## PUD-P-YMF-C

Close control

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## 1. Specifications

## 1-1.Main Features

## (1) List of Models

PUD-P250YMF-C
\} Outdoor Unit

10HP(downward flow): PFD-P250VM-A(-H)
20HP(downward flow): PFD-P500VM-A(-H) \} Indoor Unit

* '-H' in the indoor units indicates that the unit pipes come out of the top of the unit ( $50 / 60 \mathrm{~Hz}$, fit to order). * PFD-type indoor units cannot be connected to outdoor units other than the ones specified above.
* PFD-type indoor units and other types of indoor units cannot coexist in the same refrigerant system.
<10HP System>


When using a PFD-P250VM-A as an indoor unit, connect an outdoor unit PUD-P250YMF-C to each indoor unit and operate with a built-in remote control for the indoor unit.
*1: Bold line indicates refrigerant piping (gas/liquid). This system consists of one refrigerant circuit.
*2: Indicates TB3-type transmission line that connects the indoor and outdoor units.
This system consists of 1 refrigerant circuit.
*3: Indicates TB7-Type transmission line that allows the unit to communicate with the controller.

## <20HP System>



When using a PFD-P500VM-A as an indoor unit, connect 2 PUD-P250YMF-C outdoor units to each indoor unit and operate with a built-in remote control for the indoor unit.
$\approx 1$ : Bold line indicates refrigerant piping (gas/liquid). This system consists of 2 refrigerant circuits.
*2: Indicates TB3-type transmission line that connects the indoor and outdoor units.
This system consists of 2 refrigerant circuits.
*3: Indicates TB7-type transmission line that allows the unit to communicate with the controller.

## 1-2. List of Possible Combinations of Indoor and Outdoor Units

| Units |  |  |  |  |  | Indoor Units |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Model Name |  |  |  |  |  | Down-flow Type |  |
|  |  | Power Source |  |  |  | $\begin{aligned} & 380-415 \mathrm{~V}(50 \mathrm{~Hz}) \\ & 400,415 \mathrm{~V}(60 \mathrm{~Hz}) \end{aligned}$ | $\begin{aligned} & 380-415 \mathrm{~V}(50 \mathrm{~Hz}) \\ & 400,415 \mathrm{~V}(60 \mathrm{~Hz}) \end{aligned}$ |
|  |  | Unit Horse Power |  |  |  | 10HP | 20HP |
|  |  |  |  | Series Name |  | PFD-P250VM-A(-H) | PFD-P500VM-A(-H) |
| $\stackrel{\square}{\square}$ | $\begin{aligned} & \text { 응 } \\ & \text { O} \\ & \text { O} \\ & \frac{1}{4} \end{aligned}$ | $\begin{aligned} & 380 \\ & 1400 \\ & 1415 \mathrm{~V} \end{aligned}$ | 10HP | $\begin{aligned} & \text { PUD- } \\ & \text { P250YMF-C } \end{aligned}$ | Q | 28.0 | 56.0 |
| ? |  |  |  |  | W | 10.9 | 21.8 |
| 응 |  |  |  |  | A | 18.3/17.3/16.3 | 36.1/34.3/33.0 |
| $\bigcirc$ |  |  |  |  | Power factor | 90 | 91 |

*1: Refer to the following pages for detailed specifications of each unit.
*2: The values in the chart are as follows: Q, Total Capacity [kW]; W, Total Input [kW]; A, Total Electrical Current [A]; Power Factor [\%] They were measured at operation under the following conditions: Indoor Intake Temperature: $27^{\circ} \mathrm{CDB} / 19^{\circ} \mathrm{CWB}$, Outdoor Intake Temperature $35^{\circ} \mathrm{CDB}$ with 7.5 m of refrigerant piping.

## 1-3. Unit Specifications

## (1) Outdoor Unit



Note: Cooling capacity indicates the maximum value at operation under the following condition.
*1 Indoor $27^{\circ} \mathrm{CDB} / 19^{\circ} \mathrm{CWB}$, Outdoor $35^{\circ} \mathrm{CDB}$
Pipe length 7.5 m , Height difference 0 m
*2 It is measured in anechoic room.

## (2) Indoor Unit

|  |  |  |  | PFD-P250VM-A | PFD-P500VM-A |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Power source |  |  |  | $3 \mathrm{~N} \sim 380-415 \mathrm{~V} 50 \mathrm{~Hz} / 3 \mathrm{~N} \sim 400-415 \mathrm{~V} 60 \mathrm{~Hz}$ |  |
| Cooli | g capacity | * 1 | kW | 28.0 | 56.0 |
| Power | consumption |  | kW | 2.5 | 5.0 |
| Curre |  |  | A | 5.5/5.3/5.1 | 9.5/9.0/8.7 |
| External finish |  |  |  | <5Y 7/1> |  |
| Dimensions |  | Height | mm | 1895 |  |
|  |  | Width | mm | 1,200 | 1,800 |
|  |  | Depth | mm |  |  |
| Net w | eight |  | kg | 350 | 480 |
| Heat exchanger |  |  |  | Cross fin (Aluminum-plate fin and copper tube) |  |
| Fan | Type |  |  | Sirocco fan | Sirocco fan $\times 2$ |
|  | Airflow rat |  | $\mathrm{m}^{3} / \mathrm{min}$ | 160 | 320 |
|  | External pressure |  | Pa |  |  |
| Motor | Type |  |  | 3 phases induction motor |  |
|  | Output |  | kW | 3.7 | 5.5 |
| Air filter |  |  |  | PP Honeycomb fabric |  |
| Refrigerant pipe dimension |  | Gas (Flare) | mm | $\emptyset 28.58$ | $\emptyset 28.58 \times 2$ |
|  |  | Liquid (Flare) | mm | $\emptyset 12.7$ | $\emptyset 12.7 \times 2$ |
| Drain pipe dimension |  |  |  | Rp1 |  |
| Noise | evel (Lo-Mid | id1-Hi) *2 | $\mathrm{dB}(\mathrm{A})$ | 59 | 64 |

Note:*1 Cooling capacity indicates the maximum value at operation under the following conditions;
Indoor $27^{\circ} \mathrm{CDB} / 19^{\circ} \mathrm{CWB}$, Outdoor $35^{\circ} \mathrm{CDB}$
*2 Measured in an anechoic room.

## 2. Capacity Curves

## 2-1. Cooling Capacity



## 2-2. Cooling Input



* The correction curves indicate the values measured at the point where the compressor was operated at its maximum capacity.
*     - indicates the standard value.


## 2-3. SHF Curves




[^0]
## 2-4. Correction by refrigerant piping length

To obtain a decrease in cooling/heating capacity due to refrigerant piping extension, multiply by the capacity correction factor based on the refrigerant piping equivalent length in the table below.


- How to obtain piping equivalent length

Equivalent length $\boldsymbol{=}($ Actual piping length to the farthest indoor unit $)+(0.50 \times$ number of bent on the piping $) \mathrm{m}$

## 2-5. Operation limit


(Outdoor door temperature : $0^{\circ} \mathrm{CDB} \sim 43^{\circ} \mathrm{CDB}$ with outdoor unit at lower position in cooling mode.)

## 3. Sound Levels

## 3-1. Noise Level

(1) Outdoor Unit


| Series | Noise Level <br> (dB [Type A]) |
| :---: | :---: |
| PUD-P250YMF-C | 56 |

(2) Indoor Unit


## 3-2. NC Curves




## 3-3. Fan Characteristics Curves





## 4. External Dimensions





## 5. Electrical Wiring Diagrams

## PUD-P250YMF-C


<SYMBOL EXPLANATION>

| Symbol | Name | Symbol | Name | Symbol |  | Name | Symbol | Name |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| DCL | DC reactor (Power factor improvement) | LEV1 | Electronic expansion valve (Sub-cool coil bypass) | TH2 | Thermistor | Saturation evapo. temp. detect | TH10 | Compressor shell temp. |
| ACCT-U,W | Current Sensor |  |  | TH5 |  | Pipe temp. detect | THHS | Radiator panel temp. detect |
| ZNR4 | Varistor | SLEV | Electronic expansion valve(Oil return) | TH6 |  | OA temp. detect | X1~10 | Aux. relay |
| 52 C | Magnetic contactor (Inverter main circuit) | 63HS | High pressure sensor | TH7 |  | liquid outlet temp. detect at Sub-cool coil | FB1~4 | Ferrite core |
| MF1 | Fan motor (Radiator panel) | 63LS | Low pressure sensor |  |  |  | $\stackrel{(1)}{ }$ | Earth terminal |
| SV1,SV2 | Solenoid valve (Discharge-suction bypass) | L2 | Choke coil(Transmission) | TH8 |  | bypass outlet temp. detect at Sub-cool coil |  |  |
| SV3 | Solenoid valve(Heat exchanger capacity control) | IPM | Intelligent power module |  |  |  |  |  |
|  |  | TH1 | Thermistor ${ }^{\text {Discharge pipe temp. detect }}$ |  |  | High pressure liquid. temp. |  |  |



[^1]


## 6. Options

| Description | Model | Applicable capacity |
| :---: | :---: | :---: |
| Square duct flange <br> (Standard filter)* | PAC-TS75DFB | P250 |
|  | PAC-TS76DFB | P500 |
| Square duct flange <br> (High-efficiency filter) | PAC-TS70TB | P250 |
|  | PAC-TS72TB | P500 |
| High-efficiency filter <br> $65 \% * 2$ | PAC-TS60AF | P250 |
|  | PAC-TS62AF | P500 |
| High-efficiency filter <br> $90 \% ~$ | PAC-TS65AF | P250 |

*1 Used to connect Intake Duct. Use the filter supplied with the unit.
*2 Requires square duct flange (High-Efficiency Filter).

## 7. Refrigerant Circuit Diagram And Thermal Sensor

PUD-P250YMF-C


## 8. System Design

## 8-1.Piping


## 1 Caution

## Charge Liquid Refrigerant

Filling the equipment with gas refrigerant will result in a power loss due to transformation of refrigerant in the tank.

## 8-2.Control Wiring

## (1) Specifications of control wiring and maximum length of wiring

Transmission line is a type of control line. When the source of noise is located adjacent to the unit, the use of shield cable as well as moving the unit as far away from the noise source are recommended.
(1) Transmission line (M-NET transmission line)

| System component |  |  |  | For multiple-refrigerant system |
| :--- | :--- | :--- | :---: | :---: |
| Wiring specifications | Length of transmission line | $\mathrm{n} / \mathrm{a}$ |  |  |
|  | Facility type <br> (noise level measurement) | All types of facilities |  |  |
|  | Cable type | Shield cable <br> CVVS $\cdot$ CPEVS |  |  |
|  | No. of cable | 2-core cable |  |  |
|  | Diameter | Over 1.25mm ${ }^{2}$ |  |  |
| Total length of indoor/outdoor transmission line | Maximum length: 200m <br> Maximum length of centralized control transmission line and Indoor/Outdoor <br> transmission line via indoor/outdoor units: 500m maximum |  |  |  |

(2) Remote control wiring

|  |  | MA remote controller * 1 |  |
| :---: | :---: | :---: | :---: |
| Wiring specifications | Cable type | VCTF . VCTFK . | - CV |
|  | No. of cable | 2-core cable |  |
|  | Diameter | $\begin{aligned} & 0.3 \sim 1.25 \mathrm{~mm}^{2} \\ & \left(0.75 \sim 1.25 \mathrm{~mm}^{2}\right) \end{aligned}$ | $\begin{aligned} & * 2 \\ & * 3 \end{aligned}$ |
| Total Length |  | Maximum length: |  |

* 1: "MA remote controller" includes MA remote controller, Simple MA controller, and wireless remote controller.
* 2: Cables with a diameter of $0.75 \mathrm{~mm}^{2}$ or smaller recommended for easier handling.
* 3: When connecting to simple remote controller terminal, use a cable with a diameter within the range shown in the parenthesis.


## 8-3.Types of switch settings and setting methods

Whether a particular system requires switch settings depends on its components. Refer to the section "7-4 Wiring and Address Setting" before conducting electrical work.
Keep the power turned off while setting the switches. If settings are changed while being powered, the changed settings will not register, and the unit may malfunction.

| Unit |  | Symbol | Turn off the power to |
| :--- | :--- | :---: | :--- |
| Outdoor unit | OC | Outdoor unit |  |
| Indoor unit | Main/sub controllers * | IC | Indoor and outdoor units |

[^2]
## (1) Address setting

This system requires address setting. The range of address varies depending on the type of unit. Refer to " $7-4$ Wiring and Address Setting" for details.

| Unit |  | Symbol | Address <br> setting range | Setting method | Factory <br> setting |
| :--- | :--- | :---: | :---: | :--- | :---: |
| Indoor unit | Main/sub <br> controllers <br> $* 1$ | IC | $01 \sim 50$ <br> $* 2$ | Assign a number to all indoor units, starting with 1 and using <br> sequential numbers. Use odd numbers for the top controller and <br> even numbers for the bottom controller of the indoor units. Use <br> odd numbers starting with 01 for 10HP system. | 00 |

* 1: 10HP only has the main controller.
* 2: Avoid using the same address as the ones used by the indoor/outdoor units in another refrigerant system; choose a different one in the range specified above.
$* 3$ : When setting the address to 100 , set the switch to 50
(2) Setting the outdoor unit power-source switch connector (Factory setting: CN41 Connected)

| System component | Power supply switch unit |
| :---: | :---: |
| Multiple-refrigerant system | <When power-supply unit is not connected to the centralized control transmission line> |
|  | Replace the power source switch connector CN41 with CN40 on only one of the outdoor units |
|  | <When connecting the power-supply unit> |
|  | Use CN41 as it is. |

## (3) Choosing the temperature detection spot by indoor unit (Factory Setting: SWC "Standard")

When using the suction temperature sensor, set SWC to "Option."

## (4) Setting the MA "Sub" controller

When using two remote controllers or running two indoor units as a group, one of the controllers must be set to "Sub" controller.

* No more than two remote controllers can be connected to a group.
(Factory setting: "Main")
Set the controller according to the following procedure. Refer also to the instructions manual supplied with the MA remote controller.



## 8-4.Wiring and Address Setting

## (1) System Using MA Remote Controller

(1) System with one indoor unit (10HP system)

## Control Wiring Diagram


*There is one indoor controller board inside indoor unit

| Remarks | Maximum Allowable Length |
| :--- | :---: |
| 1. Use power supply connector (CN41) on the outdoor <br> unit as is. <br> 2. It is not necessary to ground the S terminal of <br> centralized control transmission terminal board (TB7) <br> on the outdoor unit. | <a. Indoor/Outdoor transmission line> <br> Maximum Length (above 1.25mm²) <br> L1 $\leqq 200 \mathrm{~m}$ |
|  |  |

## Wiring and Address Setting

## <a. Indoor/Outdoor Transmission Lines >

Connect A, B terminals of indoor/outdoor transmission line terminal board (TB3) on the outdoor unit and A, B terminals of the Indoor/outdoor transmission terminal board (TB5). (Non-polar 2 wire)

* Only use shield line.


## [Grounding the shield line]

Connect the earth terminal of the OC and S terminal of the IC terminal board (TB5).

## <b. Switch Setting >

Set the address as follows.

| $\circ$ <br> $\stackrel{\circ}{0}$ <br> $\stackrel{y}{0}$ | Unit or Controller |  |  | Address Setting Range | Setting Procedures | Remarks | Factory Setting |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | Indoor Unit | Main Unit | IC | $01 \sim 50$ | Set the address for the controller at the top of the indoor unit. Start with "01" then use sequential odd numbers (i.e.01, 03, 05). |  | 00 |
| 2 | Outdoor Unit |  | OC | $51 \sim 100$ | Add 50 to the address assigned to the indoor unit within the same refrigerant system. |  | 00 |
| 3 | MA remote controller | Main Controller | MA | n/a | - |  |  |
|  |  | Sub Controller | MA | Sub controller | Use dipswitch to set the controller as sub controller. |  |  |

## (1) System Using MA Remote Controller

(2) Unit with One Indoor Unit (20HP Systems)

## Control Wiring Diagram



| Remarks | Maximum Allowable Length |
| :---: | :---: |
| 1. Use sequential numbers to set indoor unit address. <br> 2. Do not connect TB5s' of the indoor units that are connected to different outdoor units with each other. <br> 3. Replace CN41 with CN40 on only one outdoor unit. <br> 4. Ground only one of the outdoor units' S terminal of TB7 (centralized control transmission terminal). | <a. Indoor/Outdoor transmission line> Maximum Length (above $1.25 \mathrm{~mm}^{2}$ ) $\mathrm{L} 1, \mathrm{~L} 2 \leqq 200 \mathrm{~m}$ <br> <b. Transmission line for centralized control> Maximum length via outdoor unit (over $1.25 \mathrm{~mm}^{2}$ ) $\mathrm{L} 1+\mathrm{L} 3+\mathrm{L} 2 \leqq 500 \mathrm{~m}$ |

## Wiring and Address Setting

## <a. Indoor/Outdoor Transmission Lines >

Connect A, B terminals of indoor/outdoor transmission line terminal board (TB3) on the outdoor unit and A, B terminals of the Indoor/outdoor transmission terminal board (TB5). (Non-polar 2 wire)
*Only use shield line.

## [Grounding the shield line]

Connect the earth terminal of the OC and S terminal of the IC terminal board (TB5).

## <b. Transmission Line for Centralized Control >

Connect A terminals of centralized control transmission line terminal board on each of the outdoor units with each other.
Do the same with B terminals. Replace CN41 (power supply switch connector) with CN40 on only one OC.
*Only use shield line.

## [Grounding the shield line]

Connect $S$ terminals of the TB7 of each of the outdoor units with each other.
Connect the S terminal of TB7 on the outdoor unit whose CN41 was replaced with CN40 to the earth terminal of the electric box.
<c. Switch Setting >
Set the address as follows.

| $\begin{array}{\|l} \hline \stackrel{\circ}{\circ} \\ \stackrel{\rightharpoonup}{\omega} \\ \hline \end{array}$ | Unit or Controller |  |  | Address Setting Range | Setting Procedures | Remarks | Factory Setting |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | Indoor Unit | Main Unit | IC | $01 \sim 49$ | Set the address for the controller at the top of the indoor unit. Start with "01" then use sequential odd numbers (i.e. $01,03,05$ ). |  | 00 |
|  |  | Sub Unit | IC | $02 \sim 50$ | Add 1 to the address assigned to the main unit in the same room. |  |  |
| 2 | Outdoor Unit |  | OC | $51 \sim 100$ | Add 50 to the address assigned to the indoor unit within the same refrigerant system. |  | 00 |
| 3 | MA remote controller | Main Controller | MA | n/a | - |  |  |
|  |  | Sub Controller | MA | Sub controller | Use dipswitch to set the controller as sub controller. |  |  |

## (1) System Using MA Remote Controller

(3) When connecting 2 MA remote controller to one indoor unit (20HP Systems)


## Wiring and Address Setting

## <a. Indoor/Outdoor Transmission Line >

Same as (2).
<b. Transmission Line for Centralized Control >
Same as (2).

## <c. MA Remote Controller Wiring >

[When using 2 remote controllers]
When using two remote controllers, connect terminals 1 and 2 of TB15 on the indoor unit to terminal board of MA controller(option).

* Set the connected MA remote controller (option) as sub controller (Refer to manual that came with MA remote controller.)
<d. Switch Setting >
Set the address as follows.

| $\begin{array}{\|l\|l} \hline 0 \\ \stackrel{\circ}{\otimes} \\ \dot{\omega} \\ \hline \end{array}$ | Unit or Controller |  |  | Address Setting Range | Setting Procedures | Remarks | Factory Setting |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | Indoor Unit | Main Unit | IC | $01 \sim 49$ | Set the address for the controller at the top of the indoor unit. Start with "01" then use sequential odd numbers (i.e.01, 03, 05). |  | 00 |
|  |  | Sub Unit | IC | $02 \sim 50$ | Add 1 to the address assigned to the main unit in the same room. |  |  |
| 2 | Outdoor Unit |  | OC | $51 \sim 100$ | Add 50 to the address assigned to the indoor unit within the same refrigerant system. |  | 00 |
| 3 | MA remote controller | Main Controller | MA | n/a | - |  | Main |
|  |  | Sub Controller | MA | Sub controller | Use dipswitch to set the controller as sub controller. |  |  |

## (1) System Using MA Remote Controller

(4) When grouping 2 indoor units (20HP systems) with MA remote controller

## Control Wiring Diagram



## Wiring and Address Setting

## <a. Indoor/Outdoor transmission line >

Same as (2).
<b. Transmission Line for Centralized Control >
Same as (2).
<c. MA remote controller line >

* When grouping units that use different refrigerants, set MA remote controller of one of the indoor units as sub controller.


## [When grouping indoor units]

When grouping indoor units, connect 1 and 2 terminals of both IC terminal boards (TB15) with each other (nonpolar 2 line)

* Set MA remote controller of one of the indoor units as sub controller.
<d. Switch Setting >
Set the address as follows.

| $\begin{array}{\|c} \hline \stackrel{\circ}{\circ} \\ \stackrel{\omega}{\omega} \end{array}$ | Unit or Controller |  |  | Address Setting Range | Setting Procedures | Remarks | Factory Setting |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | Indoor Unit | Main Unit | IC | 01~49 | Set the address for the controller at the top of the indoor unit. Start with "01" then use sequential odd numbers (i.e.01, 03, 05). |  | 00 |
|  |  | Sub Unit | IC | $02 \sim 50$ | Add 1 to the address assigned to the main unit in the same room. |  |  |
| 2 | Outdoor Unit |  | OC | $51 \sim 100$ | Add 50 to the address assigned to the indoor unit within the same refrigerant system. |  | 00 |
| 3 | MA remote controller | Main Controller | MA | n/a | - |  | Main |
|  |  | Sub Controller | MA | Sub controller | Use dipswitch to set the controller as sub controller. |  |  |

## (1) System Using MA Remote Controller

(5) When grouping multiple indoor units (combination of 10HP, 20HP systems)

## Control Wiring Diagram



| Remarks | Maximum Allowable Length |
| :---: | :---: |
| 1. Use odd numbers to set 10HP indoor unit address. <br> 2. When setting unit address for 20HP indoor unit, use odd numbers for the top controllers and even numbers for the bottom controllers (main controller+1). <br> 3. Replace CN41 (power supply switch connector) with CN40 on only one 20HP outdoor unit. <br> 4. Ground the S terminal of TB7 (centralized control transmission terminal board) of only one of the 20HP outdoor units. <br> 5. No more than two main and sub controllers can be connected to the indoor unit in the same group. Disconnect the MA remote control wire from TB15 if using more than 2 remote controllers | <a. Indoor/Outdoor Transmission Line > Same as (2). <br> <b. Transmission Line for Centralized Control > Same as (2). <br> <c. MA Remote Controller Line > Total Length ( $0.3 \sim 1.25 \mathrm{~mm}^{2}$ ) $\mathrm{m} 1+\mathrm{m} 2+\mathrm{m} 3+\mathrm{m} 4+\mathrm{m} 5 \leqq 200 \mathrm{~m}$ |

## Control Wiring Diagram

*There is one indoor controller board inside indoor unit.

*There are two indoor controller board inside indoor unit.



| 0 <br> 0 <br>  | Unit or Controller |  |  | Address Setting Range | Setting Procedures | Remarks | Factory Setting |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | Indoor Unit | Main Unit (10HP, 20HP) | IC | $01 \sim 49$ | Set the address for the controller at the top of the indoor unit. Start with "01" then use sequential odd numbers (i.e.01, 03, 05). |  | 00 |
|  |  | Sub Unit (20HP) | IC | $02 \sim 50$ | Add 1 to the address assigned to the main unit in the same room. |  |  |
| 2 | Outdoor Unit |  | OC | $51 \sim 100$ | Add 50 to the address assigned to the indoor unit within the same refrigerant system. |  | 00 |
| 3 | MA remote controller | Main Controller | MA | n/a | - |  | Main |
|  |  | Sub Controller | MA | Sub controller | Use dipswitch to set the controller as sub controller. |  |  |

## (2) System with MA remote controller and G-50A

(1) System with multiple indoor units (10HP, 20HP)


## Control Wiring Diagram



| $\begin{aligned} & 0 \\ & \stackrel{0}{0} \\ & \stackrel{y}{\omega} \end{aligned}$ | Unit or Controller |  |  | Address Setting Range | Setting Procedures | Remarks | Factory Setting |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | Indoor Unit | Main Unit (10HP, 20HP) | IC | $01 \sim 49$ | Set the address for the controller at the top of the indoor unit. Start with "01" then use sequential odd numbers (i.e.01, 03, 05). |  | 00 |
|  |  | Sub Unit (20HP) | IC | $02 \sim 50$ | Add 1 to the address assigned to the main unit in the same room. |  |  |
| 2 | Outdoor Unit |  | OC | $51 \sim 100$ | Add 50 to the address assigned to the indoor unit within the same refrigerant system. |  | 00 |
| 3 | MA remote controller | Main Controller | MA | n/a | - |  | Main |
|  |  | Sub Controller | MA | Sub controller | Use dipswitch to set the controller as sub controller. |  |  |

## 8-5.External input/output specifications

## (1) Input/output specifications

Input

| Function | Usage | Signals |
| :--- | :--- | :--- |
| Start/stop | Turning <br> ON/OFF <br> the indoor <br> unit | Pulse <br> (a-contact with voltage/without <br> voltage) *1 <br> <With voltage> <br> Power Source: DC12~24V <br> Electrical Current: <br> Approximately 10mA (DC12V) |
| <Standard Pulse> |  |  |

*1 Use minute-current contact (DC12V 1mA)

Output

| Function | Usage | Signal |
| :--- | :--- | :--- |
| No.1 <br> Operation <br> Status | Obtaining signals indicating <br> operation status of indoor units <br> in each refrigerant circuit. | Relay a-contact <br> output <br> DC 30V or |
| No.1 <br> Error Status | Obtaining signals indicating <br> error status of indoor units in <br> each refrigerant circuit. | AC 100V/200V |
| Standard Current : |  |  |
| No.2 2 | Obtaining signals indicating <br> Operation <br> Status | Minimum Current : <br> in eation status of indoor units |
| No. 2 <br> Error Status <br> 1mA | Obtaining signals indicating <br> error status of indoor units in <br> each refrigerant circuit. |  |

*20HP only
(2) Wiring

<Input with Applied Voltage (polarized)>

| External powe <br> source | DC12~24V <br> Electrical current input (per contact) <br> Approximately 10mA (DC12V) |
| :--- | :--- |
| SW12 | Remote start/stop switch <br> Each pressing of the SW (Pulse input) switches <br> between ON and OFF. |

<Input without voltage applied>

| SW11 | Remote start/stop <br> * Each pressing pf the SW (Pulse input) switches <br> between ON and OFF. |
| :--- | :--- |
| Minute-current contact: DC12V 1mA |  |

<Relay contact output>

| Power supply <br> for displays | DC30V 1A <br> AC220-240V 1A | L3 | No.2 Operation Status Indicator Lamp |
| :--- | :--- | :--- | :--- |
| L1 | No.1 Operation Status Indicator Lamp | L4 | No.2 Error Status Indicator Lamp |
| L2 | No.1 Error Status Indicator Lamp | XA~XE | Relay <br> (Permissible Electrical Current: 10mA~1A) |

## Setting on the Indoor Unit

Confirm the following setting when using external input
(1) No.1, No. 2 Controller board Dip SW 3-8: ON (Factory Setting: ON; External input will not be available when OFF.)
(2) No.1, No. 2 address board Dip SW 1-10: OFF (Factory Setting: OFF; External input will not be available when ON.)
(3) Normal/Local switch inside the unit controller box is set to "Normal." (Factory Setting: Normal; External input will not be available when it is set to "Local.")

## (3) Wiring Method

Check the indoor unit setting (Refer to 7-5.(2) Wiring )When using the external output function, connect each signal line to External output Terminal (TB22) on the unit, depending on the usage.
(3) When using external input function, peal the outer layer of the signal line off, and connect it to external input terminal (TB21 or TB23) on the unit, depending on the usage.

*1 20HP indoor unit is shipped with B1 and B2 terminals of TB21 and A1 and A2 terminals of TB23 short-circuited respectively. When connecting wire to those terminals, do not eliminate this feature. If it is eliminated, the units in one of the 2 refrigerant circuits may not operate.
*2 Do not bundle with high-voltage (AC220-240V) wire, since noise interference from such wire may cause the unit to malfunction.
*3 Do not bundle with minute-voltage (DC30V or below) wire, since noise interference from such wire may cause the unit to malfunction.

## . Caution

1) Wiring should be covered by insulation tube with supplementary insulation.
2) Use relays or switches with IEC or equivalent standard.
3) The electric strength between accessible parts and control circuit should have 2750 V or more.
4) TB21 is a terminal specifically for No-voltage contact point input. Do not apply voltage to TB21, since it must result in malfunction of indoor unit controller board.
5) TB23 is specifically for contact point input with voltage. Check the polarity before connecting to avoid damage to the unit.
6) Keep the wires on the input side and on the output side away from each other when using AC220240 V as a power source for displays.
7) Keep the length of the extension part of external signal line under 100 m .
8) 20 HP is shipped with B1 and B2 terminals of TB21 and A1 and A2 terminals of TB23 short-circuited respectively. Do not eliminate this feature. If it is eliminated, the units in one of the two refrigerant circuits may not operate.

## 9. Air Conditioning the Computer Room

## 9-1 Main Features of the Floor-Duct Air Conditioners

This system is installed by building a floor over an existing floor and using the space between these two floors as an air-conditioning duct. This system has the following characteristics:
(1) The temperature and humidity can efficiently and reliably be controlled, since the air-conditioned air is sent directly to the machine.
(2) It provides a comfortable environment for the operator, since the air can be conditioned to best suit the needs of the operator and machines.It is favorable in terms of appearance because the air-conditioning duct is out of sight.
(4) The location of the duct is irrelevant when considering adding new machines or rearranging the existing machines, since the entire floor serves as the air duct.


## Caution

(1) Unlike plenum ventilation and overhead-duct type conditioners, since the conditioned air is not mixed with the air in the room, the air that comes out of the unit has to meet the predetermined conditions (constant temperature/constant humidity) at the time the air exits the unit.
Close attention must be paid to the auto-controlling system.
(2) Dust in the duct space (between the free-access top floor and the existing floor) must be thoroughly removed before installing the unit.
(3) Since the existing floor is cooled by the unit, it may produce dews on the ceiling of the room down below.

## 9-2 Major Characteristics of Computer Room Air Conditioners (Constant Temperature • Constant Humidity)

A computer-room air conditioner is a device that is used to maintain certain temperature and humidity in the room. Especially, floor-duct conditioners must be able to provide air that meets predetermined requirements. In this unit, the compressor works year around. To respond to the change in temperature, the capacity control compressor regulates the temperature. Since this unit does not ship with a humidifier, humidity is controlled with the use of a humidifier installed in the room.

## 9-3 Step-by-Step Plan for the Implementation of the Air-Conditioning


$\downarrow$


| Securing | m, CVCF room, MT Disk Storage room |
| :---: | :---: |
| Necessary | ..... Supplementary computer room, system surveillance room |
| Rooms | ... Programmer room, operator room |
| $\downarrow$ | Battery room, transformer room |

Decision to Install the Air-Conditioning System
$\downarrow$
Setting the Conditions for the Room
$\downarrow$

```
Calculating the Load
```


## $\downarrow$

## Selecting the AirConditioner Model

## $\downarrow$

```
Selecting the
Controllers
```

    \(\downarrow\)
    Total System

Air-conditioning operation panel (secure individual operation circuit), Auto Controller (temperature and humidity indicator/recorder), management, safety, laws, maintenance, earthquake proof, anti-vibration (floor load, anti-vibration device), noise control, etc.

## 9-4 Conditions for the Installation of Computer-Room Air Conditioners

## (1) Outdoor Temperature and Humidity

Generally the values set for general air conditioners are used, although the value higher than the maximum outdoor temperature and humidity may be set for devices like computer-room air conditioners that must keep the air temperature and humidity under predetermined levels.

## (2) Indoor Temperature and Humidity

There is a wide range of conditions set by different computer manufacturers, and the conditions need to be set in consultation with the manufacturers. The most basic conditions include keeping dew condensation and static electricity from forming. It is also necessary to keep the room free of dust to ensure a smooth operation of the computer.

## (3) Matching the Volume of Air Flow

It is possible to use the fan on the computer to cool the room. This controlling method requires a certain volume of cold air in proportion to the amount of heat produced by the device. The inlet panel is located at the bottom of the unit, and the exhaust pipe is located either on the ceiling, front and back, or on the side.


## (4) Considering a Back-up Air Conditioning System

When the system is not allowed to stop at all, a back-up system is necessary. There are several different options for a back-up as the following:
(1) Installing two sets of air conditioning systems necessary for the computer.
(2) Utilizing regular office air conditioners (for people)
(3) Using one of the units as a back-up
(1) is used infrequently due to high costs involved. (2) involves many technical problems such as the difference between preset conditions for computer rooms and office rooms. In general, (3) is a preferred method. If (3) is chosen, the unit method (package method) is more economical than the central method.

## 9-5 Setting the Air conditioners

## (1) Air-Conditioning Load

(1) Once the floor plan is made and the conditions for the air-conditioning system are set, air conditioning capacity has to be determined by calculating the load.
(2) Unlike the outdoor air, computer load remains constant throughout the year. However, it is possible that there are considerable fluctuations within a day. This is due to the fact that, depending on the time of the day, there are changes in the number of computers that are turned on and that the different computer systems are in operation.
(3) If there is a plan to expand the current computer system in the future, it is important to include the load for the units to be added in the future when calculating the thermal load because it is practically impossible to keep the computers off for days on end during the installation of the new units.
(4) The following items need to be checked before calculating the unit capacity:

- Floor area of the computer room ( $\mathrm{m}^{2}$ )
- Total quantity of heat generated by computers


## (2) Sample Selection of Air Conditioners

## (2-1) Conditions

| Computer-generated heat | 20.9 kW |
| :--- | :---: |
| Number of workers | 5 |
| Lighting | $20 \mathrm{~W} / \mathrm{m}^{2}$ |
| Temperature and humidity | Indoor ${ }^{\circ} \mathrm{CDB} / \mathrm{Indoor}$ WBT $: 24^{\circ} \mathrm{C} / 17^{\circ} \mathrm{C}$ <br> ${ }^{\circ} \mathrm{CDB}$ of the air going into the computer : $18^{\circ} \mathrm{C}$ |

## (2-2) Building Conditions

| Windows | (W: $4.5 \mathrm{~m}, \mathrm{H}: 1.5 \mathrm{~m}) \times 2$ |
| :--- | :---: |
| Inside Measurement | Ceiling height 2.2 m |
| Surroundings | Upstairs room, downstairs room, heat and air conditioning |

(1) Coefficient of Overall Heat Transmission $U\left(W / m^{2} \cdot K\right)$

| Outer Walls | Summer 3.6, Winter 3.8 |
| :--- | :---: |
| Inner Walls | 2.05 |
| Ceiling | Downward convection 3.36, upward convection 3.3 |
| Floor (free access) | Downward convection 3.05, upward convection 4.56 |
| Floor | Downward convection 2.42, upward convection 3.3 |
| Windows | Summer 5.93, Winter 6.5 |



Window
(2) Internal Load

Number of People in the Room 5

| Lighting | $20 \mathrm{~W} / \mathrm{m}^{2}$ |
| :--- | :--- |
| Calculator | 20.9 kW |
| Draft | 0.2 times $/ \mathrm{h}$ |

(3) Volume of Outdoor Air Intake
$25 m^{3} / h \cdot$ person

## (2-3) Calculating the Load and Selecting a Model

Calculate the temperature difference by setting the outdoor temperature; then, calculate hourly loads.
The chart shows the result of a calculation, supposing that the system reaches its highest load at 12 o'clock. Outdoor temperatures in this example Summer: $32^{\circ} \mathrm{CDB}$ relative humidity $60 \%$

Winter : $-2^{\circ} \mathrm{CDB}$ relative humidity $42 \%$
(1) Load (in the summer with air-conditioning)
< Sensible Heat > SH

| Computer |  | 20.9 kW |
| :--- | :---: | ---: |
| Lighting | $1,800 \mathrm{~W}$ | 1.8 kW |
| Number of people in the room | 5 persons $\times 64(\mathrm{U})$ | 0.32 kW |
| Infiltration draft | $(0.2$ times $/ \mathrm{h}) 39.6 \mathrm{~m}^{3} \times 0.336 \times 8$ | 0.11 kW |
| Outer wall (heat transmission) | $8.5 \mathrm{~m}^{2} \times 3.6 \times 8$ | 0.25 kW |
| Windows (radiation) | $13.5 \mathrm{~m}^{2} \times 0.65 \times 188$ | 1.91 kW |
| Windows (heat transmission) | $13.5 \times 5.93 \times 8$ | 0.64 kW |
| Inner wall(heat transmission) | $61.6 \times 2.05 \times 4$ | 0.5 kW |
| Outside air | $125 \mathrm{~m}^{3} \times 0.336 \times 8$ | 0.34 kW |
|  |  | 26.8 kW |

< Latent Heat > LH

| Infiltration draft | $39.6 \times 834 \times 0.0117$ | 0.39 kW |  |  |
| :--- | :---: | :---: | :---: | :---: |
| Number of people in the room | 5 persons $\times 82$ | 0.41 kW |  |  |
| Outside air | $125 \mathrm{~m}^{3} \times 834 \times 0.0117$ | 1.22 kW |  |  |
| Total |  |  |  | 2.0 kW |

Total load is 28.8 kW
(2) Necessary Air Circulation

$$
V=\frac{26800}{0.336 \times(24-18)} \div 60=221 \mathrm{~m}^{3} / \mathrm{min}
$$

(3) Model Selection

PUY-P250YMF-C $\times 2$, PFD-P500VM-A type
Indoor ${ }^{\circ} \mathrm{CDB} 24^{\circ} \mathrm{C} /$ Indoor ${ }^{\circ} \mathrm{CWB} 17^{\circ} \mathrm{C}$ outdoor ${ }^{\circ} \mathrm{CDB} 32^{\circ} \mathrm{C}$
Capacity of the Moment $51.5 \mathrm{~kW} \quad \mathrm{SHF}=0.92$
Capacity of Sensible Heat $51.5 \times 0.92=47.4 / \mathrm{kW}$
Standard Air-Flow Volume: $320 \mathrm{~m}^{3} / \mathrm{min}$ can be accommodated with PUY-P250YMF-C $\times 2$ and PFD-P500VM-A.

## 9-6 Automatic Control of the Computer Room

Example
PFD-P560VM-A automatically controls the cooling temperature with a built-in controller.
(suction temperature or discharge temperature control)
This unit is designed for high sensible-heat specifications, and it does not include a humidifier or a dehumidifier. Install such components as necessary.

*1 Bold lines in the diagram indicate refrigerant piping (gas/liquid).
This system consists of 2 refrigerant circuits.
*2 Indicates TB3-type transmission line used to communicate with the indoor unit.
This system is made up of 2 circuits.

## 10. Maintenance/Inspection

## 10-1. Maintenance/Inspection Schedule

Having the units inspected by a specialist on a regular basis, in addition to regular maintenance such as changing the filters, will allow the users to use them safely and in good condition for an extended period of time.
The chart below indicates standard maintenance schedule.

## (1) Approximate Longevity of Various Parts

The chart shows an approximate longevity of parts. It is an estimation of the time when old parts may need to be replaced or repairs need to be made.
It does not mean that the parts must absolutely be replaced (except for the fan belt).
Please note that the figures in the chart do not mean warranty periods.

| Unit | Parts | Check every | Replace after | Daily check | Periodically check | Remarks |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \bar{o} \\ & \text { 을 } \\ & \text { 등 } \end{aligned}$ | Fan Motor | 6 months | 40000 hours |  | Yes |  |
|  | Bearing | 6 months | 40000 hours |  | Yes | Add lubricant once a year |
|  | Fan Belt | 6 months | 8000 hours |  | Yes | Disposable parts |
|  | Air Filter | 3 months | 5 years | Yes |  |  |
|  | Drain Pan | 6 months | 8 years |  | Yes | Maintenance schedule changes depending on the local conditions |
|  | Drain Hose | 6 months | 8 years |  | Yes |  |
|  | Linear Expansion Valve | 1 year | 25000 hours |  | Yes |  |
|  | Heat Exchanger | 1 year | 5 years |  | Yes |  |
|  | Float Switch | 6 months | 25000 hours |  | Yes |  |
|  | Indicator Lamp | 1year | 8000 hours |  | Yes |  |
| $\begin{aligned} & \bar{\circ} \\ & \text { 울 } \\ & \overline{3} \end{aligned}$ | Compressor | 6 months | 40000 hours |  | Yes |  |
|  | Fan motor | 6 months | 40000 hours |  | Yes |  |
|  | Linear Expansion Valve | 1 year | 25000 hours |  | Yes |  |
|  | Heat Exchanger | 1 year | 5 years |  | Yes |  |
|  | Pressure Switch | 1 year | 25000 hours |  | Yes |  |
|  | Inverter Cooling Fan | 1 year | 40000 hours |  | Yes |  |

(2) Notes
-The above chart shows a maintenance schedule for a unit that is used under the following conditions:
A. Less than 6 times per hour of compressor stoppage
B. The unit stays on 24 hours a day.

- Shortening the inspection cycle may need to be considered when the following conditions apply:
(1) When used in high temperature/high humidity area or when used in a place where the temperature and/or humidity fluctuate greatly
(2) When plugged into an unstable power source (sudden change in voltage, frequency, wave distortions) (Do not exceed the maximum capacity.)
(3) When the unit is installed in a place where it receives vibrations or major impacts.
(4) When used in a place with poor air quality (containing dust particles, salt, poisonous gas such as sulfuric acid gas and sulfuric hydrogen gas, oil mist).
- Even when the above maintenance schedule is followed, there could be unexpected problems that cannot be predicted.
- Holding of Parts

We will hold parts for the units for at least 9 years after the termination of the production of the unit, following the standards set by the ministry of economics and industries.

Details of Maintenance/Inspection

| Unit | Parts | $\begin{array}{\|c} \text { Inspection } \\ \text { Cycle } \\ \hline \end{array}$ | Check points | Assessment | What to do |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{array}{\|l} \text { 흥 } \\ \text { 으́ } \end{array}$ | Fan motor | $\begin{gathered} 6 \\ \text { months } \end{gathered}$ | Check for unusual noise - Measure the insulation resistance | - Free of unusual noise <br> - Insulation resistance over $1 \mathrm{M} \Omega$ | Replace when insulation resistance is under $1 \mathrm{M} \Omega$ |
|  | Bearing |  | - Check for unusual noise | - Free of unusual noise | If the noise doesn't stop after lubrication, change the oil. Add lubricant once a year. |
|  | Fan belt |  | - Check for excessive slack <br> - Check for wear and tear <br> - Check for unusual noise | - Resistance (3-4kg/belt) <br> - Adequate amount of slack $=5 \mathrm{~mm}$ <br> - Belt length=no longer than $102 \%$ of the original length <br> - Free of wear and tear <br> - Free of unusual noise | Adjust the belt Replace if the belt length exceeds $2 \%$ of the original length, worn, or used over 8000 hours |
|  | Air filter | $\begin{array}{\|c} 3 \\ \text { months } \end{array}$ | - Check for clogging and tear <br> - Clean the filter | - Clean, free of damage | Clean the filter Replace if extremely dirty or damaged |
|  | Drain pan | $6$ months | - Check for clogging of the drainage system <br> - Check for loosened bolts <br> - Check for corrosion | - Clean, free of clogging <br> - Free of loose screws <br> - No major disintegration | Clean if dirty or clogged Tighten bolts Replace if extremely worn |
|  | Drain hose |  | . Make sure the loop of the hose has water to prevent air from traveling through the hose (Fill the hose with water) . Check for clogging of the drainage system | - Clean, free of clogging <br> - Free of wear and tear | Clean if dirty or clogged Replace if extremely worm |
|  | Linear expansion valve | $\begin{gathered} 1 \\ \text { year } \end{gathered}$ | - Perform an operation check using the operation data | - Adequately controls the air temperature (Check temperature change on the centralized controller) | Replace if malfunctioning |
|  | Heat exchanger |  | - Check for clogging, dirt, and damage | Clean, free of clogging or damage | Clean |
|  | Float switch | 6 months | Check the outer appearance - Make sure its free of foreign objects | - Free of frayed or cut wires <br> - Free of foreign objects | Replace if damaged or extremely worn Remove foreign objects |
|  | Indicator lamp | $\begin{gathered} 1 \\ \text { year } \end{gathered}$ | - Make sure the lamp comes on | . Comes on when the output is on | Replace if the light does not come on when the power is on |
|  | Compressor | 6 months | Check for unusual noise - Check insulation resistance Check for loosened terminals | Free of unusual sound <br> - Insulation resistance over $1 \mathrm{M} \Omega$ Free of loosened terminals | Replace if insulation resistance goes below $1 \mathrm{M} \Omega$ (under the condition that the refrigerant is not liquefied) Tighten loosened bolts |
|  | Fan motor |  | - Check for unusual noise <br> - Measure insulation resistance | - Free of unusual sound <br> - Insulation resistance over $1 \mathrm{M} \Omega$ | Replace if insulation resistance goes below $1 \mathrm{M} \Omega$ |
|  | Linear expansion valve | $\begin{gathered} 1 \\ \text { year } \end{gathered}$ | - Perform an operation check using the operation data | - Adequately controls the air temperature (Check temperature change on the centralized controller) | Replace if malfunctioning |
|  | Heat exchanger |  | - Check for clogging, dirt, and damage | Clean, free of clogging or damage | Clean |
|  | Pressure switch |  | Check for torn wire, fraying, and unplugged connectors Check insulation resistance | - No frayed or cut wires or unplugged connectors - Insulation resistance over $1 \mathrm{M} \Omega$ | Replace when cut or shorted, when the insulation resistance goes below $1 \mathrm{M} \Omega$, or if there is a history of abnormal operation |
|  | Inverter cooling fan |  | - Check for unusual sound <br> - Measure insulation resistance <br> - Look for abnormal history | - Free of unusual sound <br> - Insulation resistance over $1 \mathrm{M} \Omega$ <br> - No heatsink overheat protection $(4230,4330)$ on the report | Replace when producing unusual sounds, when insulation resistance goes under $1 \mathrm{M} \Omega$, or if there is a history of abnormal operation. |


[^0]:    Operation Temparature Range : Indoor : $12^{\circ} \mathrm{CWB} \sim 24^{\circ} \mathrm{CWB}$ Outdoor: $-5^{\circ} \mathrm{CDB} \sim 43^{\circ} \mathrm{CDB}$ (RH: 30~80\%)
    : Indoor : $27^{\circ} \mathrm{CDB} / 19^{\circ} \mathrm{CWB}$ Outdoor: $35^{\circ} \mathrm{CDB} /-$

[^1]:    Note: 2. Always use odd num
    . Connect the transmission line from indoor unit to outd
    address equals he address of the connected indoor unit + 50 .
    4. Conventions: $\odot$, temminal bed; $\Theta$, connector; 四, board-insertion
    4. Conventions: $\odot$, terminal bed; $\Theta$, connector, ๒,
    connector or fastening connector of control board.

[^2]:    * 10HP has only the main controller

