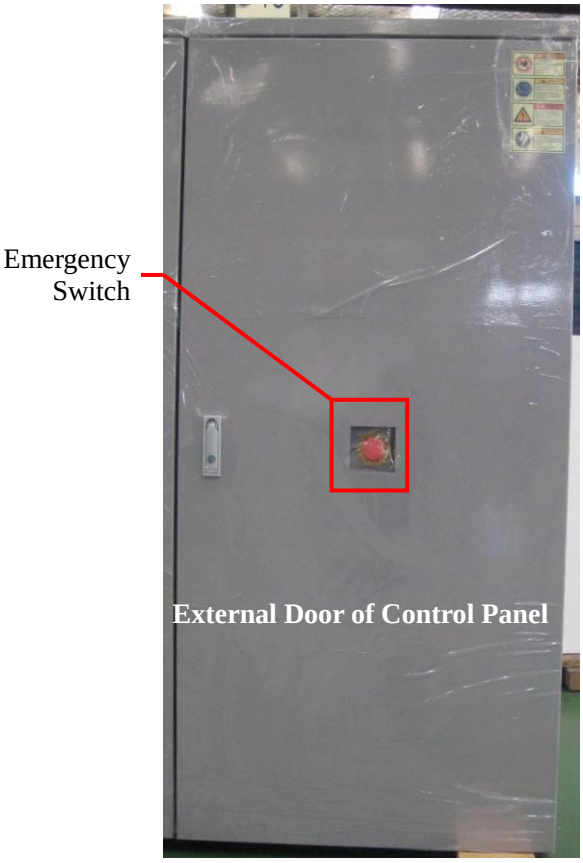
■ Fan Contactor

Fan Contactor controls the start, stop and static range of the fan motor when the product is operating.

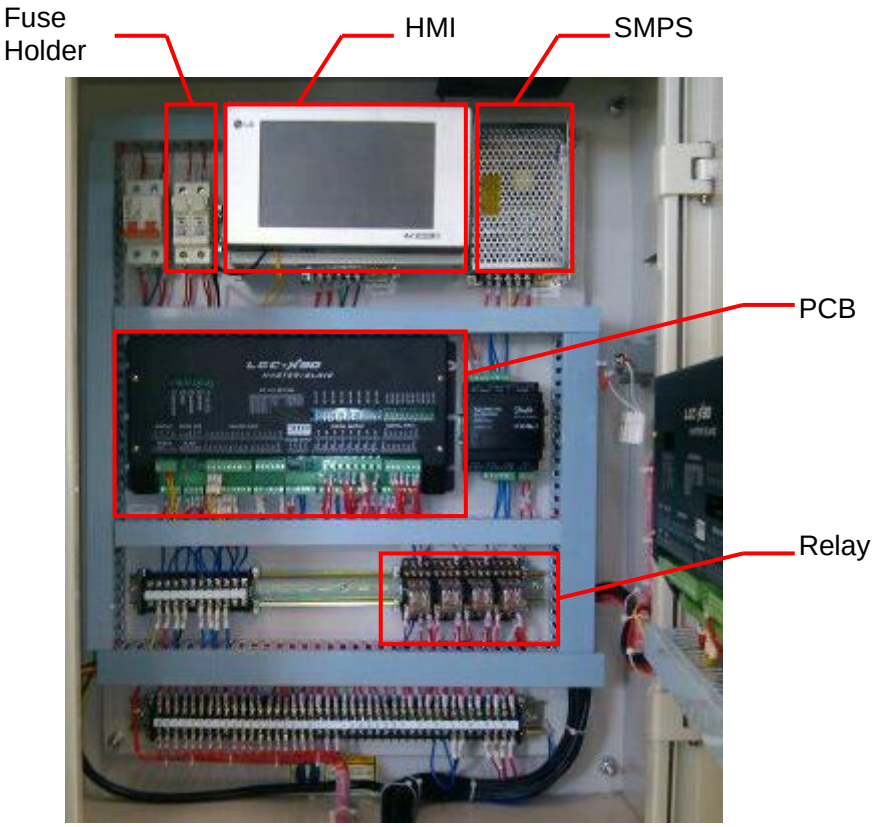


Control Panel

On the external door of the control panel there is emergency switch for the instant cutting out of control outputs from the CONTROLLER. By pushing the emergency switch, the 220VAC power supplied to the CONTROLLER relay outputs are cut out instantly. By turning the switch in clock-wise direction, the power to the output is recovered.



In the control panel, the CONTROLLER is installed as a central control station. The CONTROLLER is assembled with the HMI unit in a black case.



Maintenance

Maintenance Schedule

Check Point	Daily	Monthly	Every 2 Months	Every 3 Months	Every 6 Months	Yearly	Every 2 Years	Every 3 Years	Every 6 Years
	10h	500h	1000	1500	2500	5000	10000	15000	30000
1. Cycle Status	Check								
2. Electrical Components		Check	Check monthly						
3. Safety Switches		Check	Check monthly						
4. Water Loop System		Check		Clean	Check every 6 months				
5. Condenser Cleanness				Check	Check every 6 months Clean if operating pressure of chiller is out of range				
6. Cooling Tower Cleanness				Check	Clean	Clean yearly			
7. Refrigerant System Tightness		Check	Check monthly						
8. Oil Filter			Check	Clean	Check every 6 months Clean if needed				
9. Dryer Filter		Check				Replace	Replace yearly		
10. Oil Level		Check	Check yearly						
11. Oil Color		Check					Replace		
12. Compressor Insulation						Check	Check yearly		
13. Temperature Sensor				Check	Check every 6 months				
14. Compressor Bearing							Check		Check or Replace

TROUBLE SHOOTING

CAUTION

If a stoppage occurs more than once as a result of any of the safety devices, determine and correct the cause before attempting another restart.

General Malfunction

Before specific alarm trouble shooting, general troubles and their possible remedies are introduced. When the unit does not run at all, you have to check power supply to the chiller, refrigerant, configuration, and alarm invocation. For the power supply check, you have to check voltage applied to the terminal block inside of the power panel. If the power is absent, please check power feeder and check whether any protective device is tripped.

When the power is applied properly, refrigerant pressure must be inspected by pressure gauge installed on the chiller, when the pressure is out of range, please check whether any leakage point is by soap bubble test. If there is problem with the configuration of the CONTROLLER or too much delay is configured, the chiller will not start or the start is delayed for long time. Please recover the configuration value to factory setting before starting the chiller. Lastly, alarm invocation has to be checked. You can find whether any alarm is invoked through the HMI unit. Follow specific alarm trouble shooting procedure if any alarm is invoked.

Normally, the compressor of the chiller will cycle according to the chilled water leaving temperature, the compressor shutdown temperature and the compressor restart temperature. But the case where the compressor runs too long without cycling can be encountered. When the refrigerant is not enough, the chiller will operate continuously because the chiller cannot work at 100% power. At this case, the leakage is also to be inspected. When magnetic contactors for the compressor are mechanically welded, the chiller operation will be continued, because the CONTROLLER cannot stop the compressor by control signal even if the compressor must be stopped. When there is no problem with the refrigerant and compressor contactor, Air inside of the water loop can be a cause, because air inside of water loop obstructs thermal exchange. When the problem is revealed, the air must be purged. When there is non-condensables in the refrigerant circuit, remove the refrigerant and recharge.

Even after running condenser fan and chilled water pump, the compressor will not run caused by alarm or trouble with temperature reading. Please follow specific alarm trouble shooting procedure at this case.

Symptom	Possible Cause	Possible Remedy
Unit does not run	Check for power to unit	Check over current protection device Check no-fused disconnect (if equipped) Restore power to unit
	Low refrigerant charge	Check for leak and add refrigerant
	Wrong or incorrect unit configuration	Check unit configuration
	Active alarm	Check Alarm status. See separate alarm trouble shooting procedure and follow trouble shooting instructions Check the PLC input channels also to verify alarm status Input
	Active operating mode	Check fulfillment of oil heating time Check fulfillment of comp start delay time Check chilled water temp out Check water flow
Compressor operates too long continuously	Low refrigerant charge	Check for leak and add refrigerant
	Compressor or control contacts welded	Replace the contactors
	Air in chilled water loop	Purge water loop
	Non-condensables in refrigerant circuit	Remove refrigerant and recharge
Circuit does not run	Active alarm	Check Alarm status. See separate alarm trouble shooting procedure and follow trouble shooting instructions
	Active operating mode	Check for temperature inputs. See operation and control. Check capacity control overrides Check the PLC input channels also to verify alarm status Input

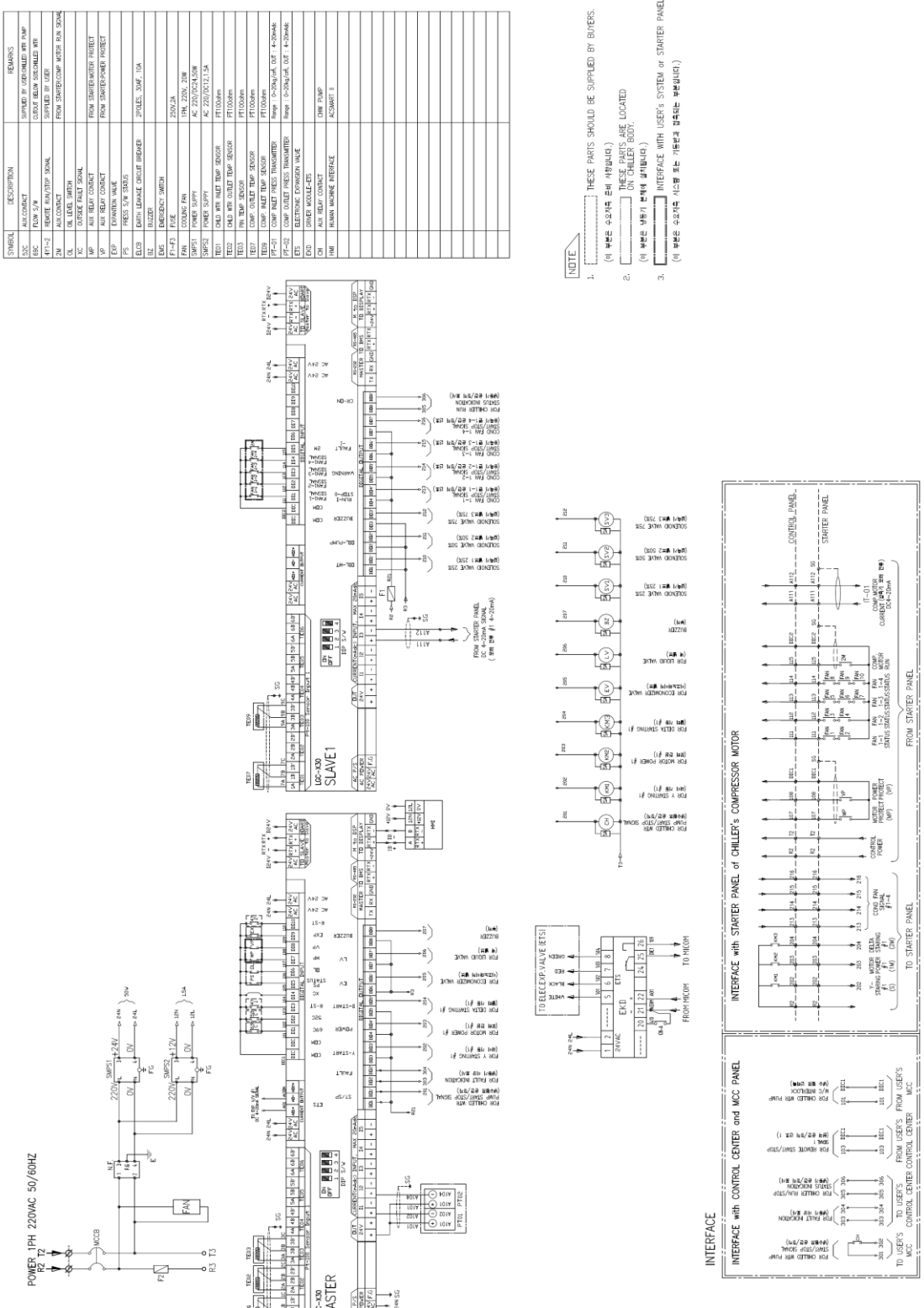
Alarm

Specific alarms, their recognition method, and their possible causes are listed here. To clear alarm and recover from the alarm, clear the alarm history after correction of the cause of the alarm.

The emergency trouble means that the emergency switch installed on the right side of the control panel is pushed by operator. This switch input is normally closed and the trouble means the switch input is opened. When the emergency switch is opened output power for the output control from the CONTROLLER is disconnected. By pulling the emergency switch, the alarm can be corrected.

Appendix

■ Wiring Diagram (Control box)

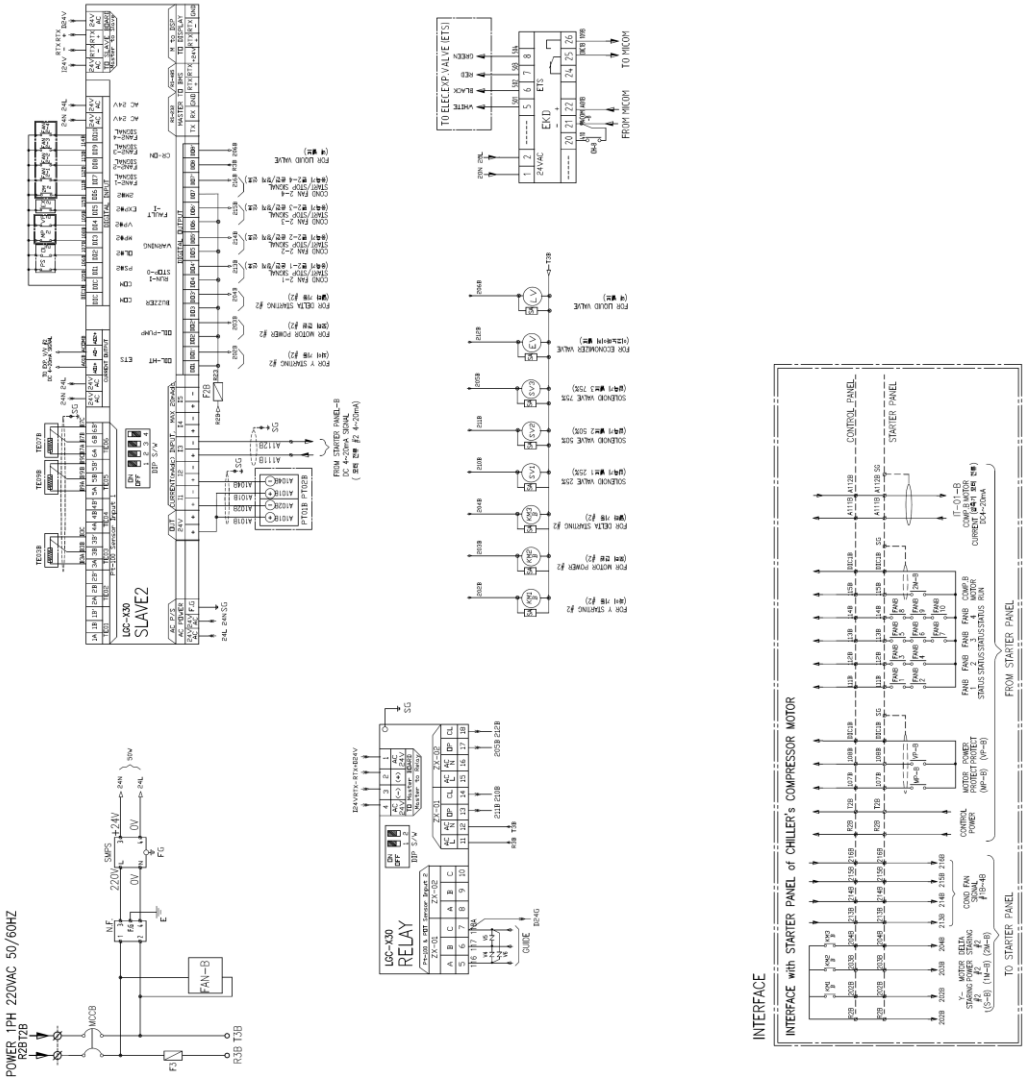


■ Wiring Diagram (Control box, 2comp)

SYMBOL	DESCRIPTION	REMARKS
52C	AUX.CONTACT	SUPPLIED BY USER(CHILLED WTR PUMP
69C	FLOW S/W	OUTPUT BELOW 30OHM(CHILLED WTR
4T1~2	REMOTE RUN/STOP SIGNAL	SUPPLIED BY USER
2M	AUX.CONTACT	FROM STARTER(COMP MOTOR RUN SIG
OL	OIL LEVEL SWITCH	
XC	OUTSIDE FAULT SIGNAL	
MP	AUX RELAY CONTACT	FROM STARTER(MOTOR PROTECT
VP	AUX RELAY CONTACT	FROM STARTER(POWER PROTECT
EXP	EXPANTION VALVE	
PS	PRESS S/W STATUS	
ELCB	EARTH LEAKAGE CIRCUIT BREAKER	2POLES, 30AF, 10A
BZ	BUZZER	
ETS	ELECTRONIC EXPANSION VALVE	
EMS	EMERGENCY SWITCH	
F1~F3	FUSE	250V,2A
FAN	COOLING FAN	1PH, 220V, 20W
SMPS	POWER SUPPY	AC 220/DC24,75VA
TED3B	FIN TEMP SENSOR	PT100ohm
TED7B	COMP. OUTLET TEMP SENSOR	PT100ohm
TED9B	COMP. INLET TEMP SENSOR	PT100ohm
PT-A03	COMP. INLET PRESS TRANSMITTER 2	Range : 0~20kg/cm², OUT : 4~20mAdc
PT-C04	COMP. OUTLET PRESS TRANSMITTER 2	Range : 0~35kg/cm², OUT : 4~20mAdc
ETS	ELECTRONIC EXPANSION VALVE	
DIO	DRIVER MODULE-ETS	

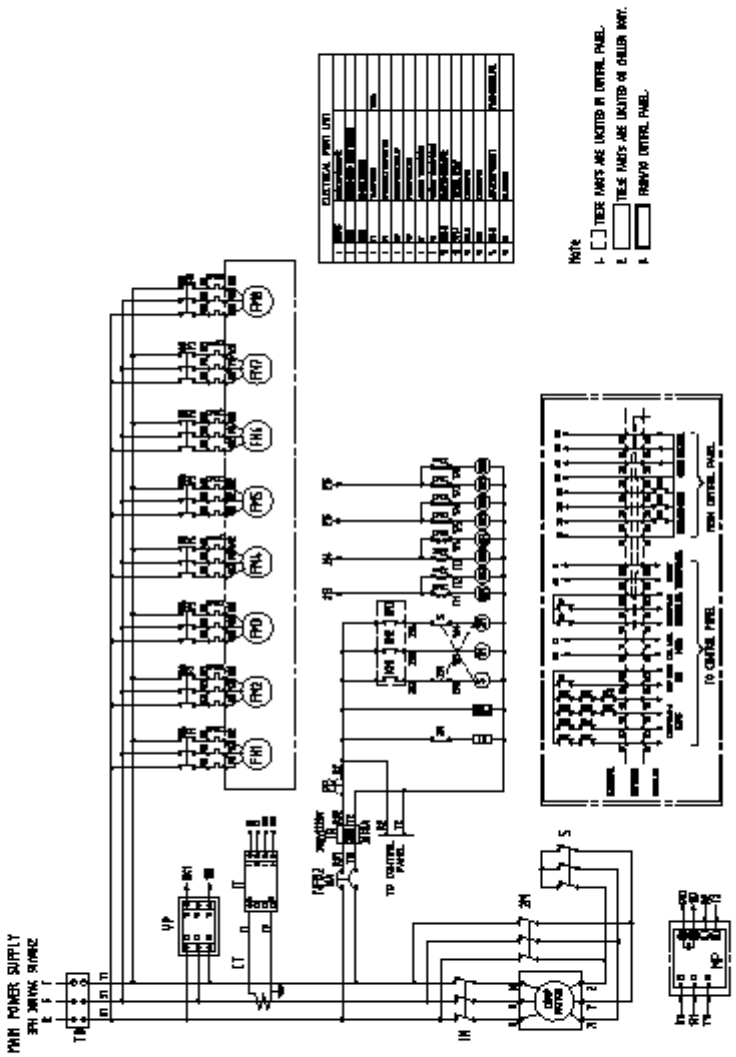
NOTE

1. [ ] THESE PARTS SHOULD BE SUPPLIED BY BUYE
   (이 부분은 수요자측 준비 사항입니다.)
2. [ ] THESE PARTS ARE LOCATED ON CHILLER BODY.
   (이 부분은 냉동기 본체에 설치됩니다.)
3. [ ] INTERFACE WITH USER's SYSTEM or STARTER I
   (이 부분은 수요자측 시스템 또는 기동반과 접속되는 부분입니다.)



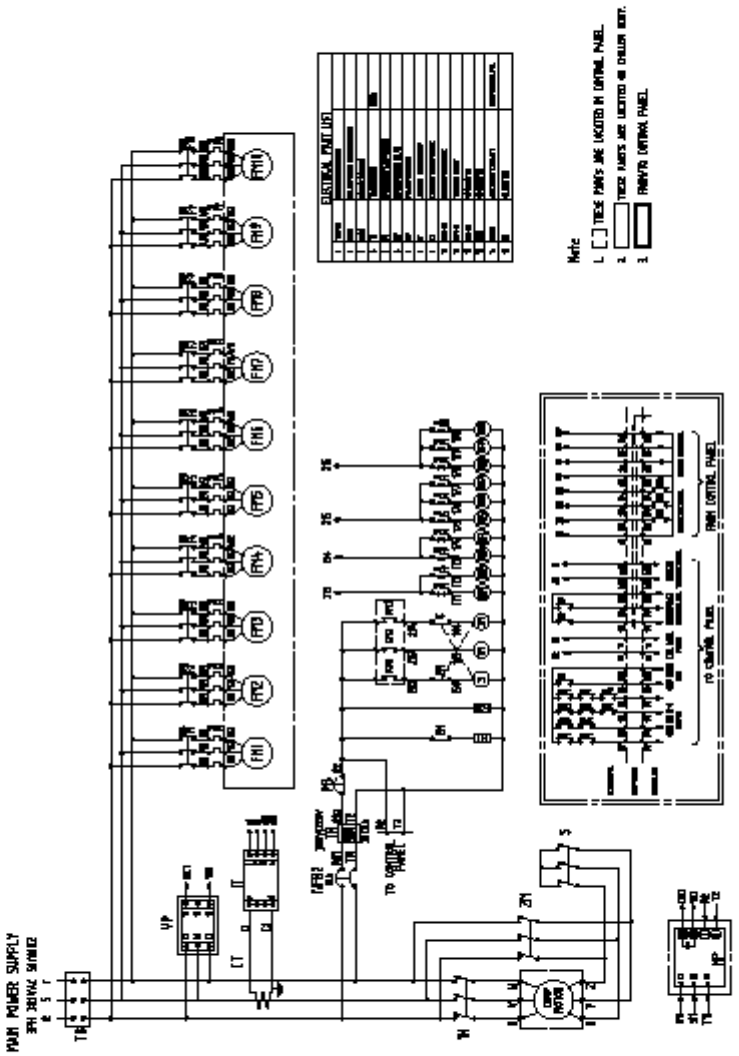
■ Wiring Diagram (Power box)

MCAW008AA11



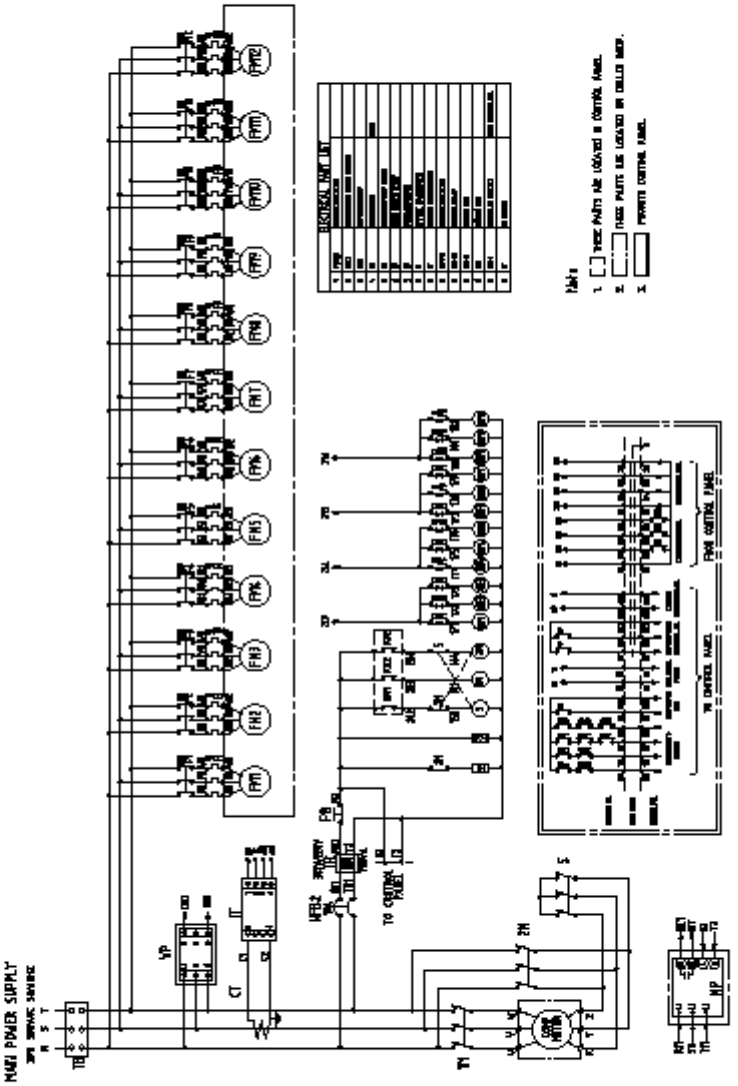
■ Wiring Diagram (Power box)

MCAW010AA11



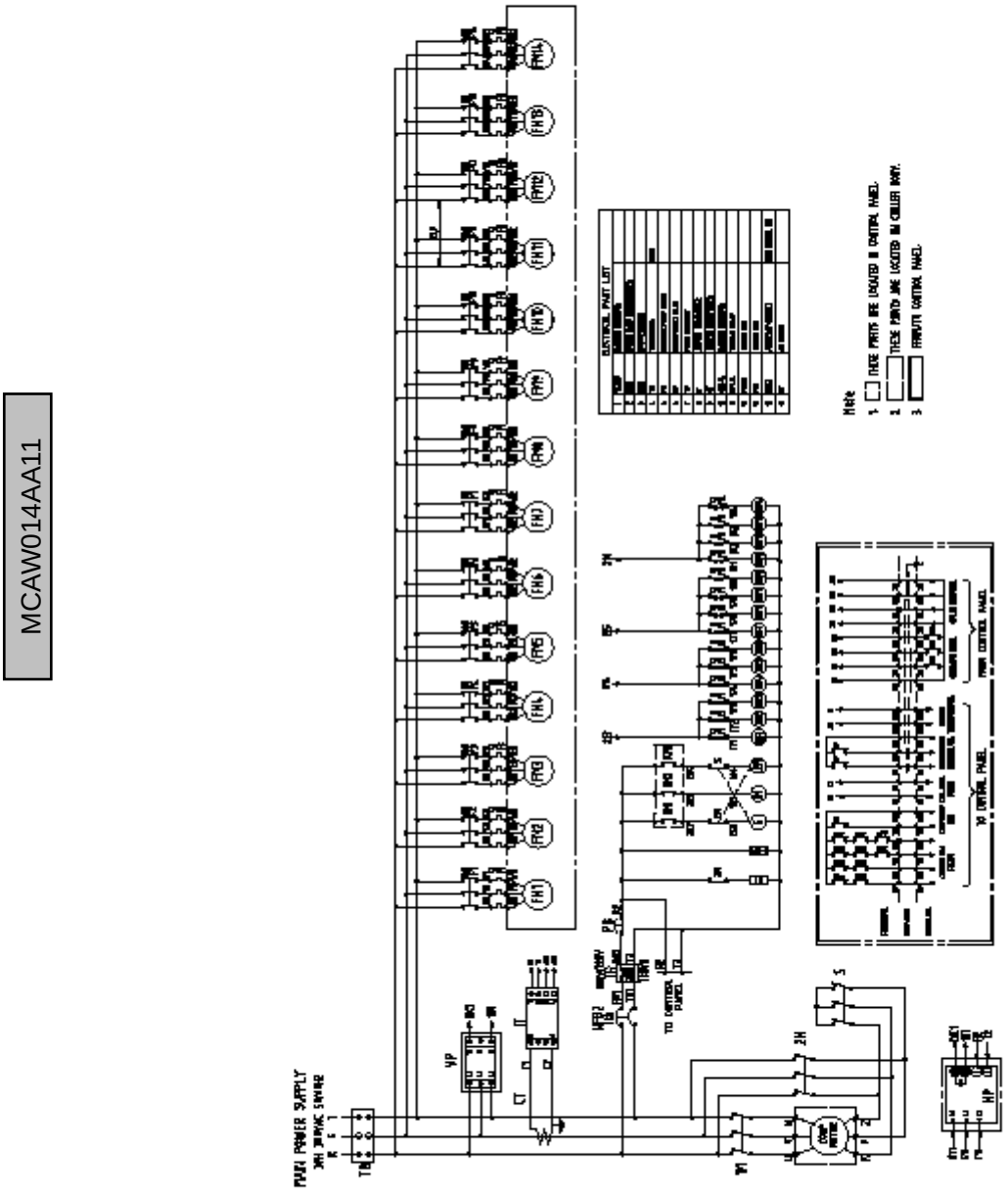
■ Wiring Diagram (Power box)

MCAW012AA11



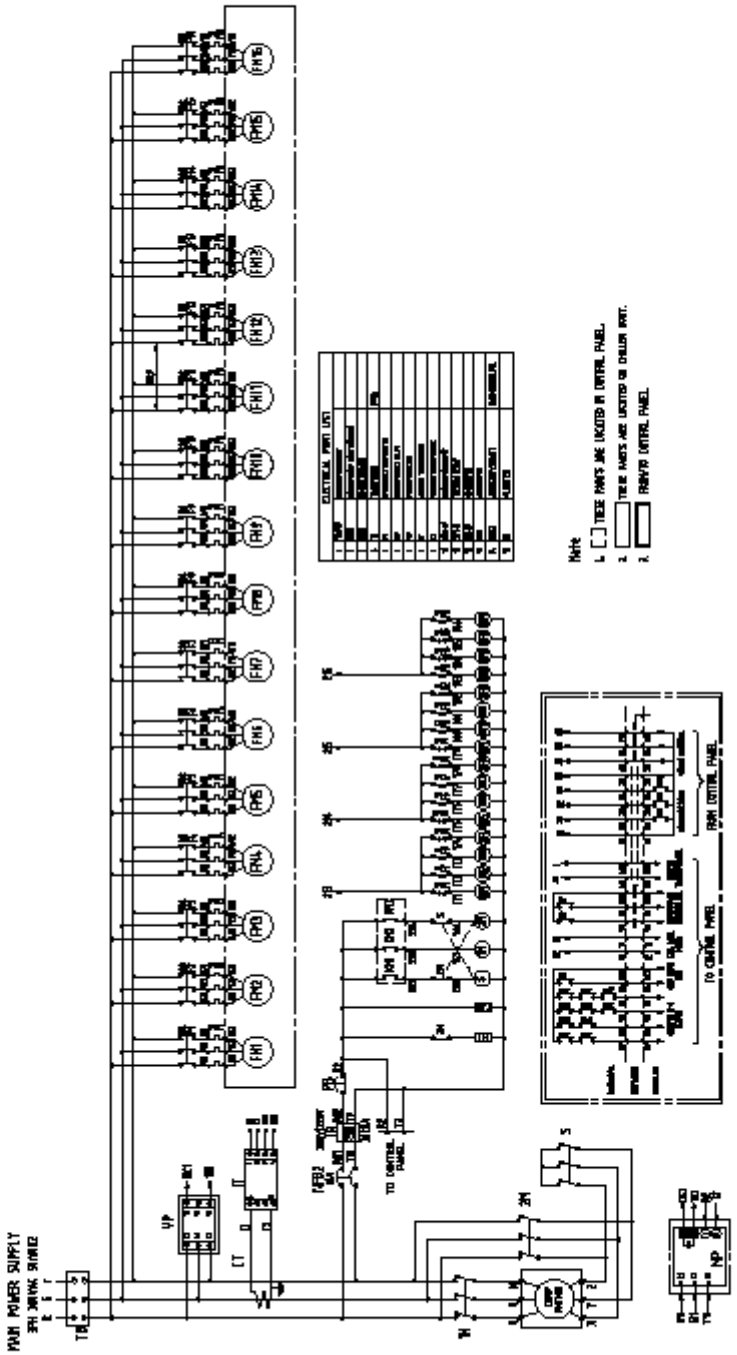
■ Wiring Diagram (Power box)

MCAW014AA11

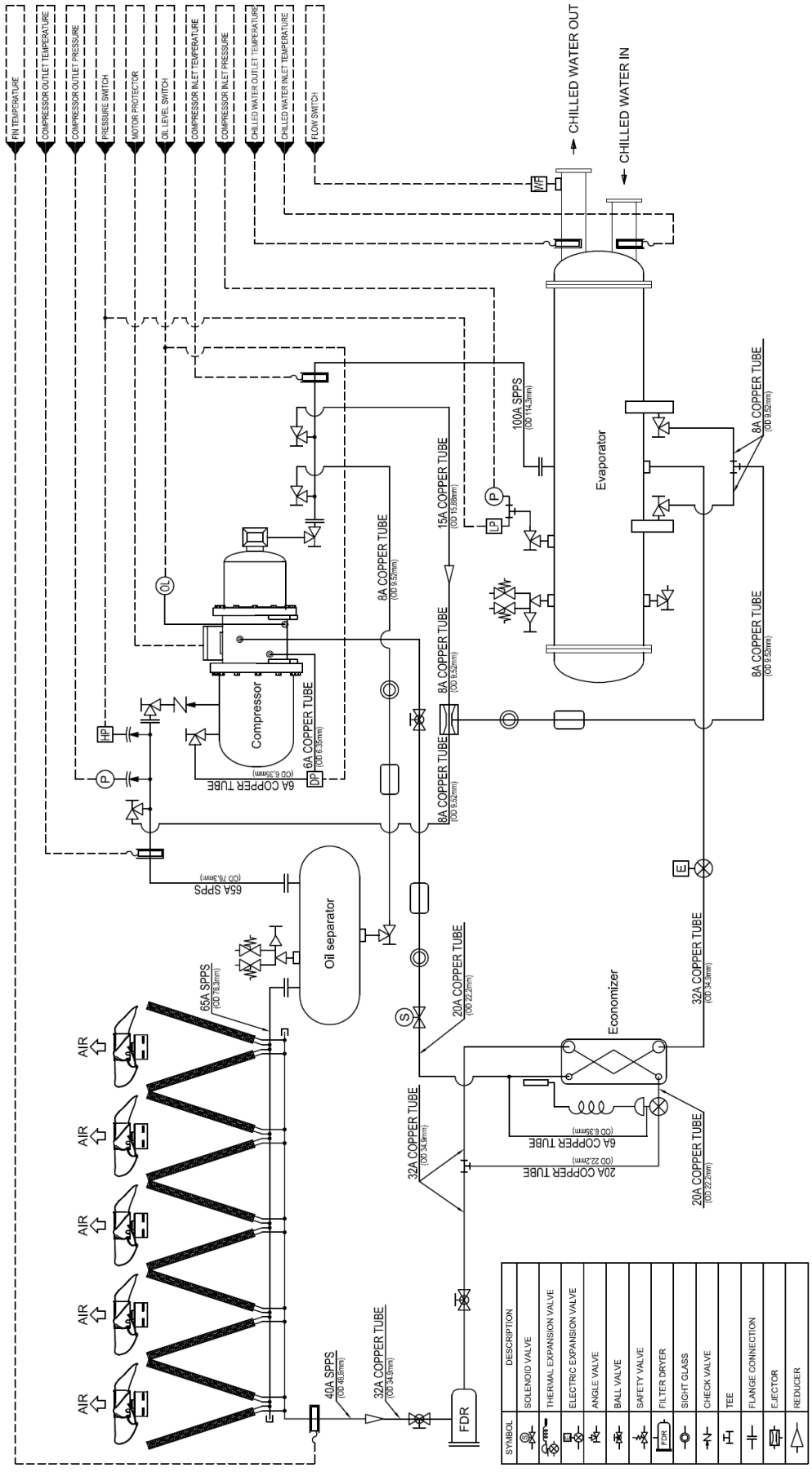


■ Wiring Diagram (Power box)

MCAW016AA11



■ Cycle Diagram



■ Check List

Checklist for installation, and operation

1. Project information

Contents	Description
PJT name	
Address	
Installing contractor	
Sales office	
Start-up performer	

2. Model information

Contents	Description
Unit	Model: Serial:
Compressor A	Model: Serial:
Compressor B	Model: Serial:

3. PRELIMINARY EQUIPMENT CHECK

Contents	Check	
Is there any physical damage?	Yes	No
⟶ If yes, where?		
Will this prevent start-up.	Yes	No
All screws and bolts are tight.	Yes	No
Power supply agrees with the unit nameplate.	Yes	No
Electrical power wiring is installed properly.	Yes	No
Unit is properly grounded.	Yes	No
Electrical circuit protection has been sized and installed properly.	Yes	No
All terminals are tight.	Yes	No
All plug assemblies are tight.	Yes	No
Oil heaters energized for 8 hours before start-up.	Yes	No
Relief valve vents piping per local codes.	Yes	No

4. Chilled Water System Check

Contents	Check	
All chilled water valves are open.	Yes	No
All piping is connected properly.	Yes	No
Drain pipe is not clogged.	Yes	No
There is no leakage.	Yes	No
All air has been purged from the system.	Yes	No
Chilled water pump is operating with the correct rotation.	Yes	No
Chilled water pump starter interlocked with chiller.	Yes	No
Chilled water flow switch is operational.	Yes	No
Inlet piping to cooler includes strainer.	Yes	No

5. START-UP & OPERATION

Contents	Check	
All refrigerant line service valves are open. (discharge, suction, economizer, oil line part…)	Yes	No
There is leakage of refrigerant. (Comp, Condenser, Economizer, Cooler…)	Yes	No
Voltage at terminal block is within 10%	Yes	No
Voltage imbalance is within 2%	Yes	No
There is no abnormal noise or vibration	Yes	No
Alarm is not generated, and the unit operates normally.	Yes	No
Compressor capacity		%
Ambient air temperature		C
Chilled water inlet temperature		C
Chilled water inlet temperature		C
Brine concentration		%
Cooler pressure drop		psig
Chilled water flow rate		Gpm(l/s)
Refrigerant high pressure		psig
Refrigerant low pressure		psig
Additional refrigerant charge		lbs
Additional oil charge		lbs