

# TECHNICAL & SERVICE MANUAL

[Model Name]  
<Branch box>

PAC-MK53BC

PAC-MK53BCB

PAC-MK33BC

PAC-MK33BCB

[Service Ref.]

**PAC-MK53BC**

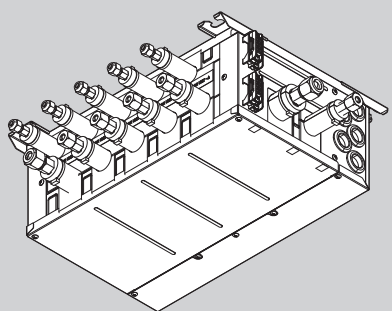
**PAC-MK53BCB**

**PAC-MK33BC**

**PAC-MK33BCB**

Note:

- This service manual describes technical data of branch box. As for indoor units and outdoor unit, refer to its service manual.



PAC-MK53BC

BRANCH BOX

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**PARTS CATALOG (OCB664)**

## 1-1. ALWAYS OBSERVE FOR SAFETY

**Before obtaining access to terminal, all supply circuit must be disconnected.**

## 1-2. CAUTIONS RELATED TO NEW REFRIGERANT

Caution for units utilizing refrigerant R410A

**Use new refrigerant pipes.**

**Make sure that the inside and outside of refrigerant piping is clean and it has no contaminants such as sulfur, oxides, dirt, shaving particles, etc, which are hazard to refrigerant cycle. In addition, use pipes with specified thickness.**

Contamination inside refrigerant piping can cause deterioration of refrigerant oil, etc.

**Store the piping indoors, and keep both ends of the piping sealed until just before brazing. (Leave elbow joints, etc. in their packaging.)**

If dirt, dust or moisture enters into refrigerant cycle, that can cause deterioration of refrigerant oil or malfunction of compressor.

**The refrigerant oil applied to flare and flange connections must be ester oil, ether oil or alkylbenzene oil in a small amount.**

If large amount of mineral oil enters, that can cause deterioration of refrigerant oil, etc.

**Charge refrigerant from liquid phase of gas cylinder.**

If the refrigerant is charged from gas phase, composition change may occur in refrigerant and the efficiency will be lowered.

**Use the specified refrigerant only.**

**Never use any refrigerant other than that specified.**  
Doing so may cause a burst, an explosion, or fire when the unit is being used, serviced, or disposed of.  
Correct refrigerant is specified in the manuals and on the spec labels provided with our products.  
We will not be held responsible for mechanical failure, system malfunction, unit breakdown or accidents caused by failure to follow the instructions.

**Do not use refrigerant other than R410A.**

If other refrigerant (R22, etc.) is used, chlorine in refrigerant can cause deterioration of refrigerant oil, etc.

**Use a vacuum pump with a reverse flow check valve.**

Vacuum pump oil may flow back into refrigerant cycle and that can cause deterioration of refrigerant oil, etc.

**Use the following tools specifically designed for use with R410A refrigerant.**

The following tools are necessary to use R410A refrigerant.

Tools for R410A	
Gauge manifold	Flare tool
Charge hose	Size adjustment gauge
Gas leak detector	Vacuum pump adaptor
Torque wrench	Electronic refrigerant charging scale

**Handle tools with care.**

If dirt, dust or moisture enters into refrigerant cycle, that can cause deterioration of refrigerant oil or malfunction of compressor.

**Do not use a charging cylinder.**

If a charging cylinder is used, the composition of refrigerant will change and the efficiency will be lowered.

**Ventilate the room if refrigerant leaks during operation. If refrigerant comes into contact with a flame, poisonous gases will be released.**

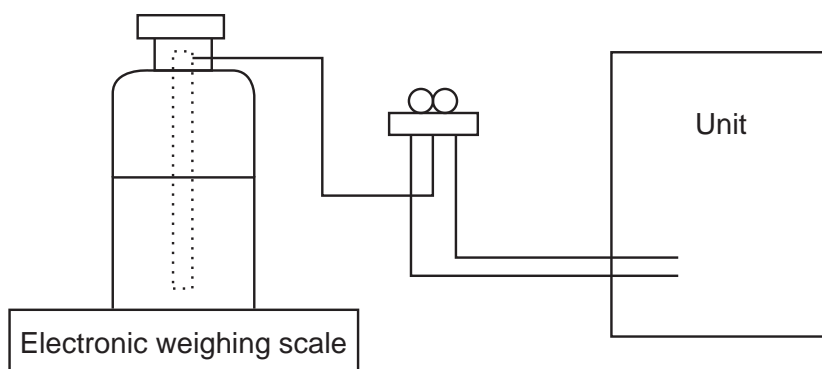
## [1] Cautions for service

- (1) Perform service after recovering the refrigerant left in unit completely.
- (2) Do not release refrigerant in the air.
- (3) After completing service, charge the cycle with specified amount of refrigerant.
- (4) If moisture or foreign matter might have entered the refrigerant piping during service, ensure to remove them.

## [2] Additional refrigerant charge

### When charging directly from cylinder

- (1) Check that cylinder for R410A on the market is a syphon type.
- (2) Charging should be performed with the cylinder of syphon stood vertically. (Refrigerant is charged from liquid phase.)



## [3] Service tools

(1) Use the below service tools as exclusive tools for R410A refrigerant.

No.	Tool name	Specifications
①	Gauge manifold	· Only for R410A
		· Use the existing fitting specifications. (UNF1/2)
		· Use high-tension side pressure of 5.3MPa·G or over.
②	Charge hose	· Only for R410A
		· Use pressure performance of 5.09MPa·G or over.
③	Electronic weighing scale	—
④	Gas leak detector	· Use the detector for R134a, R407C or R410A.
⑤	Adaptor for reverse flow check	· Attach on vacuum pump.
⑥	Refrigerant charge base	—
⑦	Refrigerant cylinder	· Only for R410A      · Top of cylinder (Pink)
		· Cylinder with syphon
⑧	Refrigerant recovery equipment	—

## (2) Cautions for refrigerant piping work

New refrigerant R410A is adopted for replacement inverter series. Although the refrigerant piping work for R410A is same as for R22, exclusive tools are necessary so as not to mix with different kind of refrigerant. Furthermore as the working pressure of R410A is 1.6 times higher than that of R22, their sizes of flared sections and flare nuts are different.

### ① Thickness of pipes

Because the working pressure of R410A is higher compared to R22, be sure to use refrigerant piping with thickness shown below. (Never use pipes of 0.7 mm or below.)

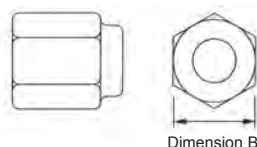
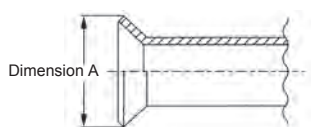
Diagram below: Piping diameter and thickness

Nominal dimensions (in)	Outside diameter (mm)	Thickness (mm)	
		R410A	R22
1/4	6.35	0.8	0.8
3/8	9.52	0.8	0.8
1/2	12.70	0.8	0.8
5/8	15.88	1.0	1.0
3/4	19.05	—	1.0

### ② Dimensions of flare cutting and flare nut

The component molecules in HFC refrigerant are smaller compared to conventional refrigerants. In addition to that, R410A is a refrigerant, which has higher risk of leakage because its working pressure higher than that of other refrigerants. Therefore, to enhance airtightness and strength, flare cutting dimension of copper pipe for R410A has been specified separately from the dimensions for other refrigerants as shown below. The dimension B of flare nut for R410A also has partly been changed to increase strength as shown below. Set copper pipe correctly referring to copper pipe flaring dimensions for R410A below. For 1/2" and 5/8" inch pipes, the dimension B changes.

Use torque wrench corresponding to each dimension.



Flare cutting dimensions

Nominal dimensions (in)	Outside diameter (mm)	Dimension A ( $+0.4$ )(mm)	
		R410A	R22
1/4	6.35	9.1	9.0
3/8	9.52	13.2	13.0
1/2	12.70	16.6	16.2
5/8	15.88	19.7	19.4
3/4	19.05	—	23.3

Flare nut dimensions

Nominal dimensions (in)	Outside diameter (mm)	Dimension B (mm)	
		R410A	R22
1/4	6.35	17.0	17.0
3/8	9.52	22.0	22.0
1/2	12.70	26.0	24.0
5/8	15.88	29.0	27.0
3/4	19.05	—	36.0

### ③ Tools for R410A (The following table shows whether conventional tools can be used or not.)

Tools and materials	Use	R410A tools	Can R22 tools be used?	Can R407C tools be used?
Gauge manifold	Air purge, refrigerant charge and operation check	Tool exclusive for R410A	×	×
Charge hose		Tool exclusive for R410A	×	×
Gas leak detector	Gas leak check	Tool for HFC refrigerant	×	○
Refrigerant recovery equipment	Refrigerant recovery	Tool exclusive for R410A	×	×
Refrigerant cylinder	Refrigerant charge	Tool exclusive for R410A	×	×
Applied oil	Apply to flared section	Ester oil and alkylbenzene oil (minimum amount)	×	Ester oil: ○ Alkylbenzene oil: minimum amount
Safety charger	Prevent compressor malfunction when charging refrigerant by spraying liquid refrigerant	Tool exclusive for R410A	×	×
Charge valve	Prevent gas from blowing out when detaching charge hose	Tool exclusive for R410A	×	×
Vacuum pump	Vacuum drying and air purge	Tools for other refrigerants can be used if equipped with adopter for reverse flow check	△ (Usable if equipped with adopter for reverse flow)	△ (Usable if equipped with adopter for reverse flow)
Flare tool	Flaring work of piping	Tools for other refrigerants can be used by adjusting flaring dimension	△ (Usable by adjusting flaring dimension)	△ (Usable by adjusting flaring dimension)
Bender	Bend the pipes	Tools for other refrigerants can be used	○	○
Pipe cutter	Cut the pipes	Tools for other refrigerants can be used	○	○
Welder and nitrogen gas cylinder	Weld the pipes	Tools for other refrigerants can be used	○	○
Refrigerant charging scale	Refrigerant charge	Tools for other refrigerants can be used	○	○
Vacuum gauge or thermistor vacuum gauge and vacuum valve	Check the degree of vacuum. (Vacuum valve prevents back flow of oil and refrigerant to thermistor vacuum gauge)	Tools for other refrigerants can be used	○	○
Charging cylinder	Refrigerant charge	Tool exclusive for R410A	×	—

× : Prepare a new tool. (Use the new tool as the tool exclusive for R410A.)

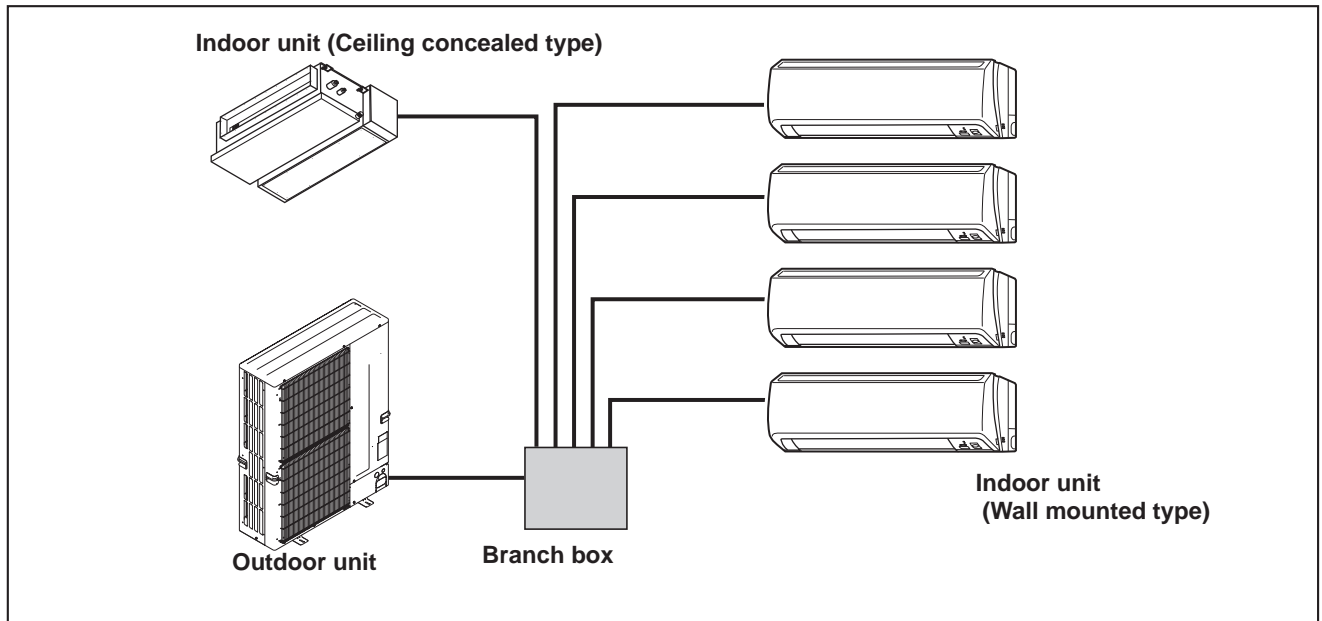
△ : Tools for other refrigerants can be used under certain conditions.

○ : Tools for other refrigerants can be used.

## 2-1. SYSTEM OUTLINE

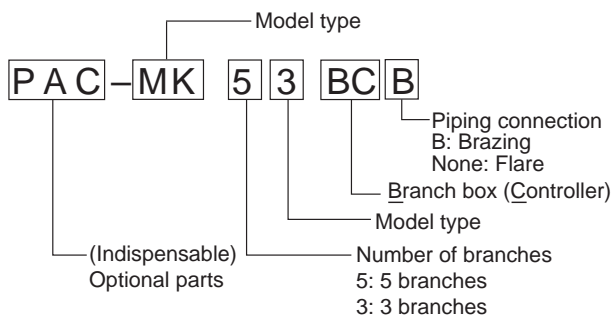
The additional connection of the branch box together with employment of the compact trunk-looking outdoor unit can successfully realize a long distance piping for big houses. Equipped with a microprocessor, the branch box can translate the transmission signal of indoor units to achieve the optimum control.

### 2-1-1. System example



### 2-1-2. Method for identifying

#### ■ Branch box



## 2-2. INSTALLATION

### 2-2-1. Space required for Installation and servicing for branch box for PAC-MK53/33BC

#### (1) Front View (Fig. 2-1)

- Ⓐ Branch box
- Ⓑ On the side of piping

#### (2) Side View (Fig. 2-2, Fig. 2-3, Fig. 2-4)

- Ⓒ For indoor installations
- Ⓓ Ceiling board
- Ⓔ Maintenance hole
- Ⓕ Reactor box (Optional parts)

\*1: A minimum 350 mm is required for 90° bends in refrigerant piping.

\*2: Ⓐ is "Min 200 mm".

In the case of less than 200 mm (for example Ⓐ is 100 mm), the exchange work of branch box from a maintenance hole becomes difficult (Only exchange work of a PCB, linear expansion valve coils and sensors is possible).

To install the optional reactor box, set Ⓐ to Min 270 mm <recommendation>. (Fig. 2-4)

\*3: Ⓑ is "600 mm".

In the case of "450 mm", prepare a maintenance hole at a PCB side (as it is shown in Fig. 2-3, Fig. 2-4), and "Min 300 mm" is needed as distance Ⓐ.

In the case of less than 300 mm (for example Ⓐ is 100 mm), the exchange work of Branch box, linear expansion valve coils and sensors from a maintenance hole becomes difficult. Only exchange work of a PCB is possible.

#### (3) Top View (Fig. 2-5)

NOTE 1: The branch box is only for indoor use.

NOTE 2: Please attach the special optional cover (PAC-AK350CVR-E) to install branch box outdoors.

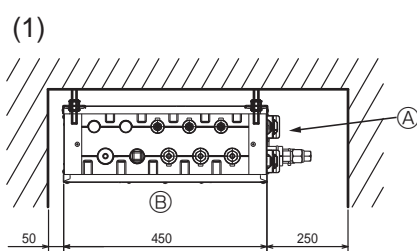


Fig. 2-1

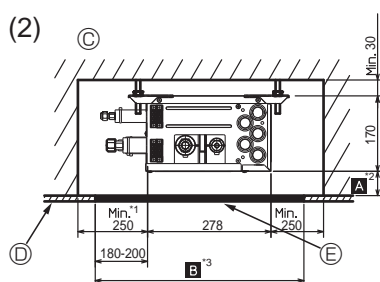


Fig. 2-2

Unit: mm

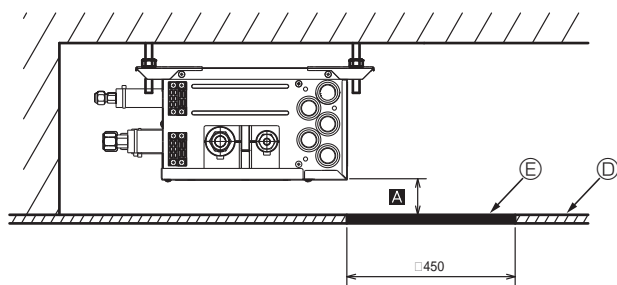


Fig. 2-3

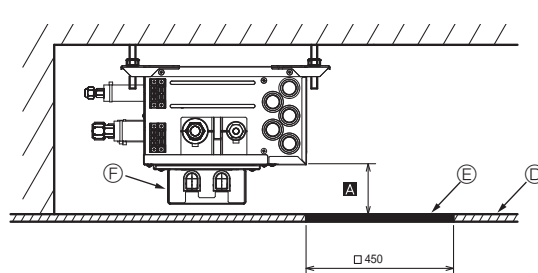


Fig. 2-4

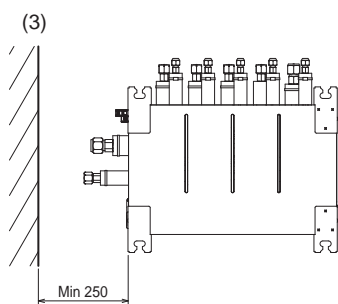


Fig. 2-5

## 2-2-2. Space required for Installation and servicing for branch box for PAC-MK53/33BCB

### (1) Front View (Fig. 2-6)

- Ⓐ Branch box
- Ⓑ On the side of piping

### (2) Side View (Fig. 2-7, Fig. 2-8, Fig. 2-9)

- Ⓒ For indoor installations
- Ⓓ Ceiling board
- Ⓔ Maintenance hole

\*1: A minimum 350 mm is required for 90° bends in refrigerant piping.

\*2: Ⓐ is "Min. 200 mm" <recommendation>.

In the case of less than 200 mm (for example Ⓐ is 100 mm), the exchange work of branch box from a maintenance hole becomes difficult (Only exchange work of a PCB, linear expansion valve coils and sensors is possible).

To install the optional reactor box, set Ⓐ to Min. 270 mm <recommendation> (Fig. 2-9)

\*3: Ⓑ is "600 mm".

In the case of "450 mm", prepare a maintenance hole at a PCB side (as it is shown in Fig. 2-8, Fig. 2-9), and "Min. 300 mm" is needed as distance Ⓐ.

In the case of less than 300 mm (for example Ⓐ is 100 mm), the exchange work of Branch box, linear expansion valve coils and sensors from a maintenance hole becomes difficult. Only exchange work of a PCB is possible.

### (3) Top View (Fig. 2-10)

NOTE 1: The branch box is only for indoor use.

NOTE 2: Please attach the special optional cover (PAC-AK350CVR-E) to install branch box outdoors.

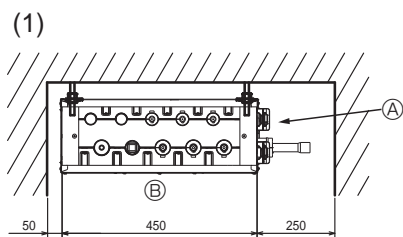


Fig. 2-6

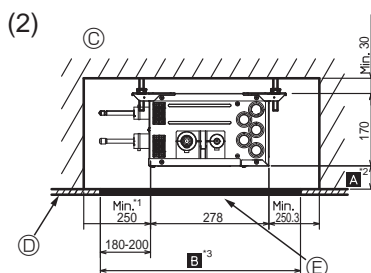


Fig. 2-7

Unit: mm

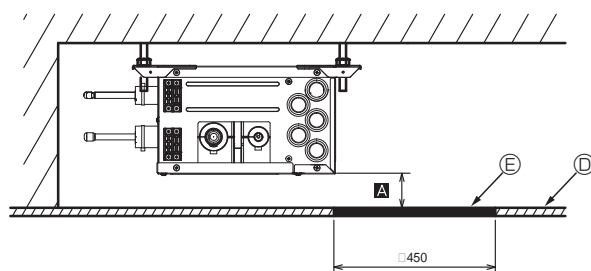


Fig. 2-8

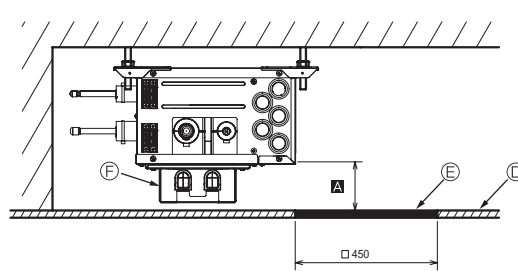


Fig. 2-9

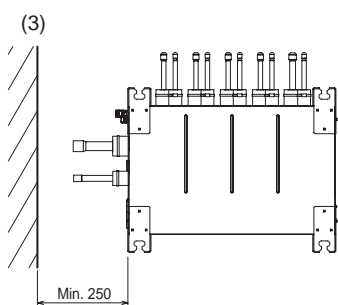


Fig. 2-10

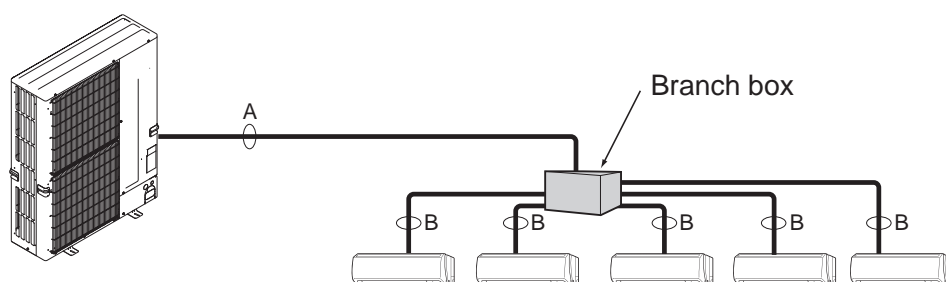
## 2-3. SIMPLIFIED PIPING SYSTEM

### Piping connection size

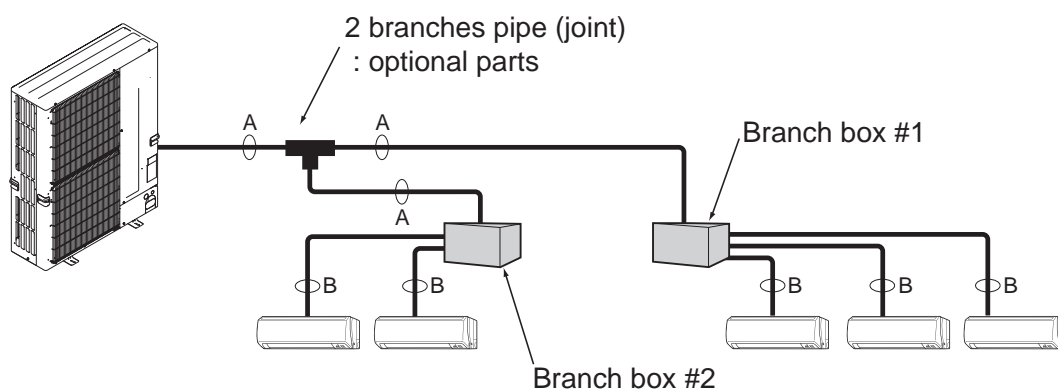
		A	B
Liquid	(mm)	φ9.52	The piping connection size differs according to the type and capacity of indoor units. Match the piping connection size of branch box with indoor unit. If the piping connection size of branch box does not match the piping connection size of indoor unit, use optional different-diameter (deformed) joints to the branch box side. (Connect deformed joint directly to the branch box side.)
Gas	(mm)	φ15.88	

#### ■ In case of using 1-branch box

Flare connection employed



#### ■ In case of using 2-branch boxes



#### ■ Installation procedure (2 branch pipe (joint))

Refer to the installation manuals of MSDD-50AR-E and MSDD-50BR-E.

## PAC-MK53BC

## PAC-MK33BC

Model Name				PAC-MK53BC	PAC-MK33BC
Connectable number of indoor units				Maximum 5	Maximum 3
Power supply (from outdoor unit)				~N, 220/230/240 V, 50 Hz, ~N, 220/230 V, 60 Hz	
Input			kW	0.003	
Running current			A	0.05 (Max. 6)	
External finish				Galvanized sheets	
Dimensions	Width		mm	450	
	Depth		mm	280	
	Height		mm	170	
Weight			kg	7.4	6.7
Piping connection (Flare)	Branch (indoor side)*	Liquid	mm	$\phi 6.35 \times 5 \{A,B,C,D,E\}$	
		Gas	mm	$\phi 9.52 \times 4 \{A,B,C,D\}, \phi 12.7 \times 1\{E\}$	
	Main (outdoor side)	Liquid	mm	$\phi 9.52$	
		Gas	mm	$\phi 15.88$	

\* The piping connection size differs according to the type and capacity of indoor units. Match the piping connection size for indoor and branch box. If the piping connection size of branch box does not match the piping connection size of indoor units, use optional different-diameter (deformed) joints to the branch box side. (Connect deformed joint directly to the branch box side.)

## PAC-MK53BCB

## PAC-MK33BCB

Model Name				PAC-MK53BCB	PAC-MK33BCB
Connectable number of indoor units				Maximum 5	Maximum 3
Power supply (from outdoor unit)				~N, 220/230/240 V, 50 Hz, ~N, 220/230 V, 60 Hz	
Input			kW	0.003	
Running current			A	0.05 (Max. 6)	
External finish				Galvanized sheets	
Dimensions	Width		mm	450	
	Depth		mm	280	
	Height		mm	170	
Weight			kg	7.0	6.5
Piping connection (Brazing)	Branch (indoor side)*	Liquid	mm	$\phi 6.35 \times 5 \{A,B,C,D,E\}$	
		Gas	mm	$\phi 9.52 \times 4 \{A,B,C,D\}, \phi 12.7 \times 1\{E\}$	
	Main (outdoor side)	Liquid	mm	$\phi 9.52$	
		Gas	mm	$\phi 15.88$	

\* The piping connection size differs according to the type and capacity of indoor units. Match the piping connection size for indoor and branch box. If the piping connection size of branch box does not match the piping connection size of indoor units, use optional different-diameter (deformed) joints to the branch box side. (Connect deformed joint directly to the branch box side.)

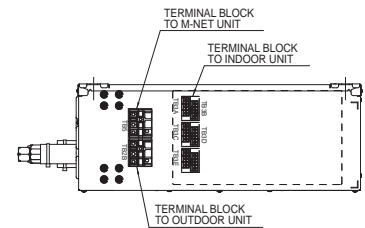
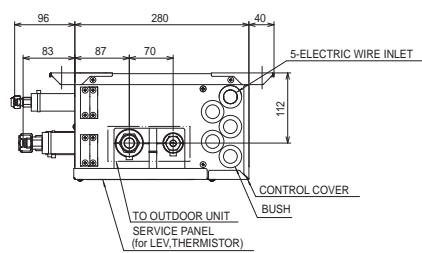
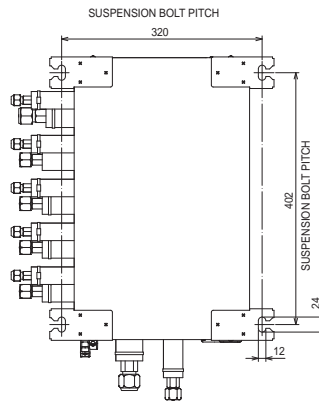
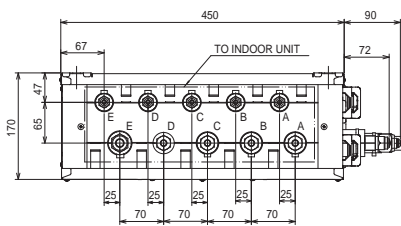
## PAC-MK53BC

Unit: mm

SUSPENSION BOLT : W3/8(M10)

REFRIGERANT PIPE BRAZED CONNECTION

	A	B	C	D	E	TO OUTDOOR UNIT
LIQUID PIPE	φ 6.35	φ 6.35	φ 6.35	φ 6.35	φ 6.35	φ 9.52
GAS PIPE	φ 9.52	φ 9.52	φ 9.52	φ 9.52	φ 12.7	φ 15.88

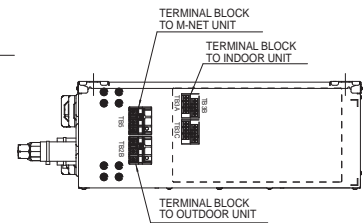
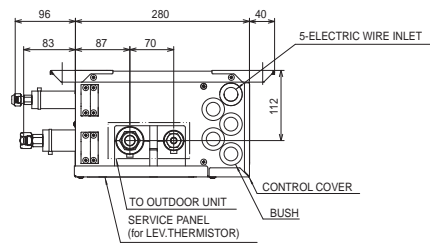
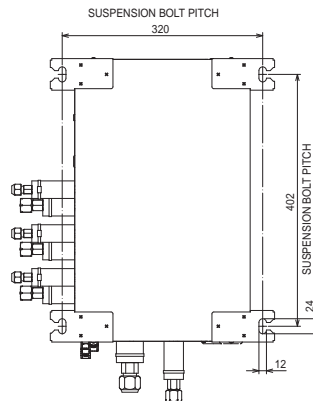
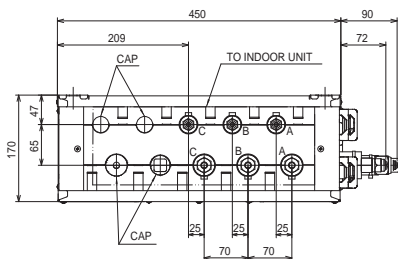


## PAC-MK33BC

SUSPENSION BOLT : W3/8(M10)

REFRIGERANT PIPE BRAZED CONNECTION

	A	B	C		TO OUTDOOR UNIT
LIQUID PIPE	φ 6.35	φ 6.35	φ 6.35		φ 9.52
GAS PIPE	φ 9.52	φ 9.52	φ 9.52		φ 15.88



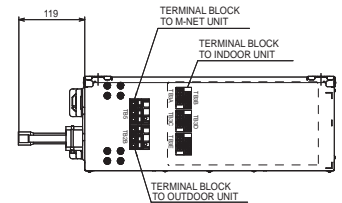
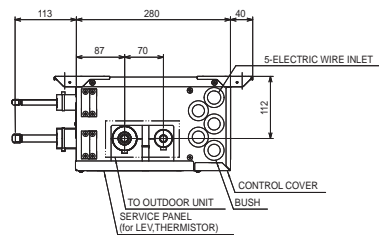
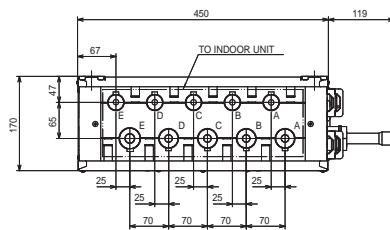
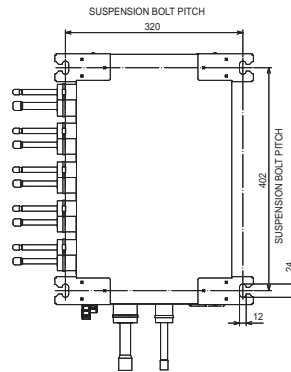
## PAC-MK53BCB

Unit: mm

SUSPENSION BOLT : W3/8(M10)

REFRIGERANT PIPE BRAZED CONNECTION

	A	B	C	D	E	TO OUTDOOR UNIT
LIQUID PIPE	φ 6.35	φ 6.35	φ 6.35	φ 6.35	φ 6.35	φ 9.52
GAS PIPE	φ 9.52	φ 9.52	φ 9.52	φ 9.52	φ 12.7	φ 15.88

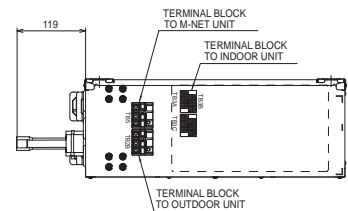
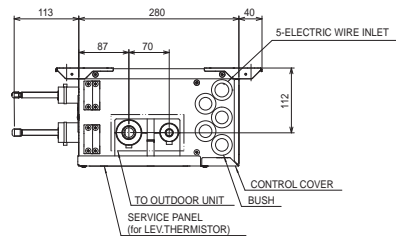
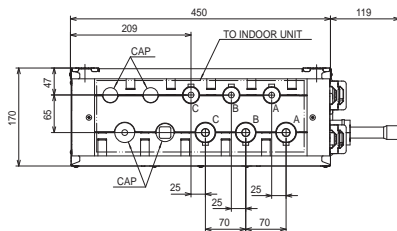
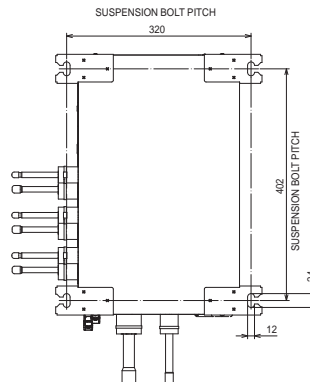


## PAC-MK33BCB

SUSPENSION BOLT : W3/8(M10)

REFRIGERANT PIPE BRAZED CONNECTION

	A	B	C		TO OUTDOOR UNIT
LIQUID PIPE	φ 6.35	φ 6.35	φ 6.35		φ 9.52
GAS PIPE	φ 9.52	φ 9.52	φ 9.52		φ 15.88



**PAC-MK53BC**  
**PAC-MK53BCB**
**PAC-MK33BC**  
**PAC-MK33BCB**

SYMBOL	NAME
B.C.	Branch box controller board
F1	Fuse <T6.3AL 250V>
F2-F4	Fuse <T10AL 250V> *1
SW1	Switch for indoor unit connection *2
SW4	Switch for function selection *3
SW5	Switch for function selection *4
CNM	Connector <Connection for service>
LED1,2	Light emitting diode *5
TB3A-E	Terminal block <To Indoor unit-A-E> *6
SW11	Address Setting ones digit
SW12	Address Setting tens digit
LEV-A-E	Linear expansion valve *6
TH-A-E	Thermistor <Gas pipe> *6
TB2B	Terminal block <To Power Supply>
TB5	Transmission line
REACTOR BOX	Optional parts
TB2C	Terminal block <To Power Supply>
TB2D	Terminal block <To Branch box (TB2B)>

\*1 F4 for PAC-MK53BC (B) only

\*2 SW1 setting

	OFF	ON
SW1-1	INDOOR UNIT-A	NOT CONNECT
SW1-2	INDOOR UNIT-B	NOT CONNECT
SW1-3	INDOOR UNIT-C	NOT CONNECT
SW1-4	INDOOR UNIT-D	NOT CONNECT
SW1-5	INDOOR UNIT-E	NOT CONNECT
SW1-6	NO USE	NOT CONNECT

PAC-MK53BC (B) only

After each indoor unit is connected to the outdoor unit, turn on the switch corresponding to each indoor unit. For example, when the indoor units are connected to INDOOR UNIT-A and C, turn SW1-1 and SW1-3 to on.

\*3 SW4 setting

	OFF	ON
SW4-5	Cooling & Heating system	Cooling only system

When the outdoor unit is cooling only system, turn SW4-5 to on.

\*4 Refer to the installation manual of Branch box for details.

<Combination of indoor units>

Enter the location of combined indoor units with model name in each blank below because it is necessary for service and maintenance.

Indoor unit-A	Indoor unit-B	Indoor unit-C	Indoor unit-D	Indoor unit-E

\*5 LED on Branch box controller board for service

• start-up

Mark	Meaning	Function
LED 1	Main power supply	Main power supply (220/230/240V)
LED 2		Power on → Lamps are lit

• normal operating

Mark	Meaning	Function
LED 1	Main power supply	Lamp is lit
LED 2	Total number of indoor units	Blink depend on the total number <example> The total number is 2 ① Blink 2 times. ② Turn off for 3 sec. ③ Repeat ① to ②.

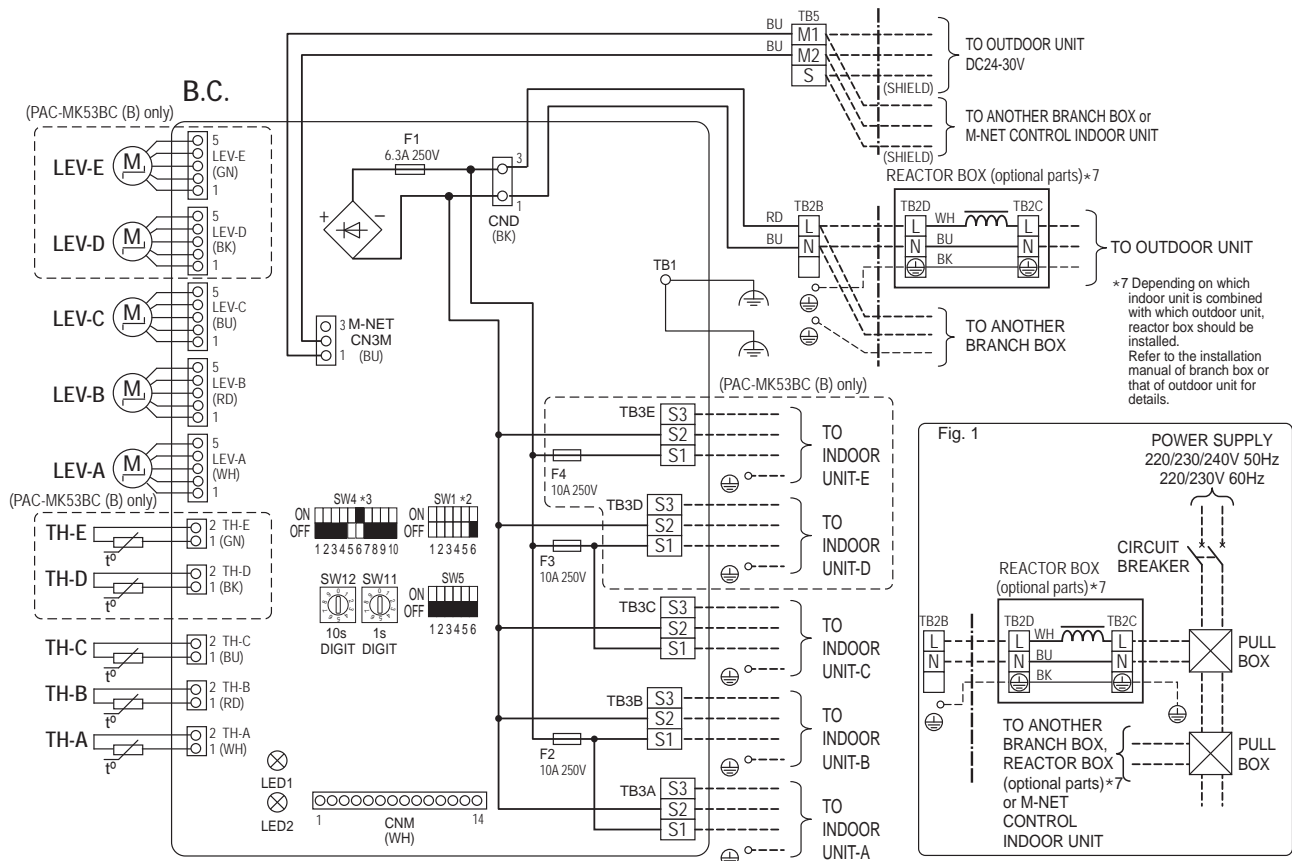
\*6 D and E for PAC-MK53BC (B) only

<Note>

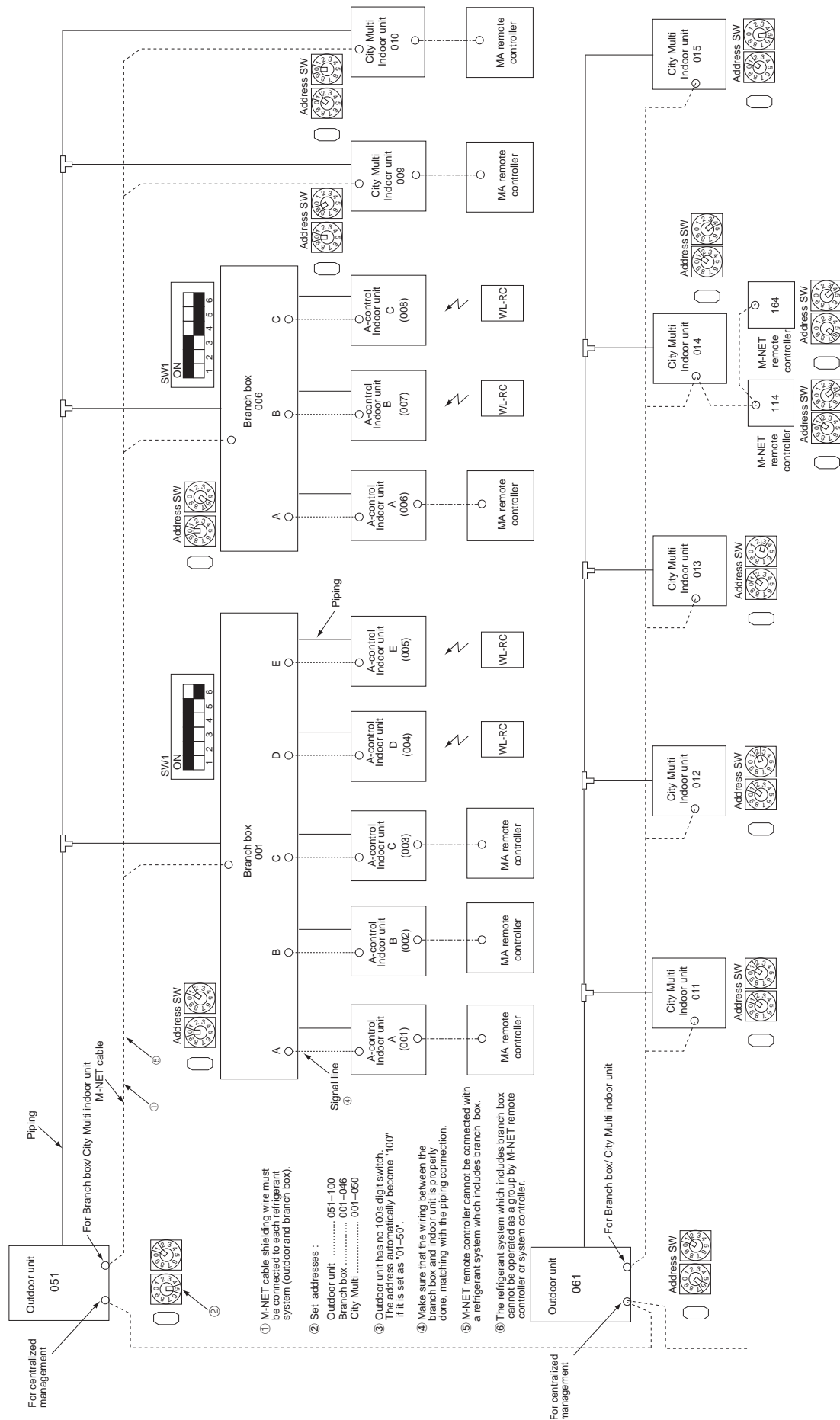
- At servicing for outdoor unit, always follow the wiring diagram of outdoor unit.
- When work to supply power separately to Branch box and outdoor units are applied, refer to Fig. 1. However, when the Branch box is connected to MXZ-6C/8C-NAM, power must not be supplied separately.
- For the connection method, please refer to the Branch box Installation Manual.

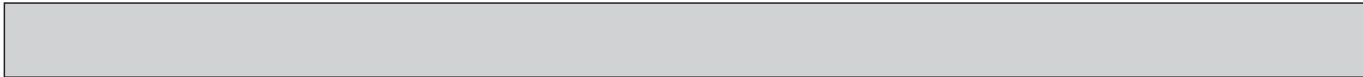
<Symbols used in wiring diagram>

□ : Terminal block, □ : Connector  
 ■ : Dip switch (■ (black square) indicates a switch position)



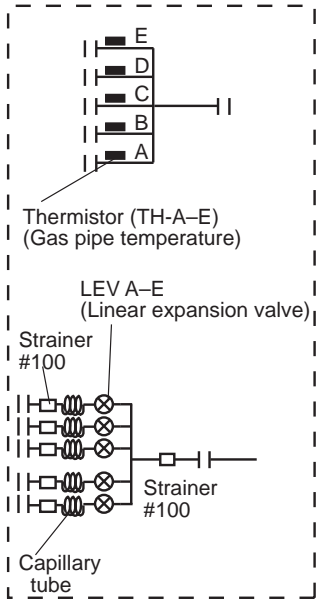
## 6-1. TRANSMISSION SYSTEM SETUP



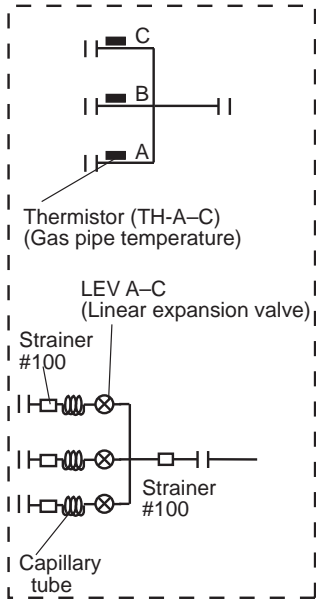


6-2. REFRIGERANT SYSTEM DIAGRAM

■ PAC-MK53BC    PAC-MK53BCB



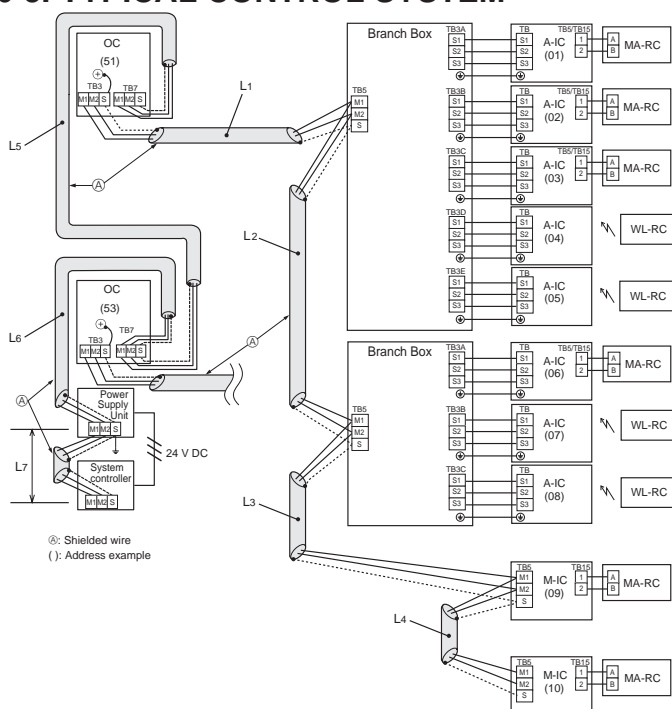
■ PAC-MK33BC    PAC-MK33BCB



Unit: mm

		Capillary tube behind LEV (in cooling mode)
Branch box	PAC-MK53BC(B)	( $\phi 4 \times \phi 3.0 \times L130$ ) $\times$ 5
	PAC-MK33BC(B)	( $\phi 4 \times \phi 3.0 \times L130$ ) $\times$ 3

## 6-3. TYPICAL CONTROL SYSTEM



OC : Outdoor unit  
M-IC : M-NET Control indoor unit (City Multi indoor unit)  
A-IC : A-control indoor unit  
MA-RC : MA Remote controller  
WL-RC : Wireless Remote controller

### IMPORTANT:

Make sure that the current leakage breaker is one compatible with higher harmonics.

Always use a current leakage breaker that is compatible with higher harmonics as this unit is equipped with an inverter.

The use of an inadequate breaker can cause the incorrect operation of inverter.

### Longest length via outdoor units:

$L1 + L2 + L3 + L4 + L5 + L6 + L7 \leq 500 \text{ m (1640 ft) (1.25 mm}^2 \text{ or more)}$

### Longest transmission cable length

$L1 + L2 + L3 + L4, L5 + L6, L7 \leq 200 \text{ m (656 ft) (1.25 mm}^2 \text{ or more)}$

Note: M-NET remote controller cannot be connected with a refrigerant system which includes branch box.

### (1) Difference between display and operation

- ① When operating the system using the system controller, details of those operations will not appear on the display of the wireless remote controller.
- ② The set temperature range is different in the wireless remote controller that comes with room air conditioner and the system controller. The room air conditioner has a wider range. If the target temperature is set to below 17°C or less, or 30°C or more by the wireless remote controller that comes with room air conditioner, the temperature displayed on the system controller may be converted to their maximum/minimum set temperature. For instance, when HEAT operation at 16°C is set at the room air conditioner, the system controller may display 17°C.
- ③ When the DRY mode is set with the wireless remote controller, the room air conditioner automatically set the optimum target temperature. The system controller will display the target temperature as a set temperature.
- ④ When the DRY mode is set with the system controller, the room air conditioner performs the DRY mode control operation according to the temperature set with the system controller.

### (2) Timer operation

- ① Timer operation should be set using only 1 controller from the remote controller that comes with the room air conditioner, the system controller or the MA remote controller. If more than 1 controller is used to set the timer at the same time, the timer will not function properly.
- ② When the timer is set with the wireless remote controller; the system controller will not show the timer display.
- ③ The timer set with the system controller will not be cancelled with the wireless remote controller.

### (3) Manual operation prohibition

- ① When the manual operation (ON/OFF, set temperature, or operation mode) is prohibited with the system controller, the command to perform the prohibited operation will not be accepted from the wireless remote controller that comes with the room air conditioner. The operation partially enabled by the system controller can be operated with the wireless remote controller. Regardless of whether the operation is disabled or enabled, 3 short beeps will sound when the signal is sent from the wireless remote controller.

### (4) Trouble

- ① If the MA remote controller or the system controller shows the abnormal indication, clear it by stopping the operation with one of the following: the MA remote controller, the system controller, or the wireless remote controller.  
(Abnormal indication of the air conditioner could be recovered automatically, but that of the MA remote controller or the system controller cannot be recovered unless the operation is stopped.)

## **(5) Group setting**

① MA group or M-NET group setting cannot be set.

## **(6) Restricted functions**

The following functions of system controller cannot be used.

- DIDO controller (Interlock with the air conditioner)
- Fan control of energy saving control or peak cut control function
- Air conditioning charge [TG-2000A]
- Set temperature range limiting function
- Operation mode changeover limit (season changing) [PAC-SF44SRA]
- Dual set point function
- Cylinder unit or hydrobox cannot be operated from system controller.

## 7-1. HOW TO CHECK THE PARTS

BRANCH BOX : PAC-MK53BC  
PAC-MK53BCB

PAC-MK33BC  
PAC-MK33BCB

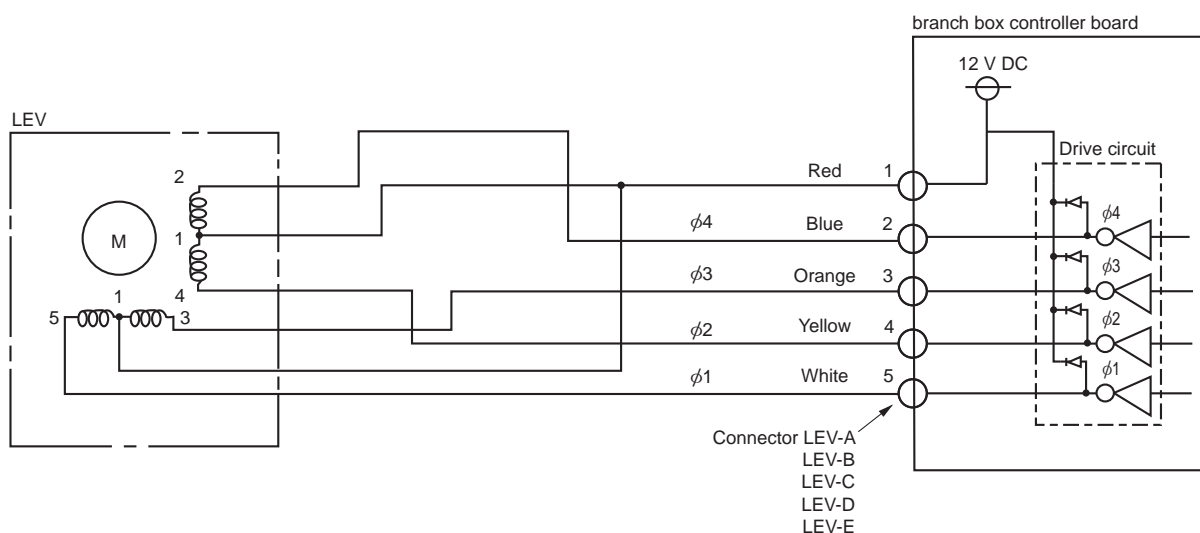
Parts name	Check points																						
Thermistor (TH-A-E) <Gas pipe>	<p>Disconnect the connector then measure the resistance with a tester. (At the ambient temperature 10 to 30°C)</p> <p>Thermistor <math>R_0=15\text{k}\Omega \pm 3\%</math> Fixed number of <math>B=3480 \pm 2\%</math></p> $R_t=15\text{exp} \left\{ 3480\left( \frac{1}{273+t} - \frac{1}{273} \right) \right\}$ <table><tr><td>10°C</td><td>9.7 kΩ</td></tr><tr><td>15°C</td><td>7.9 kΩ</td></tr><tr><td>20°C</td><td>6.4 kΩ</td></tr><tr><td>25°C</td><td>5.3 kΩ</td></tr><tr><td>30°C</td><td>4.4 kΩ</td></tr></table> <div><p>&lt; Thermistor for lower temperature &gt;</p><table><caption>Thermistor Resistance Data</caption><tr><th>Temperature (°C)</th><th>Resistance (kΩ)</th></tr><tr><td>10</td><td>9.7</td></tr><tr><td>15</td><td>7.9</td></tr><tr><td>20</td><td>6.4</td></tr><tr><td>25</td><td>5.3</td></tr><tr><td>30</td><td>4.4</td></tr></table></div>	10°C	9.7 kΩ	15°C	7.9 kΩ	20°C	6.4 kΩ	25°C	5.3 kΩ	30°C	4.4 kΩ	Temperature (°C)	Resistance (kΩ)	10	9.7	15	7.9	20	6.4	25	5.3	30	4.4
10°C	9.7 kΩ																						
15°C	7.9 kΩ																						
20°C	6.4 kΩ																						
25°C	5.3 kΩ																						
30°C	4.4 kΩ																						
Temperature (°C)	Resistance (kΩ)																						
10	9.7																						
15	7.9																						
20	6.4																						
25	5.3																						
30	4.4																						
Linear expansion valve ( LEV-A-E )	<p>Disconnect the connector then measure the resistance with a tester. (Winding temperature 20°C)</p> <table><tr><th colspan="4">Normal</th><th>Abnormal</th></tr><tr><td>Red - White</td><td>Red - Orange</td><td>Red - Yellow</td><td>Red - Blue</td><td rowspan="2">Open or short</td></tr><tr><td colspan="4">46 ± 4Ω</td></tr></table>	Normal				Abnormal	Red - White	Red - Orange	Red - Yellow	Red - Blue	Open or short	46 ± 4Ω											
Normal				Abnormal																			
Red - White	Red - Orange	Red - Yellow	Red - Blue	Open or short																			
46 ± 4Ω																							

## Linear expansion valve (LEV) in Branch box

### (1) Operation summary of the linear expansion valve

- Linear expansion valve opens/closes through stepping motor after receiving the pulse signal from the branch box controller board.
- Valve position can be changed in proportion to the number of pulse signal.

<Connection between the branch box controller board and the linear expansion valve>



### <Output pulse signal and the valve operation>

Output (Phase)	Output							
	1	2	3	4	5	6	7	8
$\phi 1$	ON	ON	OFF	OFF	OFF	OFF	OFF	ON
$\phi 2$	OFF	ON	ON	ON	OFF	OFF	OFF	OFF
$\phi 3$	OFF	OFF	OFF	ON	ON	ON	OFF	OFF
$\phi 4$	OFF	OFF	OFF	OFF	OFF	ON	ON	ON

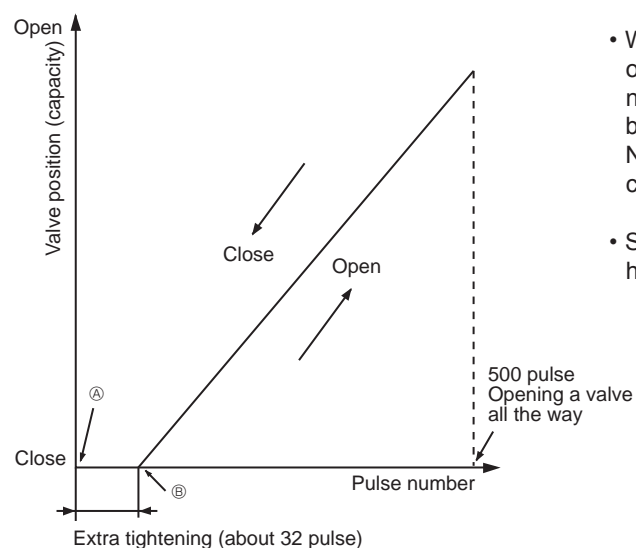
Opening a valve : 8 → 7 → 6 → 5 → 4 → 3 → 2 → 1 → 8

Closing a valve : 1 → 2 → 3 → 4 → 5 → 6 → 7 → 8 → 1

The output pulse shifts in above order.

- When linear expansion valve operation stops, all output phases become OFF.

### (2) Linear expansion valve operation



- When the power is turned on, 700 pulse closing valve signal will be sent till it goes to Ⓐ point in order to define the valve position. (The pulse signal is being sent for about 20 seconds.)

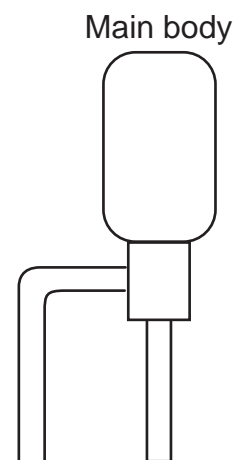
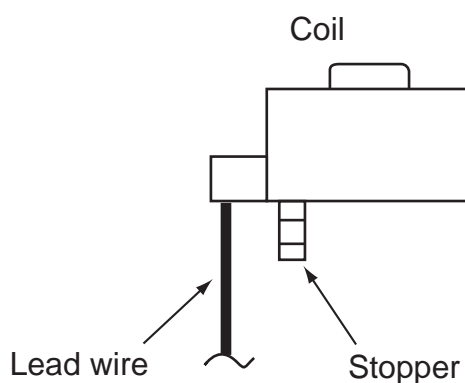
- When the valve moves smoothly, there is no sound or vibration occurring from the linear expansion valve: however, when the pulse number moves from Ⓑ to Ⓐ or when the valve is locked, sound can be heard. No sound is heard when the pulse number moves from Ⓑ to Ⓐ in case coil is burnt out or motor is locked by open-phase.

- Sound can be detected by placing the ear against the screw driver handle while putting the screw driver to the linear expansion valve.

### (3) How to attach and detach the coil of linear expansion valve

#### <Composition>

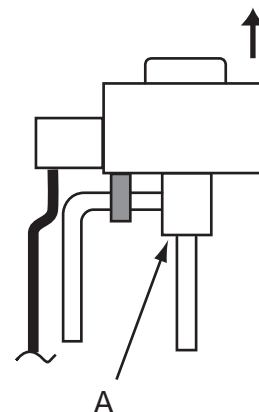
Linear expansion valve is separable into the main body and the coil as shown in the diagram below.



#### <How to detach the coil>

Hold the lower part of the main body (shown as A) firmly so that the main body does not move and detach the coil by pulling it upward.

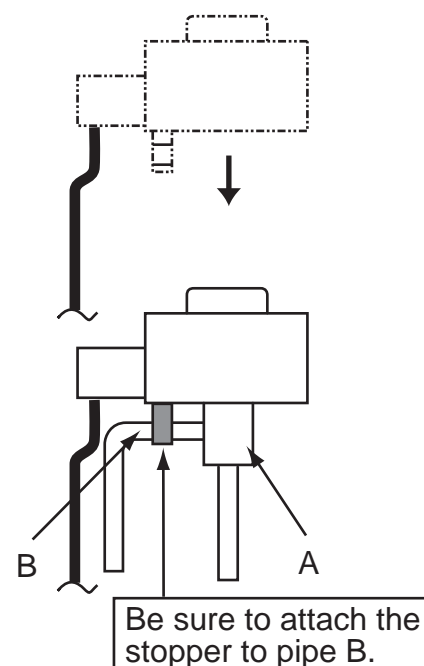
Be sure to detach the coil holding main body firmly. Otherwise pipes can bend due to stress.



#### <How to attach the coil>

Hold the lower part of the main body (shown as A) firmly so that the main body does not move and attach the coil by inserting it downward into the main body. Then securely attach the coil stopper to pipe B. (At this time, be careful that stress is not added to lead wire and main body is not wound by lead wire.) If the stopper is not firmly attached to pipe B, coil may be detached from the main body and that can cause defective operation of linear expansion valve.

To prevent piping stress, be sure to attach the coil holding the main body of linear expansion valve firmly. Otherwise pipe may break.



## Troubleshooting

Problem	Check point	Corrective measure
Locked expansion valve	If the linear expansion valve becomes locked and the motor is still operating, the motor will emit a clicking noise and will not function. This clicking noise indicates an abnormality.	Replace the linear expansion valve.
Short circuit or broken circuit in expansion valve motor coil	Use an all-purpose electrical meter to measure the resistance between the different coils (red-white, red-orange, brown-yellow, brown-blue). Normal resistance is within a range of $46\Omega \pm 4\%$ .	Replace the linear expansion valve.
Valve does not close completely.	In order to check the linear expansion valve, operate 1 indoor unit in the fan mode and another in the cooling mode. Then, use the outdoor multi controller board to operate the monitor and check the pipe temperature of the indoor unit. The linear expansion valve should be fully closed when the fan is operating. The temperature measured by the temperature sensor will drop if there is any leakage. If the measured temperature is significantly lower than that on the remote controller, this indicates that the valve is not closed. It is not necessary to replace the linear expansion valve if the leak of refrigerant is small and does not cause a malfunction.	Replace the linear expansion valve if there is a major leak of refrigerant.
Incorrect connection or connection failure	① Check improperly connected connector terminals and the wire colors. ② Remove the connector on the controller board side and check electrical conductance.	Continuity check of wrong part

## 7-2. TEST POINT DIAGRAM

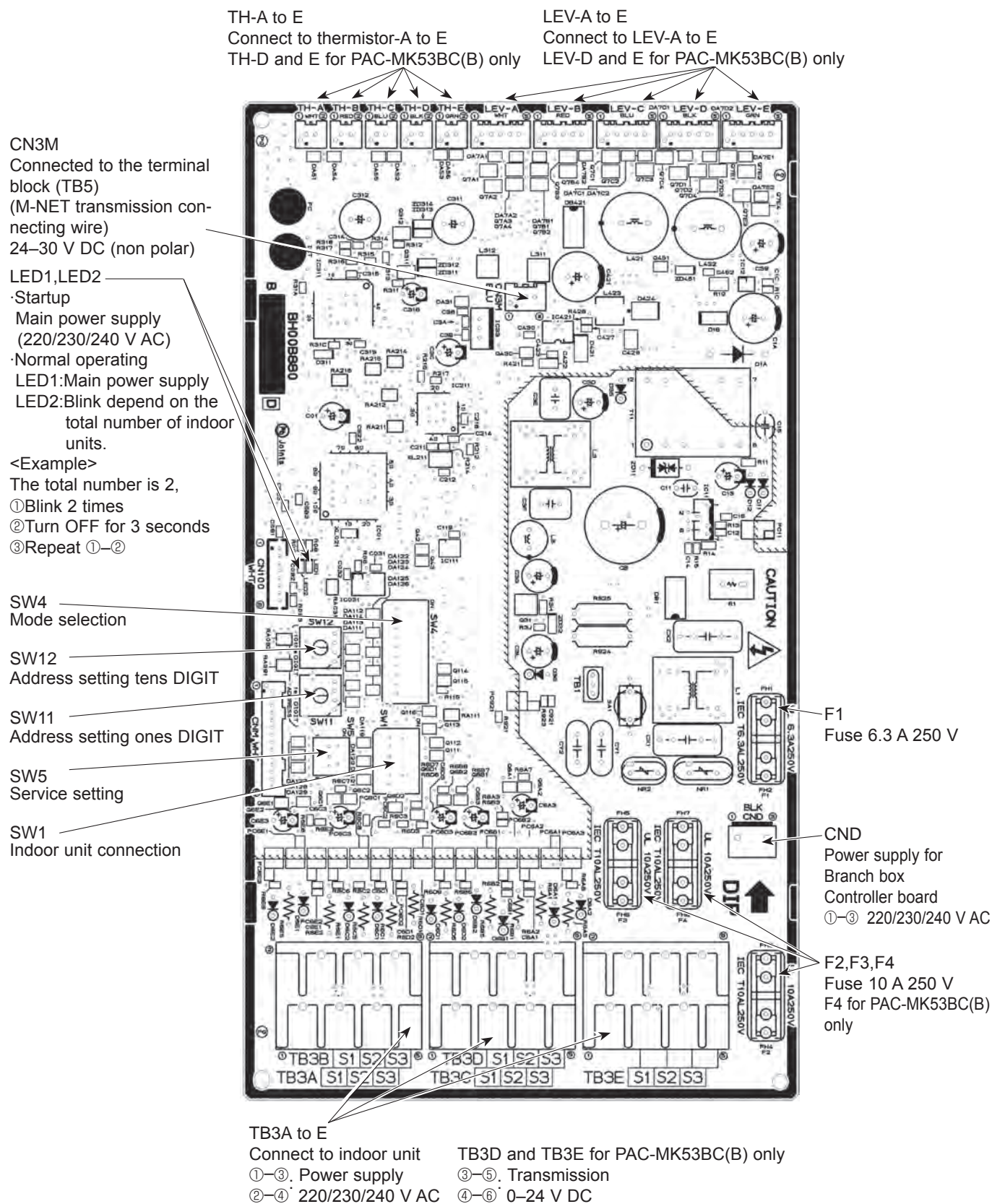
Branch box controller board

PAC-MK53BC

PAC-MK33BC

PAC-MK53BCB

PAC-MK33BCB



## 7-3. INTERNAL SWITCH FUNCTION TABLE

The black square (■) indicates a switch position.

Switch	Step	Function	Operation in Each Switch Setting		When to Set	<Initial switch setting>	Additional Information																								
			ON	OFF																											
SW11 Ones digit address setting SW12 Tens digit address setting	Rotary switch	How to set addresses Example: if address is "3", remain SW12 (for over 10) at "0", and match SW11 (for 1 to 9) with "3".			Before turning the power ON	<div><div>SW12</div><div>SW11</div><div>0</div><div>Tens digit</div><div>Ones digit</div></div>	Switch setting example. Branch box: 001 (setting No. =x) indoor-A: 001 (=x) indoor-B: 002 (=x+1) indoor-C: 003 (=x+2) indoor-D: 004 (=x+3) indoor-E: 005 (=x+4)																								
SW1 Indoor unit connection	1-6	<table><tr><td rowspan="6">SW1</td><td>1</td><td>Indoor unit A</td><td>OFF</td><td>ON</td></tr><tr><td>2</td><td>Indoor unit B</td><td>Not connected</td><td>Connected</td></tr><tr><td>3</td><td>Indoor unit C</td><td>Not connected</td><td>Connected</td></tr><tr><td>4*1</td><td>Indoor unit D</td><td>Not connected</td><td>Connected</td></tr><tr><td>5*1</td><td>Indoor unit E</td><td>Not connected</td><td>Connected</td></tr><tr><td>6</td><td>Not used</td><td></td><td></td></tr></table>	SW1	1	Indoor unit A	OFF	ON	2	Indoor unit B	Not connected	Connected	3	Indoor unit C	Not connected	Connected	4*1	Indoor unit D	Not connected	Connected	5*1	Indoor unit E	Not connected	Connected	6	Not used				Before turning the power ON	<div><div>ON</div><div>OFF</div><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div><div>6</div></div>	After each indoor unit is connected to the outdoor unit, turn ON the switch corresponding to each indoor unit. For example, when the indoor units are connected to INDOOR UNIT-A and C, turn SW1-1 and SW1-3 to ON.
SW1	1	Indoor unit A		OFF	ON																										
	2	Indoor unit B		Not connected	Connected																										
	3	Indoor unit C		Not connected	Connected																										
	4*1	Indoor unit D		Not connected	Connected																										
	5*1	Indoor unit E		Not connected	Connected																										
	6	Not used																													
SW4 Mode selection	1	Change temperature indication	Fahrenheit temperature	Celsius temperature	Before turning the power ON																										
	2	Power-supply voltage setting	220 or 230 V	240 V	Set at factory only																										
	3	Change operation if M-NET communication error occurs.	Stop operation	Continued operation		<div><div>ON</div><div>OFF</div><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div><div>6</div><div>7</div><div>8</div><div>9</div><div>10</div></div>	—																								
	4	Automatic restoration when the power comes back ON.*2	Inactive	Active																											
	5	System type	Cooling only system	Cooling & heating system	Before turning the power ON		When the outdoor unit is cooling only system, turn SW4-5 to ON.																								
	6-7 8-10	Model setting	—	—	Refer to "Initial switch setting".		—																								
SW5 Service setting	1-3	Change INDOOR UNIT No. for monitoring	Refer to "7-4. BRANCH BOX UNIT OPERATION MONITOR FUNCTION".		Can be activated at any time		—																								
	4-6	When the cylinder unit or hydrobox is used in a house, connect the indoor unit for bed room to A-C port of the branch box, then set the switches as follows:	<table><tr><td rowspan="3">SW5</td><td>4</td><td>Port A</td><td>OFF</td><td>ON</td></tr><tr><td>5</td><td>Port B</td><td>Other</td><td>Bedroom</td></tr><tr><td>6</td><td>Port C</td><td>Other</td><td>Bedroom</td></tr></table>	SW5	4	Port A	OFF	ON	5	Port B	Other	Bedroom	6	Port C	Other	Bedroom	Before turning the power ON	<div><div>ON</div><div>OFF</div><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div><div>6</div></div> <div><div>Port A</div><div>Port B</div><div>Port C</div><div>Port D</div><div>Port E</div><div>Ports available for setting</div></div>	Port A to C are available for setting for up to a maximum of 3 rooms.												
SW5	4	Port A	OFF		ON																										
	5	Port B	Other		Bedroom																										
	6	Port C	Other	Bedroom																											

\*1 PAC-MK53BC(B) only

\*2 Note that the automatic restoration starts after the unit has stopped once.

## 7-4. BRANCH BOX UNIT OPERATION MONITOR FUNCTION

[When optional part 'A-Control Service Tool (PAC-SK52ST)' is connected to branch box controller board (CNM)]  
Digital indicator LED1 displays 2 digit number or code to inform operation condition and the meaning of check code by controlling DIP SW2 on 'A-Control Service Tool'.

<Table1> SW5 setting

The black square (■) indicates a switch position.

SW5 setting	Detail
	Common
	Indoor-A
	Indoor-B
	Indoor-C
	Indoor-D
	Indoor-E

Operation indicator:

- SW2 - Use to set the displayed item
- SW5 - Use to set the displayed unit


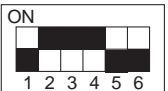
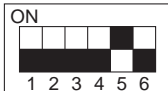
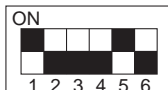


<Table2> Functions

The black square (■) indicates a switch position.

SW2 setting	SW5 setting*1	Display detail	Explanation for display	Unit
	Common	Status of branch box	<p><b>During startup</b></p> <p><b>During error detection</b> Displays a check code, and M-NET address of the unit which the check code was detected. Example: If the check code 2520 is detected in the address3,  </p> <p><b>During no power supply</b> F8</p> <p><b>Other</b> Displays the number of units in operation. 0 to 5</p>	—
	Individual unit	Status of branch box	<p><b>During startup</b></p> <p><b>During error detection</b> Displays a check code, and M-NET address of the selected unit.</p> <p><b>During no power supply</b> F8</p> <p><b>Other</b> Displays an operation mode of the selected unit. 0: Stop C: Cool/ Dry H: Heat d: Defrost</p>	—

\*1 Refer to the <Table 1> for the appropriate setting for the function.

The black square (■) indicates a switch position.

SW2 setting	SW5 setting* <sup>1</sup>	Display detail	Explanation for display	Unit
	Common	Not used	—	—
	Individual unit	Actual opening pulse of LEV (Direct-operated conversion value) 0 to 500	0 to 500 (When it is 100 pulse or more, it displays a hundredth, tens, and unit digit by turns.) Example: When 150 pulse, <div style="text-align: center;"> 0.5 s      0.5 s      2.0 s  □ 1      → 50      → □ □              ↑—————↓ </div>	Pulse
	Common	Not used	—	—
	Individual unit	Error history	Displays a check code, and M-NET address of the unit which the check code was detected. Example: If the check code 2520 is detected in the address3, <div style="text-align: center;"> 0.5 s      0.5 s      0.5 s      2.0 s  03      → 25      → 20      → □ □              ↑—————↓—————↓ </div>	Code display
	Common	The number of unit(s) operating in Thermo-ON	0 to 5	Number
	Individual unit	Operating status of unit	83: Abnormal 00: Stop 06: Forced stop 0C: Defrost 29: Hot adjust mode 05: Standby mode 2A: Auxiliary heater is ON. 0A: Thermo-ON 01: In operation	Code display
	Common	The number of indoor unit(s) connected to this branch box	0 to 5	Number
	Individual unit	M-NET address	00 to FF M-NET address of the selected unit. M-NET address is displayed in hexadecimal. Display example: When the M-NET address is 23 (decimal number), 17 (hexadecimal) is displayed.	Code display
	Common	Not used	—	—
	Individual unit	Capacity setting in Qj	03 to 50	Code display
	Common	Not used	—	—
	Individual unit	Indoor thermistor <pipe temperature/liquid> (TH2)	-39 to 88 (When the temperature is 0°C or less, "-" and temperature are displayed by turns.) Example: When -5°C, <div style="text-align: center;"> 0.5 s      0.5 s      2.0 s  - □      → □ 5      → □ □              ↑—————↓ </div>	°C

\*1 Refer to the <Table 1> for the appropriate setting for the function.

The black square (■) indicates a switch position.

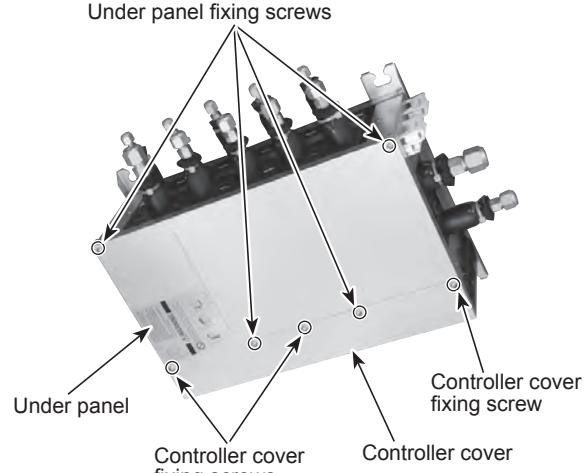
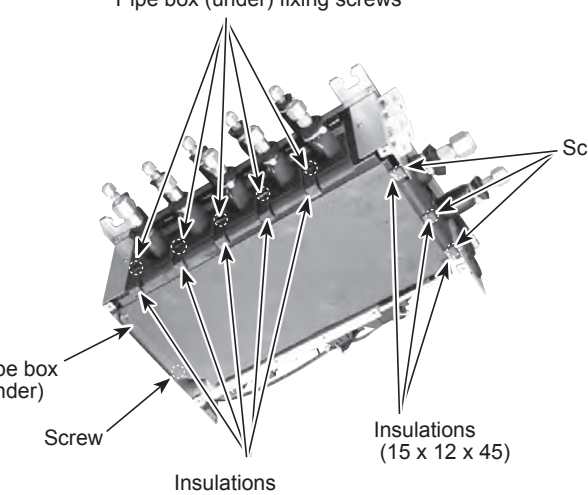
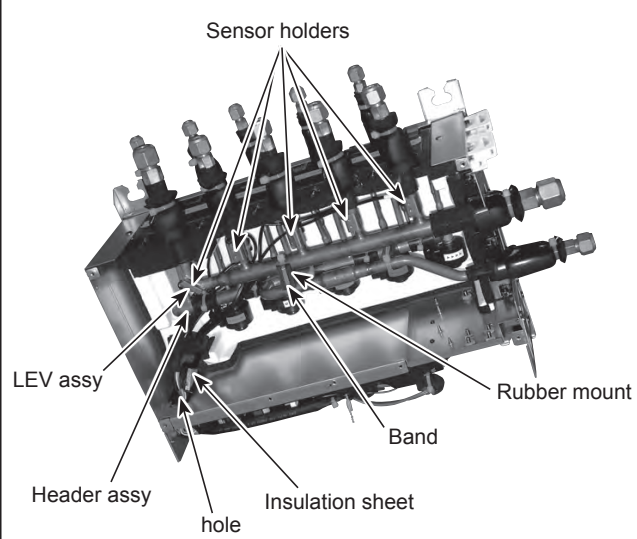
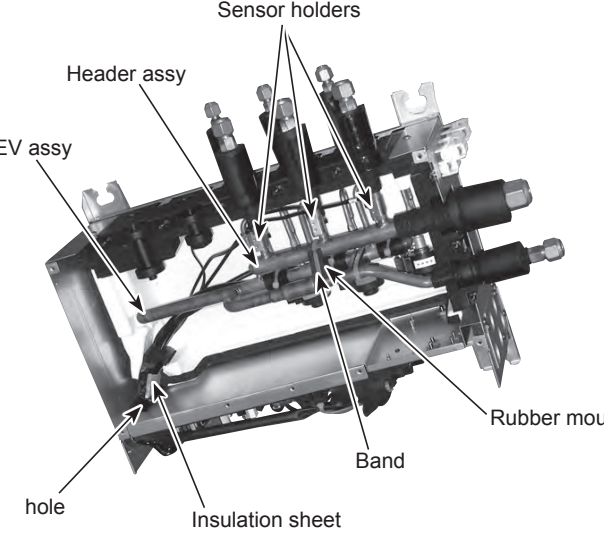
SW2 setting	SW5 setting*1	Display detail	Explanation for display	Unit
	Common	Not used	—	—
	Individual unit	Indoor thermistor <pipe temperature/ 2-phase> (TH5)	-39 to 88 (When the temperature is 0°C or less, "-" and temperature are displayed by turns.)  Example: When -5°C, <div style="text-align: center;">             0.5 s    0.5 s    2.0 s              -□ → □5 → □□              ↑—————↓           </div>	°C
	Common	Not used	—	—
	Individual unit	Branch box pipe thermistor (TH-A, B, C, D, E)	-42 to 91 (When the temperature is 0°C or less, "-" and temperature are displayed by turns.)  Example: When -5°C, <div style="text-align: center;">             0.5 s    0.5 s    2.0 s              -□ → □5 → □□              ↑—————↓           </div>	°C
	Common	Not used	—	—
	Individual unit	Indoor thermistor <room temperature> (TH1)	8 to 39	°C
	Common	Not used	—	—
	Individual unit	Set temperature of indoor unit	16 to 31	°C
	Common	Branch Box Software version	Displays a Branch Box Software version number.  Example: If it is a ver. 12.34, <div style="text-align: center;">             0.5 s    0.5 s    2.0 s              12 → 34 → □□              ↑—————↓           </div>	Code display
	Individual unit	Not used		
	Common	Not used	—	—
	Individual unit	LEV opening pulse (gear operated value)	0 to 2000	Pulse
	Common	Branch Box Software ROM check sum	0000 to FFFF  Example: If it is 0BC9h, <div style="text-align: center;">             0.5 s    0.5 s    2.0 s              0b → C9 → □□              ↑—————↓           </div>	Code display
	Individual unit	Not used		

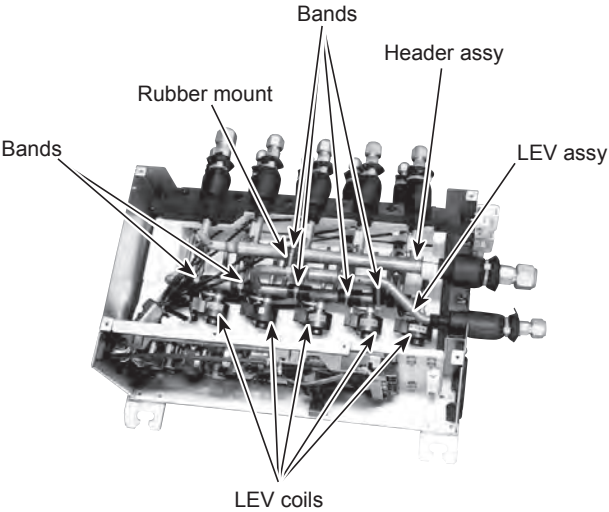
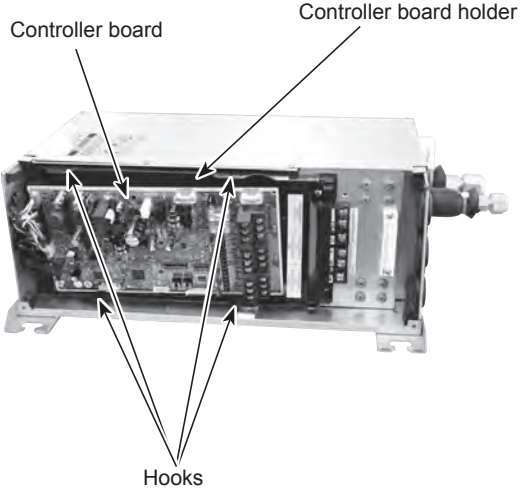
\*1 Refer to the <Table 1> for the appropriate setting for the function.

BRANCH BOX: PAC-MK53BC  
PAC-MK53BCB

PAC-MK33BC  
PAC-MK33BCB

PHOTO: PAC-MK53BC

OPERATING PROCEDURE	PHOTOS/FIGURES
<p><b>1. Removing the controller cover and under panel</b></p> <p>(1) Remove 3 controller cover fixing screws (<math>4 \times 10</math>) to detach the controller cover. (See Photo 1)</p> <p>(2) Remove 4 under panel fixing screws (<math>4 \times 10</math>) to remove the under panel. (See Photo 1)</p>	<p><b>Photo 1</b></p> 
<p><b>2. Removing the thermistor (TH-A-E*)</b></p> <p>(1) Remove the controller cover. (See Photo 1)</p> <p>(2) Remove the under panel. (See Photo 1)</p> <p>(3) Remove 8 insulations, then remove 9 pipe box (under) fixing screws (<math>4 \times 10</math>). (See Photo 2-1)</p> <p>(4) Pull out the thermistor(s), TH-A-E, from the sensor holders mounted on the gas pipe. (See Photo 2-2)</p> <p>(5) Loosen the insulation sheet which bundles the thermistor connectors.</p> <p>(6) Loosen the side clamps, then disconnect the connector(s) on the controller board.</p> <p>(7) Pull out the lead wire(s) through the hole to the controller board side.</p> <p>*TH-A-C for PAC-MK33BC(B). (See Photo 2-3)</p>	<p><b>Photo 2-1</b></p> 
<p><b>Photo 2-2</b></p> 	<p><b>Photo 2-3</b></p> 

OPERATING PROCEDURE	PHOTOS/FIGURES
<p><b>3. Removing the LEV coil (LEV-A-E*)</b></p> <ol style="list-style-type: none"> <li>(1) Remove the controller cover. (See Photo 1)</li> <li>(2) Remove the under cover. (See Photo 1)</li> <li>(3) Remove 8 insulations, then remove 9 pipe cover fixing screws (4 x 10). (See Photo 2-1)</li> <li>(4) Cut the bands that fixes the lead wire, then pull out the LEV coil(s) (LEV-A-E*). (See Photo 3)</li> <li>(5) Loosen the insulation sheet which bundles the LEV lead wires.</li> <li>(6) Loosen the side clamps, then disconnect the connector(s) on the controller board.</li> <li>(7) Pull out the lead wire(s) through the hole to the controller board side. (See Photo 2-2 or 2-3)</li> </ol> <p>*LEV-A-C for PAC-MK33BC(B). (See Photo 2-3)</p>	<p><b>Photo 3</b></p> 
<p><b>4. Removing the controller board</b></p> <ol style="list-style-type: none"> <li>(1) Remove the controller cover. (See Photo 1)</li> <li>(2) Loosen the side clamps, then disconnect the connectors on the controller board.</li> <li>(3) Pick an upper edge of the controller board, then pull forward. The controller board is fixed to the controller board holder with 4 hooks. (See Photo 4)</li> <li>(4) Remove the controller board from the controller board holder.</li> </ol>	<p><b>Photo 4</b></p> 

## OPERATING PROCEDURE

### 5. Removing the LEV assy

- (1) Remove the controller cover. (See Photo 1)
- (2) Remove the under panel. (See Photo 1)
- (3) Remove 8 the insulations, then remove 9 pipe cover fixing screws (4 x 10). (See Photo 2-1)
- (4) Loosen the side clamps, then disconnect the LEV connectors on the controller board.
- (5) Remove the earth lead wires from the LEV assy.
- (6) Pull out the lead wires through the hole to the controller board side.

#### <Removing the header assy>

- (6) Cut the band which fixes the header assy and LEV assy together, then remove the rubber mount. (See Photo 3)
- (7) Remove the header assy. (See Photo 5-1)

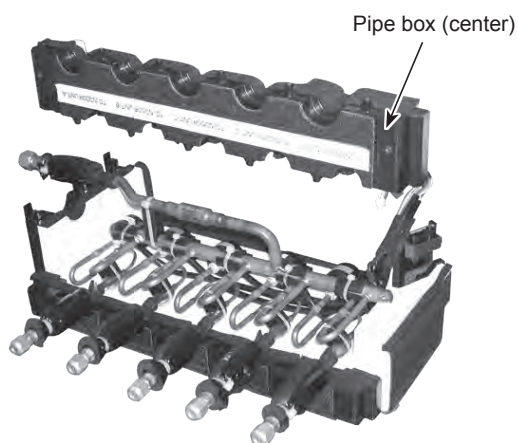
#### <Disassembling the pipe box>

- (8) Remove 2 side panel fixing screws (4 x 10). (See Photo 5-1)
- (9) Pull out the pipe box (top) and separate it from the side panel. (See Photo 5-2)
- (10) Turn the pipe box (top) upside down. (See Photo 5-3).
- (11) Remove 5 insulations, then remove 5 pipe box (top) fixing screws (4 x 10).
- (12) Turn the pipe box (top) upside down again, facing the pipe side up.
- (13) Separate the pipe box (center) from the pipe box (top). (See Photo 5-4.)
- (14) Remove the LEV assy.

#### <Pipe box cap only for PAC-MK33BC(B)>

The pipe box caps are placed in 2 unused pipe holes between the pipe box top, center and under. (See Photo 5-5)

Photo 5-4



## PHOTOS/FIGURES

Photo 5-1

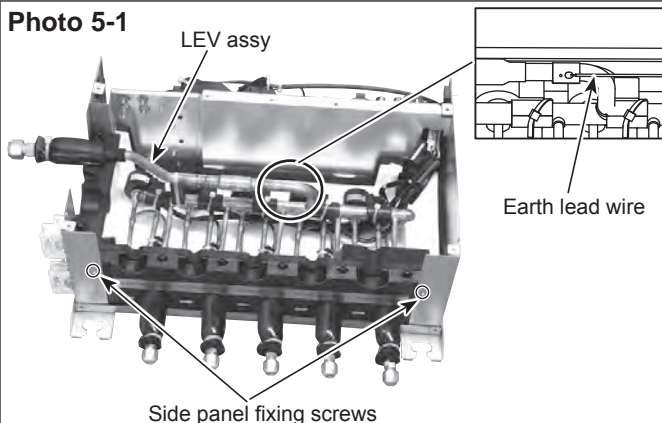


Photo 5-2

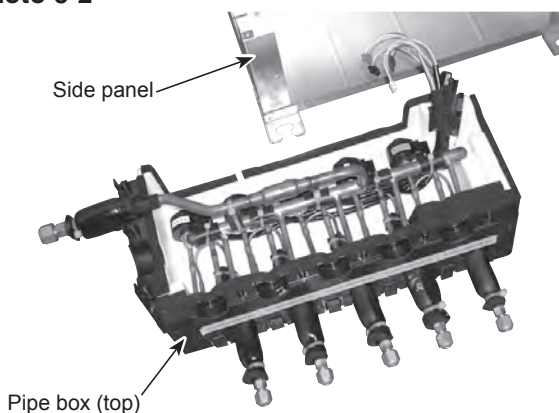


Photo 5-3

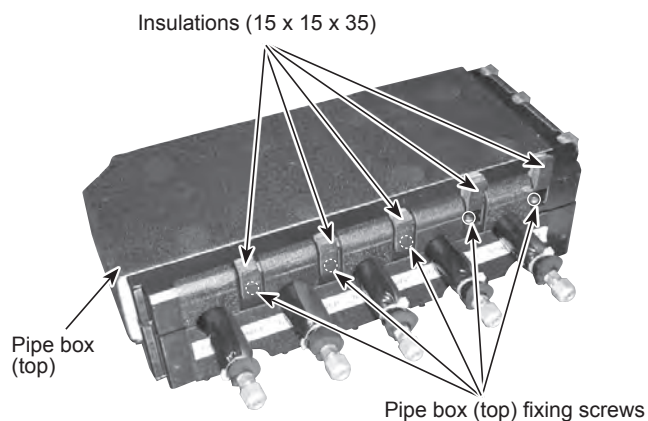
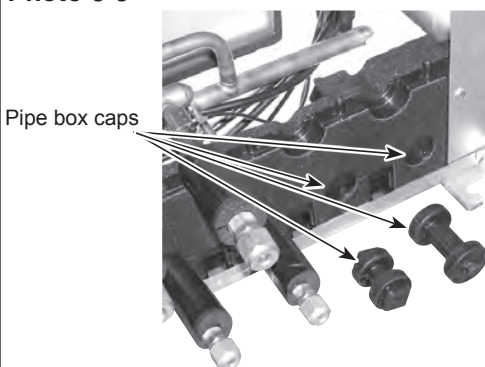


Photo 5-5





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