MITSUBISHI ELECTRIC

Changes for the Better

SPLIT-TYPE, HEAT PUMP AIR CONDITIONERS

October 2008

No. OCC09

ELECTRICAL CONTROL GUIDE R410A

<Indoor unit> **INVERTER**

[Model names]

PLA-RP·BA(2)
PEAD-RP·EA(2)
PEAD-RP·GA
PKA-RP·GAL
PKA-RP·FAL(2)

<Outdoor unit>

[Model names]

PUHZ-HRP71/100VHA
PUHZ-HRP100/125YHA
PUHZ-HRP71/100VHA2
PUHZ-HRP100/125YHA2

CONTENTS

CONFIDENCIAL
(FOR INTERNAL USE ONLY)

Zubadan Mr.SLIM™

1 REFERENCE SERVICE MANUAL

For information on service, please refer to the service manual as follows.

1-1. INDOOR UNIT

Model name	Service Ref.	Service Manual No.
PLA-RP35/50/60/100/125BA PLA-RP71/100/125BA2	PLA-RP35/50/60/100/125BA(1).UK/BA#2.UK PLA-RP71/100/125BA2.UK	OCH412 OCB412
PKA-RP35/50GAL	PKA-RP35/50GAL(#1)	OC330
PKA-RP60/100FAL PKA-RP50FAL2	PKA-RP60/100FAL(#1) PKA-RP50FAL2(#1)	OC331
PEAD-RP50/60/71/125EA PEAD-RP35/100EA2	PEAD-RP50/60/71/125EA(#1).UK PEAD-RP35/100EA2(#1).UK	HWE0521
PEAD-RP60/71/100GA	PEAD-RP60/71/100GA(#1).UK	HWE0506

1-2. OUTDOOR UNIT

Model name	Service Ref.	Service Manual No.
PUHZ-HRP71/100VHA PUHZ-HRP100/125YHA PUHZ-HRP71/100VHA2 PUHZ-HRP100/125YHA2	PUHZ-HRP71/100VHA PUHZ-HRP100/125YHA PUHZ-HRP71/100VHA2 PUHZ-HRP100/125YHA2	OCH425 OCB425

1-3. TECHNICAL DATA BOOK

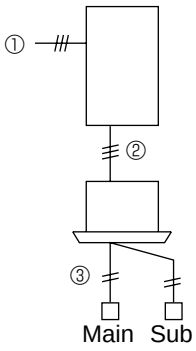
PUHZ-HRP·HA(2) series OCS11

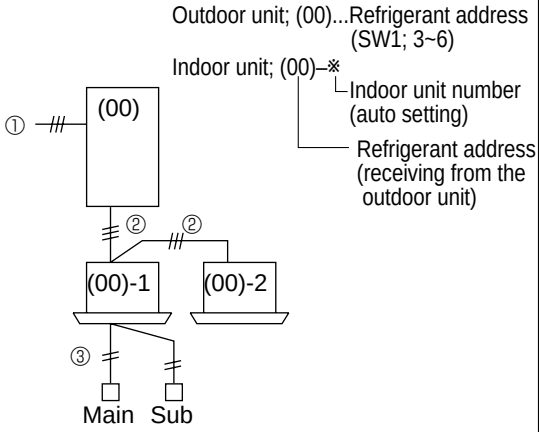
3 MICROPROCESSOR CONTROL

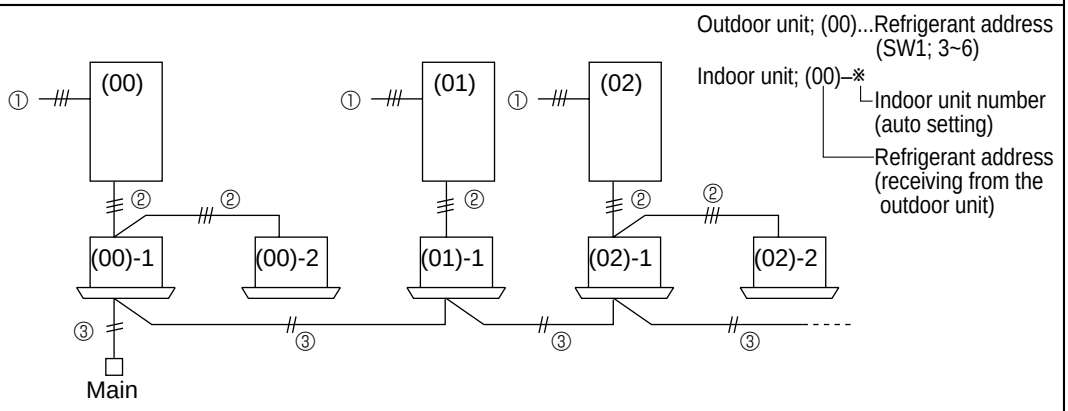
2-1. SYSTEM CONSTRUCTION

※ The figures below show the system construction with wiring diagram of superimposed power supply system.
For wiring of separate indoor/outdoor unit power supply, refer to OUTDOOR UNIT'S SERVICE MANUAL.

(1) System construction
A-control model which just wires the connecting line between the indoor and outdoor unit and supply the power is applicable to any models of standard (1:1), twin and triple. (Refer to (5) Start-up system.)

<table>
<tr><td colspan="2"></td><td>Standard 1:1</td><td>Twin</td></tr>
<tr><td colspan="2">System construction</td><td> 

①Unit (outdoor) power supply L/N (PUHZ-HRP·V) or L1/L2/L3/N (PUHZ-HRP·Y)
②Connecting line between the indoor and outdoor; S1/S2/S3, Polarized 3-wire
③Remote controller transmission line; Non polarized 2-wire</td><td> 

①Unit (outdoor) power supply L/N (PUHZ-HRP·V) or L1/L2/L3/N (PUHZ-HRP·Y)
②Connecting line between the indoor and outdoor; S1/S2/S3, Polarized 3-wire
③Remote controller transmission line; Non polarized 2-wire</td></tr>
<tr><td rowspan="4">Various setting</td><td>Remote controller</td><td>Remote control main/sub setting necessity
(In case of 2 remote controllers)</td><td>Remote control main/sub setting necessity
(In case of 2 remote controllers)</td></tr>
<tr><td>Indoor unit</td><td>No setting</td><td>No setting (initial setting)</td></tr>
<tr><td>Outdoor unit</td><td>No setting</td><td>No setting (initial setting)</td></tr>
<tr><td colspan="2">Remarks</td><td>—</td><td>(1) Indoor unit number is set automatically.</td></tr>
<tr><td colspan="2"></td><td colspan="2">Group control</td></tr>
<tr><td colspan="2">System construction</td><td colspan="2"> 

①Unit (outdoor) power supply L/N (PUHZ-HRP·V), L1/L2/L3/N(PUHZ-HRP·Y)
②Connecting line between the indoor and outdoor; S1/S2/S3, Polarized 3-wire
③Remote controller transmission line; Non polarized 2-wire</td></tr>
<tr><td rowspan="3">Various setting</td><td>Remote controller</td><td colspan="2">Remote control main/sub setting necessity
(In case of 2 remote controllers)</td></tr>
<tr><td>Indoor unit</td><td colspan="2">No setting (Initial setting)</td></tr>
<tr><td>Outdoor unit</td><td colspan="2">Refrigerant address setting; SW1; 3~6</td></tr>
<tr><td colspan="2">Remarks</td><td colspan="2">(1) Indoor unit number is set automatically.
(2) The power is supplied only to the remote controller that is connected to the refrigerant address ”00” unit.</td></tr>
</table>

(2) The transmitting specification for “A” control

①Wiring regulations

Section	Communications from remote controllers	Communications between indoor and outdoor units
Maximum length of total wiring	500m	Superimposed power supply system:80m Separate indoor/outdoor unit power supplies:120m (The length of the total wiring including the wiring among indoor units in addition to the wiring between indoor and outdoor units)
Maximum numbers of connection	Up to 16 indoor units are connectable to 1 remote controller by grouping them.*1 Up to 2 remote controllers are connectable to 1 group. *1 Remote controller considers multiplex units as a single group.	1 outdoor unit can be connected up to 2 indoor units.
Applicable cable size	0.3mm^2 to 1.25mm^2	Superimposed power supply system: Use either flat-type cable (3 cores: ϕ1.6mm or more). *2 The diameter of the cables depends on each unit. Separate indoor/outdoor unit power supplies: More than 0.3mm^2 (More than 2 cores)
Others	The wirings as follows are not allowed: • The wiring that the indoor units of the same refrigerant system are connected through TB5 • The wiring which directly connects the terminals for remote controllers	The core wire connected to terminal S2 shall be placed at the center of flat-type cable.

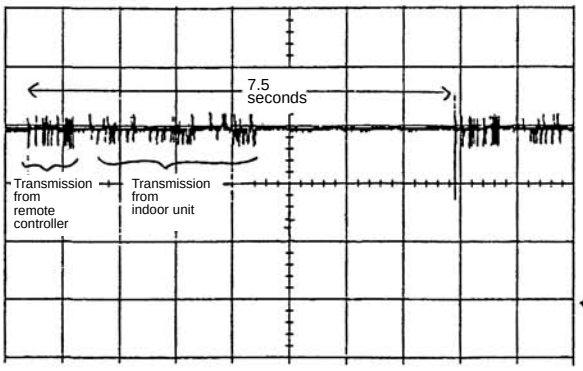
②Transmitting specification

Section	Communications from remote controllers	Communications between indoor and outdoor units
Transmitting speed	83.3 bit/sec. (1 bit = 12ms)	83.3 bit/sec. (1 bit = 12ms)
Normal transmission	The terminal for remote controller transmits signals every 7.5 seconds; the indoor unit whose refrigerant address is “0” responds them.	Outdoor unit transmits signals every 3 seconds; all the connected indoor units respond them.
Modulation	The waveform modulates at 50kHz.	There is no modulation.
Detection of abnormal communication	When transmitting error is detected for 3 consecutive minutes.	When transmitting error is detected for 3 consecutive minutes.

(3) The waveforms of remote controller communications

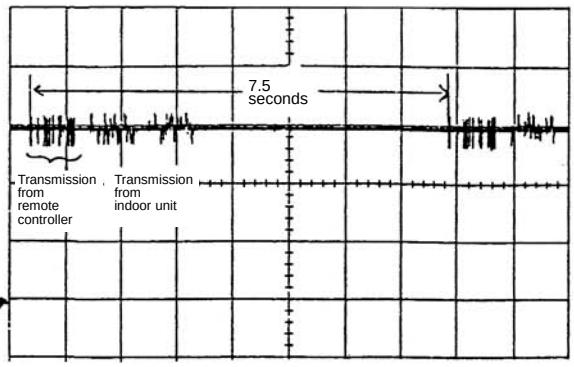
The following graphs are the examples for measuring waveforms on the wirings of remote controlled transmission at the terminal block for remote controller.

a) A measuring example in the sequence of startup



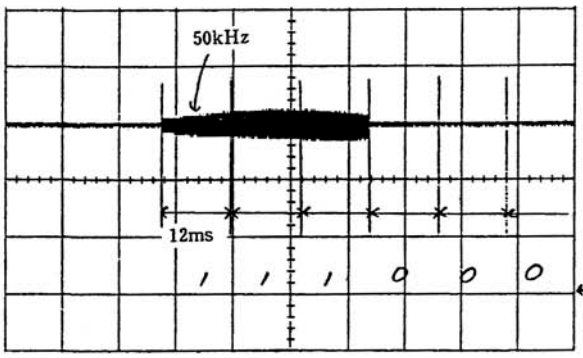
5V/div, 1sec/div:

b) A measuring example during normal stop



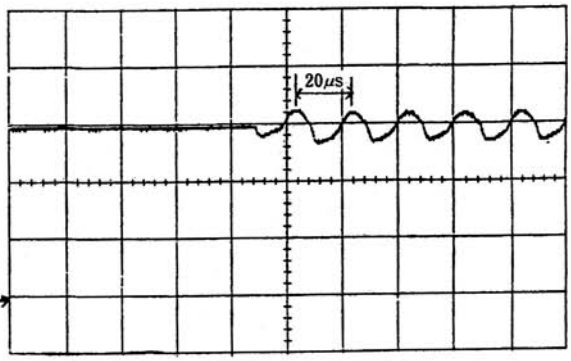
5V/div, 1sec/div:

c) Expanded waveform 1 (signal 111000....)



5V/div, 10msec/div:

d) Expanded waveform 2 (50kHz carrier)



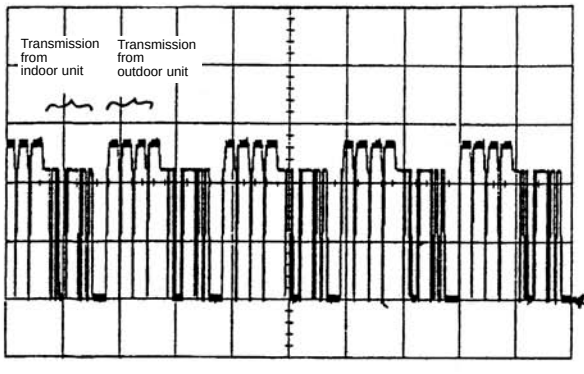
5V/div, 2μsec/div:

• During normal operation, the remote controller interactively exchanges signals with the indoor unit of refrigerant address “0”. When the remote controller cannot receive signals from the indoor unit of refrigerant address “0” for 3 minutes, it is considered as abnormal. E0 is displayed on the remote controller as an error.

(4) The waveforms of communications between indoor and outdoor units

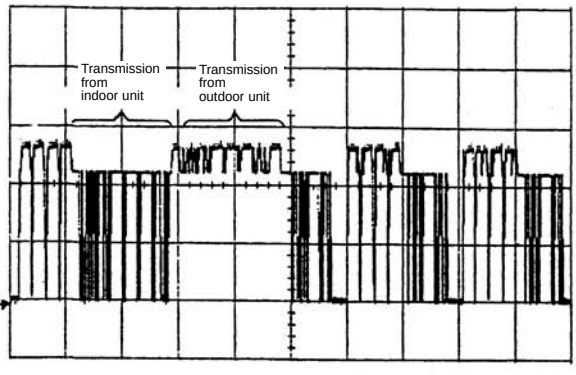
The following graphs are the examples for measuring waveforms on the wirings of connecting indoor and outdoor units at between S2 and S3 of the outdoor terminal block TB1.

a) A measuring example the sequence of startup: 1



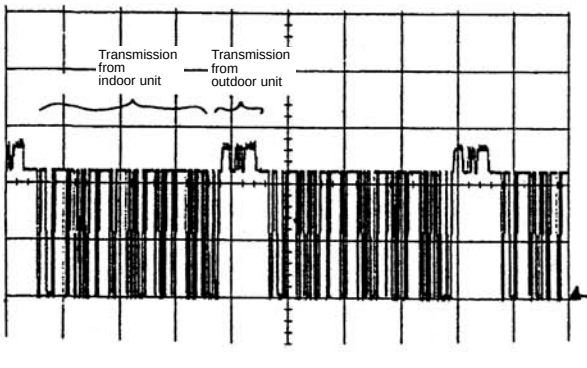
10V/div, 500msec/div:

b) A measuring example in the sequence of startup: 2



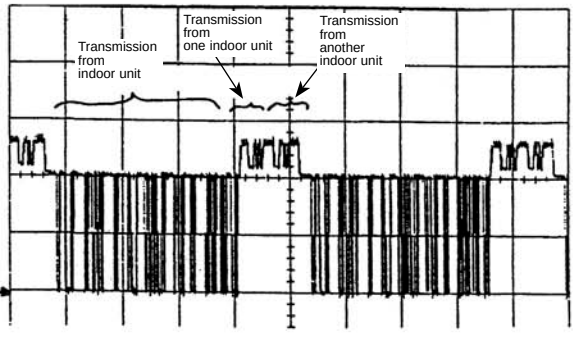
10V/div, 500msec/div:

c) A measuring example during normal stop
(When 1 outdoor unit connects 1 indoor unit)



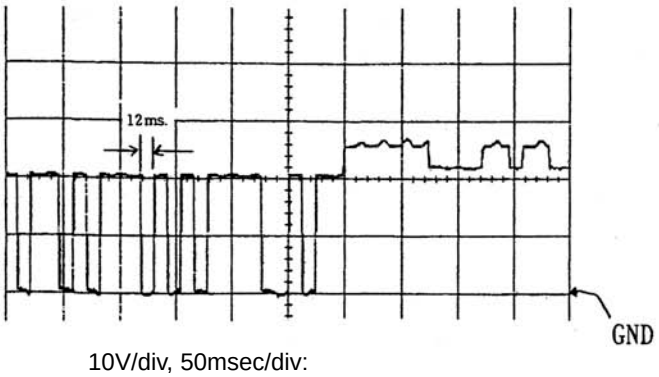
10V/div, 500msec/div:

d) A measuring example during normal stop
(When 1 outdoor unit connects 2 indoor units)



10V/div, 500msec/div:

e) Expanded waveform



10V/div, 50msec/div:

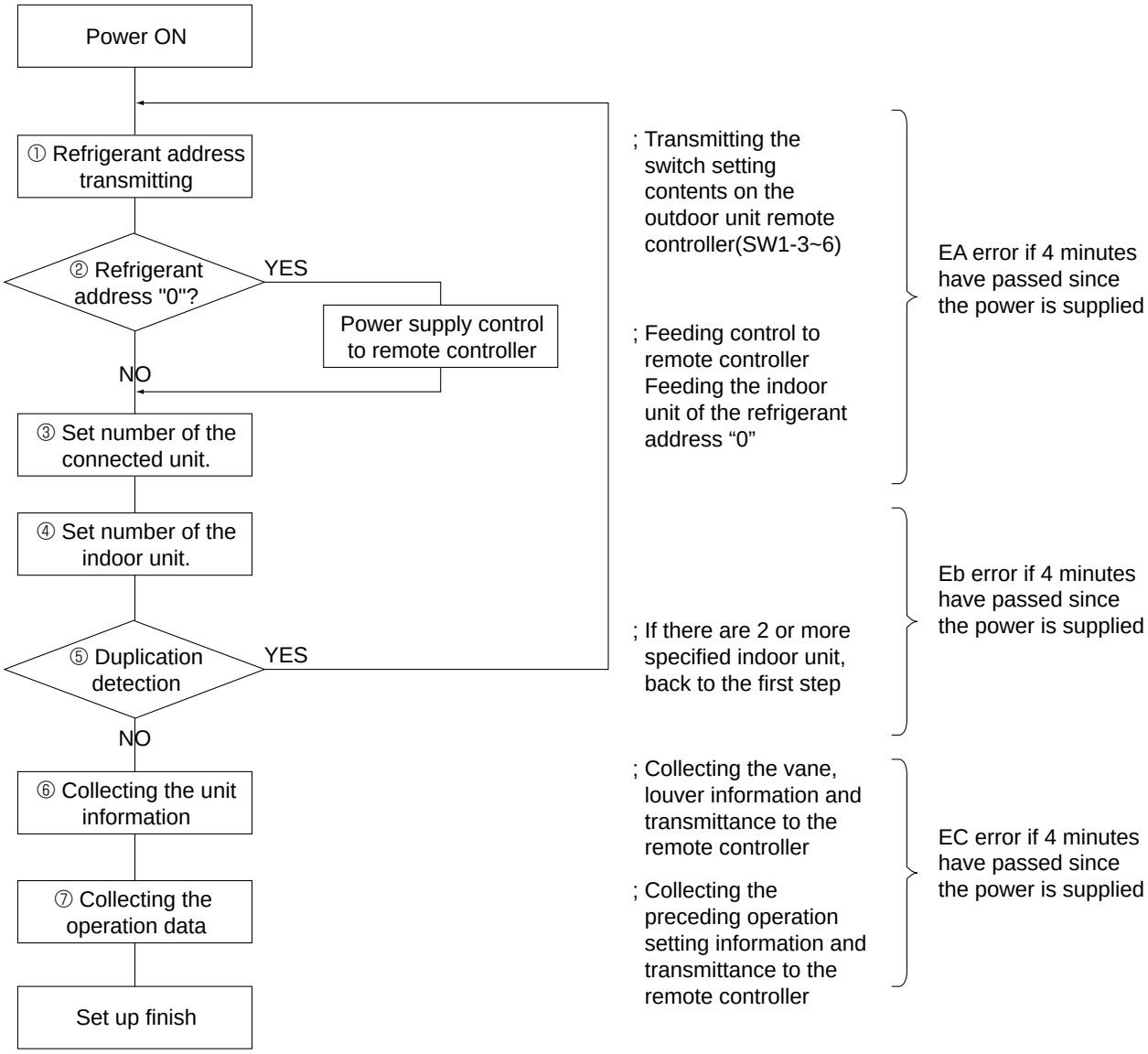
- During normal operation, outdoor unit interactively exchanges signals with all the connected indoor units.
- When outdoor unit cannot receive signals for 3 minutes from an indoor unit due to any trouble like cable disconnection, it is considered as abnormal and the outdoor unit stops. E8 is displayed on the remote controller. This is to avoid independent operation of indoor units.

(5) Start-up system

A control unit is applicable to any models of standard (1:1), twin and triple without switch setting according to carrying out the below process automatically when the power is supplied.

When the power is supplied, following processes of ① Refrigerant address transmitting, ② Power supply control to remote controller, ③ Set number of the connected unit, ④ Set number of the indoor unit, ⑤ Duplication detection, ⑥ Collecting the unit information and ⑦ Collecting the operation data are carried out as shown on the figure.

Also when detecting the duplicated setting in the step ⑤, back to the first step and reset it.



<<Feature>>

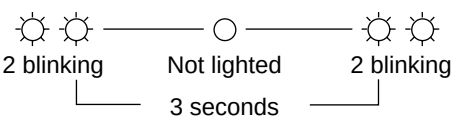
A. Start-up time from the second time will be shorter since setting of the number of connected units is memorized once set.
Start-up time can be estimated as following;
- •When installing ... 1~2 minutes (Depending on the number of connecting units)
- •Since the second time .... 20 seconds ~1 minute (Depending on the number of connecting units)

※ When the above processing does not finish, even if 4 minutes have passed, consider the processing an error and EA, Eb or EC will be displayed.
However if power is not supplied to the indoor unit due to miswiring or looseness of the connecting lines between the indoor and outdoor unit, there will be no display on the remote controller. Also when the data cannot be received from the outdoor unit, E6 is displayed on the remote controller after 6 minutes.

B. When replacing the P.C. board, only the unit number which has had its P.C. board replaced is reset.
Even if the power supply is reset, the unit number which has not had its P.C. board replaced does not change.

C. Automatic set unit is possible to confirm the unit number by blinking the frequency of LED3 in the indoor controller board.
At intervals of approx. 3 seconds, the number of the unit-number blinks.(Example:The unit(unit number:2) blinks twice at 3-second intervals.

Example



2-2. FUNCTION/ CONTROL SPECIFICATIONS

	Item		4-way ceiling cassette	Ceiling concealed	
			PLA-RP·BA(2)	PEAD-RP·EA(2)	PEAD-RP·GA
Function / specification	Fan	Notch	4 speed+Auto	2 speed	2 speed
		Drive method	Sinewave drive (DC motor)	Tap-changing (AC motor)	Tap-changing (AC motor)
	Up/down auto vane	Direction setting	5 direction *1 + Auto	—	—
		Swing function	○ (Heating mode : Wave-flow)	—	—
		Shutter mechanism	○	—	—
		Motor type	Pulse motor (12V DC)	—	—
	Left/right swing louver	Direction setting	—	—	—
		Motor type	—	—	—
	Drain pump		○ (Float switch)	△ (Drain sesnsor)	—

Note: The parts marked △ are optional.
*1: Only using wired remote controller
(4 direction : Using wireless remote controller)

	Item		Wall mounted	
			PKA-RP·GAL	PKA-RP·FAL(2)
Function / specification	Fan	Notch	4 speed	2 speed
		Drive method	Phase control (AC motor)	Phase control (AC motor)
	Up/down auto vane	Direction setting	4 direction	4 direction
		Swing function	○	○
		Shutter mechanism	○	○
		Motor type	Pulse motor (12V DC)	Pulse motor (12V DC)
	Left/right swing louver	Direction setting	(Manual operation)	(Manual operation)
		Motor type	—	—
	Drain pump		—	△ (Drain sensor)

Note: The parts marked △ are optional.

3 INDOOR UNIT CONTROL

3-1. COOL OPERATION

<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td rowspan="3">1. Compressor</td><td>1-1. Thermoregulating function (Function to prevent restarting for 3 minutes)
• Room temperature ≧ Set temperature +0.5℃ ···Compressor ON
• Room temperature ≦ Set temperature -1.5℃ ···Compressor OFF</td><td>※1 The thermoregulating function is provided in the outdoor unit.

The indoor unit transmits the indoor room temperature and set temperature data to outdoor unit, then the outdoor unit controls thermoregulation.</td></tr>
<tr><td>1-2. Anti-freezing control
Detected condition : When the liquid pipe temperature (TH2) or condenser/evaporator temperature (TH5) (※2) is 2℃ or less (※3) after 16 minutes from compressors start up, anti-freezing control starts and the compressor will be suspended.
Released condition : When any of the following conditions is satisfied, antirepeat mode operates for 3 minutes and anti-freezing control is released.
① Liquid pipe temperature (TH2) and condenser/ evaporator temperature (TH5) turn 10℃ or above.
② The condition of the compressor stop has become complete by thermoregulating, etc.
③ The operation modes became mode other than COOL.
④ The operation stopped.
⑤ Anti-freezing operation is continued for 9 minutes.</td><td rowspan="2">※2 Compare liquid pipe temperature to condenser/evaporator temperature, and the lower one is applied to anti-freezing control.

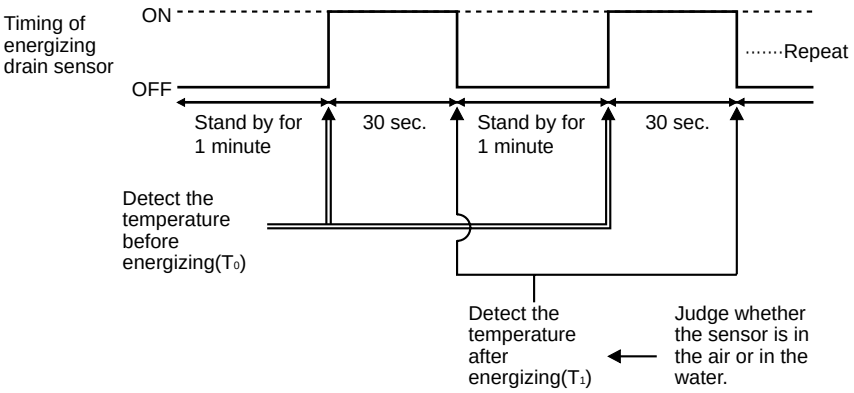
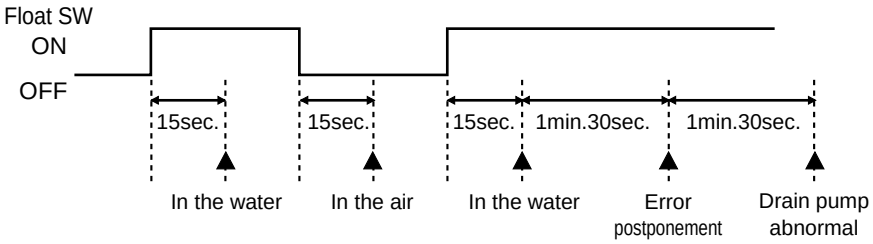
Liquid pipe
Liquid pipe temperature ≦ Condenser/ Evaporator temperature

Condenser/Evaporator pipe
Liquid pipe temperature > Condenser/ Evaporator temperature

※3 The function of remote controller can change the temperature to start anti-freezing control.</td></tr>
<tr><td>1-3. Frozen protection
Detected condition : When the indoor pipe temperature (TH2) or condenser/evaporator temperature (TH5) continues -15℃ and below for 3 minutes since 3 minutes has passed after the compressor start, the compressor stops and then the mode changes to 6-minute stop restarting. After restarting, the frozen protection (Error code : P6) operates when either ① or ② condition is satisfied.
①After 3 minutes of compressor start - up, pipe temp. (TH2 or TH5) is lower than 15℃ for 3 minutes.
②After 16 minutes of compressor start - up, pipe temp.(TH2 or TH5) is lower than –15℃.

Released condition : When the operation stops by the remote controller operation.</td></tr>
<tr><td>2. Fan</td><td>By the remote controller setting (switch of 4 speeds+Auto or 4 speeds or 2 speeds)

<table><tr><th>Type</th><th>Fan speed notch</th></tr><tr><td>4 speeds+Auto</td><td>[Low] [Medium2] [Medium1] [High][Auto]</td></tr><tr><td>4 speeds</td><td>[Low] [Medium2] [Medium1] [High]</td></tr><tr><td>2 speeds</td><td>[Low] [High]</td></tr></table>
When [Auto] is set, fan speed is changed depending on the value of:
Room temperature - Set temperature</td><td></td></tr>
</table>

Control modes	Control details	Remarks
3. Drain pump	3-1. Drain pump control •Always drain pump ON during the COOL and DRY mode operation. (Regardless of the compressor ON/ OFF) •When the operation mode has changed from the COOL or DRY to the others (including Stop), turn the drain pump ON for 3 minutes then stop the operation.	
	3-2. Liquid level detection method ■ Drain sensor type • Energize drain sensor at a fixed voltage for a fixed duration. After energizing, compare the drain sensor's temperature to the one before energizing, and judge whether the sensor is in the air or in the water. **Basic control** • While drain pump is turned on, repeat the following control system and judge whether the sensor is in the air or in the water.  •Drain sensor temperature rise (t) •Temperature of drain sensor before current is applied (T_0) •Temperature of drain sensor after current is applied (T_1) [$t = T_1 - T_0$] ■ Float switch type • Float switch control judges whether the sensor is in the air or in the water by turning the float switch ON/OFF. In the water : Detected that the float switch is ON for 15 seconds. In the air : Detected that the float switch is OFF for 15 seconds.  	· Drain sensor Indoor controller board CN31 ← 1 2 3 · If the unit is without the drain sensor, install the jumper connector. Indoor controller board CN31 ← 1 2 3 · When installing the jumper connector, determine to detect compulsorily in the air.
4. Vane (up/down vane change)	(1) Initial setting : When starting operation : Horizontal (Last setting may be applied depending on the models.) When changing operation mode : Horizontal (2) Vane position : Horizontal→Downward A→Downward B→Downward C→Downward D*1→Swing*1→Auto*1 (3) Restriction of the downward vane setting *2 When setting the downward vane A, B, C or D in [Medium2] or [Low] of the fan speed notch, the vane changes to horizontal position after 1 hour have passed.	*1 Whether the unit has a swing function is listed in the function/control specifications. · Downward, Swing, Auto have different functions depending on the models. *2 "Only 1Hr" appears on the wired remote controller.
5. Louver (Left/right change)	Remote controller setting	Model which installed louver function.

3-2. DRY OPERATION

<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td>1. Compressor</td><td>1-1. Thermoregulating function (Including the function to prevent restarting for 3 minutes)
Setting the compressor operation time by the thermoregulating signal and the room temperature (TH1).
Thermoregulating signal ON Room temperature ≧ Set temperature +1℃
Thermoregulating signal OFF Room temperature ≦ Set temperature
<table>
<tr><th>Room temp.</th><th>Thermoregulating signal</th><th>Range of room temp.</th><th>Operating time (min)</th><th>OFF time (min)</th></tr>
<tr><td rowspan="4">Over 18℃</td><td rowspan="3">ON</td><td>28℃≦ ti</td><td>9</td><td>3</td></tr>
<tr><td>26℃≦ ti < 28℃</td><td>7</td><td>3</td></tr>
<tr><td>24℃≦ ti < 26℃</td><td>5</td><td>3</td></tr>
<tr><td>ti < 24℃</td><td>3</td><td>3</td></tr>
<tr><td>OFF</td><td>—</td><td>3</td><td>10</td></tr>
<tr><td>18℃ and below</td><td colspan="4">Compressor operation stop</td></tr>
</table></td><td>The thermoregulating function is provided in the outdoor unit.

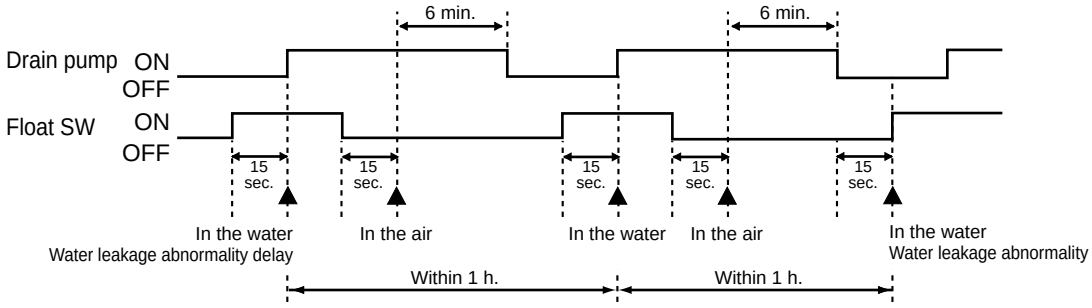
The indoor unit transmits the indoor room temperature and set temperature data to outdoor unit, then the outdoor unit controls thermoregulation.</td></tr>
<tr><td></td><td>1-2. Anti-freezing control
No control function</td><td></td></tr>
<tr><td></td><td>1-3. Frozen protection
Same control as COOL operation</td><td></td></tr>
<tr><td>2. Fan</td><td>Indoor fan operation is controlled depends on the compressor conditions.
<table>
<tr><th>Compressor</th><th>Fan speed</th></tr>
<tr><td>ON</td><td>[Low]</td></tr>
<tr><td>OFF</td><td>Stop (*1)</td></tr>
</table>
Note: Remote controller setting is not acceptable.</td><td>*1 Note that even when the compressor is OFF, the unit starts operating in [LOW] if the start condition below is met.
Start condition:
The piping temperature TH2 or TH5 has fallen to 1℃ or less.
Release condition:
The piping temperature TH2 or TH5 has returned to at least 10℃.</td></tr>
<tr><td>3. Drain pump</td><td>Same control as COOL operation</td><td></td></tr>
<tr><td>4. Vane
(up/ down vane change)</td><td>Same control as COOL operation</td><td></td></tr>
</table>

3-3. FAN OPERATION

<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td>1. Compressor</td><td>None (always stopped)</td><td></td></tr>
<tr><td>2. Fan</td><td>Fan is controlled by remote controller setting.
<table>
<tr><th>Type</th><th>Fan speed notch</th></tr>
<tr><td>4 speeds+Auto</td><td>[Low] [Medium2] [Medium1] [High] [Auto]</td></tr>
<tr><td>4 speeds</td><td>[Low] [Medium2] [Medium1] [High]</td></tr>
<tr><td>2 speeds</td><td>[Low] [High]</td></tr>
</table>
When [Auto] is set, fan sped becomes [Low].</td><td></td></tr>
<tr><td>3. Drain pump</td><td>3-1. Drain pump control
■ Drain sensor type
The drain pump turns ON for the specified amount of time when any of the following conditions is met.
① ON for 3 minutes after the operation mode is switched from COOL or DRY to another operation mode (FAN mode).
② ON for 6 minutes after the drain sensor is determined to be submerged using the liquid level detection method given below.
③ ON for 6 minutes after indoor liquid pipe temperature - indoor room temperature becomes -10℃ or less AND the drain sensor input is at the short or open level. (If condition ② or ③ is still being met after the drain pump has been turned ON for 6 minutes, the drain pump is kept ON for a further 6 minutes.)
■ Float switch type
The drain pump turns ON for the specified amount of time when any of the following conditions is met:
① ON for 3 minutes after the operation mode is switched from COOL or DRY to FAN mode.
② ON for 4 minutes after the float switch is submerged in the water when the float switch control judges the sensor is in the water.</td><td></td></tr>
</table>

Continued to the next page

From the previous page

<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td rowspan="3">3. Drain pump</td><td>3-2. Liquid level detection method
■ Drain sensor type
If any of the following conditions is met, liquid level detection is performed.
① Drain pump is ON.
② Indoor liquid pipe temperature - indoor room temperature ≦ -10℃ (except during defrosting)
③ Indoor liquid pipe temperature or indoor room temperature is at the short or open level temperature.
④ Every 1 hour after the drain pump has been switched from ON to OFF.
Float switch type
• Float switch control judges whether the sensor is in the air or in the water
■ by turning the float switch ON/OFF.
In the water : Detected that the float switch is ON for 15 seconds.
In the air : Detected that the float switch is OFF for 15 seconds.</td><td>Refer to “3-2. COOL opration” for liquid level detection method.</td></tr>
<tr><td>3-3. Detection of water leakage abnormality
① Model : PLA-RP·BA
② Conditions to detect water leakage abnormality
· When the float switch is detected to be in the water and drain switch turns to ON from OFF under the operation other than cool or dry operation.
· Humidifier cannot be operated during water leakage abnormality delay.
· Abnormal (P5) when it is repeated twice that the drain pump is detected to turn ON from OFF again within 1 hour after water leakage abnormality delay
③ Conditions to release water leakage abnormality delay
· When it is not detected that the drain pump is tuned ON from OFF within 1 hour after detecting abnormality delay
· When the operation is changed to cooling or drying.
· Indoor liquid pipe temperature - indoor room temperature ≦ -10℃
Operation mode : When drain pump is detected to be ON and in the water except in the cooling and drying operation
 
</td><td></td></tr>
<tr><td>3-4. Forced compressor stop
Same control as heat operation</td><td></td></tr>
<tr><td>4. Vane (up/ down vane change)</td><td>Same as the control performed during the COOL operation, but with no restriction on the vane's downward blow setting.</td><td></td></tr>
<tr><td>5. Louver (Left/ right change)</td><td>Remote controller setting</td><td>Model which installed louver function.</td></tr>
</table>

3-4. HEAT OPERATION

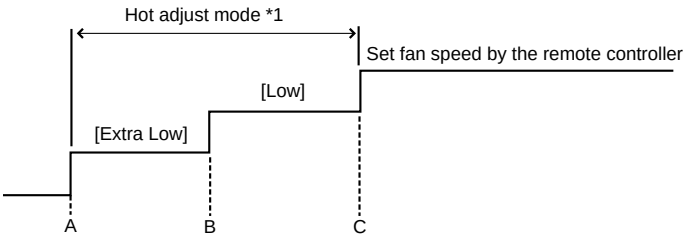
<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td rowspan="2">1. Compressor</td><td>1-1. Thermoregulating function (Function to prevent restarting for 3 minutes)
• Room temperature ≦ Set temperature -1℃ ···Compressor ON
• Room temperature ≧ Set temperature +1℃···Compressor OFF</td><td>✻1
The thermoregulating function is provided in the outdoor unit.

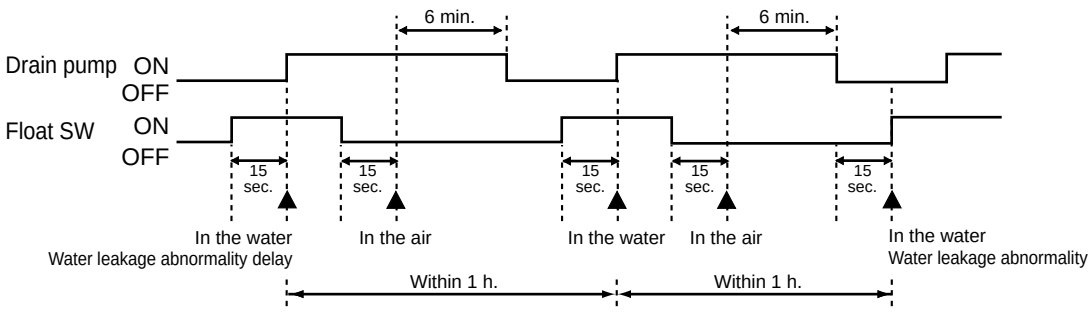
The indoor unit transmits the indoor room temperature and set temperature data to outdoor unit, then the outdoor unit controls thermoregulation.</td></tr>
<tr><td>1-2. Over-rise protection control
Detected control : When condenser/evaporator temp. (TH5) is higher than 70℃ and less than 90℃, compressor is stopped and mode is changed to 6-minute stop restarting mode.
After restarting, if condenser/evaporator temp. (TH5) is higher than 70℃ and less than 90℃ before 16 minutes passed, over- rise protection (Error code : P6) operates.

Release control : When the operation stops by the remote controller</td><td></td></tr>
<tr><td>2. Auxiliary heater</td><td>2-1. Thermoregulating function
When the mode is not hot adjust or Defrosting mode during heat compressor operation, the controller changes to auxiliary heater ON. Thermoregulating function follows the table below according to desired temp. and room temp.

<table><tr><th>Temperature difference</th><th>Auxiliary heater</th></tr><tr><td>z < 0</td><td>OFF</td></tr><tr><td>0 ≦ z < 3</td><td>Keeping condition</td></tr><tr><td>3 ≦ z</td><td>ON</td></tr></table>
Temperature difference Z = Set temperature - Room temperature
2-2. Over-rise prevention control
When condenser/evaporator temp.(TH5) is higher than 60℃ during compressor operation, auxiliary heater ON is prohibited as over - rise prevention control. When the indoor condenser/evaporator temperature is 54℃ or less for 3 minutes during over-rise prevention, over-rise prevention control will be released and auxiliary heater ON will be allowed. (However, in case the condenser/evaporator temperature becomes 66℃ or more during over-rise prevention, 40℃ or less will be required to release over-rise prevention control and allow auxiliary heater to be ON.)</td><td>Models without auxiliary heater also control the units in the same way as shown in the left.

During the over-rise prevention control, "Fan speed up mode" in the indoor fan is controlled. (Only for 4-speed model)</td></tr>
</table>

<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td>3. Fan</td><td>By the remote controller setting (switch of 4 speeds+Auto or 4 speeds or 2 speeds)
<table><tr><th>Type</th><th>Fan speed notch</th></tr><tr><td>4 speeds+Auto</td><td>[Low] [Medium2] [Medium1] [High][Auto]</td></tr><tr><td>4 speeds</td><td>[Low] [Medium2] [Medium1] [High]</td></tr><tr><td>2 speeds</td><td>[Low] [High]</td></tr></table>3-1. Hot adjust mode
3-2. Preheating exclusion mode
3-3. Thermostat OFF mode (When the compressor off by the thermoregulating)
3-4. Cool air prevention mode (Defrosting mode)
3-5. Fan speed up mode</td><td>Fan speed change notch. Refer to the model function table.</td></tr>
<tr><td></td><td>3-1. Hot adjust mode
The fan controller becomes the stand by (hot adjust) mode for the following conditions.
① When starting the HEAT operation
② When starting the compressor by the thermoregulating
③ When the HEAT defrosting operation is released
 
A: Stand by (hot adjust) mode starts.
B: 5 minutes have passed since the condition A or the indoor Condenser/ Evaporator temperature turned 35℃ or more
C: 2 minutes have passed since the condition A.
(Terminating the stand by (hot adjust) mode)</td><td>*1 "STAND BY" will be displayed during the stand by (hot adjust) mode.</td></tr>
<tr><td></td><td>3-2. Preheating exclusion mode
When the condition changes the auxiliary heater ON to OFF (thermoregulating or operation stop, etc), the indoor fan operates in [Low] mode for 1 minute.</td><td>This control is same for the model without auxiliary heater.</td></tr>
<tr><td></td><td>3-3. Thermo OFF mode
When the compressor stops by the thermoregulating, etc., the indoor fan operates in [Extra low].</td><td>Fan speed can be changed by setting the function of remote controller.</td></tr>
<tr><td></td><td>3-4. Cool air prevention mode (Heat defrosting mode)
After "hot adjust" mode is finished, the indoor fan will stop if the condition mentioned below is detected. When receiving "DEFROST" from the outdoor unit, the mode changes to defrosting mode.
Pipe temp. (Condenser/Evaporator) - Room temp. ≦ -3℃</td><td>"DEFROST "will be displayed on the remote controller during the defrost operation.</td></tr>
<tr><td></td><td>3-5. Fan speed up mode
•When the control changes to over-rise prevention
The condition of over-rise prevention (Prohibit for auxiliary heater ON) continues for 10 seconds or more and the set fan speed is [Low] or [Medium2], the fan speed changes to [Medium1].
•The fan speed up mode is released by canceling the over-rise prevention mode.</td><td>This control is applied for only
4-speed (+Auto) model.</td></tr>
</table>

Control modes	Control details	Remarks
4. Drain pump	4-1. Drain pump control ■ Drain sensor type The drain pump turns ON for the specified amount of time when any of the following conditions is met (regardless of whether the compressor is ON or OFF). ① ON for 3 minutes after the operation mode is switched from COOL or DRY to HEAT mode. ② ON for 6 minutes after the drain sensor is determined to be submerged using the liquid level detection method given below. ③ ON for 6 minutes after indoor liquid pipe temperature - indoor room temperature becomes -10℃ or less and the drain sensor input is at the short or open level. (If condition ② or ③ is still being met after the drain pump has been turned ON for 6 minutes, the drain pump is kept ON for a further 6 minutes.) ■ Float switch type The drain pump turns ON for the specified amount of time when any of the following conditions is met: ① ON for 3 minutes after the operation mode is switched from COOL or DRY to HEAT mode. ② ON for 4 minutes after the float switch is submerged in the water when the float swich control judges the sensor is in the water.	
	4-2. Liquid level detection method ■ Drain sensor type If any of the following conditions is met, liquid level detection is performed. ① Drain pump is ON. ② Indoor liquid pipe temperature - indoor room temperature ≦ -10℃ (except during defrosting) ③ Indoor liquid pipe temperature or indoor room temperature is at the short or open level temperature. ④ Every 1 hour after the drain pump has been switched from ON to OFF. ■ Float switch type • Float switch control judges whether the sensor is in the air or in the water by turning the float switch ON/OFF. In the water : Detected that the float switch is ON for 15 seconds. In the air : Detected that the float switch is OFF for 15 seconds.	Refer to “3-2. COOL OPERATION” for liquid level detection method.
	4-3. Detection of water leakage abnormality ① Model : PLA-RP·BA ② Conditions to detect water leakage abnormality · When the float switch is detected to be in the water and drain switch turns to ON from OFF under the operation other than cool or dry operation. · Humidifier cannot be operated during water leakage abnormality delay. · Abnormal (P5) when it is repeated twice that the drain pump is detected to turn ON from OFF again within 1 hour after water leakage abnormality delay ③ Conditions to release water leakage abnormality delay · When it is not detected that the drain pump is tuned ON from OFF within 1 hour after detecting abnormality delay · When the operation is changed to cooling or drying. · Indoor liquid pipe temperature - indoor room temperature ≦ -10℃ Operation mode : When drain pump is detected to be ON and in the water except in the cooling and drying operation  	

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Control modes	Control details	Remarks
4. Drain pump	4-4. Forced compressor stop The function is to stop the unit forcibly (System stopped) to prevent water leakage when the drain pump breaks down and the refrigerant leakage occurs in the linear expansion valve. ■ Conditions to detect When the following conditions are fully met (Always detected regardless of whether the unit is ON or OFF) ① Drain pump is ON. ② Detected the following for 30 minutes (except during defrosting); Indoor piping (liquid piping) temperature - room temperature ≦ -10℃ ③ Detected to be in the water 10 times continuously (Drain sensor control) Detected to be in the water for more than 15 minutes (Float switch control) ■ Control after detection The compressor of the unit stopped forcibly is turned off and all the indoor units are stopped. (Abnormality code: PA) ■ Conditions to release Reset the power supply of the outdoor unit and indoor unit which caused the anormality.	· This detection is different from drain pump abnormality.
5. Vane control (Up/ down vane change)	(1) Initial setting : OFF → HEAT…[last setting] When the last setting is [Swing] … [Swing] When changing the mode from exception of HEAT to HEAT operation …[Downward D or C] (2) Vane position : Horizontal →Downward A →Downward B →Downward C→Downward D※1→Swing※1→Auto※1 (3) Determining position (When the timing motor of AC 200-240V) Control each air outlet angle considering the starting OFF → ON of limit switch to be a standard position (Horizontal or close). When the standard position cannot be determined for 3 minutes, the vane stops at the arbitrary position. (4) Restriction of vane position The vane is horizontally fixed for the following modes. (The control by remote controller is temporally invalidated and the control by unit is validate.) • Compressor OFF mode (Thermoregulating, etc.) • Stand by (hot adjust) [Extra low] mode • Heat defrost mode • Piping (Condenser/Evaporator) temperature is 28℃ (※2) or less. (5) Wave airflow control ※3 When Swing is set, each vane runs independently and repeats horizontal and down blows with a time lag. Model: PLA-RP·BA (2)	※1 Whether the unit has a swing function is listed in the function/control specifications. · Downward, Swing, Auto have different functions depending on the models. · See the function/control specifications for the vane motor type. ※2 Changeable by unit function setting (mode 14) (Refer to OUTDOOR UNITS SERVICEMANUAL.) ※3 The vanes swing simultaneously in case of the function setting without waveflow control.

3-5. AUTO OPERATION

Control modes	Control details	Remarks
1. Initial value of operation mode	HEAT mode for room temperature < Set temperature COOL mode for room temperature ≧ Set temperature	· This mode is provided in the outdoor unit. The indoor unit follows the instruction from the outdoor unit.
2. Mode change	(1) HEAT mode → COOL mode Room temperature ≧ Set temperature + 2℃ or 15 minutes has passed (2) COOL mode → HEAT mode Room temperature ≦ Set temperature - 2℃ or 15 minutes has passed	· This mode is provided in the outdoor unit. The indoor unit follows the instruction from the outdoor unit.
3. COOL mode	Same control as cool operation	—
4. HEAT mode	Same control as heat operation	—

3-6. STOP OPERATION

Control modes	Control details	Remarks
1. Drain pump	1.1 Drain pump control ■ Drain sensor type The drain pump turns ON for the specified amount of time when any of the following conditions is met (regardless of whether the compressor is ON or OFF) ① ON for 3 minutes after the operation mode is switched from COOL or DRY to another operation mode. ② ON for 6 minutes after the drain sensor is determined to be submerged using the liquid level detection method given below. ③ ON for 6 minutes after indoor piping (liquid piping) temperature - room temperature ≦ -10℃, and the drain sensor input is at the short or open level. (If condition ② or ③ is still being met after the drain pump has seen turned ON for 6 minutes, the drain pump is kept ON for further 6 minutes.) ■ Float switch type The drain pump turns ON for the specified amount of time when any of the following conditions is met: ① ON for 3 minutes after the operation mode is switched from COOL or DRY to another operation mode. ② ON for 6 minutes after the float switch is submerged in the water when the float swich control judges the sensor is in the water.	
	1.2 Liquid level detection method ■ Drain sensor type The liquid level is detected by determining whether or not the drain sensor is submerged, based on the amount the temperature rises after self-heating the sensor. This process is performed if any of the following conditions is met. ① Drain pump is ON. ② Indoor piping (liquid piping) temperature - room temperature ≦ -10℃ (except during defrosting) ③ Indoor piping (liquid piping) temperature or room temperature is at the short or open level temperature. ④ Every hour after the drain pump has been switched from ON to OFF. ■ Float switch type Float switch control judges whether the sensor is in the air or in the water by turning the float switch ON/OFF. In the water : Detected that the float switch is ON for 15 seconds In the air : Detected that the float switch is OFF for 15 seconds	· Same control as cool operation
	1.3 Drain pump abnormality detection ① Drain sensor type · Abnormal (P5) when drain sensor detects to be in the water twice ② Float switch type · Abnormal (P5) when drain sensor judges to be in the water for 3 minutes continuously (Float switch is ON.)	· It takes 3 minutes and 15 seconds to detect abnormality including the time that the sensor judges to be in the water first. time.
	1.4 Float switch connector connection detection Same control as cooling operation	· Models with float switch
	1.5 Water leakage abnormality detection Same control as heating operation	
	1.6 Forced compressor stop Same control as heating operation	

3-7. SUPPLEMENTARY INFORMATION (UNIT FUNCTION SETTING)

(For setting, refer to OUTDOOR UNIT'S SERVICE MANUAL.)

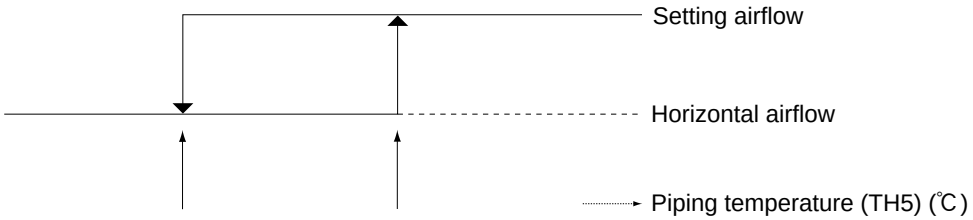
1) Vane setting (Function setting mode11)

Model	Setting No.	Setting
PLA-BA(2)	1	Downward position than the standard (less smudging setting)
	2	Standard position
	3	Upward position than the standard (less draft setting) ※

※ Be careful of the smudge on ceiling.

2) Vane differential setting in heating mode (cold wind prevention) (Function setting mode14)

When piping temperature (TH5) becomes low during heating operation, the up/down vane is set to horizontal direction for less draft setting. In this vane differential setting, the conditions of piping temperature to change airflow setting of horizontal and setting shown below can be adjusted finely.



Setting 1 (low)	• • • 24℃	28℃
Setting 2 (standard)	• • • 28℃	32℃
Setting 3 (high)	• • • 32℃	38℃

4 OUTDOOR UNIT CONTROL

4-1. COOL OPERATION

Control modes	Control details	Remarks
1. Compressor	1-1. Thermoregulating function The outdoor unit receives information of set temperature and intake temperature from the indoor unit through transmission and judges the necessity of thermoregulating from their temperature difference. (Refer to “INDOOR UNIT CONTROL” for detailed detecting method.)	
	1-2. Normal control Compressor operating frequency is controlled according to the difference between intake temperature and set temperature in order to let the intake temperature be the same as the set temperature • Control timing: Once per minute after 3 minutes have passed since the compressor started. • Frequency changing range: -12Hz to +20Hz ※ However, in the following cases, the frequency changing amount, which is different from the normal one, will be applied to control the operating frequency. (1) Frequency is fixed to the minimum just before the compressor is stopped by the thermoregulating function. Intake temperature ≦ Set temperature +0.5℃ ··· Fixed to the minimum frequency. Intake temperature ≦ Set temperature +1.0℃ ··· Fixation is released. (Returned to normal control.) (2) Correction of the frequency changing amount according to the estimated discharge temperature If the estimated discharge temperature is more than 113℃, the frequency changing amount will be corrected. • Correction amount: 0Hz to -6Hz	Refer to “4-7. Inverter control” for “Inverter control basic control frequency setting”.
	1-3. Start-up control Controls, which are conducted in 3 minutes after the compressor gets started, are categorized as below. (1) In case of start-up (first time) a. 0 min. to 1 min. after start-up: Fixed to 48Hz. b. 1 min. to 3 min. after start-up: Fixed to the Hz which has been regulated according to the temp. difference between intake temp. and set temperature • Fixed frequency: minimum Hz to 48Hz. (2) In case of restart a. 0 min. to 1 min. after start-up: Fixed to 35 Hz. b. 1 min. to 3 min. after start-up: Fixed to the Hz which has been regulated according to the temperature difference between intake temp. and set temperature • Fixed frequency: 35 Hz or 42Hz. Maximum Hz will be controlled to 66Hz for 10 minutes after the start-up of compressor.	
	1-4. Indoor anti-freezing control When the outdoor unit receives the signal of anti-freezing control mode, the compressor stops. The compressor will restart when the indoor anti-freezing control is released.	Refer to “INDOOR UNIT CONTROL” for the indoor anti-freezing control.
	1-5. Indoor frozen prevention control Frequency controls such as Hz-down and no more Hz-up will be conducted according to the indoor liquid pipe temp. (TH2) or indoor cond./eva. temp. (TH5). Temp. restriction: No more Hz-up ··· When TH2 or TH5 detects 4.5℃ or less Hz-down ··· When TH2 or TH5 detects 3.5℃ or less ※ ※ Hz-down amount: -5Hz per minute	

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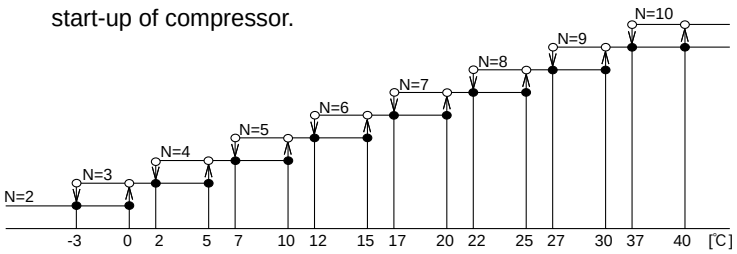
From the previous page.

<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td>1. Compressor</td><td>
1-6. Discharge temperature over-rise prevention control
Frequency controls such as Hz-down and no more Hz-up will be conducted according to the discharge temperature (TH4).
Temperature restriction: No more Hz-up ··· When TH4 detects 105℃ or more
Hz-down ··· -6Hz per min. when TH4 detects 110℃ or more
··· -10Hz per min. when TH4 detects 118℃ or more

1-7. Condensing temperature over-rise prevention control
Frequency controls such as Hz-down and no more Hz-up will be conducted according to the outdoor 2-phase pipe temperature (TH6) (V/YHA), pressure saturation temp. (T_{63HS}) (V/YHA2)
<table>
<tr><th>Temperature restriction (TH6)</th><th>HRP71~125</th></tr>
<tr><td>No more Hz-up</td><td>56℃</td></tr>
<tr><td>Hz down (-5 Hz per min.).</td><td>58℃</td></tr>
<tr><td>Hz down (-10 Hz per min.).</td><td>61℃</td></tr>
</table>
1-8. Heatsink temperature over-rise prevention control ※1
Frequency controls such as Hz-down and no more Hz-up will be conducted according to the heatsink temperature (TH8).
Temperature restriction:
<table>
<tr><th>Models</th><th>No more Hz-up</th><th>Hz-down</th><th>Models</th><th>No more Hz-up</th><th>Hz-down</th></tr>
<tr><td>PUHZ-HRP71V</td><td>78℃</td><td>81℃</td><td>PUHZ-HRP100Y</td><td>88℃</td><td>91℃</td></tr>
<tr><td>PUHZ-HRP100V</td><td>78℃</td><td>81℃</td><td>PUHZ-HRP125Y</td><td>88℃</td><td>91℃</td></tr>
</table>
※ Hz-down amount: -5Hz per minute

1-9. Outdoor unit frozen protection control
If the cooling operation is continued for 16 hours, the compressor stops for 3 minutes.
</td><td>※1 Thermistor (TH8) for HRP·YHA(2) is with built-in the power-module.</td></tr>
<tr><td>2. Fan</td><td>
2-1. Normal control
Fan rotation times (rpm) will be controlled according to the outdoor outside temperature (TH7).
• Control method: Inverter control
• Rotation times: Fan step (N) = 0 and 2 to 10
• Compressor start-up: Fan step is fixed to 9 for 30 seconds after the start-up of compressor.


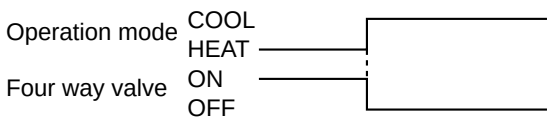
Outside temperature (TH7)

2-2. Correction of fan step according to the outdoor 2-phase pipe temperature
Fan step will be corrected according to the outdoor 2-phase pipe temp.(TH6) (V/YHA), presuure saturation temp. (T_{63HS}) (V/YHA2)
• Correction range of condensing temperature : 30℃ to 53℃
• Correction range of fan step: -1 to +3

2-3. Correction of fan step according to the heatsink temperature
Fan step will be corrected according to the heatsink temperature (TH8).
• Correction range of heatsink temperature: 68℃ to 74℃
• Correction range of fan step: 0 to +2

2-4. Other
Fan also stops when the compressor is being stopped. (Fan step = 0)
However, fan step will be set to 10 while the compressor is being stopped due to the abnormal heatsink temperature (Error code = U5).
At this time, the compressor is just waiting for 3 minutes to restart.
</td><td>
Step (N)—Rotation times(rpm)
<V/YHA>
<table>
<tr><th rowspan="2">Step (N)</th><th colspan="2">Rotation times(rpm)</th></tr>
<tr><th>71,100</th><th>125</th></tr>
<tr><td>0</td><td>0</td><td>0</td></tr>
<tr><td>1</td><td>125</td><td>105</td></tr>
<tr><td>2</td><td>155</td><td>130</td></tr>
<tr><td>3</td><td>175</td><td>145</td></tr>
<tr><td>4</td><td>200</td><td>190</td></tr>
<tr><td>5</td><td>240</td><td>240</td></tr>
<tr><td>6</td><td>285</td><td>285</td></tr>
<tr><td>7</td><td>360</td><td>360</td></tr>
<tr><td>8</td><td>465</td><td>465</td></tr>
<tr><td>9</td><td>700</td><td>700</td></tr>
<tr><td>10</td><td>720</td><td>720</td></tr>
</table>
<V/YHA2>
<table>
<tr><th>Step (N)</th><th>Rotation times(rpm)
71, 100, 125</th></tr>
<tr><td>0</td><td>0</td></tr>
<tr><td>1</td><td>100</td></tr>
<tr><td>2</td><td>125</td></tr>
<tr><td>3</td><td>140</td></tr>
<tr><td>4</td><td>185</td></tr>
<tr><td>5</td><td>220</td></tr>
<tr><td>6</td><td>275</td></tr>
<tr><td>7</td><td>370</td></tr>
<tr><td>8</td><td>450</td></tr>
<tr><td>9</td><td>680</td></tr>
<tr><td>10</td><td>700</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td>3. LEV(A)</td><td>
3-1. Normal control
Opening pulse will vary among steps (1 to 3) according to air conditioner's operating status.
• Control timing: Once every 5 minutes after 3 or 7 minutes have passed since the compressor started.
• LEV opening pulse for each step:
<table>
<tr><th>Step</th><th>71</th><th>100</th><th>125</th></tr>
<tr><td>1</td><td>170</td><td>170</td><td>170</td></tr>
<tr><td>2</td><td>240</td><td>240</td><td>240</td></tr>
<tr><td>3</td><td>480</td><td>480</td><td>480</td></tr>
</table>
• Requirement for step-up
LEV opening pulse will step up when any of following conditions is satisfied.
(1) The discharge temperature (TH4) is 100℃ or more.
(2) V/YHA: The outdoor 2-phase pipe temperature (TH6) is 57℃ or more.
V/YHA2: The pressure saturation temp. (T_{63HS}) is 63℃ or more .
(3) The discharge super heat temperature is 50℃ or more.
V/YHA: Super heat temperature = Discharge temperature (TH4) - Outdoor 2-phase pipe temperature (TH6)
V/YHA2: Super heat temperature = Discharge temperature (TH4) - Pressure saturation temp. (T_{63HS})
(4) The sub cool temperature is 12℃ or more.
V/YHA: Sub cool temperature = Outdoor 2-phase pipe temperature (TH6) - Outdoor liquid pipe temperature (TH3)
V/YHA2: Sub cool temperature = Pressure saturation temp. (T_{63HS}) - Outdoor liquid pipe temperature (TH3)
• Requirement for step-down
LEV opening pulse will step down when any of following conditions is satisfied and any of step-up conditions are NOT satisfied.
(1) The discharge temperature (TH4) is 85~90℃ or less.
(2) V/YHA: The outdoor 2-phase pipe temperature (TH6) is 52℃ or less.
V/YHA2: The pressure saturation temp. (T_{63HS}) is 57℃ or less.
(3) The discharge super heat temp. is 40℃ or less.
V/YHA: Super heat temperature = Discharge temperature (TH4) - Outdoor 2-phase pipe temperature (TH6)
V/YHA2: Super heat temperature = Discharge temperature (TH4) - Pressure saturation temp. (T_{63HS})
(4) The sub cool temperature is 3℃ or less.
V/YHA: Sub cool temperature = Outdoor 2-phase pipe temperature (TH6) - Outdoor liquid pipe temperature (TH3)
V/YHA2: Sub cool temperature = Pressure saturation temp. (T_{63HS}) - Outdoor liquid pipe temperature (TH3)
• The step does not change if neither step-up conditions nor step-down conditions are satisfied.
</td><td></td></tr>
<tr><td></td><td>
3-2. Compulsory step-up
When any of the following conditions is satisfied, the step will be forced to 3.
(1) The discharge temperature (TH4) is 110℃ or more.
(2) V/YHA: The 2-phase pipe temperature (TH6) is 62℃ or more.
V/YHA2: The pressure saturation temp. (T_{63HS}) is 65℃ or more.
</td><td></td></tr>
<tr><td></td><td>
3-3. Stop control
When the LEV is being stopped, the step will be set to 3.
</td><td></td></tr>
</table>

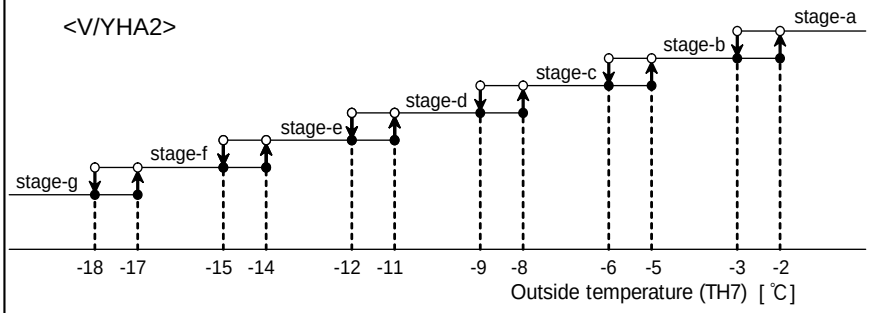
<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td>4. LEV(B)</td><td>4-1. Normal control
LEV opening pulse will be controlled according to the change of compressor operating frequency and regulated every minute to adjust the discharge temperature to let the intake super heat temperature be 0℃ to 5℃.
• Control timing: Once per minute after 3 or 7 minutes have passed since the compressor started.
• Opening pulse range: The following range is specified according to the compressor operating frequency.
<table><tr><td rowspan="2">Compressor frequency</td><td colspan="2">Opening pulse range (Lower limit to upper limit)</td></tr><tr><td>71</td><td>100, 125</td></tr><tr><td>49Hz or less</td><td>80 ~ 300</td><td>60 ~ 300</td></tr><tr><td>50Hz to 75Hz</td><td>105 ~ 350</td><td>70 ~ 350</td></tr><tr><td>76Hz to 90Hz</td><td>160 ~ 400</td><td>80 ~ 400</td></tr><tr><td>91Hz or more</td><td>160 ~ 480</td><td>100 ~ 480</td></tr></table>• Opening pulse range corresponding to the change of compressor operating frequency
Opening pulse range = Present opening pulse × (Target frequency/Operating frequency -1) × 0.8
• Compressor start-up
Opening pulse will be adjusted according to only the change of frequency during 3 or 7 minute start-up. The start-up control time will be changed according to the discharge temperature (TH4).
Discharge temperature (TH4) ≧ 30℃ : 3 minute start-up
Discharge temperature (TH4) < 30℃ : 7 minute start-up</td><td></td></tr>
<tr><td></td><td>4-2. Evaporation protection control
The targeted opening pulse should be made large in the condition written below.
Indoor cond./eva. temperature (TH5) - Indoor liquid pipe temperature (TH2) ≧ 3℃
Set the targeted value of the discharge temperature about 5 to 15℃ lower.
※ This control does not work for 3 or 7 minutes after the compressor gets started.</td><td></td></tr>
<tr><td></td><td>4-3. Low discharge super heat temperature protection control
Set a small value for the targeted opening pulse according to the discharge super heat temperature.
• Correction range of the discharge super heat temp. : 10℃ or less
※ This control does not work for 3 or 7 minutes after the compressor gets started.</td><td>Discharge super heat temp. is calculated from discharge temp. (TH4) and outdoor 2-phase pipe temp.(TH6) (V/YHA)/ pressure saturation temp.(T_{63HS})(V/YHA2).</td></tr>
<tr><td></td><td>4-4. Others
① LEV opening pulse is set to 400 while the compressor is being stopped.
② After LEV opening pulse is initialized to 0 by making 700 pulse down from the present pulse, set the pulse to 400.
③ 20 pulses are added to the present pulse if the following conditions are satisfied within 14 minutes after the compressor gets started.
COOL: Indoor 2-phase pipe temperature (TH5) - Indoor liquid pipe temperature (TH2) ≧ 25℃
HEAT: Outdoor 2-phase pipe temperature (TH6) - Outdoor liquid pipe temperature (TH3) ≧ 25℃</td><td></td></tr>
<tr><td>5. Four way valve</td><td>5-1. Normal control
Always OFF during normal operation.</td><td></td></tr>
<tr><td></td><td>5-2. Change of Operation mode
When the mode changes from HEAT to COOL:
  </td><td></td></tr>
</table>

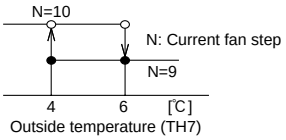
4-2. HEAT OPERATION

<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td>1. Compressor</td><td>1-1. Thermoregulating function
The outdoor unit receives information of set temperature and intake temperature from the indoor unit through transmission and judges the compressor ON/OFF controlled by thermoregulating from their temperature difference. However, the compressor does not stop when the indoor unit is in the hot adjuster mode even though the information tells the need to turn off the compressor.</td><td>Refer to “INDOOR UNIT CONTROL” for the detailed detection method.</td></tr>
<tr><td></td><td>1-2. Normal control
• Control timing: Once per minute after 3 minutes have passed since the compressor started.
• Frequency changing range: -12Hz to +20Hz ※1
※1. However, in the following cases, the frequency changing amount, which is different from the normal one, will be applied to control the operating frequency.
(1) Frequency is fixed to the minimum just before the compressor is stopped by the thermoregulating function.
Intake temperature ≧ Set temperature - 0.5℃ ··· Fixed to the minimum frequency.
Intake temperature ≦ Set temperature - 1.0℃ ··· Fixation is released. (Returned to normal control.)
(2) Correction of the frequency changing amount according to the estimated discharge temp.
If the estimated discharge temperature is more than 113℃, the frequency changing amount will be corrected.
• Correction amount: 0Hz to -6Hz
(3) Frequency control after the defrosting operation
After the defrosting operation is finished, the compressor will be stopped for 1 minute and then get restarted.</td><td></td></tr>
<tr><td></td><td>1-3. Start-up control
Controls, which are conducted in 3 minutes after the compressor gets started, are categorized according to the outside temperature(TH7) as shown below.
<table>
<tr><th rowspan="2">Outside temp.</th><th colspan="2">Start-up pattern</th><th rowspan="2">Defrosting restart</th></tr>
<tr><th>Initial start-up</th><th>Restart</th></tr>
<tr><td>TH7 < 0℃</td><td>(A)</td><td>(B)</td><td>(D)</td></tr>
<tr><td>0℃ ≦ TH7 < 12℃</td><td>(A)</td><td>(B)</td><td>(D)</td></tr>
<tr><td>TH7 ≧ 12℃</td><td>(C)</td><td>(C)</td><td>(D)</td></tr>
</table>
(1) In case of pattern (A)
a. 0 min. to 1 min. after start-up: Fixed to 48Hz.
b. 1 min. to 3 min. after start-up: Fixed to the Hz which has been regulated according to the temp. difference between intake temp. and set temp.
• Fixed frequency: minimum Hz to 48Hz.
(2) In case of pattern (B)
a. 0 min. to 1 min. after start-up: Fixed to the 35 Hz.
b. 1 min. to 3 min. after start-up: Fixed to the Hz which has been regulated according to the temp. difference between intake temp. and set temp.
• Fixed frequency: 35 Hz or 42Hz.
(3) In case of pattern (C)
a. 0 min. to 3 min. after start-up: Fixed to 35 Hz.
(4) In case of pattern (D)
a. 0 min. to 1 min. after start-up: Fixed to the 70 Hz.
b. 1 min. to 3 min. after start-up: Fixed to the Hz which has been regulated according to the temp. difference between intake temp. and set temp.
• Fixed frequency: 63 Hz or 70Hz.
Maximum Hz will be limited to 66Hz for 10 minutes after the start-up of compressor.</td><td></td></tr>
<tr><td></td><td>1-4. Discharge temperature over-rise prevention control
The same control as that of COOL operation.</td><td></td></tr>
</table>

Continued to the next page.

From the previous page.

<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td>1. Compressor</td><td>
1-5. Condensing temperature over-rise prevention control
Frequency controls such as Hz-down and no more Hz-up will be conducted according to the indoor cond./eva. temperature (TH5) (V/YHA) /the pressure saturation temp. (T_{63HS}) (V/YHA2).
<V/YHA>
<table>
<tr><td>Temperature restriction (TH5)</td><td>HRP71-125</td></tr>
<tr><td>No more Hz-up</td><td>51℃</td></tr>
<tr><td>Hz down (-5 Hz per min.).</td><td>56℃</td></tr>
<tr><td>Hz down (-10 Hz per min.).</td><td>61℃</td></tr>
</table>
<V/YHA2>


<table>
<tr><td rowspan="2">Temperature restriction (T_{63HS})</td><td colspan="7">HRP71 - 125</td></tr>
<tr><td>stage-a</td><td>stage-b</td><td>stage-c</td><td>stage-d</td><td>stage-e</td><td>stage-f</td><td>stage-g</td></tr>
<tr><td>No more Hz-up</td><td>61</td><td>60</td><td>59</td><td>58</td><td>57</td><td>55</td><td>49</td></tr>
<tr><td>Hz down (-5 Hz per min.)</td><td>63</td><td>62</td><td>61</td><td>60</td><td>59</td><td>57</td><td>51</td></tr>
<tr><td>Hz down (-10 Hz per min.)</td><td>64</td><td>64</td><td>63</td><td>62</td><td>61</td><td>59</td><td>53</td></tr>
</table>
</td><td></td></tr>
<tr><td>2. Fan</td><td>
2-1. Normal control
Fan rotation times (rpm) will be controlled according to the outdoor outside temperature (TH7).
• Control method: Inverter control
• Rotation times: Fan step (N) = 0, 9 and 10


Step (N)—Rotation times (rpm)
<V/YHA>
<table>
<tr><td rowspan="2">Step (N)</td><td colspan="2">Rotation times (rpm)</td></tr>
<tr><td>71,100</td><td>125</td></tr>
<tr><td>0</td><td>0</td><td>0</td></tr>
<tr><td>1</td><td>125</td><td>105</td></tr>
<tr><td>2</td><td>155</td><td>130</td></tr>
<tr><td>3</td><td>175</td><td>145</td></tr>
<tr><td>4</td><td>200</td><td>190</td></tr>
<tr><td>5</td><td>240</td><td>240</td></tr>
<tr><td>6</td><td>285</td><td>285</td></tr>
<tr><td>7</td><td>360</td><td>360</td></tr>
<tr><td>8</td><td>465</td><td>465</td></tr>
<tr><td>9</td><td>700</td><td>700</td></tr>
<tr><td>10</td><td>720</td><td>720</td></tr>
</table>
Step (N)—Rotation times (rpm)
<V/YHA2>
<table>
<tr><td rowspan="2">Step (N)</td><td>Rotation times (rpm)</td></tr>
<tr><td>71, 100, 125</td></tr>
<tr><td>0</td><td>0</td></tr>
<tr><td>1</td><td>100</td></tr>
<tr><td>2</td><td>125</td></tr>
<tr><td>3</td><td>140</td></tr>
<tr><td>4</td><td>185</td></tr>
<tr><td>5</td><td>220</td></tr>
<tr><td>6</td><td>275</td></tr>
<tr><td>7</td><td>370</td></tr>
<tr><td>8</td><td>※</td></tr>
<tr><td>9</td><td>680</td></tr>
<tr><td>10</td><td>700</td></tr>
</table>
</td><td>※ Cooling : 450
Heating : 500</td></tr>
<tr><td></td><td>
2-2. Start-up control in HEAT operation at low outside temperature
[Requirement] All of following conditions should be satisfied.
a. The first start-up after the power has been reset, or the start-up in HEAT mode after 30 minutes have passed since the compressor stopped.
b. Outside temperature (TH7) ≦ 0℃
[Control details]
Fan step will be set to 0 (N = 0) for 2 minutes after the start-up of compressor.
Start-up control will turn into the normal control after the 2-minute operation of compressor.
</td><td></td></tr>
<tr><td></td><td>
2-3. Others
Fan also stops when the compressor is being stopped. (Fan step = 0)
However, fan step will be set to 10 while the compressor is being stopped due to the abnormal heat sink temperature (Error code = U5).
At that time, the compressor is just waiting for 3 minutes to restart.
</td><td></td></tr>
</table>

<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td>3. LEV(A)</td><td>
3-1. Normal control
<Without INJ>
LEV opening pulse will be controlled every minute to adjust the discharge temperature in order to let the intake super heat be 0℃ to 5℃.
• Control timing: Once per minute after 3 or 7 minutes have passed since the compressor started.
• Opening pulse range: The following range is specified according to the compressor operating frequency.
<table>
<tr><th rowspan="2">Compressor frequency</th><th colspan="3">Opening pulse range (Lower limit to upper limit)</th></tr>
<tr><th>71 (V/YHA)</th><th>100, 125 (V/YHA)</th><th>71,100,125 (V/YHA2)</th></tr>
<tr><td>49Hz or less</td><td>80 ~ 300</td><td>60 ~ 300</td><td>55 ~ 300</td></tr>
<tr><td>50Hz to 75Hz</td><td>85 ~ 350</td><td>70 ~ 350</td><td>60 ~ 350</td></tr>
<tr><td>76Hz to 90Hz</td><td>100 ~ 400</td><td>80 ~ 400</td><td>70 ~ 400</td></tr>
<tr><td>91Hz to more</td><td>130 ~ 480</td><td>100 ~ 480</td><td>90 ~ 480</td></tr>
</table>
• Opening pulse range corresponding to the change of compressor operating frequency
Opening pulse range = Present opening pulse × (Target frequency/ Operating frequency -1) × 0.8
• Compressor start-up
Opening pulse will be adjusted according to only the change of frequency during 3 or 7 minute start-up.
The start-up control time will be changed according to the discharge temperature (TH4).
Discharge temperature (TH4) ≧ 30℃ : 3 minute start-up
Discharge temperature (TH4) < 30℃ : 7 minute start-up

<With INJ>
Ajdust the discharge temperature in order to let the intake super heat temperature be around 10℃.
• Control timing: 2℃≦ | ΔSH | ·····Once per minute
1℃≦ | ΔSH | < 2℃ ·····Once per 2 mitutes
| ΔSH | < 1℃ ·····No change
• Variation for each time: 0~20 pulse
</td><td>ΔSH = Intake super heat -10℃.</td></tr>
<tr><td></td><td>3-2. Low discharge super heat temperature protection control
Set a small value for the targeted opening pulse according to the discharge super heat temperature.
• Correction range of the discharge super heat temperature : 10℃ or less
• This control does not work for 3 or 7 minutes after the compressor gets started.</td><td>Discharge super heat temp. is calculated from discharge temp. (TH4) and outdoor 2-phase pipe temp. (TH6) (V/YHA)/ pressure saturation temp. (T_{63HS}) (V/YHA2).</td></tr>
<tr><td></td><td>3-3. Evaporation protection control
20 pulse will be added to the present opening pulse in the condition written below.
Outdoor 2-phase pipe temperature (TH6) - Outdoor liquid pipe temperature (TH3) ≧ 6℃
※ This control does not work for 3 or 7 minutes after the compressor gets started.</td><td></td></tr>
<tr><td></td><td>3-4. Others
① LEV opening pulse is set to 400 while the compressor is being stopped.
② After LEV opening pulse is initialized to 400 by making 700 pulse down from the present pulse, set the pulse to 400.</td><td></td></tr>
</table>

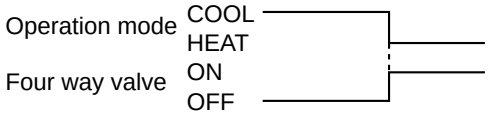
<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td>4. LEV(B)</td><td>
4-1. Normal control
Opening pulse will vary among steps (1 to 3) according to air conditioner's operating status.
• Control timing: Once every 5 minutes after 3 or 7 minutes have passed since the compressor started.
• LEV opening pulse for each step:
<table>
<tr><th>Step</th><th>71</th><th>100</th><th>125</th></tr>
<tr><td>1</td><td>140</td><td>140</td><td>140/150</td></tr>
<tr><td>2</td><td>220</td><td>220</td><td>220</td></tr>
<tr><td>3</td><td>480</td><td>480</td><td>480</td></tr>
</table>
• Start-up step
The step is set to 2 when the compressor starts up.
• Requirement for step-up
LEV opening pulse will step up when any of following conditions is satisfied.
(1) The discharge temp. (TH4) is 100℃ or more.
(2) V/YHA: The indoor 2-phase pipe temperature (TH5) is 57℃ or more.
V/YHA2: The pressure saturation temp. (T_{63HS}) is 63℃ or more.
(3) The discharge super heat temperature is 50℃ or more.
V/YHA: Super heat temperature = Discharge temperature (TH4) - Indoor 2-phase pipe temperature (TH5)
V/YHA2: Super heat temperature = Discharge temperature (TH4) - Pressure saturation temp. (T_{63HS})
(4) The sub cool temperature is 12℃ or more.
V/YHA: Sub cool temperature = Indoor 2-phase pipe temperature (TH5) - Indoor liquid pipe temperature (TH2)
V/YHA2: Sub cool temperature = pressure saturation temp. (T_{63HS}) - Indoor liquid pipe temperature (TH2)
• Requirement for step-down
LEV opening pulse will step down when any of following conditions are satisfied and above step-up conditions are not satisfied.
(1) The discharge temperature (TH4) is 85~90℃ or less.
(2) V/YHA: The indoor 2-phase pipe temperature (TH5) is 52℃ or less.
V/YHA2: The pressure saturation temp. (T_{63HS}) is 57℃ or less.
(3) The discharge super heat temperature is 40℃ or less.
V/YHA: Super heat temperature = Discharge temperature (TH4) - Indoor 2-phase pipe temperature (TH5)
V/YHA2: Super heat temperature = Discharge temperature (TH4) - Pressure saturation temp. (T_{63HS})
(4) The sub cool temperature is 3℃ or less.
V/YHA: Sub cool temperature = Indoor 2-phase pipe temperature (TH5) - Outdoor liquid pipe temperature (TH3)
V/YHA2: Sub cool temperature = Pressure saturation temp. (T_{63HS}) - Outdoor liquid pipe temperature (TH3)
• The step does not change if neither step-up conditions nor step-down conditions are satisfied.
</td><td></td></tr>
<tr><td></td><td>
4-2. Compulsory step-up
When any of the following conditions are satisfied, the step will be forced to 3.
(1) The discharge temperature (TH4) is 110℃ or more.
(2) V/YHA: The 2-phase pipe temperature (TH6) is 62℃ or more.
V/YHA2: The pressure saturation temp. (T_{63HS}) is 65℃ or more.
</td><td></td></tr>
<tr><td></td><td>
4-3. Stop control
When the LEV is being stopped, the step will be set to 3.
</td><td></td></tr>
</table>

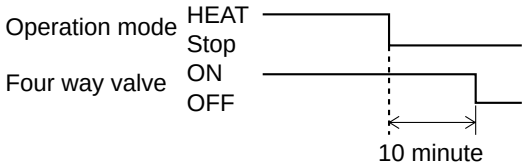
<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td>5. LEV(C)</td><td>6-1. Requirement for starting INJ
INJ starts when all of the following conditions are satisfied.
(1) The outdoor outside temp. (TH7) is 3℃ or less.
(2) The compressor frequency is 65Hz or more.
(3) The condensation temperature (Indoor 2-phase pipe temp. (TH5) (V/YHA)/ Pressure saturation temp. (T_{63HS}) (V/YHA2)) is 56℃ or less.
(4) Having no abnormal delay.

6-2. Starting step
Discharge super heat ≧ 30℃ step4
30℃ ≦ Discharge super heat < 30℃ step3
Discharge super heat ≦ 20℃ step1

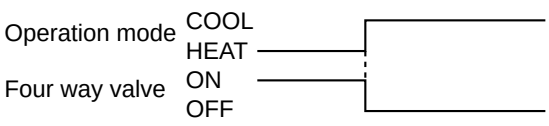
6-3. Normal control
Discharge super heat ≧ 30℃ 2 steps up
20℃ < Discharge super heat ≦ 30℃ 1 step up
10℃ ≦ Discharge super heat ≦ 20℃ keep the step
Discharge super heat < 10℃ 1 step down

6-4. Requirement for ending INJ
INJ finishes when any of the following conditions are satisfied.
(1) Operation stop or mode change
(2) After 30 minutes, the outdoor outside temp. (TH7) ≧ 4℃
(3) The compressor frequency is less than 60Hz.
(4) The condensation temperature (Indoor 2-phase pipe temp. (TH5) (V/YHA)/ Pressure saturation temp. (T_{63HS}) (V/YHA2)) is 61℃ or less.

Opening pulse is set to 5 when INJ finishes.</td><td><table><tr><th>Step</th><th>HRP71~125</th></tr><tr><td>0</td><td>5</td></tr><tr><td>1</td><td>70</td></tr><tr><td>2</td><td>100</td></tr><tr><td>3</td><td>150</td></tr><tr><td>4</td><td>200</td></tr><tr><td>5</td><td>250</td></tr><tr><td>6</td><td>300</td></tr><tr><td>7</td><td>400</td></tr><tr><td>8</td><td>460</td></tr></table></td></tr>
<tr><td>6. Four way valve</td><td>7-1. Normal control
Always OFF during normal operation.</td><td></td></tr>
<tr><td></td><td>7-2. Change of Operation mode
• When the mode changes from HEAT to COOL:
 

• When the operation stops in HEAT mode:
 
</td><td></td></tr>
<tr><td></td><td>7-3. Start-up control in HEAT operation at low outside temperature
[Requirement] Same as the explanation in fan control.
[Control details] OFF for 2 minutes after the start-up of compressor, but ON if 2 minutes pass.</td><td></td></tr>
<tr><td></td><td>7-4. In the defrosting operation
Always OFF during the defrosting operation</td><td></td></tr>
</table>

4-3. DRY OPERATION

Control modes	Control details	Remarks
1. Compressor	1-1. Thermoregulating function The outdoor unit receives information of set temp. and intake temp. from the indoor unit through transmission and judges the compressor ON/OFF with thermoregulating function from their temperature difference.	Refer to "INDOOR UNIT CONTROL" for ON/OFF judgment method
	1-2. Normal control Same control as that of COOL operation.	
	1-3. Start-up control Same control as that of COOL operation.	
	1-4. Indoor anti-freezing control Not available	
	1-5. Outdoor frozen prevention control Same control as that of COOL operation	
	1-6. Discharge temperature over-rise prevention control Same control as that of COOL operation	
	1-7. Condensing temperature over-rise prevention control Same control as that of COOL operation	
	1-8. Heatsink temperature over-rise prevention control Same control as that of COOL operation.	
	1-9. Others Same control as that of COOL operation.	
2. Fan	2-1. Normal control Fan rotation times (rpm) will be controlled according to the outdoor outside temp. (TH7). • Control method: Inverter control • Rotation times: Fan step (N) = 0 and 2 to 10 • Comp. Start-up: Fan step is fixed to 9 for 30 seconds after the start-up of compressor.	
	2-2. Correction of fan step according to the outdoor 2-phase pipe temperature Fan step will be corrected according to the outdoor 2-phase pipe temperature (TH6). • Correction range of condensing temperature : 30℃ to 53℃ • Correction range of fan step: -1 to +3	
	2-3. Correction of fan step according to the heatsink temperature Fan step will be corrected according to the heatsink temperature (TH8) • Correction range of heatsink temperature: 68℃ to 78℃ • Correction range of fan step: 0 to +2	
	2-4. Others Fan also stops when the compressor is being stopped. (Fan step = 0.) However, fan step will be set to 10 while the compressor is being stopped due to the abnormal heatsink temperature (Error code = U5). At this time, the compressor is just waiting 3 minutes to restart.	
3. LEV	The same control as that of COOL operation.	
4. Four way valve	4-1. During normal operation Always OFF during normal operation.	
	4-2. Operation mode change When the mode changes from HEAT to COOL; 	

4-4. FAN OPERATION

Control modes	Control details	Remarks
1. Compressor	Always OFF	
2. Fan	Always OFF	
3. Four way valve	Always OFF	

4-5. DEFROSTING OPERATION

Control modes	Control details	Remarks
1. Start	1-1. Requirements for starting Defrosting starts whe any of the following conditions is satisfied. (Conditions) a. In HEAT operation and when the outdoor liquid pipe temp. (TH3) continues to be -2℃ or less for 7 minutes after the compressor integrating operation time fulfils defrosting prohibition time (τ1 ※). b. In HEAT operation and when the outdoor liquid pipe temp. (TH3) continues be -5℃ or less and TH7 - 10℃ or less after the compressor integrating operation time fulfils defrosting prohibition time (τ3 ※). c. In HEAT operation and when the outdoor liquid pipe temp. (TH3) continues to be -2℃ or less for 7 minutes after the compressor integrating operation time fulfils the defrosting prohibition time (τ1 ※) and the compressor stops twice within 10 minutes from its start-up. (Complementary explanation) The (a) indicates the defrosting operation with the light frost amount . The (b) indicates the defrosting operation with the heavy frost amount. The (c) indicates the defrosting operation in case the thermostat is turned ON/OFF frequently because the frost amount is small and the air-conditioning load is light.	※ Refer to the table of “Defrosting prohibition time τ1, τ3” on this page.
	1-2. Actuator at the beginning of defrosting operation Activate the actuator by the following procedure if any of the above conditions is detected. ① Let compressor operating frequency down to 30Hz. ② When the compressor operating frequency becomes 30Hz; • Turn off the four way valve. • Stop the outdoor fan. • Set LEV A and B opening pulse to 480 and LEV C to 200. After ① and ② are completed, the compressor will be set to the defrosting operation frequency※.	※ Defrosting operation frequency Model name: 71~125 — Frequency: 92Hz
2. Stop	2-1. Requirements for ending Defrosting stops when any of the following conditions is satisfied. (Conditions) a. 15 minutes have passed since the defrosting operation started. b. The outdoor liquid pipe temperature (TH3) has become 20℃ or more within 2 minutes from the start of defrosting operation. c. The outdoor liquid pipe temperature (TH3) has become 8℃ or more after the defrosting operation is conducted for 2 minutes. d. During defrosting operation, the compressor has been stopped due to errors or something. e. During defrosting operation, the operation mode except HEAT has been selected by remote controller.	

Continued to the next page.

From the previous page.

<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td>2. Stop</td><td>2-2. Actuator at the end of defrosting operation
Activate the actuator by the following procedure if any of the above conditions except d & e is detected.
① Start the outdoor fan.
② Let the compressor operation frequency down to 30Hz from the defrosting operation frequency.
③ Stop the compressor for 1 minute when the compressor operation frequency becomes 30Hz.
After ① to ③ are completed, set the compressor operation frequency to the normal (start-up pattern A).</td><td></td></tr>
<tr><td>3. Defrosting prohibition time</td><td>Defrosting prohibition time (τ1 and τ3) are decided by the set contents of defrosting control and the previous defrosting operation time (τ2).
• Prohibition time table for standard region
<table>
<tr><th rowspan="2">Previous operation time</th><th colspan="2">Prohibition time</th></tr>
<tr><th>τ1</th><th>τ3</th></tr>
<tr><td>τ2 ≦ 3 minutes</td><td>150 minutes</td><td>30 minutes</td></tr>
<tr><td>3 < τ2 ≦ 7 minutes</td><td>90 minutes</td><td>20 minutes</td></tr>
<tr><td>7 < τ2 ≦ 10 minutes</td><td>50 minutes</td><td>20 minutes</td></tr>
<tr><td>10 < τ2 ≦ 15 minutes</td><td>30 minutes</td><td>20 minutes</td></tr>
<tr><td>τ2 = 15 minutes</td><td>20 minutes</td><td>20 minutes</td></tr>
</table>
• Prohibition time table for high humidity region
<table>
<tr><th rowspan="2">Previous operation time</th><th colspan="2">Prohibition time</th></tr>
<tr><th>τ1</th><th>τ3</th></tr>
<tr><td>τ2 ≦ 7 minutes</td><td>50 minutes</td><td>20 minutes</td></tr>
<tr><td>7 < τ2 ≦ 15 minutes</td><td>20 minutes</td><td>20 minutes</td></tr>
</table>
• Others
<table>
<tr><th rowspan="2"></th><th colspan="2">Prohibition time</th></tr>
<tr><th>τ1</th><th>τ3</th></tr>
<tr><td>Operation mode has been changed to the other mode except HEAT during defrosting operation.</td><td>90 minutes</td><td>40 minutes</td></tr>
<tr><td>Protection devices have worked during defrosting operation.</td><td>10 minutes</td><td>10 minutes</td></tr>
<tr><td>Initial prohibition time when power is reset.</td><td>90 minutes</td><td>40 minutes</td></tr>
</table></td><td></td></tr>
<tr><td>4. Forced defrosting</td><td>4-1. Requirements for starting
Compulsory defrosting operation will be conducted if all conditions below are satisfied when SW1-1 (OFF → ON) is detected during HEAT operation.
(Conditions)
a. The compressor is operating.
b. 10 minutes have passed since the compressor started or the last defrosting operation was conducted.
c. The outdoor liquid pipe temperature (TH3) is less than 8℃.</td><td></td></tr>
<tr><td></td><td>4-2. Requirements for ending
The same conditions as the above ending conditions of normal defrosting</td><td></td></tr>
</table>

4-6. AUTO OPERATION

Control modes	Control details	Remarks
1. Initial operation mode	When a operation mode turns into AUTO operation; ① HEAT mode will be operated if intake temperature < set temperature ② COOL mode will be operated if intake temperature ≧ set temperature	
2. Change of operation mode	① HEAT mode will turn into COOL mode when intake temperature ≧ set temperature + 2deg and 15 minutes have passed since the HEAT operation started. ② COOL mode will turn into HEAT mode when intake temperature ≦ set temperature – 2deg and 15 minutes have passed since the COOL operation started.	
3. COOL mode	The same controls as those of COOL operation.	
4. HEAT mode	The same controls as those of HEAT and defrosting operation.	

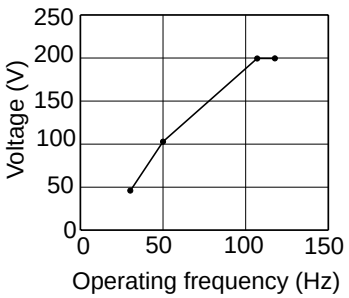
4-7. INVERTER CONTROL

Control modes	Control details	Remarks
1. Basic control	1-1. Frequency setting	

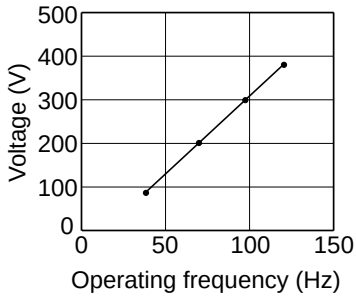
		min	PLA-RP·BA (2)		PEAD-RP·EA (2)		PEAD-RP·GA		PKA-RP·FAL	
			RATED	MAX	RATED	MAX	RATED	MAX	RATED	MAX
71V	COOL	25	36	61	38	61	38	61	—	—
	HEAT	25	39	64	40	64	41	64	—	—
100V/Y	COOL	25	51	76	51	76	55	76	57	76
	HEAT	25	53	80	53	80	56	80	55	80
125Y	COOL	25	69	98	70	98	—	—	—	—
	HEAT	25	67	91	66	91	—	—	—	—

1-2. V/F pattern

PUHZ-HRP71,100VHA (2) ※ 1



PUHZ-HRP100,125YHA (2) ※ 1

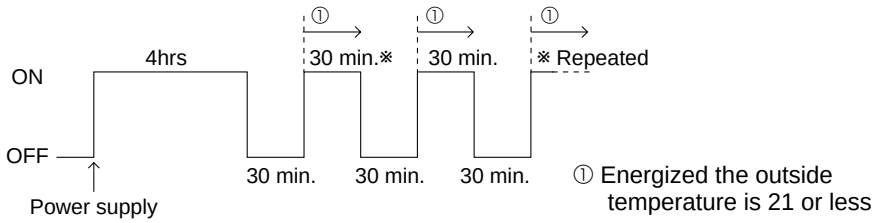
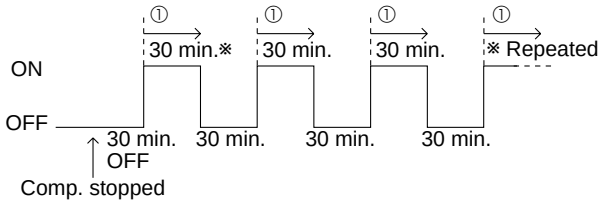


※1. Actual performance does not exactly match the V/F line on both graphic charts due to the air-conditioning load because the inverter control is based on vector.

2. Frequency	2-1. Frequency is restricted by the compressor electrical current (CT1). Frequency control such as Hz-down and no more Hz-up will be conducted according to the compressor electrical current (CT1).	※ Hz-down amount: -5Hz per minute

Models	No more Hz-up	Hz-down
PUHZ-HRP71, 100VHA	24.5A	26A
PUHZ-HRP100, 125YHA	16A	17A
PUHZ-HRP71, 100VHA2	24.5A	26A
PUHZ-HRP100, 125YHA2	19A	20A

3. Voltage correction	3-1. Voltage is corrected by bus voltage. Inverter voltage will be corrected by dc bus voltage. Even though the power supply voltage varies within ±10%, the voltage should be corrected in order to make the output voltage of inverter stable.	

Control modes	Control details	Remarks
4. Power supply to locked compressor	4-1. Compressor energizing method • Compressor ON/OFF pattern when power is supplied;  • Compressor ON/OFF pattern when power is cut off;  	"08" will be displayed on the LED1 of "A-Control Service Tool" while power is supplied to the compressor. ※ Outdoor temp.≦21℃ Outdoor temp.>21℃ Cycle : 15 min. ON 30 min. OFF
5. 52C	ON/OFF method 52C will turn ON/OFF in the following conditions. • 52C turns ON when power is supplied, and remains ON regardless of the compressor's ON/OFF. • 52C turns OFF when power is cut off.	

4-8. REPLACEMENT OPERATION

Control modes	Control details	Remarks
1. Start and end of replacement operation	1-1. Requirements for starting Replacement operation will start when SW8-2 on the outdoor controller board is turned on while units are being stopped.	
	1-2. Requirements for ending Replacement operation will end if any of the following condition is satisfied. a. 2 hours have passed since replacement operation started. b. SW8-2 has been turned off. c. Operation (COOL/DRY/HEAT) has been started and controlled by remote controller.	※ Normal air conditioning can be operated even if SW8-2 remains ON after the replaement operation is finished.
2. During replacement operation	2-1. Normal control In COOL operation replacement operation will be conducted by opening the replacement filter circuit in order to circulate refrigerant. • Compressor control The same continuous operation as COOL operation regardless of intake temperature. • LEV(A) control Alaways closed. • LEV(B) control The same operation as that of COOL operation. • LEV(C) control Alaways closed. • Fan control The same operation as that of COOL operation. • Four way valve control The same operation as that of COOL operation. (Always OFF.) • Solenoid valve Always opened. • Others LED on the outdoor controller circuit board comes ON/OFF per second during replacement operation.	※ Cold air comes out of indoor unit because the replacement operation is conducted in COOL operation.

Continued to the next page.

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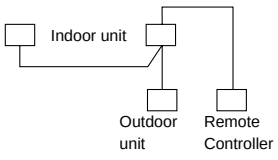
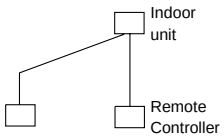
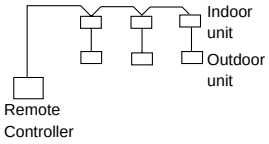
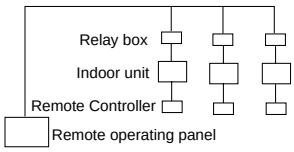
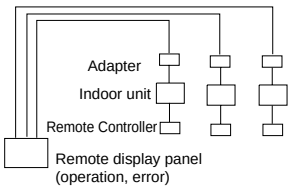
Control modes	Control details	Remarks
2. During replacement operation	2-2. Indoor frozen prevention control The compressor will be stopped for 3 minutes if the indoor liquid pipe temperature (TH2) or indoor condenser/evaporator temperature (TH5) is 3℃ or less after 10 minutes have passed since the compressor started.	※ Frozen protection control may be activated when the indoor intake temp. is 15℃ or less.

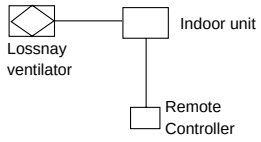
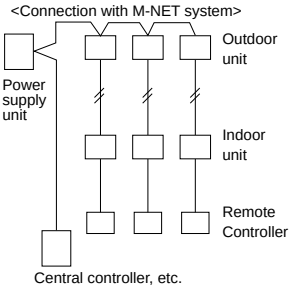
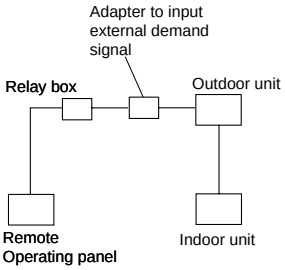
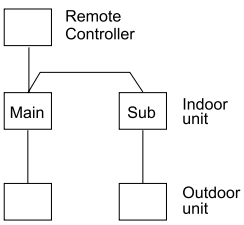
4-9. REFRIGERANT COLLECTING (pump down)

Control modes	Control details	Remarks
1. Start and end of pump down operation	1-1. Requirements for starting Pump down operation will be conducted when SWP on the outdoor controller board is turned on while the unit is being stopped.	
	1-2. Requirements for ending Pump down operation will end if any of the following conditions is satisfied. a. Low pressure switch has been used. b. 3 minutes have passed since the pump down operation started. c. Operation has been stopped by remote controller or changed to the other mode except COOL. d. Error has been detected.	
2. During pump down operation	2-1. Following controls are activated during pump down operation. • Compressor control The same continuous operation as COOL operation regardless of intake temperature. • LEV (A) control Opening pulse is fixed to step 3 (480 pulse). • LEV (B) (C) control Completely closed (0 pulse). • Fan control Fan step is fixed to step 10. • Four way valve OFF in COOL operation.	
<Complementary explanation for above 2 controls>	① Pump down operation is considered to be finished normally when the ending condition (a) or (b) is satisfied. At this time, the outdoor controller board's LED1 (green) turns OFF and LED2 (red) turns ON. The unit cannot be operated until the power is reset. ② If the pump down operation ends due to the ending conditions (c) or (d), the unit will be in a state of normal stop.	To prevent the unit from operating with pump down operation.

5 SYSTEM CONTROL

5-1. VARIETY OF SYSTEM CONTROL FUNCTIONS

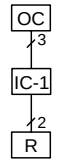
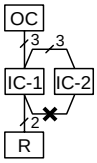
System Name	System Diagram	Features	Parts Required in addition to Standard System Components (Indoor/Outdoor Units, Remote Controller)
A. Remote controller operation (Standard)		• There are 2 types of remote controllers: Wired type and wireless type. • Simultaneous twin, triple units are counted as 1 unit, and the indoor units are started or stopped simultaneously.	———
B. Remote controller operation Use of 2 controllers enables operation of the air conditioner both from a distance and nearby.	 * One of the wired remote controllers must be set as a sub remote controller.	• Up to 2 remote controllers can be connected to 1 group. • Simultaneous twin units are counted as 1 unit. • Operation control by the latest command (last entered priority) • Wired and wireless remote controllers can be combined as a pair.	Wired remote controller (additional) (PAR-21MAA) For models PKA-RP·FAL/GAL use remote controller (PAR-21MAAT-E). * For models equipped with a terminal block.
C. Group control operation Use of 1 remote controller to control multiple air conditioners with the same settings simultaneously. * Outdoor unit's refrigerant address needs to be set.		• 1 group can consist of up to 16 indoor units, and they can be started sequentially by connecting the remote controller to them and assigning an address to each unit. • Simultaneous twin units are counted as 1 unit. • All the units belonging to the same group are operated in the same mode, but thermostats can be turned ON/OFF individually for each outdoor unit. • Up to 2 remote controllers can be connected.	For models PKA-RP·FAL/GAL use remote controller (PAR-21MAAT-E). * For models equipped with a terminal block.
D. Remote/local combined control operation Allows start/stop of the air conditioner from a distance, and prohibits/permits start/stop from remote controllers.		• All the air conditioners can be turned ON/OFF collectively from a distance. • Operation can be switched between the remote operating panel and local controller. • Operations (e.g., temperature adjustment, airflow, airflow direction) except for start/stop operations can be performed even if the remote controller is being operated. • In the case of simultaneous twin, triple units, connect the controller to 1 indoor unit only. If connected to 2 or more indoor units, an error (operation stop) may occur. • Control by an external timer is possible by connecting it.	Remote ON/OFF adapter (PAC-SE55RA-E) Relay box (Part to be provided locally) Remote operating panel (Part to be provided locally)
E. Operation by external signal	———	• Use of optional "remote ON/OFF adapter" enables remote control via relay. (Level signal)	Remote ON/OFF adapter (PAC–SE55RA-E)
F. Control and remote display by external signal (extraction of monitor signal) Enables you to display the operation state and control start/stop from a distance.		Extraction of non-voltage contact output • Use of optional "remote operation adapter" and "remote display panel" (Part to be provided locally) provides non-voltage contact outputs of signals (operation, error) and operation/stop input function.	Remote operation adapter (PAC-SF40RM-E) Remote display panel (Part to be provided locally)
		Extraction of DC12 V contact output • Use of optional "multiple remote controller adapter" and "remote display panel" (Part to be provided locally) provides DC12 V contact outputs of signals (operation, error) and operation/stop input function.	Multiple remote controller adapter (PAC-SA88HA) Remote display panel (Part to be provided locally)

System Name	System Diagram	Features	Parts Required in addition to Standard System Components (Indoor/Outdoor Units, Remote Controller)
G. Timer operation [Enables control of start and stop.] * For control by external timer, refer to Remote/ local combined control operation".	———	• Weekly timer: In addition to ON/OFF, up to 8 temperature patterns can be set for each day of the week. *Only 1 timer can be selected; the auto off, simple and weekly timers cannot be combined. • Simple timer: Start and stop operations can each be performed once within 72 hours (can be set in 1-hour increments). • Auto off timer: Operation is stopped when the preset time elapses following the start of operation. The time can be set from 30 minutes to 4 hours in 30-minute increments. *Only 1 timer can be selected; the simple and auto off timers cannot be combined.	MA Remote controller (PAR-21MAA)
H.Interlock operation with peripheral equipment [Enables control of Mitsubishi Lossnay ventilator by remote controller.]		• Connecting a Lossnay ventilator and an indoor unit enables control of interlock/solo ventilation operation and airflow. (Only the microcomputer type Lossnay ventilator can be used.)	
I.Central control		• Connecting the M-NET connection adapter to indoor unit enables connection of MELANS system controller (for M-NET). • When using A-control operation, the number of indoor units in a MELANS system is limited to the number of outdoor units. (Simultaneous twin, triple units are counted as 1 unit.) • Number of controlled outdoor units Central controller: 50 units Group remote controller (PAC-SC30GR): 16 units	M-NET adapter (Option PARTS) Central controller (G-50A) Group remote controller (PAC-SC30GR), etc.
J.Demand control		• Demand control is available by external input. In this mode, power consumption is decreased within the range of usual 0-100%.	Adapter to input external demand signals (PAC-SC36NA) Relay box (Part to be provided locally) Remote operating panel (Part to be provided locally)
K.Rotation		• Rotation Main and sub unit operate alternately according to the interval of roration setting. • Back-up When abnormality occurs while operation, it changes into operating the backup unit, and operation is continued. • 2nd stage cut-in · Number of operating units is determined according to the room temperature and set point. · When room temperature becomes higher than set point, standby unit starts. (2 units operation) · When room temperature falls below set point -4°C, standby unit stops. (1 unit operation)	This function is available when only 2 indoor units are connected to each PUHZ type outdoor unit. Application model Indoor unit PLA-RP・BA2/BA#2.UK PCA-RP・GA(2)#1/HA#1 PKA-RP・GAL#1/FAL(2)#1 PSA-RP・GA#1 PEAD-RP・EA(2)#1/GA#1

5-2. 1 REMOTE CONTROLLER (STANDARD) OPERATION

(1) 1 Wired Remote Controller

(OC: Outdoor unit IC: Indoor unit R: Remote controller (for wireless type: Receiver)

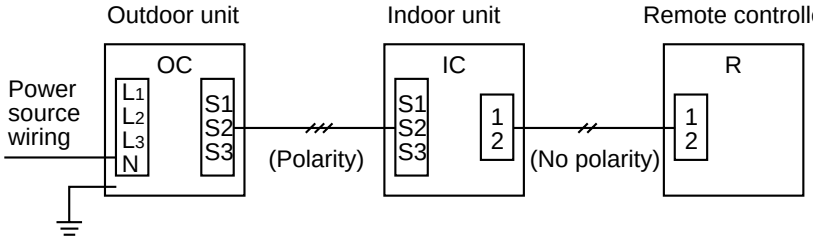
Slim Air Conditioners System		Standard 1:1	Simultaneous Twin
System diagram (Wired remote controller)	Outdoor unit OC Indoor unit IC Wired remote controller R	Indoor/Outdoor connection cable Remote controller cable 	

(Reference)

① If simultaneous twin, connect the remote controller to an indoor unit. All functions of the indoor unit can be controlled even if different models (different types) are mixed. Note that there may be some restrictions of the functions.

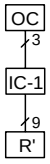
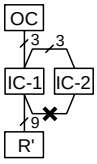
② Do not use crossover wiring among indoor units with simultaneous twin units. (Prohibited item.)

③ Electrical wiring diagram



- Power supply terminal block L_1, L_2, L_3, N
- Indoor/outdoor connection cable terminal block S1, S2, S3 (Polarity)
- Remote controller cable terminal block 1,2 (No polarity)

(2) Wireless remote controller

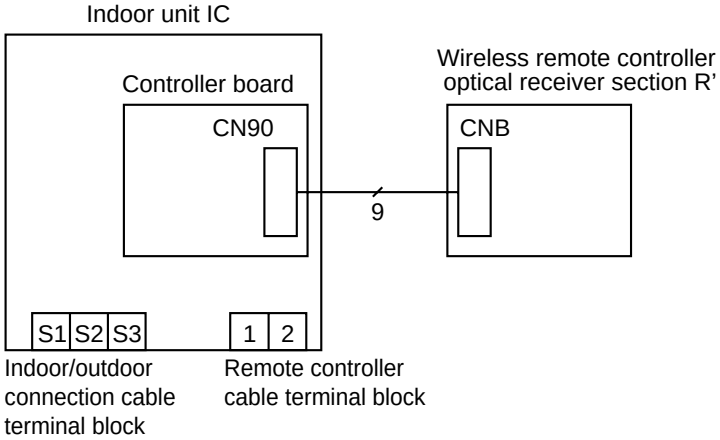
Slim Air Conditioners System		Standard 1:1	Simultaneous Twin
Sytem diagram (Wireless remote controller receiver)	Outdoor unit OC Indoor unit IC Wireless remote controller receiver section R'	Indoor/Outdoor connection cable 	

(Reference)

① If simultaneous twin, connect the remote controller to an indoor unit. All functions of the indoor unit can be controlled even if different models (different types) are mixed. Note that there may be some restrictions of the functions.

② Do not use crossover wiring among indoor units with simultaneous twin units. (Prohibited item.)

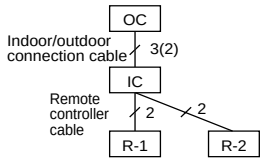
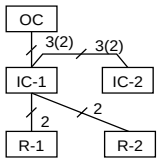
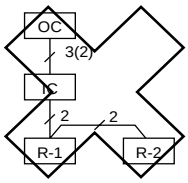
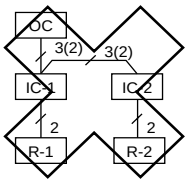
③ Electrical wiring diagram



5-3. 2-REMOTE CONTROLLER OPERATION

(1) 2 Wired Remote Controllers

(R: Wired remote controller)

Slim Air Conditioner System		Standard 1:1	Simultaneous Twin
System diagram (Wired remote controller)	Outdoor unit OC Indoor unit IC Wired remote controller R		
	Outdoor unit OC Indoor unit IC Wired remote controller R		

* Numbers given in ( ) apply when power is supplied to the indoor and outdoor units separately.

[Reference]

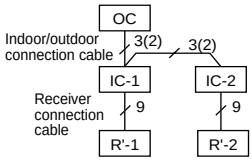
① In the case of multi type systems consisting of simultaneous twin units, connect the remote controllers to an indoor unit. All the functions of the connected indoor units can be controlled even if the system consists of different models. However, some functions may be restricted.

② In the case of multi type systems consisting of simultaneous twin and triple units, the indoor units should not be connected by crossover wiring. (Prohibited)

③ Set one of the remote controllers as the main controller (initial setting) and the other as the sub controller using the remote controller's function selection.

(2) 2 Wireless Remote Controllers

(R': Wireless remote controller receiver)

Slim Air Conditioner System		Standard 1:1	Simultaneous Twin
System diagram (Wireless remote controller receiver)	Outdoor unit OC Indoor unit IC Wireless remote controller receiver section R'	—	

* Numbers given in ( ) apply when power is supplied to the indoor and outdoor units separately.

[Reference]

① In the case of multi type systems consisting of simultaneous twin units, connect 2 wireless remote controller receivers (one each) to any 2 of the indoor units. All the functions of the connected indoor units can be controlled even if the system consists of different models. However, some functions may be restricted.

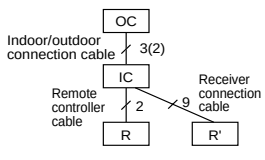
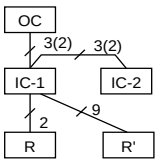
② In the case of multi type systems consisting of simultaneous twin units, the indoor units should not be connected by crossover wiring. (Prohibited)

③ In the case of " standard 1:1 connection", it is not possible to connect 2 remote controller receivers to the indoor units. However, with systems consisting of simultaneous twin, triple units, it is possible to connect a remote controller receiver to 2 indoor units. In this case, all the pair numbers will be "0" (initial setting, no change necessary), and all the units will be turned ON/OFF simultaneously.

④ When using 2 or more wireless remote controllers, the display contents on the remote controllers may differ from the actual settings, since the operation made last by any of the remote controllers will be effective.

(3) 1 Wired and One Wireless Remote Controller

(R: Wired remote controller, R : Wireless remote controller recelver)

Slim Air Conditioner System		Standard 1:1	Simultaneous Twin
System diagram (Wireless remote controller, wired remote controller)	Outdoor unit OC Indoor unit IC Wired remote controller Receiver R·R'		

* Numbers given in ( ) apply when power is supplied to the indoor and outdoor units separately.

[Reference]

① In the case of multi type systems consisting of simultaneous twin units, connect both the wired remote controller and wireless remote controller receiver to an indoor unit. All the functions of the connected indoor units can be controlled even if the system consists of different models. However, some functions may be restricted.

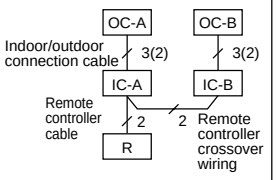
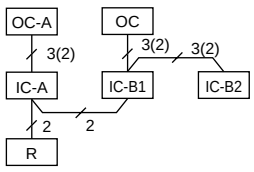
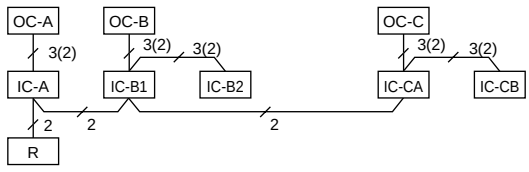
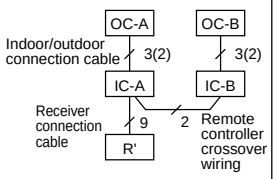
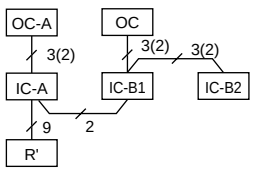
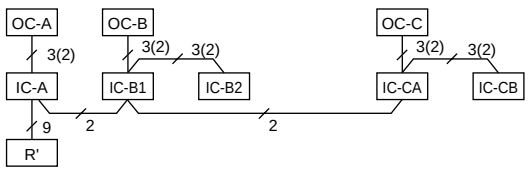
② In the case of multi type systems consisting of simultaneous twin units, the indoor units should not be connected by crossover wiring. (Prohibited)

③ When using 2 or more wireless remote controllers, the display contents on the remote controllers may differ from the actual settings, since the operation made last by any of the wireless remote controllers will be effective.

5-4. GROUP CONTROL OPERATION
(COLLECTIVE OPERATION AND CONTROL OF MULTIPLE REFRIGERANT SYSTEMS (2 to 16))

- Multiple Mr.Slim air conditioners can be operated with the same settings (e.g., operation mode, preset temperature, etc.) by using 1 remote controller. Each outdoor unit can be turned ON/OFF individually by the intake sensor.
- Up to 16 refrigerant systems can be controlled as a group by 1 remote controller.
- A refrigerant address must be set for each outdoor unit. Addresses "0" to "15" can be set with no duplicates. Address "0" must be set for one of the outdoor units.

* In the case of simultaneous twin units, only 1 refrigerant system is used.

Slim Air Conditioner System		Standard 1:1 2	Standard 1:1 + Simultaneous Twin	Standard 1:1 + Simultaneous Twin + Simultaneous Twin
System diagram (Wired remote controller, wireless remote controller)	Outdoor unit OC Indoor unit IC Wired remote controller R			
	Outdoor unit OC Indoor unit IC Wireless remote controller receiver section R'			

* Numbers given in ( ) apply when power is supplied to the indoor and outdoor units separately.

[Reference]

① For 2-remote controller control, refer to "5-3. 2-Remote Controller Operation". However, when using both wired and wireless remote controllers, receivers must be connected to indoor units that are connected by crossover wiring.

② Connect an indoor unit having the highest functions among the group to the outdoor unit assigned to refrigerant address "0" (Refer to the example given below). If indoor units with vanes are used with those without vanes, connect the outdoor unit to a unit with vanes.

Function specifications <Example>

Item			4-way ceiling cassette	Wall mounted		Celing concealed
			PLA-RP·BA	PKA-RP·GAL	PKA-RP·FAL	PEAD-RP·EA(2)
Function	Fan	Notch	4 speed + Auto	4 speed	2 speed	2 speed
	Up/down vane	Presence/absence	○	○	○	×
		Swing function	○	○	○	×
	Left/right swing louver	Presence/absence	×	×	×	×
Function order			1	2	3	4

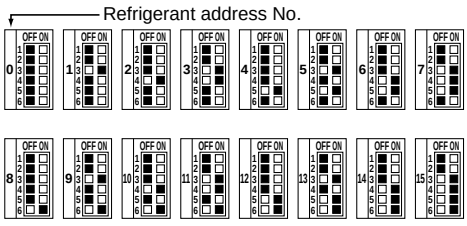
③ In the case of free component multi type systems consisting of simultaneous twin, triple and quad units, the indoor units should not be connected by crossover wiring. (Prohibited)

■ Outdoor unit address setting

- For group control, an address must be set for each outdoor unit.
- To set addresses to outdoor units, use the DIP switch SW1 (3-6) provided on each outdoor control board (Initial setting: All are set to "OFF".)
- Address setting by SW1 is as follows.

		Function	Operation by switch	
			ON	OFF
SW1 Function selection	1	Forced defrosting	Start	Normal
	2	Error history clear	Clear	Normal
	3	Refrigerant address setting	Used to set outdoor unit addresses ("0" to "15").	
	4	↑		
	5	↑		
	6	↑		

<SW1>



Initial setting: All switches are set to OFF (i.e., refrigerant address "0").

*** Checking the outdoor unit refrigerant addresses**

To find the location of an outdoor unit with a specific refrigerant address, specify the address in self-diagnosis mode. The outdoor unit will operate intermittently.

■ Group operation by multiple remote controllers

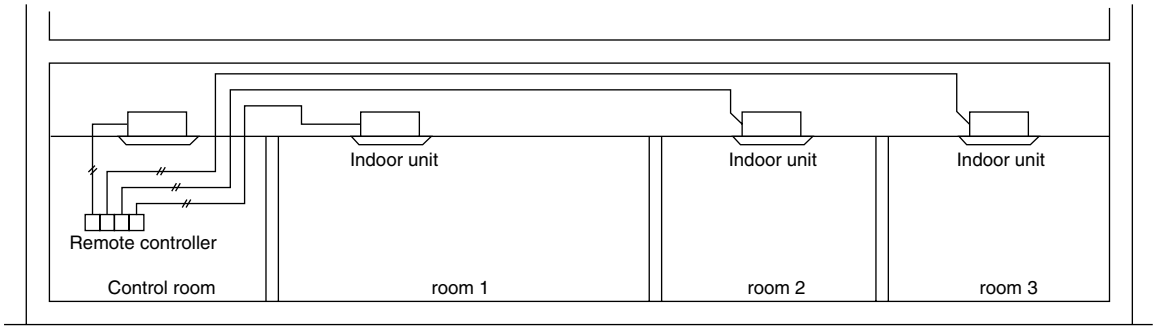
- Up to two remote controllers can be connected to each group. For details, refer to "5-3. 2-REMOTE CONTROLLER OPERATION".

5-5. POWER OUTAGE AUTOMATIC RECOVERY OPERATION

- Whenever a power outage or switching of the power supply causes the power supply of an operating air conditioner to go from OFF to ON, this function will automatically restore the operation of the air conditioner to its previous operating mode.
  ※ If the power is turned from OFF to ON when the air conditioner is not in operation, the air conditioner will not automatically be turned on. However, the timer operation will be cancelled if the air conditioner is in timer operation (including when the unit is waiting for its start time). Setting for timer operation must be performed once again.
- If there is a momentary power outage of less than 1 second while the air conditioner is in operation, there may not be a clear determination of whether or not there was a power failure. When it has been determined that there has been a power failure, recovery will take approximately 4 minutes after the power is restored. So please wait. (Once "PLEASE WAIT" has appeared on the display, a protection system will operate to prevent the unit from restarting for 3 minutes.)
  When it has been determined that there has been no power failure, operation will continue as is.
- Settings can be made by function selections from the remote controller.
- When there is group control, selection of all refrigerants is required.

5-6. INDIVIDUAL CONTROL OPERATION FROM A SEPARATE ROOM

- By simply centralizing the remote controllers installed in each room in a separate control room, individual control or centralized monitoring of the air conditioners in each room can be attained.
- Air conditioner control can be performed up to a total of 500 meters away by connecting the indoor units and remote controllers with 0.3 to 1.25 mm^2 2-core cable.



- If a remote controller is installed in a room and control room, refer to the section on operating with 2 remote controllers.

5-7. COMBINED REMOTE/LOCAL CONTROL

- Operation/remote controller prohibit/stop can be controlled from a remote location by routing the remote stop/start adapter (PAC-SE55RA-E optional parts) through the relay box installed on site. When this remote control is cancelled, the local remote controller can be used for operating and stopping the air conditioner.

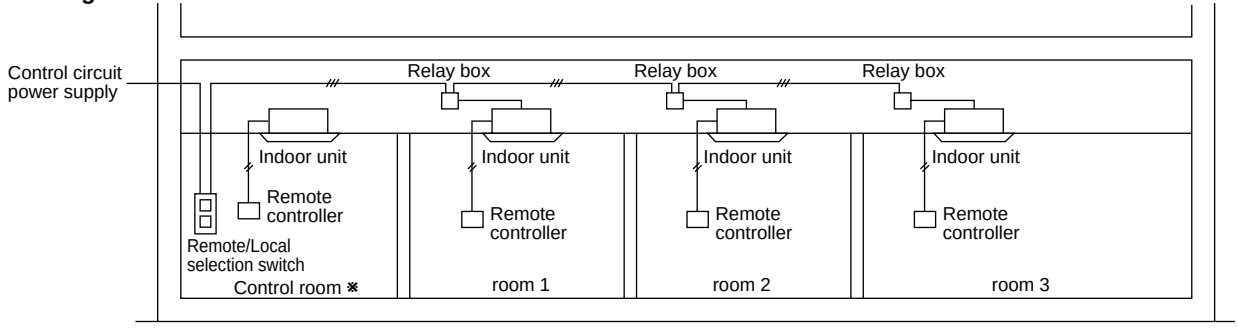
1. Basic system wiring

- Use the remote start/stop adapter (PAC-SE55RA-E) and connect the "Start/Stop Circuit From Remote Location" that comes from the relay box and remote/local selection switch and connect it to the CN32 connector on the printed circuit board for the indoor unit.

<Points of precaution>

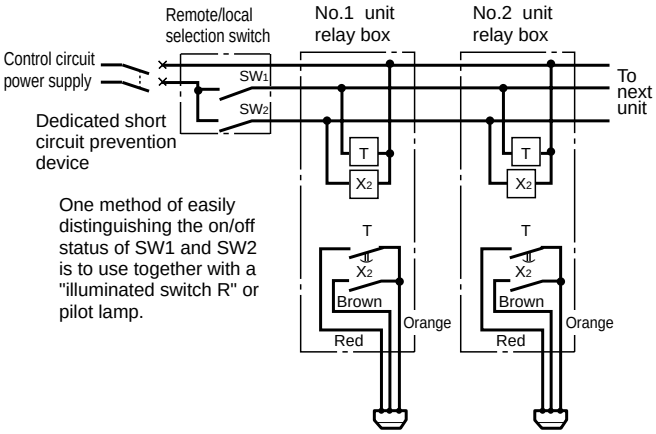
① Match the rated power supply voltage of the remote/local selection switch and relay (X2) with the power supply for the controller.
② When performing group control of multiple outdoor unit using a timer, be sure to arrange the timer so that all units do not start at the same time. If this is not performed, all of the units will start at one time creating an overcurrent that will cause the circuit breaker to operate.
③ An on-delay system is one that includes specifications for operating a limited time when an ON signal is received and has a temporary off timer for recovery operations.
④ Use a connecting relay when the wiring length exceeds 10 meters, such as when performing remote wiring. If this is not provided, abnormal operation will occur.

(1) System diagram



※ The air conditioner for the control room is usually disconnected from the remote/local control system.

(2) Basic wiring diagram



Note: When using group address, connect to refrigerant address "0" on the inside.

(3) Part specifications

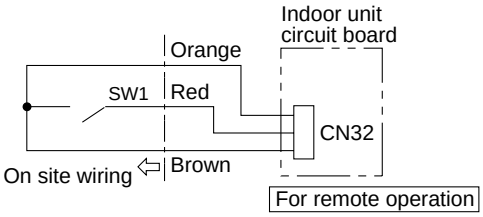
① Remote/local selection switch	② Adapter for remote start/stop	③ Relay box
(Example) Single polarity single-throw switch (125V rating)	Model PAC-SE55RA-E (Optional parts)	Ⓣ Timer (On delay system) Ⓧ Relay

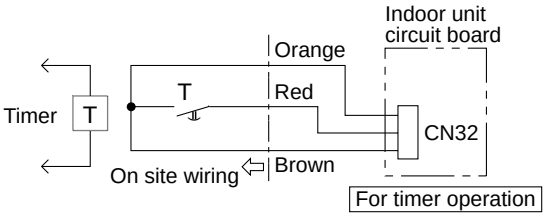
Remote control	SW1	ON		OFF	
Remote/local selection switch	SW2	ON	OFF	ON	OFF
Description of functions		• Starting/stopping with remote controller disabled. • AC is in operation. • Starting/stopping by remote operation enabled.	• Starting/stopping with remote controller disabled. • Starting/stopping by remote operation enabled.	• Starting/stopping with remote controller disabled. • AC is in operation. • Starting/stopping by remote operation enabled.	• Starting/stopping with remote controller disabled. • Starting/stopping by remote operation enabled.

2. Examples of system applications

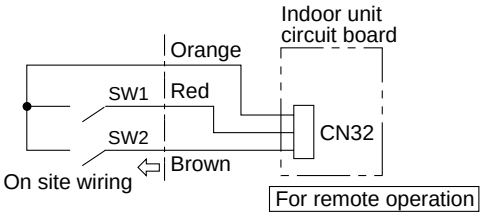
In any of the following examples, there is a 5 to 6 seconds delay from the time the operating command is issued until the operation begins.

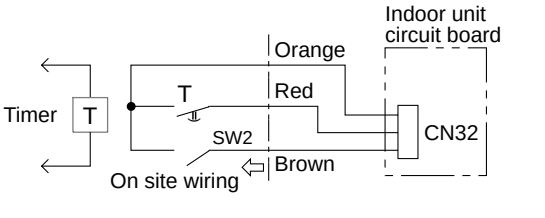
① This is when starting and stopping is performed by remote operation or external timer and when starting and stopping by the remote controller is to be prohibited.



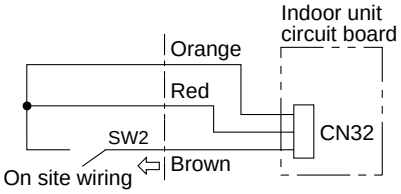


② This is when starting and stopping is performed by remote operation or external timer and when starting and stopping by the remote controller is to be separated.



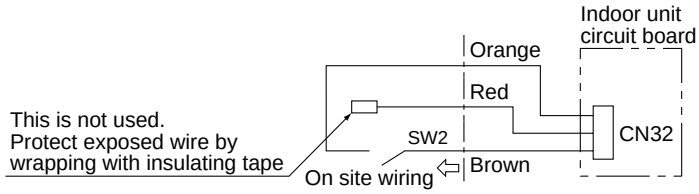


③ This is when starting and stopping is performed by remote operation and then allowing starting or stopping by remote control at any time.



Use momentary switch for SW2. (Manual operation/automatic recover switch on time is more than 1 second.)
Press SW2 (on time is more than 1 second) and operation starts. After this has been done, stopping or restarting can be done by remote controller.

④ This is when permitting or prohibiting operation by remote controller is performed by external circuit.

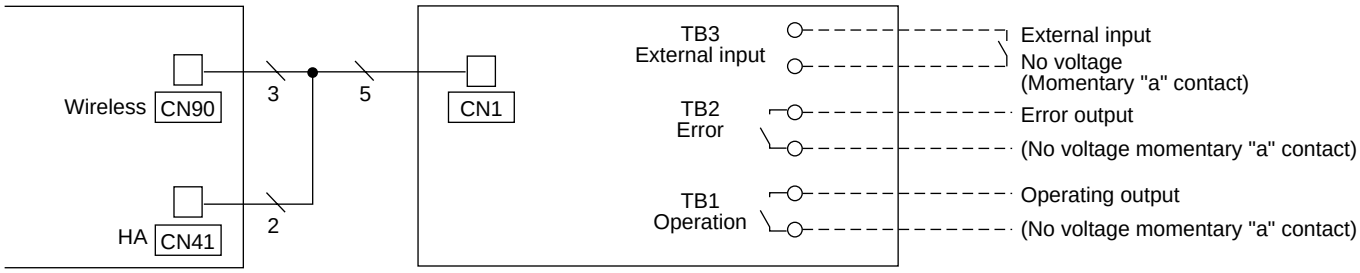


If SW2 is on, operation by remote controller cannot be performed.
If SW2 is off, operation by remote controller is permitted.

5-8. OBTAINING REMOTE DISPLAY

Use the remote operation adapter (PAC-SF40RM-E) to provide operation/error non-voltage contact output and on/off input function.

(1) Wiring method



A control indoor control circuit board　　Remote operation adapter

⚠Caution	**TB3 is a dedicated terminal for contact point input. Never input voltage. It will damage the indoor control circuit board.**

<Connections on the indoor unit side>

① When using external output function
Insert the 9-pole connector (3-core) of the attached cable to CN90 on the indoor control circuit board.

② When using the external input function
Insert the 4-pole connector (2-core) of the attached cable to CN41 on the indoor control circuit board.

※ The connector is direction-sensitive. Take care not to make an error when inserting.
Never force the connectors. This will result in damage.

(2) Locally procured parts

Item	Name	Model and specifications
External output function	External output signal wire	Use sheathed vinyl coated cord or cable. Wire type: CV, CVS or equivalent Wire size: Stranded wire : 0.5mm² to 1.25mm² Solid wire : ϕ0.65mm to 1.2mm
	Display lamp, etc.	No voltage “a” contact AC200V (DC30V), 1A or less
External input function	External input signal wire	Use sheathed vinyl coated cord or cable. Wire type: CV, CVS or equivalent Wire size: Stranded wire : 0.5mm² to 1.25mm² Solid wire : ϕ0.65mm to 1.2mm
	Switch	No voltage “a” contact (Start and stop operation is switched by inputting a pulse of 200ms or more.)

5-9. TIMER OPERATION

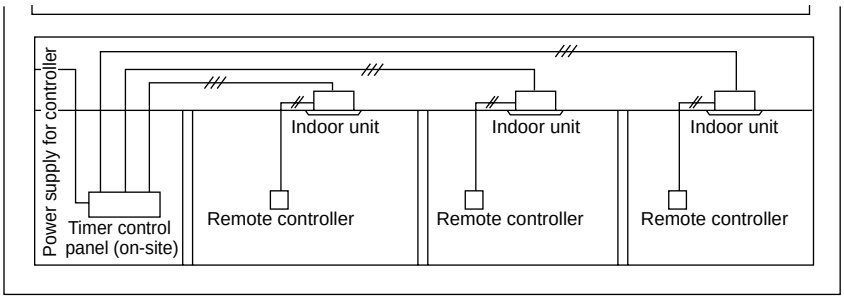
- Timer operation can be performed by setting the wired or wireless remote controller timer. Start and stop times can be set in 10-minute increments within a 24-hour period.
- When the timer operation is used in combination with the central control remote controller of the M-NET control system for the outdoor unit, one program timer can be used for individual timer settings for each group of the central control system. (Each timer setting can be stored in data memory so timer settings for up to 50 groups can be set individually.)

※ Please refer to the MELANS catalog or technical information for details about the central control remote controller.

Operating with on-site timer

(1) Summary of system

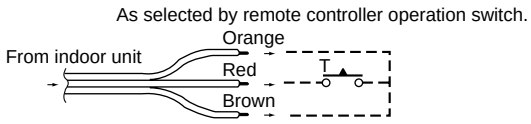
If the “Remote ON/OFF adapter” (PAC-SE55RA-E) (optional parts) is used, the on-site timer can be operated to turn each unit on and off.



(2) Basic pattern for timer control

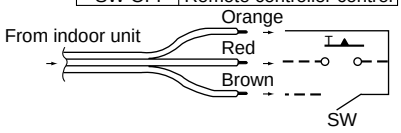
Use a no-voltage contact point output timer (one that has separate circuits for the load side and timer power supply).

a) Timer-independent control



b) Combined control by timer and remote controller

SW ON	Timer control
SW OFF	Remote controller control



(3) Basic system

Refer to 5-7 COMBINED REMOTE / LOCAL CONTROL.

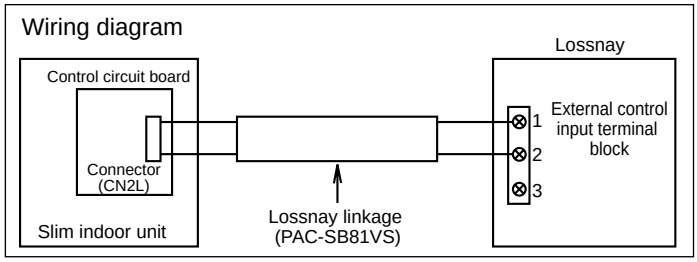
5-10. LINKED OPERATION WITH PERIPHERAL AIR CONDITIONERS EQUIPMENT

■ Lossnay operation

- Linked operation with a Lossnay unit can be obtained by connecting Lossnay linkage cable (Model PAC-SB81VS - optional parts) to the CN2L (Remote kit) on the circuit board of the indoor unit. This function must be selected from the remote controller.

① **Summary of wiring**

- Connect the Lossnay linkage cable (Model PAC-SB81VS) connector to CN2L on the indoor unit on the circuit board of the indoor unit.
- Connect the lead wire of the Lossnay linkage cable to the Lossnay external control input terminal blocks (1) and (2).
  (At this time, the input terminal blocks (1) and (2) have no polarity.)



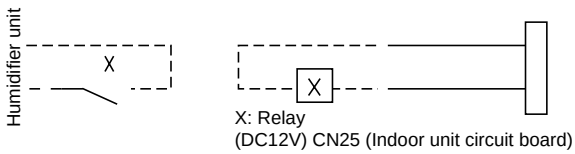
② **Precautions when wiring**

- The Lossnay linkage cable can be extended up to a maximum of 500 meters.
  When extending the Lossnay linkage cable, be sure to connect securely and take proper steps to ensure insulation.
  (Extension cable specifications: Sheathed vinyl cord or cable 0.5 to 0.75mm^2)
- Arrange wiring so that there can be no contact between the Lossnay linkage cable and the power supply cable. Contact may cause malfunction. (Separate by 5cm or more.)

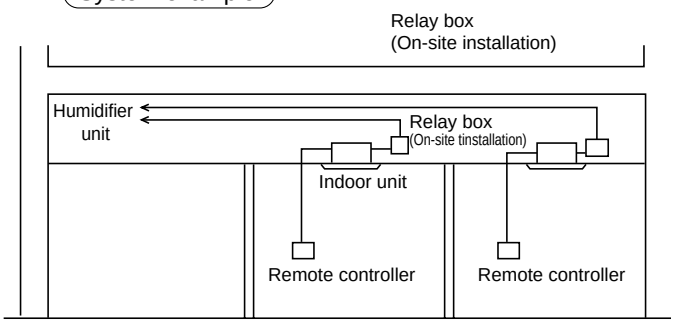
5-11. OBTAINING HUMIDIFIER SIGNAL

- The humidifier signal that is linked to the AC heating operation (indoor unit ventilator) can be obtained by connecting the adaptor for the humidifier signal to connector CN25 on the printed circuit for the indoor unit and wiring it to the humidifier unit via the on-site relay box. There is no output when the thermostat is off during heating preparation and during defrosting.

Basic wiring



System example



5-12. EXTERNAL MOUNTING OF TEMPERATURE SENSOR

- Temperature control from an alternative external location can be performed by connecting the temperature sensor (Model PAC-SE41TS-E - optional parts) to the CN20 connector on the circuit board for the indoor unit.
- The wired remote controller also has an internal temperature sensor. Function selection from the remote controller is required.
  Refer to “FUNCTION SETTING” for information of installation manual about selecting functions with the remote controller.

5-13. MULTIPLE REMOTE CONTROL DISPLAY

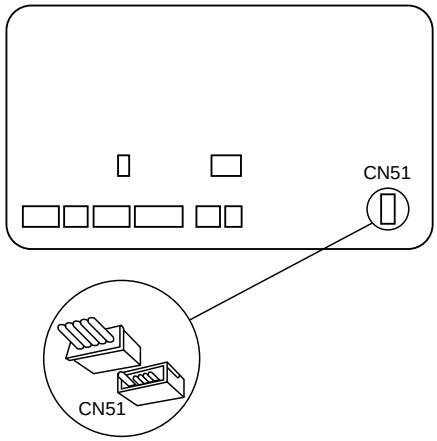
You can control several units with a multiple remote control display, by wiring an optional multiple remote controller adapter (PAC-SA88HA-E) with relays and lamps on the market.

How to wire

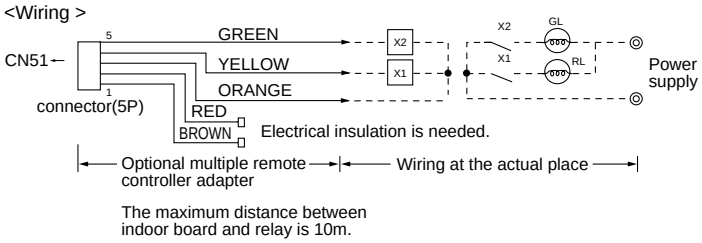
(1) Connect the multiple remote controller adapter to the connector CN51 on the indoor controller board.

(2) Wire three of the five wires from the multiple remote controller adapter as shown in the figure below.

Indoor controller board



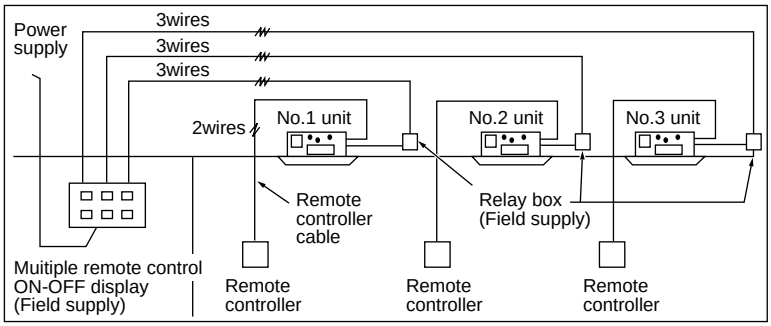
<Wiring >



[Notes on Signs]
X1:Relay (for operation lamp)
X2:Relay (for check lamp)
RL:Operation Lamp
GL:Check Lamp

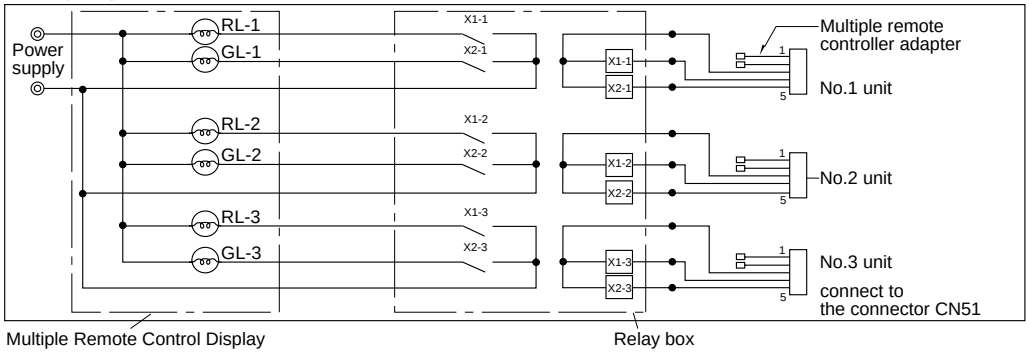
[Field supplied parts]
Relays:12V DC with rated coil power consumption below 0.9W.
Lamps:Matching to power supply voltage.

<System>



(Operation check)

<Wiring diagram>



5-14. OPERATION IN CONJUNCTION WITH DUCT FAN (Booster fan)

●Whenever the indoor unit is operating, the duct fan operates.

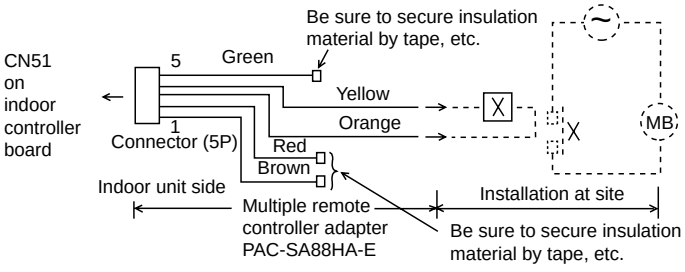
(1)Connect the optional multiple remote controller adapter(PAC-SA88HA-E) to the connector CN51 on the indoor controller board.

(2)Drive the relay after connecting the 12V DC relay between the Yellow and Orange connector lines.

Use a relay of 1W or smaller.

MB: Electromagnetic switch power relay for duct fan.

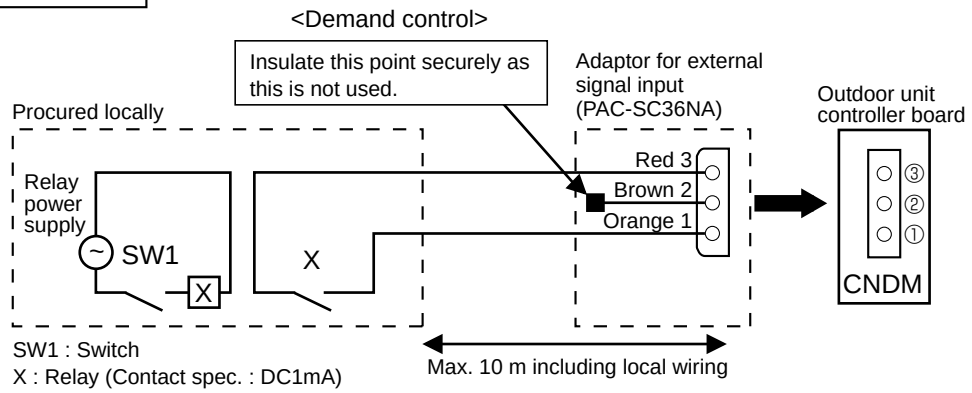
X: Auxiliary relay (12V DC LY-1F)



5-15. DEMAND CONTROL

Demand control is available by external input. In this mode, power consumption is decreased within the range of usual 0~100%.

How to wire



1) Make the circuit as shown above with Adapter for external signal input(PAC-SC36NA).
2) Turn SW1 on for demand control mode.
   Turn SW1 off to release demand control mode and normal operation.

It is possible to set it to the following power consumption (compared with ratings) by setting the SW7-1, 2 on outdoor controller board.

SW7-1	SW7-2	Power consumption (SW1 on)
OFF	OFF	0% (Operation stop)
ON	OFF	50%
OFF	ON	75%

5-16. ROTATION FUNCTION (AND BACK-UP FUNCTION, 2ND STAGE CUT-IN FUNCTION)

5-16-1. Operation

(1) Rotation function (and Back-up function)

• Outline of functions

· Main and sub units operate alternately according to the interval of rotation setting.

※ Main and sub unit should be set by refrigerant address. (Outdoor Dip switch setting)
Refrigerant address "00" ⟶ Main unit
Refrigerant address "01" ⟶ Sub unit

· When error occurrs to one unit, another unit will start operation. (Back-up function)

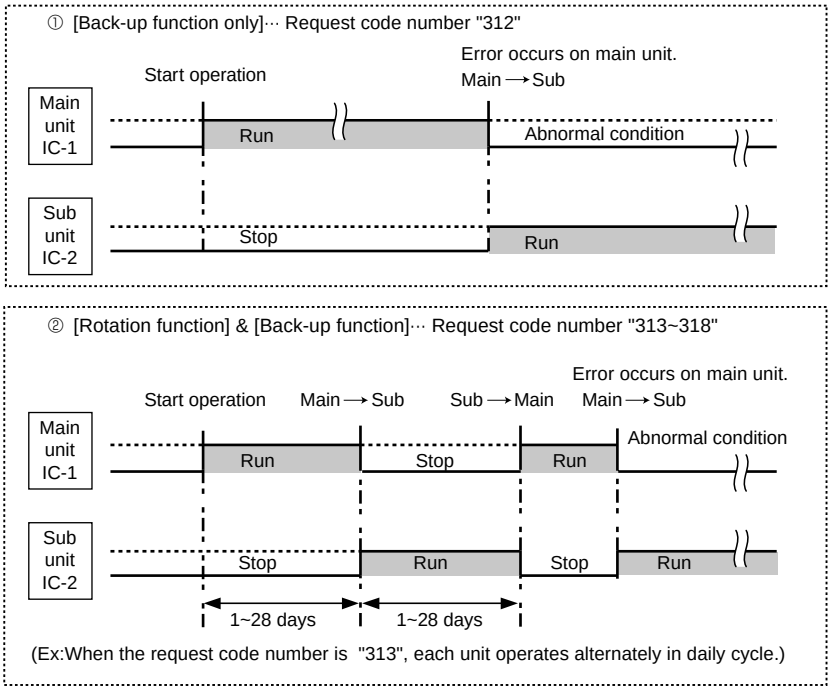
• System constraint

· This function is available only by the grouping control system(INDOOR UNIT : OUTDOOR UNIT=1:1) of 2 refrigerant groups. (Refer to Fig. 1)

· Main indoor unit should be connected for wired remote controller and the transmission line (TB5) for main and sub unit should also be connected. (Refer to Fig. 1)
(This function cannot be set by wireless remote controller.)

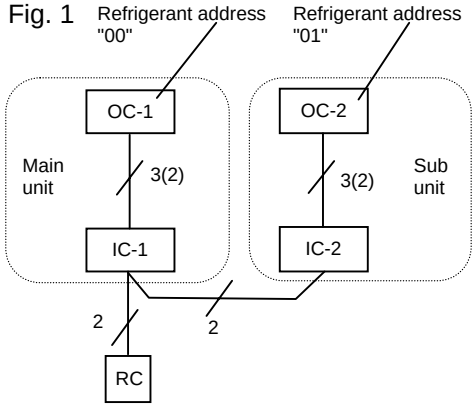
· Set refrigerant address of each unit. (Dip switch on the outdoor unit ··· Refrigerant address 00/01)

Operation pattern



(Ex:When the request code number is "313", each unit operates alternately in daily cycle.)

Fig. 1



OC : Outdoor unit
IC : Indoor unit
RC : Wired remote controller

Note:

· When the uint is restarted to operate after turning off the power or OFF operation, the unit which was operating will start operation.

· To operate the main unit, refer to the 5-16-2. and set the requet code No. which is not the same as the current one, and set again the former request code No.

(2) 2nd stage cut-in function

• Outline of functions

· When the 1st unit can NOT supply with sufficient capacity for exceptionally high-demand conditions and the actual room temperature reaches set point *, the 2nd unit starts operation in conjunction with the 1st unit.

· Once the actual room temperature goes down to 4degrees C below set point *, the 2nd unit stops operation automatically.
(* set point = set temperature by R/C (remote controller) + 4, 6, 8℃ (selectable))

· Number of operating units is determined according to the room temperature and set point.

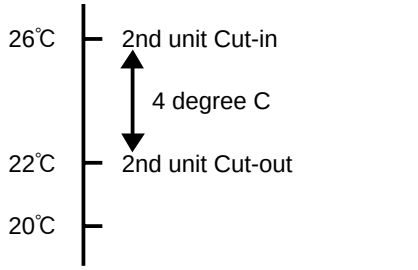
· When room temperature becomes higher than set point, standby unit starts. (2 units operation)

· When room temperature falls below set point -4℃, standby unit stops. (1 unit operation)

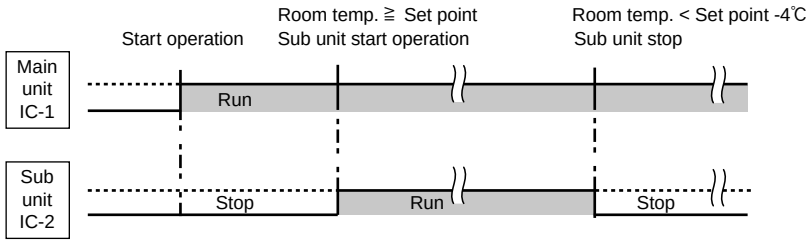
• System constraint

· This function is available only in cooling mode.

Ex.) Set temp. by R/C = 20℃
Set point = 26℃
When request code number is “323”.



[2nd stage cut-in function]··· Request code number "322~324"



5-16-2. How to set rotation function (Back-up function, 2nd stage cut-in function)

You can set these functions by wired remote controller. (Maintenance monitor)

NOTICE

Both main and sub unit should be set in same setting.
Every time replacing indoor controller board for servicing, the function should be set again.

(1) Request Code List

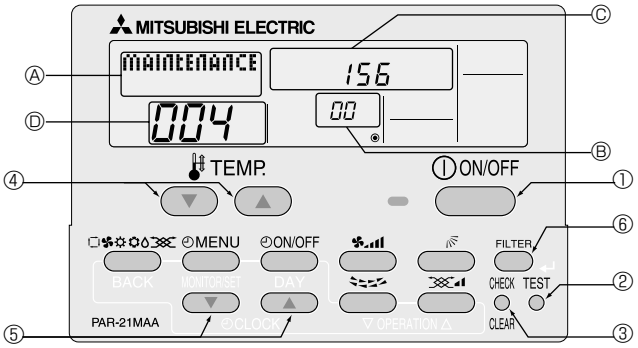
Rotation setting

Setting No. (Request code)	Setting contents	Initial setting
No.1 (310)	Monitoring the request code of current setting.	
No.2 (311)	Rotation and Back-up OFF (Normal group control operation)	◎
No.3 (312)	Back-up function only	
No.4 (313)	Rotation ON (Alternating interval = 1day) and back up function	
No.5 (314)	Rotation ON (Alternating interval = 3days) and back up function	
No.6 (315)	Rotation ON (Alternating interval = 5days) and back up function	
No.7 (316)	Rotation ON (Alternating interval = 7days) and back up function	
No.8 (317)	Rotation ON (Alternating interval = 14days) and back up function	
No.9 (318)	Rotation ON (Alternating interval = 28days) and back up function	

2nd stage cut-in setting

Setting No. (Request code)	Setting contents	Initial setting
No.1 (320)	Monitoring the request code of current setting.	
No.2 (321)	Cut-in function OFF	◎
No.3 (322)	Cut-in Function ON (Set point = Set temp.+ 4°C (7.2°F))	
No.4 (323)	Cut-in Function ON (Set point = Set temp.+ 6°C (10.8°F))	
No.5 (324)	Cut-in Function ON (Set point = Set temp.+ 8°C (14.4°F))	

(2) Setting method of each function by wired remote controller



B: Refrigerant address
C: Data display area
D: Request code display area

1. Stop operation(①).

2. Press the (TEST) button (②) for 3 seconds so that [Maintenance mode] appears on the screen (Ⓐ).
   After a while, [00] appears in the refrigerant address number display area. (at Ⓑ)

3. Press the (CHECK) button (③) for 3 seconds to switch to [Maintenance monitor].
   Note) It is not possible to switch to [Maintenance monitor] during data request in maintenance mode
   (i.e., while "----" is blinking) since no buttons are operative.

   [----] appears on the screen (Ⓓ) when [Maintenance monitor] is activated.
   (The display (Ⓓ) now allows you to set a request code No.)

4. Press the [TEMP ((▽) and (△))] buttons (④) to select the desired refrigerant address.

   [ScreenB] → 00 ⟷ 01 ⟷ ····· ⟷ 15 ←

5. Press the [CLOCK ((▽) and (△))] buttons (⑤) to set the desired request code No.("311~318", "321~324")

6. Press the (FILTER) button (⑥) to perform function setting.
   If above setting operations are done correctly, "Request code number" will appear in data display area. (Ⓒ)
   [Example: When the "311" of "Request code number" is set, [311] appears on the screen. (Ⓒ)]

[Refererence]
You can check current "request code number" setting by setting the "request code number"("310" or "320") and pressing the (FILTER) button. (⑥)
[Example: When the current setting is "Setting No.2(Request code 311)", [311] appears on the screen. (Ⓒ)]

7. To return to normal mode, press the (ΦON/OFF) button (①).

Mr.SLIM™

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