

6. Electric Wiring

Electrical installation work must be performed by an electrical installation service provider qualified by a power provider of the country.

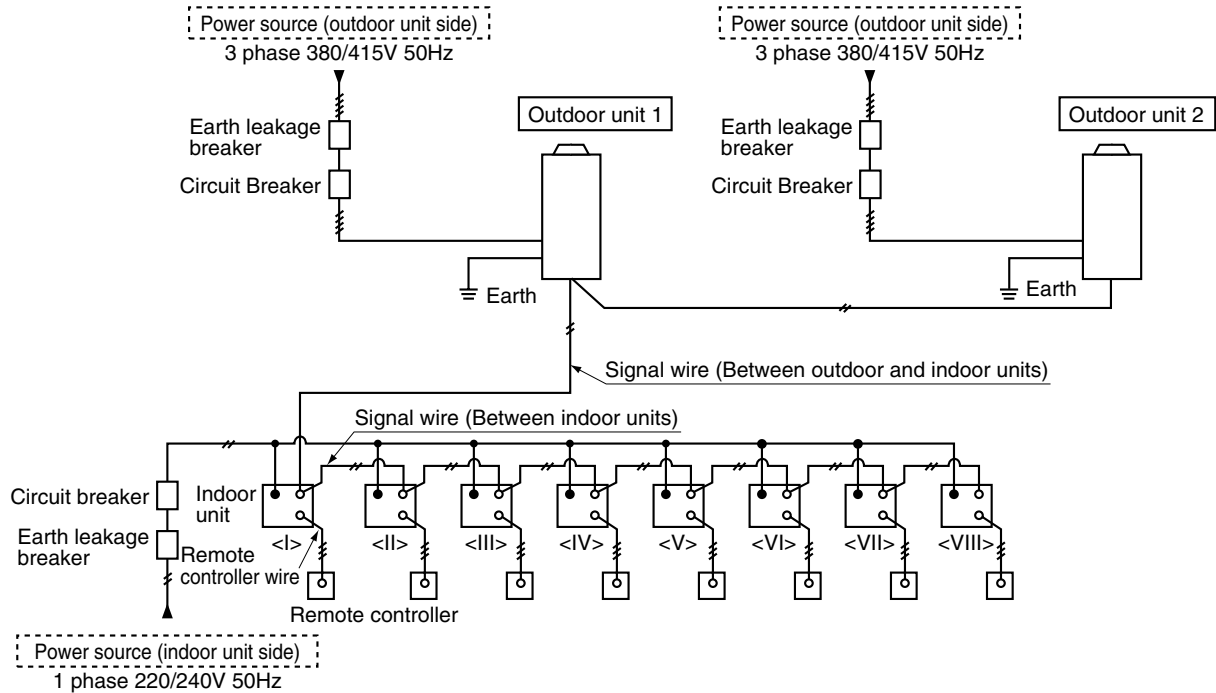
Electrical installation work must be executed according to the technical standards and other regulations applicable to electrical installations in the country.

⚠ Please install an earth leakage breaker without fail. The installation of an earth leakage breaker is compulsory in order to prevent electric shocks or fire accidents.

Please note

1. Use only copper wires.
Do not use any supply cord lighter than one specified in parentheses for each type below.
 - braided cord (code designation 60245 IEC 51), if allowed in the relevant part 2;
 - ordinary tough rubber sheathed cord (code designation 60245 IEC 53);
 - flat twin tinsel cord (code designation 60227 IEC 41)
 - ordinary polyvinyl chloride sheathed cord (code designation 60227 IEC 53).Please do not use anything lighter than polychloroprene sheathed flexible cord (cord designation 60245 IEC 57) for supply cords of parts of appliances for outdoor use.
2. Use separate power supplies for the indoor and outdoor units.
3. Ground the unit. Do not connect the grounding wire to a gas pipe, water pipe, lightning rod or telephone grounding wire.
If improperly grounded, an electric shock or malfunction may result.
4. A grounding wire must be connected before connecting the power cable. Provide a grounding wire longer than the power cable.
5. The installation of an impulse withstanding type earth leakage breaker is necessary. A failure to install an earth leakage breaker can result in an accident such as an electric shock or a fire. Do not turn on the power until the electrical work is completed. Be sure to turn off the power when servicing.
6. Please do not use a running capacitor for power factor improvement under any circumstances. (It does not improve power factor, while it can cause an abnormal overheat accident)
7. For power supply cables, use conduits.
8. Please do not lay electronic control cables (remote control and signaling wires) and other cables together outside the unit. Laying them together can result in malfunctioning or a failure of the unit due to electric noises.
9. Power cables and signaling wires must always be connected to the power cable terminal block and secured by cable fastening clamps provided in the unit.
10. Fasten cable so that they may not touch the piping etc.
11. When cables are connected, please make sure that all electrical components within the electrical component box are free of loose connector coupling or terminal connection and then attach the cover securely. (Improper cover attachment can result in malfunctioning or a failure of the unit, if water penetrates into the box.)
12. A grounding wire must be connected before connecting the power cable. Provide a grounding wire longer than the power cable.

6.1 Wiring System Diagrams



6.2 Method of Connecting Power Cables

1. Method of leading out cables
 - a) Cables can be laid through the front, right, left or bottom casing.
 - b) In wiring on the installation site, cut off a half-blank ($\phi 50$ or oblong hole measuring 40×80) covering a penetration of the casing with nippers.
2. Notabilia in connecting power cables

Power cables must always be connected to the power cable terminal block and clamped outside the electrical component box.

In connecting to the power cable terminal block, use round solderless terminals.

 - a) Use specified wires in wiring, and fasten them securely in such a manner that the terminal blocks are not subject to external force.
 - b) In fastening a screw of a terminal block, use a correct-size drive.
Fastening a screw of a terminal block with excessive force can break the screw.
 - c) When electrical installation work is completed, make sure that all electrical components within the electrical component box are free of loose connector coupling or terminal connection.

6.3 Power Supply Wiring

(1) Outdoor unit power supply specifications

It is a standard method that power supply constructions are carrying out for indoor and outdoor respectively. The table below shows the power supply specification for a single outdoor unit.

Model	Power source	Cable size for power source (mm ²)	Wire length (m)	Moulded-case circuit breaker (A)		Earth leakage breaker	Earth wire	
				Rated current	Switch capacity		Size (mm ²)	Screw type
140	3 phase 4 wire 380/ 415V 50Hz	3.5	22	30	30	30A 30mA less than 0.1 sec	2	M5
224		5.5	54	40	50	60A 100mA less than 0.1 sec	3.5	M5
280		5.5	54	40	50	60A 100mA less than 0.1 sec	3.5	M5
335		5.5	54	40	50	60A 100mA less than 0.1 sec	3.5	M5
335-k		14	76	60	50	60A 100mA less than 0.1 sec	3.5	M5
400		14	76	60	60	60A 100mA less than 0.1 sec	5.5	M5
450		14	76	60	60	60A 100mA less than 0.1 sec	5.5	M5
504		14	76	125	100	60A 100mA less than 0.1 sec	5.5	M10
560		14	76	125	100	60A 100mA less than 0.1 sec	5.5	M10
615		14	76	125	100	60A 100mA less than 0.1 sec	8	M10
680		14	76	150	200	60A 100mA less than 0.1 sec	8	M10

- Please note**
- (1) The method of laying cables has been determined pursuant to the Japanese indoor wiring regulations (JEAC8001). (Please adapt it to the regulations in effect in each country)
 - (2) In the case of distributed, separate power supply system, the listed data represent those of an outdoor unit.
 - (3) For details, please refer to the installation manual supplied with the indoor.

* Notice when connecting power supply line to outdoor unit

For combination outdoor unit, don't get across terminal block and use breaker for wiring separately or use another terminal box to branch.

(2) Indoor unit power supply specifications

Combined total capacity of indoor units	Cable size for power source (mm ²)	Wire length (m)	Moulded-case circuit breaker (For ground fault, overload) and short circuit protection	Signal wire size (mm ²)	
				Outdoor-Indoor	Indoor-Indoor
Less than 7A	2	21	20A100mA less than 0.1 sec	2cores × 0.75-2.0	2cores × 0.75-2.0
Less than 11A	3.5	21	20A100mA less than 0.1 sec		
Less than 12A	5.5	33	20A100mA less than 0.1 sec		
Less than 16A	5.5	24	30A100mA less than 0.1 sec		
Less than 19A	5.5	20	40A100mA less than 0.1 sec		
Less than 22A	8	27	40A100mA less than 0.1 sec		
Less than 28A	8	21	50A100mA less than 0.1 sec		

- Please note**
- (1) The above table shows a standard specification. The power supply is different according to the type of the indoor unit. Please prepare power supply of a single-phase 220V or three-phase 220V.
 - (2) Wire length in the table above is the value for when the indoor unit is connect to the power cable in series also the wire size and minimum length when the power drop is less than 2% are shown. If the current exceeds the value in the table above, change the wire size according to the indoor wiring regulations. (Please adapt it to the regulations in effect in each country)
 - (3) As for connected line to the indoor unit, even 5.5mm² is possible, but for connected line of 8mm² or more, you must use special pull box and branch to the indoor unit by 5.5mm² or less.
 - (4) The above table has been described for unit containing no any electric heater (optional). Please notice that the power supply specification and the wiring specification are different when an electric heater is built in.
 - (5) Please connect three terminals of the terminal blocks of the indoor unit to power supply for the heater, only when you use an optional supplementary heater.

6.4 Precaution in Electric Wiring

1. Use separate power supplies for the outdoor and indoor units respectively (Standard specification)
2. Signal wiring (for indoor and outdoor units)
 - Double-core cable with a diameter 0.75 to 2mm² should be used for the signal wires.
 - Never make the indoor and outdoor connecting signal line use "co-axial cable" or "strand" with the power wiring for indoor and outdoor unit and other power line.
(Never use a multiconductor wire together with power line. It may cause erroneous operation.)
 - Do not connect high voltage wires 220V or 380V to signal wires. as these wires are DC 5V. Signal wires should be connected so that the terminal Nos. conform with each other for between outdoor and between indoor units. However, they will work properly if different polarities are connected.
(Connect (A) and (A), (B)and (B).)
 - Do not strand or run the remote control cord with power line, electric line, etc.
 - The total length of the signal wires Should be 1000m or less.
 - Recommended signal wire list

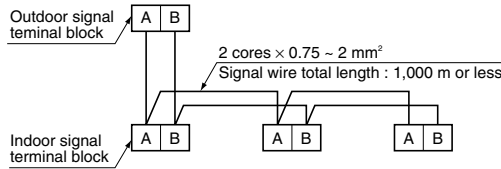
No.	Name	Symbol
1	Vinyl cable round cord	VCTF double-core 0.75 to 2mm ²
2	Vinyl cable round cable	VCT double-core 0.75 to 2mm ²
3	Control vinyl insulated, vinyl sheathed cable	CVV double-core 0.75 to 2mm ²
4	Shielding wire	MVVS double-core 0.75 to 2mm ²

When No. 4 shielding wire is used, always ground the single wire side of the shielding wire. In addition, using the shielding wire is helpful to prevent the incorrect connection between 5V DC and 220V or 380V AC because the discrimination from the power supply wire is clear.

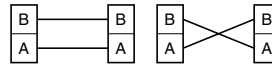
6.5 Method of Connecting Signaling Wires

- The signal wires are 5VDC, so absolutely do not connect them to a 220/240V wire. If such a connection is mistakenly made, all the printed circuit boards will be burned out. Signal wires do not have a polarity. Connect them between the indoor and outdoor units, between indoor units, between indoor units, and between the same terminal Nos. (Connection between (A) and (A), (B) and (B).)
- Please use shielded cords for signaling wires. (For grounding of a shielded cord, find a point of connection to the metal casing in the proximity of the terminal block for the AB lines)
Indoor and outdoor signal wires

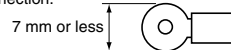
When there is 1 outdoor unit



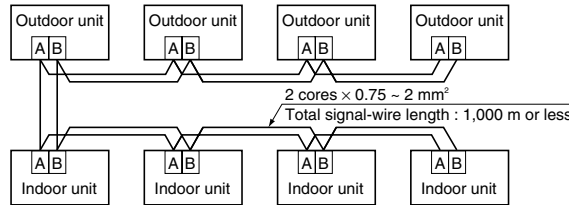
Indoor and outdoor signal wires do not have a polarity. Any of the connections in the following illustration can be made.



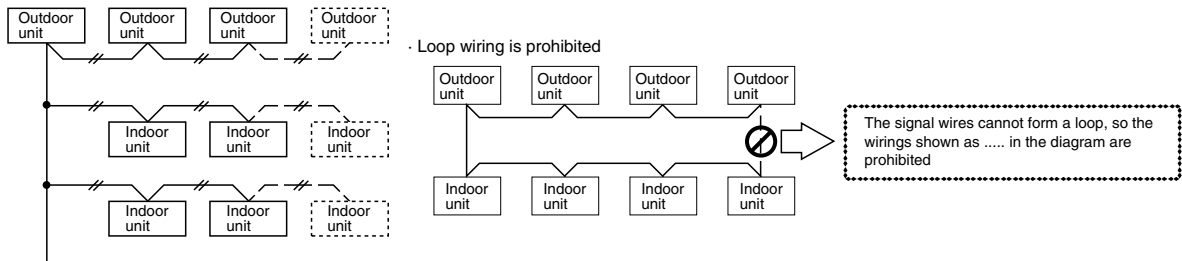
When wiring to the terminal block, use the M3.5 crimp terminals shown in the illustration below to make the connection.



When connecting multiple outdoor units



- The maximum number of indoor units that can be connected in a system is 48 and it is possible to configure outdoor units and/or indoor units as an outdoor or indoor unit group connected with each other with two wiring.
- The signal wires can also be connected using the method shown below.



6.6 Remote Controller Wiring Specifications

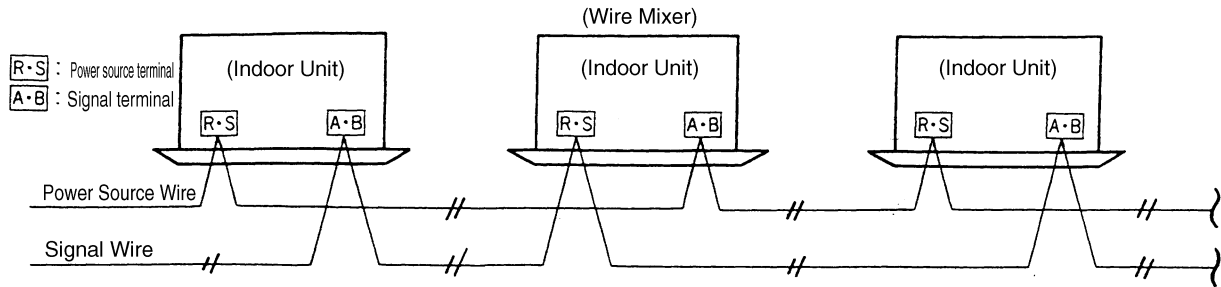
- For the remote controller the standard wire is $0.3\text{mm}^2 \times 3$ cores. The max. length is up to 600m. When the wire is more than 100m long, use the wire shown in the following table.

Length (m)	Wire size
100 to 200	$0.5\text{mm}^2 \times 3$ cores
To 300	$0.75\text{mm}^2 \times 3$ cores
To 400	$1.25\text{mm}^2 \times 3$ cores
To 600	$2.0\text{mm}^2 \times 3$ cores

- When the remote controller wire runs parallel to another power supply wire or when it is subject to outside noise, such as from a high-frequency device, use shielded wire. (Be sure to ground only one end of the shielded wire.)

6.7 Judgment on Mixture of Signal Wires and Power Source Wires

Example of Mixed Wires



1. Judgment Procedure

- 1) Check prior to power-on.
- 2) Check and confirm the number of remote controllers for both indoor and outdoor units.
- 3) Measure the resistance at AB signal terminal.

2. Judging Method

- 1) Use

$$\frac{9100 \Omega}{(\text{Number of indoor units} + \text{Number of outdoor units} + P)}$$

P : Number of units added for SLA-1-E;
Number of units not added for SLA-2A-E, SLA-200EC

- 2) When the resistance is below 80Ω it means that mixed wires exist in more than 1 unit.
- 3) The resistance of half-way broken signal wires is much greater than the standard value.
- 4) Total number of units and valve between A and B.

Total Number of Units	Normal Value between A and B (Ω)	Resistance Value between A and B in case of 1 unit with mixed wires (Ω)	Resistance Value between A and B in case of 2 units with mixed wires (Ω)	Resistance Value between A and B in case of 3 units with mixed wires (Ω)
2	4550	74	—	—
3	3033	73	37	—
4	2275	73	37	25
5	1820	72	37	25
6	1517	71	37	25
7	1300	71	36	25
8	1138	70	36	24
9	1011	70	36	24
10	910	69	36	24
20	455	64	35	24
40	228	56	32	23
60	152	50	30	22
80	114	45	28	21
97	94	42	27	20

6.8 Address Setting

6.8.1 FDCA140HKXEN4

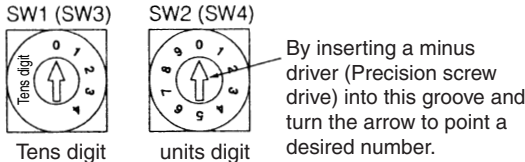
- (a) Addresses can be set either with the automatic address setting, remote control address setting or manual address setting by the combinations of address switches (refer to the table below) of the indoor and outdoor units.
- (b) No mixed use of three kinds of different methods for the same system.

Method of setting address	Outdoor unit		Indoor unit	
	Outdoor No.	Outdoor No.	Indoor No.	Indoor No.
Automatic address setting	49	49	49	49
Remote control address setting	00 ~ 47	49	49	49
Manual address setting	00 ~ 47	00 ~ 47	00 ~ 47	00 ~ 47

- (c) Address No. setting Set setting SW1~4 on the indoor board and setting SW1, 2 on the outdoor board as shown in the figure below.

On the indoor board	SW1, 2 (Blue)	For Indoor No. setting (Tens digit and units digit)
	SW3, 4 (Green)	For Outdoor No. setting (Tens digit and units digit)
On the outdoor board	SW1, 2 (Blue)	For Outdoor No. setting (Tens digit and units digit)

		SW2 (SW4) units digit									
		0	1	2	3	4	5	6	7	8	9
SW1 (SW3) Tens digit	0	00	01	02	03	04	05	06	07	08	09
	1	10	11	12	13	14	15	16	17	18	19
	2	20	21	22	23	24	25	26	27	28	29
	3	30	31	32	33	34	35	36	37	38	39
	4	40	41	42	43	44	45	46	47	48	49



48 and 49 are used for the automatic address setting.

- Notes (1) Set the inverter unit No. of the constant speed outdoor unit connected by refrigerant pipe and outdoor No. of the indoor unit same as the outdoor No. of the inverter unit.
- (2) Indoor No. is a number to identify the indoor unit. Please do not duplicate.

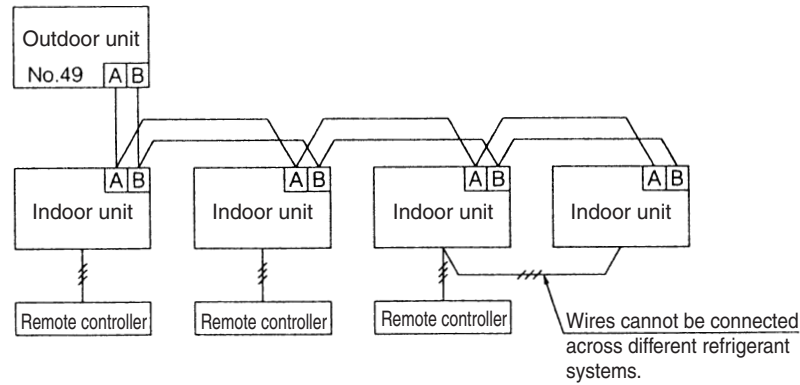
1. Automatic address setting

It is possible when wiring with each outdoor unit.

- a) Set the address switch of the inverter outdoor unit to 49. (The factory setting at shipment is 49.)
- b) Set the address switch of the indoor unit to 49. (The factory setting at shipment is 49.)
- c) Turn on power in the order of the outdoor units and then the indoor units. The address is automatically set. Automatic address setting can be done when power supplies of indoor and outdoor units are both ON. If only power supply of the indoor unit is ON, "Outdoor No." will be displayed in remote controller, then turn on the power supply of outdoor unit, please.
- d) After the power supply is turned on, No. will be set in about one minute.
- e) If the check switch of remote controller is pressed after No. is set, the address of the indoor unit will be displayed. (No. of the outdoor unit is not displayed.)
- f) An automatic address setting can be done even when one remote controller controls several units. However, Wires cannot be connected across different refrigerant systems..
 Note : The address set once is also memorized in the microcomputer though power is turned off. The remote control address setting and the manual address setting are also possible even if wiring in each refrigerant system as a unit.

g) Deletion of the memorized content set in an automatic address setting

Press the "WIND VOL" button while pressing the "CHECK" and "TIMER" buttons on the remote controller to delete the memorized address. Afterwards, if the power supplies of the indoor unit and the outdoor unit are turned OFF, the address will return to the unsetting state. Select the three kinds of method of address setting by combining the address buttons.



2. Remote control address setting

a) The remote control address setting can be done under the following condition.

- ① More outdoor units and indoor units are wired by super-link, and remote controller is individually connected with each one unit.
- ② The outdoor unit address switch is within the range from 0 to 47, and number of indoor unit and the number of outdoor unit of indoor unit address switch both are either 48 or 49 (setting at shipment) until power supplies are turned ON.

b) Method of address setting

- ① Set the address switch for outdoor No. of inverter and the constant speed outdoor unit in a range from 0 to 47. Avoid duplication.
- ② Set the address switch on the PCB of the indoor unit to 49. (This is set to 49 at shipment from factory.)
- ③ Turn ON power supply.
- ④ Enters into the address setting mode after "Please wait for a moment" is displayed in remote controller. The display changes as follows. "Setting of number of outdoor unit ◆" → "Outdoor unit -- ▲" (flashing)
 - * The display of "Please turn on the power supply for indoor unit" flashes when the power supply for outdoor unit is OFF or communicating with the outdoor unit. When communicating with the outdoor unit, the display becomes "Outdoor unit ▲".
- ⑤ Set outdoor No.. Outdoor No. increases with 00~01~02 whenever the indoor temperature setting switch ▲ is pressed. Outdoor No. decreases with 47~46~45 if the indoor temperature setting switch ▼ is pressed. Press the switch till set No. of the outdoor unit.
- ⑥ If setting switch is pressed, the display of outdoor No. changes from flashing to lighting and outdoor No. is set. Moreover, ◆ that shows indoor No. flashes at the same time.
 - * At this time, if the set number of outdoor unit is changed, the reset switch is pressed. "Number of outdoor unit" flashes again, and the address can be changed.
- ⑦ Indoor No. can be set by indoor temperature setting switches ▲ and ▼ as for outdoor No. setting.
- ⑧ The setting of the numbers of outdoor units and indoor units end if set switch is pressed after setting. "Number of outdoor units and number of indoor units" set lights for two seconds, and then it returns to the halt condition.
- ⑨ The address setting is completed.

c) Change in address

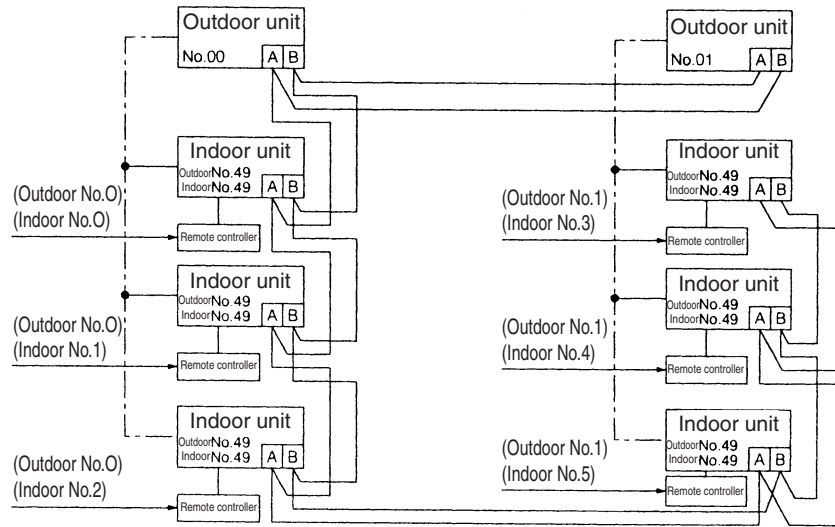
The address set once is memorized in the microcomputer even if power is turned off. If pressing the switch of the number of air-conditioner for more than three seconds, the display will become into "Outdoor unit ◆" (flashing) from "Setting of the number of outdoor unit-- ▲". A new address can be set by a similar operation to the above. The address setting can be done only when the unit stops.

d) If pressing the number of air-conditioner for more than three seconds, the message of "Operation invalid" will be displayed (lighting for three seconds), when the remote control address setting is invalidly set (when it is impossible to combine the remote control address setting for the address setting of the indoor unit and the outdoor unit).

e) The method of deleting the memory of address set by the remote control address can be selected.

Press the "WIND VOL" switch while pressing the "CHECK" and "TIMER" switches on the remote controller. The memory of the address is deleted. Afterwards, if the power supplies of the indoor unit and the outdoor unit are turned OFF, the address will return to the unsetting state. These three kinds of method of address setting can be selected again through changing the combination of dip-switches.

Unit No. shown in the parenthese is the address number set with the remote controller as follows in the diagram stands for refrigerant piping.



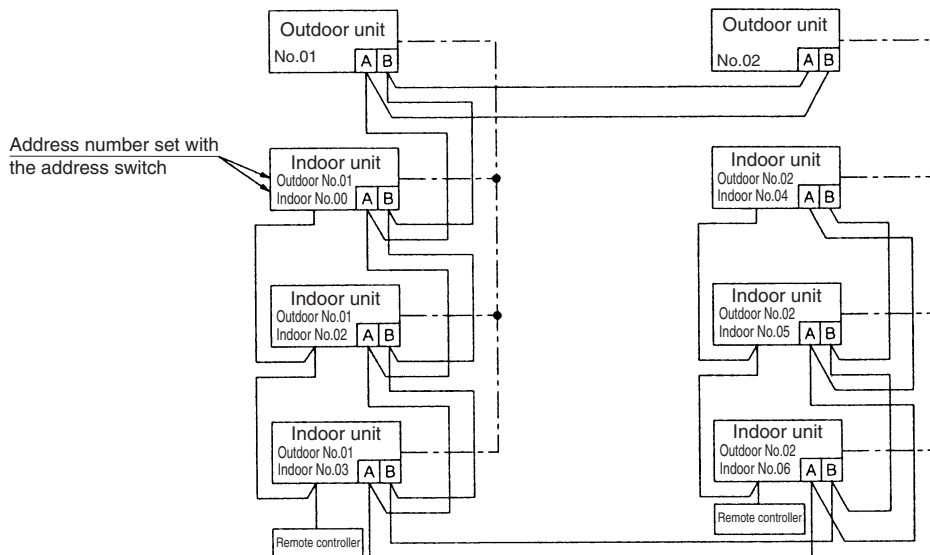
3. Manual address setting

It corresponds to the wiring for all super-links including an automatic address and the remote address setting specification.

Operate the address switches after power supply is turned off. The change of the address switch is not accepted under the energizing state.

- a) Set the address of the outdoor unit with the address switch (green) on the PCB of outdoor unit within a range from 00 to 47 avoiding duplication with another outdoor unit.
- b) Outdoor No. is set with the address switch (green) on the PCB of indoor unit.
- c) Set the number of the indoor unit with the address switch (green) within a range from 00 to 47 avoiding duplication with another outdoor unit among all connecting units.

--- No. shown in refrigerant piping diagram is address number set with the address switch on the printed circuit board.



6.8.2 FDCA224HKXE4 ~ FDCA1360HKXE4

Attention: Please note that the mistake of address setting might cause the breakdown of the compressor enough.

1. Introduction

This control system performs communication control through the microcomputers built in the outdoor unit, indoor unit and remote control unit. Address setting needs to be done for both outdoor and indoor units. Turn on power in the order of the outdoor units and then the indoor units. Use 1 minute as the rule of thumb for an interval between them.

2. Method of address setting

Addresses can be set either with the automatic address setting, remote control address setting or manual address setting by the combinations of address switches of the indoor and outdoor units (refer to the table below). (Operate the address switches before turning power on.) It is recommended that the signal wires are wired separately with respect to each refrigerant system when not doing centralized control.

		Auto address	Manual address	Remote control address
More than one refrigerant system are connected together by signal wires. (For instance, when doing concentrated control.)	Each indoor unit is connected with one remote controller	× (*1)	○	○
	There are some units whose remote controllers are not connected	× (*1)	○	× (*2)
Only single refrigerant system (The signal wire doesn't cover multiple refrigerant system)	Each indoor unit is connected with one remote controller	○	○	○
	There are some units whose remote controllers are not connected	○	○	× (*2)

Notes (1) ○ : OK, × : Not

(2) (*1) Auto address might cause outdoor units address abnormal duplication in more than one system, so the Auto address setting is unavailable.

(*2) The address cannot be set when there are indoor unit with which remote controller is not connected because remote control address decides address No. of the indoor unit with which remote control is connected.

< Notices and requirements >

- ① The address setting method is different depending on how to combine the network. Select it according to the installation situation in field.
- ② When more than one system are controlled centrally, It is recommended that address No. of the indoor each unit is set designed beforehand.
- ③ These three methods cannot be mixed in the same system.
- ④ In general, the signal wire should be wired along the refrigerant pipe.
- ⑤ When more than one refrigerant system are connected by signal wire, if these signal wires are also wired along the refrigerant pipe and the connection between outdoor units is done after the test run of air-conditioners, it will be easy to check wiring mistake in each refrigerant system.
- ⑥ For manual address, if the address No. is decided on the drawing beforehand, and address setting can be executed simultaneously, the work efficiency is good and setting mistake can be prevented.
- ⑦ Loop wiring of signal wires is prohibited.

3. Address setting method and setting of address switches

Address setting method	Outdoor unit (main unit)		Outdoor unit (sub unit) ⁽²⁾		Indoor unit	
	Outdoor No.	SW4-7	Outdoor No.	SW4-7	Outdoor No.	Indoor No.
Auto address	49 (shipment)	OFF (shipment)	49 (shipment)	ON	49 (shipment)	49 (shipment)
Remote control address	00~47	OFF (shipment)	same as the master	ON	49 (shipment)	49 (shipment)
Manual address	00~47	OFF (shipment)	same as the master	ON	00~47	00~47

Notes (1) At the shipment from factory, both the indoor unit and outdoor unit are set at 49 and the setting method is prepared for the automatic address setting.

(2) At the shipment from factory, dip switch (SW4-7) for outdoor main unit and sub unit address setting are set all at OFF. Setting is needed only when using outdoor units in combinational way, and when the outdoor unit is used alone, the setting is not needed.

4. Address setting switches and their location

4.1 Outdoor unit address setting

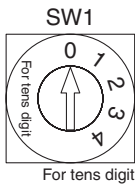
On the control board of the outdoor unit, there are rotary switches (SW1, SW2) for outdoor No. setting and dip switch (SW4) for the master / sub unit setting.

SW1..... Outdoor No. switch (tens digit) [0-4].

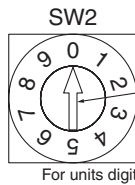
SW2..... Outdoor No. switch (units digit) [0-9].

SW4-7 ... Master/sub unit setting switches.

OFF is for setting as a main unit and ON, a sub unit (The factory setting at shipment is OFF.)



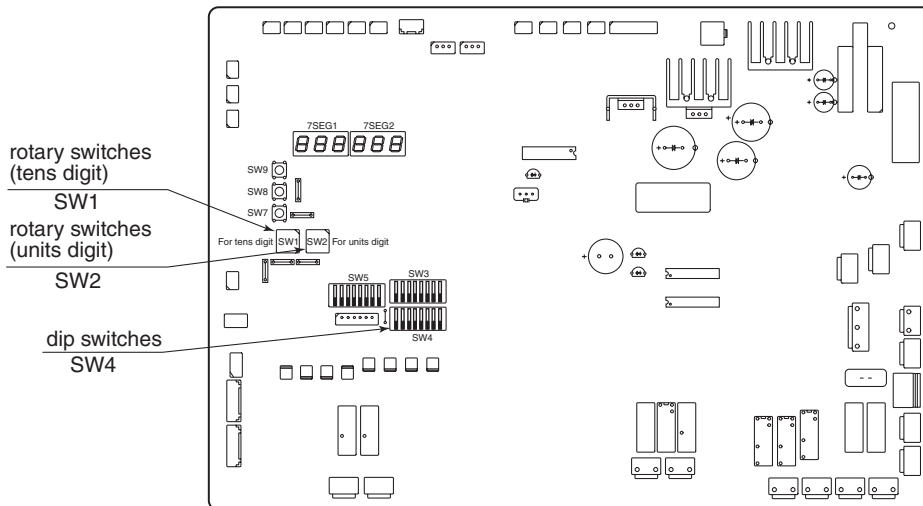
Outdoor unit rotary switches (SW)



By inserting a minus driver (Precision screw driver) into this groove and turn the arrow to point a desired number.



Outdoor unit dip switches (SW)



Parts arrangement diagram of outdoor unit control board

< Address No. setting table >

		units digit									
		0	1	2	3	4	5	6	7	8	9
tens digit	0	00	01	02	03	04	05	06	07	08	09
	1	10	11	12	13	14	15	16	17	18	19
	2	20	21	22	23	24	25	26	27	28	29
	3	30	31	32	33	34	35	36	37	38	39
	4	40	41	42	43	44	45	46	47	48	49

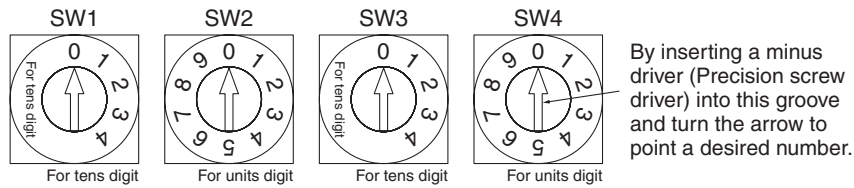
48 and 49(the default setting at shipment from factory) are used for automatic address or the remote control address setting.

4.2 Indoor unit address setting

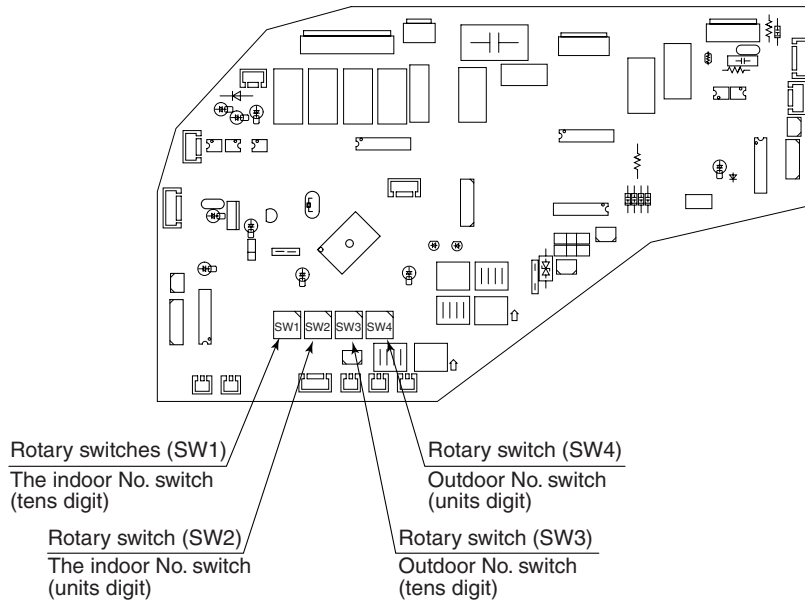
In setting an address of the indoor unit, use rotary switches (SW1,SW2) for indoor No.setting used to communicate with the outdoor unit and rotary switches (SW3,SW4) for outdoor No. setting.

SW1..... Indoor No. switch (tens digit) [0-4]	} Indoor No. is number to identify the indoor unit. Avoid duplication.
SW2..... Indoor No. switch (units digit) [0-9]	

SW3..... Outdoor No. switch (tens digit) [0-4]	} Outdoor No. is number to indicate which outdoor unit is connected with which indoor unit by the refrigerant pipe. Set indoor and the outdoor unit connected by the refrigerant pipe to same number as the outdoor No..
SW4..... Outdoor No. switch (units digit) [0-9]	



Indoor unit rotary SW



Parts arrangement diagram of indoor unit control board
(for FDT.)

5. Automatic address setting

- The automatic address setting is a method by which the address is automatically set by turning on the power like the default setting values of each rotary switch (SW1~4) and dip switch (SW4-7) at the shipment from factory.
- However, only when outdoor units are used in combination by the automatic address setting, it is necessary to set dip switch (SW4-7) for the master/slave setting of the outdoor unit to be used as sub unit to ON.
- Turn on power in the order of the outdoor units and then the indoor units. Use 1 minute as the rule of thumb for an interval between them.

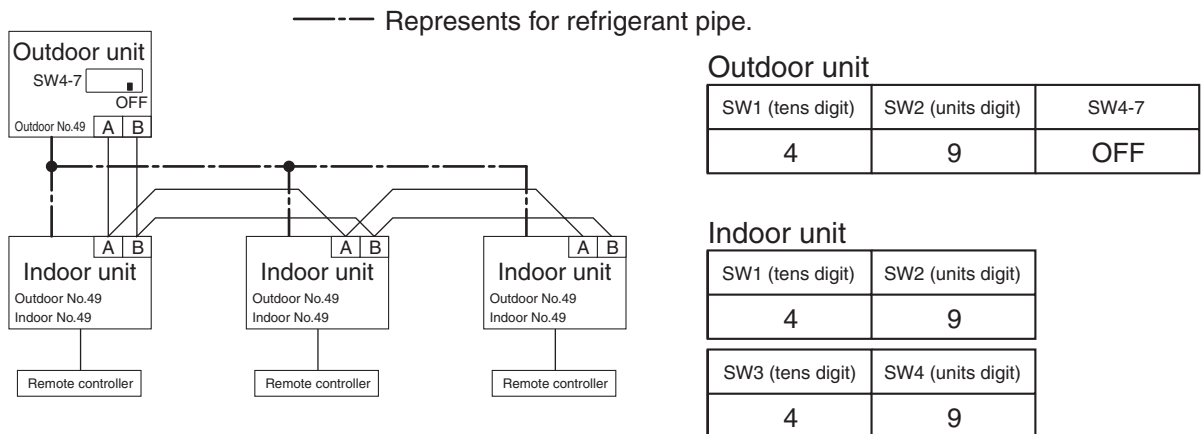
- Notes (1) If making a mistake in the order by which power is turned on, the address might not be recognized. Turn on the power of the indoor unit after making sure LED (green) flashing on the outdoor unit board.
- (2) Turn on all power supplies about the indoor and the outdoor units in the same refrigerant system even when the breaker between the indoor units is different.
- The addresses of outdoor unit and the indoor unit are automatically set and registered to 49 and within the range of 00~47 respectively.

Attentions

- The automatic address setting is available when wiring for the signal wire in each refrigerant system. It is not possible to set it when wiring for the signal wire covering different refrigerant system. Doing automatic address setting in more than one refrigerant system, might cause outdoor unit address abnormal duplication.
- Return to the default setting at the shipment from factory and then start the above-mentioned automatic address setting when the setting has been changed from the default setting at the shipment from factory.

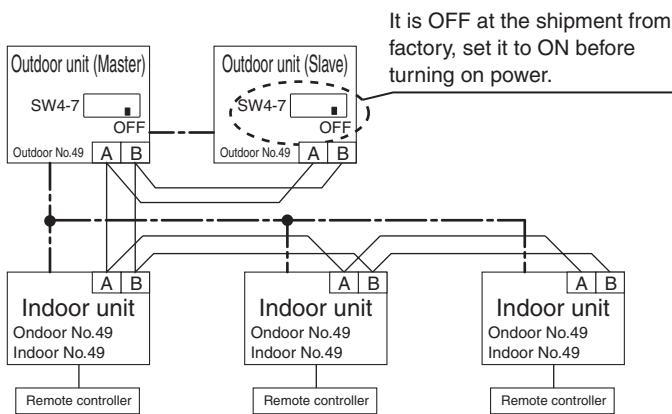
Default setting at the shipment from factory

(1) A single outdoor unit



(2) Combinational outdoor units

--- Represents for refrigerant pipe.



It is OFF at the shipment from factory, set it to ON before turning on power.

It is OFF at the shipment from factory, set it to ON before turning on power.

Outdoor unit

Outdoor unit	SW1 (tens digit)	SW2 (units digit)	SW4-7
Master unit	4	9	OFF
Slave unit	4	9	OFF

Note (1) The network address of a slave unit is registered to the master unit address + 1 depending on the setting of SW4-7.

Indoor unit

SW1 (tens digit)	SW2 (units digit)
4	9
SW3 (tens digit)	SW4 (units digit)
4	9

< method of deleting address >

To delete the address automatically set, the address can be deleted by the operation from remote control.

① With remote controller

Press the **WIND VOL** switch while pressing the **CHECK** and **TIMER** switches on the remote controller.

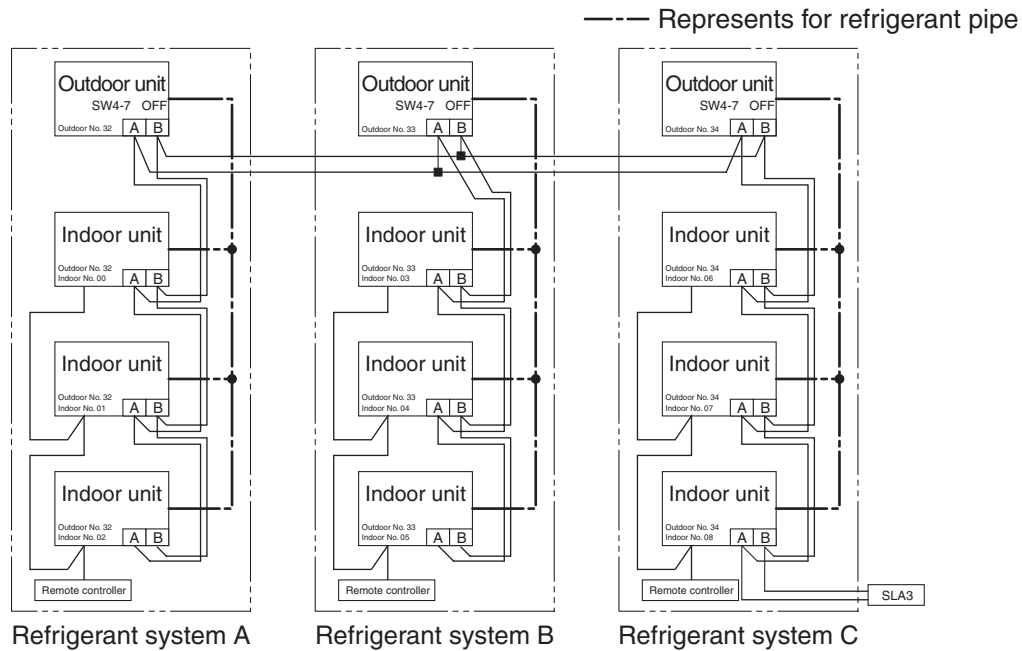
② Without remote controller

- a) Indoor address No. of the indoor unit is manually set in the range of 00 to 47 after the power is turned on.
- b) The power supply of the indoor unit is turned off once and then turned on again after the above-mentioned operation ends. (As the result, the address is deleted.)
- c) Indoor address No. is set to 49 again, then the power supply of the indoor unit is turned off once and turned on again, deleting address operation is completed.

6. Manual address setting

- Manual address setting is a method setting address No. with each rotary switch (SW1~4) and dip switch [SW4-7 (Only for combining outdoor units)] of the indoor and the outdoor unit.
- It is recommended that it is essential to do separately address setting for each individual refrigerant system and prior to address setting address No. of each indoor and outdoor unit should be decided by installation drawing beforehand.

6.1 A single outdoor unit



- Notes (1) Do the wiring of the signal wire along the refrigerant pipe to prevent the faulty wiring across multiple system. It is easy to discover and restore the address setting mistake, if operating check is separately done for each individual system.
- (2) It is recommended that in the view of the loop wiring prevention and work easiness the signal wire wiring of signal wire should be done on the outdoor unit side when extending from more than one system. It is also recommended that the signal wire between systems is connected after the test run, because it is easy to discover and restore the address setting mistake in this way.
- (3) At most two signal wires are allowed to connect with one terminal, and use the close edge connection terminal in case of more than two signal wires. (■mark in figure represents for the close edge connection terminal.)

(1) Outdoor unit address setting

- ① Set the rotary switches (SW1,2) for outdoor unit No. setting to a number within the range of 00 to 47. In setting a number, care must be taken so that no duplicating outdoor unit No. is assigned in the same network.

< Illustration example of above figure >

Refrigerant system	SW1 (tens digit)	SW2 (units digit)	SW4-7	Address on a network
A	3	2	OFF	32
B	3	3	OFF	33
C	3	4	OFF	34

(2) Indoor unit address setting

- ① Set rotary switch (SW1,2) for indoor unit No. setting to a number within the range of 00 to 47. In setting a number, care must be taken so that no duplicating indoor unit No. is assigned in the same network.
- ② Set the rotary switches for outdoor unit number setting to the corresponding outdoor unit's address number.

(3) Turning on power

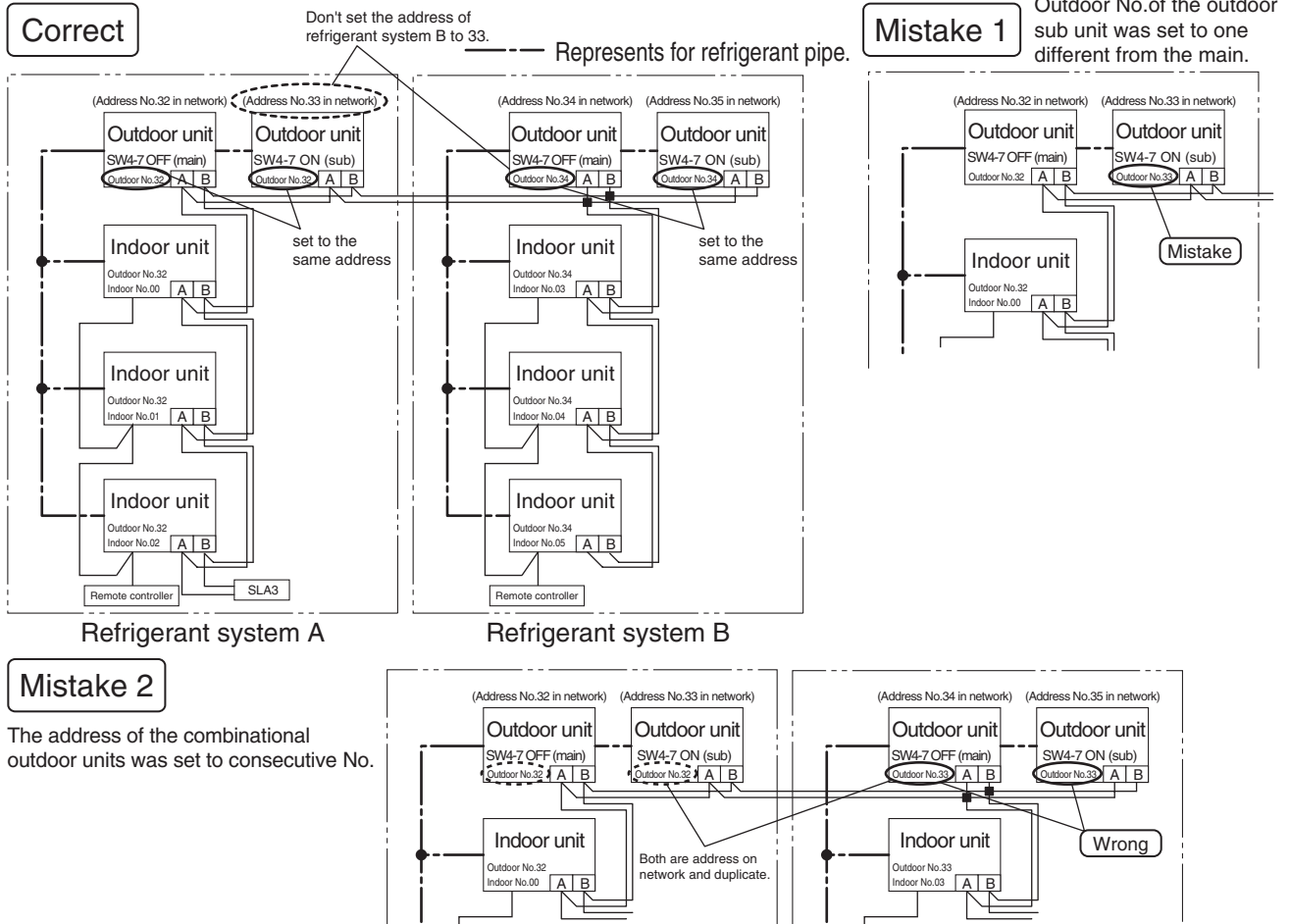
Turn on power in the order of the outdoor units and then the indoor units. Use over 1 minute as the rule of thumb for an interval between them.

Note (1) Turn on the power of the indoor unit after making sure LED (green) flashing on the outdoor unit board when the address cannot be recognized (even if the indoor unit is operated there is communication abnormality).

Attention

- Even when more than one indoor unit are controlled by one remote controller, care must be taken so that no duplicating indoor unit number is assigned within the group of units.
- Dip switch (SW4-7) for the master/sub unit setting of the outdoor unit must be set to OFF (default setting at the shipment from factory).

6.2 Combinational outdoor units



- Notes (1) Do the wiring of the signal wire along the refrigerant pipe to prevent the faulty wiring across the system. It is easy to discover and restore the address setting mistake, if operating check is separately done for each individual system.
- (2) It is recommended that in the view of the loop wiring prevention and work easiness the signal wire wiring of signal wire should be done on the outdoor unit side when extending from more than one system. It is also recommended that the signal wire between systems is connected after the test run, because it is easy to discover and restore the address setting mistake in this way.
- (3) At most two signal wires are allowed to connect with one terminal, and use the close edge connection terminal in case of more than two signal wires. (■mark in figure represents for the close edge connection terminal.)

(1) Outdoor unit address setting

- ① Set dip switches (SW4-7) for master/slave setting to OFF as a main unit and ON as a sub unit. The default setting at shipment from factory is OFF.
- ② Set rotary switches (SW1,2) for outdoor No. setting of the master and sub unit in a same refrigerant system to same number within the range of 00 to 47. In the case of more than one refrigerant system, it is desirable not to set consecutive number and make all an even number. [Setting consecutive number might cause error. Refer to attention (1).]

Note (1) Which one of outdoor units can be set as master or sub unit.

< Illustration example of above figure >

Refrigerant system	Outdoor unit	SW1	SW2	SW4-7	Address on a network
A	Main unit	3	2	OFF	32
	Sub unit	3	2	ON	33
B	Main unit	3	4	OFF	34
	Sub unit	3	4	ON	35

Attention(1)

- The network address of a sub unit is the rotary switch settings +1.
- In the case of more than one refrigerant system, if consecutive addresses are set, an address on the network of a sub unit in a refrigerant systems will duplicate with an address in another refrigerant system.. (Refer to the example about mistake-2 in above figure.)
- Assign the setting of the address of combinational outdoor units to a different even number to avoid such a trouble. The trouble can be avoided. In addition, the odd number setting is also possible. (When the address of the main unit is set as 47, the address of sub unit will become 00.)

(2)Indoor unit address setting

- ① Set rotary switches (SW1, 2) for indoor No. to a number within the range of 00 to 47. In setting a number, care must be taken so that no duplicating indoor unit number is assigned in the same network.
- ② Set the rotary switches (SW3, 4) for outdoor unit No. setting to the corresponding outdoor unit's address No..

(3)Turning on power

Turn on power in the order of the outdoor units and then the indoor units. Use over 1 minute as the rule of thumb for an interval between them.

Note (1) Turn on the power of the indoor unit after making sure LED (green) flashing on the outdoor unit board when the address cannot be recognized (even if the indoor unit is operated there is communication abnormality).

Attention(2)

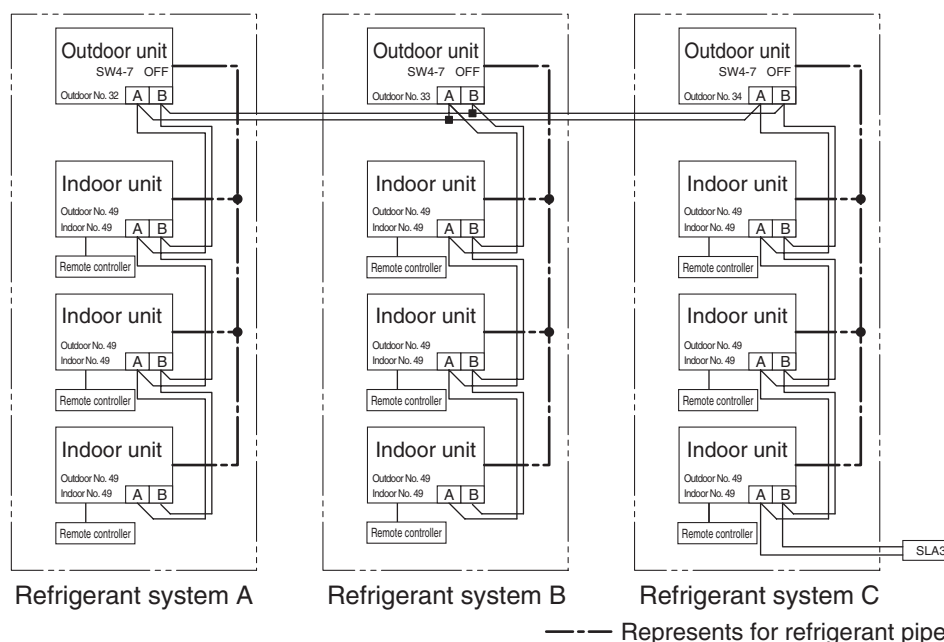
- Even when more than one indoor unit are be controlled by one remote controller, care must be taken so that no duplicating indoor unit number is assigned within the group of units.
- When the outdoor units are used in combination, set the rotary switches (SW1, 2) for outdoor sub unit No. setting to the corresponding master outdoor unit's address No..

< method of deleting address >

The address of a unit can be changed, if setting the rotary switch of this unit again and resetting the power. However, care must be taken so that no duplicating indoor unit number is assigned.

7. Remote control address setting

- Remote control address setting is a method of the address setting by remote controller. However, the address setting by the remote controller is available only when an indoor unit and a remote controller are connected in a one-to-one configuration.
- The remote control address setting cannot be done when one remote controller is connected with more than one indoor unit. In this case, to do remote control address setting, you can select: connect an indoor unit and a remote controller in a one-to-one configuration, or equipping an indoor unit with a remote controller only when the remote control address setting is done.



- Notes (1) Do the wiring of the signal wire along the refrigerant pipe to prevent the faulty wiring across the system. It is easy to discover and restore the address setting mistake, if operating check is separately done for each individual system.
- (2) It is recommended that in the view of the loop wiring prevention and work easiness the signal wire wiring of signal wire should be done on the outdoor unit side when extending from more than one system. It is also recommended that the signal wire between systems is connected after the test run, because it is easy to discover and restore the address setting mistake in this way.
- (3) At most two signal wires are allowed to connect with one terminal, and use the close edge connection terminal in case of more than two signal wires. (■mark in figure represents for the close edge connection terminal.)

7.1 A single outdoor unit

(1)Outdoor unit address setting

- ① Set the rotary switches (SW1,2) for outdoor unit No. setting to a number within the range of 00 to 47 separately for each individual refrigerant system. In setting a number, care must be taken so that no duplicating outdoor unit No. is assigned in the same network.

<Illustration example for above figure>

Refrigerant system	SW1 (tens digit)	SW2 (units digit)	SW4-7	Address on a network
A	3	2	OFF	32
B	3	3	OFF	33
C	3	4	OFF	34

(2)Indoor unit address setting

- ② Set rotary switch (SW1,2) for indoor unit No. setting to 49 that is the default setting at shipment from factory.
- ③ Set the rotary switches (SW3,4) for outdoor unit No. setting to 49 that is the default setting at shipment from factory.

SW1 (Tens digit)	SW2 (Units digit)
4	9

SW3 (Tens digit)	SW4 (Units digit)
4	9

(3)Turning on power

- ① Turn on power in the order of the outdoor units and then the indoor units. Use over 1 minute as the rule of thumb for an interval between them.

Notes (1) "Please wait for a while" will be displayed on the dot part of the screen of the remote controller when turning on the power for the indoor unit. Then a temporary address is assigned, and it is available for indoor unit to communicate with remote controller.

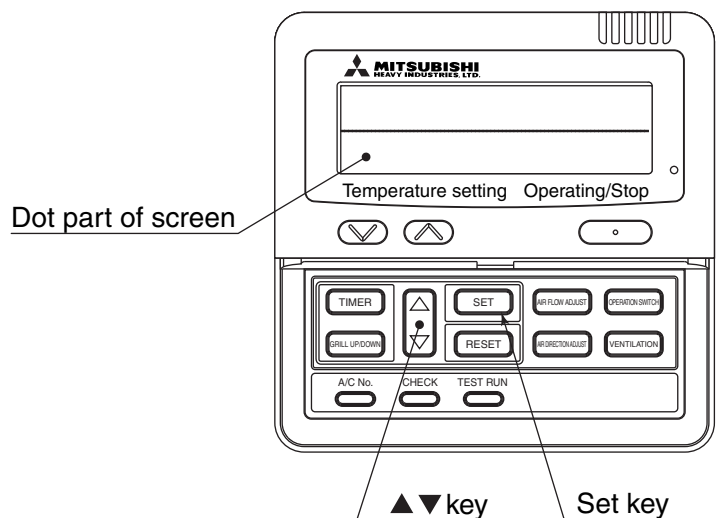
- (2) "Please turn on the power for outdoor unit" will be displayed on the dot part of the screen of the remote controller if there is no power for the outdoor unit.

(4)Setting of the indoor unit by remote controller

- ① "Outdoor No. setting" will be displayed on the dot part of the screen of the remote controller. Next, press the ▲ ▼ key of remote controller, and set outdoor No.. Press the "SET" key of remote controller when the setting ends.

Note (1) Outdoor address No. of each refrigerant system set according to the table of 7.1 (1) ① is displayed in outdoor No..

- ② Next, move to the indoor No. setting. press the ▲ ▼ key of remote controller as well as the outdoor unit and set indoor No.. Press the "SET" key of remote controller when the setting ends. Normal display status is returned to after

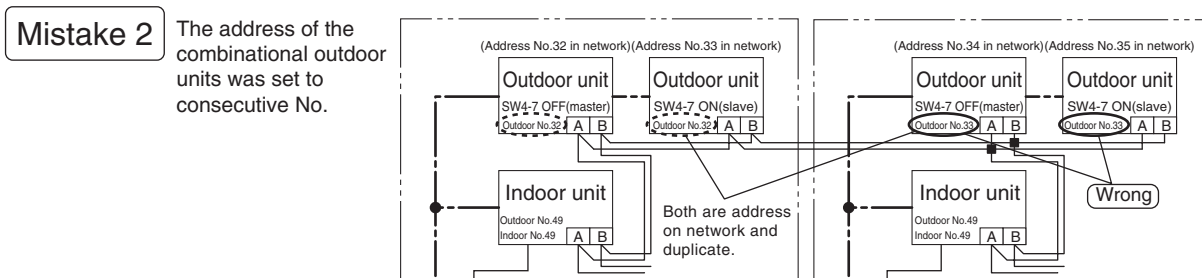
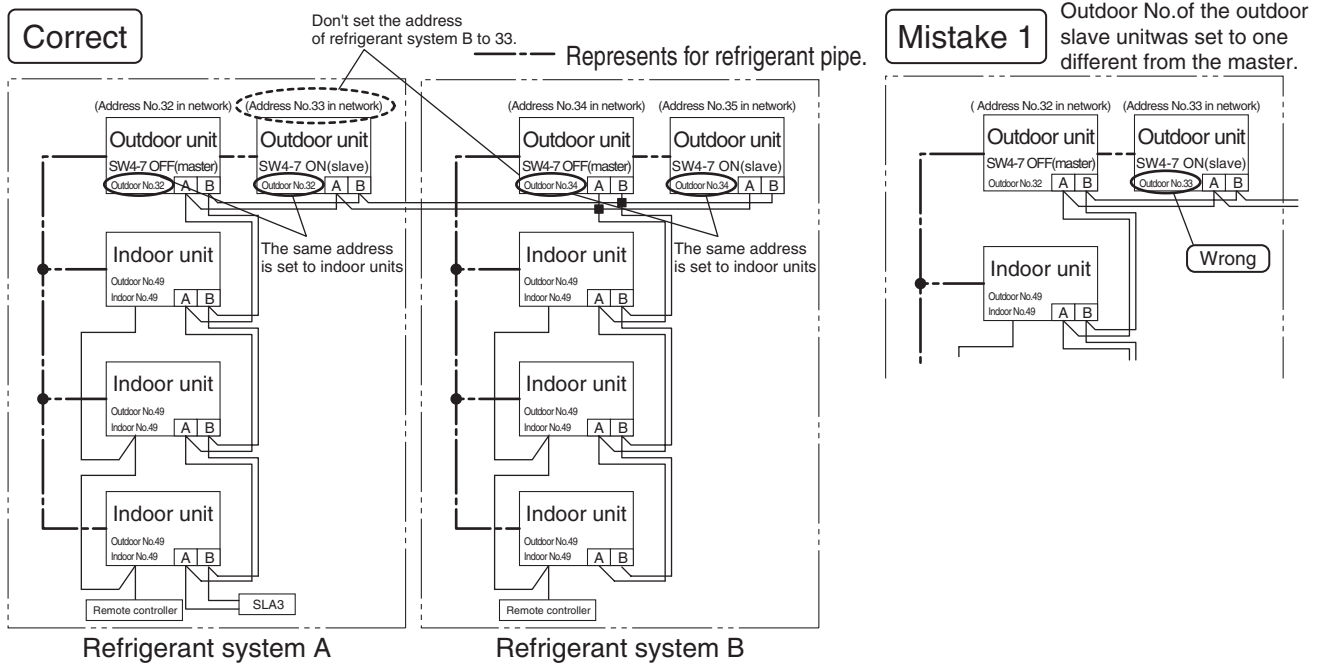


the final content is highlighted on the dot part of the screen of remote controller for about two seconds.

Note (1) Set the indoor No. a number within the range of 00 to 47. In setting a number, care must be taken so that no duplicating outdoor unit No. is assigned in the same network.

- Notes (1) The indoor unit cannot be operated if the setting is done in the order of ① next ②.
 (2) When two remote controller are connected to an indoor unit, it is allowed to set from the master remote controller only.
 (3) Press the "air conditioner No." key of remote controller for over three seconds when you want to correct address No. after address No. has been set. Then set address No. again in the order ① next ②.

7.2 Combinational outdoor units



- Notes (1) Do the wiring of the signal wire along the refrigerant pipe to prevent the faulty wiring across the system. It is easy to discover and restore the address setting mistake, if operating check is separately done for each individual system.
 (2) It is recommended that in the view of the loop wiring prevention and work easiness the signal wire wiring of signal wire should be done on the outdoor unit side when extending from more than one system. It is also recommended that the signal wire between systems is connected after the test run, because it is easy to discover and restore the address setting mistake in this way.
 (3) At most two signal wires are allowed to connect with one terminal, and use the close edge connection terminal in case of more than two signal wires. (■mark in figure represents for the close edge connection terminal.)

(1) Outdoor unit address setting

- ① Set dip switches (SW4-7) for master/slave setting to OFF as a main unit and ON as a sub unit. The default setting at shipment from factory is OFF.
- ② Set rotary switches (SW1,2) for outdoor No. setting of the master and sub unit in a same refrigerant system to same number within the range of 00 to 47. In the case of more than one refrigerant system, it is desirable not to set consecutive number and make all an even number. [Setting consecutive number might cause error. Refer to Attention.]

Note (1) Which one of outdoor units can be set as master or sub unit.

< Illustration example of figure in above page >

Refrigerant system	Outdoor unit	SW1	SW2	SW4-7	Address on a network
A	Main unit	3	2	OFF	32
	Sub unit	3	2	ON	33
B	Main unit	3	4	OFF	34
	Sub unit	3	4	ON	35

Attention:

- The network address of a sub unit is the rotary switch settings +1.
- In the case of more than one refrigerant system, if consecutive addresses are set, an address on the network of a sub unit in a refrigerant systems will duplicate with an address in another refrigerant system.. (Refer to the example about mistake-2 in above figure.)
- Assign the setting of the address of combinational outdoor units to a different even number to avoid such a trouble. The trouble can be avoided. In addition, the odd number setting is also possible. (When the address of the main unit is set as 47, the address of sub unit will become 00.)
- Set rotary switch (SW1,2) for outdoor No. of the outdoor sub unit to same address No as outdoor No. of the corresponding main unit for the combinational outdoor units.

(2) Indoor unit address setting

- ① Set rotary switch (SW1,2) for indoor unit No. setting to 49 that is the default setting at shipment from factory.
- ② Set the rotary switches (SW3,4) for outdoor unit No. setting to 49 that is the default setting at shipment from factory.

SW1 (Tens digit)	SW2 (Units digit)
4	9

SW3 (Tens digit)	SW4 (Units digit)
4	9

(3) Turning on power

Turn on power in the order of the outdoor units and then the indoor units. Use over 1 minute as the rule of thumb for an interval between them.

Notes (1) "Please wait for a while" will be displayed on the dot part of the screen of the remote controller when turning on the power for the indoor unit. Then a temporary address is assigned, and it is available for indoor unit to communicate with remote controller.

(2) "Please turn on the power for outdoor unit" will be displayed on the dot part of the screen of the remote controller if there is no power for the outdoor unit.

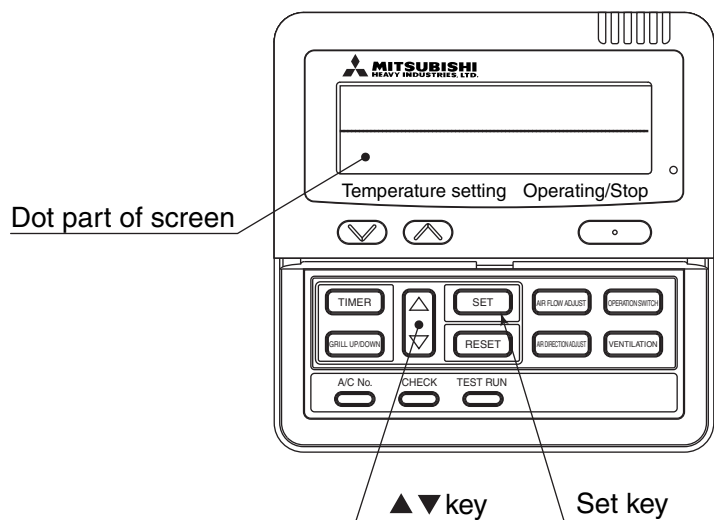
(4) Setting of the indoor unit by remote controller

- ① "Outdoor No. setting" will be displayed on the dot part of the screen of the remote controller. Next, press the ▲ ▼ key of remote controller, and set outdoor No.. Press the "SET" key of remote controller when the setting ends.

Note (1) Outdoor address No. (main unit) of each refrigerant system set according to the table of 7.1 (1) ② is displayed in outdoor No..

- ② Next, move to the indoor No. setting. press the ▲ ▼ key of remote controller as well as the outdoor unit and set indoor No.. Press the "SET" key of remote controller when the setting ends. Normal display status is returned to after the final content is highlighted on the dot part of the screen of remote controller for about two seconds.

Note (1) Set the indoor No. a number within the range of 00 to 47. In setting a number, care must be taken so



that no duplicating outdoor unit No. is assigned in the same network.

- Notes (1) The indoor unit cannot be operated if the setting is done in the order of ① next ②.
- (2) When two remote controller are connected to an indoor unit, it is allowed to set from the master remote controller only.
- (3) Press the "air conditioner No." key of remote controller for over three seconds when you want to correct address No. after address No. has been set. Then set address No. again in the order ① next ②.

< method of deleting address >

To delete the set address, the address can be deleted by the operation from remote controller.

Operation method

Press the **WIND VOL** key while pressing the **CHECK** and **TIMER** keys on the remote controller.

Attention:

- Turn on the power to the centralized control equipment after over two minutes when addresses are set. If power is turned on in the wrong order, a failure to recognize addresses may occur.
- Turn on the power to the centralized control equipment again after making sure that all the indoor and the outdoor units are operated normally, when failing to recognize the address (The indoor units have not been displayed in the centralized control equipment). It might take about five minutes until all the indoor units are displayed when there are a lot of air conditioners controlled by the centralized control equipment.

6.9 Notice on Design and Wiring of Electric Equipment

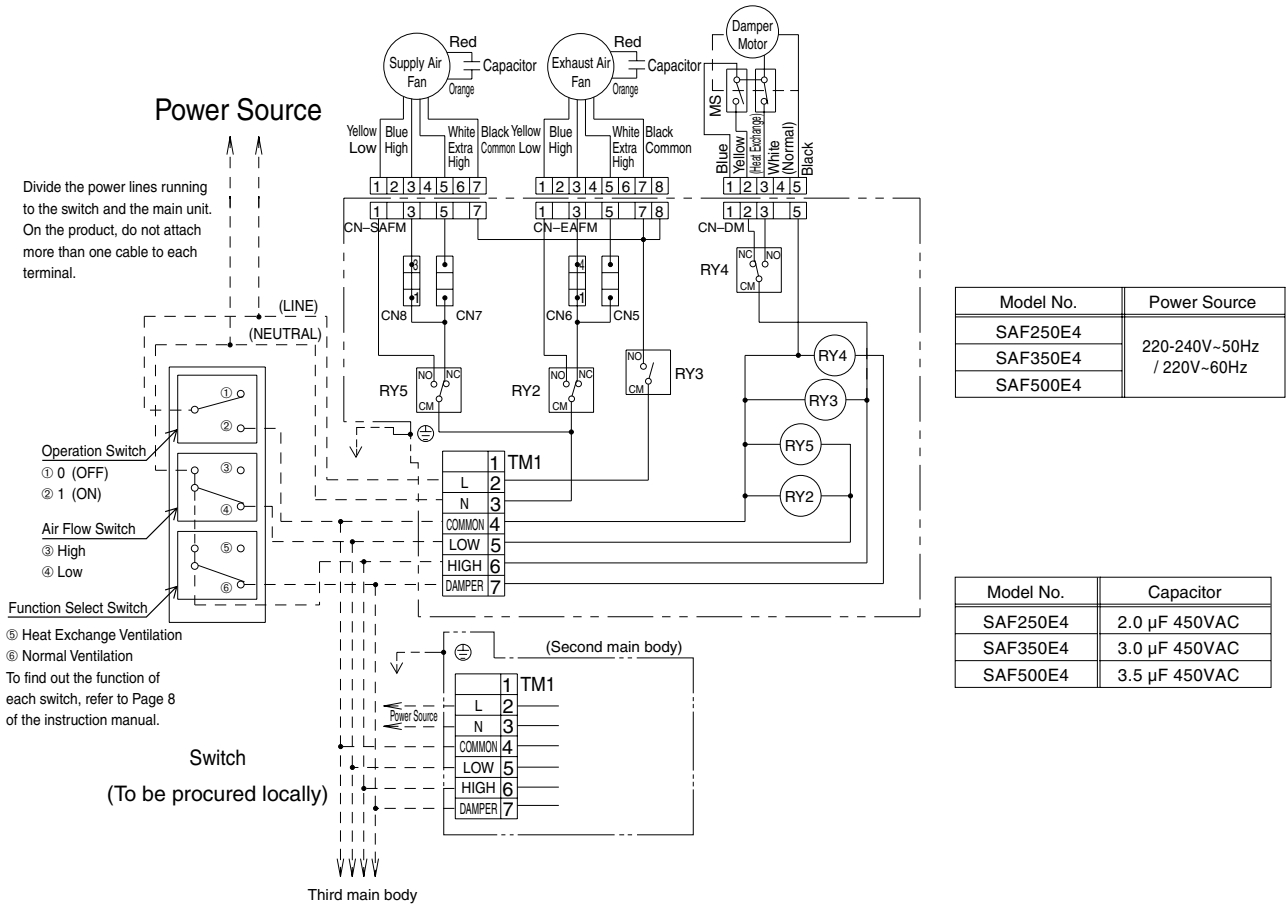
No.	Classification	Items to be Checked	Standard	Reference Page	Remarks	
1	Outdoor	Electric Equipment	Are different power sources used for the indoor and outdoor units?	■ Different power sources should be used.	P.354	<ul style="list-style-type: none"> ■ The capacity of the terminal block of the inverter unit is only enough for the inverter unit and does not have any spare capacity. ■ Obtaining power source for the constant speed unit from the main unit → fire accidents might be caused due to insufficient capacity. ■ Electric shock may arise. ■ If the circuit breakers do not match the inverter type, misoperation of the circuit breaker may occur.
2			Are different power sources used for the inverter unit and each constant speed unit in the combination KX4?	■ Different power sources should be used for different units.		
3			Is the current leakage breaker firmly set up?	■ Separate setting is required.		
4			Does the current leakage breaker of the outdoor unit (the unit carrying the inverter compressor) match the inverter type?	■ Circuit breakers corresponding to the inverter type must be used.		
5	Outdoor	Power Source	Are different power sources used for the indoor and outdoor units?	■ Different power sources should be used.	P.354	<ul style="list-style-type: none"> ■ The current capacity of the terminal block of each group is only enough for itself. ■ Leading power from the inverter unit to the constant speed unit → high likelihood of fire accident.
6			Are different power sources used for the inverter unit and each constant speed unit in the combination KX4?	■ The power source must not be connected from the inverter unit to the constant speed unit (the wiring size is required to be less than 22mm ²).		
7			Is the voltage of the power source within the specified limit?	<ul style="list-style-type: none"> ■ Imbalance among phases in operation: within ± 10% ■ Voltage drop at the compressor start-up: within -15% ■ Imbalance among phases: within ± 3% 		
8			Do the specifications of the wiring and circuit breaker comply with laws and regulations of relevant country?			
9			Is the current leakage breaker firmly set up?	■ Current leakage breakers should be properly set up for each unit.		
10	Indoor / Outdoor	Signal Wire	Does the inside / outside signal wire have loop wiring?	■ Loop wiring is not permitted.	P.356	■ Loop wiring → E5 and E2 may happen now and again.
11			Are the signal wire and the power cord crossed?	■ The type of wire must be changed.	P.357	■ Making judgement in accordance with the resistance value between Terminal A and B (If the resistance is below 80Ω, it means there exists crossed wires → the base plate will possibly be burnt and damaged.)
12			Are the inside/outside signal wire and the shared line crossed?	■ The type of wire must be changed.	-	
13			Is the signal wire of the correct type and size?	<ul style="list-style-type: none"> ■ Size: 0.75 ~ 2.0mm² ■ Type: VCTF, VCT, CVV, MVVS 	P.355	
14	System	Address	Are proper address numbers determined?	■ Has reasonable determination be made (similarity between the operation time belts) after giving consideration to the combination of indoor unit / outdoor unit, purpose of the room, time of use and sorting of occupants?	P.358	
15			Are the address numbers of the indoor/outdoor units clearly indicated on the equipment diagram (indoor unit configuration diagram, etc.)?		-	<ul style="list-style-type: none"> ■ Incomplete instructions except those on the drawings. ■ Crossed wires → the base plate of the air-conditioner is burnt and damaged.
16			Have the drawings been submitted to the address setting operator, and setting instruction been given?	<ul style="list-style-type: none"> ■ Instructions must be made via the drawings instead of verbal indication. ■ Standards for selection of address setting methods <ol style="list-style-type: none"> 1. Signal wire, individual: automatic address or manual address 2. Signal wire, super link, manual address 	-	Incorrect address setting may lead to the following serious accidents: <ol style="list-style-type: none"> 1. Poor cooling / heating effect 2. Water leakage, anomalous stop (abnormal high pressure, anomalous discharge temperature, etc.) 3. Compressor failures, etc.
17			Has any confirmation been made on whether there is any crossing of the signal wire and the power cord?	<ul style="list-style-type: none"> ■ The resistance should be measured at the terminal block (A, B) of the signal wire and the measured value should be close to the one calculated with the following formula. <p>Appropriate resistance value (Ω) = 9100 / number of connected units</p> <p>If the actually measured resistance is below 80Ω, there definitely exist some crossed wires.</p>	P.357	■ Crossed wires → base plate of the air-conditioner is burnt and damaged.

6.10 Electric Works for Air-to-air Heat Exchange Units

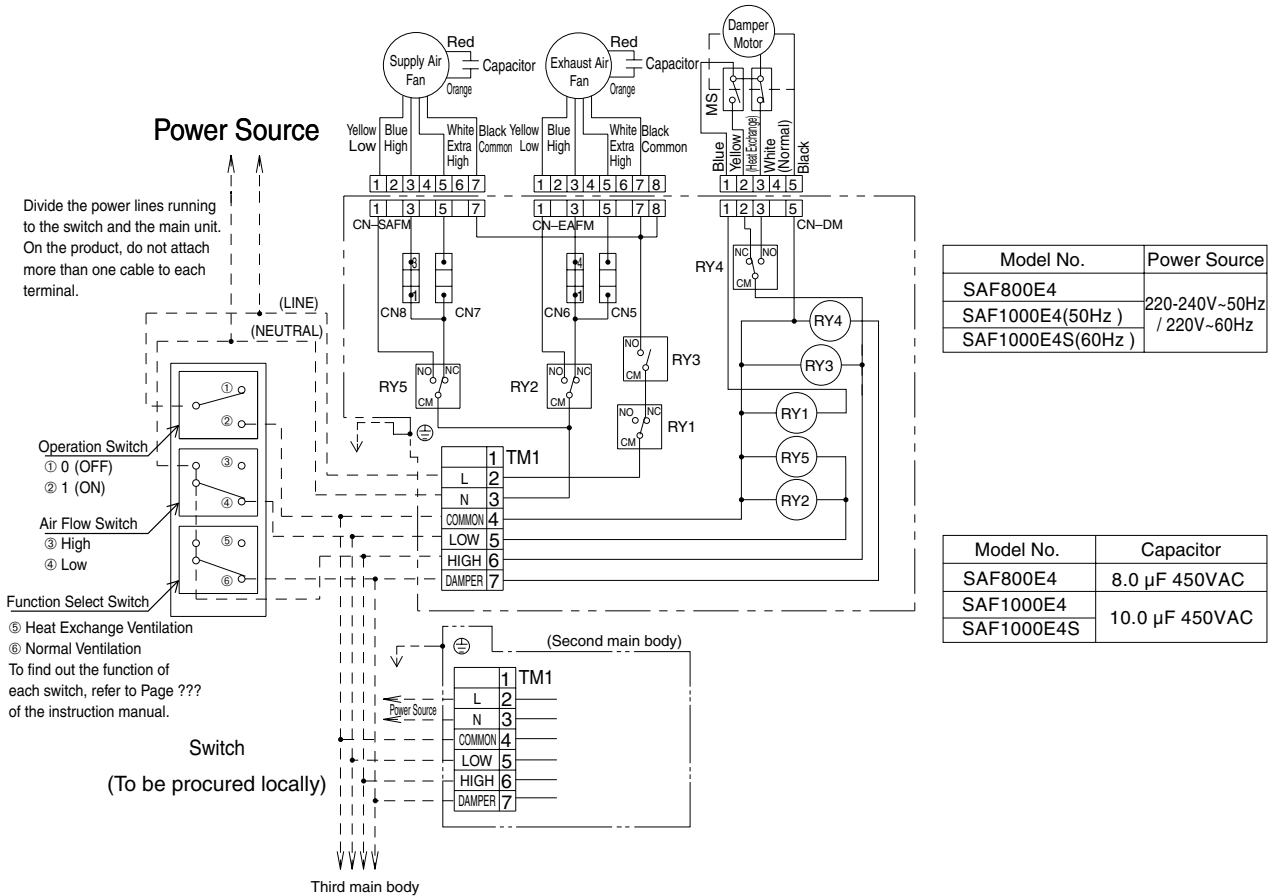
Have a specialized working contractor perform wiring in accordance with the laws and regulations of the country concerned.

1. Connect the wires shown by the broken lines.
2. We recommend that you use a switch having more than 3mm distance to break contact and more than 15A rated current.

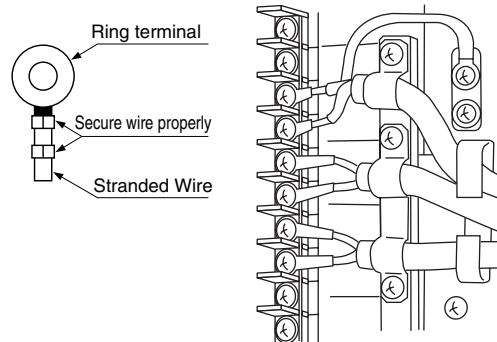
SAF250E4, SAF350E4, SAF500E4



SAF800E4, SAF1000E4

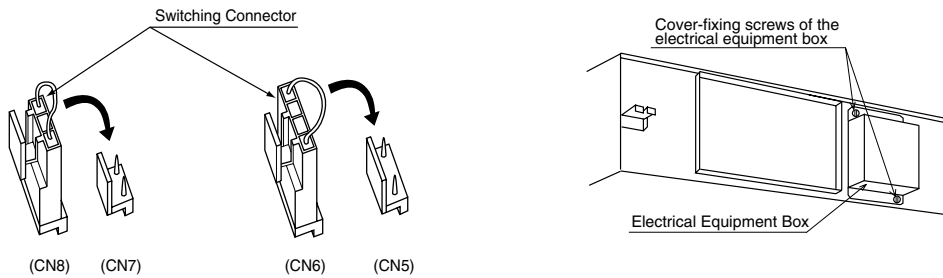


- Use two-core polyvinyl chloride insulated and sheathed cables for fixed wiring that have a cross-sectional conductive area of 2.5mm² and conforms to the IEC 60227-4 standard. When using stranded wire, attach a ring terminal securely at two points as shown right. (Carry out the work based on the laws, regulations and technical standards of the country concerned.)



- Follow the following steps for wiring.
 - Unfasten two cover-fixing screws of the electrical equipment box, open the box cover, and then connect wiring firmly.
 - Fit the cables from the terminal firmly with a cord clamber.

5. When you need much airflow or a duct is long, change the wire connection from High to Extra High.
 - ① Unfasten two cover-fixing screws of the electrical equipment box and open the box cover.
 - ② Change CN6 to CN5 and CN8 to CN7 inside the electrical Equipment box.
6. It is possible to operate up to 10 units by from one switch set.



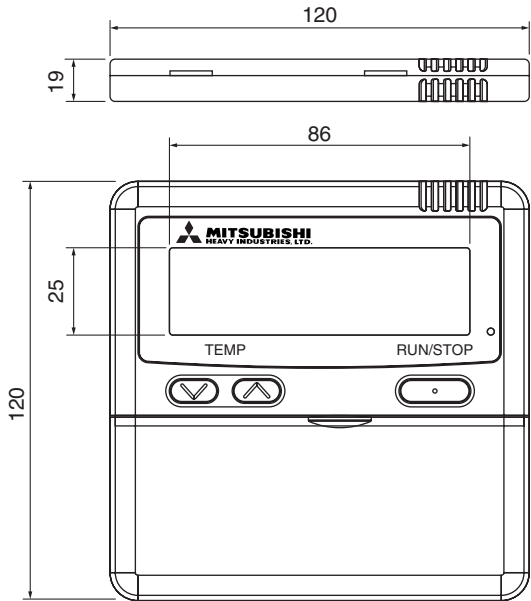
- Caution**
- (1) Use the power source corresponding to the name plate. Using a different power source may cause the motor to burn out.
 - (2) Carry out grounding work according to the laws and regulations of the country concerned and the technical standard.
 - (3) After completion of wiring, check again there are no wrong wirings before power ON.
 - (4) After completion of wiring, power ON and perform a pilot run according to the following steps for checking the airflow condition and a damper operation.
 - (5) Check the opening and closing of a damper by opening the inspection cover of the side of the unit. Model No. SAF800E4, SAF1000E4 and SAF1000E4S, two Fan Motors are stopped during an operation of the damper.

	Each switch setting		Checking items	
	Function Select Switch	Air Flow Switch	Airflow condition	Damper
1	Heat Exchange	High (Extra High)	Check if the air from inside supply opening and the one from room intake opening are set to High (Extra High) and to Low, respectively	Open (A Damper is beyond)
		Low		
2	Normal Ventilation	High (Extra High)		Close (A Damper is near)
		Low		

Note(1) In case that any abnormality occurs in a pilot running, its conceivable cause would be a wrong wiring.
 Don't forget to switch the exclusive breaker to OFF before correcting the wiring. Otherwise, it is likely to cause an electric shock.

7. Installation of Remote Controller (Optional Parts)

7.1 Remote Controller (Optional Parts)



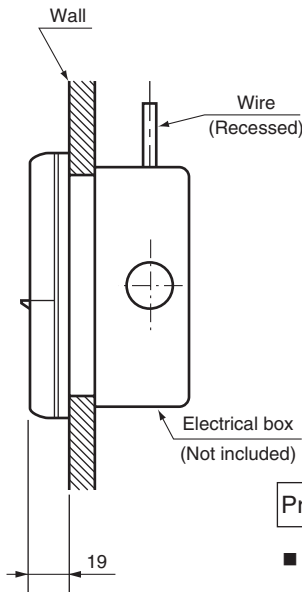
● Remote controller product number

Applicable model	MHI Product number
FD All models of series	RC-E1

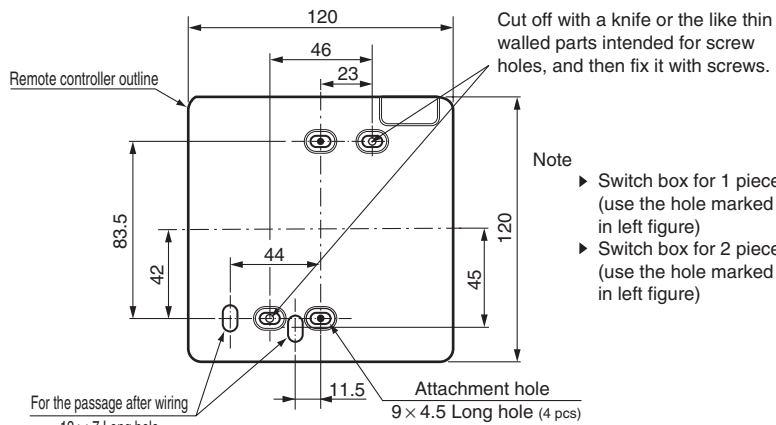
■ Remote control cable (optional)

Applicable model	MRE Product number	Length (m)	Remarks
FD All models of series	HP17845	10	Core number of cable : 3 (0.3mm ²)
	HP17851	30	
	HP17867	50	Shielded wire

Recessed fitting



Remote controller mounting dimensions

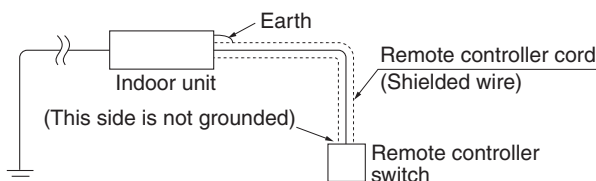


- Note
- ▶ Switch box for 1 piece (use the hole marked ● shown in left figure)
 - ▶ Switch box for 2 pieces (use the hole marked ○ shown in left figure)

Precision in Extending the Remote controller cord

- Maximum total extension 600m. The cord should be a shielded wire.
 - For all types : 0.3mm² × 3 cores
- Note (1) Use cables up to 0.5mm² (maximum) for those laid inside the remote controller unit casing and connect to a different size cable at a vicinity point outside the remote controller unit, if necessary.
- | | |
|----------------------|--------------------------------|
| Within 100-200m..... | 0.5 mm ² × 3 cores |
| Within 300m..... | 0.75 mm ² × 3 cores |
| Within 400m..... | 1.25 mm ² × 3 cores |
| Within 600m..... | 2.0 mm ² × 3 cores |

- The shielded wire should be grounded at one side only.



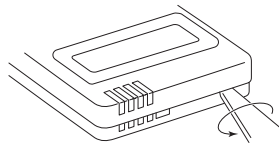
7.2 Installation of Remote Controller (Optional Parts)

1. Selection of installation location

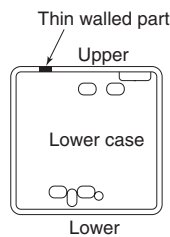
Avoid the following locations

 - a) Direct sunlight.
 - b) Close to heating device.
 - c) Highly humid or water splashing area.
 - d) Uneven surface.
2. Installation procedure
 - a) Exposed fitting
 - ① Open the remote controller case.

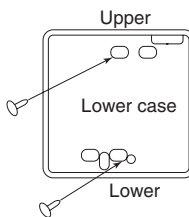
Put a screw driver (flat-head) into the concavity made on the upper part of a remote controller unit and twist it lightly to open the casing.



- ② The cord of a remote controller unit can only be pulled out in the upward direction. Cut off with nippers or a knife a thin walled part made on the upper end of the remote controller unit's bottom casing, and then remove burrs with a file or the like.



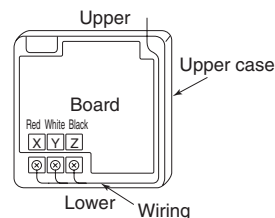
- ③ Fix the remote controller unit's bottom casing onto a wall with two wood screws supplied as accessories.



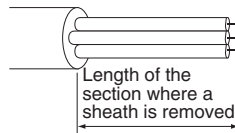
- ④ Connect the remote controller to the terminal block. Connect the terminals of the remote controller to the indoor unit with the same numbers. Because the terminal block has polarity, the device becomes inoperative if there are wrong connections.

Use a cord of 0.3mm² (recommended) - 0.5mm² (maximum) for a remote controller unit cord. Remove a sheathe of the remote control unit cord for the section laid within the remote controller unit casing.

Terminals : (X)Red wire, (Y)White wire, (Z)Black wire



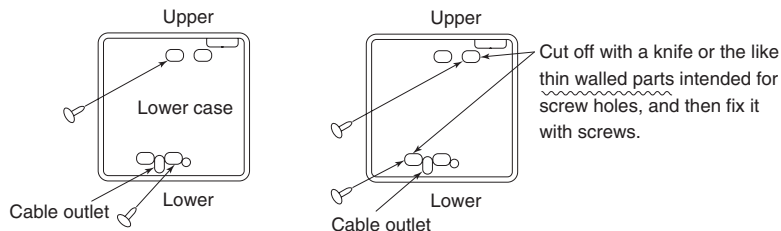
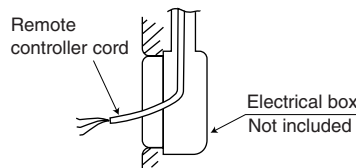
The length of each wire that should be left after a sheath is removed is as follows:
 Black: 195mm, White: 205mm, Red: 5125mm



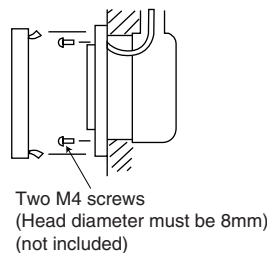
- ⑤ Replace the top casing as before.
- ⑥ Use a cord clamp to attach the remote controller cord to the wall.
- ⑦ Set the functions according to the types of indoor unit. See Section "Function Setting".

b) Recessed fitting

- ① The Electrical box and remote controller (shield wire must be use in case of extension) are first embedded.



- ② Remove the upper case to the remote controller.
- ③ Attach the lower case to the Electrical box with two M4 screws. (Head diameter must be 8 mm). Choose either of the following two positions in fixing it with screws.
- ④ Connect the remote cord to the remote controller. Refer to [Exposed Fitting].
- ⑤ Installation work is completed by replacing the top casing onto the bottom casing as before.

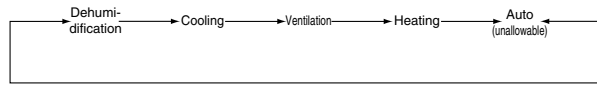


- ⑥ Set the fuction switch according to the type of the indoor unit. Refer to [Function setting].

- Notes
- (1) When removing the remote controller for guarding against theft, be sure to mark so that wiring of XYZ is not mistaken.
 - (2) Do not place the remote controller wire in a naked condition, or short circuit may damage the PCB.
 - (3) Before turning on the power, confirm that the removed remote controller is securely connected.

7.3 Setting Functions Using the Remote Controller

1. Switching order of remote controller for operation mode



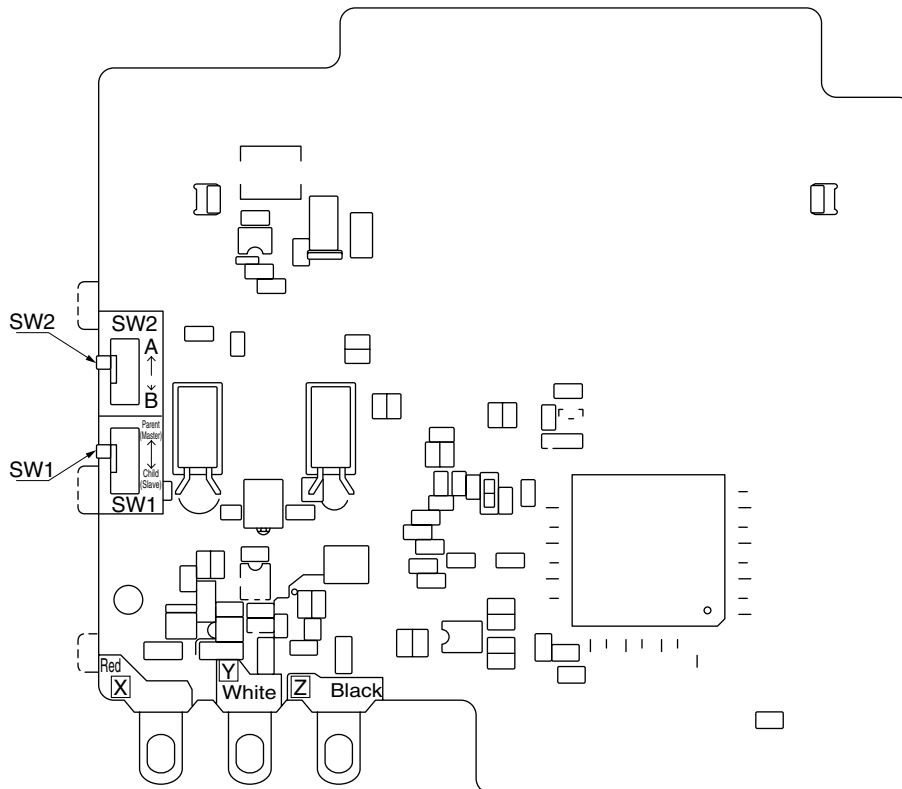
2. CPU reset

It functions when remote controller's check switch and up/down switch of the grill are pushed simultaneously. The operation is same as the one for power supply reset.

3. Functions compensating for power cut

- If " Functions compensating for power cut " is set to enable by the remote control function setting, it becomes effective.
- The state of remote control is always memorized, and it resumes operations according to the memory content after it returns from the power cut. However, the weekly timer setting is restored at Friday and holiday setting though the auto swing stop position and the timer mode are canceled.

Part arrangement of printed circuit board for remote controller



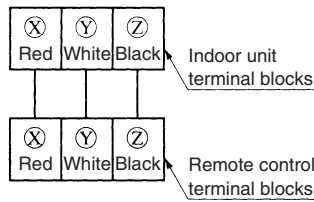
- Control change over switch (SW1)

Switch		Functions
SW1	Master	Master remote controller
	Slave	Slave remote controller

Note (1) SW2 is usually not used, and do not change please.

7.4 Cable for Remote Control Wiring

7.4.1 Control for a single unit



Note (1) The remote control wiring has the polarity. Please connect same terminal block No. together each other.

7.4.2 Multiple units control-simultaneous control of 16 unit with one remote controller

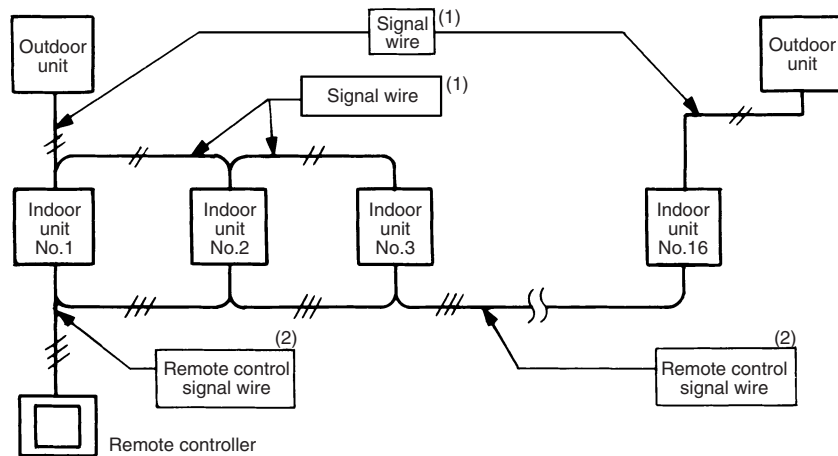
1. Function

Multiple units (even of outdoor different systems, 16 units maximum) can be simultaneously controlled by using a remote controller. The remote controller is used to set the "operation mode", and all the unit can be operated and stopped. Thermostat and protective functions of each unit functions independently.

Note : When part of the group gets out of order (the protective device operates), the relevant unit comes to an abnormal stop, but other normal units keep operating.

2. Wiring Procedures

- (i) Lay power cable of each unit and signal wire as usual. (Remove the remote control switches from all units excluding only one unit.) Lay wiring for the remote controller separately from power cable and wires for all other electrical equipment.
- (ii) Arrange the terminal block (X, Y, Z) of the remote controller as shown below for the simultaneous control, and lay cross over in each indoor unit.



- Notes
- (1) The overall length of the signal wire shall be less than 1000m.
 - (2) The length of remote control signal wire and crossover for remote controller between room shall be less than 600m.

MEMO

Part 4

Control System

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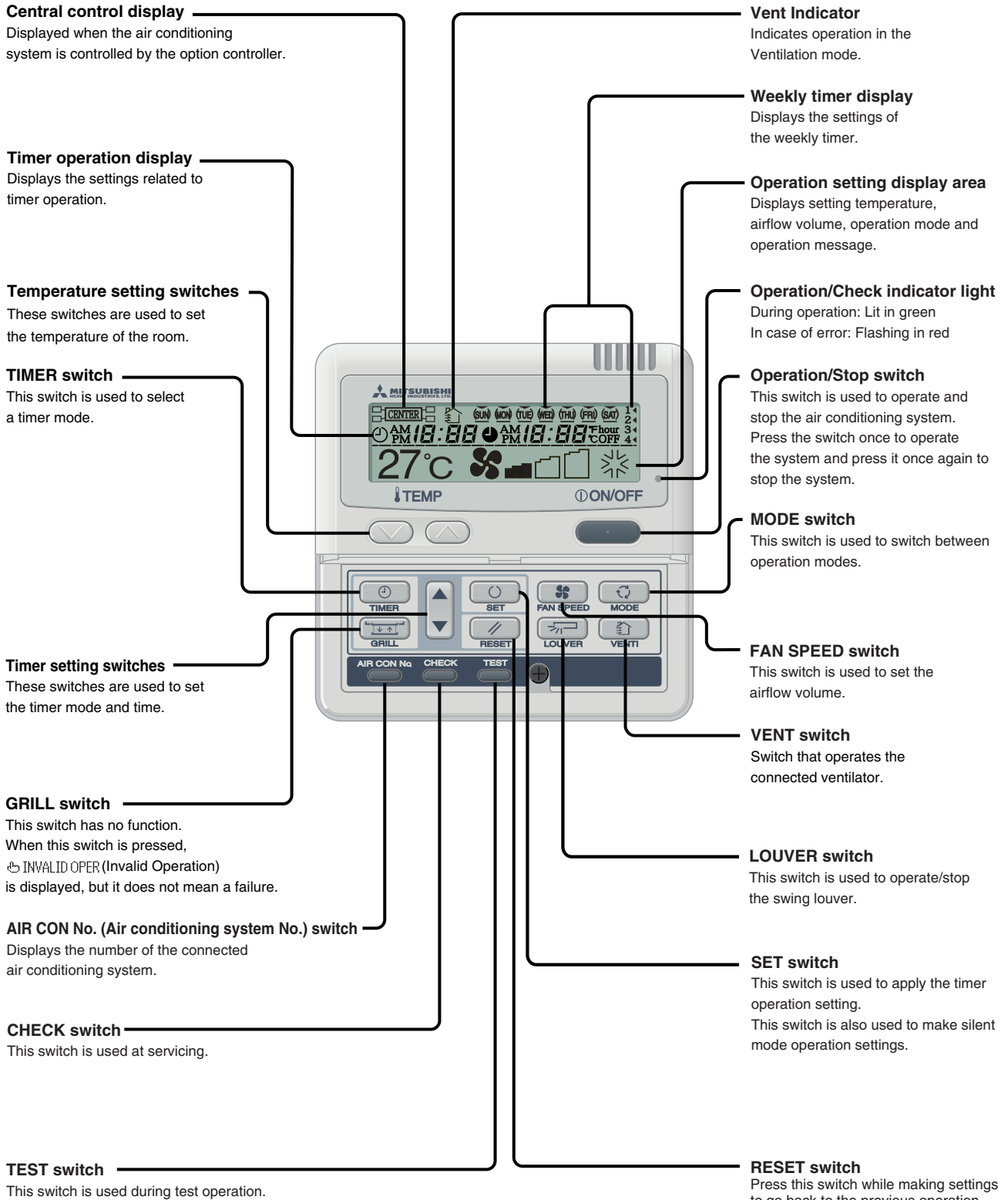
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1. Outline of Operation Control by Microcomputer

1.1 Wired Remote Controller (Optional Parts)

The figure below shows the remote controller with the cover opened. Note that all the items that may be displayed in the liquid crystal display area are shown in the figure for the sake of explanation. Characters displayed with dots in the liquid crystal display area are abbreviated.

Pull the cover downward to open it.

























* If you press any of the switches above and "INVALID OPER" is display, the switch has no function. But it does not mean a failure.

1.2 Setting Functions Using the Remote Controller

- The default settings of this unit's functions are as follows: If you want to change a setting, follow the procedure found in the installation manual and set to your desired setting.

For the method of setting, please refer to the installation manual of a remote controller.



Remote control unit functions ( FUNCTION ▼)

Function number [Ⓐ]	Function description [Ⓑ]	Setting [Ⓒ]	Default setting
01	GRILLE \updownarrow SET (Grille lift panel setting)	\updownarrow INVALID	<input type="radio"/>
		50Hz AREA ONLY	
		60Hz AREA ONLY	
02	AUTO RUN SET	AUTO RUN ON	*
		AUTO RUN OFF	
03	 TEMP S/W	 VALID	<input type="radio"/>
		 INVALID	
04	 MODE S/W	 VALID	<input type="radio"/>
		 INVALID	
05	 ON/OFF S/W	 VALID	<input type="radio"/>
		 INVALID	
06	 FANSPEED S/W	 VALID	<input type="radio"/>
		 INVALID	
07	 LOUVER S/W	 VALID	*
		 INVALID	
08	 TIMER S/W	 VALID	<input type="radio"/>
		 INVALID	
09	 SENSOR SET (Remote control sensor setting)	 SENSOR OFF (Invalid)	<input type="radio"/>
		 SENSOR ON (Valid)	
10	POWER FAILURE COMPENSATION SET	INVALID	<input type="radio"/>
		VALID	
11	VENTI SET	NO VENTI	<input type="radio"/>
		VENTI LINK SET	
		NO VENTI LINK	
12	TEMP RANGE SET	DISP CHANGE	<input type="radio"/>
		NO DISP CHANGE	
13	I/U FAN SPEED (Indoor unit fan speed setting)	3 FAN SPEED	*
		2 FAN SPEED	
		1 FAN SPEED	
14	MODEL TYPE	HEAT PUMP	*
		COOLING ONLY	
15	EXTERNAL CONTROL SET	INDIVIDUAL OPERATION	<input type="radio"/>
		SAME OPERATION FOR ALL UNITS	
16	ERROR DISP SET	ERROR DISP	<input type="radio"/>
		NO ERROR DISP	
17	 POSITION (Louver control setting)	FIX (1 OF 4) (4 position stop)	<input type="radio"/>
		IN MOTION (Free stop)	
18	°C/°F SET	°C	<input type="radio"/>
		°F	




Notes(1) Setting marked with are the default setting.

- (2) Setting marked with [*] are those that are set automatically according to an indoor unit or an outdoor unit connected.

Please check default settings with the indoor unit's installation manual.

- (3) When Item 17 : " POSITION" is changed, please also change Item 04 " POSITION" setting found in "Indoor unit functions".

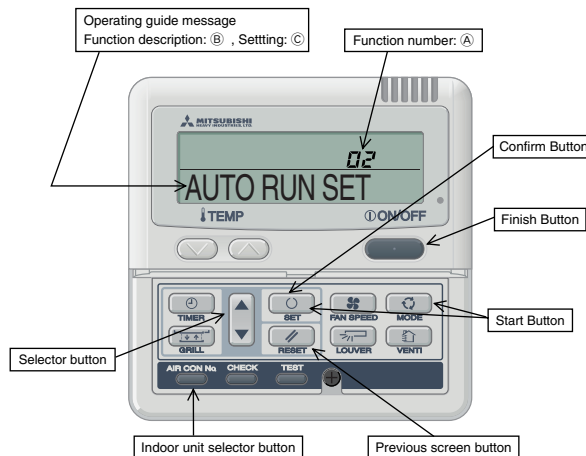
Indoor unit functions (I/U FUNCTION ▲)

Function number [Ⓐ]	Function description [Ⓑ]	Setting [Ⓒ]	Default setting
01	Hi CEILING SET	STANDARD	*
		Hi CEILING 1	
03	FILTER SIGN SET	NO DISPLAY	
		AFTER 180H	
		AFTER 600H	<input type="radio"/>
		AFTER 1000H	
04	 POSITION (Louver control setting)	FIX (1 OF 4) (4 position stop)	<input type="radio"/>
		IN MOTION (Free stop)	
05	EXTERNAL INPUT SET	LEVEL INPUT	<input type="radio"/>
		PULSE INPUT	
06	OPERATION PERMISSION PROHIBITED	NORMAL OPERATION	<input type="radio"/>
		VALID	
07	 ROOM TEMP OFFSET (Heating room temperature offset)	NORMAL OPERATION	<input type="radio"/>
		TEMP SHIFT +3°C	
08	 FAN CONTROL (Heating fan control)	LOW FAN	*
		STOP→LOW FAN (Intermittent operation)	
09	FREEZE PREVENT TEMP	TEMP Hi	
		TEMP Lo	<input type="radio"/>
10	FREEZE PREVENT CONTROL	FAN CONTROL ON	<input type="radio"/>
		FAN CONTROL OFF	
11	ELECTR DUST COLLEOR	FAN CONTROL OFF	<input type="radio"/>
		FAN CONTROL ON	
12	HUMIDI CONTROL	DM LINK OFF	<input type="radio"/>
		DM LINK ON	

Notes(1) Setting marked with are the default setting.

- (2) Setting marked with [*] are those that are set automatically according to an indoor unit or an outdoor unit connected. Please check default settings with the indoor unit's installation manual.

2. Function setting method
 - 1) Stop the air conditioner



- 2) Press the SET and MODE buttons simultaneously for 3 seconds or longer. The screen display will be switched as follows:

" SELECT ITEM " → " SET " → "FUNCTION SET ▼ "



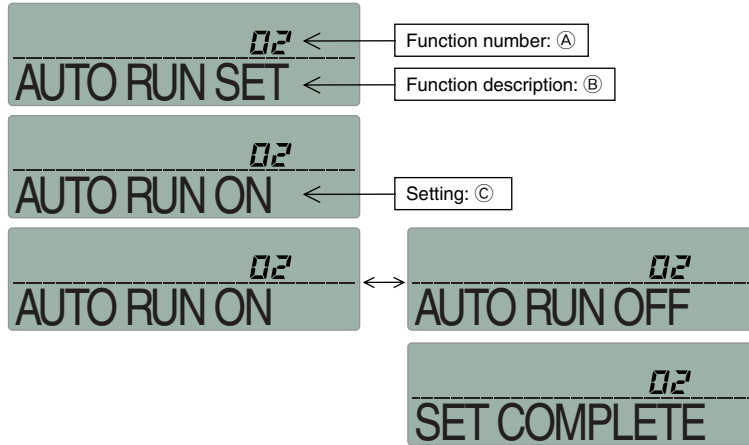
- 3) Press the SET button. The unit will enter the function setting mode. The screen display will change to " FUNCTION ▼ ".
- 4) Check which category your desired setting belongs to, " FUNCTION ▼ (Remote controller unit function)" or " I/U FUNCTION ▲ "(Indoor unit function).
- 5) Press either ▲ or ▼ button. Select either " FUNCTION ▼ " or " I/U FUNCTION ▲ "



- 6) Press the SET button.
 - When " FUNCTION ▼ " is selected.
 - ① "DATA LOADING" (blinking) → " FUNCTION " → " 01 GRILLE ↑↓ SET " (Function number: (A), Function description: (B))
The screen display will be switched like this.
 - ② Press either ▲ or ▼ button.
"Function number: (A), Function description: (B)" from the list of remote controller unit functions will be displayed one by one. Select a desired function.
 - ③ Press the SET button.
The screen display will be switched as follows:
" SETTING " → "Setting: (C)" (ex. "AUTO RUN ON")
 - ④ Press either ▲ or ▼ button.
A list of "Settings: (C)" will be displayed one by one. Select your desired setting.

- ⑤ Press the SET button.
The selected setting is displayed for 2 seconds, then followed by "SET COMPLETE" and the function setting process is completed. Then the screen display will be switched to "Function number: (A), Function description: (B)," so if you want to continue to set another function, repeat the steps as explained above. To finish the function setting process, please proceed to Step (c).

* When "02 AUTO RUN SET" is selected.



■ When "I/U FUNCTION ▲" is selected.

- ① The screen display will be switched as follows:
" I/U SELECT" → " I/U SET" → "I/U No.00" (blinking)



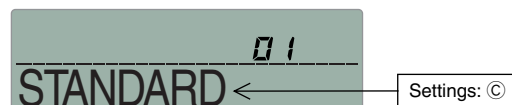
- ② Press either ▲ or ▼ button.
Select the indoor unit number that you want to change settings. If only one indoor unit is connected, the indoor unit number will not change, so please proceed to Step ③.
If "ALL I/U ▼" is selected while indoor group control is in effect, you can set all units to the same settings.

- ③ Press the SET button.
Indoor unit number indication will change from blinking to lit continuously, The screen display will be switched as follows:
"DATA LOADING" (blinking for about 2 to 23 seconds) → " I/U FUNCTION" → "01 Hi CEILING SET" (Function number: (A), Function description: (B))

* When "01 Hi CEILING SET" is selected.



- ④ Press either ▲ or ▼ button.
"Function number: (A), Function description: (B)" from the list of indoor unit functions will be displayed one by one. Select a desired function.
- ⑤ Press the SET button.
The screen display will be switched as follows: " I/U SETTING" → "Setting: (C)" (ex. "STANDARD")



- ⑥ Press either ▲ or ▼ button.
A list "Setting: (C)" will be displayed one by one. Select your desired setting.
- ⑦ Press the SET button.
The selected setting is displayed for 2 seconds, then followed by "SET COMPLETE" and the function setting process is completed.
Then the screen display will be switched to "Function number: (A), Function description: (B)" so if you want to continue to set another function, repeat the steps as explained above. To finish the function setting process, please proceed to Step 7).

- ⑧ Press AIR CON No. button.
The screen display will go back to the indoor unit selection screen (ex. " I/U No.00").
If you want to continue to set another indoor unit, please follow the steps explained above.
- 7) Press the ON/OFF button.
This ends a function setting process. Even if a function setting process is not completed, this ends the process. Please note that any setting that is not completed will become void.
 - Pressing the RESET button during a function setting process will allow you to go back the previous step. Please note that any setting that is not completed will become void.
 - Method of checking the current setting
While following the above mentioned step, the setting that appears when the SET button is pressed for each "Function number: ①, Function description: ②" is the current setting "Setting: ③". (When "ALL I/U ▼" is selected, the setting of the indoor unit with the lowest number is displayed)
 - Settings are stored in the controller and not lost even a power outage occurs.
- 3. Changing the remote controller's temperature setting range
 - 1) The temperature setting range of the remote controller can be changed.
Through remote controller button operations, the upper limit and lower limit set temperature values can be changed individually.
During heating operation, the changed upper limit value becomes valid and at times other than during heating operation, (during cooling, dehumidification, auto and fan operation), the changed lower limit value becomes valid.
Range of Possible Changes
Upper Limit Value: 22~30°C (valid during heating) Lower Limit Value: 18 ~ 26°C (valid at times other than during heating)
 - 2) Operation
 - a) With the remote controller in the stopped state, press the SET and MODE buttons simultaneously for 3 seconds or longer.
The display will changed from "SELECT ITEM" → "SET" → "FUNCTION SET ▼"
 - b) Press the [DOWN] button once. The display will change to TEMP RANGE ▲.
 - c) Press the SET button to enter the temperature range setting mode.
 - d) Using the [UP] or [DOWN] button, select "Hi LIMIT SET ▼" or "Lo LIMIT SET ▲", the press the SET button.
 - e) If "Hi LIMIT SET" is selected,
 - ① The display changes from "SET UP" → "Hi LIMIT 22°C ▲" (flashing).
 - ② Using the [DOWN] [UP] button, select the upper limit value. Display example: "Hi LIMIT 22°C ▲" (flashing)
 - ③ Press the SET button to fix the setting. Display example: "Hi LIMIT 22°C" (lighted up)
 - f) If "Lo LIMIT SET" is selected,
 - ① The display changes from "SET UP" → "Lo LIMIT 26°C ▼" (flashing).
 - ② Using the [DOWN] [UP] button, select the upper limit value. Display example: "Lo LIMIT 26°C ▼" (flashing)
 - ③ Press the SET button to fix the setting. Display example: "Lo LIMIT 26°C" (lighted up)
 - g) Press the ON/OFF button to end the setting procedure.
(The procedure also ends if the ON/OFF button is pressed during the setting operation. However, settings which have not been fixed become invalid, so exercise caution.)
 - If the RESET button is pressed during a setting operation, the display returns to the previously displayed setting screen. However, settings which have not been fixed become invalid, so exercise caution.
 - * If "NO DISP CHANGE" is selected in No. 12, "TEMP RANGE SET" of the remote controller's functions, of the function setting modes, the remote controller's display does not change even if the temperature range has been changed.
(Example) If the upper limit is set at 28°C

Function No. A	Function Contents B	Setting Contents C	Control Contents
12	TEMP RANGE SET	DISP CHANGE	The remote controller's display and sent data upper limit changes to 28°C.
		NO DISP CHANGE	The remote controller's display upper limit remains at 30°C and only the upper limit of the sent data is changed to 28°C.

2. Operation Control Function by the Indoor Controller

1. Cooling operation

a) Cooling

- 1) If the sum of selected and required frequencies is not larger than the maximum frequency, the required frequencies listed in the following table apply. If the sum of required frequencies is larger than the maximum frequency, the required frequencies divided proportionally apply.

Frequency bands for indoor unit models

Model(Indoor) Category	All series								
	22 model	28 model	36 model	45 model	56 model	71 model	90 model	112 model	140 model
Required frequency (Hz)	5~15	5~20	5~24	5~27	5~30	5~40	5~50	5~60	5~70
Selected frequency (Hz)	5~15	5~20	5~24	5~27	5~30	5~40	5~50	5~60	5~70

Note (1) The required frequency is counted in the unit and the selected frequency in the unit of 1 Hz.

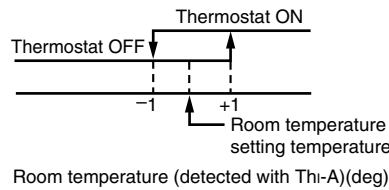
- 2) This indoor unit electronic expansion valve (EEV) controls opening of each indoor unit corresponding to decision frequency. Also, the thermostat is sampled in pitch of 20 second.

b) Cooling thermostat off

- 1) Fan control operates the thermostat as shown in the following diagram.

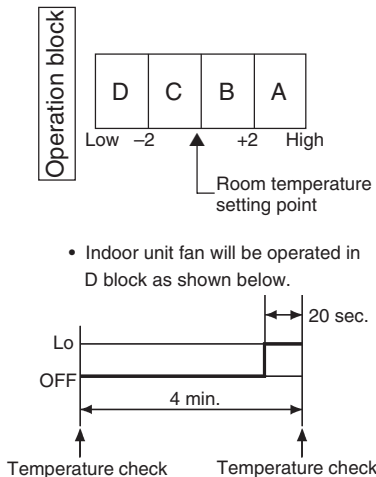
If the thermostat goes ON, even if the thermostat is OFF as shown in the following diagram, the thermostat does not go OFF for 2 minutes after the compressor goes ON. If the thermostat goes OFF within 2 minutes, a minimum required frequency other than 0 Hz is output.

- 2) If all the thermostats for indoor units in a module go OFF, outdoor units carry out cooling thermostat OFF operation in modular units.



2. Dehumidifying (Thermal dry)

- a) This cooling operation is mainly for dehumidifying, with which the compressor, indoor and outdoor fans are operated in the patterns as listed in the following table and in accordance with operation blocks switched with the room temperature sensor. The operation blocks are selected by checking the return air temperature at 4-minute intervals. Respective functional items are operated in each operation block as shown by the following table.



Item		Operation block			
		A	B	C	D
Indoor unit frequency (Hz)	22 model	10	10	10	0
	28 model	15	10	10	0
	36 model	20	15	10	0
	45 model	20	15	10	0
	56 model	25	15	15	0
	71 model	30	20	15	0
	90 model	45	30	25	0
	112 model	50	40	35	0
	140 model	60	45	35	0
Compressor		Sum of frequencies on combined indoor units			
Indoor unit electronic expansion valve		Superheat control			
Indoor unit fan	3 speed model	Me	Lo	Lo	Lo ↔ OFF
	2 speed model	Hi	Lo	Lo	Lo ↔ OFF
Outdoor unit fan		Operation	Operation	Operation	Stop

3. Heating operation

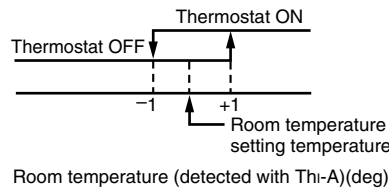
a) Heating

- This is same as the cooling operation.

b) Heating operation with thermostat OFF

- 1) The thermostat operates as shown in the following diagram through fuzzy control.

If the thermostat goes ON, even if the thermostat is off in the following diagram, it doesn't go OFF for 2 minutes after the compressor goes ON. If the thermostat goes OFF within 2 minutes, a minimum required frequency other than 0 Hz is output.



- 2) If all the thermostats for indoor units in a module go OFF, outdoor units carry out heating thermostat OFF operation in modular units.

3) Intermittent fan operation control

- a) When the jumper wire J3 (SW7-3), J4 (SW-7) on the indoor PCB is shorted (installed at shipping), the fan of the unit of which the thermostat is turned OFF during heating is operated in the Lo mode, and the indoor fan is turned OFF if the temperature rises 1°C or more than the return air temperature at the thermostat OFF.
- b) Indoor fan OFF condition is maintained for 5 minutes and then the operation is reset at the Lo mode again. After operating for 2 minutes in the Lo mode, return air temperature is checked and, if it is 1°C or higher, the indoor fan is turned OFF or, if it is not higher than 1°C, the Lo mode operation continues.

Notes (1) If the heating thermostat has been turned OFF, the temperature is indicated on the remote controller only when the indoor fan is operated in the Lo mode. When it is OFF, the room temperature at the end of Lo operation is indicated.

(2) If the operation is changed to the defrosting mode while the heating thermostat is at OFF or the thermostat is turned OFF during defrosting, the indoor fan is turned OFF.

(3) Residual operation of heater is dominant over this control.

4) Fan Lo Operation Control

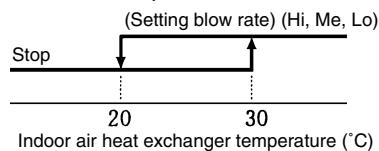
If jumper wire J4 (SW7-4) on the indoor PCB (set at shipping) is disconnected, indoor units with the thermostat turned OFF during heating operation will operate with the fan on Lo.

5) Fan stop control

- a) If the jumper wire J3 (SW7-3) on the indoor PCB (installed at shipment) is opened or the thermostat is turned OFF during heating operation with the remote control sensor operating, the fan on the indoor unit is turned OFF.

c) Hot start (Prevention of cold draft during heating)

- 1) If the required frequency in the room is other than 0 Hz at the start of heating operation, the indoor fan is controlled in accordance with the temperature of indoor air heat exchanger (detected with Thi-R1, R2).



Notes (1) If it is turned OFF forcibly for 1 minute after starting, and after one minute the indoor temperature exceeds 30°C, then this becomes flow rate setting.

(2) When the hot start (the compressor is operating and the indoor unit fan is not operating at the setting blow rate) is going on, the heating preparation is displayed (LCD on the remote controller).

(3) When the required frequency is other than 0 Hz, once the blower should start, it will not stop even if the temperature drops below 20°C.

- 2) During heating, the required frequency becomes 0 Hz (heating thermostat OFF), then afterward, if the required frequency is other than 0 Hz, and the answer back frequency from the outdoor unit is other than 0 Hz (during thermostat reset), hot start control is carried out.

- 3) If the indoor fan motor is OFF continuously for 7 minutes due to hot start control, the indoor fan motor goes ON regardless of the temperature detected by the heat exchanger temperature thermistor (Thi-R1, R2) and "Heating Preparation" LCD goes off.

- 4) Even if the fan motor is stopped continuously for 7 minutes during defrosting, it is not turn ON forcibly, but after defrosting is completed, if the fan motor is OFF continuously for 7 minutes, it is turned ON regardless of the temperature detected by the heat exchanger temperature thermistor (Thi-R1, R2).

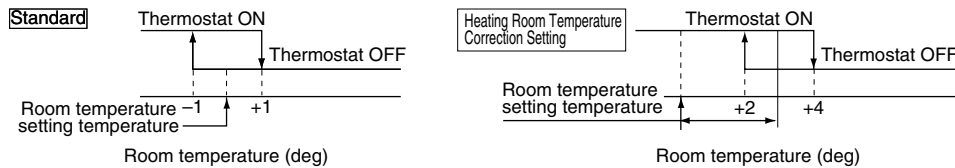
d) Residual operation of humidifier

The fan does the residual operation for 30 minutes by turning on SW5-2 on the indoor PCB to prevent the overflow water that stays in the drain pan from evaporating again after the humidifying operation ends, when it is stopped and thermostat is turned off.

- Notes (1) During the compressor stop and the abnormal stop and defrosting, doesn't execute this process.
 (2) Residual operation of heater is dominant over this control.

4. Value shift adjustment of room air temperature detection in heating

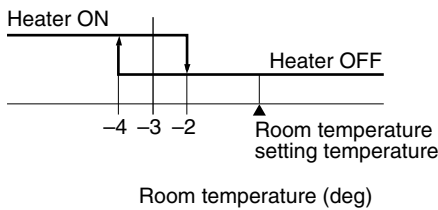
Under the standard specifications, the room temperature is adjusted at the setting temperature by controlling the indoor unit capacity based on the setting temperature of thermostat and the suction air temperature. However, where the unit is installed in the ceiling and warm air tends to stay around the ceiling, temperature in the living space may not be adjusted at the setting temperature. If "ROOM TEMP OFFSET" (heating space temperature compensation) is set in the remote controller's functions, the thermostat is set to go OFF at a temperature which is 3 degrees higher than the space temperature setting, enabling an improved feeling of warmth in the room.



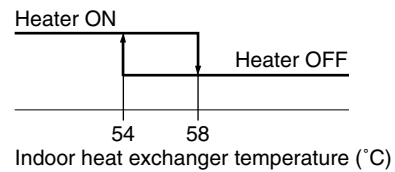
5. Heater control

a) If an optional electric heater is installed, the heater can be controlled by turning the relay (52H-optional for DC12V) on and off according to the temperatures detected with room temperature sensor (THi-A) and air heat exchanger temperature sensor (THi-R1, R2).

■ Room temperature (THi-A)



■ Heat exchanger temperature (THi-R1, R2)



Notes (1) When the conditions for thermostat ON and 52H-ON are satisfied, → 52H-ON

(2) When the conditions for thermostat OFF or 52H-OFF are satisfied, → 52H-OFF

Additionally, when the indoor blower stops, during the compressor stop and the control of the temperature of the outlet pipe and the high pressure control, and the current safe control, even if above-mentioned conditions for 52H-ON are satisfied, 52H are still turned OFF.

b) When the heater became no energizing from energizing, even if indoor blower (FMI) satisfies the stop (stopping operation by remote control or abnormal stop) condition, in order to take the remaining heat of the heater, none but after making FMI operate in Lo for 40 seconds it can be made stop.

6. FILTER sign

a) If cumulative operating time (the time the Run/Stop switch is ON) reaches 600 hours, "FILTER CLEANING" is displayed in the remote controller.

Note (1) If jumper wire J1 (SW7-1) on the indoor PCB is disconnected, this function is deactivated.

b) The functions of the remote controller can be set to display 180 hours, 600 hours, 1,000 hours, 1,000 hours & Forced Stop, and no display.

c) If it is set on 1,000 hours & Forced Stop, after 1,000 hours of operation, there is a forced stop after an additional 24 hours have passed. (If the filter sign is not reset, operation cannot be resumed.)


Resetting from the remote controller is possible at all times (while running, while stopped and before time up) when a filter reset signal is received. It is also reset when the power is turned OFF.


7. Auto swing control (FDT, FDTW, FDTQ, FDTS, FDE and FDK only)

a) Louver Control


1) When the air conditioner is operating, press the "LOUVER" switch to move the swing louvers. "AUTO " is displayed for 3 seconds, then the swing louvers begin moving up and down continuously.

2) When you desire to fix the position of the swing louvers, press the "LOUVER" switch while the swing louvers are moving, and 4 stop positions will be displayed one at a time in 1 second intervals. When the position you desire to louvers to stop at is displayed, press the "LOUVER" switch again. The display will

- stop message (ex. "STOP 1-  ") will be displayed for 3 seconds and the swing louvers will stop.
- 3) Louver operation when the power to the 4-position louver controller is turned on.
When the power is turned on, the louvers automatically swing 1 (2) time (without remotecontroller operation). This operation inputs the position of the louver motor (LM) in the microcomputer so it can confirm the louver position.

Notes (1) The louver position LCD displays the swing operation for 10 seconds when the "LOUVER" switch is turned ON. After that, "AUTO  " is displayed for 3 seconds in the LCD.
(2) Values in () show in cases other than the FDT, FDE and FDK 22~56 models.

b) Louver auto horizontal set during heating

The louvers are in the horizontal position regardless of whether the auto swing switch is operated (auto swing or louver stop) while "  (Heating Preparation)" is displayed (during hot start and when the heating thermostat is OFF). (This is to prevent cold drafts), and the display that was in the louver position display LCD before this control was activated continues.
If the "Heating Preparation" display goes off, both the louvers and the LCD display return to their original setting.

c) Louver free stop control

If "IN MOTION (louver free stop)" is set in the remote controller's function settings, the louver motor stops if there is a stop signal from the remote control unit and the stop position is stored in memory. Also, if there is an auto swing signal from the remote control unit, auto swing control starts from the position the louvers were in before being stopped.

8. Simple and clean mechanism control (for FDKA28~45 model only)

When OFF state of limit SW (open) is detected for one second while operating, operating is stopped.

9. Condensate pump motor (DM) control (Only FDT, FDTW, FDTQ, FDTS, FDR, FDQM, FDUM models)

a) Drain motor is started no sooner than the compressor is turned ON during cooling or dehumidifying operation. The drain motor continues to operate for 5 minutes after the stop of unit operation, stop with the error stop, thermostat stop and at switching from cooling or dehumidifying operation to blowing or heating operation. When there is any unit subjected to oil return control, the drain motor is operated for 5 minutes at such occasion.

Note (1) The drain motor is turned on at the same time as heating operation, when the humidifying and draining are synchronized (J8 opening). (Do not synchronize with ON/OFF of the compressor.)

b) Overflow detection is always operable by means of the float switch regardless of operation modes. If the overflow is detected (or when the float switch is disconnected or its wire is broken), operation is stopped with the error stopped. If the overflow is detected while the drain motor is stopped, the drain motor is operated for 3 minutes and then the overflow detection is performed to judge whether it is normal or not.

	Indoor unit operation mode				
	OFF ⁽¹⁾	COOL	DRY	FAN ⁽²⁾	HEAT
During compressor ON		Control A			
During compressor OFF		Control B			

Notes (1) Including OFF and error stop during COOL, DRY, FAN and HEAT.

(2) Including "FAN" operation due to unmatch of operation mode.

(1)Control A

- 1) If the float switch senses draining, it performs an abnormal stop (E9 is displayed) and operates the drain pump. after 3 minutes pass, the float switch is checked and if it is normal, drain pump operation is stopped. It also preserves an abnormal stop state.
- 2) If the float switch continues to detect draining, the drain pump continues to operate and the float switch operates while draining is detected.

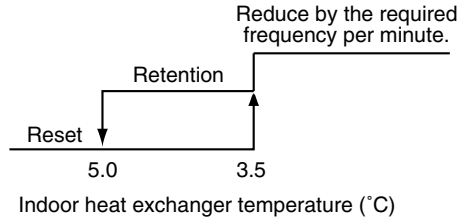
(2)Control B

If the float switch detects draining, it turns the drain motor on for 3 minutes, then 10 seconds after the drain motor goes OFF, it checks the float switch. If it is normal, a normal stop is performed and if it is abnormal, E9 is displayed and the drain motor goes ON. (It remains ON while draining is detected.)

10. Frost prevention during cooling, dehumidifying

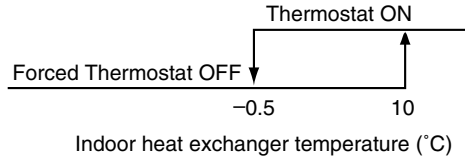
In order to prevent frost during cooling and dehumidifying, 9 minutes after compressor operation starts, the temperature sensed the indoor heat exchanger (sensed by Thi-R1, R2) is checked and the following controls are carried out.

a) Required frequency down control



- Notes (1) Through required frequency down control, if the required frequency is not reached, fuzzy control is carried out.
 (2) If the temperature at Th_i-R1 and R2 becomes 5.0°C continuously for 6 minutes, this control is terminated.

b) Thermostat OFF control



- Notes (1) After the thermostat goes ON, forced thermostat OFF does not operate for a period of 9 minutes.
 (2) Forced thermostat OFF operates if the temperature at Th_i-R1 or R2 becomes -0.5°C or lower.

11. Indoor expansion valve control

a) Cooling superheat control

1 minute after the thermostat switches ON during a cooling or dehumidifying operation, superheating is maintained at a suitable level by expansion valve aperture control based on the difference between the indoor heat exchanger's inlet and outlet temperatures (detected by Th_i-R3 and Th_i-R1 or R2), and the amount of deviation from the superheat setting value. Cooling superheat control ends when operation stops, or when the thermostat switches OFF.

b) Heating supercool control

Opening of expansion valve is controlled and the supercooling is kept proper by using the error between the temperature difference of indoor air heat exchanger (detected with Th_i-R1 and Th_i-R2) and the sub-cooling setting value while heating, and after 1 minute since thermostat is turned ON and after 2 minutes since defrosting ends. This process ends when operation stops, and thermostat is turned OFF, and defrosting starts.

c) Heating paused unit refrigerant control

In order to control the amount of refrigerant collected in a heating paused unit during outdoor unit heating operation, paused unit refrigerant control occurs individually at the paused units that satisfy the following conditions.

(1) Start conditions

- ① After thermostat switches OFF
 - ② After heating → stop, or stop → blow switching
 - ③ After outdoor unit heating begins during a stop (including error stops)
 - ④ After electronic expansion valve full-closed control
 - ⑤ After receiving a "refrigerant recovery" signal from the outdoor unit
- } After 12 hours elapses

(2) Control description

The electronic expansion valve opens to the setting aperture for 1 minutes.

(3) Control termination conditions.

- ① When the outdoor unit stops
- ② When a defrost operation begins
- ③ When the thermostat switches ON
- ④ When the indoor heat exchanger sensor (Th_i-R1 or Th_i-R2) detects a temperature exceeding 55°C.

12. High ceiling control

In the case of indoor units installed in high ceilings, air flow mode control can be changed by using DIP switch SW9-4 on the indoor PCB, or by using the remote controller indoor function setting (see page 387).

DIP SW	SW9-4 OFF (Normal Control)	SW9-4 ON (High Ceiling Control)
Item	Hi, Me, Lo	UHi, Hi, Me
Air Flow Mode	Hi, Me, Lo	UHi, Hi, Me

- Notes (1) When the unit is shipped, SW9-4 is turned OFF.
 (2) If SW9-4 is ON, the fan operates in Me even during hot start and when the heating thermostat is OFF.

13. Thermistor (Return air, heat exchanger) disconnected
- a) Return air temperature thermistor
If the temperature detected by the thermistor is -20°C or lower continuously for 5 seconds, an abnormal stop is performed.
 - b) Indoor heat exchanger temperature thermistor
If the temperature detected by the thermistor (Thi-R1, R2 or R3) 2 minutes ~ 2 minutes 20 seconds after the thermostat goes ON and the compressor starts is -40°C or lower continuously for 5 seconds, or if the temperature is -40°C or lower continuously for 5 seconds within 10 seconds after the power is turned on, an abnormal stop is performed.

14. Indoor fan abnormal [FDTA112, 140 or FDKA22 ~ 56 types only]
- If the indoor unit fan speed is less than 200 rpm continuously for 30 seconds after a n indoor unit fan run command is output, it stops for 2 seconds. After 2 seconds, it restarts, but if this operation is repeated 4 times within 60 seconds, an abnormal stop is performed.

15. Control for operating permission, prohibition, and coin timer
- Whether air conditioner operation is enabled or not is controlled by opening the jumper on indoor control PCB and external input to CnT.
(Use when it is controlled to be able to use air conditioner and not to operate it according to signal etc. of coin timer on the market)

- a) It changes into the operating permission and the prohibition mode by opening the jumper on the indoor control PCB.

Jumper(J2)short circuit	Jumper(J2)open
It is possible to operate normally. (Ship it.) CnT ①-⑥ ON :operating OFF:stop	Operating permission and prohibition mode CnT ①-⑥ ON :operating permission OFF:operating prohibition mode

- b) When the input to CnT is ON (operating permission)
 - 1) The air conditioner corresponds to the signal from the remote control and it is possible to do the operations and the stop, etc.
(When the center mode is set, it is possible to operate it only from the center.)
 - 2) The states of air conditioner when the input to CnT becoming ON from OFF are switched between operating and stop by the state of SW5-3 on the indoor control PCB.

SW5-3 · OFF	SW5-3 · ON
It starts according to the signal of item 1) like the air conditioner stop. (Ship it)	It depends on the signal of item 1) after the air conditioner begins to operate. (Local setting)

Note (1) The operation to external is output.

- c) When the input to CnT is OFF (operating prohibition)
 - 1) It is impossible to do the operations of operating and the stop to air conditioner through the corresponding signal from the remote control.
 - 2) When the input to CnT changes into OFF from ON, air conditioner stops.
- d) It becomes item a) when making operating permission/prohibiting active through the indoor function set by remote control.

16. External control (remote display) / control of input signal
- Make sure to connect the standard remote control unit. Control of input signal is not available without the standard remote control unit.

- a) External control (remote display) output
Following output connectors (CNT) are provided on the printed circuit board of indoor unit.
 - 1) Operation output: Power to engage DC 12V relay (provided by the customer) is outputted during operation.
 - 2) Heating output: Power to engage DC 12V relay (provided by the customer) is outputted during the heating operation.
 - 3) Thermistor ON output: Power to engage DC 12V relay (provided by the customer) is outputted while the thermistor is operating.
 - 4) Error output: When any error occurs, the power to engage DC 12V relay (provided by the customer) is outputted.

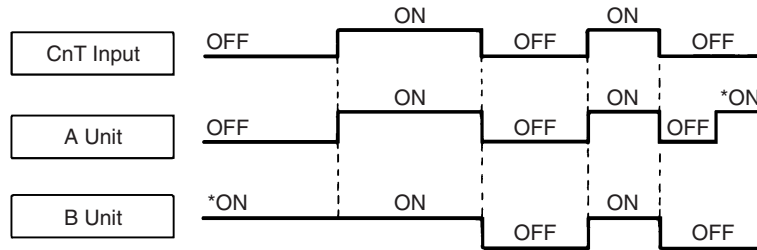
Remark: Connect the remote monitoring kit and take out each non-voltage contact.

b) Control of input signal

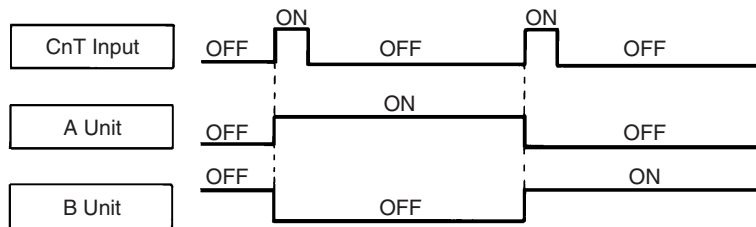
Control of input signal (switch input, timer input) connectors (CnT) are provided on the control circuit board of the indoor unit. However, when the operation of air conditioner is under the Center Mode, the remote control by CnT is invalid.

(1) If the factory settings (SW5-3 on the PCB is OFF) are set, or "LEVEL INPUT" is selected in the remote controller's indoor unit settings.

- 1) Input signal to CnT OFF → ON ----- Air conditioner ON
- 2) Input signal to CnT ON → OFF ----- Air conditioner OFF



- Note (1) The ON with the * mark indicates an ON operation using the remote control unit switch, etc.
 (2) When SW5-3 on the PCB of indoor unit is turned on at the field or "PULSE INPUT" is selected in the remote controller's indoor unit settings. Input signal to CnT becomes valid at OFF → ON only and the motion of air conditioner [ON/OFF] is inverted.



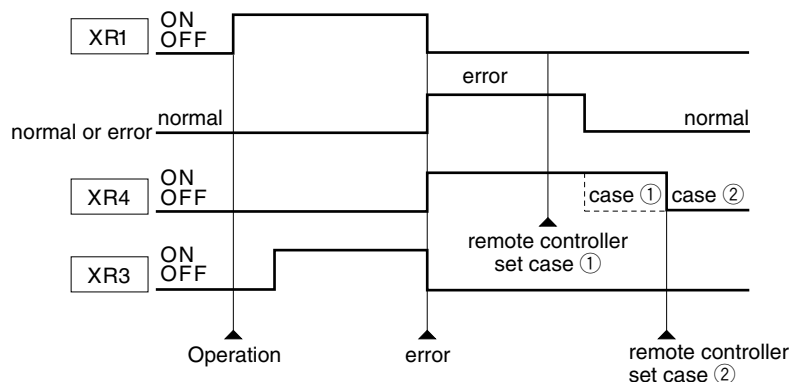
17. Operation/error output

The following signal is output to CnT connector on indoor control PCB.

(Use the remote monitoring kit for the DC12v relay.)

- a) Operation output [XR1] (Operation : ON, stop and abnormal stop : OFF)
- b) Error output [XR4] (Error : ON)
- c) Thermistor output [XR3] (Indoor unit thermistor ON)
- d) Heating output [XR2] (Heating operation ON)

Output relay operates



18. Multiple units control-simultaneous control of 16 unit with one remote controller

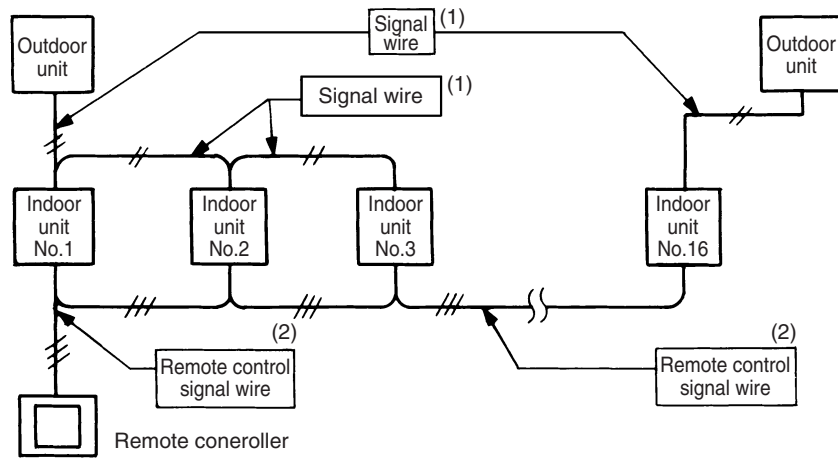
a) Function

Multiple units (even of outdoor different systems, 16 units maximum) can be simultaneously controlled by using a remote controller. The remote controller is used to set the "operation mode", and all the unit can be operated and stopped. Thermostat and protective functions of each unit functions independently.

Note (1) When part of the group gets out of order (the protective device operates), the relevant unit comes to an abnormal stop, but other normal units keep operating.

b) Wiring Procedures

- (1) Lay power cable of each unit and signal wire as usual. (Remove the remote control switches from all units excluding only one unit.) Lay wiring for the remote controller separately from power cable and wires for all other electrical equipment.
- (2) Arrange the terminal block (X, Y, Z) of the remote controller as shown below for the simultaneous control, and lay cross over in each indoor unit.



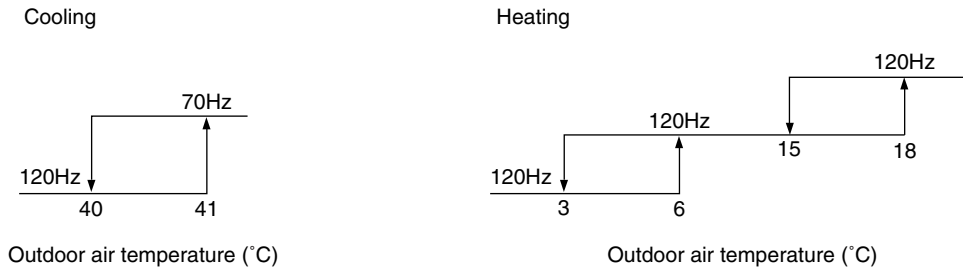
- Notes
- (1) The overall length of the signal wire shall be less than 1000m.
 - (2) The length of remote control signal wire and crossover for remote controller between room shall be less than 600m.

3. Operation Control Function by the Outdoor Controller

3.1 Standard Multi-Unit FDCA140HKXE4

3.1.1 Compressor operating frequency decision

According to the outdoor temperature, the maximum operating frequency of the compressor is determined as follows. Moreover, the minimum operating frequencies become 20Hz for both heating and cooling.



3.1.2 Compressor starting control

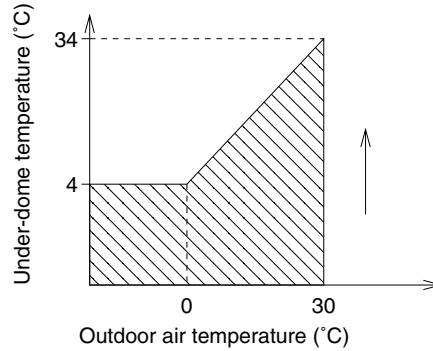
- a) 4-way valve switching assurance start
 - 1) When the compressor is started except the following condition, the four ways valve is switched on for operation assurance.
 - When the total times for the compressor to start after power supply is turned ON are more than 2, if the period for which the OFF state of thermostat is stopped is less than 6 hours and the condition for thermostat ON, and start.
 - 2) The compressor is started at the specified speed regardless of the required speed when it is started.
 - 3) 30 seconds after the compressor starts, the 4-way valve switching assurance start terminates.
- b) Compressor protective start

After the four ways valve is switched for security, the following compressor protection operation starts.

	Initial start (remote control ON abnormality release)	Thermostat ON start	
		There is an operation mode change during thermostat OFF.	There is no operation mode change during thermostat OFF.
The total first time for Compressor ON	Compressor protection start B according the making time for crankcase heater	Compressor protection start B according the making time for crankcase heater	Compressor protection start B according the making time for crankcase heater
After the total second times for Compressor ON	Protection start	Protection start	Inching protection start

- 1) Protection start
 - (a) After the four ways valve switch operation for security ends, during 2 minutes from the compressor start, if the demand frequency is 38Hz, upper limit for the compressor real operating frequency to increase up is 60Hz/30 second.
 - (b) 2 minutes after starting, the speed is changed to the target speed.
- 2) Inching protection start
 - (a) The compressor is operated at the specified speed regardless of the speed required of the compressor when it is operated from the thermostat OFF stop state to the thermostat ON state.
 - Note (1) If the operation mode is changed during a thermostat OFF stop, the next time the compressor is started, 4-way valve switching assurance start is performed without performing inching protection start.
 - (b) 2 minutes after starting, the speed is changed to the target speed.
- 3) Crankcase heater conducting time compressor protective start B

Control System



- (a) If any one of the following conditions is satisfied, compressor protective start B is performed.
 - Ⓐ 30 minutes or longer have passed since the power was turned ON.
 - Ⓑ The service switch (SW3-3) is ON.
 - Ⓒ If the temperature deviates from the range shown by the shaded portion of the above figure.
- [Control Contents]
 - Ⓐ The upper limit compressor speed is raised by 6 rps/5 min. for a period of 30 minutes after starting.
 - Ⓑ The upper limit compressor speed is raised by 6 rps/2 min. for the period from 30 minutes to 40 minutes after starting.
 - Ⓒ If the compressor stops in the first 40 minutes after starting, the next time it starts, the speed increase method is calculated by this control method, and continues to be controlled by this control method up to the time 40 minutes have passed.
- (b) The following control is done, and the compressor is not started when it is in a slash area in above figure in compressor protection start B control.
 - Ⓐ The following data are displayed in the 7-segment LED.
Display Data: Immediately after the power goes ON, " 30" is displayed. This is reduced by " 1" every minute thereafter.
 - Ⓑ It is enabled that a compressor starts, after 30 minutes from the time when the supply power is turned ON.
 - Ⓒ It is enabled that a compressor starts, even if the time passed is less than 30 minutes since the supply power is turned ON, but it is not in a slash area in above figure.

3.1.3 Outdoor fan control

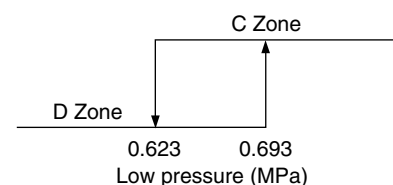
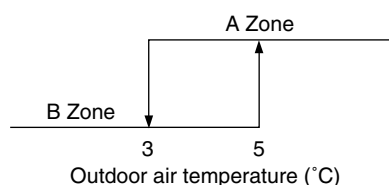
a) Fan tap and fan motor control contents during control

Fan tap	FM01	FM02
6 speed	UHi	UHi
5 speed	UHi	Hi
4 speed	Hi	Hi
3 speed	Hi	Lo
2 speed	Lo	Lo
1 speed	Lo	OFF

- b) Fan motor starts at four-speed. After 20 seconds it will shift to each control mode.
- c) Heating fan control

1) Fan tap control is performed in accordance with the low pressure (sensed by PSL) and the outdoor air temperature (sensed by Tho-A). However, Fan tap changes into a low-speed side when the detected temperature is in the desired range at power supply ON. In the case a high-pressure control starts while heating mode operation, it operates according to the following.

	A Zone	B Zone
C Zone	4 speed	4 speed
D Zone	4 speed	6 speed

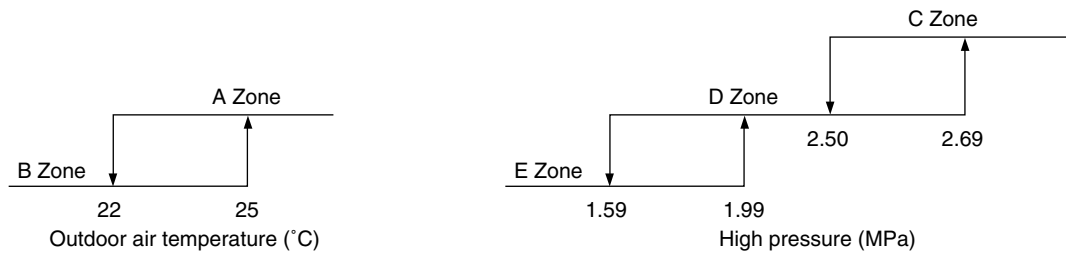


- 2) It depends on the following when outdoor temperature (detected with Tho-A) is higher than 12°C and the outdoor fan is started.
 - ① After it starts by the 4 speed tap, it will become 2 speed in three seconds.
 - ② After it is operated forcibly for 4 minutes at 2 speed tap, it shifts to the control in item 1).
 - ③ The operation is priority when the outdoor fan control with the high-pressure pressure sensor starts while controlling, and operating is continued forcibly for four minutes at 2 speedy tap if the outdoor temperature is higher than 12°C after it ends.

d) Cooling fan control

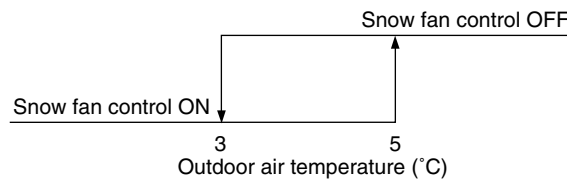
Fan tap control is performed in accordance with the high pressure (sensed by PSH) and the outdoor air temperature (sensed by Tho-A). However, Fan tap changes into a low-speed side when the detected temperature is in the desired range at power supply ON.

	A Zone	B Zone
C Zone	6 speed	4 speed
D Zone	4 speed	2 speed
E Zone	4 speed	1 speed



e) Snow fan control

If jumper wire J8 on the outdoor unit PCB is open, a full stop is performed, and in the abnormal stop mode, if the temperature of the outdoor air at the outdoor unit fan becomes 3° C or lower, it runs at 6th speed for 10 seconds once every 10 minutes.

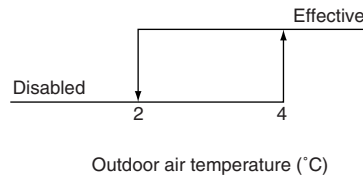
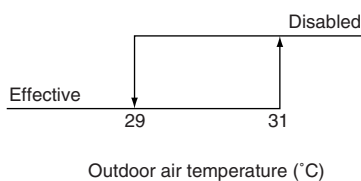


3.1.4 Silent mode control

- a) If the silent mode start signal is received from an indoor unit or CnG2 (with short pin) is shorted, if the outdoor temperature is within the following range, operation is performed in the silent mode.

■Cooling

■Heating



- b) The outdoor fan starts at 4th speed, and Fan tap will be decreased to 2nd speed in 20 seconds.
- c) The upper limit of compressor operating frequency is specified to be 80Hz except while defrosting.

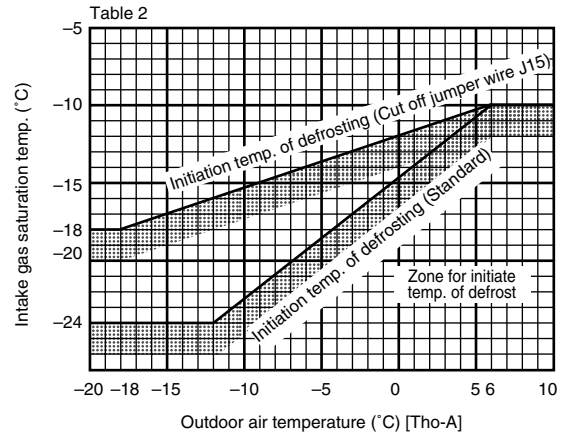
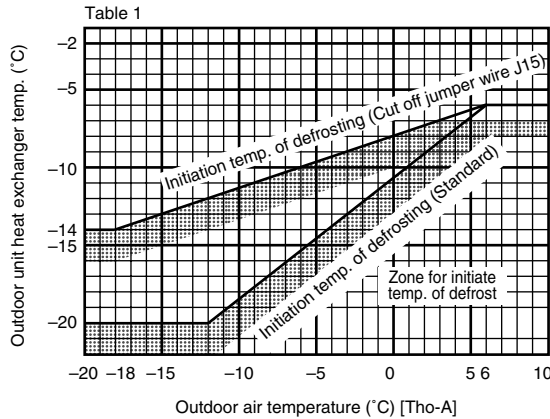
3.1.5 Defrosting

1) Temperature conditions defrosting

- a) When all the following conditions are satisfied, temperature conditions defrosting begins.
 - (1) There have been 45 minutes of cumulative compressor operation since defrosting was completed, or there have been 30 minutes of cumulative compressor operation since the start of heating operation (remote control unit ON).
 - (2) 5 minutes have passed since the compressor went ON.
 - (3) 5 minutes have passed since the outdoor fan started operating.
 - (4) The temperature detected by the heat exchanger thermistor (Tho-R) and the outdoor temperature thermistor (Tho-A) is lower than the defrosting operation start temperature in Table 1 at right after all the above conditions have been satisfied. Also, if the suction gas saturation temperature determined from

the value detected by the low pressure sensor (PSL) and the temperature detected by the outdoor temperature thermistor (Tho-A) continue unchanged for three minutes, and drop below the defrosting start temperature shown in Table 2 at right. However, when the temperature drops to the start temperature of the low pressure sensor or lower, it is not performed for the following operations for 10 minutes after the compressor starts.

The case is when outdoor temperature detected (Tho-A) is less than 5°C and higher than -10°C and low-pressure pressure become less than 0.243MPa, or when outdoor temperature detected (Tho-A) is less than -10°C and low-pressure pressure become less than 0.2048MPa. However, defrosting by low-pressure pressure and condition of total time for compressor to operate after defrosting ends are 30 minutes instead of 45 minutes.



b) Changing the defrosting start temperature range

Disconnect jumper J15 on the outdoor PCB.

- (1) When there is a total of 30 minutes of operation in the heating mode after defrosting is terminated.
- (2) When the temperature at the heat exchanger thermistor (Tho-R) and outdoor temperature thermistor (Tho-A) drops below the defrosting start temperature in the above graph continuously for 30 seconds.
- (3) When conditions are normal except for items 1) and 2) above.

c) Defrosting end conditions

If either of the following conditions is satisfied, the defrosting end operation starts.

- (1) When 10 minutes have passed since the start of defrosting.
- (2) When the temperature at the heat exchanger thermistor (Tho-R) becomes 12°C or higher.

2) Time conditions defrosting (Oil return control during heating)

a) Defrosting start conditions

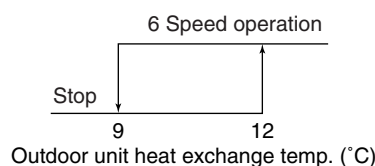
- (1) When 4 hours of cumulative running time have passed since the compressor's power was turned ON and cumulative compressor running time in the first operation in the heating mode exceeds 1 hour. However, if the mode was changed from cooling to heating, 30 minutes after the compressor was turned ON.
- (2) If temperature conditions defrost operating time prior to time conditions defrosting was 1 minutes or longer, the time conditions defrost timer (4 hours) is reset. (It is regarded that oil return during temperature conditions defrosting was complete.)
- (3) Time conditions defrost is performed after the 4-hour timer's time is up, or 45 minutes or more after the previous temperature conditions defrost is completed, whichever is the slowest.

b) Defrosting end conditions

If either of the following conditions is satisfied, the defrosting end operation starts.

- (1) When the temperature at the heat exchanger thermistor (Tho-R) becomes 12°C or higher.
- (2) When 10 minutes have passed since the start of defrosting.

c) After defrosting starts, when the temperature detected by air heat exchanger temperature sensor becomes higher than 12°C within 2 minutes 30 seconds, the outdoor fan is operated at 6th speed, and the outdoor fan is stopped when less than 9°C.



Note (1)The outdoor fan stops regardless of the temperature after two minutes 30 seconds.

3.1.6 Cooling and heating forced operation

Turning SW3-7 on the outdoor unit PCB ON and closing and opening CnG1 circuit (with short pin), forces the indoor units to operate in the cooling or heating mode. If an operation mode other than a forced mode is commanded from the indoor units, mode mismatch is displayed in the remotecontroller, etc.

SW3-7	CnG1	Operation
OFF	Open	Normal operation
	Closed	
ON	Open	Cooling
	Closed	Heating

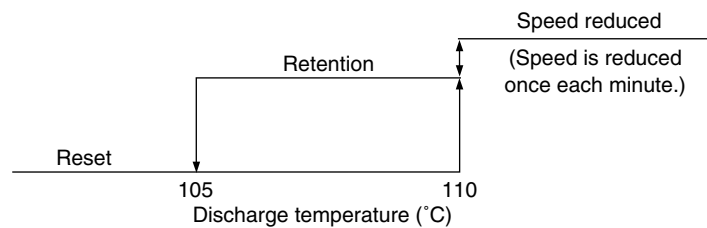
Note (1) When the unit is shipped from the factory, SW-7 is OFF and CnG1 is open.

3.1.7 Compressor protective control

a) Discharge temperature control

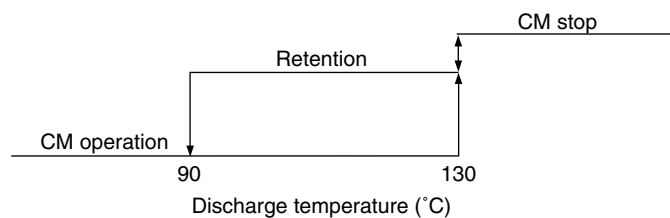
If the discharge temperature exceeds the set value, the compressor's speed is controlled to suppress the rise in the discharge temperature. If it rises still higher, the compressor is stopped.

1) Compressor speed control



2) Discharge temperature abnormal

- (a) If the discharge temperature rises to 130°C or higher, the compressor is stopped. It recovers automatically if the temperature drops to 90°C or lower.



- (b) If the discharge temperature is abnormal 5 times within 60 minutes, or if the temperature remains at 130°C or higher continuously for 60 minutes, including when the compressor is stopped, the unit performs an abnormal stop (E36).

Note (1) If the discharge temperature does not drop to 90°C or lower continuously for 45 minutes after a discharge temperature abnormality occurs, the compressor cannot be restarted. (It is possible to reset it using the remote control unit.)

b) Current safe control

- 1) If the input current value (converter inlet T-phase) at the inverter inlet exceeds the set value, the compressor's speed drops.

If the detected value increases even if the speed goes down, the speed will drop even further.

- 2) If the value drops below the cancellation value continuously for 3 minutes, this control ends and the speed protect release operation begins.

c) High pressure control

1) Compressor speed protect control during heating

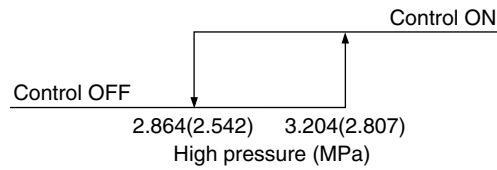
- (a) When all the following conditions are satisfied, compressor speed is controlled during compressor operation.

- (1) SW4-7 ON : High pressure is 3.0 MPa or higher.
- (2) SW4-7 OFF : High pressure is 3.2 MPa or higher.

- (b) If the pressure sensed by the high pressure sensor is lower than the value above continuously for 6 minutes, this control ends.

- (c) When the compressor operating, the frequency and the high-pressure pressure exceed 20Hz and 3.8MPa respectively, the compressor is stopped.

- (d) Outdoor fan control with high-pressure pressure sensor
 When the high-pressure pressure becomes 3.204(2.807) MPa or higher while heating, the outdoor fan runs at 2ND (max) speed.



Note (1) Values in () show when SW4-7 is OFF.

2) Compressor speed protect control during cooling

- (a) When all the following conditions are satisfied, compressor speed is controlled.

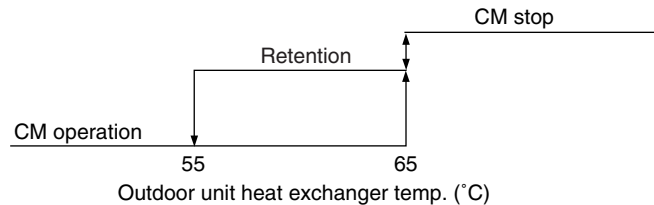
- ① High pressure is 3.299 MPa or higher during compressor operation.
- ② Outdoor air temperature is 40°C or higher.
- ③ Outdoor fan runs at 6th speed continuously for 30 seconds or longer.
- ④ Compressor operating frequency is ≥ 30 Hz.

- (b) The high pressure is detected 1 minute later, and if it is 3.299 MPa or higher, the speed drops further.

- (c) If the high pressure drops below 3.299 MPa, this control ends and speed protect release operation begins.

3) Control by outdoor heat exchanger temperature

- (a) If the temperature at the outdoor heat exchanger rises to 65°C or higher during cooling, the compressor is stopped. If the temperature drops to 55°C or lower, the compressor recovers automatically.



- (b) If the outdoor heat exchanger temperature rises to 65°C 5 times within 60 minutes, or is 65°C or higher continuously for 60 minutes, including when the compressor is stopped, the unit is subjected to an abnormal stop (E35).

Note (1) If the outdoor heat exchanger temperature drops to 55°C continuously for 3 minutes after an abnormal stop occurs, it is possible to reset it using the remote control unit.

4) High pressure abnormal detection

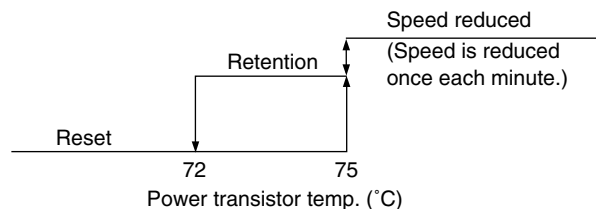
- (a) If the high pressure is 4.055 MPa or higher, stop the compressor.

- (b) If the high pressure drops to 3.658 MPa or lower, it will recover automatically.

- (c) When above-mentioned in item a) occurs 5 times within 60 minutes or when after high-pressure pressure of 4.055MPa is detected and the pressure of 3.658MPa or more persists for 60 minutes or more, the unit is subject to abnormal stop (E40).

d) Power transistor temperature control

If the power transistor's temperature rises to 75°C or higher, the compressor speed is controlled.



e) Low pressure control

1) Compressor speed control

- (a) If 10 minutes have passed since the compressor start, or since the defrost termination, and the pressure measured by the low pressure sensor (PSL) is 0.150 MPa or lower continuously for 10 seconds, the compressor's speed is reduced.

- (b) The low pressure is measured 10 seconds later, and if it is 0.150 MPa or lower, the compressor speed is reduced even further.

- (c) If the low pressure rises to 0.189 MPa or higher, this control ends and speed protect release operation begins.

2) Low pressure abnormal detection

- (a) If the low pressure sensor detects a low pressure of 0.079 MPa or lower continuously for 15 seconds and the suction superheat temperature is 30°C continuously for 60 seconds, the compressor performs an abnormal stop. Also, if the detected pressure is 0.227 MPa continuously for 10 seconds, the compressor

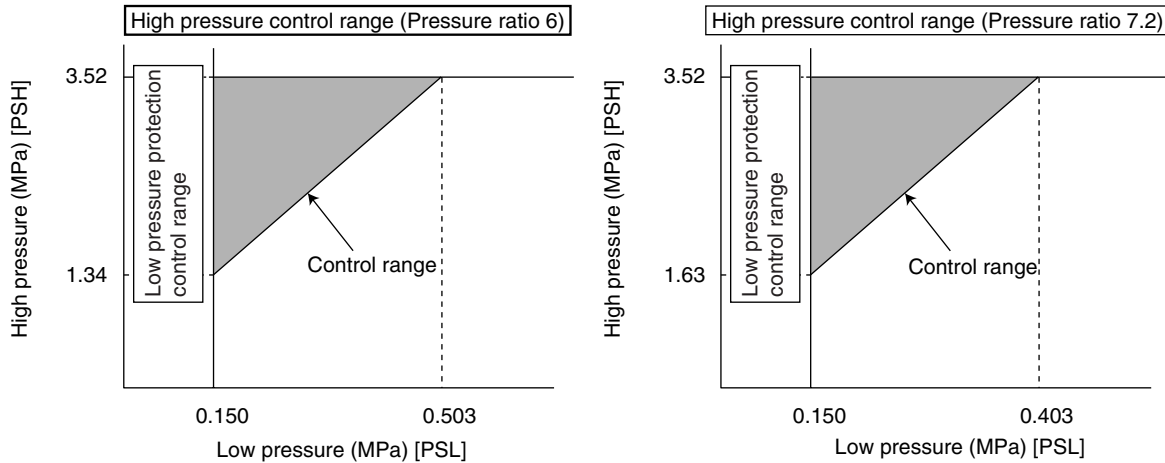
resumes operation automatically 3 minutes later.

- (b) When above-mentioned ① or ② in item a) occurs 3 times within 60 minutes, or when low-pressure pressure (PSL) has been 0.079MPa or less for over 60 minutes while the compressor is stopping and the low-pressure pressure (PSL) after the compressor starts is 0.079MPa or less continuously, the unit makes abnormal stop (E49).
- f) High pressure ratio protection control
During heating, the compressor's speed is controlled in accordance by the low pressure thermistor and high pressure thermistor.

1) Starting conditions

When all the following conditions are satisfied:

- ① If 5 minutes have passed since the compressor started.
- ② If the outdoor fan is ON and 5 minutes have passed since operation started.
- ③ If 5 minutes have passed since defrosting ended.
- ④ If the pressure levels detected by the low pressure sensor (PSL) and high pressure sensor (PSH) are within the control range shown in the figures below for 30 seconds.



2) Control contents

The compressor's speed is reduced. 1 minute later, the sensors operate again and if the ratio is within the range in item ④, the speed is reduced still further.

3) End conditions

When operation has continued 6 minutes outside the control range in item ④.

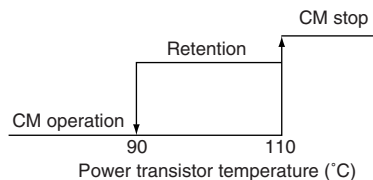
g) Inverter error

1) Current cut control

This control prevents overcurrent conditions at the inverter. The inverter is immediately stopped when the current exceeds the setting value, and is then automatically restarted 3 minutes later. If the current control is activated 4 times within 15 minutes, 52C1 and 52C2 are switched OFF, and an error stop occurs.

2) Power transistor temperature abnormal

- (a) If the temperature sensed by the power transistor temperature thermistor rises to 110°C or higher, the compressor (CM1, 2) is stopped.



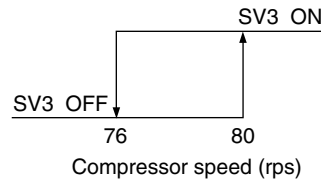
- (b) If the power transistor's temperature is abnormal 5 times within 60 minutes, or if the temperature is 110°C or higher for 15 minutes continuously, including when the compressor is stopped, an abnormal stop is performed.

h) Compressor protection at low frequency

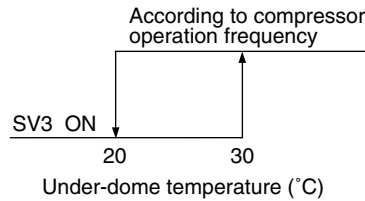
- 1) 30Hz operation is performed for 1 minute when a 29Hz or lower operation has continued for 20 minutes.
- 2) If the high-pressure becomes 3.5MPa or more while controlling in this way, the refrigerant is recovered for 60 seconds.
- 3) If operation of 30Hz cannot continue for 1 minute, by the protection control etc, the compressor is stopped forcibly for about 3 minutes.

3.1.8 Oil separator bypass valve (SV3) control (SV2 is always turning ON while the compressor is operating.)

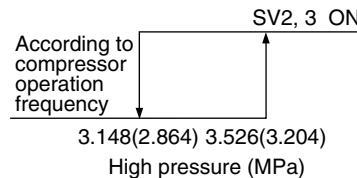
- 1) The oil separator bypass valves (SV3) are controlled in accordance with the compressor speed.



- 2) When the following conditions hold regardless of the compressor rotational speed, SV3 is turned ON.
 a) Temperature detected by the temperature sensor (Tho-C) under the dome is as follows while the compressor is operating.

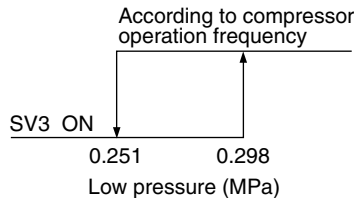


- b) Pressure detected by the high-pressure pressure sensor (PSH) is as follows while the compressor is operating in heating.



Notes (1) Values in () show when SW3-3 is ON.

- c) Pressure detected by the low-pressure pressure sensor (PSL) is as follows while the compressor is operating.



3.1.9 Refrigerant recovery control

- a) When electronic expansion valve (EEVh) for heating is in full opening and either of following requirement is met while the compressor is operating in the heating mode, refrigerant is sequentially recovered from each indoor unit at 30 seconds under the condition of thermostat OFF and ventilation and the stop, and the abnormal stop.
- ① Low-pressure pressure ≤ 0.2 MPa
 - ② Heating level ≥ 30 deg
 - ③ Temperature of discharge pipe ≥ 120 °C
- b) When the compressor is turned OFF when all subject the indoor units for refrigerant recovery has refrigerant recovered or when the refrigerant recovery control is ended.

3.1.10 Abnormal stop due to abnormal compressor start

- a) If the compressor cannot change to the DC motor rotor position detection operation within 5 seconds after compressor start conditions are established, the compressor stops temporarily, then after 3 minutes, performs the position detection operation.
- b) If it cannot change to the position detection-3 operation 20th time, it is judged that a compressor abnormal start condition exists and it is subjected to an abnormal stop (E59).

3.1.11 Compressor abnormal rotor lock

If, after changing to the compressor rotor position detection operation, the rotor position cannot be detected a second time, the compressor is stopped. After 3 minutes, it recovers automatically, but if this occurs 4 times within 15 minutes, the compressor is subjected to an abnormal stop (E60).

3.1.12 Test operation

Test operation can be performed from the outdoor unit using DIP switches SW5-1, 2 on the outdoor unit PCB.

SW5-1	ON	SW5-2	OFF	Test run for heating
			ON	Test run for cooling
	OFF	Normally and after test operation		

Be sure to turn SW5-1 OFF when the test operation is terminated.

3.1.13 Pump down control

Pump down operation can be performed through operation of DIP switches (SW5-1, 2, 3). (Pump down operation cannot be done during indoor unit operation, backup operation or during an abnormal stop.)

- a) Pump down procedure
 - 1) Close the liquid side service valve on the outdoor unit.
 - 2) Turn SW5-2 (test operation operation mode) ON (cooling).
 - 3) Turn SW5-3 (pump down switch) ON.
 - 4) Turn SW5-1 (test operation switch) ON.
- b) Control
 - 1) In the cooling mode, the compressor is started with the target speed set at 60Hz.
About the method of start, please refer to compressor protective start.
 - 2) The red and green (LED's) on the outdoor control PCB flashes together continuously and "PoS" is displayed in the 7-segment display.
 - 3) Except for low pressure control, all the protective and abnormal sensing controls are activated.
 - 4) Test operation commands are sent to the indoor units.
- c) Ending

If any of the following conditions exists, pump down operation ends.

 - 1) If a low pressure (sensed by PSL) of ≤ 0.087 MPa is detected continuously for 5 seconds.
 - (a) The displays are as follows.

■ Red LED: Lights up continuously	■ Green LED: flashing
■ 7-segment LED display: PoE	■ Remote controller: Stop
 - (b) At low pressure > 0.087 MPa, restarting is possible.
 - 2) If operation is stopped by abnormal sensing control.
 - 3) If the cumulative compressor operation time totals 5 minutes.
The displays are as follows.

■ Red LED: stays OFF	■ Green LED: flashing
■ 7-segment LED display: No display	■ Remote controller: Stop
- 4) If any one of DIP switches SW5-1, 2 or 3 is turned OFF during the pump down operation.

3.1.14 Thermistor and pressure sensor disconnection (discharge · suction · outdoor heat exchanger · under-dome, outdoor air, temperature)

- a) Outdoor heat exchanger, outdoor thermistor, pressure sensor

If a temperature of -50°C or lower is sensed by the outdoor heat exchanger thermistor, or -30°C or lower is sensed by the outdoor thermistor for 5 seconds, or the low pressure sensor or high pressure sensor voltage is 0 V or lower or 3.94 V or higher in the interval between 2 minutes and 2 minutes 20 seconds after the compressor goes ON, the compressor is stopped.

After a 3-minute delay, the compressor is restarted, but if this occurs 3 times within 40 minutes, an abnormal stop is performed.

Note (1) No sensing is performed during defrosting or for 3 minutes after defrosting.
- b) Discharge pipe, intake pipe, under-dome temperature thermistor

If the discharge pipe thermistor temperature detects a temperature of 3°C or lower and the suction pipe and under-dome temperature thermistor detects a temperature of -50°C or lower continuously for 5 seconds in the interval between 10 minutes and 10 minutes 20 seconds after the compressor goes ON, the compressor is stopped. After a 3-minute delay, the compressor is restarted, but if the same conditions are detected again 3 times within 40 minutes, an abnormal stop is performed.

Note (1) No sensing is performed during defrosting or for 3 minutes after defrosting.

3.1.15 External input operation and demand input operation

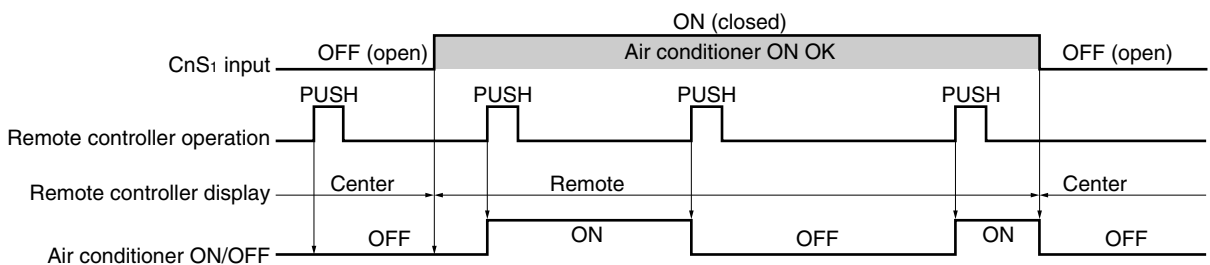
- a) Operation permission / prohibition mode
 - 1) External input: From CnS1 and J13, operation permission/prohibition control
 - J13 : Switches according to CnS1 input method
 - J13 short circuit: Level input by CnS1.
 - J13 open: Pulse input by CnS1.
 - 2) From CnS1, operation permission/prohibition control

Input : CnS1	CnS1 input method change: J13	CnS1 : Operation permission/ Prohibition mode change
	J13; Closed circuit Level input	Operation prohibition mode → Operation permission mode
	J13; Disconnection Pulse input	Operation permission/Prohibition model change (Reversal)
	J13; Closed circuit Lever input	Operation permission mode → Operation prohibition mode
	J13; Disconnection Pulse input	— (NOP)

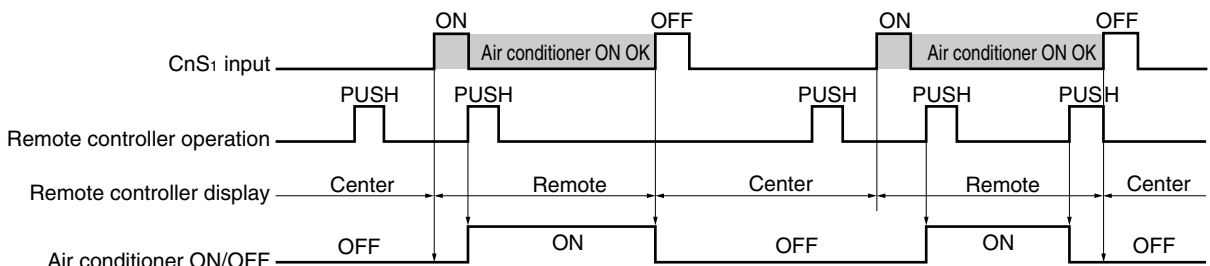
Note (1) The factory settings are : J13-closed circuit; CnS1-closed circuit (closed pin connection).

- 3) The remote controller displays the operation mode. "To Option" sends the operation mode.
- 4) When the control from remote controller is not received by this control, "Center" is displayed. (Refer to the next item.)
- 5) CnS1, performs the following operations by the changing of jumper wire J13 from short circuit to open circuit. If pulse input, the pulse duration is 500 ms or more.

① Operation with J13 short circuit



② Operation with J13 disconnection



- b) Demand control
 - 1) From CnS2 and J13 : Demand control / normal operation switching
 - J13 : Switches according to CnS2 input method
 - J13 closed circuit : level input by CnS2.
 - J13 open : Pulse input by CnS2.

2) From CnS₂, operation permission/prohibition control

Input : CnS ₂	CnS ₂ input method Formula switching: J13	CnS ₂ : Demand control/normal operating switching
	J13; Closed circuit Level input	Demand control →Normal operation
	J13; Open circuit Pulse input	Normal operation/Demand control switching (Reversal)
	J13; Closed circuit Level input	Normal operation →Demand control
	J13; Open circuit Pulse input	— (NOP)

Note (1)The factory settings are: J13 - closed circuit; CnS₂ - closed circuit (closed pin connection)

3) The remote controller displays the operation mode. "To Option" sends the operation mode.

4) Demand control

It is possible to switch the demand using jumper wires J5 and J6.

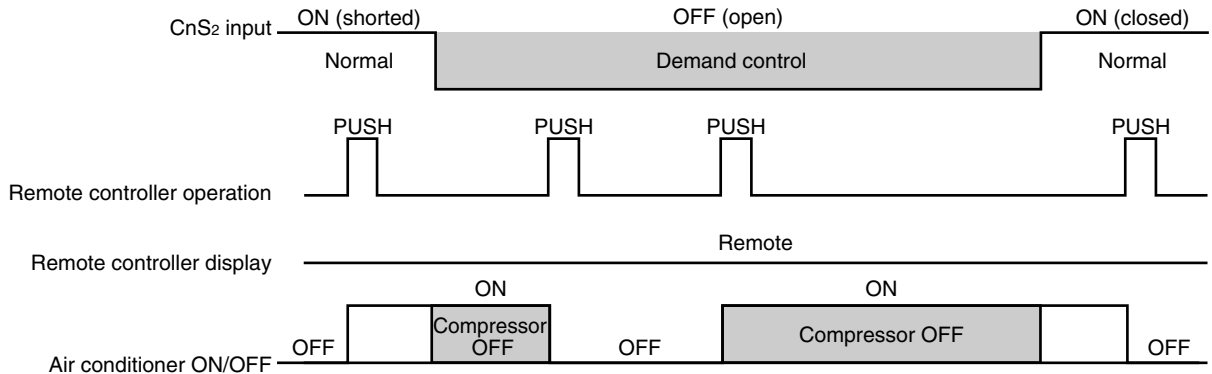
J6	J5	Compressor upper limit frequency	Compressor output (%)
1	1	80	80
1	0	60	60
0	1	40	40
0	0	0	0

Note (1)0: open, 1: shorted

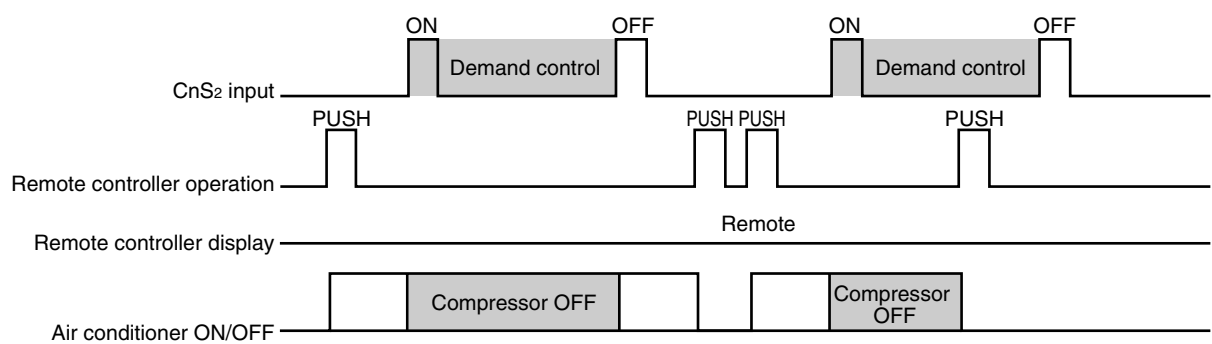
5) CnS₂, performs the following operations by the changing of jumper wire J13 from closed circuit to open circuit.

If pulse input, the pulse duration is 500 ms or more.

① J13 - Closed circuit



② J13 - Open circuit



3.1.16 7-Segment display

The data in the following table can be displayed using the display select switch (SW8: 1's digit; SW9: 10's digit).

Code No.	Contents of display	Data display range	Minimum units	Remarks
—	Unusual code Pump down Check mode Outdoor unit setup	—	—	E?? PoE, PoS CH? OPE??
00	CM1 operating frequency	0~130	1Hz	
01	CM2 operating frequency	0~130	1Hz	
02	Tho-A Outdoor air temp.	L, -20~43	1°C	[L] is indicated when the temperature is -20°C or below and the actual temperature is indicated when it is higher than -20°C and up to 43°C.
03	Tho-R1 Heat exchanger temp. 1 (Exit. Front)	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
04	Tho-R2 Heat exchanger temp. 2 (Exit. Rear)	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
05	Tho-R3 Heat exchanger temp. 3 (Entrance. Front)	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
06	Tho-R4 Heat exchanger temp. 4 (Entrance. Rear)	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
07	Tho-D1 Discharge pipe temp.	L, 31~136	1°C	[L] is indicated when the temperature is 31°C or below and the actual temperature is indicated when it is higher than 31°C and up to 136°C.
08	Tho-D2 Discharge pipe temp.	L, 31~136	1°C	[L] is indicated when the temperature is 31°C or below and the actual temperature is indicated when it is higher than 31°C and up to 136°C.
10	Tho-C1 Under-dome temp.	L, 5~90	1°C	[L] is indicated when the temperature is 5°C or below and the actual temperature is indicated when it is higher than 5°C and up to 80°C.
11	Tho-C2 Under-dome temp.	L, 5~90	1°C	[L] is indicated when the temperature is 5°C or below and the actual temperature is indicated when it is higher than 5°C and up to 80°C.
12	Tho-P1 Power transistor temp.	L, 31~136	1°C	[L] is indicated when the temperature is 31°C or below and the actual temperature is indicated when it is higher than 31°C and up to 136°C.
13	Tho-P2 Power transistor temp.	L, 31~136	1°C	[L] is indicated when the temperature is 31°C or below and the actual temperature is indicated when it is higher than 31°C and up to 136°C.
14	Tho-SC Sub-cooling coil temp.1	L, 18~73	1°C	[L] is indicated when the temperature is 18°C or below and the actual temperature is indicated when it is higher than 18°C and up to 73°C.

Code No.	Contents of display	Data display range	Minimum units	Remarks
15	Tho-SC Sub-cooling coil temp.2	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
16	Tho-S Suction pipe temp.	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
17	Cooling operation super cooling	0~50	0.1°C	
18	Super heate	0~50	0.1°C	
19	Superheat of sub-cooling coil	0~50	0.1°C	
20	CT1 Current	0~70	1A	
21	CT2 Current	0~70	1A	
22	EEVH1 Heating expansion valve opening angle	0~500	1 Pulse	
23	EEVH2 Heating expansion valve opening angle	0~500	1 Pulse	
24	Opening angle of EEVSC overcooling coil expansion valve	0~500	1 Pulse	
26	FM01 Number of rotations	0~1500	10 min ⁻¹	
27	FM02 Number of rotations	0~1500	10 min ⁻¹	
28	PSH High pressure sensor	0~5.00	0.01MPa	
29	PSL Low pressure sensor	0~2.00	0.01MPa	
30	FMC1, 2 Cooling fan Crankcase heater	0,1	—	Order of 100 : FMC1, 2 Order of 10 : CH1 Order of 1 : CH2 (0: OFF, 1: ON)
31	63H1-1 63H1-2	0,1	—	Order of 100 : 63H1-1, 2 Order of 10 : — (0: Close, 1: Open)
32	SV1 SV2	0,1	—	Order of 100 : SV1 Order of 10 : SV2 Order of 1 : — (0: Close, 1: Open)
33	SV6 SV7	0,1	—	Order of 100 : SV6 Order of 10 : SV7 Order of 1 : — (0: Close, 1: Open)
34	20S	0,1	—	Order of 100 : 20S, Order of 10 : — Order of 1 : — (0: close, 1: open)
35	Compressor stop causes ①	0,1	—	Order of 100 : Defective outdoor temperature thermistor Order of 10 : Defective outdoor unit heat exchanger thermistor 1 Order of 1 : Defective outdoor unit heat exchanger thermistor 2 (0:Normal, 1: Anomaly)
36	Compressor stop causes ②	0,1	—	Order of 100 : Defective outdoor unit heat exchanger thermistor 3 Order of 10 : Defective outdoor unit heat exchanger thermistor 4 Order of 1 : Defective discharge pipe thermistor 1 (0:Normal, 1: Anomaly)
37	Compressor stop causes ③	0,1	—	Order of 100 : Defected discharge pipe thermistor 2 Order of 10 : Defective Sub cooling coil thermistor 1 Order of 1 : Defective Sub cooling coil thermistor 2 (0:Normal, 1: Anomaly)
38	Compressor stop causes ④	0,1	—	Order of 100 : Defective suction pipe thermistor Order of 10 : Defective low pressure sensor Order of 1 : Defective high pressure sensor (0:Normal, 1: Anomaly)

Code No.	Contents of display	Data display range	Minimum units	Remarks
39	Compressor stop causes ⑤	0,1	—	Order of 100 : Anomaly in inverter 1 Order of 10 : Anomaly in inverter 2 Order of 1 : Anomaly high pressure (0:Normal, 1: Anomaly)
40	Compressor stop causes ⑥	0,1	—	Order of 100 : Anomalous low pressure Order of 10: Anomalous discharge pipe thermistor 1 Order of 1 : Anomalous discharge pipe thermistor 2 (0:Normal, 1: Anomaly)
41	Compressor stop causes ⑦	0,1	—	Order of 100 : Defect CM1 starting Order of 10 : Defect CM2 starting Order of 1 : Rotor lock CM1 (0:Normal, 1: Anomaly)
42	Compressor stop causes ⑧	0,1	—	Order of 100 : Rotor lock CM2 Order of 10 : CM1 Current cut Order of 1 : CM2 Current cut (0:Normal, 1: Anomaly)
43	Compressor stop causes ⑨	0,1	—	Order of 100 : Power transistor 1 overheating Order of 10 : Power transistor 2 overheating Order of 1 : Anomalies in DC fan1 (0:Normal, 1: Anomaly)
44	Compressor stop causes ⑩	0,1	—	Order of 100 : Anomalies in DC fun2 Order of 10 : Stop command from indoor Order of 1 : Operation mode charge (0:Normal, 1: Anomaly)
45	Compressor stop causes ⑪	0,1	—	Order of 100 : Dilute protection Order of 10 : Demand control 0% Order of 1 : 0 (0:Normal, 1: Anomaly)
46	Control status	0,1	—	Order of 100 : During equal oil control Order of 10: During oil return control Order of 1 : During defrost (0:Non-operation, 1: Operation)
47	Control status	0,1	—	Order of 100 : During Td control Order of 10 : During HP control Order of 1 : During CS control (0:Non-operation, 1: Operation)
48	Control status	0,1	—	Order of 100 : During LP control Order of 10 : During PT control Order of 1 : Under cooling low pressure control (0:Non-operation, 1: Operation)
49	Control status	0,1	—	Order of 100 : Cooling high pressure protection control Order of 10 : Heating high pressure protection control Order of 1 : Heating low pressure protection control (0:Non-operation, 1: Operation)
50	Number of connected indoor unit	0~50	1	
51	Number of operation indoor unit	0~50	1	
52	Required Hz total	0~999	1Hz	
53	Target Fk	0~999	1Hz	
54	Compressor cumulative operating time (CM1)	0~655	100h	
55	Compressor cumulative operating time (CM2)	0~655	100h	
56	Discharge pressure saturation temperature	-50~70	0.1°C	1°C at -10 or lower
57	Air inlet pressure saturation temperature	-50~30	0.1°C	1°C at -10 or lower
58	Target cooling low pressure	0.00~2.00	0.01MPa	

Code No.	Contents of display	Data display range	Minimum units	Remarks
59	Target heating high pressure	1.60~4.15	0.01MPa	
60	Counter · Compressor 2 starting failure	0, 1	—	
61	Counter · Motor lock compressor 2	0~3	—	
62	Power transistor 2 overheating	0~4	—	
63	Inverter 1 operating frequency command	0~130	1Hz	
64	Inverter 2 operating frequency command	0~130	1Hz	
65	Counter · Inverter 2 communications error	0~3	—	
66	Control status	0,1	—	Order of 100 : During silent mode Order of 1 : During test operation (0:Non-operation, 1: Operation)
67	Control status	0,1	—	Order of 100 : Unmatch Order of 10 : Indoor EEV check Order of 1 : — (0:Non-operation, 1: Operation)
68	Control status	0,1	—	Order of 100 : Piping cleaning Order of 10 : Under-dome temperature control Order of 1 : Compression ratio protection control (0:Non-operation, 1: Operation)
70	Operation priority switching	0,1	—	0: Prior press priority (when shipped) 1: After press priority
71	High pressure control of cooling	2.2, 2.5	0.01MPa	2.2: Factory setting 2.5: Alternate setting
72	Low pressure control of cooling	-0.05~+0.05	0.01MPa	0.00: Factory setting
73	Heating high pressure compensation	0.00~0.30	0.01MPa	0.00: Factory setting
74	Low pressure of heating	0.80, 0.90	—	0.8: Factory setting 0.9: Alternate setting
75	Snow protection fan control	0,1	—	0: Snow protection fan control deactivated 1: Snow protection fan control activated
77	Data reset	---, dEL	—	
80	Counter · Thermistor disconnection	0~2	—	
81	Counter · Inverter 1 communications error	0~3	—	
82	Counter · High pressure protection	0~4	—	
83	Counter · Compressor 1 starting failure	0,1	—	
84	Counter · Anomalous low pressure ① (Under stop)	0~4	—	
85	Counter · Anomalous low pressure ② (Immediately after starting)	0,1	—	
86	Counter · Anomalous low pressure ③ (Under operation)	0~4	—	
87	Counter · Motor lock of compressor 1	0~3	—	
88	Counter · Overheating of power transistor 1	0~4	—	
89	Counter · Abnormal temp. of discharge pipe 1	0,1	—	
90	Counter · Abnormal temp. of discharge pipe 2	0,1	—	
91	Counter · Current cut (CM1)	0~3	—	
92	Counter · Current cut (CM2)	0~3	—	
93	Counter · Indoor-outdoor communications error	0~255	—	

Code No.	Contents of display	Data display range	Minimum units	Remarks
94	Counter · Outdoor inverter communications error 2	0~255	—	
95	Counter · CPU reset	0~255	—	
96	Counter · Anomalous FM01	0~255	—	
97	Counter · Anomalous FM02	0~255	—	
98	Program version	—	—	Example (2.11)
99	Auto send display	—	—	

3.1.17 Saving of Operation Data

Operating data for a period of 30 minutes prior to the time when trouble occurs are recorded, and these data can be fetched to a personal computer through the RS232C connector on the control board. Data are updated continuously, and when there is an abnormal stop, data updates stop at that point. Pressing DIP switch SW7 for 5 seconds causes the data to be erased. Data can also be sampled at 1 ~ 60 second intervals during operation and fetched to a personal computer.

Code No.	Write-in contents	Record data					
		Data write-in range	Write-in unit	Number of bytes	Contents		
00	Anomaly code	00~99	—	1	00: No abnormality, outdoor unit all abnormalities ???		
01	Address of unit where trouble occurred	00~FF	—	1	0~3F: Outdoor unit side, 40~6F: Indoor unit side		
02	Operation mode	0~2	—	1	0	Stop	
					1	Cooling	
					2	Heating	
03	High pressure sensor	0.00~5.00	A/D value	1			
04	Low pressure sensor	0.00~2.00	A/D value	1			
05	Heat exchanger temp. 1 (Exit, Front)	-35~75	A/D value	2	Cooling liquid side		
06	Heat exchanger temp. 2 (Exit, Rear)	-35~75	A/D value	2	Cooling liquid side		
07	Heat exchanger temp. 3 (Entrance, Front)	-35~75	A/D value	2	Cooling gas side		
08	Heat exchanger temp. 4 (Entrance, Rear)	-35~75	A/D value	2	Cooling gas side		
09	Tho-D1 Discharge pipe temp.	20~140	A/D value	1			
10	Tho-D2 Discharge pipe temp.	20~140	A/D value	1			
11	Tho-C1 Under-dome temp.	-15~90	A/D value	1			
12	Tho-C2 Under-dome temp.	-15~90	A/D value	1			
13	Tho-A Outdoor air temp.	-20~43	A/D value	1			
14	Tho-P1 Power transistor temp. (Heat dissipation fin)	20~140	A/D value	1			
15	Tho-P2 Power transistor temp. (Heat dissipation fin)	20~140	A/D value	1			
16	Tho-SC Sub cooling coil temp. 1	18~73	A/D value	1	Liquid pipe side		
17	Tho-H Sub cooling coil temp. 2	-35~75	A/D value	2	Suction pipe side		
18	Tho-S Suction pipe temp.	-35~75	A/D value	2			
19	Cooling operation super cooling	0~50	A/D value	1			
20	Super heat	0~50	A/D value	1			
21	Super heat of sub-cooling coil	0~50	A/D value	1			
22	CT1 Current	0~50	A/D value	1			
23	CT2 Current	0~50	A/D value	1			
24	Power source voltage	180~500	A/D value	1			
25	Pressure switch	—	—	1	Bit0	63H1	0: open, 1: close
26	Solenoid valve	—	—	1	Bit0	20S	0:OFF, 1:ON
					Bit2	SV1	0:OFF, 1:ON
					Bit3	SV2	0:OFF, 1:ON
					Bit4	SV6	0:OFF, 1:ON
					Bit5	SV7	0:OFF, 1:ON
27	Crankcase heater etc.	—	—	1	Bit0	CH1	0:OFF, 1:ON
					Bit1	CH2	0:OFF, 1:ON
					Bit2	FM1,2	0:OFF, 1:ON

Code No.	Write-in contents	Record data				
		Data write-in range	Write-in unit	Number of bytes	Contents	
28	FM01 Number of rotations	0~65535	10 min ⁻¹	2		
29	FM02 Number of rotations	0~65535	10 min ⁻¹	2		
30	EEVH1 opening angle	0~65535	1pulse	2		
31	EEVH2 opening angle	0~65535	1pulse	2		
32	EEVSC opening angle	0~65535	1pulse	2		
34	Indoor unit connection number	0~255	1 unit	1		
35	Indoor unit connection capacity	0~65535	—	2		
36	Indoor unit thermostat ON number	0~255	1 unit	1		
37	Indoor unit thermostat ON capacity	0~65535	—	2		
38	Required Hz total	0~65535	1Hz	2		
39	Target FK	0~65535	1Hz	2		
40	Inverter CM1 operation frequency	0~255	1Hz	1		
41	Inverter CM2 operation frequency	0~255	1Hz	1		
42	Answer Hz total	0~65535	1Hz	2		
43	Compressor 1 cumulative operating time (estimate)	0~65535	1 h	2		
44	Compressor 2 cumulative operating time (estimate)	0~65535	1 h	2		
45	Compressor 1 start times	0~65535	20 times	2		
46	Compressor 2 start times	0~65535	20 times	2		
47	Compressor stop causes	—	—	1	Bit0	Defective outdoor temperature thermistor
					Bit1	Defective outdoor unit heat exchanger 1 thermistor
					Bit2	Defective outdoor unit heat exchanger 2 thermistor
					Bit3	Defective outdoor unit heat exchanger 3 thermistor
					Bit4	Defective outdoor unit heat exchanger 4 thermistor
					Bit5	Defective discharge pipe thermistor 1
					Bit6	Defective discharge pipe thermistor 2
					Bit7	Defective sub-cooling coil thermistor 1
48	Compressor stop causes	—	—	1	Bit0	Defective sub-cooling coil thermistor 2
					Bit1	Defective suction pipe thermistor
					Bit2	Defective low pressure sensor
					Bit3	Defective high pressure sensor
					Bit4	Inverter 1 abnormal communication
					Bit5	Inverter 2 abnormal communication
					Bit6	Anomalous high pressure
					Bit7	Anomalous low pressure

Code No.	Write-in contents	Record data				
		Data write-in range	Write-in unit	Number of bytes	Contents	
49	Compressor stop causes	—	—	1	Bit0	Td1 Anomalous discharge pipe temp.
					Bit1	Td2 Anomalous discharge pipe temp.
					Bit2	CM1 starting defect
					Bit3	CM2 starting defect
					Bit4	Rotor lock of CM1
					Bit5	Rotor lock of CM2
					Bit6	Current cut of CM1
					Bit7	Current cut of CM2
50	Compressor stop causes	—	—	1	Bit0	Power transistor 1 overheating
					Bit1	Power transistor 2 overheating
					Bit2	FM01 anomaly
					Bit3	FM02 anomaly
					Bit4	Compressor stop command from indoor unit
					Bit6	Dilution rate protection
					Bit7	Demand control 0%
51	Control status	0~180	1 second	1	CM1 3-minute delay timer	
52	Control status	0~180	1 second	1	CM2 3-minute delay timer	
53	Discharge pressure saturation temperature	-50~70	0.1°C	2		
54	Intake pressure saturation temperature	-50~70	0.1°C	2		
55	Control status oil return	0,1	—	1	0	None
					1	Under control
56	Control status oil return	0~2	—	1	0	None
					1	Waiting for oil return
					2	Under oil return
57	Control status defrost conditions	0~3	—	1	0	None
					1	Temperature conditions
					2	Strengthening temperature conditions
					3	Time conditions
58	Control status defrost status	0~4	—	1	0	None
					1	Defrosting status 1
					2	Defrosting status 2
					3	Defrosting status 3
					4	Defrosting status 4
59	Control status Td	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under Td control
60	Control status	0~1	—	1	Td1 error counter	

Code No.	Write-in contents	Record data			
		Data write-in range	Write-in unit	Number of bytes	Contents
61	Control status	0, 1	—	1	Td2 error counter
62	Control status HP	0~2	—	1	0 None
					1 Frequency down
					2, 3 Under high pressure control
63	Control status	0~1	—	1	HP error (63H1) counter
64	Control status CS	0~2	—	1	0 None
					1 Frequency down
					2, 3 Under CS control
65	Control status LP	0~2	—	1	0 None
					1 Frequency down
					2, 3 Under low pressure control
66	Control status	0~3	—	1	LP error (when stopped) counter
67	Control status	0~4	—	1	LP error (when started) counter
68	Control status	0,1	—	1	LP error (when driving) counter
69	Control status PT	0~2	—	1	0 None
					1 Frequency down
					2, 3 Under PT control
70	Check operation status	—	—	1	Bit0 Unmatch check
					Bit1 Indoor side EEV check
					Bit3 Piping cleaning
71	Control status	0~360	3 minutes	2	CH compressor protection timer
72	Control status CH compressor protective start	0~15	—	1	15 Protective start end
					0~14 During protective start
73	Switch etc.	—	—	1	Bit0 External operation (CnS1) 0: Operation prohibition 1: Operation permission
					Bit1 Demand (CnS2) 0: None 1: Under control
					Bit2 Forced cooling, heating (CnG1) 0: None 1: Under control
					Bit3 Silent mode (CnG2) 0: None 1: Under control
					Bit4 Back up operation 0: None 1: Back up operation
					Bit5 Hz cancel operation 0: None 1: Under control
74	Control status	0~3	—	1	Current cut anomalous counter (INV1)
75	Control status	0~4	—	1	Power transistor overheating abnormality counter (INV1)

Code No.	Write-in contents	Record data				
		Data write-in range	Write-in unit	Number of bytes	Contents	
76	Control status	0~3	—	1	Rotor lock abnormality counter (INV1)	
77	Control status	0~1	—	1	Starting failure counter (INV1)	
78	Control status	0~3	—	1	Communications anomaly counter (INV1)	
79	Control status	0~3	—	1	Current cut anomaly counter (INV2)	
80	Control status	0~4	—	1	Power transistor overheating anomaly counter (INV2)	
81	Control status	0~3	—	1	Rotor lock anomaly counter (INV2)	
82	Control status	0~1	—	1	Starting failure counter (INV2)	
83	Control status	0~3	—	1	Communications anomaly counter (INV2)	
84	Control status	0~1	—	1	DC fan motor 1 error counter	
85	Control status	0~1	—	1	DC fan motor 2 error counter	
86	Control status	0~2	—	1	Thermistor disconnection counter	
87	Control status	0~255	—	1	Communications error counter (INV)	
88	Registered indoor units 1~8 operation mode	0~4	—	8	0	AUTO
					1	DRY
					2	COOL
					3	FAN
					4	HEAT
89	Registered indoor units 1~8 required Hz	0~255	1Hz	8		
90	Registered indoor units 1~8 answer Hz	0~255	1Hz	8		
91	Operation priority switching	0~1	—	1	0	Prior press priority
					1	After press priority
92	High pressure control of cooling	2.20,2.50	0.01MPa	1		
93	Cooling low pressure compensation	-0.05~0.05	0.01MPa	1		
94	Low pressure control of heating	0.80,0.90	0.01MPa	1		
95	Snow protection fan control	0~1	—	1	0	With
					1	None
96	CM1 frequency command	0~130	1Hz	1		
97	CM2 frequency command	0~130	1Hz	1		
98	Target cooling low pressure	0.00~2.00	0.01MPa	1		
99	Control status TC	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under-dome temperature control
100	Target heating high pressure	1.60~4.15	0.01MPa	2		
101	Heating high pressure compensation	0.00~0.30	0.01MPa	1		
102	Control / status SCR	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under compression ratio protection control

3.2 Standard Multi-Unit FDCA224, 280, 335HKXE4

3.2.1 Operations of major functional items under each operation mode

Functional item \ Operation mode	Cooling		Fan	Heating			Dehumidify
	Thermostat ON	Thermostat OFF		Thermostat ON	Thermostat OFF	Defrost	
Indoor unit fan	Remote controller command	Remote controller command	Remote controller command	Remote controller command	Intermittent operation	○ → ×	○ / ×
Indoor unit electronic expansion valve	Superheat control	Fully closed	Fully closed	Superheat control	60 pulse	Model-specific aperture opening angle	Superheat Control
Compressor [CM1]	○	×	×	○	×	○	○ / ×
Magnetic contactor CM1 [52C1]	○	○	× / ○	○	○	○	○
Outdoor unit fan [FMo-1]	○ / ×	×	× / ○	○ / ×	×	○ → ×	○ / ×
Outdoor unit fan [FMo-2]	○	×	× / ○	○	×	○ → ×	○ / ×
4 way valve [20S]	×	×	×	○	○	○ → ×	×
Inverter cooling fan [FMC1]	○ / ×	○ / ×	×	○ / ×	○ / ×	○ / ×	○ / ×
Electronic expansion valve for heating [EEVH1, 2]	Fully open	Fully open	*1	Opening Angle Control	*1	Opening Angle Control	Fully open
Electronic expansion valve for sub-cooling [EEVSC]	Opening Angle Control	Fully closed	Fully closed	Opening Angle Control	Fully closed	Fully closed	Opening Angle Control
Solenoid valve [SV1]	○ / ×	×	×	○ / ×	×	○ / ×	○ / ×
Solenoid valve [SV6]	○ / ×	×	×	○ / ×	×	○ / ×	○ / ×
Crankcase heater [CH1]	○ / ×	○ / ×	○ / ×	○ / ×	○ / ×	○ / ×	○ / ×

Notes (1) ○ : ON, × : OFF, ○/× : ON or OFF

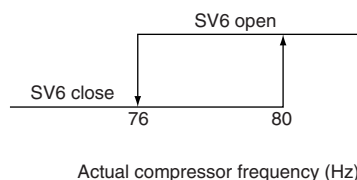
(2) *marks indicate fully open when stopped after cooling begins, and fully closed when the opening angle is other than the specified opening angle through low pressure protective control when stopped after heating begins.

■ Frequency bands for outdoor unit models

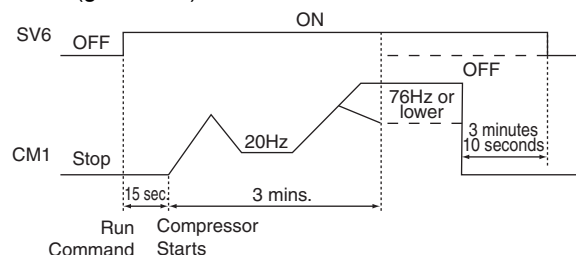
Item \ Models	FDCA224HKXE4	FDCA280HKXE4
	Total operation frequency of compressor	28 ~ 146

3.2.2 Oil separator solenoid valve (SV6) control

- a) If the inverter compressor starts, solenoid valve SV6 opens (goes ON), then 15 seconds later, it starts.
- b) SV6 stays open (ON) for 3 minutes, until 4-way valve switching assurance and compressor protective start are completed.
- c) If the compressor operating frequency becomes 80Hz or higher, SV6 opens (goes ON) and it goes off if the frequency is 76Hz or lower.



- d) If the inverter compressor goes off after SV6 opens (goes ON), SV6 remains open (ON) for 3 minutes and 10 seconds, then closes (goes OFF).



3.2.3 Control of increasing and decreasing of compressor frequency

- a) When rising, the frequency change rate is 2Hz/sec while increasing, and when descending, the frequency change rate is 1Hz/sec while decreasing. The frequency change makes the inverter function. When the frequency is fixed to 0Hz, it stops at once.
- b) The operating frequency of the inverter compressor is fixed between 20~120Hz.

3.2.4 Outdoor fan control

- a) DC fan motor control

The outdoor fan tap has 0 speed to 4nd speed assigned as the regular speed depending on the model and operation mode. Under normal operation, 1st speed and 4nd speed is used, and in each outdoor fan control, control is stepless between 1st speed and 4nd speed.

- b) Outdoor fan tap

Unit: min^{-1}

Fan tap	FDCA224, 280HKXE4				FDCA335HKXE4				Remarks
	Cooling		Heating		Cooling		Heating		
	FMo 1	FMo 2	FMo 1	FMo 2	FMo 1	FMo 2	FMo 1	FMo 2	
1th speed	0	160	0	160	0	160	0	160	1-unit operation min. speed
2th speed	0	400	0	400	0	400	0	400	1-unit operation max. speed
3th speed	160	160	160	160	160	160	160	160	2-unit operation min. speed
4th speed	835	835	835	835	1060	1060	1060	1060	2-unit operation max. speed

- c) When operation is starting, operation is at 4nd speed.
- d) Judgment of whether or not to start the DC fan motor
If the outdoor fan starts after stopping, the fan speed is checked and start control is performed.
 - 1) Fan rotational speed is reversed while the unit is stopping, and fan motor (Both FMo1 and 2) doesn't start if either FMo1 or 2 rotates at over 700min^{-1} .
 - 2) If the unit is stopped (free-running state) and the fan speed is in reverse, either FMo1 or FMo2 is 700min^{-1} or higher, it is not started, and if both FMo1 and FMo2 is under 700min^{-1} for 3 seconds, it is started.
 - 3) The compressor is started regardless of the state of the outdoor fan, and the above contents are sensed 5 seconds or more after the time that 52C1 goes ON.

3.2.5 4-way valve switching assurance

The start of the inverter compressor does the following operation regardless of the decided frequency.

- a) 0-20Hz Operation

It operates in the range of 0 – 20Hz. However, in this operation, the compressor cannot be operated with the current safe, high pressure controls, low pressure controls, power transistor temp. controls, discharge temp. control, unde-dome temp. control or compression ratio protection controls.

- b) 20-40Hz (48) Operation

Maximum frequency is determined based on the temperature detected with the outdoor air temperature thermistor (Tho-A).

- 1) If the temperature is 0°C or lower, after starting with 48Hz as the maximum frequency, it stops at 48Hz.
- 2) If the temperature is higher than 0°C , after starting with 40Hz as the maximum frequency, it stops at 40Hz.
However, if the starting conditions for current safe, high pressure controls, low pressure controls, power transistor temp. controls, discharge temp. controls or compression ratio protection controls are satisfied during this time, this control ends and control according to current safe, high pressure controls, low pressure controls, power transistor temp. controls, discharge temp. controls, under-dome temp. control or compression ratio protection controls commences, and if the compressor's frequency is determined and cancelled, operation returns to normal operation.

3.2.6 Compressor protective start

After 4-way valve switching assurance is completed, the following compressor protection begins.

		Initial Start (Remote controller ON error cancel)	Thermostat ON start	
			Operation Mode Changed While Thermostat Was OFF	Operation Mode Unchanged While Thermostat Was OFF
Compress or ON count: 1st time	Less than 45 minutes after power ON	Compressor protective start B according to crankcase heater's power ON time	Compressor protective start B according to crankcase heater's power ON time	Compressor protective start B according to crankcase heater's power ON time
	45 minutes or more after power ON	Compressor protective start A according to crankcase heater's power ON time	Compressor protective start A according to crankcase heater's power ON time	Compressor protective start A according to crankcase heater's power ON time
Compress or ON count: From 2nd time	Less than 45 minutes after stop	Protective start	Protective start	Protective start
	45 minutes or more after stop	Compressor protective start A according to crankcase heater's power ON time	Compressor protective start A according to crankcase heater's power ON time	Compressor protective start A according to crankcase heater's power ON time

- a) Compressor protective start

The compressor's speed is controlled as follows, regardless of the target frequency.

 - 1) Operation occurs at 20Hz for a 1 minute 45 second period following a compressor start.
 - 2) Operation occurs in accordance with pressure control after the post-start 1 minute 45 second period.
- b) Compressor protective start sequence "A" according to crankcase heater power ON time

The cumulative power ON time from power ON is calculated, and compressor protective start sequence "A" control occurs at the 1st compressor start after a 45-minute period, and at all subsequent compressor starts that follow a power ON after a compressor stop of 45 minutes or longer.

 - 1) The inverter is set to 20Hz following 4-way valve switching assurance. The target frequency is then established 1 minute after a 1-minute period has elapsed since the frequency reduction to 20Hz was reached.
 - 2) During a 15-minute period following the start, the 20Hz frequency is increased at a rate of 5Hz per minute, and the start of the 15-minute period becomes the inverter's start completion point (10Hz).
 - 3) If the inverter is stopped within a 15-minute period after a compressor start, this control increases the frequency 5Hz per minute for 15 minutes when the compressor starts again.
- c) Compressor protective start sequence "B" according to crankcase heater power ON time

The cumulative power ON time from power ON is calculated, and compressor protective start sequence "B" control occurs at the 1st compressor power start within a 45-minute period.

 - 1) The inverter is set to 20Hz following 4-way valve switching assurance. The target frequency is then established 1 minute after a 1-minute period has elapsed since the frequency reduction to 20Hz was reached.
 - 2) During a 18-minute period following the start, the 20Hz frequency is increased at a rate of 5Hz per minute, and the start of the 18-minute period becomes the inverter's start completion point (10Hz).
 - 3) The frequency is increased 5Hz per minute through the 18-minute to 24-minute period, and this control ends when 24 minutes is reached.
 - 4) After this control ends 1 time, the system reverts to protective start "A" control from the 2nd time, or after 45 minutes have elapsed.
 - 5) If the inverter is stopped for 24 minutes following a compressor start, a protective start is performed when started again, and protective start sequence "B" control increases the frequency for a period of 24 minutes. However, the system reverts to protective start sequence "A" control when started again if 45 minutes or more have elapsed since the inverter stop.

3.2.7 Crankcase heater control

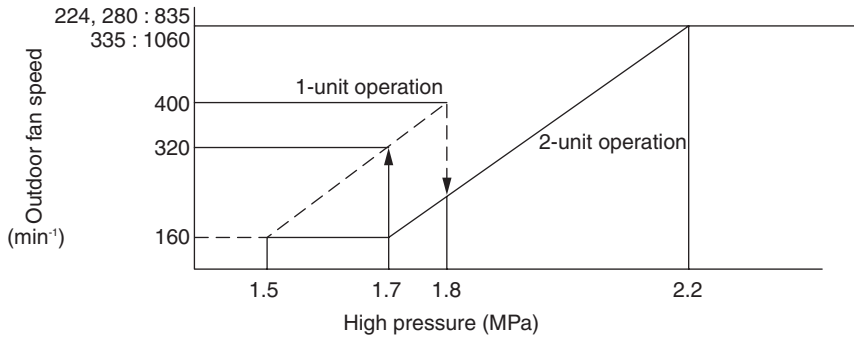
The crankcase heater (CH1) is switched OFF and ON in accordance with the under-dome temperature thermistor (Tho-C1).

- a) Under-dome temperature thermistor (Tho-C1) \leq low-pressure sensor (LPS) detected pressure saturation temperature ($^{\circ}\text{C}$) + 20 $^{\circ}\text{C}$ \Rightarrow crankcase heater (CH1) ON.
- b) Under-dome temperature thermistor (Tho-C1) \geq low-pressure sensor (LPS) detected pressure saturation temperature ($^{\circ}\text{C}$) + 25 $^{\circ}\text{C}$ \Rightarrow crankcase heater (CH1) OFF.
- c) Under-dome temperature thermistor (Tho-C1 \leq -40 $^{\circ}\text{C}$ or less, and compressor (CM1) is running. \Rightarrow crankcase heater (CH1) OFF.

3.2.8 Cooling high pressure control

High pressure is controlled by the outdoor fan speed during cooling and dehumidifying operations, and this control is activated when the high pressure is less than 2.20MPa at 1 minute 45 seconds after a compressor protective start completion. Moreover, the outdoor fan speed is determined by the high pressure level, and outdoor fans are switched between 2-unit operation and 1-unit operation accordingly.

High level side setting pressure (HPH)	Pressure classification	2-unit operation	1-unit operation
2.2	Low level side high pressure (HPL1)	1.7	1.5
	High level side high pressure (HPH1)	2.2	1.8



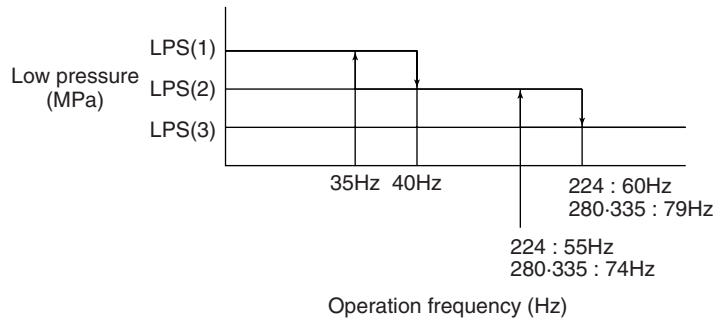
Control termination conditions

- 1) When a mode other than cooling or dehumidifying is selected.
- 2) When compressor stops
- 3) When high pressure is 2.20MPa or more

3.2.9 Cooling low pressure control

During cooling and dehumidifying operations, a constant low pressure is maintained by compressor frequency control.

- a) Compressor frequency control occurs as shown below, 1 minute 45 seconds after the completion of a compressor protective start.



Unit : MPa

Model	LPS(1)	LPS(2)	LPS(3)
224	0.80	0.75	0.70
280	0.82	0.77	0.73
335	0.82	0.79	0.76

- b) Control termination conditions

- 1) When a mode other than cooling or dehumidifying is selected.
- 2) When the compressor stops.

3.2.10 Heating high pressure control

During heating operation, a constant high pressure is maintained by compressor frequency control.

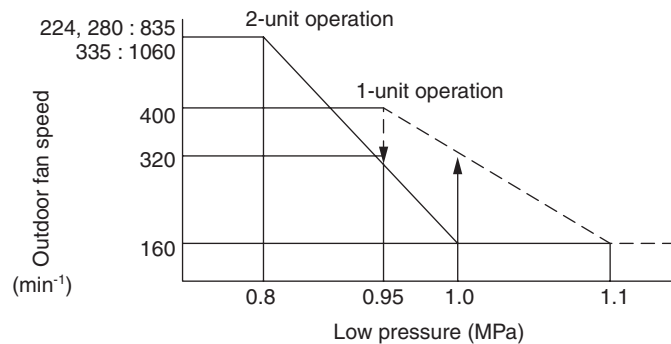
- a) Control activation condition
1 minute 45 seconds have elapsed since the completion of a compressor protective start.
- b) Control description
The compressor frequency is controlled to maintain a high pressure of 2.75MPa.

- c) Control termination conditions
 - 1) When a mode other than heating is selected.
 - 2) When the compressor stops.

3.2.11 Heating low pressure control

Low pressure is controlled by the outdoor fan speed during heating operation, and this control is activated when the low pressure is 0.80MPa or higher at 1 minute 45 seconds after a compressor protective start completion. Moreover, the outdoor fan speed is determined by the low pressure level, and outdoor fans are switched between 2-unit operation and 1-unit operation accordingly.

Low level side setting pressure (LPL)	Pressure classification	2-unit operation	1-unit operation
0.8	Low level side high pressure (LPL1)	0.80	0.95
	High level side high pressure (LPH1)	1.00	1.10



- Control termination conditions
- 1) When a mode other than heating is selected.
 - 2) When the compressor stops.

3.2.12 Sub cooling coil control

- a) Control activation condition

Control is activated 6 seconds after a compressor start occurs during cooling and dehumidifying operations.
- b) Control description
 - 1) The specified sub cooling coil outlet superheat is maintained by controlling the sub cooling coil's electronic expansion valve.
 - 2) Sub cooling coil superheat feed-forward control

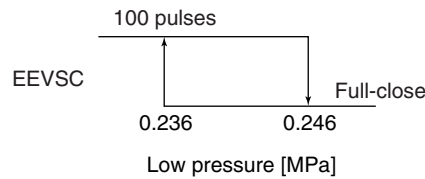
(Applied when a sudden change occurs in the compressor frequency)

 - (a) The sub cooling coil's expansion valve (EEVSC) closes at a rate of -4 pulses/sec. if the superheat control value (SHS) reaches 5°C or lower.
 - (b) Superheat PI control is resumed when the superheat control value (SHS) subsequently returns to 8°C or higher.
- c) Control termination conditions
 - 1) When a mode other than heating is selected.
 - 2) When the compressor stops.
- d) Changing the sub cooling coil's target superheat level
 - 1) Control activation conditions

Control occurs when all the following conditions are satisfied.

 - (a) When 10 minutes are more have elapsed since the compressor start.
 - (b) When the high pressure (HP) is 1.1MPa or lower.
 - 2) Control description
 - (a) The sub cooling coil outlet's target temperature (SHC) is changed to 5.0°C .
 - (b) The cooling coil's expansion valve (EEVSC) closes at a rate of -4 pulses/sec. if the superheat control value (SHS) reaches 3°C or lower.
 - (c) Superheat PI control is resumed when the superheat control value (SHS) subsequently returns to 4°C or higher.
 - 3) Control termination conditions
 - (a) When the compressor stops.
 - (b) When the target low pressure (LPS) reaches 0.246MPa or higher.

- e) When the control termination conditions are satisfied, the following sub cooling coil's expansion valve (EEVSC) apertures are adopted :
- 100 pulses if the low pressure (LPS) is less than 0.236MPa when stopped. Full-open (0 pulse) at all other times. If the low pressure (LPS) subsequently reaches 0.246MPa or higher when stopped, the sub cooling coil's expansion valve (EEVSC) is fully closed.



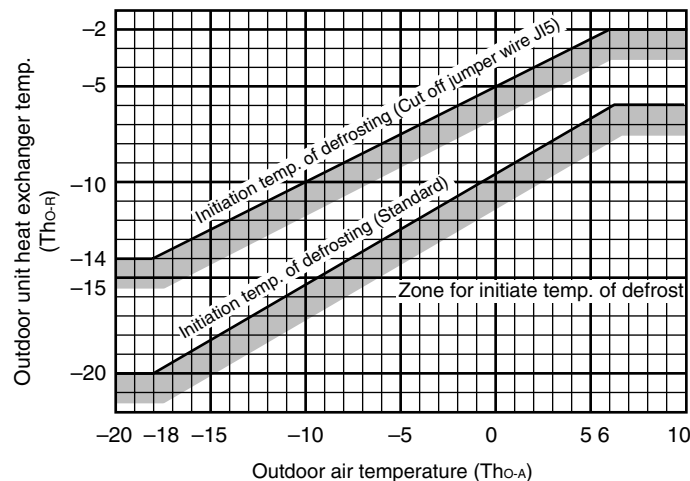
3.2.13 Defrosting

1) Temperature condition defrosting

a) Conditions for starting defrosting

When all the following conditions are met, the defrosting operation will start.

- (1) The cumulative operating time of the compressor comes up to 33 minutes after completion of a defrosting operation, or it comes up to 33 minutes after a heating operation starts (the remote controller is turned on).
- (2) If 8 minutes have passed after the compressor goes ON after it has gone OFF.
- (3) If 8 minutes have passed after one outdoor unit fan goes ON after all outdoor fans have gone OFF.
- (4) After all the above conditions are satisfied, when the temperature at the outdoor heat exchanger thermistor (Tho-R) and outdoor temperature thermistor is below the defrost initiation temperature in the above graph continuously for 3 minutes.



b) Conditions for finishing defrosting

■ Standard (J14: closed circuit)

- (1) When the increase of the temperature of the heat exchanger thermistor (Tho-R1 or Tho-R2) is greater than 9°C.
- (2) When 12 minutes have passed since defrosting started.

■ With operation Judgment Function (J14: Open)

- (1) If Tho-R1 and R2 are $\geq 9^\circ\text{C}$, after 2 minutes and 30 seconds have passed since defrosting started, if either of the following conditions is satisfied, the defrosting end operation starts.
 - (a) 2 minutes and 30 seconds have passed since the temperature sensed by either Tho-R1 or Tho-R2 is 14°C or higher.
 - (b) The temperature sensed by either Tho-R1 or Tho-R2 is 30°C or higher.
 - (c) 14 minutes have passed since the start of defrosting.
- (2) If Tho-R1 or R2 are $< 9^\circ\text{C}$ after 2 minutes and 30 seconds have passed since defrosting started, if either of the following conditions is satisfied, the defrosting end operation starts.
 - (a) 5 minutes have passed since the temperature sensed by either Tho-R1 or Tho-R2 is 14°C or higher.
 - (b) The temperature sensed by either Tho-R1 or Tho-R2 is 30°C or higher.
 - (c) 14 minutes have passed since the start of defrosting.

2) Time condition defrosting (oil return)

a) Defrosting start conditions

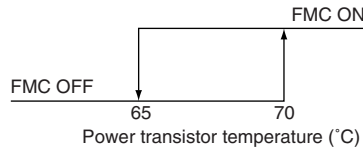
- (1) Defrosting starts when the heating mode is in effect at the 1st compressor start following a power ON,

and when the heating mode is in effect after 2 hours of cumulative operation time. However, if mode switching from cooling to heating occurred, defrosting starts 33 minutes after CM1 operation begins.

- (2) If there was 5 minutes or more of temperature condition defrosting before time condition defrosting, the 10-hour timer for time condition defrosting is reset.
 - (3) The "time condition defrosting" time is the point when the detected oil rise amount reaches the setting value (following 2 hours of cumulative compressor operation time counting from the 1st compressor start after power ON), or the point when 10 hours elapse, whichever comes first.
 - (4) When the 10-hour timer period elapses, time condition defrosting occurs at the completion of the previous temperature condition defrosting operation, or after 33 minutes, whichever comes first.
- b) Defrosting end conditions
 If either of the following conditions is satisfied, the defrosting end operation starts.
- (1) If defrosting continues for 5 minutes and the temperature sensed by Tho-R1 and Tho-R2 becomes 9°C or higher.
 - (2) If 12 minutes has passed since defrosting started.
 - (3) When the compressor inlet superheating level becomes 20°C or less (OFF) in 1 minute after switching the four ways valve (Even if five minutes is not passed end).

3.2.14 Inverter cooling fan control

- a) Inverter power transistor temperature rises are controlled by the cooling fan (FMC) in accordance with the temperature sensed by the power transistor temperature thermistor (Tho-P) after the inverter starts.



- b) A cooling fan ON status is maintained for 3 minutes 10 seconds if the cooling fan (FMC) is ON when the compressor is switched from ON to OFF.

3.2.15 Unit protective maintenance related devices

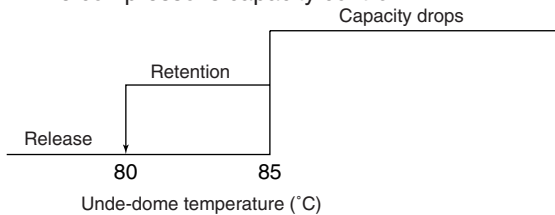
- a) Test operation mode
 Outdoor unit test operation mode operation is started by the DIP switches SW5-1 and 5-2 on the outdoor unit control board.
 Switch functions

SW5-1	ON	SW5-2	OFF	Heating Test Operation
			ON	Cooling Test Operation
	OFF	Normal or Test Operation End		

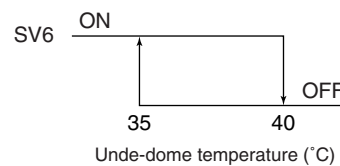
Note (1) This operation takes priority over other options such as the center console. It sets the options in the operating state.

- b) Compressor protection at low frequency
 If operation of 29Hz or less is continued for 20 minutes, it operates at 30Hz for 1 minute.
- c) Under-dome temperature control
 The compressor's capacity, the oil separator solenoid valve (SV6, 7) and the cooling solenoid (SV1) are controlled in accordance with the temperature at the under-dome thermistor (Tho-C) installed on the compressor.

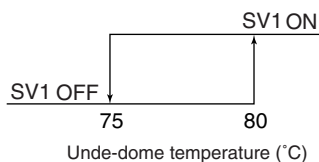
■ The compressor's capacity control



■ The oil separator solenoid valve(SV6) control



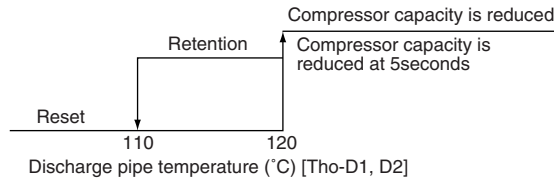
■ The cooling solenoid Valve(SV1)control



d) Discharge pipe temperature control

If the discharge pipe temperature (sensed by Tho-D1, D2) exceeds the set value, the compressor cooling solenoid valve (SV1, 2) goes ON, the indoor expansion valve opens and the compressor's capacity is controlled, thus suppressing rises in the discharge pipe temperature. If the temperature rises even further, the compressor stops.

1) Compressor control

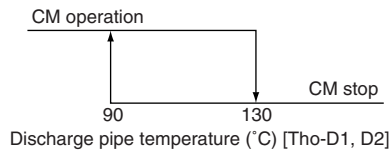


2) Compressor Cooling Solenoid Valve (SV1, 2) Control



3) Discharge pipe temperature error

- When the discharge pipe temperatures (Tho-D1, D2 detection) rise beyond 130°C and is maintained for 2 seconds, the compressors are stopped but it will be reset if the temperatures drop below 90°C.



- If a discharge pipe temperature (Tho-D1, D2 detection) error occurs 2 times within 60 minutes, an abnormal stop is performed.

Note (1) Unless the temperature of 90 °C or under is maintained for 45 minutes after the discharge pipe error, the unit cannot be started again. (Reset the power supply to clear.)

e) Current safe control

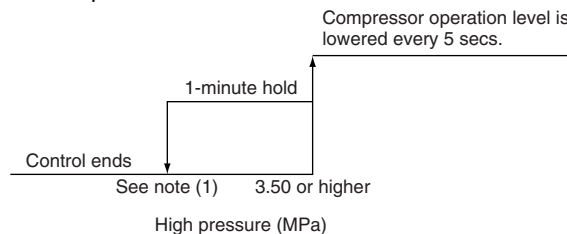
- The compressor speed is reduced if the inverter inlet's input current (converter inlet L3-phase) exceeds the setting value. If the setting value is still exceeded after the speed reduction, the speed is reduced again.
- This control ends when the input current drops below the setting value for a continuous period of 3 minutes, and the speed protection cancel operation begins.

f) High pressure protective control

During cooling and heating operations, high pressure is detected by the high pressure sensor (PSH), and the compressor the oil separator solenoid valve (SV6) and outdoor fan are controlled to prevent the pressure from rising.

1) Cooling

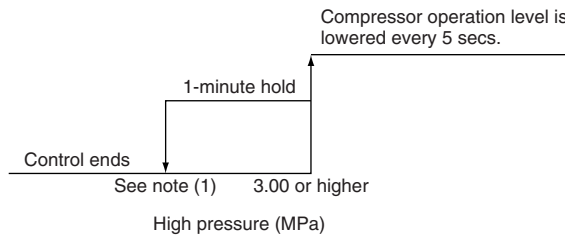
High pressure based compressor control



Note (1) High pressure of less than 3.50MPa continues for 1 minute

2) Heating

(a) High pressure based fan speed control



Note (1) High pressure of less than 3.00MPa continues for 1 minute

(b) High pressure based fan speed control

(1) Control activation conditions

When a high pressure of 3.0MPa or higher occurs 1 minute 45 seconds after a compressor protective start completion.

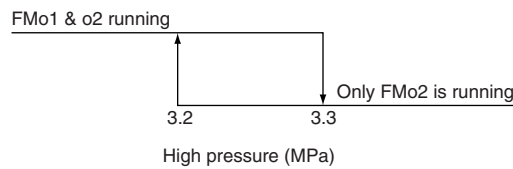
(2) Control description

① The fan speed is kept within a 160~835 (1060) min⁻¹ range.

Both fan motors (FMo1 & 2) run at the same speed.

Note (1) Values shown in parentheses apply to the FDCA335 model.

② The FMo1 fan motor (right side) stops if the high pressure exceeds the value shown below.



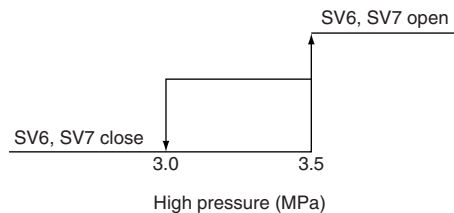
(3) Control termination conditions

① When a mode other than heating is selected.

② When the compressor stops.

③ When the high pressure becomes less than 3.0MPa.

3) Solenoid valves SV6 & SV7 open (ON) when the high pressure reaches 3.5MPa or higher.



g) Current cut control

This control prevents overcurrent conditions at the inverter. The inverter is immediately stopped when the current exceeds the setting value, and is then automatically restarted 3 minutes later. If the current control is activated 4 times within 15 minutes, 52C1 and 52C2 are switched OFF, and an error stop occurs.

h) Anomalous high pressure increase protection

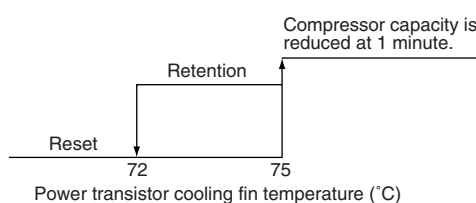
If the high pressure side pressure switch [63H1-1 : 3.80 Open / 2.90 Closed MPa] operates 5 times within 60 minutes, an anomalous stop is performed.

However, when first operated, the compressor is stopped, then after a 3-minute delay, normal operation is resumed.

i) Power transistor temperature control

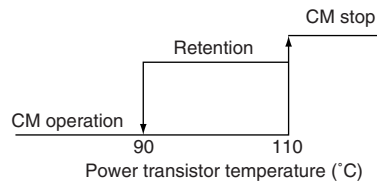
If the temperature of the power transistor cooling fins (sensed by Tho-P) exceeds the set value, the compressor's capacity is controlled to keep the power transistor's temperature from rising. If it rises still higher, the compressor is stopped.

1) Compressor control



2) Power transistor temperature abnormal

- (a) If the temperature sensed by the power transistor temperature thermistor rises to 110°C or higher, the compressor (CM1, 2) is stopped.

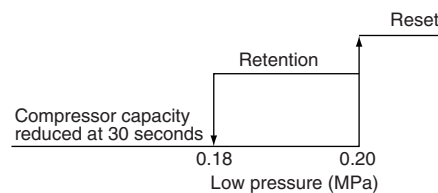


- (b) If the power transistor's temperature is abnormal 5 times within 60 minutes, or if the temperature is 110°C or higher for 15 minutes continuously, including when the compressor is stopped, an anomalous stop is performed.

j) Low pressure protective control

If the low pressure (sensed by PSL) drops below the set value, the compressor's capacity is controlled to prevent the low level pressure from dropping. If it drops still further, the compressor is stopped.

1) Compressor control

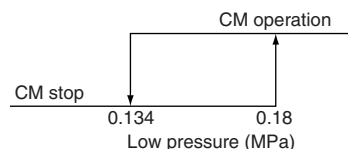


Note(1) Starting Conditions

- Later than 1 minute 45 seconds after compressor operation starts
- Sensed continuously for 10 seconds

2) Low pressure anomaly

- If the low pressure (sensed by PSL) drops to 0.134 MPa or lower continuously for 30 seconds, the compressor is stopped and if a pressure of 0.18 MPa or higher is detected continuously for 10 seconds, the compressor is automatically reset. If this occurs 5 times within 60 minutes, an anomalous stop is performed.



- A low pressure (sensed by PSL) of 0.18 MPa or lower while the compressor is stopped, or sensed continuously for 30 seconds while the compressor is operating, compressor operation is prohibited. If this occurs 5 times within 60 minutes, an abnormal stop is performed. It is possible to reset the system only by turning the power off, then turning it on again.
- First cooling operation after the power is turned on
If a low pressure of 0.003 MPa or lower is detected continuously for 60 seconds after 4-way valve switching assurance, the compressor is stopped, and if a low pressure of 0.18 MPa or higher is detected continuously for 10 seconds, the compressor is restarted automatically, but if an abnormal pressure is detected again, an abnormal stop is performed. It is possible to reset the system only by turning the power off, then turning it on again.

k) Outdoor fan motor (DC) anomaly protection

1) DC fan speed down control

(a) Control description

- (1) If an error status exists, the commanded speed is reduced by 100min^{-1} , and a start condition check then occurs every 10 seconds.
- (2) If an error status is still detected at each check, the item a) operation above is repeated. If the higher of the FMo1 and FMo2 commanded speeds drops to 400min^{-1} or less, the 100min^{-1} speed reduction no longer occurs.
- (3) If an error is not detected for a period of 60 continuous seconds, the speed is increased 100min^{-1} every 60 seconds until the target speed is reached. The 100min^{-1} correction is stopped, however, if the higher of the FMo1 and FMo2 commanded speeds is 400min^{-1} or less.

(b) Control termination conditions

- (1) When the fan speed is less than 400min^{-1} before being corrected.
- (2) When the amount of speed reduction correction that occurred is recovered.

2) DC fan overcurrent error detection

- (a) DC fan1 error detection
 - An error occurs when any one of the following occurs.
 - (1) When 52C1 is ON, and the FMo1 commanded speed $\leq 400\text{min}^{-1}$, and an overcurrent error status has been detected at DC fan1 for 10 continuous seconds.
 - (2) When an FMo1 actual speed of 100min^{-1} or less has continued for 30 seconds following an "FMo1 commanded speed $> 0\text{min}^{-1}$ " status that continued for 60 seconds. (Fan motor lock detection)
- (b) DC fan2 error detection
 - An error occurs when any one of the following occurs.
 - (1) When 52C1 is ON, and the FMo2 commanded speed $\leq 400\text{min}^{-1}$, and an overcurrent error status has been detected at DC fan2 for 10 continuous seconds.
 - (2) When an FMo2 actual speed of 100min^{-1} or less has continued for 30 seconds following an "FMo2 commanded speed $> 0\text{min}^{-1}$ " status that continued for 60 seconds. (Fan motor lock detection)
 - (3) If an item (ii) 1) or 2) error is detected, all outdoor units are stopped, and are then automatically restarted after 3 minutes.
 - (4) An error stop occurs if an item (ii) a) or b) error occurs 5 times in 1 hour at any of the units.
 - (5) A power supply reset is required to recover from an error stop.
 - (6) An error stop occurs if a fan speed error occurs within 45 minutes following power ON.
 - (7) When a stop occurs due to an error detection, both 52C1 and 52C2 are switched OFF.

3.2.16 Silent mode control

- a) If the silent mode start signal is received from an indoor unit or CnG2 (with short pin) is shorted, if the outdoor temperature is within the following range, operation is performed in the silent mode.
 - Cooling
 - Heating



- b) Outdoor fan maximum speed & maximum compressor operation frequency (excluding the 30-second period after a start, and defrost operations)

Model \ Item	Fan maximum speed	Maximum compressor operation frequency
FDCA224HKXE4	400min^{-1}	58Hz
FDCA280HKXE4	400min^{-1}	76Hz
FDCA335HKXE4	500min^{-1}	79Hz

3.2.17 Oil return control

When in the cooling or dehumidifying mode, this control occurs every 10 hours (after an initial 2 hours of cumulative compressor operation time counting from the 1st compressor start after power ON), or when the oil rise amount reaches the setting value.

Note (1) The operation time count begins at the point when heating-to-cooling switching occurs.

- a) Control description
 - 1) Oil return control occurs with units where the thermostat is OFF, with units that are in fan operation, and with units at stop and emergency stop.
 - 2) The oil return operation frequencies are shown below.

Model \ Item	Frequency (Hz)
FDCA224HKXE4	76Hz
FDCA280HKXE4 335HKXE4	100Hz

- 3) The sub cooling electronic expansion valve (EEVSC) closes fully.
 - Note(1) Refrigerant low-pressure control is disabled during oil return control.
- b) Control termination conditions
 - 1) When 5 minutes have elapsed since the compressor reached the oil return operation frequency.
 - 2) When, 60 seconds after all compressors reached the oil return operation frequency, the compressor suction superheat SH was 4°C or less for 10 continuous seconds.

3.2.18 Forced heating/cooling operation

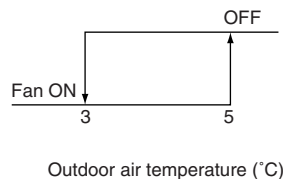
With this control, SW3-7 on the outdoor unit PCB is turned on and CnG1 (equipped with short circuit pin) is shorted or opened so as to forcibly determine whether the indoor unit is operated for cooling or heating. If any operation mode other than the forcible mode is commanded from the indoor unit, the mode unmatched message is displayed on the remote controller or others and the operation enters in the blowing mode.

SW3-7	CnG1	Operation
OFF	Open/short	Normal operation
ON	Open	Cooling
	Short	Heating

Note (1)SW-7 is at OFF and CnG1 is open at the shipping from factory.

3.2.19 Snow protection fan control

- a) This control is enabled/disabled by the selector switch at the 7-segment display.
 - ① Set the Code No. to "75".
 - ② "0" or "1" displays at the data display area.
 - 0: Outdoor fan control disabled (factory setting)
 - 1: Outdoor fan control enabled
 - ③ Press SW7 continuously for 3 seconds.
 - ④ "0" or "1" blinks every 0.5 seconds at the data display area.
 - ⑤ Press SW8 to toggle between the blinking "0" and "1" displays.
 - ⑥ If SW7 is pressed for 3 seconds or longer while "0" and "1" is blinking, the blinking stops, and that enabled/disabled setting is registered. If enabled, fan control occurs as described below.
 - ⑦ Outdoor fan control occurs in accordance with the information stored in memory, even if the power is turned OFF and back ON again.
- b) Control description
 - 1) If the outside temperature drops to 3°C or lower when all units are stopped, or during an error stop, the outdoor fan runs at level 4 speed once every 10 minutes.



- 2) The outdoor fan runs for 30 seconds.
- 3) During this snow protection control, the compressor's magnetic contactor (52C1) is ON.

3.2.20 Pump down control

Pump down operation can be performed through operation of DIP switches (SW5-1, 2, 3). (Pump down operation cannot be done during indoor unit operation, backup operation or during an anomalous stop.)

- a) Pump down procedure
 - 1) Close the liquid side service valve on the outdoor unit.
 - 2) Turn SW5-2 (test operation operation mode) ON (cooling).
 - 3) Turn SW5-3 (pump down switch) ON.
 - 4) Turn SW5-1 (test operation switch) ON. This will start the pump down operation.
- b) Control
 - 1) The compressor operates in cooling mode with 62Hz (FDCA280HKXE4 or FDCA335HKXE4), 50HZ (FDCA224HKXE4) as the upper frequency limit.
(About the method of start, please refer to compressor protective start.)
 - 2) The red and green (LED's) on the outdoor control PCB flashes together continuously and "PoS" is displayed in the 7-segment display.
 - 3) Except for low pressure control, all the protective and anomaly sensing controls are activated.
- c) Ending

If any of the following conditions exists, pump down operation ends.

 - 1) If a low pressure (sensed by PSL) of ≤ 0.01 MPa is detected continuously for 5 seconds.
 - (a) The displays are as follows.

■ Red LED: Lights up continuously	■ Green LED: flashing
■ 7-segment LED display: PoE	■ Remote controller: Stop
 - (b) It is possible for operation to restart if the low pressure (sensed by PSL) becomes > 0.01 MPa.
 - 2) If operation is stopped by anomaly sensing control.

3) If the cumulative compressor operation time totals 15 minutes.

The displays are as follows.

- Red LED: Off
- Green LED: flashing
- 7-segment LED display: No display
- Remote controller: Stop

4) If any one of DIP switches SW5-1, 2 or 3 is turned OFF during the pump down operation.

3.2.21 Indoor unit refrigerant recovery control

When a refrigerant shortage occurs due to a heating overload, the indoor unit's expansion valve is opened in accordance with the outdoor unit inlet's superheat level and operation pressure, to permit a refrigerant recovery.

a) Control activation conditions

This control is activated when any one of the following conditions are satisfied.

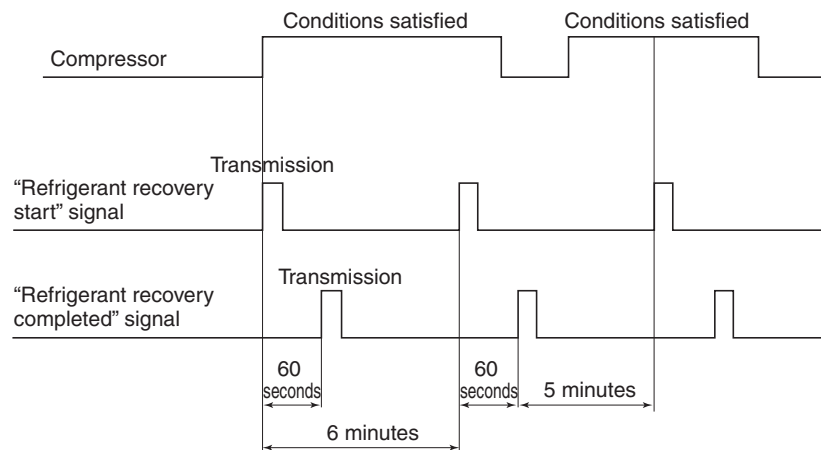
- 1) Superheat control temperature $\geq 15^{\circ}\text{C}$, and heating electronic expansion valve 1 (front) [EEVH1] ≥ 470 pulses
- 2) Superheat control temperature $\geq 15^{\circ}\text{C}$, and heating electronic expansion valve 2 (back) [EEVH2] ≥ 470 pulses
- 3) Discharge pipe temperature (Tho-D1 or D2) $\geq 120^{\circ}\text{C}$

b) Control description

1) When the control activation conditions are satisfied, refrigerant recovery occurs at 6-minute intervals.

Following the "refrigerant recovery completed" signal transmission, another "refrigerant recovery start" signal is not transmitted again for 5 minutes even if the control activation conditions are satisfied.

2) If defrost or low frequency protection conditions are satisfied during this 5-minute period, the refrigerant recovery for those operations takes precedence, and the 6-minute timer is cleared.



c) Control termination conditions

- 1) When a mode other than heating is selected.
- 2) When all of the compressors stop.
- 3) When all of the control activation conditions are not satisfied.

3.2.22 Emergency stop control

When an indoor unit's external input (optional: refrigerant leakage, etc.) indicates a refrigerant leak, that information is transmitted to the outdoor unit, stopping operation. An emergency stop error is then transmitted to all indoor units that are running.

- a) Error stop occurs when the "emergency stop" command is received from the indoor unit.
- b) Error code E63 occurs, and the "emergency stop" command is transmitted to all indoor units.
- c) When a "emergency stop clear" command is received from the indoor unit, the outdoor unit's error status is cleared, and an "emergency stop clear" command is transmitted to all the indoor units.

3.2.23 Compression ratio protection control

The frequency is reduced in accordance with the compressor's compression ratio.

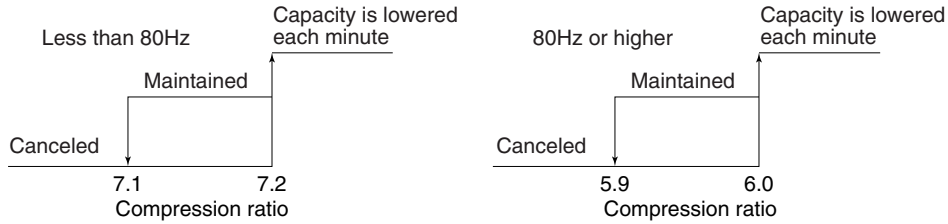
a) Control activation conditions

This control is activated when all the following conditions are satisfied.

- 1) When 10 minutes or more have elapsed since the compressor start.
- 2) When the low pressure is 0.18MPa or higher, and the high pressure is 3.52MPa or lower.

Note (1) The above does not apply for a 10-minute period following a defrost, or when pump-down control is in progress.

b) Control description



c) Control termination conditions

Control ends when any one of the following conditions is satisfied.

- 1) When the low pressure is 0.18MPa or higher, and the high pressure is 3.52MPa or lower.
- 2) When the compression ratio falls below the cancel value.

3.2.24 Indoor unit connection number protection

If the number of indoor units on the connection exceeds the number as listed below, the compressor stops with the error stop.

model	FDCA224, 280, 335HKXE4
Number of units on connection	16 Units

Note (1) They are the numbers of units used for judgement of error for the purpose of control and not equal to the numbers of units which can be connected.

3.2.25 External input operation and demand input operation

a) Operation permission/prohibition mode

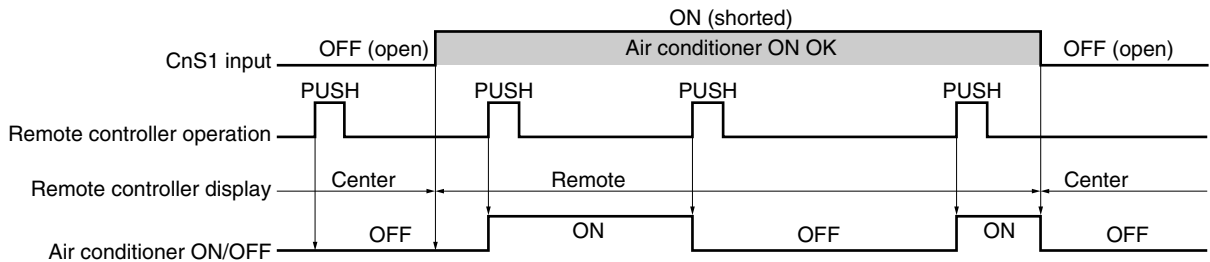
- 1) External input: From CnS1 and J13, operation permission/prohibition control
 - J13: Switches according to CnS1 input method
 - J13 closed circuit: Level input by CnS1.
 - J13 open: Pulse input by CnS1.
- 2) From CnS1, operation permission/prohibition control

Input : CnS1	CnS1 input method change: J13	CnS1 : Operation permission/ Prohibition mode change
Closed circuit ↑ Disconnection	J13: Closed circuit Level input	Operation prohibition mode → Operation permission mode
	J13: Disconnection Pulse input	Operation permission/Prohibition model change (Reversal)
Closed circuit ↓ Disconnection	J13: Closed circuit Level input	Operation permission mode → Operation prohibition mode
	J13: Disconnection Pulse input	— (NOP)

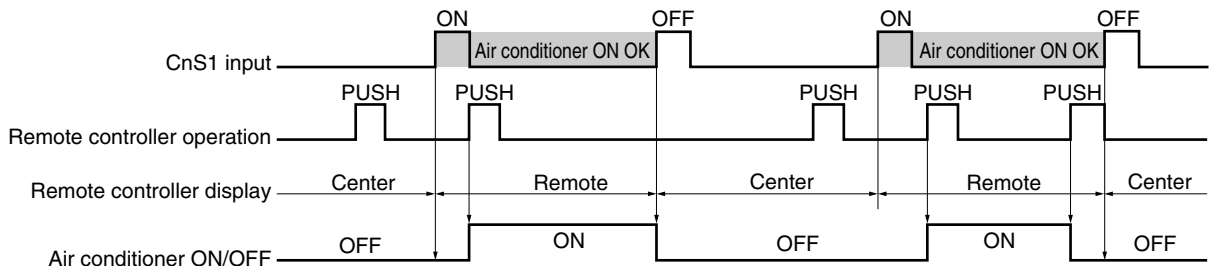
Note (1) The factory settings are: J13-short circuit CnS1-closed circuit (closed pin connection).

- 3) The remote controller displays the operation mode. "To Option" sends the operation mode.
- 4) When the control from remote controller is not received by this control, "Center" is displayed. (Refer to the next item.)
- 5) CnS1, performs the following operations by the changing of jumper wire J13 from closed circuit to open circuit.
 - If pulse input, the pulse duration is 500 ms or more.

① Operation with J13 short circuit



② Operation with J13 disconnection



b) Demand control

1) From CnS2 and J13: Demand control/normal operation switching

J13: Switches according to CnS2 input method

J13 closed circuit: level input by CnS2.

J13 open: Pulse input by CnS2

2) From CnS2, operation permission/prohibition control

Input : CnS2	CnS2 input method Formula switching: J13	CnS2 : Demand control/normal operating switching
	J13; Closed circuit Level input	Demand control → Normal operation
	J13; Open circuit Pulse input	Normal operation/Demand control switching (Reversal)
	J13; Closed circuit Level input	Normal operation → Demand control
	J13; Open circuit Pulse input	— (NOP)

Note (1) The factory settings are: J13 - short circuit; CnS2 - short circuit (short pin connection)

3) The remote controller displays the operation mode. "To Option" sends the operation mode.

4) Demand control

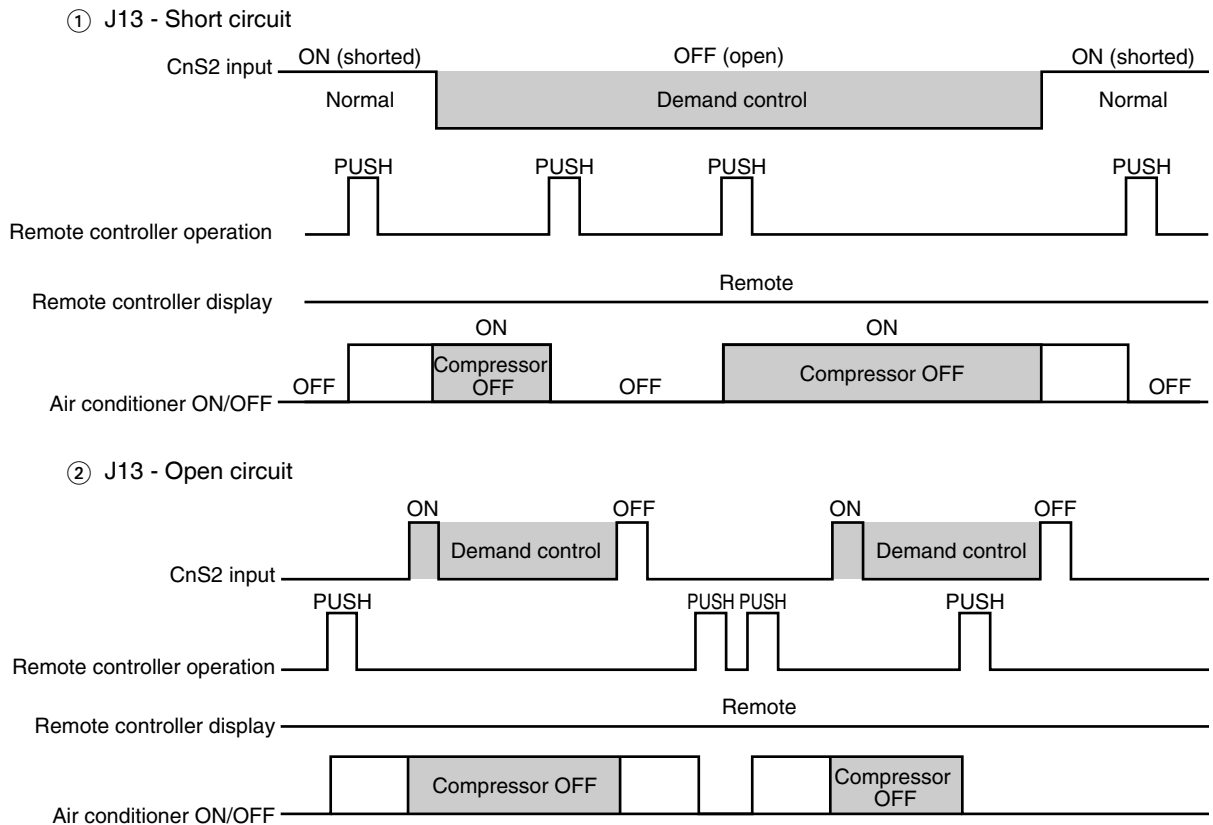
It is possible to switch the demand using DIP switch SW4-5, 6.

SW4-5	SW4-6	Compressor upper limit frequency (Hz)			Compressor output (%)
		224	280	335	
0	0	66	79	95	80
1	0	50	62	70	60
0	1	33	40	48	40
1	1	OFF	OFF	OFF	0

Note (1) 0: Open, 1: Shorted

5) CnS2, performs the following operations by the changing of jumper wire J13 from closed circuit to open circuit.

If pulse input, the pulse duration is 500 ms or more.



3.2.26 7-Segment display

The data in the following table can be displayed using the display select switch (SW8: 1's digit; SW9: 10's digit).

Code No.	Contents of display	Data display range	Minimum units	Remarks
—	Anomaly code Pump down Check mode Outdoor unit setup	—	—	E?? PoE, PoS CH? OPE??
00	CM1 operating frequency	0~130	1Hz	
01	CM2 operating frequency	0~130	1Hz	
02	Tho-A Outdoor air temp.	L, -20~43	1°C	[L] is indicated when the temperature is -20°C or below and the actual temperature is indicated when it is higher than -20°C and up to 43°C.
03	Tho-R1 Heat exchanger temp. 1 (Outlet. Front)	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
04	Tho-R2 Heat exchanger temp. 2 (Outlet. Rear)	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
05	Tho-R3 Heat exchanger temp. 3 (Inlet. Front)	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
06	Tho-R4 Heat exchanger temp. 4 (Inlet. Rear)	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
07	Tho-D1 Discharge pipe temp.	L, 31~136	1°C	[L] is indicated when the temperature is 31°C or below and the actual temperature is indicated when it is higher than 31°C and up to 136°C.

Code No.	Contents of display	Data display range	Minimum units	Remarks
08	Tho-D2 Discharge pipe temp.	L, 31~136	1°C	[L] is indicated when the temperature is 31°C or below and the actual temperature is indicated when it is higher than 31°C and up to 136°C.
10	Tho-C1 Under-dome temp.	L, 5~90	1°C	[L] is indicated when the temperature is 5°C or below and the actual temperature is indicated when it is higher than 5°C and up to 80°C.
11	Tho-C2 Under-dome temp.	L, 5~90	1°C	[L] is indicated when the temperature is 5°C or below and the actual temperature is indicated when it is higher than 5°C and up to 80°C.
12	Tho-P1 Power transistor temp.	L, 31~136	1°C	[L] is indicated when the temperature is 31°C or below and the actual temperature is indicated when it is higher than 31°C and up to 136°C.
13	Tho-P2 Power transistor temp.	L, 31~136	1°C	[L] is indicated when the temperature is 31°C or below and the actual temperature is indicated when it is higher than 31°C and up to 136°C.
14	Tho-SC Sub-cooling coil temp.1	L, 18~73	1°C	[L] is indicated when the temperature is 18°C or below and the actual temperature is indicated when it is higher than 18°C and up to 73°C.
15	Tho-SC Sub-cooling coil temp.2	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
16	Tho-S Suction pipe temp.	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
17	Cooling operation super cooling	0~50	0.1°C	
18	Suction superheat	0~50	0.1°C	
19	Superheat of sub-cooling coil	0~50	0.1°C	
20	CT1 Current	0~70	1A	
21	CT2 Current	0~70	1A	
22	EEVH1 Heating expansion valve opening angle	0~500	1 Pulse	
23	EEVH2 Heating expansion valve opening angle	0~500	1 Pulse	
24	Opening angle of EEVSC over cooling coil expansion valve	0~500	1 Pulse	
26	FM01 Number of rotations	0~1500	10 min ⁻¹	
27	FM02 Number of rotations	0~1500	10 min ⁻¹	
28	PSH High pressure sensor	0~5.00	0.01MPa	
29	PSL Low pressure sensor	0~2.00	0.01MPa	
30	FMC1, 2 Cooling fan Crankcase heater	0,1	—	Order of 100 : FMC1, 2 Order of 10 : CH1 Order of 1 : CH2 (0: OFF, 1: ON)
31	63H1-1 63H1-2	0,1	—	Order of 100 : 63H1-1, 2 Order of 10 : — (0: Close, 1: Open)
32	SV1 SV2	0,1	—	Order of 100 : SV1 Order of 10 : SV2 Order of 1 : — (0: Close, 1: Open)
33	SV6 SV7	0,1	—	Order of 100 : SV6 Order of 10 : SV7 Order of 1 : — (0: Close, 1: Open)
34	20S	0,1	—	Order of 100 : 20S, Order of 10 : — Order of 1 : — (0: Close, 1: Open)

Code No.	Contents of display	Data display range	Minimum units	Remarks
35	Compressor stop causes ①	0,1	—	Order of 100 : Defective outdoor temperature thermistor Order of 10 : Defective outdoor unit heat exchanger thermistor 1 Order of 1 : Defective outdoor unit heat exchanger thermistor 2 (0:Normal, 1: Anomaly)
36	Compressor stop causes ②	0,1	—	Order of 100 : Defective outdoor unit heat exchanger thermistor 3 Order of 10 : Defective outdoor unit heat exchanger thermistor 4 Order of 1 : Defective discharge pipe thermistor 1 (0:Normal, 1: Anomaly)
37	Compressor stop causes ③	0,1	—	Order of 100 : Defective discharge pipe thermistor 2 Order of 10 : Defective Sub cooling coil thermistor 1 Order of 1 : Defective Sub cooling coil thermistor 2 (0:Normal, 1: Anomaly)
38	Compressor stop causes ④	0,1	—	Order of 100 : Defective suction pipe thermistor Order of 10 : Defective low pressure sensor Order of 1 : Defective high pressure sensor (0:Normal, 1: Anomaly)
39	Compressor stop causes ⑤	0,1	—	Order of 100 : Abnormal in inverter 1 Order of 10 : Abnormal in inverter 2 Order of 1 : Abnormal high pressure (0:Normal, 1: Anomaly)
40	Compressor stop causes ⑥	0,1	—	Order of 100 : Abnormal low pressure Order of 10 : Abnormal discharge pipe thermistor 1 Order of 1 : Abnormal discharge pipe thermistor 2 (0:Normal, 1: Anomaly)
41	Compressor stop causes ⑦	0,1	—	Order of 100 : Defect CM1 starting Order of 10 : Defect CM2 starting Order of 1 : Rotor lock CM1 (0:Normal, 1: Anomaly)
42	Compressor stop causes ⑧	0,1	—	Order of 100 : Rotor lock CM2 Order of 10 : CM1 Current cut Order of 1 : CM2 Current cut (0:Normal, 1: Anomaly)
43	Compressor stop causes ⑨	0,1	—	Order of 100 : Power transistor 1 overheating Order of 10 : Power transistor 2 overheating Order of 1 : Abnormalities in DC fan1 (0:Normal, 1: Anomaly)
44	Compressor stop causes ⑩	0,1	—	Order of 100 : Abnormalities in DC fan2 Order of 10 : Stop command from indoor Order of 1 : Operation mode charge (0:Normal, 1: Anomaly)
45	Compressor stop causes ⑪	0,1	—	Order of 100 : Dilute protection Order of 10 : Demand control 0% Order of 1 : 0 (0:Normal, 1: Abnormal)
46	Control status	0,1	—	Order of 100 : During equal oil control Order of 10 : During oil return control Order of 1 : During defrost (0:Non-operation, 1: Operation)

Code No.	Contents of display	Data display range	Minimum units	Remarks
47	Control status	0,1	—	Order of 100 : During Td control Order of 10 : During HP control Order of 1 : During CS control (0:Non-operation, 1: Operation)
48	Control status	0,1	—	Order of 100 : During LP control Order of 10 : During PT control Order of 1 : Under cooling low pressure control (0:Non-operation, 1: Operation)
49	Control status	0,1	—	Order of 100 : Cooling high pressure protection control Order of 10 : Heating high pressure protection control Order of 1 : Heating low pressure protection control (0:Non-operation, 1: Operation)
50	Number of connected indoor unit	0~50	1	
51	Number of connected indoor unit	0~50	1	
52	Required Hz total	0~999	1Hz	
53	Target Fk	0~999	1Hz	
54	Compressor cumulative operating time (CM1)	0~655	100h	
55	Compressor cumulative operating time (CM2)	0~655	100h	
56	Discharge pressure saturation temperature	-50~70	0.1°C	1°C at -10 or lower
57	Suction pressure saturation temperature	-50~30	0.1°C	1°C at -10 or lower
58	Target cooling low pressure	0.00~2.00	0.01MPa	
59	Target heating high pressure	1.60~4.15	0.01MPa	
60	Counter · Compressor 2 starting failure	0, 1	—	
61	Counter · Motor lock compressor 2	0~3	—	
62	Power transistor 2 overheating	0~4	—	
63	Inverter 1 operating frequency command	0~130	1Hz	
64	Inverter 2 operating frequency command	0~130	1Hz	
65	Counter · Inverter 2 communications error	0~3	—	
66	Control status	0,1	—	Order of 100 : During silent mode Order of 1 : During test operation (0:Non-operation, 1: Operation)
67	Control status	0,1	—	Order of 100 : Unmatch Order of 10 : Indoor EEV check Order of 1 : — (0:Non-operation, 1: Operation)
68	Control status	0,1	—	Order of 100 : Piping cleaning Order of 10 : Under-dome temperature control Order of 1 : Compression ratio protection control (0:Non-operation, 1: Operation)
70	Operation priority switching	0,1	—	0: Prior press priority (when shipped) 1: After press priority
71	High pressure control of cooling	2.2, 2.5	0.01MPa	2.2: Factory setting 2.5: Alternate setting
72	Low pressure control of cooling	-0.05~ +0.05	0.01MPa	0.00: Factory setting

Code No.	Contents of display	Data display range	Minimum units	Remarks
73	Heating high pressure compensation	0.00~0.30	0.01MPa	0.00: Factory setting
74	Low pressure of heating	0.80, 0.90	—	0.8: Factory setting 0.9: Alternate setting
75	Snow protection fan control	0,1	—	0: Snow protection fan control deactivated 1: Snow protection fan control activated
77	Data reset	---, dEL	—	
80	Counter · Thermistor disconnection	0~2	—	
81	Counter · Inverter 1 communications error	0~3	—	
82	Counter · High pressure protection	0~4	—	
83	Counter · Compressor 1 starting failure	0,1	—	
84	Counter · Abnormal low pressure ① (Under stop)	0~4	—	
85	Counter · Anomalous low pressure ② (Immediately after starting)	0,1	—	
86	Counter · Anomalous low pressure ③ (Under operation)	0~4	—	
87	Counter · Motor lock of compressor 1	0~3	—	
88	Counter · Overheating of power transistor 1	0~4	—	
89	Counter · Anomalous temp. of discharge pipe 1	0,1	—	
90	Counter · Anomalous temp. of discharge pipe 2	0,1	—	
91	Counter · Current cut (CM1)	0~3	—	
92	Counter · Current cut (CM2)	0~3	—	
93	Counter · Indoor-outdoor communications error	0~255	—	
94	Counter · Outdoor inverter communications error 2	0~255	—	
95	Counter · CPU reset	0~255	—	
96	Counter · Anomalous FM01	0~255	—	
97	Counter · Anomalous FM02	0~255	—	
98	Program version	—	—	Example (2.11)
99	Auto send display	—	—	

Notes (1)The error No. display in anomalous circumstances returns normal by turning Dipswitch SW3-1 ON.

(2)Code No.77 can be reset. (Data is displayed by code No., and SW7 is pushed for 3 seconds.)

3.2.27 Saving of Operation Data

Operating data for a period of 30 minutes prior to the time when trouble occurs are recorded, and these data can be retrieved by a personal computer through the RS232C connector on the control board. Data are updated continuously, and when there is an abnormal stop, data updates stop at that point. Pressing DIP switch SW7 for 5 seconds causes the data to be erased. Data can also be sampled at 1 ~ 60 second intervals during operation and fetched to a personal computer.

- Data is transmitted from a personal computer upon demand.

Data	Data Range	Example
Software version	Ascii 15 byte	KD4C270#####(#:NULL)
PID (program ID)	Ascii 2 byte	D8
Outdoor unit capacity	Ascii 3 byte	280
Power supply frequency	Ascii 2 byte	60
Outdoor address	Ascii 2 byte	00 ~ 3F
Indoor address × 16 units	Ascii 2 byte ~ 16 units	40 ~ 7F
Indoor capacity × 16 units	Ascii 3 byte ~ 16 units	022 ~ 280

Code No.	Write-in contents	Record data			
		Data write-in range	Write-in unit	Number of bytes	Contents
00	Anomaly code	00~99	—	1	00: No abnormality, outdoor unit all abnormalities ???
01	Address of unit where trouble occurred	00~FF	—	1	0~3F: Outdoor unit side, 40~6F: Indoor unit side
02	Operation mode	0~2	—	1	0 Stop
					1 Cooling
					2 Heating
03	High pressure sensor	0.00~5.00	A/D value	1	
04	Low pressure sensor	0.00~2.00	A/D value	1	
05	Heat exchanger temp. 1 (Exit, Front)	-35~75	A/D value	2	Cooling liquid side
06	Heat exchanger temp. 2 (Exit, Rear)	-35~75	A/D value	2	Cooling liquid side
07	Heat exchanger temp. 3 (Entrance, Front)	-35~75	A/D value	2	Cooling gas side
08	Heat exchanger temp. 4 (Entrance, Rear)	-35~75	A/D value	2	Cooling gas side
09	Tho-D1 Discharge pipe temp.	20~140	A/D value	1	
10	Tho-D2 Discharge pipe temp.	20~140	A/D value	1	
11	Tho-C1 Under-dome temp.	-15~90	A/D value	1	
12	Tho-C2 Under-dome temp.	-15~90	A/D value	1	
13	Tho-A Outdoor air temp.	-20~43	A/D value	1	
14	Tho-P1 Power transistor temp. (Heat dissipation fin)	20~140	A/D value	1	
15	Tho-P2 Power transistor temp. (Heat dissipation fin)	20~140	A/D value	1	
16	Tho-SC Sub cooling coil temp. 1	18~73	A/D value	1	Liquid pipe side
17	Tho-H Sub cooling coil temp. 2	-35~75	A/D value	2	Suction pipe side
18	Tho-S Suction pipe temp.	-35~75	A/D value	2	
19	Cooling operation super cooling	0~50	A/D value	1	
20	Suction superheat	0~50	A/D value	1	
21	Super heat of sub-cooling coil	0~50	A/D value	1	
22	CT1 Current	0~50	A/D value	1	
23	CT2 Current	0~50	A/D value	1	
24	Power source voltage	180~500	A/D value	1	

Code No.	Write-in contents	Record data			
		Data write-in range	Write-in unit	Number of bytes	Contents
25	Pressure switch	—	—	1	Bit0 63H1 0: Open, 1: Close
26	Solenoid valve	—	—	1	Bit0 20S 0:OFF, 1:ON
					Bit2 SV1 0:OFF, 1:ON
					Bit3 SV2 0:OFF, 1:ON
					Bit4 SV6 0:OFF, 1:ON
					Bit5 SV7 0:OFF, 1:ON
27	Crankcase heater etc.	—	—	1	Bit0 CH1 0:OFF, 1:ON
					Bit1 CH2 0:OFF, 1:ON
					Bit2 FM1,2 0:OFF, 1:ON
28	FM01 Number of rotations	0~65535	10 min ⁻¹	2	
29	FM02 Number of rotations	0~65535	10 min ⁻¹	2	
30	EEVH1 opening angle	0~65535	1 pulse	2	
31	EEVH2 opening angle	0~65535	1 pulse	2	
32	EEVSC opening angle	0~65535	1 pulse	2	
34	Indoor unit connection number	0~255	1 unit	1	
35	Indoor unit connection capacity	0~65535	—	2	
36	Indoor unit thermostat ON number	0~255	1 unit	1	
37	Indoor unit thermostat ON capacity	0~65535	—	2	
38	Required Hz total	0~65535	1Hz	2	
39	Target FK	0~65535	1Hz	2	
40	Inverter CM1 operation frequency	0~255	1Hz	1	
41	Inverter CM2 operation frequency	0~255	1Hz	1	
42	Answer Hz total	0~65535	1Hz	2	
43	Compressor 1 cumulative operating time (estimate)	0~65535	1 h	2	
44	Compressor 2 cumulative operating time (estimate)	0~65535	1 h	2	
45	Compressor 1 start times	0~65535	20 times	2	
46	Compressor 1 start times	0~65535	20 times	2	
47	Compressor stop causes	—	—	1	Bit0 Defective outdoor temperature thermistor
					Bit1 Defective outdoor unit heat exchanger 1 thermistor
					Bit2 Defective outdoor unit heat exchanger 2 thermistor
					Bit3 Defective outdoor unit heat exchanger 3 thermistor
					Bit4 Defective outdoor unit heat exchanger 4 thermistor
					Bit5 Defective discharge pipe thermistor 1
					Bit6 Defective discharge pipe thermistor 2
					Bit7 Defective sub-cooling coil thermistor 1

Code No.	Write-in contents	Record data				
		Data write-in range	Write-in unit	Number of bytes	Contents	
48	Compressor stop causes	—	—	1	Bit0	Defective sub-cooling coil thermistor 2
					Bit1	Defective suction pipe thermistor
					Bit2	Defective low pressure sensor
					Bit3	Defective high pressure sensor
					Bit4	Inverter 1 anomalous communication
					Bit5	Inverter 2 anomalous communication
					Bit6	Anomalous high pressure
					Bit7	Anomalous Low pressure
49	Compressor stop causes	—	—	1	Bit0	Td1 Anomalous discharge pipe temp.
					Bit1	Td2 Anomalous discharge pipe temp.
					Bit2	CM1 starting defect
					Bit3	CM2 starting defect
					Bit4	Rotor lock of CM1
					Bit5	Rotor lock of CM2
					Bit6	Current cut of CM1
					Bit7	Current cut of CM2
50	Compressor stop causes	—	—	1	Bit0	Power transistor 1 overheating
					Bit1	Power transistor 2 overheating
					Bit2	FM01 anomaly
					Bit3	FM02 anomaly
					Bit4	Compressor stop command from indoor unit
					Bit6	Dilution rate protection
					Bit7	Demand control 0%
51	Control status	0~180	1 second	1	CM1 3-minute delay timer	
52	Control status	0~180	1 second	1	CM2 3-minute delay timer	
53	Discharge pressure saturation temperature	-50~70	0.1°C	2		
54	Intake pressure saturation temperature	-50~70	0.1°C	2		
55	Control status oil return	0,1	—	1	0	None
					1	Under control
56	Control status oil return	0~2	—	1	0	None
					1	Waiting for oil return
					2	Under oil return

Code No.	Write-in contents	Record data				
		Data write-in range	Write-in unit	Number of bytes	Contents	
57	Control status defrost conditions	0~3	—	1	0	None
					1	Temperature conditions
					2	Strengthening temperature conditions
					3	Time conditions
58	Control status defrost status	0~4	—	1	0	None
					1	Defrosting status 1
					2	Defrosting status 2
					3	Defrosting status 3
					4	Defrosting status 4
59	Control status Td	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under Td control
60	Control status	0~1	—	1	Td1 error counter	
61	Control status	0, 1	—	1	Td2 error counter	
62	Control status HP	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under high pressure control
63	Control status	0~1	—	1	HP error (63H1) counter	
64	Control status CS	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under CS control
65	Control staus LP	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under low pressure control
66	Control status	0~3	—	1	LP error (when stopped) counter	
67	Control status	0~4	—	1	LP error (when started) counter	
68	Control status	0,1	—	1	LP error (when driving) counter	
69	Control status PT	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under PT control
70	Check operation status	—	—	1	Bit0	Unmatch check
					Bit1	Indoor side EEV check
					Bit3	Piping cleaning
71	Control status	0~360	3 minutes	2	CH compressor protection timer	
72	Control status CH compressor protective start	0~15	—	1	15	Protective start end
					0~14	During protective start

Code No.	Write-in contents	Record data				
		Data write-in range	Write-in unit	Number of bytes	Contents	
73	Switch etc.	—	—	1	Bit0	External operation (CnS1)
						0: Operation prohibition
						1: Operation permission
					Bit1	Demand (CnS2)
						0: None
						1: Under control
					Bit2	Forced cooling, heating (CnG1)
						0: None
					Bit3	Silent mode (CnG2)
						0: None
					Bit4	Back up operation
						0: None
1: Back up operation						
Bit5	Hz cancel operation					
	0: None					
						1: Under control
74	Control status	0~3	—	1	Current cut anomaly counter (INV1)	
75	Control status	0~4	—	1	Power transistor overheating anomaly counter (INV1)	
76	Control status	0~3	—	1	Rotor lock anomaly counter (INV1)	
77	Control status	0~1	—	1	Starting failure counter (INV1)	
78	Control status	0~3	—	1	Communications anomaly counter (INV1)	
79	Control status	0~3	—	1	Current cut anomaly counter (INV2)	
80	Control status	0~4	—	1	Power transistor overheating anomaly counter (INV2)	
81	Control status	0~3	—	1	Rotor lock anomaly counter (INV2)	
82	Control status	0~1	—	1	Starting failure counter (INV2)	
83	Control status	0~3	—	1	Communications anomaly counter (INV2)	
84	Control status	0~1	—	1	DC fan motor 1 error counter	
85	Control status	0~1	—	1	DC fan motor 2 error counter	
86	Control status	0~2	—	1	Thermistor disconnection counter	
87	Control status	0~255	—	1	Communications error counter (INV)	
88	Registered indoor units 1~8 operation mode	0~4	—	8	0	AUTO
					1	DRY
					2	COOL
					3	FAN
					4	HEAT
89	Registered indoor units 1~8 required Hz	0~255	1Hz	8		
90	Registered indoor units 1~8 answer Hz	0~255	1Hz	8		

Code No.	Write-in contents	Record data				
		Data write-in range	Write-in unit	Number of bytes	Contents	
91	Operation priority switching	0~1	—	1	0	Prior press priority
					1	After press priority
92	High pressure control of cooling	2.20,2.50	0.01MPa	1		
93	Cooling low pressure compensation	-0.05~0.05	0.01MPa	1		
94	Low pressure control of heating	0.80,0.90	0.01MPa	1		
95	Snow protection fan control	0~1	—	1	0	With
					1	None
96	CM1 frequency command	0~130	1Hz	1		
97	CM2 frequency command	0~130	1Hz	1		
98	Target cooling low pressure	0.00~2.00	0.01MPa	1		
99	Control status TC	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under-dome temperature control
100	Target heating high pressure	1.60~4.15	0.01MPa	2		
101	Heating high pressure compensation	0.00~0.30	0.01MPa	1		
102	Control / status SCR	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under compression ratio protection control

3.3 Standard Combination Multi-Unit FDCA335HKXE4-K, FDCA400HKXE4 ~ FDCA1360HKXE4

3.3.1 Operations of major functional items under each operation mode

Functional item \ Operation mode	Cooling		Fan	Heating			Dehumidify
	Thermostat ON	Thermostat OFF		Thermostat ON	Thermostat OFF	Defrost	
Indoor unit fan	Remote controller command	Remote controller command	Remote controller command	Remote controller command	Intermittent operation	○ → ×	○ / ×
Indoor unit electronic expansion valve	Superheat control	Fully closed	Fully closed	Overheating control response	60 pulse	Model-specific aperture opening angle	Superheat Control
Compressor [CM1]	○	×	×	○	×	○	○ / ×
Magnetic contactor CM1 [52C1]	○	○	× / ○	○	○	○	○
Compressor [CM2]	○ / ×	×	×	○ / ×	×	○	○ / ×
Magnetic contactor CM2 [52C2]	○	○	×	○	○	○	○
Outdoor unit fan [FMo-1]	○ / ×	×	× / ○	○ / ×	×	○ → ×	○ / ×
Outdoor unit fan [FMo-2]	○	×	× / ○	○	×	○ → ×	○ / ×
4 way valve	×	×	×	○	○	○ → ×	×
Inverter cooling fan [FMC1, 2]	○ / ×	○ / ×	×	○ / ×	○ / ×	○ / ×	○ / ×
Electronic expansion valve for heating [EEVH1, 2]	Fully open	Fully open	Fully closed	Opening angle control	Fully closed	Fully closed / Fully open	Fully open
Electronic expansion valve for sub-cooling [EEVSC]	Opening angle control	Fully closed	Fully closed	Fully closed	Fully closed	Fully closed	Opening angle control
Solenoid valve [SV1]	○ / ×	×	×	○ / ×	×	○ / ×	○ / ×
Solenoid valve [SV2]	○ / ×	×	×	○ / ×	×	○ / ×	○ / ×
Solenoid valve [SV6]	○ / ×	×	×	○ / ×	×	○ / ×	○ / ×
Solenoid valve [SV7]	○ / ×	×	×	○ / ×	×	○ / ×	○ / ×
Crankcase heater [CH1,2]	○ / ×	○ / ×	○ / ×	○ / ×	○ / ×	○ / ×	○ / ×

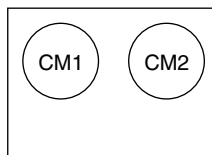
Note (1) ○ : ON, × : OFF, ○ / × : ON or OFF, × / ○ : OFF or ON

3.3.2 Compressor starting order and load classes

Compressor operating · stopping order is determined by compressor starting control among all outdoor units, depending on standard specifications or combination specifications.

a) Standard specifications: (FDCA335HKXE4-K, FDCA400HKXE4 ~ 680HKXE4:2 Compressor)

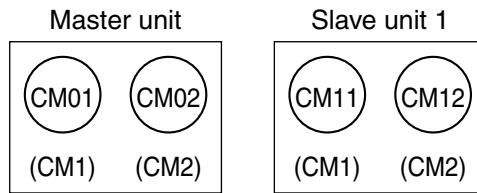
Standard



Operating frequency ranges for each compressor corresponding to different loads are as shown below. The following table applies to the case when CM1 starts at first. (When CM2 starts first, the frequency of CM1 for the Load Category 1 becomes the frequency of CM2.)

Load Category	0	1	2
CM1	0Hz	20~80Hz	42~120Hz
CM2	0Hz	0Hz	42~120Hz

- b) Combination specifications (FDCA7351 ~ 1360HKXE4: main unit + 1 slave (remote) unit)



Operating frequency ranges for each compressor corresponding to different loads are as shown below. The following table applies to the case when CM01 starts at first. (When CM11 starts first, the frequency of CM01 for the Load Category 1 becomes the frequency of CM11.)

Load Category		0	1	2	3
Master unit	CM01	0Hz	20~80Hz	42~80Hz	42~120Hz
	CM02	0Hz	0Hz	0Hz	42~120Hz
Slave unit	CM11	0Hz	0Hz	42~80Hz	42~120Hz
	CM12	0Hz	0Hz	0Hz	42~120Hz

3.3.3 Compressor start control between outdoor units (Main unit / sub (remote) unit)

- a) Determining the starting order for the main unit and sub units
Determine the starting order for the outdoor units of main unit and sub-units (remote), which is decided by the order in which the power switches are turned on.
- 1) Starting order of main unit (N=0) ... First
 - 2) Starting order of sub unit 1 (N=1) ... Second
- b) Determining starting order for compressors within main unit and sub unit groups.
Determine the starting order for compressors 1 and 2 within the main unit and sub unit groups as follows.
- 1) Starting order of compressor 1 (M=0) ... First
 - 2) Starting order of compressor 2 (M=1) ... Second
- c) Compressor starting order and start control for combination specifications I
When all outdoor units change from the full stop state to the cooling/dehumidifying operation (including when all indoor units start from the cooling thermostat OFF state)
- 1) Start control
 - (a) Starting is controlled by determining the start order and the stop order for compressors in the load categories.
 - (b) When only one outdoor unit is used, the starting order for compressor 1 and compressor 2 is reversed every time the outdoor unit stops.
 - (c) Each time the main unit and each sub unit stop independently of each other, the starting order for compressor 1 and compressor 2 is switched.
 - (d) Each time an outdoor unit stops within the main unit and sub unit groups, the starting order for compressors within the main unit and sub unit groups is switched.

Starting order of outdoor units Main unit → Sub unit

Model	HP	Starting Order of Outdoor Units	Starting Order of Compressors
335 ~ 680	12-24	—	CM1 → CM2 → CM1
735 ~ 1360	26-48	Main unit → Sub unit → Main unit	CM1 → CM2 → CM1

- d) Compressor starting order and start control for combination specifications II
When all outdoor units change from the full stop state or a cooling/dehumidifying operation to the heating operation (Excluding starting from the heating thermostat OFF state)
- 1) Start control
This is same as the cooling/dehumidifying operation.
 - 2) After the compressor which is first in the starting order starts, all outdoor units are started temporarily in accordance with the operation order N.
 - 3) 4-way valves (20S) are subject to the control prior to the start of the compressor.
 - 4) 4-way valve switching assurance
 - (a) Regarding the outdoor unit which is second in the starting order, the 4-way valve (20S) is turned ON in compliance with 4-way valve switching assurance control in order to perform 4-way valve switching assurance control. (During the 4-way valve switching assurance operation, the outdoor fan motor is operated under normal control.)

- (b) After 4-way valve switching assurance operation, the compressors are stopped in accordance with the target operation frequency. (4-way valve is in the ON condition.)
- 5) Unless all 4-way valves on the outdoor units which are in second place in the starting order can be turned ON, the Compressor ON command is transmitted continually until they are turned ON.

3.3.4 Starting the compressor (Main unit / sub unit)

As shown in the following table, compressor starts occur in accordance with the amount of elapsed time from power ON, and in accordance with the number of starts that have occurred. However, during defrost control, oil return control, and equal oil control, starts occur in accordance with those controls.

Condition	Start Method
① 1st start occurs 45 minutes or more after power ON, and subsequent starts occur after a power ON that follows a compressor stop of 45 minutes or longer.	After 4-way valve switching assurance, perform compressor protective start sequence "A" in accordance with the crankcase heater ON time. (See below)
② 1st start occurs less than 45 minutes after power ON.	After 4-way valve switching assurance, perform compressor protective start sequence "B" in accordance with the crankcase heater ON time. (See below)
③ Starts other than ① and ② above.	After 4-way valve switching assurance, perform a compressor protective start sequence.

- a) 4-way valve switching assurance (Main unit, sub unit)

The start of the inverter compressor dose the following operation regardless of the decided frequency.

 - 1) 0-20Hz Operation

It operates in the range of 0 – 20Hz. However, in this operation, the compressor cannot be operated with the current safe, high pressure controls, low pressure controls, power transistor temp. controls, discharge temp. control, under-dome temp. control or compression ratio protection controls.
 - 2) 20 – 40Hz (48) Operation

Maximum frequency is determined based on the temperature detected with the outdoor air temperature thermistor (Tho-A).

 - (1) If the temperature is 0 °C or lower, after starting with 48Hz as the maximum frequency, it stops at 48Hz.
 - (2) If the temperature is higher than 0°C, after starting with 40Hz as the maximum frequency, it stops at 40Hz. However, if the starting conditions for current safe, high pressure controls, low pressure controls, power transistor temp. controls, discharge temp. controls or compression ratio protection controls are satisfied during this time, this control ends and control according to current safe, high pressure controls, low pressure controls, power transistor temp. controls, discharge temp. controls , under-dome temp. control or compression ratio protection controls commences, and if the compressor's frequency is determined and cancelled, operation returns to normal operation.
- b) Compressor protective start

The compressor's speed is as follows regardless of the target frequency.

 - 1) Up to 1 minute and 45 seconds after the compressor starts, operation is at 20Hz.
 - 2) When 1 minute and 45 seconds has passed since starting, operation is in accordance with the target speed.
- c) Compressor protective starting sequence A, in accordance with the amount of time power to the crankcase heater has been on.

The amount of time the power to the heater has been on since the power was switched ON is calculated, and if 45 or more minutes have passed and it is the first start, or if 45 or more minutes have passed and the compressor has been stopped, then the power turned on again, and the cumulative number of starts is 2 times or more, starting is done according to this control sequence.

 - 1) The inverter is set to 20Hz following 4-way valve switching assurance. The target frequency is then established 1 minute after a 1-minute period has elapsed since the frequency reduction to 20Hz was reached.
 - 2) During a 15-minute period following the start, the 20Hz frequency is increased at a rate of 5Hz per minute, and the start of the 15-minute period becomes the inverter's start completion point (10Hz).
 - 3) If the inverter is stopped within a 15-minute period after a compressor start, this control increases the frequency 5Hz per minute for 15 minutes when the compressor starts again.
- d) Compressor protective starting sequence B, in accordance with the amount of time power to the crankcase heater has been on.

Power on time is calculated after the power is turned ON, and the first compressor start if less than 45 minutes have passed is according to this control.

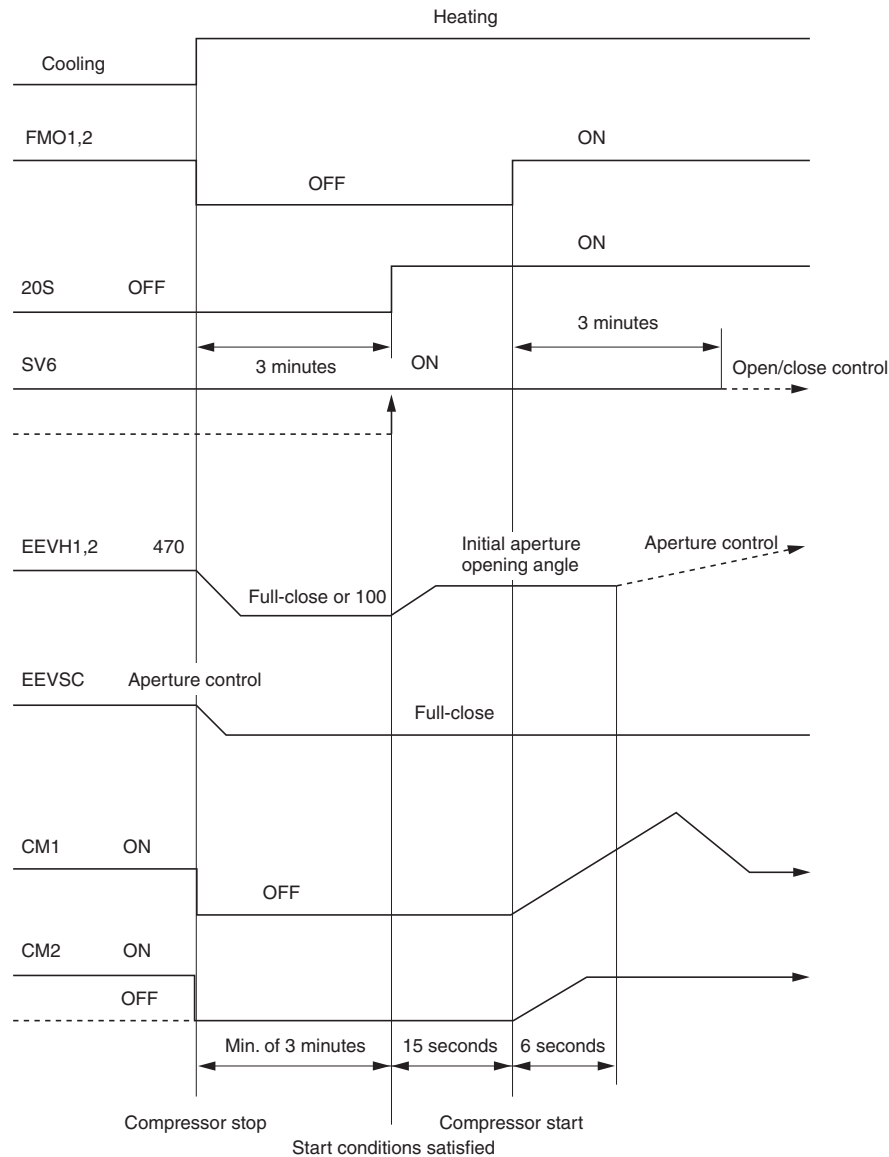
 - 1) The inverter is set to 20Hz following 4-way valve switching assurance. The target frequency is then established 1 minute after a 1-minute period has elapsed since the frequency reduction to 20Hz was reached.

- 2) During a 18-minute period following the start, the 20Hz frequency is increased at a rate of 5Hz per minute, and the start of the 18-minute period becomes the inverter's start completion point (10Hz).
- 3) The frequency is increased 5Hz per minute through the 18-minute to 24-minute period, and this control ends when 24 minutes is reached.
- 4) After this control ends 1 time, the system reverts to protective start "A" control from the 2nd time, or after 45 minutes have elapsed.
- 5) If the inverter is stopped for 24 minutes following a compressor start, a protective start is performed when started again, and protective start sequence "B" control increases the frequency for a period of 24 minutes. However, the system reverts to protective start sequence "A" control when started again if 45 minutes or more have elapsed since the inverter stop.

3.3.5 Compressor pre-start control (Main unit / sub unit)

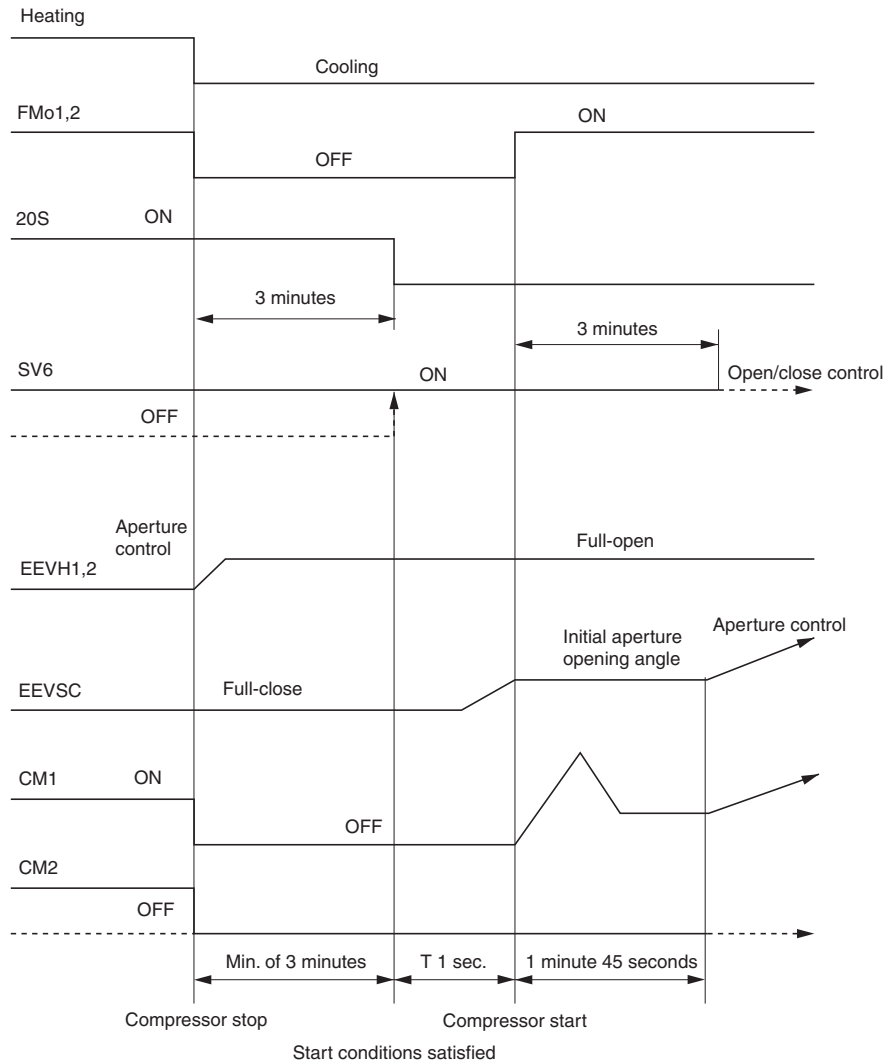
- a) The following control occurs from the point when the compressor ON conditions are satisfied.
 - 1) Pre-start control when operation mode is the same as at the previous operation :
 - ① If in the "cooling / dehumidifying" mode, the 4-way valve switches OFF. If in the "heating" mode, it switches ON. However, When in the same mode as at the previous operation, with the prescribed power ON condition (see above item) established, the 4-way valve's power ON status continues as it is
 - ② Solenoid valves SV6 and SV7 switch ON.
 - ③ The apertures of the heating mode's EEVH1, 2, and the sub cooling coil's EEVSC are set to their initial opening angles. The EEVH1 and 2 expansion valves are started first, and after their operation is completed, the EEVSC expansion valve operation begins.
- Each main unit and sub unit are operated respectively.

◆Cooling → Heating



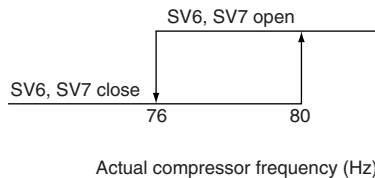
- ④ Fan motors FMo1, FMo2, and the compressor start 15 seconds after the compressor ON conditions are satisfied.

◆Heating → Cooling

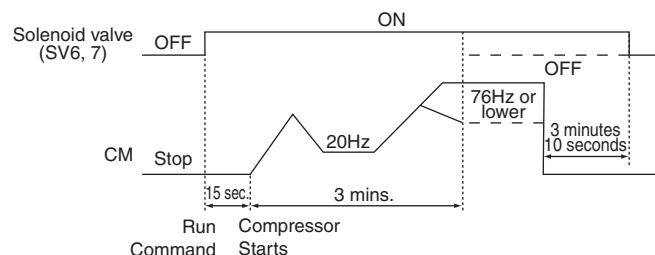


3.3.6 Oil separator solenoid valve (SV6, 7) control

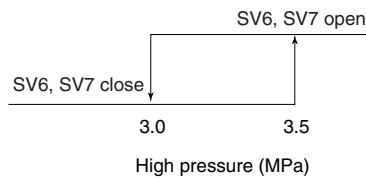
- If the inverter compressor (CM1, 2) starts, solenoid valve SV6, 7 opens (goes ON), then 15 seconds later, it starts.
- During a 3-minute period following the compressor start, solenoid valves SV6 and SV7 switch ON.
- If the compressor operating frequency becomes 80Hz or higher, SV6, 7 opens (goes ON) and it goes off if the frequency is 76Hz or lower.



- If the inverter compressor goes off after SV6, 7 opens (goes ON), SV6, 7 remains open (ON) for 3 minutes and 10 seconds, then closes (goes OFF).



- e) During heating operations, The SV6 and SV7 valves switch ON when the high pressure is 3.5MPa or higher, and switch OFF when the high pressure is 3.0MPa or lower.



3.3.7 Outdoor fan control (Main unit / sub unit)

- a) DC fan motor control

The outdoor fan tap has 0 speed to 4nd speed assigned as the regular speed depending on the model and operation mode. Under normal operation, 1st speed and 4nd speed is used, and in each outdoor fan control, control is stepless between 1st speed and 4nd speed.

- b) Outdoor fan tap

Unit : min^{-1}

Fan tap	335				400				450				Remarks
	Cooling		Heating		Cooling		Heating		Cooling		Heating		
	FMo1	FMo1	FMo2	FMo1	FMo1	FMo2	FMo1	FMo2	FMo1	FMo1	FMo2	FMo1	
0th speed	0	0	0	0	0	0	0	0	0	0	0	0	Stop
1th speed	0	160	0	160	0	160	0	160	0	160	0	160	1-unit operation min. speed
2th speed	0	400	0	400	0	400	0	400	0	400	0	400	1-unit operation max. speed
3th speed	160	160	160	160	160	160	160	160	160	160	160	160	2-unit operation min. speed
4th speed	960	960	960	960	960	960	960	960	1080	1080	1080	1080	2-unit operation max. speed

Unit : min^{-1}

Fan tap	504				560				615, 680				Remarks
	Cooling		Heating		Cooling		Heating		Cooling		Heating		
	FMo1	FMo1	FMo1	FMo2	FMo1	FMo2	FMo2	FMo1	FMo1	FMo2	FMo1	FMo2	
0th speed	0	0	0	0	0	0	0	0	0	0	0	0	Stop
1th speed	0	160	0	160	0	160	0	160	0	160	0	160	1-unit operation min. speed
2th speed	0	400	0	400	0	400	0	400	1140	1140	1140	1140	1-unit operation max. speed
3th speed	160	160	160	160	160	160	160	160	160	160	160	160	2-unit operation min. speed
4th speed	1140	1140	1140	1140	1140	1140	1140	1140	1140	1140	1140	1140	2-unit operation max. speed

- c) When operation is starting, operation is at 4nd speed.
- d) Judgment of whether or not to start the DC fan motor
- 1) If the outdoor fan starts after stopping, the fan speed is checked and start control is performed.
 - 2) If the unit is stopped (free-running state) and the fan rotation is in reverse, either FMo1 or FMo2 is 700min^{-1} or higher, it is not started, and if both FMo1 and FMo2 is under 700min^{-1} for 3 seconds, it is started.
 - 3) The compressor is started regardless of the state of the outdoor fan, and the above contents are sensed 5 seconds or more after the time that 52C1 goes ON.

3.3.8 Crankcase heater control

The crankcase heater (CH1) is switched OFF and ON in accordance with the under-dome temperature thermistor (Tho-C1).

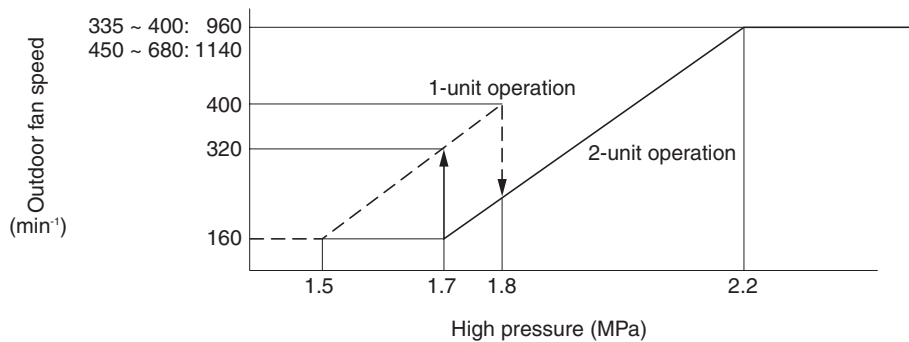
- a) Under-dome temperature thermistor (Tho-C1) \leq low-pressure sensor (LPS) detected pressure saturation temperature ($^{\circ}\text{C}$) + 20 $^{\circ}\text{C}$ \Rightarrow crankcase heater (CH1) ON.
- b) Under-dome temperature thermistor (Tho-C1) \geq low-pressure sensor (LPS) detected pressure saturation temperature ($^{\circ}\text{C}$) + 25 $^{\circ}\text{C}$ \Rightarrow crankcase heater (CH1) OFF.
- c) Under-dome temperature thermistor (Tho-C1) \leq -40 $^{\circ}\text{C}$ or less, and compressor (CM1) is running.
 \Rightarrow crankcase heater (CH1) OFF.

3.3.9 Cooling high pressure control

High pressure is controlled by the outdoor fan speed during cooling and dehumidifying operations, and this control is activated when the high pressure is less than 2.2MPa at 1 minute 45 seconds after a compressor protective start completion. Moreover, the outdoor fan speed is determined by the high pressure level, and outdoor fans are switched between 2-unit operation and 1-unit operation accordingly.

Unit: MPa

High level side setting pressure (HPH)	Pressure classification	2-unit operation	1-unit operation
2.2	Low level side high pressure (HPL1)	1.7	1.5
	High level side high pressure (HPH1)	2.2	1.8



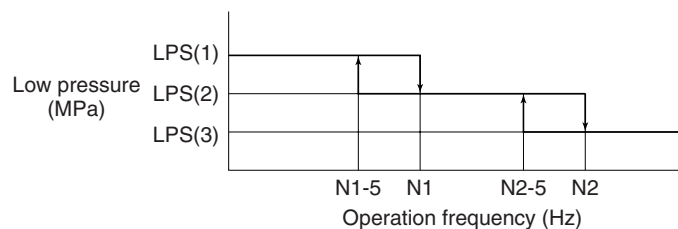
Control termination conditions

- 1) When a mode other than cooling or dehumidifying is selected.
- 2) When compressor stops
- 3) When high pressure is 2.2MPa or more

3.3.10 Cooling low pressure control (Main unit)

During cooling and dehumidifying operations, a constant low pressure is maintained by compressor frequency control.

- a) Compressor frequency control occurs as shown below, 1 minute 45 seconds after the completion of a compressor protective start.



Model	LPS(1)	LPS(2)	LPS(3)	N1	N2	N1-5	N2-5
335	0.81	0.79	0.77	60Hz \times 1	46Hz \times 2	55Hz \times 1	41Hz \times 2
400	0.80	0.77	0.73	70Hz \times 1	50Hz \times 2	65Hz \times 1	45Hz \times 2
450	0.81	0.79	0.75	70Hz \times 1	54Hz \times 2	65Hz \times 1	49Hz \times 2
504	0.82	0.79	0.71	70Hz \times 1	54Hz \times 2	65Hz \times 1	49Hz \times 2
560	0.82	0.78	0.69	70Hz \times 1	64Hz \times 2	65Hz \times 2	59Hz \times 2
615	0.81	0.77	0.67	80Hz \times 1	70Hz \times 2	75Hz \times 1	65Hz \times 2
680	0.81	0.77	0.65	80Hz \times 1	70Hz \times 2	75Hz \times 1	65Hz \times 2

735	0.82	0.79	0.76	70Hz × 2	50Hz × 4	65Hz × 2	45Hz × 4
800	0.80	0.77	0.73	70Hz × 2	50Hz × 4	65Hz × 2	45Hz × 4
850	0.82	0.79	0.71	70Hz × 2	54Hz × 4	65Hz × 2	49Hz × 4
900	0.82	0.78	0.69	70Hz × 2	64Hz × 4	65Hz × 2	59Hz × 4
960	0.82	0.78	0.69	70Hz × 2	64Hz × 4	65Hz × 2	59Hz × 4
1010	0.82	0.79	0.76	80Hz × 2	80Hz × 4	75Hz × 2	75Hz × 4
1065	0.82	0.79	0.76	80Hz × 2	80Hz × 4	75Hz × 2	75Hz × 4
1130	0.82	0.79	0.71	70Hz × 2	54Hz × 4	65Hz × 2	49Hz × 4
1180	0.82	0.79	0.71	70Hz × 2	54Hz × 4	65Hz × 2	49Hz × 4
1235	0.82	0.78	0.69	70Hz × 2	64Hz × 4	65Hz × 2	59Hz × 4
1300	0.82	0.78	0.69	70Hz × 2	64Hz × 4	65Hz × 2	59Hz × 4
1360	0.81	0.77	0.67	70Hz × 2	64Hz × 4	65Hz × 2	59Hz × 4

b) Control termination conditions

- ① When a mode other than cooling or dehumidifying is selected.
- ② When the compressor stops.

3.3.11 Heating high pressure control (Main unit only)

During heating operation, a constant high pressure is maintained by compressor frequency control.

a) Control activation condition

1 minute 45 se

conds have elapsed since the completion of a compressor protective start.

b) Control description

The compressor frequency is controlled to maintain a high pressure of 2.75MPa.

c) Control termination conditions

- 1) When a mode other than heating is selected.
- 2) When the compressor stops.

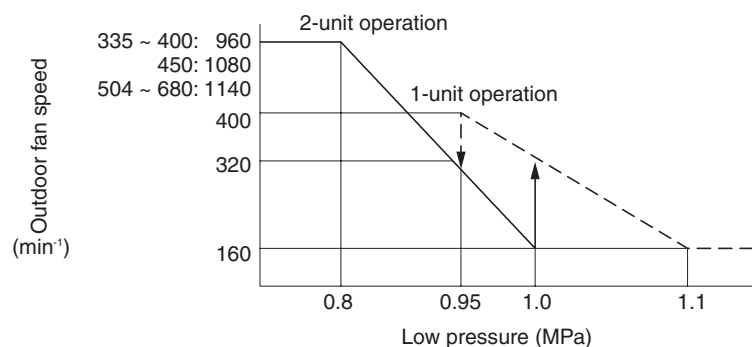
3.3.12 Heating low pressure control (Main unit / sub unit)

This control applies to the main unit and sub units independently.

Low pressure is controlled by the outdoor fan speed during heating operation, and this control is activated when the low pressure is 0.8MPa or higher at 1 minute 45 seconds after a compressor protective start completion. Moreover, the outdoor fan speed is determined by the low pressure level, and outdoor fans are switched between 2-unit operation and 1-unit operation accordingly.

Unit : MPa

Low level side setting pressure (LPL)	Pressure classification	2-unit operation	1-unit operation
0.8	Low level side high pressure (LPL1)	0.8	0.95
	High level side high pressure (LPH1)	1.0	1.1

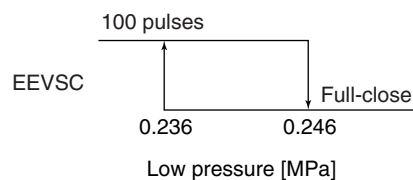


Control termination conditions

- 1) When a mode other than heating is selected.
- 2) When the compressor stops.

3.3.13 Sub cooling coil control

- a) Control activation condition
Control is activated 6 seconds after a compressor start occurs during cooling and dehumidifying operations.
- b) Control description
 - 1) The specified sub cooling coil outlet superheat is maintained by controlling the subcooling coil's electronic expansion valve.
 - 2) Sub cooling coil superheat feed-forward control
(Applied when a sudden change occurs in the compressor frequency)
 - (1) The cooling coil's expansion valve (EEVSC) closes at a rate of -4 pulses/sec. if the superheat control value (SHS) reaches 5°C or lower.
 - (2) Superheat PI control is resumed when the superheat control value (SHS) subsequently returns to 8°C or higher.
- c) Control termination conditions
 - 1) When a mode other than heating is selected.
 - 2) When the compressor stops.
- d) Changing the sub cooling coil's target superheat level
 - 1) Control activation conditions
Control occurs when all the following conditions are satisfied.
 - (1) When 10 minutes more have elapsed since the compressor start.
 - (2) When the high pressure (HP) is 1.1MPa or lower.
 - 2) Control description
 - 1) The sub cooling coil outlet's target temperature (SHC) is changed to 5.0°C .
 - 2) The sub cooling coil's expansion valve (EEVSC) closes at a rate of -4 pulses/sec. if the superheat control value (SHS) reaches 3°C or lower.
 - 3) Superheat PI control is resumed when the superheat control value (SHS) subsequently returns to 4°C or higher.
 - 3) Control termination conditions
 - 1) When the compressor stops.
 - 2) When the target low pressure (LPS) reaches 0.246MPa or higher.
- e) When the control termination conditions are satisfied, the following overcooling coil's expansion valve (EEVSC) apertures are adopted:
100 pulses if the low pressure (LPS) is less than 0.236MPa when stopped. Full-open (0 pulse) at all other times. If the low pressure (LPS) subsequently reaches 0.246MPa or higher when stopped, the subcooling coil's expansion valve (EEVSC) is fully closed.



3.3.14 Defrosting (Main unit / sub unit)

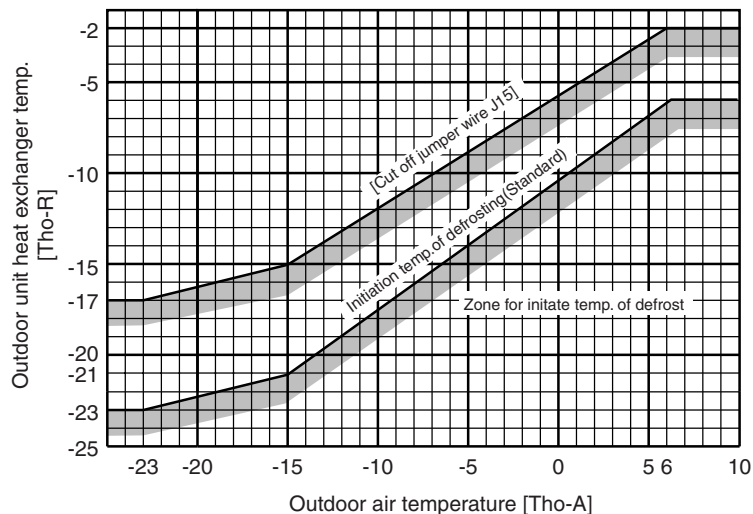
If defrosting start conditions are established at the outdoor unit heat exchanger for any of the indoor units, a defrosting operation starts.

1) Temperature condition defrosting

a) Conditions for starting defrosting

When all the following conditions are met, the defrosting operation will start.

- (1) The cumulative operating time of the compressor comes up to 33 minutes after completion of a defrosting operation, or it comes up to 33 minutes after a heating operation starts (the remote controller is turned on).
- (2) If 8 minutes have passed after the compressor goes ON after it has gone OFF.
- (3) If 8 minutes have passed after one outdoor unit fan goes ON after all outdoor fans have gone OFF.
- (4) After all the above conditions are satisfied, when the temperature at the outdoor heat exchanger thermistor (Tho-R) and outdoor temperature thermistor is below the defrost initiation temperature in the above graph continuously for 3 minutes.



b) Conditions for finishing defrosting

■ Standard (J14: closed)

- (1) When the increase of the temperature of the heat exchanger thermistor (Tho-R1 or Tho-R2) is greater than 9°C.
- (2) When 12 minutes have passed since defrosting started.

■ With operation Judgment Function (J14: Open)

- (1) If Tho-R1 and R2 are $\geq 9^{\circ}\text{C}$, after 2 minutes and 30 seconds have passed since defrosting started, if either of the following conditions is satisfied, the defrosting end operation starts.
 - a) 2 minutes and 30 seconds have passed since the temperature sensed by either Tho-R1 or Tho-R2 is 14°C or higher.
 - b) The temperature sensed by either Tho-R1 or Tho-R2 is 30°C or higher.
 - c) 14 minutes have passed since the start of defrosting.
 - (2) If Tho-R1 or R2 are $< 9^{\circ}\text{C}$ after 2 minutes and 30 seconds have passed since defrosting started, if either of the following conditions is satisfied, the defrosting end operation starts.
 - (a) 5 minutes have passed since the temperature sensed by either Tho-R1 or Tho-R2 is 14°C or higher.
 - (b) The temperature sensed by either Tho-R1 or Tho-R2 is 30°C or higher.
 - (c) 14 minutes have passed since the start of defrosting.
- 2) Time condition defrosting (oil return)
- ##### a) Defrosting start conditions
- (1) Defrosting starts when the heating mode is in effect at the 1st compressor start following a power ON, and when the heating mode is in effect after 2 hours of cumulative operation time. However, if mode switching from cooling to heating occurred, defrosting starts 33 minutes after CM1 operation begins.
 - (2) If there was 5 minutes or more of temperature condition defrosting before time condition defrosting, the 10-hour timer for time condition defrosting is reset.
 - (3) The "time condition defrosting" time is the point when the detected oil rise amount reaches the setting value (following 2 hours of cumulative compressor operation time counting from the 1st compressor start after power ON), or the point when 10 hours elapse, whichever comes first.
 - (4) When the 10-hour timer period elapses, time condition defrosting occurs at the completion of the previous temperature condition defrosting operation, or after 33 minutes, whichever comes first.
- ##### b) Defrosting end conditions

If either of the following conditions is satisfied, the defrosting end operation starts.

- 1) The temperature sensed by Tho-R1 and Tho-R2 becomes 9°C or higher.
- 2) If 12 minutes has passed since defrosting started.
- 3) When the compressor inlet super heating level becomes 20°C or less (End even if 5 minutes is not passed) in 1 minute after switching the 4-way valve (OFF).

3.3.15 Indoor unit refrigerant recovery control

When a refrigerant shortage occurs due to a heating overload, the indoor unit's expansion valve is opened in accordance with the outdoor unit inlet's superheat level and operation pressure, to permit a refrigerant recovery.

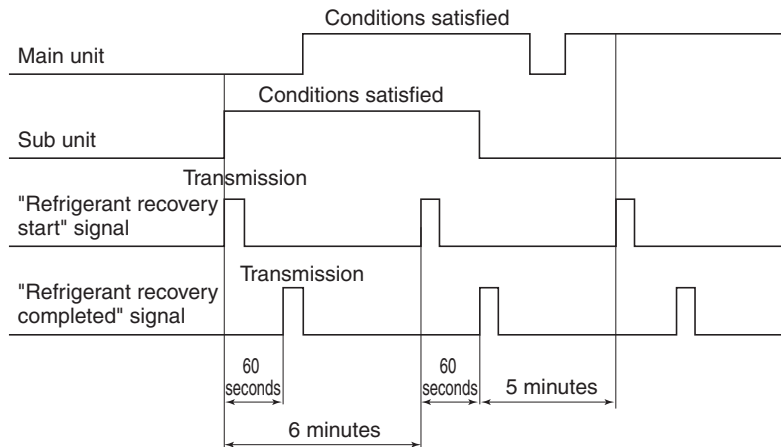
a) Control activation conditions

This control is activated when any one of the following conditions are satisfied.

- 1) Superheat control temperature $\geq 15^\circ\text{C}$, and heating electronic expansion valve 1 (front) $[\text{EEVH1}] \geq 470$ pulses
- 2) Superheat control temperature $\geq 15^\circ\text{C}$, and heating electronic expansion valve 2 (back) $[\text{EEVH2}] \geq 470$ pulses
- 3) Discharge pipe temperature (Tho-D1 or D2) $\geq 120^\circ\text{C}$

b) Control description

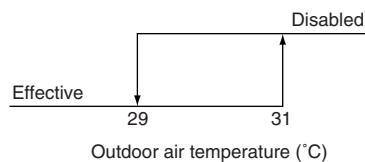
- 1) When the control activation conditions are satisfied, refrigerant recovery occurs at 6-minute intervals. Following the "refrigerant recovery completed" signal transmission, another "refrigerant recovery start" signal is not transmitted again for 5 minutes even if the control activation conditions are satisfied.
- 2) If defrost or low frequency protection conditions are satisfied during this 5-minute period, the refrigerant recovery for those operations takes precedence, and the 6-minute timer is cleared.



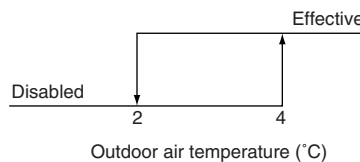
3.3.16 Silent mode control (Main unit / sub unit)

- a) If the silent mode start signal is received from an indoor unit or CnG2 (with closed circuit pin) is connected, if the outdoor temperature is within the following range, operation is performed in the silent mode.

■ Cooling



■ Heating



- b) Outdoor fan maximum speed & maximum compressor operation frequency (excluding the 30-second period after a start, and defrost operations)

- 1) Maximum outdoor fan speed (excluding the 30-second period after a start, and defrost operations)

Model	Speed upper limit	Model	Speed upper limit
335	500min ⁻¹	560	660min ⁻¹
400		615	
450		680	
504	660min ⁻¹	—	

Note (1) In case of combination unit, main units and sub units have respective speeds depending on models in the above table.

2) Maximum compressor operation frequency

Model	Operation frequency upper limit (Hz)	Model	Operation frequency upper limit (Hz)
335	46×2	900	52×4
400		960	56×4
450	52×2	1010	60×4
504	60×2	1065	64×4
560	70×2	1130	70×4
615	78×2	1180	74×4
680	84×2	1235	78×4
735	42×2	1300	
800	46×2	1360	
850	50×4	—	—

3.3.17 Compression ratio protection control

The frequency is reduced in accordance with the compressor's compression ratio.

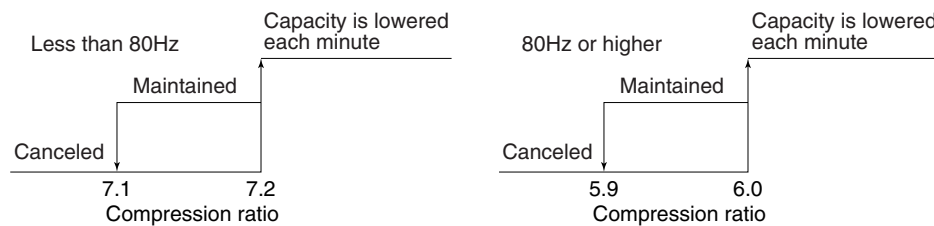
a) Control activation conditions

This control is activated when all the following conditions are satisfied.

- 1) When 10 minutes or more have elapsed since the compressor start.
- 2) When the inverter frequency is 30Hz or higher.
- 3) When the low pressure is 0.18MPa or higher, and the high pressure is 3.52MPa or lower.

Note (1) The above does not apply for a 10-minute period following a defrost, or when pump-down control is in progress.

b) Control description



c) Control termination conditions

Control ends when any one of the following conditions is satisfied.

- 1) When the low pressure is 0.18MPa or higher, and the high pressure is 3.52MPa or lower.
- 2) When the compression ratio falls below the cancel value.

3.3.18 Oil return control (Main unit / sub unit)

When in the cooling or dehumidifying mode, this control occurs every 10 hours (after an initial 2 hours of cumulative compressor operation time counting from the 1st compressor start after power ON), or when the oil rise amount reaches the setting value.

Note (1) The operation time count begins at the point when heating-to-cooling switching occurs.

(2) The start that is according to the check operation is included in the 1st start after power ON.

a) Control description

- 1) Oil return control occurs at units where the operation, thermostat is OFF, with units in fan operation, and at stoppage and emergency stopped units.

2) The oil return operation frequencies are shown below. Operation frequency is differentiated according to the DIP Switch SW3-3 on the outdoor PCB.

Item Model	Frequency (Hz)	Item Model	Frequency (Hz)
335	62 × 2	900	54 × 4
400	62 × 2	960	54 × 4
450	60 × 2	1010	54 × 4
504	76 × 2	1065	54 × 4
560	78 × 2	1130	56 × 4
615	78 × 2	1180	56 × 4
680	78 × 2	1235	56 × 4
735	56 × 4	1300	56 × 4
800	54 × 4	1360	56 × 4
850	54 × 4	—	—

b) Control termination conditions

Control ends when any one of the following conditions occurs.

- 1) When 5 minutes have elapsed after the compressor reached the oil return operation frequency.
- 2) When, 60 seconds after all compressors reached the oil return operation frequency, the compressor inlet superheat SH was 4°C or less for 10 continuous seconds.

3.3.19 Oil equalization rotation (Main unit / sub unit)

a) Starting conditions

After the end of the initial oil return operation after power on, compressors are operated with either of the following rotation patterns.

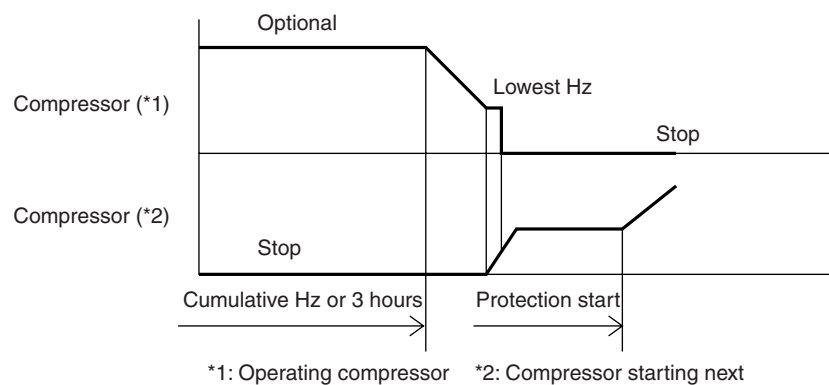
- 1) When only one compressor unit has been operating continually for 3 hours in a combination unit.
- 2) When the cumulative operating Hz for the compressor has reached the following values.

Operation mode	Cumulative rotation Hz	Cumulative frequency (Hz)
Cooling	7200	40 or higher
Heating	9000	60 or higher

Cumulative operating Hz is given for each compressor by accumulating the actual operating frequency (in 1 Hz units) or by sampling at 10-second intervals of the compressor's indicated frequency. However, for the cumulative operating Hz, when the operating Hz is higher than the Hz shown in the table above, it is accumulated in each operation mode.

b) Description of control

Operating compressors are stopped, then the compressors are rotated in accordance with the starting order.



3.3.20 Oil equalization control (Main unit / sub unit)

- a) Oil equalization control is performed on a combination unit after the oil return operation when the compressor of each unit is operating.
- b) Starting state
 - 1) Oil equalization is performed with the patterns shown in the following table.

Combination	Main unit		Sub unit 1		Sub unit 2		State	Oil equalization operation
	CM1	CM2	CM1	CM2	CM1	CM2		
1	○	○	—	—	—	—	Normal	Oil equalization III
	○	×					Normal/backup operation	Oil equalization I
2	○	○	○	○	—	—	Normal	Oil equalization III
	○	×	○	○	—	—	Backup operation	Oil equalization III
	○	×	○	×	—	—	Normal/backup operation	Oil equalization II
	○	○	×	×	—	—	Backup operation	Oil equalization III

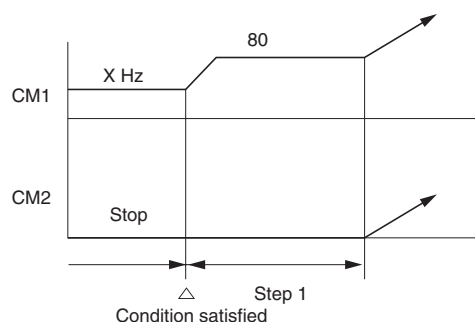
- 2) Depending on the following conditions, when the cumulative heating operation time passes 5 minutes after the end of the oil return operation.
 - (1) After the cooling oil return operation ends.
 - (2) After the defrosting operation ends during heating
 - (3) After a defrosting operation ends under heating temperature conditions
- 3) It is not under the "compressor start control between outdoor units" which is performed during heating operation after the stop condition.
- c) Description of control
 - 1) The following controls are invalid during this control.
 - (1) Cooling low pressure control (During cooling operation)
 - (2) Heating high pressure control (During heating operation)
 - (3) Compressor protection start A and B
 - 2) Acceleration to the specified Hz takes place at the rate of 2 Hz/second.
 - 3) In the case of backup operation, oil equalization is performed according to the specified steps by the operating compressor only while any stopped compressors (in trouble) remain in the stopped condition.
 - 4) Cumulative frequency of oil equalization control (Cumulative oil equalization Hz)
 - (1) Cumulative operating frequency (Hz) required for the oil equalization during cooling or heating is as follows. However, the operating frequency is accumulated from above the Hz shown in the following table.

Operation mode	Cumulative oil equalization (Hz)	Cumulative frequency (Hz)
Cooling	28800	40 or higher
Heating	36000	60 or higher

- (2) Cumulative oil equalization Hz is given for each compressor by accumulating the actual operating frequency (in 1 Hz units) or by sampling at 10-second intervals of the indicated compressor frequency.
- d) Description of control: Oil equalization operation I (Operation of 1 compressor unit)
 - 1) When one compressor unit is operating at the start of the oil equalization operation.
 - (1) Oil equalization steps are as follows. (The following table applies to the case when compressor 1 of the master group is operating.)

Combination	Main unit		Sub unit		Sub unit		Oil equalization time (sec)
	CM1	CM2	CM1	CM2	CM1	CM2	
Before oil equalization starts	×	0	0	0	0	0	—
1	80	0	0	0	0	0	80

- (2) Oil equalization control time chart



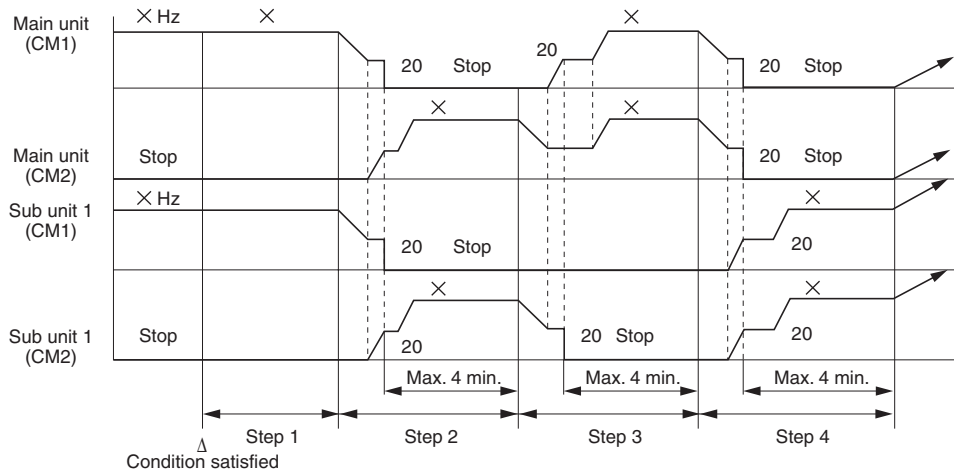
- e) Description of control: Oil equalization operation II (One compressor unit is operating in each group)

When two compressor units are operating at the start of oil equalization operation (Main unit and a sub unit)

- 1) The oil equalization steps and cumulative oil equalization Hz at each oil equalization step are as follows.
 (The following example shows the case where compressor 1 of the main unit group and compressor 1 of the sub unit group are operating.)

Combination	Main unit		Sub unit 1		Cumulative oil equalization Hz
	CM1	CM2	CM1	CM2	
Before oil equalization starts	×	○	×	—	—
1	×	○	×	○	900
2	○	×	○	×	900
3	×	×	○	○	900
4	○	○	×	×	900

2) Oil equalization control time chart



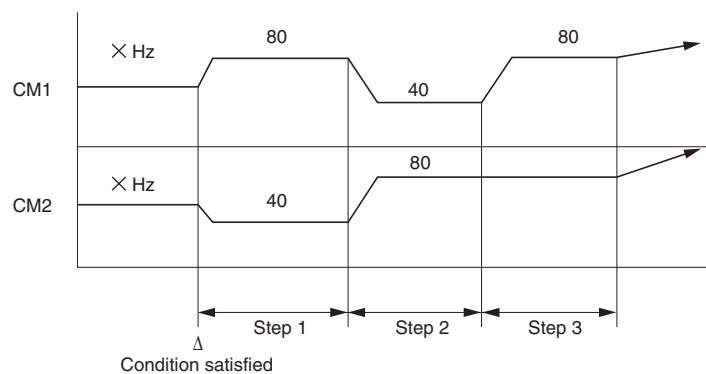
f) Description of control: Oil equalization operation III (Two compressor units are operating in each group)

- 1) When two compressor units are operating at the start of oil equalization operation (Main unit)

(1) Oil equalization steps are as follows.

Step	CM1	CM2	Oil equalization time (sec)
Before oil equalization starts	×	×	—
1	80	40	80
2	40	80	80
3	80	80	80

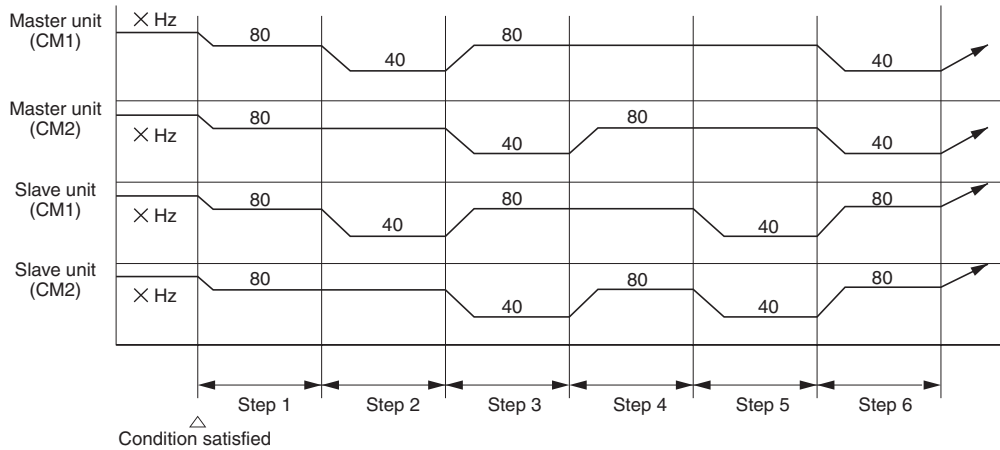
(2) Oil equalization control time chart



- 2) When 4 compressor units are operating at the start of oil equalization (2 main units and 2 sub units)
 (1) Oil equalization steps are as follows.

Step	Main unit		Sub unit 1		Oil equalization time (sec)
	CM1	CM2	CM1	CM2	
Before oil equalization starts	×	×	×	×	—
1	80	80	80	80	80
2	40	80	40	80	80
3	80	40	80	40	80
4	80	80	80	80	80
5	80	80	40	40	80
6	40	40	80	80	80

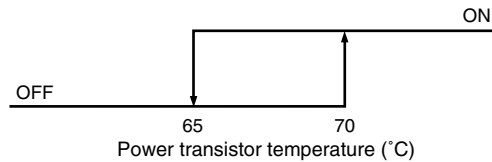
(2) Oil equalization control time chart



3.3.21 Inverter cooling fan control (Main unit/sub unit)

This control applies to the main unit and sub units independently.

- a) After the inverter starts, the cooling fans (FCM1, 2) are turned ON or OFF depending on the temperatures detected by the power transistor thermistor (Tho-P1, 2).



- b) When the compressor changes from the ON to the OFF state, if the cooling fan is turned ON, the fan continues in the ON state for 3 minutes 10 seconds.

3.3.22 Unit protective maintenance related devices (Main unit only)

- a) Test operation mode

1) This control is performed from the main unit. It cannot be controlled from the sub unit side. If control from the sub unit side is attempted, the following codes are indicated on the 7-segment display.

Code indicator	Data indicator	Description of disabled control
OPE	10	Setting from a slave unit is invalid.

Note (1) Normal display can be restored if the test operation control switch is reset.

- 2) Outdoor unit test operation mode operation is started by the DIP switches SW5-1 and 5-2 on the outdoor unit PCB.

Switch functions

SW5-1	ON	SW5-2	OFF	Heating Test Operation
			ON	Cooling Test Operation
OFF	Normal or Test Operation End			

Notes (1) Leave all DIP Switches except 5-1 and 5-2 OFF.

(2) This operation takes priority over other options such as the center console. It sets the options in the operating state.

b) Compressor protective start control (Main unit / sub unit)

1) Compressor protection at low frequency

a) 30Hz operation is performed for 1 minute when a 29Hz or lower operation has continued for 20 minutes.

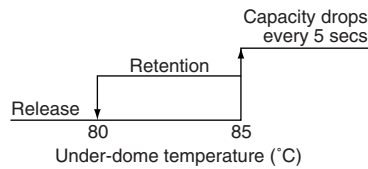
2) Compressor start delay (3-minute timer)

The inverter compressor (CM1) does not start again for 3 minutes after being stopped by cooling/heating thermostat control, by the remote controller, or by an error.

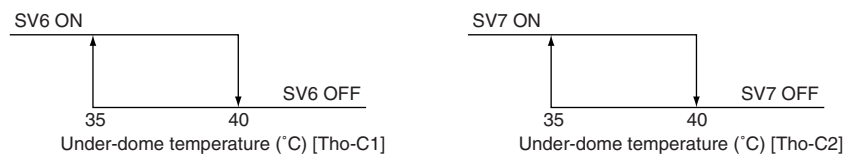
c) Under-dome temperature control (Main unit / sub unit)

The compressor's capacity, the oil separator solenoid valve (SV6, 7) and the cooling solenoid (SV1, 2) are controlled in accordance with the temperature at the under-dome thermistor (Tho-C) installed on the compressor. (Main unit, sub unit independently)

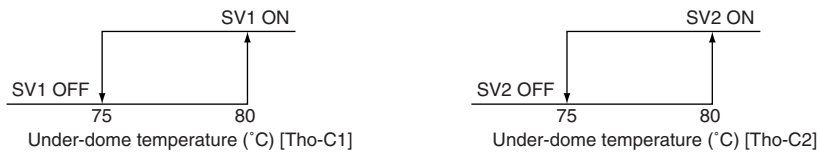
1) Compressor capacity control



2) Oil separator solenoid valve (SV6, 7) control



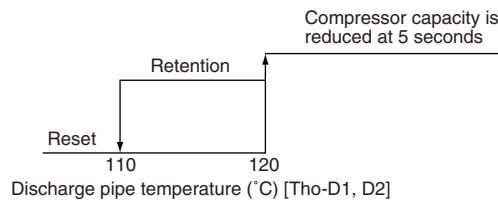
3) Compressor cooling solenoid Valve (SV1, 2) control



d) Discharge pipe temperature control (Main unit / sub unit)

If the discharge pipe temperature (sensed by Tho-D1, D2) exceeds the set value, the compressor cooling solenoid valve (SV1, 2) goes ON, the indoor expansion valve opens and the compressor's capacity is controlled, thus suppressing rises in the discharge pipe temperature. If the temperature rises even further, the compressor stops. (Main unit, sub unit independently)

1) Compressor control

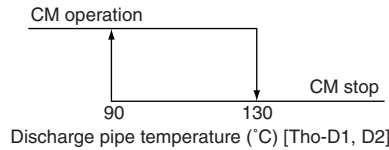


2) Compressor cooling solenoid Valve (SV1, 2) control



3) Discharge pipe temperature error

- (a) When the discharge pipe temperatures (Tho-D1, D2 detection) rise beyond 130°C and is maintained for 2 seconds, the compressors are stopped but it will be reset if the temperatures drop below 90°C.



- (b) Compressors are counted individually if a discharge pipe temperature (Tho-D1, D2 detection) error occurs 2 times within 60 minutes.

(c) Control description

When the main unit auto-backup operation is invalid (SW3-2 ON), it stops with an abnormal stop. When the main unit auto-backup operation is valid (SW3-2 OFF, the factory setting), it does not stop with an abnormal stop and the compressor remains stopped.

Note (1) Unless the temperature of 90 °C or under is maintained for 45 minutes after the discharge pipe error, the unit cannot be started again. (Reset the power supply to clear.)

e) Current safe control (Main unit / sub unit)

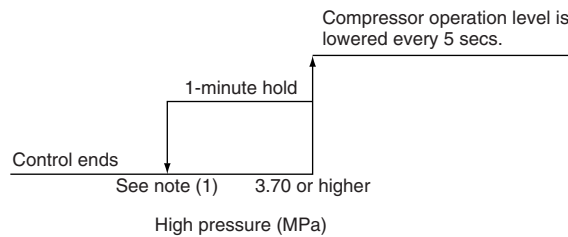
- 1) The compressor speed is reduced if the inverter inlet's input voltage (converter inlet L3-phase) exceeds the setting value while the compressor is running at a speed of 20Hz or higher. If the setting value is still exceeded after the speed reduction, the speed is reduced again.
- 2) This control ends when the input voltage drops below the setting value for a continuous period of 3 minutes, and the speed protection cancel operation begins.
- 3) This is performed by the main unit and sub units independently.

f) High pressure protective control

During cooling and heating operations, high pressure is detected by the high pressure sensor (PSH), and the compressor and outdoor fan are controlled to prevent the pressure from rising.

1) Cooling

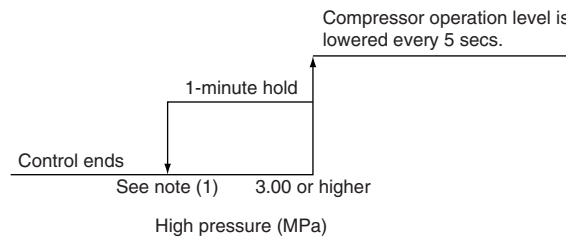
High pressure based compressor control



Note (1) High pressure of less than 3.70MPa continues for 1 minute.

2) Heating

(a) High pressure based fan speed control



Note (1) High pressure of less than 3.00MPa continues for 1 minute.

(b) High pressure based fan speed control

(1) Control activation conditions

When a high pressure of 3.0MPa or higher occurs 1 minute 45 seconds after a compressor protective start completion.

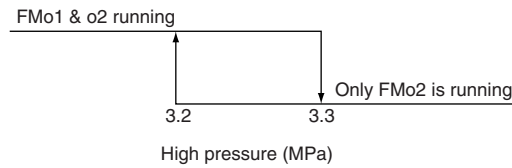
(2) Control description

- ① The fan speed is kept within a 160~960 (1080) [1140]min⁻¹ range.

Both fan motors FMo1 & 2 run at the same speed.

Note (1) Values shown in () apply to the FDCA450 model, show in [] apply to the FDCA504 ~ 680 model.

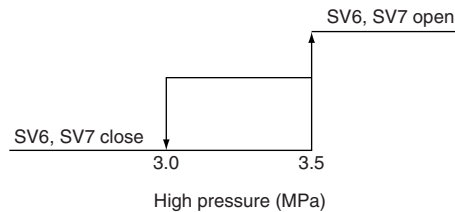
- ② The FMO1 fan motor (right side) stops if the high pressure exceeds the value shown below.



(3) Control termination conditions

- ① When a mode other than heating is selected.
- ② When the compressor stops.
- ③ When the high pressure becomes less than 3.0MPa.

3) Solenoid valves SV6 & SV7 open (ON) when the high pressure reaches 3.5MPa or higher.



g) Current cut control (Main unit · sub unit)

This control prevents overcurrent conditions at the inverter. The inverter is immediately stopped when the current exceeds the setting value, and is then automatically restarted 3 minutes later. If the current control is activated 4 times within 15 minutes, 52C1 and 52C2 are switched OFF, and an error stop occurs. (Main unit, sub unit independently)

h) Anomalous high pressure increase protection (Main unit, sub unit)

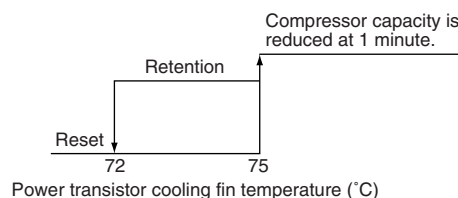
If the high pressure side pressure switch [63H1-1, 63H1-2: 4.15 Open / 3.15 Closed MPa] operates 5 times within 60 minutes, an anomalous stop is performed.

However, when first operated, the compressor is stopped, then after a 3-minute delay, normal operation is resumed.

i) Power transistor temperature control (Main unit · sub unit)

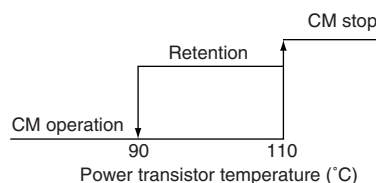
If the temperature of the power transistor cooling fins (sensed by Tho-P) exceeds the set value, the compressor's capacity is controlled to keep the power transistor's temperature from rising. If it rises still higher, the compressor is stopped.

1) Compressor control



2) Power transistor temperature abnormal (Main unit / sub unit)

(a) If the temperature sensed by the power transistor temperature thermistor rises to 110°C or higher, the compressor (CM1, 2) is stopped.

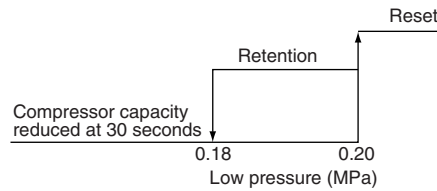


(b) If the power transistor's temperature is abnormal 5 times within 60 minutes, or if the temperature is 110°C or higher for 15 minutes continuously, including when the compressor is stopped, an anomalous stop is performed.

j) Low pressure protective control (Main unit only)

If the low pressure (sensed by PSL) drops below the set value, the compressor's capacity is controlled to prevent the low level pressure from dropping. If it drops still further, the compressor is stopped.

1) Compressor control

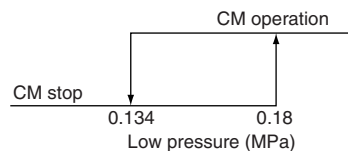


Note (1) Starting Conditions

- Later than 1 minute 45 seconds after compressor operation starts
- Sensed continuously for 10 seconds
- Compressor operation frequency: higher than 20Hz

2) Low pressure anomaly

- (a) If the low pressure (sensed by PSL) drops to 0.134 MPa or lower continuously for 30 seconds, the compressor is stopped and if a pressure of 0.18 MPa or higher is detected continuously for 10 seconds, the compressor is automatically reset. If this occurs 2 times within 60 minutes, an anomalous stop is performed.



- (b) A low pressure (sensed by PSL) of 0.18 MPa or lower while the compressor is stopped, or sensed continuously for 30 seconds while the compressor is operating, is prohibited. If this occurs 5 times within 60 minutes, an abnormal stop is performed.

It is possible to reset the system only by turning the power off, then turning it on again.

(c) First cooling operation after the power is turned on

If a low pressure of 0.003 MPa or lower is detected continuously for 60 seconds after 4-way valve switching assurance, the compressor is stopped, and if a low pressure of 0.18 MPa or higher is detected continuously for 10 seconds, the compressor is restarted automatically, but if an anomalous pressure is detected again, an abnormal stop is performed. It is possible to reset the system only by turning the power off, then turning it on again.

k) Outdoor fan motor (DC) anomaly protection (Main unit / sub unit)

This control applies to the main unit and sub units independently.

1) DC fan speed down control

(a) Control activation conditions

When the commanded speed for an outdoor fan motor (FMo1 or FMo2) exceeds 400min^{-1} , the DC Fan1 and DC Fan2 error counters are checked every second, and an error stop occurs if the count is 3 or higher. (A count of 2 or less is judged as noise related.)

(b) Control description

- (1) If an error status exists, the commanded speed is reduced by 100min^{-1} , and a start condition check then occurs every 10 seconds.
- (2) If an error status is still detected at each check, the item a) operation above is repeated. If the higher of the FMo1 and FMo2 commanded speeds drops to 400min^{-1} or less, the 100min^{-1} speed reduction no longer occurs.
- (3) If an error is not detected for a period of 60 continuous seconds, the speed is increased 100min^{-1} every 60 seconds until the target speed is reached. The 100min^{-1} correction is stopped, however, if the higher of the FMo1 and FMo2 commanded speeds is 400min^{-1} or less.

(c) Control termination conditions

- (1) When the fan speed is less than 400min^{-1} before being corrected.
- (2) When the amount of speed reduction correction that occurred is recovered.

2) DC fan overcurrent error detection

(a) DC fan1 error detection

An error occurs when any one of the following occurs.

- (1) When 52C1 is ON, and the FMo1 commanded speed $\leq 400\text{min}^{-1}$, and an overcurrent error status has been detected at DC fan1 for 10 continuous seconds.
- (2) When an FMo1 actual speed of 100min^{-1} or less has continued for 30 seconds following an "FMo1 commanded speed $> 0\text{min}^{-1}$ " status that continued for 60 seconds. (Fan motor lock detection)

(b) DC fan2 error detection

An error occurs when any one of the following occurs.

- (1) When 52C1 is ON, and the FMo2 commanded speed $\leq 400\text{min}^{-1}$, and an overcurrent error status has been detected at DC fan2 for 10 continuous seconds.
- (2) When an FMo2 actual speed of 100min^{-1} or less has continued for 30 seconds following an "FMo2 commanded speed $> 0\text{min}^{-1}$ " status that continued for 60 seconds. (Fan motor lock detection)
- (3) If an item (ii) 1) or 2) error is detected, all outdoor units are stopped, and are then automatically restarted after 3 minutes.
- (4) An error stop occurs if an item (ii) 1) or 2) error occurs 5 times in 1 hour at any of the units.
- (5) A power supply reset is required to recover from an error stop.
- (6) An error stop occurs if a fan speed error occurs within 45 minutes following power ON.
- (7) When a stop occurs due to an error detection, both 52C1 and 52C2 are switched OFF.

3.3.23 Forced heating / cooling operation (Main unit)

With this control, SW3-7 on the outdoor unit PCB is turned on and CnG1 (equipped with short circuit pin) is closed or opened so as to forcibly determine whether the indoor unit is operated for cooling or heating. If any operation mode other than the forcible mode is commanded from the indoor unit, the mode unmatched message is displayed on the remote controller or others and the operation enters in the blowing mode.

SW3-7	CnG1	Operation
OFF	Open/short	Normal operation
ON	Open	Cooling
	Short	Heating

Note (1) SW-7 is at OFF and CnG1 is open at the shipping from factory.

3.3.24 Automatic backup operation (Main unit / sub unit)

When one or more compressors fail, operation occurs using only the functioning compressors.

- a) Automatic backup operation is only enabled when SW3-2 is ON (alternate setting) at the main unit.
- b) The following error status are disabled and not detected at failed compressors.

① L3-phase "open phase" error (E32)	⑨ Inverter PCB communication error (E45)
② Discharge pipe temperature error (E36)	⑩ DC fan error (E48)
③ Heat exchanger thermistor disconnection (E37)	⑪ Low-pressure error (E49)
④ Outdoor temperature thermistor disconnection (E38)	⑫ Power transformer overheat (continuous) (E51)
⑤ Discharge pipe temperature thermistor (E39)	⑬ Suction pipe thermistor disconnection (E53)
⑥ High pressure error (E40)	⑭ Compressor start error (E59)
⑦ Power transformer overheat (E41)	⑮ Compressor rotor lock error (E60)
⑧ Current cut (E42)	
- c) If any of the item (b) errors shown above occur while a compressor is running, that compressor is stopped, but other compressors continue running as usual.
- d) After recovering from the error, with start conditions satisfied, the compressors (CM1, 2) which are capable of running at the minimum frequency are started.
- e) An automatic recovery does not occur if a thermistor disconnection/severed wire occurs 3 times within 40 minutes. (Unit is stopped.)
- f) When a failure-recovered compressor is started, the other compressors revert back to their usual control.

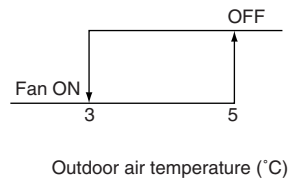
3.3.25 Snow protection fan control (Main unit / sub unit)

Set this for the main unit as well as sub units.

- a) This control is enabled/disabled by the selector switch at the 7-segment display.
 - ① Set the Code No. to "75".
 - ② "0" or "1" displays at the data display area.
 - 0: Outdoor fan control disabled (factory setting)
 - 1: Outdoor fan control enabled
 - ③ Press SW7 continuously for 3 seconds.
 - ④ "0" or "1" blinks every 0.5 seconds at the data display area.
 - ⑤ Press SW8 to toggle between the blinking "0" and "1" displays.
 - ⑥ If SW7 is pressed for 3 seconds or longer while "0" and "1" is blinking, the blinking stops, and that enabled/disabled setting is registered. If enabled, fan control occurs as described below.
 - ⑦ Outdoor fan control occurs in accordance with the information stored in memory, even if the power is turned OFF and back ON again.

b) Control description

- 1) If the outside temperature drops to 3°C or lower when all units are stopped, or during an error stop, the outdoor fan runs at level 4 speed once every 10 minutes.



- 2) The outdoor fan runs for 30 seconds.
3) During this snow protection control, the compressor's magnetic contactor (52C1) is ON.

3.3.26 Pump down control (Main unit / sub unit)

- a) This control is performed from the main unit side. It cannot be controlled from the sub unit side. If control from the sub unit side is attempted, the following codes are displayed on the 7-segment display of the sub unit.

Code indicator	Data indicator	Description of disabled control
OPE	10	Setting from a slave unit is invalid.

Note (1) The display returns to normal if the pump-down control switch is reset.

- b) Pump down operation can be performed through operation of DIP switches (SW5-1, 2, 3). (Pump down operation cannot be done during indoor unit operation, backup operation or during an anomalous stop.)

1) Pump down procedure

- (a) Close the liquid side service valve on the outdoor unit.
(b) Turn SW5-2 (test operation operation mode) ON (cooling).
(c) Turn SW5-3 (pump down switch) ON.
(d) Turn SW5-1 (test operation switch) ON.

2) Control

- (a) In the cooling mode, it operates with the compressor's pump-down frequency (see the following table) as the upper limit.

(About the method of start, please refer to Compressor protective start)

Model	Frequency (Hz)	Model	Frequency (Hz)
335	40	900	46
400	40	960	48
450	46	1010	52
504	52	1065	56
560	60	1130	60
615	68	1180	64
680	72	1235	68
735	37	1300	68
800	40	1360	72
850	42		

- (b) The red and green (LED's) on the outdoor control PCB flashes together continuously and "PoS" is displayed in the 7-segment display.
(c) Except for low pressure control, all the protective and anomaly sensing controls are activated.
(d) Test operation commands are sent to the indoor units.
- c) Ending

If any of the following conditions exists, pump down operation ends.

- 1) If a low pressure (sensed by PSL) of ≤ 0.01 MPa is detected continuously for 5 seconds.
The displays are as follows.
- | | |
|-----------------------------------|---------------------------|
| ■ Red LED: Lights up continuously | ■ Green LED: flashing |
| ■ 7-segment LED display: PoE | ■ Remote controller: Stop |
- 2) If operation is stopped by abnormal sensing control.

3) If the cumulative compressor operation time totals 15 minutes.

The displays are as follows.

- Red LED: stays OFF
- Green LED: flashing
- 7-segment LED display: No display
- Remote controller: Stop

4) If any one of DIP switches SW5-1, 2 or 3 is turned OFF during the pump down operation.

3.3.27 Emergency stop control

When an indoor unit's external input (optional: refrigerant leakage, etc.) indicates a refrigerant leak, that information is transmitted to the outdoor unit, stopping operation. An emergency stop error is then transmitted to all indoor units that are running.

- a) Error stop occurs when the "emergency stop" command is received from the indoor unit.
- b) Error code E63 occurs, and the "emergency stop" command is transmitted to all indoor units.
- c) When a "emergency stop clear" command is received from the indoor unit, the outdoor unit's error status is cleared, and an "emergency stop clear" command is transmitted to all the indoor units.

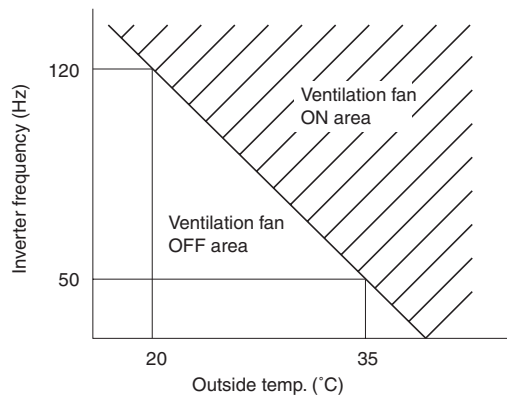
3.3.28 Ventilation fan control (Main unit / sub unit)

This control applies to the main unit and sub units independently.

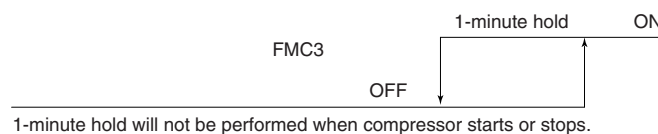
- a) Control activation conditions

When either compressor 1 or compressor 2 is running.

Control description



- 1) The ventilation fan (FMC3) switches ON when the outdoor air temperature (Tho-A detected temp.) and the inverter frequency (the higher of the compressor 1 & 2 frequencies) relationship is in the "ventilation fan ON area" shown in the above figure.
- 2) Linear interpolation occurs for frequencies beyond the outside temperature range shown above.
- 3) Once the ON or OFF area is entered, the ON or OFF status can be changed after a 1-minute status hold.



- b) Control termination conditions

Control ends when compressors stop in all units.

3.3.29 Outdoor unit combination protection (Main unit only)

Capacity of connectable outdoor unit is judged, and in case of faulty connection, protection is provided by error display in 7-segment. However error stop and error sending to indoor unit will not be performed.

a) Combination unit

Units other than the combination in the table below will not operate due to error.

Outdoor unit model		Outdoor unit combination model						
Model	HP	335HLX-K	400HLX	450HLX	504HLX	560HLX	615HLX	680HLX
735	26	1	1	—	—	—	—	—
800	28	—	2	—	—	—	—	—
850	30	—	1	1	—	—	—	—
900	32	—	—	2	—	—	—	—
960	34	—	—	1	1	—	—	—
1010	36	—	—	—	2	—	—	—
1065	38	—	—	—	1	1	—	—
1130	40	—	—	—	—	2	—	—
1180	42	—	—	—	—	1	1	—
1235	44	—	—	—	—	—	2	—
1300	46	—	—	—	—	—	1	1
1360	48	—	—	—	—	—	—	2

Note (1) This control is performed from the main unit side.

b) 7-segment display in abnormal circumstances

Code indicator	Data indicator	Description of disable control
OPE	3	Setting from a sub unit is invalid

3.3.30 Indoor unit connection number protection (Main unit only)

If the number of indoor units on the connection exceeds the number as listed below, the compressor stops with the error stop.

Model	Number of units on connection	Model	Number of units on connection
335	48	900	48
400		960	
450		1010	
504		1065	
560		1130	
615		1180	
680		1235	
735		1300	
800		1360	
850		—	

3.3.31 External input operation and demand input

a) Operation permission / prohibition control

1) External input: From CnS1 and J13, operation permission/prohibition control switching.

J13: Switches of CnS1 input method

J13 closed circuit: Level input by CnS1.

J13 open: Pulse input by CnS1.

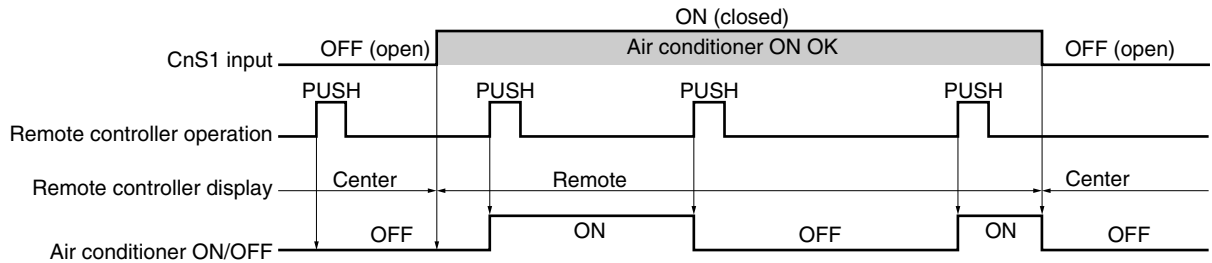
2) From CnS1, operation permission/prohibition control

Input : CnS1	CnS1 input method change: J13	CnS1 : Operation permission/ Prohibition mode change
Disconnection	J13; Closed circuit Level input	Operation prohibition mode → Operation permission mode
	J13; Disconnection Pulse input	Operation permission/Prohibition model change (Reversal)
Closed circuit	J13; Closed circuit Level input	Operation permission mode → Operation prohibition mode
	J13; Disconnection Pulse input	— (NOP)

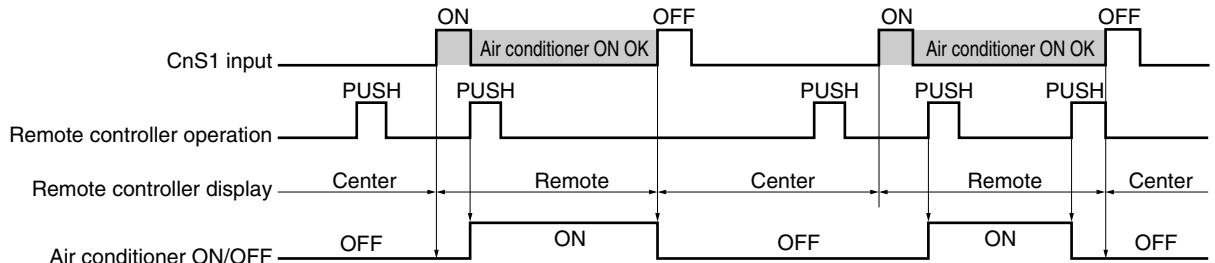
Note (1) The factory settings are: J13-closed circuit; CnS1-closed circuit (short pin connection)

- 3) The remote controller displays the operation mode. "To Option" sends the operation mode.
- 4) When the control from remote controller is not received by this control, "Center" is displayed. (Refer to the next item)
- 5) CnS1, performs the following operations by the changing of jumper wire J13 from short circuit to open circuit. If pulse input, the pulse duration is 500 ms or more.

① Operation with J13 short circuit



② Operation with J13 disconnection



b) Demand control

1) From CnS1 and J13: Demand control / normal operation switching.

- J13: Switches of CnS2 input method.
- J13 closed circuit: Level input by CnS2.
- J13 open: Pulse input by CnS2.

2) From CnS2, operation permission / prohibition control

Input : CnS2	CnS2 input method Formula switching: J13	CnS2 : Demand control/normal operating switching
Closed circuit	J13; Closed circuit Level input	Demand control → Normal operation
Open circuit	J13; Open circuit Pulse input	Normal operation/Demand control switching (Reversal)
Closed circuit	J13; Closed circuit	Normal operation → Demand control
Open circuit	J13; Open circuit	— (NOP)

Note (1) The factory settings are: J13 - short circuit; CnS2 - short circuit (short pin connection)

3) The remote controller displays the operation mode. "To Option" sends the operation mode.

4) Demand control

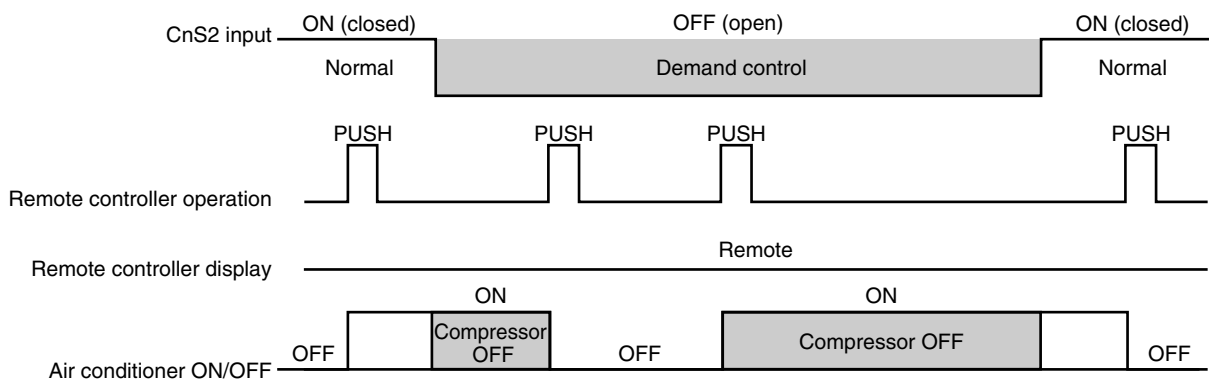
It is possible to switch the demand using DIP switch SW4-5, 6.

SW4-5	SW4-6	Compressor output (%)
0	0	80
1	0	60
0	1	40
1	1	0

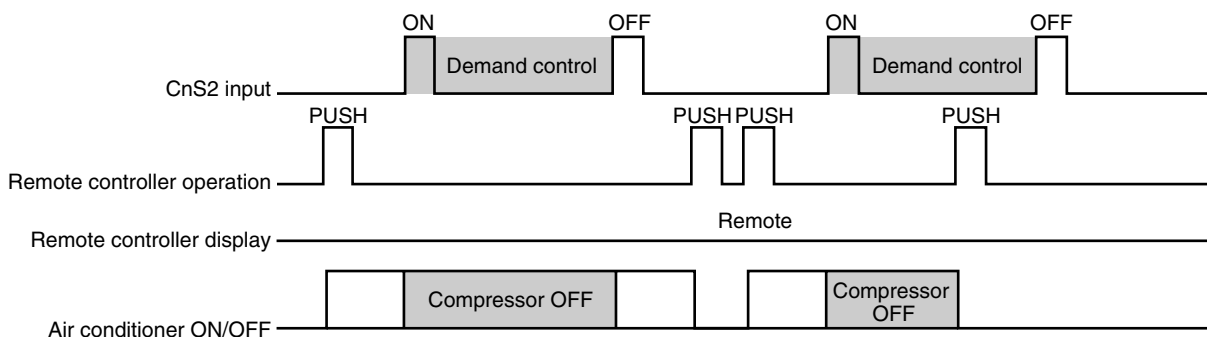
Note (1) 0: Open, 1: Shorted

5) CnS2, performs the following operations by the changing of jumper wire J13 from short circuit to open circuit. If pulse input, the pulse duration is 500 ms or more.

① J13 - Short circuit



② J13 - Open circuit



3.3.32 7-Segment display

The data in the following table can be displayed using the display select switch (SW8: 1's digit; SW9: 10's digit).

Code No.	Contents of display	Data display range	Minimum units	Remarks
—	Unusual cade Pump down Check mode Outdoor unit setup	—	—	E?? PoE, PoS CH? OPE??
00	CM1 operating frequency	0~130	1Hz	
01	CM2 operating frequency	0~130	1Hz	
02	Tho-A Outdoor air temp.	L, -20~43	1°C	[L] is indicated when the temperature is -20°C or below and the actual temperature is indicated when it is higher than -20°C and up to 43°C.
03	Tho-R1 Heat exchanger temp. 1 (Exit. Front)	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
04	Tho-R2 Heat exchanger temp. 2 (Exit. Rear)	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
05	Tho-R3 Heat exchanger temp. 3 (Entrance. Front)	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
06	Tho-R4 Heat exchanger temp. 4 (Entrance. Rear)	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
07	Tho-D1 Discharge pipe temp.	L, 31~136	1°C	[L] is indicated when the temperature is 31°C or below and the actual temperature is indicated when it is higher than 31°C and up to 136°C.
08	Tho-D2 Discharge pipe temp.	L,31~136	1°C	[L] is indicated when the temperature is 31°C or below and the actual temperature is indicated when it is higher than 31°C and up to 136°C.
10	Tho-C1 Under-dome temp.	L, 5~90	1°C	[L] is indicated when the temperature is 5°C or below and the actual temperature is indicated when it is higher than 5°C and up to 80°C.
11	Tho-C2 Under-dome temp.	L, 5~90	1°C	[L] is indicated when the temperature is 5°C or below and the actual temperature is indicated when it is higher than 5°C and up to 80°C.
12	Tho-P1 Power transistor temp.	L, 31~136	1°C	[L] is indicated when the temperature is 31°C or below and the actual temperature is indicated when it is higher than 31°C and up to 136°C.
13	Tho-P2 Power transistor temp.	L, 31~136	1°C	[L] is indicated when the temperature is 31°C or below and the actual temperature is indicated when it is higher than 31°C and up to 136°C.
14	Tho-SC Sub-cooling coil temp.1	L, 18~73	1°C	[L] is indicated when the temperature is 18°C or below and the actual temperature is indicated when it is higher than 18°C and up to 73°C.
15	Tho-SC Sub-cooling coil temp.2	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.
16	Tho-S Suction pipe temp.	L, -25~73	1°C	[L] is indicated when the temperature is -25°C or below and the actual temperature is indicated when it is higher than -25°C and up to 73°C.

Code No.	Contents of display	Data display range	Minimum units	Remarks
17	Cooling operation super cooling	0~50	0.1°C	
18	Suction superheat	0~50	0.1°C	
19	Superheat of sub-cooling coil	0~50	0.1°C	
20	CT1 Current	0~70	1A	
21	CT2 Current	0~70	1A	
22	EEVH1 Heating expansion valve opening angle	0~500	1 Pulse	
23	EEVH2 Heating expansion valve opening angle	0~500	1 Pulse	
24	Opening angle of EEVSC overcooling coil expansion valve	0~500	1 Pulse	
26	FM01 Number of rotations	0~1500	10 min ⁻¹	
27	FM02 Number of rotations	0~1500	10 min ⁻¹	
28	PSH High pressure sensor	0~5.00	0.01MPa	
29	PSL Low pressure sensor	0~2.00	0.01MPa	
30	FMC1, 2 Cooling fan Crankcase heater	0,1	—	Order of 100: FMC1, 2 Order of 10 : CH1 Order of 1 : CH2(0: OFF, 1: ON)
31	63H1-1 63H1-2	0,1	—	Order of 100: 63H1-1, 2 Order of 10 : — (0: Close, 1: Open)
32	SV1 SV2	0,1	—	Order of 100: SV1 Order of 10 : SV2 Order of 1 : — (0: Close, 1: Open)
33	SV6 SV7	0,1	—	Order of 100: SV6 Order of 10 : SV7 Order of 1 : — (0: Close, 1: Open)
34	20S	0,1	—	Order of 100: 20S, Order of 10 : — Order of 1 : — (0: Close, 1: Open)
35	Compressor stop causes ①	0,1	—	Order of 100: Defective outdoor temperature thermistor Order of 10 : Defective outdoor unit heat exchanger thermistor 1 Order of 1 : Defective outdoor unit heat exchanger thermistor 2 (0:Normal, 1: Anomaly)
36	Compressor stop causes ②	0,1	—	Order of 100: Defective outdoor unit heat exchanger thermistor 3 Order of 10 : Defective outdoor unit heat exchanger thermistor 4 Order of 1 : Defective discharge pipe thermistor 1 (0:Normal, 1: Anomaly)
37	Compressor stop causes ③	0,1	—	Order of 100: Defective discharge pipe thermistor 2 Order of 10 : Defective Sub cooling coil thermistor 1 Order of 1 : Defective Sub cooling coil thermistor 2 (0:Normal, 1: Anomaly)
38	Compressor stop causes ④	0,1	—	Order of 100: Defective suction pipe thermistor Order of 10 : Defective low pressure sensor Order of 1 : Defective high pressure sensor (0:Normal, 1: Abnormal)

Code No.	Contents of display	Data display range	Minimum units	Remarks
39	Compressor stop causes ⑤	0,1	—	Order of 100: Anomaly in inverter 1 Order of 10 : Anomaly in inverter 2 Order of 1 : Anomaly high pressure (0:Normal, 1: Anomaly)
40	Compressor stop causes ⑥	0,1	—	Order of 100: Abnormal low pressure Order of 10 : Abnormal discharge pipe thermistor 1 Order of 1 : Abnormal discharge pipe thermistor 2 (0:Normal, 1: Anomaly)
41	Compressor stop causes ⑦	0,1	—	Order of 100: Defect CM1 starting Order of 10 : Defect CM2 starting Order of 1 : Rotor lock CM1 (0:Normal, 1: Anomaly)
42	Compressor stop causes ⑧	0,1	—	Order of 100: Rotor lock CM2 Order of 10 : CM1 Current cut Order of 1 : CM2 Current cut (0:Normal, 1: Anomaly)
43	Compressor stop causes ⑨	0,1	—	Order of 100: Power transistor 1 overheating Order of 10 : Power transistor 2 overheating Order of 1 : Abnormalities in DC fan1 (0:Normal, 1: Anomaly)
44	Compressor stop causes ⑩	0,1	—	Order of 100: Abnormalities in DC fan2 Order of 10 : Stop command from indoor Order of 1 : Operation mode charge (0:Normal, 1: Anomaly)
45	Compressor stop causes ⑪	0,1	—	Order of 100: Dilute protection Order of 10 : Demand control 0% Order of 1 : 0 (0:Normal, 1: Anomaly)
46	Control status	0,1	—	Order of 100: During equal oil control Order of 10 : During oil return control Order of 1 : During defrost (0:Non-operation, 1: Operation)
47	Control status	0,1	—	Order of 100: During Td control Order of 10 : During HP control Order of 1 : During CS control (0:Non-operation, 1: Operation)
48	Control status	0,1	—	Order of 100: During LP control Order of 10 : During PT control Order of 1 : Under cooling low pressure control (0:Non-operation, 1: Operation)
49	Control status	0,1	—	Order of 100: Cooling high pressure protection control Order of 10 : Heating high pressure protection control Order of 1 : Heating low pressure protection control (0:Non-operation, 1: Operation)
50	Number of connected indoor unit	0~50	1	
51	Number of operation indoor unit	0~50	1	
52	Required Hz tota	0~999	1Hz	
53	Target Fk	0~999	1Hz	
54	Compressor cumulative operating time (CM1)	0~655	100h	
55	Compressor cumulative operating time (CM2)	0~655	100h	

Code No.	Contents of display	Data display range	Minimum units	Remarks
56	Discharge pressure saturation temperature	-50~70	0.1°C	1°C at -10 or lower
57	Air inlet pressure saturation temperature	-50~30	0.1°C	1°C at -10 or lower
58	Target cooling low pressure	0.00~2.00	0.01MPa	
59	Target heating high pressure	1.60~4.15	0.01MPa	
60	Counter · Compressor 2 starting failure	0, 1	—	
61	Counter · Motor lock compressor 2	0~3	—	
62	Power transistor 2 overheating	0~4	—	
63	Inverter 1 operating frequency command	0~130	1Hz	
64	Inverter 2 operating frequency command	0~130	1Hz	
65	Counter · Inverter 2 communications error	0~3	—	
66	Control status	0,1	—	Order of 100 : During silent mode Order of 1 : During test operation (0:Non-operation, 1: Operation)
67	Control status	0,1	—	Order of 100 : Unmatch Order of 10 : Indoor EEV check Order of 1 : — (0:Non-operation, 1: Operation)
68	Control status	0,1	—	Order of 100 : Piping cleaning Order of 10 : Under-dome temperature control Order of 1 : Compression ratio protection control (0:Non-operation, 1: Operation)
70	Operation priority switching	0,1	—	0 : Prior press priority (when shipped) 1 : After press priority
71	High pressure control of cooling	2.2, 2.5	0.01MPa	2.2 : Factory setting 2.5 : Alternate setting
72	Low pressure control of cooling	-0.05~+0.05	0.01MPa	0.00 : Factory setting
73	Heating high pressure compensation	0.00~0.30	0.01MPa	0.00 : Factory setting
74	Low pressure of heating	0.80, 0.90	—	0.8 : Factory setting 0.9 : Alternate setting
75	Snow protection fan control	0,1	—	0 : Snow protection fan control deactivated 1 : Snow protection fan control activated
77	Data reset	---, dEL	—	
80	Counter · Thermistor disconnection	0~2	—	
81	Counter · Inverter 1 communications error	0~3	—	
82	Counter · High pressure protection	0~4	—	
83	Counter · Compressor 1 starting failure	0,1	—	
84	Counter · Anomalous low pressure ① (Under stop)	0~4	—	
85	Counter · Anomalous low pressure ② (Immediately after starting)	0,1	—	
86	Counter · Anomalous low pressure ③ (Under operation)	0~4	—	

Code No.	Contents of display	Data display range	Minimum units	Remarks
87	Counter · Motor lock of compressor 1	0~3	—	
88	Counter · Overheating of power transistor 1	0~4	—	
89	Counter · Anomalous temp. of discharge pipe 1	0,1	—	
90	Counter · Anomalous temp. of discharge pipe 2	0,1	—	
91	Counter · Current cut (CM1)	0~3	—	
92	Counter · Current cut (CM2)	0~3	—	
93	Counter · Indoor-outdoor communications error	0~255	—	
94	Counter · Outdoor inverter communications error 2	0~255	—	
95	Counter · CPU reset	0~255	—	
96	Counter · Anomalous FM01	0~255	—	
97	Counter · Anomalous FM02	0~255	—	
98	Program version	—	—	Example (2.11)
99	Auto send display	—	—	

Notes (1)The error No. display in abnormal circumstances returns normal by turning Dipswitch SW3-1 ON.

(2)Code No. 77 can be reset. (Data is displayed by code No., and SW7 is pushed for 3 seconds.)

3.3.33 Saving of operation data

Operating data for a period of 30 minutes prior to the time when trouble occurs are recorded, and these data can be fetched to a personal computer through the RS232C connector on the control board. Data are updated continuously, and when there is an abnormal stop, data updates stop at that point. Pressing DIP switch SW7 for 5 seconds causes the data to be erased. Data can also be sampled at 1 ~ 60 second intervals during operation and fetched to a personal computer.

- Data is transmitted from a personal computer upon demand.

Data	Data Range	Example
Software version	ASCII 15-byte	KD3C218##### (#: NULL)
PID (program ID)	ASCII 2-byte	5D
Outdoor unit capacity	ASCII 3-byte	As shown in table at right
Power supply frequency	ASCII 2-byte	60
Outdoor address	ASCII 2-byte	00 ~ 3F
Indoor address × 16 units	ASCII 2-byte × 16 units	40 ~ 7F
Indoor capacity × 16 units	ASCII 3-byte × 16 units	022 ~ 280

Outdoor capacity data	Remarks
Integrated type Ex: 24PS or S24	S: Horsepower of integrated type or combined master units
Master unit of combination Ex: 46PS or S46	S: Horsepower of integrated type and combined master units
Combined slave units Ex: 20PS or C22	C: Horsepower of combined slave units

Code No.	Write-in contents	Record data			
		Data write-in range	Write-in unit	Number of bytes	Contents
00	Anomaly code	00~99	—	1	00: No abnormality, outdoor unit all abnormalities ???
01	Address of unit where trouble occurred	00~FF	—	1	0~3F: Outdoor unit side, 40~6F: Indoor unit side
02	Operation mode	0~2	—	1	0 Stop
					1 Cooling
					2 Heating
03	High pressure sensor	0.00~5.00	A/D value	1	
04	Low pressure sensor	0.00~2.00	A/D value	1	
05	Heat exchanger temp. 1 (Exit, Front)	-35~75	A/D value	1	Cooling liquid side
06	Heat exchanger temp. 2 (Exit, Rear)	-35~75	A/D value	2	Cooling liquid side
07	Heat exchanger temp. 3 (Entrance, Front)	-35~75	A/D value	2	Cooling gas side
08	Heat exchanger temp. 4 (Entrance, Rear)	-35~75	A/D value	2	Cooling gas side
09	Tho-D1 Discharge pipe temp.	20~140	A/D value	1	
10	Tho-D2 Discharge pipe temp.	20~140	A/D value	1	
11	Tho-C1 Under-dome temp.	-15~90	A/D value	1	
12	Tho-C2 Under-dome temp.	-15~90	A/D value	1	
13	Tho-A Outdoor air temp.	-20~43	A/D value	1	
14	Tho-P1 Power transistor temp. (Heat dissipation fin)	20~140	A/D value	1	
15	Tho-P2 Power transistor temp. (Heat dissipation fin)	20~140	A/D value	1	
16	Tho-SC Sub cooling coil temp. 1	18~73	A/D value	1	Liquid pipe side
17	Tho-H Sub cooling coil temp. 2	-35~75	A/D value	2	Suction pipe side
18	Tho-S Suction pipe temp.	-35~75	A/D value	2	
19	Cooling operation super cooling	0~50	A/D value	1	
20	Suction superheat	0~50	A/D value	1	
21	Super heat of sub-cooling coil	0~50	A/D value	1	
22	CT1 Current	0~50	A/D value	1	
23	CT2 Current	0~50	A/D value	1	
24	Power source voltage	180~500	A/D value	1	

Code No.	Write-in contents	Record data			
		Data write-in range	Write-in unit	Number of bytes	Contents
25	Pressure switch	—	—	1	Bit0 63H1 0: Open, 1: Close
26	Solenoid valve	—	—	1	Bit0 20S 0:OFF, 1:ON
					Bit2 SV1 0:OFF, 1:ON
					Bit3 SV2 0:OFF, 1:ON
					Bit4 SV6 0:OFF, 1:ON
					Bit5 SV7 0:OFF, 1:ON
27	Crankcase heater etc.	—	—	1	Bit0 CH1 0:OFF, 1:ON
					Bit1 CH2 0:OFF, 1:ON
					Bit2 FM1,2 0:OFF, 1:ON
28	FM01 Number of rotations	0~65535	10 min ⁻¹	2	
29	FM02 Number of rotations	0~65535	10 min ⁻¹	2	
30	EEVH1 opening angle	0~65535	1pulse	2	
31	EEVH2 opening angle	0~65535	1pulse	2	
32	EEVSC opening angle	0~65535	1pulse	2	
34	Indoor unit connection number	0~255	1 unit	1	
35	Indoor unit connection capacity	0~65535	—	2	
36	Indoor unit thermostat ON number	0~255	1 unit	1	
37	Indoor unit thermostat ON capacity	0~65535	—	2	
38	Required Hz total	0~65535	1Hz	2	
39	Target FK	0~65535	1Hz	2	
40	Inverter CM1 operation frequency	0~255	1Hz	1	
41	Inverter CM2 operation frequency	0~255	1Hz	1	
42	Answer Hz total	0~65535	1Hz	2	
43	Compressor 1 cumulative operating time (estimate)	0~65535	1 h	2	
44	Compressor 2 cumulative operating time (estimate)	0~65535	1 h	2	
45	Compressor 1 start times	0~65535	20 times	2	
46	Compressor 2 start times	0~65535	20 times	2	
47	Compressor stop causes	—	—	1	Bit0 Defective outdoor temperature thermistor
					Bit1 Defective outdoor unit heat exchanger 1 thermistor
					Bit2 Defective outdoor unit heat exchanger 2 thermistor
					Bit3 Defective outdoor unit heat exchanger 3 thermistor
					Bit4 Defective outdoor unit heat exchanger 4 thermistor
					Bit5 Defective discharge pipe thermistor 1
					Bit6 Defective discharge pipe thermistor 2
					Bit7 Defective sub-cooling coil thermistor 1

Code No.	Write-in contents	Record data				
		Data write-in range	Write-in unit	Number of bytes	Contents	
48	Compressor stop causes	—	—	1	Bit0	Defective sub-cooling coil thermistor 2
					Bit1	Defective suction pipe thermistor
					Bit2	Defective low pressure sensor
					Bit3	Defective high pressure sensor
					Bit4	Inverter 1 abnormal communication
					Bit5	Inverter 2 abnormal communication
					Bit6	Anomalous high pressure
					Bit7	Anomalous Low pressure
49	Compressor stop causes	—	—	1	Bit0	Td1 Abnormal discharge pipe temp.
					Bit1	Td2 Abnormal discharge pipe temp.
					Bit2	CM1 starting defect
					Bit3	CM2 starting defect
					Bit4	Rotor lock of CM1
					Bit5	Rotor lock of CM2
					Bit6	Current cut of CM1
					Bit7	Current cut of CM2
50	Compressor stop causes	—	—	1	Bit0	Power transistor 1 overheating
					Bit1	Power transistor 2 overheating
					Bit2	FM01 anomaly
					Bit3	FM02 anomaly
					Bit4	Compressor stop command from indoor unit
					Bit6	Dilution rate protection
					Bit7	Demand control 0%
51	Control status	0~180	1 second	1	CM1 3-minute delay timer	
52	Control status	0~180	1 second	1	CM2 3-minute delay timer	
53	Discharge pressure saturation temperature	-50~70	0.1°C	2		
54	Intake pressure saturation temperature	-50~70	0.1°C	2		
55	Control status oil return	0,1	—	1	0	None
					1	Under control
56	Control status oil return	0~2	—	1	0	None
					1	Waiting for oil return
					2	Under oil return

Code No.	Write-in contents	Record data				
		Data write-in range	Write-in unit	Number of bytes	Contents	
57	Control status defrost conditions	0~3	—	1	0	None
					1	Temperature conditions
					2	Strengthening temperature conditions
					3	Time conditions
58	Control status defrost status	0~4	—	1	0	None
					1	Defrosting status 1
					2	Defrosting status 2
					3	Defrosting status 3
					4	Defrosting status 4
59	Control status Td	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under Td control
60	Control status	0~1	—	1	Td1 error counter	
61	Control status	0, 1	—	1	Td2 error counter	
62	Control status HP	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under high pressure control
63	Control status	0~1	—	1	HP error (63H1) counter	
64	Control status CS	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under CS control
65	Control status LP	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under low pressure control
66	Control status	0~3	—	1	LP error (when stopped) counter	
67	Control status	0~4	—	1	LP error (when started) counter	
68	Control status	0,1	—	1	LP error (when driving) counter	
69	Control status PT	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under PT control
70	Check operation status	—	—	1	Bit0	Unmatch check
					Bit1	Indoor side EEV check
					Bit3	Piping cleaning
71	Control status	0~360	3 minutes	2	CH compressor protection timer	
72	Control status CH compressor protective start	0~15	—	1	15	Protective start end
					0~14	During protective start

Code No.	Write-in contents	Record data				
		Data write-in range	Write-in unit	Number of bytes	Contents	
73	Switch etc.	—	—	1	Bit0	External operation (CnS1)
						0: Operation prohibition
						1: Operation permission
					Bit1	Demand (CnS2)
						0: None
						1: Under control
					Bit2	Forced cooling, heating (CnG1)
						0: None
					Bit3	Silent mode (CnG2)
						0: None
Bit4	Back up operation					
	0: None					
Bit5	Hz cancel operation					
	0: None					
						1: Under control
74	Control status	0~3	—	1	Current cut abnormality counter (INV1)	
75	Control status	0~4	—	1	Power transistor overheating abnormality counter (INV1)	
76	Control status	0~3	—	1	Rotor lock anomalous counter (INV1)	
77	Control status	0~1	—	1	Starting failure counter (INV1)	
78	Control status	0~3	—	1	Communications anomalous counter (INV1)	
79	Control status	0~3	—	1	Current cut anomalous counter (INV2)	
80	Control status	0~4	—	1	Power transistor overheating anomalous counter (INV2)	
81	Control status	0~3	—	1	Rotor lock anomalous counter (INV2)	
82	Control status	0~1	—	1	Starting failure counter (INV2)	
83	Control status	0~3	—	1	Communications anomalous counter (INV2)	
84	Control status	0~1	—	1	DC fan motor 1 error counter	
85	Control status	0~1	—	1	DC fan motor 2 error counter	
86	Control status	0~2	—	1	Thermistor disconnection counter	
87	Control status	0~255	—	1	Communications error counter (INV)	
88	Registered indoor units 1~8 operation mode	0~4	—	8	0	AUTO
					1	DRY
					2	COOL
					3	FAN
					4	HEAT
89	Registered indoor units 1~8 required Hz	0~255	1Hz	8		
90	Registered indoor units 1~8 answer Hz	0~255	1Hz	8		

Code No.	Write-in contents	Record data				
		Data write-in range	Write-in unit	Number of bytes	Contents	
91	Operation priority switching	0~1	—	1	0	Prior press priority
					1	After press priority
92	High pressure control of cooling	2.20,2.50	0.01MPa	1		
93	Cooling low pressure compensation	-0.05~0.05	0.01MPa	1		
94	Low pressure control of heating	0.80,0.90	0,01MPa	1		
95	Snow protection fan control	0~1	—	1	0	With
					1	None
96	CM1 frequency command	0~130	1Hz	1		
97	CM2 frequency command	0~130	1Hz	1		
98	Target cooling low pressure	0.00~2.00	0.01MPa	1		
99	Control status TC	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under-dome temperature control
100	Target heating high pressure	1.60~4.15	0.01MPa	2		
101	Heating high pressure compensation	0.00~0.30	0.01MPa	1		
102	Control / status SCR	0~2	—	1	0	None
					1	Frequency down
					2, 3	Under compression ratio protection control

Part 5

Air Conditioning Control System

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1. System Features

A variety of system expansions is possible by the controller's combination use in addition to individual use of each centralized controller.

"Super-link control system" is an advanced, high-speed transfer method of which Mitsubishi Heavy Industry boasts. It is a network that can connect at most 48 air-conditioning equipments including indoor units and total heat exchanger units etc.

It is a centralized control system that can flexibly meet the needs of managing building with different usage from a large-scale building to a small and medium-sized scale building over the wide range. The controllers for achieving a fine operation and management and the equipment group for management system are abundantly prepared.

The interface equipments that expand the communication function including the charge management and the air conditioner checker are also enhanced. Moreover, because the super-link adopts two lines type with no polarity, the construction cost and the area of the wiring shaft can be reduced greatly. It takes pride in the labor saving and the construction saving of the industry-leading class as it can easily access the building managing computer.

Fuzzy control

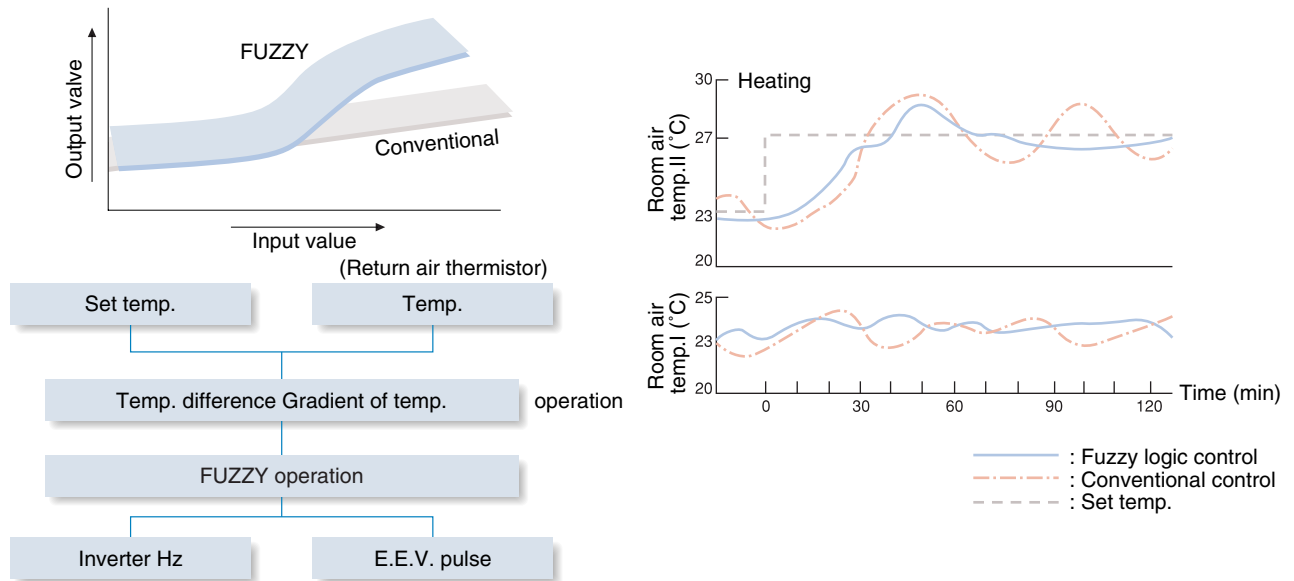
1. Response speed and stability are enhanced.

The system automatically controls changes of return air temperature, set temperature and room temperature according to the fuzzy control.

The system response speed, can keep room temperature constant, and can adjust room temperature to set temperature quickly.

2. Elimination of temperature irregularity as the time of operation ON/OFF control

The system finely controls the compressor to room temperature according to the temperature sensor, air conditions room temperature consistently and improves cooling or heating feeling in each room(or minimize influence of shutdown in other room)



"Super Link Network" Control System

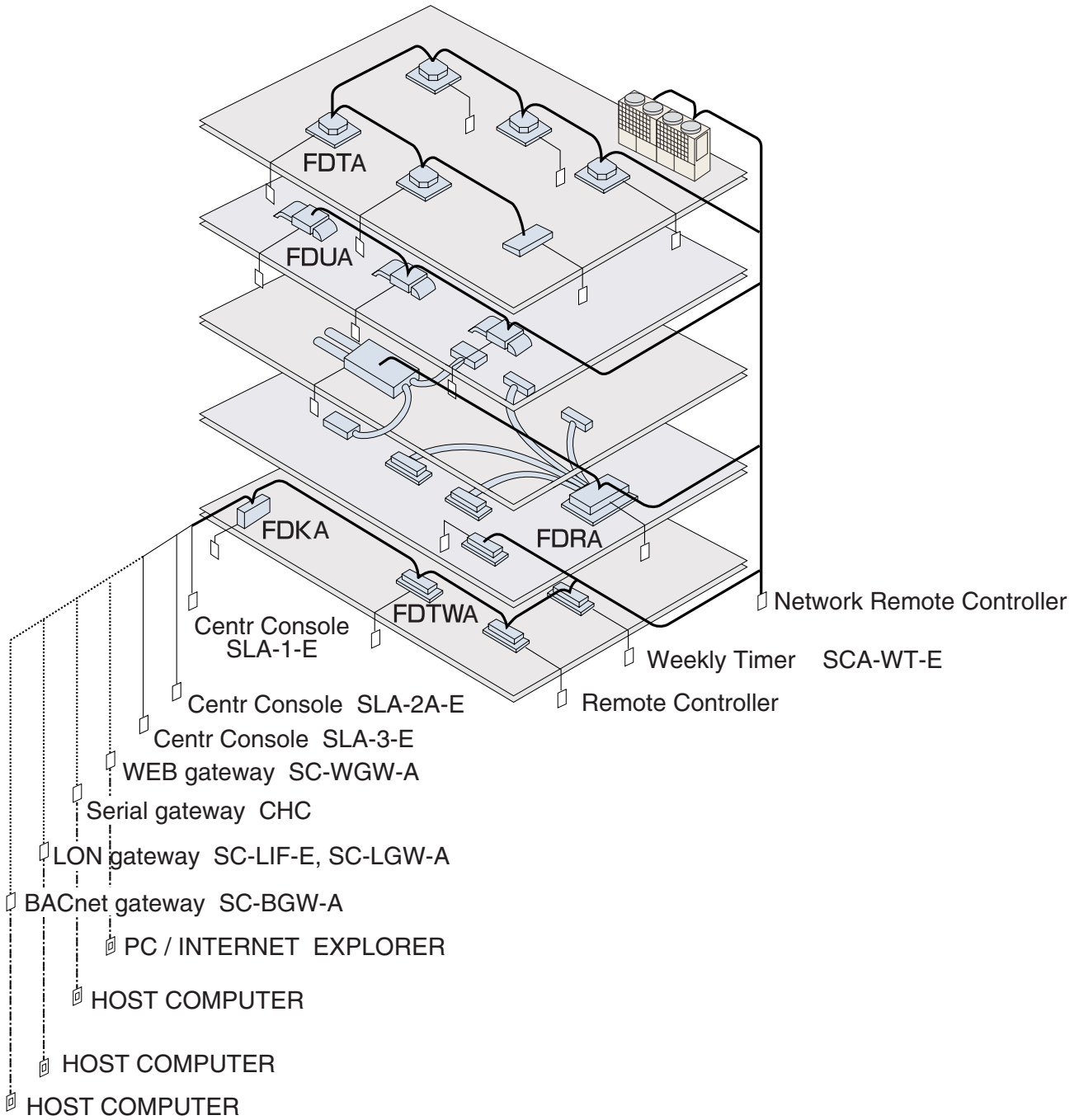
1. Non-polarity twin wires allow a maximum of 48 indoor units to constitute one network.

Up to 48 indoor units can be connected to form a network by setting the address number of the indoor and outdoor units.

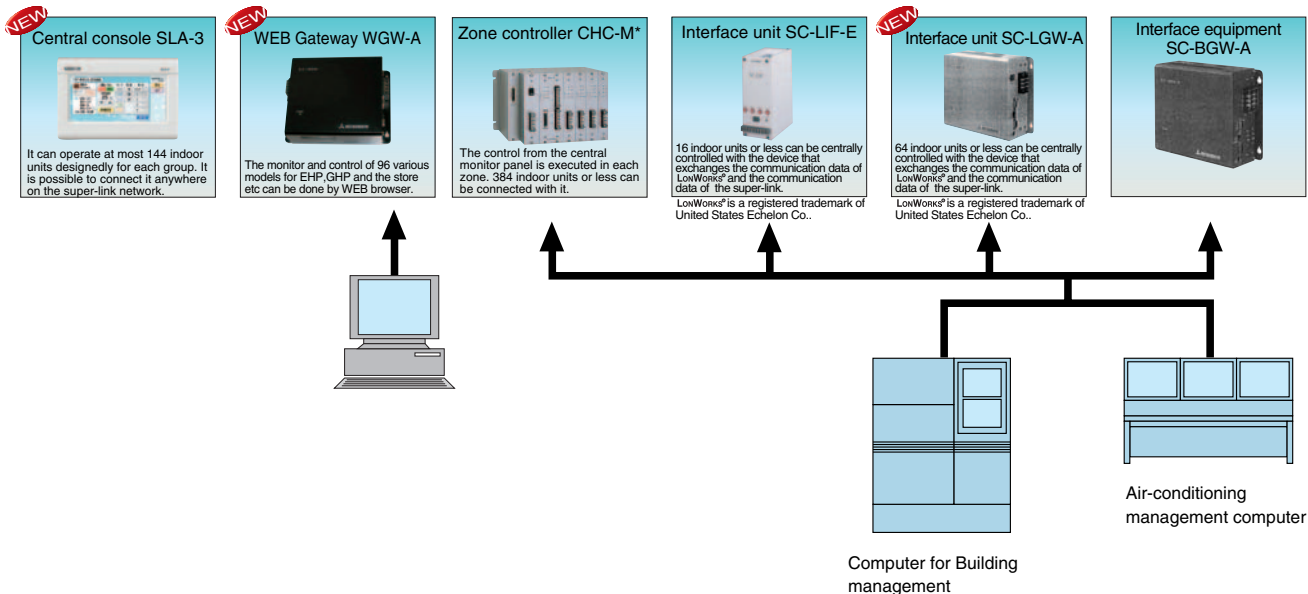
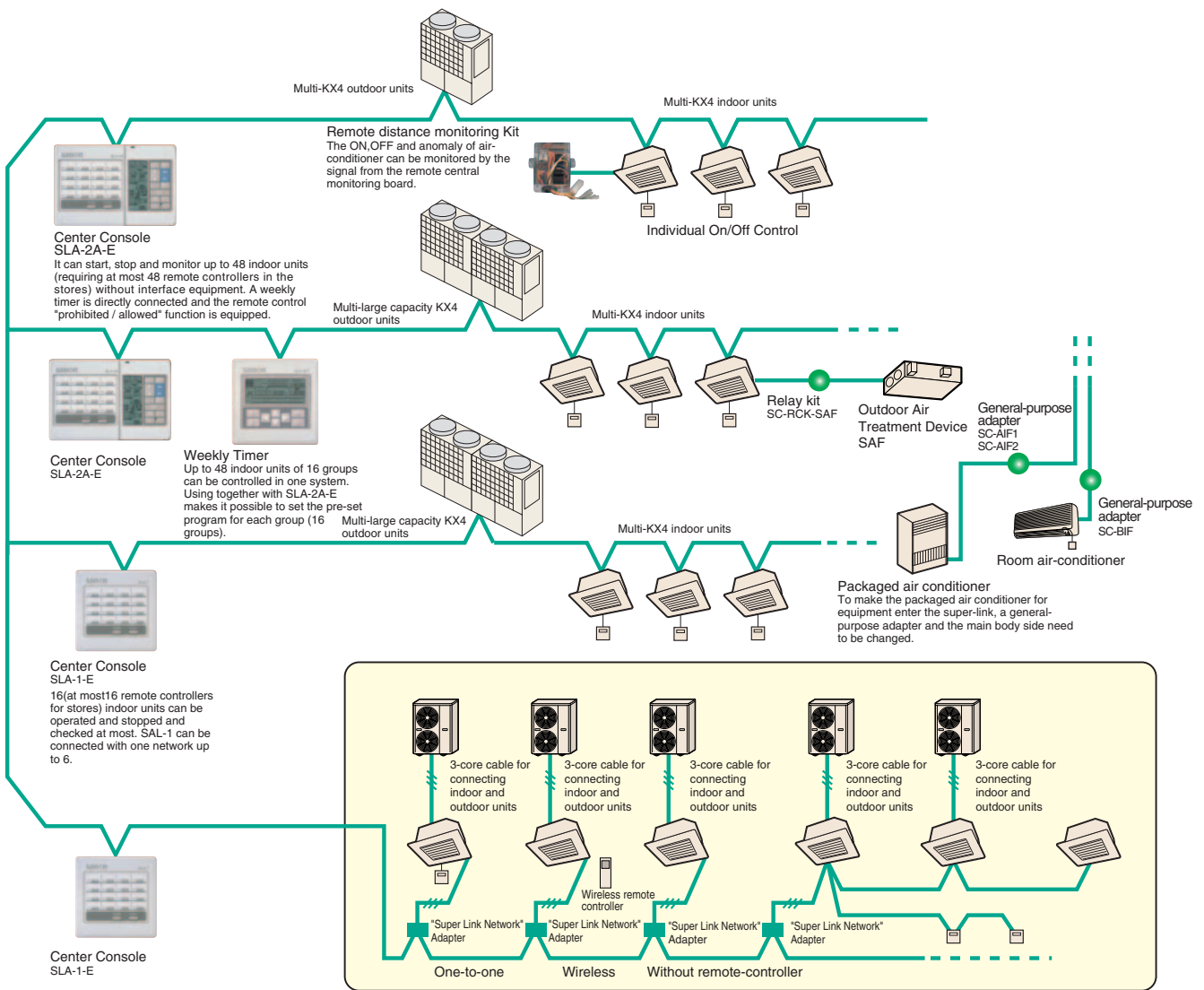
Only two lines are required for wiring both inside and outside, and the conventional six or eight wires are abolished, which fully satisfies the air-conditioning requirements of the new intelligent rooms, and also dramatically cuts both installation costs and wiring shaft area.

2. Network control system can directly act on multi combination KX2 packaged air-conditioners.

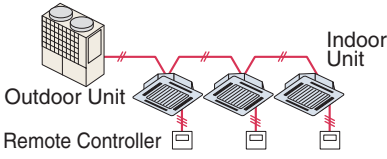
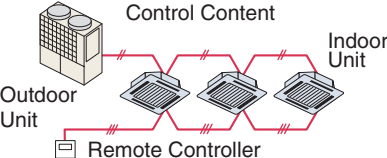
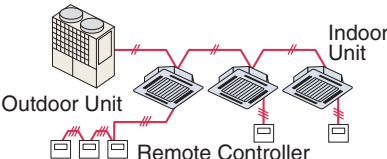
Multi combination KX packaged air-conditioners and an optional controller can be used to constitute the network and establish the system. This can be done only using one non-polarity twin signal wire for connection.



Air Conditioning Control System (SUPERLINK Control System)

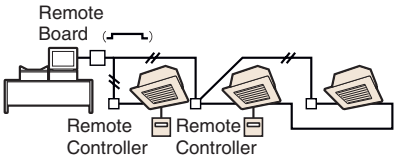
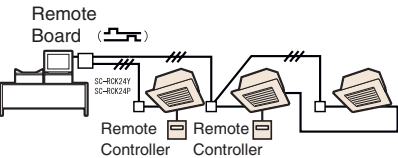
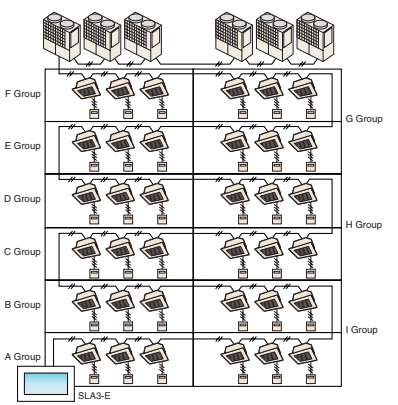


3. Building a diversified control system meeting the diversified air-conditioning demands of large buildings

	Control Method	Control Content	Remote Equipment		Adjacent Equipment	
			Name-Model	Number of Units	Description-Model	Number of Units
Standard Controller	 <p>Outdoor Unit Remote Controller Indoor Unit</p>	<ul style="list-style-type: none"> ■ Various controls for the indoor unit. Indoor remote controller or wireless remote controller. ■ The cooling and heating modes of the outdoor unit are dependent on the press-first priority. The system will automatically enter into the "fan" operation upon start-up if first priority operation has already been in operating status in advance. 	—	—	<ul style="list-style-type: none"> ■ Standard Remote Controller RC-D2-E 	1 for each
Control by Remote Controller	 <p>Control Content Outdoor Unit Remote Controller Indoor Unit</p>	<ul style="list-style-type: none"> ■ A new standard remote controller can control up to 16 indoor units (group operation). 	—	—	<ul style="list-style-type: none"> ■ Standard Remote Controller RC-D2-E 	1 for each group
	 <p>Outdoor Unit Remote Controller Indoor Unit</p>	<ul style="list-style-type: none"> ■ One indoor unit (1 group) can be connected up to 4 new standard remote controllers (press-last priority). Note: up to four wireless remote controllers are also included. (Resetting of automatic elevating cleaner dust filter and anomaly resetting are impossible.) 	—	—	<ul style="list-style-type: none"> ■ Standard Remote Controller RC-D2-E 	Max. 2 for each group

	Control Method	Control Content	Remote Equipment		Adjacent Equipment	
			Name-Model	Number of Units	Description-Model	Number of Units
Central Controller		<p>■ ON/OFF of up to 16 indoor units can be individually or simultaneously controlled with one SLA-1-E central controller. (But to be used together with the new standard remote controller)</p>	<p>■ Central Controller SLA-1-E</p>	<p>Max. 6 units for each network</p>	<p>■ Standard Remote Controller RC-D2-E</p>	<p>1 for each</p>
		<p>■ ON/OFF of up to 48 indoor units can be individually or simultaneously controlled with six SLA-1-E central controllers in one network. (But to be used together with the new standard remote controller)</p>	<p>■ Central Controller SLA-1-E</p>	<p>Max. 6 units for each network</p>	<p>■ Standard Remote Controller RC-D2-E</p>	<p>1 for each</p>

	Control Method	Control Content	Remote Equipment		Adjacent Equipment										
			Description-Model	Number of Units	Description-Model	Number of Units									
Central Controller		<p>■ The external timer function can be connected to the central controller SLA-1-E. Indoor units to be controlled all run according to the timer.</p>	<p>■ Central Controller SLA-1-E</p>	<p>Up to 6 for each network</p>	<p>■ New Standard Remote Controller RC-D2-E</p>	<p>1 for each</p>									
		<p>■ ON/OFF, temperature setting and fan speed setting of up to 48 indoor units can be controlled individually or by group with one central controller SLA-2A-E. Group setting function can handle up to 16 groups.</p> <p>Note 1: A part of or all new standard remote controllers can be omitted.</p> <p>The pre-set programs for every 16 groups can be run through combination of SLA-2A-E and the weekly timer.</p>	<p>■ Central Controller SLA-1-E SLA-2A-E can decide "prohibited/allowed" of the remote control through external input.</p>	<p>Up to 3 for each network</p>	<p>■ New Standard Remote Controller RC-D2-E</p>	<p>1 for each or none</p>									
		<p>■ Up to three SLA-2A-E can be connected in one network (with maximum 48 indoor units). Mixing with SLA-1-E is also allowed. Therefore, when using SLA-2A-E to perform the centralized On/Off management for all the floors, SLA-1-E is also applicable.</p> <p>Note 1: The number of units that can be mixed in one network is indicated in the following table.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>SLA-1-E</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>SLA-2A-E</td> <td>3</td> <td>2</td> <td>2</td> <td>1</td> </tr> </table>	SLA-1-E	0	1	2	3	SLA-2A-E	3	2	2	1	<p>■ Central Controller SLA-2A-E</p>	<p>Up to 3 for each network</p>	<p>■ New Standard Remote Controller RC-D2-E</p>
SLA-1-E	0	1	2	3											
SLA-2A-E	3	2	2	1											

	Control Method	Control Content	Remote Equipment		Adjacent Equipment	
			Description-Model	Number of Units	Description-Model	Number of Units
Central Controller	 <p>■ Please use it when the operating output is a continuous contact output.</p>  <p>■ Please use it when the ON,OFF signals are pulse signal.</p>	<p>■ The ON,OFF and abnormality of air-conditioner can be monitored by the signal from the central board.</p>	<p>■ For level input SC-RCK12 (For DC12V) SC-RCK24 (For DC24V) SC-RCK100 (For DA100V) SC-RCK12R SC-RCK24R SC-RCK100R</p> <p>■ Pulse input SC-RCK24Y, P</p>	1	<p>■ Remote Controller RC-D2-E</p>	1
	 <p>■ Each group is controlled separately for 144 groups or less set arbitrarily with central console SLA-3-E.</p> <p>Note 1: Only one central console SLA-3-E can be connected to the super-link.</p> <p>Note 2: A portion or all of the remote controllers can be omitted.</p>	<p>■ Central Controller SLA-3-E</p>	1	<p>■ Remote Controller RC-D2-E</p>	1 for each or none	

1-1 ■ Applicable to individual or centralized On/Off control for up to 16 air-conditioners.
Center console SLA-1-E



Combination

Type	Combination	Remarks
Standard Remote Controller	Customized	-
Commercial Timer	O.K.	Package controlled On/Off only
Weekly Timer (SCA-WT-E)	O.K.	-
SLA-2A-E	O.K.	See the description on SLA-2A-E mentioned below

This central controller can perform individual or centralized On/Off and check control for up to 16 indoor units.

- 16 operation switches are used to control up to sixteen (16) indoor units, greatly enhancing the operability.

Operation condition confirmation function is available in each individual standard air-conditioner.

- The serial number of the air-conditioner in operation is displayed by a LED display composed of 16 LEDs with green light indicating the operating status, red light indicating check (fault) and no light indicating Off or disconnected status, thus indicating clearly the status of each air-conditioner.

Applicable to installation at each floor

Design of power failure compensation function

- The power failure compensation function is provided as one of the standard features. In case of a power failure during the operation, the operation can be resumed after restoration using the information stored in the memory.

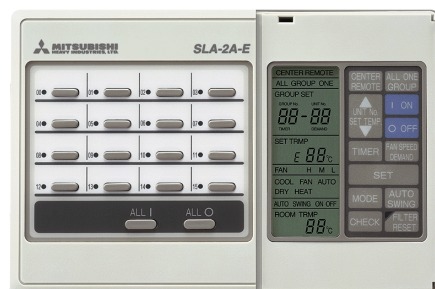
Compact and rigid design without space occupancy

- A rigid and compact design of 120mm (4.72 in.) L by 120mm (4.72 in.) W by 15mm (0.6in.) H.

Simplified wiring installation work by advantage of the simple system

- Connecting the central controller to the Super Link Network can be accomplished directly by only connecting the non-polarity twin signal wire, which simplifies the wiring installation work and reduces the work hours.

1-2 ■ Up to 48 indoor units (1 to 16 groups) can be controlled simultaneously.
Center console SLA-2A-E



Combination of SLA-1-E and SLA-2A-E

	SLA-1-E	SLA-2A-E
Case 1	6 Units	0
Case 2	0	3 Units
Case 3	3 Units	1 Units
Case 4	2 Units	1 Units

The interface is unnecessary in the connection with a weekly timer. Remote control disable and enable function is equipped with it.

Combination with SLA-2A-E

	Combination	Remarks
New Standard Remote Controller	Individual or Plural Connection	Possibly without connection
SLA-1-E	O.K.	—
SLA-2A-E	O.K.	—
Weekly Timer (SCA-WT-E)	O.K.	—
Commercial Timer	O.K.	—
External Input	O.K.	By connecting the non-voltage contact "a", emergency stop, customized control and "allowed / prohibited" of operation can be performed.

Effective thin and compact design

- 16 operation switches are used to provide the group control for up to 16 groups (48 units), greatly improving the operability.
- A large, easy-to-read LED display is adopted. The operation condition and contents of setting can be confirmed easily.
- The central controller can be connected at anywhere with the Super Link Network.

Free individual control by new standard remote control is possible.

- In addition to the individual and centralized control, the individual control from the new standard remote control is possible by setting the central controller and remote controller.
- The new standard remote controller can be eliminated.

The SLA-1-E makes ON/OFF control of one air-conditioner possible at each floor

- In case that the central controller SLA-2A-E is set individual or for each floor, connecting the SLA-1-E makes the ON/OFF control of individual / each floor possible for the SLA-1-E.

Expansion of Network Control

- Free connection is possible from 1 to 48 units per one group and up to 16 groups (totally 48 air-conditioners for the whole group) even though the addresses are not consecutive.
- Up to three SLA-2A-E can be connected in one Super Link Network.
- The Super Link can stop / start and monitor the air-conditioner individually, in package or by group, and it also can control the operation mode and temperature setting. Therefore, the Super Link creates an advanced air-conditioning control system.

Customized control and emergency stop control

- For customized control, the external signal can be used.
- Free emergency stop control.

Power failure compensation (Power black out restart)

- The power failure compensation function is provided as one standard feature. In case of a power failure during the operation, the operation is resumed after restoration using the information stored in the memory.

Same operation for same program

- By connecting an optional weekly timer, one group of the program can operate up to 16 groups of the air-conditioner.

A simple system simplifies wiring work.

- Wiring work is greatly reduced with a simple system of two no polarity wire type.

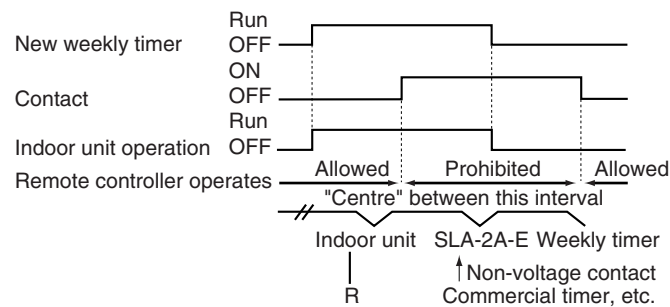
Connection with the weekly timer without interface

- Interface used to be necessary, but now it is unnecessary.

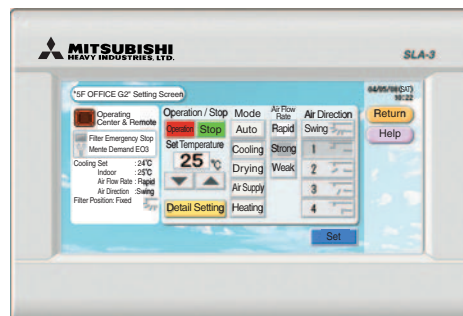
The weekly timer can be easily connected. Only the SLA-2A-E is equipped with the same function as that of the old SL-2.

Central lock function is equipped.

- Disconnecting the jumper wire (J1) of SLA-2A-E, the customized function is converted into the central lock function.
- When the non-voltage contact input is added to the customized input contact of the SLA-2A-E from commercial timer, the customized status device set in the SLA-2A-E is converted into the central mode.
- In the central lock status, the central / remote changeover switch becomes invalid.



- 1-3 ■ It corresponds to 144 individual, concentrated operating and stop at most.
Center console SLA-3-E



It is equipped with the large-scale color liquid crystal and the touch panel type, so it is easy to operate.

It is three super-link systems and can connect with 144 indoor units at most.

It is possible to control.

The energy consumption calculation function has been enhanced (SLB-3-E).

- Abundant pulse input points (eight points).
- The external access of data per minute for the energy consumption calculation is possible (by way of media).
- The data per minute can be selected from three techniques (operating time, refrigerant flow rate and thermostat ON).

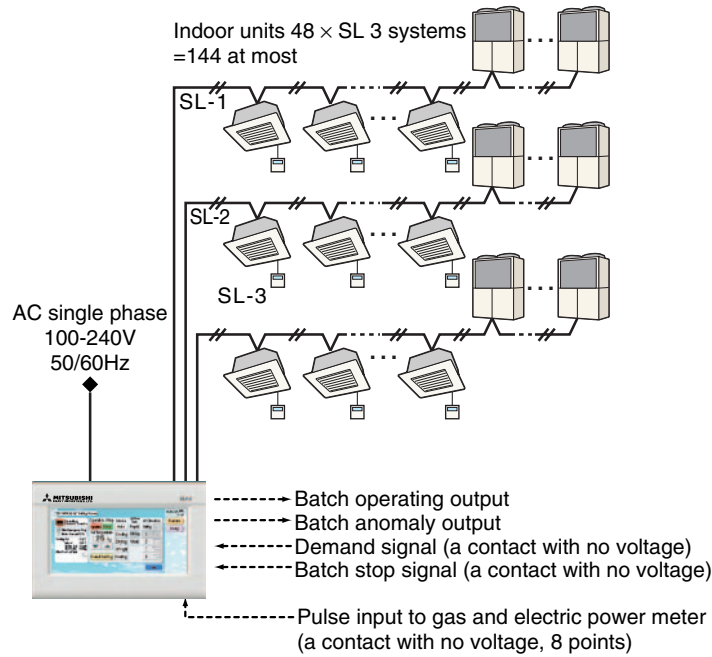
(Note) The energy consumption calculated by this unit does not conform to DIML, and there are no guarantees concerning the results of the calculations.

Enhancement of schedule function.

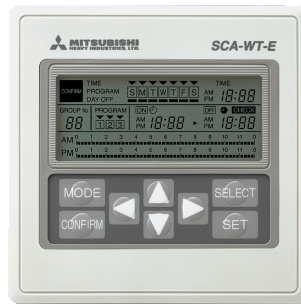
The number of operation that can be set during a day has been increased greatly: 16 operations

The Enable and Disable setting according to the mode are possible, and power for the management needs has been enhanced.

System Drawing



1-4 ■ Each system can control up to 48 indoor units.
Weekly Timer (SCA-WT-E)



Function List

- Monitor mode
Display of current day of the week, time, and program status.
- Time setting
Setting of current day of the week and time.
- Timer setting
Setting of the timer program
- Holiday setting
Setting of week and day for holidays

SW9 = Control changeover switch (SW9-1 and SW-2)

SW9-1	OFF	ON / OFF in package
SW9-1	ON	By using together with the SLA-2A-E, reservation and group setting for each group can be performed at the SLA-2A-E end.

The program of daily and weekly is possible by an easy operation

- The operating reservation of one week is possible.
- The ON-OFF time of three times a day can be set in minute as unit. The OFF forgetting can be prevented by setting only OFF.
- The operating reservation can be canceled temporarily by setting a day of the week when the operating reservation has been done as holiday.
- The program operating time of that day when operating reservation is done, time and a day of the week now is displayed in the graph of 24 hours.

Daily/weekly program can be set by the standard operation.

- Work reservation for one week can be set.
- The start/stop time can be set three times a day with minute as the smallest unit. Setting of stop (OFF) only prevents forgetting to set the stop time.
- Setting the work reservation day of the week to the holiday setting makes it possible to temporarily cancel a work reservation.
- The current time, day of the week, and a 24-hour time graph for the program operation in the day can be displayed.

Using together with the SLA-2A-E makes it possible to set a schedule for each group.

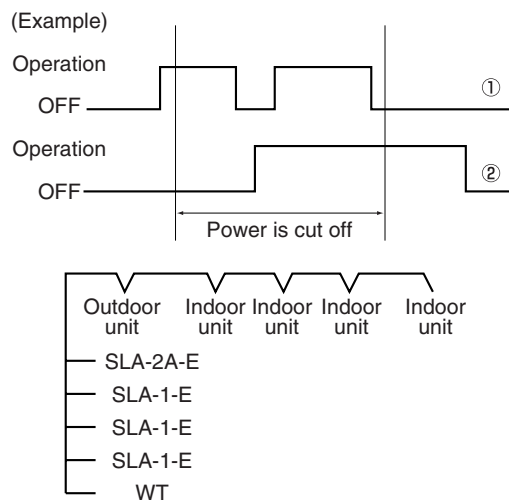
- One weekly timer can control up to 48 indoor units in one system. And furthermore, by combination with SLA-2A-E, the reservation plan can be set for each group (up to 16 groups).

Example of combined system connecting with SLA-2A-E

- It is necessary to use together with SLA-2A-E for the group start/stop by the weekly timer. The allowable number of the unit connectable with SLA-2A-E is only one per one system and connection exceeding this number is not allowed.

Power failure compensation function is equipped.

- When power fails or when power is off, the work condition set by the weekly timer is stored. After the power is restored, the monitor mode is displayed according to the restoration time.
- Use the timer setting mode under the restoration status, switch the control changeover switch (SW9-2) to ON after the power failure is eliminated, and an operation (stop) command is released.
When the timer setting mode (shown in the graph below) is ①, a stop command is transmitted because the system is in the stop mode at power restoration. When it is ②, an operation command is transmitted because the system is in the operation mode at power restoration. Pay attention that the control changeover switch is set to OFF at delivery from the factory, therefore no operation (stop) command is released after power is restored.
- Switch the control changeover switch (SW9) according to whether SLA-2A-E is used together or power is restored.



1-5 ■ By using WEB browser, monitor and control up to 96 units of various models for EHP, GHP and shop Multi Thread Technology

SUPERLINK® WEB Gateway
SC-WGW-A



<WEB Gateway>
Make to order

MHI Model SC-WGW-A

- Dimensions / height 200 × width 260 × depth 79mm

Can independently set functions such as ON & OFF / Operation mode, Set Temperature, Remote Controller Operation Prohibition, etc.

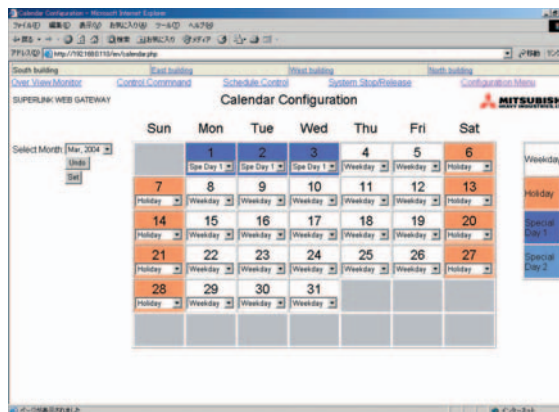
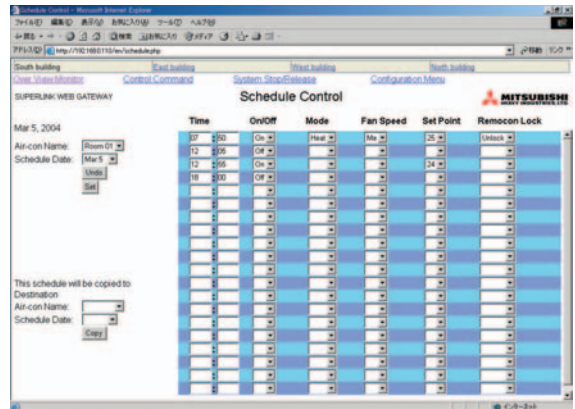
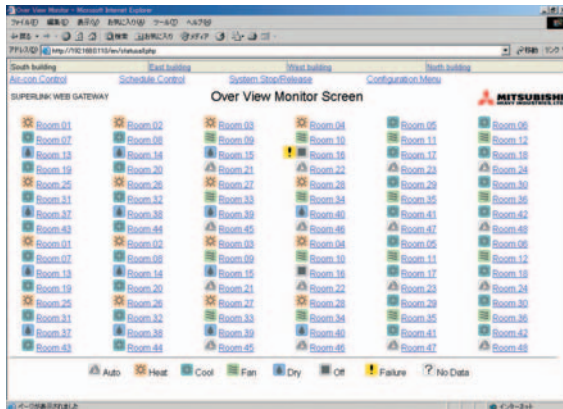
The "Multi Thread Technology" that conducts parallel processing of transmitted and received various data with "Thread" as the program unit, after connecting the two SUPERLINK® communication ports for the packaged air conditioner control network of our company.

Highly Reliable Performance without Hard Disk

Adopt Lowpower Embedded CPU without cooling fan, Compact Flash ROM as without hard disk, to ensure free and highly reliable performance of the rotating parts while ensuring high-speed CPU and large-capacity memory.

Safety Measures

Can restrict accessing computers through IP address filtering, and can ensure the security of Class 3 user authentication.



- Excluding engineering service cost

1-6 ■ Centralized control of packaged air conditioner with LONWORKS®

Interface equipment SC-LIF-E



Make to order (3 months)
MHI product No. SC-LIF-E
*excluding technology fee

Centralized control of packaged air conditioner with open network LONWORKS®

- SC-LIF-E is a device that converts the communication data of LONWORKS® into communication data of SUPERLINK. The basic operation and status monitoring that can be done with the remote controller of the packaged air conditioner can be done from the upper-stream units connected to LONWORKS®.
- Up to 16 indoor units can be connected.
- There are 3 installation methods available for selection. Depending on the conditions of installation space, selection can be made from 3 methods, i.e. 1) vertical installation, 2) horizontal installation and 3) flush installation.

■List of functions

[Control functions]

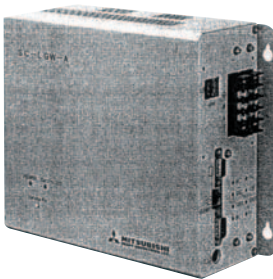
- 1 On & Off command
Control the Operation / Stop (On & Off) of each indoor unit
- 2 Operation mode setting
Conduct setting of the operation mode (auto, cooling, air supply, heating) of each indoor unit.
- 3 Temperature setting
Determine the set temperature of indoor unit
Set value is set in the unit of 1°C. The scope is 18 ~ 30°C.
- 4 Remote controller operation prohibition
Implement the setting of control room operation permit / prohibit.
The function of uniform permit / prohibit of remote controller functions
- 5 Filter sign reset
Reset the filter sign of each indoor unit
- 6 System forced stop setting
Immediately stop the indoor unit under control, and prohibit operation from the remote controller.

[Monitor functions]

- 1 On & Off status notice
Inform the operation / stop status of each indoor unit.
- 2 Operation mode status notice
Inform the setting of operation mode of each indoor unit.
- 3 Temperature setting notice
Inform the temperature setting of indoor unit.
- 4 Filter sign notice
Inform the filter sign that urges the cleaning of air suction filter of indoor unit.
- 5 Failure notice
Inform with / without failure of indoor unit.
- 6 Room temperature notice
Inform the temperature of air suction sensor of indoor unit (room temperature).
- 7 Temperature control status notice
Inform whether there is refrigerant flowing through the indoor unit.
- 8 Indoor unit communication status notice
Inform whether this interface equipment can communicate with each indoor unit

LONWORKS® is the communication network system developed by Echelon Corporation.
It has gradually become the international standard of building management system.
LON is the abbreviation of Local Operation Network.
(LONWORKS® is the registered trademark of Echelon Corporation.)

Interface equipment SC-LGW-A



Make to order (3 months)
MHI product No. SC-LGW-A
*excluding technology fee

- SC-LGW-A is a device that converts the communication data of LONWORKS® into communication data of SUPERLINK. The basic operation and status monitoring that can be done with the remote controller of the packaged air conditioner can be done from the upper-stream units connected to LONWORKS®.
- Up to 64 indoor units can be connected.
- There are 3 installation methods available for selection. Depending on the conditions of installation space, selection can be made from 3 methods, i.e. 1) vertical installation, 2) horizontal installation and 3) flush installation.

■List of functions

[Control functions]

- 1 On & Off command
Control the Operation / Stop (On & Off) of each indoor unit
- 2 Operation mode setting
Conduct setting of the operation mode (auto, cooling, air supply, heating) of each indoor unit.
- 3 Temperature setting
Determine the set temperature of indoor unit
Set value is set in the unit of 1°C. The scope is 18 ~ 30°C.
- 4 Remote controller operation prohibition
Implement the setting of control room operation permit / prohibit.
The function of uniform permit / prohibit of remote controller functions
- 5 Filter sign reset
Reset the filter sign of each indoor unit.
- 6 System forced stop setting
Immediately stop the indoor unit under control, and prohibit operation from the remote controller.
- 7 Fan speed command
Send fanspeed select command (Hi, Me, Lo) to an indoor unit

[Monitor functions]

- 1 On & Off status notice
Inform the operation / stop status of each indoor unit.
- 2 Operation mode status notice
Inform the setting of operation mode of each indoor unit.
- 3 Temperature setting notice
Inform the temperature setting of indoor unit.
- 4 Filter sign notice
Inform the filter sign that urges the cleaning of air suction filter of indoor unit.
- 5 Failure notice
Inform with / without failure of indoor unit.
- 6 Room temperature notice
Inform the temperature of air suction sensor of indoor unit (room temperature).
- 7 Fan speed status
Monitor Fan speed select status of indoor unit.
- 8 Monitor All air-conditioner forced off status.

- Excluding engineering service cost
- To apply SC-LIF-E, SC-LGW-A and if consulting is needed, please contact to MHI and BMS manufacturer.

1-7 ■ Centralized control of packaged air conditioner with BACnet

Interface equipment
SC-BGW-A



Make to order (3 months)
MHI product No. SC-BGW-A
*excluding technology fee

Centralized control of packaged air conditioner with open network **BACnet**

- SC-LIF-A is a device that converts the communication data of **BACnet** into communication data of SUPERLINK. The basic operation and status monitoring that can be done with the remote controller of the packaged air conditioner can be done from the upper-stream units connected to **BACnet**.
- Up to 16 indoor units can be connected.
- There are 3 installation methods available for selection. Depending on the conditions of installation space, selection can be made from 3 methods, i.e. 1) vertical installation, 2) horizontal installation and 3) flush installation.

■List of functions

[Control functions]

- 1 On & Off command
Control the Operation / Stop (On & Off) of each indoor unit
- 2 Operation mode setting
Conduct setting of the operation mode (auto, cooling, air supply, heating) of each indoor unit.
- 3 Temperature setting
Determine the set temperature of indoor unit
Set value is set in the unit of 1°C. The scope is 18 - 30°C.
- 4 Remote controller operation prohibition
Implement the setting of control room operation permit / prohibit.
The function of uniform permit / prohibit of remote controller functions
- 5 Filter sign reset
Reset the filter sign of each indoor unit
- 6 System forced stop setting
Immediately stop the indoor unit under control, and prohibit operation from the remote controller.

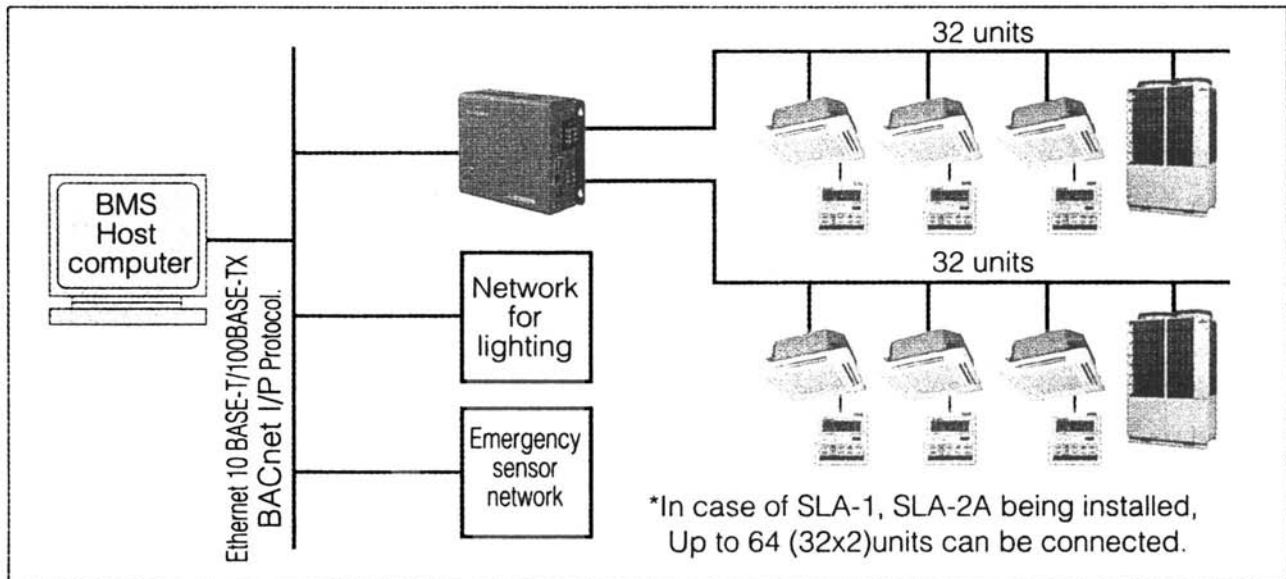
[Monitor functions]

- 1 On & Off status notice
Inform the operation / stop status of each indoor unit.
- 2 Operation mode status notice
Inform the setting of operation mode of each indoor unit.
- 3 Temperature setting notice
Inform the temperature setting of indoor unit.
- 4 Filter sign notice
Inform the filter sign that urges the cleaning of air suction filter of indoor unit.
- 5 Failure notice
Inform with / without failure of indoor unit.
- 6 Room temperature notice
Inform the temperature of air return sensor of indoor unit (room temperature).
- 7 Temperature control status notice
Inform whether there is refrigerant flowing through the indoor unit.
- 8 Indoor unit communication status notice
Inform whether this interface equipment can communicate with each indoor unit

It supports BACnet / IP for BACnet, utilizing the IP network technology.

BACnet I / P standard 1995 version is applied.
BACnet (Building Automation Control Network) is the standard protocol established by ASHRAE in 1995.

System Structure Example



- Excluding engineering service cost and software development cost
- To apply SC-BGW-A, and if consulting is needed, please contact to MHI and BMS manufacturer.

2. Central controller Overview

List of Functions

Item		Description	Central controller SLA-1-E	Central controller SLA-2A-E	Central controller SLA-3-E
Model			SC-SLA1-E	SC-SLA2-E	SC-SLA3-E
Individual Control (Number of Packaged Air Conditioners)			16	48	144
Group Control (Number of Groups)			–	16	144
Control	Start / stop (centralized, group, individual)		○	○	○
	Program Control		–	–	○
	Group Setting		–	○	○
	Operation Mode (cooling, drying, heating, air supply, automatic)		–	○	○
	Priority Indication (central control, remote control)		–	–	○
	Room Temperature Setting		–	○	○
	Air Flow Changeover		–	○	○
	Emergency Stop (intelocked control in case of fire accidents)		–	○	○
	Power Failure Restoration Control		○	○	○ ⁽¹⁾
	Demand Control		–	○	○
	Filter Sign Reset		–	○	○
	Check Sign Reset		○	○	○
Program	Weekly Operation Setting (group, individual, weekday)		–	–	○
	Yearly Operation Program		–	–	○
	Change of Current Day Operation Program		–	–	○
	Operation Program for One Day		–	–	○
	Special Date Setting		–	–	○
Monitoring	Operation Status (operation, stop)		○	○	○
	Priority Indication (central control, remote control)		–	○	○
	Operation Mode (cooling, drying, heating, air supply, automatic)		–	○	○
	Air flow (High, Medium, Low)		–	○	○
	Set Temperature		–	○	○
	Automatic Swing (ON, OFF)		–	○	○
	Room Temperature Display		–	○	○
	Filter Sign		–	○	○
	Check Signal (Error, Alarm)		○	○	○
Operation Time Accumulation		–	–	–	
Calculation	Power Consumption Calculation		–	–	○ ⁽²⁾
Record	Error Record		–	–	○
	Operation Time Record		–	–	–
	Calculation of Power Consumption		–	–	○ ⁽²⁾
	Air-conditioning Expense		–	–	–
Reference Page			P. 505	P. 510	P. 515

Notes (1) The group setting and the schedule setting are maintained, and the operating status is not maintained.

(2) It is possible to meet needs with SLB-3-E.

3. System Overview

3.1 Specifications

Description		Central controller SLA-1-E	Central controller SLA-2A-E		
MHI Model		SC-SLA1-E	SC-SLA2A-E		
Machine	Power source		Single phase 220V 50Hz		
	External dimension (H × W × D) mm	Main body	120 × 120 × 15	120 × 180 × 16	
		Power source kit	100 × 85 × 50		
	Product weight	kg	0.64	0.96	
	Power consumption	VA	5	6	
	Displayed component		LED (Check)	LCD display, red LED (Check, filter sign)	
	Operation switch		Function key: 18	Function key: 31	
	Input and output	Number of connected combination units		Up to 16 units	Up to 48 units
		External operation input		1 point, non-voltage contact a	
		Emergency stop capability		–	1 point, non-voltage contact a
Weekly timer input		–	1 SCA-WT-E		
Operation output		–	1 Point, DC5V 30mA (Max)		
Anomaly output		–	1 Point, DC5V 30mA (Max)		
Installation environment	Surrounding temperature and humidity		0~40°C, less than 75% (dew condensation not allowed)		
	Wiring specifications	Power source	0.75mm ² (butt joint)		
		Signal wire	0.75mm ² ~2mm ² , with a length within 1000m (connecting the terminal block)		
		Power cord	Main Body~power source kit equipped with 4m wiring connection		
Applicable models		All models			
Control	Individual start / stop		ON/OFF control for each unit		
	Group start / stop		–	ON/OFF control for each group	
	Simultaneous start / stop		Simultaneous ON/OFF control for all air-conditioners (sequentially start one unit every one second)		
	Check reset		–	Check signal reset for each unit	
	Filter sign		–	The filter sign can be reset to Individual/Group/Simultaneous.	
	Emergency stop		–	Switch off all units upon signal reception.	
	Timer operation		Automatic start/stop by program timer and manual start/stop by switches.		
	Power failure restoration control		At Stop Status after Power Failure (Record Setting Status)	Restart after power restoration (Memory setting status)	
Demand operation		–	The thermostats of the designated units must be kept OFF upon signal reception.		

Monitoring	Logon monitoring	–	Air-conditioner No. is displayed using sequential numbers from 0 to 47.
	Operation monitoring	LED display of the operation status of each unit.	LCD displays the operation status of each unit.
	Abnormality monitoring	Red LED displays each abnormal machine.	LCD displays the error codes of each abnormal machine with the check LED light ON.
	Operation mode monitoring	–	LCD displays cooling, heating, air supply, drying, and automatic.
	Room temperature monitoring	–	LCD displays the air suction temperature of each unit.
			13, 13~35, 35
	Operation status monitoring	–	LCD flashes to display the operation mode of unmatched units.
	Filter sign monitoring	–	LED flashes to display the filter sign.
Priority setting monitoring	–	LCD displays remote control/central control/central control and remote control.	
Setting	Group setting	–	Individual / Group / Simultaneous
	Group Logon	–	Up to 16 groups can be logged on (free setting).
	Priority setting	–	Remote control, Central control, Central control and remote control
	Function switch	–	Automatic swing ON/OFF
	Operation mode setting	–	Cooling, Heating, Air supply, Drying, Automatic.
	Air flow setting	–	High, Medium, Low
	Timer setting	External operation input Valid / Invalid	
	Room temperature setting	–	Every 1°C from 18 to 30°C

Note (1) (For air-conditioners connected with (SC-SIF BIF GIF) interfaces, attention should be paid to the following points:

- ① Check Reset: Please perform this setting individually on each air-conditioner. (This setting is not possible on the system side.)
- ② Operation Mode Monitoring: The display mode has nothing to do with the the actual operation mode.
- ③ Room Temperature Monitoring: The room temperature displayed is normally below 13°C (13 for SLA-2A-E).
- ④ Filter sign monitoring: Signal on the air-conditioner side is not displayed.
- ⑤ Priority setting: Invalid. (Operation on the standard remote controller side cannot be prohibited.)
- ⑥ Operation mode setting: Invalid. (Operation in the mode on the standard remote controller side.)
- ⑦ Air rate setting: Invalid. (Operation in the mode on the standard remote controller side.)
- ⑧ Room temperature setting: Invalid. (Operation in the mode on the standard remote controller side.)

Note (2) In case of any abnormality with SLA-2A-E, the mode will be automatically switched to remote control operation (remote control operation mode).

Item	Description	SLA-3-E,SLB-3-E
Model		SC-SLA3-E, SC-SLB3-E
Number of units controlled		144 units / 144 groups (three super-link systems)
Power		Single phase 100-240V
Dimension (height × width × depth)		162mm × 240mm × 40 (+68) mm
Display device		Color liquid crystal (7 inches wide)
Operating switch		Touch panel type
Display	Name of air-conditioner	SBC case eight characters
	Schedule setting	Calendar display.
	Help function	With
Operation setting	Operating / Stop unit	Group and batch
	operation mode	Cooling, dehumidification, ventilation, heating (auto)
	Temperature setting	18°C ~ 30°C (1°C scale)
	Priority instruction	Remote control operation permission (center & remote) and prohibition (center) (It is possible to set permission or prohibition of Operating/Stop, operation mode and temperature setting)
	Wind speed setting	High, Medium, Low
	Setting for wind direction	Auto swing (four way setting)
	Filter reset	Available
	Emergent stop	All stand center and the stop
	Demand control	Switch by external demand control input (The demand object is set to each air-conditioner)
Monitoring	Monitoring unit	Block, group, and air-conditioner
	Monitoring contents	Operating/stop, fault, abnormality (error code), operation mode, temperature setting, indoor temperature, priority instruction, wind speed setting, setting for wind direction and periodic check (GIP)
Schedule	Operating / stop unit	Group
	Operating / stop frequency	16 operations / day
	Minimum time unit	1 minute
	Operation item	Permission / prohibition, operation mode, preset temperature operating enable
	Schedule range	Week, year, that day
Power blackout restart		With
Energy consumption calculation function (SLB-3)	Pulse input	8 points
	Unit of calculation	Each air-conditioner
	Calculation method	Operating: ON / OFF, thermostat: ON / OFF, refrigerant flow volume
	Calculation range	Consumption proportional calculation data for energy consumption calculation (The calculation is executed with personal computer *)
	Account time zone	Setting possible
	Account data readout	USB memory
	Account data records	Three months

*The customer must prepare for the personal computer. Software for the calculation is attached to SLB-3-E.

Model	SC-WGW-A
Dimensions	200 (H) × 260 (W) × 79 (D) mm
Power Supply	Single phase AC100V ~ 240V (50 / 60Hz)
No. of Controllable Unit	Up to 96 indoor units
Corresponding WEB Browser	Internet Explorer 6.0
Communication	WEB browser side: Ethernet 10 / 100Mbps Air-conditioning equipment side: our company's communication protocol 9.6kbps
Function	Setting: On & Off / Operation mode, temperature setting, air volume, remote control operation Display: On & Off / Operation mode, temperature setting, air volume, room temperature, alarm, error code Schedule / Calendar

	Item	Specification	Remarks
Structure	Dimensions	250 (H) × 100 (W) × 180 (D)	Excluding the protruding part
	Weight	Approx 2.6kg	
	Finish material	Zinc plate (t1.2)	
	Finish paint	Bright white (Munsell color code approximation 2.5Y8.5 / 1)	
	Installation method	Screw fixing 4 points, fixing with attached installation tool	
Power supply	Power voltage	Single phase AC100V - 15% ~ AC200V + 10% (50 / 60Hz)	Main switch and power LED equipped in the front
	Wiring connection	Terminal block	Terminal block symbol L, N
	Power consumption	Max. 5W	
Ambient condition	Ambient temperature for application	0°C ~ 40°C	
	Ambient humidity for application	85% RH below (no condensing)	
Interface equipment	LONWORKS® network		
	Wiring connection	Terminal block	Terminal block symbol 1, 2
	Radio receive-transmit device	FTT-10A	Free topological type (78kbps)
	Maintenance pin	Equipped on the front panel, each branch equipped with 1, totaling 4	Switch LED integrated
	SUPERLINK network		
	Wiring connection	Terminal block	Terminal block symbols A, B
	No. of connected units	Up to 16 indoor units	

3.2 List of the System Machine Combination

		Standard remote controller	Weekly timer (SCA-WT-E)	Central controller		
				SLA-1-E	SLA-2A-E	SLA-3-E
Standard remote controller		–	○	○ ^{*1}	○ ^{*2}	○ ^{*2}
Weekly timer (SCA-WT-E)		×	–	○ ^{*3}	○	×
Central controller	SLA-1-E	○ ^{*1} ○ ^{*4}	○ ^{*3}	–	○ ^{*4}	×
	SLA-2A-E	○ ^{*2} ○ ^{*4}	○	○ ^{*4}	–	○ ^{*5}
	SLA-3-E	○ ^{*2}	×	×	○ ^{*5}	–

■ Symbol Description

Symbol ○ : Combination possible; Symbol × : combination not possible; Symbol - : not required (already equipped as a standard part or unnecessary).

Note *1: Standard remote controller must be used for SLA-1-E.

*2: Operation is possible even without standard remote controller or mini remote controller. Standard remote controller must be used if the wired automatic elevating panel is used.

*3: All the units in the network perform start / stop simultaneously.

*4: Maximum 6 SLA-1-E and 3 SLA-2A-E can be used in one network. Please pay attention that the number of units used may change during combination, with details shown in the following table.

Number of SLA-1-E	Number of SLA-2A-E
0	3
1	2
2	2
3	1
4	0
5	0
6	0

*5: The center console SLA-2A-E can be connected 1 unit per network.

4. Detailed Description of the System Machines

4.1 Center Console SLA-1-E

Outside view



Applicable models: all models after J series.

[Remarks] The central controller SLA-1-E must be used together with the standard remote controller.

Components

Description	MHI Component No.
Center console SLA-1-E	SC-SLA1-E

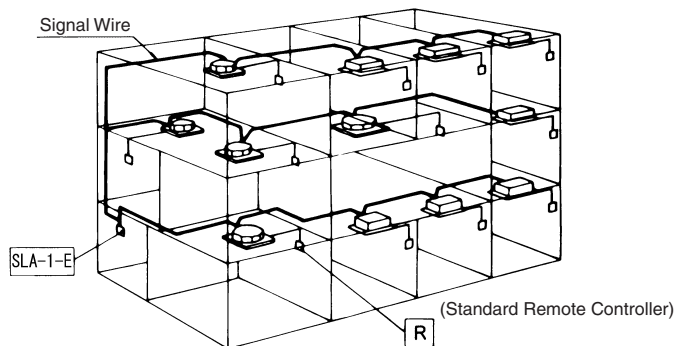
System architecture

Central Controller Signal Wire

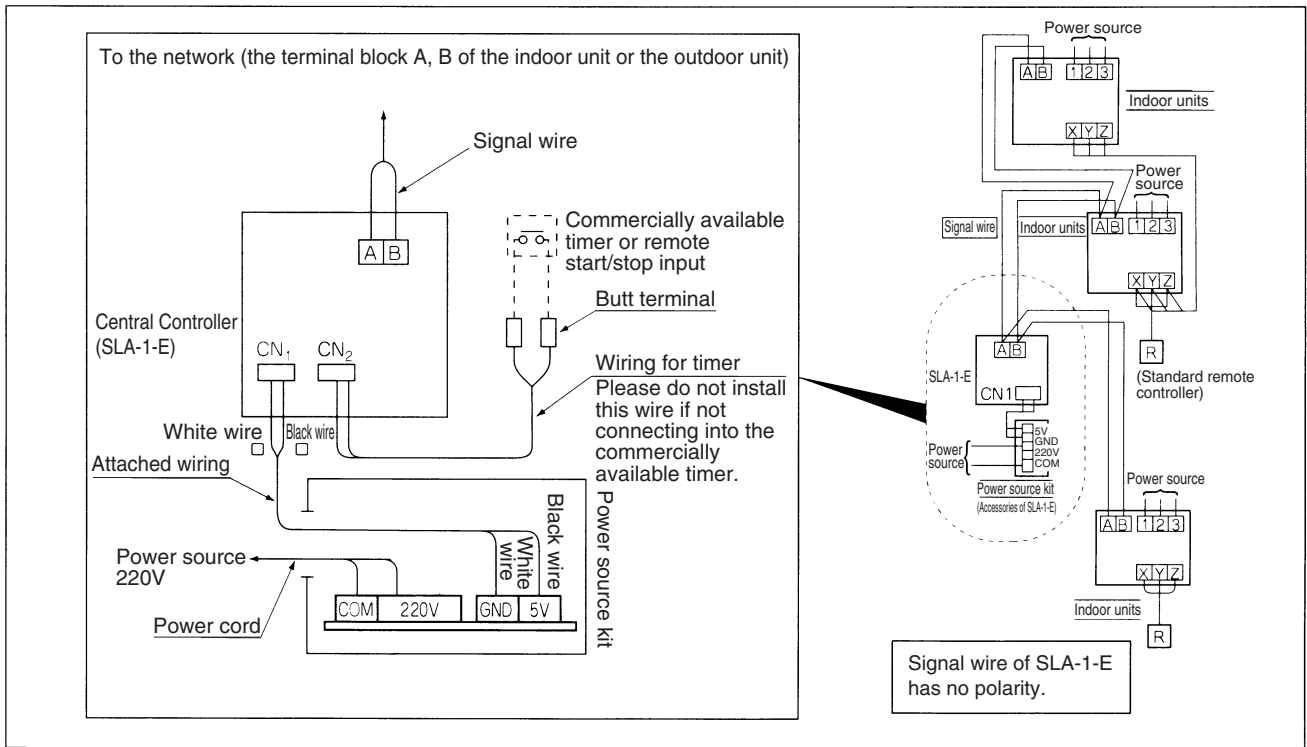
- Size: 0.75mm²~2.0mm²
- Allowed extension length: within 1,000m
- Wiring material: standard wires (use shielded wires in case of any interference)
- Recommended signal wires

No.	Description	Symbol
1	Round ethylene rubber insulated flexible cord	VCTF Twin Wire: 0.75mm ² ~2.0mm ²
2	Round ethylene rubber insulated flexible cable	VCT Twin Wire: 0.75mm ² ~2.0mm ²
3	Insulated ethylene armoured cable for control	CVV Twin Wire: 0.75mm ² ~2.0mm ²
4	Shielded Wire	MVVS Twin Wire: 0.75mm ² ~2.0mm ²

If No. 4 shielded wire is used, the shielded wire must be grounded on one end. In addition, if the shielded wire is used as signal wire, mistaken connection of DC5V and AC220V can be avoided because it is obviously distinguishable by the wiring style.



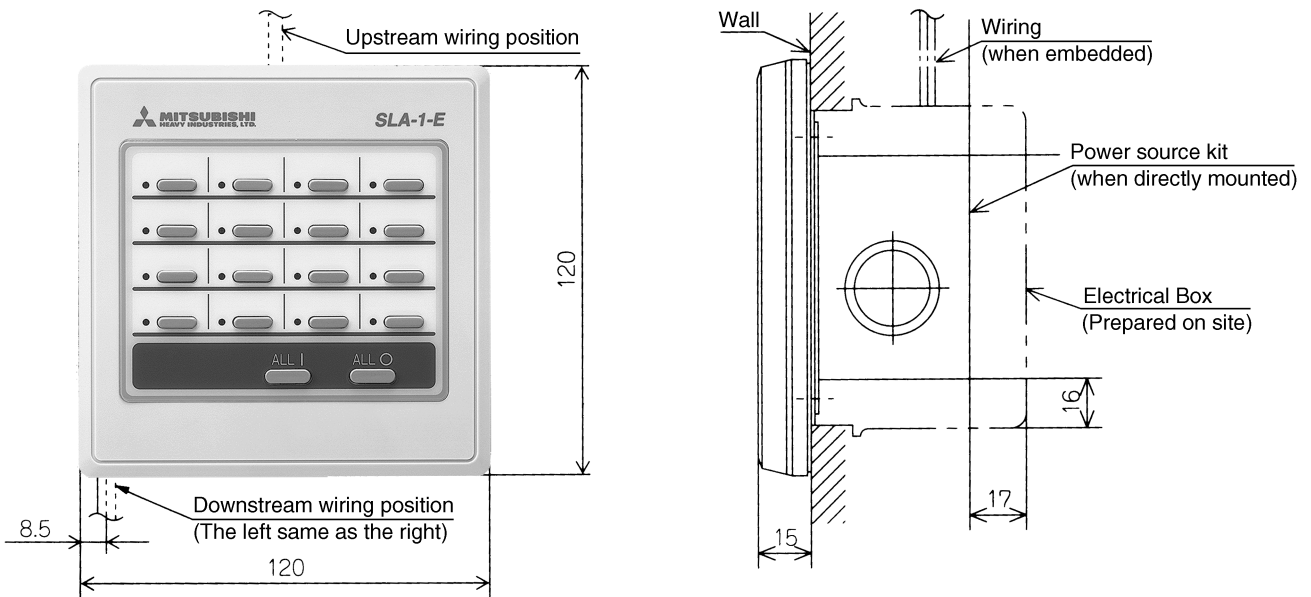
Wiring diagram



Outside view

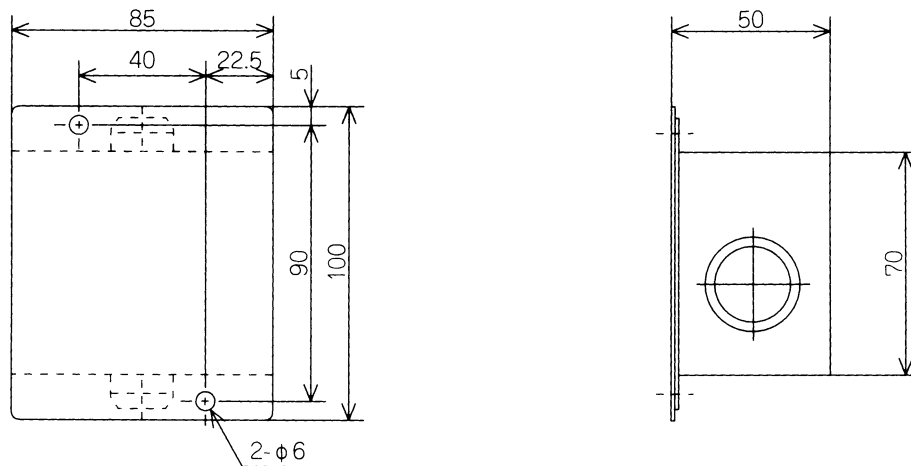
- SLA-1-E

Unit : mm



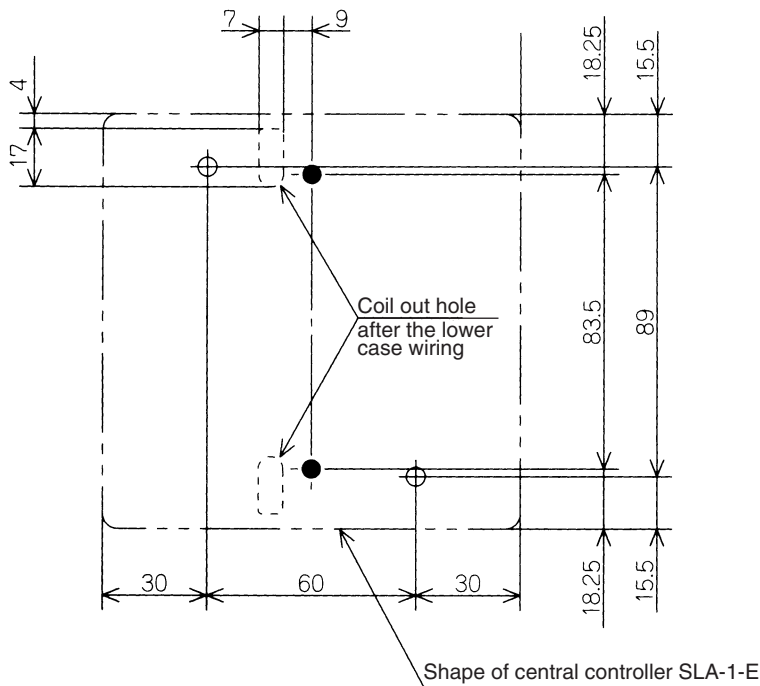
■ Power source kit

Unit : mm



Installation dimension of central controller SLA-1-E

Unit : mm



■ Operation Instructions

Central controller SLA-1-E can control the individual ON/OFF and simultaneous operation / stop of the indoor units.

It is possible for direct operation through the central controller SLA-1-E instead of the remote controller mode display on the unit site (central controller, remote controller, central controller and remote controller).

■ Unit number setting of controlled units

- The unit number of the units controlled with central controller SLA-1-E is decided by setting the start address and the number of connected units.

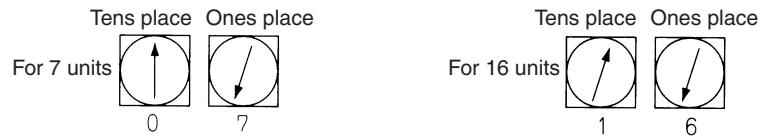
1. Address Setting

The tens place and the ones place of the initial unit number of the units controlled by central controller SLA-1-E should be set respectively.



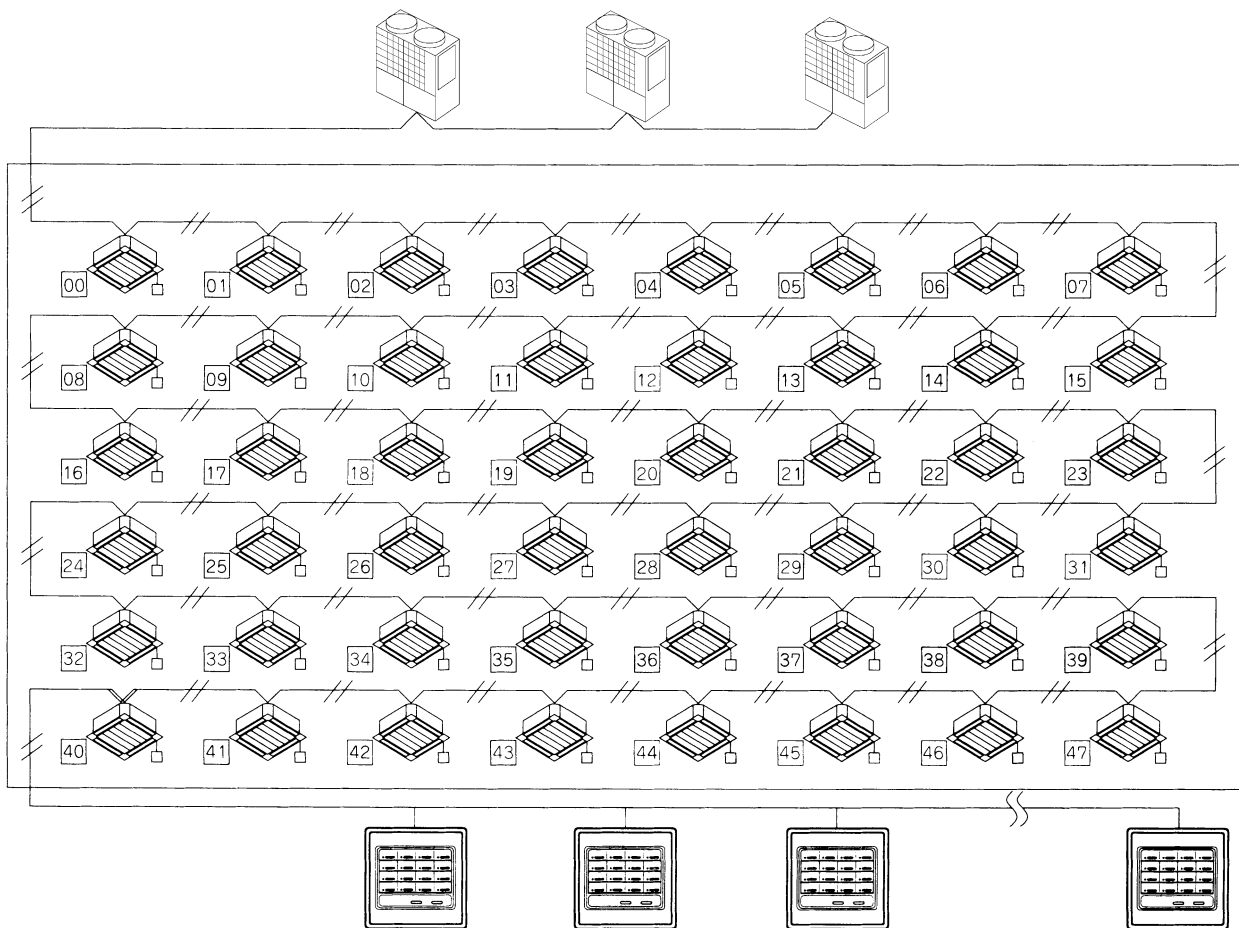
2. Setting of the Number of Connected Units

The tens place and the ones place of the number of the units controlled by central controller SLA-1-E should be set respectively.



Note: The central controller SLA-1-E can control up to 16 units. Therefore, the maximum number of connectable units is 16.

System Drawing



Example 1: Control of Multiple Central Controllers SLA-1-E

It is necessary to consider using multiple SLA-1-E central controllers and adding the network management function if more than 17 air-conditioners are to be controlled by the central controller SLA-1-E. The maximum number of SLA-1-E usable in one network is 6. If each SLA-1-E is to set the number of the corresponding air-conditioner, the maximum number of controllable indoor units is 48. In this case, setting of the unit number of each unit should be performed by group. In case of any confusion of the unit number setting outside the group, the unit will not be controlled by the SLA-1-E.

Instructions

- Use of multiple central controllers SLA-1-E.

Number of Air-conditioners, networks and SLA-1-E central controllers required

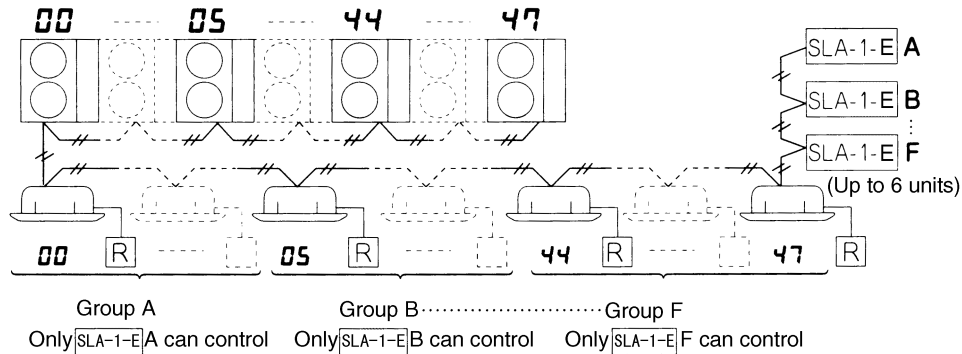
Number of Air-conditioners	Number of Networks	Number of SLA-1-E Used	Remarks
1~16 (units)	1	1~6	• Up to 6 central controllers can be used in one network.
17~32 (units)	1	2~6	
33~48 (units)	1	3~6	

Note (1) Up to 6 central controllers can be connected in one network.

Address setting example when 6 (A~F) central controllers are used.

Group	Start Address	Number of Units Connected	Unit Number of the Controlled Units
A	00	05	00~04
B	05	15	05~19
C	20	06	20~25
D	26	08	26~33
E	34	10	34~43
F	44	04	44~47

■ System Drawing

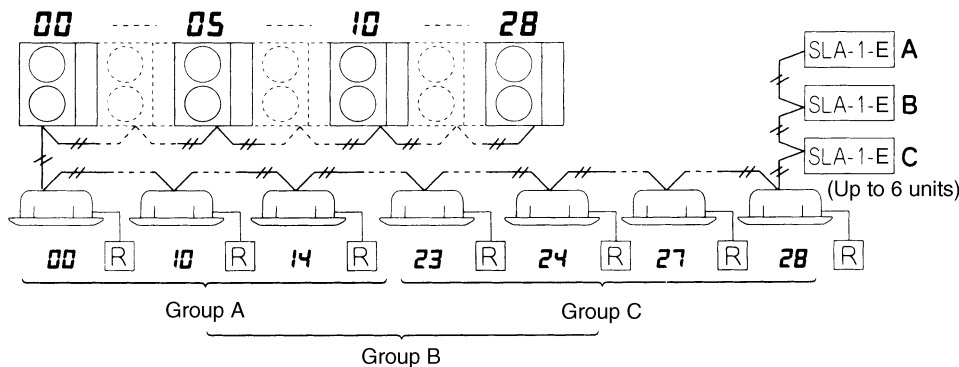


(2) Repetition of unit numbers is allowed in multiple central controllers.
 Address setting example when 3 (a-c) central controllers are used.

Group	Address	Number of Units Connected	Unit Number of the Controlled Units
a	00	15	00~14
b	10	15	10~24
c	23	06	23~28

No. 10 to No. 14 units can be controlled by central controller a and b and No. 23 to No. 24 units by b and c.

■ System Drawing



Example 2: Operation of Timer Controlled by Central Controller

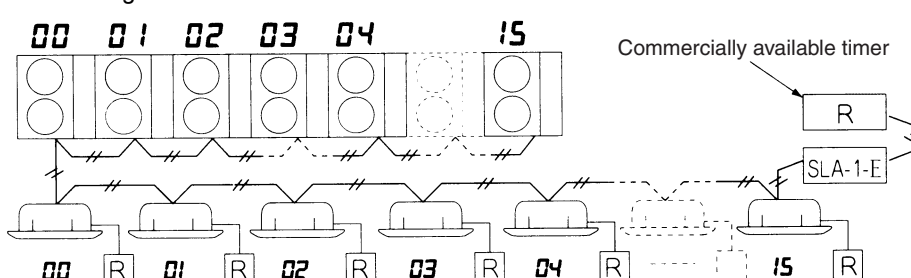
The external timer function can be accessed on the central controller SLA-1-E. By just connecting one timer, it is possible for the timing operation of all controlled units.

Up to 16 indoor units can be controlled by one central controller SLA-1-E in a centralized way.

Function

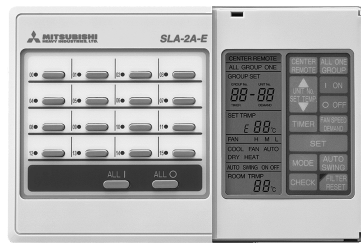
For the object units controlled by the central controller SLA-1-E, ON/OFF of the timer and the indoor units can be controlled in chain.

■ System Drawing



4.2 Center Console SLA-2A-E

Outside view



Up to 48 air-conditioners can be controlled by one SLA-2A-E.

More than two network systems are required if more than 49 air-conditioners are controlled.

Applicable models: all models after J series.

Remarks(1) When the external timer function is connected, the function is only valid in the central control or central / remote control mode.

(2) When the weekly timer is connected, it must not be used together with the external timer.

(Note) The weekly timer can be connected without interface.

(3) Up to 3 timers can be connected to the SLA-2A-E in one network.

(4) For connection of multiple standard remote controllers, please set the central/remote control uniformly.

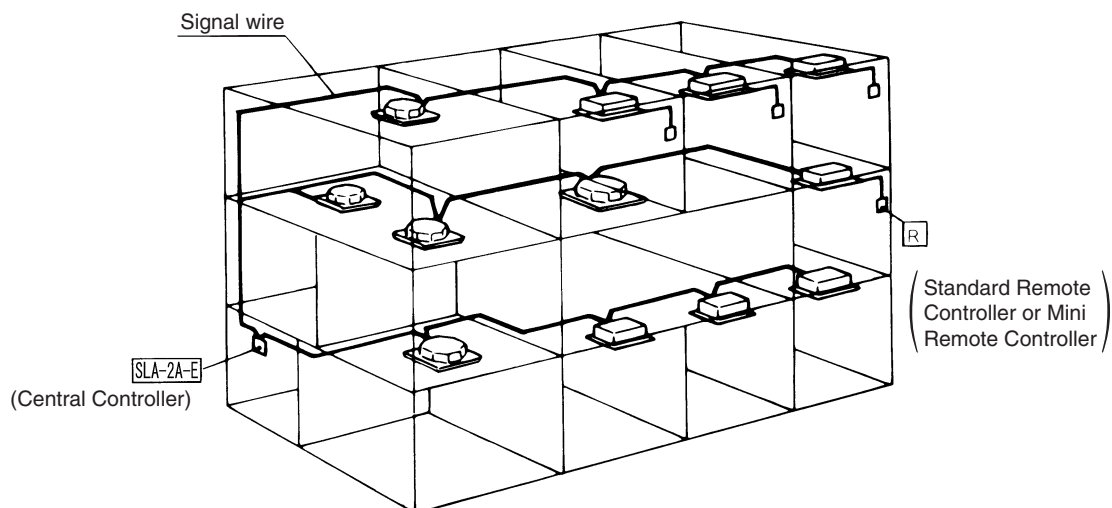
Components

Description	MHI Number
Center console SLA-2A-E	SC-SLA2A-E

System architecture

Signal wire used by the central controller

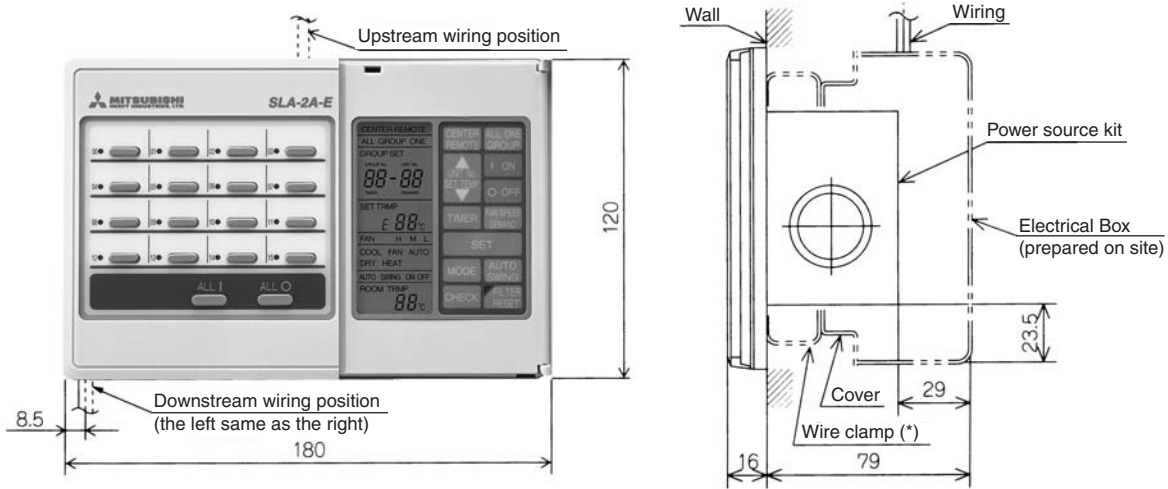
- Size of cross section: 0.75mm²~2.0mm²
- Wiring material: standard wires (shielded wires in case of any interference)
- Allowed extension length: within 1,000m.
- Recommended signal wires: see Page 355.



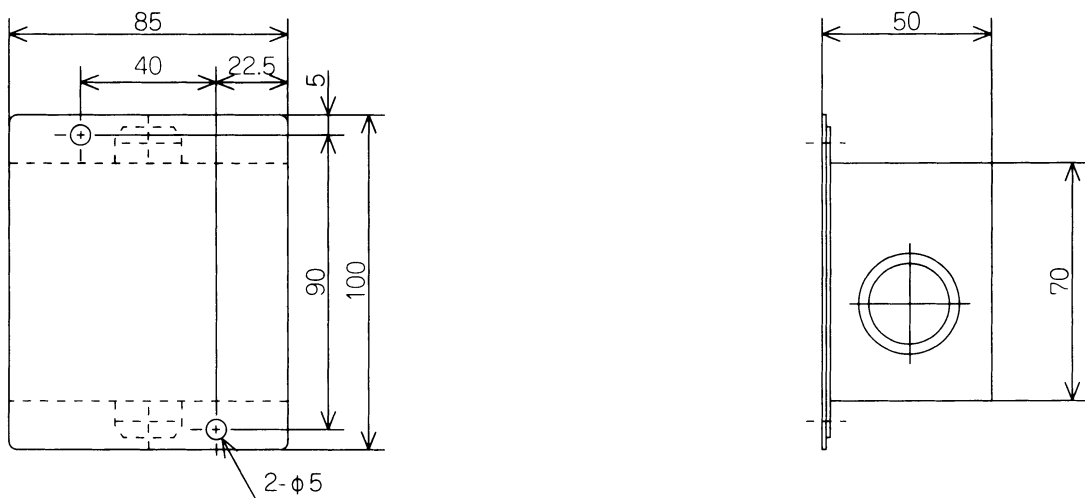
Outside view

■ SLA-2A-E

Unit : mm

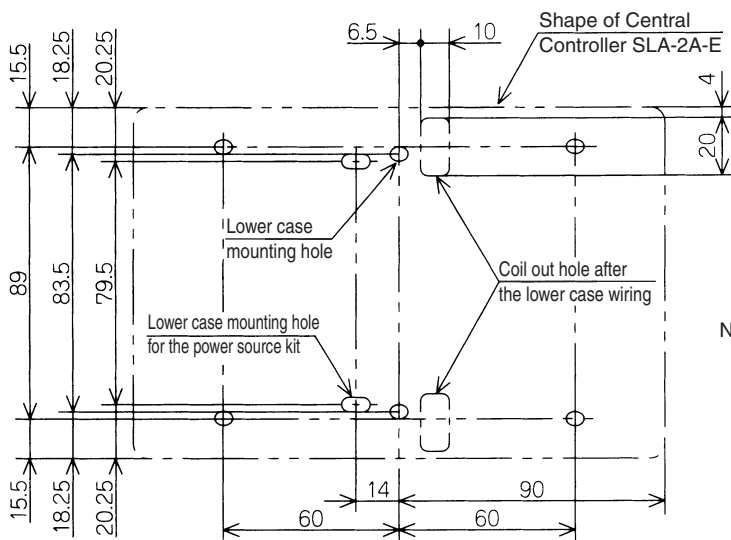


■ Power source kit



Installation dimension of central controller SLA-2A-E

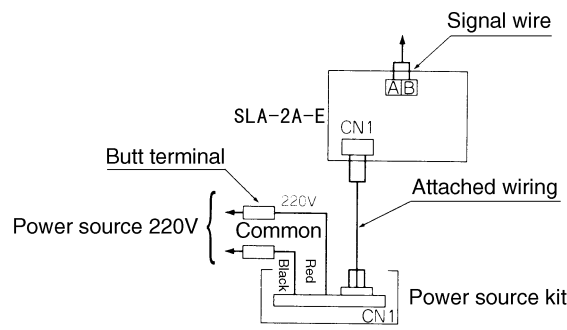
Unit : mm



Note: SLA-2A-E is specially used for embedding installation. If separate setting is required, the distance between the main body and the power source kit should be controlled within 4m.

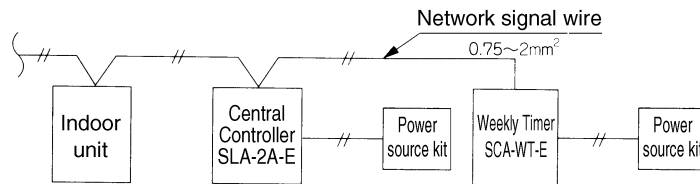
Wiring diagram

To the network (the terminal block A, B of the indoor unit or the outdoor unit)

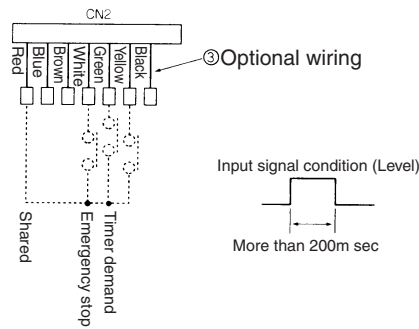


1. Example of Weekly Timer

■ When a weekly timer (SCA-WT-E) is connected

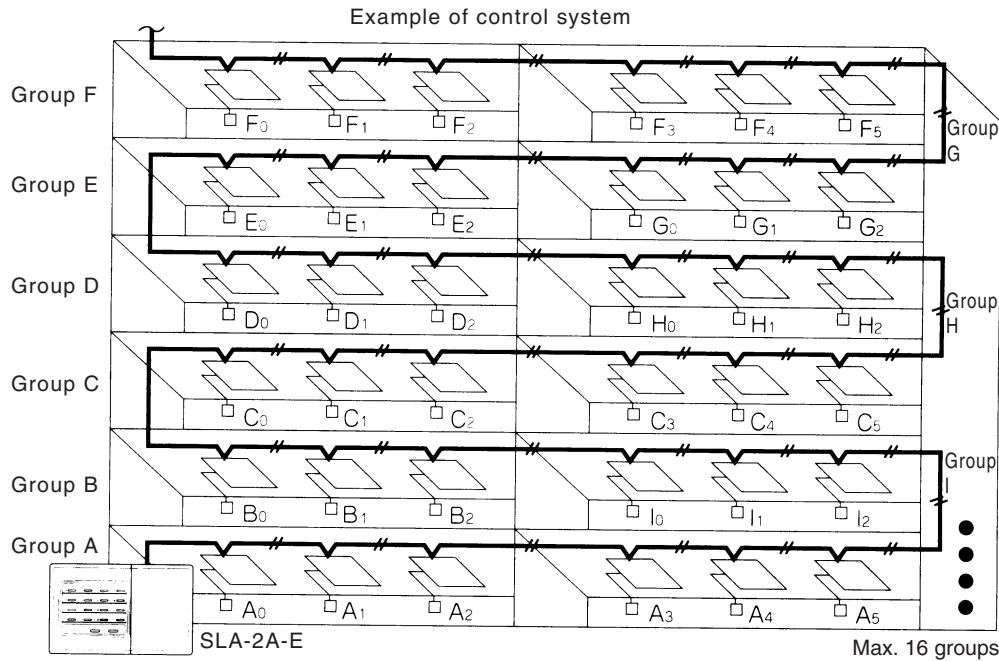


2. Example of External Timer Input



Scope of connection [connectable freely on the Super Link Network]

- **Group Control by Central Controller SLA-2A-E**
The most appropriate group setting is possible through the group setting function. Maximum 48 air-conditioners in 16 groups can be controlled.



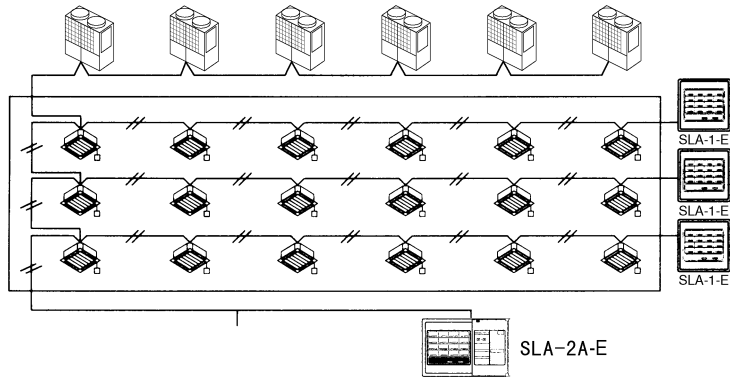
- **Group Setting**
Free group setting is possible on the menu. Up to 16 groups can be set.

Group No.	Air-conditioner Address No.
00	00, 01, 02, 18, 19, 20
01	10, 11, 24, 25, 26
⋮	
16	07, 08, 44, 45, 46, 47

- **Operation Monitoring**
The operation status of each group is explicitly displayed on the LED.
Green light On : Operation
Red light On : Abnormality
Light off: stop or no group set
- **Multi-unit Control**
Up to 3 SLA-2A-E can be connected in one network. In addition, SLA-2A-E may be used together with central controller SLA-1-E. The number of the both types that may be used together in one network is indicated in the following table.

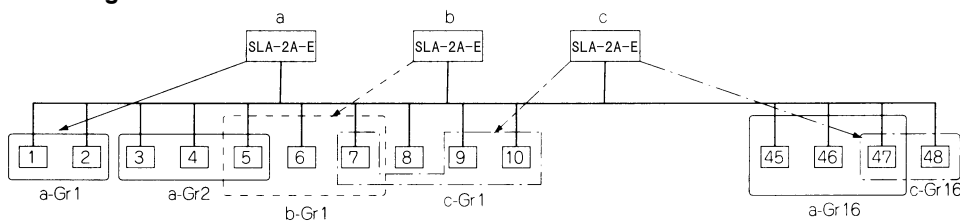
SLA-1-E	0	1	2	3	4	5	6
SLA-2A-E	3	2	1	1	0	0	0

System Drawing



- Group control when multi units are used
Free group setting by each central controller SLA-2A-E is possible when multiple SLA-2A-E central controllers are connected in one network.

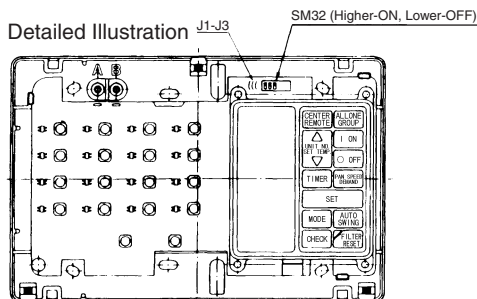
System Drawing



Control switching

Switching of the following control items is possible by changing the setting of SW32 on the PCB of the central controller SLA-2A-E. Field switching is possible if necessary.

Switch Symbol	Setting	Control Content	
SW32	1	ON (At delivery from the factory)	Filter sign Valid
		OFF (Field switching)	Filter sign Invalid
	2	ON (At delivery from the factory)	Power failure compensation Valid
		OFF (Field switching)	Power failure compensation Invalid
	3	ON	Preparation
		OFF	
		ON	
		OFF	



- Jump Wire Function

Jump Wire	Function	
J1	Shut	Demand function
	Open	Central lock function
J2	Shut	Auto mode can be set
	Open	Auto mode can not be set
J3	Shut	CENTER / REMOTE setting can be changed
	Open	CENTER / REMOTE setting cannot be changed

Central lock function

Disconnecting the jumper wire (J1) of SLA-2A-E, the demand function is converted into the central lock function.

- ① When the non-voltage contact input is supplied from the commercially available timer to the demand input contact of SLA-2A-E, the unit that has been set to the demand mode in SLA-2A-E is converted into the "central control" mode. Switching of the operation mode when the display is locked after the contact is released will not return to the operation mode. (Same for temperature)
- ② The demand input is also converted into the central control lock when the remote start/stop interface of SLA-2A-E is used.
- ③ During the central control lock, the central / remote control changeover switch becomes invalid.



4.3 Center Console SLA-3-E

(1) Model used all super lynk related models

Name	Model	Remark
Center Console SLA-3-E SLB-3-E	SC-SLA3-E SC-SLB3-E	If the SLA-3-E and SLB-3-E is buried, it must be installed in a separately sold box (SLA3-BX).

(2) Specifications

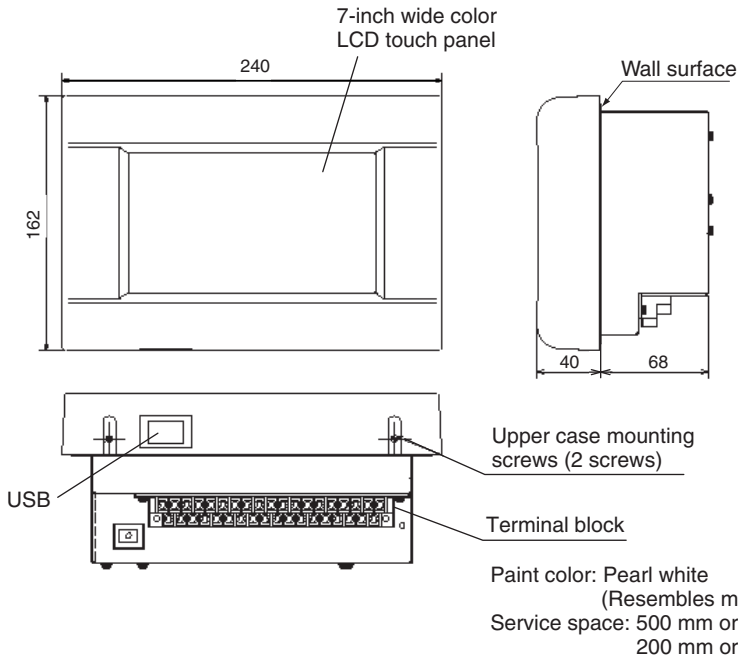
Model		SLA-3-E, SLB-3-E ⁽⁹⁾
Item		
Ambient temperature during use		0 ~ 40 °C
Power supply		1 Phase 100V/200~240V 50Hz
Power consumption		23W
External dimensions (Height × Width × Depth)		162mm × 240mm × 108mm
Net weight		2.2kg
Maximum number of connectable units (Indoor units)		Maximum 48 units/system × 3 systems = 144 units
LCD touch panel ^{(4), (5)}		Color LCD, 7 inches wide
Inputs	SL (Super lynk) Signal inputs	3 systems
	Gas, Power pulse input ⁽²⁾	8-point pulse width 100 ms or more
	Fire signal input ⁽²⁾	1 point non-voltage a contact input continuous input (closed, forced stop)
	Demand signal input ⁽²⁾	1 point non-voltage a contact input continuous input (closed, demand control)
Outputs	Simultaneous operation output	1 point maximum rated current 40 mA, 24 V During full stop: Open; If even 1 unit is operating, Closed
	Simultaneous error output	1 point maximum rated current 40 mA, 24 V Normal: If even one unit is abnormal, Open ⁽⁶⁾
Use with other central control units		(8)

Notes (1) Some functions cannot be used depending on the indoor model used. (Refer to page 363)

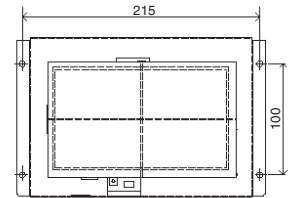
- (2) The receiving side power supply is DC 12 V (10 mA).
- (3) If the energy consumption calculation function is necessary, use the SLB-3-E.
- (4) The LCD has an endurance of approximately 32,000 hours, depending also upon the backlight OFF time setting.
- (5) The touch panel has an endurance of approximately 1 million times.
- (6) In the environment setting screen, it is also possible to change the batch error output setting as open for normal and closed for error.

- (7) The air conditioning charges calculations of this unit are not based on OIML, the international standard.
- (8) • The center console SLA-2A-E can be connected 1 unit per system.
 - It cannot be combined with the center console SLA-1-E and SLA-200 series, the CHC-M* Series, SC-WGW-A, SC-BGW-A or SC-LGW-A.
 - Multiple SLA-3-E and SLB-3-E units cannot be connected on the same network.
- (9) SLB-3-E cost calculation results cannot be guaranteed.

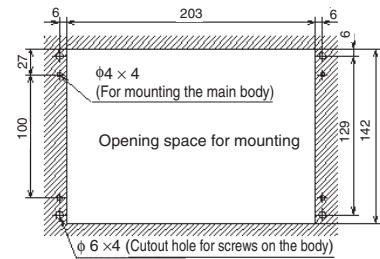
(3) External view



• Mounting hole positions



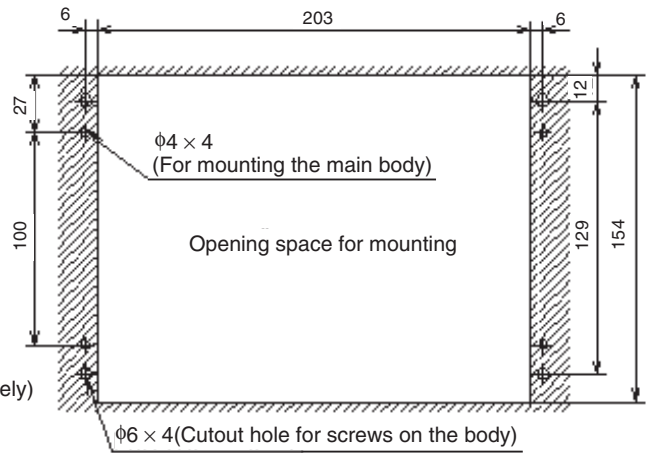
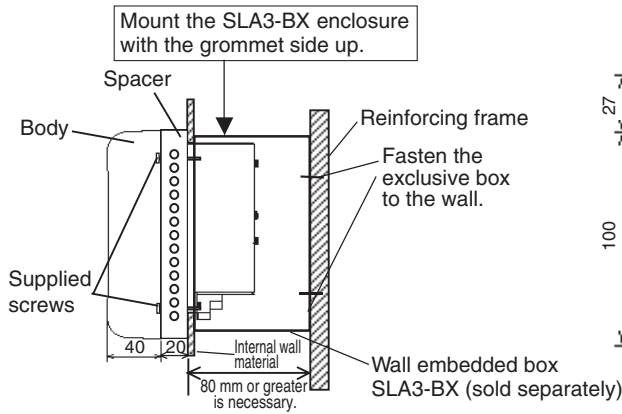
• Required opening space if unit is mounted in an enclosure



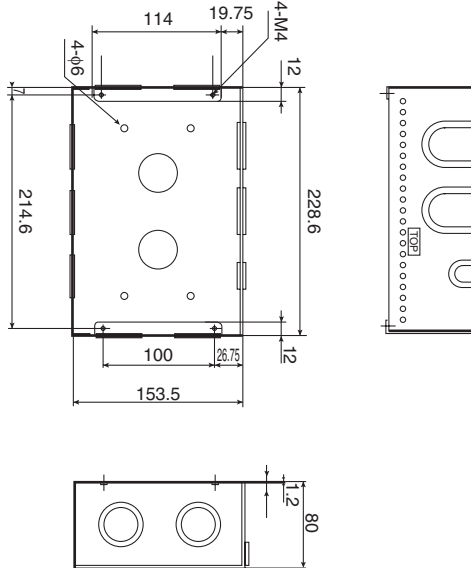
(4) Embedded in a wall

If it is embedded in a wall, space is needed for the following installation dimensions and the opening.

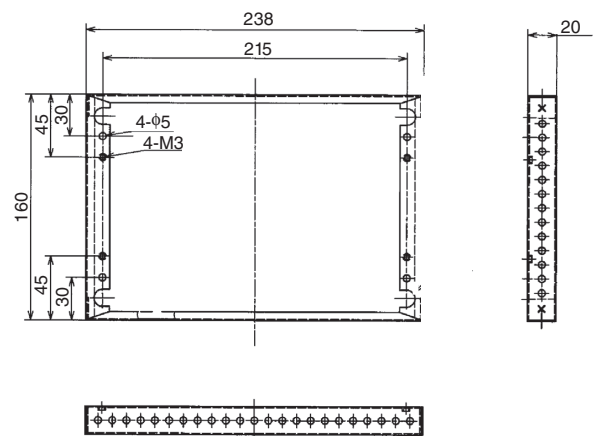
Note (1) If you embed it, the exclusive enclosure (SLA3-BX), sold separately, is required.



• External dimensions of wall embedded box (SLA3-BX) (for heat dissipation)



• External dimensions of spacer for wall embedded box (accessory for SLA3-BX) (for heat dissipation)



(5) Functions

(a) Operation, Settings

Carries out batch operation and settings in group units for up to 144 groups. It is necessary that the groups for which batch operation and settings are carried out be set in advance.

No.	Item	Contents
1	Run/Stop	Starts or stops operation.
2	Mode	Sets COOL, HEAT, DRY, FAN and AUTO operation.
3	Set temperature	Sets the temperature in a range of 18 °C ~ 30 °C (in 1 °C units).
4	Operation permitted/prohibited ⁽¹⁾	Enables or disables manual operation, enables or disables run/stop operations, enables or disables mode setting and enables or disables temperature setting.
5	Fan speeds	Sets Hi, Me or Lo fan speed.
6	Air direction	Sets auto swing ON or OFF and sets positions 1 ~ 4.
7	Filter reset	Resets (turns off) the filter sign.

Note (1) The enable or disable function for each function is enabled in EHP connections with KXE4 or subsequent indoor unit models and in combination with new remote controllers (RC-E1 or subsequent models).

(b) Status monitor

Status monitoring is carried out in block units (only monitored operating state and breakdown), group units or air conditioner units.

No.	Item	Contents
1	Operating state	Monitors the operating and stopped state of the air conditioner. When 1 or more units is running, it shows operation and when all units are stopped, it shows that operation is stopped.
2	Mode	Displays the operation mode of a representative air conditioner.
3	Set temperature	Displays the set temperature of a representative air conditioner.
4	Room temperature	Displays the return air temperature of a representative air conditioner.
5	Operation enabled	It shows whether manual operation, the run and stop operation, mode setting and temperature setting are enabled or disabled of a representative air conditioner.
6	Fan speeds	Displays the fan speed setting for a representative air conditioner.
7	Air direction	Displays the auto swing ON/OFF setting and position setting for a representative air conditioner.
8	Filter sign	Displays the filter sign if the filter sign for one or more units is lighted up. When the filter sign is off for all units, the monitor's filter sign goes off.
9	Maintenance (Inspections 1, 2 or backup)	Displays the maintenance indicator when the <Inspection 1, 2 or backup> lights up on 1 or more units. When <Inspection 1, 2 or backup> is off on all units, the maintenance indicator goes off. There are 3 types of inspection, 1, 2 and backup. The display priority order for these three types is as follows. Backup > Inspection 1 > Inspection 2
10	Breakdown	Displays the breakdown indicator when one or more units has broken down. When all units are normal, the breakdown indicator goes off.

(c) Setting the schedule

The operation schedule can be set in group units. In one day, up to 16 schedules can be registered for operation time, run/stop, mode, operation enable, and temperature settings. Operation time settings can be set in minute units.

No.	Item	Contents
1	Yearly schedule	Set the schedule for one year as weekdays, holidays, special day 1 and special day 2.
2	Today's schedule	Sets the schedule that will be valid for the current day only. This schedule has priority over annual schedules.
3	Special day schedule	Sets each schedule of weekday, holiday, special day 1 and special day 2 in the yearly schedule.

(d) Administration, Control

No.	Item	Contents
1	Block definition	Sets the block name and the groups constituting the block. The groups registered in a block must first be registered by group definition. Groups that are not set in blocks cannot be set in detail from the display of all blocks or their status displayed. <ul style="list-style-type: none"> • Maximum number of blocks is 16 • Maximum number of groups per block is 9 • Maximum number of characters in a block name is 16 characters. The initial state is with all blocks not defined.
2	Group definition	Sets the group name and the air conditioners constituting the group (up to 16 units per group), a representative air conditioner, and whether the group is controlled simultaneously or not. Air conditioners which are not set in groups are not subject to control by SLA-3-E or SLB-3-E. <ul style="list-style-type: none"> • Maximum number of groups is 144 • Maximum number of air conditioners per group is 16 • Maximum number of characters in a group name is 16 characters. In the initial state, 1 air conditioner is assigned to 1 group, and the air conditioner number is for the group name.
3	Unit definition	The type of energy consumption and capacity of each air conditioner connected to SLB-3-E, and whether it is subject to demand control or not, are set.
4	Time and data setting	Sets the clock used for the schedule, etc. Annual (Anno Domini) / Month / Day / Hour (24 hr. system) / Minute
5	Alarm history	Displays the error occurrence and recovery history for up to 300 occasions in air conditioner units.
6	Energy consumption calculation period	Sets the "regular hours" time bands used for calculation.
7	Energy consumption calculation cumulative operation time	Calculates the cumulative operating hours for each air conditioner, dividing them between "regular hours" or "irregular hours," and saves them.
8	Demand control	"Starts the fan" or "Prohibits operation" for air conditioners which have previously been set by external demand signals. The air conditioners return to their original status when the demand signals are cancelled.
9	Emergency stop	Causes all the air conditioners connected to this unit to "Stop" or "Prohibits operation" in response to an external emergency signal. When the emergency signal is cancelled, the air conditioners return to their original setting permitting or prohibiting manual operation, but all unit remain in the "Stop" state.
10	Power failure recovery control	When the power is turned on again after a power failure, the groups set in the schedule operate in accordance with the schedule that was set most recently prior to the power failure. If Run/Stop, the operation mode, operation permitted and set temperature items are not set and "-----" is displayed for that item, the time is set to the time that was closest to the time of the power recovery. If there is no schedule setting for the affected date, the air conditioner is set to its initial state.

(e) Energy consumption calculation data (SLB-3-E)

SLB-3-E outputs energy consumption calculation data using USB memory. These data can be edited using commercial spreadsheet software.

Energy consumption calculation data are created for each individual month.

<Calculation procedure>

- ① The cumulative operating time is calculated for each air conditioner. (in minutes)
- ② The total operating time (K_i) for each air conditioner, and the operating time in each time band (regular hours, irregular hours) are calculated (in minutes).

$$K_i = K_i + K_M$$

K_M = Amount of air conditioner operation in 1 minute.

The amount of operation is calculated by the following 3 methods.

The amount of operation in the case calculated for the rated opening area value for that air conditioner, E.

- MULTI 1: The conversion value considering the amount of refrigerant flowing in the indoor unit is calculated ($\sum E_j$).

(E_j : Conversion value for the opening area of the indoor unit's expansion valve.)

- MULTI 2: The time that refrigerant flows through the indoor unit is additionally calculated. (Thermostat ON time \times E)

- RUN/STOP: A conversion value for the time when the remote controller is ON is added. (Operating time \times E)

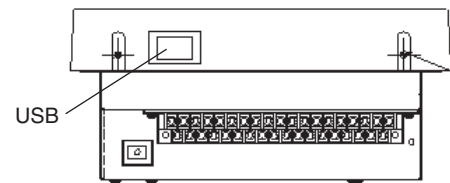
(E: Conversion value for the capacity of the indoor unit.)

(Do not mix different methods in the same pulse system.)

- Simple software is included for editing the energy consumption calculation data.

See the included software concerning the operation method.

- Energy consumption calculation data are obtained from this unit using the USB memory.



Bottom of the unit

★User login

For owners the fee apportionment for multi machine air conditioners is more complicated and harder to explain to customers. In many cases it's best to use simple explanations.

In addition, consumption for multi machines are calculated based on volume, making it easy for excessive cooling and differences in building load to lead to discrepancies in electricity consumption. These different values are hard to explain. Therefore, it is easier to explain how many horsepower were used for how long.

At this point, recommend [RUN/STOP] registration.

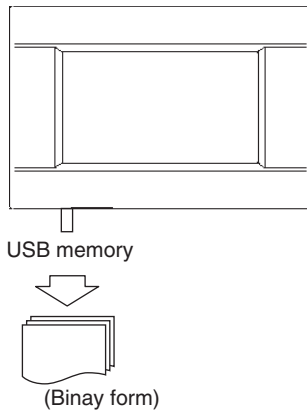
Both multi machines and single machines use [RUN/STOP] registration.

Recommend that separate electricity meters be installed for single machine and multi machine systems.

Display every unit of electricity (kW) on the electricity consumption board. For example, register P280H as 28.0.

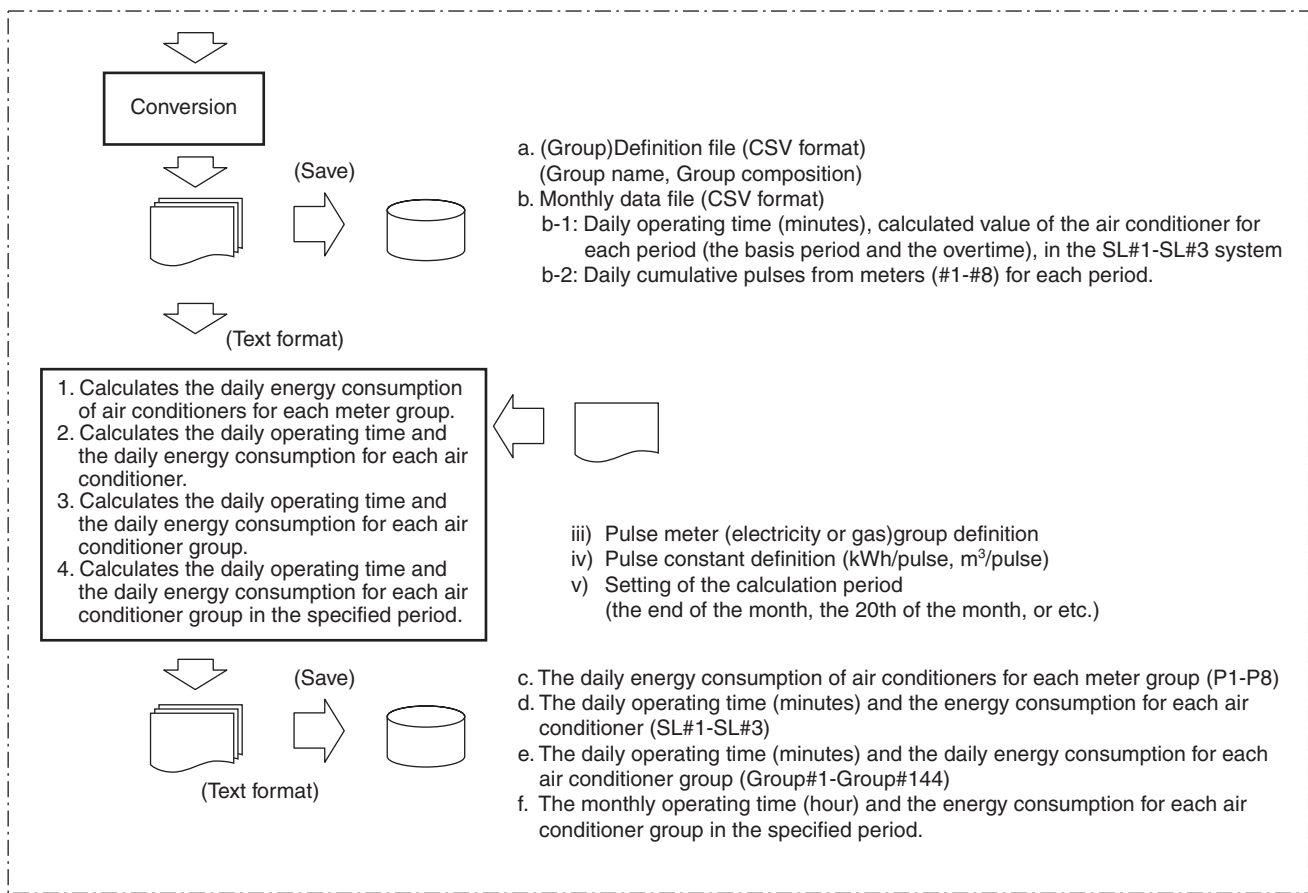
Current operational value = electricity volume \times time of operation, calculated according to the electricity volume ratio.

<Flow of data processing>



The energy consumption calculated by this equipment close not conform to OIML.
This unit calculates only energy consumption(gas,electric power).
You need to calculate the air-conditioning rates.

- ① Definition file
(Group name, group composition)
- ② Monthly accounting data files
Air conditioner operating time during regular hours and irregular hours for each day, amount of operating time during regular and irregular hours, pulse count value during regular and irregular hours.



Customer processing

Calculating the air conditioner's energy charge.
Printing out the bill of a tenant.

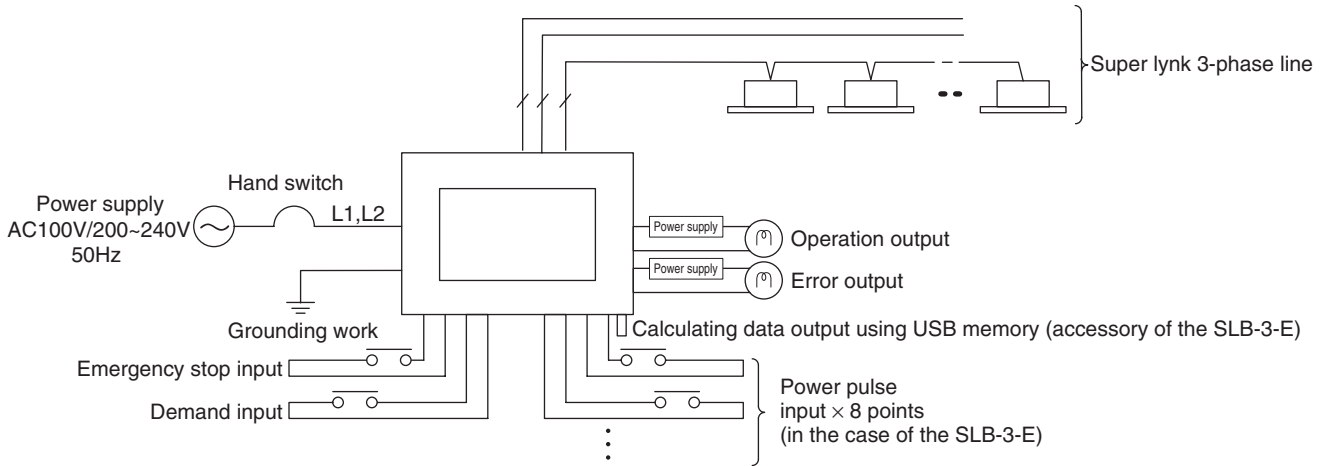
- vi) Group definition for each tenant
- vii) Setting of energy charge (the unit price and the basic charge of electricity and gas)
- viii) The sheet form of a bill

Note (1) The calculation results for the SLB-3-E are not guaranteed.

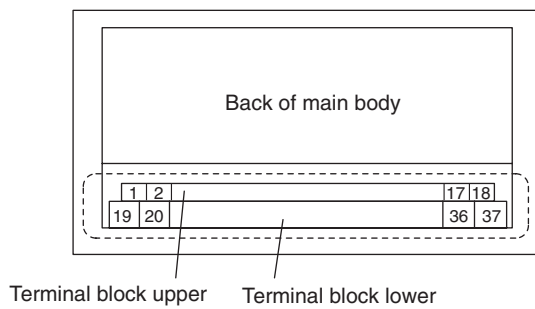
(6) Electrical wiring

- Be sure to carry out grounding. Do not run the ground wire to a gas pipe, water pipe, electric meter, or telephone ground line.
- Do not turn on the power until all construction operations are completed (manual switches).
- All wiring, switches, relays, power supply and lamps, shown in the figure, besides SLA3-E (SLB3-E), are to purchased locally.

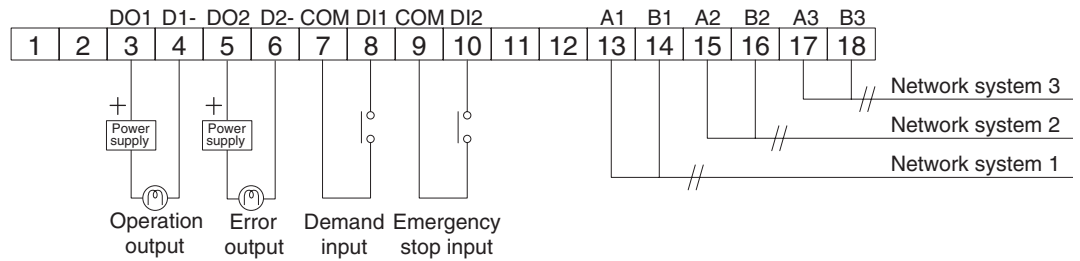
(a) System wiring



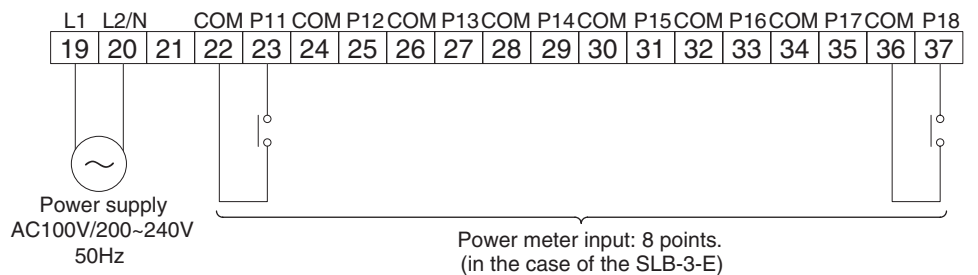
(b) The terminal block has 2 tiers.



• Terminal block upper



• Terminal block lower



Notes (1) Do not connect the power lines to another terminal block. If a mistake is made in the connections, electrical components will be damaged or destroyed and it will be extremely dangerous. Check the wiring once again thoroughly before turning on the power for the first time.

(2) Use an electric meter that satisfies the following specifications.

- A meter with a pulse generator.
- The pulse width should be 100 ms or greater.

(c) Signal wire for super link

- Size; 0.75mm² ~ 2.0mm²
- The total length of the signal wires should be 1000m or less. (per line)

• Recommended signal wire list

No.	Name	Symbol
1	Vinyl cabtire rounge cord	VCTF double-core 0.75 to 2 mm ²
2	Vinyl cabtire round cable	VCT double-core 0.75 to 2 mm ²
3	Control vinyl insulated, vinyl sheathed cable	CVV double-core 0.75 to 2 mm ²
4	Shielding wire	MVVS double-core 0.75 to 2 mm ²

When No. 4 shielding wire is used, always ground the single wire side of the shielding wire. In addition, using the shielding wire is helpful to prevent the incorrect connection between 5V DC and 220/240V AC because the discrimination from the power supply wire is clear.

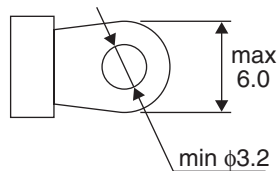
(d) Other signal wire

- Size; 0.75mm² ~ 1.25mm²
- Maximum extension: 200m

(e) Power supply wire

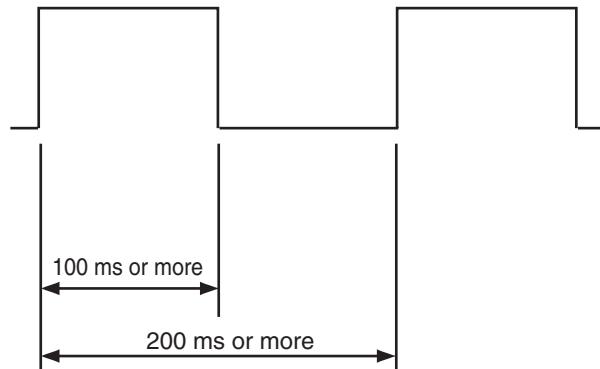
- Size; 1.25mm²

(f) Round eye-let terminal



(7) Selecting a new pulse unit

1) Input acceptor restrictions



Machine restrictions

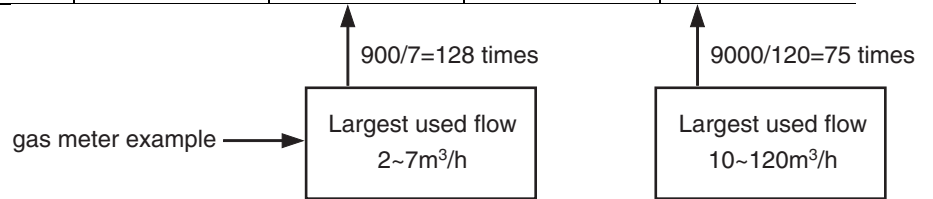
- 1 second: 5 pulses or fewer
- 1 minute: 300 pulses or fewer
- 1 day: 1 pulse or more

2) pulse unit selection

- ① Find the total capacity of all connected air conditioners
- ② Assume that the correct electricity meter is being used
- ③ Air conditioners operating at full load: assume summer overload power consumption $\times 1.2$
 For example, Set the total electricity consumption = 100kw, power rate = 90%
 Operating at full load = $100 \times 1.2 = 120\text{kW}$
 With 3 in conjunction, $I = 120 \times 1000 / (1.732 \times 200 \times 0.9) = 385\text{A}$
 → Electricity meter must be 400A
 If you use 400A Mitsubishi transmission equipment, then
 - K11 type, pulse unit at 100kwh/P
select while at 10kwh/P
 - K11 type, pulse unit at 100kwh/P
10kwh/P
select while at 1kwh/P
 - There are other products with smaller pulses, ask an electric meter manufacturer for details.
- ④ Inspection while electricity consumption is at 120kwh
 - When pulse input is highest
 - Use 0.1kwh/P, then $1200\text{P}/\text{h} = 20\text{P}/\text{min}$ exactly 1 minute 20 pulse (300pulses or fewer)
10 minutes 200 pulses OK
 - Use 1kwh/P, then $120\text{P}/\text{h} = 2\text{P}/\text{min}$ exactly 1 minute 2 pulses
10 minutes 20 pulses OK
 - Use 10kwh/P, then $12\text{P}/\text{h} = 0.2\text{P}/\text{min}$, so 1 minute no pulses
10 minutes 2 pulses OK
 - Lower usage rate, for example 1/10 time (12kwh),
 - Use 0.1kwh/P, then $120\text{P}/\text{h} = 2\text{P}/\text{min}$ so 1 minute 2 pulses
10 minutes 20 pulses OK
 - Use 1kwh/P, then $12\text{P}/\text{h} = 0.2\text{P}/\text{min}$, so no pulses in 1 minute
10 minutes 2 pulses OK
 - Use 10kwh/P, then $12\text{P}/\text{h} = 0.2\text{P}/\text{min}$, so 1 minute no pulses
10 minutes no pulse NG
- ⑤ Pulse units should reach 0.1kwh/P.
 - 10kwh/P is NG.
 - 1kwh/P usage rate is the lowest, there might not be any pulses in 10 minutes, causing a calculation error.

3) Largest gas pulse input value

Gas amount pulse unit	0.01m ³ /P	0.05m ³ /P	0.1m ³ /P	0.5m ³ /P
Largest measurable flow volume	4,320m ³ /B	21,600m ³ /B	4,3200m ³ /B	21,6000m ³ /B
	180m ³ /h	900m ³ /h	1,800m ³ /h	9,000m ³ /h



0.05m³/P time: If you use 2m³/h 40 pulse/h
 If you use 3m³/h 60 pulse/h
 If you use 5m³/h 100 pulse/h
 If you use 7m³/h 140 pulse/h

0.5m³/P time: If you use 10m³/h 20 pulse/h
 If you use 15m³/h 30 pulse/h
 If you use 30m³/h 60 pulse/h
 If you use 50m³/h 100 pulse/h
 If you use 90m³/h 180 pulse/h
 If you use 120m³/h 240 pulse/h

4) Largest electric pulse input value

Gas amount pulse unit	0.01køh/P	0.1køh/P	1køh/P	10køh/P
Largest measurable flow volume	4,320køh/B	43,200køh/B	432,000køh/B	4320,000køh/B
	180køh/h	1,800køh/h	18,000køh/h	180,000køh/h

Note (1) Electricity meter pulse unit, please select 10kw/p or less.

(Example) using 3200V– 30A electric meters, power rate at 100%, largest flow will be 30A

Electricity consumption = $\sqrt{3} \times 200 \times 30 \times 1.0 = 10,392$ kwh

This time, set to 0.1køh/P, so 103,920P/h=1730 pluse/minute NG

Set to 1.0køh/P, so 10,392P/h=173 pluse/minute OK

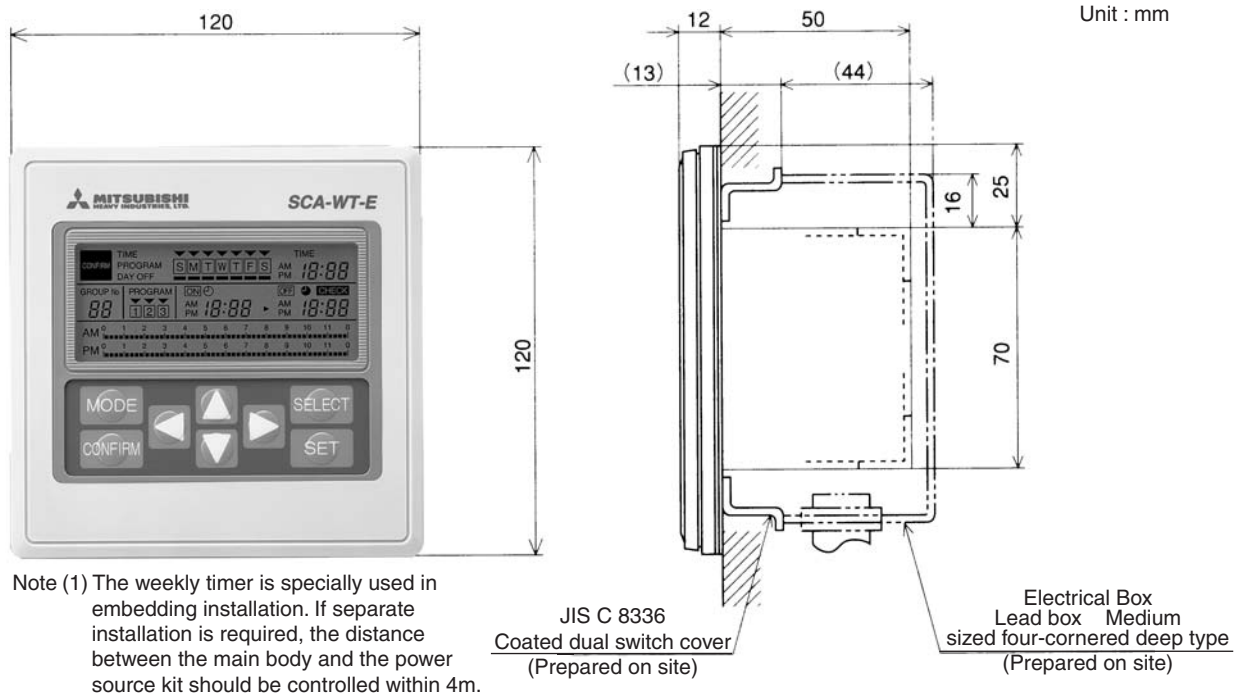
Set to 10.0køh/P, so 1,039P/h=17.3 pluse/minute OK

4.4 Weekly Timer SCA-WT-E

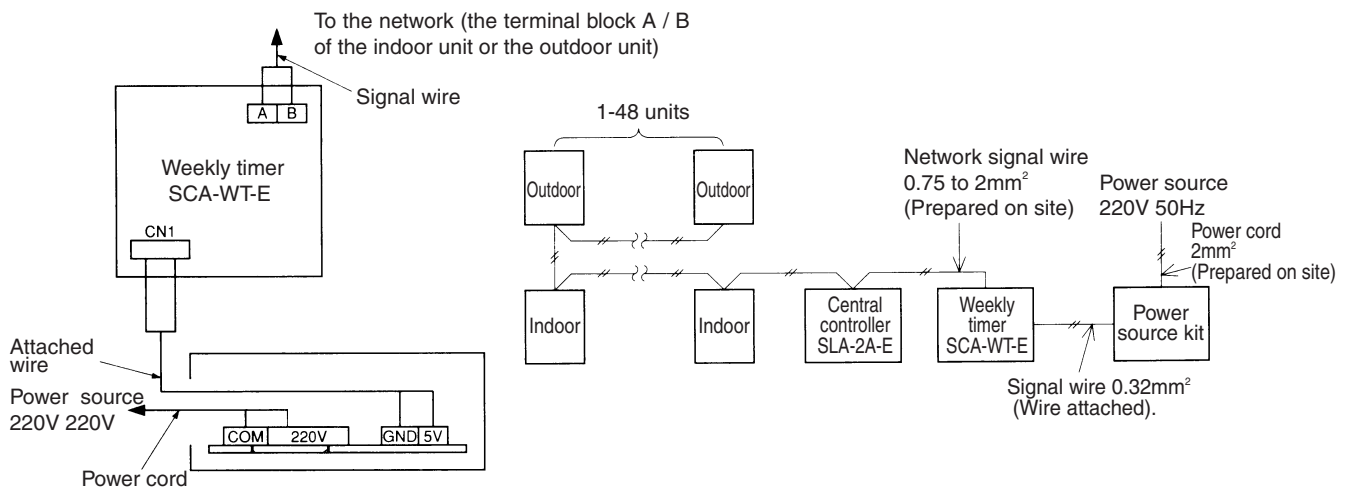
Specifications

Description	Weekly timer	Function	<ul style="list-style-type: none"> • One week operation can be reserved. • The ON/OFF time can be set 3 times a day by "minute". • Setting is possible to avoid forgetting to disconnect. • Operation reservation may be temporarily cancelled by week. • Graphic display of current time as well as the operation time of weekly program and current day program is possible. • Setting can be memorized during power failure. • The operation program for up to 16 groups can be set separately when used together with SLA-2A-E. • Up to 48 units can be controlled.
Model	SCA-WT-E		
Applicable Model	MHI combination air-conditioner, model JN		
Power Source	AC220V,50Hz		
External Dimension (mm) (H × W × L)	Main body 120 × 120 × 12 Power source kit 100 × 85 × 50		
Combinable Optional Components	Central controller SLA-2A-E		
Accessories	Mounting screws, Power source kit Installation instruction manual Operation manual		

Outside view



Wiring diagram



- Note (1) If setting by group is desired, always use one SC-SLA2A-E.
 (2) If setting by group is not required, all the indoor units in the network will perform the programmed operation simultaneously.

Control switching

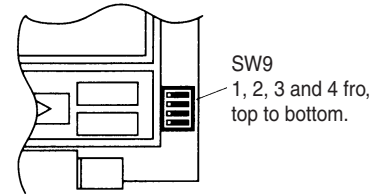
The following control switching is possible through the control switch (SW9).

Switch to left for OFF, right for ON.

There are 4 switches, but do not change the third and fourth ones. (set to OFF)

Switching must be made before power on.

1	ON	Group start / stop is possible if used together with SLA-2A-E.	
	OFF	Facilitate the centralized start / stop of all indoor units in the network.	At delivery from the factory
2	ON	The operation / stop command is issued when power is restored.	
	OFF	No operation / stop command is issued when power is restored.	At delivery from the factory



Note) ■ For start / stop operation by group, be sure to use one SLA-2A-E.

■ Group setting by SLA-2A-E.

■ The indoor units in the network perform timed operation when Switch 1 is OFF no matter whether the central controller is used.

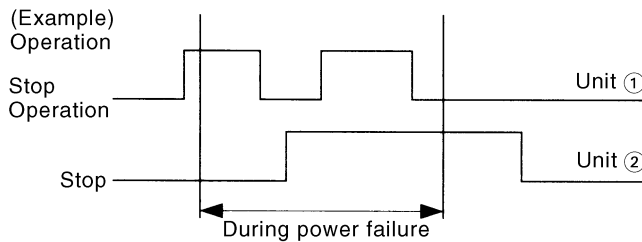
Only the indoor units controlled by the central controller or the central remote controller perform timed operation set through SLA-2A-E when Switch 1 is ON.

■ Pressing down switches "Setting" and "Setting Mode" simultaneously can clear the current time, timer setting and off-day settings.

Power failure compensation function

① The set status of WT is held in case of power failure or power cut off. After power is restored, the monitor mode is displayed conforming to the time when power is restored.

② Operation (Stop) Command is issued based on the timer setting at the power restoration moment by pushing the control switch SW.



When the timer setting is shown as the above diagram, unit ① is at Stop status when power is restored. Therefore, a Stop command is issued.

Unit ② is at the operation status when power is restored. Therefore, an operation command is issued.

4.5 Super Link Serial Gateway CHC

1. MODEL

Model	Applicable
CHC-MFE4	Super-link for 4 systems (for PAC192)
CHC-MFE8	Super-link for 8 systems (for PAC384)

2. SPECIFICATION

Item.	Model	CHC-MFE4	CHC-MFE8
Ambient operating temperature		0°C ~ 40°C	
Power-supply voltage		Signal phase AC200 ~ 240V ± 10% 50 / 60Hz	
Power consumption		35W	
Dimension (height × width × depth)		200mm × 300mm × 180mm	200mm × 470mm × 180mm
Weight		6.2kg	8.6kg
Stretching resistance of terminal block		Less than 10kg	
Pulse input for integrating wattmeter		Max. four points and 2 non-voltage contacts, DC24V, 20mA, Pulse width: over 100ms 1pulse (min), 300 pulse(max) within 1 minute	
Maximum number of units connecting with package		48 / 1 system × 4 systems=192	48 / 1 system × 8 systems=384

Notes (1)While CHC-MFE is being connected to air-conditioning system, central console (SLA-3-E,SL-200-E), the charge management system (RKS Series), and the networked remote controller all cannot be used.

(2)When CHC-MFE is connected, central console (SLA-1-E,SLA-2A-E) can be connected under the following condition.

(a)It is possible to connect these products delivered from 1999.

(b)Change the setting of central & remote / central to the same setting CHC-MFE and SLS-2A-E. Set mode cannot be fixed if the setting is not changed to the same setting.

(c)The number of them that can coexist with a central console on the network is shown in the table below.

Per Super Link 1 system

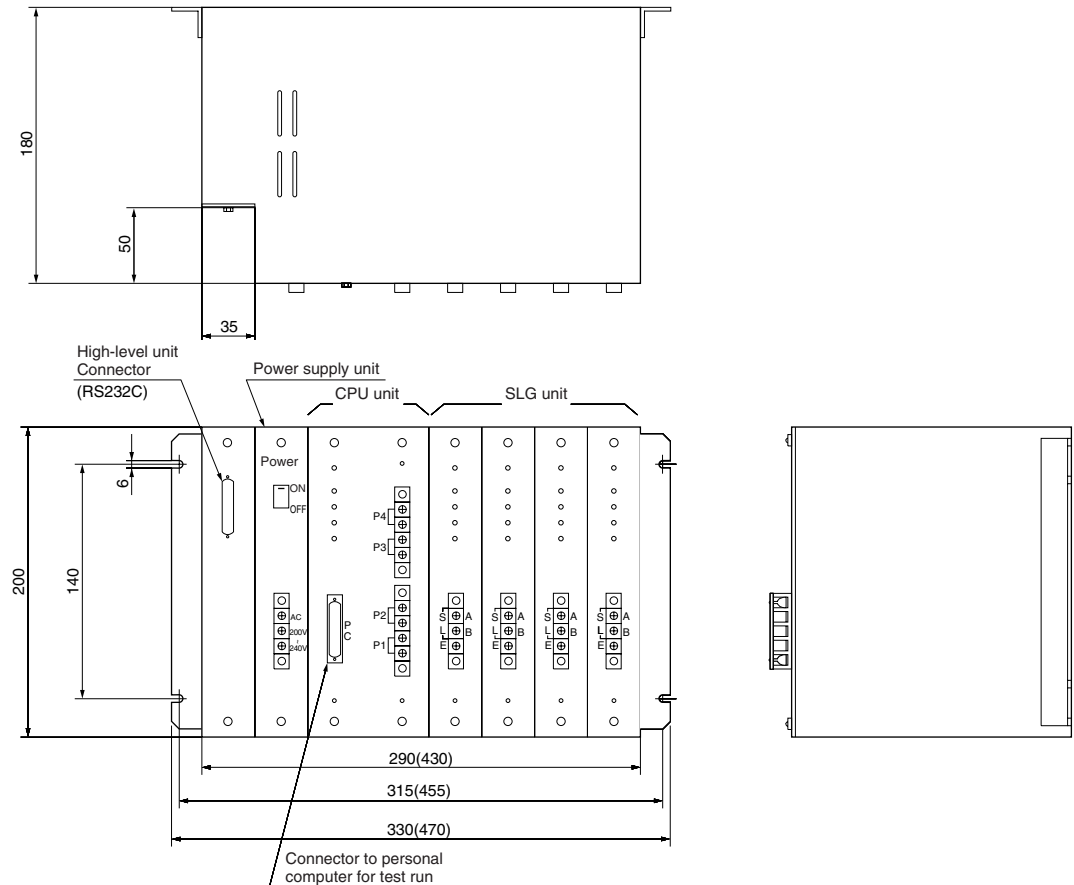
CHC	SLA-2A-E	SLA-1-E
1 piece	2 pieces	0 piece
1 piece	1 piece	2 pieces
1 piece	0 piece	3 pieces

(3)When a system involves even one unit of a 5-HP GHP outdoor unit, an 8-HP GHP outdoor unit or 10-HP GHP outdoor unit, the number of indoor units will be subject to restrictions shown in the table below.

Per Super Link 1 system

The number of SLA-2AEs connected	A maximum number of connectable indoor units
0 piece	44 units
1 piece	32 units
2 piece	21 units

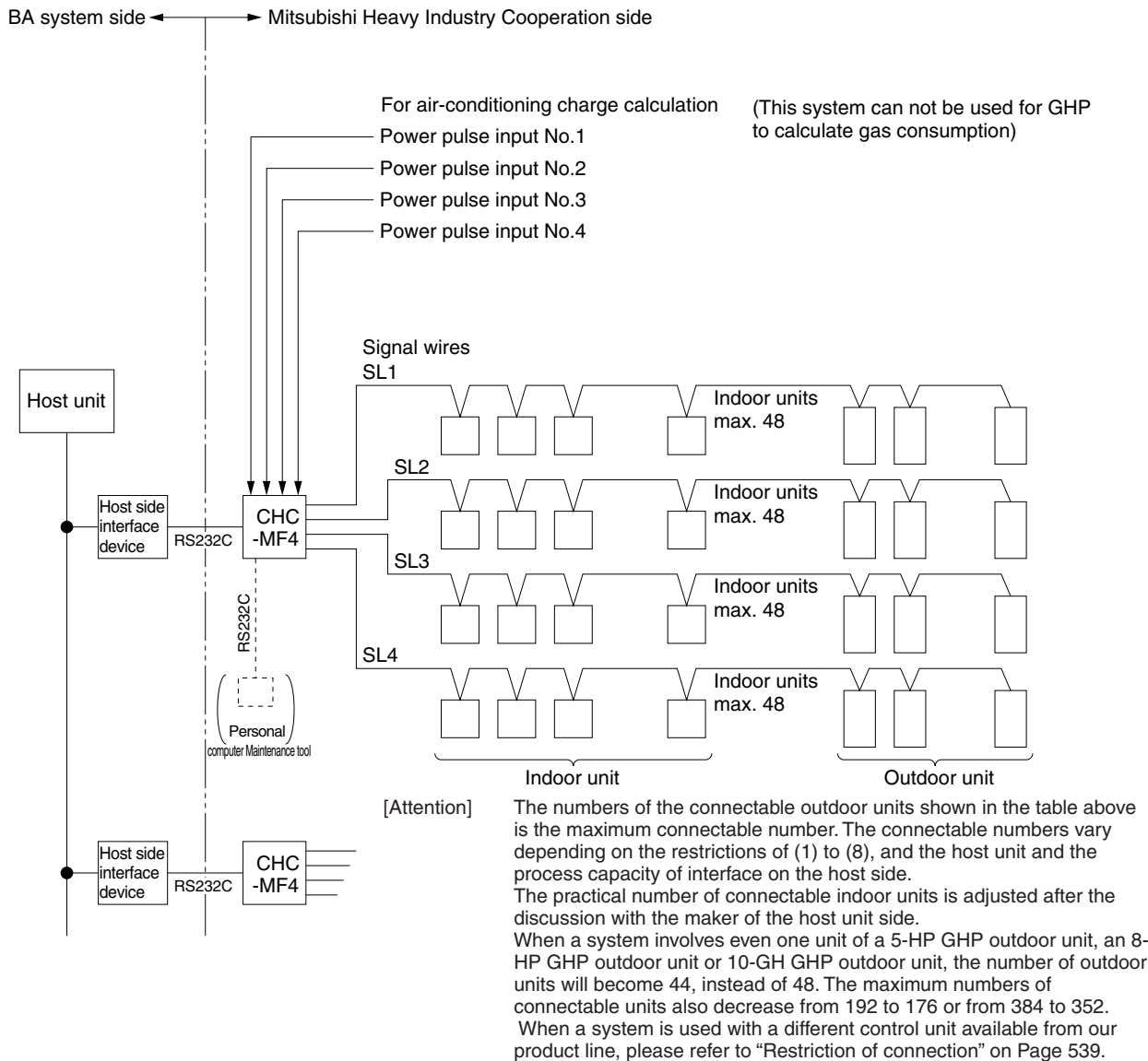
3. DIMENSIONS



Note(1)The numerical value inside () is shown for CHC-MFE8.

4. SYSTEM ARCHITECTURE

CHC monitors and controls the packaged air conditioner through the communication with BA system.



1. The communication with the CHC and host (I / F) transmits information in block units. (Air-conditioner trouble is also transmitted in block units.)
2. The maximum for one block is 64 groups.
3. The minimum for one group is one remote controller group.
4. The maximum for one group is 16 units.
5. Registering different SL system in the same group is prohibited.
6. The block and group definition is not restarted to outdoor unit groups (refrigerant piping system).
7. The group definition is not restarted to outdoor unit groups (refrigerant piping system).
8. The maximum number of blocks is 256, groups is 256.

5. FUNCTION OF CHC

- 1) CHC-MFE is used to transfer information only, besides for the calculation of amount electric power used per minute.
 - CHC receives the instruction from host unit through host side interface device and, then transfers to each air-conditioner.
 - CHC receives information about each air-conditioner is received, and then transfers to the host unit through host side interface device.
- 2) CHC-MFE receives the power pulse input, and calculates the amount of electric power used per minute for the air-conditioning charge calculation every minute.
 - It preserves total amount of electric power used at each block and unit, and updates every minute.
 - Replying to the request from the host unit, it transfers the total value.
 - The calculation of the amount of the electric power used at each block (charge calculation) is done by the host unit.
- 3) CHC-MFE cannot do anything alone. However, start/stop, the temperature setting, and the driving mode

switching, etc. can be done from the personal computer to every one unit or the block if the maintenance tool (personal computer) is connected with it. It is used for the test run adjustment.

Moreover, it is also used for registration and the registration change.

- 4) Remedy for power failure
 - Registered setting data (Representative group identifier at every block and air-conditioner No. identifier of each group, representative air-conditioner identifier of each group, model setting of each air-conditioner, and power pulse input setting value) are saved in nonvolatile memory (EEPROM) and don't disappear.
 - Set mode (preset temperature, operation mode, and central / remote) at every the block and the total amount electric power used can be remedied until 48 hours. (change for 48 hours, battery life is 10 years.)

Note (1) Please understand a block to be a unit of the instruction (start / stop). 1 piece of host side interface device can be connected with 64 blocks at most.

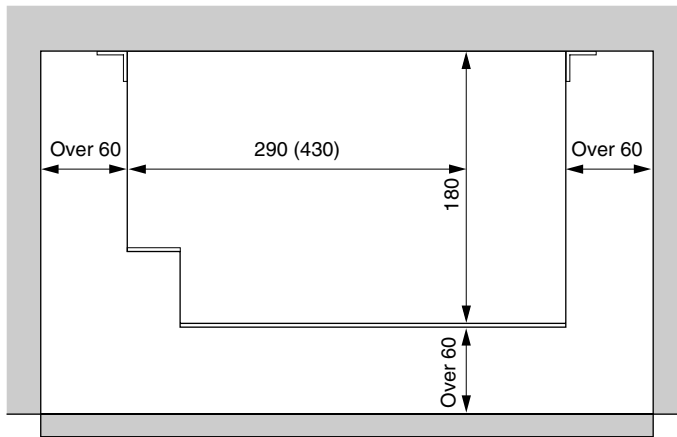
6. FUNCTIONS OF CHC-MFE

CHC-MFE has the following functions to locally control the air-conditioner and communicate the data with the BA system.

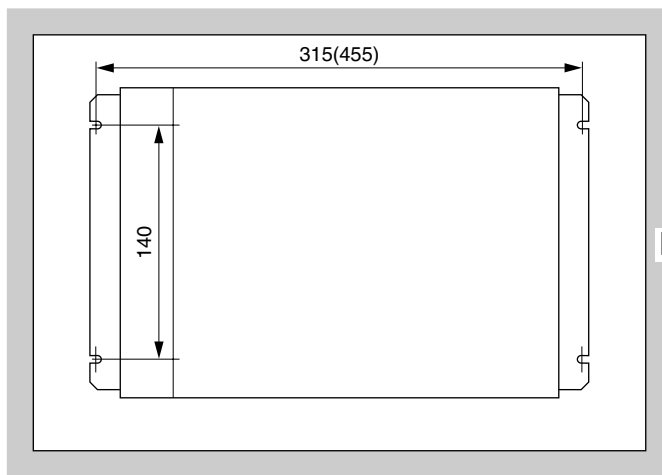
- 1) Air-conditioner ON / OFF command
Each block is started and stopped by the ON / OFF command from the air-conditioner interface.
- 2) Temperature setting
The temperature setting of each block is set by the command from the air-xonditioner interface.
- 3) Operation mode switch
The operation mode (COOL, HEAT, FAN or AUTO) is switched by the command from the air-conditioner interface.
- 4) Remote controller operation mode setting
The permission mode ("center & remote") or prohibition mode ("center") is set by the command from the air-conditioner interface.
- 5) Filter sign (alarm) resetting
The filter sign (alarm) sent from the air-conditioner is reset by blocks with the command from the air-conditioner interface.
- 6) Power limit control
Each block is set with the setting command from the air-conditioner interface.
In the power limit control mode, the operation mode of the air-conditioner is set at "FAN" and the remote controller operation mode is set at "center" (remote control operation prohibited).
When the emergency control is canceled, above setting will return to the former setting when the power limit control started.
- 7) Emergency control (Forced all stop)
Air-conditioners are all stopped with the emergency control signal from the air-conditioner interface with the air-conditioner turned to "center" (remote control operation prohibited).
When the emergency control is canceled by the air-conditioner interface, all air-conditioner return to former state, and keep stopping.
- 8) Monitoring air-conditioners condition (A sampling time of the state is 4 minutes)
 - a) The data of the run / stop state, malfunction, setting temperature and indoor temperature of air-conditioner block are transferred to the air-conditioner interface.
 - b) The data of whether the air-conditioner is abnormal or not, are transferred to the air-conditioner interface each air-conditioner block.
 - c) The filter sign (alarm) from the air-conditioner is transferred to the air-conditioner interface each block.
- 9) Measurement data transmission
According to the running state of the air-conditioner, the power consumption is distributed and calculated, and the integrated value of the calculated power consumption is transferred to the air-conditioner interface each block. The data of the integrated power is in the range of 0.0kWh to 99999.9kWh, and the monthly power consumption and other are calculated by the air-conditioner interface.
- 10) Guarantee for power outage
 - a) The set data (designation of group number for every block, designation of representative group number for every block, designation of air-conditioner number for every group, designation of representative air-conditioner number for every group, designation of model for every air-conditioner and power pulse input set value) are stored by the nonvolatile memory (E²PROM).
 - b) The run/stop, set mode (room temperature setting, operation mode and center/remote selection) and the accumulated power for every air-conditioner are stored for 48 hours. (Charge for 48 hours, battery life is 10 years.)

7. SERVICE SPACE AND POINTS FOR WIRING

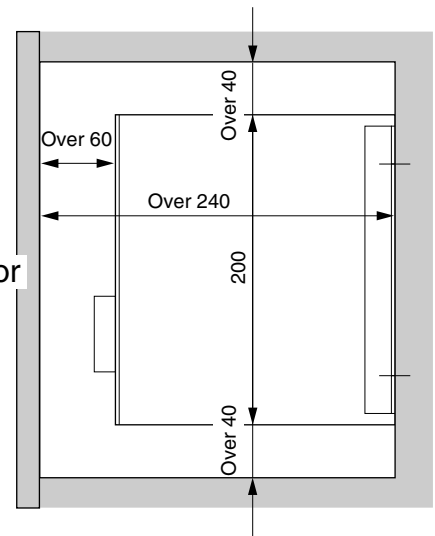
1) Service space



Door (service from ahead)

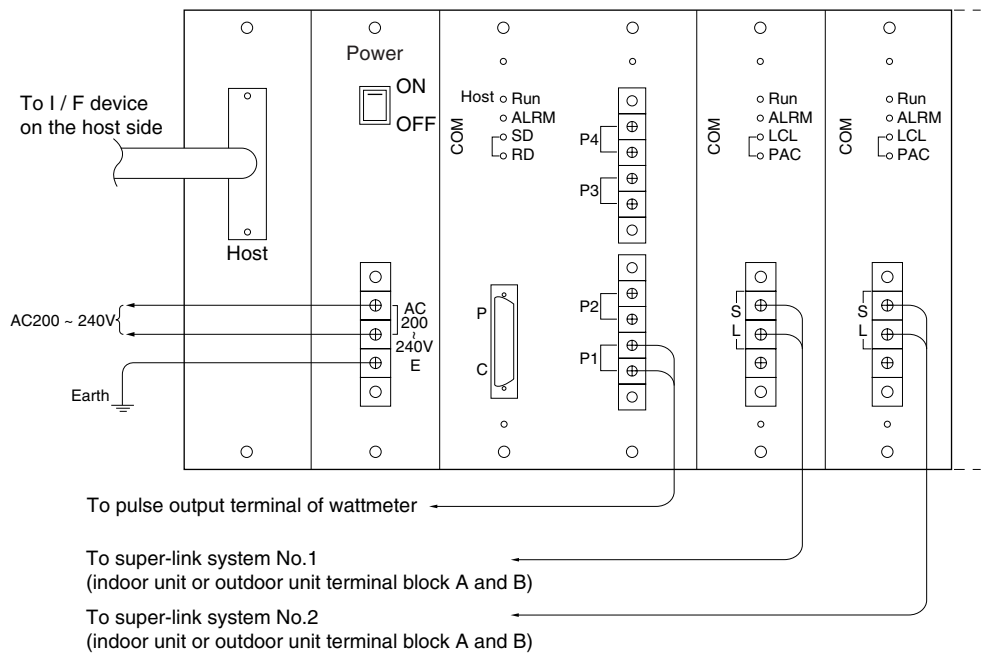


The numerical value inside () is size of CHC-MF8



Door

2) Points for wiring



3) signal wire and others

a) Signal wire for superlink

(a) size: $0.75\text{mm}^2 \sim 2.0\text{mm}^2$ permissible extension length 1000m / one system

(b) Wiring material: Standard wire (Use the shield wire when there are influences of noises .)

(c) Recommended signal wire

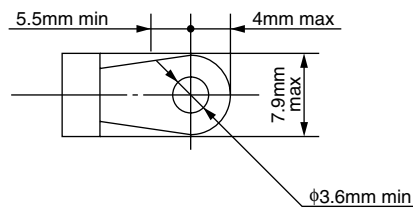
NO.	Name	Symbol
1	Vinyl cab tire round type cord	VCTF 2 cores $0.75 \sim 2\text{mm}^2$
2	Vinyl cab tire round type cable	VCT 2 cores $0.75 \sim 2\text{mm}^2$
3	Vinyl insulation and vinyl sheath cable for control	CVV 2 cores $0.75 \sim 2\text{mm}^2$
4	Shield wire	MVVS 2 cores $0.75 \sim 2\text{mm}^2$

(Using No.4 shield wire help to prevent mis-connection with AC200V or AC100V,)
 because the distinction with the power supply wire is clear.

b) Wattmeter pulse signal wire

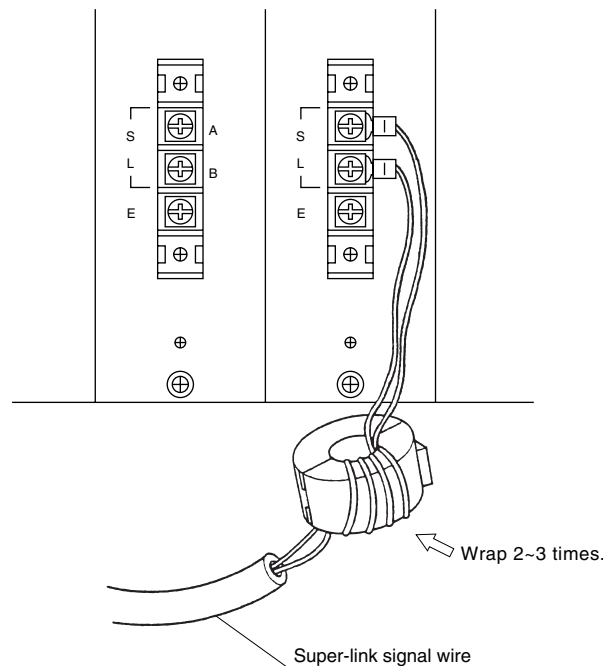
Size: $0.75\text{mm}^2 \times 2$ core or $\phi 0.9 \sim \phi 1.2 \times 2$ core

c) Applicable crimp terminal



d) Notices when wiring

- Wrap super-link signal wire 2~3 times around an attached filter core as shown in the figure below.

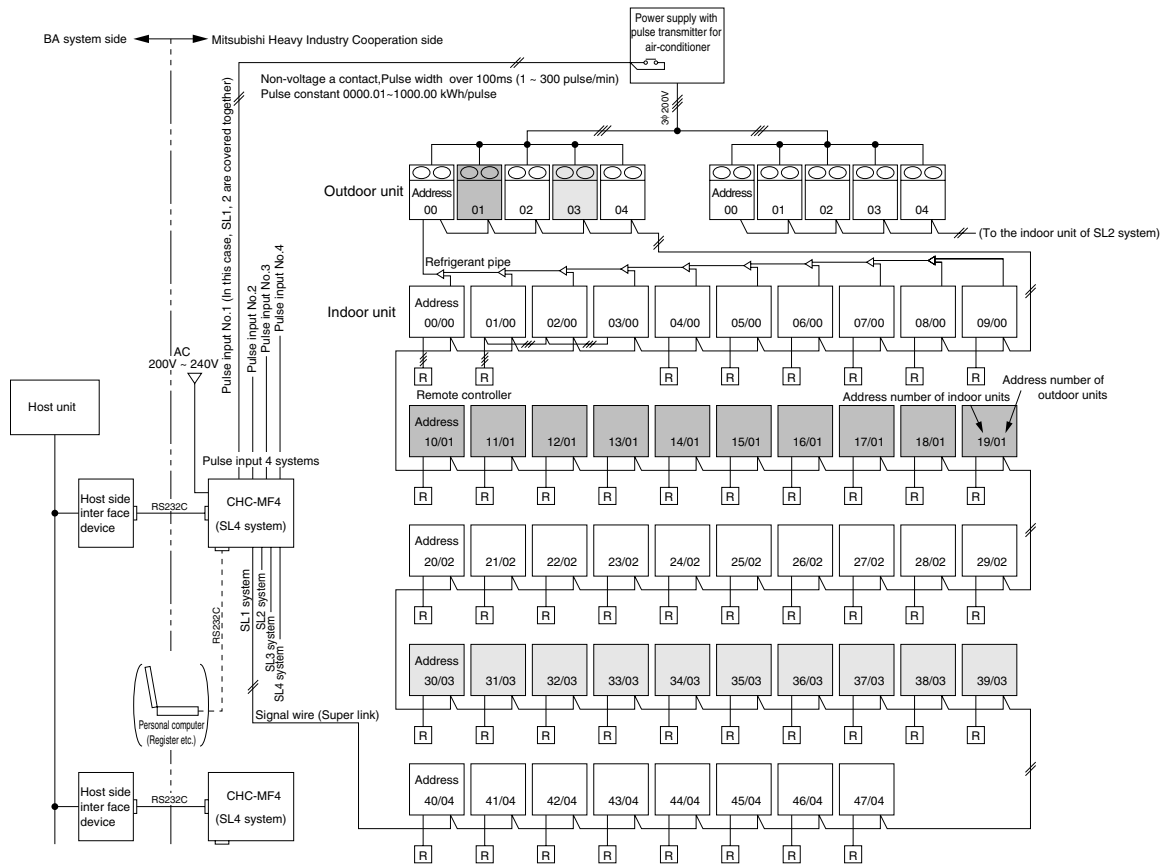


Note(1)Please bind these cables together so that an unacceptable load is not applied to the terminal block of CHC-MFE when wiring.

e) RS232C cable between CHC and the host I / F is not longer than15m

f) Example of system configuration diagram

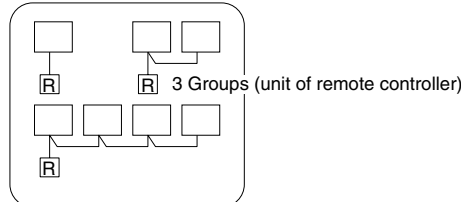
(The example of setting the indoor and outdoor address is shown. Moreover, SL1 and the SL2 systems are covered by one power pulse input No.1 in this case.)



Number of connectable indoor units

- CHC-MFE4 Maximum 48 / SL × 4 system = Maximum 192
(Maximum 48 / SL 1 system)
- The unit of start / stop from the central monitor board is called as block unit.
Maximum 64 blocks
- Group start / stop with remote controller in hand
At most 16 indoor units can be started / stopped by one remote controller.

Example One block



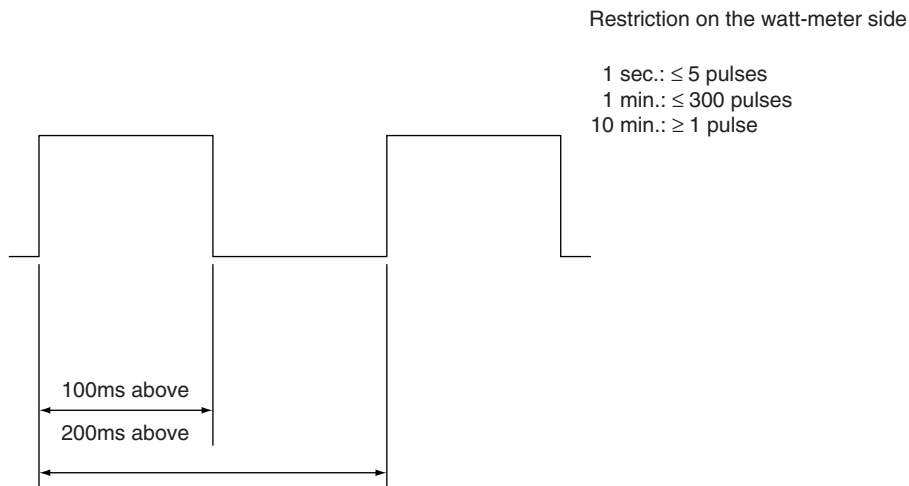
- CHC identifies each indoor unit with following No.
 - Block No
 - Group No
 - SL system No
 - Indoor No etc.

Selection of integral watt-hour meter

When charged according to CHC, please select the watt-hour meter for measurement of the power consumption according to the operating condition of the air conditioner (estimated maximum and minimum power consumption). Please select the pulse unit for the watt-hour meter that is more than 1 pulse but less than 300 pulses in 1 minute. (Refer to the next page)

Example About selection of pulse unit

1) Restriction on the pulse input receiving side



2) Selection of pulse unit

- ① Calculate the total power capacity necessary for the air conditioner.
- ② Pre-select the watt-hour meter corresponding to the total capacity.
- ③ Maximum workload of the air conditioner: assuming overload condition in summer total power consumption $\times 1.2$

Example assuming that: total power consumption = 100kW, power factor = 90%

Maximum workload = $100 \times 1.2 = 120\text{kW}$

In case of 3-phase 200V : $1 = 120 \times 1000 / (1.732 \times 200 \times 0.9) = 385\text{A}$

→ 400A class watt-hour meter is required.

For 400A class manufactured by Mitsubishi Electric, select signal transmitter in the following

- For K11 model select one from pulse unit 100k \varnothing h / P
10k \varnothing h / P
- For K12 model select one from pulse unit 100k \varnothing h / P
10k \varnothing h / P
1k \varnothing h / P
- Consult with the watt-hour meter maker for products with smaller pulse unit.

- ④ Check when power consumption is 120k \varnothing h
 - When pulse input is maximum
 - If 0.1k \varnothing h / P is selected, $1200\text{P} / \text{h} = 20\text{P} / \text{min}$, i.e. 20 pulses in 1 minute (≤ 300 pulses) ○
 - If 1k \varnothing h / P is selected, $120\text{P} / \text{h} = 2\text{P} / \text{min}$, i.e. 2 pulses in 1 minute ○
 - If 10k \varnothing h / P is selected, $12\text{P} / \text{h} = 0.2\text{P} / \text{min}$, i.e. 0 pulse in 1 minute ×
 - When the usage frequency is decreased to 1 / 10 (12K \varnothing h),
 - If 0.1k \varnothing h / P is selected, $120\text{P} / \text{h} = 2\text{P} / \text{min}$, i.e. 2 pulses in 1 minute ○
 - If 1k \varnothing h / P is selected, $12\text{P} / \text{h} = 0.2\text{P} / \text{min}$, i.e. 0 pulse in 1 minute ×
 - If 10k \varnothing h / P is selected, $1.2\text{P} / \text{h} = 0.02\text{P} / \text{min}$, i.e. 0 pulse in 1 minute ×
- ⑤ The watt-hour meter that can generate the pulse unit of 0.1k \varnothing h / P is desirable.
 - 10k \varnothing h / P is NG
 - For 1k \varnothing h / P, when the usage frequency is extremely low, calculation error will occur because no pulse enters for 1 minute.

g) Fault indication list of CHC

Referring to the display content of green LED (power display and micro computer validity indicating lamp), red LED (faulty indicating lamp) and yellow LED (communication monitor), whether any fault is present or not can be found.

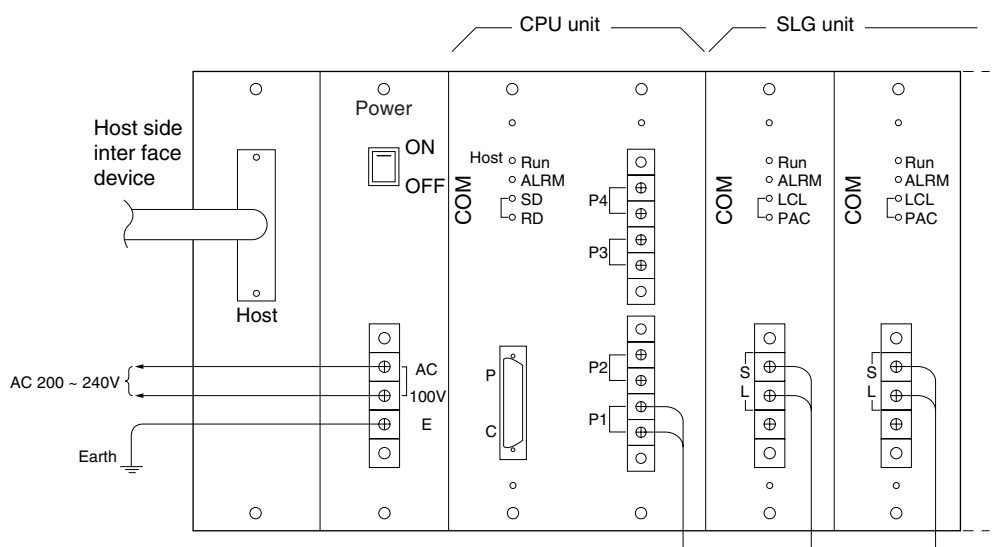
	Display LED	Display state	Trouble details
CPU unit	"RUN" (green)	Continuous flickering	Normal
		Continuous lit or unlit	CPU unit PCB fault, CPU runaway
	"ALRM" (red)	Unlit	Normal
		One-time flickering	<Communication fault against SLG > ① CPU unit PCB fault ② SLG unit PCB fault ③ Inner connection fault
		Three-time flickering	<Host fault> ① Fault on the host side ② Host connection fault ③ CPU unit PCB fault ④ Inner connection fault
	"Host Communication monitor · SD" (yellow) "Host Communication monitor · RD" (yellow)	Continuous flickering	Valid (communicating with host)
		Unlit	① Power off or fault on the host side ② Communication stop (off line) on the host side ③ Host connection fault
		Continuous lit	① Fault on the host side ② Host connection fault ③ CPU unit PCB fault
SLG unit	"RUN" (green)	Continuous flickering	Normal
		Continuous lit or unlit	CPU unit PCB fault, CPU runaway
	"ALRM" (red)	Unlit	Normal
		One-time flickering	<Super link communication wire connection fault> ① SLG unit PCB fault ② Air-conditioner control PCB fault ③ Super link communication wire connection fault
		Two-time flickering	<Super link communication wire connection fault> ① Wrong Connection of plural systems
	"Communication monitor LCL" (yellow)	Continuous flickering	Valid (communicating with CPU unit)
		Continuous lit or unlit	① CPU unit PCB fault ② SLG unit PCB fault ③ Inner connection fault
	"Communication monitor PAC" (yellow)	Continuous flickering	Valid (communicating with air-conditioner)
Continuous lit or unlit		① SLG unit PCB fault ② Air-conditioner control PCB fault ③ Super link communication wire connection fault	

CPU unit, master / slave PCB, dip switch setting

	SW No.	Factor setting	Content	
Master	SW1	1	OFF	EEPROM zero clear
		2	OFF / ON	Model switching OFF : CHC-M*4, ON : CHC-M*8
		3	OFF	PC control switching (CHC-MY / MF), OFF : Host priority. ON: backup priority
		4	OFF	Measured value switching, OFF: power consumption, ON: operating capacity (CHC-MY4 / 8U, MF4 / 8T)
		5, 6	OFF	Not used
		7	ON	Operating capacity display switching (CHC-MY4 / 8U, MF4 / 8T) OFF : 1 / 1, ON : 1 / 100
		8	OFF	Not used
		JP1	Short circuit	Battery connection (only some models)
Slave	SW2	ON	Terminal resistance switching OFF: none, ON: 120 form	
	SW3	—	— (actually not mounted)	

SLG PCB, dip switch setting

SW No.	CHC-M*4				CHC-M*8						Content
	SLG1	SLG2	SLG3	SLG4	SLG1 ~ 3	SLG4	SLG5	SLG6	SLG7	SLG8	
SW1	1	OFF	ON	OFF	Same as left	ON	OFF	ON	OFF	ON	SLG No.
	2	OFF	OFF	ON		ON	OFF	OFF	ON	ON	
	3	OFF	OFF	OFF		OFF	ON	ON	ON	ON	
	4 ~ 8	OFF	OFF	OFF		OFF	OFF	OFF	OFF	OFF	
SW2	1 ~ 4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Not used
SW3		OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON	Terminal resistance switching OFF: none, ON: 120 form
SW4		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Terminal resistance switching OFF: none, ON: 150 form



4.6 Super Link Web Gateway SC-WGW-A

1. INTRODUCTION

1. SCOPE

This product specification is applied to the WEB Gateway SC-WGW-A that connects a Control & Monitor personal computer with the MITSUBISHI HEAVY INDUSTRIES' "SUPERLINK" networks by the "WEB"*1 communication protocol. This document describes the specifications of the product as for May 1, 2004. Any contents of this document may be changed without prior notification.

*1 This product uses the WEB HTTP communication protocol which is widely used in the Internet. However, this Gateway is basically for use in a local LAN.

2. STANDARD PACKAGE

The standard package of this product includes the followings;

- A Gateway SC-WGW-A unit
- User's manual
- Installation manual

The following materials are not included in the standard package.

- Personal computer systems for monitor and control.
- LAN materials such as Ethernet cables and switching hubs

3. ENGINEERING WORK

"Engineering work" means technical service work such as dispatching engineers to the site, the address allocation planning work, configuration of this Gateway, trial operation of the system and so on. These engineering works may be paid services.

4. CUSTOMIZE WORK

This WEB Gateway is a kind of ready-made product. Customization of the functions of this Gateway will not be supplied.

2. SYSTEM ARCHITECTURE

1. SYSTEM DIAGRAM

Fig. 5.1 shows a basic case of the system diagram of connection between the building management system host computer, the WEB Gateway and the SUPERLINK control networks.

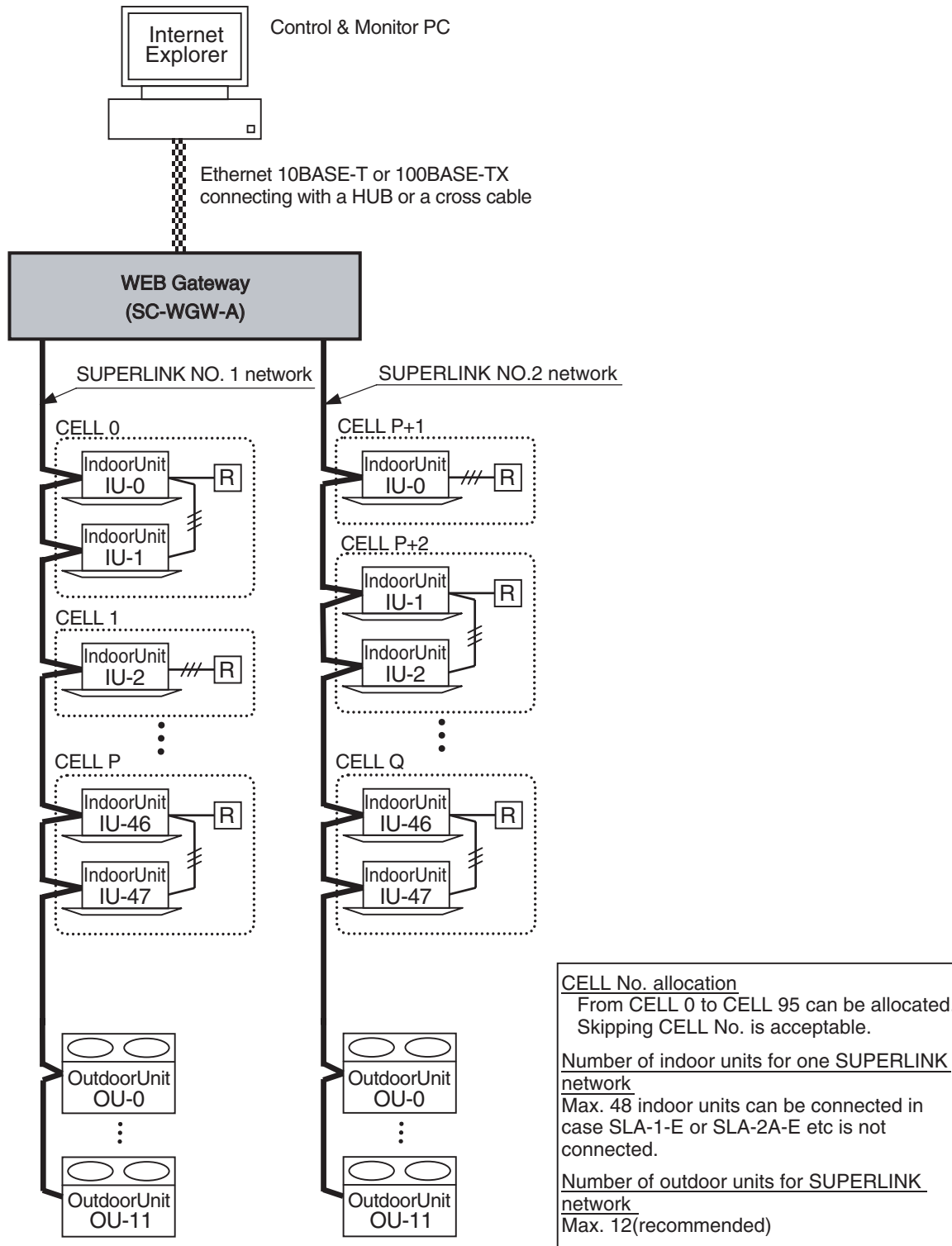


Fig. 5.1 System Diagram (Basic case)

Fig. 5.2 shows a case of the system diagram of connection between the building management system host computer, the WEB Gateway, and the SUPERLINK control networks along with SUPERLINK option controllers such as SLA-1-E or SLA-2A-E. The SC-AD-L adapter should be used for connection of MHI's single type packaged air-conditioner models.

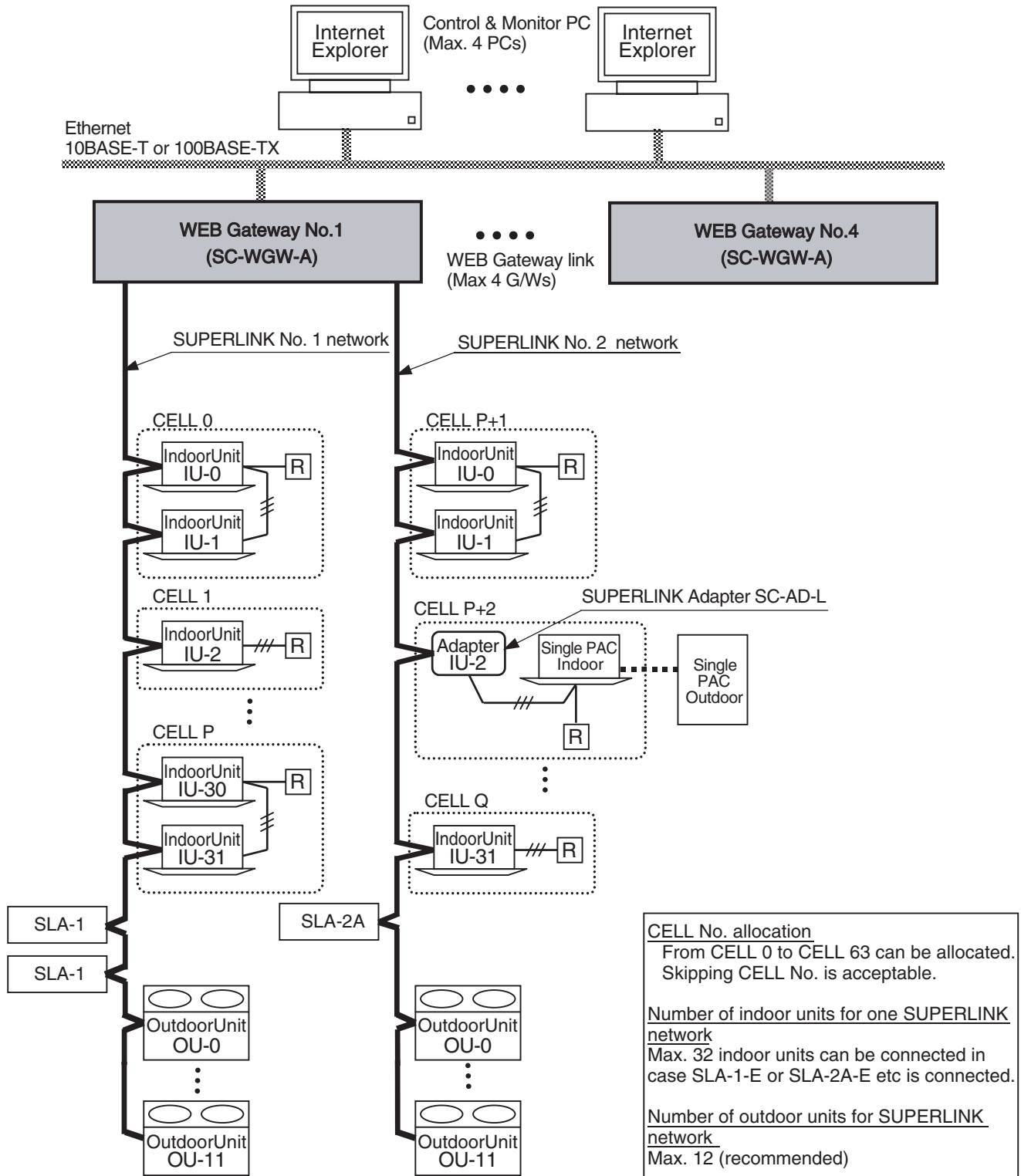


Fig. 5.2 System Diagram (Option controller connected)

2. ETHERNET NETWORK

(1) Private Ethernet

As shown in Fig.2.1, recommended network environment for this Gateway system is the private local Ethernet line for exclusive use. In other words, no network nodes except this Gateway and the PCs for this system are connected to the Ethernet line. Connection to the Intranet (i.e. office LAN) or the Internet may be possible under responsibility of the network administrator on the site and with paid engineering work. Network wiring for the Ethernet line shall be done according to each network equipment manufacturer's wiring specifications. This Gateway does not require special wiring for the Ethernet line and assume the following Ethernet specifications;

- 10BASE-T or 100BASE-TX twisted-pair cable Ethernet

The IP address for this Gateway has been set before shipment as the following initial IP address for the CLASS C PRIVATE ADDRESS;

- Initial IP Address: 192. 168. 0. 110

Alternation of the IP address of this Gateway has to be done by editing the initial network configuration file for this WEB Gateway's software. This procedure requires high technical knowledge on computer networks. In the case of IP address alternation, consult the dealer of this product.

(2) Network Security

This Gateway does not have any special measures for the Ethernet network security such as counter measures for evil attacks from the network, network virus and so on. It is assumed that this Gateway will be used in the private Ethernet network. If this Gateway is connected to an office LAN or the Internet, there might be risks for injustice access, and consequently, this Gateway might be altered to be harmful communication source to other network nodes.

It is not the responsibility of this Gateway to such injustice network access and is exempted from compensation for the damage by such unexpected attacks.

3. CONTROL & MONITOR PC

(1) PC Models

Personal computers used as the WEB browsers for this system are out of the product supply scope. The personal computers with relating software and hardware should be prepared by the customer.

Minimum performance conditions of the PC are as follows;

- CPU clock : 500MHz or above. (2GHz or above recommended.)
- Main memory : 128MB or above. (512MB or above recommended.)
- Screen size : 1024 × 768 or above. (1280 × 1024 recommended.)

(2) Operating System and WEB Browser

The recommended Operating System and WEB Browser versions for both the Control and Monitor PC and the Monitor PCs are followings;

- Operating System : Microsoft Windows XP or 2000
- WEB Browser : Microsoft Internet Explorer, version 6.0 or above.

This Gateway system executes only the Internet Explorer on the PC side. The Gateway does not automatically download any executable codes to the PCs.

4. CONNECTION WITH AIR CONDITIONER

(1) Models

- KX series
- GHP series
- Air conditioner with SC-AD-L adapter + split one to one PAC series.

(When using SC-AD-L some functions of air conditioner will become invalid.)

(2) "AIR-CON CELL"

A group of indoor units connected by the remocon line is called an "Air-con CELL" in this WEB Gateway system. An Air-con CELL is defined as a logical group of indoor units for control & monitor from this WEB Gateway. In the Fig. 5.1 and Fig. 5.2, an Air-con CELL is indicated by a surrounding dashed line. The indoor units of the CELL should be on the same SUPERLINK network. But the CELL identification numbers can be allocated over the SUPERLINK networks as shown in Table 5.1 below.

Sending a control command to a CELL is equal to sending the control command to every indoor unit of the CELL. It is possible to control and monitor each individual indoor unit by defining a CELL as an indoor unit. All indoor units in the same CELL must be connected by the same remote controller, that is, a remocon group connection.

The CELL grouping definition is common to all the functions of this Gateway. The CELL definition is provided by the PAC information file. The information file must be set before the test operation of this Gateway. This PAC information file is memorized by the non-volatile memory of this Gateway once it is uploaded.

(3) Max number of indoor units

The maximum number of indoor units connected is shown in the Table 5.1 depending on connection of the SUPERLINK option controller such as SLA-1-E or SLA-2A-E. The reason why the number of indoor units connectable is reduced in the case of option controller connection is for communication traffic limitation.

Table 5.1

	Without option controller	With option controller(*)
Number of SUPERLINK networks	2 networks	2 networks
Number of indoor units	Max48 units × 2 = Max 96	Max32 units × 2 = Max 64
Number of CELLS	Max48 CELLS × 2 = Max 96	Max32 CELLS × 2 = Max 64
Range of CELL number	CELL 0 to CELL 95	CELL 0 to CELL 63

(*) Option controllers should be max. 2 of SLA-1-E or only one of SLA-2A-E for one SUPERLINK network.

3. FUNCTION OVERVIEW

1. WEB SERVER FUNCTION OVERVIEW

The "WEB Server functions" mean functions as a WEB server from the WEB browser's point of view. The Table 5.2 shows the list of the WEB functions of the SC-WGW-A Gateway.

Table 5.2 List of the WEB Server Functions (List of Screens)

WEB Function (Screen)	Content
Login	Authentication of the user by the UserID and Password.
Overview Monitor	Display the overall status of all CELLS of the whole PAC system without scroll of the screen.
Individual Monitor	Display the detail status of each CELL in the pop up window.
Control Command	Input Control command to CELLS by the array of pull down menus.
System Stop	Stop all the CELLS and set the remote controller reject mode by one click.
PAC Configuration	Set the full room name and the short name for each CELL. These names to appear on the Monitor screen.
Config. File Transfer	Upload and Download of the PAC Information CSV file which defines the indoor unit grouping of the CELLS.
Communication Config.	Set the browser's auto-refresh interval of the Overview Monitor screen.
Security Config.	Set the accessible IP address of a PC, that is IP address filtering.
Password Change	Password can be changed from this screen.
Calendar Config.	Set the yearly calendar defining each day as "Weekday", "Holiday", etc This yearly calendar is common to all CELLS.
Master Schedule Config.	The Master Schedules are default daily operation schedules depending on a day of a week or a special day. Set each Master Schedule of a CELL. Each CELL has a different default daily schedule.
Schedule Control	Set temporarily alternation to the daily operation schedule of a CELL for maximum 7 days from the current day. The temporary alternation does not affect the Master Schedule.
Date Time Set	Adjust the date and time of the WEB server.

* "CELL" is a group of the indoor units connected by one remocon, or an indoor unit. A remocon is a packaged air-conditioner's remote controller.

2. CONTROL & MONITOR FUNCTION OVERVIEW

The control and monitor functions mean categories of jobs from an air-conditioning system's point of view. The Table 5.3 shows the control and monitor functions of the SC-WGW-A Gateway.

Table 5.3 List of Control & Monitor Functions of the SC-WGW-A

Function		Content
CONTROL	On / Off command	Send the On/Off command to a CELL.
	Mode command	Send the operation mode command (Auto, Cooling, Dry, Heating, Fan) to a CELL.
	Setpoint command	Send the temperature setpoint command to a CELL. The range is from 18 to 30 degrees Celsius.
	Fan Speed command	Send the fan speed select command (Hi, Me, Lo) to a CELL.
	Remocon Lock / Unlock command	Send the remote controller operation Lock or Unlock command to a CELL.
	Filter Sign Reset command	Send the reset command for the filter sign on the remote controller of a CELL.
	System Stop command	Send the Off commands to all CELLS and set all CELLS as the Remocon Lock mode simultaneously.
MONITOR	Failure status	Monitor the failure status LED on / off on the remote controller for a CELL.
	On / Off status	Monitor the On/Off status of a CELL.
	Mode status	Monitor the operation mode status of a CELL .
	Setpoint status	Monitor the setpoint status of a CELL
	Fan Speed status	Monitor the fan speed select status of a CELL.
	Remocon Lock / Unlock status	Monitor the setting of the remote controller Lock/Unlock mode of a CELL.
	Filter Sign status	Monitor the status of the filter sign LED on the remote controller of a CELL.
	Room Temperature Status	Monitor the room temperature sensor data of a CELL.

* A "CELL" is a group of the indoor units connected by one remocon, or an indoor unit.

3. HARDWARE SPECIFICATIONS

(1) Power Supply

- AC single phase 100V - 240V +10%, -15% 50/60Hz

(2) Operation Temperature

- Ambient Temperature : 0 to 40 degrees Celsius
- Relative Humidity : Max 85 %RH (without dewing)

(3) Storage Temperature

- Ambient Temperature : -10 to 50 degrees Celsius
- Relative Humidity : Max 85 %RH (After 48 hours from out of storage, dewing should not exist)

(4) Power Blackout Compensation

- This Gateway does not have a battery circuit for power blackout recovery.
- If blackout or manual power off occurs for more than 30 msec, the monitoring data and the setting of each CELL (indoor unit), such as the operation mode or set point temperature, may disappear.
- This Gateway periodically writes the monitoring data of the CELLS to the non-volatile memory at every 24 hours. If the power supply is cut off, at the worst case, the monitoring data of 24 hours before that time will be stored. The stored settings are automatically recovered when this Gateway is restarted
- This Gateway does not store and recover the On/Off control settings. However, depending on the setting of the remote controller, indoor units will restart when the power supplies to the whole air-conditioner system resume to normal state.

(3) Appearance

- Outline drawing : Fig 5.3 on the following page
- Outline dimensions : 260(W) × 200(H) × 79(D) mm
- Color : Black

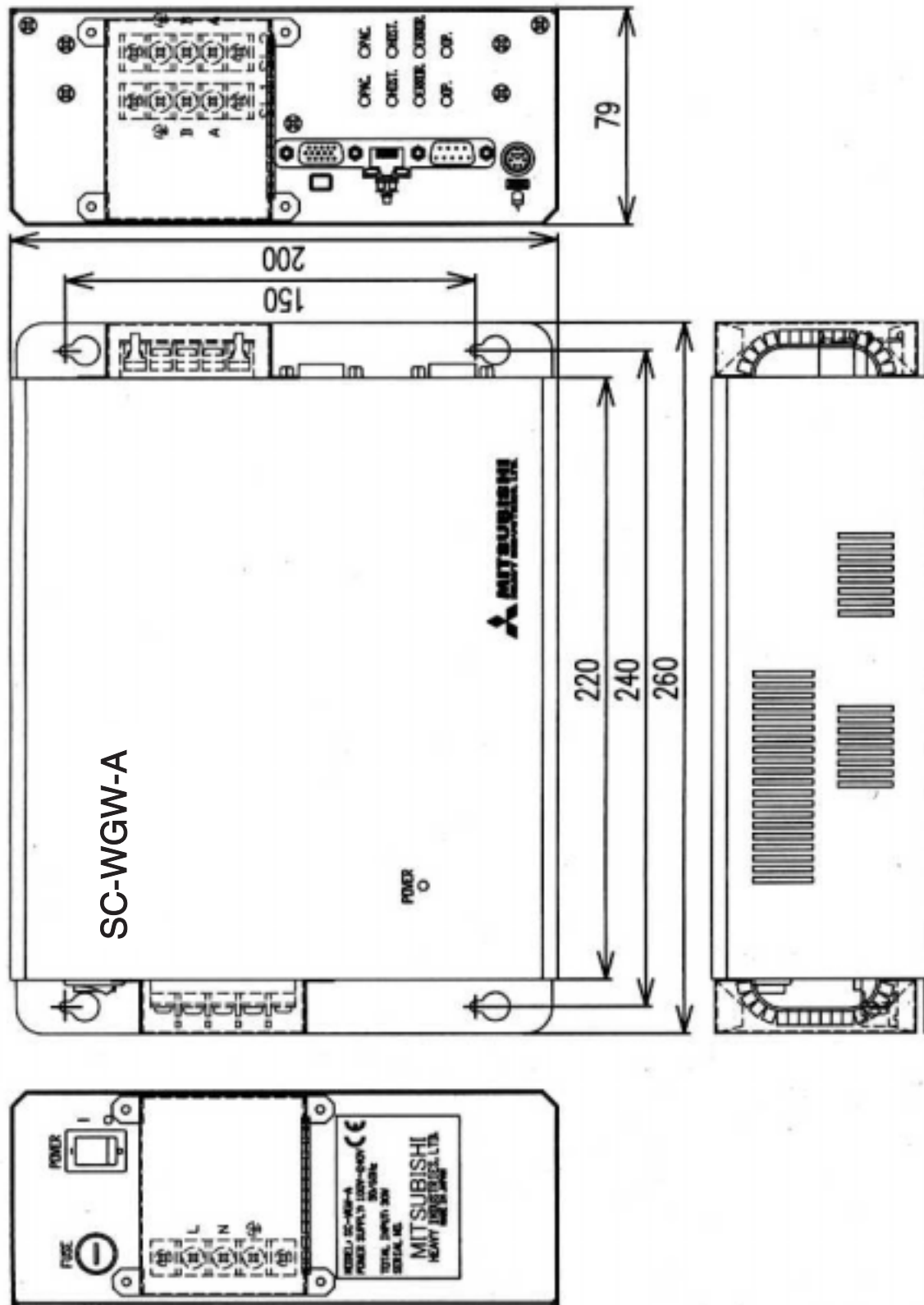


Fig. 5.3 Outline Drawing of SC-WGW-A

5.INSTALLATION

1. INSTALLATION CONDITIONS

This Gateway SC-WGW-A has a terminal block for the AC power supply on the outside surface of the casing.

For avoiding electrical shock injury, the SC-WGW-A should be installed inside a cabinet with a lock

The direction of placement of this Gateway when installation should be such a way that the front panel is vertical and the lettering of the front panel is right direction to enable air-cooling.

The recommended service space surrounding this Gateway is as follows;

- Upper clearance : Minimum 30 mm
- Lower clearance : Minimum 30 mm
- Right side clearance : Minimum 50 mm (more than 200 mm is recommended)
- Left side clearance : Minimum 50 mm (more than 200 mm is recommended)

The side clearance is for wiring workspace.

2. WIRING

The Fig 5.4 shows the wiring of this Gateway. After wiring to the WEB Gateway, the terminal covers, which are included in this Gateway's product package, should be installed by screws as shown in the Fig 5.3. After wiring work finished, fix the terminal covers securely by the screws

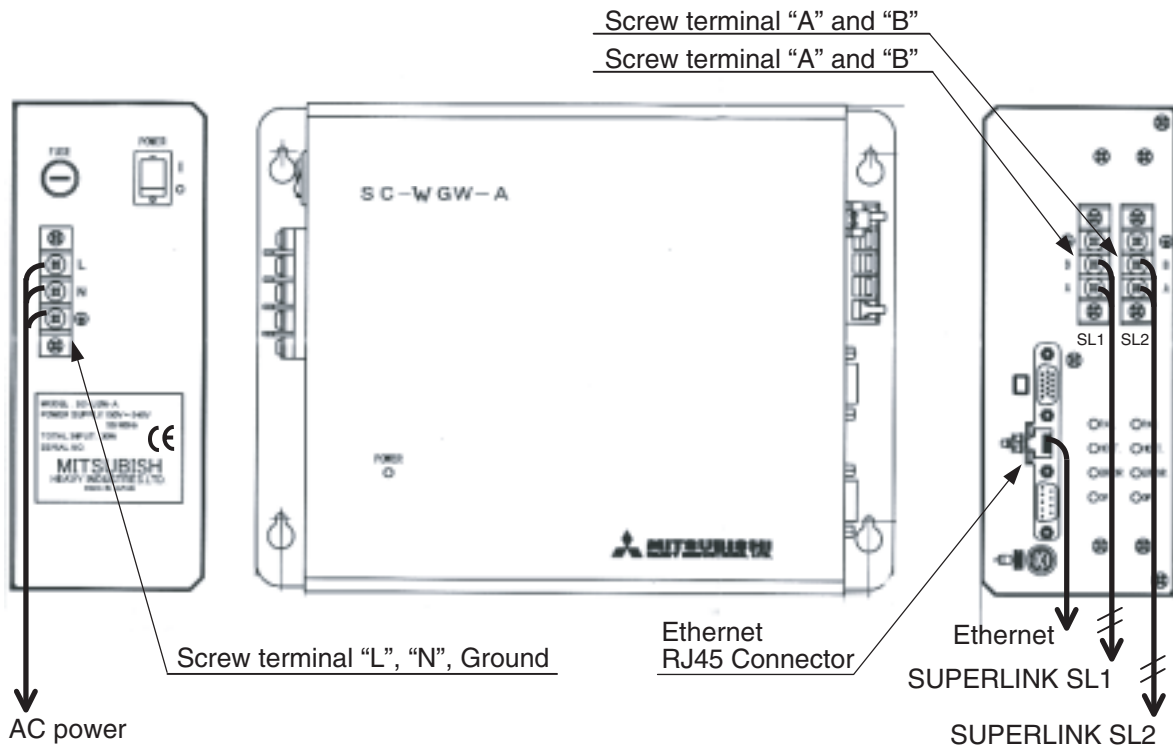


Fig. 5.4 SC-WGW-A Wiring

3. ETHERNET CABLE

This Gateway supports the Ethernet 10BASE-T or 100BASE-TX which are most popular among the standards of the Ethernet. In the case of only one PC is used for control and monitor, the PC and the Gateway can be connected directly by a cross Ethernet cable. The cross cable is a kind of Ethernet cable which connects two computers directly. In the case of using more than one PCs for control and monitor, an Ethernet HUB must be used. For both cases, the category 5 cable grade or higher must be used.

Materials for wiring the Ethernet, such as cables or HUBs, are not included this Gateway's product package. The type of the HUB may be ordinary office LAN use.

4. SUPERLINK CABLE

This Gateway supports the SUPERLINK control network. The recommended specifications of the cable for the SUPERLINK are shown as follows;

- (1) Size of cable : 0.75 to 2.0 square mm
- (2) Max length of wiring : 1000m/channel (loop wiring is not allowed)
- (3) Cable materials :

Twisted Vinyl Cabtyre Cable	VCTF 2 core 0.75 to 2.0 square mm
Twisted Vinyl Cabtyre Cable	VCT 2 core 0.75 to 2.0 square mm
Twisted Vinyl Cable for Control	CVV 2 core 0.75 to 2.0 square mm

- (4) For prevention of electromagnetic noise malfunctions, parallel wiring with the power line should be avoided.