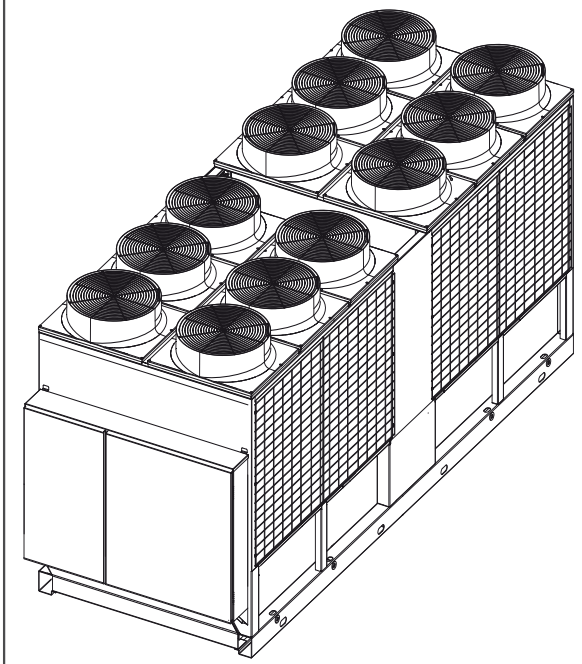
HITACHI
Inspire the Next

SAMURAI SERIES
AIR COOLED AND AIR TO WATER HEAT PUMP WATER CHILLERS
-SCREW TYPE-



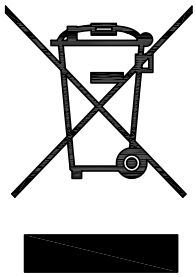
Technical Catalogue

RCU2E(40-400)AG2
RHU2E(40-240)AG2

HITACHI
Inspire the Next

Specifications in this manual are subject to change without notice in order that HITACHI may bring the latest innovations to their customers.

Whilst every effort is made to ensure that all specifications are correct, printing errors are beyond Hitachi's control; Hitachi cannot be held responsible for these errors.



ATTENTION:

This product and the batteries contained on it shall not be mixed with general house waste at the end of its life. They shall be retired according to the appropriated local or national regulations in a environmentally correct way in order to be treated at a specialized treatment facility for re-use, recycling and recovery. If a chemical symbol is printed beneath the symbol, it means that the battery contains heavy metal above a certain concentration.

If a chemical symbol is printed beneath the symbol, it means that the battery contains heavy metal above a certain concentration. Possible chemical symbols: - Pb: Lead (>0,004%).

Following Regulation EC Nº 842/2006 on Certain Fluorinated Greenhouse gases, the total amount of refrigerant charged in the unit is indicated on the specification label.

Do not vent R410A/R407C into the atmosphere: R410A & R407C are fluorinated greenhouse gases covered by the Kyoto protocol global warming potential (GWP) R410A/R407C: = 1975/1652.5.

THIS EQUIPMENT CONTAINS FLUORINATED GREENHOUSE GASES COVERED BY THE KYOTO PROTOCOL

DO NOT VENT R407C INTO THE ATMOSPHERE

GWP: 1652.5

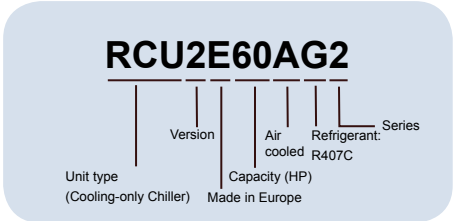
Contents

◆ Unit code list

NOTE:

MODEL CODIFICATION	Please check by model name your air cooled type, its abbreviation and reference number in this technical catalogue.

RCU2E-AG2 SERIES			
Unit	Code	Unit	Code
RCU2E40AG2	8E041075	RCU2E160AG2	8E161075
RCU2E50AG2	8E051075	RCU2E180AG2	8E181075
RCU2E60AG2	8E061075	RCU2E210AG2	8E211075
RCU2E70AG2	8E071075	RCU2E240AG2	8E241075
RCU2E80AG2	8E081075	RCU2E280AG2	8E281075
RCU2E100AG2	8E101075	RCU2E320AG2	8E321075
RCU2E120AG2	8E121075	RCU2E350AG2	8E351075
RCU2E140AG2	8E141075	RCU2E400AG2	8E401075
			
❄ 3~			

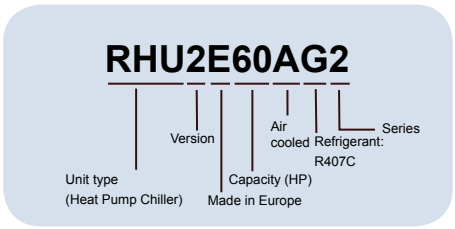


MODEL CODIFICATION

Please check by model name your air-to-water heat pump model type, its abbreviation and reference number in this technical catalogue.

RHU2E-AG2 SERIES			
Unit	Code	Unit	Code
RHU2E40AG2	9E041075	RHU2E120AG2	9E121075
RHU2E50AG2	9E051075	RHU2E140AG2	9E141075
RHU2E60AG2	9E061075	RHU2E160AG2	9E161075
RHU2E70AG2	9E071075	RHU2E180AG2	9E181075
RHU2E80AG2	9E081075	RHU2E210AG2	9E211075
RHU2E100AG2	9E101075	RHU2E240AG2	9E241075

3~



1. Important Notice

- HITACHI pursues a policy of continuing improvement in design and performance of Products. The right is therefore reserved to vary specifications without notice.
- HITACHI cannot anticipate every possible circumstance that might involve a potential hazard.
- No part of this manual may be reproduced without written permission.
- Signal words (DANGER, WARNING and CAUTION) are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided below with their respective signal words.

DANGER:
Immediate hazards which WILL result in severe personal injury or death.

WARNING:
Hazards or unsafe practices which COULD result in severe personal injury or death.

CAUTION:
Hazards or unsafe practices which COULD result in minor personal injury or product or property damage.

NOTE:
Useful information for operation and/or maintenance.

- If you have any questions, contact your contractor or dealer of HITACHI.
- This instruction gives a common description and information for this water Chiller which you operate as well as for other models.
- This water Chiller has been designed for the following temperatures. Operate the unit within this range:

Working Range for RCU2E-AG2 ºC		
	Maximum	Minimum
Ambient temperature	46	-15
Chilled Water Outlet Temperature	15	5 (-10)*

(*) In case of low water outlet temperature option

Working Range for RHU2E-AG2 (Cooling Operation) ºC		
	Maximum	Minimum
Ambient Temperature	46	-15
Chilled Water Outlet Temperature	15	5 (-10)*

(*) In case of low water outlet temperature option

Working Range for RHU2E-AG2 (Heating Operation) ºC		
	Maximum	Minimum
Ambient Temperature	21 (DB) (35)* 15.5 (WB)	-9.5 (DB) -10 (WB)
Hot Water Outlet Temperature	55	35

(*) In case of Heating Operation in high ambient temperature

- These instructions should be considered as a permanent part of the water Chiller equipment and should remain with the unit.

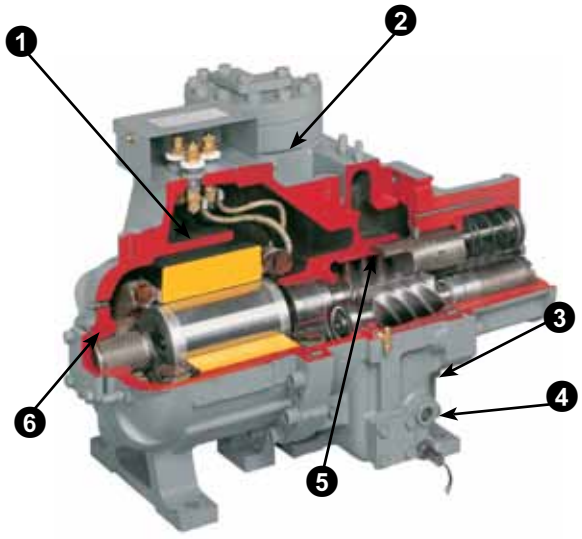
2. Features and Benefits

Contents

2.1. Unit picture

HITACHI is a world leader in technology and with continual research and product development, which offers screw type **Air Cooled Water Chillers** from 112 KW to 1030KW and **Air-to-Water Heat Pump Water Chillers** from 106 kW to 585 kW (in Cooling mode) and from 110 kW to 555 kW (in Heating mode).

2.2. Compressor

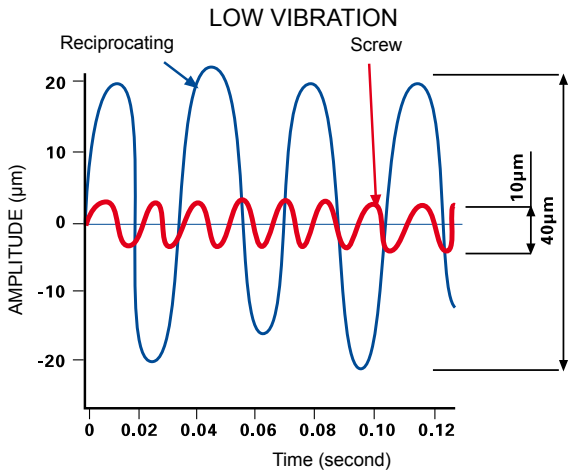


◆ **THE SAMURAI RANGE INCORPORATES THE LATEST DEVELOPMENT OF HITACHI´S SCREW COMPRESSOR TECHNOLOGY FOR THE NEW MILLENNIUM.**

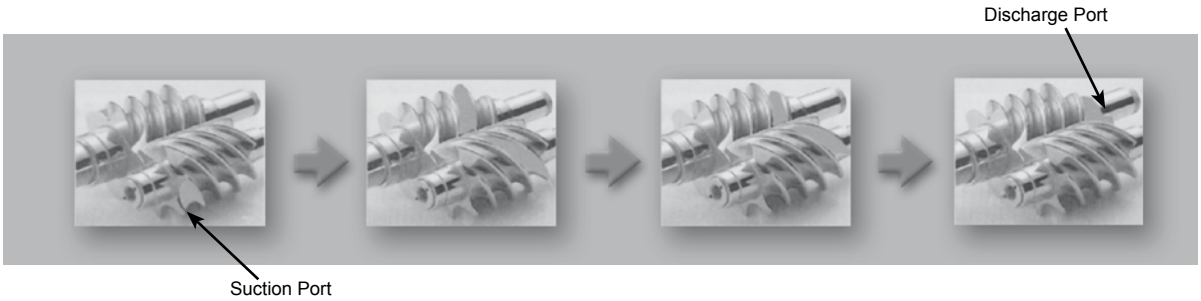
1. Highly Reliable HITACHI Two-Pole Motor
2. Built-in Oil Separator (Cyclone oil separator)
3. Oil Sight Glass
4. Oil Heater
5. High precision Twin Screw Rotors
6. Suction Filter

◆ **Twin screw compressor**

By having so few moving parts, it has become highly reliable with very low noise level and low vibration



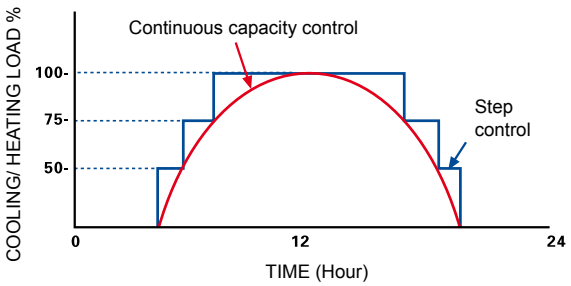
◆ **Principle of compression**



◆ **Continuous capacity control**

HITACHI´s Continuous Capacity Control system uses advanced electronic controls to position the infinitely variable slide valve within each compressor.

This modulation allows exact load control and accurate chilled water temperature without the need for expensive inverters.

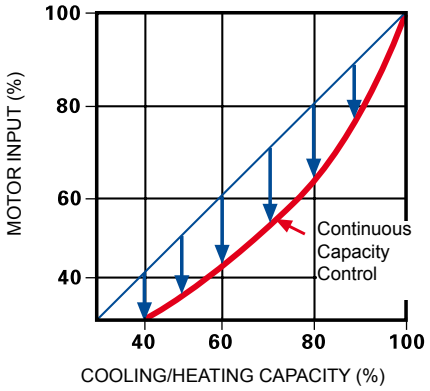


◆ **Energy Saving**

Thanks to Continuous Capacity Control, 15~20% energy saving is possible compared with current step control systems due to the following:

- The cooling/heating load can be more closely matched
- Continuous Capacity Control takes advantage of high efficiency part load performance.
- Frequent compressor starts and stops are eliminated.

PART LOAD PERFORMANCE



2.3. Control

◆ **Many Functions**

Newly developed Control Board has many functions shown below as standard.

- Current limiter
- Forced compressor load control
- 2 different temperatures setting
- Various fan control mode
- Memory data in alarm
- Automatic restart after power failure
- Output signal for free cooling application etc...

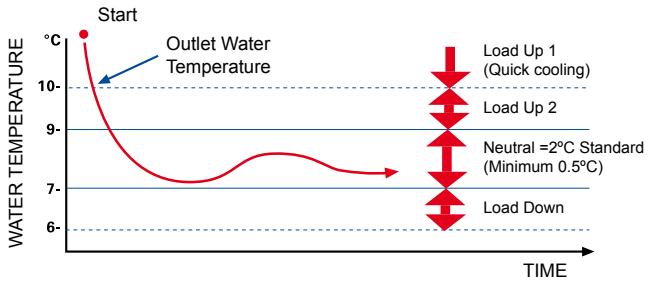
◆ **Precise Temperature Control**

Combination of “Continuous Capacity Control Compressor” and “HITACHI´s unique electronic controls” enable the Chiller to control outlet water temperature precisely, independent of cooling/heating load.

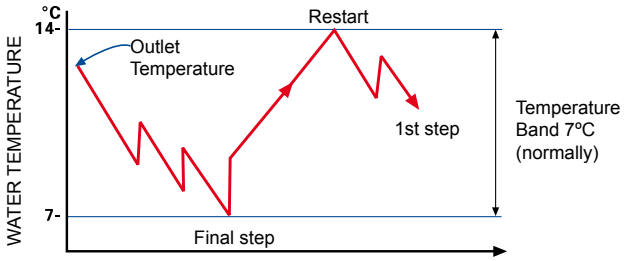
This control benefits not only air-conditioning but also industrial process use.

◆ **Example in cooling mode**

CONTINUOUS CAPACITY CONTROL



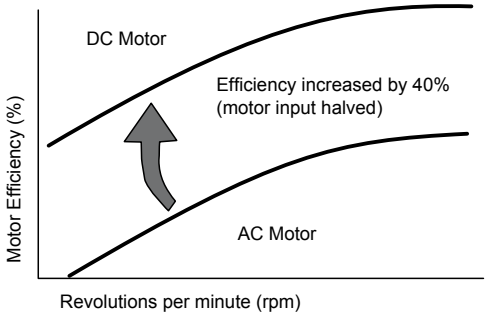
CONVENTIONAL STEP CONTROL



2.4. Fan motor

◆ **DC Fan Motor with Outstanding Efficiency**

The DC fan motor greatly improves efficiency compared to conventional products using an AC motor. Furthermore, air blasts are reduced by controlling the rotation speed of the fan.



PWM (pulse width modulation) concept of speed control

The switching element (a power MOSFET) switches back and forth at a frequency of several tens of kHz. This controls the ON//OFF duty rate per cycle and thus changes the voltage applied to the fan motor to control the rotation speed.

◆ **Low Sound**

Hitachi uses high technology to achieve the lowest sound. The new two bladed propeller, rather than four bladed, achieves a reduction of noise level, increases air flow volume, and at the same time provides an important reduction of motor power input

2.5. Electronic expansion valve

These units are equipped with an electronic expansion valve to provide sophisticated control under any temperature condition.

The electronic expansion valve provides reduced electrical power consumption compared to the classical system.

3. Operation Instructions

Contents

3.1. Hitachi water chillers

- **To start the Unit.**
  1. Open the water inlet and outlet valves.
  2. After assuring that all control switches have been cut OFF, and the "LOCAL/REMOTE" switch on the printed circuit board is in the "LOCAL" position, turn ON the power switch.
  3. Confirm that phases R, S and T are correctly connected. The correct phase connection can be checked by a phase sequence indicator. If not correctly connected, the compressor does not start due to activation of a reversal phase protection device. Cut the main switch and interchange two of three terminals, R, S and T at the main power source terminals.
  4. Set the changeover switch the "Cool" or "Heat"
  5. Fully open the liquid line stop valves.
  6. Operate the chilled/hot water pump.
  7. Depress the "ON"(*) push button switch.
     (*)(Field-Supplied)
  8. Set the thermostat at the desired temperature

- **To stop the Unit**
  1. Depress the "OFF"(*) push button switch.
     (*)(Field–Supplied)
  2. Switch OFF the main power source when the unit is shut down for a long time period.

- **Pilot lamp**

  The red LED indicates the normal operation.
  When the orange LED is activated, any one of the safety devices may be functioning.
  Please contact your service assistant, if this condition is detected.

- **Daily checking**
  1. Check the power supply to ensure that it is proper.
  2. Check for abnormal sounds and vibrations.
  3. Check the unit amperage.
  4. Check the operating pressure.

- **Troubleshooting**
  - Unit Does Not Start
    1. Is the main switch ON?
    2. Is the main fuse OK?
    3. Is the chilled/hot water running?
    4. Are the thermostats calling for the cooling/heating operation?
  - Poor Cooling/Heating Operation
    1. Is there sufficient Air supplied to the air side heat exchanger?
    2. Is the setting temperature correct?
    3. Are the operating pressures normal?
    4. Is there sufficient water running through the water side heat exchanger?
  - Maintenance
    1. Remove any obstacles to the air side heat exchanger airflow, and clean the air side heat exchanger.
    2. Clean the unit with a cleaner.
    3. Clean the water side heat exchanger. (It is recommended that a specialist will be contacted for this kind of work.)

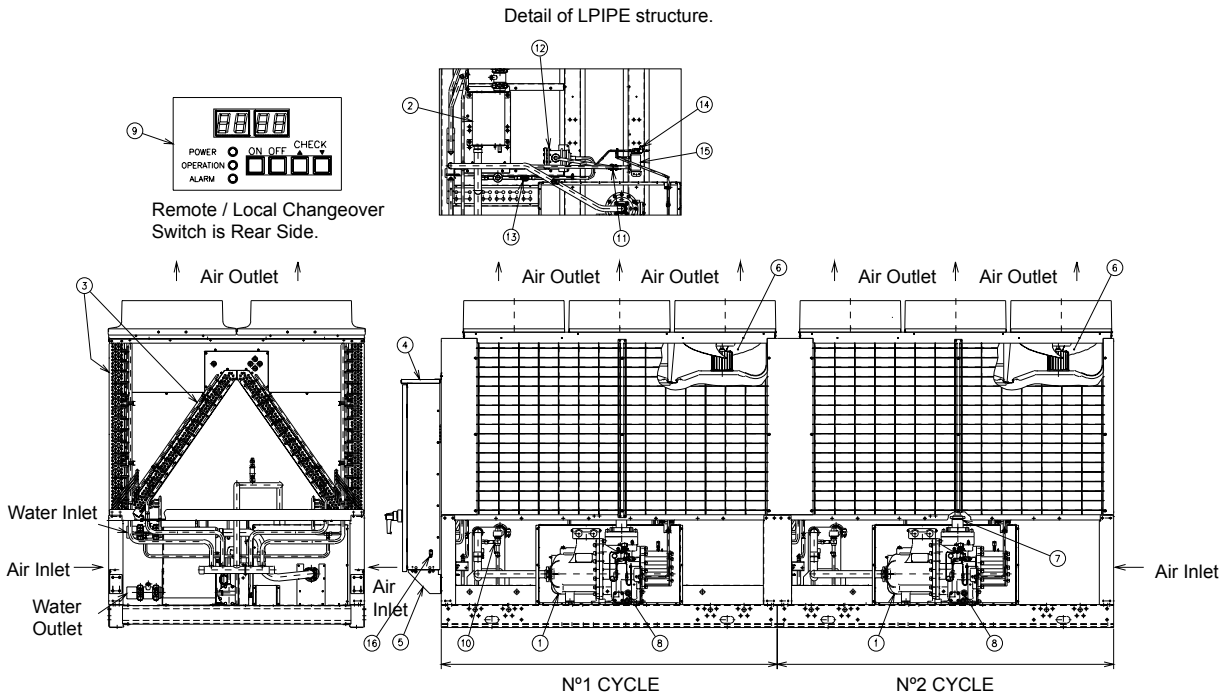
DANGER:
Switch OFF main interruptor (M.I) for any work inside electrical box.
Keep electrical box cover closed 2 min. after switching power off (to discharge the capacitors).

4. Components of Chiller

Contents

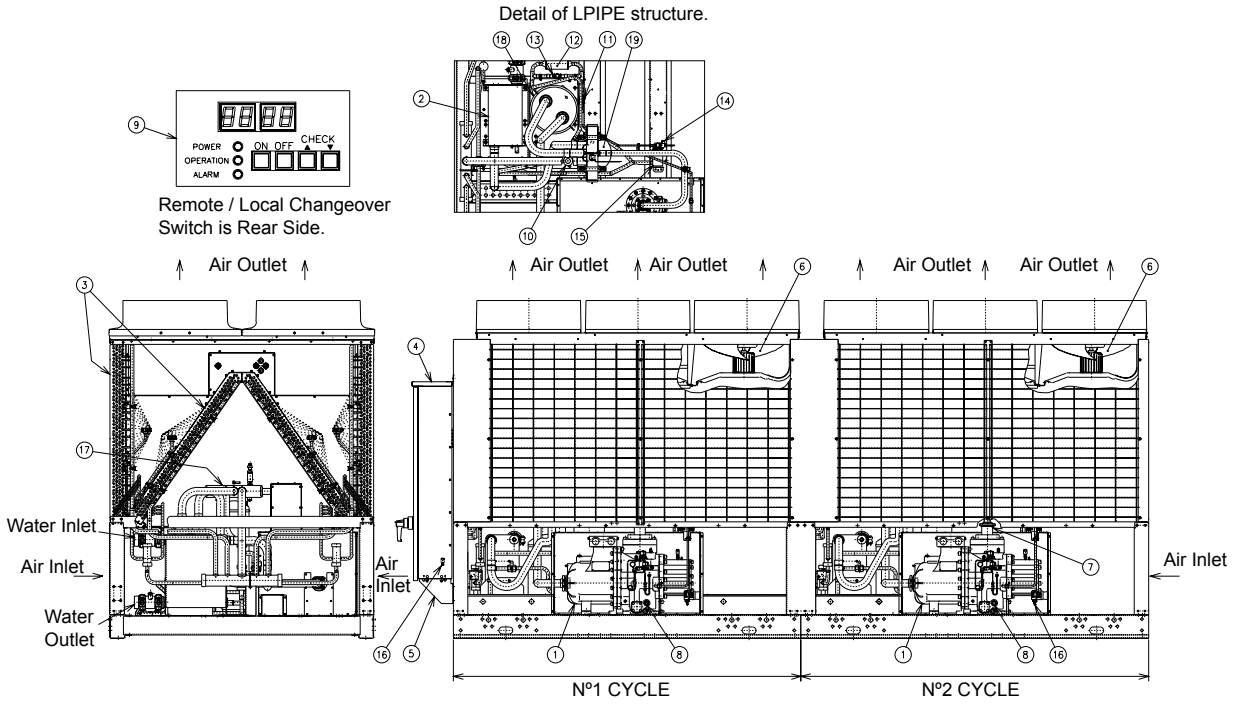
4.1. Structure drawing

◆ **HITACHI Air-Cooled Water Chiller (Example of 2 Compressors Chiller)**



N°	Name	N°	Name
1	Compressor	9	Operation Switch
2	Water Cooler	10	Electronic Expansion Valve
3	Condenser	11	Liquid Line Stop Valve
4	Electrical Box	12	Filter Drier
5	Power Wiring Supply	13	Liquid Sight Glass
6	Fan	14	Solenoid Valve (only for 80, 160, 240, 320, 400 HP)
7	Check Valve	15	Economiser (only for 80, 160, 240, 320, 400 HP)
8	Oil Sight Glass	16	High Pressure Switch (inside electrical box)

◆ HITACHI Air-to-Water heat pump Water Chiller (Example of 2 Compressors Chiller)



N°	Name	N°	Name
1	Compressor	11	Liquid Line Stop Valve
2	Water Side Heat Exchanger	12	Biflow Drier
3	Air Side Heat Exchanger	13	Liquid Sight Glass
4	Electrical Box	14	Solenoid Valve (only for 80, 160, 240 HP)
5	Power Wiring Supply	15	Economiser (only for 80, 160, 240 HP)
6	Fan	16	High Pressure Switch (inside electrical box)
7	Check Valve	17	4-Way Valve
8	Oil Sight Glass	18	Accumulator
9	Operation Switch	19	Liquid Tank
10	Electronic Expansion Valve		

5. Preparation Initial Check

Contents

5.1. Initial check

DANGER:
If leakage is detected, stop the unit and contact the installer or service shop. Do not use a naked fire near the refrigerant gas. If a naked fire is utilised near the refrigerant gas, refrigerant is turned into a harmful phosgene compound.

WARNING:
This unit is operated with refrigerant R407C, which is non-flammable and non-poisonous. However, refrigerant itself is heavier than the atmosphere so that a floor is covered with refrigerant gas if refrigerant is leaked. Therefore, keep good ventilation to avoid choke during servicing.

CAUTION:
Check to ensure that valves are correctly opened. If not opened, serious damage will occur to the compressor due to an abnormal high pressure.
This unit controls air flow for condenser during low ambient temperature.
Due to this control, avoid the strong wind hits the unit directly. In such a case, put buffer plate around the unit.

- **Required Materials**

  Measure and Architectural Information Regarding Installation Location

- **Installation Location**

  Confirm that the final installation location is provided with convenient piping and wiring work. Strong water runoff should be avoided.

  This unit must be installed in a restricted area not accessible to the general public. Install the unit on a roof or in an area where people, except service engineer, can not touch the unit.

- **Installation Space**

  Check for obstacles which restrict condenser Air flow or hamper maintenance work in the space specified in Fig. 1.

- **Foundation**

  Check to ensure that the foundation is flat, level and sufficiently strong, taking into account the maximum foundation gradient (Fig. 2) and the unit weight balance. Confirm elevation provision for the unit on a solid base with an iron frame or concrete curbs shown in chapter 5.4.

  In order to obtain proper clearance beneath the unit for either rooftop or on the ground installation, where foundation bolts should be sunk into concrete. Additionally, for on the ground installation, provide a gravel or concrete space around the condenser Air intake in order to avoid airflow obstruction due to grass or other vegetation.

- **Unit**

  Check to ensure that the unit has been transported without damage. File a damage claim with the transportation companies if mishandling due to transportation company negligence is suspected.

- **Transportation**

  Secure the route to the final installation location by confirming the dimensions (Refer to the “General Data” in Chapter 13.1).

5.2. Placing the unit

◆ **Tools and Instruments**

Pincers, Wrenches, Facilities to Transport and Place The Unit.

◆ **Transportation**

Transport the unit as close to the final installation location as practical before unpacking is accomplished. Provide adequate facilities to place the unit on the foundation, with sufficient consideration given to those individuals performing the installation.

◆ **Unpacking**

Follow the instructions marked on the packing.

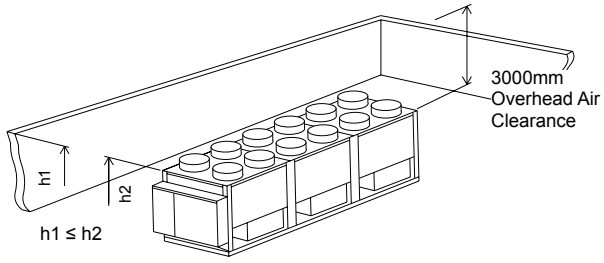
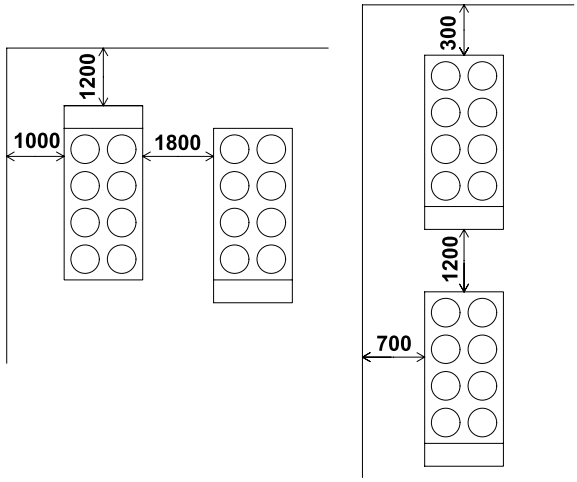


Fig.1. Operation Space



NOTE:

The height of the wall shall be smaller than that of the unit cabinet.
When the unit is installed at a location where the unit is encircled with walls and obstruction of free Air circulation is suspected, construction with HITACHI regarding the operation space is recommended.

◆ **Maximum Foundation Gradient**

The unit should be installed in an upright position within the gradient shown in Fig.2.

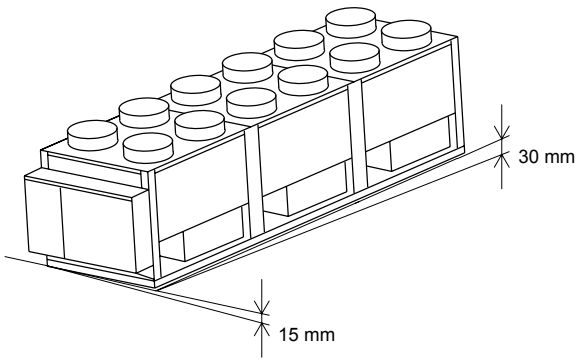


Fig.2. Maximum Foundation Gradient

5.3. Gravity centre

◆ Air-Cooled Water Chiller

Centre of Gravity

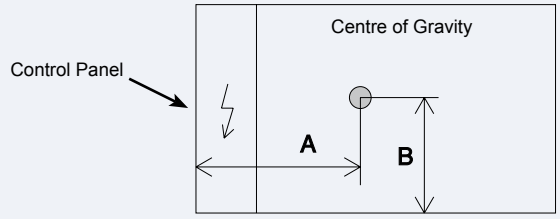
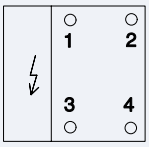
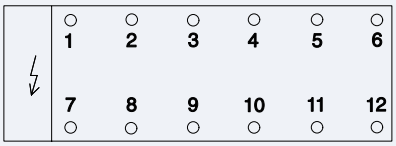


Fig.3. Centre of Gravity

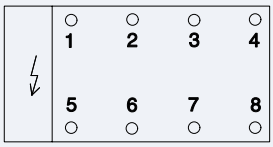
RCU2E 40, 50, 60, 70, 80AG2



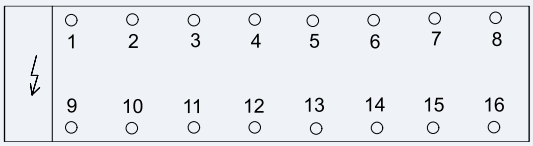
RCU2E 180, 210, 240AG2



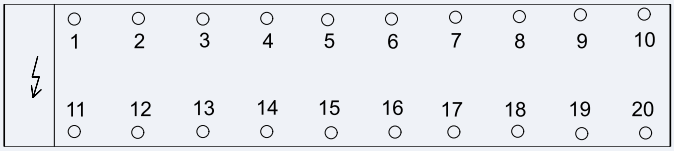
RCU2E 100, 120, 140, 160AG2



RCU2E 280, 320AG2



RCU2E 350, 400AG2



Model	RCU2E–AG2															
	40	50	60	70	80	100	120	140	160	180	210	240	280	320	350	400
Location	Weight Distribution (kg)															
1	297	311	327	367	381	297	319	361	367	315	354	372	354	372	354	369
2	297	311	327	367	381	297	319	361	367	315	354	372	354	372	354	369
3	423	432	460	521	536	297	319	361	367	315	354	372	354	372	354	369
4	423	432	460	521	536	297	319	361	367	315	354	372	354	372	354	369
5						418	439	502	528	315	354	372	354	372	354	369
6						418	439	502	528	315	354	372	354	372	354	369
7						418	439	502	528	434	498	511	354	372	354	369
8						418	439	502	528	434	498	511	354	372	354	369
9										434	498	511	497	372	354	369
10										434	498	511	497	511	354	369
11										434	498	511	497	511	498	513
12										434	498	511	497	511	498	513
13													497	511	498	513
14													497	511	498	513
15													497	511	498	513
16													497	511	498	513
17														511	498	513
18															498	513
19															498	513
20															498	513
Operating Weight																
(Kg)	1440	1485	1575	1775	1835	2860	3030	3450	3580	4495	5115	5295	6810	7060	8525	8825
Location of Centre of Gravity (mm)																
Dimension A	1180	1175	1180	1360	1370	2100	2005	2480	2490	2930	3700	3710	4890	4905	6110	6125
Dimension B	785	795	790	785	790	790	800	795	780	800	790	800	790	800	790	795

◆ Air-to-Water heat pump Water Chiller

Centre of Gravity

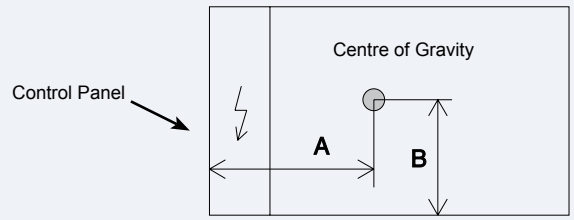
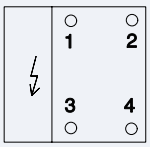
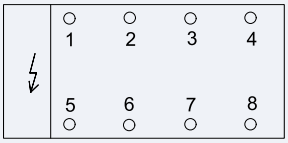


Fig.4. Centre of Gravity

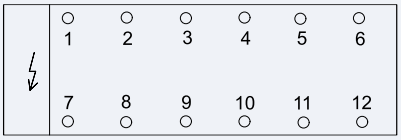
RHU2E 40, 50, 60, 70, 80AG2



RHU2E 100,120,140, 160AG2



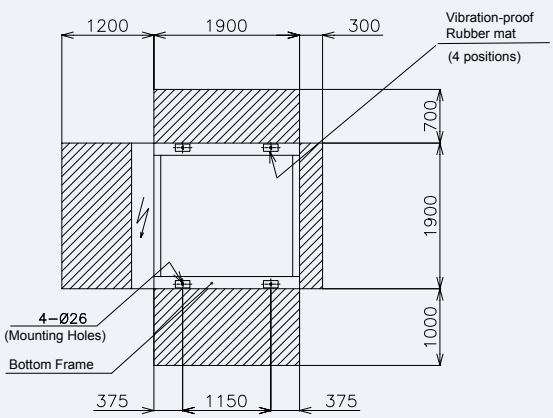
RHU2E 180, 210, 240AG2



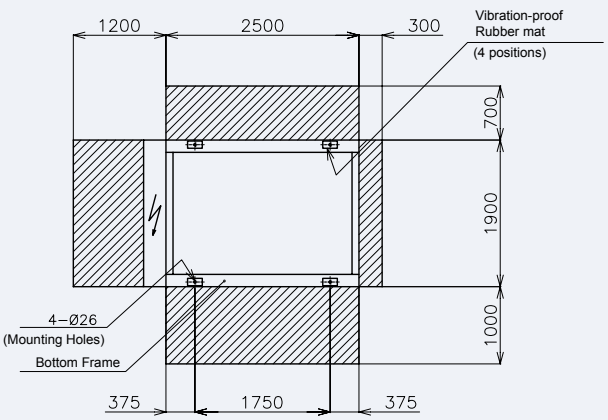
Model	RHU2E–AG2											
	40	50	60	70	80	100	120	140	160	180	210	240
Location	Weight Distribution (kg)											
1	336	350	364	406	424	331	356	399	413	349	394	412
2	336	350	364	406	424	331	356	399	413	349	394	412
3	447	460	484	546	564	331	356	399	413	349	394	412
4	447	460	484	546	564	331	356	399	413	349	394	412
5						440	468	531	544	349	394	412
6						440	468	531	544	349	394	412
7						440	468	531	544	459	525	542
8						440	468	531	544	459	525	542
9										459	525	542
10										459	525	542
11										459	525	542
12										459	525	542
Operating Weight												
(Kg)	1565	1620	1695	1905	1975	3085	3295	3720	3830	4850	5515	5725
Location of Centre of Gravity (mm)												
Dimension A	1170	1165	1170	1340	1350	2095	2005	2470	2480	2930	3690	3700
Dimension B	815	820	815	810	815	815	820	815	820	820	815	820

5.4. Service space and foundation

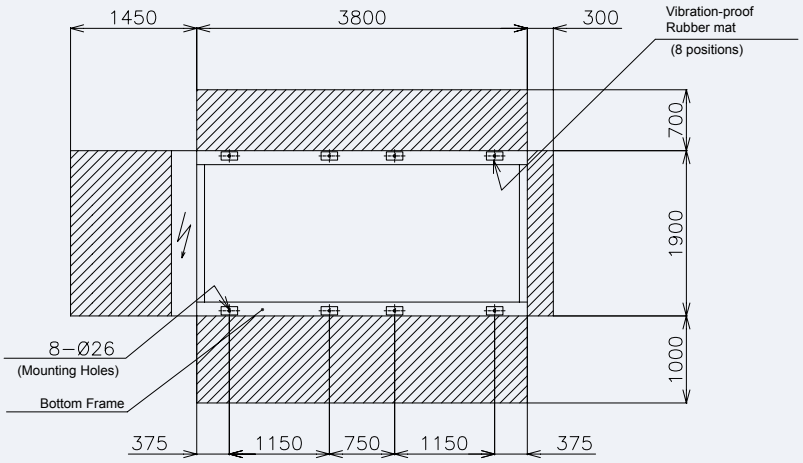
R(C/H)U2E 40, 50, 60 AG2



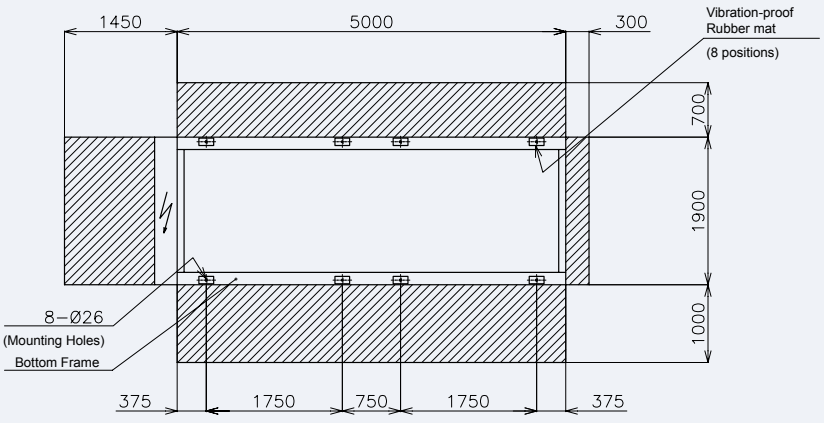
R(C/H)U2E 70, 80 AG2



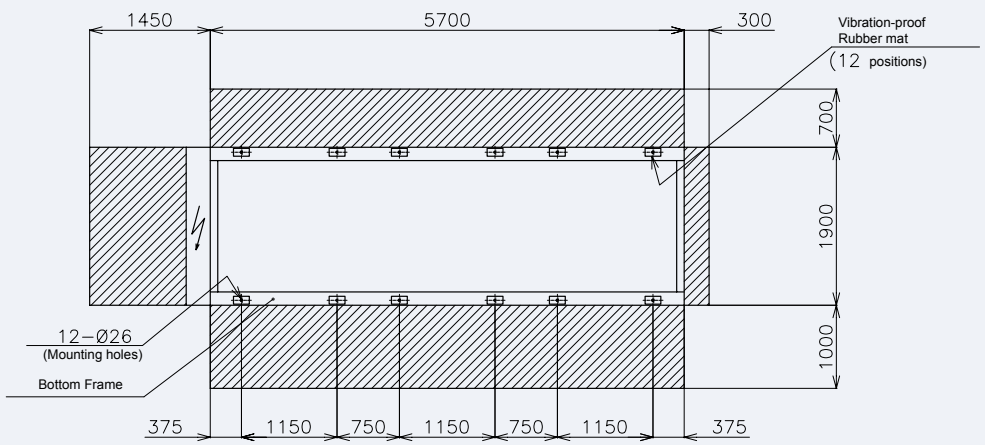
R(C/H)U2E 100, 120 AG2



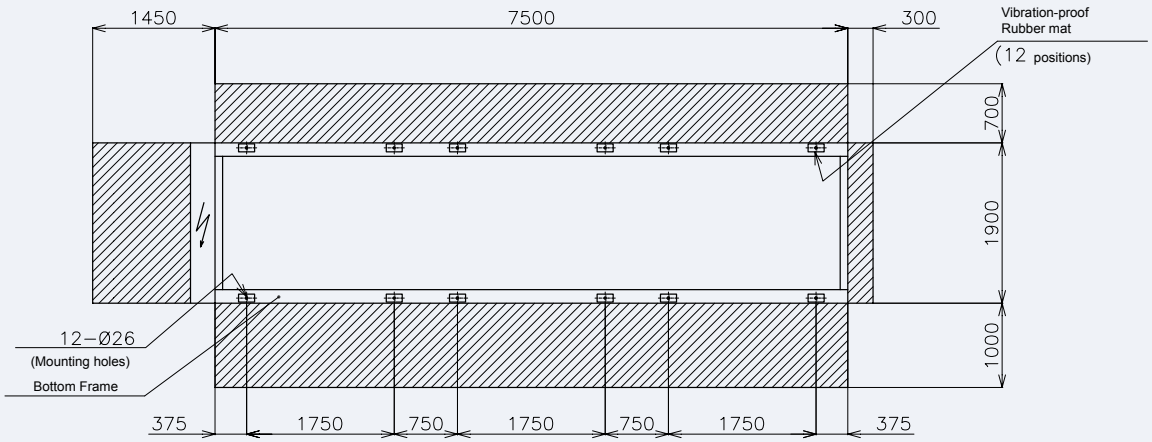
R(C/H)U2E 140, 160 AG2



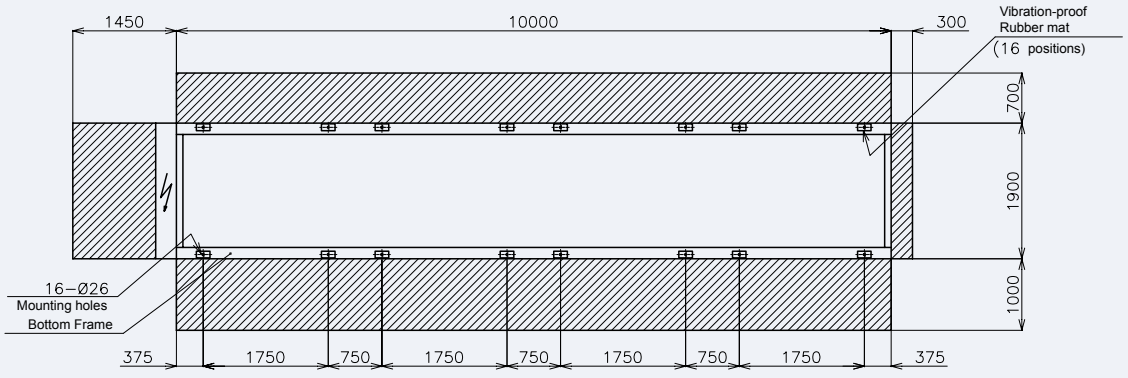
R(C/H)U2E 180 AG2



R(C/H)U2E 210, 240 AG2

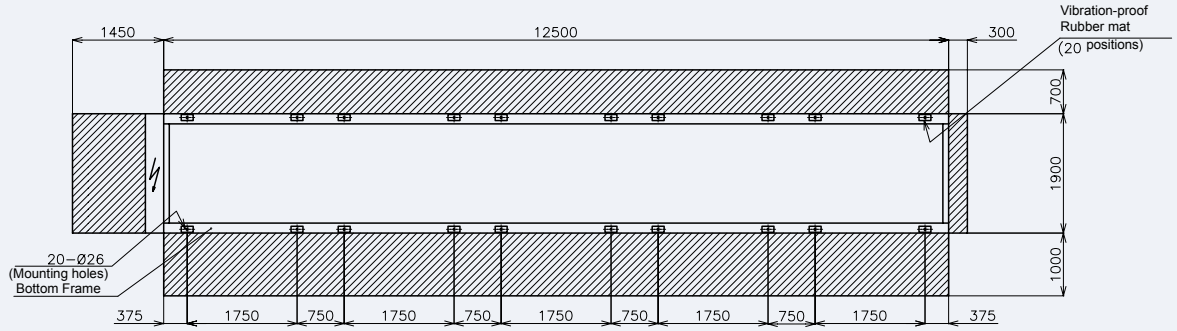


RCU2E 280,320 AG2

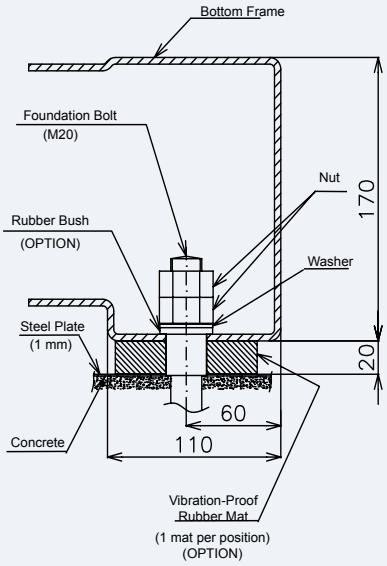


5

RCU2E 350, 400 AG2



DETAIL OF FOUNDATION



5.5. Transportation

5.5.1. Transportation by Rigging

DANGER:
Do not stand below the unit when rigging.

CAUTION:
Put clothes between wires and the unit to avoid damages.

Hook wire cables and apply field-supplied spreader bars on the top of the unit (see figure below) to prevent the unit panels from damage due to cable scratches. The unit should remain in an upright position even during rigging. The wire cable to rig the unit shall be three times stronger than the unit weight. Check to ensure that the rigging bolts are tightly fixed to the unit. The rigging angle shall be less than 60° as shown. The weight of the unit is indicated on the unit label.

Rigging shall be performed by the instruction drawing attached to the unit.

(Here the example of RCU2E180AG2 is shown).

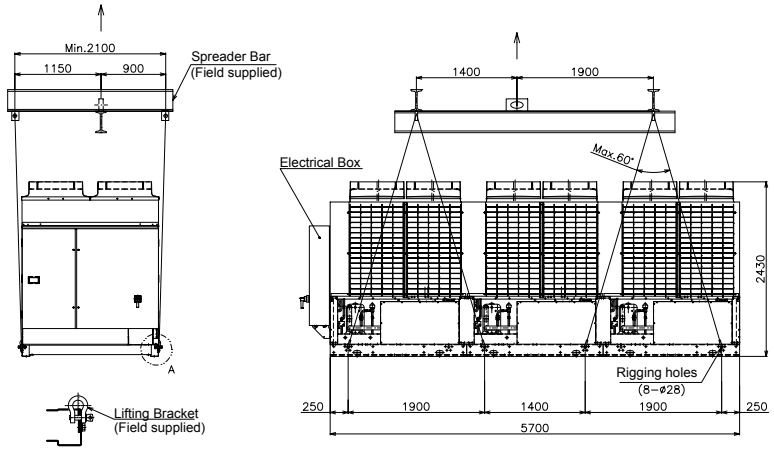


Fig.3. Rigging the unit

5.5.2. Declining the unit during transportation.

WARNING:
Do not decline the unit more than an angle of 15º as shown in the figure during transportation. If declined more than an angle of 15º, the unit may fall down.

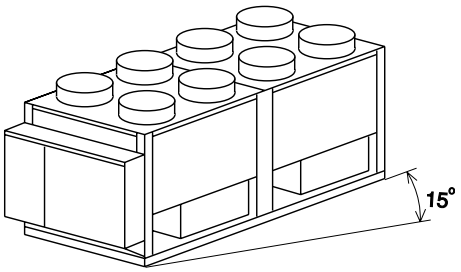


Fig.4. Declining the unit.

6. Installation

Contents

6.1. Electrical Wiring

◆ **Tools and Instruments**

One Set of Wiring tools and Electrical Tester (Clamp Meter)

◆ **Schedule Check**

DANGER:

Switch OFF main interruptor (M.I) for any work inside electrical box.
Keep electrical box cover closed 2 min. after switching power off (to discharge the capacitors)

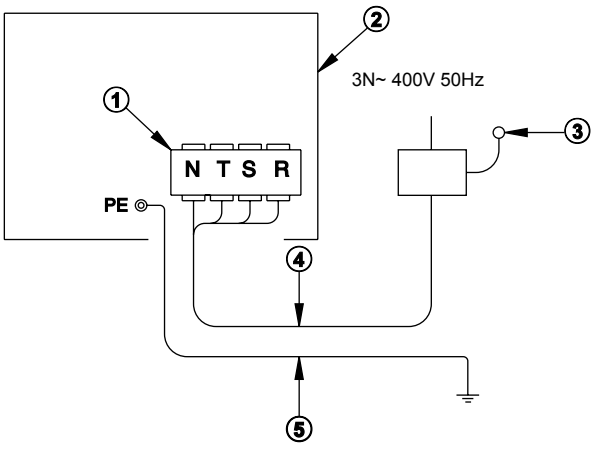
WARNING:

- *Confirm that the field-selected electrical components (main power switch, fuses, wires, conduit connections, wire terminals and others) are properly selected according to the "Electrical Data" in this Technical Catalogue, and ensure that they comply with national and local codes.*
- *It is recommended that the main power switch be locked in the "OFF" position, to prevent against accidental supply of power during equipment servicing.*
- *Check to ensure that an earthing wire is correctly connected to the unit. This wire protects from an electric shock. Utilisation of an earth leakage breaker is necessary.*
- *Unit access must be restricted to the general public.*

◆ **Main Power Wiring Procedures**

Confirm that electrical power is not being supplied to the installation location prior to any electrical installation work.

1. Install the field-supplied main switch box(es) at a properly selected location.
2. Install conduit connectors in the hole for the power wiring.
3. Lead main power wires and the earthing wire through the connector to the screw terminals for main power and earthing in the magnetic switch box. The neutral wires for 380V/50Hz and 415V/50Hz power supply should also be led through the connector.
4. Firmly connect the wires with wire terminals to unit screw terminals R, S, T and N according to Fig. 6.
5. Connect the wires between the power source and the field-supplied magnetic switches.
6. Consider that the main power source will not be left turned OFF, easily, because it is necessary to energise the oil heater even during unit stoppage.

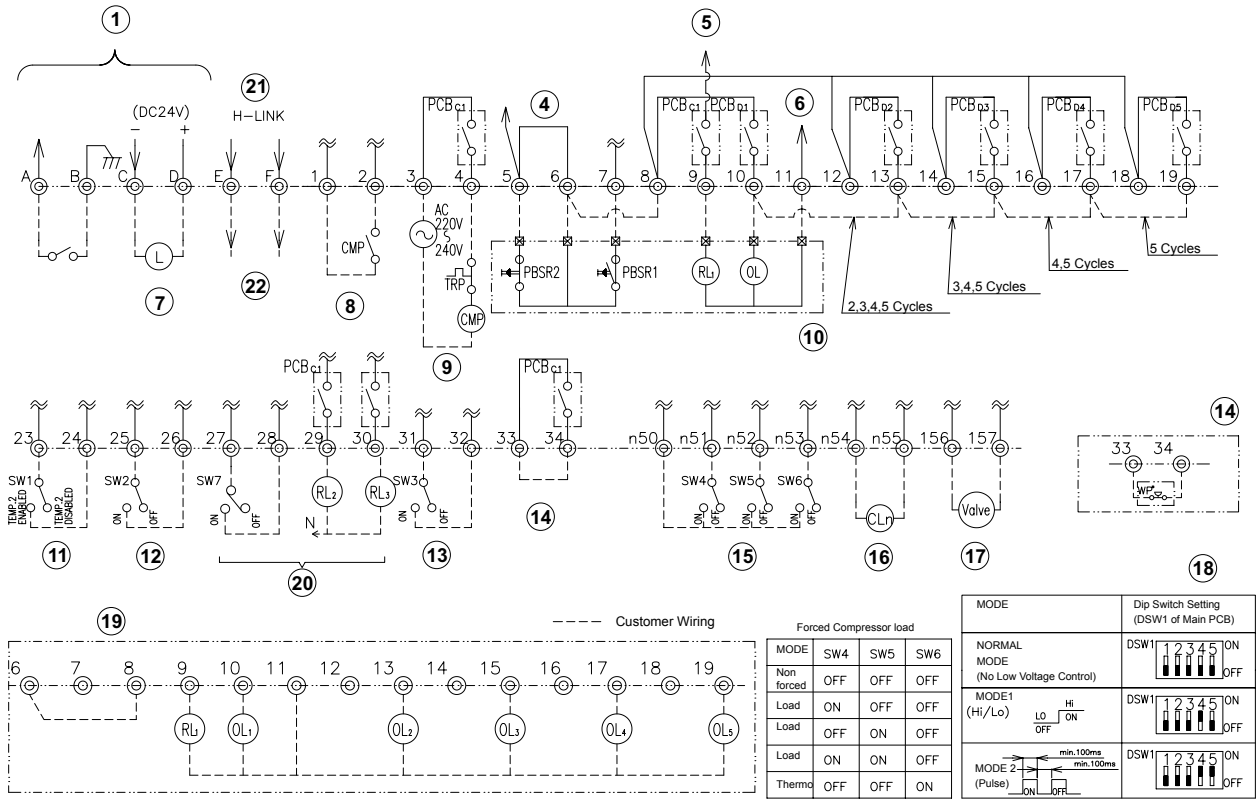


Fg.6. Main Power Wiring.

N°	Name
1	Main Power/Terminal Board (R,S,T,N)
2	Electrical Box
3	Main Power Switch
4	Main Power Wiring
5	Earth Wiring

◆ Control Wiring

Connect the interlock wiring and control wiring between the unit terminals and the magnetic switches for the water pumps, according to Fig. 7 or the wiring label. The main connection to terminal N is required.



Forced Compressor load

MODE	SW4	SW5	SW6
Non forced	OFF	OFF	OFF
Load	ON	OFF	OFF
Load	OFF	ON	OFF
Load	ON	ON	OFF
Thermo	OFF	OFF	ON

MODE	Dip Switch Setting (DSW1 of Main PCB)
NORMAL MODE (No Low Voltage Control)	DSW1 1 2 3 4 5 ON OFF
MODE1 (Hi/Lo) LO OFF Hi ON	DSW1 1 2 3 4 5 ON OFF
MODE 2 (Pulse) min.100ms min.100ms ON OFF	DSW1 1 2 3 4 5 ON OFF

Fig.7. Control Circuit Wiring.

N°	Name
1	Low voltage / Remote Control
2	Run / Stop Signal
3	Alarm signal (DC24V)
4	In case of Remote Control operation this wire shall be removed
5	1~ 230V
6	Neutral
7	Alarm Lamp
8	Pump Interlock
9	Pump Operation
10	Remote Control Switch
11	2nd Setting Temperature
12	External Thermostat Operation
13	External Fan Operation
14	Only used for different water pressure switch or flow switch options
15	Force Compressor load operation
16	Caution lamp for fan operation
17	Free cooling output signal
18	Setting of low voltage control
19	In case of individual indication without Remote Control Switch.
20	Operation mode switch/lamp (only for heat pumps models)
21	H-Link
22	Connection for control Devices (CSC-5S,...)

NOTE:

1. *All the settings shall be performed before Power ON.*
2. *Remote/Local Change over Switch on Operation Switch shall be set to "Remote".*
3. *Terminals 15~n57 are for AC220-240V,*
   Terminals A~D are for DC24V
   Terminals E~F are H-LINK (Low signal)

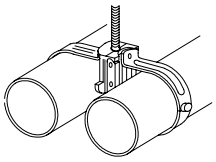
6.2. Water Piping

◆ **When Piping Connections are performed:**

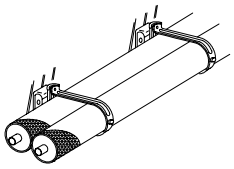
1. Connect all pipes as close as possible to the unit, so that disconnection can be easily performed when required.
2. Connect the Water Coolers in the same unit to the same common Water Piping.
3. It is recommended for the piping of the chilled water inlet and outlet that flexible joints be utilised, so that vibration will not transmit.
4. Whenever permissible, sluice valves should be utilised for water piping, in order to minimise flow resistance and to maintain sufficient water flow.
5. Proper inspection should be performed to check for leaking parts inside and outside the system, by completely opening the chilled water inlet and outlet valves to the water cooler.
   Additionally, equip valves to the inlet and outlet piping.
   Equip an air purge cock on the inlet piping and a drain cock on the outlet piping. The cock handle should be removed so that the cock can not be opened under normal circumstances. If this cock is opened during operation, trouble will occur due to water blow-off.
6. Sufficiently perform insulation to keep the chilled water piping cool and to prevent sweating of the piping.
7. Under the condition where the ambient temperature is low in winter, there is a case where equipment and piping will become damaged during the shutdown periods at night, because the water in the pump or piping will be frozen. To prevent freezing of the water, it is effective to operate the pumps.
   HITACHI Chiller has the pump ON/OFF operation control (see wiring diagram) water from piping.
   Additionally, in a case where measures such as water draining are difficult, utilise antifreeze mixture of ethylene glycol type or propylene glycol type.
8. Suspend the refrigerant and water piping at certain points and prevent the refrigerant and water piping from being in direct contact with the building: walls, ceilings, etc...
   If there is direct contact between pipes, abnormal sound may occur due to the vibration of the piping. Pay special attention in cases of short piping lengths.

   Do not fix the refrigerant and water pipes directly with the metal fittings (refrigerant piping may expand and contract).
   Some examples for suspension method are shown below.

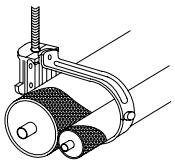
For suspending heavies



For piping along the wall



For instant installation work



9. The common water pipes (Inlet/Outlet) for RCU2E100~400AG2 are field supplied. Typical pipe working examples are indicated on chapter 6.3.
   It is not necessary to install any sensor in these common pipes for standard models.

   Number of connections for models:

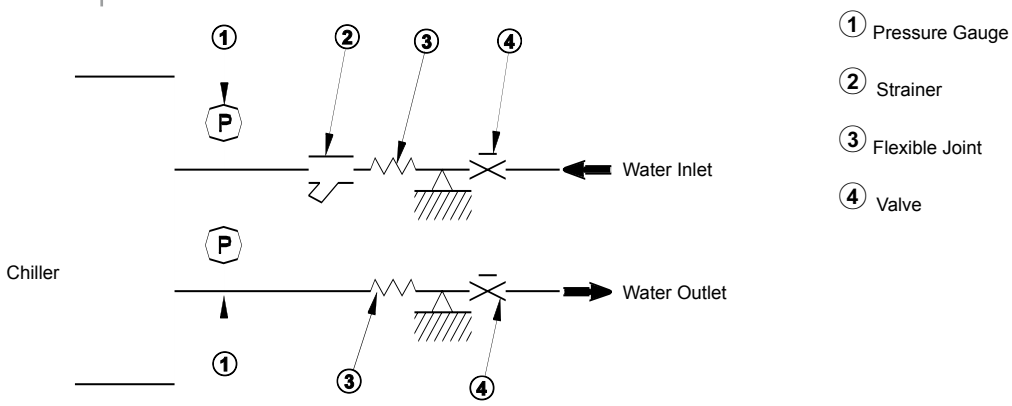
Models	Water Inlet	Water Outlet
RCU2E40, 50, 60, 70, 80AG2	1	1
RCU2E100, 120, 140, 160AG2	2	2
RCU2E180, 210, 240AG2	3	3
RCU2E280, 320AG2	4	4
RCU2E380, 400AG2	5	5

NOTE:

Common Water Piping connecting each cooler can be prepared as Option.

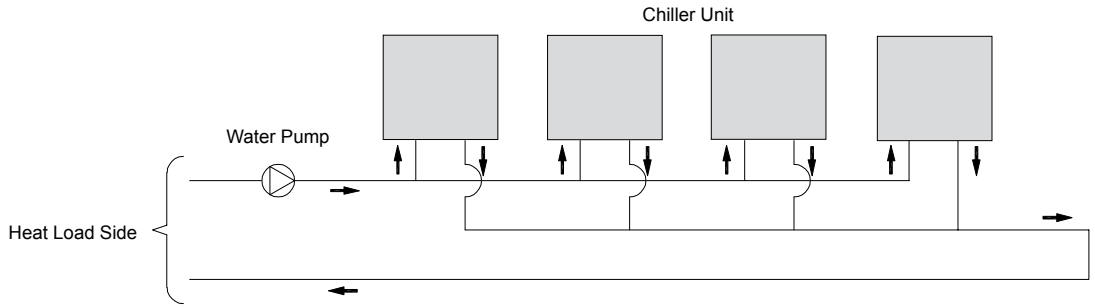
CAUTION:

This product is equipped with plate type heat exchanger. In the plate heat exchanger, water flows through a narrow space between the plates. Therefore, there is a possibility that freezing may occur if foreign particles or dust are clogged. In order to avoid this clogging, 20 mesh water strainer shall be attached at the inlet of chilled water piping near the product. In case of punching metal type strainer, mesh hole size shall be ∅ 1.6mm or less.
Never use the salt type antifreeze mixture, because it possesses strong corrosion characteristics, and water equipment will be damaged.



NOTE:
Water strainer is prepared as option.

CAUTION:
In case of connecting some units to the same water piping, design the water piping so that the water distribution to each unit is equal (refer to figure below) Imbalance of water distribution may cause a serious damage like a water freezing in the heat-exchanger.



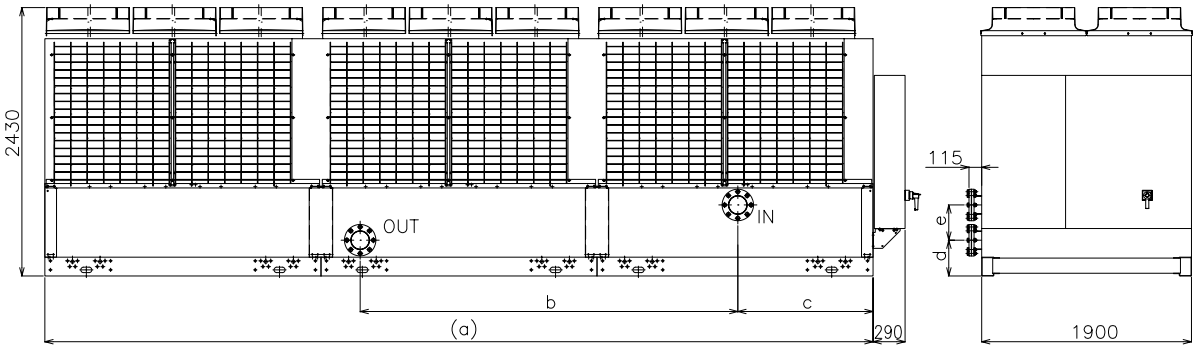
6.3. Typical Common Water Piping

The Common Water Pipe Distributor collects water from each inlet and outlet, providing a single water inlet and outlet connections, as shown in below drawing.

It is available as an option for use on Chillers with multiple plate heat exchangers.

The Common Water Pipe Distributor is pre assembled and integrated into the Chiller unit as a factory fitted option (see "Options line up" chapter).

◆ **RCU2E 100, 120, 140, 160, 180, 210, 240, 280, 320, 350, 400AG2**



◆ **DIMENSIONS TABLE**

Model / Dim	a	b	c	d	e	Flange size	Connecting pipe diameter (mm)
RCU2E100AG2 RCU2E120AG2	3800	0	1385	335	300	4”	114.3
RCU2E140AG2 RCU2E160AG2	5000		1685				
RCU2E180AG2	5700	2220	1225	325	320	6”	168.3
RCU2E210AG2 RCU2E240AG2	7500	3420					
RCU2E280AG2 RCU2E320AG2	10000	5920					
RCU2E350AG2 RCU2E400AG2	12500	8420				8”	219.1

6.4. Minimum internal system water volume

To ensure the cooling operation at least 5 minutes without interruption, the internal chilled water volume in the piping system should be greater than the minimum volume shown below.

MODEL RCU2E-AG2		40	50	60	70	80	100	120	140	160	180	210	240	280	320	350	400
Minimum Internal System Water Volume	m³	0.40	0.47	0.56	0.64	0.74	0.93	1.12	1.28	1.48	1.68	1.91	2.21	2.55	2.95	3.19	3.69

MODEL RHU2E-AG2		40	50	60	70	80	100	120	140	160	180	210	240
Minimum Internal System Water Volume	m³	0.39	0.46	0.54	0.66	0.70	0.91	1.09	1.33	1.40	1.63	1.99	2.10

NOTE:

Minimum internal system water volume written above is for standard ON/OFF differential.

In case of changing ON/OFF differential, minimum internal water volume changes as following percentage.

Inlet ON/OFF Differential (set by Dip-switch 5, 3&4pins)	4°C	3°C	2°C	1°C
Minimum Internal Water Volume	50%	67%	100%	200%

To prevent frequent ON/OFF for no load or extremely low load operation, system internal water volume shall be more than above table.

ON/OFF cycles shall be maximum 6 times per hour.
(minimum 5 minutes operation and minimum 5 minutes thermostat OFF)

6.5. Water Control

CAUTION:

When industrial water is applied for chilled water and condenser water, industrial water rarely causes deposits of scales or other foreign substances on equipment. However, well water or river water may in most cases contain suspended solid matter, organic matter, and scales in great quantities. Therefore, such water should be subjected to filtration or softening treatment with chemicals before application as chilled water.

It is also necessary to analyse the quality of water by checking pH, electrical conductivity, ammonia ion content, sulphur content, and others, and to utilise industrial water only if problem is encountered through these checks.

The following is the recommended standard water quality.

Item	Chilled Water System		Tendency (1)	
	Circulating Water (20 °C Less than)	Supply Water	Corrosion	Deposits of Scales
Standard Quality pH (25 °C)	6.8 ~ 8.0	6.8 ~ 8.0	❍	❍
Electrical Conductivity (mS/m) (25°C) {μS/cm} (25 °C) (2)	Less than 40 Less than 400	Less than 30 Less than 300	❍	❍
Chlorine Ion (mg Cl^-/l)	Less than 50	Less than 50	❍	
Sulphur Acid Ion (mg SO_4^{2-}/l)	Less than 50	Less than 50	❍	
The Amount of Acid Consumption (pH 4.8) (mg $CaCO_3$/l)	Less than 50	Less than 50		❍
Total Hardness (mg $CaCO_3$/l)	Less than 70	Less than 70		❍
Calcium Hardness (mg $CaCO_3$/l)	Less than 50	Less than 50		❍
Silica L (mg SIO_2/l)	Less than 30	Less than 30		❍
Reference Quality Total Iron (mg Fe/l)	Less than 1.0	Less than 0.3	❍	❍
Total Copper (mg Cu/l)	Less than 1.0	Less than 0.1	❍	
Sulphur Ion (mg S^{2-}/l)	It shall not be detected.		❍	
Ammonium Ion (mg NH_4^+/l)	Less than 1.0	Less than 0.1	❍	
Remaining Chlorine (mg Cl/l)	Less than 0.3	Less than 0.3	❍	
Floating Carbonic Acid (mg CO_2/l)	Less than 4.0	Less than 4.0	❍	
Index of Stability	6.8 ~ 8.0	-	❍	❍

NOTE:

(1). The mark "❍" in the table means the factor concerned with the tendency of corrosion or deposits of scales.

(2). The value showed in "{ }" are for reference only according to the former unit.

6.6. BMS gateways

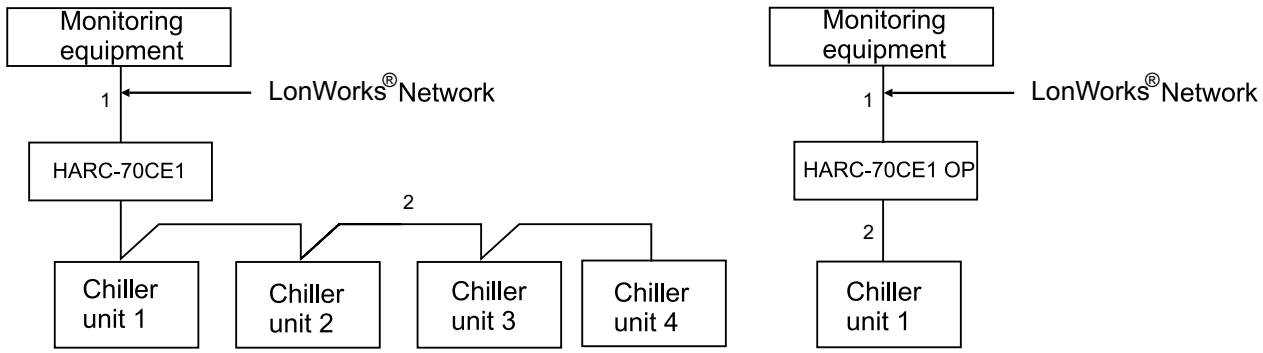
6.6.1. HARDC70-CE1 (OP) - LonWorks® interface.

◆ General Features

- There are two options for water chillers:
  - HARC-70CE1
  - HARC-70CE1 OP
- Gateway interface with BMS LonWorks systems (installations with intelligent BMS control).
- With the HARC-70CE1 connection to a H-LINK network, it is possible to control 4 setting points and 7 monitoring points of up to 4 chillers.
- With the HARC-70CE1 OP connection to a H-LINK network, it is possible to control 4 setting points and up to 44 monitoring points of one chiller unit.
- The HARC-70CE1 (OP) remote controls offer the option of self-checking their own status.

◆ System

The following figure shows the internal configuration of the BMS connection used by the HARC-70CE1(OP).



Nº	Description	Wire size
1	Connection wire with upper system (field supplied)	
2	Connection with chiller, H- Link (field supplied)	0.75 mm² twisted-pair cable with a maximum length of 1000 m

CAUTION:
Make sure that the shielded cable is earthed.

◆ HARC-70CE1 (OP) Specifications

– Hardware specifications

Element	Specification
Power supply	1~ 230V ±10% 50Hz
Energy consumption	10W (maximum)
External dimensions	Width: 170 mm, height: 75 mm, depth: 80 mm (Installed inside the box)
Weight	0.6 kg
Installation conditions	Indoor
Temperature conditions	0~45 °C
Humidity conditions	10~80% (Without condensation)
Power supply wiring sizes (field supplied)	2 mm^2 shielded

– Telecommunications specifications for water chillers

Element	Specification
Communication unit	Water chillers
Communications cable	Non polar, twisted and shielded 2 cable system
Telecommunications system	Half-duplex telecommunications
Synchronous system	Asynchronous communication system
Telecommunications speed	9,600 bps
Wire size (field supply)	0.75 mm^2 twisted-pair cable with a maximum length of 1000 m
Cable length (field supply)	1,000 m (total length)
Connection quantity	HARC-70CE1 type: Maximum of 4 chiller addresses HARC-70CE1 OP type: Maximum of 1 chiller address

– Telecommunication specifications for the upper system

Element	Specification
Communication unit	Upper monitoring equipment
Transmission protocol	LonTalk (*) protocol
Access method	Persistent CSMA/CD system planned
Coding system	Differential Manchester Code
Telecommunications speed	78,000 bps
Maximum cable length	500 m (total bus length)

(*) "LonTalk" is an "Echelon Corporation" trademark in the USA and other countries.

◆ Control Signal

Control Operation	ON/OFF Chiller	All HARC'S
	Outlet Water Setting	All HARC'S
State Monitoring	ON/OFF	All HARC'S
	Chilled Water Outlet Setting	All HARC'S
	Chilled Water Outlet Temperature	All HARC'S
	Chilled Water Inlet Temperature.	All HARC'S
	Alarm Codes	All HARC'S
	Operation Status	All HARC'S
	Discharge Pressure 1,2	Only HARC OP
	Suction Pressure 1,2	Only HARC OP
	Discharge Temperature 1,2	Only HARC OP
	Suction Temperature 1,2	Only HARC OP
	Compressor Status (ON/OFF) 1,2	Only HARC OP
	Outlet Water Temp. 1	Only HARC OP
	Water Temp. In Evap. Backside 1	Only HARC OP

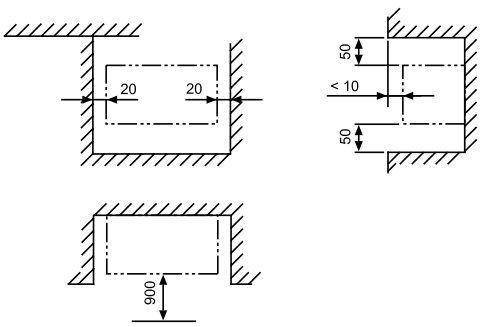
◆ Installation

a. Space requirements

NOTE:

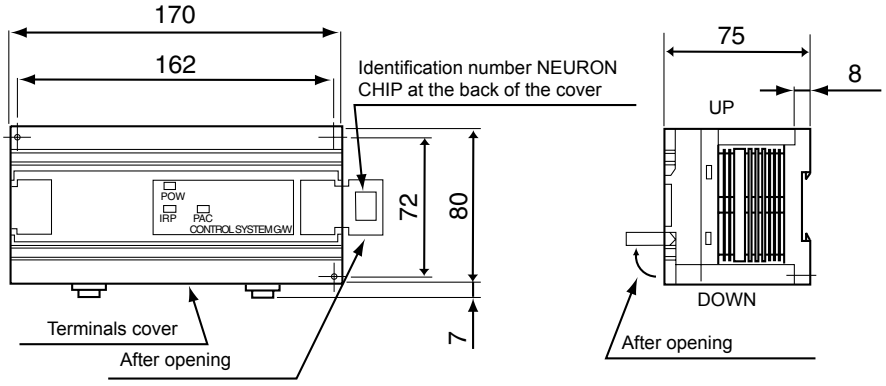
- *Bear in mind the safety summary warnings when selecting the installation site.*
- *The installation site should be located in a place with an earthing connection.*

Space required for the installation



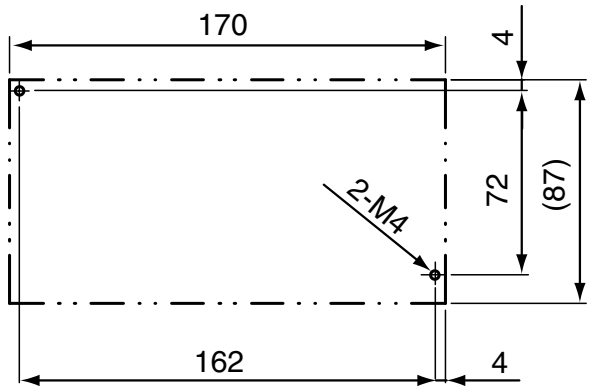
b. Installation procedure

1. Install the HARC-70CE1 in an earthed metal box, bearing in mind the following HARC-70CE1 dimensions for the box that it will be installed in.

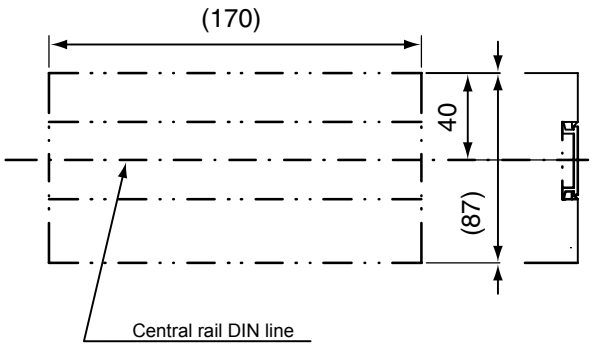


2. Secure the HARC-70CE1 in accordance with the following instructions, depending on if it is mounted with screws or DIN rails.

Screw mounting



DIN rail mounting



6

CAUTION:

- All wiring work must be done in accordance with local regulations and the instructions of the electricity company.

- A qualified electrician should carry out the electrical wiring.

- Adjust the electrical leakage detector switch in accordance with local regulations.

3 The HARC-70CE1 should be installed between the power supply, the monitoring equipment, the water chiller and the earth connection.

Please use it correctly according to the Controllers Technical Catalogue (TCGB0061).

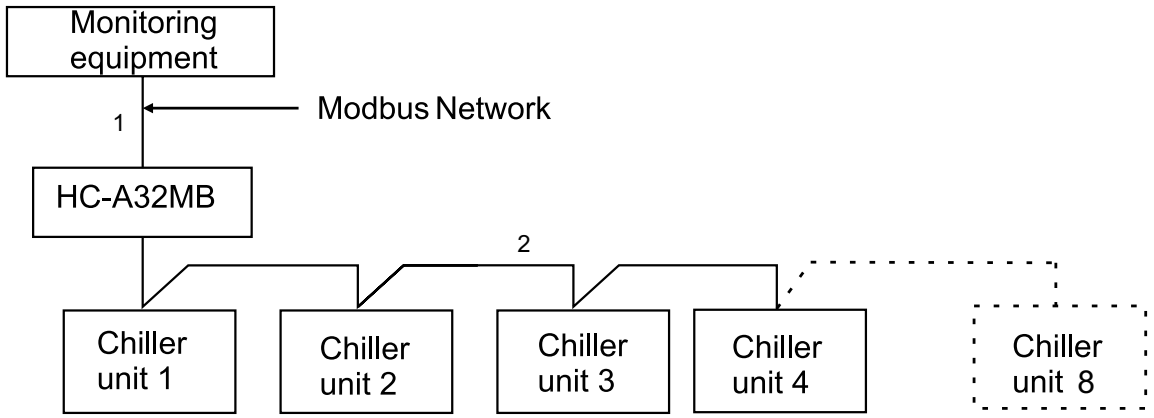
6.6.2 HC-A32MB - ModBus interface

◆ **General features**

- Gateway interface with BMS Modbus systems (installations with intelligent control or BMS).
- With the HC-A32MB connection to a H-LINK network, it is possible to control 4 setting points and 16 monitoring points.
- With the HC-A32MB it can be controlled up to 8 AG2 chillers

◆ **System**

The following figure shows the internal configuration of the BMS connection used by the HC-A32MB



Nº	Description	Wire size
1	Connection wire with upper system (field supplied)	
2	Connection with chiller, H- Link (field supplied)	Communication cables for the connection of HC-A32MB to an Hitachi installation. Twisted-pair shielded cable 0.75mm²

CAUTION:
Make sure that the shielded cable is earthed

◆ HC- A32MB Specifications

Hardware Specifications

Item	Specifications
Power supply	1~ 230 V ±10% 50Hz
Consumption	25 W (maximum)
Outer dimensions	Width: 143 mm, Depth: 302 mm, Height: 76 mm
Weight	1.75 kg
Assembling conditions	Indoors (in a control panel or desktop)
Ambient temperature	0~40 °C
Humidity	20~85% (Without condensation)
Power supply wiring sizes (field supplied)	2 mm^2 shielded

MODBUS

Item	Specifications
K5	Serial Port RS485 (3 Pins connector) - MODBUS Protocol
Communication line	Twisted pair cable. Polarity
Communication system	Half-duplex, multipoint serial connection
Communication method	Non parity or odd/even parity selection. Data length: 8 bits - 1 stop bit
Baud rate transmission	19,200/9,600 Baud
Length	max. 1,200 m according EIA-485

H-LINK

Item	Specifications
Communication with	HITACHI CHILLER
Communication line	Twisted pair shielded cable, non polarity
Communications system	Half-duplex
Communication method	Asynchronous
Speed of transmission	9,600 Bauds
Length of wiring	1,000 m maximum (total length of HLINK I/O bus)
Maximum number of HC-A32MB	1 HC-A32MB/H-LINK SYSTEM (CHILLER)

◆ **Control signal**

Control Operation	ON/OFF Setting order
	Mode setting order
	Cool/Heat setting temperature
	Central setting
State Monitoring	Exist
	Chiller Address
	ON/OFF Status
	Mode Status
	COOL setting temperature status
	HEAT setting temperature status
	Inlet temperature
	Outlet temperature
	Ambient temperature
	Unit operation condition
	Alarm code for general Chiller Alarm
	Alarm code for cycle alarm

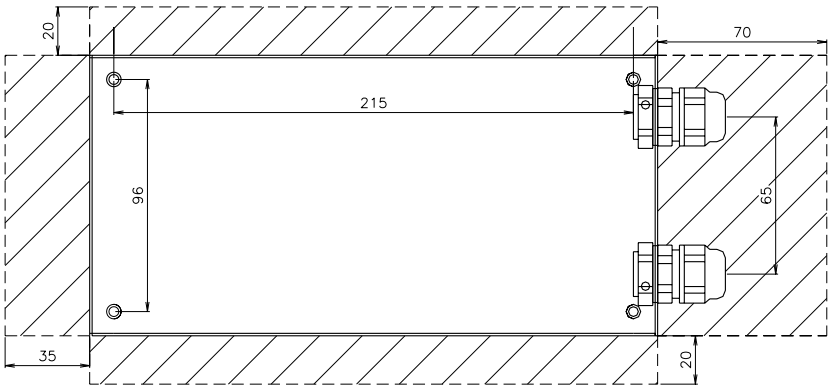
◆ **Installation**

a. Space requirements

NOTE:

Bear in mind the safety summary warnings when the installation site.
The installation site should be located in place with an earthing connection.

Keep free grated area for ventilation and cable connection



b. Installation procedure

Perform the following procedure:

1 Remove the rubber supports

2 Unscrew the 4 screws from the top cover and remove it

3 Attach the box to the rear vertical board from the inside with M4 screws (not provided) and place 3 mm washers on the outside to separate the box from the wall.

4 Reinstall the top cover. Be careful to position it correctly.

Please use it correctly according to the Controllers Technical Catalogue (TCGB0061).

6.7. Remote controllers

6.7.1. CSC-5S – Central Station

◆ **General features:**

- 8 chiller and 8 CSC-5S central remote control addresses can be connected on each H-LINK
- Up to 8 central remote controls (CSC-5S) can be connected to a H-LINK.
- Basic functions, heat/cold mode and temperature setting.
- When a problem occurs, an alarm code will immediately be displayed with detailed information about the error.
- A standard external input terminal is included for possible connection to a timer.
- The external signals control the following functions

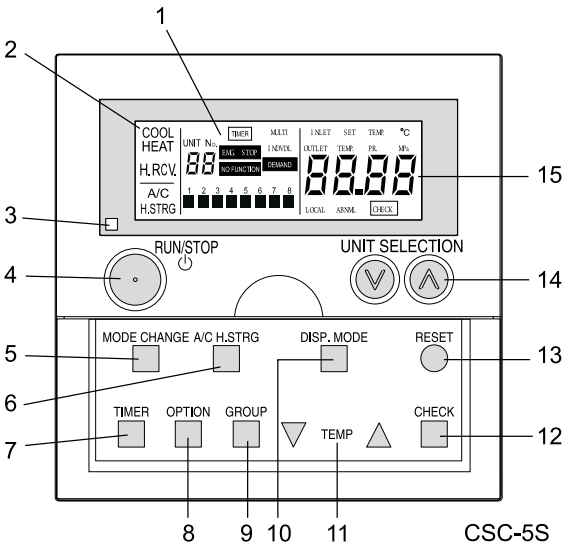
  Start/Stop.

  Operation mode (Cooling/Heating).

  Temperature setting (Cold/Heat).

◆ **CSC-5S Specifications**

1	Unit operating indicator Individual control indicator Multiple unit control indicator Timer indicator Emergency stop indicator Operation indicator for each unit Demand indicator “No Function” indicator, in the event of a malfunction
2	Operation mode indication Indicates the operation mode selected for the indicated group: “Cool” (cooling), “Heat” (heating) and “H.RCV” (heat recovery) (not available).
3	Run indicator (red pilot).
4	“RUN/STOP” button .
5	“MODE” button (operation mode selection).
6	“A/C H.STRG” button (air-conditioning/heat storage).
7	“TIMER” button (timer selection).
8	“OPTION” button Used for selecting the different options.
9	"GROUP" button (for setting groups).
10	“MODE” button (button for changing display).
11	“TEMP” button (for setting groups).
12	“CHECK” button Used for service tasks.
13	“RESET” button (reset).
14	“UNIT SELECTION” button.
15	Temperature setting indicator Inlet/outlet temperature indicator “ABNML” alarm indicator “LOCAL” local indicator



CSC-5S

6

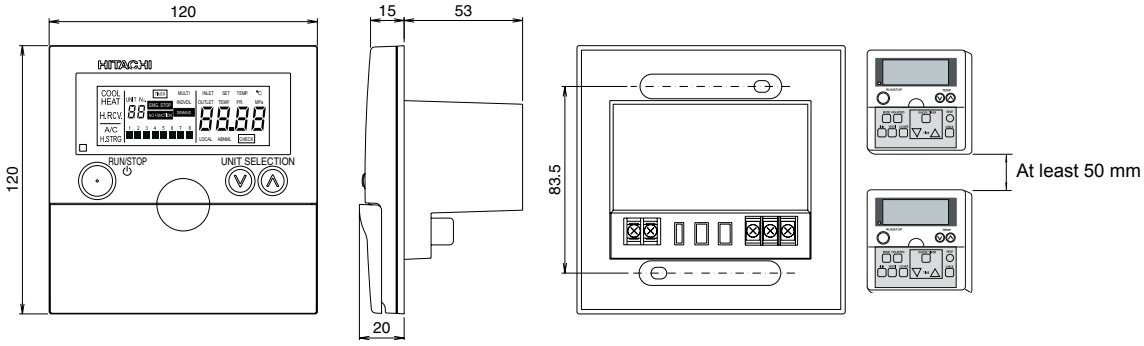
◆ Installation

a. Space requirements

Take note of the maximum admissible cable length between units and the control as well as between the units themselves, as shown in the following table:

Cable section	0.3mm²	≥0.75mm²
Cable length	30m	2 mm² shielded

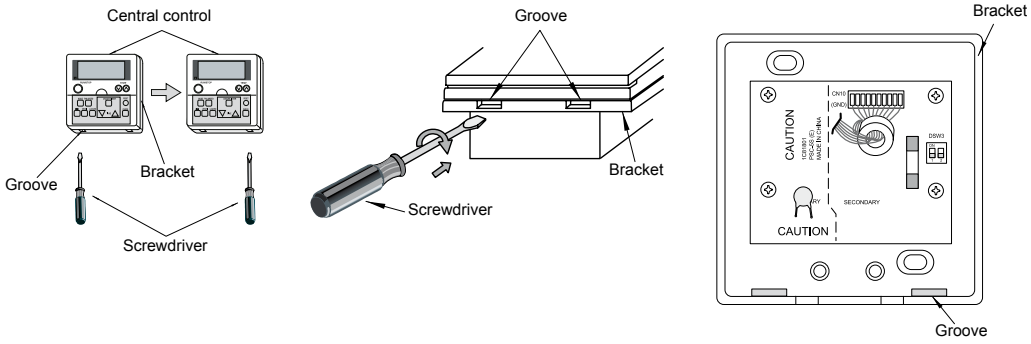
If several control units are to be installed in a vertical position, leave a distance of at least 50 mm between them to allow the front cover to be opened and to insert the tool for removing the control from its housing.



b. Installation procedure

1. Insert the flat headed screwdriver's tip into the grooves on the bottom of the bracket. Push and turn the screwdriver.

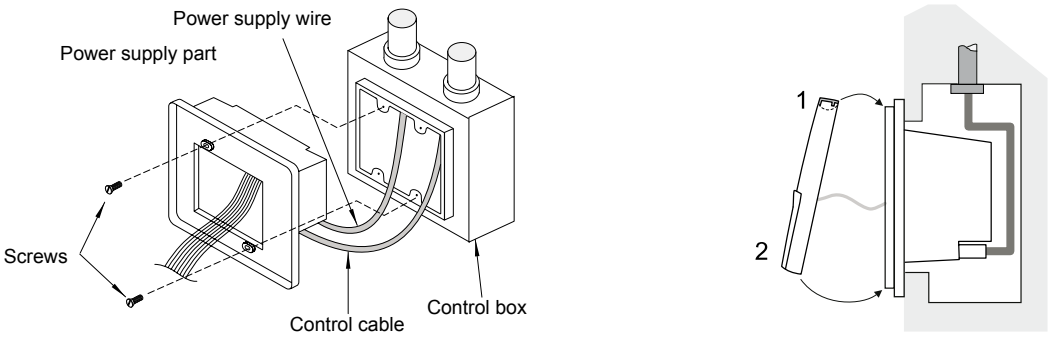
   Remove the part of the remote control linked to the power supply part, as shown in the following figure:



2. Connect the power supply part to the control box, as shown below.

NOTE:

Do not lay the power supply cable and the remote control cable in the same conduit



3. Connect the control unit part to the power supply part. Position the top first and then the bottom.

CAUTION:

- Do not position all the signal cables together with the power supply cable and other signal cables. The noise caused by these cables could lead to the malfunction of the remote control and chiller unit. If the signal cables are next to the power cables and any other signal cables, maintain a distance of at least 15 cm between the signal cables and other cables, or pass the signal cables through a metal conduit which is earthed at one end.

- If the power supply cable is accidentally connected to the terminal board for the transmission signal and voltage is applied, the fuse will blow to protect the printed circuit board. In this case, this remote control can operate without the fuse, if pin no. 2 of DSW3 is set to the ON position.

- If the PSC-A1T remote control's timer is used, set the same address no. for the remote control and the timer.

- Make sure that the wiring is correct (do place the signal cables together with the electricity cables). Incorrect wiring could cause the remote control to malfunction

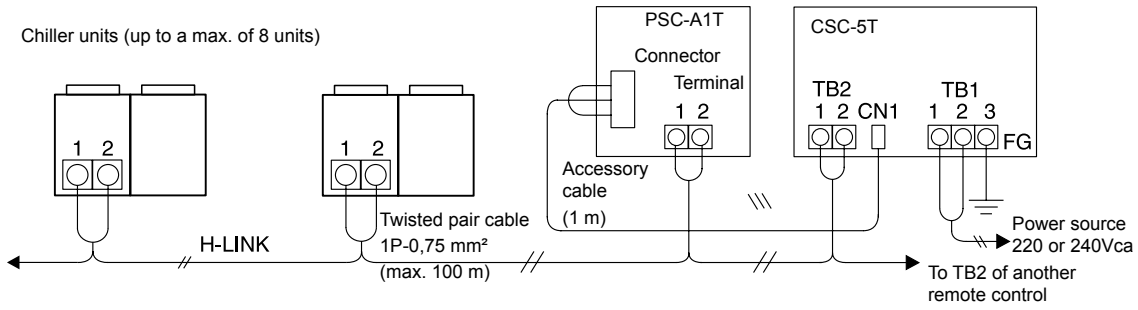
- Before installing the wiring, switch off the power supply to the air conditioning system and central control unit.

- Installing the wiring while the central control power supply is switched on may cause the central control unit to malfunction.

Electrical connection of the CSC-5S central remote control with the PSC-A1T timer

NOTE:

- Up to 8 CSC-5S *central control units and one* PSC-A1T *timer can be connected to one H-Link.*



NOTE:

Always use 0.75 mm2 twisted pair cable.

- Use the field supply cable for connection if the CSC-5S central remote control is used together with the PSC-A1T.

- The maximum total length of the wiring for all units is 1000 meters.

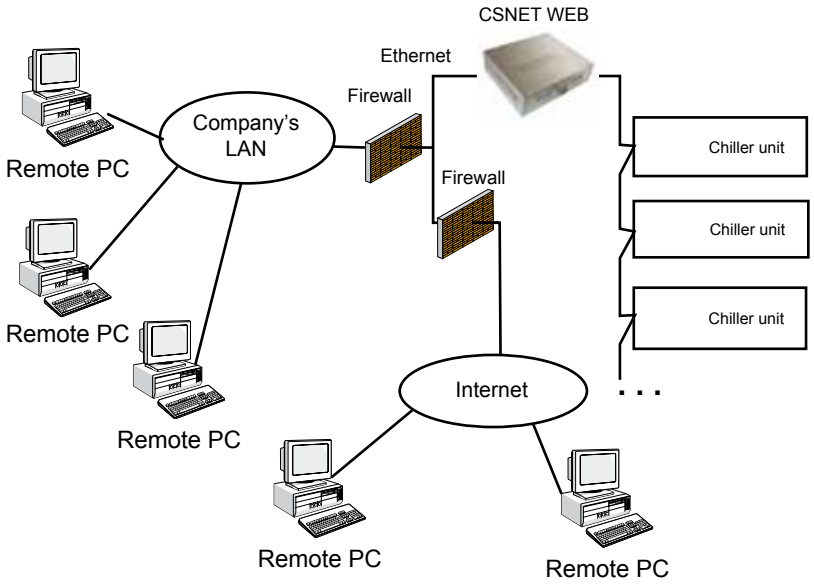
6.7.2. CSNET Web – Computer central control

◆ **General features**

- CSNET WEB is an independent centralised control system which can control an H-LINK communication line. When it is connected to a system with package units, it can control up to 160 indoor units or up to 8 water chillers.
- CSNET WEB uses JAVA technology to control and monitor remotely operation of the installation.
- Can be connected to a Local Area Network through its Ethernet port. After configuring the network, the system will be accessible from any site in the company's network.
- TIMER which is easier to program the calendar. It can memorize up to 4 years of programming and lets you choose an annual timer independently for each unit and day.
- Building layout view.

◆ System

The following figure shows the different connection of CSNET WEB



◆ CSNET Web Specifications

Hardware specifications

Elements	Specifications
Power supply	AC 230 V 1~ ±10% (50Hz)
Consumption	20W (maximum)
External dimensions	Width: 240 mm, Length: 204 mm, Alt: 74,5 mm
Weight	1,94 kg
Installation conditions	Indoors (in a control panel, table-top)
Ambient temperature	0~40 °C
Humidity	20~85% (without condensation)

Specifications for communication with the units

Elements	Specifications
Communication with	H-LINK
Communication cable	Twin wire, without polarity
Communication system	Half-duplex
Communication method	Asynchronous
Transmission speed	9600 Bauds
Cable length	Maximum 1000 m (total length)
Number of units	Up to 8 water chillers (1)

Communication specifications with a local area network

Elements	Specifications
Remote computer	Processor at 100 MHz, 256 MB RAM, 200 Mb free hard disc space. Windows 2000 or higher, with Java Runtime Environment (2) version 6 Update 3 or higher Installed (included in the CD-ROM)

(1) Water chillers only can be connected in an H_LINK communication line. Mixed connection of package units and water chillers is not permitted

(2) Java(R) is a registered trade mark of Sun Microsystems

◆ Installation

a. Space requirements

Make sure that there is sufficient space around the CSNET WEB (a minimum of 50 mm) for heat to dissipate properly (see “Installation procedure”). If the equipment is installed vertically, situate the power feed below and the control outputs above.

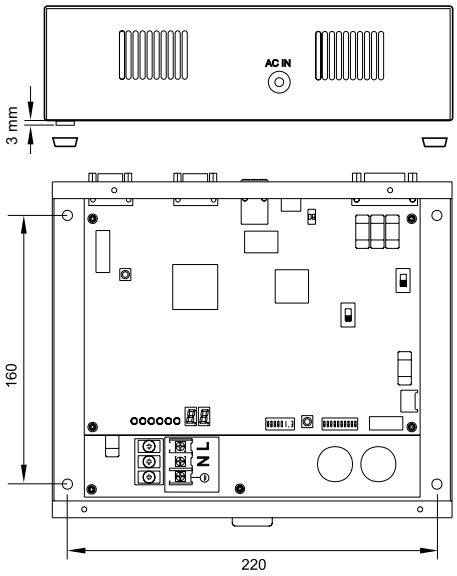
b. Installation procedure

1 Remove the rubber base pads

2 Remove the 4 screws from the cover and take it off

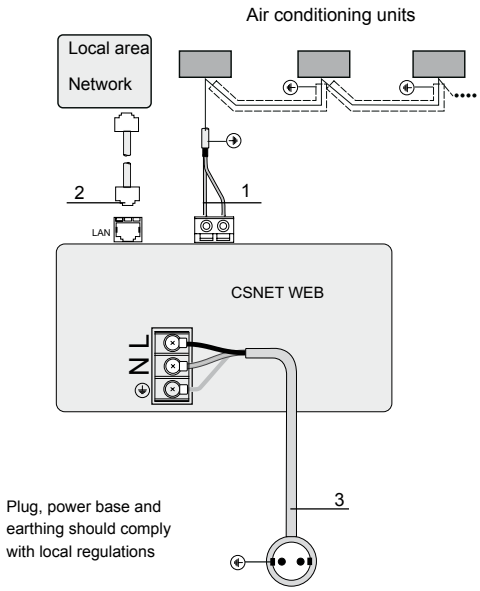
3 Secure the box to the vertical back plate from inside with M5 screws (not supplied), using 3 mm washers outside to separate the box from the wall.

4 Replace the cover. Be careful to position the top correctly.



c. Electrical wiring

Nº	Connection	Cable Specifications
①	Transmission cable for the units (H-Link)	Twisted pair cable 1P-0.75 mm². Without polarity. Insulated and earthed at one end. To select the type of cable, see the Outdoor Unit Installation and Operation Manual.
②	LAN line	Category 5 or above LAN cable – A cross-over cable is needed for direct connection to a PC. – A direct cable is needed for connection to a commercial distributor (Hub)
③	Network cable 2 phases + earth	AC 230V 1~50Hz Make sure that the cable used complies with local regulations and that both the plug and socket are correctly earthed



After making the connections, replace the cover

6.8. Installation final check

Inspect the installation work according to all documents and drawings. Sub-chapter 6.8.1 shows the minimum check points.

6.8.1. Installation Work Check List

1. Is the unit solidly mounted and levelled?

2. Is the installation location adequate?

- ☐ Space for Condenser Air Flow
- ☐ Space for Maintenance Work
- ☐ Noise and Vibration
- ☐ Sunshine and Rainfall
- ☐ Appearance

3. Is the water piping system adequate?

- ☐ Tube Size
- ☐ Length
- ☐ Flexible Joint
- ☐ Insulation
- ☐ Strainer
- ☐ Common Pipes (for 2~5 cycles)
- ☐ Water Drain
- ☐ Water Control
- ☐ Air Purge
- ☐ Pressure Control

4. Is the electrical wiring system adequate?

- ☐ Wire Size
- ☐ Switch Size
- ☐ Fuse Size
- ☐ Voltage and Hz
- ☐ Tightened Connections
- ☐ Operation Control Devices
- ☐ Safety Devices
- ☐ Interlock

5. Have the R, S and T phases of the water Chiller correctly been connected to the R, S and T phases of the main power source?

6. Are the stop valves for the condenser liquid line open?

7. Have the packing glands and the cap nuts for the stop valves been tightened?

8. Is BMS connected correctly and operate as decided?

7. Test Running

Contents

CAUTION:
Switch On the main power switch, and energise the oil heater for 12 hours before start-up, to sufficiently warm the oil.
Check to ensure that valves are correctly opened. If not opened, serious damage will occur to the compressor due to an abnormally high pressure.

DANGER:
Switch OFF main interruptor (M.I) for any work inside Electrical Box.

CAUTION:
When the unit is wired according to the HITACHI standard wiring shown on the wiring label. Switch ON the main power switch, and energise the oil heater for 12 hours before start-up to sufficiently warm the oil.

NOTE:
A loud sound occurs when this compressor is stopped after the normal operation. However, this sound indicates no abnormalities and stops within a few seconds by the activation of the check valve. This sound is due to the reverse rotation of the screw rotors, resulting from the pressure difference between the discharge and the suction pressure.
Each compressor may show the different valves of running current due to individual capacity control for each compressor. This is not abnormal.

7.1. Preparation

- **Tools and instruments**

– High Pressure Compound Gauge. Low Pressure Compound Gauge. Electrical Tester and General Tools.

– Remove the foreign particles and substances from the water piping, without going through the water coolers and clearing the water strainer filter before running. Check to ensure that no foreign particle and substance exists in the water piping.

7.2. Test running

Test running should be performed as follows, when the unit is wired according to the HITACHI standard wiring label.

1. Switch ON the field-supplied pump and it will be started immediately and check the condition and operation state of that.
2. Fully open the liquid outlet stop valve.
3. Set the operation switch to “ON”, and the compressor will be started in a few minutes after this operation.

Test running should be accomplished as follows.

Each rotation direction of two rotors in the compressor is fixed so that a reversal phase protection device is equipped.

However, the rotation direction should be checked with a following method.

Confirm that phases R, S and T for the compressor are correctly connected. The correct phase connection can be checked by a phase sequence indicator. If not, the compressor does not start due to the activation of the reversal phase protection device.

Cut the main switch and interchange two of three terminals, R, S and T on the main terminals at the field connection side in the unit.

– Operate the pump for chilled water and other auxiliary equipment such as fan coil units and Air handling units.

– Check to ensure that the chilled water flows sufficiently and that other auxiliary equipment operates properly.

– Set the switch at the desired temperature.

– Depress the “ON“ push button, the condenser fans will start to operate and the compressor will be started.

– Check the rotation direction of the condenser fans.

– After system operation becomes stabilised, check the discharge and suction pressures by 7-segment on control panel.

– Check to ensure that the thermostat works properly.

– Check to ensure that the control and protective devices work properly.

– Starting timer and unload-starting timer are set at five (5), thirty (30) seconds and three (3) minutes, respectively, in accordance with operation characteristics. Therefore, local adjustment should be avoided.

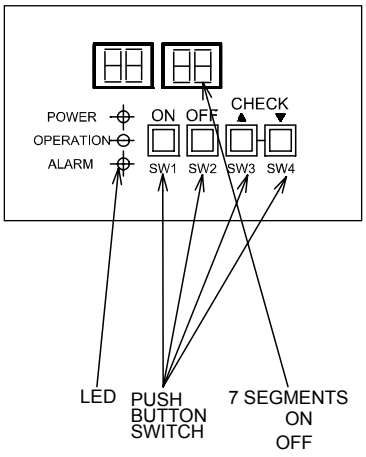
7.3. Instructions after test running

When the test running is completed, please instruct customers about operation and periodic maintenance methods before leaving the unit, by using this manual. A special attention is required to the following caution:

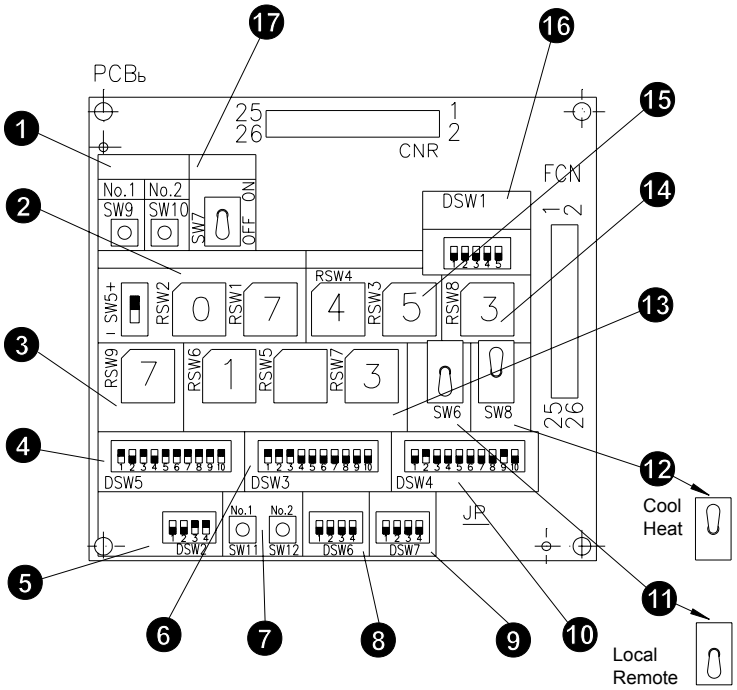
CAUTION:
Do not cut off the power source switch during the operating season. When the power source switch is cut off, the oil heater for screw compressor is not energised, and the compressor might be damaged due to oil foaming at starting.
When the operation season starts after long disconnection of the power source switch, please turn on the power source switch 12 hours before starting operation.

8. Controller Adjustment

Contents



SWITCH POSITION	
ON / OFF	ON
ON / OFF	OFF



❶ High Cut Check (Fan Stop for Checking)

❷ Chilled Water Temperature Setting
(STANDARD: “+07”)

❸ Defrosting Set by Ambient Temperature (Heat Pump)
(NOT AVAILABLE)

❹ Continuous Capacity Control Setting
(STANDARD)

❺ Compressor starting Delay Time
(STANDARD: 3 min)

❻ Mode Set Switch A/ H-LINK address
(DEPEND ON MODEL)

❼ Manual Defrost (Heat Pump)
(NOT AVAILABLE)

❽ Optional Function B
(STANDARD: ALL OFF)

❾ Optional Function C
(STANDARD: ALL OFF)

❿ Mode Set Switch B

⓫ Local/Remote Changeover Switch
(STANDARD: “Remote”)

⓬ Cool/Heat Changeover Switch
(STANDARD: “Cool”)

⓭ Current Limiter Setting
(DEPEND ON MODEL)

⓮ Neutral Zone Setting
(STANDARD: “3”)

⓯ Hot Water Temperature Setting for Heat Pump
(NOT AVAILABLE)

⓰ Optional Function A (Outernals signals, Self-Checking mode)
(STANDARD: ALL OFF)

⓱ Pump Operation
(STANDARD: OFF)

NOTE:
In case of RCU2E280~400AG2 (4,5 cycles models), there are 2 PCBb. The first PCBb has the same functions. The second PCBb (subsidiary) has only available functions ❶, ❻ and ❼.

8.1. Control System

Electrical Operation Controls advanced HITACHI Water Chillers are as follows.

- **Capacity Control**

  All models are equipped with an unloading system for each compressor, in order to adjust the cooling capacity and to provide precise temperature control for the chilled water, coupled with electronic thermostats.

- **Control Panel**

  ON switch, OFF switch, Power Supply Lamp, Operation Lamp, Alarm Lamp, Operation/Alarm Indicator for each refrigerant cycle and check switch are mounted in the Control Panel. The Control Panel is located at a position where easy access is available. Operation/Alarm indicator can display individual alarm codes such as High-Cut, Low-Cut etc. This function is very useful for detecting what alarm has occurred. Check switches are for checking chilled water temperature and alarm occurrence data. Chilled water temperature setting switches, ON/OFF Differential Setting Switches, Remote-Local Switch and so on are located at the rear side of Control Panel, in order not to access during operation.

- **Operation Hour-Meter**

  This hour-meter indicates the sum of the compressor operation.

- **Printed Circuit Board**

  A micro-processor, relays and electronic components are mounted on the Printed Circuit Board. Increased reliability is assured due to the elimination of mechanical parts and wires. This board contains various functions by applying micro-processor as follows:

  Screw Compressor Cycling Protection Circuit.
  The electronic timer of the screw compressor cycling protection (ccp) connected in the compressor control circuit delays the screw compressor restarting period for approximately three (3) minutes for No.1 compressor, four (4) minutes for No.2 compressor, five (5) minutes for No.3 compressor, six (6) minutes for No.4 compressor and seven (7) minutes for No. 5 compressor.

  Electronic Thermostat Circuit.
  The electronic thermostat senses chilled water outlet temperature, and operate capacity control solenoid valves of HITACHI screw compressor.

  Screw Compressor Reversing Protection Circuit.
  This circuit is composed of a reverse-phase protection device, preventing reverse operation of the screw compressor, because the screw compressor definitely cannot be operated in the wrong direction due to the misconnection of the main power phases.

  Restart after Power-Failure.
  In case that a power failure shorter than 2 seconds occurs, compressors can be restarted automatically within 3 minutes after power supply.

  If power failure longer than 2 seconds occurs, compressor also can be restarted by selection Switch Setting.

8.2. Controller Adjustment

Setting functions are next:

- **Chilled Water Outlet Temperature Setting Switch = RSW1 and RSW2 (07 ºC standard)**

  7°C for chilled water outlet temperature is recommended. The RSW1 and RSW2 dials are already set at 7 and 0. Setting at the figures from 3 to 9 of the RSW2 dial should not be permitted.

- **Heated Water Outlet Temperature Setting Switch = RSW3 and RSW4 (45 ºC standard)**

  7°C for chilled water outlet temperature is recommended. The RSW1 and RSW2 dials are already set at 4 and 5. Setting at the figures from 0 to 1 and from 6 to 9 of the RSW4 dial should not be permitted.

- **Current Limiter Set Switch = RSW5, 6, 7**

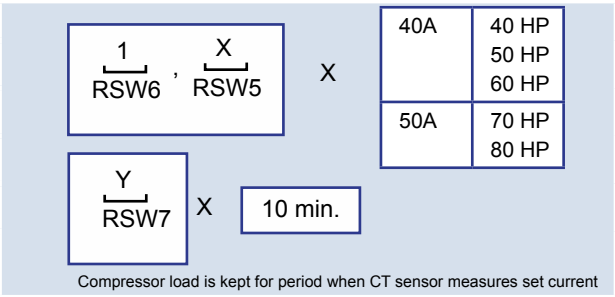
  RSW5 and RSW6 are used for setting the limiter current value. RSW7 is used for setting activating time of current limiter.

  – **PCB_{B1} RSW5,6,7: CT Sensor function (Supplied as standard)**

  (PCB_{B2} RSW5,6,7: No function)

Num. “X”	Model (HP)
2	40
3	50/100
5	60/120/180
6	70/140/210/280/350
7	80/160/240/320/400



e.g.:

RCU2E40AG2: Compressor load is “down” and “hold” for 30min (Y=3; 3*10min) when compressor current is higher than 48 A (X=2; 1.2*40A).

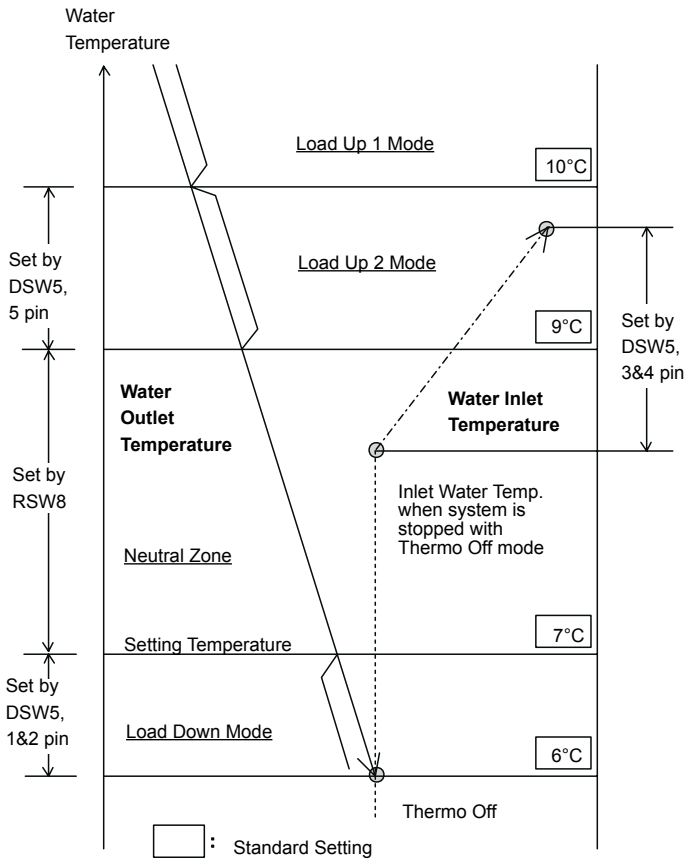
◆ **Neutral Zone Setting Switch = RSW8**

= 2 degrees is standard. The RSW8 dial is already set at 3 (= 2 degrees).
The figures at the RSW8 dial mean as follows:

Figure	0	1	2	3	4	5	6	7	8	9
Band (degree)	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0

◆ **Continuous Capacity Control Setting Switch = DSW5**

Definition of Special Terms.



8

◆ **Continuous Capacity Control Setting Switch=DSW5**

Temperature Band for Stop Setting Switch (1.0 ºC standard)

The figure 1 and 2 of the DSW5 switch are already set at figure 1 = ON side, 2 = OFF side.
The locations at the figure 1 and 2 of the DSW5 mean as follows.

Figure	1	2	1	2	1	2	1	2
Location	ON	ON	ON	OFF	OFF	ON	OFF	OFF
Band(degree)	0.5		1.0		1.5		2.0	

Temperature Band for Restart Setting Switch (2.0 ºC standard)
The figure 3 and 4 of the DSW5 switch are already set at figure 3 = ON side, 4 = OFF side.
The locations at the figure 3 and 4 of the DSW5 mean as follows.

Figure	3	4	3	4	3	4	3	4
Location	ON	ON	ON	OFF	OFF	ON	OFF	OFF
Band(degree)	1.0		2.0		3.0		4.0	

Differential Temperature of Load-up 2 Mode Setting Switch (1.0 ºC standard)
The figure 5 of the DSW5 switch is already set at ON side.
The locations at the figure 5 of the DSW5 mean as follows.

Figure	5	5
Location	ON	OFF
Band(degree)	1.0	3.0

Output Signal Time for Load-up 1 Mode Setting Switch (12 seconds standard)
The figure 6 of the DSW5 switch is already set at ON side.
The locations at the figure 6 of the DSW5 mean as follows.

Figure	6	6
Location	ON	OFF
Time(second)	12	24

Output Signal Time for Load-up 2 and Load-down Mode Setting Switch (2 seconds standard)
The figure 7 and 8 of the DSW5 switch are already set at figure 7 = ON side,
8 = ON side.
The locations at the figure 7 and 8 of the DSW5 mean as follows.

Figure	7	8	7	8	7	8	7	8
Location	ON	ON	ON	OFF	OFF	ON	OFF	OFF
Time(second)	2		4		6		8	

Interval of Output Signal Time for Load-up 2 and Load-down Mode Setting Switch. (60 seconds standard)

The figure 9 and 10 of the DSW5 switch, are already set at figure 9 = ON side, 10 = ON side. The locations at the figure 9 and 10 of the DSW5 mean as follows.

Figure	9	10	9	10	9	10	9	10
Location	ON	ON	ON	OFF	OFF	ON	OFF	OFF
Time(second)	60		90		120		30	

◆ **Setting of Compressor Cycling Protection Start = DSW2**

* Time Delay Starting for Compressor Setting Switch *

The compressor will be started after this setting time. (3 minutes standard)

The figure 1 and 2 of the DSW2 switch are already set at figure 1 = OFF side, 2 = OFF side.

The locations at the figure 1 and 2 of the DSW2 mean as follows.

Figure	1	2	1	2	1	2	1	2
Location	ON	ON	ON	OFF	OFF	ON	OFF	OFF
Time(minute)	0.5		6		10		3	

◆ **Manual Set Switch A = DSW3**

* Compressor Forcedly Stop Mode Setting Switch *

Master Printed Circuit Board: Switch “DSW3-1” is for No.1 compressor, “DSW3-2” for No.2, and “DSW3-3” for No.3,

Subsidiary Printed Circuit Board: Switch “DSW3-1” is for No. 4 compressor, and “DSW3-2” for No.5.

If necessary to stop any compressor, turn these switches (DSW3-1, DSW3-2 or DSW3-3) to the OFF side, the compressors corresponding to these switches which are turned to the OFF side will be stopped.

The figures of the DSW3 switch are initially set as follows depending on the compressor quantity.

This switch is for servicing, therefore, all the compressors shall be ON for normal operation:

	Master PCB			Subsidiary PCB		
Figure	1	2	3	1	2	3
Location	ON	OFF	OFF	OFF	OFF	OFF
Model	1 Comp. System					

	Master PCB			Subsidiary PCB		
Figure	1	2	3	1	2	3
Location	ON	ON	OFF	OFF	OFF	OFF
Model	2 Comp. System					

	Master PCB			Subsidiary PCB		
Figure	1	2	3	1	2	3
Location	ON	ON	ON	OFF	OFF	OFF
Model	3 Comp. System					

	Master PCB			Subsidiary PCB		
Figure	1	2	3	4	5	6
Location	ON	ON	ON	ON	OFF	OFF
Model	4 Comp. System					

	Master PCB			Subsidiary PCB		
Figure	1	2	3	4	5	6
Location	ON	ON	ON	ON	ON	OFF
Model	5 Comp. System					

DSW3-4,5,6,7: Enable of DC Fan Motor No. 11, 12, 13, 14 – Cycle Nº1 (PCB_{B1})
DSW3-4,5,6,7: Enable of DC Fan Motor No. 41, 42, 43, 44 – Cycle Nº4 (PCB_{B2})
DSW3-8,9,10: H-LINK ADDRESS [000 by default on PCB_{B1}];
Use same address in $PCB_{G1,G2}$ (DSW4-1,2,3)
DSW3-8,9,10: H-LINK ADDRESS [001 by default on PCB_{B2}];
Use same address in PCB_{G3} (DSW4-1,2,3)

NOTE:
The figures of DSW3 which are Not corresponding to the equipped compressor number are always turned to the OFF side.

◆ **Manual Set Switch B = DSW4**

The figure 1 of the DSW4 switch must be turned to the ON side for Heat Pump models and to the OFF side for Cooling Only models

The figure 2 and 7 of the DSW4 switch must be turned to the ON side.

Setting at the figures 3,4, 5, 6 and 8 of the DSW4 switch should not be permitted (always at OFF side).

The figures 9 and 10 of DSW4 switch are for compressor and unit size setting as follows.

Figure	9	10	9	10	9	10	9	10
Location	OFF	ON	ON	OFF	ON	ON	OFF	OFF
Compressor	40 HP		40 HP		50 HP		60 HP	
Unit	40 HP		50 HP		60 HP		70,80 HP	

◆ **Selection Switch for Cooling/ Heating Operation = SW8**

= All model in this series are for cooling only. So that Heating function is Not available.

The SW8 Selection Switch must be turned to the ***upper side***.

◆ **Selection Switch for Local/ Remote Operation = SW6**

= Remote operation is standard. So that the SW6 selection switch is turned to the ***lower side***.

If local operation is required, the SW6 selection switch is turned to the upper side.

■ **Selection Switch for Local/ Remote Pump Operation = SW7**

= The SW7 selection switch is turned to the ***lower ("OFF") side*** as remote setting.

If local operation is required, the SW7 selection switch is turned to the upper side.

◆ **Other Switches = SW5, DSW6 and RSW9**

This control panel is equipped with other switches:

The SW5 selection switch for chilled water/brine water, so that this switch must be turned to the ***upper side ("water")***. DSW6 and RSW9 for operation mode and setting change of these switches are not available.

It is recommended that the setting is not changed at site.

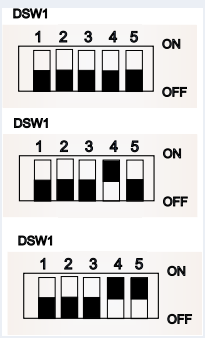
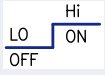
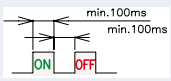
◆ **Setting of Low Voltage for Remote Control = DSW1**

This switch is used also for checking, resulting in easy troubleshooting.

– **Setting of Low Voltage for Remote Control = DSW1**

(PCB_{B2} DSW1: No function)

This switch is used also for checking (troubleshooting)

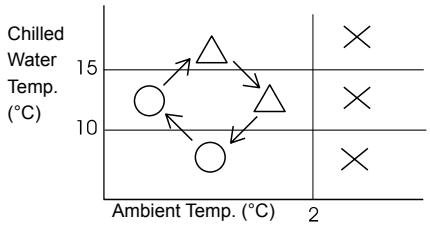
MODE	Dip Switch Setting (DSW1 of Main PCB)
NORMAL MODE (Now low voltage control)	
MODE 1 (Hi/Lo) 	
MODE 2 (Pulse) 	

◆ **Anti-freeze Control by Pump Operation = DSW6-2pin**

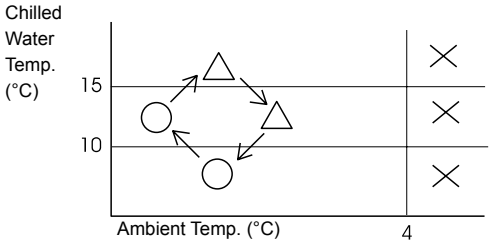
If the ambient temperature get lower than 2°C, water pump is operated forcedly and it protects water line against freezing. OFF side setting of DSW6-2pin makes this control available.
This control is available only when the pump is controlled by Chiller (See wiring diagram).

If water outlet temperature gets higher than 15°C, water pump is intermittently run with 5 minutes running and 55 minutes stopping.
The segment indicates 'PU' for 5 minutes in running and '88' for 55 minutes in stopping.
If ambient temperature gets higher than 4°C, this control will be cancelled.

Case 1. In case of ambient temperature decreasing



Case 2. In case of ambient temperature increasing



Symbols Show		
	○	Continuous Run
	△	Intermittent Run
	×	Stopped

For example, in case that this protection works under ambient temperature 2°C and chilling water is 10 ~15°C, then the water pump is running continuously.

When DSW6-2 is positioned at ON, makes this control be invalid. In case Chiller receives the running operation during this control, this protective control will be cancelled and go back to the normal water pump control.

This freeze protective control is not available under alarming due to water outlet or ambient thermistor abnormality (open or short circuit: alarm code... '12' or '22').

◆ **Low water outlet temperature option Setting = DSW4 and DSW7**

When this option is requested, the figure 4 of the DSW4 must be turned to the ON (UPPER) side.
Depend on Temperature Range, the figure 1 and 2 of the DSW7 is necessary to set as below.

Figure	1	2	1	2	1	2
Location	OFF	OFF	ON	OFF	OFF	ON
Temp. Range	Standard		-5~5 °C		-10~6 °C	

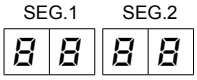
NOTE:
Other information on Low water outlet temperature option is on chapter 16.3

9. Self-Inspection Functions

Contents

9.1. Alarm Indication

If the unit is operated under abnormal conditions, an alarm code (refer to the table below) is indicated and the “Alarm” LED lamp is lighted.
Function of 7-Segment Light Emitted Diode on Control Panel is as shown in the table below.



Code					Content
No.1 Cycle	No.2 Cycle	No.3 Cycle	No.4 Cycle	No.5 Cycle	
E1H1	E2H2	E3H3	E4H4	E5H5	Activation of High Pressure Switch
E1L1	E2L2	E3L3	E4L4	E5L5	Excessively Low Pressure
E1L1	E2L2	E3L3	E4L3	E5L5	Activation of Low Pressure Protection Control
E1H1	E2H2	E3H3	E4H4	E5H5	Activation of AC Fan Internal Thermostat
E1S1	E2S2	E3S3	E4S4	E5S5	Activation of Thermal Relay for Compressor or Malfunction of Auxiliary Relay ARn
E1b1	E2b2	E3b3	E4b4	E5b5	Activation of Discharge Gas Thermistor
E1n1	E2n2	E3n3	E4n4	E5n5	Activation of Compressor Internal Thermostat
E1H1	E2H2	E3H3	E4H4	E5H5	Excess Low Temperature of Cooler Inlet Refrigerant
E1E1	E2E2	E3E3	E4E4	E5E5	Activation of Suction Gas Thermistor
E1U5	E2U5	E3U5	E4U5	E5U5	Phase Abnormally
E1U2	E2U2	E3U2	E4U2	E5U2	Failure of Water Outlet Thermistor (Only for 2 - 5 cycle unit)
E1U3	E2U3	E3U3	E4U3	E5U3	Activation of Freeze Protection Control (More Than 2 Cycle Unit)
E1U1	E2U1	E3U1	E4U1	E5U1	Failure of Cooler inlet Refrigerant Thermistor (Open / Short)
E1U3	E2U3	E3U3	E4U3	E5U3	Failure of Discharge Gas Thermistor (Open / Short)
E1U4	E2U4	E3U4	E4U4	E5U4	Failure of Thermistor set before Expansion Valve
E1U5	E2U5	E3U5	E4U5	E5U5	Failure of Water Outlet Thermistor (Rear side of Water Cooler)
E1U6	E2U6	E3U6	E4U6	E5U6	Failure of Suction Gas Thermistor (Open / Short)
E1U7	E2U7	E3U7	E4U7	E5U7	Failure of Discharge Gas Pressure Sensor (Open / Short)
E1U8	E2U8	E3U8	E4U8	E5U8	Failure of Suction Gas Pressure Sensor (Open / Short)
E1F0	E2F0	E3F0	E4F0	E5F0	Incorrect Setting of Fan Number
F1U1	F2U1	F3U1	F4U1	F5U1	Fan Inverter Rotation Abnormally *1
F1U2	F2U2	F3U2	F4U2	F5U2	Activation of Fan Inverter Over Current Protection Control *1
F1U3	F2U3	F3U3	F4U3	F5U3	Fan Inverter Phase Abnormally *1
F1U4	F2U4	F3U4	F4U4	F5U4	Error Communication between Inverter PCB and Control or Fan Control PCB *1
F1U5	F2U5	F3U5	F4U5	F5U5	Inverter Power Supply Abnormally *1

Code					Content
No.1 Cycle	No.2 Cycle	No.3 Cycle	No.4 Cycle	No.5 Cycle	
		05 05			Phase Abnormally
		11 11			Failure of Water Inlet Temperature Thermistor
		12 12			Failure of Water Outlet Thermistor. (Only for Single Cycle Unit)
		13 13			Activation of Freeze Protection Control (Only for Single Cycle Unit)
		22 22			Failure of Ambient Temperature Thermistor (Open / Short)
		SP SP			No Feedback Signal from Water Pump
		40 40			Incorrect Operation
		EU EU			Error Communication between Expansion Valve PCB and Control PCB
		Fc Fc			Error Communication between Fan Control PCB and Control PCB
		CP CP			Error Communication between Control PCB (PCB_{C1}, PCB_{C2})
		“PU” “PU”			Alarm of Excessively High Water Temperature
		6E 6E			Alarm of Water Failure (Differential Pressure Switch or Flow Switch Option)
		AP AP			Activation of Additional Protection Device
		03 03			Error Communication between Chiller and Remote Controller (If CSC-5S is connected.)
F1P7	F2P7	F3P7	F4P7	F5P7	Retry Operation (More Than 3 Fans Retry at The Same Time)
F1P8	F2P8	F3P8	F4P8	F5P8	Retry Operation (by Alarm Fx-41 or Fx-51, x: Cycle No.)
C1P5	C2P5	C3P5	C4P5	C5P5	Retry Operation (by Alarm Cx-6x or Cx-7x, x: Cycle No.)
C1P6	C2P6	C3P6	C4P6	C5P6	Retry Operation (by Alarm Cx-9x or Cx-Lx, x: Cycle No.)

“”-”” : Flickering , *1 : 21 Right side segment shows Fan No.

9.2. Normal Indication

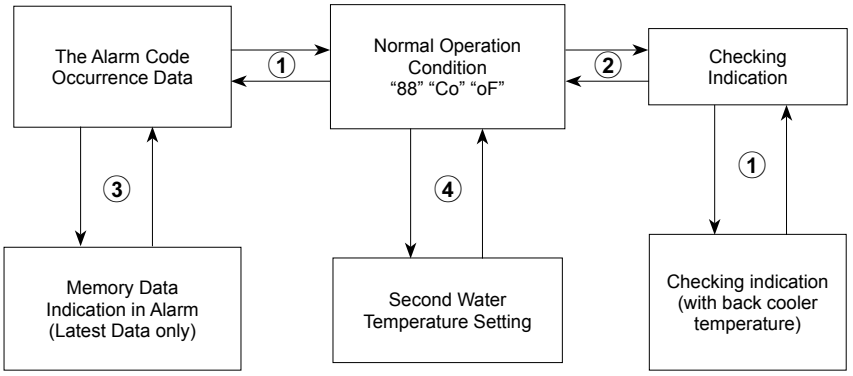
If the unit is operated under a normal operation condition, the operation code (refer to the table below) is indicated on 7-Segment LED’s of the control panel.

Code					Content
No.1 Cycle	No.2 Cycle	No.3 Cycle	No.4 Cycle	No.5 Cycle	
C1 88	C2 88	C3 88	C4 88	C5 88	Power Supply, After Stoppage
C1 Co	C2 Co	C3 Co	C4 Co	C5 Co	Cooling Operation
C1 oF	C2 oF	C3 oF	C4 oF	C5 oF	Stoppage by Thermo-OFF
		PU PU			Pump Operation, Warning of Pump Feedback
C1 Et	C2 Et	C3 Et	C4 Et	C5 Et	Activation of Current Limiter
C1 E0	C2 E0	C3 E0	C4 E0	C5 E0	Initializing Electronic Expansion Valve

9.3. Function for indication of operation condition

◆ Function for indication of operation condition

The setting temperature, chilled water temperature sensed at the thermistor, the setting differential temperature and the last alarm code are digitally indicated on the control panel.



① Press the check "Δ" and "∇" switches simultaneously for more than 3 sec.
It is changed to the normal mode by pressing the "Δ" and "∇" switches simultaneously for more than 3 sec. again.

② Press the check "Δ" switch for more than 3 sec.
It is changed to the normal mode by pressing the "Δ" switch for more than 3 sec. again.

③ Press the check "∇" switch for more than 3 seconds at the time to display latest Alarm code. It is changed to the normal mode by pressing the "∇" switch for more than 3 sec. again.

④ Press the check "∇" switch for more than 3 seconds.
It is changed to the normal mode by pressing the "∇" switch for more than 3 sec. again.

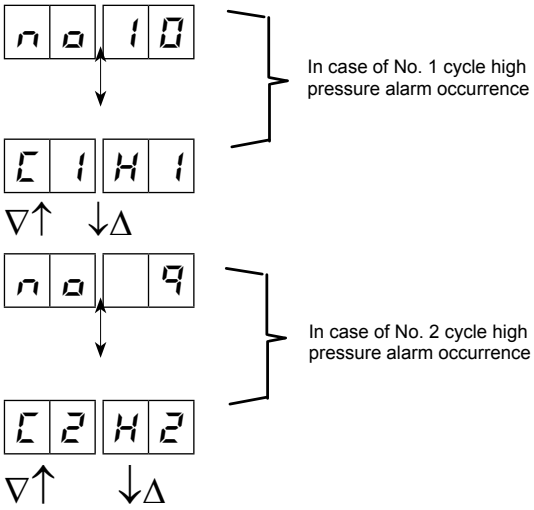
NOTE:
Each indication mode shall be changed from the normal mode.

◆ Indication mode of alarm occurrence data ①

The content of abnormal stoppage including activation of safety devices is memorised and indicated on the control panel

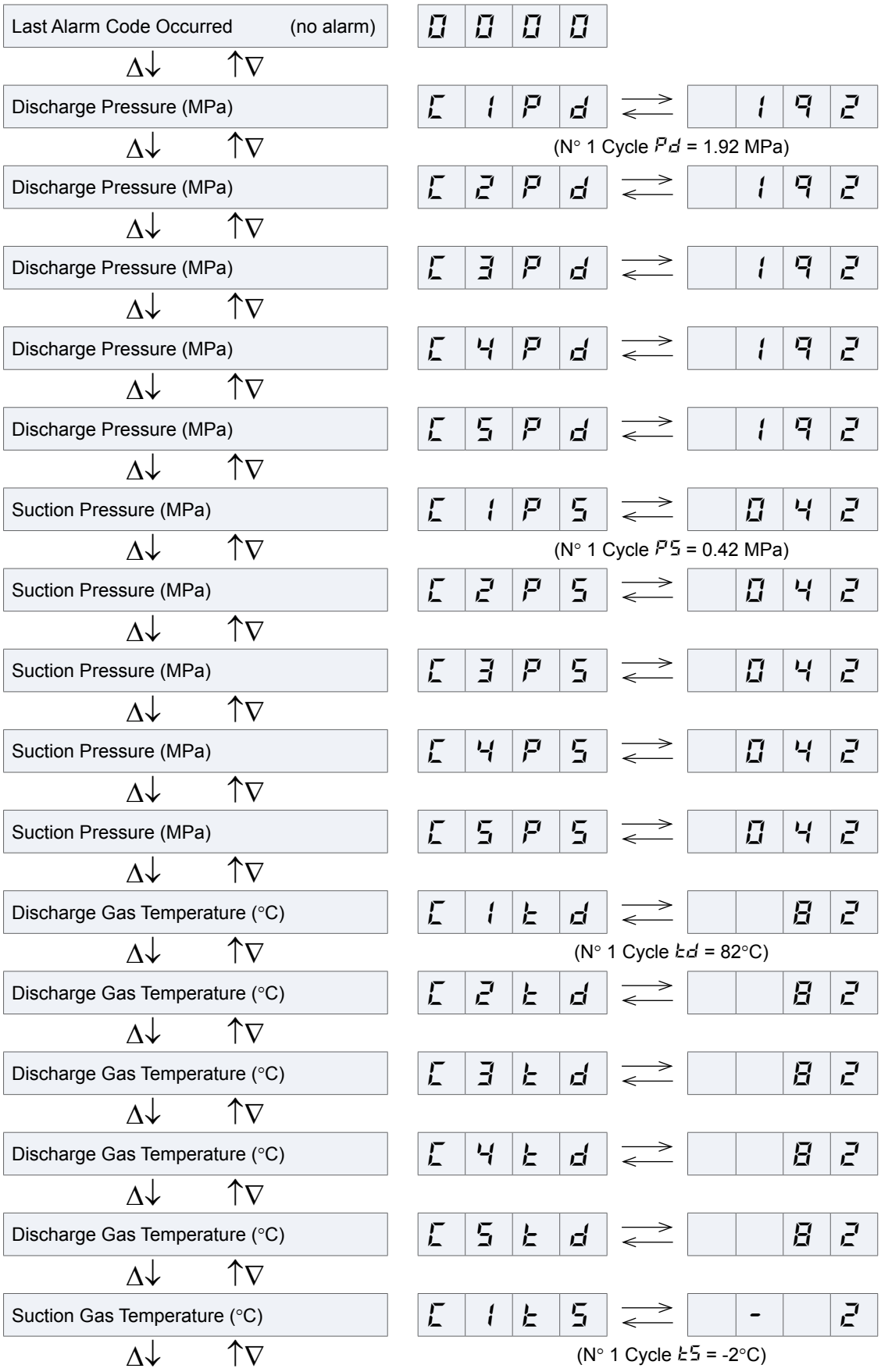
Alarm Occurrence Data (Max.10 data)

Example:



NOTE:
If an abnormal operation is occurred under this indication mode, this indication mode is changed to the alarm indication mode.

◆ **Checking Indication ②**



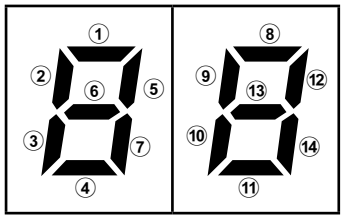
9

Suction Gas Temperature (°C)	C2t5 ⇄	- 2
Suction Gas Temperature (°C)	C3t5 ⇄	- 2
Suction Gas Temperature (°C)	C4t5 ⇄	- 2
Suction Gas Temperature (°C)	C5t5 ⇄	- 2
Evaporating Temperature (°C)	C1tr →	- 5
Evaporating Temperature (°C)	C2tr →	- 5
Evaporating Temperature (°C)	C3tr →	- 5
Evaporating Temperature (°C)	C4tr →	- 5
Evaporating Temperature (°C)	C5tr →	- 5
Liquid Temperature (°C)	C1tE ⇄	35
Liquid Temperature (°C)	C2tE ⇄	35
Liquid Temperature (°C)	C3tE ⇄	35
Liquid Temperature (°C)	C4tE ⇄	35
Liquid Temperature (°C)	C5tE ⇄	35
Water Inlet Temperature (°C)	CEL ⇄	12
Average Water Outlet Temperature (°C)	CoL ⇄	7
Water Outlet 1 Temperature (°C)	CoL1 ⇄	7
Water Outlet 2 Temperature (°C)	CoL2 ⇄	6

(N° 1 Cycle Er_1 = 36°C)

Water Outlet 3 Temperature (°C)	C o L 3	7
Water Outlet 4 Temperature (°C)	C o L 4	7
Water Outlet 5 Temperature (°C)	C o L 5	7
Setting Water Outlet Temperature (°C)	t S C	7
Second Setting Water Outlet Temperature (°C)	t S C d	5
Setting Neutral Zone Temperature Difference (°C)	d F	2
Ambient Temperature (°C)	t A	3 5
Compressor Capacity Control (°C)	C 1 L d	U P (Load up)
Compressor Capacity Control (°C)	C 2 L d	n U (Hold)
Compressor Capacity Control (°C)	C 3 L d	d 0 (Load down)
Compressor Capacity Control (°C)	C 4 L d	- - (Thermo-off)
Compressor Capacity Control (°C)	C 5 L d	U P

Alarm Control Status



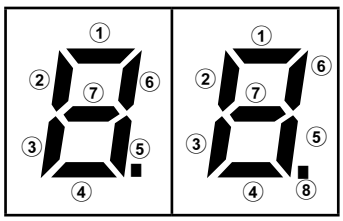
①	Discharge Pressure Control	⑧	High Efficiency Mode
②	Suction Pressure Control	⑨	Low Noise Mode
③	Different Pressure Control	⑩	Load Down Control (Water Outlet Temp.)
④	Freeze Protection Control	⑪	Not Available
⑤	Compressor Start Control	⑫	Discharge Temperature Control
⑥	Discharge Temperature Retry	⑬	Liquid Bypass (Not Available)
⑦	Current Limiter	⑭	Not Available

Control Status	C 1 P C	C o 8 (Compressor Start Control)
Control Status	C 2 P C	C o 9 (Suction Pressure Control Activated)
Control Status	C 3 P C	C o 5 (Discharge Temperature Control Activated)

Control Status — C4PC ⇄ Co 0
Discharge Temperature Control Activated

Control Status — C5PC ⇄ Co 0
Different Pressure Control Activated

Alarm Fan Position



NOTE:
The 7-segment indicates the fan location.
The fan ⑤ to ⑧ are ***Not available****.*

Fan Control — C1FC ⇄ 00 3b
Alarm indication / Hz

Fan Control — C2FC ⇄ 140

Fan Control — C3FC ⇄ 20

Fan Control — C4FC ⇄ 25

Ambient Temperature (°C) — C5FC ⇄ 00 30

Ambient Temperature (°C) — bA ⇄ 35

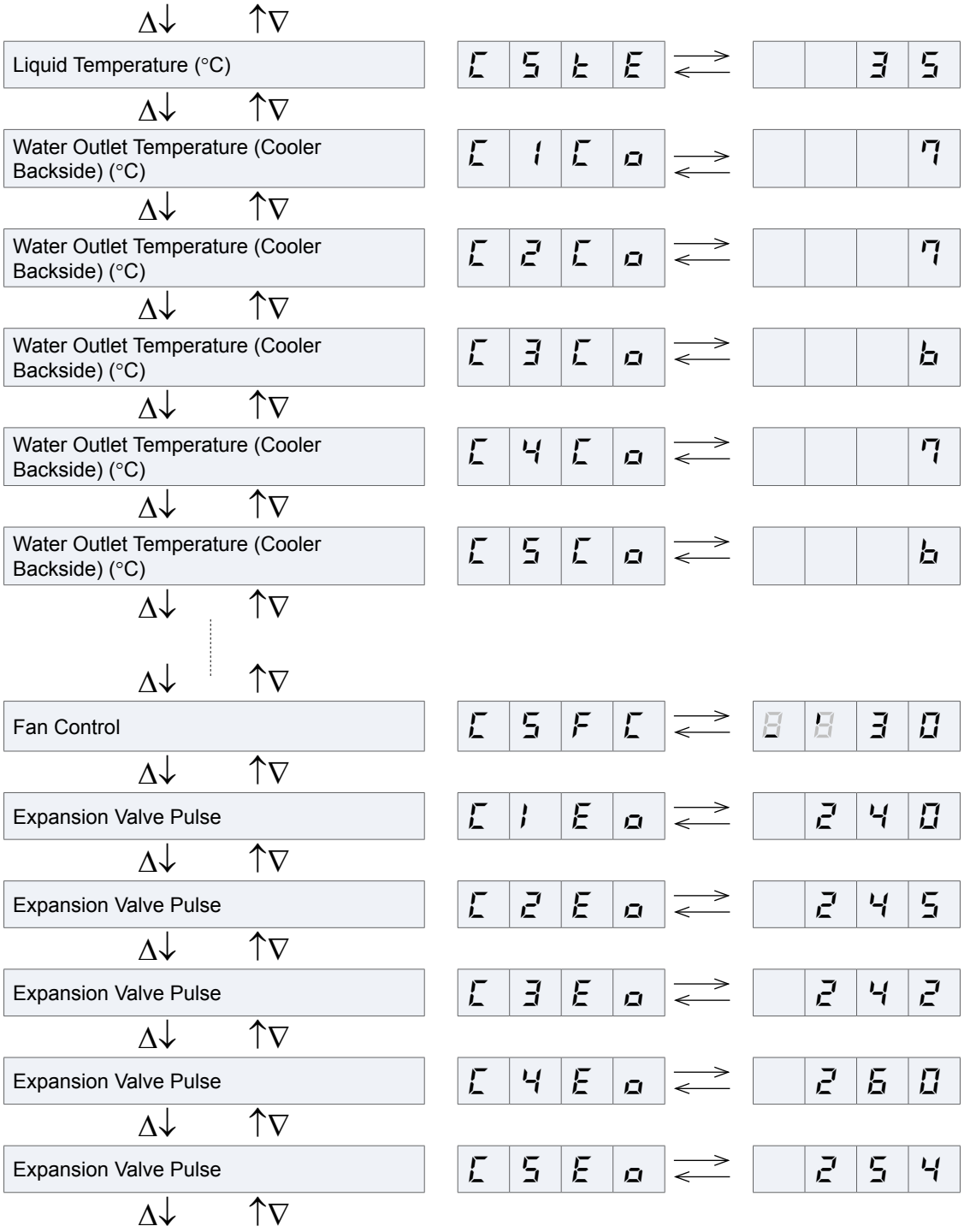
CPU ROM Number — rno ⇄ 203
(ROM N° = C-203)

Return to “Alarm Code Ocurred List”

◆ **Memory Data Indication in Alarm** ③

Data is indicated same as Checking Indication.

In addition the checking data, below data is added.



9

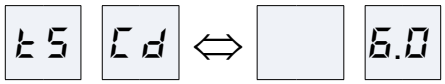
◆ **Second Water Temperature Setting** ④

This temperature setting can provide another setting value for water temperature.

It can be changed by external signal

Second Water Temperature Setting Procedure

1) Press the check "∇" switch for more than 3 seconds.
Then, display shows the current setting value.

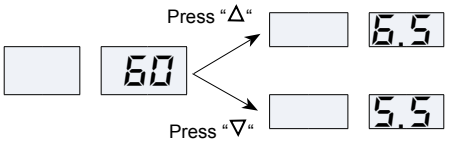


* This shows the setting value is 6ºC.

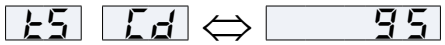
2) Press the check "Δ" and "∇" switches simultaneously for more than 3 seconds.The mode is changed to setting mode.

Then, the setting value can be changed by pressing the check "Δ" and "∇" switches.

However, the setting value shown on display, is not available in this moment.

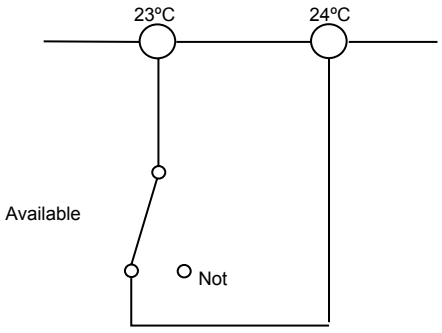


3) Press the check "Δ" and "∇" switches simultaneously for more than 3 seconds. At the same time, the setting value shown on display is memorized and available.



* The setting is changed to 9.5ºC.

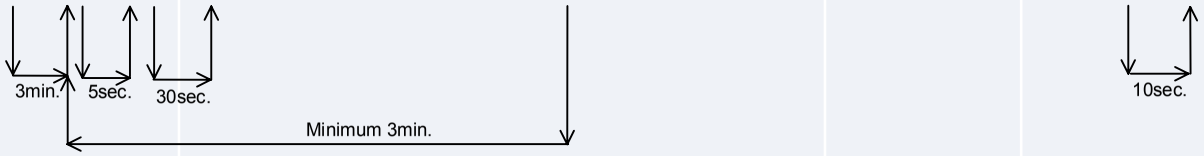
When the wiring connection shown below, this second temperature setting is available.



10. Control System

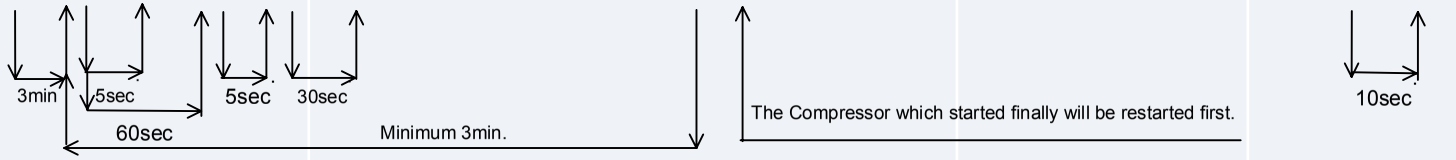
Contents

Control Devices \ Control Stage			Starting Control					Capacity Control									Safety Devices			Shut Down			
Main Power Switch		MI	OFF	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ON	ON	ON	OFF
Operation Switch		PBS	-	-	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	OFF	ON	OFF	-	-
Controller	Load Up		-	-	-	-	-	☆	☆	-	-	-	-	-	☆	-	-	-	-	-	-	-	-
	Neutral		-	-	-	-	-	-	-	★	-	-	-	-	-	★	★	★	-	★	-	-	-
	Load Down		-	-	-	-	-	-	-	-	☆	☆	-	-	-	-	-	-	-	-	-	-	-
Safety Devices		No.1	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	OPN	CLS	CLS	CLS	CLS	CLS
Chilled Water Pump		CPUE	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF
Power Supply Indicator			OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
Operation Indicator			OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
Alarm Indicator			OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
Oil Heater		CH1	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON	ON	OFF	ON	ON	OFF
Compressor Motor		MC1	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15~99%	DLT (FLD) 100%	DLT (FLD) 100%	DLT (ULD) 15~99%	DLT (ULD) 15%	OFF	STA (ULD) 15%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	OFF	OFF	DLT (ULD) 15~99%	OFF	OFF	OFF
Fan Motor		MF11~14	OFF	OFF							ON							OFF	OFF	ON	OFF	OFF	OFF
Solenoid Valve		SV11	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV12	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV13	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Time Schedule																							



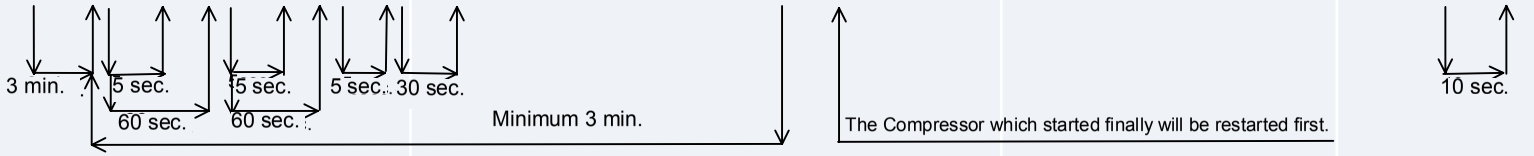
CLS: Close
OPN: Open
STA: Star
DLT: Delta
ULD: Unload
FLD: Full Load
☆: Changing Compressor Load
★: Keeping Compressor Load

Control Devices \ Control Stage			Starting Control							Capacity Control									Safety Devices				Shut Down			
Main Power Switch		MI	OFF	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ON	ON	ON	OFF
Operation Switch		PBS	-	-	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OFF	ON	OFF	-	-
Controller	Load Up		-	-	-	-	-	-	-	☆	☆	-	-	-	-	-	☆	-	-	-	☆	-	-	-	-	-
	Neutral		-	-	-	-	-	-	-	-	-	★	-	-	-	-	-	★	★	★	-	-	★	-	-	-
	Load Down		-	-	-	-	-	-	-	-	-	-	☆	☆	-	-	-	-	-	-	-	-	-	-	-	-
Safety Devices		No.1	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	OPN	OPN	CLS	CLS	CLS	CLS	CLS
		No.2	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	OPN	CLS	CLS	CLS	CLS	CLS
Chilled Water Pump		CPUE	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF
Power Supply Indicator			OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
Operation Indicator			OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
Alarm Indicator			OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
Oil Heater		CH1	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	ON	ON	OFF
		CH2	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	ON	ON	OFF
Compressor Motor		MC1	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15~99%	DLT (FLD) 100%	DLT (FLD) 100%	DLT (ULD) 15~99%	DLT (ULD) 15%	OFF	STA (ULD) 15%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	OFF	OFF	OFF	DLT (ULD) 15~99%	OFF	OFF	OFF
		MC2	OFF	OFF	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15~99%	DLT (FLD) 100%	DLT (FLD) 100%	DLT (ULD) 15~99%	DLT (ULD) 15%	OFF	STA (ULD) 15%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	OFF	OFF	DLT (ULD) 15~99%	OFF	OFF	OFF
Fan Motor		MF11~16	OFF	OFF									ON								OFF	OFF	ON	OFF	OFF	OFF
		MF21~26	OFF	OFF									ON								OFF	OFF	ON	OFF	OFF	OFF
Solenoid Valve		SV11	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV12	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV13	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV21	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV22	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV23	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Time Schedule																										



CLS: Close
OPN: Open
STA: Star
DLT: Delta
ULD: Unload
FLD: Full Load
☆: Changing Compressor Load
★: Keeping Compressor Load

Control Devices \ Control Stage			Starting Control									Capacity Control									Safety Devices					Shut Down			
Main Power Switch		MI	OFF	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ON	ON	ON	OFF
Operation Switch		PBS	-	-	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OFF	ON	OFF	-	-
Controller	Load Up		-	-	-	-	-	-	-	-	-	☆	☆	-	-	-	-	-	☆	-	-	-	☆	☆	-	-	-	-	-
	Neutral		-	-	-	-	-	-	-	-	-	-	-	★	-	-	-	-	-	★	★	★	-	-	-	★	-	-	-
	Load Down		-	-	-	-	-	-	-	-	-	-	-	-	☆	☆	-	-	-	-	-	-	-	-	-	-	-	-	-
Safety Devices		No.1	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	OPN	OPN	OPN	CLS	CLS	CLS	CLS	CLS
		No.2	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	OPN	OPN	CLS	CLS	CLS	CLS	CLS
		No.3	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	OPN	CLS	CLS	CLS	CLS	CLS
Chilled Water Pump		CPUE	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF
Power Supply Indicator			OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
Operation Indicator			OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
Alarm Indicator			OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
Oil Heater		CH1	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	ON	ON	OFF
		CH2	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	ON	ON	OFF
		CH3	OFF	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	ON	ON	OFF
Compressor Motor		MC1	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15~99%	DLT (FLD) 100%	DLT (FLD) 100%	DLT (ULD) 15~99%	DLT (ULD) 15%	OFF	STA (ULD) 15%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	OFF	OFF	OFF	OFF	DLT (ULD) 15~99%	OFF	OFF	OFF
		MC2	OFF	OFF	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15~99%	DLT (FLD) 100%	DLT (FLD) 100%	DLT (ULD) 15~99%	DLT (ULD) 15%	OFF	STA (ULD) 15%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	OFF	OFF	OFF	DLT (ULD) 15~99%	OFF	OFF	OFF
		MC3	OFF	OFF	OFF	OFF	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15~99%	DLT (FLD) 100%	DLT (FLD) 100%	DLT (ULD) 15~99%	DLT (ULD) 15%	OFF	STA (ULD) 15%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	OFF	OFF	DLT (ULD) 15~99%	OFF	OFF	OFF
Fan Motor		MF11~16	OFF	OFF	ON																				OFF	OFF	ON	OFF	OFF	OFF
		MF21~26	OFF	OFF	ON																				OFF	OFF	ON	OFF	OFF	OFF
		MF31~36	OFF	OFF	ON																				OFF	OFF	ON	OFF	OFF	OFF
Solenoid Valve		SV11	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV12	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV13	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV21	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV22	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV23	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV31	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV32	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV33	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
Time Schedule																													



CLS Close ULD: Unload
OPN: Open FLD: Full Load
STA: Star ☆: Changing Compressor Load
DLT Delta ★: Keeping Compressor Load

10.4. Standard Operation Sequence RCU2E280AG2, 320AG2

Control Devices \ Control Stage		Starting Control											Capacity Control								
Main Power Switch	MI	OFF	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operation Switch	PBS	-	-	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Controller Load Up		-	-	-	-	-	-	-	-	-	-	-	☆	☆	-	-	-	-	-	☆	-
Controller Neutral		-	-	-	-	-	-	-	-	-	-	-	-	-	★	-	-	-	-	-	★
Controller Load Down		-	-	-	-	-	-	-	-	-	-	-	-	-	-	☆	☆	-	-	-	-
Safety Devices	No.1	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS
	No.2	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS
	No.3	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS
	No.4	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS
Chilled Water Pump	CPUE	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Power Supply Indicator		OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Operation Indicator		OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Alarm Indicator		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Oil Heater	CH1	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
	CH2	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
	CH3	OFF	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
	CH4	OFF	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
Compressor Motor	MC1	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15~99%	DLT (FLD) 100%	DLT (FLD) 100%	DLT (ULD) 15~99%	DLT (ULD) 15%	OFF	STA (ULD) 15%	DLT (ULD) 15~99%	DLT (ULD) 15~99%
	MC2	OFF	OFF	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15~99%	DLT (FLD) 100%	DLT (FLD) 100%	DLT (ULD) 15~99%	DLT (ULD) 15%	OFF	STA (ULD) 15%	DLT (ULD) 15~99%	DLT (ULD) 15~99%
	MC3	OFF	OFF	OFF	OFF	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15~99%	DLT (FLD) 100%	DLT (FLD) 100%	DLT (ULD) 15~99%	DLT (ULD) 15%	OFF	STA (ULD) 15%	DLT (ULD) 15~99%	DLT (ULD) 15~99%
	MC4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15~99%	DLT (FLD) 100%	DLT (FLD) 100%	DLT (ULD) 15~99%	DLT (ULD) 15%	OFF	STA (ULD) 15%	DLT (ULD) 15~99%	DLT (ULD) 15~99%
Fan Motor	MF11~16	OFF	OFF										ON								
	MF21~26	OFF	OFF										ON								
	MF31~36	OFF	OFF										ON								
	MF41~46	OFF	OFF										ON								
Solenoid Valve	SV11	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
	SV12	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
	SV13	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
	SV21	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
	SV22	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
	SV23	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
	SV31	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
	SV32	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
	SV33	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
	SV41	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
	SV42	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
	SV43	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
Time Schedule		3min.	5sec.	5sec.	5sec.	5sec.	5sec	30sec.	60sec.	60sec.	60sec.	Minimum	The Compressor which started finally will be restarted first.								

CLS: Close
OPN: Open
STA: Star
DLT: Delta
ULD: Unload
FLD: Full Load
☆: Changing Compressor Load
★: Keeping Compressor Load

to be continued in next page ⟶

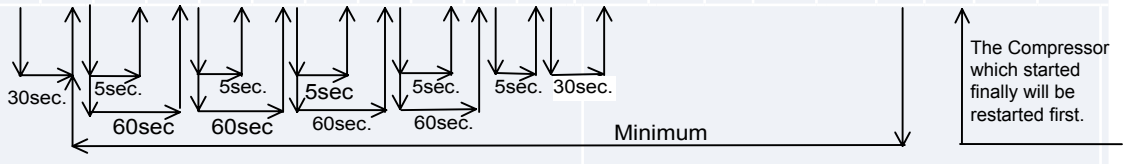
Standard Operation Sequence RCU2E280AG2, 320AG2 (cont.)

Control Devices \ Control Stage			Safety Devices						Shut Down			
Main Power Switch		MI	-	-	-	-	-	-	ON	ON	ON	OFF
Operation Switch		PBS	-	-	-	-	-	OFF	ON	OFF	-	-
Controller	Load Up		-	-	☆	☆	☆	-	-	-	-	-
	Neutral		★	★	-	-	-	-	★	-	-	-
	Load Down		-	-	-	-	-	-	-	-	-	-
Safety Devices		No.1	CLS	OPN	OPN	OPN	OPN	CLS	CLS	CLS	CLS	CLS
		No.2	CLS	CLS	OPN	OPN	OPN	CLS	CLS	CLS	CLS	CLS
		No.3	CLS	CLS	CLS	OPN	OPN	CLS	CLS	CLS	CLS	CLS
		No.4	CLS	CLS	CLS	CLS	OPN	CLS	CLS	CLS	CLS	CLS
Chilled Water Pump		CPUE	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF
Power Supply Indicator			ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
Operation Indicator			ON	ON	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
Alarm Indicator			OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
Oil Heater		CH1	OFF	ON	ON	ON	ON	ON	OFF	ON	ON	OFF
		CH2	OFF	OFF	ON	ON	ON	ON	OFF	ON	ON	OFF
		CH3	OFF	OFF	OFF	ON	ON	ON	OFF	ON	ON	OFF
		CH4	OFF	OFF	OFF	OFF	ON	ON	OFF	ON	ON	OFF
Compressor Motor		MC1	DLT (ULD) 15~99%	OFF	OFF	OFF	OFF	OFF	DLT (ULD) 15~99%	OFF	OFF	OFF
		MC2	DLT (ULD) 15~99%	DLT (ULD) 15~99%	OFF	OFF	OFF	OFF	DLT (ULD) 15~99%	OFF	OFF	OFF
		MC3	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	OFF	OFF	OFF	DLT (ULD) 15~99%	OFF	OFF	OFF
		MC4	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	OFF	OFF	DLT (ULD) 15~99%	OFF	OFF	OFF
Fan Motor		MF11~16	ON				OFF	OFF	ON	OFF	OFF	OFF
		MF21~26	ON				OFF	OFF	ON	OFF	OFF	OFF
		MF31~36	ON				OFF	OFF	ON	OFF	OFF	OFF
		MF41~46	ON				OFF	OFF	ON	OFF	OFF	OFF
Solenoid Valve		SV11	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV12	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV13	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV21	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV22	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV23	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV31	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV32	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV33	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV41	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV42	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV43	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
Time Schedule			The Compressor which started finally will be restarted first.							10sec.		

CLS: Close
OPN: Open
STA: Star
DLT: Delta
ULD: Unload
FLD: Full Load
☆: Changing Compressor Load
★: Keeping Compressor Load

10.5. Standard Operation Sequence RCU2E350AG2, 400AG2

Control Devices \ Control Stage			Starting Control													Capacity Control								
Main Power Switch		MI	OFF	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operation Switch		PBS	-	-	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Controller	Load Up		-	-	-	-	-	-	-	-	-	-	-	-	-	☆	☆	-	-	-	-	-	☆	-
	Neutral		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	★	-	-	-	-	-	★
	Load Down		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	☆	☆	-	-	-	-
Safety Devices		No.1	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS
		No.2	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS
		No.3	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS
		No.4	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS
		No.5	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS
Chilled Water Pump		CPUE	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Power Supply Indicator			OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Operation Indicator			OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Alarm Indicator			OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	Oil Heater	CH1	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
		CH2	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
		CH3	OFF	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
		CH4	OFF	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
		CH5	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
Compressor Motor		MC1	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15~99%	DLT (FLD) 100%	DLT (FLD) 100%	DLT (ULD) 15~99%	DLT (ULD) 15%	OFF	STA (ULD) 15%	DLT (ULD) 15~99%	DLT (ULD) 15~99%
		MC2	OFF	OFF	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15~99%	DLT (FLD) 100%	DLT (FLD) 100%	DLT (ULD) 15~99%	DLT (ULD) 15%	OFF	STA (ULD) 15%	DLT (ULD) 15~99%	DLT (ULD) 15~99%
		MC3	OFF	OFF	OFF	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15~99%	DLT (FLD) 100%	DLT (FLD) 100%	DLT (ULD) 15~99%	DLT (ULD) 15%	OFF	STA (ULD) 15%	DLT (ULD) 15~99%	DLT (ULD) 15~99%
		MC4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15~99%	DLT (FLD) 100%	DLT (FLD) 100%	DLT (ULD) 15~99%	DLT (ULD) 15%	OFF	STA (ULD) 15%	DLT (ULD) 15~99%	DLT (ULD) 15~99%
		MC5	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15~99%	DLT (FLD) 100%	DLT (FLD) 100%	DLT (ULD) 15~99%	DLT (ULD) 15%	OFF	STA (ULD) 15%	DLT (ULD) 15~99%	DLT (ULD) 15~99%
	Fan Motor	MF11~16	OFF	OFF										ON										
		MF21~26	OFF	OFF										ON										
		MF31~36	OFF	OFF										ON										
		MF41~46	OFF	OFF										ON										
		MF51~56	OFF	OFF										ON										
Solenoid Valve		SV11	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
		SV12	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
		SV13	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
		SV21	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
		SV22	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
		SV23	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
		SV31	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
		SV32	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
		SV33	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
		SV41	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
		SV42	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
		SV43	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
		SV51	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
		SV52	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
		SV53	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
Time Schedule																								



CLS Close ULD: Unload
OPN: Open FLD: Full Load
STA: Star ☆: Changing Compressor Load
DLT Delta ★: Keeping Compressor Load

to be continued in next page ⟶

Standard Operation Sequence RCU2E350AG2, 400AG2 (cont.)

Control Devices \ Control Stage			Safety Devices							Shut Down			
Main Power Switch		MI	-	-	-	-	-	-	-	ON	ON	ON	OFF
Operation Switch		PBS	-	-	-	-	-	-	OFF	ON	OFF	-	-
Controller	Load Up		-	-	☆	☆	☆	☆	-	-	-	-	-
	Neutral		★	★	-	-	-	-	-	★	-	-	-
	Load Down		-	-	-	-	-	-	-	-	-	-	-
Safety Devices		No.1	CLS	OPN	OPN	OPN	OPN	OPN	CLS	CLS	CLS	CLS	CLS
		No.2	CLS	CLS	OPN	OPN	OPN	OPN	CLS	CLS	CLS	CLS	CLS
		No.3	CLS	CLS	CLS	OPN	OPN	OPN	CLS	CLS	CLS	CLS	CLS
		No.4	CLS	CLS	CLS	CLS	OPN	OPN	CLS	CLS	CLS	CLS	CLS
		No.5	CLS	CLS	CLS	CLS	CLS	OPN	CLS	CLS	CLS	CLS	CLS
Chilled Water Pump		CPUE	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF
Power Supply Indicator			ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
Operation Indicator			ON	ON	ON	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
Alarm Indicator			OFF	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
Oil Heater		CH1	OFF	ON	ON	ON	ON	ON	ON	OFF	ON	ON	OFF
		CH2	OFF	OFF	ON	ON	ON	ON	ON	OFF	ON	ON	OFF
		CH3	OFF	OFF	OFF	ON	ON	ON	ON	OFF	ON	ON	OFF
		CH4	OFF	OFF	OFF	ON	ON	ON	ON	OFF	ON	ON	OFF
		CH5	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	ON	ON	OFF
Compressor Motor		MC1	DLT (ULD) 15~99%	OFF	OFF	OFF	OFF	OFF	OFF	DLT (ULD) 15~99%	OFF	OFF	OFF
		MC2	DLT (ULD) 15~99%	DLT (ULD) 15~99%	OFF	OFF	OFF	OFF	OFF	DLT (ULD) 15~99%	OFF	OFF	OFF
		MC3	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	OFF	OFF	OFF	OFF	DLT (ULD) 15~99%	OFF	OFF	OFF
		MC4	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	OFF	OFF	OFF	DLT (ULD) 15~99%	OFF	OFF	OFF
		MC5	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	DLT (ULD) 15~99%	OFF	OFF	DLT (ULD) 15~99%	OFF	OFF	OFF
Fan Motor		MF11~16			ON			OFF	OFF	ON	OFF	OFF	OFF
		MF21~26			ON			OFF	OFF	ON	OFF	OFF	OFF
		MF31~36			ON			OFF	OFF	ON	OFF	OFF	OFF
		MF41~46			ON			OFF	OFF	ON	OFF	OFF	OFF
		MF51~56			ON			OFF	OFF	ON	OFF	OFF	OFF
Solenoid Valve		SV11	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV12	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV13	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV21	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV22	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV23	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV31	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV32	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV33	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV41	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV42	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV43	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV51	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV52	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
		SV53	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
Time Schedule			The Compressor which started finally will be restarted first.							10sec			

CLS Close ULD: Unload
OPN: Open FLD: Full Load
STA: Star ☆: Changing Compressor Load
DLT Delta ★: Keeping Compressor Load

11. Maintenance

Contents

WARNING:
If a fire accidentally occurs, turn OFF the main switch and use an extinguisher for an oil fire and an electric fire.
Do not operate the unit near flammable gases such aslacquer, paint oil, etc. to avoid a fire or an explosion.
Turn OFF the main switch when electrical box covers are removed for setting the temperature. Do not operate the unit without fixing panels.

DANGER:
Switch OFF main interruptor (MI) for any work inside electrical box.
Keep electrical box cover closed 2 min. after switching power off (to discharge the capacitors)

CAUTION:
Perform periodical maintenance according to the "INSTRUCTIONS" to maintain the unit in a good condition.
Do not touch the parts at the discharge gas side by hand, since the pipes at the discharge side are heated by refrigerant and the temperature becomes higher than 100 °C.
Do not utilise this unit for cooling or heating of drinking water or food. Comply with local codes and regulations.
Turn OFF all the main switches if refrigerant leakage or chilled water leakage occurs. Also, if the unit can not be stopped by the control switch, turn OFF all the switches for power source.

The unit should be periodically inspected according to the same items as those described in the paragraph titled
"Test Running". In order to ensure dependable performance and long life operation, the following additional items should be given for particular attention.

11.1. Components

- **Compressor**

  The semi-hermetic screw compressor requires periodic maintenance, including replacement of parts. See the HITACHI Service Handbook for Screw Compressors, for details.

- **Air-cooled Condenser**

  Inspect the condenser and remove any accumulated dirt from the coil, at regular intervals. Other obstacles such as growing grass and pieces of paper, which might restrict Air flow, should also be removed.

- **Electrical Equipment**

  Always pay careful attention to working voltage, amperage and phase balance. Check for faulty contact caused by loosened terminal connections, oxidised contacts, foreign matter, and others.

- **Control and Protective Devices**

  Do not readjust the settings in the field unless the setting is maintained at the point other than the point listed in the table on chapter 8.

11.2. Lubrication

- **Compressor**

  The compressors are charged at the factory with the correct oil listed on the compressor nameplate. It is not necessary to add oil, if the refrigerant cycle remains sealed.

- **Fan Motor**

  Bearing of all fan motors are pre-lubricated. Lubrication is not required.

11.3. Deposit

Lime and other minerals in the chilled water tend to deposit on surfaces of plates over a long period of operation. As deposits of these minerals increase, excessive lower operation pressure is detected, indicating evidence of deposits on the water cooler.

CAUTION:
Cleaning of Plate type Heat Exchangers shall be performed by specialists.
Please contact your contractor o dealer of HITACHI.

Clean the Water Strainer periodically according to its clogging degree.

It is strongly recommended to clean the Plate Heat Exchanger at the same time the Water Strainer is cleaned.

WARNING:
This product is equipped with Plate type Heat Exchangers, which are very sensitive of clogging and therefore they could get frozen unless special care is taken.

For that reason it is recommended to follow accurately the next caution about normal cleaning method. For further details, please contact your HITACHI installer.

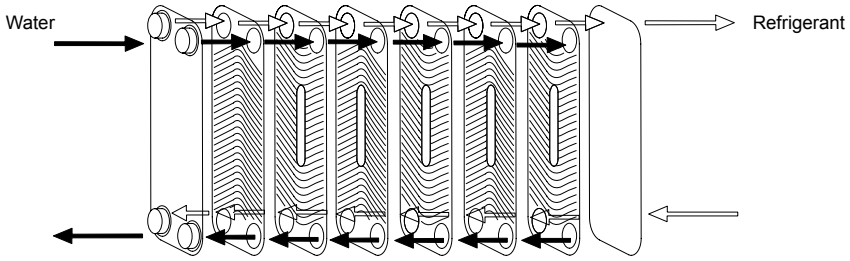
CAUTION:

Correctly select cleaning agent depending on scales in the plate type heat exchangers. The cleaning chemicals are different depending on fouling degree.

This plate type heat exchanger is made of stainless steel. Do not use a cleaning agent containing hydrochloric acid or fluorine compound. If used, the heat exchanger will be damaged, resulting in refrigerant leakage.

After cleaning with cleaning agent, clean inside of water piping including the heat exchangers by using clean water. Perform water treatment (preventive treatment) in order to prevent the water circuit from corrosion or re-adhering of scales after cleaning.

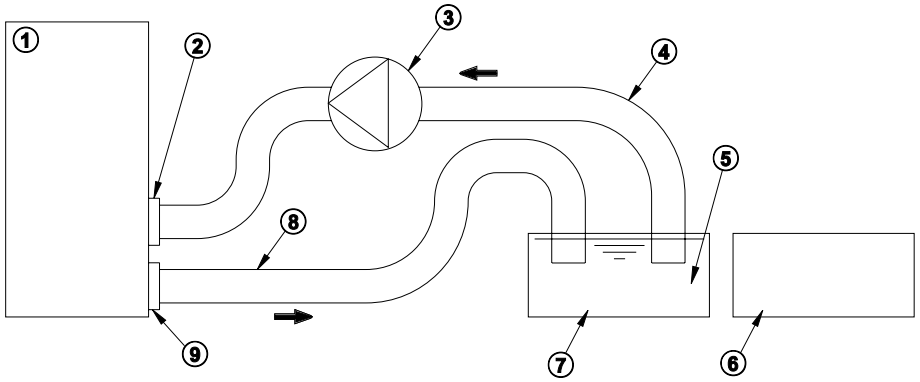
In the case that a cleaning agent is used, adjust concentration of the cleaning agent, cleaning period and temperature according to the scale degree.



In the case that acid cleaning is performed, neutralisation treatment is required after cleaning. Treatment for neutralisation fluid should be performed by a waste fluid contractors.

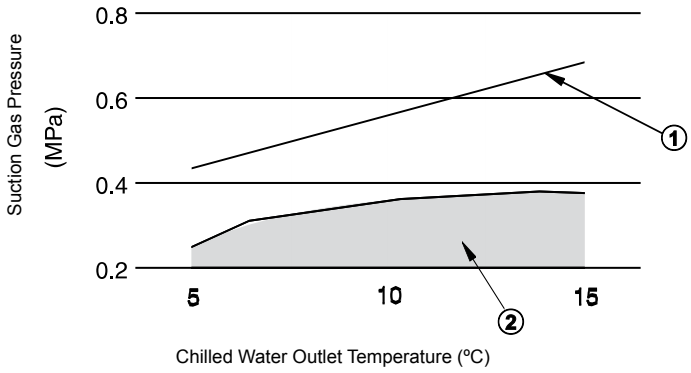
The cleaning agent and neutralising agent have erosiveness and stimulativeness against eyes, skin, mucous membrane etc. Therefore use protection tools (protection glasses, protection gloves, protection shoes, protection cloth, protection mask, etc.) in order not to absorb or touch these agents during this cleaning work.

11.4. Cleaning Method



N°	Name	N°	Name
1	Chiller Unit	6	Waste Fluid Tank
2	Chilled Water / Inlet Piping	7	Cleaning Water Tank
3	Acid-resistant Type Water Pump	8	Hose
4	Hose	9	Chilled Water / Outlet Piping
5	Diluted Cleaning Fluid		

1. Installation of Cleaning Circuit
   - Stop the water Chiller unit.
   - Stop the circulating water pump.
   - Disconnect the connections at the chilled water inlet and install a circulating water circuit by using an acid-resistant type water pump.
2. Check of Circulating Circuit
   - Pour water in the cleaning tank and operate the acid-resistant type water pump.
   - Check to ensure that no water leakage exists.
   - Check to ensure that the water hose is firmly fixed.
   - Check to ensure that the cleaning agent will not damage equipment near the water Chiller even if bubbles occur and touch them.
   - Check to ensure that good ventilation is available.
   - Check to ensure that no abnormal sound occurs.
3. Cleaning Work
   - Discharge water in the water circuit of the air conditioning system.
   - Supply diluted cleaning fluid from the cleaning water tank by operating the acid-resistant pump.
   - Circulate the cleaning fluid for an appropriate period of time (the operating time should be determined according to the type of cleaning agent, concentration and fouling degree).
4. Waste Fluid
   - Stop the acid-resistant pump.
   - Put the waste fluid into the waste fluid tank.
   - Supply water into the cleaning tank and operate the pump for water cleaning.
   - Put the cleaning water into the waste fluid tank as same as the waste fluid.
   - Measure pH degree by using a pH test sheet and neutralise the waste fluid by gradually adding neutralising agent.
   - After neutralisation ask a waste fluid treatment contractors to handle it.
5. Neutralisation Treatment in the Water Piping
   - Put water into the cleaning tank.
   - Operate the acid-resistant pump after Air-purging.
   - Measure the pH degree and gradually add neutralising agent until the pH reaches pH = 7.
   - Operate the pump for a specified period of time for neutralisation.
   - Discharge the used water.
   - Operate the circulating pump and clean the circuit with water until no fouling fluid is observed.
6. Re-starting
   - Reconnect the water piping as they were so that the water Chiller can operate.
   - After cleaning, perform water treatment (preventive treatment) in order to prevent the water circuit from corrosion.



N°	Name
1	Saturation Line of R407C
2	Area Requiring Cleaning

11.5. Winter Shutdown

When shutting down the unit for winter, clean the inside and outside of the cabinet, and dry the unit. Pump down the refrigerant to the condenser and close the liquid outlet stop valves. This unit should be covered during shutdown, in order to protect it from dust and environmental conditions. Be sure to tighten the packing glands and the cap nuts of the valves.

Remove the drain plug and drain all residual water from the water cooler piping systems, as such water may freeze during the cold season. It is very helpful to supply brine (anti-freezer) to the piping systems.

11.6. Spring Start-Up

After any extended shutdown period, prepare the unit for operation as follows.

1. Thoroughly inspect and clean the unit.
2. Clean the water piping lines and the strainer.

Inspect the pump and other auxiliary equipment in the piping line.

3. Tighten all wiring connections and access panel.

CAUTION:
When the main switch for this unit has been at the OFF position for an extended period of time, it should be switched ON at least 12 hours before start-up, so that oil in the compressor discharge casing may be warmed enough, to prevent oil foaming by the oil heater during start-up.

11.7. Part Replacement

Replacement of parts should be undertaken by ordering from the HITACHI Spare Parts List.

CAUTION:
Do not replace with spare parts which are not the equivalent.

11.8. Refrigeration Cycle

- **Strainer**

  Check for clogging each time when the refrigeration cycle is opened.

- **Refrigerant Charge**

  Inspect the refrigerant charge of the system by checking the discharge and suction pressures. Perform a leakage test, if any leakage is suspected, and always perform such a test after a refrigeration cycle component is replaced. When refrigerant charge is required, follow the following instructions given for two cases:

  1. When Refrigerant Gas Completely Leaked.
     Before charging the entire cycle must be completely evacuated and dehydrated. A gauge manifold or equivalent piping preparation shown in the next page is recommended as a convenient procedure regarding both charging and evacuation.

     Fully open all the stop valves.

     Connect the evacuation line to the check joints of the high and the low pressure sides.

     Completely evacuate the entire cycle with a vacuum pump.

     Charge refrigerant to the refrigeration cycle by weighing the charging cylinder. The proper refrigerant charge is listed on the nameplate.

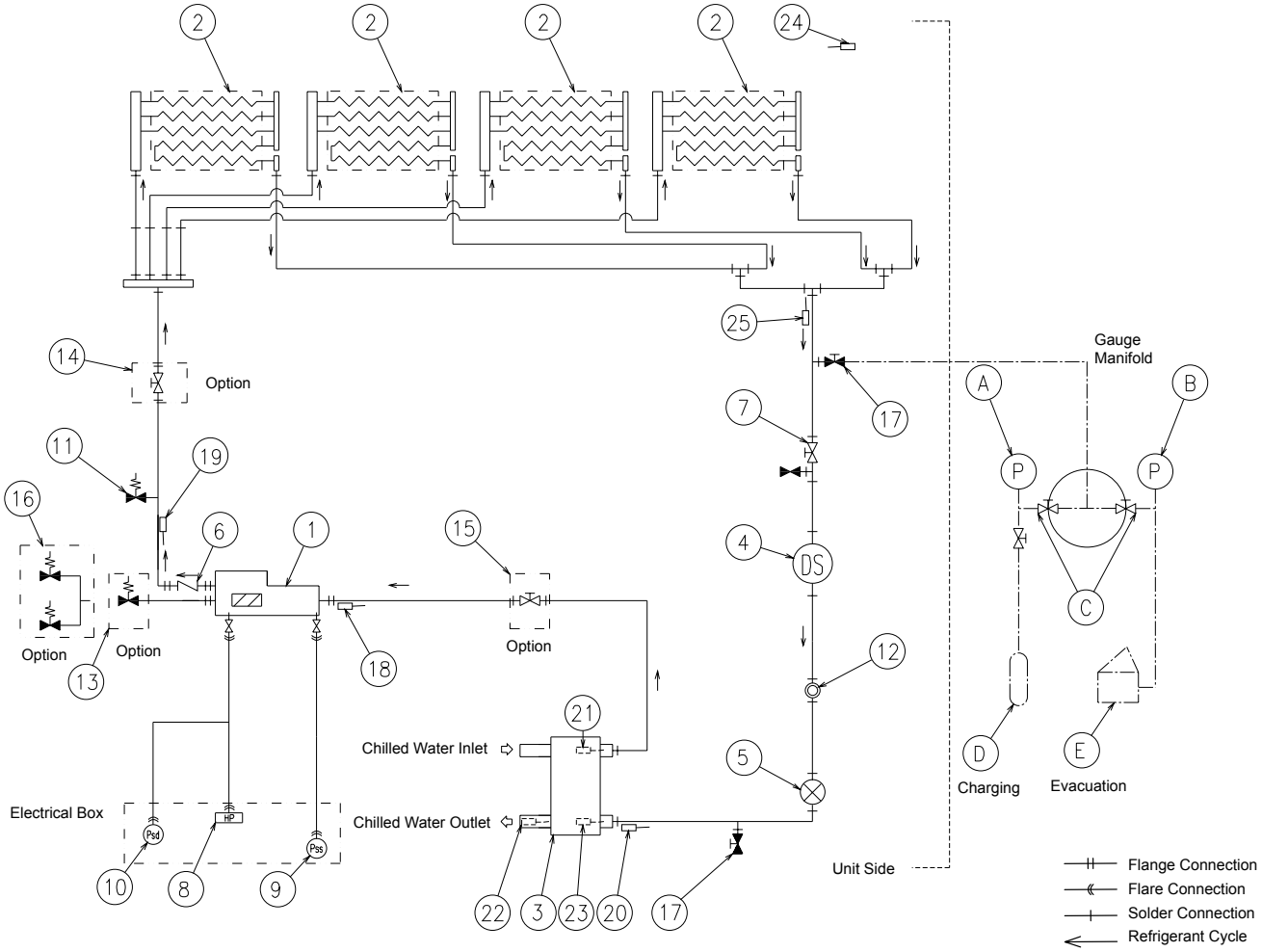
     When charging by weight is stopped due to high ambient temperature, close the valve and operate the unit after circulating the chilled water through the water cooler and installing a jumper on the low pressure switch, if required.

  2. When Only Additional Refrigerant is Required.
     Connect a gauge manifold to check joint of low pressure side, and connect a charge cylinder to gauge manifold.
     Operate the unit after circulating the chilled water and install a jumper on the low pressure switch, if required. Repeat the following procedure until pressure becomes proper (refer to page 58).

     Charge the gas refrigerant a little slowly into refrigeration cycle from check joint for low pressure.

     Check the pressure after refrigeration cycle becomes stable.

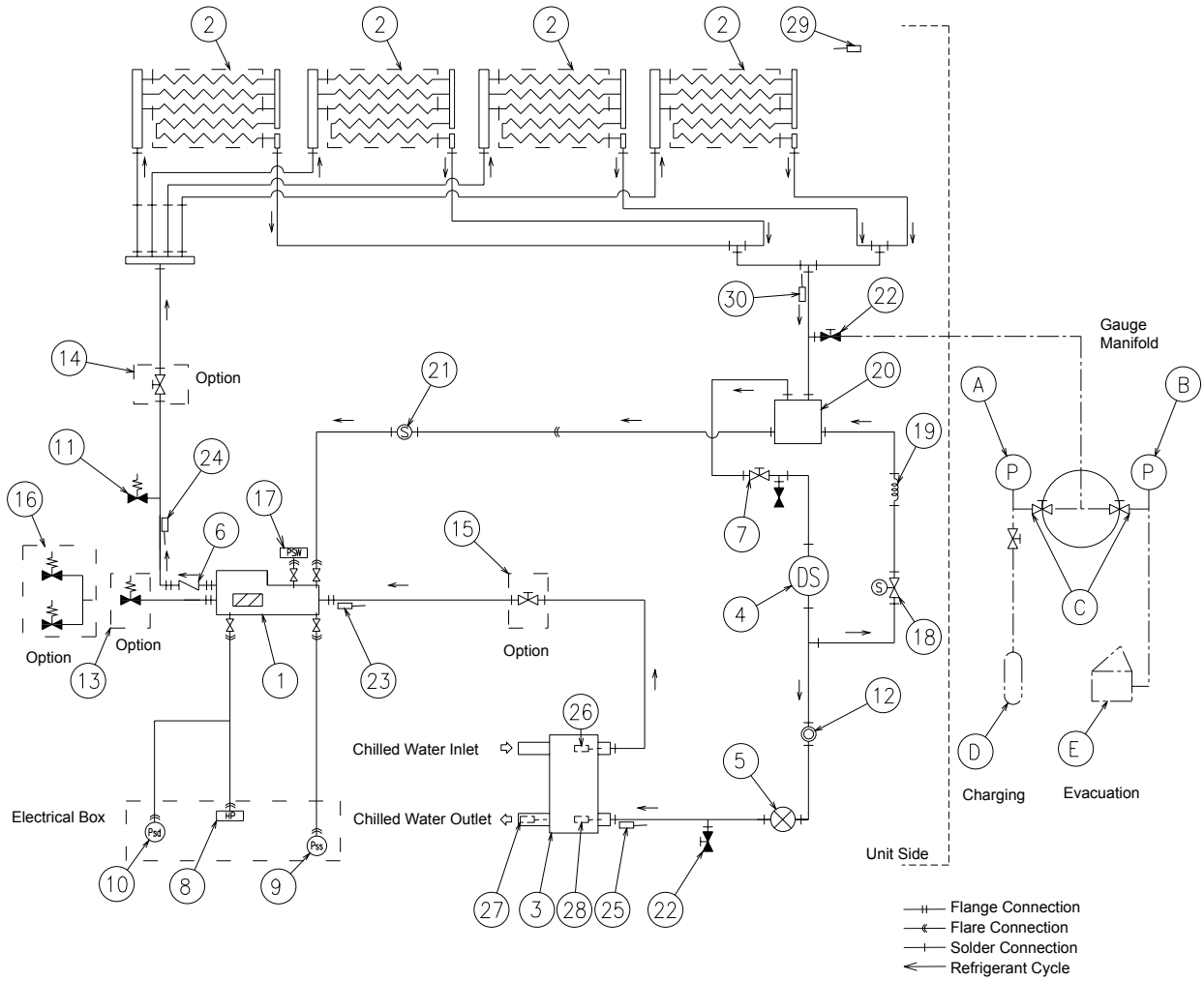
11.9. Refrigerant cycle diagram of Hitachi Air-Cooled Water Chiller (RCU2E40, 50, 60, 70, 100, 120, 140, 180, 210, 280, 350AG2)



No.	Name	No.	Name
1	Compressor	16	Compressor Dual Safety Valve (Option)
2	Air-Cooled Condenser	17	Stop Valve
3	Water Cooler	18	Thermistor (Suction, THMsn)
4	Filter Drier	19	Thermistor (Discharge, THMdn)
5	Electronic Expansion Valve	20	Thermistor (Evaporation, THMr2n)
6	Check Valve	21	Thermistor (Cooler water inlet, THMwi)
7	Stop Valve (with check joint)	22	Thermistor (Cooler water outlet, THMwon)
8	High Pressure Switch	23	Thermistor (Cooler water outlet, THMwon1)
9	Pressure Sensor (Low)	24	Thermistor (Ambient, THMa)
10	Pressure Sensor (High)	25	Thermistor (Liquid, THMl)
11	Pressure Relief Valve	A	High Pressure Gauge
12	Sight Glass	B	Low Pressure Gauge
13	Compressor Safety Valve (Option)	C	Stop Valve
14	Stop Valve (Option)	D	Charging Cylinder
15	Stop Valve (Option)	E	Vacuum Pump

NOTE:
R407C shall be charged by LIQUID.

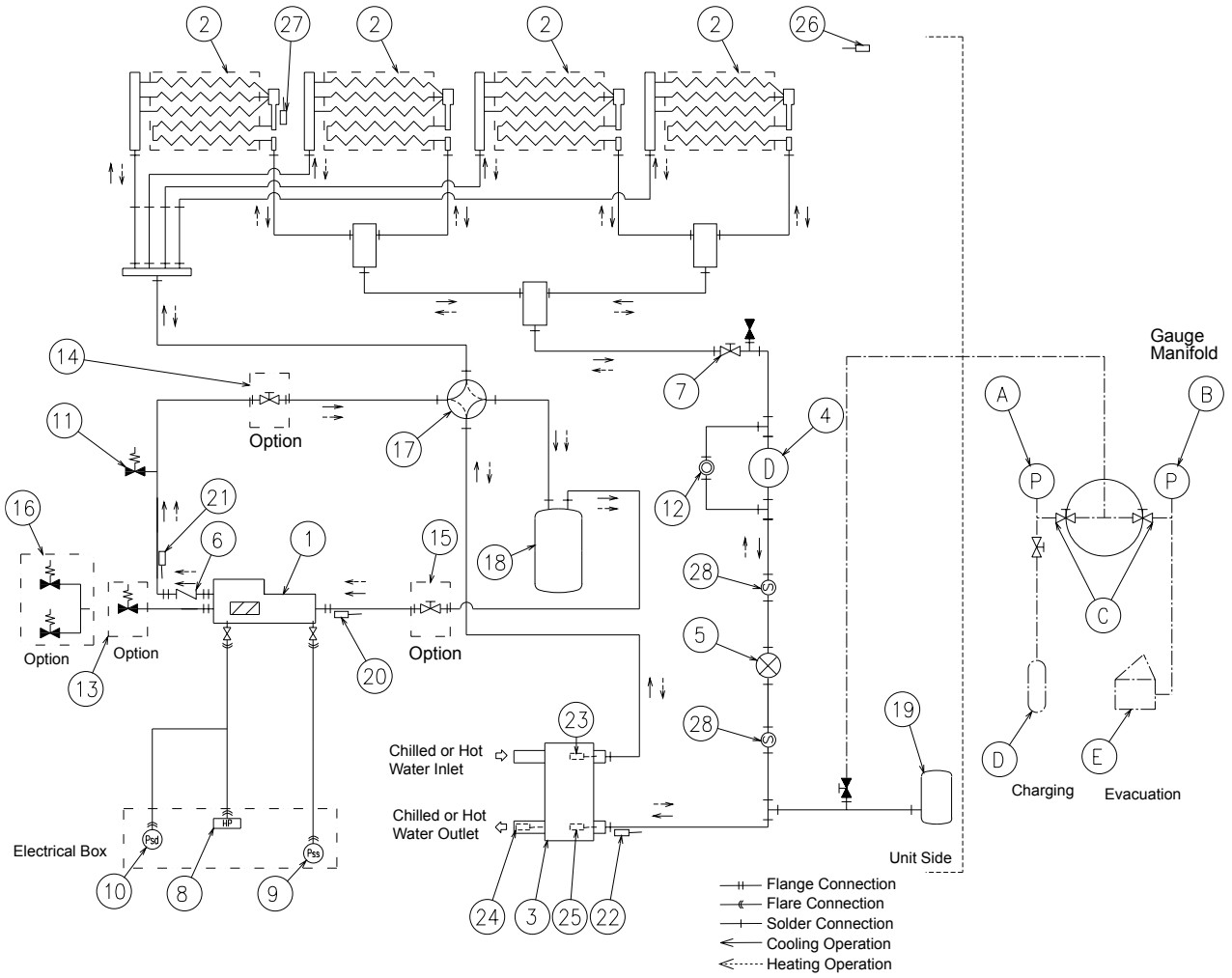
11.10. Refrigerant cycle diagram of Hitachi Air-Cooled Water Chiller (RCU2E80, 160, 240, 320, 400AG2) with economiser.



No.	Name	No.	Name
1	Compressor	19	Capillary Tube
2	Air-Cooled Condenser	20	Economiser
3	Water Cooler	21	Strainer
4	Filter Drier	22	Stop Valve
5	Electronic Expansion Valve	23	Thermistor (Suction, THMsn)
6	Check Valve	24	Thermistor (Discharge, THMdn)
7	Stop Valve (with check joint)	25	Thermistor (Evaporation, THMr2n)
8	High Pressure Switch	26	Thermistor (Cooler water inlet, THMwi)
9	Pressure Sensor (Low)	27	Thermistor (Cooler water outlet, THMwon)
10	Pressure Sensor (High)	28	Thermistor (Cooler water outlet, THMwon1)
11	Pressure Relief Valve	29	Thermistor (Ambient, THMa)
12	Sight Glass	30	Thermistor (Liquid, THMl)
13	Compressor Safety Valve (Option)	A	High Pressure Gauge
14	Stop Valve (Option)	B	Low Pressure Gauge
15	Stop Valve (Option)	C	Stop Valve
16	Compressor Dual Safety Valve (Option)	D	Charging Cylinder
17	Pressure Switch	E	Vacuum Pump
18	Solenoid Valve		

NOTE:
R407C shall be charged by LIQUID.

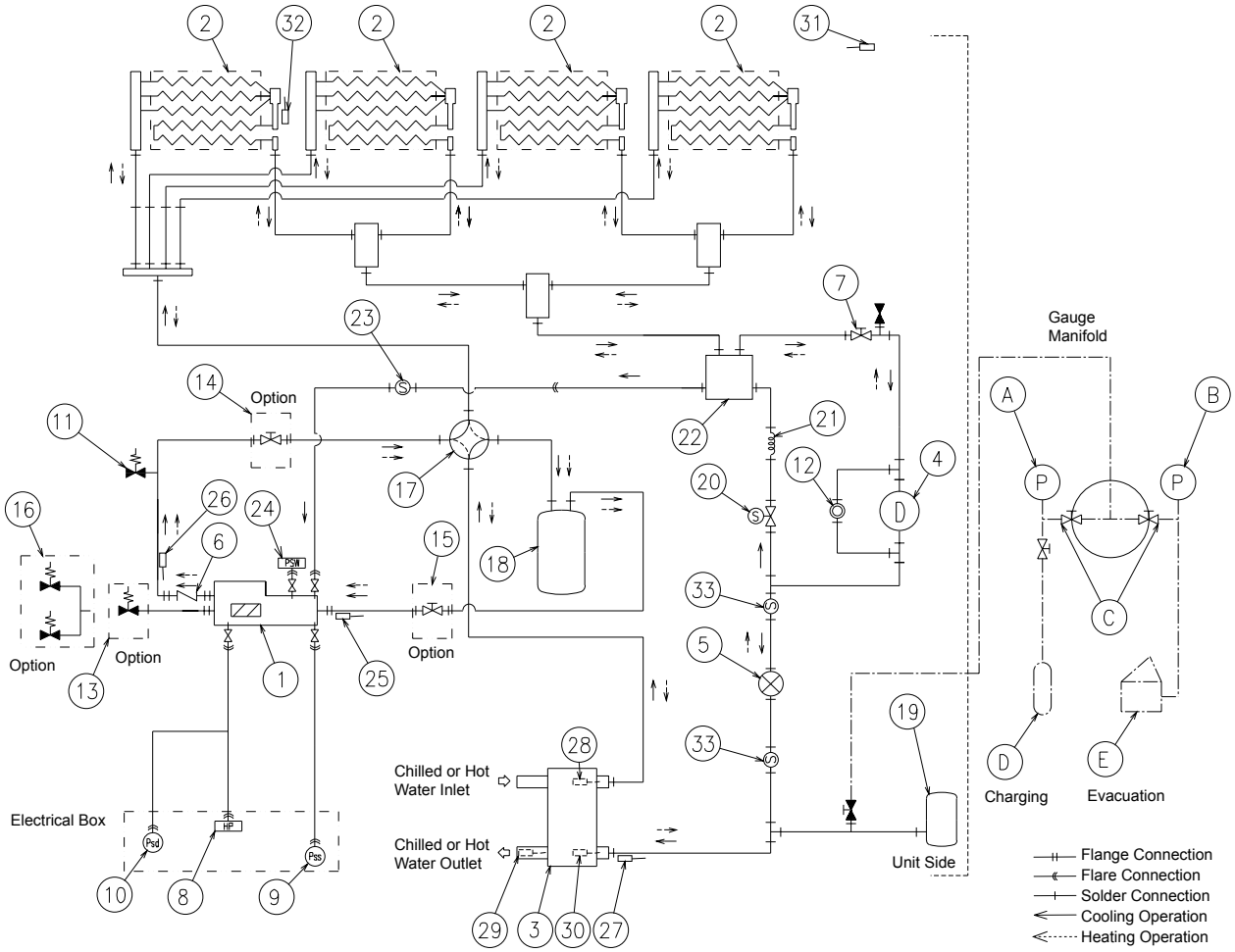
11.11. Refrigerant cycle diagram of Hitachi Air-to-Water Heat Pump Water Chiller (RHU2E40, 50, 60, 70, 100, 120, 140, 180, 210AG2)



No.	Name	No.	Name
1	Compressor	17	4-Way Valve
2	Air Side Heat Exchanger	18	Accumulator
3	Water Side Heat Exchanger	19	Liquid tank
4	Biflow drier	20	Thermistor (Suction, THMsn)
5	Electronic Expansion Valve	21	Thermistor (Discharge, THMdn)
6	Check Valve	22	Thermistor (Evaporation, THMr2n)
7	Stop Valve (with check joint)	23	Thermistor (Cooler water inlet, THMwi)
8	High Pressure Switch	24	Thermistor (Cooler water outlet, THMwon)
9	Pressure Sensor (Low)	25	Thermistor (Cooler water outlet, THMwon1)
10	Pressure Sensor (High)	26	Thermistor (Ambient, THMa)
11	Pressure Relief Valve	27	Thermistor (Liquid, THMl)
12	Sight Glass	A	High Pressure Gauge
13	Compressor Safety Valve (Option)	B	Low Pressure Gauge
14	Stop Valve (Option)	C	Stop Valve
15	Stop Valve (Option)	D	Charging Cylinder
16	Compressor Dual Safety Valve (Option)	E	Vacuum Pump

NOTE:
R407C shall be charged by LIQUID.

11.12. Refrigerant cycle diagram of Hitachi Air-to-Water Heat Pump Water Chiller (RHU2E80, 160, 240AG2) with economiser.



No.	Name	No.	Name
1	Compressor	20	Solenoid Valve
2	Air Side Heat Exchanger	21	Capillary Tube
3	Water Side Heat Exchanger	22	Economiser
4	Biflow Drier	23	Strainer
5	Electronic Expansion Valve	24	Pressure Switch
6	Check Valve	25	Thermistor (Suction, THMsn)
7	Stop Valve (with check joint)	26	Thermistor (Discharge, THMdn)
8	High Pressure Switch	27	Thermistor (Evaporation, THMr2n)
9	Pressure Sensor (Low)	28	Thermistor (Cooler water inlet, THMwi)
10	Pressure Sensor (High)	29	Thermistor (Cooler water outlet, THMwon)
11	Pressure Relief Valve	30	Thermistor (Cooler water outlet, THMwon1)
12	Sight Glass	31	Thermistor (Ambient, THMa)
13	Compressor Safety Valve (Option)	32	Thermistor (Liquid, THMl)
14	Stop Valve (Option)	33	Strainer
15	Stop Valve (Option)	A	High Pressure Gauge
16	Compressor Dual Safety Valve (Option)	B	Low Pressure Gauge
17	4-Way Valve	C	Stop Valve
18	Accumulator	D	Charging Cylinder
19	Liquid Tank	E	Vacuum Pump

NOTE:
R407C shall be charged by LIQUID.

CAUTION:

Do not charge OXYGEN, ACETYLENE or other flammable and poisonous gases into the refrigeration cycle when performing a leakage test or an airtight test. These types of gases are extremely dangerous, because explosion can occur. It is recommended that compressed air or nitrogen is charged for these types of tests.

Mineral deposits on water cooler plates act as thermal insulators, and also act as resistance against water flow, causing a decrease of the water flow running through them, and resulting in a decreasing of the cooling capacity. Deposits on the plates should be inspected at regular intervals. Experience with the water Chiller will dictate accurate inspection intervals.

These deposits should be removed by circulating diluted acid through the water passes after the water has been drained. As water in different localities contains different minerals, different acids are required, depending upon the thickness of the deposits.

This unit is equipped with an operation hour meter. In the case that the total operation time reaches 24,000 hours or 3 years pass after installation, exchange the bearings of the compressor. For details, refer to the Service Handbook for HITACHI Screw Compressors.

For R407C refrigerant system, charge the refrigerant with liquid condition to avoid its composition change.

11.13. Compressor Removal

◆ **When Removing the Compressor**

Remove the compressor while completing the following procedures.

1. Collect all refrigerant into a condenser before this work.
2. Turn off the switch DSW3 of the PCB in the magnetic switch box in order not to operate the compressor except for the cycle.
3. Circulate the chilled water sufficiently through the water cooler, and operate the water Chiller for 10 minutes, and check to ensure that the oil level is maintained at a stable condition.
4. Stop the water Chiller and completely close the liquid stop valve.
5. Operate the water Chiller after circulating water through the water cooler.
6. Stop the water Chiller when the low pressure reaches at approximately 0.05 MPa. Do not operate at a pressure lower than 0.05 MPa. If operated, it will cause a damage to the compressor.
7. Wait for several minutes. If the low pressure increases up to 0.45 to 0.5 MPa, repeat the above procedures 5 and 6 four or five times.
8. Turn OFF the power supply to the unit.
9. After these works above, almost all refrigerant can be collected in the condenser.
10. Recover the rest of refrigerant from the water cooler and the compressor.
11. Remove the bolts on the discharge and suction flanges of the compressor.
12. Remove all the wiring of the compressor.
13. Remove the bolts fixing the compressor.
14. Remove the compressor.

11.14. Safety and protection control

The safety and protective devices are equipped with the unit to ensure dependable and long life operation.

Their functions should be carefully noted, and field adjustment is not recommended, if the setting is maintained at the point listed in the table.

◆ **Compressor protection**

1. Fuse and thermal relay equipped in the control box cut out each compressor operation when the current to the compressor exceeds the setting

2. The internal thermostat embedded in the motor winding cuts out each operation, when the temperature exceeds the setting

3. The oil heater in the compressor prevents from oil foaming during cold starting. This heater warms the oil, while the compressor is stopped

◆ **Refrigeration Cycle**

1. The high pressure switch and low pressure control protect against excessive discharge pressure and exceedingly low suction pressure. The switch and control cut out compressor operation when discharge pressure or suction pressure is abnormal.

2. The pressure relief valve is equipped on discharge gas line. When high pressure exceeds the setting, gas refrigerant will be discharged to prevent abnormal high pressure

◆ **Condenser Fan Motor Protection**

Fuse and internal thermostat are equipped
The internal thermostat embedded in fan motor winding cut out fan operation and compressor operation, when the temperature of the motor winding exceeds the setting

◆ **Water Cooler**

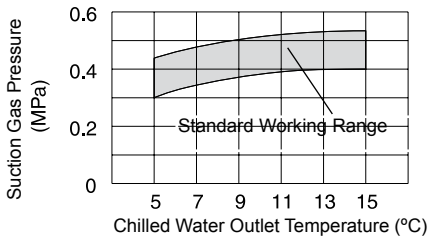
Pump interlock, freeze protection thermostat, low pressure control and suction gas thermostat can protect water cooler against water cooler freezing

Model R(C/H)U2E – AG2		40	50	60	70	80	100	120	140	160	180	210	240	280	320	350	400
For Compressor High Pressure Switch		Manual Reset, Non-Adjustable (One Switch for Each Compressor Motor)															
Cut - Out	MPa	2,80	2,80	2,80	2,80	2,80	2,80	2,80	2,80	2,80	2,80	2,80	2,80	2,80	2,80	2,80	2,80
Low Pressure Control		Electronic Control															
Cut - Out	MPa	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05
Internal Thermostat for Compressor		Manual Reset, Non-Adjustable (One Switch for Each Compressor Motor)															
Cut - Out	°C	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115
Cut - In	°C	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93
Compressor Motor (400V / 50Hz)		(3 Fuses for Each Compressor)															
Fuse	A	125	125	125	160	160	125	125	160	160	125	160	160	160	160	160	160
		(One Three-Phase Set for Each Compressor Motor)															
Thermal Relay	A	55	60	70	85	90	60	70	85	90	70	85	90	85	90	85	90
		Manual Reset, Adjustable (One Three-Phase Set for Each Compressor Motor)															
Circuit Breaker Protector (Option)	A	112	112	136	160	160	112	136	160	160	136	160	160	160	160	160	160
Oil Heater		(One Heater for Each Compressor Motor)															
Capacity	W	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Discharge Gas Temperature Control		(One for Each Circuit)															
Cut - Out	°C	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140
CCP Timer		Non-Adjustable (One Timer for Each Compressor Motor)															
Setting Timer	s	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180
Star - Delta	s	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Unloading During Starting	s	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
For Control Circuit																	
Fuse	A	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
For Refrigerant Circuit Pressure Relief Valve		(One for Each Circuit)															
Setting Pressure	MPa	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0
Freeze Protection Control		(One for Each Water Cooler)															
Cut - Out	°C	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Fan Motor (380-415V / 50Hz)		(3 Fuses for Each Circuit)															
Fuse	A	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
		(One Fuse for Each Fan (Both DC Fan and AC Fan))															
Fuse	A	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5
		(One Protector for Each Fan (Both DC Fan and AC Fan))															
Circuit Breaker Protector (Option)	A	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14

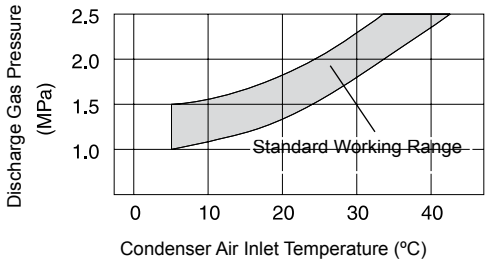
11.15. Normal operating pressure

Check to ensure that Chiller is operating within the working range as shown below, after at least 15 minutes operation.

◆ **Hitachi Air-Cooled Water Chiller**

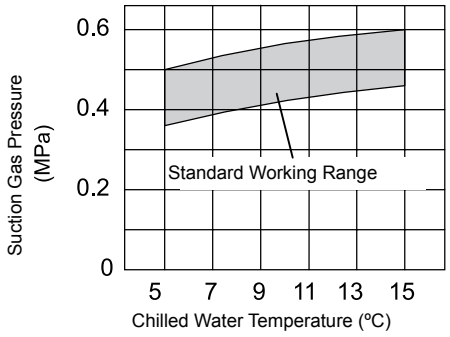


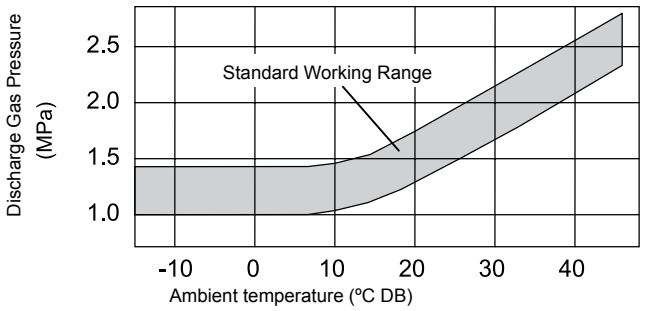
Conditions:
-Compressor: 100% Load
-Condenser Fans: 4 or 6 fans running each cycle



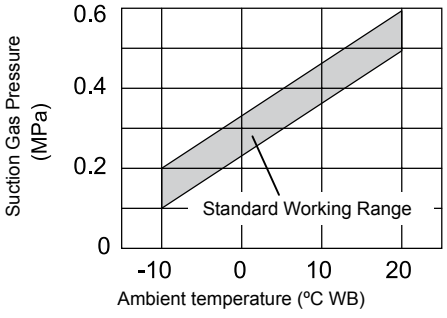
◆ **Hitachi Air-to-Water Heat Pump Water Chiller**

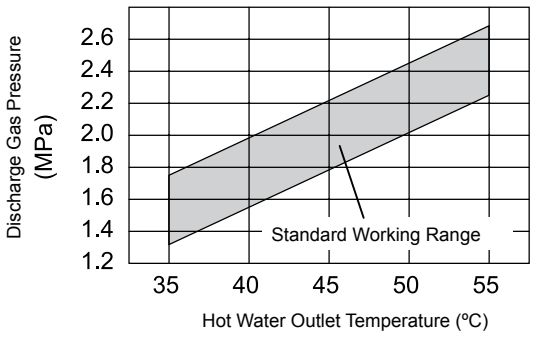
Cooling operation





Heating operation





Conditions:
-Compressor: 100% Load
-Air Side Heat Exchanger Fans: 4 or 6 fans running each cycle

CAUTION:

Periodical Maintenance
Perform periodical maintenance according to the "INSTRUCTIONS" to maintain the unit in a good condition.

Fire
If a fire accidentally occurs, turn OFF the main switch and use an extinguisher for an oil fire and electric fire.

Flammable Gases
Do not operate the unit near the flammable gases such as lacquer, paint, oil, etc. to avoid a fire or an explosion.

Service Panels and Electrical Box Cover
Turn OFF the main switch when service panels or electrical box covers are removed for setting the temperature.
Do not operate the unit without fixing panels.

Heated Pipe
Do not touch the parts at discharge gas side by hand, since the pipes at the discharge side are heated by refrigerant and temperature becomes higher than 100ºC.

Use
Do not utilise this unit for cooling of drinking water or food. Comply with local codes and regulations.

Failure
Turn OFF all the main switches if refrigerant leakage or chilled water leakage occurs. Also, if the unit can not be stopped by the control switch, turn OFF all the switches for power source.

Activation of Safety Device
In the case that one of safety devices is activated and unit is stopped, remove the cause of the stoppage and restart the unit.
The protection devices are utilised to protect the unit from an abnormal operation.
Therefore, if one of safety devices is activated, remove the cause by referring the "Troubleshooting" in the "INSTRUCTION" or call the local agency.

Fuse
Utilise a fuse with specified capacity. Do not use a steel wire or a copper wire instead of a fuse. If an incorrect wire is utilised, a serious accident such as a fire will occur.

Safety Devices
Do not make a short-circuit at the protection line. If a short-circuit is made, a serious accident will occur.

Setting of Safety devices
Do not change the setting of safety devices, if changed, a serious accident will occur.
Do not touch any electrical parts except for the operation switches during the operation.
Do not press the button on the magnetic switch. If pressed, a serious accident will occur.

11.16. Test Running And Maintenance Record

MODEL:	RCU2E		MFG. NO.	
		COMPRESSOR	MFG. NO.	
CUSTOMER NAME AND ADDRESS			DATE	

Is there adequate water flow for the water cooler?				
Has all water piping been checked for leakage?				
Has the unit been operated for at least twenty minutes?				
Check Ambient Temperature:	ºC			
Check Chilled Water Temperature:				
Inlet ºC	Outlet ºC			
Check Water Flow:	m^3/h			
Check Suction Line Temperature and Superheat:				
Suction Line Temperature	ºC	ºC	ºC	ºC
Superheat	deg	deg	deg	deg
Check Pressure:				
Discharge Pressure	MPa	MPa	MPa	MPa
Suction Pressure	MPa	MPa	MPa	MPa
Check Running Current:				
	A	A	A	A
Check Voltage for System:				
R-S, S-T, T-R=	V	V	V	
Has the unit been checked for refrigerant leakage?				
Is the unit clean inside and outside?				
Are all cabinet panels free from rattling?				

11.17. Daily Operating Records

Model:

Date:

Weather:

Time of Operation : Start, Stop. (Operation hour:)

	Sampling Time					
	Compressor Number					
	Term					
Ambient Temperature	DB	ºC				
	WB	ºC				
Compressor	High Pressure	MPa				
	Low Pressure	MPa				
	Voltage	V				
	Current	A				
Chiller Water Temperature	Inlet	ºC				
	Outlet	ºC				
Current for Chilled Water Pump		A				

NOTES:

11.18. Servicing for R407C Refrigerant System

◆ **Refrigerant**

This R407C refrigerant is HFC type so that it has a feature of no ozone depletion. If it is mixed with another refrigerant, the serious changing would occur on its character. Therefore notice the following point when handling this refrigerant.

1. Charge the refrigerant in LIQUID condition and NOT in GAS. As “R407C” is geotropic mixed refrigerant, if gas charging is performed, only the easy vaporising refrigerant would be charged into the system and the difficult vaporising one would be remained in the charge cylinder.

The cylinder, gauge equipped manifold and charge hose are only used for R407C refrigerant.

Adjust the cylinder setting to charge in liquid.

◆ **Refrigerant Oil**

UX300, which R407C refrigerant is easy to blend into it, is used for this system. The other oil is prohibited to use, so that not to be mixed with another kind of oil at the maintenance and service work. This oil is very hygroscopic.

Therefore minimum humidity handling is necessary.

◆ **Servicing Equipment**

When servicing R407C system, servicing equipment such as Charging Cylinder, Charging Hose, Vacuum Pump and so on, shall not be mixed with R22 equipment to avoid R407C composition change.

12. Troubleshooting

Contents

12.1.Procedures for trouble

◆ **The following table shows efficient checking procedures for trouble.**

Fault	Possible Cause	Check/Corrective Action
Fan does not operate	Current to Unit is Shut Off	1. Reset the power supply line to the unit.
	Fuse for Operation Circuit is Blown Out or Faulty Contact	1. Check for shorted components. 2. Check for loose connection. Tighten or replace. If necessary.
	Contactor Holding Coil is Burned Out or Faulty Contact	1. Find the causes, and repair or replace.
	Tripped Overcurrent Relay	1. Remove the causes, and reset the overcurrent relay.
	Low Voltage	1. Check the voltage of unit rating.
	Shorted Motor or Terminals.	1. Check the motor and terminals. Repair or replace, if necessary.
Compressor does not operate	Condenser Fan is Not Operating	1. Remove all causes of inoperative fan.
	Interlock Circuit for Chilled Water Pump is Open	1. Check the pump contactor. Repair or replace, if necessary. 2. Check for the faulty pump.
	Electrical Protective Devices Are Tripped.	1. Remove the causes, and reset the “ON” button. See the following causes.
	Incorrect Wiring Connection for Compressor Power Source	1. Interchange two of three terminals R, S and T at the main power source terminals.
Compressor stops on High Pressure Switch	Excessively High Discharge Pressure	1. See “High Discharge Pressure”
	Malfunction of High Pressure Switch	1. Readjust the setting or replace, if defective.
Compressor stops on Overcurrent Relay	Excessively High Discharge Pressure and Suction Pressure	1. See “High Discharge Pressure” and “High Suction Pressure”.
	High or Low Voltage, Single-Phase or Phase Imbalance	1. Check the power supply line and contactors. Repair, if necessary.
	Loose connection	1. Tighten the loose electrical connection or repair, if necessary.
	Faulty Compressor Motor	1. Check the compressor motor. Repair or replace, if necessary.
	Faulty Overcurrent Relay	1. Replace it, if necessary.

◆ **The following table shows efficient checking procedures for trouble.**

Fault	Possible Cause	Check/Corrective Action
Compressor Stops on Freeze Protection Control.	Excessively Low Chilled water Outlet Temperature	1. Check for excessively low setting of the chilled water setting knob.
	Defective Thermistor	1. Check for malfunction of the thermistor. Replace, if necessary.
	Shortage of Chilled Water Flow	1. Check the rotation of the pump.
	Air in water Circuit	1. Purge air.
Compressor Stops on Internal Thermostat or Discharge Gas Temperature Control.	High or Low Voltage, Single-Phase or Phase Imbalance	1. Check the power supply line and contactor. Repair, if necessary.
	Excessive Superheat	1. Check for refrigerant leakage.
	Defective Element	1. Check the contact of the internal thermostat during the cold condition.
	Excessive High Discharge Pressure and Low Suction Pressure	1. See “High Discharge Pressure” and “Low Suction Pressure”.
Insufficient Cooling	High Discharge Pressure or Low Suction Pressure	1. See “High Discharge Pressure” and “Low Suction Pressure”.
	Improper Thermostat Setting	1. Readjust the setting.
	Defective Unload Mechanism	1. Adjust unload mechanism. Repair or replace unloaded parts, if necessary.
Noisy Compressor	Slugging Due to Liquid Flooding Back to Compressor	1. Check the superheat of suction gas. Check the position of Expansion Valve coil. Repair or replace if necessary.
	Worn parts	1. Check for the sound of internal parts. Replace the compressor, if necessary.
Miscellaneous Noise	Loose Fixed Screw	1. Tighten the screws of all parts.
Unloaded Does not Function	Trouble with the Thermistor	1. Adjust the setting temperature. 2. Replace the thermistor.
	Trouble with the Solenoid Valve	1. Check the coil in the solenoid valve. 2. Check oil passage for clogging.
	Worn Unloader Mechanism	1. Check the unloaded system parts in the compressor.
High Discharge Pressure	High Condenser Air Temperature or Insufficient Air Flow Through the Condenser	1. Check the fan operation. 2. Check for coil clogging; clean, if necessary.
	Defective Check Valve or partially Closed Liquid Line Valve	1. Check the valves and strainer. Replace, if necessary.
	Overcharged Refrigerant	1. Adjust the refrigerant quantity.
	Air or Non-Condensable Gas in the Refrigerant Cycle.	1. Purge the gas from the refrigerant cycle.
	Suction Pressure is Higher than Standard	1. See “High Suction Pressure”.
Low Discharge Pressure	Extremely Cold Condenser Air	1. Check the ambient Temperature.
	Insufficient Refrigerant Charge	1. Add Refrigerant.
	Leakage from the Compressor Discharge Valve	1. Replace the valves. Replace the compressor, if required.
	Suction Pressure is Lower than Standard	1. See “ Low Suction Pressure”
High Suction Pressure	High Inlet Temperature of Chilled Water	1. Check the insulation of the piping. 2. Check the installation specifications.
	Excessive Opening of Expansion Valve	1. Check the position of Expansion Valve coil, or replace, if defective.
Low Suction Pressure	Low Inlet Temperature of Chilled Water	1. Check the installation specifications.
	Improperly controlled Expansion Valve or Faulty Valve	1. Check the position of Expansion Valve coil. Repair or replace, if necessary.
	Insufficient Refrigerant Charge	1. Add Refrigerant.
	Excessive Oil in the Water Cooler	1. Purge Oil.
	Scales on Water Cooler Plates	1. Clean the plates.

13. General Specifications

Contents

13.1. General Data

◆ **Hitachi Air-Cooled Water Chiller units RCU2E40~400AG2**

Model			RCU2E40AG2	RCU2E50AG2	RCU2E60AG2	RCU2E70AG2
Electrical Power Supply		-	3N~ 400V 50Hz			
Cooling Capacity		kW	112	130	156	178
Total Power Input		kW	38.6	44.7	53.0	61.0
EER		-	2.90	2.91	2.94	2.92
ESEER		-	3.48	3.49	3.52	3.50
Outer Dimension	Height	mm	2430	2430	2430	2430
	Width	mm	1900	1900	1900	1900
	Depth	mm	2190	2190	2190	2790
Cabinet Colour		-	Natural Grey (Munsell code 1.0Y8.5/0.5)			
Net Weight		kg	1430	1470	1560	1760
Compressor Type		-	Semi-Hermetic Screw Type			
Models		-	40ASC-Z	40ASC-Z	50ASC-Z	60ASC-Z
Quantity		-	1	1	1	1
Oil Heater		W	150	150	150	150
Capacity Control		-	Continuous Capacity Control			
		%	15 ~ 100			
Water Cooler Type		-	Brazing Plate Type			
Condenser Type		-	Multi-Pass Cross Finned Tube			
Fan Motor (pole)		kW	0.38 (8)			
Quantity		-	4	4	4	6
Refrigerant Type		-	R407C (Factory Charged)			
Flow Control		-	Electronic Expansion Valve			
Number of circuits		-	1	1	1	1
Oil Type		-	JAPAN ENERGY FREOL UX300 (Ester)			
Water pipe Connection		Inch	3” Victaulic (1×Inlet / 1×Outlet)			
Control System		-	Micro-Processor Control			
Chilled Water Outlet Temperature		°C	(-10) 5 ~ 15			
Condenser Air Inlet Temperature		°C	-15 ~ 46			
Permissible Water Pressure Max.		MPa	1.0			
Safety and Protection Devices		-	Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Fuse and Internal Thermostat for Fan Motor, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, High Pressure Relief Valve, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter			

NOTE:

The nominal cooling capacities are based on the European Standard EN14511.

- Chilled Water Inlet / Outlet Temperature : 12 / 7 °C

- Condenser Inlet Air Temperature : 35 °C

Model			RCU2E80AG2	RCU2E100AG2	RCU2E120AG2	RCU2E140AG2
Electrical Power Supply		-	3N~ 400V 50Hz			
Cooling Capacity		kW	206	260	312	356
Total Power Input		kW	70.0	89.4	106	122
EER		-	2.94	2.91	2.94	2.92
ESEER		-	3.52	3.49	3.52	3.50
Outer Dimension	Height	mm	2430	2430	2430	2430
	Width	mm	1900	1900	1900	1900
	Depth	mm	2790	4090	4090	5290
Cabinet Colour		-	Natural Grey (Munsell code 1.0Y8.5/0.5)			
Net Weight		kg	1820	2830	3000	3420
Compressor Type		-	Semi-Hermetic Screw Type			
Model		-	60ASC-Z	40ASC-Z	50ASC-Z	60ASC-Z
Quantity		-	1	2	2	2
Oil Heater		W	150	150×2	150×2	150×2
Capacity Control		-	Continuous Capacity Control			
		%	15 ~ 100			
Water Cooler Type		-	Brazing Plate Type			
Condenser Type		-	Multi-Pass Cross Finned Tube			
Fan Motor (pole)		kW	0.38 (8)			
Quantity		-	6	8	8	12
Refrigerant Type		-	R407C (Factory Charged)			
Flow Control		-	Electronic Expansion Valve			
Number of circuits		-	1	2	2	2
Oil Type		-	JAPAN ENERGY FREOL UX300 (Ester)			
Water pipe Connection		Inch	3” Victaulic (1×Inlet / 1×Outlet)	3” Victaulic (2×Inlet / 2×Outlet)		
Control System		-	Micro-Processor Control			
Chilled Water Outlet Temperature		°C	(-10) 5 ~ 15			
Condenser Air Inlet Temperature		°C	-15 ~ 46			
Permissible Water Pressure Max.		MPa	1.0			
Safety and Protection Devices		-	Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Fuse and Internal Thermostat for Fan Motor, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, High Pressure Relief Valve, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter			

NOTE:

The nominal cooling capacities are based on the European Standard EN14511.

- Chilled Water Inlet / Outlet Temperature : 12 / 7°C

- Condenser Inlet Air Temperature: 35 °C

Model			RCU2E160AG2	RCU2E180AG2	RCU2E210AG2	RCU2E240AG2
Electrical Power Supply		-	3N~ 400V 50Hz			
Cooling Capacity		kW	412	468	534	618
Total Power Input		kW	140	159	183	210
EER		-	2.94	2.94	2.92	2.94
ESEER		-	3.52	3.52	3.50	3.52
Outer Dimension	Height	mm	2430	2430	2430	2430
	Width	mm	1900	1900	1900	1900
	Depth	mm	5290	5990	7790	7790
Cabinet Colour		-	Natural Grey (Munsell code 1.0Y8.5/0.5)			
Net Weight		kg	3550	4450	5070	5250
Compressor Type		-	Semi-Hermetic Screw Type			
Models		-	60ASC-Z	50ASC-Z	60ASC-Z	60ASC-Z
Quantity		-	2	3	3	3
Oil Heater		W	150×2	150×3	150×3	150×3
Capacity Control		-	Continuous Capacity Control			
		%	15 ~ 100			
Water Cooler Type		-	Brazing Plate Type			
Condenser Type		-	Multi-Pass Cross Finned Tube			
Fan Motor (pole)		kW	0.38 (8)			
Quantity		-	12	12	18	18
Refrigerant Type		-	R407C (Factory Charged)			
Flow Control		-	Electronic Expansion Valve			
Number of circuits		-	2	3	3	3
Oil Type		-	JAPAN ENERGY FREOL UX300 (Ester)			
Water pipe Connection		Inch	3” Victaulic (2×Inlet / 2×Outlet)	3” Victaulic (3×Inlet / 3×Outlet)		
Control System		-	Micro-Processor Control			
Chilled Water Outlet Temperature		°C	(-10) 5 ~ 15			
Condenser Air Inlet Temperature		°C	-15 ~ 46			
Permissible Water Pressure Max.		MPa	1.0			
Safety and Protection Devices		-	Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Fuse and Internal Thermostat for Fan Motor, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, High Pressure Relief Valve, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter			

NOTE:

The nominal cooling capacities are based on the European Standard EN14511.

- Chilled Water Inlet / Outlet Temperature : 12 / 7 °C

- Condenser Inlet Air Temperature: 35 °C

Model			RCU2E280AG2	RCU2E320AG2	RCU2E350AG2	RCU2E400AG2
Electrical Power Supply		-	3N~ 400V 50Hz			
Cooling Capacity		kW	712	824	890	1030
Total Power Input		kW	244	280	305	350
EER		-	2.92	2.94	2.92	2.94
ESEER		-	3.50	3.52	3.50	3.52
Outer Dimension	Height	mm	2430	2430	2430	2430
	Width	mm	1900	1900	1900	1900
	Depth	mm	10290	10290	12790	12790
Cabinet Colour		-	Natural Grey (Munsell code 1.0Y8.5/0.5)			
Net Weight		kg	6750	7000	8450	8750
Compressor Type		-	Semi-Hermetic Screw Type			
Models		-	60ASC-Z	60ASC-Z	60ASC-Z	60ASC-Z
Quantity		-	4	4	5	5
Oil Heater		W	150×4	150×4	150×5	150×5
Capacity Control		-	Continuous Capacity Control			
		%	15 ~ 100			
Water Cooler Type		-	Brazing Plate Type			
Condenser Type		-	Multi-Pass Cross Finned Tube			
Fan Motor (pole)		kW	0.38 (8)			
Quantity		-	24	24	30	30
Refrigerant Type		-	R407C (Factory Charged)			
Flow Control		-	Electronic Expansion Valve			
Number of circuits		-	4	4	5	5
Oil Type		-	JAPAN ENERGY FREOL UX300 (Ester)			
Water pipe Connection		Inch	3” Victaulic (4×Inlet / 4×Outlet)		3” Victaulic (5×Inlet / 5×Outlet)	
Control System		-	Micro-Processor Control			
Chilled Water Outlet Temperature		°C	(-10) 5 ~ 15			
Condenser Air Inlet Temperature		°C	-15 ~ 46			
Permissible Water Pressure Max.		MPa	1.0			
Safety and Protection Devices		-	Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Fuse and Internal Thermostat for Fan Motor, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, High Pressure Relief Valve, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter			

NOTE:

The nominal cooling capacities are based on the European Standard EN14511.

- Chilled Water Inlet / Outlet Temperature : 12 / 7 °C

- Condenser Inlet Air Temperature: 35 °C

◆ Hitachi Air-to-Water Heat Pump Water Chiller units RHU2E40~240AG2

Model			RHU2E40AG2	RHU2E50AG2	RHU2E60AG2	RHU2E70AG2
Electrical Power Supply		-	3N~ 400V 50Hz			
Cooling Capacity		kW	106	123	148	169
Heating Capacity		kW	110	127	152	185
Total Power Input in Cooling		kW	37.9	42.7	52.0	60.0
Total Power Input in Heating		kW	40.7	44.5	54.0	68.0
EER		-	2.80	2.88	2.85	2.82
COP		-	2.70	2.85	2.81	2.72
ESEER		-	3.36	3.45	3.42	3.38
Outer Dimension	Height	mm	2430	2430	2430	2430
	Width	mm	1900	1900	1900	1900
	Depth	mm	2190	2190	2190	2790
Cabinet Colour		-	Natural Grey (Munsell code 1.0Y8.5/0.5)			
Net Weight		kg	1550	1600	1670	1880
Compressor Type		-	Semi-Hermetic Screw Type			
Models		-	40ASC-Z	40ASC-Z	50ASC-Z	60ASC-Z
Quantity		-	1	1	1	1
Oil Heater		W	150	150	150	150
Capacity Control		-	Continuous Capacity Control			
		%	15 ~ 100			
Water side heat exchanger		-	Brazing Plate Type			
Air side heat exchanger		-	Multi-Pass Cross Finned Tube			
Fan Motor (pole)		kW	0.38 (8)			
Quantity		-	4	4	4	6
Refrigerant Type		-	R407C (Factory Charged)			
Flow Control		-	Electronic Expansion Valve			
Number of circuits		-	1	1	1	1
Oil Type		-	JAPAN ENERGY FREOL UX300 (Ester)			
Water pipe Connection		Inch	3” Victaulic (1×Inlet / 1×Outlet)			
Control System		-	Micro-Processor Control			
Chilled Water Outlet Temperature		°C	(-10) 5 ~ 15			
Heated Water Outlet Temperature		°C	35 ~ 55			
Condenser Air Inlet Temperature		°C	-15 ~ 46 for Cooling Operation			
Evaporator Air inlet Temperature		°C	DB: -9.5 ~ 21 / WB: -10 ~ 15.5 for Heating Operation			
Permissible Water Pressure Max.		MPa	1.0			
Safety and Protection Devices		-	Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Fuse and Internal Thermostat for Fan Motor, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, High Pressure Relief Valve, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter			

NOTES:

1. *The nominal cooling capacities are based on the European Standard EN14511.*
   - *Chilled Water Inlet / Outlet Temperature : 12 / 7 °C*
   - *Condenser Inlet Air Temperature : 35 °C*
2. *The nominal heating capacities are based on the European Standard EN14511.*
   - *Heated Water Inlet / Outlet Temperature : 40 / 45 °C*
   - *Evaporator Air Inlet Temperature : 6 °C (WB)*

Model			RHU2E80AG2	RHU2E100AG2	RHU2E120AG2	RHU2E140AG2
Electrical Power Supply		-	3N~ 400V 50Hz			
Cooling Capacity		kW	195	246	296	338
Heating Capacity		kW	185	254	304	370
Total Power Input in Cooling		kW	70.0	85.4	104	120
Total Power Input in Heating		kW	68.0	89.0	108	136
EER		-	2.79	2.88	2.85	2.82
COP		-	2.72	2.85	2.81	2.72
ESEER		-	3.34	3.45	3.42	3.38
Outer Dimension	Height	mm	2430	2430	2430	2430
	Width	mm	1900	1900	1900	1900
	Depth	mm	2790	4090	4090	5290
Cabinet Colour		-	Natural Grey (Munsell code 1.0Y8.5/0.5)			
Net Weight		kg	1950	3050	3250	3670
Compressor Type		-	Semi-Hermetic Screw Type			
Model		-	60ASC-Z	40ASC-Z	50ASC-Z	60ASC-Z
Quantity		-	1	2	2	2
Oil Heater		W	150	150×2	150×2	150×2
Capacity Control		-	Continuous Capacity Control			
		%	15 ~ 100			
Water side heat exchanger		-	Brazing Plate Type			
Air side heat exchanger		-	Multi-Pass Cross Finned Tube			
Fan Motor (pole)		kW	0.38 (8)			
Quantity		-	6	8	8	12
Refrigerant Type		-	R407C (Factory Charged)			
Flow Control		-	Electronic Expansion Valve			
Number of circuits		-	1	2	2	2
Oil Type		-	JAPAN ENERGY FREOL UX300 (Ester)			
Water pipe Connection		Inch	3” Victaulic (1×Inlet / 1×Outlet)	3” Victaulic (2×Inlet / 2×Outlet)		
Control System		-	Micro-Processor Control			
Chilled Water Outlet Temperature		°C	(-10) 5 ~ 15			
Heated Water Outlet Temperature		°C	35 ~ 55			
Condenser Air Inlet Temperature		°C	-15 ~ 46 for Cooling Operation			
Evaporator Air inlet Temperature		°C	DB: -9.5 ~ 21 / WB: -10 ~ 15.5 for Heating Operation			
Permissible Water Pressure Max.		MPa	1.0			
Safety and Protection Devices		-	Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Fuse and Internal Thermostat for Fan Motor, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, High Pressure Relief Valve, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter			

NOTES:

1. *The nominal cooling capacities are based on the European Standard EN14511.*
   - *Chilled Water Inlet / Outlet Temperature : 12 / 7 °C*
   - *Condenser Inlet Air Temperature : 35 °C*
2. *The nominal heating capacities are based on the European Standard EN14511.*
   - *Heated Water Inlet / Outlet Temperature : 40 / 45 °C*
   - *Evaporator Air Inlet Temperature : 6 °C (WB)*

Model			RHU2E160AG2	RHU2E180AG2	RHU2E210AG2	RHU2E240AG2
Electrical Power Supply		-	3N~ 400V 50Hz			
Cooling Capacity		kW	390	444	507	585
Heating Capacity		kW	370	456	555	555
Total Power Input in cooling		kW	140	156	180	210
Total Power Input in heating		kW	136	162	204	204
EER		-	2.79	2.85	2.82	2.79
COP		-	2.72	2.81	2.72	2.72
ESEER		-	3.34	3.42	3.38	3.34
Outer Dimension	Height	mm	2430	2430	2430	2430
	Width	mm	1900	1900	1900	1900
	Depth	mm	5290	5990	7790	7790
Cabinet Colour		-	Natural Grey (Munsell code 1.0Y8.5/0.5)			
Net Weight		kg	3780	4780	5440	5650
Compressor Type		-	Semi-Hermetic Screw Type			
Models		-	60ASC-Z	50ASC-Z	60ASC-Z	60ASC-Z
Quantity		-	2	3	3	3
Oil Heater		W	150×2	150×3	150×3	150×3
Capacity Control		-	Continuous Capacity Control			
		%	15 ~ 100			
Water side heat exchanger		-	Brazing Plate Type			
Air side heat exchanger		-	Multi-Pass Cross Finned Tube			
Fan Motor (pole)		kW	0.38 (8)			
Quantity		-	12	12	18	18
Refrigerant Type		-	R407C (Factory Charged)			
Flow Control		-	Electronic Expansion Valve			
Number of circuits		-	2	3	3	3
Oil Type		-	JAPAN ENERGY FREOL UX300 (Ester)			
Water pipe Connection		Inch	3” Victaulic (2×Inlet / 2×Outlet)	3” Victaulic (3×Inlet / 3×Outlet)		
Control System		-	Micro-Processor Control			
Chilled Water Outlet Temperature		°C	(-10) 5 ~ 15			
Heated Water Outlet Temperature		°C	35~55			
Condenser Air Inlet Temperature		°C	-15 ~ 46 for Cooling Operation			
Evaporator Air Inlet Temperature			DB: -9.5 ~ 21 / WB: -10 ~ 15.5 for Heating Operation			
Permissible Water Pressure Max.		MPa	1.0			
Safety and Protection Devices		-	Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Fuse and Internal Thermostat for Fan Motor, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, High Pressure Relief Valve, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter			

NOTE:

1. The nominal cooling capacities are based on the European Standard EN14511.
- Chilled Water Inlet / Outlet Temperature : 12 / 7 °C
- Condenser Inlet Air Temperature : 35 °C
2. The nominal heating capacities are based on the European Standard EN14511.
- Heated Water Inlet / Outlet Temperature : 40 / 45 °C
- Evaporator Air Inlet Temperature : 6 °C (WB)

13.2. Options line up

Following table shows options:

(✓ mark shows available)

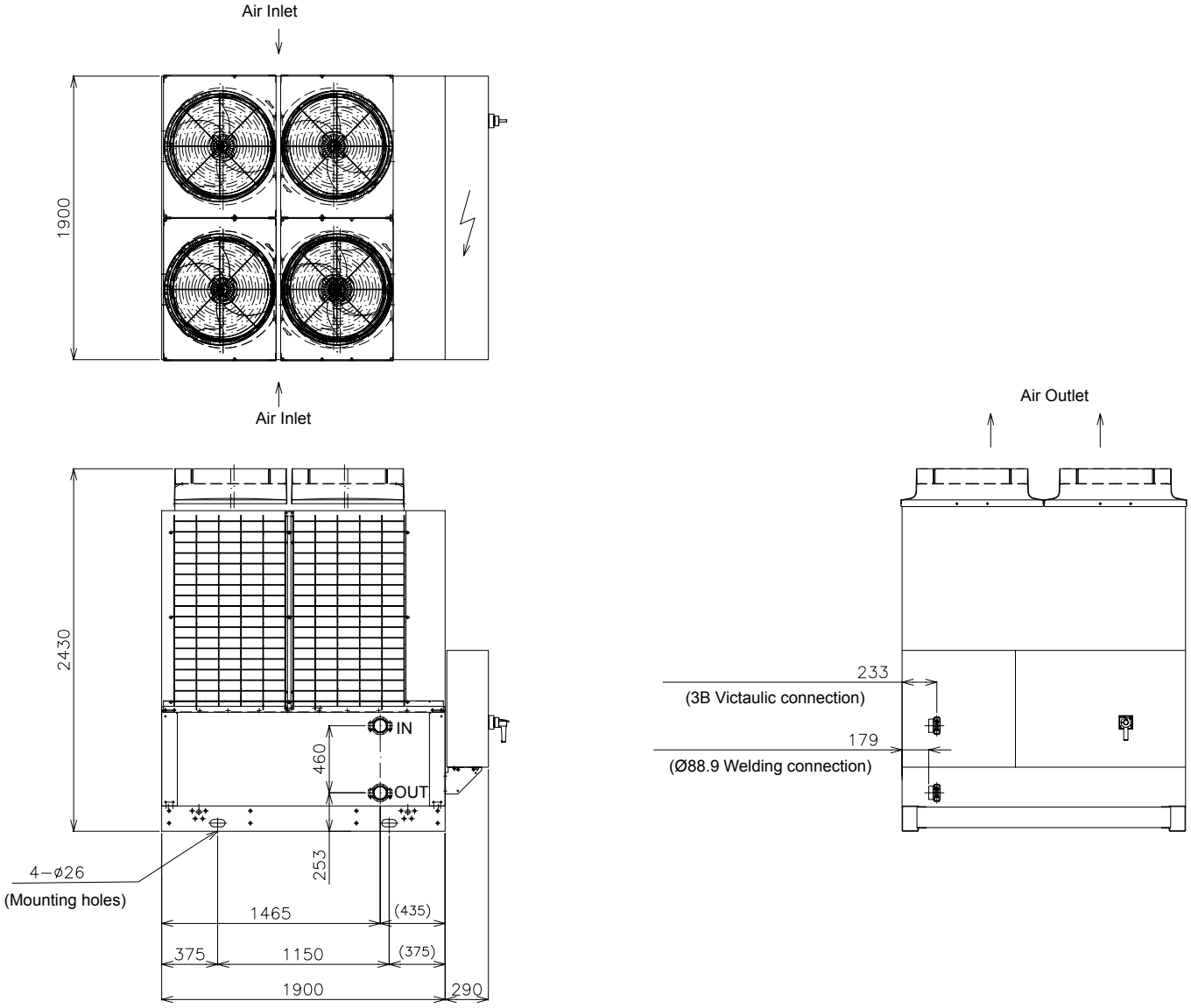
Specifications		Standard	Option	Remarks
General	Low Noise		✓	
	Super Low Noise		✓	
	Low Ambient Fan Control (-15ºC)	✓		
Low Water Temperature	Outlet Temperature: 0 ~ 4ºC (Low1)		✓	
	Outlet Temperature: -1 ~ -5ºC (Low2)		✓	
	Outlet Temperature: -6 ~ -10ºC (Low3)		✓	
Compressor	Compressor Enclosure	✓		
Control System	Circuit Breaker Protector		✓	For Compressor & Fans
	Fan Circuit Breaker Protector		✓	Only for Fans
	Current Limiter	✓		
	Star-Delta starting	✓		For compressors
	Main Isolator Switch	✓		
	Local/Remote Changeover Switch	✓		
	Individual Alarm	✓		By Alarm Code
	Compressor Operation Hour Meter	✓		
	Pressure Sensor (High and Low)	✓		
	Pump Freeze Protection Operation	✓		Pump ON/OFF Operation
	Pump Operation Circuit	✓		Pump ON/OFF Contact
	Non Voltage Contact for Remote indication	✓		Pump, Operation, Alarm
	DC24V External Control	✓		Level or pulse
	Short Period Power OFF Protection	✓		
	Power Failure Recover Control	✓		
	2 Different Temperatures Setting	✓		
	Remote Control Switch (Field Supplied)	✓		AC 220-240V
	BMS Control (HARC-70CE1/OP) / (HC-A32MB)		✓	LON-WORKS / MODBUS
	Remote Controller (CSC-5S)		✓	
	Remote Controller via Intra/Internet		✓	CSNETWEB
	Power Meter (Field installed)		✓	Power Meter + CSNETWEB
	Numbered Cables	✓		
	Output ON/OFF Signal for Free Cooling	✓		
	Output ON/OFF Signal for Fan operation	✓		Snow Protection
	Output Signal for Forcing Compressor Load	✓		
Air Condenser	Coil Guard Nets	✓		Unit both sides
	Coated Aluminium Fin	✓		
	Copper Fin		✓	
Refrigeration Cycle	Independent Circuit	✓		
	Insulation Suction Pipe		✓	Low pressure side
	Discharge Valve		✓	
	Suction Valve		✓	
	Dual Safety Valve		✓	
	Compressor Safety Valve		✓	
	Compressor Dual Safety Valve		✓	
	Heat Recovery		✓	Except RHU2E units with common water pipe option
	Heating Operation in High Ambient Temperature		✓	Only RHU2E units
	Pressure Display (High and Low)	✓		Display on Operation Panel
Water Cooler	Water Cooler Heater		✓	
Water system	10 bar Water Pressure	✓		
	PN 16 Flange		✓	With Companion Flange
	Differential Water Pressure Switch		✓	
	Water Flow Switch (Field Installed)		✓	
	Pressure port		✓	Water inlet / outlet
	Water Strainer (Field installed)		✓	
	Stainless Steel Water Pipe		✓	AISI 304
	Common Water Pipe		✓	Except 40,50,60,70,80HP
	Hydrokit		✓	Only 40, 50,60, 70, 80HP
Others	Foundation Rubber Mats (Field installed)		✓	
	Spring Anti-vibration (Field installed)		✓	
	Lower Guard Nets		✓	
	All Painted		✓	
	Wooden Crate		✓	
	Witness Test		✓	

14. Drawings

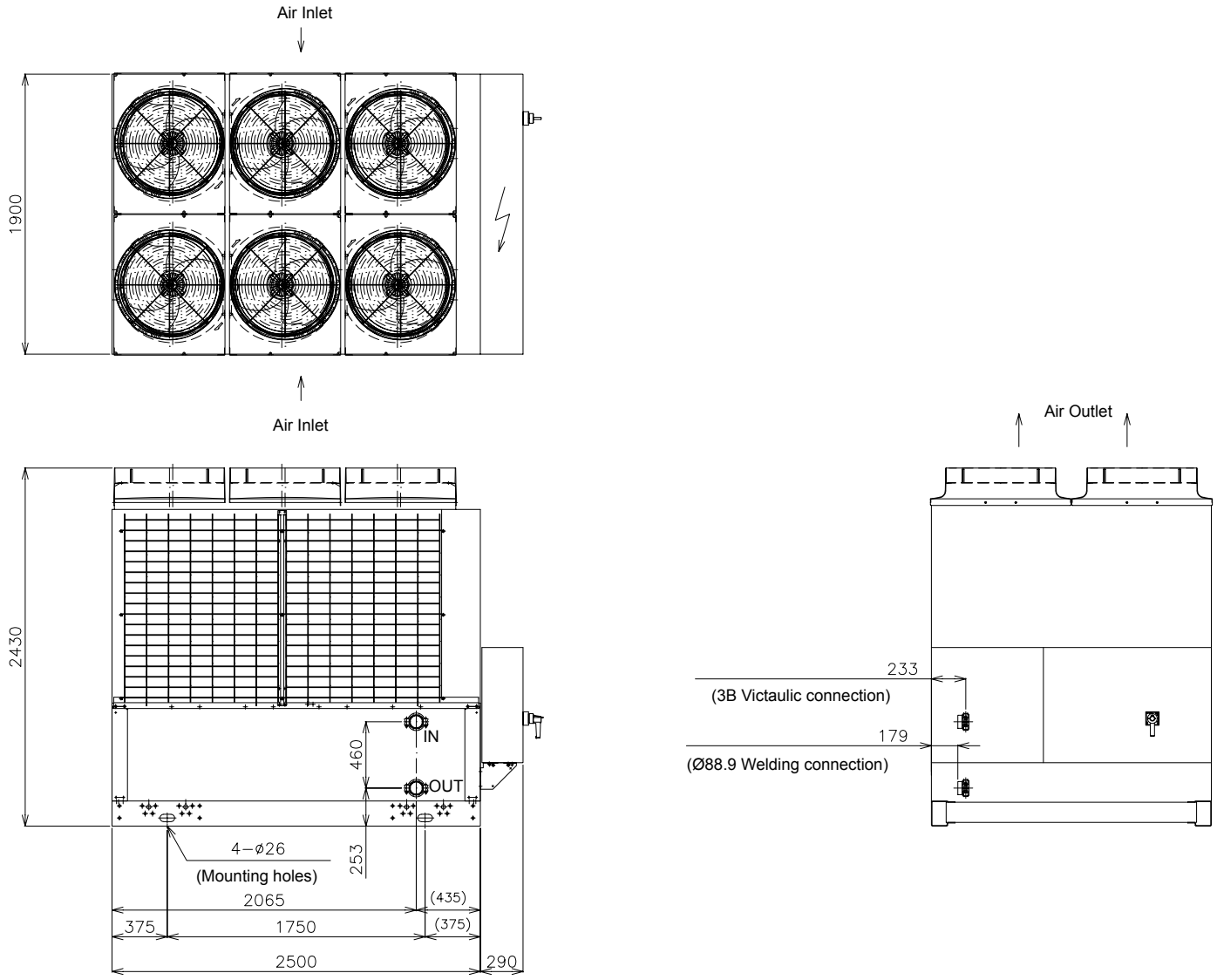
Contents

14.1. Dimensional Drawing

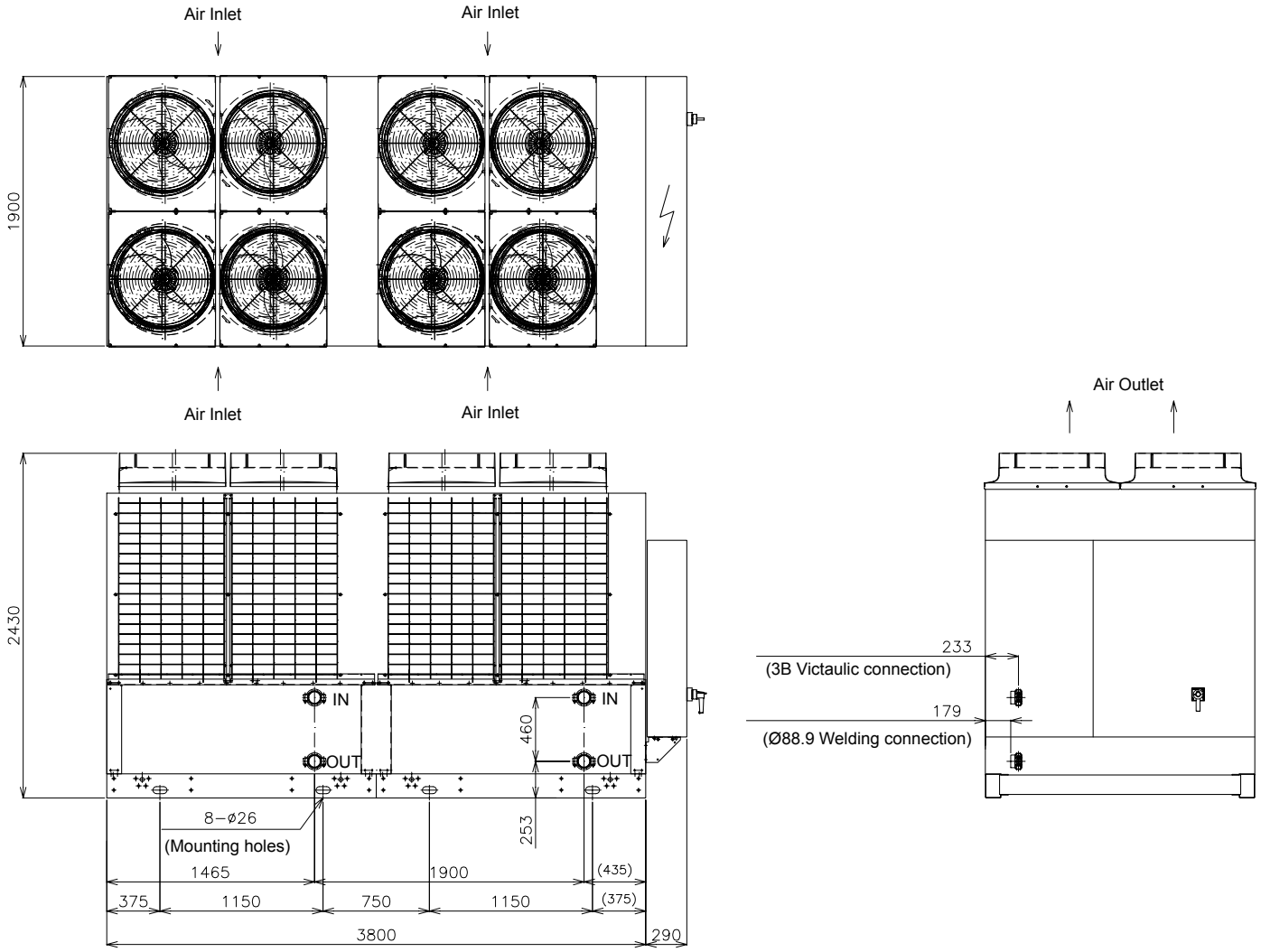
14.1.1. RCU2E40~60AG2, RHU2E40AG2~60AG2



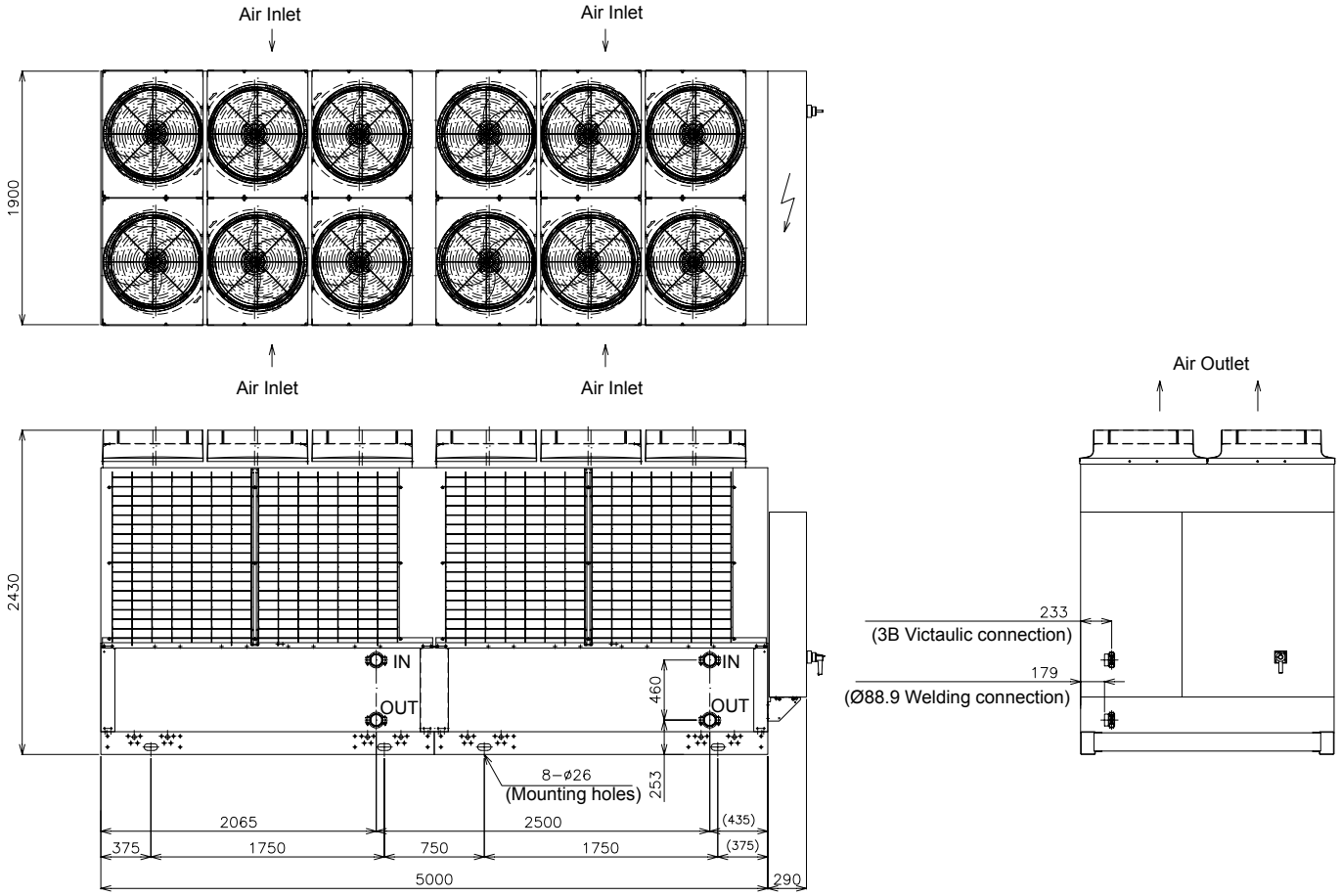
14.1.2 RCU2E70,80AG2, RHU2E70,80AG2



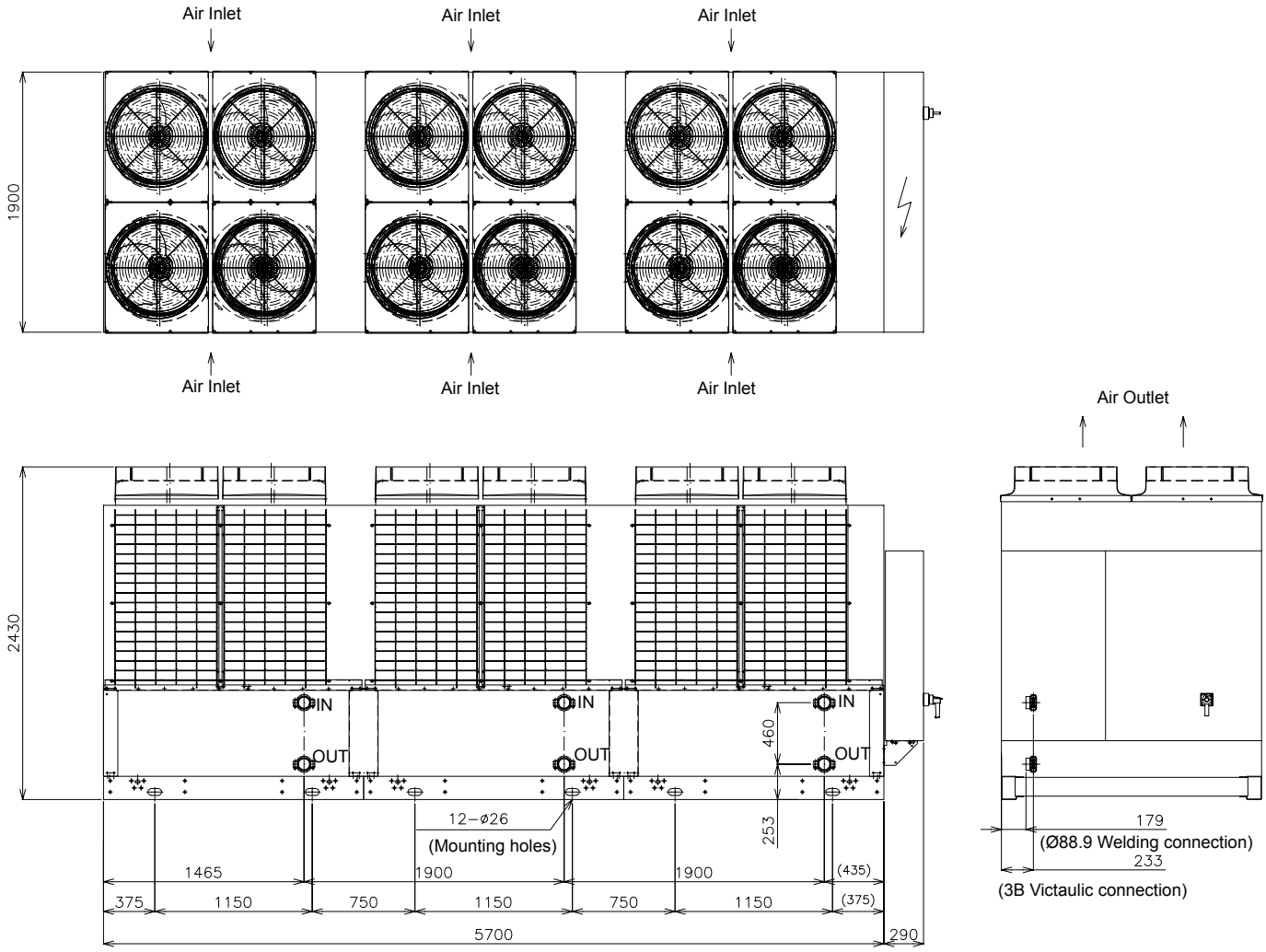
14.1.3 RCU2E100,120AG2, RHU2E100,120AG2



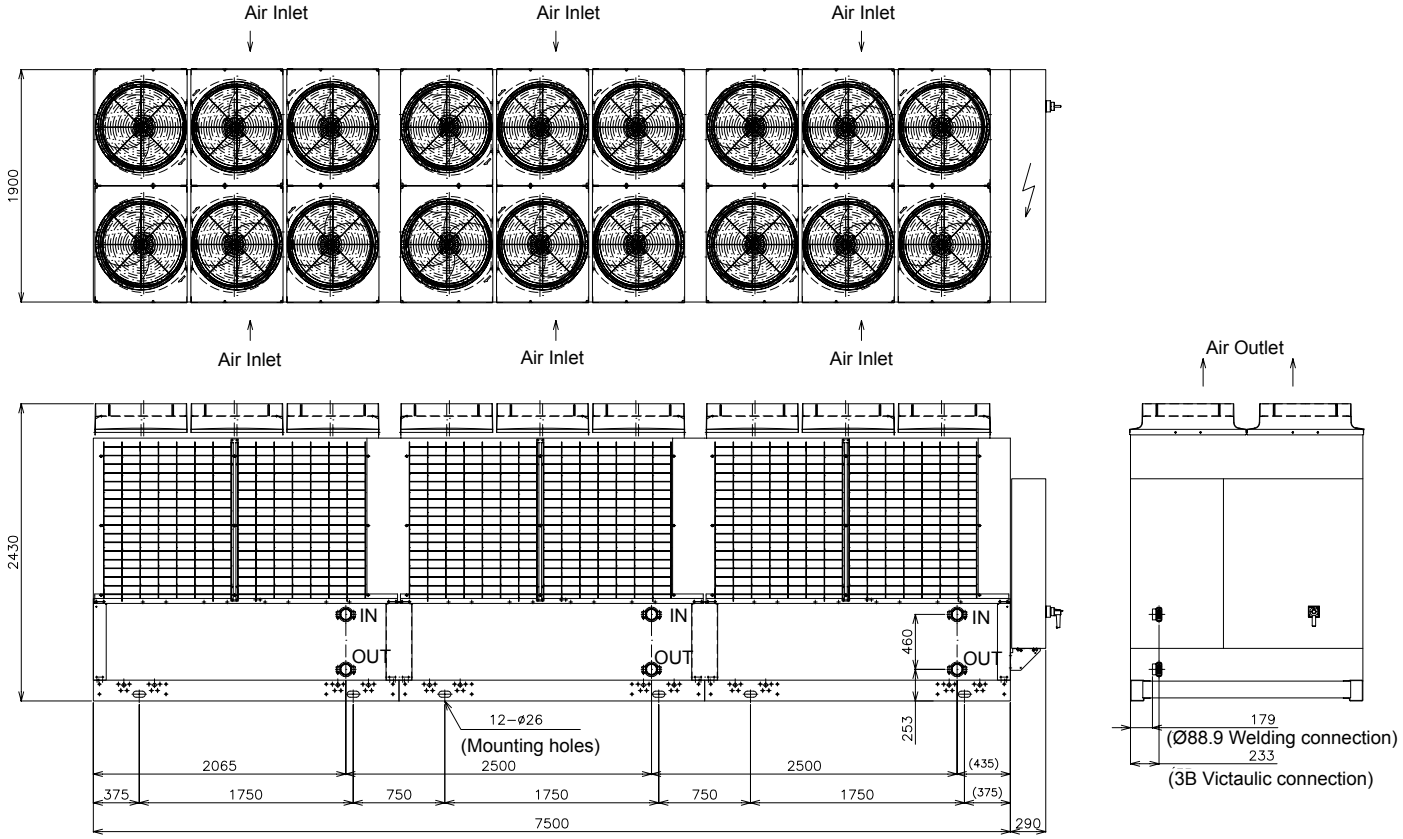
14.1.4 RCU2E140,160AG2, RHU2E140,160AG2



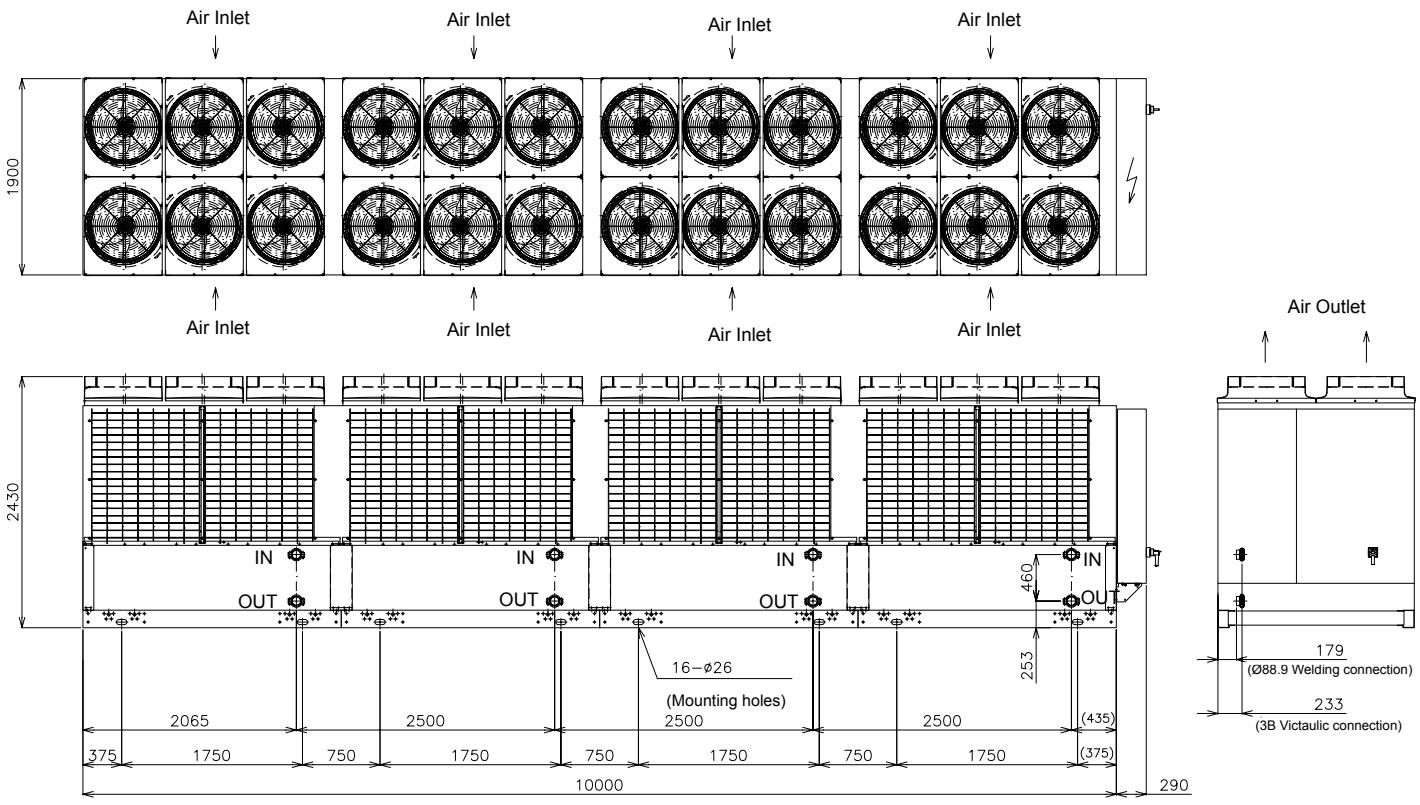
14.1.5 RCU2E180AG2, RHU2E180AG2



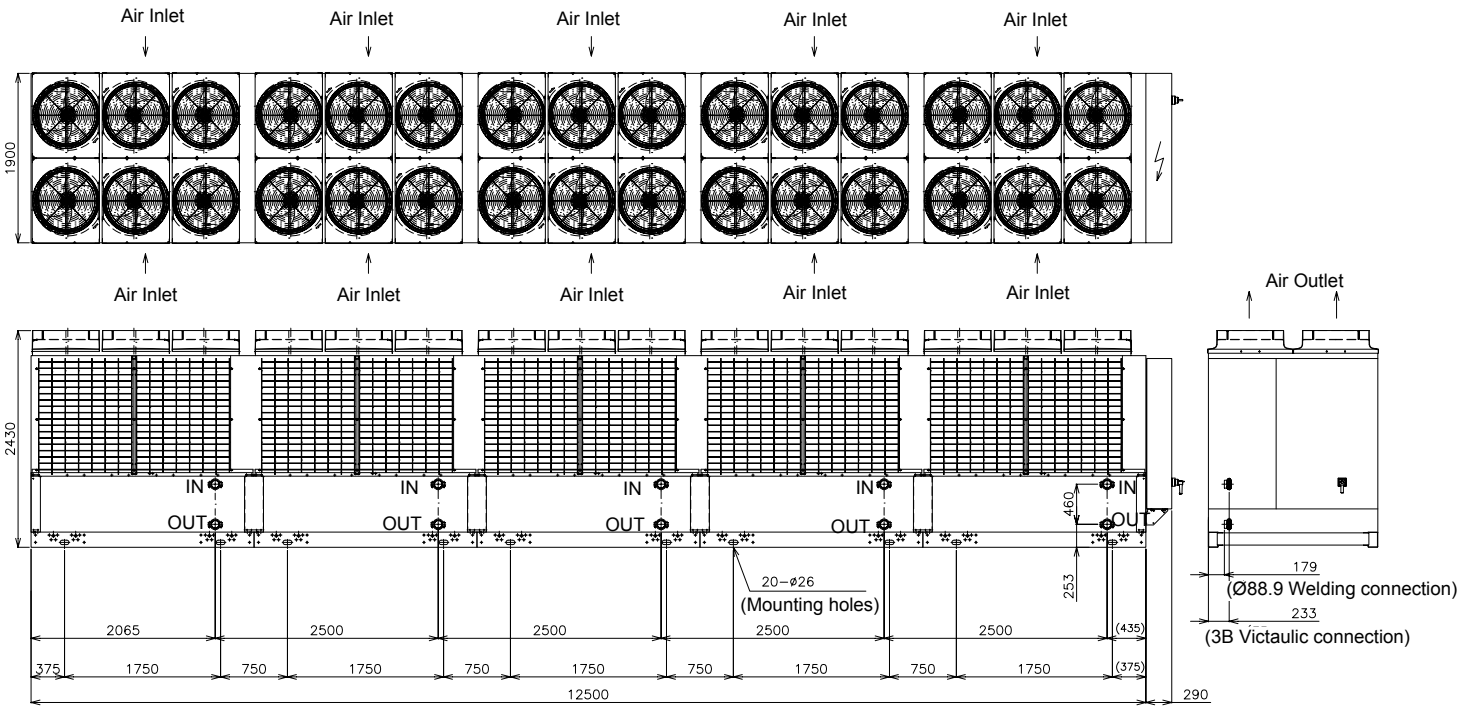
14.1.6 RCU2E210,240AG2, RHU2E210,240AG2



14.1.7 RCU2E280AG2, RCU2E320AG2

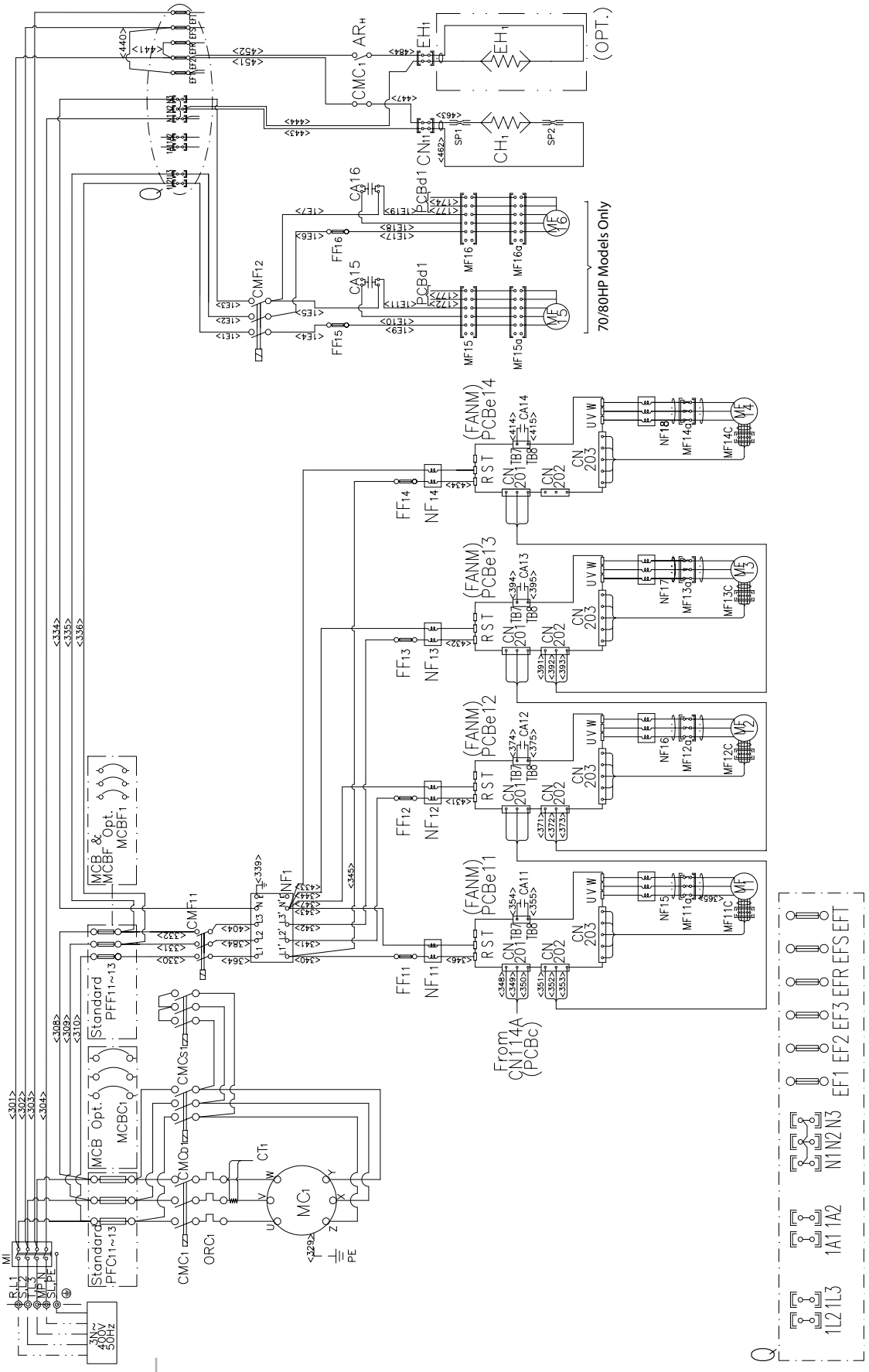


14.1.8. RCU2E350,400AG2

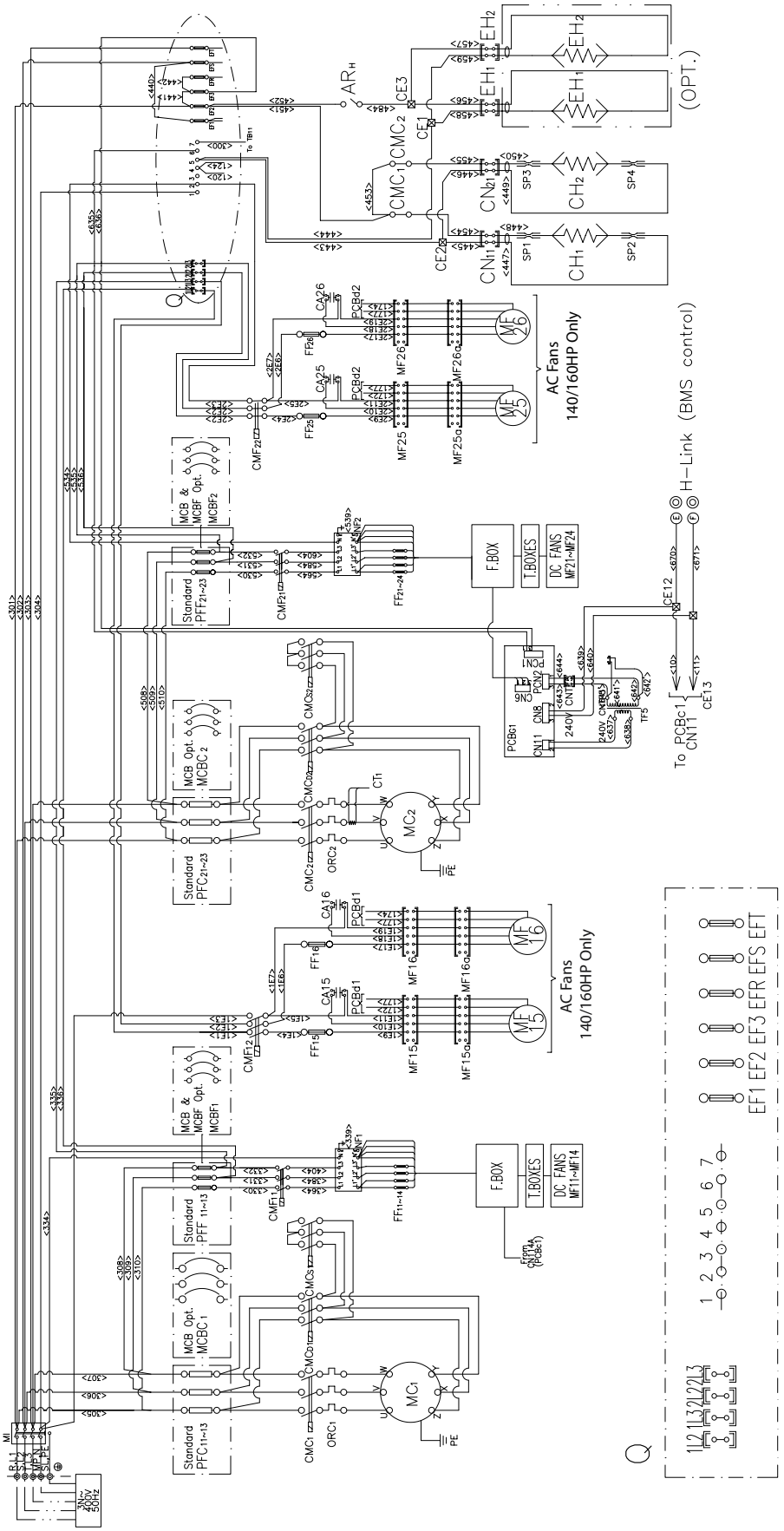


14.2. Wiring Diagram

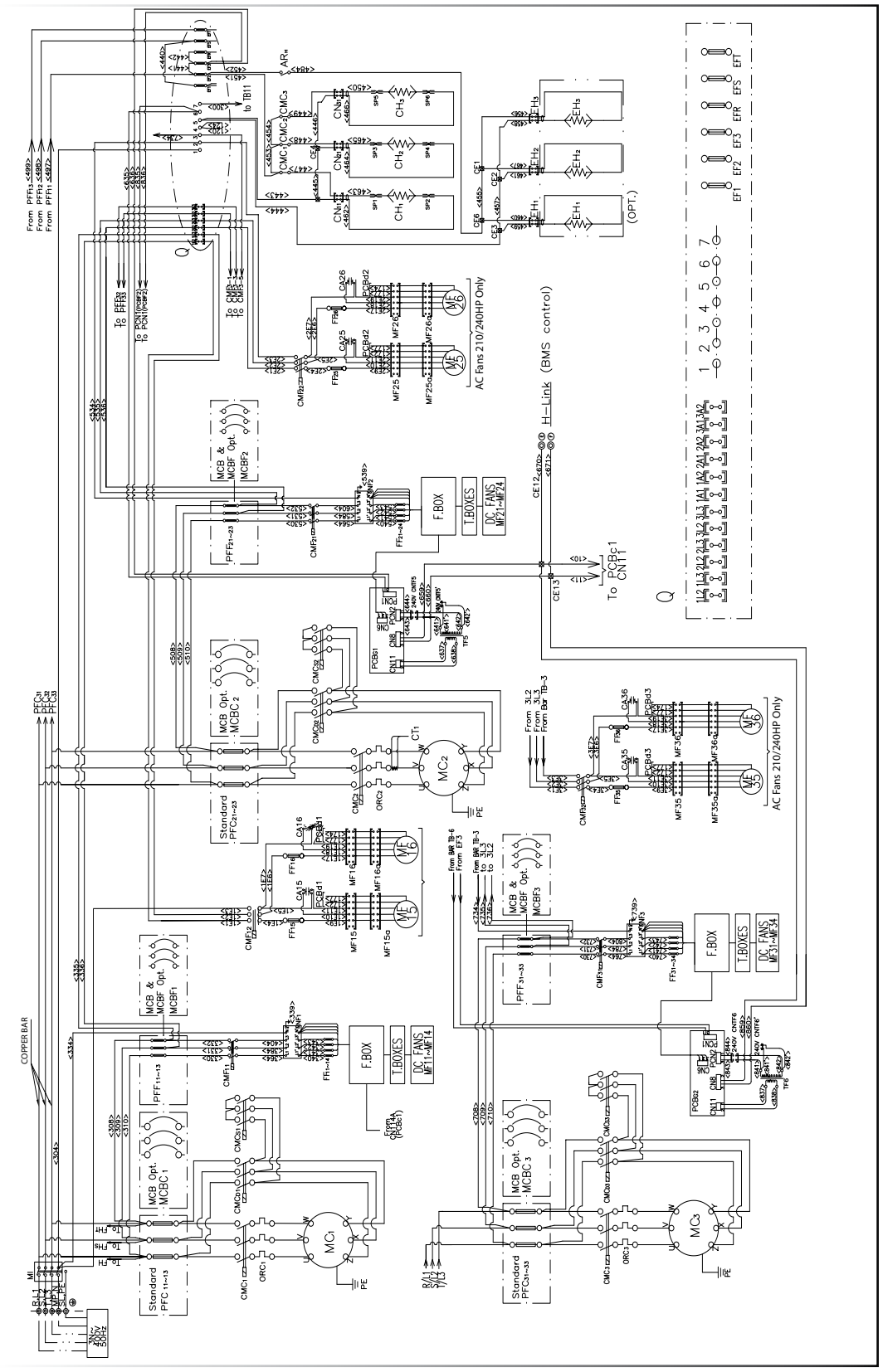
14.2.1 POWER CIRCUIT FOR R(C/H)U2E40AG2, R(C/H)U2E50AG2, R(C/H)U2E60AG2, R(C/H)U2E70AG2, R(C/H)U2E80AG2



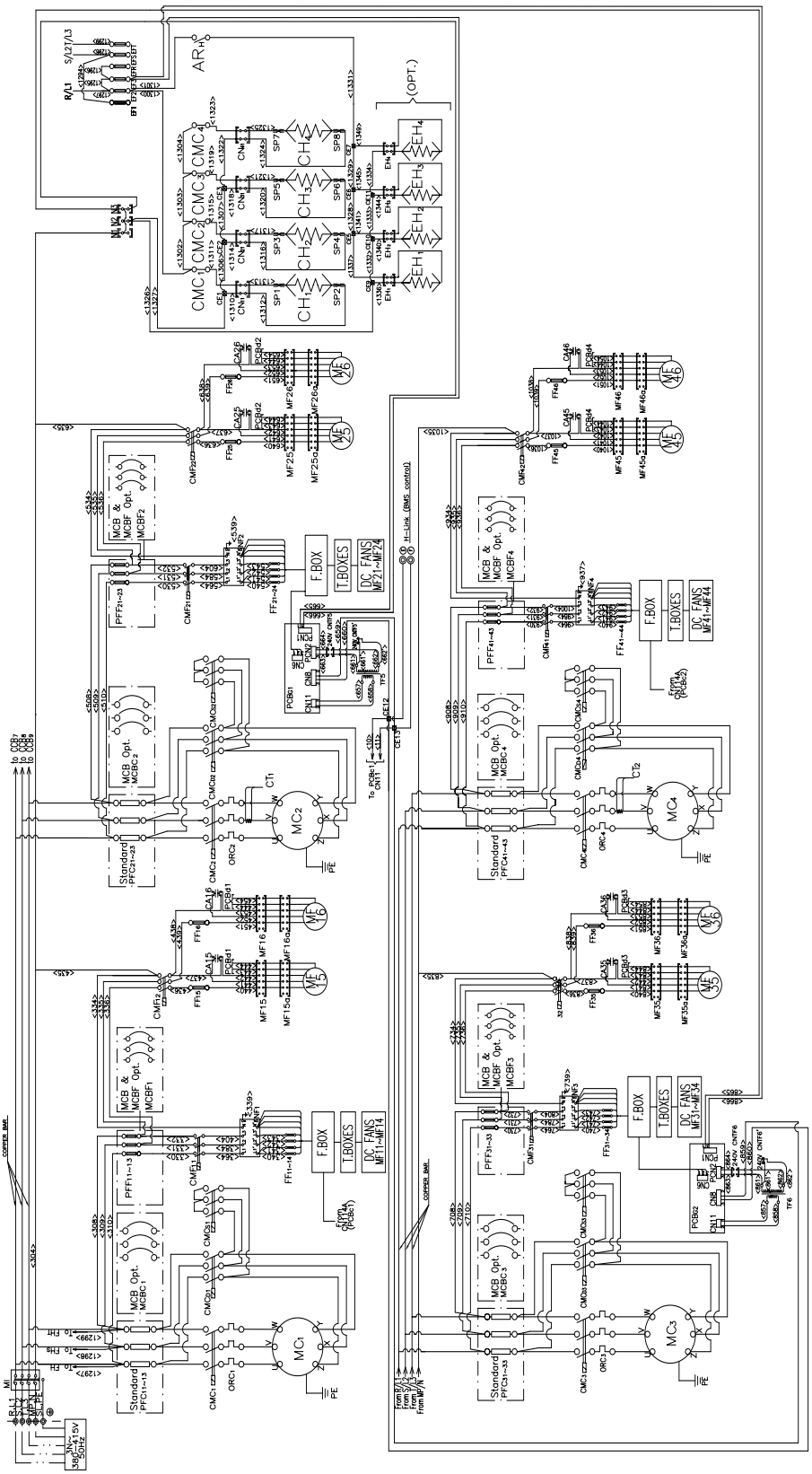
14.2.2 POWER CIRCUIT FOR R(C/H)U2E100AG2, R(C/H)U2E120AG2, R(C/H)U2E140AG2, R(C/H)U2E160AG2



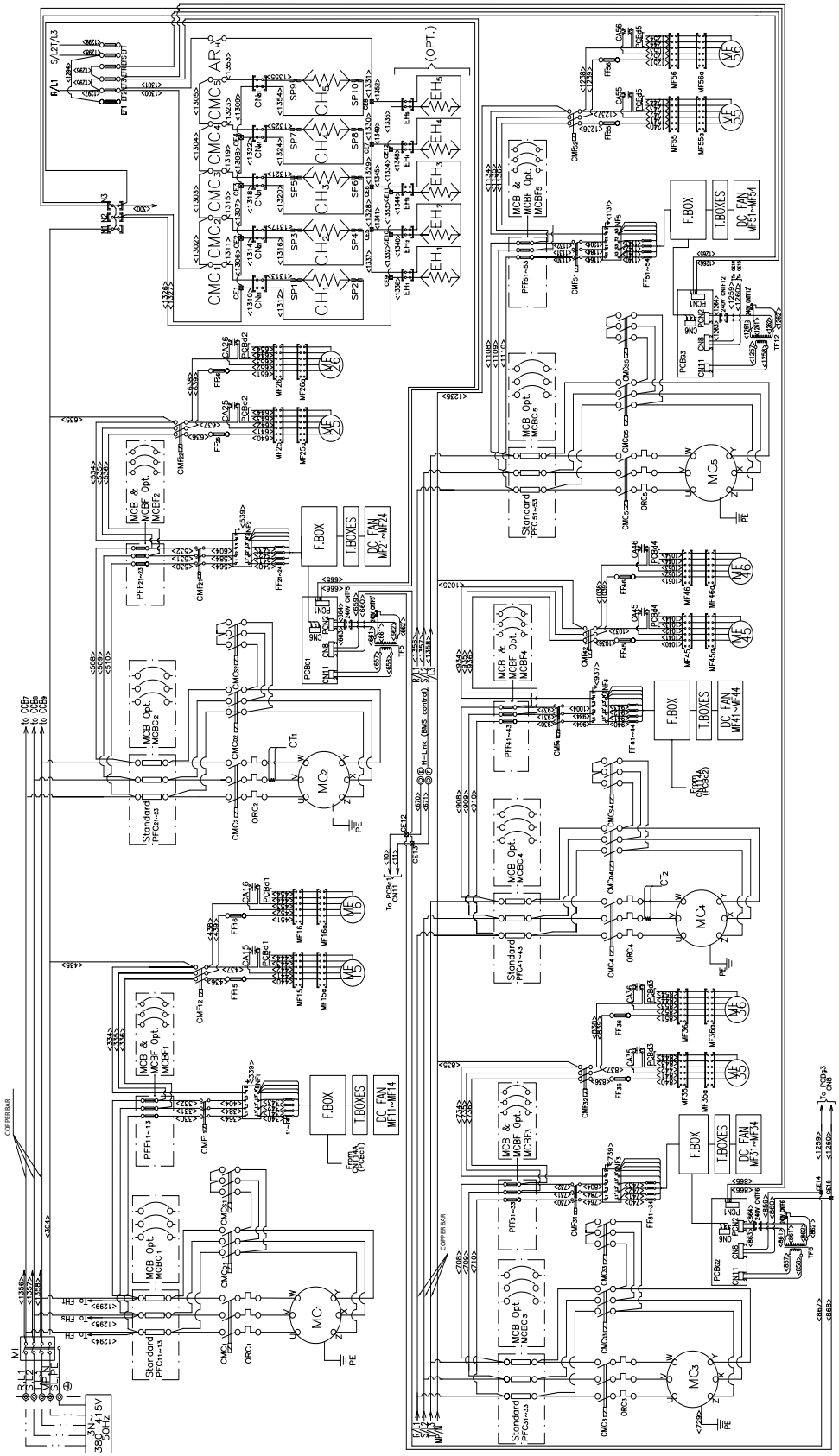
14.2.3 POWER CIRCUIT FOR R(C/H)U2E180AG2, R(C/H)U2E210AG2, R(C/H)U2E240AG2



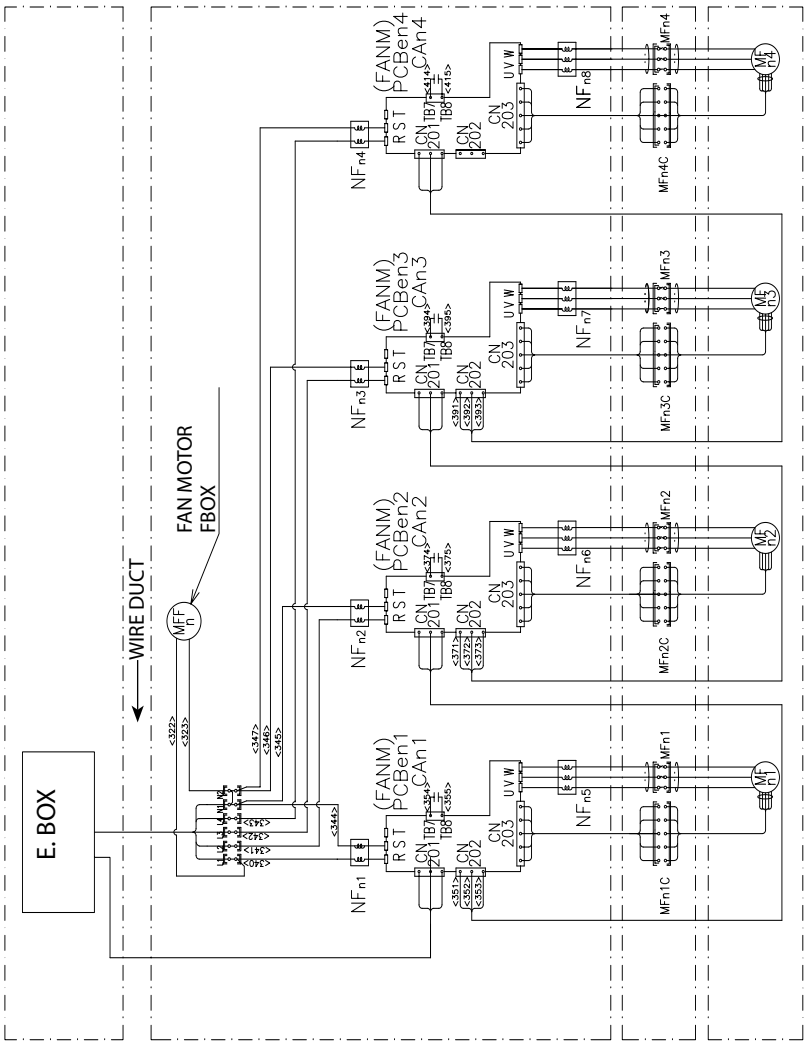
14.2.4 POWER CIRCUIT FOR RCU2E280AG2, RCU2E320AG2



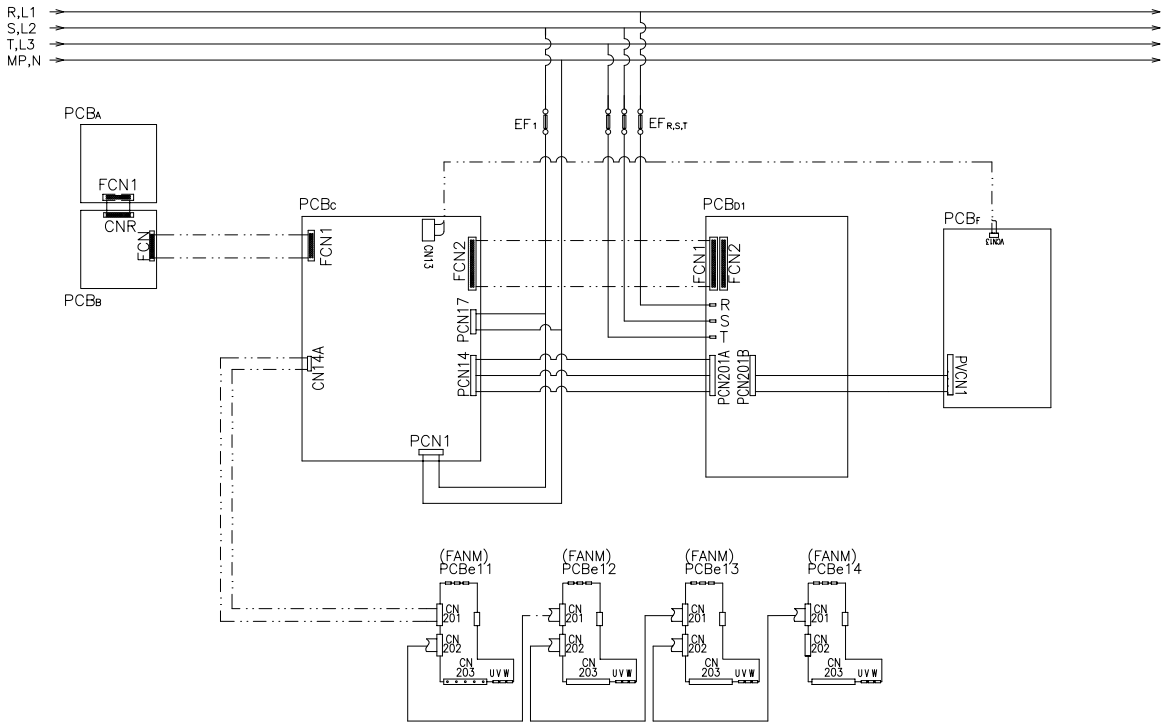
14.2.5 POWER CIRCUIT FOR RCU2E350AG2, RCU2E400AG2



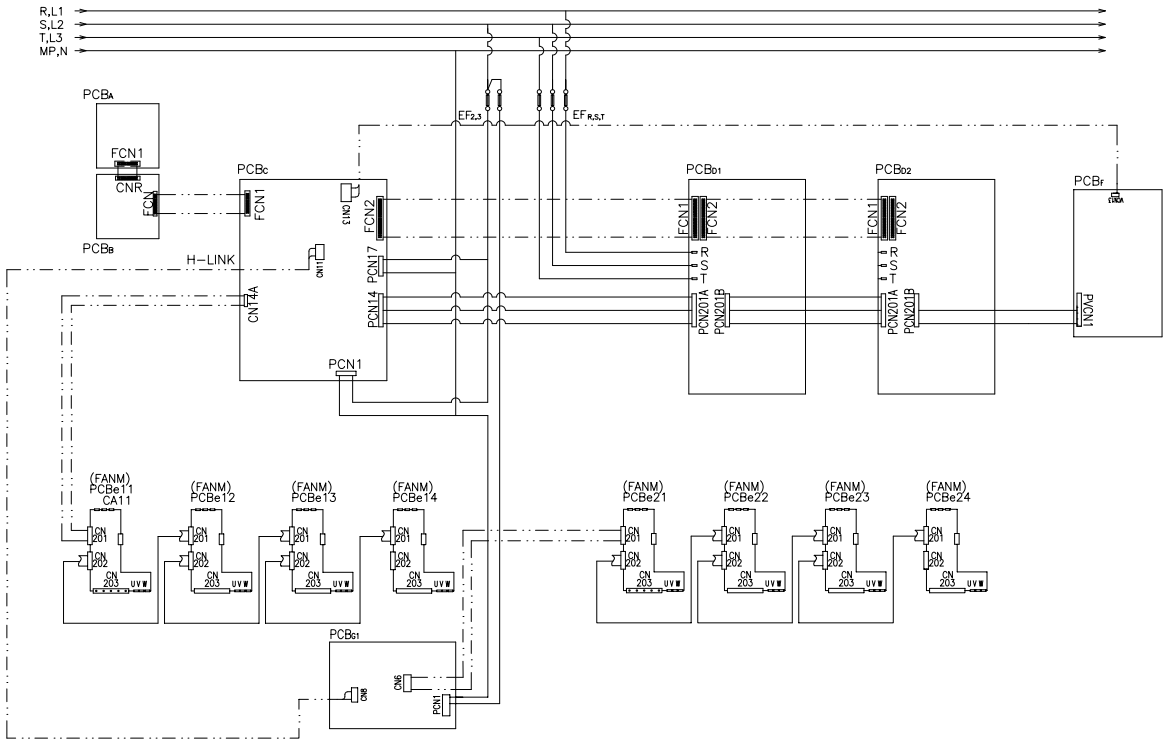
14.2.6 FAN BOX


E. BOX
WIRE DUCT
FAN MOTOR
FBOX
MFF n1
(FANM) PCBen1
CAn1
(FANM) PCBen2
CAn2
(FANM) PCBen3
CAn3
(FANM) PCBen4
CAn4
RST
CN 201
TB7
TB8
CN 202
CN 203
U V W
NF n1
NF n2
NF n3
NF n4
NF n5
NF n6
NF n7
NF n8
MFn1C
MFn2C
MFn3C
MFn4C
MF n1
MF n2
MF n3
MF n4
FAN BOX
T. BOXES
DC FAN MOTOR

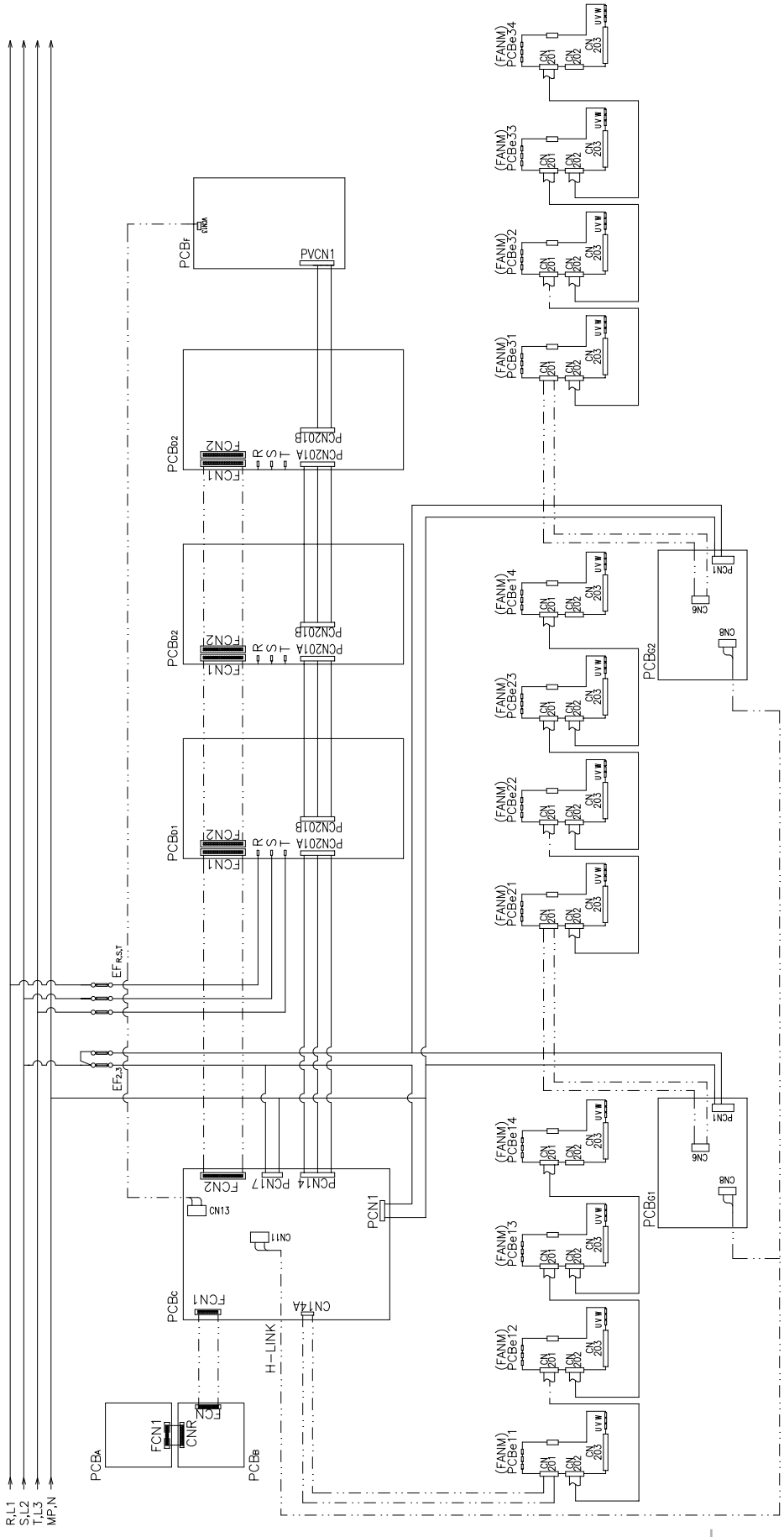
14.2.7 CONTROL CIRCUIT FOR R(C/H)U2E40AG2, R(C/H)U2E50AG2, R(C/H)U2E60AG2, R(C/H)U2E70AG2, R(C/H)U2E80AG2



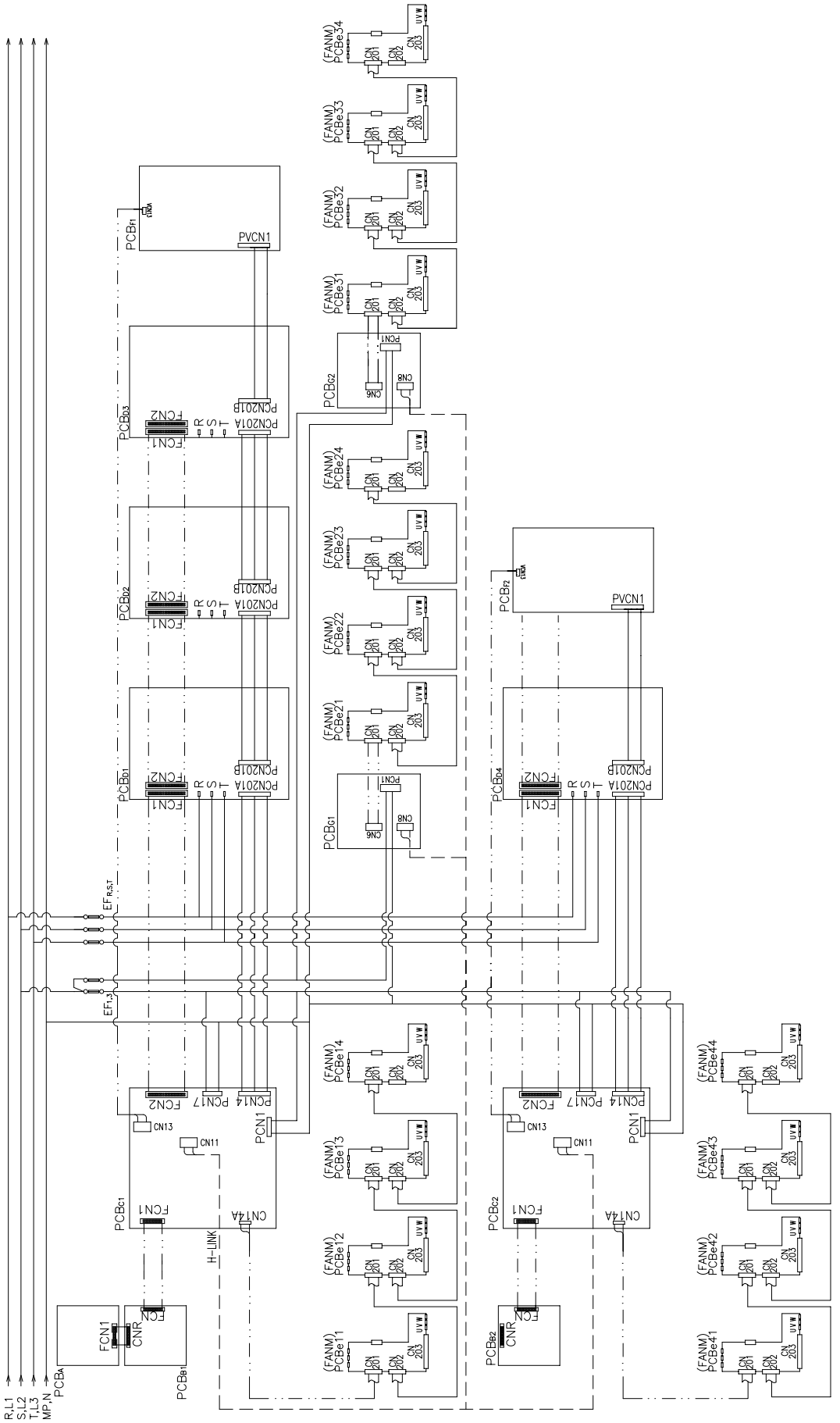
14.2.8 CONTROL CIRCUIT FOR R(C/H)U2E100AG2, R(C/H)U2E120AG2, R(C/H)U2E140AG2, R(C/H)U2E160AG2



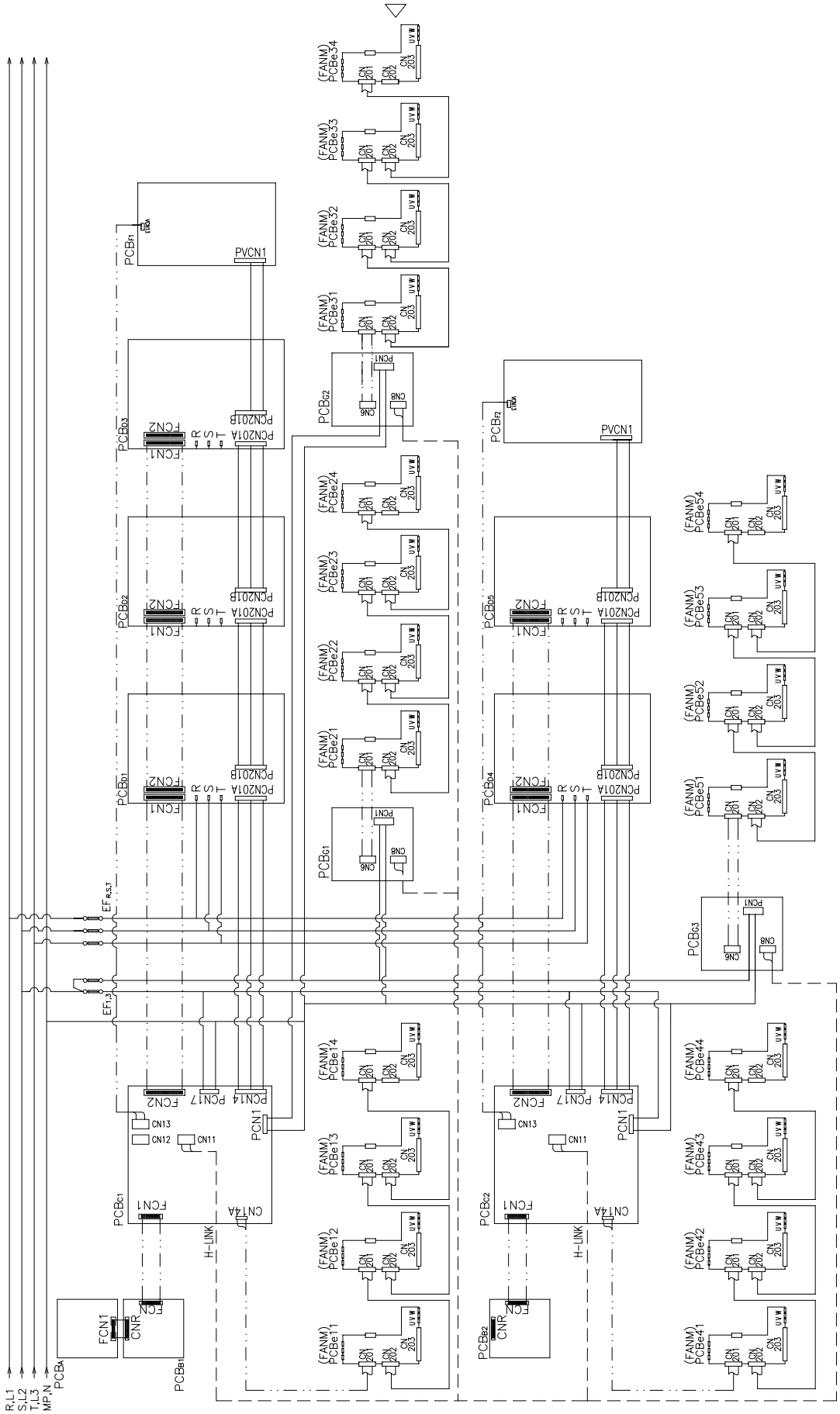
14.2.9 CONTROL CIRCUIT FOR R(C/H)U2E180AG2, R(C/H)U2E210AG2, R(C/H)U2E240AG2



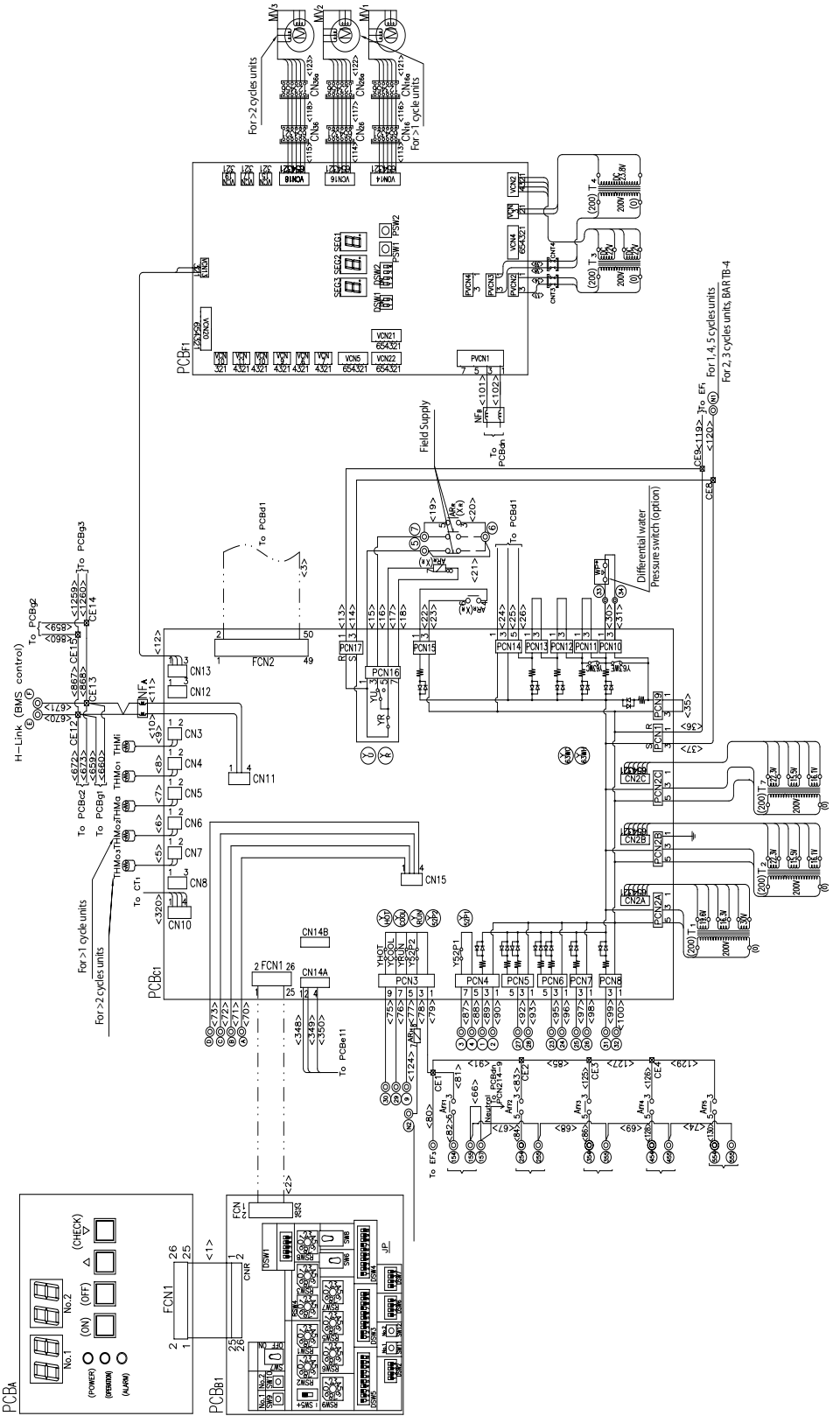
14.2.10 CONTROL CIRCUIT FOR RCU2E280AG2, RCU2E320AG2



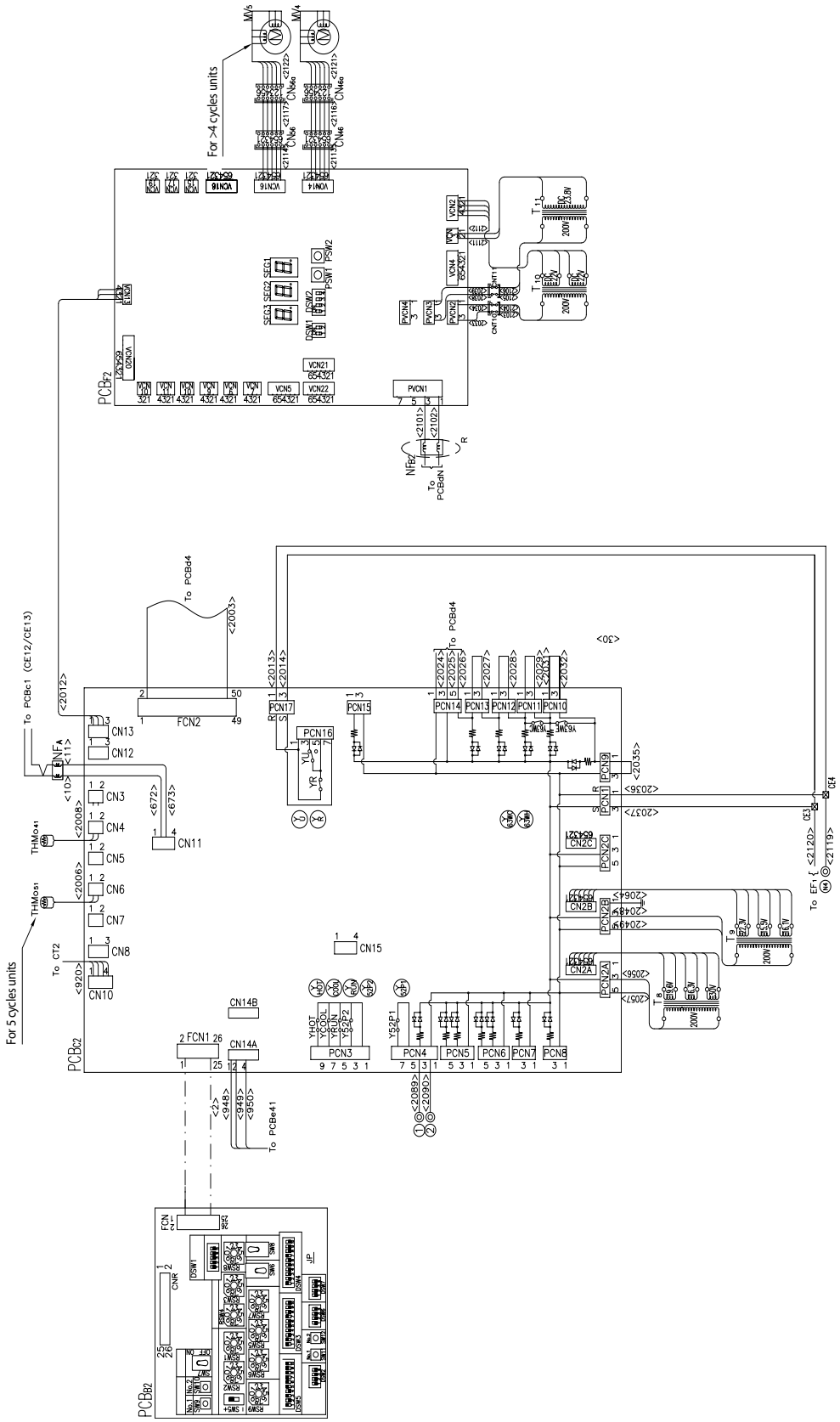
14.2.11 CONTROL CIRCUIT FOR RCU2E350AG2, RCU2E400AG2



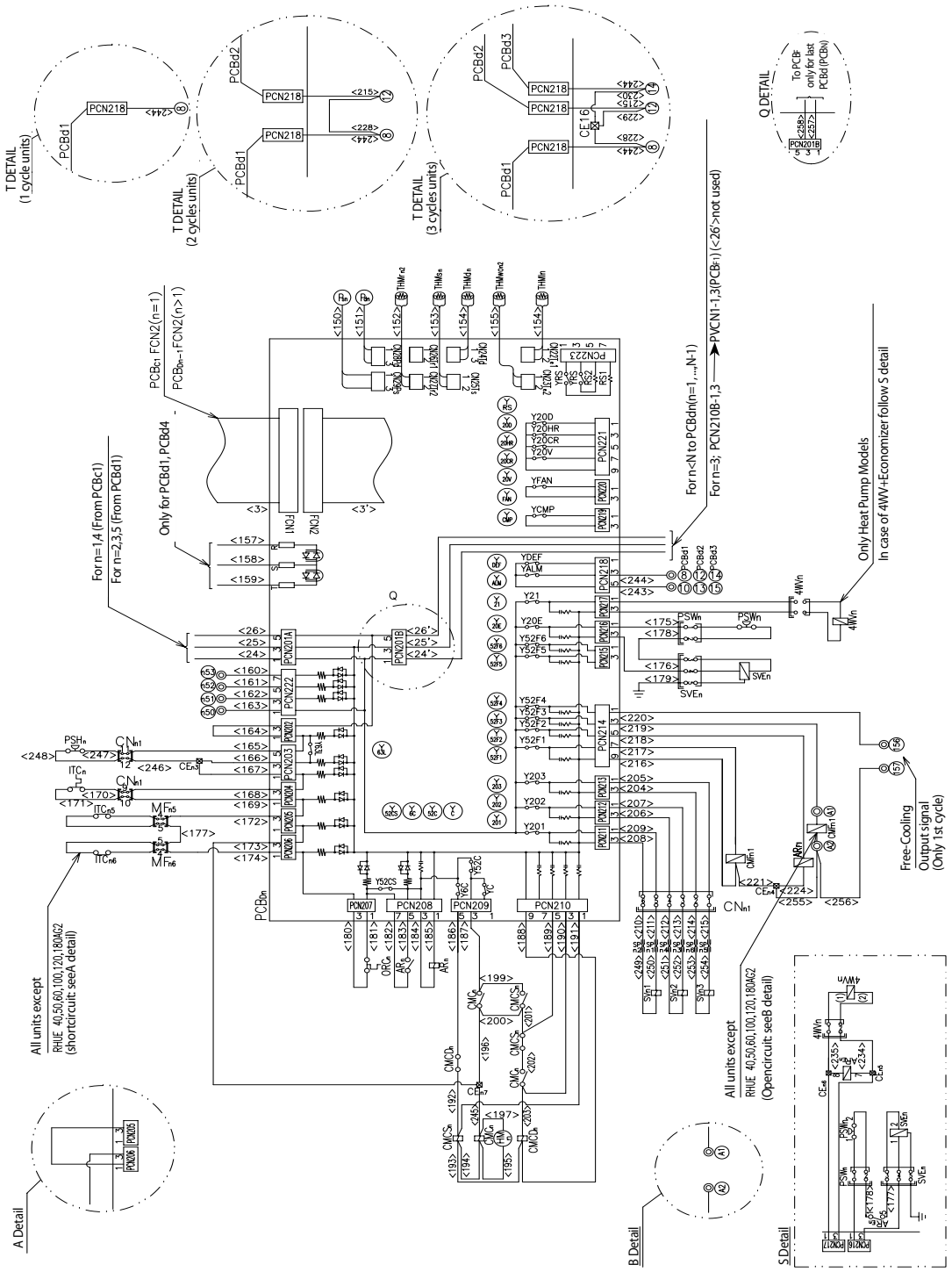
14.2.12 MAIN PRINTED CIRCUIT BOARD (MASTER)



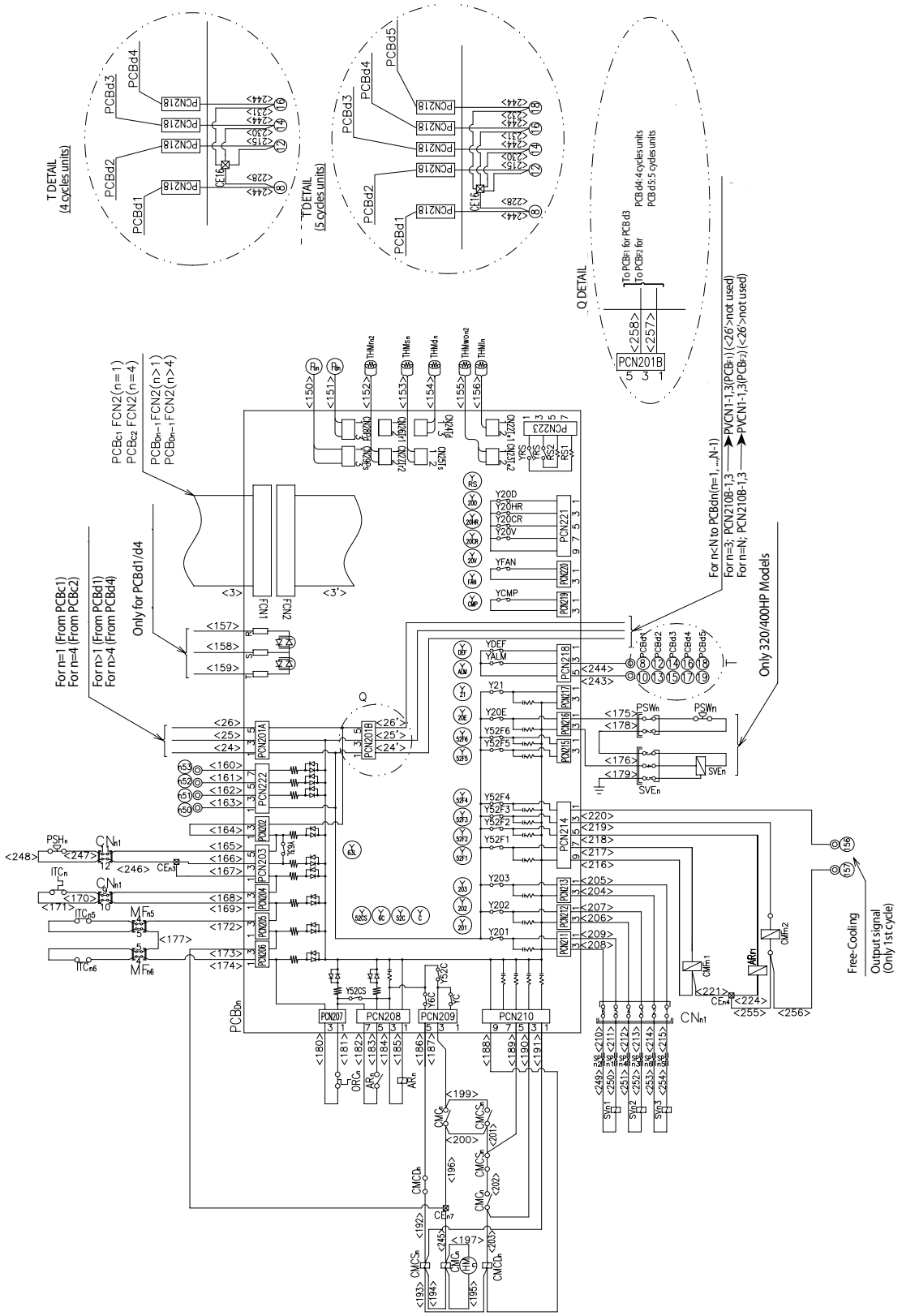
14.2.13 MAIN PRINTED CIRCUIT BOARD (SUBSIDIARY) (4,5 cycles units)



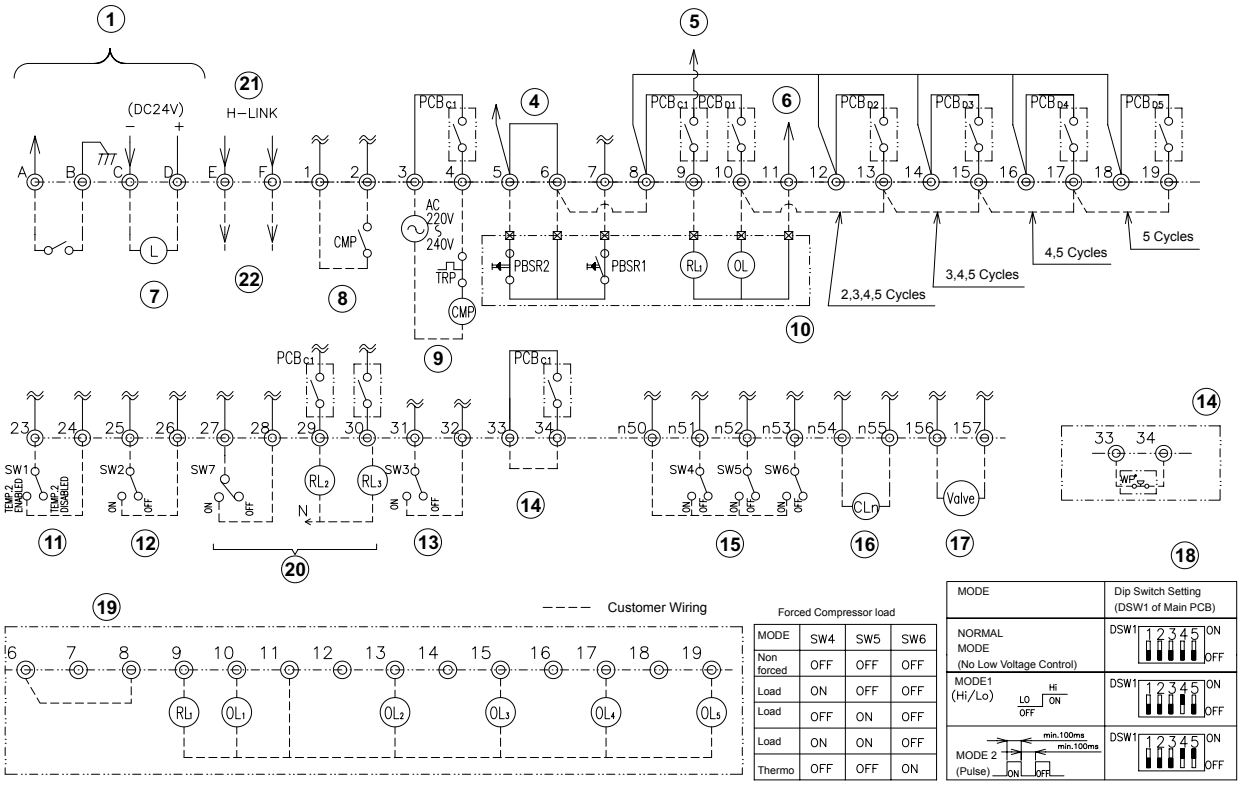
14.2.14 RELAYS PRINTED CIRCUIT BOARD (1, 2, 3 cycles units)



14.2.15 RELAYS PRINTED CIRCUIT BOARD (4, 5 cycles units)



14.2.16 CUSTOMER WIRING



Forced Compressor load

MODE	SW4	SW5	SW6
Non forced	OFF	OFF	OFF
Load	ON	OFF	OFF
Load	OFF	ON	OFF
Load	ON	ON	OFF
Thermo	OFF	OFF	ON

MODE	Dip Switch Setting (DSW1 of Main PCB)
NORMAL MODE (No Low Voltage Control)	DSW1 1 2 3 4 5 ON OFF
MODE1 (Hi/Lo) LO OFF Hi ON	DSW1 1 2 3 4 5 ON OFF
MODE 2 (Pulse) min.100ms min.100ms ON OFF	DSW1 1 2 3 4 5 ON OFF

Nº	Name
1	Low voltage / Remote Control
2	Run / Stop Signal
3	Alarm Signal (DC24V)
4	In case of Remote Control operation this wire shall be removed
5	1~ 230V
6	Neutral
7	Alarm Lamp
8	Pump Interlock
9	Pump Operation
10	Remote Control Switch
11	2nd Setting Temperature
12	External Thermostat Operation
13	External Fan Operation
14	Only used for different water pressure switch or flow switch options
15	Force Compressor load operation
16	Caution lamp for fan operation
17	Free cooling output signal
18	Setting of low voltage control
19	In case of individual indication without Remote Control Switch.
20	Operation mode switch/lamp (only for heat pumps models)
21	H-LINK
22	Connection for control devices (CSC-5S,...)

14.2.17 PARTS LIST

(n=1~N)

Mark	Name	Remark	Mark	Name	Remark
MC_n	Compressor Motor		$FF_{11\sim N4}$	Fan fuse protection	12A
MF_{11-N6}	Condenser Fan Motor		MFF_n	Fan motor inside Electrical Box	
MI	Main Isolator		$CA_{11\sim N6}$	Capacitors for Fan	
CMC_1	Contactor for Compressor Motor		$EF_{1\sim3,\ R,S,T}$	Fuse	6A
CMC_{sn}	Contactor for Compressor Motor (Star Operation)		SV_{11-N1}	Solenoid Valve for Starting	
CMC_{Dn}	Contactor for Compressor Motor (Delta Operation)		SV_{12-N2}	Solenoid Valve for Load-down	
CMF_{11-N2}	Contactor for Condenser Fan Motor		SV_{13-N3}	Solenoid Valve for Load-up	
EFC_n	Fuse for Compressor Motor	or optional Circuit Breaker	TM_n	Hour Meter	
ORC_n	Overcurrent Relay for Compressor Motor		PCB_A	Printed Circuit Board for Display	
EFF_{11-N4}	Fuse for Condenser Fan Motor	or optional Circuit Breaker	$PCB_{B1,B2}$	Printed Circuit Board for Operation	
ITC_{1-n}	Internal Thermostat for Compressor		$PCB_{C1,C2}$	Printed Circuit Board for CPU	
$ITF_{n5,n6}$	Internal Thermostat for Fan Motor		PCB_{D1}	Printed Circuit Board for Relay	
CH_n	Crankcase Heater		$PCB_{E11\sim}$	Printed Circuit Board for Fan Control	
$AR_{n,H,R}$	Auxiliary Relay		$PCB_{F1,F2}$	PCB for Electronic Expansion Valve	
PSH_n	High Pressure Switch	OFF: 2.74Mpa ON: Manual Reset	$PCB_{G1,G2,G3}$	PCB for DC Fan control	
Pd_n	High Pressure Sensor		WP	Water Pressure Switch, Water Flow Switch	OPTION
Ps_n	Low Pressure Sensor		SVEn	Solenoid Valve for Economizer	
THM_i	Inlet Water Temperature Thermistor		PSWn	Pressure Switch for Economizer	
THM_{W01n}	Outlet Water Temperature Thermistor		EH_n	Cooler Heater	
$THMr2_n$	Cooler Inlet Refrigerant Thermistor		$TF_{1,2,3,4,5,6,7}$	Transformers	
THM_n	Suction Gas Temperature Thermistor				
$THMI_{won2}$	Water Temperature cooler backside				
$THMd_n$	Discharge Gas Thermistor		$SW_{2\sim8}$	External Switch	Field Supplied
PFC_n	Fuse holder for Compressor Motor	Or optional Circuit Breaker	CL	Pilot Lamp for caution signal (from Fans)	
PFF_n	Fuse holder for Compressor Fan Motor	Or optional Circuit Breaker	$PBSR_1$	Push Button Switch for Starting (REMOTE)	
THM_a	Ambient Temperature Thermistor		$PBSR_2$	Push Button Switch for Stoppage (REMOTE)	
NF_n	Noise Filter (PCB)		RL_n	Pilot Lamp for Remote Indication (Unit Operation)	
$NF_{A,B,11\sim9N}$	Noise Filter (PCB)		OL_n	Pilot Lamp for Remote Indication (Alarm)	
MV_n	Electronic Expansion Valve (Exp.v)		CMP	Contactor for Pump	
$CT_{1,2}$	Current sensor		TRP	Thermal Relay for Pump	

n:1~n

Model	N
R(C/H)U2E40, 50, 60, 70, 80AG2	1
R(C/H)U2E100, 120,140, 160AG2	2
R(C/H)U2E180, 210, 240AG2	3
RCU2E280, 320AG2	4
RCU2E350,400AG2	5

15. Model Selection

Contents

15.1. Selection Example

1. Determine the system requirements

Condenser Air Inlet Temperature:	40 °C
Chilled Water Inlet Temperature:	12 °C
Chilled Water Outlet Temperature:	7 °C
Cooling Load:	320 kW
Refrigerant:	R407C

2. Select Model and read the performance

From the performance table, model RCU2E140AG2 can be selected with the following performance:

Cooling Capacity:	333.3 kW
Chilled Water Flow Rate:	57.3 m³/h
Water Cooler Pressure Drop:	30.2 kPa
Compressor Input Power:	122.8 kW

3. Correct the Data

- Flow rate
  When the water Inlet/Outlet temperature difference is not 5°C, correct the flow rate by the following formula:

$$\text{Corrected Flow Rate} = \frac{5(°C) \times \text{Tabulated Flow Rate (CFR)}}{\text{Given Temp. Difference}(°C)}$$

  The corrected Flow Rate must be confirmed to be within the working range.

- Cooling capacity and compressor input.
  When the fouling factor is taken into consideration, the cooling capacity and the compressor input will be different from the value indicated in the cooling capacity table.

$$\text{Corrected Capacity} = Kfc \times CAP$$

$$\text{Corrected Input} = Kfi \times IPT$$

CAP:	Tabulated Cooling Capacity
IPT:	Tabulated Compressor Input
Kfc:	Capacity Correction Factor
Kfi:	Compressor Input Correction Factor

	Fouling Factor m²h °C/kcal (m² °C/kW)	Kfc	Kfi
Water Heat Exchanger	0	1.00	1.00
	0.00005 (0.043)	1.00	1.00
	0.0001(0.086)	0.99	1.01

4. Water Pressure Drop

- Water pressure drop is given by the following formula

$$PD = \alpha \times Q^{\beta}$$

PD:	Pressure Drop (kPa)
Q:	Water Flow (m³/h)
α, β	Parameters (table below)

	Model: RCU2E-AG2	α	β
Water heat exchanger	40	0.0614	1.9381
	50	0.0547	1.9434
	60,70,80	0.0418	1.9616
	100	0.0142	1.9434
	120,140,160	0.0107	1.9616
	180,210,240	0.0048	1.9616
	280,320	0.0028	1.9616
	350,400	0.0018	1.9616

	Model: RHU2E-AG2	α	β
Water heat exchanger	40	0.0614	1.9381
	50	0.0547	1.9434
	60	0.0418	1.9616
	70,80	0.0357	1.9771
	100	0.0142	1.9434
	120	0.0107	1.9616
	140,160	0.0091	1.9771
	180	0.0048	1.9616
	210,240	0.0041	1.9771

15.2. Performance Table (RCU2E-AG2)

		RCU2E40AG2				RCU2E50AG2				RCU2E60AG2				RCU2E70AG2			
ABT	COT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT
	5	115.4	19.8	20.1	30.0	133.9	23.0	24.3	34.3	160.7	27.6	28.1	41.1	183.4	31.5	36.4	46.3
	6	119.2	20.5	21.4	30.3	138.4	23.8	25.9	34.7	166.1	28.6	30.0	41.6	189.5	32.6	38.9	46.9
	7	123.1	21.2	22.8	30.7	142.9	24.6	27.6	35.1	171.5	29.5	31.9	42.1	195.6	33.6	41.4	47.4
	8	126.9	21.8	24.2	31.0	147.4	25.3	29.3	35.5	176.8	30.4	33.9	42.6	201.8	34.7	43.9	48.0
	9	130.8	22.5	25.6	31.4	151.8	26.1	31.0	35.9	182.2	31.3	36.0	43.1	207.9	35.8	46.6	48.5
25	10	134.6	23.2	27.1	31.7	156.3	26.9	32.8	36.3	187.5	32.3	38.1	43.6	214.0	36.8	49.3	49.1
	11	138.5	23.8	28.6	32.1	160.8	27.7	34.7	36.7	192.9	33.2	40.2	44.0	220.1	37.9	52.1	49.6
	12	142.4	24.5	30.2	32.4	165.2	28.4	36.6	37.1	198.3	34.1	42.5	44.5	226.2	38.9	55.0	50.2
	13	146.2	25.1	31.8	32.8	169.7	29.2	38.5	37.5	203.6	35.0	44.7	45.0	232.4	40.0	57.9	50.7
	14	150.1	25.8	33.4	33.1	174.2	30.0	40.5	37.9	209.0	35.9	47.1	45.5	238.5	41.0	61.0	51.3
	15	153.9	26.5	35.1	33.5	178.6	30.7	42.5	38.3	214.4	36.9	49.5	46.0	244.6	42.1	64.1	51.8
	5	111.5	19.2	18.8	32.8	129.4	22.3	22.7	37.5	155.3	26.7	26.3	45.0	177.2	30.5	34.1	50.7
	6	115.3	19.8	20.1	33.2	133.8	23.0	24.3	37.9	160.6	27.6	28.1	45.5	183.3	31.5	36.4	51.3
	7	119.1	20.5	21.4	33.5	138.3	23.8	25.9	38.3	165.9	28.5	29.9	46.0	189.3	32.6	38.8	51.9
	8	122.9	21.1	22.7	33.9	142.7	24.5	27.5	38.8	171.2	29.5	31.8	46.5	195.4	33.6	41.3	52.4
	9	126.8	21.8	24.1	34.3	147.1	25.3	29.2	39.2	176.6	30.4	33.8	47.0	201.5	34.7	43.8	53.0
30	10	130.6	22.5	25.5	34.6	151.6	26.1	30.9	39.6	181.9	31.3	35.8	47.5	207.5	35.7	46.4	53.5
	11	134.4	23.1	27.0	35.0	156.0	26.8	32.7	40.0	187.2	32.2	37.9	48.0	213.6	36.7	49.1	54.1
	12	138.2	23.8	28.5	35.3	160.4	27.6	34.5	40.4	192.5	33.1	40.1	48.5	219.7	37.8	51.9	54.7
	13	142.0	24.4	30.1	35.7	164.9	28.4	36.4	40.8	197.8	34.0	42.3	49.0	225.7	38.8	54.8	55.2
	14	145.8	25.1	31.7	36.1	169.3	29.1	38.3	41.3	203.1	34.9	44.5	49.5	231.8	39.9	57.7	55.8
	15	149.7	25.7	33.3	36.4	173.7	29.9	40.3	41.7	208.5	35.9	46.8	50.0	237.9	40.9	60.7	56.4
	5	104.6	18.0	16.6	35.4	121.4	20.9	20.1	40.5	145.7	25.1	23.2	48.7	166.3	28.6	30.1	54.8
	6	108.3	18.6	17.8	35.8	125.7	21.6	21.5	41.0	150.9	25.9	24.8	49.2	172.1	29.6	32.2	55.4
	7	112.0	19.3	19.0	36.2	130.0	22.4	22.9	41.4	156.0	26.8	26.5	49.7	178.0	30.6	34.4	56.0
	8	115.7	19.9	20.2	36.6	134.3	23.1	24.4	41.8	161.1	27.7	28.3	50.2	183.9	31.6	36.6	56.6
	9	119.4	20.5	21.5	37.0	138.6	23.8	26.0	42.3	166.3	28.6	30.1	50.7	189.7	32.6	38.9	57.2
35	10	123.1	21.2	22.8	37.3	142.8	24.6	27.5	42.7	171.4	29.5	31.9	51.2	195.6	33.6	41.3	57.7
	11	126.7	21.8	24.1	37.7	147.1	25.3	29.2	43.1	176.5	30.4	33.8	51.8	201.4	34.6	43.8	58.3
	12	130.4	22.4	25.5	38.1	151.4	26.0	30.8	43.6	181.7	31.2	35.8	52.3	207.3	35.7	46.3	58.9
	13	134.1	23.1	26.9	38.5	155.7	26.8	32.6	44.0	186.8	32.1	37.8	52.8	213.1	36.7	48.9	59.5
	14	137.8	23.7	28.4	38.8	159.9	27.5	34.3	44.4	191.9	33.0	39.8	53.3	219.0	37.7	51.6	60.1
	15	141.5	24.3	29.8	39.2	164.2	28.2	36.1	44.8	197.1	33.9	41.9	53.8	224.9	38.7	54.3	60.7
	5	97.8	16.8	14.6	38.9	113.5	19.5	17.6	44.5	136.2	23.4	20.3	53.4	155.4	26.7	26.3	60.2
	6	101.3	17.4	15.6	39.3	117.6	20.2	18.9	44.9	141.1	24.3	21.8	54.0	161.0	27.7	28.2	60.8
	7	104.9	18.0	16.7	39.7	121.7	20.9	20.2	45.4	146.1	25.1	23.3	54.5	166.7	28.7	30.2	61.4
	8	108.4	18.6	17.8	40.1	125.9	21.6	21.5	45.9	151.0	26.0	24.9	55.0	172.3	29.6	32.2	62.0
	9	112.0	19.3	19.0	40.5	130.0	22.4	22.9	46.3	156.0	26.8	26.5	55.6	178.0	30.6	34.3	62.6
40	10	115.5	19.9	20.2	40.9	134.1	23.1	24.4	46.8	160.9	27.7	28.2	56.1	183.6	31.6	36.5	63.2
	11	119.1	20.5	21.4	41.3	138.2	23.8	25.8	47.2	165.9	28.5	29.9	56.7	189.3	32.6	38.8	63.9
	12	122.6	21.1	22.6	41.7	142.4	24.5	27.4	47.7	170.8	29.4	31.7	57.2	194.9	33.5	41.1	64.5
	13	126.2	21.7	23.9	42.1	146.5	25.2	28.9	48.1	175.8	30.2	33.5	57.8	200.6	34.5	43.4	65.1
	14	129.7	22.3	25.2	42.5	150.6	25.9	30.5	48.6	180.7	31.1	35.4	58.3	206.2	35.5	45.8	65.7
	15	133.3	22.9	26.6	42.9	154.7	26.6	32.2	49.0	185.7	31.9	37.3	58.8	211.9	36.4	48.3	66.3
	5	93.6	16.1	13.4	41.0	108.7	18.7	16.2	46.9	130.4	22.4	18.7	56.3	148.8	25.6	24.2	63.4
	6	97.1	16.7	14.4	41.4	112.7	19.4	17.4	47.3	135.3	23.3	20.1	56.8	154.4	26.5	26.0	64.0
	7	100.6	17.3	15.4	41.8	116.8	20.1	18.6	47.8	140.1	24.1	21.5	57.4	159.9	27.5	27.8	64.7
	8	104.1	17.9	16.5	42.2	120.8	20.8	19.9	48.3	145.0	24.9	23.0	57.9	165.4	28.4	29.7	65.3
	9	107.5	18.5	17.5	42.6	124.8	21.5	21.2	48.7	149.8	25.8	24.5	58.5	170.9	29.4	31.7	65.9
43	10	111.0	19.1	18.7	43.0	128.9	22.2	22.5	49.2	154.6	26.6	26.1	59.1	176.4	30.3	33.8	66.5
	11	114.5	19.7	19.8	43.4	132.9	22.9	23.9	49.7	159.5	27.4	27.7	59.6	182.0	31.3	35.9	67.2
	12	118.0	20.3	21.0	43.8	136.9	23.6	25.4	50.1	164.3	28.3	29.4	60.2	187.5	32.2	38.0	67.8
	13	121.4	20.9	22.2	44.2	141.0	24.2	26.8	50.6	169.2	29.1	31.1	60.7	193.0	33.2	40.3	68.4
	14	124.9	21.5	23.4	44.6	145.0	24.9	28.4	51.1	174.0	29.9	32.9	61.3	198.5	34.1	42.6	69.1
	15	128.4	22.1	24.7	45.1	149.0	25.6	29.9	51.5	178.8	30.8	34.7	61.9	204.0	35.1	44.9	69.7
	5	89.5	15.4	12.3	43.1	103.9	17.9	14.8	49.2	124.7	21.4	17.1	59.1	142.3	24.5	22.1	66.6
	6	92.9	16.0	13.2	43.5	107.9	18.6	16.0	49.7	129.4	22.3	18.4	59.7	147.7	25.4	23.8	67.3
46	7	96.3	16.6	14.2	43.9	111.8	19.2	17.1	50.2	134.2	23.1	19.7	60.3	153.1	26.3	25.6	67.9
	8	99.7	17.2	15.1	44.3	115.7	19.9	18.3	50.7	138.9	23.9	21.1	60.8	158.5	27.3	27.4	68.6
	9	103.1	17.7	16.2	44.7	119.7	20.6	19.5	51.2	143.6	24.7	22.6	61.4	163.9	28.2	29.2	69.2
	10	106.5	18.3	17.2	45.2	123.6	21.3	20.8	51.6	148.3	25.5	24.0	62.0	169.3	29.1	31.1	69.8

Where,

ABT: Condenser Air Inlet Temperature (°C)
COT: Chilled Water Outlet Temperature (°C)
CCAP: Cooling Capacity (kW)
CFR: Chilled Water Flow Rate at 5°C (m^3/h)
CPD: Water Cooler Pressure Drop (kPa)
IPT: Compressor Input Power (kW)*

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

* Fan input power (kW) is included in the Electrical Data chapter

Performance Table (cont.)

		RCU2E80AG2				RCU2E100AG2				RCU2E120AG2				RCU2E140AG2			
ABT	COT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT
25	5	212.2	36.5	48.5	53.8	267.9	46.1	24.3	68.5	321.5	55.3	28.1	82.3	366.8	63.1	36.4	92.7
	6	219.3	37.7	51.7	54.4	276.8	47.6	25.9	69.3	332.2	57.1	30.0	83.2	379.0	65.2	38.9	93.8
	7	226.4	38.9	55.1	55.1	285.8	49.2	27.6	70.1	342.9	59.0	31.9	84.2	391.3	67.3	41.4	94.9
	8	233.5	40.2	58.5	55.7	294.7	50.7	29.3	71.0	353.6	60.8	33.9	85.2	403.5	69.4	43.9	96.0
	9	240.6	41.4	62.0	56.3	303.6	52.2	31.0	71.8	364.4	62.7	36.0	86.1	415.8	71.5	46.6	97.1
	10	247.7	42.6	65.7	57.0	312.6	53.8	32.8	72.6	375.1	64.5	38.1	87.1	428.0	73.6	49.3	98.2
	11	254.7	43.8	69.4	57.6	321.5	55.3	34.7	73.4	385.8	66.4	40.2	88.1	440.2	75.7	52.1	99.2
	12	261.8	45.0	73.2	58.2	330.5	56.8	36.6	74.2	396.6	68.2	42.5	89.1	452.5	77.8	55.0	100.3
	13	268.9	46.3	77.2	58.9	339.4	58.4	38.5	75.0	407.3	70.1	44.7	90.0	464.7	79.9	57.9	101.4
	14	276.0	47.5	81.2	59.5	348.3	59.9	40.5	75.8	418.0	71.9	47.1	91.0	477.0	82.0	61.0	102.5
	15	283.1	48.7	85.4	60.1	357.3	61.5	42.5	76.6	428.7	73.7	49.5	92.0	489.2	84.1	64.1	103.6
30	5	205.1	35.3	45.4	58.9	258.8	44.5	22.7	75.0	310.6	53.4	26.3	90.0	354.4	61.0	34.1	101.5
	6	212.1	36.5	48.4	59.5	267.7	46.0	24.3	75.8	321.2	55.2	28.1	91.0	366.5	63.0	36.4	102.6
	7	219.1	37.7	51.6	60.2	276.5	47.6	25.9	76.7	331.9	57.1	29.9	92.0	378.7	65.1	38.8	103.7
	8	226.1	38.9	54.9	60.8	285.4	49.1	27.5	77.5	342.5	58.9	31.8	93.0	390.8	67.2	41.3	104.8
	9	233.2	40.1	58.3	61.5	294.3	50.6	29.2	78.3	353.1	60.7	33.8	94.0	402.9	69.3	43.8	106.0
	10	240.2	41.3	61.8	62.2	303.1	52.1	30.9	79.2	363.8	62.6	35.8	95.1	415.1	71.4	46.4	107.1
	11	247.2	42.5	65.4	62.8	312.0	53.7	32.7	80.0	374.4	64.4	37.9	96.1	427.2	73.5	49.1	108.2
	12	254.2	43.7	69.1	63.5	320.9	55.2	34.5	80.8	385.0	66.2	40.1	97.1	439.3	75.6	51.9	109.4
	13	261.2	44.9	72.9	64.1	329.7	56.7	36.4	81.7	395.7	68.1	42.3	98.1	451.5	77.7	54.8	110.5
	14	268.3	46.1	76.8	64.8	338.6	58.2	38.3	82.5	406.3	69.9	44.5	99.1	463.6	79.7	57.7	111.6
	15	275.3	47.3	80.8	65.4	347.4	59.8	40.3	83.4	416.9	71.7	46.8	100.1	475.7	81.8	60.7	112.7
35	5	192.4	33.1	40.0	63.6	242.9	41.8	20.1	81.1	291.5	50.1	23.2	97.3	332.6	57.2	30.1	109.7
	6	199.2	34.3	42.9	64.3	251.4	43.2	21.5	81.9	301.7	51.9	24.8	98.4	344.3	59.2	32.2	110.8
	7	206.0	35.4	45.8	65.0	260.0	44.7	22.9	82.8	312.0	53.7	26.5	99.4	356.0	61.2	34.4	112.0
	8	212.8	36.6	48.8	65.7	268.6	46.2	24.4	83.7	322.3	55.4	28.3	100.4	367.7	63.2	36.6	113.2
	9	219.6	37.8	51.9	66.4	277.1	47.7	26.0	84.5	332.5	57.2	30.1	101.5	379.4	65.3	38.9	114.3
	10	226.3	38.9	55.0	67.0	285.7	49.1	27.5	85.4	342.8	59.0	31.9	102.5	391.1	67.3	41.3	115.5
	11	233.1	40.1	58.3	67.7	294.2	50.6	29.2	86.2	353.1	60.7	33.8	103.5	402.9	69.3	43.8	116.7
	12	239.9	41.3	61.7	68.4	302.8	52.1	30.8	87.1	363.3	62.5	35.8	104.6	414.6	71.3	46.3	117.8
	13	246.7	42.4	65.2	69.1	311.3	53.5	32.6	88.0	373.6	64.3	37.8	105.6	426.3	73.3	48.9	119.0
	14	253.4	43.6	68.7	69.7	319.9	55.0	34.3	88.8	383.9	66.0	39.8	106.6	438.0	75.3	51.6	120.1
	15	260.2	44.8	72.4	70.4	328.4	56.5	36.1	89.7	394.1	67.8	41.9	107.7	449.7	77.4	54.3	121.3
40	5	179.8	30.9	35.0	69.9	227.0	39.0	17.6	89.0	272.3	46.8	20.3	106.8	310.8	53.5	26.3	120.4
	6	186.4	32.1	37.6	70.6	235.2	40.5	18.9	89.9	282.2	48.5	21.8	107.9	322.1	55.4	28.2	121.6
	7	192.9	33.2	40.2	71.3	243.5	41.9	20.2	90.8	292.1	50.2	23.3	109.0	333.3	57.3	30.2	122.8
	8	199.4	34.3	42.9	72.0	251.7	43.3	21.5	91.7	302.0	52.0	24.9	110.1	344.6	59.3	32.2	124.0
	9	206.0	35.4	45.7	72.7	260.0	44.7	22.9	92.6	311.9	53.7	26.5	111.2	355.9	61.2	34.3	125.3
	10	212.5	36.5	48.6	73.4	268.2	46.1	24.4	93.5	321.8	55.4	28.2	112.3	367.2	63.2	36.5	126.5
	11	219.0	37.7	51.6	74.1	276.5	47.5	25.8	94.4	331.7	57.1	29.9	113.4	378.5	65.1	38.8	127.7
	12	225.6	38.8	54.7	74.8	284.7	49.0	27.4	95.3	341.6	58.8	31.7	114.4	389.8	67.0	41.1	128.9
	13	232.1	39.9	57.8	75.5	292.9	50.4	28.9	96.2	351.5	60.5	33.5	115.5	401.1	69.0	43.4	130.2
	14	238.6	41.0	61.1	76.3	301.2	51.8	30.5	97.1	361.4	62.2	35.4	116.6	412.4	70.9	45.8	131.4
	15	245.2	42.2	64.4	77.0	309.4	53.2	32.2	98.0	371.3	63.9	37.3	117.7	423.7	72.9	48.3	132.6
43	5	172.2	29.6	32.2	73.6	217.4	37.4	16.2	93.7	260.9	44.9	18.7	112.5	297.7	51.2	24.2	126.8
	6	178.6	30.7	34.6	74.3	225.5	38.8	17.4	94.7	270.6	46.5	20.1	113.6	308.7	53.1	26.0	128.0
	7	185.0	31.8	37.1	75.0	233.5	40.2	18.6	95.6	280.2	48.2	21.5	114.8	319.8	55.0	27.8	129.3
	8	191.4	32.9	39.6	75.8	241.6	41.6	19.9	96.5	289.9	49.9	23.0	115.9	330.8	56.9	29.7	130.6
	9	197.8	34.0	42.3	76.5	249.7	42.9	21.2	97.5	299.6	51.5	24.5	117.0	341.8	58.8	31.7	131.8
	10	204.2	35.1	45.0	77.2	257.7	44.3	22.5	98.4	309.3	53.2	26.1	118.1	352.9	60.7	33.8	133.1
	11	210.6	36.2	47.8	78.0	265.8	45.7	23.9	99.3	318.9	54.9	27.7	119.2	363.9	62.6	35.9	134.4
	12	217.0	37.3	50.7	78.7	273.9	47.1	25.4	100.3	328.6	56.5	29.4	120.4	375.0	64.5	38.0	135.6
	13	223.4	38.4	53.6	79.4	281.9	48.5	26.8	101.2	338.3	58.2	31.1	121.5	386.0	66.4	40.3	136.9
	14	229.8	39.5	56.7	80.2	290.0	49.9	28.4	102.1	348.0	59.9	32.9	122.6	397.1	68.3	42.6	138.1
	15	236.1	40.6	59.8	80.9	298.0	51.3	29.9	103.1	357.7	61.5	34.7	123.7	408.1	70.2	44.9	139.4
46	5	164.7	28.3	29.5	77.3	207.8	35.7	14.8	98.5	249.4	42.9	17.1	118.2	284.6	48.9	22.1	133.2
	6	170.9	29.4	31.7	78.1	215.7	37.1	16.0	99.4	258.9	44.5	18.4	119.4	295.4	50.8	23.8	134.5
	7	177.2	30.5	34.0	78.8	223.6	38.5	17.1	100.4	268.3	46.2	19.7	120.5	306.2	52.7	25.6	135.8
	8	183.4	31.5	36.4	79.6	231.5	39.8	18.3	101.4	277.8	47.8	21.1	121.7	317.0	54.5	27.4	137.1
	9	189.7	32.6	38.9	80.3	239.4	41.2	19.5	102.3	287.2	49.4	22.6	122.8	327.7	56.4	29.2	138.4
	10	195.9	33.7	41.5	81.1	247.2	42.5	20.8	103.3	296.7	51.0	24.0	124.0	338.5	58.2	31.1	139.7

Where,
ABT: Condenser Air Inlet Temperature (°C)
COT: Chilled Water Outlet Temperature (°C)
CCAP: Cooling Capacity (kW)
CFR: Chilled Water Flow Rate at 5°C (m^3/h)
CPD: Water Cooler Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

Performance Table (cont.)

		RCU2E160AG2				RCU2E180AG2				RCU2E210AG2				RCU2E240AG2			
ABT	COT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT
25	5	424.5	73.0	48.5	107.6	482.2	82.9	28.1	123.4	550.2	94.6	36.4	139.0	636.7	109.5	48.5	161.4
	6	438.7	75.4	51.7	108.9	498.3	85.7	30.0	124.9	568.5	97.8	38.9	140.7	658.0	113.2	51.7	163.3
	7	452.8	77.9	55.1	110.1	514.4	88.5	31.9	126.3	586.9	100.9	41.4	142.3	679.2	116.8	55.1	165.2
	8	467.0	80.3	58.5	111.4	530.5	91.2	33.9	127.8	605.3	104.1	43.9	144.0	700.5	120.5	58.5	167.1
	9	481.2	82.8	62.0	112.7	546.6	94.0	36.0	129.2	623.6	107.3	46.6	145.6	721.7	124.1	62.0	169.0
	10	495.3	85.2	65.7	113.9	562.6	96.8	38.1	130.7	642.0	110.4	49.3	147.2	743.0	127.8	65.7	170.9
	11	509.5	87.6	69.4	115.2	578.7	99.5	40.2	132.1	660.4	113.6	52.1	148.9	764.2	131.4	69.4	172.8
	12	523.7	90.1	73.2	116.5	594.8	102.3	42.5	133.6	678.7	116.7	55.0	150.5	785.5	135.1	73.2	174.7
	13	537.8	92.5	77.2	117.7	610.9	105.1	44.7	135.0	697.1	119.9	57.9	152.2	806.7	138.8	77.2	176.6
	14	552.0	94.9	81.2	119.0	627.0	107.8	47.1	136.5	715.4	123.1	61.0	153.8	828.0	142.4	81.2	178.5
	15	566.1	97.4	85.4	120.3	643.1	110.6	49.5	137.9	733.8	126.2	64.1	155.4	849.2	146.1	85.4	180.4
30	5	410.1	70.5	45.4	117.8	465.9	80.1	26.3	135.1	531.6	91.4	34.1	152.2	615.2	105.8	45.4	176.6
	6	424.2	73.0	48.4	119.1	481.8	82.9	28.1	136.6	549.8	94.6	36.4	153.9	636.3	109.4	48.4	178.6
	7	438.2	75.4	51.6	120.4	497.8	85.6	29.9	138.1	568.0	97.7	38.8	155.6	657.3	113.1	51.6	180.6
	8	452.3	77.8	54.9	121.7	513.7	88.4	31.8	139.6	586.2	100.8	41.3	157.3	678.4	116.7	54.9	182.5
	9	466.3	80.2	58.3	123.0	529.7	91.1	33.8	141.1	604.4	104.0	43.8	159.0	699.5	120.3	58.3	184.5
	10	480.3	82.6	61.8	124.3	545.6	93.8	35.8	142.6	622.6	107.1	46.4	160.6	720.5	123.9	61.8	186.5
	11	494.4	85.0	65.4	125.6	561.6	96.6	37.9	144.1	640.8	110.2	49.1	162.3	741.6	127.6	65.4	188.4
	12	508.4	87.5	69.1	126.9	577.5	99.3	40.1	145.6	659.0	113.3	51.9	164.0	762.6	131.2	69.1	190.4
	13	522.5	89.9	72.9	128.2	593.5	102.1	42.3	147.1	677.2	116.5	54.8	165.7	783.7	134.8	72.9	192.4
	14	536.5	92.3	76.8	129.6	609.4	104.8	44.5	148.6	695.4	119.6	57.7	167.4	804.8	138.4	76.8	194.3
	15	550.6	94.7	80.8	130.9	625.4	107.6	46.8	150.1	713.6	122.7	60.7	169.1	825.8	142.0	80.8	196.3
35	5	384.9	66.2	40.0	127.3	437.2	75.2	23.2	146.0	498.9	85.8	30.1	164.5	577.3	99.3	40.0	190.9
	6	398.4	68.5	42.9	128.6	452.6	77.8	24.8	147.6	516.4	88.8	32.2	166.3	597.7	102.8	42.9	193.0
	7	412.0	70.9	45.8	130.0	468.0	80.5	26.5	149.1	534.0	91.8	34.4	168.0	618.0	106.3	45.8	195.0
	8	425.6	73.2	48.8	131.4	483.4	83.1	28.3	150.6	551.6	94.9	36.6	169.7	638.3	109.8	48.8	197.0
	9	439.1	75.5	51.9	132.7	498.8	85.8	30.1	152.2	569.1	97.9	38.9	171.5	658.7	113.3	51.9	199.1
	10	452.7	77.9	55.0	134.1	514.2	88.4	31.9	153.7	586.7	100.9	41.3	173.2	679.0	116.8	55.0	201.1
	11	466.2	80.2	58.3	135.4	529.6	91.1	33.8	155.3	604.3	103.9	43.8	175.0	699.3	120.3	58.3	203.1
	12	479.8	82.5	61.7	136.8	545.0	93.7	35.8	156.8	621.9	107.0	46.3	176.7	719.7	123.8	61.7	205.1
	13	493.3	84.9	65.2	138.1	560.4	96.4	37.8	158.4	639.4	110.0	48.9	178.5	740.0	127.3	65.2	207.2
	14	506.9	87.2	68.7	139.5	575.8	99.0	39.8	159.9	657.0	113.0	51.6	180.2	760.3	130.8	68.7	209.2
	15	520.5	89.5	72.4	140.8	591.2	101.7	41.9	161.5	674.6	116.0	54.3	182.0	780.7	134.3	72.4	211.2
40	5	359.6	61.9	35.0	139.7	408.5	70.3	20.3	160.2	466.1	80.2	26.3	180.6	539.5	92.8	35.0	209.6
	6	372.7	64.1	37.6	141.1	423.4	72.8	21.8	161.9	483.1	83.1	28.2	182.4	559.1	96.2	37.6	211.7
	7	385.8	66.4	40.2	142.6	438.2	75.4	23.3	163.5	500.0	86.0	30.2	184.2	578.7	99.5	40.2	213.8
	8	398.9	68.6	42.9	144.0	453.1	77.9	24.9	165.1	517.0	88.9	32.2	186.1	598.3	102.9	42.9	216.0
	9	411.9	70.9	45.7	145.4	467.9	80.5	26.5	166.8	533.9	91.8	34.3	187.9	617.9	106.3	45.7	218.1
	10	425.0	73.1	48.6	146.8	482.8	83.0	28.2	168.4	550.8	94.7	36.5	189.7	637.5	109.6	48.6	220.2
	11	438.1	75.3	51.6	148.2	497.6	85.6	29.9	170.0	567.8	97.7	38.8	191.6	657.1	113.0	51.6	222.4
	12	451.1	77.6	54.7	149.7	512.5	88.1	31.7	171.7	584.7	100.6	41.1	193.4	676.7	116.4	54.7	224.5
	13	464.2	79.8	57.8	151.1	527.3	90.7	33.5	173.3	601.7	103.5	43.4	195.3	696.3	119.8	57.8	226.6
	14	477.3	82.1	61.1	152.5	542.2	93.3	35.4	174.9	618.6	106.4	45.8	197.1	715.9	123.1	61.1	228.8
	15	490.4	84.3	64.4	153.9	557.0	95.8	37.3	176.5	635.6	109.3	48.3	198.9	735.5	126.5	64.4	230.9
43	5	344.5	59.3	32.2	147.2	391.3	67.3	18.7	168.8	446.5	76.8	24.2	190.2	516.7	88.9	32.2	220.7
	6	357.3	61.5	34.6	148.6	405.8	69.8	20.1	170.5	463.1	79.6	26.0	192.1	535.9	92.2	34.6	222.9
	7	370.1	63.6	37.1	150.1	420.4	72.3	21.5	172.1	479.6	82.5	27.8	194.0	555.1	95.5	37.1	225.1
	8	382.8	65.8	39.6	151.6	434.9	74.8	23.0	173.8	496.2	85.3	29.7	195.9	574.3	98.8	39.6	227.3
	9	395.6	68.0	42.3	153.0	449.4	77.3	24.5	175.5	512.8	88.2	31.7	197.8	593.4	102.1	42.3	229.5
	10	408.4	70.2	45.0	154.5	463.9	79.8	26.1	177.2	529.3	91.0	33.8	199.6	612.6	105.4	45.0	231.7
	11	421.2	72.4	47.8	156.0	478.4	82.3	27.7	178.9	545.9	93.9	35.9	201.5	631.8	108.7	47.8	233.9
	12	434.0	74.6	50.7	157.4	492.9	84.8	29.4	180.5	562.5	96.7	38.0	203.4	650.9	112.0	50.7	236.1
	13	446.7	76.8	53.6	158.9	507.5	87.3	31.1	182.2	579.0	99.6	40.3	205.3	670.1	115.3	53.6	238.3
	14	459.5	79.0	56.7	160.3	522.0	89.8	32.9	183.9	595.6	102.4	42.6	207.2	689.3	118.6	56.7	240.5
	15	472.3	81.2	59.8	161.8	536.5	92.3	34.7	185.6	612.1	105.3	44.9	209.1	708.4	121.9	59.8	242.7
46	5	329.3	56.6	29.5	154.6	374.1	64.3	17.1	177.3	426.9	73.4	22.1	199.8	494.0	85.0	29.5	231.9
	6	341.8	58.8	31.7	156.1	388.3	66.8	18.4	179.1	443.1	76.2	23.8	201.8	512.8	88.2	31.7	234.2
	7	354.3	60.9	34.0	157.6	402.5	69.2	19.7	180.8	459.2	79.0	25.6	203.7	531.5	91.4	34.0	236.4
	8	366.8	63.1	36.4	159.1	416.7	71.7	21.1	182.5	475.4	81.8	27.4	205.7	550.2	94.6	36.4	238.7
	9	379.3	65.2	38.9	160.6	430.9	74.1	22.6	184.2	491.6	84.6	29.2	207.6	569.0	97.9	38.9	241.0
	10	391.8	67.4	41.5	162.2	445.0	76.5	24.0	186.0	507.8	87.3	31.1	209.5	587.7	101.1	41.5	243.2

Where,

ABT: Condenser Air Inlet Temperature (°C)
COT: Chilled Water Outlet Temperature (°C)
CCAP: Cooling Capacity (kW)
CFR: Chilled Water Flow Rate at 5°C (m^3/h)
CPD: Water Cooler Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

Performance Table (cont.)

		RCU2E280AG2				RCU2E320AG2				RCU2E350AG2				RCU2E400AG2			
ABT	COT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT
	5	733.6	126.2	36.4	185.4	849.0	146.0	48.5	215.2	917.0	157.7	36.4	231.7	1061.2	182.5	48.5	269.0
	6	758.1	130.4	38.9	187.6	877.3	150.9	51.7	217.7	947.6	163.0	38.9	234.5	1096.6	188.6	51.7	272.1
	7	782.5	134.6	41.4	189.8	905.6	155.8	55.1	220.3	978.2	168.2	41.4	237.2	1132.1	194.7	55.1	275.3
	8	807.0	138.8	43.9	191.9	934.0	160.6	58.5	222.8	1008.8	173.5	43.9	239.9	1167.5	200.8	58.5	278.5
	9	831.5	143.0	46.6	194.1	962.3	165.5	62.0	225.3	1039.4	178.8	46.6	242.7	1202.9	206.9	62.0	281.7
25	10	856.0	147.2	49.3	196.3	990.6	170.4	65.7	227.9	1070.0	184.0	49.3	245.4	1238.3	213.0	65.7	284.8
	11	880.5	151.4	52.1	198.5	1019.0	175.3	69.4	230.4	1100.6	189.3	52.1	248.1	1273.7	219.1	69.4	288.0
	12	904.9	155.7	55.0	200.7	1047.3	180.1	73.2	232.9	1131.2	194.6	55.0	250.9	1309.1	225.2	73.2	291.2
	13	929.4	159.9	57.9	202.9	1075.6	185.0	77.2	235.5	1161.8	199.8	57.9	253.6	1344.5	231.3	77.2	294.3
	14	953.9	164.1	61.0	205.1	1104.0	189.9	81.2	238.0	1192.4	205.1	61.0	256.3	1380.0	237.4	81.2	297.5
	15	978.4	168.3	64.1	207.2	1132.3	194.8	85.4	240.5	1223.0	210.4	64.1	259.1	1415.4	243.4	85.4	300.7
	5	708.8	121.9	34.1	202.9	820.3	141.1	45.4	235.5	886.0	152.4	34.1	253.6	1025.3	176.4	45.4	294.4
	6	733.0	126.1	36.4	205.2	848.3	145.9	48.4	238.1	916.3	157.6	36.4	256.5	1060.4	182.4	48.4	297.7
	7	757.3	130.3	38.8	207.4	876.4	150.7	51.6	240.8	946.6	162.8	38.8	259.3	1095.5	188.4	51.6	300.9
	8	781.6	134.4	41.3	209.7	904.5	155.6	54.9	243.4	977.0	168.0	41.3	262.1	1130.6	194.5	54.9	304.2
	9	805.8	138.6	43.8	211.9	932.6	160.4	58.3	246.0	1007.3	173.3	43.8	264.9	1165.8	200.5	58.3	307.5
30	10	830.1	142.8	46.4	214.2	960.7	165.2	61.8	248.6	1037.6	178.5	46.4	267.7	1200.9	206.5	61.8	310.8
	11	854.4	147.0	49.1	216.5	988.8	170.1	65.4	251.2	1068.0	183.7	49.1	270.6	1236.0	212.6	65.4	314.1
	12	878.6	151.1	51.9	218.7	1016.9	174.9	69.1	253.9	1098.3	188.9	51.9	273.4	1271.1	218.6	69.1	317.3
	13	902.9	155.3	54.8	221.0	1044.9	179.7	72.9	256.5	1128.6	194.1	54.8	276.2	1306.2	224.7	72.9	320.6
	14	927.2	159.5	57.7	223.2	1073.0	184.6	76.8	259.1	1159.0	199.3	57.7	279.0	1341.3	230.7	76.8	323.9
	15	951.5	163.7	60.7	225.5	1101.1	189.4	80.8	261.7	1189.3	204.6	60.7	281.9	1376.4	236.7	80.8	327.2
	5	665.1	114.4	30.1	219.3	769.8	132.4	40.0	254.6	831.4	143.0	30.1	274.2	962.2	165.5	40.0	318.2
	6	688.6	118.4	32.2	221.7	796.9	137.1	42.9	257.3	860.7	148.0	32.2	277.1	996.1	171.3	42.9	321.6
	7	712.0	122.5	34.4	224.0	824.0	141.7	45.8	260.0	890.0	153.1	34.4	280.0	1030.0	177.2	45.8	325.0
	8	735.4	126.5	36.6	226.3	851.1	146.4	48.8	262.7	919.3	158.1	36.6	282.9	1063.9	183.0	48.8	328.4
	9	758.9	130.5	38.9	228.7	878.2	151.1	51.9	265.4	948.6	163.2	38.9	285.8	1097.8	188.8	51.9	331.8
35	10	782.3	134.6	41.3	231.0	905.3	155.7	55.0	268.1	977.9	168.2	41.3	288.7	1131.7	194.6	55.0	335.1
	11	805.7	138.6	43.8	233.3	932.5	160.4	58.3	270.8	1007.1	173.2	43.8	291.6	1165.6	200.5	58.3	338.5
	12	829.1	142.6	46.3	235.6	959.6	165.0	61.7	273.5	1036.4	178.3	46.3	294.5	1199.5	206.3	61.7	341.9
	13	852.6	146.6	48.9	238.0	986.7	169.7	65.2	276.2	1065.7	183.3	48.9	297.5	1233.4	212.1	65.2	345.3
	14	876.0	150.7	51.6	240.3	1013.8	174.4	68.7	278.9	1095.0	188.3	51.6	300.4	1267.2	218.0	68.7	348.6
	15	899.4	154.7	54.3	242.6	1040.9	179.0	72.4	281.6	1124.3	193.4	54.3	303.3	1301.1	223.8	72.4	352.0
	5	621.5	106.9	26.3	240.7	719.3	123.7	35.0	279.4	776.9	133.6	26.3	300.9	899.1	154.6	35.0	349.3
	6	644.1	110.8	28.2	243.2	745.4	128.2	37.6	282.3	805.1	138.5	28.2	304.0	931.8	160.3	37.6	352.8
	7	666.7	114.7	30.2	245.6	771.6	132.7	40.2	285.1	833.4	143.3	30.2	307.0	964.5	165.9	40.2	356.4
	8	689.3	118.6	32.2	248.1	797.7	137.2	42.9	288.0	861.6	148.2	32.2	310.1	997.1	171.5	42.9	360.0
	9	711.9	122.4	34.3	250.5	823.9	141.7	45.7	290.8	889.8	153.1	34.3	313.2	1029.8	177.1	45.7	363.5
40	10	734.5	126.3	36.5	253.0	850.0	146.2	48.6	293.6	918.1	157.9	36.5	316.2	1062.5	182.7	48.6	367.1
	11	757.1	130.2	38.8	255.4	876.1	150.7	51.6	296.5	946.3	162.8	38.8	319.3	1095.2	188.4	51.6	370.6
	12	779.6	134.1	41.1	257.9	902.3	155.2	54.7	299.3	974.6	167.6	41.1	322.4	1127.9	194.0	54.7	374.2
	13	802.2	138.0	43.4	260.3	928.4	159.7	57.8	302.2	1002.8	172.5	43.4	325.4	1160.5	199.6	57.8	377.7
	14	824.8	141.9	45.8	262.8	954.6	164.2	61.1	305.0	1031.0	177.3	45.8	328.5	1193.2	205.2	61.1	381.3
	15	847.4	145.8	48.3	265.2	980.7	168.7	64.4	307.9	1059.3	182.2	48.3	331.5	1225.9	210.9	64.4	384.8
	5	595.3	102.4	24.2	253.6	689.0	118.5	32.2	294.3	744.2	128.0	24.2	317.0	861.2	148.1	32.2	367.9
	6	617.4	106.2	26.0	256.1	714.5	122.9	34.6	297.3	771.8	132.7	26.0	320.1	893.2	153.6	34.6	371.6
	7	639.5	110.0	27.8	258.6	740.1	127.3	37.1	300.2	799.4	137.5	27.8	323.3	925.1	159.1	37.1	375.2
	8	661.6	113.8	29.7	261.1	765.7	131.7	39.6	303.1	827.0	142.2	29.7	326.4	957.1	164.6	39.6	378.9
	9	683.7	117.6	31.7	263.7	791.2	136.1	42.3	306.0	854.6	147.0	31.7	329.6	989.0	170.1	42.3	382.6
43	10	705.8	121.4	33.8	266.2	816.8	140.5	45.0	309.0	882.2	151.7	33.8	332.7	1021.0	175.6	45.0	386.2
	11	727.9	125.2	35.9	268.7	842.3	144.9	47.8	311.9	909.8	156.5	35.9	335.9	1052.9	181.1	47.8	389.9
	12	749.9	129.0	38.0	271.2	867.9	149.3	50.7	314.8	937.4	161.2	38.0	339.1	1084.9	186.6	50.7	393.5
	13	772.0	132.8	40.3	273.8	893.5	153.7	53.6	317.8	965.0	166.0	40.3	342.2	1116.8	192.1	53.6	397.2
	14	794.1	136.6	42.6	276.3	919.0	158.1	56.7	320.7	992.6	170.7	42.6	345.4	1148.8	197.6	56.7	400.9
	15	816.2	140.4	44.9	278.8	944.6	162.5	59.8	323.6	1020.2	175.5	44.9	348.5	1180.7	203.1	59.8	404.5
	5	569.2	97.9	22.1	266.4	658.7	113.3	29.5	309.2	711.5	122.4	22.1	333.0	823.4	141.6	29.5	386.5
	6	590.7	101.6	23.8	269.0	683.7	117.6	31.7	312.2	738.4	127.0	23.8	336.3	854.6	147.0	31.7	390.3
	7	612.3	105.3	25.6	271.6	708.6	121.9	34.0	315.3	765.4	131.7	25.6	339.5	885.8	152.4	34.0	394.1
46	8	633.9	109.0	27.4	274.2	733.6	126.2	36.4	318.3	792.4	136.3	27.4	342.8	917.0	157.7	36.4	397.8
	9	655.5	112.7	29.2	276.8	758.6	130.5	38.9	321.3	819.4	140.9	29.2	346.0	948.3	163.1	38.9	401.6
	10	677.1	116.5	31.1	279.4	783.6	134.8	41.5	324.3	846.3	145.6	31.1	349.2	979.5	168.5	41.5	405.4

Where,
ABT: Condenser Air Inlet Temperature (°C)
COT: Chilled Water Outlet Temperature (°C)
CCAP: Cooling Capacity (kW)

CFR: Chilled Water Flow Rate at 5°C (m^3/h)
CPD: Water Cooler Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

15.3. Performance Table (RHU2E-AG2) (Cooling Operation)

		RHU2E40AG2				RHU2E50AG2				RHU2E60AG2				RHU2E70AG2			
ABT	COT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT
25	5	109.2	18.8	18.1	29.4	126.7	21.8	21.8	32.6	152.5	26.2	25.4	40.3	174.1	29.9	29.6	45.5
	6	112.9	19.4	19.3	29.7	131.0	22.5	23.3	33.0	157.6	27.1	27.1	40.8	179.9	30.9	31.6	46.1
	7	116.5	20.0	20.5	30.1	135.2	23.3	24.7	33.4	162.7	28.0	28.8	41.3	185.7	31.9	33.7	46.6
	8	120.1	20.7	21.7	30.4	139.4	24.0	26.3	33.8	167.8	28.9	30.6	41.7	191.6	32.9	35.8	47.1
	9	123.8	21.3	23.0	30.8	143.6	24.7	27.8	34.1	172.8	29.7	32.4	42.2	197.4	33.9	38.0	47.7
	10	127.4	21.9	24.4	31.1	147.9	25.4	29.5	34.5	177.9	30.6	34.3	42.7	203.2	34.9	40.2	48.2
	11	131.1	22.5	25.7	31.5	152.1	26.2	31.1	34.9	183.0	31.5	36.3	43.2	209.0	35.9	42.5	48.7
	12	134.7	23.2	27.1	31.8	156.3	26.9	32.8	35.3	188.1	32.4	38.3	43.6	214.8	36.9	44.9	49.3
	13	138.4	23.8	28.6	32.2	160.6	27.6	34.6	35.7	193.2	33.2	40.3	44.1	220.6	37.9	47.3	49.8
	14	142.0	24.4	30.1	32.5	164.8	28.3	36.4	36.1	198.3	34.1	42.5	44.6	226.4	38.9	49.8	50.3
	15	145.7	25.1	31.6	32.8	169.0	29.1	38.2	36.5	203.4	35.0	44.6	45.1	232.2	39.9	52.3	50.9
30	5	105.5	18.1	16.9	32.2	122.4	21.1	20.4	35.7	147.3	25.3	23.7	44.1	168.2	28.9	27.7	49.8
	6	109.1	18.8	18.0	32.5	126.6	21.8	21.8	36.1	152.4	26.2	25.3	44.6	174.0	29.9	29.6	50.4
	7	112.7	19.4	19.2	32.9	130.8	22.5	23.2	36.5	157.4	27.1	27.0	45.1	179.8	30.9	31.5	50.9
	8	116.4	20.0	20.4	33.2	135.0	23.2	24.7	36.9	162.5	27.9	28.7	45.6	185.5	31.9	33.6	51.5
	9	120.0	20.6	21.7	33.6	139.2	23.9	26.2	37.3	167.5	28.8	30.5	46.1	191.3	32.9	35.7	52.0
	10	123.6	21.3	23.0	33.9	143.4	24.7	27.8	37.7	172.6	29.7	32.3	46.6	197.0	33.9	37.8	52.6
	11	127.2	21.9	24.3	34.3	147.6	25.4	29.4	38.1	177.6	30.5	34.2	47.1	202.8	34.9	40.0	53.1
	12	130.8	22.5	25.6	34.7	151.8	26.1	31.0	38.5	182.6	31.4	36.1	47.6	208.6	35.9	42.3	53.7
	13	134.4	23.1	27.0	35.0	156.0	26.8	32.7	38.9	187.7	32.3	38.1	48.0	214.3	36.9	44.7	54.3
	14	138.0	23.7	28.4	35.4	160.2	27.5	34.4	39.3	192.7	33.1	40.2	48.5	220.1	37.9	47.1	54.8
	15	141.6	24.4	29.9	35.7	164.4	28.3	36.2	39.7	197.8	34.0	42.2	49.0	225.8	38.8	49.5	55.4
35	5	99.0	17.0	14.9	34.8	114.9	19.8	18.0	38.6	138.3	23.8	20.9	47.7	157.9	27.2	24.4	53.9
	6	102.5	17.6	16.0	35.1	119.0	20.5	19.3	39.0	143.1	24.6	22.4	48.2	163.4	28.1	26.1	54.4
	7	106.0	18.2	17.1	35.5	123.0	21.2	20.6	39.4	148.0	25.5	23.9	48.7	169.0	29.1	27.9	55.0
	8	109.5	18.8	18.2	35.9	127.0	21.9	21.9	39.8	152.9	26.3	25.5	49.2	174.6	30.0	29.8	55.6
	9	113.0	19.4	19.3	36.2	131.1	22.5	23.3	40.2	157.7	27.1	27.1	49.7	180.1	31.0	31.7	56.1
	10	116.5	20.0	20.5	36.6	135.1	23.2	24.7	40.6	162.6	28.0	28.8	50.2	185.7	31.9	33.6	56.7
	11	120.0	20.6	21.7	37.0	139.2	23.9	26.2	41.0	167.5	28.8	30.5	50.7	191.2	32.9	35.7	57.3
	12	123.4	21.2	22.9	37.3	143.2	24.6	27.7	41.4	172.4	29.6	32.3	51.2	196.8	33.9	37.7	57.9
	13	126.9	21.8	24.2	37.7	147.3	25.3	29.2	41.9	177.2	30.5	34.1	51.7	202.4	34.8	39.9	58.4
	14	130.4	22.4	25.5	38.1	151.3	26.0	30.8	42.3	182.1	31.3	35.9	52.2	207.9	35.8	42.1	59.0
	15	133.9	23.0	26.8	38.5	155.4	26.7	32.4	42.7	187.0	32.2	37.8	52.7	213.5	36.7	44.3	59.6
40	5	92.5	15.9	13.1	38.2	107.4	18.5	15.8	42.3	129.2	22.2	18.3	52.3	147.5	25.4	21.3	59.1
	6	95.9	16.5	14.0	38.5	111.3	19.1	17.0	42.8	133.9	23.0	19.7	52.9	152.9	26.3	22.9	59.7
	7	99.3	17.1	15.0	38.9	115.2	19.8	18.1	43.2	138.6	23.8	21.0	53.4	158.2	27.2	24.5	60.3
	8	102.6	17.7	16.0	39.3	119.1	20.5	19.3	43.6	143.3	24.6	22.4	53.9	163.6	28.1	26.2	60.9
	9	106.0	18.2	17.0	39.7	123.0	21.2	20.6	44.1	148.0	25.5	23.9	54.5	169.0	29.1	27.9	61.5
	10	109.3	18.8	18.1	40.1	126.9	21.8	21.9	44.5	152.7	26.3	25.4	55.0	174.3	30.0	29.7	62.1
	11	112.7	19.4	19.2	40.5	130.8	22.5	23.2	44.9	157.4	27.1	27.0	55.5	179.7	30.9	31.5	62.7
	12	116.1	20.0	20.3	40.9	134.7	23.2	24.6	45.4	162.1	27.9	28.6	56.1	185.1	31.8	33.4	63.3
	13	119.4	20.5	21.5	41.3	138.6	23.8	26.0	45.8	166.8	28.7	30.2	56.6	190.4	32.8	35.4	63.9
	14	122.8	21.1	22.7	41.6	142.5	24.5	27.4	46.2	171.5	29.5	31.9	57.1	195.8	33.7	37.3	64.5
	15	126.2	21.7	23.9	42.0	146.4	25.2	28.9	46.7	176.1	30.3	33.7	57.7	201.1	34.6	39.4	65.1
43	5	88.6	15.2	12.1	40.2	102.8	17.7	14.5	44.6	123.8	21.3	16.8	55.1	141.3	24.3	19.6	62.3
	6	91.9	15.8	12.9	40.6	106.7	18.3	15.6	45.0	128.3	22.1	18.1	55.7	146.6	25.2	21.1	62.9
	7	95.2	16.4	13.8	41.0	110.5	19.0	16.7	45.5	132.9	22.9	19.4	56.2	151.8	26.1	22.6	63.5
	8	98.5	16.9	14.8	41.4	114.3	19.7	17.9	45.9	137.5	23.7	20.7	56.8	157.0	27.0	24.2	64.1
	9	101.8	17.5	15.8	41.8	118.1	20.3	19.0	46.4	142.1	24.4	22.1	57.3	162.3	27.9	25.8	64.7
	10	105.1	18.1	16.8	42.2	121.9	21.0	20.2	46.8	146.7	25.2	23.5	57.9	167.5	28.8	27.4	65.4
	11	108.4	18.6	17.8	42.6	125.7	21.6	21.5	47.3	151.3	26.0	25.0	58.4	172.8	29.7	29.2	66.0
	12	111.6	19.2	18.9	43.0	129.6	22.3	22.8	47.7	155.9	26.8	26.5	59.0	178.0	30.6	30.9	66.6
	13	114.9	19.8	19.9	43.4	133.4	22.9	24.1	48.2	160.5	27.6	28.0	59.5	183.2	31.5	32.8	67.2
	14	118.2	20.3	21.1	43.8	137.2	23.6	25.5	48.6	165.1	28.4	29.6	60.1	188.5	32.4	34.6	67.8
	15	121.5	20.9	22.2	44.2	141.0	24.3	26.9	49.0	169.7	29.2	31.3	60.6	193.7	33.3	36.6	68.5
46	5	84.7	14.6	11.0	42.2	98.3	16.9	13.3	46.9	118.3	20.3	15.4	57.9	135.1	23.2	17.9	65.4
	6	87.9	15.1	11.9	42.6	102.1	17.6	14.3	47.3	122.8	21.1	16.6	58.5	140.2	24.1	19.3	66.1
	7	91.2	15.7	12.7	43.0	105.8	18.2	15.4	47.8	127.3	21.9	17.8	59.0	145.3	25.0	20.7	66.7
	8	94.4	16.2	13.6	43.5	109.5	18.8	16.4	48.2	131.8	22.7	19.0	59.6	150.5	25.9	22.2	67.3
	9	97.6	16.8	14.5	43.9	113.2	19.5	17.5	48.7	136.3	23.4	20.3	60.2	155.6	26.8	23.7	68.0
	10	100.8	17.3	15.5	44.3	117.0	20.1	18.7	49.1	140.7	24.2	21.7	60.7	160.7	27.6	25.3	68.6

Where,
ABT: Condenser Air Inlet Temperature (°C)
COT: Chilled Water Outlet Temperature (°C)
CCAP: Cooling Capacity (kW)

CFR: Chilled Water Flow Rate at 5°C (m^3/h)
CPD: Water Cooler Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

Performance Table (cont.)

		RHU2E80AG2				RHU2E100AG2				RHU2E120AG2				RHU2E140AG2			
ABT	COT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT
25	5	200.9	34.6	39.3	53.8	253.5	43.6	21.8	65.2	305.0	52.5	25.4	80.6	348.2	59.9	29.6	91.0
	6	207.6	35.7	41.9	54.4	261.9	45.0	23.3	66.0	315.2	54.2	27.1	81.6	359.9	61.9	31.6	92.1
	7	214.3	36.9	44.7	55.1	270.4	46.5	24.7	66.8	325.3	56.0	28.8	82.5	371.5	63.9	33.7	93.2
	8	221.0	38.0	47.5	55.7	278.8	48.0	26.3	67.5	335.5	57.7	30.6	83.5	383.1	65.9	35.8	94.3
	9	227.7	39.2	50.4	56.3	287.3	49.4	27.8	68.3	345.7	59.5	32.4	84.4	394.7	67.9	38.0	95.3
	10	234.4	40.3	53.3	57.0	295.7	50.9	29.5	69.1	355.9	61.2	34.3	85.4	406.4	69.9	40.2	96.4
	11	241.1	41.5	56.4	57.6	304.2	52.3	31.1	69.8	366.0	63.0	36.3	86.3	418.0	71.9	42.5	97.5
	12	247.8	42.6	59.5	58.2	312.7	53.8	32.8	70.6	376.2	64.7	38.3	87.3	429.6	73.9	44.9	98.6
	13	254.5	43.8	62.8	58.9	321.1	55.2	34.6	71.4	386.4	66.5	40.3	88.2	441.2	75.9	47.3	99.6
	14	261.3	44.9	66.1	59.5	329.6	56.7	36.4	72.1	396.6	68.2	42.5	89.2	452.8	77.9	49.8	100.7
	15	268.0	46.1	69.5	60.1	338.0	58.1	38.2	72.9	406.7	70.0	44.6	90.1	464.5	79.9	52.3	101.8
30	5	194.1	33.4	36.7	58.9	244.9	42.1	20.4	71.4	294.7	50.7	23.7	88.2	336.5	57.9	27.7	99.6
	6	200.8	34.5	39.3	59.5	253.3	43.6	21.8	72.2	304.7	52.4	25.3	89.2	348.0	59.9	29.6	100.7
	7	207.4	35.7	41.9	60.2	261.7	45.0	23.2	73.0	314.8	54.2	27.0	90.2	359.5	61.8	31.5	101.9
	8	214.1	36.8	44.6	60.8	270.0	46.4	24.7	73.8	324.9	55.9	28.7	91.2	371.0	63.8	33.6	103.0
	9	220.7	38.0	47.3	61.5	278.4	47.9	26.2	74.6	335.0	57.6	30.5	92.2	382.5	65.8	35.7	104.1
	10	227.3	39.1	50.2	62.2	286.8	49.3	27.8	75.4	345.1	59.4	32.3	93.1	394.1	67.8	37.8	105.2
	11	234.0	40.2	53.1	62.8	295.2	50.8	29.4	76.1	355.2	61.1	34.2	94.1	405.6	69.8	40.0	106.3
	12	240.6	41.4	56.2	63.5	303.6	52.2	31.0	76.9	365.3	62.8	36.1	95.1	417.1	71.7	42.3	107.4
	13	247.3	42.5	59.3	64.1	312.0	53.7	32.7	77.7	375.4	64.6	38.1	96.1	428.6	73.7	44.7	108.5
	14	253.9	43.7	62.5	64.8	320.3	55.1	34.4	78.5	385.5	66.3	40.2	97.1	440.2	75.7	47.1	109.6
	15	260.6	44.8	65.7	65.4	328.7	56.5	36.2	79.3	395.5	68.0	42.2	98.0	451.7	77.7	49.5	110.7
35	5	182.2	31.3	32.4	63.6	229.8	39.5	18.0	77.2	276.5	47.6	20.9	95.4	315.8	54.3	24.4	107.7
	6	188.6	32.4	34.7	64.3	237.9	40.9	19.3	78.0	286.3	49.2	22.4	96.4	326.9	56.2	26.1	108.9
	7	195.0	33.5	37.1	65.0	246.0	42.3	20.6	78.8	296.0	50.9	23.9	97.4	338.0	58.1	27.9	110.0
	8	201.4	34.6	39.5	65.7	254.1	43.7	21.9	79.6	305.7	52.6	25.5	98.4	349.1	60.0	29.8	111.1
	9	207.8	35.7	42.0	66.4	262.2	45.1	23.3	80.4	315.5	54.3	27.1	99.4	360.2	62.0	31.7	112.3
	10	214.2	36.9	44.6	67.0	270.3	46.5	24.7	81.3	325.2	55.9	28.8	100.4	371.4	63.9	33.6	113.4
	11	220.7	38.0	47.3	67.7	278.4	47.9	26.2	82.1	335.0	57.6	30.5	101.4	382.5	65.8	35.7	114.6
	12	227.1	39.1	50.1	68.4	286.5	49.3	27.7	82.9	344.7	59.3	32.3	102.5	393.6	67.7	37.7	115.7
	13	233.5	40.2	52.9	69.1	294.6	50.7	29.2	83.7	354.4	61.0	34.1	103.5	404.7	69.6	39.9	116.9
	14	239.9	41.3	55.8	69.7	302.7	52.1	30.8	84.5	364.2	62.6	35.9	104.5	415.9	71.5	42.1	118.0
	15	246.3	42.4	58.8	70.4	310.8	53.5	32.4	85.3	373.9	64.3	37.8	105.5	427.0	73.4	44.3	119.1
40	5	170.2	29.3	28.3	69.9	214.7	36.9	15.8	84.7	258.4	44.4	18.3	104.7	295.0	50.7	21.3	118.2
	6	176.4	30.3	30.4	70.6	222.5	38.3	17.0	85.6	267.8	46.1	19.7	105.7	305.8	52.6	22.9	119.4
	7	182.6	31.4	32.5	71.3	230.3	39.6	18.1	86.4	277.2	47.7	21.0	106.8	316.5	54.4	24.5	120.6
	8	188.8	32.5	34.8	72.0	238.2	41.0	19.3	87.3	286.6	49.3	22.4	107.9	327.2	56.3	26.2	121.8
	9	195.0	33.5	37.0	72.7	246.0	42.3	20.6	88.1	295.9	50.9	23.9	108.9	337.9	58.1	27.9	123.0
	10	201.2	34.6	39.4	73.4	253.8	43.6	21.9	89.0	305.3	52.5	25.4	110.0	348.7	60.0	29.7	124.2
	11	207.3	35.7	41.8	74.1	261.6	45.0	23.2	89.9	314.7	54.1	27.0	111.1	359.4	61.8	31.5	125.4
	12	213.5	36.7	44.3	74.8	269.4	46.3	24.6	90.7	324.1	55.7	28.6	112.1	370.1	63.7	33.4	126.6
	13	219.7	37.8	46.9	75.5	277.2	47.7	26.0	91.6	333.5	57.4	30.2	113.2	380.8	65.5	35.4	127.8
	14	225.9	38.9	49.6	76.3	285.0	49.0	27.4	92.4	342.9	59.0	31.9	114.3	391.6	67.3	37.3	129.0
	15	232.1	39.9	52.3	77.0	292.8	50.4	28.9	93.3	352.3	60.6	33.7	115.3	402.3	69.2	39.4	130.3
43	5	163.0	28.0	26.0	73.6	205.7	35.4	14.5	89.2	247.5	42.6	16.8	110.3	282.6	48.6	19.6	124.5
	6	169.1	29.1	28.0	74.3	213.3	36.7	15.6	90.1	256.7	44.1	18.1	111.4	293.1	50.4	21.1	125.8
	7	175.1	30.1	30.0	75.0	221.0	38.0	16.7	91.0	265.9	45.7	19.4	112.5	303.6	52.2	22.6	127.0
	8	181.2	31.2	32.0	75.8	228.6	39.3	17.9	91.9	275.0	47.3	20.7	113.6	314.1	54.0	24.2	128.2
	9	187.2	32.2	34.2	76.5	236.2	40.6	19.0	92.8	284.2	48.9	22.1	114.6	324.6	55.8	25.8	129.5
	10	193.3	33.2	36.4	77.2	243.8	41.9	20.2	93.6	293.4	50.5	23.5	115.7	335.0	57.6	27.4	130.7
	11	199.3	34.3	38.7	78.0	251.5	43.3	21.5	94.5	302.6	52.0	25.0	116.8	345.5	59.4	29.2	132.0
	12	205.4	35.3	41.1	78.7	259.1	44.6	22.8	95.4	311.8	53.6	26.5	117.9	356.0	61.2	30.9	133.2
	13	211.4	36.4	43.5	79.4	266.7	45.9	24.1	96.3	321.0	55.2	28.0	119.0	366.5	63.0	32.8	134.4
	14	217.5	37.4	46.0	80.2	274.4	47.2	25.5	97.2	330.1	56.8	29.6	120.1	377.0	64.8	34.6	135.7
	15	223.5	38.4	48.5	80.9	282.0	48.5	26.9	98.1	339.3	58.4	31.3	121.2	387.5	66.6	36.6	136.9
46	5	155.9	26.8	23.8	77.3	196.6	33.8	13.3	93.7	236.6	40.7	15.4	115.8	270.2	46.5	17.9	130.8
	6	161.8	27.8	25.6	78.1	204.1	35.1	14.3	94.6	245.6	42.2	16.6	117.0	280.4	48.2	19.3	132.1
	7	167.7	28.8	27.5	78.8	211.6	36.4	15.4	95.5	254.6	43.8	17.8	118.1	290.7	50.0	20.7	133.4
	8	173.6	29.9	29.5	79.6	219.0	37.7	16.4	96.5	263.5	45.3	19.0	119.2	300.9	51.8	22.2	134.7
	9	179.5	30.9	31.5	80.3	226.5	39.0	17.5	97.4	272.5	46.9	20.3	120.4	311.2	53.5	23.7	135.9
	10	185.4	31.9	33.5	81.1	233.9	40.2	18.7	98.3	281.5	48.4	21.7	121.5	321.4	55.3	25.3	137.2

Where,
ABT: Condenser Air Inlet Temperature (°C)
COT: Chilled Water Outlet Temperature (°C)
CCAP: Cooling Capacity (kW)

CFR: Chilled Water Flow Rate at 5°C (m^3/h)
CPD: Water Cooler Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

Performance Table (cont.)

		RHU2E160AG2				RHU2E180AG2				RHU2E210AG2				RHU2E240AG2			
ABT	COT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT	CCAP	CFR	CPD	IPT
25	5	401.8	69.1	39.3	107.6	457.5	78.7	25.4	120.9	522.4	89.8	29.6	136.6	602.7	103.7	39.3	161.4
	6	415.2	71.4	41.9	108.9	472.7	81.3	27.1	122.3	539.8	92.8	31.6	138.2	622.8	107.1	41.9	163.3
	7	428.6	73.7	44.7	110.1	488.0	83.9	28.8	123.8	557.2	95.8	33.7	139.8	643.0	110.6	44.7	165.2
	8	442.1	76.0	47.5	111.4	503.3	86.6	30.6	125.2	574.7	98.8	35.8	141.4	663.1	114.0	47.5	167.1
	9	455.5	78.3	50.4	112.7	518.5	89.2	32.4	126.6	592.1	101.8	38.0	143.0	683.2	117.5	50.4	169.0
	10	468.9	80.6	53.3	113.9	533.8	91.8	34.3	128.0	609.5	104.8	40.2	144.6	703.3	121.0	53.3	170.9
	11	482.3	83.0	56.4	115.2	549.1	94.4	36.3	129.5	627.0	107.8	42.5	146.2	723.4	124.4	56.4	172.8
	12	495.7	85.3	59.5	116.5	564.3	97.1	38.3	130.9	644.4	110.8	44.9	147.8	743.5	127.9	59.5	174.7
	13	509.1	87.6	62.8	117.7	579.6	99.7	40.3	132.3	661.8	113.8	47.3	149.4	763.6	131.3	62.8	176.6
	14	522.5	89.9	66.1	119.0	594.9	102.3	42.5	133.7	679.3	116.8	49.8	151.0	783.8	134.8	66.1	178.5
	15	535.9	92.2	69.5	120.3	610.1	104.9	44.6	135.2	696.7	119.8	52.3	152.7	803.9	138.3	69.5	180.4
30	5	388.2	66.8	36.7	117.8	442.0	76.0	23.7	132.3	504.7	86.8	27.7	149.5	582.3	100.2	36.7	176.6
	6	401.5	69.1	39.3	119.1	457.1	78.6	25.3	133.8	522.0	89.8	29.6	151.1	602.3	103.6	39.3	178.6
	7	414.8	71.3	41.9	120.4	472.3	81.2	27.0	135.3	539.3	92.8	31.5	152.8	622.2	107.0	41.9	180.6
	8	428.1	73.6	44.6	121.7	487.4	83.8	28.7	136.8	556.5	95.7	33.6	154.5	642.2	110.5	44.6	182.5
	9	441.4	75.9	47.3	123.0	502.5	86.4	30.5	138.2	573.8	98.7	35.7	156.1	662.1	113.9	47.3	184.5
	10	454.7	78.2	50.2	124.3	517.7	89.0	32.3	139.7	591.1	101.7	37.8	157.8	682.0	117.3	50.2	186.5
	11	468.0	80.5	53.1	125.6	532.8	91.6	34.2	141.2	608.4	104.6	40.0	159.4	702.0	120.7	53.1	188.4
	12	481.3	82.8	56.2	126.9	547.9	94.2	36.1	142.7	625.7	107.6	42.3	161.1	721.9	124.2	56.2	190.4
	13	494.6	85.1	59.3	128.2	563.1	96.8	38.1	144.1	642.9	110.6	44.7	162.8	741.9	127.6	59.3	192.4
	14	507.9	87.4	62.5	129.6	578.2	99.4	40.2	145.6	660.2	113.6	47.1	164.4	761.8	131.0	62.5	194.3
	15	521.2	89.6	65.7	130.9	593.3	102.1	42.2	147.1	677.5	116.5	49.5	166.1	781.7	134.5	65.7	196.3
35	5	364.3	62.7	32.4	127.3	414.8	71.3	20.9	143.1	473.6	81.5	24.4	161.6	546.5	94.0	32.4	190.9
	6	377.2	64.9	34.7	128.6	429.4	73.9	22.4	144.6	490.3	84.3	26.1	163.3	565.8	97.3	34.7	193.0
	7	390.0	67.1	37.1	130.0	444.0	76.4	23.9	146.1	507.0	87.2	27.9	165.0	585.0	100.6	37.1	195.0
	8	402.8	69.3	39.5	131.4	458.6	78.9	25.5	147.6	523.7	90.1	29.8	166.7	604.2	103.9	39.5	197.0
	9	415.7	71.5	42.0	132.7	473.2	81.4	27.1	149.1	540.4	92.9	31.7	168.4	623.5	107.2	42.0	199.1
	10	428.5	73.7	44.6	134.1	487.8	83.9	28.8	150.7	557.0	95.8	33.6	170.1	642.7	110.6	44.6	201.1
	11	441.3	75.9	47.3	135.4	502.4	86.4	30.5	152.2	573.7	98.7	35.7	171.9	662.0	113.9	47.3	203.1
	12	454.2	78.1	50.1	136.8	517.1	88.9	32.3	153.7	590.4	101.6	37.7	173.6	681.2	117.2	50.1	205.1
	13	467.0	80.3	52.9	138.1	531.7	91.4	34.1	155.2	607.1	104.4	39.9	175.3	700.5	120.5	52.9	207.2
	14	479.8	82.5	55.8	139.5	546.3	94.0	35.9	156.7	623.8	107.3	42.1	177.0	719.7	123.8	55.8	209.2
	15	492.7	84.7	58.8	140.8	560.9	96.5	37.8	158.2	640.5	110.2	44.3	178.7	739.0	127.1	58.8	211.2
40	5	340.4	58.6	28.3	139.7	387.6	66.7	18.3	157.0	442.6	76.1	21.3	177.3	510.7	87.8	28.3	209.6
	6	352.8	60.7	30.4	141.1	401.7	69.1	19.7	158.6	458.7	78.9	22.9	179.1	529.2	91.0	30.4	211.7
	7	365.2	62.8	32.5	142.6	415.7	71.5	21.0	160.2	474.7	81.7	24.5	180.9	547.8	94.2	32.5	213.8
	8	377.6	64.9	34.8	144.0	429.8	73.9	22.4	161.8	490.8	84.4	26.2	182.7	566.3	97.4	34.8	216.0
	9	389.9	67.1	37.0	145.4	443.9	76.4	23.9	163.4	506.9	87.2	27.9	184.5	584.9	100.6	37.0	218.1
	10	402.3	69.2	39.4	146.8	458.0	78.8	25.4	165.0	523.0	90.0	29.7	186.4	603.5	103.8	39.4	220.2
	11	414.7	71.3	41.8	148.2	472.1	81.2	27.0	166.6	539.1	92.7	31.5	188.2	622.0	107.0	41.8	222.4
	12	427.1	73.5	44.3	149.7	486.2	83.6	28.6	168.2	555.2	95.5	33.4	190.0	640.6	110.2	44.3	224.5
	13	439.4	75.6	46.9	151.1	500.3	86.0	30.2	169.8	571.3	98.3	35.4	191.8	659.1	113.4	46.9	226.6
	14	451.8	77.7	49.6	152.5	514.4	88.5	31.9	171.4	587.3	101.0	37.3	193.6	677.7	116.6	49.6	228.8
	15	464.2	79.8	52.3	153.9	528.4	90.9	33.7	173.0	603.4	103.8	39.4	195.4	696.3	119.8	52.3	230.9
43	5	326.1	56.1	26.0	147.2	371.3	63.9	16.8	165.4	423.9	72.9	19.6	186.8	489.1	84.1	26.0	220.7
	6	338.2	58.2	28.0	148.6	385.0	66.2	18.1	167.0	439.7	75.6	21.1	188.6	507.3	87.3	28.0	222.9
	7	350.3	60.3	30.0	150.1	398.8	68.6	19.4	168.7	455.4	78.3	22.6	190.5	525.4	90.4	30.0	225.1
	8	362.4	62.3	32.0	151.6	412.6	71.0	20.7	170.3	471.1	81.0	24.2	192.4	543.6	93.5	32.0	227.3
	9	374.5	64.4	34.2	153.0	426.3	73.3	22.1	172.0	486.8	83.7	25.8	194.2	561.7	96.6	34.2	229.5
	10	386.6	66.5	36.4	154.5	440.1	75.7	23.5	173.6	502.6	86.4	27.4	196.1	579.9	99.7	36.4	231.7
	11	398.7	68.6	38.7	156.0	453.9	78.1	25.0	175.3	518.3	89.1	29.2	197.9	598.0	102.9	38.7	233.9
	12	410.8	70.7	41.1	157.4	467.7	80.4	26.5	176.9	534.0	91.9	30.9	199.8	616.2	106.0	41.1	236.1
	13	422.9	72.7	43.5	158.9	481.4	82.8	28.0	178.6	549.7	94.6	32.8	201.7	634.3	109.1	43.5	238.3
	14	435.0	74.8	46.0	160.3	495.2	85.2	29.6	180.2	565.5	97.3	34.6	203.5	652.5	112.2	46.0	240.5
	15	447.1	76.9	48.5	161.8	509.0	87.5	31.3	181.8	581.2	100.0	36.6	205.4	670.6	115.3	48.5	242.7
46	5	311.8	53.6	23.8	154.6	354.9	61.0	15.4	173.8	405.3	69.7	17.9	196.2	467.6	80.4	23.8	231.9
	6	323.6	55.7	25.6	156.1	368.4	63.4	16.6	175.5	420.7	72.4	19.3	198.2	485.4	83.5	25.6	234.2
	7	335.4	57.7	27.5	157.6	381.8	65.7	17.8	177.1	436.0	75.0	20.7	200.1	503.1	86.5	27.5	236.4
	8	347.2	59.7	29.5	159.1	395.3	68.0	19.0	178.8	451.4	77.6	22.2	202.0	520.8	89.6	29.5	238.7
	9	359.0	61.8	31.5	160.6	408.8	70.3	20.3	180.5	466.8	80.3	23.7	203.9	538.6	92.6	31.5	241.0
	10	370.9	63.8	33.5	162.2	422.2	72.6	21.7	182.2	482.1	82.9	25.3	205.8	556.3	95.7	33.5	243.2

Where,
ABT: Condenser Air Inlet Temperature (°C)
COT: Chilled Water Outlet Temperature (°C)
CCAP: Cooling Capacity (kW)
CFR: Chilled Water Flow Rate at 5°C (m^3/h)
CPD: Water Cooler Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

15.4. Performance Table (RHU2E-AG2) (Heating Operation)

		RHU2E40AG2				RHU2E50AG2				RHU2E60AG2				RHU2E70AG2			
ABTW	HOT	HCAP	HFR	CPD	IPT	HCAP	HFR	CPD	IPT	HCAP	HFR	CPD	IPT	HCAP	HFR	CPD	IPT
	35	135.9	23.4	27.6	32.7	156.9	27.0	33.1	35.2	187.8	32.3	38.2	43.3	228.6	39.3	50.7	53.9
	40	135.4	23.3	27.4	35.3	156.3	26.9	32.8	38.0	187.1	32.2	37.9	46.7	227.7	39.2	50.3	58.1
15	45	134.8	23.2	27.2	39.4	155.7	26.8	32.5	42.4	186.3	32.0	37.6	52.1	226.7	39.0	49.9	64.8
	50	134.3	23.1	27.0	45.0	155.0	26.7	32.3	48.4	185.5	31.9	37.3	59.5	225.8	38.8	49.5	74.0
	55	133.7	23.0	26.7	52.1	154.4	26.6	32.0	56.0	184.7	31.8	37.0	68.9	224.9	38.7	49.1	85.6
	35	123.3	21.2	22.9	32.2	142.4	24.5	27.4	34.7	170.4	29.3	31.5	42.6	207.4	35.7	41.9	53.0
	40	122.2	21.0	22.5	34.8	141.1	24.3	26.9	37.5	168.8	29.0	31.0	46.1	205.5	35.3	41.1	57.3
10	45	121.0	20.8	22.0	38.8	139.7	24.0	26.4	41.7	167.2	28.8	30.4	51.3	203.6	35.0	40.3	63.8
	50	119.9	20.6	21.6	44.1	138.4	23.8	25.9	47.4	165.7	28.5	29.8	58.4	201.6	34.7	39.6	72.5
	55	118.7	20.4	21.3	50.8	137.1	23.6	25.4	54.6	164.1	28.2	29.3	67.2	199.7	34.3	38.8	83.5
6	45	110.0	18.9	18.3	38.3	127.0	21.8	21.9	41.2	152.0	26.1	25.2	50.7	185.0	31.8	33.4	63.0
	35	110.7	19.0	18.5	31.7	127.8	22.0	22.2	34.1	153.0	26.3	25.5	41.9	186.2	32.0	33.8	52.1
	40	109.0	18.7	18.0	34.3	125.8	21.6	21.5	36.9	150.6	25.9	24.7	45.4	183.3	31.5	32.8	56.5
5	45	107.2	18.4	17.4	38.2	123.8	21.3	20.9	41.1	148.2	25.5	24.0	50.5	180.4	31.0	31.8	62.8
	50	105.5	18.1	16.9	43.2	121.8	21.0	20.2	46.5	145.8	25.1	23.2	57.2	177.5	30.5	30.8	71.1
	55	103.8	17.9	16.4	49.5	119.8	20.6	19.6	53.2	143.4	24.7	22.5	65.5	174.6	30.0	29.8	81.4
	35	98.1	16.9	14.7	31.2	113.2	19.5	17.5	33.5	135.5	23.3	20.1	41.2	164.9	28.4	26.6	51.3
	40	95.8	16.5	14.0	33.8	110.6	19.0	16.7	36.4	132.3	22.8	19.2	44.8	161.1	27.7	25.4	55.7
0	45	93.5	16.1	13.4	37.6	107.9	18.6	16.0	40.4	129.1	22.2	18.3	49.7	157.2	27.0	24.2	61.8
	50	91.1	15.7	12.7	42.4	105.2	18.1	15.2	45.6	126.0	21.7	17.4	56.1	153.3	26.4	23.0	69.7
	55	88.8	15.3	12.1	48.2	102.6	17.6	14.5	51.8	122.8	21.1	16.6	63.8	149.4	25.7	21.9	79.3
	35	85.4	14.7	11.2	30.6	98.7	17.0	13.4	33.0	118.1	20.3	15.4	40.6	143.7	24.7	20.3	50.4
	40	82.6	14.2	10.5	33.4	95.3	16.4	12.5	35.9	114.1	19.6	14.4	44.2	138.8	23.9	18.9	54.9
-5	45	79.7	13.7	9.8	37.0	92.0	15.8	11.7	39.8	110.1	18.9	13.4	48.9	134.0	23.0	17.6	60.8
	50	76.8	13.2	9.1	41.5	88.6	15.2	10.9	44.6	106.1	18.2	12.5	54.9	129.1	22.2	16.4	68.2
	55	73.9	12.7	8.5	46.9	85.3	14.7	10.1	50.4	102.1	17.6	11.5	62.1	124.3	21.4	15.2	77.1
	35	72.8	12.5	8.2	30.1	84.1	14.5	9.8	32.4	100.6	17.3	11.2	39.9	122.5	21.1	14.8	49.5
	40	69.4	11.9	7.5	32.9	80.1	13.8	8.9	35.4	95.8	16.5	10.2	43.5	116.6	20.1	13.4	54.1
-10	45	65.9	11.3	6.8	36.4	76.1	13.1	8.1	39.1	91.0	15.7	9.2	48.1	110.8	19.1	12.1	59.8
	50	62.4	10.7	6.1	40.6	72.1	12.4	7.3	43.7	86.2	14.8	8.3	53.8	105.0	18.1	10.9	66.8
	55	58.9	10.1	5.5	45.6	68.0	11.7	6.5	49.1	81.4	14.0	7.4	60.4	99.1	17.0	9.7	75.0
	35	54.2	9.3	4.6	29.6	62.6	10.8	5.5	31.8	74.9	12.9	6.3	39.2	91.1	15.7	8.2	48.7
	40	50.5	8.7	4.1	32.4	58.3	10.0	4.8	34.8	69.8	12.0	5.5	42.9	85.0	14.6	7.2	53.3
-15	45	46.9	8.1	3.5	35.8	54.1	9.3	4.2	38.5	64.8	11.1	4.7	47.3	78.9	13.6	6.2	58.8
	50	43.2	7.4	3.0	39.7	49.9	8.6	3.6	42.7	59.7	10.3	4.0	52.6	72.7	12.5	5.3	65.4
	55	39.6	6.8	2.5	44.3	45.7	7.9	3.0	47.7	54.7	9.4	3.4	58.7	66.6	11.5	4.4	72.9

Where,
ABTW: Evaporator Air Inlet Temperature (°C)
HOT: Heated Water Outlet Temperature (°C)
HCAP: Heating Capacity (kW)

HFR: Heated Water Flow Rate at 5°C (m^3/h)
CPD: Water Heat Exchanger Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

Performance Table (cont.)

		RHU2E80AG2				RHU2E100AG2				RHU2E120AG2				RHU2E140AG2			
ABTW	HOT	HCAP	HFR	CPD	IPT	HCAP	HFR	CPD	IPT	HCAP	HFR	CPD	IPT	HCAP	HFR	CPD	IPT
	35	228.6	39.3	50.7	53.9	313.9	54.0	33.1	70.4	375.7	64.6	38.2	86.7	457.2	78.6	50.7	107.7
	40	227.7	39.2	50.3	58.1	312.6	53.8	32.8	76.0	374.1	64.4	37.9	93.5	455.4	78.3	50.3	116.2
15	45	226.7	39.0	49.9	64.8	311.3	53.5	32.5	84.7	372.6	64.1	37.6	104.3	453.5	78.0	49.9	129.6
	50	225.8	38.8	49.5	74.0	310.0	53.3	32.3	96.8	371.0	63.8	37.3	119.1	451.6	77.7	49.5	147.9
	55	224.9	38.7	49.1	85.6	308.7	53.1	32.0	112.0	369.5	63.6	37.0	137.8	449.7	77.4	49.1	171.3
	35	207.4	35.7	41.9	53.0	284.7	49.0	27.4	69.3	340.8	58.6	31.5	85.3	414.8	71.3	41.9	106.0
	40	205.5	35.3	41.1	57.3	282.1	48.5	26.9	74.9	337.6	58.1	31.0	92.2	410.9	70.7	41.1	114.6
10	45	203.6	35.0	40.3	63.8	279.5	48.1	26.4	83.4	334.5	57.5	30.4	102.7	407.1	70.0	40.3	127.6
	50	201.6	34.7	39.6	72.5	276.8	47.6	25.9	94.9	331.3	57.0	29.8	116.8	403.3	69.4	39.6	145.1
	55	199.7	34.3	38.8	83.5	274.2	47.2	25.4	109.2	328.2	56.4	29.3	134.4	399.4	68.7	38.8	167.0
6	45	185.0	31.8	33.4	63.0	254.0	43.7	21.9	82.4	304.0	52.3	25.2	101.4	370.0	63.6	33.4	126.0
	35	186.2	32.0	33.8	52.1	255.6	44.0	22.2	68.2	305.9	52.6	25.5	83.9	372.3	64.0	33.8	104.2
	40	183.3	31.5	32.8	56.5	251.6	43.3	21.5	73.9	301.1	51.8	24.7	90.9	366.5	63.0	32.8	112.9
5	45	180.4	31.0	31.8	62.8	247.6	42.6	20.9	82.1	296.4	51.0	24.0	101.1	360.7	62.0	31.8	125.6
	50	177.5	30.5	30.8	71.1	243.7	41.9	20.2	93.0	291.6	50.2	23.2	114.4	354.9	61.0	30.8	142.2
	55	174.6	30.0	29.8	81.4	239.7	41.2	19.6	106.4	286.8	49.3	22.5	131.0	349.1	60.0	29.8	162.8
	35	164.9	28.4	26.6	51.3	226.5	38.9	17.5	67.0	271.0	46.6	20.1	82.5	329.9	56.7	26.6	102.5
	40	161.1	27.7	25.4	55.7	221.1	38.0	16.7	72.8	264.7	45.5	19.2	89.6	322.1	55.4	25.4	111.3
0	45	157.2	27.0	24.2	61.8	215.8	37.1	16.0	80.8	258.3	44.4	18.3	99.5	314.3	54.1	24.2	123.6
	50	153.3	26.4	23.0	69.7	210.5	36.2	15.2	91.1	251.9	43.3	17.4	112.1	306.6	52.7	23.0	139.3
	55	149.4	25.7	21.9	79.3	205.1	35.3	14.5	103.7	245.5	42.2	16.6	127.6	298.8	51.4	21.9	158.5
	35	143.7	24.7	20.3	50.4	197.3	33.9	13.4	65.9	236.1	40.6	15.4	81.1	287.4	49.4	20.3	100.8
	40	138.8	23.9	18.9	54.9	190.6	32.8	12.5	71.8	228.2	39.2	14.4	88.3	277.7	47.8	18.9	109.7
-5	45	134.0	23.0	17.6	60.8	184.0	31.6	11.7	79.5	220.2	37.9	13.4	97.9	268.0	46.1	17.6	121.6
	50	129.1	22.2	16.4	68.2	177.3	30.5	10.9	89.2	212.2	36.5	12.5	109.8	258.3	44.4	16.4	136.5
	55	124.3	21.4	15.2	77.1	170.6	29.3	10.1	100.9	204.2	35.1	11.5	124.2	248.5	42.7	15.2	154.3
	35	122.5	21.1	14.8	49.5	168.2	28.9	9.8	64.8	201.3	34.6	11.2	79.7	245.0	42.1	14.8	99.0
	40	116.6	20.1	13.4	54.1	160.1	27.5	8.9	70.7	191.7	33.0	10.2	87.0	233.3	40.1	13.4	108.1
-10	45	110.8	19.1	12.1	59.8	152.1	26.2	8.1	78.2	182.1	31.3	9.2	96.3	221.6	38.1	12.1	119.6
	50	105.0	18.1	10.9	66.8	144.1	24.8	7.3	87.4	172.5	29.7	8.3	107.5	209.9	36.1	10.9	133.6
	55	99.1	17.0	9.7	75.0	136.1	23.4	6.5	98.1	162.9	28.0	7.4	120.7	198.2	34.1	9.7	150.0
	35	91.1	15.7	8.2	48.7	125.1	21.5	5.5	63.6	149.7	25.8	6.3	78.3	182.3	31.3	8.2	97.3
	40	85.0	14.6	7.2	53.3	116.7	20.1	4.8	69.6	139.7	24.0	5.5	85.7	170.0	29.2	7.2	106.5
-15	45	78.9	13.6	6.2	58.8	108.3	18.6	4.2	76.9	129.6	22.3	4.7	94.7	157.7	27.1	6.2	117.6
	50	72.7	12.5	5.3	65.4	99.8	17.2	3.6	85.5	119.5	20.6	4.0	105.2	145.4	25.0	5.3	130.7
	55	66.6	11.5	4.4	72.9	91.4	15.7	3.0	95.3	109.4	18.8	3.4	117.3	133.1	22.9	4.4	145.8

Where,
ABTW: Evaporator Air Inlet Temperature (°C)
HOT: Heated Water Outlet Temperature (°C)
HCAP: Heating Capacity (kW)

HFR: Heated Water Flow Rate at 5°C (m^3/h)
CPD: Water Heat Exchanger Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

Performance Table (cont.)

		RHU2E160AG2				RHU2E180AG2				RHU2E210AG2				RHU2E240AG2			
ABTW	HOT	HCAP	HFR	CPD	IPT	HCAP	HFR	CPD	IPT	HCAP	HFR	CPD	IPT	HCAP	HFR	CPD	IPT
	35	457.2	78.6	50.7	107.7	563.5	96.9	38.2	130.0	685.9	118.0	50.7	161.6	685.9	118.0	50.7	161.6
	40	455.4	78.3	50.3	116.2	561.2	96.5	37.9	140.2	683.0	117.5	50.3	174.3	683.0	117.5	50.3	174.3
15	45	453.5	78.0	49.9	129.6	558.9	96.1	37.6	156.4	680.2	117.0	49.9	194.4	680.2	117.0	49.9	194.4
	50	451.6	77.7	49.5	147.9	556.6	95.7	37.3	178.6	677.4	116.5	49.5	221.9	677.4	116.5	49.5	221.9
	55	449.7	77.4	49.1	171.3	554.2	95.3	37.0	206.7	674.6	116.0	49.1	256.9	674.6	116.0	49.1	256.9
	35	414.8	71.3	41.9	106.0	511.2	87.9	31.5	127.9	622.2	107.0	41.9	159.0	622.2	107.0	41.9	159.0
	40	410.9	70.7	41.1	114.6	506.5	87.1	31.0	138.3	616.4	106.0	41.1	171.8	616.4	106.0	41.1	171.8
10	45	407.1	70.0	40.3	127.6	501.7	86.3	30.4	154.0	610.7	105.0	40.3	191.4	610.7	105.0	40.3	191.4
	50	403.3	69.4	39.6	145.1	497.0	85.5	29.8	175.1	604.9	104.0	39.6	217.6	604.9	104.0	39.6	217.6
	55	399.4	68.7	38.8	167.0	492.3	84.7	29.3	201.6	599.1	103.0	38.8	250.5	599.1	103.0	38.8	250.5
6	45	370.0	63.6	33.4	126.0	456.0	78.4	25.2	152.1	555.0	95.5	33.4	189.0	555.0	95.5	33.4	189.0
	35	372.3	64.0	33.8	104.2	458.9	78.9	25.5	125.8	558.5	96.1	33.8	156.4	558.5	96.1	33.8	156.4
	40	366.5	63.0	32.8	112.9	451.7	77.7	24.7	136.3	549.8	94.6	32.8	169.4	549.8	94.6	32.8	169.4
5	45	360.7	62.0	31.8	125.6	444.6	76.5	24.0	151.6	541.1	93.1	31.8	188.4	541.1	93.1	31.8	188.4
	50	354.9	61.0	30.8	142.2	437.4	75.2	23.2	171.7	532.4	91.6	30.8	213.3	532.4	91.6	30.8	213.3
	55	349.1	60.0	29.8	162.8	430.3	74.0	22.5	196.5	523.7	90.1	29.8	244.1	523.7	90.1	29.8	244.1
	35	329.9	56.7	26.6	102.5	406.5	69.9	20.1	123.7	494.8	85.1	26.6	153.8	494.8	85.1	26.6	153.8
	40	322.1	55.4	25.4	111.3	397.0	68.3	19.2	134.4	483.2	83.1	25.4	167.0	483.2	83.1	25.4	167.0
0	45	314.3	54.1	24.2	123.6	387.4	66.6	18.3	149.2	471.5	81.1	24.2	185.4	471.5	81.1	24.2	185.4
	50	306.6	52.7	23.0	139.3	377.9	65.0	17.4	168.2	459.9	79.1	23.0	209.0	459.9	79.1	23.0	209.0
	55	298.8	51.4	21.9	158.5	368.3	63.3	16.6	191.4	448.2	77.1	21.9	237.8	448.2	77.1	21.9	237.8
	35	287.4	49.4	20.3	100.8	354.2	60.9	15.4	121.7	431.1	74.2	20.3	151.2	431.1	74.2	20.3	151.2
	40	277.7	47.8	18.9	109.7	342.2	58.9	14.4	132.5	416.5	71.6	18.9	164.6	416.5	71.6	18.9	164.6
-5	45	268.0	46.1	17.6	121.6	330.3	56.8	13.4	146.8	402.0	69.1	17.6	182.4	402.0	69.1	17.6	182.4
	50	258.3	44.4	16.4	136.5	318.3	54.7	12.5	164.7	387.4	66.6	16.4	204.7	387.4	66.6	16.4	204.7
	55	248.5	42.7	15.2	154.3	306.3	52.7	11.5	186.2	372.8	64.1	15.2	231.4	372.8	64.1	15.2	231.4
	35	245.0	42.1	14.8	99.0	301.9	51.9	11.2	119.6	367.4	63.2	14.8	148.6	367.4	63.2	14.8	148.6
	40	233.3	40.1	13.4	108.1	287.5	49.5	10.2	130.5	349.9	60.2	13.4	162.2	349.9	60.2	13.4	162.2
-10	45	221.6	38.1	12.1	119.6	273.1	47.0	9.2	144.4	332.4	57.2	12.1	179.5	332.4	57.2	12.1	179.5
	50	209.9	36.1	10.9	133.6	258.7	44.5	8.3	161.3	314.9	54.2	10.9	200.4	314.9	54.2	10.9	200.4
	55	198.2	34.1	9.7	150.0	244.3	42.0	7.4	181.1	297.4	51.1	9.7	225.0	297.4	51.1	9.7	225.0
	35	182.3	31.3	8.2	97.3	224.6	38.6	6.3	117.5	273.4	47.0	8.2	146.0	273.4	47.0	8.2	146.0
	40	170.0	29.2	7.2	106.5	209.5	36.0	5.5	128.6	255.0	43.9	7.2	159.8	255.0	43.9	7.2	159.8
-15	45	157.7	27.1	6.2	117.6	194.4	33.4	4.7	142.0	236.6	40.7	6.2	176.5	236.6	40.7	6.2	176.5
	50	145.4	25.0	5.3	130.7	179.2	30.8	4.0	157.8	218.1	37.5	5.3	196.1	218.1	37.5	5.3	196.1
	55	133.1	22.9	4.4	145.8	164.1	28.2	3.4	176.0	199.7	34.4	4.4	218.7	199.7	34.4	4.4	218.7

Where,
ABTW: Evaporator Air Inlet Temperature (°C)
HOT: Heated Water Outlet Temperature (°C)
HCAP: Heating Capacity (kW)

HFR: Heated Water Flow Rate at 5°C (m^3/h)
CPD: Water Heat Exchanger Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

15.5. Electrical Data

◆ Air-Cooled Water Chiller units (RCU2E-AG2)

Model	Unit Main Power			Applicable Instantaneous Voltage (V)		Compressor Motor			Condenser Fan Motor		Maximum Unit Current	STC*2 Unit Maximum
						STC*1	RNC	IPT	RNC	IPT		
	Ph	(V)	(Hz)	Maximum	Minimum	(A)	(A)	(kW)	(A)	(kW)	(A)	(A)
RCU2E40AG2	3N~	400	50	440	360	125	60,1	36,2	12,0	2,4	94	125
RCU2E50AG2	3N~	400	50	440	360	125	68,7	41,4	12,0	3,3	105	125
RCU2E60AG2	3N~	400	50	440	360	161	82,5	49,7	12,0	3,3	123	161
RCU2E70AG2	3N~	400	50	440	360	195	92,9	56,0	12,0	5,0	137	195
RCU2E80AG2	3N~	400	50	440	360	195	108	65,0	12,0	5,0	157	195
RCU2E100AG2	3N~	400	50	440	360	125	137	82,8	24,0	6,6	211	154
RCU2E120AG2	3N~	400	50	440	360	161	165	99,4	24,0	6,6	247	194
RCU2E140AG2	3N~	400	50	440	360	195	186	112	24,0	10,0	274	230
RCU2E160AG2	3N~	400	50	440	360	195	216	130	24,0	10,0	314	230
RCU2E180AG2	3N~	400	50	440	360	161	247	149	36,0	9,9	370	226
RCU2E210AG2	3N~	400	50	440	360	195	279	168	36,0	15,0	412	265
RCU2E240AG2	3N~	400	50	440	360	195	324	195	36,0	15,0	471	265
RCU2E280AG2	3N~	400	50	440	360	195	372	224	48,0	20,0	549	301
RCU2E320AG2	3N~	400	50	440	360	195	431	260	48,0	20,0	628	301
RCU2E350AG2	3N~	400	50	440	360	195	465	280	60,0	25,0	686	336
RCU2E400AG2	3N~	400	50	440	360	195	539	325	60,0	25,0	784	336

RNC: Running Current (A)
STC: Starting Current (A)
IPT: Input (kW)
Ph: Nº of phases

NOTES:

1. *This data is based on the following conditions:*
   Chilled Water Inlet/Outlet Temperature: 12/7ºC, Ambient Temperature: 35ºC.
2. *The "Maximum Unit Current" shown in the above table is the maximum total unit running current at the following conditions.*
   Supply Voltage: 90% of the rated voltage, Unit Capacity: 100% at max. operating conditions
3. *The power supply cables must be sized to cover this maximum current value.*
4. *Starting Current (*1,*2) means as follows.*
   **1:First Compressor Starting Current*
   **2:Unit Maximum Starting Current, when Last Compressor starts.*
5. *Compressor motor is star-delta starting.*

◆ Air-to-Water Heat Pump Water Chiller (RHU2E-AG2)

Model	Unit Main Power			Applicable Instantaneous Voltage (V)		Compressor Motor					Air Side Heat Exchanger Fan Motor		Maximum Unit Current	STC*2 Unit Maximum
						STC*1 (A)	Cooling Operation		Heating Operation					
	Ph	(V)	(Hz)	Maximum	Minimum		RNC (A)	IPT (kW)	RNC (A)	IPT (kW)	RNC (A)	IPT (kW)	(A)	(A)
RHU2E40AG2	3N~	400	50	440	360	125	58.9	35.5	63.5	38.3	12.0	2.4	99	125
RHU2E50AG2	3N~	400	50	440	360	125	65.4	39.4	68.4	41.2	12.0	3.3	105	125
RHU2E60AG2	3N~	400	50	440	360	161	80.8	48.7	84.1	50.7	12.0	3.3	126	161
RHU2E70AG2	3N~	400	50	440	360	195	91.2	55.0	105	63.0	12.0	5.0	153	195
RHU2E80AG2	3N~	400	50	440	360	195	108	65.0	105	63.0	12.0	5.0	157	195
RHU2E100AG2	3N~	400	50	440	360	125	131	78.8	137	82.4	24.0	6.6	210	153
RHU2E120AG2	3N~	400	50	440	360	161	162	97.4	168	101	24.0	6.6	251	193
RHU2E140AG2	3N~	400	50	440	360	195	182	110	209	126	24.0	10.0	305	230
RHU2E160AG2	3N~	400	50	440	360	195	216	130	209	126	24.0	10.0	314	230
RHU2E180AG2	3N~	400	50	440	360	161	242	146	252	152	36.0	9.9	377	225
RHU2E210AG2	3N~	400	50	440	360	195	274	165	314	189	36.0	15.0	458	265
RHU2E240AG2	3N~	400	50	440	360	195	324	195	314	189	36.0	15.0	471	265

RNC: Running Current (A)
STC: Starting Current (A)
IPT: Input (kW)
Ph: Nº of phases

NOTES:

1. *This data is based on the following conditions...*
   Cooling operation: Chilled Water Inlet/Outlet Temperature: 12/7ºC, Ambient Temperature: 35ºC.
   Heating operation: Hot Water Inlet/Outlet Temperature 40/45ºC. Ambient Temperature: 6ºC (WB).
2. *The "Maximum Unit Current" shown in the above table is the maximum total unit running current at the following conditions.*
   Supply Voltage: 90% of the rated voltage, Unit Capacity: 100% at max. operating conditions
3. *The power supply cables must be sized to cover this maximum current value.*
4. *Starting Current (*1,*2) means as follows.*
   **1:First Compressor Starting Current*
   **2:Unit Maximum Starting Current, when Last Compressor starts.*
5. *Compressor motor is star-delta starting.*

15.6. Sound Data

◆ Standard Models

Model	Sound Power Level (dB)								Overall (dBA)
	Frequency Band (Hz)								
	63	125	250	500	1000	2000	4000	8000	
R(C/H)U2E40AG2	89	87	82	77	80	72	62	57	82
R(C/H)U2E50AG2	91	89	84	79	80	72	63	59	83
R(C/H)U2E60AG2	91	89	84	79	82	74	64	59	84
R(C/H)U2E70AG2	92	90	85	83	81	74	64	60	85
R(C/H)U2E80AG2	92	90	85	83	81	74	64	60	85
R(C/H)U2E100AG2	94	92	87	82	83	75	66	62	86
R(C/H)U2E120AG2	94	92	87	82	85	77	67	62	87
R(C/H)U2E140AG2	95	93	88	86	84	77	67	63	88
R(C/H)U2E160AG2	95	93	88	86	84	77	67	63	88
R(C/H)U2E180AG2	96	94	89	87	85	78	68	64	89
R(C/H)U2E210AG2	98	96	91	89	87	80	70	66	91
R(C/H)U2E240AG2	98	96	91	89	87	80	70	66	91
RCU2E280AG2	99	97	92	90	88	81	71	67	92
RCU2E320AG2	99	97	92	90	88	81	71	67	92
RCU2E350AG2	101	99	94	92	90	83	73	69	94
RCU2E400AG2	101	99	94	92	90	83	73	69	94

◆ Low Noise Option

Model	Sound Power Level (dB)								Overall (dBA)
	Frequency Band (Hz)								
	63	125	250	500	1000	2000	4000	8000	
R(C/H)U2E40AG2	87	85	80	75	78	70	60	55	80
R(C/H)U2E50AG2	89	87	82	77	78	70	61	57	81
R(C/H)U2E60AG2	89	87	82	77	80	72	62	57	82
R(C/H)U2E70AG2	90	88	83	81	79	72	62	58	83
R(C/H)U2E80AG2	90	88	83	81	79	72	62	58	83
R(C/H)U2E100AG2	92	90	85	80	81	73	64	60	84
R(C/H)U2E120AG2	92	90	85	78	83	75	65	60	85
R(C/H)U2E140AG2	93	91	86	84	82	75	65	61	86
R(C/H)U2E160AG2	93	91	86	84	82	75	65	61	86
R(C/H)U2E180AG2	94	92	87	85	83	76	66	62	87
R(C/H)U2E210AG2	96	94	89	87	85	78	68	64	89
R(C/H)U2E240AG2	96	94	89	87	85	78	68	64	89
RCU2E280AG2	97	95	90	88	86	79	69	65	90
RCU2E320AG2	97	95	90	88	86	79	69	65	90
RCU2E350AG2	99	97	92	90	88	81	71	67	92
RCU2E400AG2	99	97	92	90	88	81	71	67	92

◆ Super Low Noise Option

Model	Sound Power Level (dB)								Overall (dBA)
	Frequency Band (Hz)								
	63	125	250	500	1000	2000	4000	8000	
R(C/H)U2E40AG2	85	83	78	73	76	68	58	53	78
R(C/H)U2E50AG2	87	85	80	75	76	68	59	55	79
R(C/H)U2E60AG2	87	85	80	75	78	70	60	55	80
R(C/H)U2E70AG2	88	86	81	79	77	70	60	56	81
R(C/H)U2E80AG2	88	86	81	79	77	70	60	56	81
R(C/H)U2E100AG2	90	88	83	78	79	71	62	58	82
R(C/H)U2E120AG2	90	88	83	76	81	73	63	58	83
R(C/H)U2E140AG2	91	89	84	82	80	73	63	59	84
R(C/H)U2E160AG2	91	89	84	82	80	73	63	59	84
R(C/H)U2E180AG2	92	90	85	83	81	74	64	60	85
R(C/H)U2E210AG2	94	92	87	85	83	76	66	62	87
R(C/H)U2E240AG2	94	92	87	85	83	76	66	62	87
RCU2E280AG2	95	93	88	86	84	77	67	63	88
RCU2E320AG2	95	93	88	86	84	77	67	63	88
RCU2E350AG2	97	95	90	88	86	79	69	65	90
RCU2E400AG2	97	95	90	88	86	79	69	65	90

NOTE:

Operating conditions for all sound data are as follows.
Water Inlet/Outlet Temperature 12/7 °C, Ambient Temperature 35 °C, All Fans Running

16. Application Data

Contents

16.1. Working Range

◆ Air-Cooled Water Chiller units RCU2E-AG2

Item		Description	Remarks
Power Supply	Working Voltage	90%~110% of Rated Voltage	
	Voltage Imbalance	Within ±3% Deviation from Each Voltage at Compressor Terminals	
	Starting Voltage	Higher than 85% of Rated Voltage	
Ambient Temperature		-15 ~ 46ºC	
Water Outlet Temperature	Standard	5 ~ 15ºC	Water
	Low Water Temperature Option	4 ~ 0ºC (Low 1) -1 ~ -5ºC (Low2) -6 ~ -10ºC (Low3)	Ethylene glycol
Maximum Permissible Water Pressure		1.0 MPa	
Humidity		≤ 50% (40 °C) (1)	
Altitude		≤ 1000 m (1)	

(1) Minimum working range requirements according to EN60204-1. In case of different working range conditions, ask conformity to HITACHI Distributor.)

◆ Air-to-Water Heat Pump Water Chiller units RHU2E-AG2

Item		Description		Remarks
		Cooling operation	Heating operation	
Power Supply	Working Voltage	90%~110% of Rated Voltage		
	Voltage Imbalance	Within ±3% Deviation from Each Voltage at Compressor Terminals		
	Starting Voltage	Higher than 85% of Rated Voltage		
Ambient Temperature	Standard	-15 ~ 46ºC	-9,5 ~ 21ºC DB -10 ~ 15,5ºC WB	
	Heating operation in High Ambient Temperature Option		-9,5 ~ 35ºC DB	
Water Outlet Temperature	Standard	5 ~ 15ºC		Water
	Low Water Temperature Option	4 ~ 0ºC (Low 1) -1 ~ -5ºC (Low2) -6 ~ -10ºC (Low3)		Ethylene glycol / Propylene glycol
Maximum Permissible Water Pressure		1.0 MPa		
Humidity		≤ 50% (40 °C) (1)		
Altitude		≤ 1000 m (1)		

(1) Minimum working range requirements according to EN60204-1. In case of different working range conditions, ask conformity to HITACHI Distributor.)

◆ **Water Flow Range**

MODEL RCU2E- AG2			40	50	60	70	80	100	120	140	160	180	210	240	280	320	350	400
Water Flow Range	Min.	m^3/h	12.0	13.9	16.6	19.0	22.0	27.8	33.2	38.0	44.0	49.8	57.0	66.0	76.0	88.0	95.0	110
	Max.	m^3/h	32.2	37.4	45.0	51.0	59.0	74.8	90.0	102	118	135	153	177	204	236	255	295

MODEL RHU2E- AG2			40	50	60	70	80	100	120	140	160	180	210	240
Water Flow Range	Min.	m^3/h	12.0	13.9	16.6	19.0	22.0	27.8	33.2	38.0	44.0	49.8	57.0	66.0
	Max.	m^3/h	32.2	37.4	45.0	51.0	59.0	74.8	90.0	102	118	135	153	177

16.2. Part Load Performance

Model: RCU2E40AG2 ~ RCU2E400AG2 & RHU2E40AG2 ~ RHU2E240AG2

Ambient Temperature (°C)	Performance	Compressor Load 15~99%											FULL LOAD	
43	Capacity	18	20	25	30	40	50	60	70	75	80	89		
	Input	24	26	31	36	45	54	65	79	87	96	117		
	EER	74	76	80	84	89	92	92	89	87	83	76		
40	Capacity	19	20	25	30	40	50	60	70	75	80	90	94	
	Input	24	25	30	34	42	51	60	71	77	84	102	110	
	EER	79	80	85	89	95	99	100	98	97	95	88	85	
35	Capacity		20	25	30	40	50	60	70	75	80	90	100	
	Input		23	27	31	38	45	53	61	66	72	84	100	
	EER		87	92	97	105	111	114	114	113	112	107	100	
30	Capacity		21	25	30	40	50	60	70	75	80	90	100	106
	Input		24	27	30	37	43	50	57	61	66	76	89	99
	ERR		87	93	99	109	115	120	122	122	121	118	112	108
25	Capacity		22	25	30	40	50	60	70	75	80	90	100	110
	Input		25	27	30	36	42	48	55	59	64	74	89	100
	EER		88	94	100	111	120	125	127	126	125	121	113	110
20	Capacity		22	25	30	40	50	60	70	75	80	90	100	110
	Input		20	21	24	29	33	38	43	46	49	56	65	76
	EER		113	119	123	139	150	158	163	164	164	161	155	145

:Standard Condition
(Ambient: 35°C, Water Inlet/Outlet: 12/7°C, Full Load)

NOTE:

1. *Capacity: Cooling Capacity (kW)*
   Input: Total Input Power (Compressor + Fans) (kW)
   COP: Capacity/Input (kW/kW)
2. *Operating Conditions:*
   Chilled Water Outlet Temperature: 7°C
   Water Flow Rate: Constant
   Condenser Fan: All Fans Running
3. *Above Table shows the percentage of Capacity, Input and COP based on the standard condition. Therefore, each value can be calculated as below example:*

Example: Model RCU2E100AG2

Standard Condition		*Ambient: 30°C, Capacity 70%*	
Capacity:	*260 kW*	*Capacity:*	*260 × 0.70 = 182 kW*
Input:	*89.4 kW*	*Input:*	*89.4 × 0.57 = 51.0 kW*
COP:	*2.91*	*COP:*	*2.91 × 1.22= 3.5*

16.3. Ethylene Glycol Application

◆ Low Ambient Application

Under the condition where the ambient temperature is low in winter, there is a case where the unit and piping will become damaged by freezing during the shutdown periods.

To prevent freezing, it is effective to operate the pump. This Chiller has the pump ON/OFF operation control to avoid freezing. This control becomes available by connecting Pump Operation circuit. (See Wiring Diagram).

Additionally, in a case where measures such as water raining are difficult, utilise antifreeze mixture of ethylene glycol.

Below table shows the ethylene glycol percentage suggested for the different temperature values.

The table also shows the correction factors, since unit with antifreeze mixture have a slight different performance compared with no glycol.

Example:

- Cooling Capacity with ethylene glycol = Kc × Cooling Capacity without ethylene glycol
- Input Power, Flow Rate and Pressure Drop is calculated in the same way as Cooling Capacity

(Water Outlet Temperature: 5 ~ 15°C)

Minimum Ambient Temperature	°C	-3	-7	-13	-22
Required Ethylene Glycol Percentage	wt%	10	20	30	40
Cooling Capacity Correction Factor	Kc	0.99	0.98	0.97	0.96
Input Power Correction Factor	Ki	1.00	0.99	0.99	0.98
Flow Rate Correction Factor	Kf	1.00	1.01	1.04	1.08
Pressure Drop Correction Factor	Kp	1.04	1.11	1.18	1.29

◆ Low Water Temperature Application (Option)

When utilising water less than 5 °C, antifreezing mixture of ethylene glycol shall be input to the water system.

Low water temperature Option is categorised 3 level depending on water outlet temperature.

Therefore, please specify the level when ordering .

Freeze Protection Thermostat has been set in the factory.

Table shows Required Ethylene Glycol percentage for each category.

1. Category

Category	Outlet Water Temp. (°C)	Required Ethylene Glycol (wt%)	Ethylene Glycol Freezing Temp. (°C)
Low 1	4 ~ 0	20	-7
Low 2	-1 ~ -5	30	-13
Low 3	-6 ~ -10	40	-22

NOTE:
Freeze Protection Thermostat is the electronic control, but non-adjustable.

For the performance, each value can be given by using following table. (See below example)

Performance

Ethylene Glycol (wt%)	Outlet Water Temp. (°C)	Flow Rate Correction Factor (Kf)	Pressure Drop Correction Factor (Kp)	Ambient Temperature (°C)									
				25		30		35		40		43	
				CAP (%)	IPT (%)	CAP (%)	IPT (%)	CAP (%)	IPT (%)	CAP (%)	IPT (%)	CAP (%)	IPT (%)
20	4	1.011	1.15	98	82	93	90	87	97	81	106	78	112
	3	1.012	1.16	94	81	89	89	83	96	77	106	75	111
	2	1.013	1.17	92	81	86	88	80	96	75	105	72	111
	1	1.013	1.18	88	80	82	87	77	95	72	104	69	110
	0	1.014	1.19	86	79	80	87	75	94	70	103	66	109
30	-1	1.034	1.30	83	78	78	86	73	94	68	103	64	109
	-2	1.035	1.32	80	78	75	86	71	93	65	102	62	108
	-3	1.037	1.34	78	77	74	85	68	92	63	102	60	108
	-4	1.037	1.36	75	77	71	85	66	92	61	101	58	107
	-5	1.038	1.38	74	76	69	84	64	91	59	101	57	106
40	-6	1.073	1.50	71	76	66	84	61	91	57	100	55	106
	-7	1.075	1.52	69	75	64	83	59	91	55	100	52	106
	-8	1.076	1.54	66	75	61	83	58	90	53	100	50	105
	-9	1.076	1.56	63	75	59	83	55	90	51	99	48	105
	-10	1.077	1.58	61	74	57	82	53	90	49	99	46	105

NOTE:

1. *CAP: Cooling Capacity, IPT: Compressor Input*
2. *Capacity and Compressor Input show the percentage of the standard condition: Ambient temperature: 35°C, Chilled Water Inlet/Outlet: 12/7 °C*
3. *Water flow rate and pressure drop can be calculated by the Correction Factor Kf and Kp.*
4. *Example:*

a) Model: RCU2E140AG2

b) Standard Condition: Capacity: 356 kW, Compressor Input: 112 kW

c) Outlet/Inlet Water Temperature: -3/2°C, Ambient Temperature: 40°C

- Ethylene glycol: 30%

*- Capacity = 356*0.63=224.3 kW*

*Compressor Input = 112*1.02=114.2 kW*

*- Water Flow(m^3/h) = Kf*Capacity(kW)*0.86/ΔT (ΔT=Inlet Temp.- Outlet Temp.)*

*= 1.037*224.3*0.86/(2-(-3))*

= 40.0 m^3/h

*- Pressure Drop = Kp*Pressure Drop (water)*

= $1.34*0.0107*40.0^{1.9616}$

= 19.9 kPa

where Pressure Drop(water)= $\alpha \times Q^{\beta}$: see Chapter 15.1.

17. Components Data

Contents

17.1. Compressor

Model			40ASC-Z	50ASC-Z	60ASC-Z
Type			Semi-Hermetic		
Revolution		rpm	2880		
Displacement		m^3/h	137.4	169.5	208.7
Capacity Control		%	100 ~ 15, 0		
Pneumatic Pressure	High Side	MPa	3.0		
	Low Side	MPa	2.0		
Motor	Type		Special Squirrel Cage, Three-Phase Motor		
	Starting Method		Star-Delta Starting		
	Nominal Output	kW	30	37	45
	Poles		2		
	Insulation		E		
Oil	Name		JAPAN ENERGY, FREOL UX300		
	Charge	Litre	6		
Net Weight		kg	400	440	460

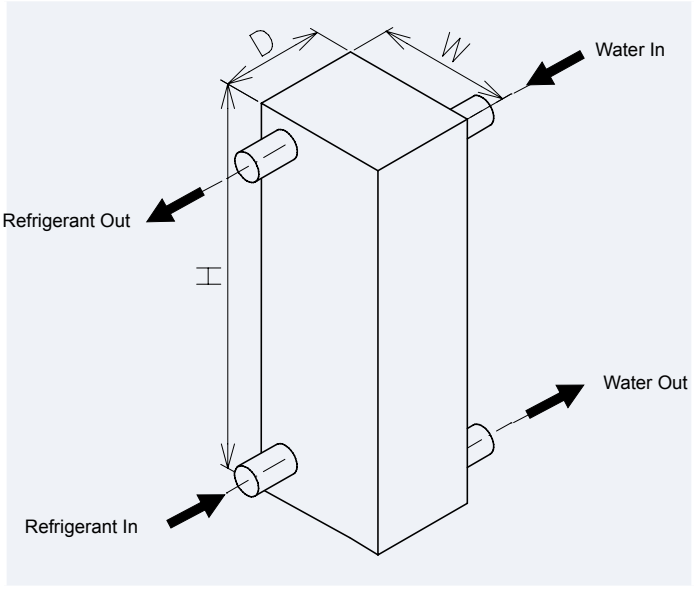
17.2. Air Heat Exchanger and fan

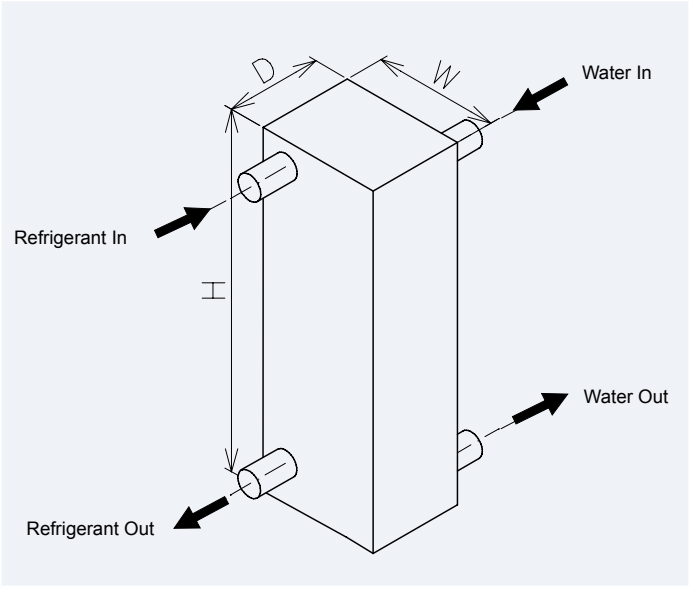
	Model RCU2E-AG2			40	50	60	70	80	100	120	140	160	180	210	240	280	320	350	400
	Model RHU2E-AG2			40	50	60	70	80	100	120	140	160	180	210	240				
Air Heat Exchanger	Type			Multi-pass cross finned tube															
	Piping	Material		Copper Tube															
		Outer Diameter	mm	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53
		Rows		3/3	3/4	4/4	3/4	4/4	3/4	4/4	3/4	4/4	4/4	3/4	4/4	3/4	4/4	3/4	4/4
	Fin	Material		Aluminium															
		Pitch	mm	2.1/2.1	2.1/2.2	2.2/2.2	2.1/2.2	2.2/2.2	2.1/2.2	2.2/2.2	2.1/2.2	2.2/2.2	2.2/2.2	2.1/2.2	2.2/2.2	2.1/2.2	2.2/2.2	2.1/2.2	2.2/2.2
	Quantity			4	4	4	4	4	8	8	8	8	12	12	12	16	16	20	20
	Maximum operating Pressure		MPa	3.0															
Fan	Fan	Type		Direct-driven propeller fan															
		Quantity		4	4	4	6	6	8	8	12	12	12	18	18	24	24	30	30
		Outer diameter		644	644	644	644	644	644	644	644	644	644	644	644	644	644	644	644
		Revolution		870	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999
		Air Flow	m^3/min	750	860	860	1330	1330	2*860	2*860	2*1330	2*1330	3*860	3*1330	3*1330	4*1330	4*1330	5*1330	5*1330
	Motor	Type		Drip-proof type enclosure															
		Type		DC AC	DC AC	DC AC	DC AC	DC AC	DC AC	DC AC	DC AC	DC AC	DC AC	DC AC	DC AC	DC AC	DC AC	DC AC	DC AC
		Poles		8 6	8 6	8 6	8 6	8 6	8 6	8 6	8 6	8 6	8 6	8 6	8 6	8 6	8 6	8 6	8 6
		Quantity		4 -	4 -	4 -	4 2	4 2	8 -	8 -	8 4	8 4	12 -	12 6	12 6	16 8	16 8	20 10	20 10
		Nominal output	kW	0.38 0.28	0.38 0.28	0.38 0.28	0.38 0.28	0.38 0.28	0.38 0.28	0.38 0.28	0.38 0.28	0.38 0.28	0.38 0.28	0.38 0.28	0.38 0.28	0.38 0.28	0.38 0.28	0.38 0.28	0.38 0.28
		Starting method		Direct-On-Line Starting															

17.3. Water Heat Exchanger

Type			A	B	C	D
Dimensions	Height (H)	mm	532	532	532	532
	Width (W)	mm	271	271	271	271
	Depth (D)	mm	249.5	272	344	411.5
Maximum Permissible Pressure	Refrigerant Side	MPa	3.0	3.0	3.0	3.0
	Water Side	MPa	3.0	3.0	3.0	3.0
Internal Volume	Refrigerant Side	Liter	12.0	13.1	16.8	20.2
	Water Side	Liter	12.2	13.3	17.0	20.5
Material			Stainless Steel			

Cooling Operation	Heating Operation
Dimension	Dimension





Model RCU2E-AG2	40	50	60, 70, 80	100	120, 140, 160	180, 210, 240	280, 320	350, 400
Water Heat Exchanger	Brazed Type Plate Heat Exchanger							
Type (Quantity)	A (1)	B (1)	C (1)	B (2)	C (2)	C (3)	C (4)	C (5)

Model RHU2E-AG2	40	50	60	70, 80	100	120	140, 160	180	210, 240
Water Heat Exchanger	Brazed Type Plate Heat Exchanger								
Type (Quantity)	A (1)	B (1)	C (1)	D (1)	B (2)	C (2)	D (2)	C (3)	D (3)

HITACHI
Inspire the Next

Hitachi Air Conditioning Products Europe, S.A.
Ronda Shimizu, 1 - Políg. Ind. Can Torrella
08233 Vacarisses (Barcelona) España

Hitachi certifies that our products have met EU consumer safety, health and environmental requirements.

Hitachi Air Conditioning Products Europe, S.A. is certified with:
ISO 9001 of AENOR, Spain for its Quality Management accordance with the standard
ISO 14001 of AENOR Spain for its Environmental Management systems accordance with the standard.

HITACHI participates in the Eurovent Certification Programme; the certified data of certified models are listed in the Eurovent Certification Online Directory (www.eurovent-certification.com).

TCGB0074 rev.0 - 04/2011 Printed in Spain