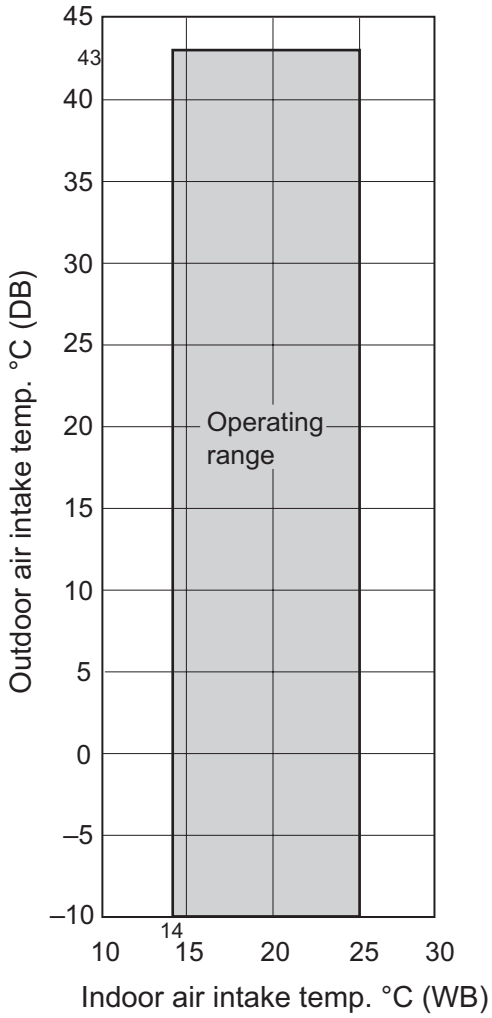
## Contents

# 2. DESIGN OF 2WAY SYSTEM

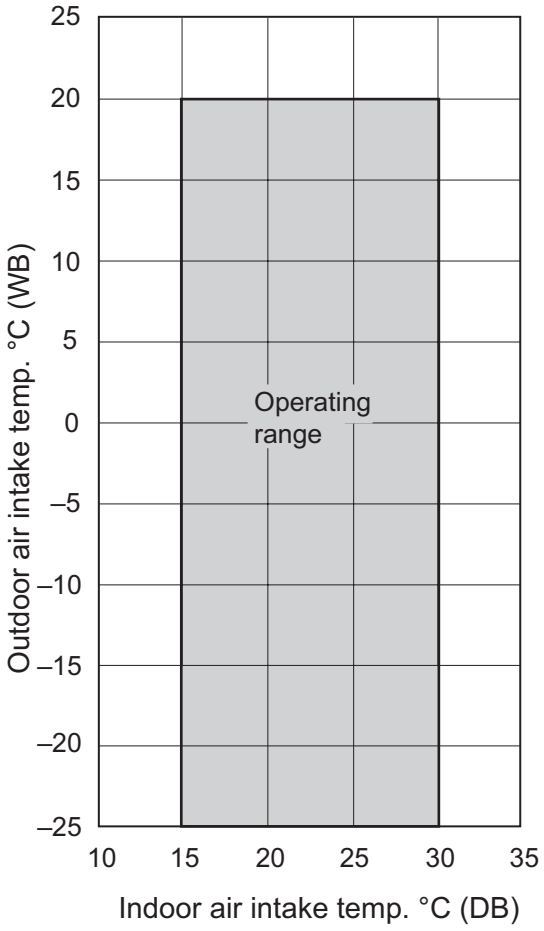
# 1. Model Selecting and Capacity Calculator

## 1-1. Operating Range

**Cooling**




**Heating**




2

# 1. Model Selecting and Capacity Calculator

## 1-2. Procedure for Selecting Models and Calculating Capacity

### ■ Model Selection Procedure

Select the model and calculate the capacity for each refrigerant system according to the procedure shown below.

Calculation of the indoor air-conditioning load
- Calculate the maximum air-conditioning load for each room or zone.

↓

Selection of an air conditioning system
- Select the ideal air conditioning system for air conditioning of each room or zone.

↓

Design of the control system
- Design a suitable control system for the selected air conditioning system.

↓

Preliminary selection of indoor and outdoor units
- Make preliminary selections that are within the allowable range for the system. ..... **2**-4 ~ **2**-13

↓

Check of the tubing length and elevation difference
- Check that the length of refrigerant tubing and the elevation difference are within the allowable ranges..... **2**-4

↓

Calculation of the corrected outdoor unit capacity
- Capacity correction coefficient for model..... **2**-13
- Capacity correction coefficient for tubing length and elevation difference ..... **2**-16
- Heating capacity correction coefficient for frosting/defrosting ..... **2**-15

↓

Calculation of the corrected capacity for each indoor unit
- Capacity correction coefficient for indoor temperature conditions ..... **2**-14, 16
- Capacity distribution ratio based on the tubing length and elevation difference ..... **2**-14 ~ 2-16

↓

Recheck of the actual capacity for each indoor unit
- If the capacity is inadequate, reexamine the unit combinations.
  Example 1: Increasing the outdoor unit capacity..... **2**-20, 21
  Example 2: Increasing the indoor unit capacity ..... **2**-22, 23
- Increasing the tubing size ..... **2**-19

↓

Design of tubing
- Create a tubing design which minimizes the amount of additional refrigerant charge as much as possible. ..... **2**-4 ~ **2**-12
- If tubing extension for additional unit is expected in the future, create the tubing design with adequate consideration for this extension.
- Select the tubing size for the main tube (LA) up to the No. 1 distribution joint based on the rated cooling capacity of the outdoor unit. Select tubing sizes after the distribution point based on the total rated cooling capacity of the connected indoor units.
- Increasing the tubing size of the wide tubes can reduce the loss of capacity caused by longer tubing lengths. (Only the main wide tube with the largest tube diameter (main tube LA and main tubes after the distribution point that are the same size as LA) can be changed.) In this case, it is necessary to recalculate the actual indoor unit capacities. ..... **2**-22, 23

↓

Calculation of additional refrigerant charge amount
- Calculate the additional refrigerant charge from the diameters and lengths of the refrigerant tubing. Even if the wide tubing diameter was increased, determine the additional refrigerant charge based only on the narrow tubing size. ..... **2**-6
- Check the minimum indoor capacity (limit density) with respect to the amount of refrigerant. If the limit density is exceeded, be sure to install ventilation equipment or take other corrective steps. **2**-12

↓

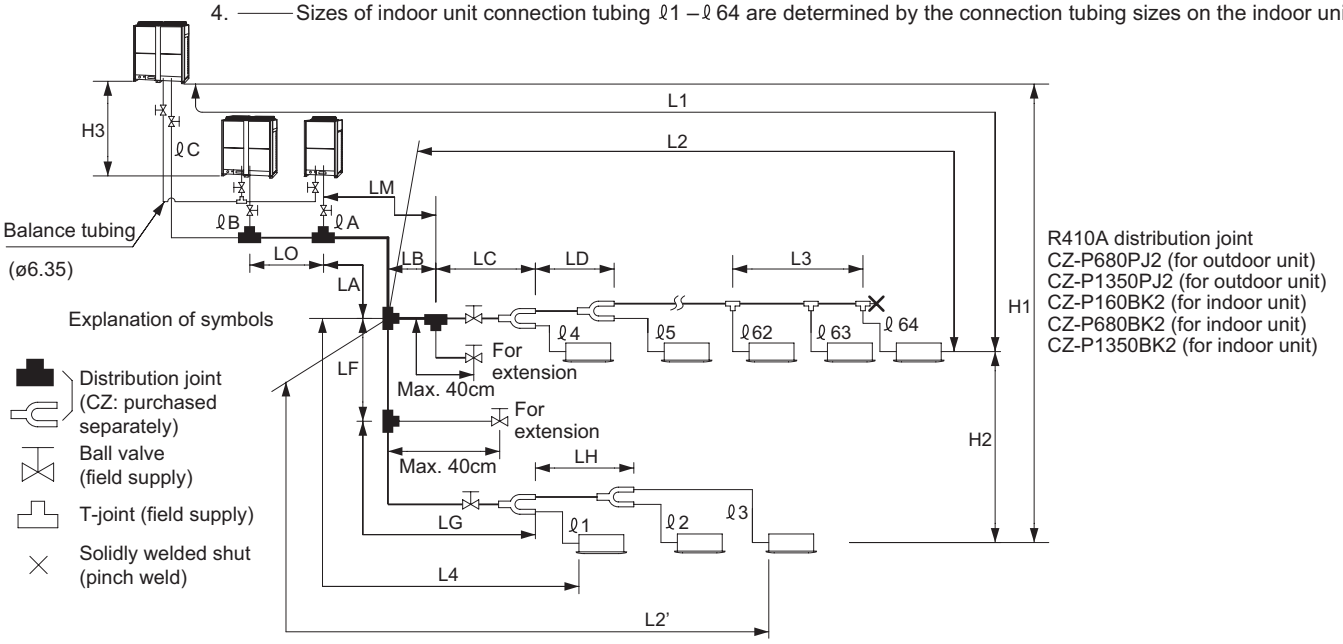
Design of electrical wiring capacity
- Select a wiring capacity according to the method of power supply. ..... **2**-26

# 1. Model Selecting and Capacity Calculator

## 1-3. Tubing Length

Select the installation location so that the length and size of refrigerant tubing are within the allowable range shown in the figure below.

1. —— Main tubing length LM = LA + LB …
2. —— Main distribution tubes LC – LH are selected according to the capacity after the distribution joint.
3. The outdoor connection main tubing (LO portion) is determined by the total capacity of the outdoor units that are connected to the tube ends.
4. —— Sizes of indoor unit connection tubing ℓ1 – ℓ64 are determined by the connection tubing sizes on the indoor units.




Note: Do not use commercially available T-joints for the liquid tubing and parts.

* Be sure to use special R410A distribution joints (purchased separately) for outdoor unit connections and tubing branches.

**Table 2-1 Ranges that Apply to Refrigerant Tubing Lengths and to Differences in Installation Heights**

| Item | Mark | Contents | | Length (m) |
|---|---|---|---|---|
| Allowable tubing length | L1 | Max. tubing length | Actual length | ≤ 180 |
| | | | Equivalent length | ≤ 200 |
| | Δ L (L2 – L4) | Difference between max. length and min. length from the No.1 distribution joint | | ≤ 50 *5 |
| | LM | Max. length of main tubing (at max. diameter) | | *3 |
| | ℓ1, ℓ2...ℓ64 | Max. length of each distribution tube | | ≤ 30 |
| | L1+ ℓ1+ ℓ2...ℓ63+ ℓA+ ℓB+LF+LG+LH | Total max. tubing length including length of each distribution tube (only liquid tubing) | | ≤ 1000 |
| | ℓA, ℓB+LO, ℓC+LO | Maximum tubing length from outdoor's 1st distribution joint to each outdoor unit | | ≤ 10 |
| Allowable elevation difference | H1 | When outdoor unit is installed higher than indoor unit | | ≤ 50 |
| | | When outdoor unit is installed lower than indoor unit | | ≤ 40 |
| | H2 | Max. difference between indoor units | | ≤ 15 *6 |
| | H3 | Max. difference between outdoor units | | ≤ 4 |
| Allowable length of joint tubing | L3 | T-joint tubing (field-supply); Max. tubing length between the first T-joint and solidly welded-shut end point | | ≤ 2 |

L = Length, H = Height

**NOTE**

1: The outdoor connection main tubing (LO portion) is determined by the total capacity of the outdoor units that are connected to the tube ends.

2: If the longest tubing length (L1) exceeds 90 m (equivalent length), increase the sizes of the main tubes (LM) by 1 rank for gas tubes and liquid tubes. (Use a field supply reducer.) (Select the tube size from the table of main tube sizes (Table 2-5) on the following page (LA table), and from the table of refrigerant tubing sizes (Table 2-7) on the second following page.)

3: If the longest main tube length (LM) exceeds 50 m, increase the main tube size at the portion before 50 m by 1 rank for the gas tubes. (Use a field supply reducer.) Determine the length less than the limitation of allowable maximum tubing length. (For the portion that exceeds 50 m, set based on the main tube sizes (LA) listed in the table on the following page.)

# 1. Model Selecting and Capacity Calculator

4: If the size of the existing tubing is already larger than the standard tubing size, it is not necessary to further increase the size.
* If the existing tubing is used and the amount of on-site refrigerant charge exceeds the value listed below, change the size of the tubing to reduce the amount of refrigerant.

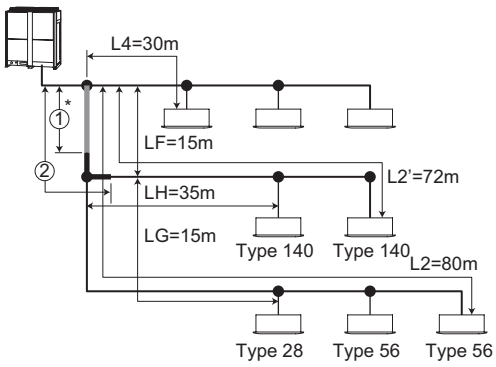
| | with 1 outdoor unit | with 2 outdoor units | with 3 outdoor units |
|---|---|---|---|
| Total amount of refrigerant for the system | 50 kg | 80 kg | 100 kg |

5: 1) Calculate the ΔL (L2(L2', L2" ･･･ ) - L4) of each combined indoor unit from the first distribution joint.
The L2(L2', L2"･･･ ) indicates the pipe length connected to the farthest indoor unit among each combined indoor unit from the first distribution joint. The L4 indicates the pipe length connected to the nearest indoor unit among all connected indoor units to the system. It is necessary to calculate the ΔL of each combined indoor unit.

2) If the calculated ΔL exceeds 40m, increase by one size of both the liquid and gas tubes.
The length of pipe needed to increase by one size becomes different according to the total cooling capacity of combined indoor unit which the ΔL exceeds 40m.
Calculate the total cooling capacity of combined indoor units which the ΔL exceeds 40m.
Then apply to a certain pipe length from the first distribution listed below.
Be sure to use the reducer (field supply) at joint portion between the original pipe and the pipe increased by one size.
If there is the necessity to increase by one size, do not increase the pipe (LB or LF) any more when the pipe LB or pipe LF part is overlapped. There can be only one time effective to increase by one size from original pipe size.

The total cooling capacity after distribution for each combined indoor unit is less than 22.4kW: 12m
The total cooling capacity after distribution for each combined indoor unit is over 22.4kW and less than 52.4kW: 20m
The total cooling capacity after distribution for each combined indoor unit is over 52.4kW: 28m

Example 1 :



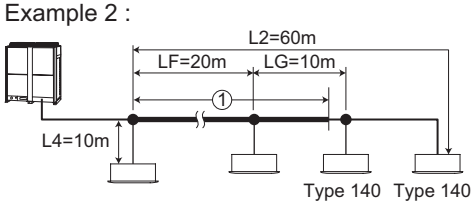

* There is an overlapping area between ① and ② . However, this is an increase by only one size.

Refer to the figure on the left.
The ΔL exceeds 40m.
ΔL = L2 - L4 = 80m - 30m = 50m
ΔL = L2' - L4= 72m - 30m = 42m
Then, calculate the value for the tube amounts.
Capacity 42 kW LF : 15m, liquid tube ø12.7, gas tube ø28.58
Capacity 14 kW LG : 15m,liquid tube ø9.52, gas tube ø15.88
Capacity 28 kW LH : 35m,liquid tube ø9.52, gas tube ø22.22

① Since the gas tube and liquid tube are extended to 12m from the 1st distribution joint to be directed towards the L2 indoor units, increase the LF to 12m by one size.
② Since the gas tube and liquid tube are extended to 20m from the 1st distribution joint to be directed towards the L2' indoor units, increase the LF to 15m and the LH to 5m by one size.

The tube length eventually becomes as follows.
LF: Total 15m, liquid tube ø15.88, gas tube ø31.75
LH: The 2nd distribution joint to 5m, liquid tube ø12.7, gas tube ø25.4. Then, the remainder is 30m, liquid tube ø9.52, gas tube ø22.22.

Example 2 :




Refer to the figure on the left.
The ΔL exceeds 40m.
ΔL = L2 - L4 = 60m - 10m = 50m
Then, calculate the value for the tube amounts.
Capacity 54 kW LF: 20m, liquid tube ø15.88, gas tube ø28.58
Capacity 28 kW LG: 10m, liquid tube ø9.52, gas tube ø22.22

① Since the gas tube and liquid tube are extended to 28m from the 1st distribution joint to be directed towards the L2 indoor units.
LF: Total 20m, liquid tube ø19.05, gas tube ø31.75
LG: The 2nd distribution joint to 8m, liquid tube ø12.7, gas tube ø25.4. Then, the remainder is 2m, liquid tube ø9.52, gas tube ø22.22.

6: If the tubing length exceeds 500m, the formula is 15 x (2 - all tubing length/500). Determine the length less than the limitation of allowable maximum tubing length.

# 1. Model Selecting and Capacity Calculator

### Additional Refrigerant Charge

Additional refrigerant charge amount is calculated below.

Required amount of additional refrigerant charge
= [ (Amount of additional refrigerant charge per meter of each size of liquid tube x its tube length) + (...) + (...)]
+ [(Necessary amount of additional refrigerant charge per outdoor unit + (...) + (...)]

* Always charge accurately using a scale for weighing.

* If the existing tubing is used and the amount of on-site additional refrigerant charge exceeds the value listed below, change the size of the tubing to reduce the amount of refrigerant.

| | with 1 outdoor unit | with 2 outdoor unit | with 3 outdoor unit |
|---|---|---|---|
| Total amount of refrigerant for the system | 50 kg | 80 kg | 100 kg |

**Table 2-2-1 Amount of Additional Refrigerant Charge Per Meter, According to Liquid Tubing Size**

| **Liquid tubing size** | 6.35 | 9.52 | 12.7 | 15.88 | 19.05 | 22.22 | 25.4 |
|---|---|---|---|---|---|---|---|
| **Amount of additional refrigerant charge/m (g/m)** | 26 | 56 | 128 | 185 | 259 | 366 | 490 |



**Table 2-2-2 Necessary Amount of Additional Refrigerant Charge Per Outdoor Unit**

| U-8ME1E8(E) | U-10ME1E8(E) | U-12ME1E8(E) | U-14ME1E8(E) | U-16ME1E8(E) | U-18ME1E8(E) | U-20ME1E8(E) |
|---|---|---|---|---|---|---|
| 2.5 kg | 3.5 kg | 3.5 kg | 6.4 kg | 6.4 kg | 7.6 kg | 7.6 kg |

**Table 2-3 Refrigerant Charge Amount at Shipment (for Outdoor Unit)**

| U-8ME1E8(E) | U-10ME1E8(E) | U-12ME1E8(E) | U-14ME1E8(E) | U-16ME1E8(E) | U-18ME1E8(E) | U-20ME1E8(E) |
|---|---|---|---|---|---|---|
| 9.9 kg | 9.9 kg | 9.9 kg | 9.9 kg | 9.9 kg | 9.9 kg | 9.9 kg |

**Table 2-4 System Limitations**

| | |
|---|---|
| Max. No. allowable connected outdoor units | 3 * 2 |
| Max. capacity allowable connected outdoor units | 168 kW (60 hp) |
| Max. connectable indoor units | 64 * 1 |
| Max. allowable indoor/outdoor capacity ratio | 50 – 200 % * 3 |

*1: In the case of 22 hp (type 61.5 kW) or smaller units, the number is limited by the total capacity of the connected indoor units.

*2: Up to 3 units can be connected if the system has been extended.

*3: It is strongly recommended that you choose the unit so the load can become between 50 and 130%.

# 1. Model Selecting and Capacity Calculator

## 1-4. Tubing Size

**Table 2-5-1 Main Tubing Size (LA) (Standard-COP mode)**

| Total system horsepower (kW) | Combined outdoor units | | | Liquid tubing (mm) | Gas tubing (mm) |
|---|---|---|---|---|---|
| 8 hp (22.4) | U-8ME1E8(E) | — | — | ø9.52 | ø19.05 |
| 10 hp (28.0) | U-10ME1E8(E) | — | — | ø9.52 | ø22.22 |
| 12 hp (33.5) | U-12ME1E8(E) | — | — | ø12.7 | ø25.4 |
| 14 hp (40.0) | U-14ME1E8(E) | — | — | ø12.7 | ø25.4 |
| 16 hp (45.0) | U-16ME1E8(E) | — | — | ø12.7 | ø28.58 |
| 18 hp (50.0) | U-18ME1E8(E) | — | — | ø15.88 | ø28.58 |
| 20 hp (56.0) | U-20ME1E8(E) | — | — | ø15.88 | ø28.58 |
| 22 hp (61.5) | U-14ME1E8(E) | U-8ME1E8(E) | — | ø15.88 | ø28.58 |
| 24 hp (68.0) | U-14ME1E8(E) | U-10ME1E8(E) | — | ø15.88 | ø28.58 |
| 26 hp (73.0) | U-14ME1E8(E) | U-12ME1E8(E) | — | ø19.05 | ø31.75 |
| 28 hp (78.5) | U-16ME1E8(E) | U-12ME1E8(E) | — | ø19.05 | ø31.75 |
| 30 hp (85.0) | U-16ME1E8(E) | U-14ME1E8(E) | — | ø19.05 | ø31.75 |
| 32 hp (90.0) | U-16ME1E8(E) | U-16ME1E8(E) | — | ø19.05 | ø31.75 |
| 34 hp (96.0) | U-18ME1E8(E) | U-16ME1E8(E) | — | ø19.05 | ø31.75 |
| 36 hp (101.0) | U-20ME1E8(E) | U-16ME1E8(E) | — | ø19.05 | ø38.1 |
| 38 hp (107.0) | U-20ME1E8(E) | U-18ME1E8(E) | — | ø19.05 | ø38.1 |
| 40 hp (113.0) | U-20ME1E8(E) | U-20ME1E8(E) | — | ø19.05 | ø38.1 |
| 42 hp (118.0) | U-16ME1E8(E) | U-14ME1E8(E) | U-12ME1E8(E) | ø19.05 | ø38.1 |
| 44 hp (124.0) | U-16ME1E8(E) | U-16ME1E8(E) | U-12ME1E8(E) | ø19.05 | ø38.1 |
| 46 hp (130.0) | U-16ME1E8(E) | U-16ME1E8(E) | U-14ME1E8(E) | ø19.05 | ø38.1 |
| 48 hp (135.0) | U-16ME1E8(E) | U-16ME1E8(E) | U-16ME1E8(E) | ø19.05 | ø38.1 |
| 50 hp (140.0) | U-18ME1E8(E) | U-16ME1E8(E) | U-16ME1E8(E) | ø19.05 | ø38.1 |
| 52 hp (145.0) | U-20ME1E8(E) | U-16ME1E8(E) | U-16ME1E8(E) | ø19.05 | ø38.1 |
| 54 hp (151.0) | U-20ME1E8(E) | U-18ME1E8(E) | U-16ME1E8(E) | ø19.05 | ø38.1 |
| 56 hp (156.0) | U-20ME1E8(E) | U-18ME1E8(E) | U-18ME1E8(E) | ø19.05 | ø38.1 |
| 58 hp (162.0) | U-20ME1E8(E) | U-20ME1E8(E) | U-18ME1E8(E) | ø19.05 | ø38.1 |
| 60 hp (168.0) | U-20ME1E8(E) | U-20ME1E8(E) | U-20ME1E8(E) | ø19.05 | ø38.1 |

*1: If future extension is planned, select the tubing diameter based on the total horsepower after extension.
However extension is not possible if the resulting tubing size is two ranks higher.
*2: The balance tube (outdoor unit tube) diameter is ø6.35.
*3: The refrigerant tubing should be used with R410A refrigerant.
*4: If the length of the longest tube (L1) exceeds 90 m (equivalent length), increase the main tube (LM) size by 1 rank for the gas and liquid tubes. (Use field-supply reducers.) (Select from Table 2-5-1 and Table 2-9.)
*5: If the longest main tube length (LM) exceeds 50 m, increase the main tube size at the portion before 50 m by 1 rank for the gas tubes.
(For the portion that exceeds 50 m, set based on the main tube sizes (LA) listed in the table above.)

# 1. Model Selecting and Capacity Calculator

## 1-4. Tubing Size (continued)

### High-COP mode

Setting the DIP switch (S011) on the outdoor unit PCB to “ON” activates the high-COP mode.

* Hereafter, the DIP switch (S011) “ON” is defined as the high-COP mode and “OFF” is defined as the standard COP mode.

### Outdoor unit capacity and tubing diameter during high-COP mode

When operating in the high-COP mode, the outdoor unit capacity decreases against the standard COP mode.
Referring to the following table, select the most suitable unit and main pipe diameter for the air conditioning load.

**Table 2-5-2 Main Tubing Size (LA) (High-COP mode)**

| Total system horsepower (kW) | Combined outdoor units | | | Liquid tubing (mm) | Gas tubing (mm) |
|---|---|---|---|---|---|
| 8 hp (22.4) | | — | — | — | — |
| 10 hp (28.0) | U-14ME1E8(E) | — | — | ø9.52 | ø22.22 |
| 12 hp (33.5) | U-16ME1E8(E) | — | — | ø12.7 | ø25.4 |
| 14 hp (40.0) | U-18ME1E8(E) | — | — | ø12.7 | ø25.4 |
| 16 hp (45.0) | U-20ME1E8(E) | — | — | ø12.7 | ø28.58 |
| 18 hp (50.0) | U-14ME1E8(E) | U-8ME1E8(E) | — | ø15.88 | ø28.58 |
| 20 hp (56.0) | U-16ME1E8(E) | U-8ME1E8(E) | — | ø15.88 | ø28.58 |
| 22 hp (61.5) | U-18ME1E8(E) | U-8ME1E8(E) | — | ø15.88 | ø28.58 |
| 24 hp (68.0) | U-16ME1E8(E) | U-16ME1E8(E) | — | ø15.88 | ø28.58 |
| 26 hp (73.0) | U-18ME1E8(E) | U-16ME1E8(E) | — | ø19.05 | ø31.75 |
| 28 hp (78.5) | U-20ME1E8(E) | U-16ME1E8(E) | — | ø19.05 | ø31.75 |
| 30 hp (85.0) | U-20ME1E8(E) | U-18ME1E8(E) | — | ø19.05 | ø31.75 |
| 32 hp (90.0) | U-20ME1E8(E) | U-20ME1E8(E) | — | ø19.05 | ø31.75 |
| 34 hp (96.0) | U-18ME1E8(E) | U-16ME1E8(E) | U-8ME1E8(E) | ø19.05 | ø31.75 |
| 36 hp (101.0) | U-16ME1E8(E) | U-16ME1E8(E) | U-16ME1E8(E) | ø19.05 | ø38.1 |
| 38 hp (107.0) | U-18ME1E8(E) | U-16ME1E8(E) | U-16ME1E8(E) | ø19.05 | ø38.1 |
| 40 hp (113.0) | U-20ME1E8(E) | U-16ME1E8(E) | U-16ME1E8(E) | ø19.05 | ø38.1 |
| 42 hp (118.0) | U-20ME1E8(E) | U-18ME1E8(E) | U-16ME1E8(E) | ø19.05 | ø38.1 |
| 44 hp (124.0) | U-20ME1E8(E) | U-18ME1E8(E) | U-18ME1E8(E) | ø19.05 | ø38.1 |
| 46 hp (130.0) | U-20ME1E8(E) | U-20ME1E8(E) | U-18ME1E8(E) | ø19.05 | ø38.1 |
| 48 hp (135.0) | U-20ME1E8(E) | U-20ME1E8(E) | U-20ME1E8(E) | ø19.05 | ø38.1 |

* Be sure that the total load of indoor units (load when operating the maximum number of units) should not exceed 130% of the outdoor unit capacity.

### Tube diameter of each outdoor unit

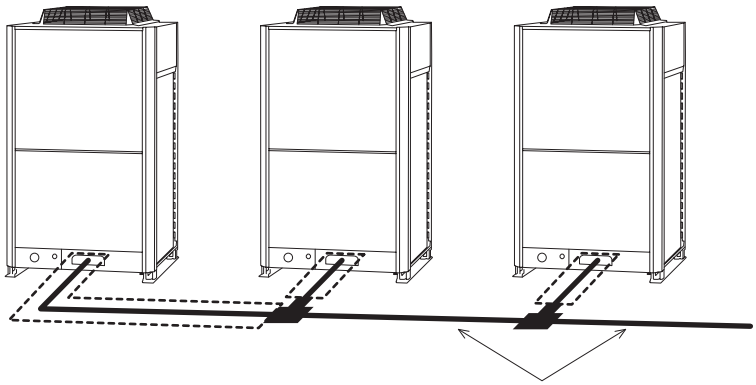
When connecting the tube to the outdoor unit in the high-COP mode, you may need to use smaller diameter tubes.
So, it is necessary to provide the reducer for the connection. Supply the reducer in the field.

For the system to which more than two outdoor units are connected, you can use the tube diameter of the standard COP mode between the outdoor unit and the first distribution joint (inside the dotted lines of Fig. 2-1).

* Beyond the first distribution joint (outside the dotted lines of Fig. 2-1), be sure to select the tube diameter according to the outdoor unit capacity in the high-COP mode.
* The balance tube diameter is 6.35 mm in every unit.

# 1. Model Selecting and Capacity Calculator

**Tube diameter of each outdoor unit (Continued)**



Select the diameter of these tubes according to the outdoor unit capacity in the high-COP mode.

**Fig. 2-1**

**Table 2-5-3** Unit : mm

| | | | | | |
|---|---|---|---|---|---|
| Standard COP mode | Capacity | 14 hp | 16 hp | 18 hp | 20 hp |
| | Gas tubing | ø25.4 | ø28.58 | ø28.58 | ø28.58 |
| | Liquid tubing | ø12.7 | ø12.7 | ø15.88 | ø15.88 |

**Table 2-5-4**

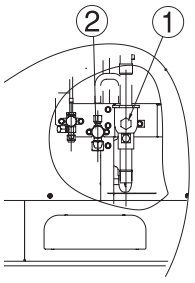
| | | | | | |
|---|---|---|---|---|---|
| High-COP mode | Capacity | 10 hp | 12 hp | 14 hp | 16 hp |
| | Gas tubing | ø22.22 | ø25.4 | ø25.4 | ø28.58 |
| | Liquid tubing | ø9.52 | ø12.7 | ø12.7 | ø12.7 |

| | | | | |
|---|---|---|---|---|
| Gas valve diameter of outdoor unit | ø25.4 | ø25.4 | ø28.58 | ø28.58 |
| Liquid valve diameter of outdoor unit | ø12.7 | ø12.7 | ø15.88 | ø15.88 |

* Only for the system to which more than two outdoor units are connected, you can use the tube diameter for the standard COP mode up to the first distribution joint.

**Example : When the capacity is 10 hp in the high-COP mode**

- You need to use reducers (field supplied) to connect the 22.22 mm diameter tube (Table 2-5-4) to the 25.4 mm diameter gas valve (Table 2-5-3).
  However, only for the system to which more than two outdoor units are connected, you can use 25.4 mm diameter tubes without using any reducers.
- You need to use reducers (field supplied) to connect the 9.52 mm diameter tube (Table 2-5-4) to the 12.7 mm diameter liquid valve (Table 2-5-3).
  However, only for the system to which more than two outdoor units are connected, you can use 12.7 mm diameter tubes without using any reducers.



# 1. Model Selecting and Capacity Calculator

## ■ Size of tubing (LO) between outdoor units

Select the size of tubing between outdoor units based on the main tubing size (LA) as given in the tables under the section of 2-5-1 Main Tubing Size (LA)(Standard-COP mode) and 2-5-2 Main Tubing Size (LA)(High-COP mode).

**Table 2-6 Main Tubing Size After Distribution (LB, LC...)**

Unit: mm
hp = horsepower

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Total capacity after distribution | Below kW | 7.1 (2.5 hp) | 16.0 (6 hp) | 22.5 (8.1 hp) | 30.0 (11 hp) | 42.0 (15 hp) | 52.4 (19 hp) | 70.0 (25 hp) | 98.0 (35 hp) | – |
| | Over kW | – | 7.1 (2.5 hp) | 16.0 (6 hp) | 22.5 (8.1 hp) | 30.0 (11 hp) | 42.0 (15 hp) | 52.4 (19 hp) | 70.0 (25 hp) | 98.0 (35 hp) |
| Tubing size | Gas tubing (mm) | ø12.7 | ø15.88 | ø19.05 | ø22.22 | ø25.4 | ø28.58 | ø28.58 | ø31.75 | ø38.1 |
| | Liquid tubing (mm) | ø9.52 | ø9.52 | ø9.52 | ø9.52 | ø12.7 | ø12.7 | ø15.88 | ø19.05 | ø19.05 |

**NOTE** In case the total capacity of connected indoor units exceeds the total capacity of the outdoor units, select the main tubing size for the total capacity of the outdoor units. (Especially the main tubing segments of LA, LB and LF.)

**Table 2-7 Outdoor Unit Tubing Connection Size( ⓛA – ⓛC)**

Unit: mm

| kW | 22.4 | 28.0 | 33.5 | 40.0 | 45.0 | 50.0 | 56.0 |
|---|---|---|---|---|---|---|---|
| Gas tubing | ø19.05 | ø22.22 | ø25.4 | | ø28.58 | | |
| | Brazing connection | | | | | | |
| Liquid tubing | ø9.52 | | ø12.7 | | | ø15.88 | |
| | Flare connection | | | | | | |
| Balance tubing | ø6.35 | | | | | | |
| | Flare connection | | | | | | |

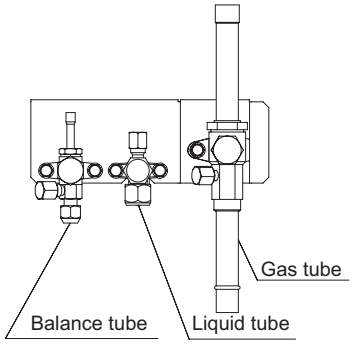



**Table 2-8 Indoor Unit Tubing Connection Size**

| Indoor unit type | 22 | 28 | 36 | 45 | 56 | 73 | 90 | 106 | 140 | 160 | 224 | 280 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gas tubing (mm) | ø12.7 | | | | | ø15.88 | | | | | ø19.05 | ø22.22 |
| Liquid tubing (mm) | ø6.35 | | | | | ø9.52 | | | | | | |

**Note:** Use C1220T-1/2H or -H material for tubing over ø22.22.

**Table 2-9 Refrigerant tubing (Existing tubing can be used.)**

| Tubing size (mm) | | | |
|---|---|---|---|
| Material O | | Material 1/2H•H | |
| ø6.35 | t 0.8 | ø22.22 | t 1.0 |
| ø9.52 | t 0.8 | ø25.40 | t 1.0 |
| ø12.7 | t 0.8 | ø28.58 | t 1.0 |
| ø15.88 | t 1.0 | ø31.75 | t 1.1 |
| ø19.05 | t 1.2 | ø38.10 | over t 1.35 |
| | | ø41.28 | over t 1.45 |

* When bending the tubes, use a bending radius that is at least 4 times the outer diameter of the tubes. In addition, take sufficient care to avoid crushing or damaging the tubes when bending them.

# 1. Model Selecting and Capacity Calculator

## ■ Straight equivalent length of joints

### 1-5. Straight Equivalent Length of Joints

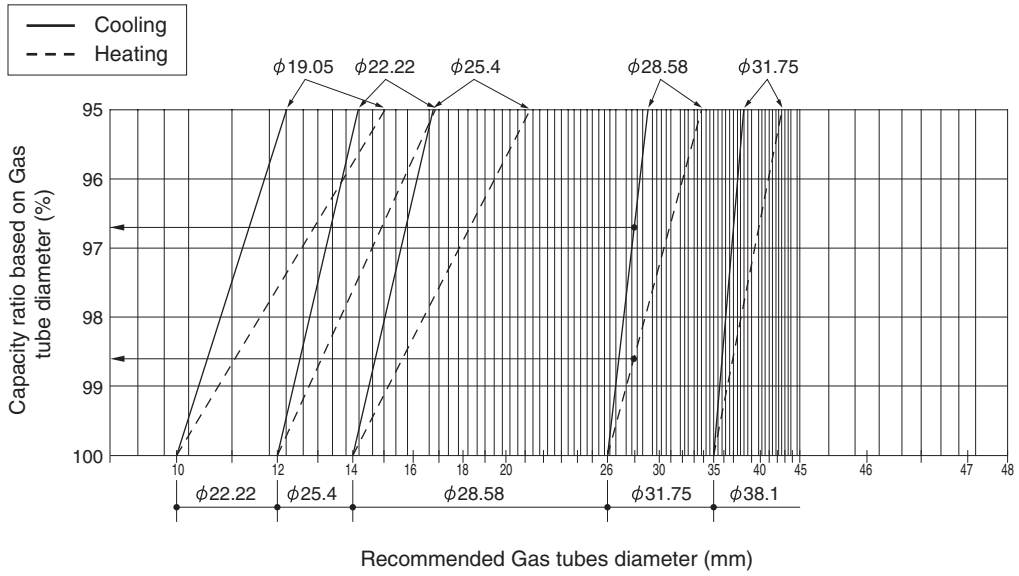
Design the tubing system by referring to the following table for the straight equivalent length of joints.

**Straight Equivalent Length of Joints**

| **Wide tubing size (mm)** | **12.7** | **15.88** | **19.05** | **22.22** | **25.4** | **28.58** | **31.75** | **38.1** |
|---|---|---|---|---|---|---|---|---|
| 90° elbow | 0.3 | 0.35 | 0.42 | 0.48 | 0.52 | 0.57 | 0.7 | 0.79 |
| 45° elbow | 0.23 | 0.26 | 0.32 | 0.36 | 0.39 | 0.43 | 0.53 | 0.59 |
| U-shape tube bent (R60 - 100 mm) | 0.9 | 1.05 | 1.26 | 1.44 | 1.56 | 1.71 | 2.1 | 2.37 |
| Trap bend | 2.3 | 2.8 | 3.2 | 3.8 | 4.3 | 4.7 | 5.0 | 5.8 |
| Y-branch distribution joint | Equivalent length conversion not needed. | | | | | | | |
| Ball valve for service | Equivalent length conversion not needed. | | | | | | | |

### ● Capacity loss caused by differences in tubing diameters

* Capacity loss will occur if a tubing system that matches the horsepower is not selected (for example, if a tubing system was determined and installed with no plan for extension and extension occurs later). The loss rate can be found from the graph below.




(Reading the graph)
<Example 1>
Currently a 20 HP system and ϕ 28.58 Gas tubings are used. Subsequently the system is expanded, with 8 HP added to the same tubing system.

- Horsepower after extension: 20 + 8 = 28 HP
- From the graph above: Cooling: Capacity ratio is 96.7%. Actual capacity = 28 × 0.967 = 27.1 HP
  Heating: Capacity ratio is 98.6%. Actual capacity = 28 × 0.986 = 27.6 HP

# 1. Model Selecting and Capacity Calculator

## ■ Additional refrigerant charge amount

Additional refrigerant charge amount is calculated below.

Required amount of additional refrigerant charge
= [ (Amount of additional refrigerant charge per meter of each size of liquid tube x its tube length) + (...) + (...)]
+ [(Necessary amount of additional refrigerant charge per outdoor unit + (...) + (...)]

* Always charge accurately using a scale for weighing.
* If the existing tubing is used and the amount of on-site refrigerant charge exceeds the value listed below, change the size of the tubing to reduce the amount of refrigerant.

Total amount of refrigerant for the system with 1 outdoor unit : 50 kg
Total amount of refrigerant for the system with 2 outdoor units : 80 kg
Total amount of refrigerant for the system with 3 outdoor units : 100 kg

**Amount of Additional Refrigerant Charge Per Meter, According to Liquid Tubing Size**

| **Liquid tubing size** | 6.35 | 9.52 | 12.7 | 15.88 | 19.05 | 22.22 |
|---|---|---|---|---|---|---|
| **Amount of additional refrigerant charge/m (g/m)** | 26 | 56 | 128 | 185 | 259 | 366 |

2

## ■ Check of limit density

**WARNING** **Always check the gas density limit for the room in which the unit is installed.**

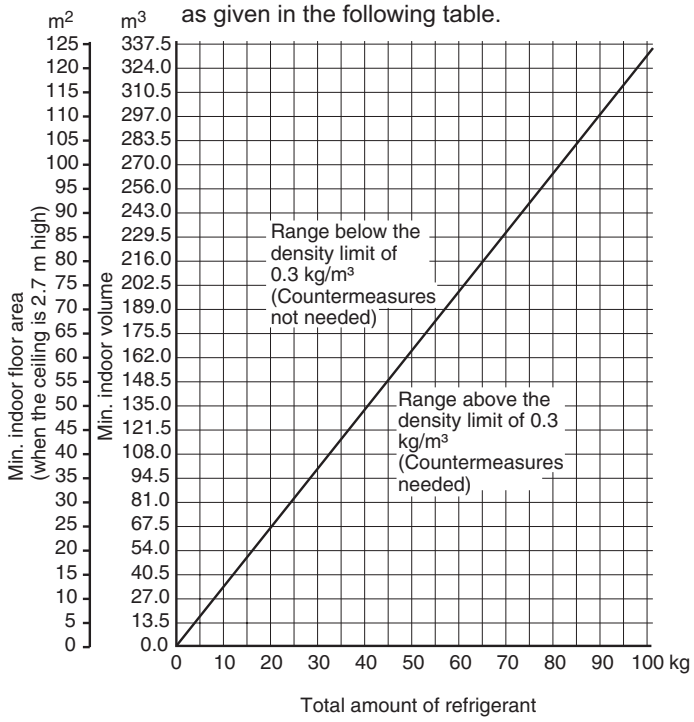
### 1-6. Check of Limit Density

When installing an air conditioner in a room, it is necessary to ensure that if the refrigerant gas accidentally leaks out, its density does not exceed the limit level for that room.
If the density could exceed the limit level, it is necessary to provide an opening between the unit and the adjacent room, or to install mechanical ventilation which is interlocked with the leak detector.

**Overall refrigerant charge amount for the air conditioner : kg**
**(Minimum room volume for indoor unit: $m^3$)**
**≦ Limit density 0.3 ($kg/m^3$)**

The limit density of refrigerant which is used in this unit is 0.3 $kg/m^3$ (ISO 5149).
The shipped outdoor unit comes charged with the amount of refrigerant fixed for each type, so add it to the amount that is charged in the field. (For the refrigerant charge amount at shipment, refer to the unit's nameplate.)

Minimum indoor volume and floor area as against the amount of refrigerant is roughly as given in the following table.




**CAUTION** **Pay special attention to any location, such as a basement, etc., where leaking refrigerant can accumulate, since refrigerant gas is heavier than air.**

# 1. Model Selecting and Capacity Calculator

## 1-7. Calculation of Actual Capacity of Indoor Unit

### ■ Calculating the actual capacity of each indoor unit

Because the capacity of a multi air-conditioner changes according to the temperature conditions, tubing length, elevation difference and other factors, select the correct model after taking into account the various correction values. When selecting the model, calculate the corrected capacities of the outdoor unit and each indoor unit. Use the corrected outdoor unit capacity and the total corrected capacity of all the indoor units to calculate the actual final capacity of each indoor unit.

**1. Outdoor unit capacity correction**

**Outdoor unit capacity correction (kW) = Rated capacity × (A) × (B) × (C) × (D)**

(A) Capacity correction for the outdoor unit temperature conditions (%)

Read the capacity correction for outdoor unit temperature, indoor unit temperature and indoor/ outdoor ratio as shown in the section “8. CAPACITY TABLE”.

* Indoor unit temperature is indoor unit rated capacity - weighted average temperature.

Example

Cooling operation

| No. | (a) Rated capacity | (b) Intake temperature | (a) × (b) |
|---|---|---|---|
| 1 | 2.8 kW | 19 WB | 53.2 |
| 2 | 3.6 kW | 18 WB | 64.8 |
| 3 | 4.5 kW | 17 WB | 76.5 |
| 4 | 5.6 kW | 16 WB | 89.6 |

Rated capacity-weighted average temperature = $\frac{\sum((a)\times(b))}{\sum(a)}$ = 17.2WB

* The indoor/ outdoor ratio should be selected according to the real rated capacity.

Example

There are 4 indoor units for class 28, 36, 45, 56 and the outdoor unit HP is 8 (22.4kW in the cooling-mode, 25.0kW in the heating-mode).

| No. | Rated cooling capacity | Rated heating capacity |
|---|---|---|
| 1 | 2.8 kW | 3.2 kW |
| 2 | 3.6 kW | 4.2 kW |
| 3 | 4.5 kW | 5.0 kW |
| 4 | 5.6 kW | 6.3 kW |
| Total | 16.5 kW | 18.7 kW |
| I/O ratio | 73.7% | 74.8 % |

(B) Capacity correction coefficient for outdoor unit tubing length (%)

From the graph of capacity change characteristics resulting from tubing length and elevation difference on page “ 2-16 ”, read the capacity correction coefficient.

* Use the lowest capacity changing ratio. Usually, the furthest and highest or the lowest indoor unit is used.

(C) Surplus capacity correction coefficient for outdoor unit temperature conditions (%)

From the graph of surplus capacity characteristics resulting from outdoor temperature on page “ 2-15 ”, read the capacity correction coefficient.

(D) Capacity correction coefficient for outdoor unit frosting and defrosting during heating operation (%)

From the outdoor unit heating capacity correction coefficient during frosting / defrosting on page “ 2-15 ”, read the capacity correction coefficient.

# 1. Model Selecting and Capacity Calculator

## 2. Indoor unit capacity correction coefficient

**Indoor unit capacity correction (kW) = (G) × (H) × (C) × (D)**

* Indoor unit capacity correction ≦ (G)

(E) Capacity correction for the indoor unit temperature conditions (kW)

From the graph of indoor capacity characteristics on page " 2-16 ", read the capacity correction coefficient for indoor unit temperature conditions.

(E) = Capacity correction coefficient for indoor unit temperature conditions × Rated capacity

(F) Calculate the Capacity distribution ratio (%)

$$(F) = \frac{(E)}{\sum(E)}$$

(G) Distribute the outdoor unit capacity among each indoor unit (kW)

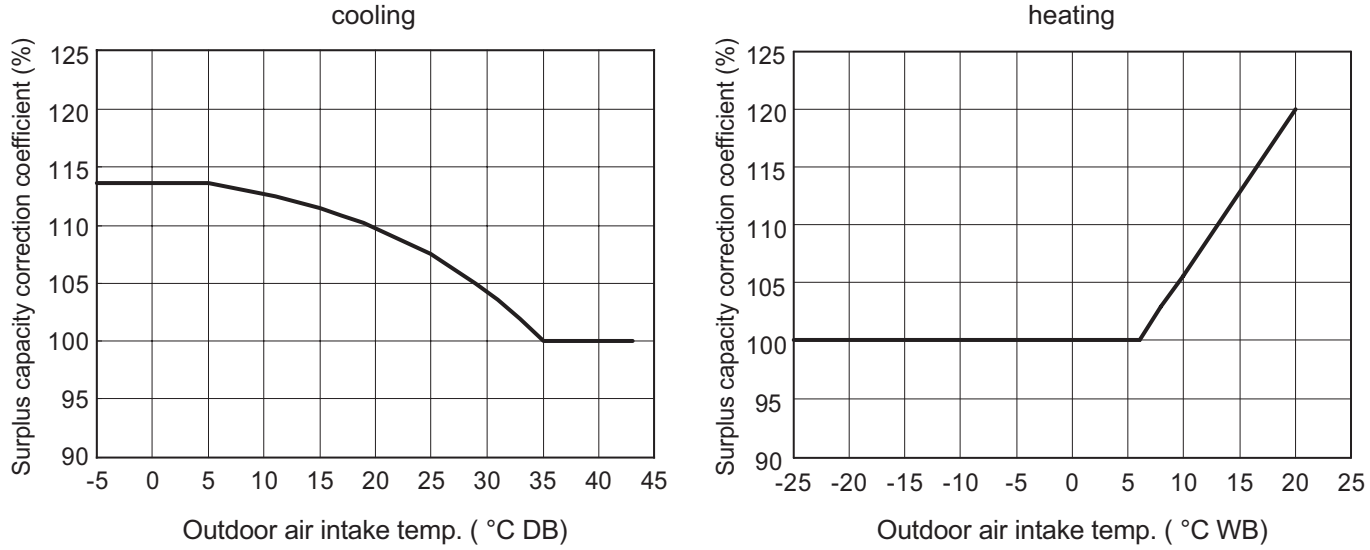
(G) = (A) × (F)

(H) Capacity correction coefficient for tubing length and elevation difference (%)

From the graph of capacity change characteristics resulting from tubing length and elevation difference on page " 2-16 ", read the capacity correction coefficient.

# 1. Model Selecting and Capacity Calculator

Surplus capacity correction coefficient (%)






### 5. Graph of capacity correction coefficients

■ **Outdoor unit heating capacity correction coefficient during frosting/defrosting (1 – (4))**

| Outdoor intake air temp. (°CWB, RH85%) | –25 | –24 | –23 | –22 | –21 | –20 | –15 | –10 | –8 | –6 | –5 | –4 | –2 | –1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Correction coefficient | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.96 | 0.94 | 0.91 | 0.89 | 0.87 | 0.87 |

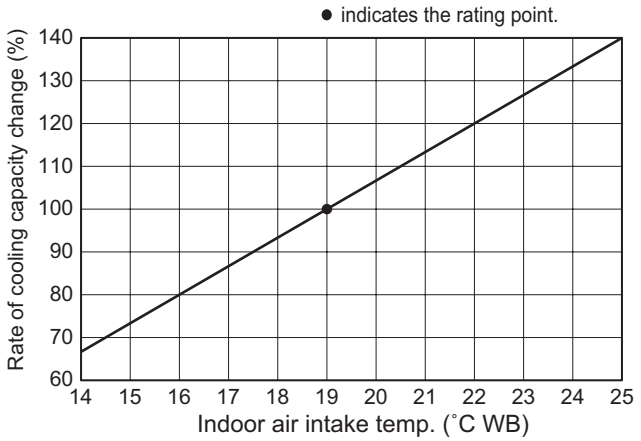
| Outdoor intake air temp. (°CWB, RH85%) | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Correction coefficient | 0.87 | 0.88 | 0.89 | 0.91 | 0.92 | 0.95 | 1.0 |

* To calculate the heating capacity with consideration for frosting/defrosting operation, multiply the heating capacity found from the capacity graph by the correction coefficient from the table above.

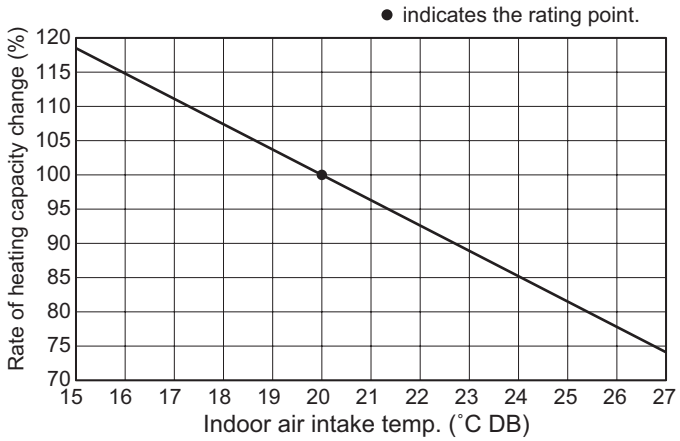
# 1. Model Selecting and Capacity Calculator

## ■ Graph of indoor unit capacity characteristics (2 – (2))

**Indoor unit cooling capacity characteristics**



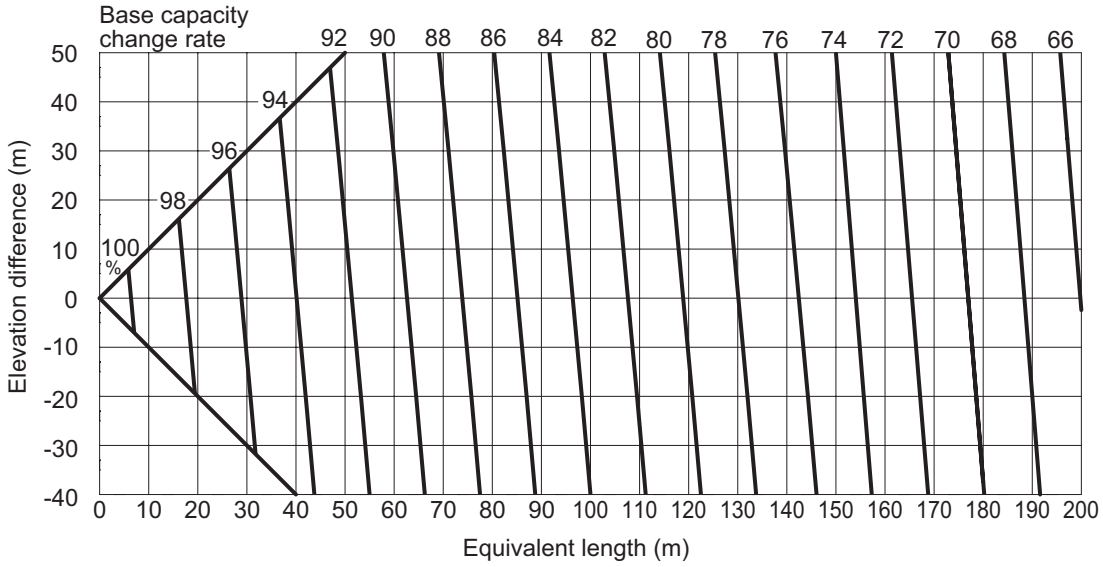

**Indoor unit heating capacity characteristics**



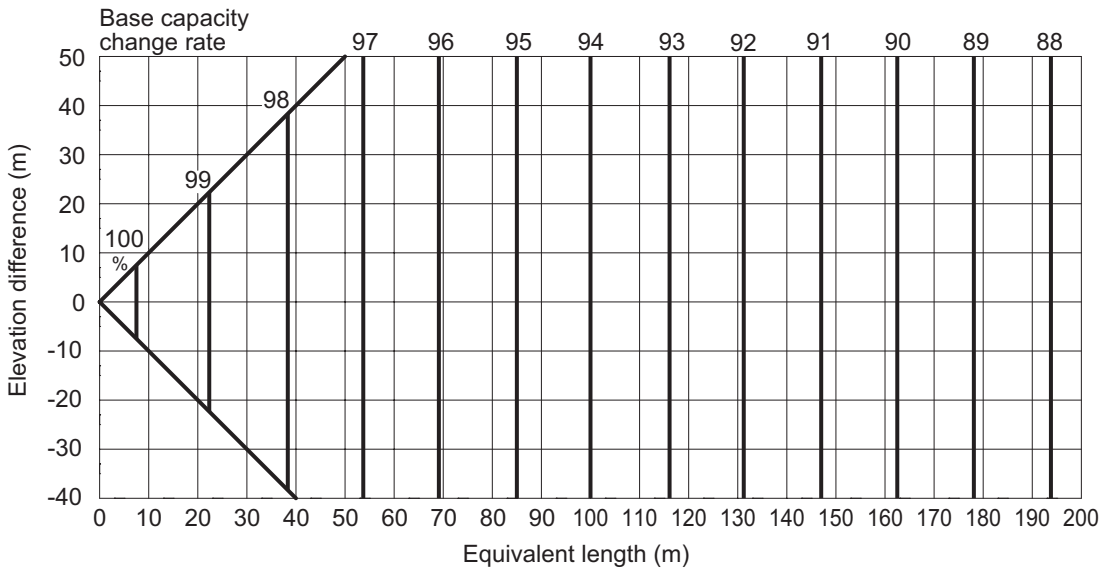

## ■ Graph of capacity change characteristics resulting from tubing length and elevation difference (1 / 2 – (3))

(Performance correction coefficients by elevation difference of refrigerant tube length [performance change rate ÷ 100] is calculated by the following line map.)

<Cooling>




<Heating>



# 1. Model Selecting and Capacity Calculator

The positive side for the elevation difference indicates that the outdoor unit is installed at a higher position than the indoor units. The negative side indicates the opposite.

- The capacity loss that is caused by the tubing length can be reduced by increasing the sizes of the gas tubes.
  Refer to Table 2-10 and make the appropriate changes. However be sure that the total length does not exceed the maximum.
  * The only sizes which can be increased are the LM (main tube with the largest diameter) gas tubes, and the changes are limited to those shown in Table 2-10.
    In addition, note that the additional refrigerant charge is determined only by the liquid tube size.

**Table 2-10 Equivalent Length Correction Coefficient when the Size of the Gas Tubes (LM) is Increased**

| Standard tubing diameter (gas tube, mm) | ø12.7 | ø15.88 | ø19.05 | ø22.22 | ø25.4 | ø28.58 | ø31.75 | ø38.1 |
|---|---|---|---|---|---|---|---|---|
| Tubing diameter after change (gas tube, mm) | ø15.88 | ø19.05 | ø22.22 | ø25.4 | ø28.58 | ø31.75 | ø38.1 | ø41.28 |
| Equivalent length correction coefficient | 0.4 | | 0.5 | | | 0.6 | | 0.7 |

* If the size of the gas tubes (LM) have been increased, apply the correction coefficient from Table 2-10 and calculate the equivalent length of the LM section.

> Equivalent length of tubing after size increase
> = Standard tubing equivalent length × Equivalent length correction coefficient

# 1. Model Selecting and Capacity Calculator

## 1-8. Capacity Correction Graph According to Tubing Length and Elevation Difference

● **Sample calculations**

Indoor/Outdoor Capacity Ratio : (cooling) 125%
: (heating) 127%

| Total Indoor Unit Rated Capacity<br>Cooling : 70.0 kW<br>Heating : 80.0 kW | |
|---|---|
| Total Outdoor Unit Estimation Capacity<br>Cooling : 56.54 kW<br>Heating : 57.81 kW | Total Indoor Unit Estimation Capacity<br>Cooling : 58.19 kW<br>Heating : 65.75 kW |

| Model name | | Rated Capacity | Capacity Estimation by Temp. condition and Indoor/Outdoor Capacity Ratio | | | | Capacity Estimation by the Equiverant Length | | | Capacity Estimation coefficient by Frost /Defrost |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Temperature Conditions | | Estimation coefficient | Capacity | Elevation Difference | Equiverant Length | Estimation coefficient | |
| | | (kW) | °C | % | % | kW | m | m | % | % |
| U-20ME1E8 | Cooling | 56.0 | 40.0 | 27.0 | 107.94 | 60.44 | 5.0 | 42.0 | 93.54 | |
| | Heating | 63.0 | 7.0 | 38.0 | 105.52 | 66.48 | | | 97.71 | 89.0 |
| Indoor Unit class 140 | Cooling | 14.0 | 27.0 | 21.0 | 57.57 | 8.06 | 5.0 | 8.4 | 99.42 | |
| | Heating | 16.0 | 15.0 | 53.0 | 98.49 | 15.76 | | | 99.86 | |
| Indoor Unit class 140 | Cooling | 14.0 | 27.0 | 36.0 | 74.84 | 10.48 | 5.0 | 18.0 | 97.74 | |
| | Heating | 16.0 | 18.0 | 34.0 | 89.26 | 14.28 | | | 99.25 | |
| Indoor Unit class 140 | Cooling | 14.0 | 27.0 | 47.0 | 86.35 | 12.09 | 5.0 | 26.4 | 96.27 | |
| | Heating | 16.0 | 20.0 | 25.0 | 83.10 | 13.30 | | | 98.71 | |
| Indoor Unit class 140 | Cooling | 14.0 | 27.0 | 59.0 | 97.86 | 13.70 | 5.0 | 42.0 | 93.54 | |
| | Heating | 16.0 | 22.0 | 17.0 | 76.94 | 12.31 | | | 97.71 | |
| Indoor Unit class 140 | Cooling | 14.0 | 27.0 | 78.0 | 115.13 | 16.12 | 5.0 | 27.6 | 96.06 | |
| | Heating | 16.0 | 25.0 | 31.0 | 67.71 | 10.83 | | | 98.63 | |

# 1. Model Selecting and Capacity Calculator

- If the maximum tubing length (L1) exceeds 90 m (equivalent length), increase the tubing size of the main liquid, gas tubes (LM) by one rank.
  However, the upper limit for the gas tube size is ø41.28.
- Increasing the tubing size of the gas tubes can reduce the loss of capacity caused by longer tubing lengths.
  Refer to Table 2-10 to increase the tubing size. However, the maximum allowable tubing length must not be exceeded.

* The amount of additional refrigerant charge is determined from the liquid tube size only.

**Table 2-10 Equivalent Length Correction Coefficient when the Size of the Gas Tubes (LM) is Increased**

| Standard tubing diameter (gas tube, mm) | ø12.7 | ø15.88 | ø19.05 | ø22.22 | ø25.4 | ø28.58 | ø31.75 | ø38.1 |
|---|---|---|---|---|---|---|---|---|
| Tubing diameter after change (gas tube, mm) | ø15.88 | ø19.05 | ø22.22 | ø25.4 | ø28.58 | ø31.75 | ø38.1 | ø41.28 |
| Equivalent length correction coefficient | 0.4 | | 0.5 | | | 0.6 | | 0.7 |

* If the size of the gas tubes (LM) have been increased, apply the correction coefficient from Table 2-10 and calculate the equivalent length of the LM section.

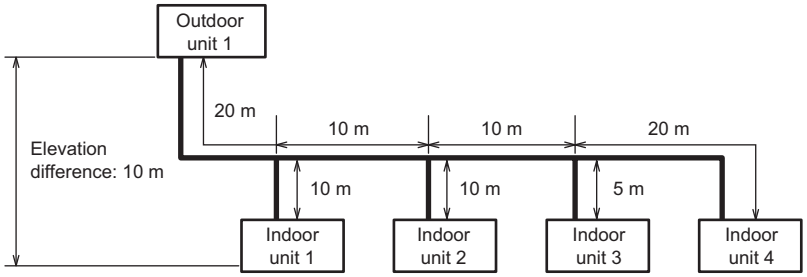
> Equivalent length of tubing after size increase
> = Standard tubing equivalent length × Equivalent length correction coefficient

2

# 2. System Design

## 2-1. System Example

Below are the tables created using the “PAC System Diagram Software”.




### Selection conditions

Assume that installation is in a 50 Hz region.

| | | Outdoor unit | Room1 (indoor unit 1) | Room2 (indoor unit 2) | Room3 (indoor unit 3) | Room4 (indoor unit 4) |
|---|---|---|---|---|---|---|
| Cooling | Air condition (DB / WB) | 33.0 / 22.5 | 26.0 / 18.0 | 26.0 / 18.0 | 26.0 / 18.0 | 26.0 / 18.0 |
| | Max. load (kW) | - | 14.0 | 12.0 | 12.0 | 7.0 |
| Heating | Air condition (DB / WB) | 3.0 / 2.0 | 21.0 / 16.0 | 21.0 / 16.0 | 21.0 / 16.0 | 21.0 / 16.0 |
| | Max. load (kW) | - | 16.0 | 14.5 | 14.5 | 7.2 |
| Actual tubing length | | 60 m | 30 m | 40 m | 45 m | 60 m |
| Equivalent length (with consideration for curves, etc.) | | 72 m | 36 m | 48 m | 54 m | 72 m |

**Preliminary selection**

| | Outdoor unit | Room1 (indoor unit 1) | Room2 (indoor unit 2) | Room3 (indoor unit 3) | Room4 (indoor unit 4) |
|---|---|---|---|---|---|
| Selected model | U-18ME1E8E | Type 160 | Type 140 | Type 140 | Type 73 |
| Load (cooling / heating) (kW) | - | 14.0 | 12.0 | 12.0 | 7.0 |
| Rated capacity (cooling / heating) (kW) | 50.0 / 56.0 | 16.0 / 18.0 | 14.0 / 16.0 | 14.0 / 16.0 | 7.3 / 8.0 |
| Corrected capacity (cooling / heating) (kW) | 43.3 / 48.0 | 14.5 / 17.2 | 12.4 / 15.1 | 12.2 / 15.1 | 6.2 / 7.5 |
| Actual capacity (cooling / heating) (kW) | - | 14.5 / 17.2 | 12.4 / 15.1 | 12.2 / 15.1 | 6.2 / 7.5 |

### Indoor unit changes

Increase by one rank because the capacity of the indoor unit 4 is lower than the maximum load.

| | Outdoor unit | Room1 (indoor unit 1) | Room2 (indoor unit 2) | Room3 (indoor unit 3) | Room4 (indoor unit 4) |
|---|---|---|---|---|---|
| Selected model | U-18ME1E8E | Type 160 | Type 140 | Type 140 | Type 106 |
| Load (cooling / heating) (kW) | - | 14.0 | 12.0 | 12.0 | 7.0 |
| Rated capacity (cooling / heating) (kW) | 50.0 / 56.0 | 16.0 / 18.0 | 14.0 / 16.0 | 14.0 / 16.0 | 10.6 / 11.4 |
| Corrected capacity (cooling / heating) (kW) | 42.9 / 47.1 | 13.5 / 15.9 | 11.5 / 14.0 | 11.4 / 14.0 | 8.3 / 9.8 |
| Actual capacity (cooling / heating) (kW) | - | 13.5 / 15.9 | 11.5 / 14.0 | 11.4 / 14.0 | 8.3 / 9.8 |

# 2. System Design

### Outdoor unit changes

The capacity of the indoor units 1, 2 and 3 is lower than the maximum load.
Increase the capacity of the outdoor unit by one rank because of inability to increase the indoor unit 1 by one rank.

| | Outdoor unit | Room1 (indoor unit 1) | Room2 (indoor unit 2) | Room3 (indoor unit 3) | Room4 (indoor unit 4) |
|---|---|---|---|---|---|
| Selected model | U-20ME1E8E | Type 160 | Type 140 | Type 140 | Type 106 |
| Load (cooling / heating) (kW) | - | 14.0 | 12.0 | 12.0 | 7.0 |
| Rated capacity (cooling / heating) (kW) | 56.0 / 63.0 | 16.0 / 18.0 | 14.0 / 16.0 | 14.0 / 16.0 | 10.6 / 11.4 |
| Corrected capacity (cooling / heating) (kW) | 45.8 / 50.4 | 14.4 / 17.0 | 12.3 / 15.0 | 12.2 / 14.9 | 8.9 / 10.5 |
| Actual capacity (cooling / heating) (kW) | - | 14.4 / 17.0 | 12.3 / 15.0 | 12.2 / 14.9 | 8.9 / 10.5 |

(3) Increasing the size of the refrigerant tubing

■ Increasing the tubing size of the gas tubes can reduce the loss of capacity caused by longer tubing lengths. Refer to Table 2-10 to increase the tubing size. However, the maximum allowable tubing length must not be exceeded.

* The amount of additional refrigerant charge is determined from the liquid tube size only.

**Table 2-10 Equivalent Length Correction Coefficient when the Size of the Gas Tubes (LM) is Increased**

| Standard tubing diameter (gas tube, mm) | ø12.7 | ø15.88 | ø19.05 | ø22.22 | ø25.4 | ø28.58 | ø31.75 | ø38.1 |
|---|---|---|---|---|---|---|---|---|
| Tubing diameter after change (gas tube, mm) | ø15.88 | ø19.05 | ø22.22 | ø25.4 | ø28.58 | ø31.75 | ø38.1 | ø41.28 |
| Equivalent length correction coefficient | 0.4 | | 0.5 | | | 0.6 | | 0.7 |

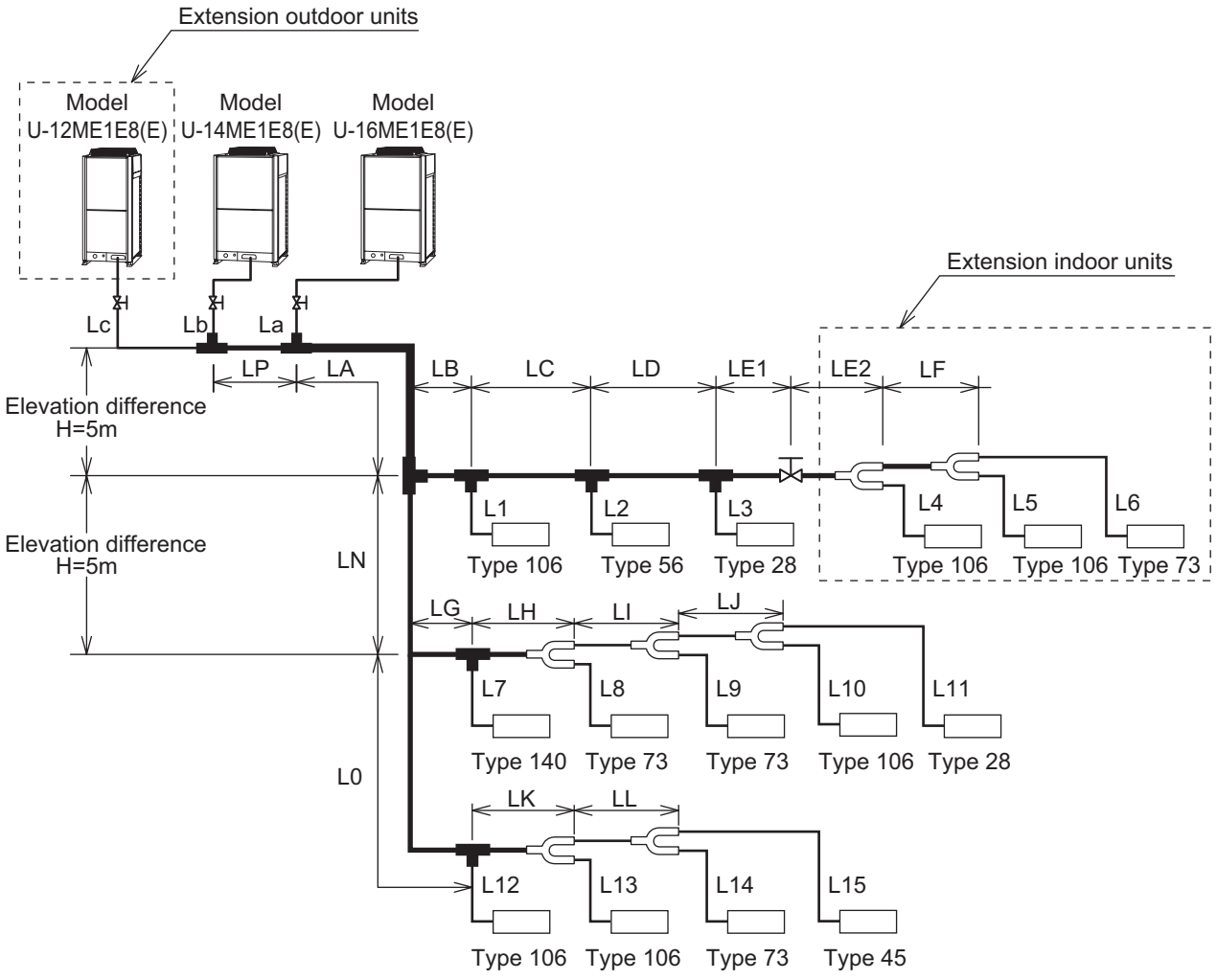
* If the size of the gas tubes (LM) have been increased, apply the correction coefficient from Table 2-10 and calculate the equivalent length of the LM section.

> Equivalent length of tubing after size increase
> = Standard tubing equivalent length × Equivalent length correction coefficient

2

### 2-2. Example of Tubing Size Selection for Extension and Additional Charge Amount

● Sample calculation for the system below



# 2. System Design

**Additional refrigerant charge before extension**

| | Liquid tube diameter | Tubing length (m) (A) | Additional refrigerant charge per 1 m (kg/m) (B) | (A) × (B) kg |
|---|---|---|---|---|
| La | ø12.7 | 2 | 0.128 | 0.256 |
| Lb | ø12.7 | 1 | 0.128 | 0.128 |
| Lc | ø9.52 | 1 | 0.056 | 0.056 |
| LP | ø15.88 | 20 | 0.185 | 3.700 |
| LA | ø19.05 | 5 | 0.259 | 1.295 |
| LB | ø15.88 | 6 | 0.185 | 1.110 |
| LC | ø12.7 | 6 | 0.128 | 0.768 |
| LD | ø12.7 | 0.4 | 0.128 | 0.051 |
| LE1 | ø9.52 | 5 | 0.056 | 0.280 |
| LN | ø15.88 | 3 | 0.185 | 0.555 |
| LG | ø12.7 | 3 | 0.128 | 0.384 |
| LH | ø9.52 | 4 | 0.056 | 0.224 |
| LI | ø9.52 | 5 | 0.056 | 0.280 |
| LJ | ø9.52 | 5 | 0.056 | 0.280 |
| LK | ø12.7 | 2 | 0.128 | 0.256 |
| LL | ø9.52 | 3 | 0.056 | 0.168 |
| LM | ø9.52 | 4 | 0.056 | 0.224 |
| L1 | ø9.52 | 3 | 0.056 | 0.168 |
| L2 | ø6.35 | 3 | 0.026 | 0.078 |
| L3 | ø6.35 | 3 | 0.026 | 0.078 |
| L7 | ø9.52 | 3 | 0.056 | 0.168 |
| L8 | ø9.52 | 3 | 0.056 | 0.168 |
| L9 | ø9.52 | 4 | 0.056 | 0.224 |
| L10 | ø6.35 | 4 | 0.026 | 0.104 |
| L11 | ø6.35 | 6 | 0.026 | 0.156 |
| L12 | ø9.52 | 4 | 0.056 | 0.224 |
| L13 | ø9.52 | 4 | 0.056 | 0.224 |
| L14 | ø9.52 | 4 | 0.056 | 0.224 |
| L15 | ø6.35 | 6 | 0.026 | 0.156 |
| Total (kg) | | | | 11.987 → 11.99 kg |

**Additional refrigerant charge after extension**

| | Liquid tube diameter | Tubing length (m) (A) | Additional refrigerant charge per 1 m (kg/m) (B) | (A) × (B) kg |
|---|---|---|---|---|
| LE2 | ø9.52 | 4 | 0.056 | 0.224 |
| LF | ø9.52 | 5 | 0.056 | 0.280 |
| L4 | ø9.52 | 4 | 0.056 | 0.224 |
| L5 | ø9.52 | 6 | 0.056 | 0.336 |
| L6 | ø9.52 | 7 | 0.056 | 0.392 |
| Total (kg) | | | | 1.4560 → 1.46 kg |

Calculation of additional refrigerant charge for the entire 2-WAY system

(Additional refrigerant charge for entire 2-WAY system)

= (Refrigerant charge at outdoor unit)

+ (Neccessary amount of additional refrigerant charge per outdoor unit)

+ [Additional total refrigerant charge (before extension + after extension) ]

= [(9.9 + 9.9 + 9.9 =29.7) refrigerant charge at outdoor unit]

+ [(6.4 + 6.4 + 3.5 =16.3) neccessary amount of additional refrigerant charge per outdoor unit]

+ [(11.99+1.46 =13.36) additional total refrigerant charge]

= 59.36 (after extension)

[Before extension : (9.9 + 9.9 =19.8) + (6.4 + 6.4 =12.8) + 11.99 = 44.59 kg ]

### ■ Checking of limit density

The limit density judgment is made based on the room with the indoor unit having the smallest capacity in the system after extension.

The volume of the room where a type 09 indoor unit is used (connected to tubing L11) is calculated as follows :

floor area 15m$^2$ x ceiling height 2.7m = room volume 40.5m$^3$.

Due to the room volume,

**Maximum overall refrigerant charge amount**

**= (room volume) × (limit density)**

**= 40.5(m$^3$) × 0.3(kg/m$^3$)**

**= 12.15kg**

From the graph at right, the minimum room volume for 59.36 kg of refrigerant is 197.9 m$^3$ (floor area 73.3 m$^2$).

**Required minimum room volume**

**= (overall refrigerant charge amount) ÷ (limit density)**

**= 59.36(kg) ÷ 0.3(kg/m$^3$)**

**= 197.9(m$^3$)**

**Required minimum floor area**

**= (minimum room volume) ÷ (ceiling height)**

**= 197.9 (m$^3$) ÷ 2.7(m)**

**= 73.3(m$^2$)**

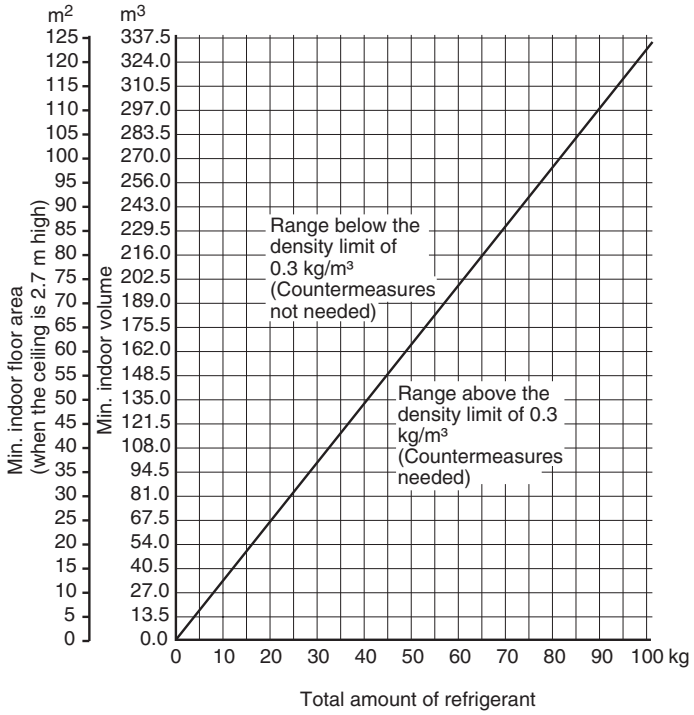
Therefore an opening for ventilation is required.

< Formula for computation >

$$\frac{\text{Overall refrigerant charge amount for the air conditioner : kg}}{\text{(Minimum room volume for indoor unit: m}^3\text{)}}$$

$$= \frac{59.36\ (\text{kg})}{40.5\ (\text{m}^3)} = 1.47\ (\text{kg/m}^3) > 0.30\ (\text{kg/m}^3)$$

Accordingly, it is necessary to install a ventilation fan for this room.




**WARNING** **Always check the gas density limit for the room in which the unit is installed.**

### ■ Check of Limit Density

When installing an air conditioner in a room, it is necessary to ensure that even if the refrigerant gas accidentally leaks out, its density does not exceed the limit level for that room.

If the density could exceed the limit level, it is necessary to provide an opening between the unit and the adjacent room, or to install mechanical ventilation which is interlocked with the leak detector.

$$\frac{\text{Overall refrigerant charge amount for the air conditioner : kg}}{\text{(Minimum room volume for indoor unit: m}^3\text{)}} \leq \text{Limit density 0.3 (kg/m}^3\text{)}$$

The limit density of refrigerant which is used in this unit is 0.3 kg/m$^3$ (ISO 5149).

The shipped outdoor unit comes charged with the amount of refrigerant fixed for each type, so add it to the amount that is charged in the field. (For the refrigerant charge amount at shipment, refer to the unit's nameplate.)

**CAUTION** **Pay special attention to any location, such as a basement, etc., where leaking refrigerant can accumulate, since refrigerant gas is heavier than air.**

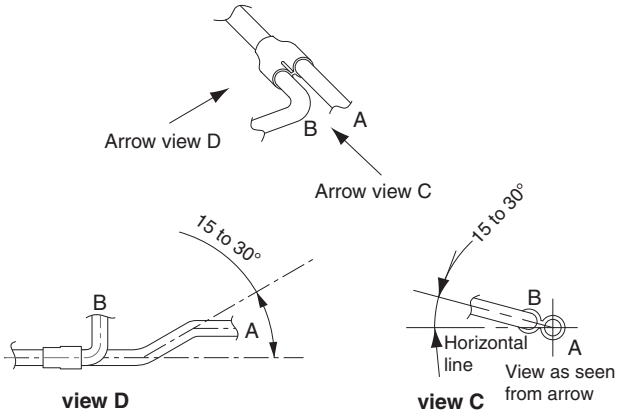
### ■ Installing distribution joint

(1) Refer to “HOW TO ATTACH DISTRIBUTION JOINT” enclosed with the optional distribution joint kit (CZ-P680PJ2, P1350PJ2, P160BK2, P680BK2, P1350BK2).

(2) In order to prevent accumulation of refrigerant oil in stopped units, if the main tubing is horizontal then each branch tubing length should be at an angle that is greater than horizontal. If the main tubing is vertical, provide a raised starting portion for each branch.

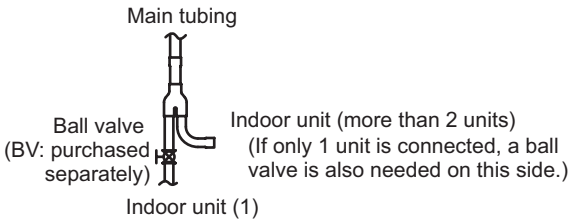
(3) If there are height differences between indoor units or if branch tubing that follows a distribution joint is connected to only 1 unit, a trap or ball valve must be added to that distribution joint. (When adding the ball valve, locate it within 40 cm of the distribution joint.) (Consult with the dealer separately concerning the ball valve.)
**If a trap or ball valve is not added, do not operate the system before repairs to a malfunctioning unit are completed. (The refrigerant oil sent through the tubing to the malfunctioning unit will accumulate and may damage the compressor.)**

**Tube branching methods** (horizontal use)

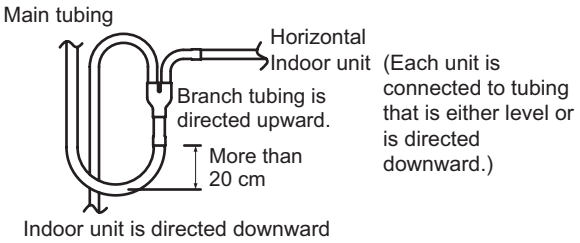



Types of vertical trap specifications

**(When using ball valve)**




**(When not using ball valve)**



# 3. Electrical Wiring

## 3-1. General Precautions on Wiring

(1) Before wiring, confirm the rated voltage of the unit as shown on its nameplate, then carry out the wiring closely following the wiring diagram.
(2) Provide a power outlet to be used exclusively for each unit, and a power supply disconnect, circuit breaker and earth leakage breaker for overcurrent protection should be provided in the exclusive line.
(3) To prevent possible hazards from insulation failure, the unit must be grounded.
(4) Each wiring connection must be done in accordance with the wiring system diagram. Wrong wiring may cause the unit to misoperate or become damaged.
(5) Do not allow wiring to touch the refrigerant tubing, compressor, or any moving parts of the fan.
(6) Unauthorized changes in the internal wiring can be very dangerous. The manufacturer will accept no responsibility for any damage or misoperation that occurs as a result of such unauthorized changes.
(7) Regulations on wire diameters differ from locality to locality. For field wiring rules, please refer to your LOCAL ELECTRICAL CODES before beginning. You must ensure that installation complies with all relevant rules and regulations.
(8) To prevent malfunction of the air conditioner caused by electrical noise, care must be taken when wiring as follows:
- The remote control wiring and the inter-unit control wiring should be wired apart from the inter-unit power wiring.
- Use shielded wires for inter-unit control wiring between units and ground the shield on both sides.

(9) If the power supply cord of this appliance is damaged, it must be replaced by a repair shop appointed by the manufacturer, because special purpose tools are required.

2

## 3-2. Recommended Wire Length and Wire Diameter for Power Supply System

**Outdoor unit**

| | (A) Power supply | | Time delay fuse or circuit capacity |
|---|---|---|---|
| | Wire size | Max. length | |
| U-8ME1E8E(E) | 4 mm² | 84 m | 25 A |
| U-10ME1E8E(E) | 6 mm² | 90 m | 30 A |
| U-12ME1E8E(E) | 6 mm² | 75 m | 35 A |
| U-14ME1E8E(E) | 10 mm² | 105 m | 40 A |
| U-16ME1E8E(E) | 10 mm² | 86 m | 50 A |
| U-18ME1E8E(E) | 10 mm² | 80 m | 50 A |
| U-20ME1E8E(E) | 10 mm² | 69 m | 50 A |

or

| (A) Power supply | | Time delay fuse or circuit capacity |
|---|---|---|
| Wire size | Max. length | |
| 4 mm² | 84 m | 25 A |
| 6 mm² | 90 m | 35 A |
| 6 mm² | 75 m | 35 A |
| 10 mm² | 105 m | 50 A |
| 10 mm² | 86 m | 50 A |
| 10 mm² | 80 m | 50 A |
| 10 mm² | 69 m | 50 A |

**Indoor unit**

| Type | (B) Power supply | Time delay fuse or circuit capacity |
|---|---|---|
| | 2.5 mm² | |
| K1 | Max. 150 m | 10 – 16 A |
| D1, L1, U1, Y1, T1,F1, M1, P1,R1 | Max. 130 m | 10 – 16 A |
| E1 (73, 106, 140) | Max. 60 m | 10 – 16 A |
| E1 (224/280) | Max. 50/30 m | 10 – 16 A |

**Control wiring**

| (C) Inter-unit (between outdoor and indoor units) control wiring | | |
|---|---|---|
| 0.75 mm² (AWG #18)<br>**Use shielded wiring*** | or | 2.0 mm² (AWG #14)<br>**Use shielded wiring*** |
| Max. 1,000 m | | Max. 2,000 m |

| (D) Remote control wiring |
|---|
| 0.75 mm² (AWG #18) |
| Max. 500 m |

**NOTE** * With ring-type wire terminal.

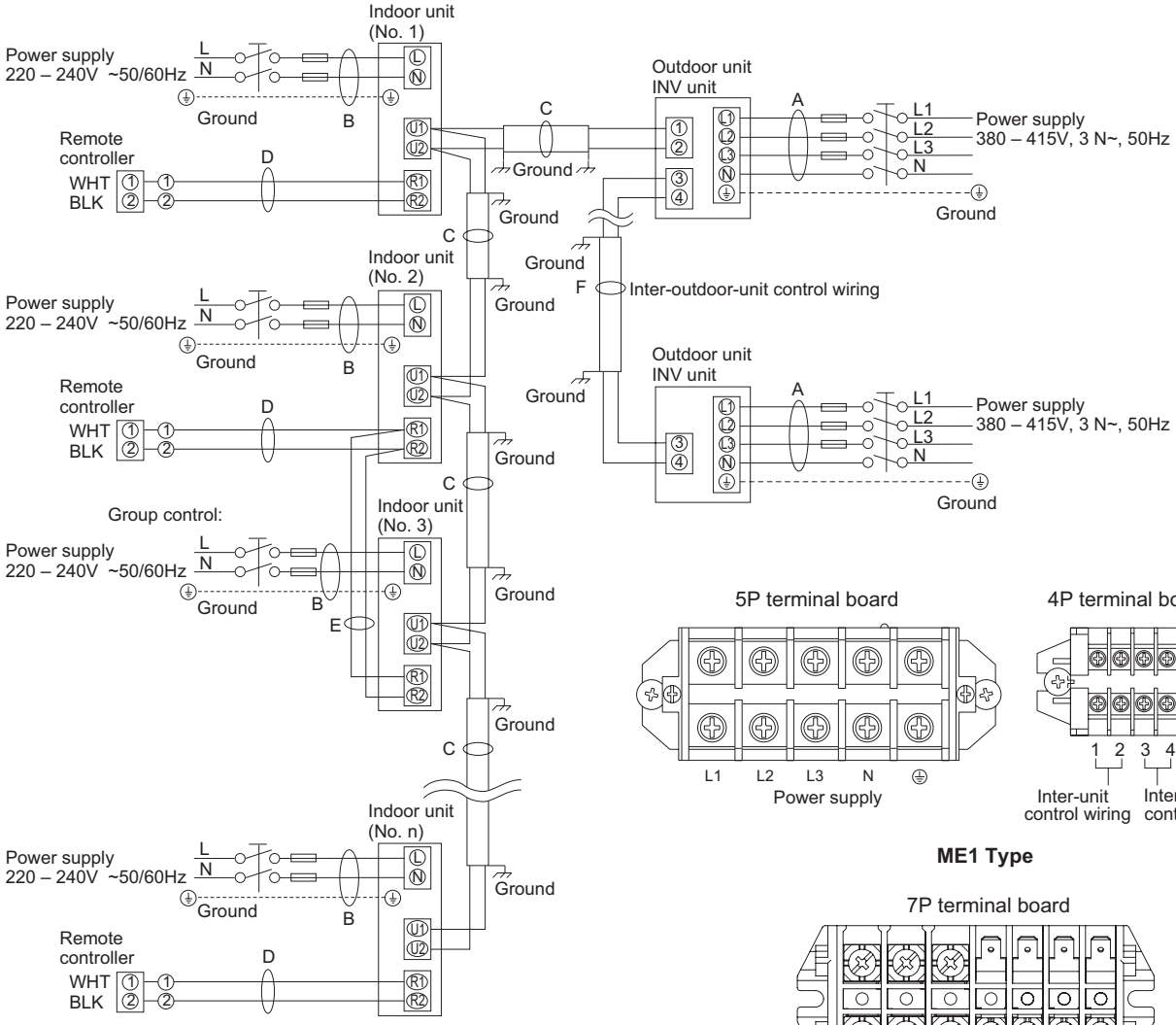
| (E) Control wiring for group control |
|---|
| 0.75 mm² (AWG #18) |
| Max. 200 m (Total) |

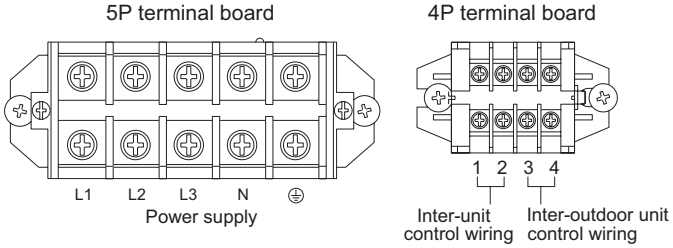
| (F) Inter-outdoor unit control wiring |
|---|
| 0.75 mm² (AWG #18)<br>**Use shielded wiring** |
| Max. 300 m |

# 3. Electrical Wiring

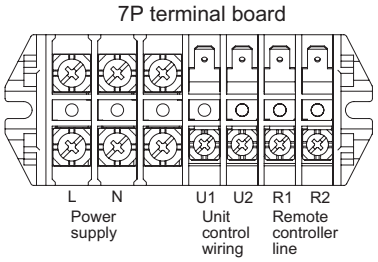


### 3-3. Wiring System Diagrams

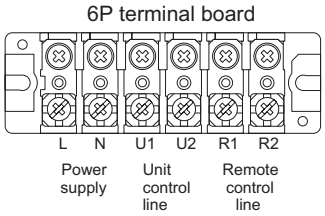


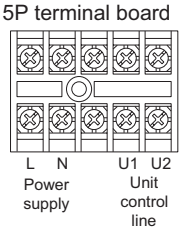

**ME1 Type**




**T1, F1, E1, D1, L1 Types**




**U1, Y1, M1, P1, R1 Types**




**K1 Type**

(1) Refer to Section 3-2. “Recommended Wire Length and Wire Diameter for Power Supply System” for the explanation of “A”, “B”, “C”, “D”, “E” and “F” in the above diagram.

(2) The basic connection diagram of the indoor unit shows the 7P terminal board, so the terminal boards in your equipment may differ from the diagram.

(3) Refrigerant Circuit (R.C.) address should be set before turning the power on.

(4) Regarding the R.C. address setting, refer to Section 5. Address setting can be executed by remote controller automatically. Refer to Section 5.

(5) Regarding S-280ME1E5, the power supply is 220-240V, 50Hz.

## 3. Electrical Wiring

**CAUTION**

**(1) When linking outdoor units in a network, disconnect the terminal extended from the short plug (CN072, 2P Black, location: right bottom on the outdoor main control PCB) from all outdoor units except any one of the outdoor units.**
**(When shipping: In shorted condition.)**
**For a system without link (no connection wiring between outdoor units), do not remove the short plug.**

**(2) Do not install the inter-unit control wiring in a way that forms a loop. (Fig. 2-2)**

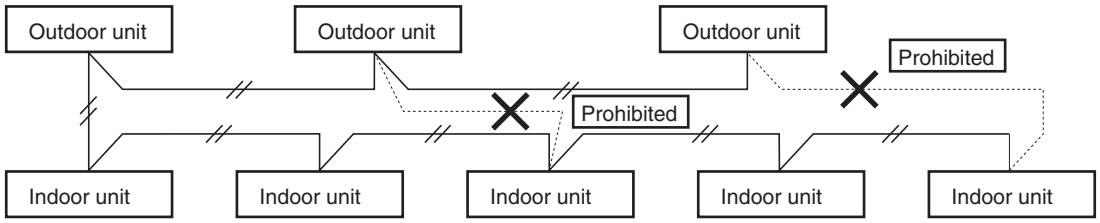



**Fig. 2-2**



**(3) Do not install inter-unit control wiring such as star branch wiring. Star branch wiring causes misaddress setting.**

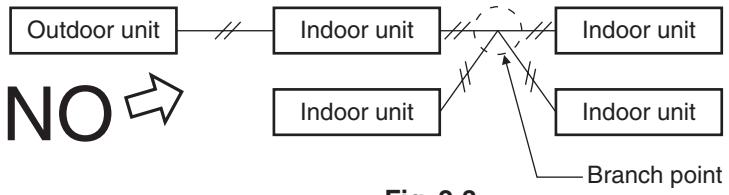



**Fig. 2-3**

**(4) If branching the inter-unit control wiring, the number of branch points should be 16 or fewer. (Branches less than 1 m are not included in the total branch number.) (Fig. 2-4)**

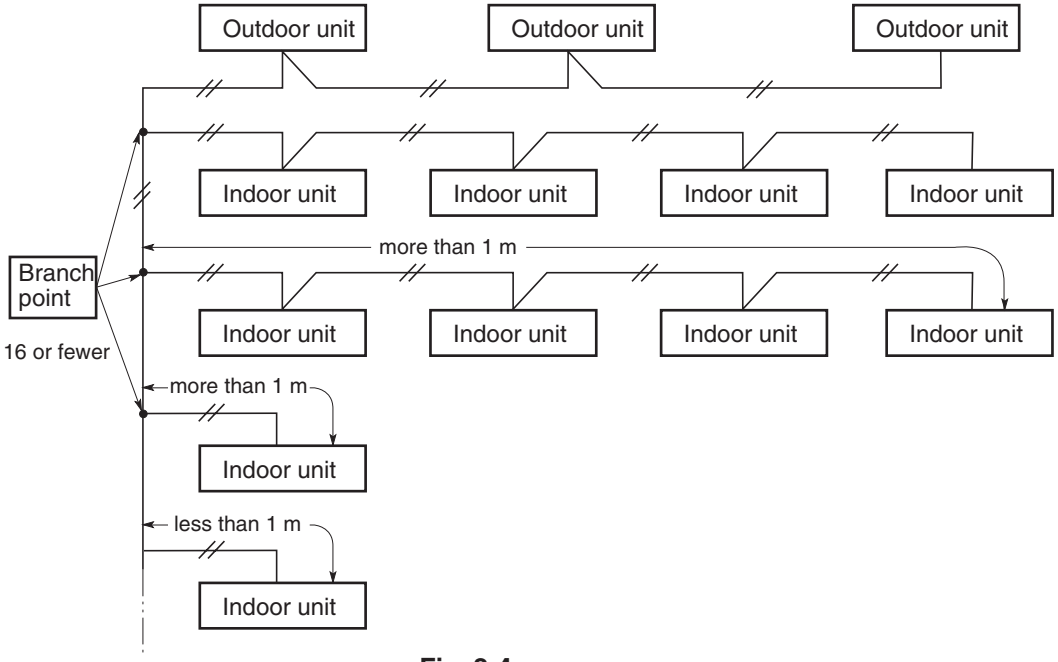



**Fig. 2-4**

# 3. Electrical Wiring

**(5) Use shielded wires for inter-unit control wiring (c) and ground the shield on both sides, otherwise misoperation from noise may occur. (Fig. 2-5) Connect wiring as shown in Section "3-3. Wiring System Diagram."**

**(6) Use the standard power supply cables for Europe (such as H05RN-F or H07RN-F which conforms to CENELEC (HAR) rating specifications) or use the cables based on IEC standard. (245 IEC57, 245 IEC66)**

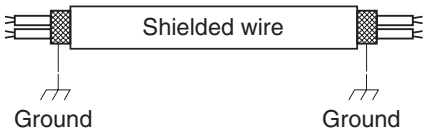



**Fig. 2-5**

**WARNING**

**Loose wiring may cause the terminal to overheat or result in unit malfunction. A fire hazard may also exist. Therefore, ensure that all wiring is tightly connected.**

When connecting each power wire to the terminal, follow the instructions on "How to connect wiring to the terminal" and fasten the wire securely with the fixing screw of the terminal plate.

**How to connect wiring to the terminal**

## ■ For stranded wiring

(1) Cut the wire end with cutting pliers, then strip the insulation to expose the stranded wiring about 10 mm and tightly twist the wire ends. (Fig. 2-6)

(2) Using a Phillips head screwdriver, remove the terminal screw(s) on the terminal plate.

(3) Using a ring connector fastener or pliers, securely clamp each stripped wire end with a ring pressure terminal.

(4) Place the ring pressure terminal, and replace and tighten the removed terminal screw using a screwdriver. (Fig. 2-7)

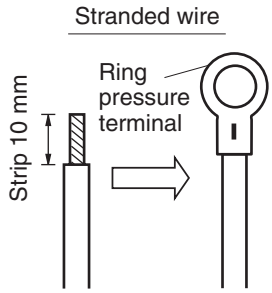



**Fig. 2-6**

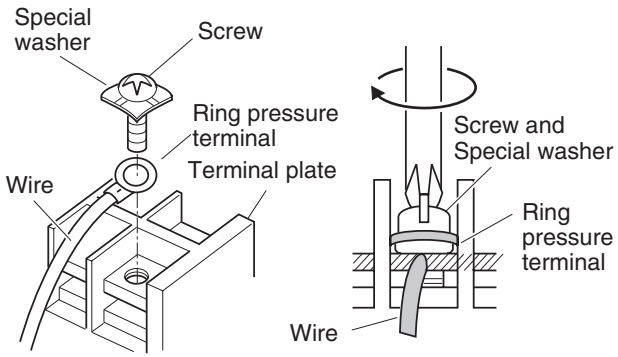



**Fig. 2-7**

## ■ Examples of shield wires

(1) Remove cable coat not to scratch braided shield. (Fig. 2-8)

(2) Ravel braided shield carefully and put tightly braided shield together.
Coat with insulation tube or wrap insulation tape after putting tightly. (Fig. 2-9)

(3) Remove coat of signal wire. (Fig. 2-10)

(4) Connect signal wire removed coat and shield wire with pressure terminal. (Fig. 2-11)

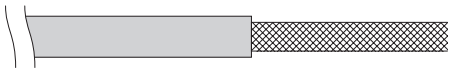


**Fig. 2-8**

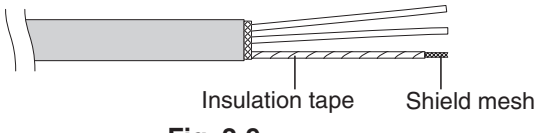



**Fig. 2-9**

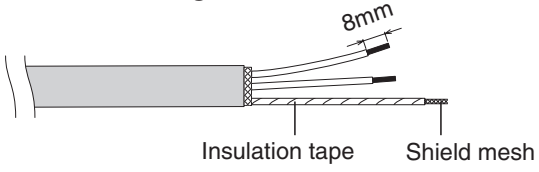



**Fig. 2-10**

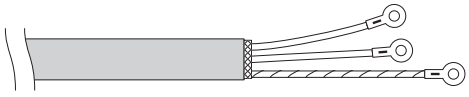


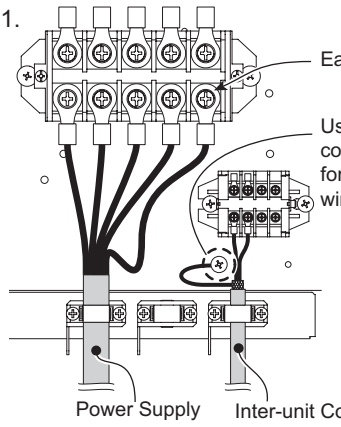
**Fig. 2-11**

# 3. Electrical Wiring

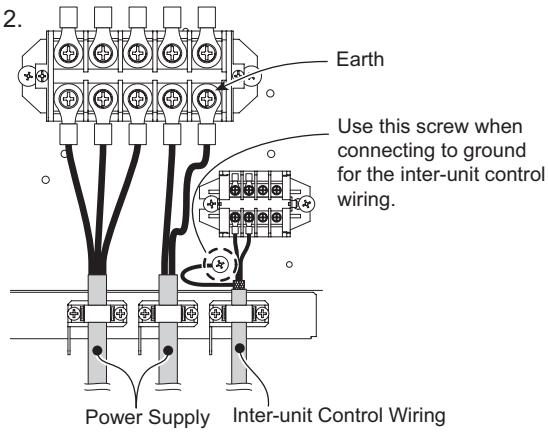
## ■ Wiring sample

### Outdoor Unit : ME1 Type

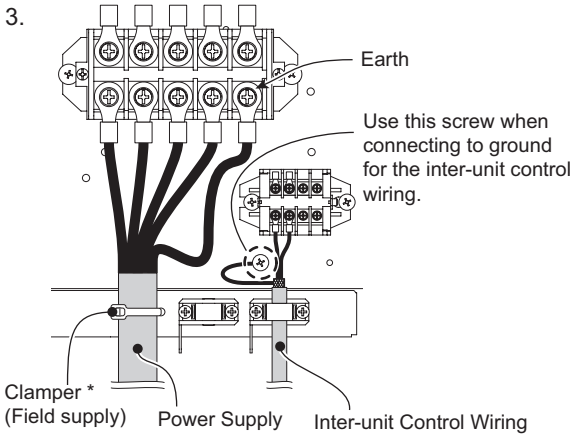
1.




2.

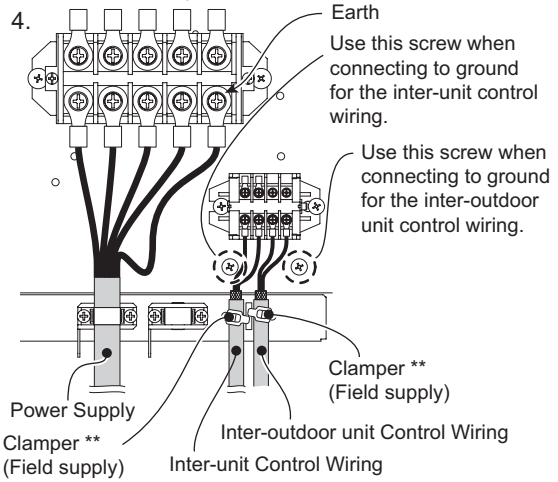



3.



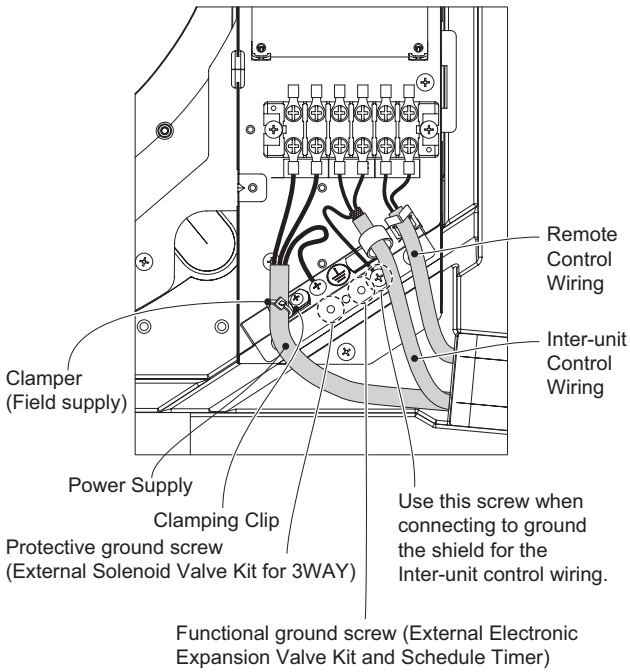

* First remove the attached resin fixture.
Then lead the clamper (field supply) through the screw hole and fix the power supply wire.

4.

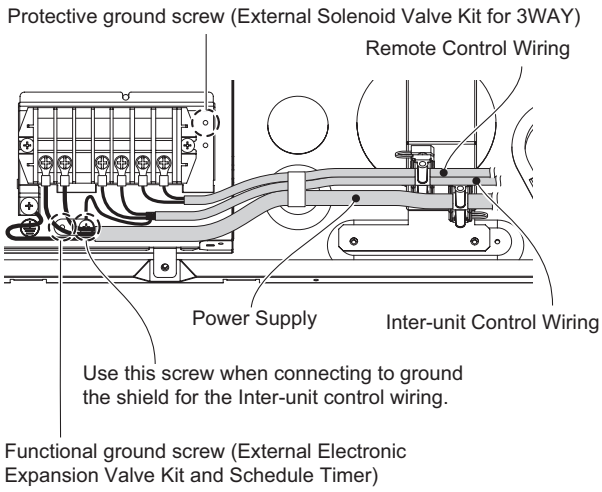



** First remove the attached resin fixture.
Then lead the clamper (field supply) through the screw hole and square hole from top to bottom or vice versa.
Finally fix each inter-outdoor unit control wire and the inter-unit control wire separately with the clamper (field supply).

### Indoor Unit : U1 Type



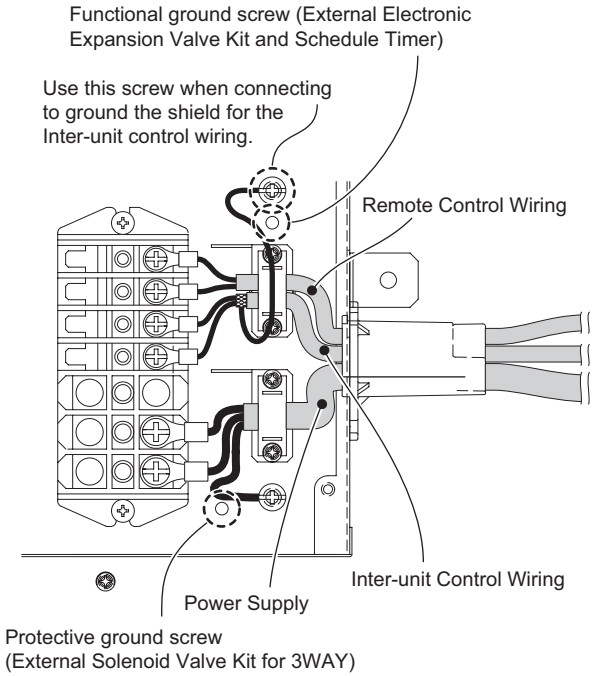

### Indoor Unit : T1 type



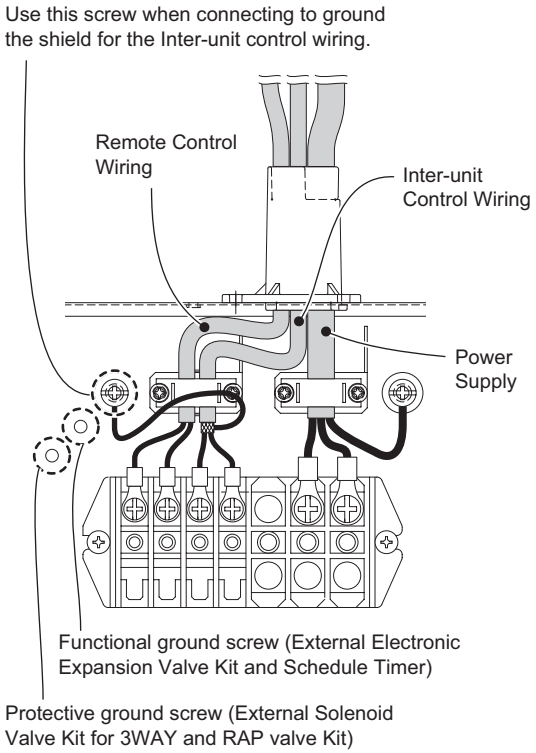
# 3. Electrical Wiring

## ■ Wiring sample

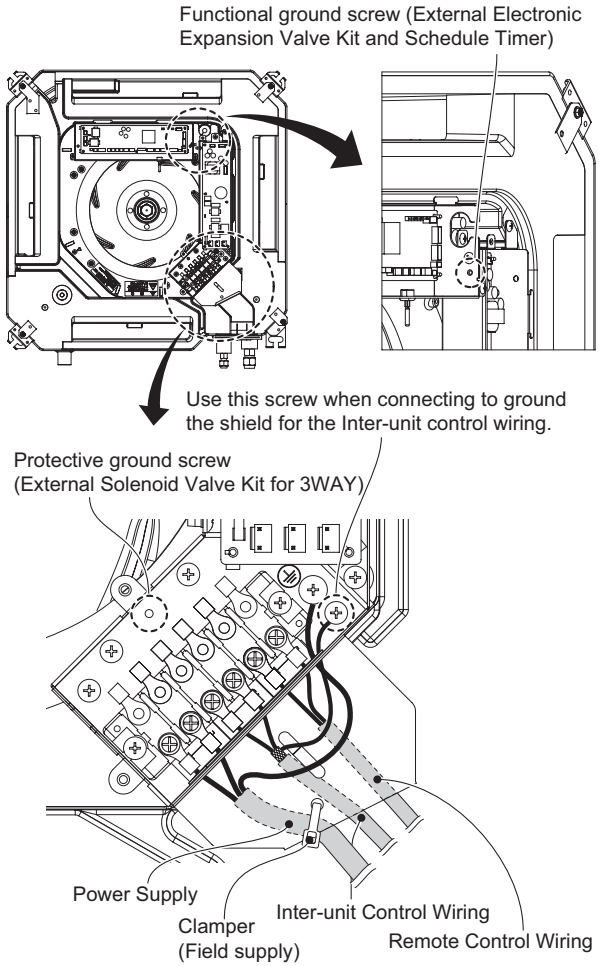
### Indoor Unit : E1 Type (73, 106, 140)



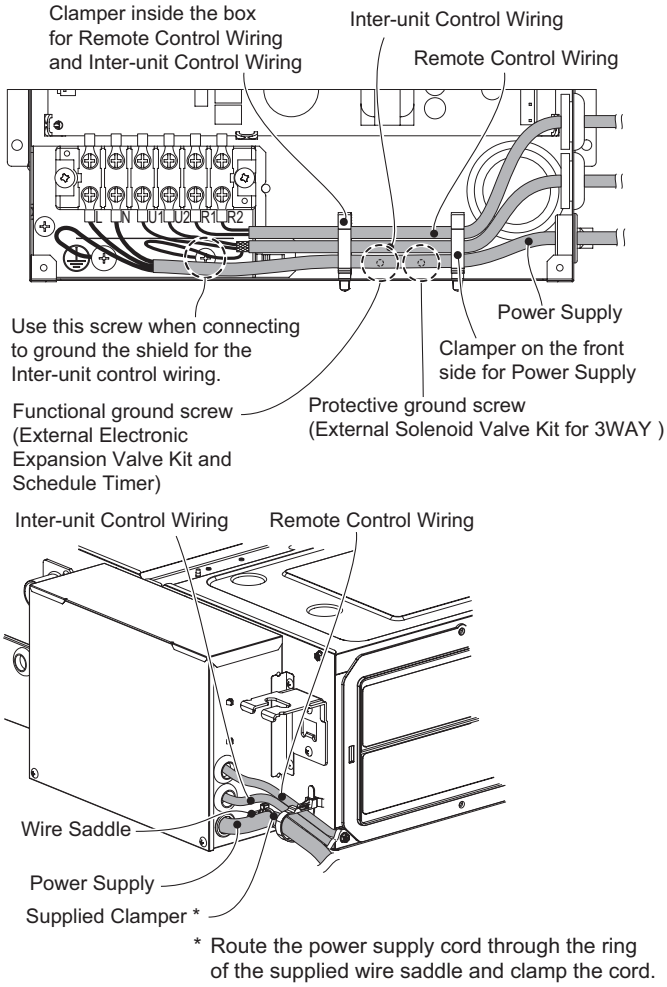

### Indoor Unit : E1 Type (224, 280)




### Indoor Unit : Y1 Type




### Indoor Unit : M1 Type

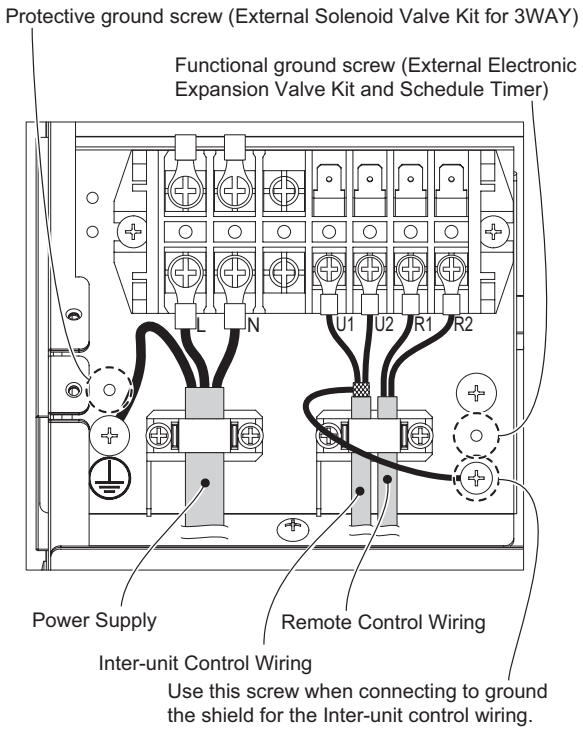



* Route the power supply cord through the ring of the supplied wire saddle and clamp the cord.

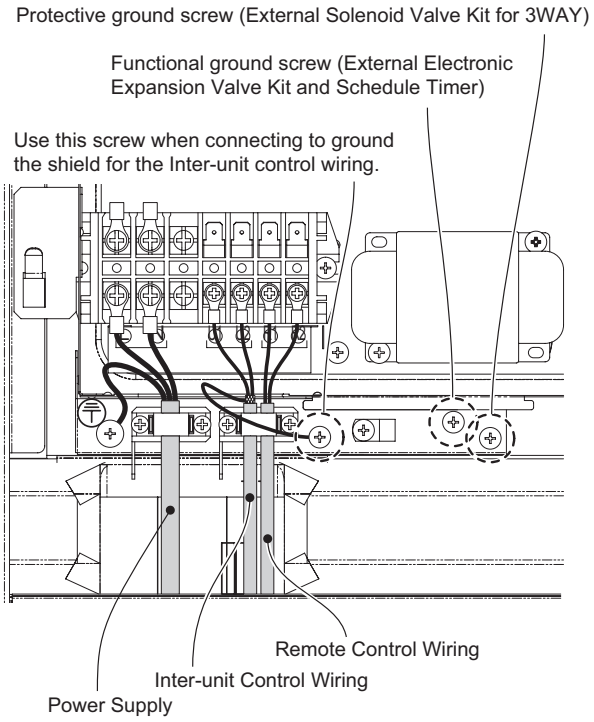
# 3. Electrical Wiring

## ■ Wiring sample

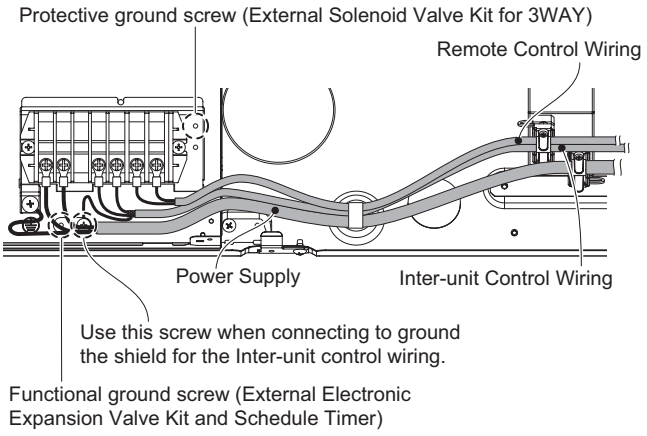
### Indoor Unit : F1 Type



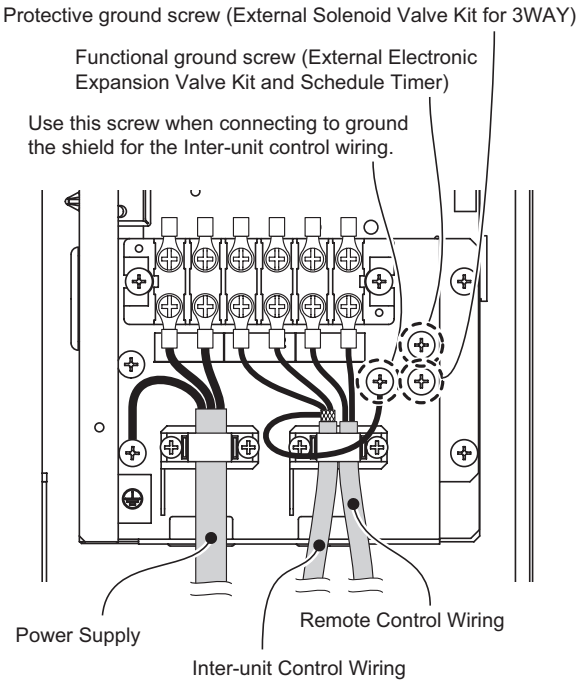

### Indoor Unit : L1 Type




### Indoor Unit : D1 Type



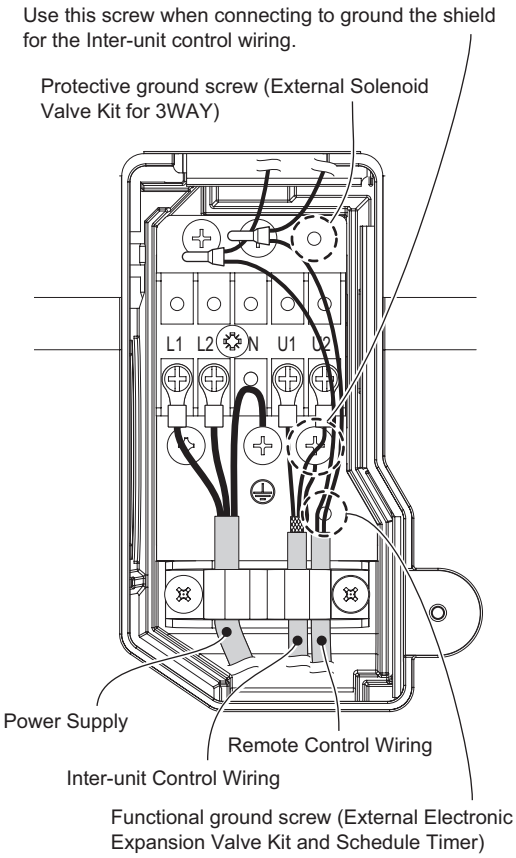

### Indoor Unit : P1 and R1 Types



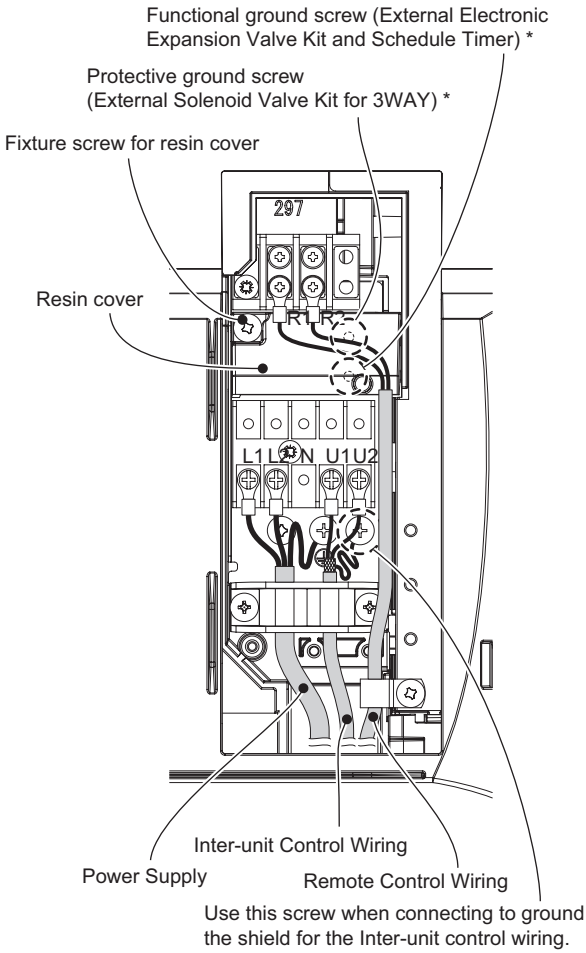
# 3. Electrical Wiring

## ■ Wiring sample

### Indoor Unit : K1 Type (22, 28, 36)




### Indoor Unit : K1 Type (45, 56, 73, 106)




* As to functional ground screw and protective ground screw, remove the fixture screw and resin cover.
Then, carry out earth ground work.

# 4. Installation Instructions

## 4-1. Selecting the Installation Site for Outdoor Unit

**AVOID:**

- heat sources, exhaust fans, etc.
- damp, humid or uneven locations
- indoors (no-ventilation location)

**DO:**

- choose a place as cool as possible.
- choose a place that is well ventilated.
- allow enough room around the unit for air intake/ exhaust and possible maintenance.

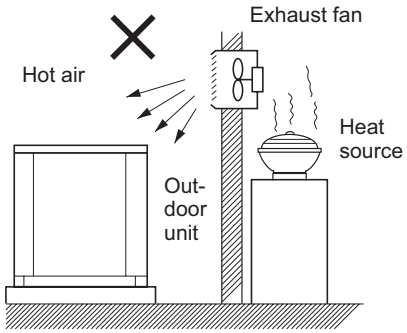
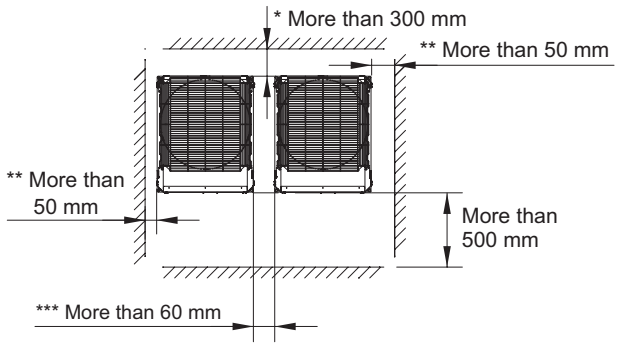



**Fig. 2-12**

**Installation Space**

Install the outdoor unit where there is enough space for ventilation. Otherwise the unit may not operate properly. Fig. 2-13 shows the minimum space requirement around the outdoor units when 3 sides are open and only 1 side is shuttered, with open space above the unit. The mounting base should be concrete or a similar material that allows for adequate drainage. Make provisions for anchor bolts, platform height, and other site-specific installation requirements.

Example of installation of 2 units
(when 3 sides are open and only 1 side is shuttered)




* Make a walk-in space behind the unit to erase maintenance and servicing.

** When setting the anchor bolt to position “B” or “C” (See Fig. 2-14), make the space between the unit and the wall more than 250 mm for installation operation.

*** When setting the anchor bolt to position “B” or “C” (See Fig. 2-14), make the space between the outdoor units more than 180 mm for installation operation.

**Fig. 2-13**

**CAUTION**

- **Leave space open above the unit.**
- **Construct louvers or other openings in the wall, if necessary, to ensure adequate ventilation.**

**NOTE**

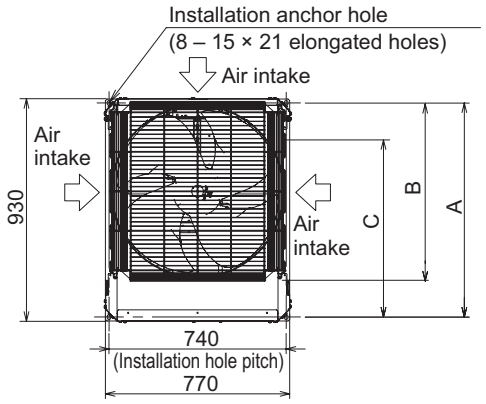
- Do not do any wiring or tubing within 30 cm of the front panel, because this space is needed as a servicing space for the compressor.
- Ensure a base height of 100 mm or more to ensure that drainage water does not accumulate and freeze around the bottom of the unit.
- If installing a drain pan, install the drain pan prior to installing the outdoor unit.

* Make sure there is at least 150 mm between the outdoor unit and the ground.
Also, the direction of the tubing and electrical wiring should be from the front of the outdoor unit.

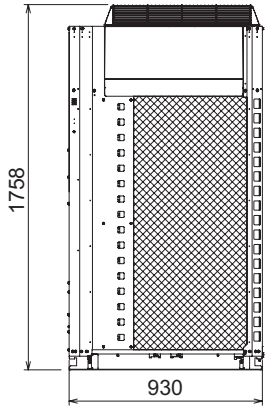
# 4. Installation Instructions

Unit: mm

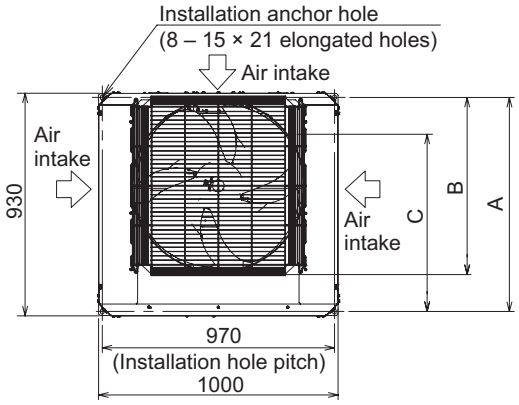
Top view



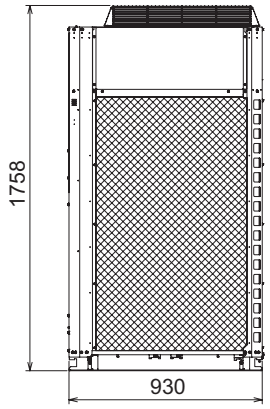

Side view



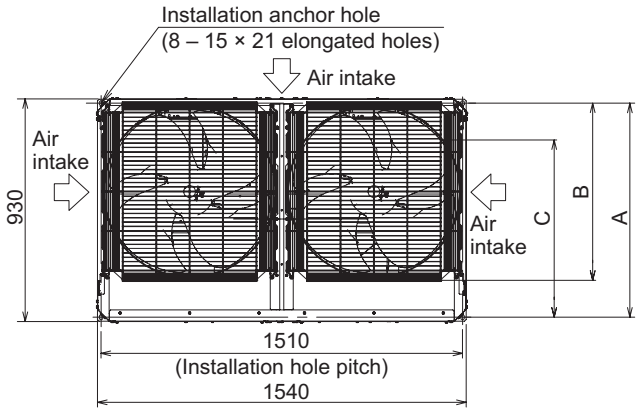

Top view



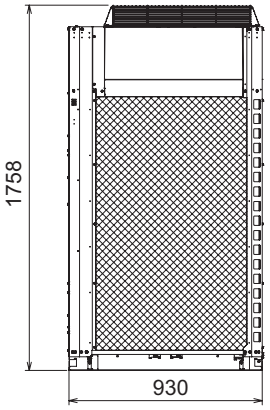

Side view




Top view




Side view




* According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

A : 894 (Installation hole pitch) * For removing tube forward
B : 730 (Installation hole pitch) * For removing the tube downward
C : 730 (Installation hole pitch)

**Fig. 2-14**

* When making a combination of more than 2 units, refer to pages from 1-8 to 1- 17 regarding the confirmation of the unit installation holes and unit size.

# 4. Installation Instructions



### 4-2. Shield for Horizontal Exhaust Discharge

It is necessary to install an air-discharge chamber (field supply) to direct exhaust from the fan horizontally if it is difficult to provide a minimum space of 2 m between the air-discharge outlet and a nearby obstacle. (Fig. 2-15)

**CAUTION**

**In regions with heavy snowfall, the outdoor unit should be provided with a solid, raised platform and snow-proof vents. (Fig. 2-16)**

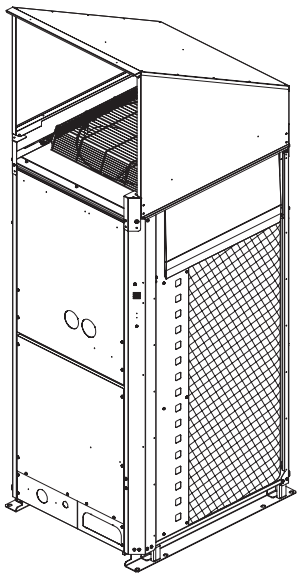


**Fig. 2-15**

### 4-3. Installing the Outdoor Unit in Heavy Snow Areas

In locations where wind-blown snow can be a problem, snow-proof vents should be fitted to the unit and direct exposure to the wind should be avoided as much as possible. (Fig. 2-17)
The following problems may occur if proper countermeasures are not taken:

- The fan in the outdoor unit may stop running, causing the unit to be damaged.
- There may be no air flow.
- The tubing may freeze and burst.
- The condenser pressure may drop because of strong wind, and the indoor unit may freeze.

### 4-4. Precautions When Installing in Heavy Snow Areas

a) The platform should be higher than the maximum snow depth. (Fig. 2-17)
b) The 2 anchoring feet of the outdoor unit should be used for the platform, and the platform should be installed beneath the air-intake side of the outdoor unit.
c) The platform foundation must be solid and the unit must be secured with anchor bolts.
d) When installing on a roof subject to strong wind, countermeasures must be taken to prevent the unit from being overturned.

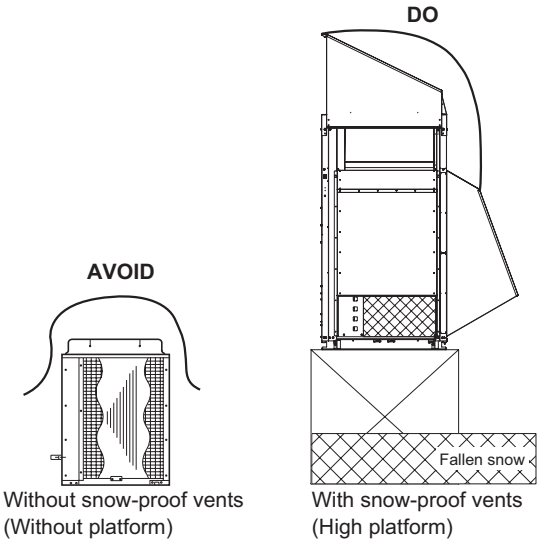



**Fig. 2-16**

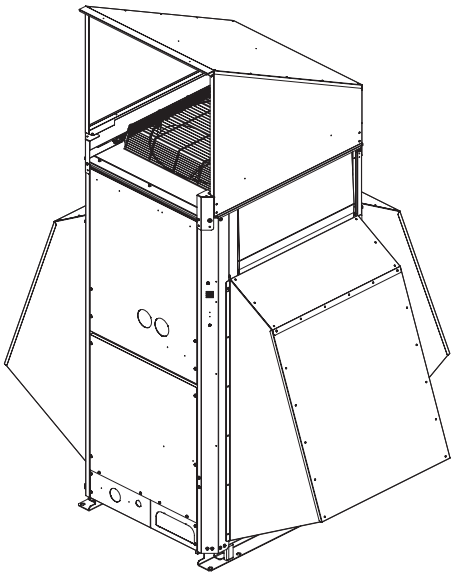


**Fig. 2-17**

# 4. Installation Instructions



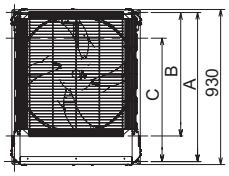
## 4-5. Dimensions of Wind Ducting

### Reference diagram for air-discharge chamber (field supply)

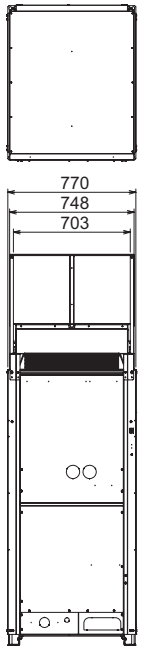
Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

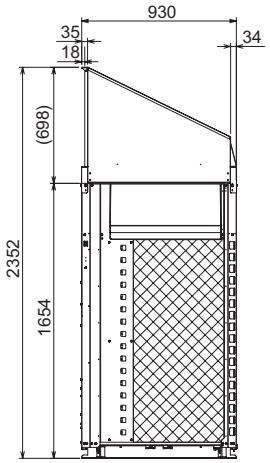
**U-8ME1E8(E), 10ME1E8(E), 12ME1E8(E)**

unit: mm

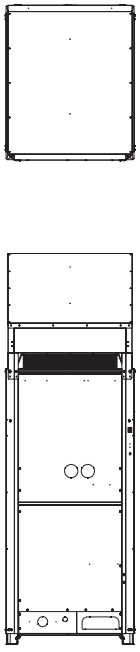


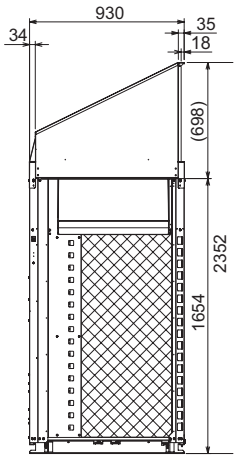

Air direction: Front direction



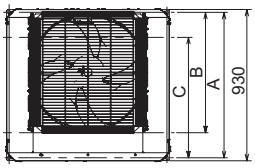

Air direction: Rear direction



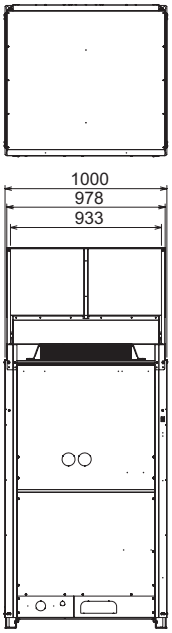


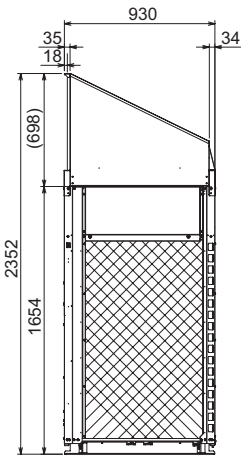

**U-14ME1E8(E), 16ME1E8(E)**

unit: mm

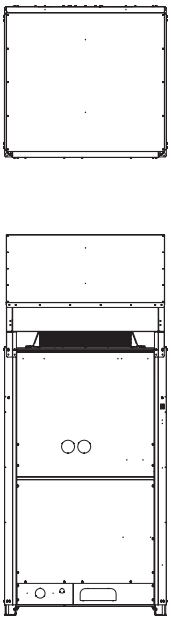


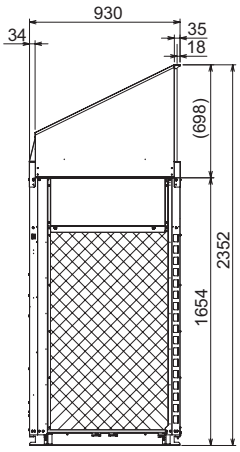

Air direction: Front direction




Air direction: Rear direction





# 4. Installation Instructions

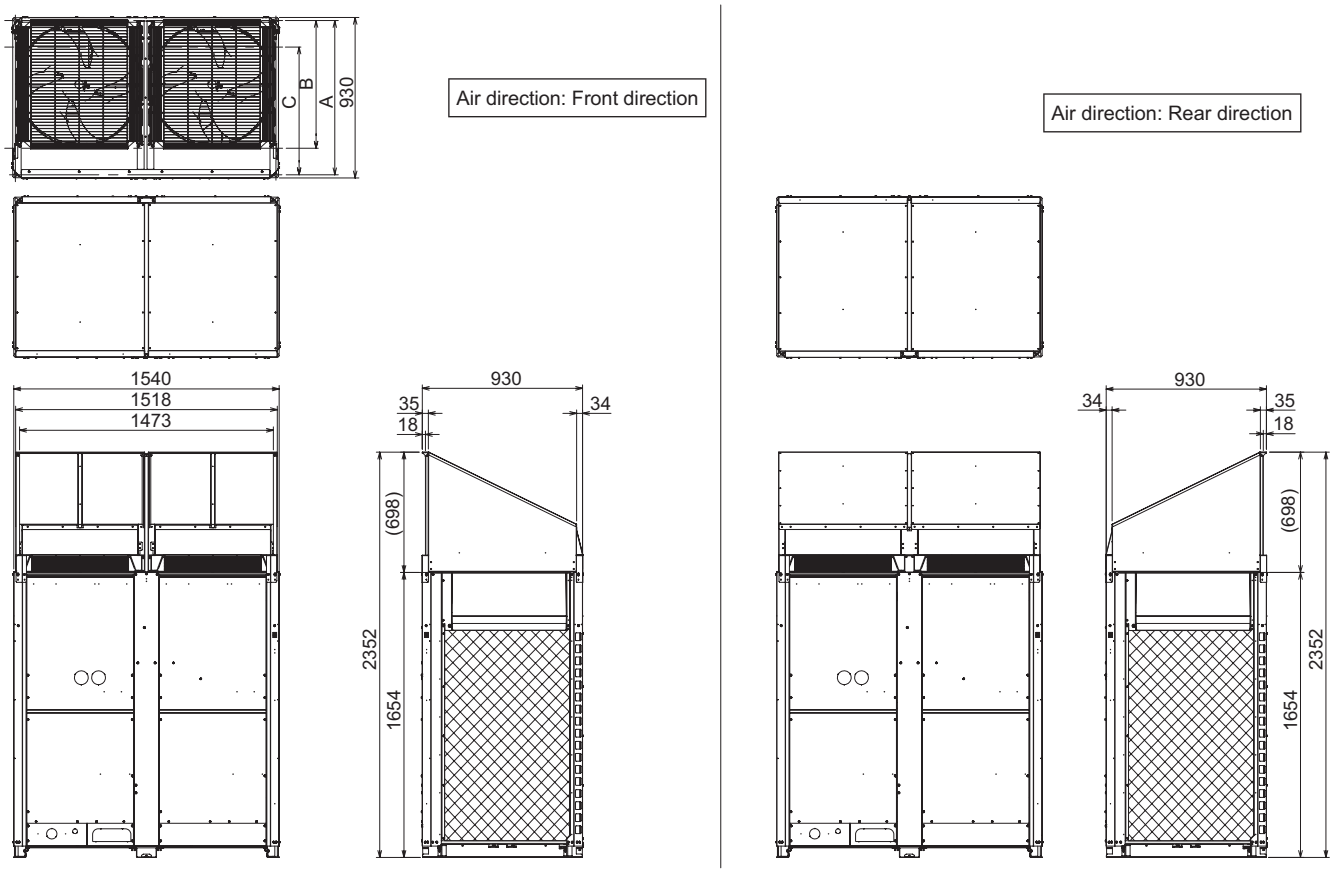


### Reference diagram for air-discharge chamber (field supply)

Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**U-18ME1E8(E), 20ME1E8(E)**

unit: mm



# 4. Installation Instructions



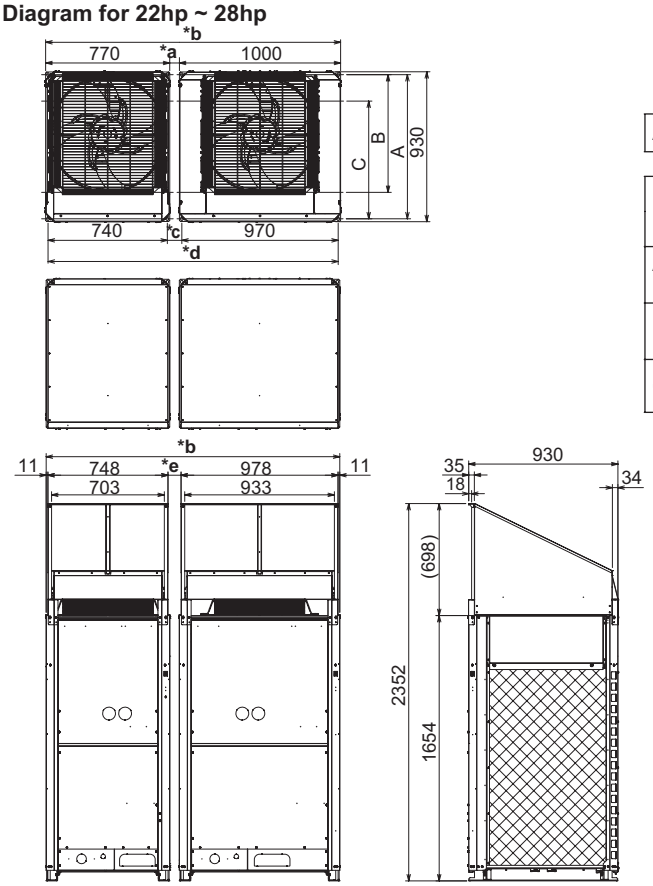
### Reference diagram for air-discharge chamber (field supply) (continued)

### Unit combinations for Standard-COP mode

Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 22hp ~ 28hp**

unit: mm

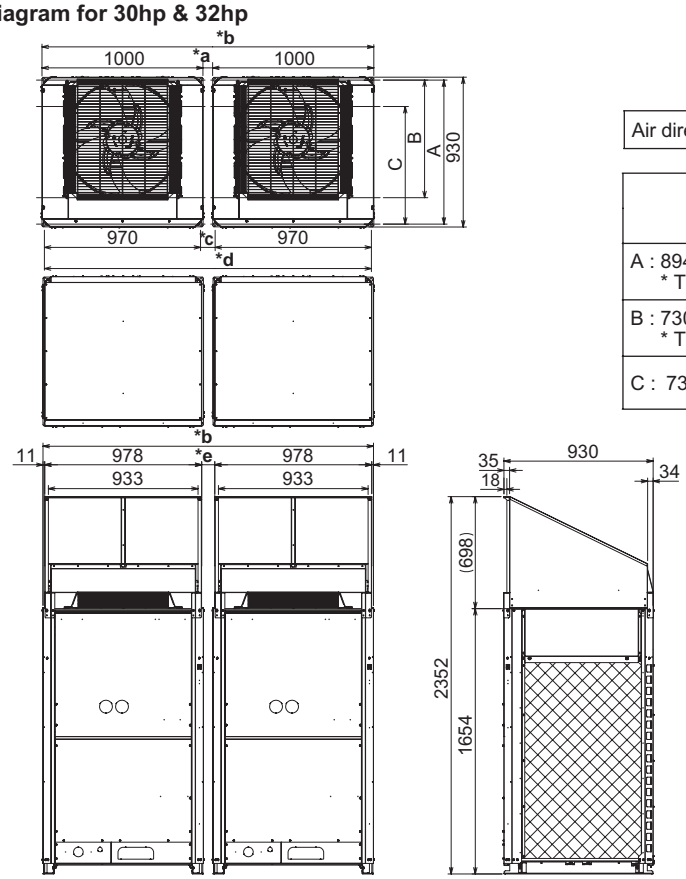



Air direction: Front direction

| | For 22hp ~ 28hp | | | | |
|---|---|---|---|---|---|
| | ***a** | ***b** | ***c** | ***d** | ***e** |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 1830 | 90 | 1800 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 1950 | 210 | 1920 | 202 |
| C : 730 (Installation hole pitch) | 180 | 1950 | 210 | 1920 | 202 |

**Diagram for 30hp & 32hp**

unit: mm




Air direction: Front direction

| | For 30hp & 32hp | | | | |
|---|---|---|---|---|---|
| | ***a** | ***b** | ***c** | ***d** | ***e** |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 2060 | 90 | 2030 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 2180 | 210 | 2150 | 202 |
| C : 730 (Installation hole pitch) | 180 | 2180 | 210 | 2150 | 202 |

# 4. Installation Instructions



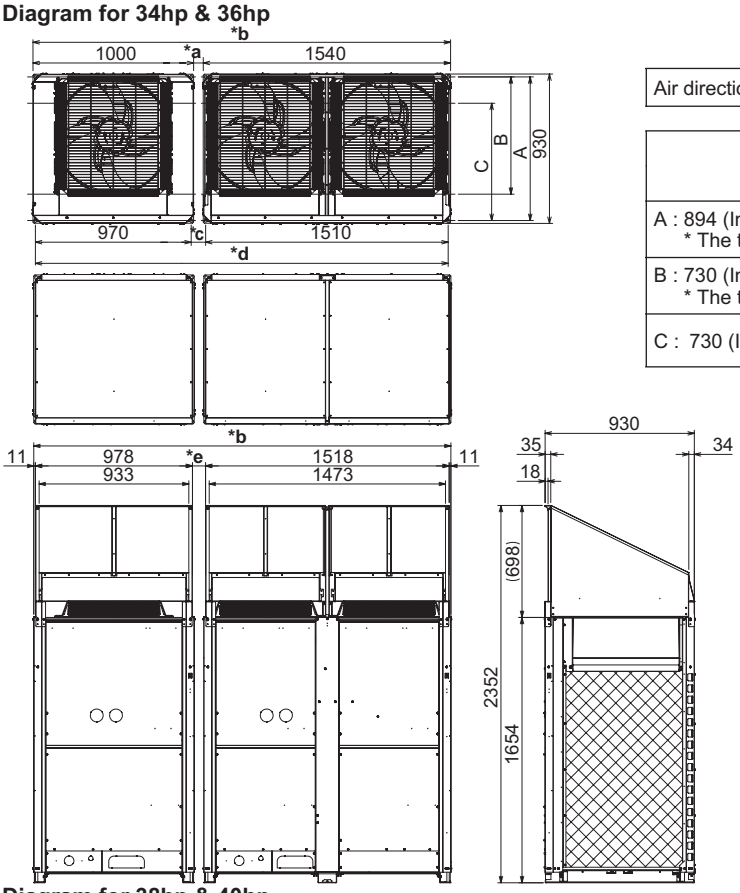
### Reference diagram for air-discharge chamber (field supply) (continued)

### Unit combinations for Standard-COP mode

Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 34hp & 36hp**

unit: mm

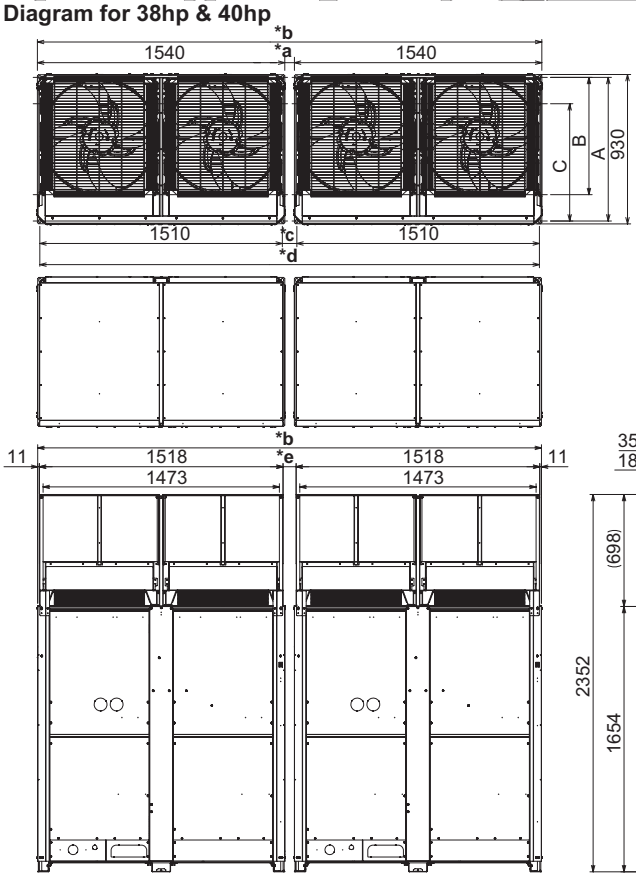



Air direction: Front direction

| | For 34hp & 36hp | | | | |
|---|---|---|---|---|---|
| | ***a** | ***b** | ***c** | ***d** | ***e** |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 2600 | 90 | 2570 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 2720 | 210 | 2690 | 202 |
| C : 730 (Installation hole pitch) | 180 | 2720 | 210 | 2690 | 202 |

**Diagram for 38hp & 40hp**

unit: mm




Air direction: Front direction

| | For 38hp & 40hp | | | | |
|---|---|---|---|---|---|
| | ***a** | ***b** | ***c** | ***d** | ***e** |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 3140 | 90 | 3110 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 3260 | 210 | 3230 | 202 |
| C : 730 (Installation hole pitch) | 180 | 3260 | 210 | 3230 | 202 |

# 4. Installation Instructions



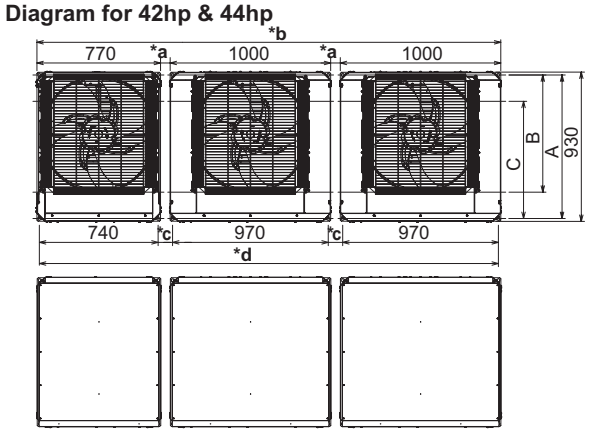
### Reference diagram for air-discharge chamber (field supply) (continued)

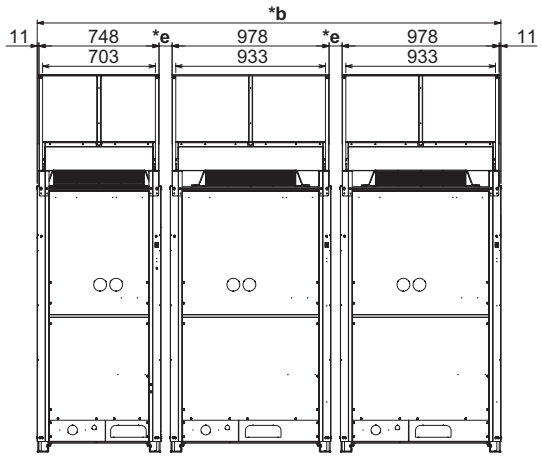
### Unit combinations for Standard-COP mode

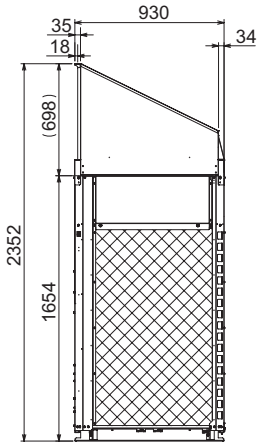
Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 42hp & 44hp**

unit: mm



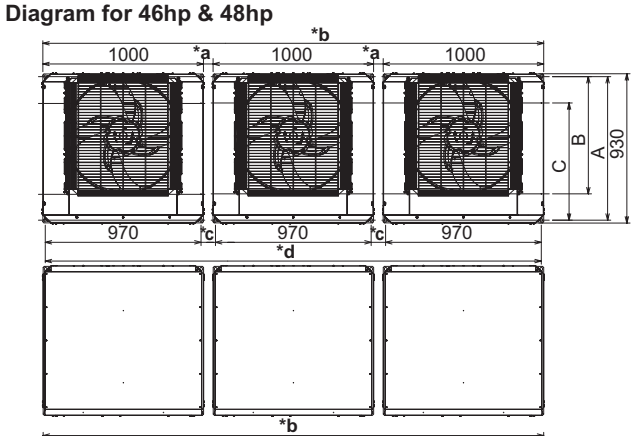



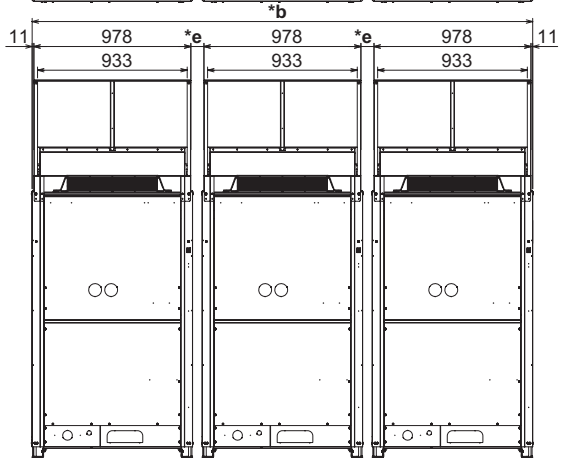

Air direction: Front direction

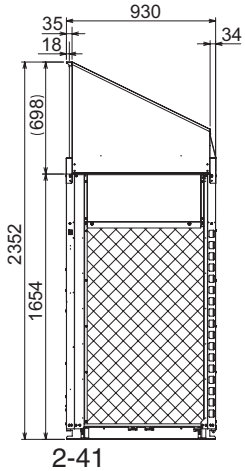
| | For 42hp & 44hp | | | | |
|---|---|---|---|---|---|
| | ***a** | ***b** | ***c** | ***d** | ***e** |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 2890 | 90 | 2860 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 3130 | 210 | 3100 | 202 |
| C : 730 (Installation hole pitch) | 180 | 3130 | 210 | 3100 | 202 |

**Diagram for 46hp & 48hp**

unit: mm




Air direction: Front direction

| | For 46hp & 48hp | | | | |
|---|---|---|---|---|---|
| | ***a** | ***b** | ***c** | ***d** | ***e** |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 3120 | 90 | 3090 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 3360 | 210 | 3330 | 202 |
| C : 730 (Installation hole pitch) | 180 | 3360 | 210 | 3330 | 202 |

# 4. Installation Instructions

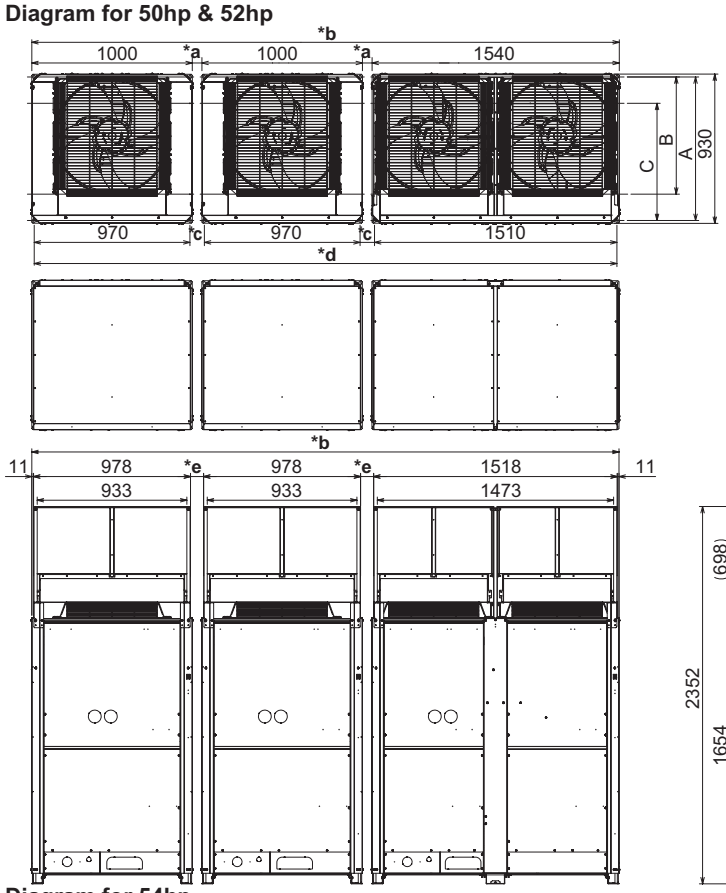


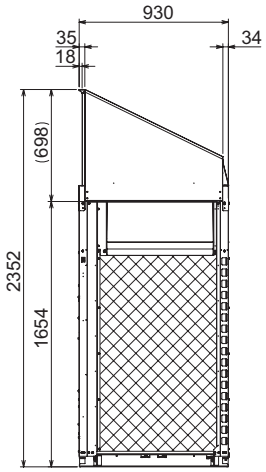
### Reference diagram for air-discharge chamber (field supply) (continued)

### Unit combinations for Standard-COP mode

Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 50hp & 52hp**



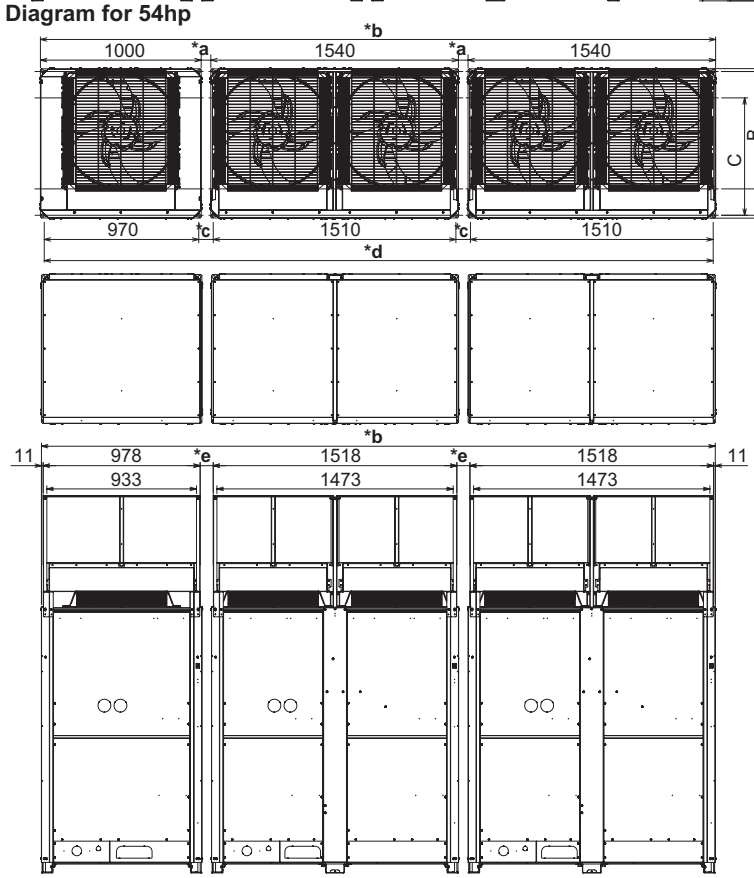



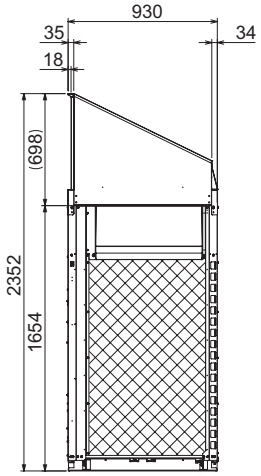

Air direction: Front direction

unit: mm

| | For 50hp & 52hp | | | | |
|---|---|---|---|---|---|
| | *a | *b | *c | *d | *e |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 3360 | 90 | 3630 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 3900 | 210 | 3870 | 202 |
| C : 730 (Installation hole pitch) | 180 | 3900 | 210 | 3870 | 202 |

**Diagram for 54hp**




Air direction: Front direction

unit: mm

| | For 54hp | | | | |
|---|---|---|---|---|---|
| | *a | *b | *c | *d | *e |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 4200 | 90 | 4170 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 4440 | 210 | 4410 | 202 |
| C : 730 (Installation hole pitch) | 180 | 4440 | 210 | 4410 | 202 |

# 4. Installation Instructions

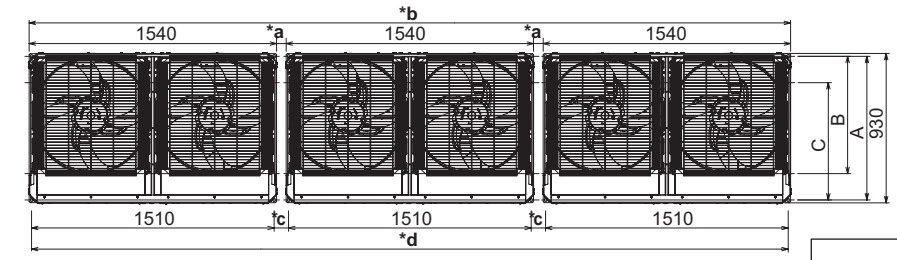
## Reference diagram for air-discharge chamber (field supply) (continued)

### Unit combinations for Standard-COP mode

Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

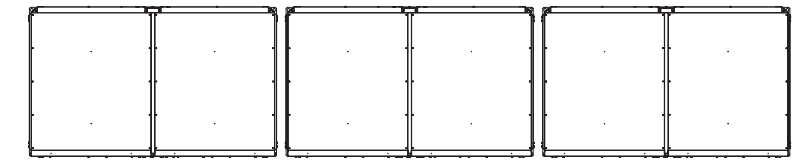
**Diagram for 56hp ~ 60hp**

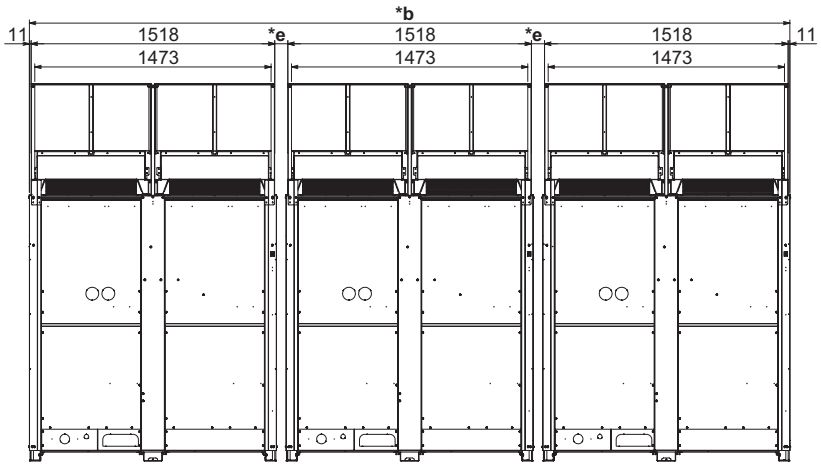
unit: mm

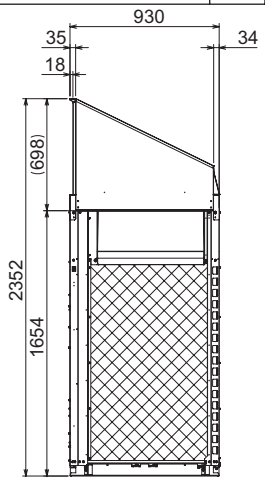



Air direction: Front direction

| | For 56hp ~ 60hp | | | | |
|---|---|---|---|---|---|
| | ***a** | ***b** | ***c** | ***d** | ***e** |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 4740 | 90 | 4710 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 4980 | 210 | 4950 | 202 |
| C : 730 (Installation hole pitch) | 180 | 4980 | 210 | 4950 | 202 |





# 4. Installation Instructions



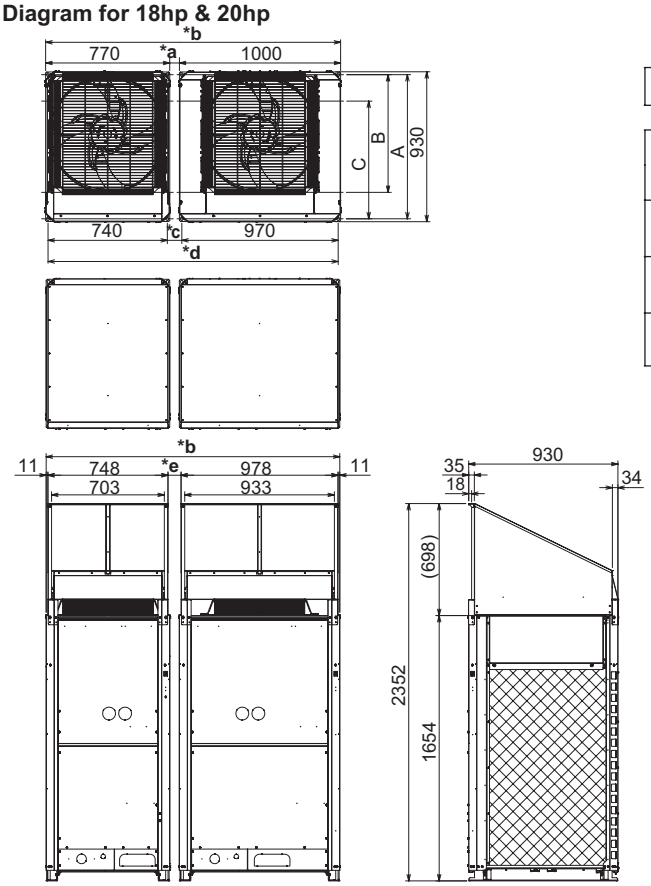
### Reference diagram for air-discharge chamber (field supply) (continued)

### Unit combinations for High-COP mode

Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 18hp & 20hp**

unit: mm

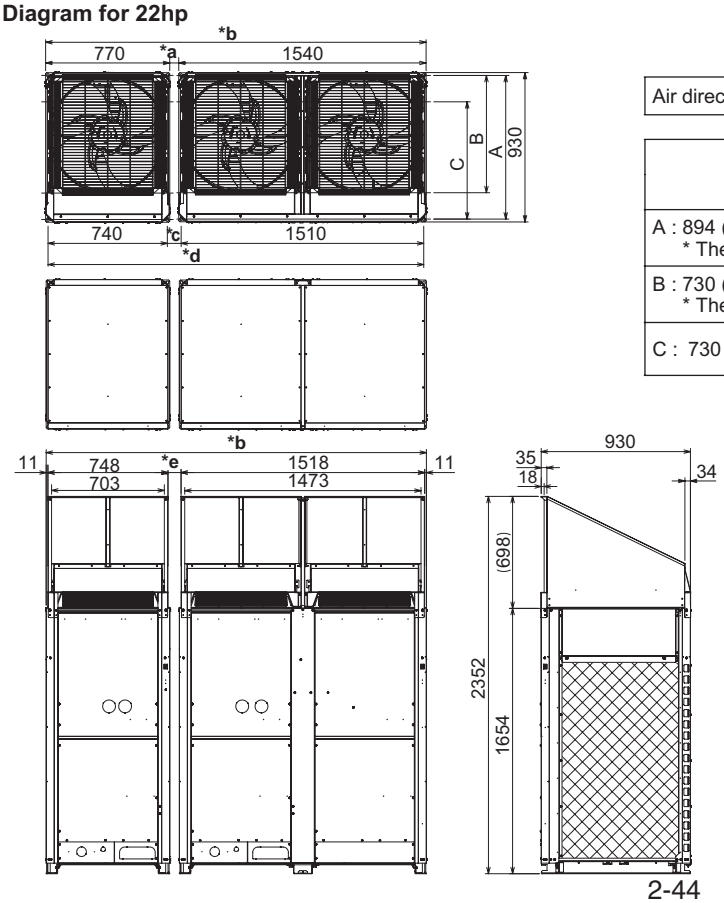



Air direction: Front direction

| | For 18hp ~ 20hp | | | | |
|---|---|---|---|---|---|
| | ***a** | ***b** | ***c** | ***d** | ***e** |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 1830 | 90 | 1800 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 1950 | 210 | 1920 | 202 |
| C : 730 (Installation hole pitch) | 180 | 1950 | 210 | 1920 | 202 |

**Diagram for 22hp**

unit: mm




Air direction: Front direction

| | For 22hp | | | | |
|---|---|---|---|---|---|
| | ***a** | ***b** | ***c** | ***d** | ***e** |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 2370 | 90 | 2340 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 2490 | 210 | 2460 | 202 |
| C : 730 (Installation hole pitch) | 180 | 2490 | 210 | 2460 | 202 |

# 4. Installation Instructions



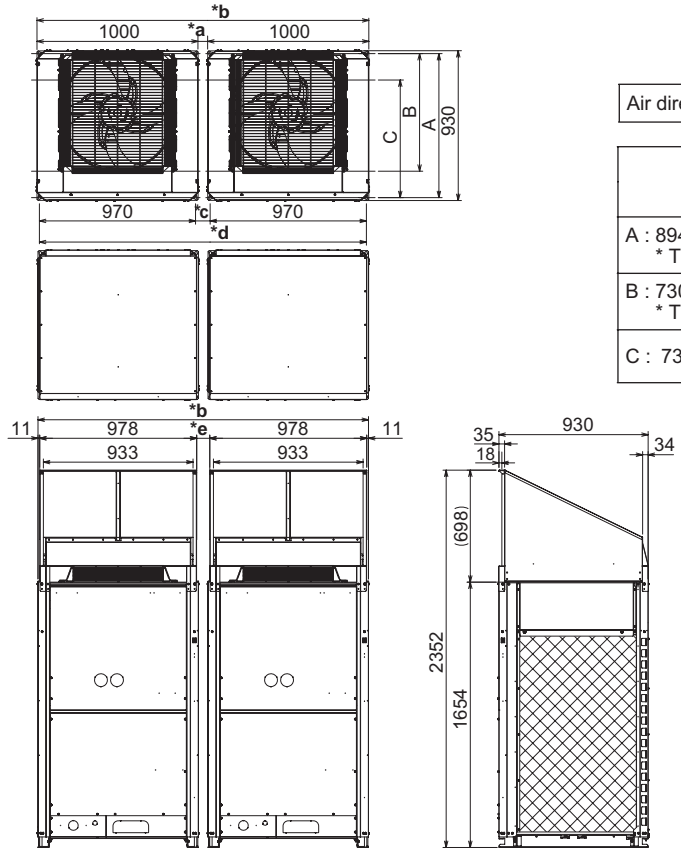
### Reference diagram for air-discharge chamber (field supply) (continued)

### Unit combinations for High-COP mode

Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 24hp**

unit: mm

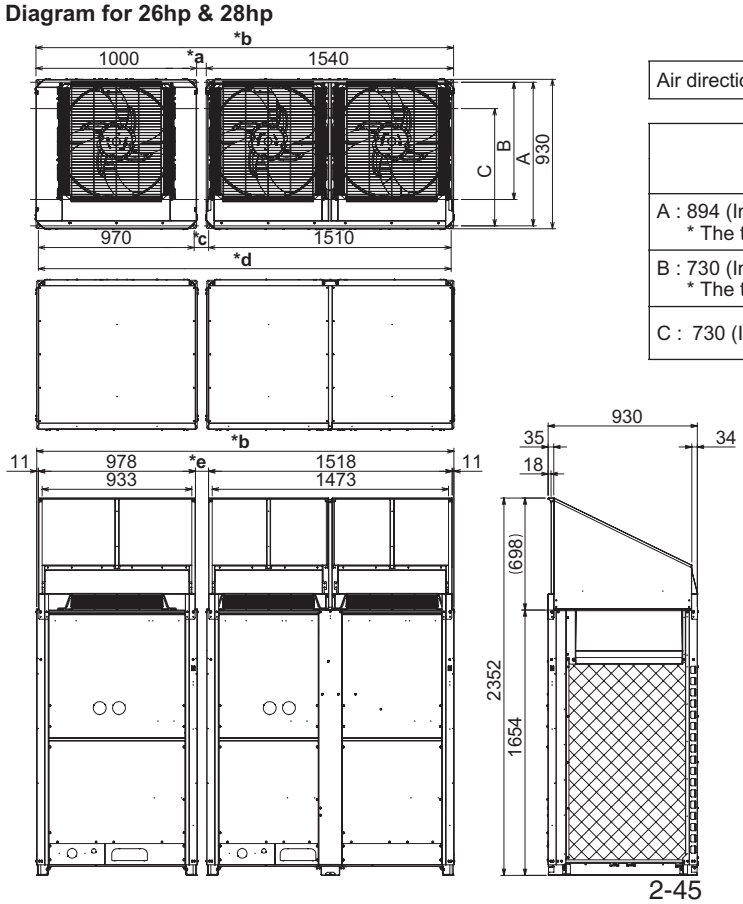



Air direction: Front direction

| | For 24hp | | | | |
|---|---|---|---|---|---|
| | ***a** | ***b** | ***c** | ***d** | ***e** |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 2060 | 90 | 2030 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 2180 | 210 | 2150 | 202 |
| C : 730 (Installation hole pitch) | 180 | 2180 | 210 | 2150 | 202 |

**Diagram for 26hp & 28hp**

unit: mm




Air direction: Front direction

| | For 26hp & 28hp | | | | |
|---|---|---|---|---|---|
| | ***a** | ***b** | ***c** | ***d** | ***e** |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 2600 | 90 | 2570 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 2720 | 210 | 2690 | 202 |
| C : 730 (Installation hole pitch) | 180 | 2720 | 210 | 2690 | 202 |

# 4. Installation Instructions



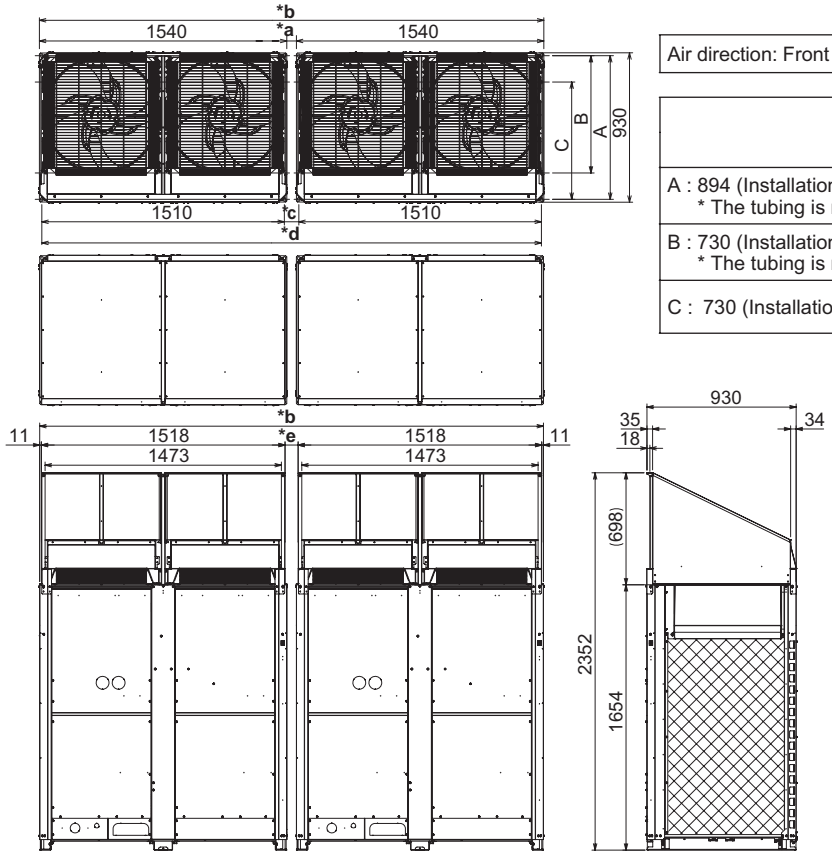
### Reference diagram for air-discharge chamber (field supply) (continued)

### Unit combinations for High-COP mode

Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 30hp & 32hp**

unit: mm

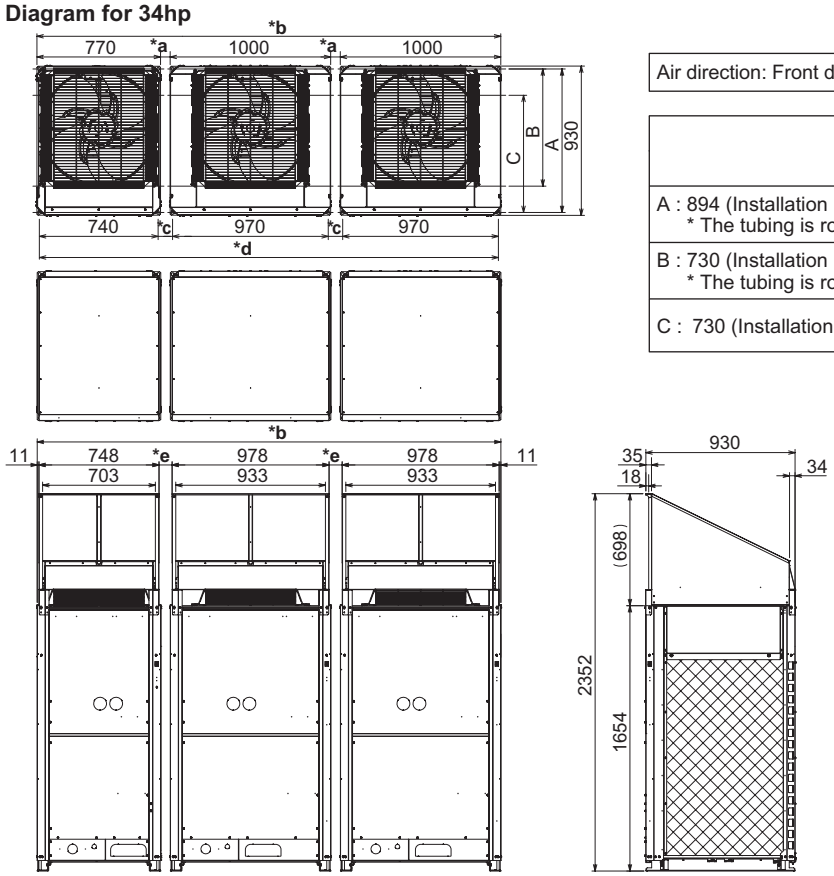



Air direction: Front direction

| | For 30hp & 32hp | | | | |
|---|---|---|---|---|---|
| | ***a** | ***b** | ***c** | ***d** | ***e** |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 3140 | 90 | 3110 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 3260 | 210 | 3230 | 202 |
| C : 730 (Installation hole pitch) | 180 | 3260 | 210 | 3230 | 202 |

**Diagram for 34hp**

unit: mm




Air direction: Front direction

| | For 34hp | | | | |
|---|---|---|---|---|---|
| | ***a** | ***b** | ***c** | ***d** | ***e** |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 2890 | 90 | 2860 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 3130 | 210 | 3100 | 202 |
| C : 730 (Installation hole pitch) | 180 | 3130 | 210 | 3100 | 202 |

# 4. Installation Instructions



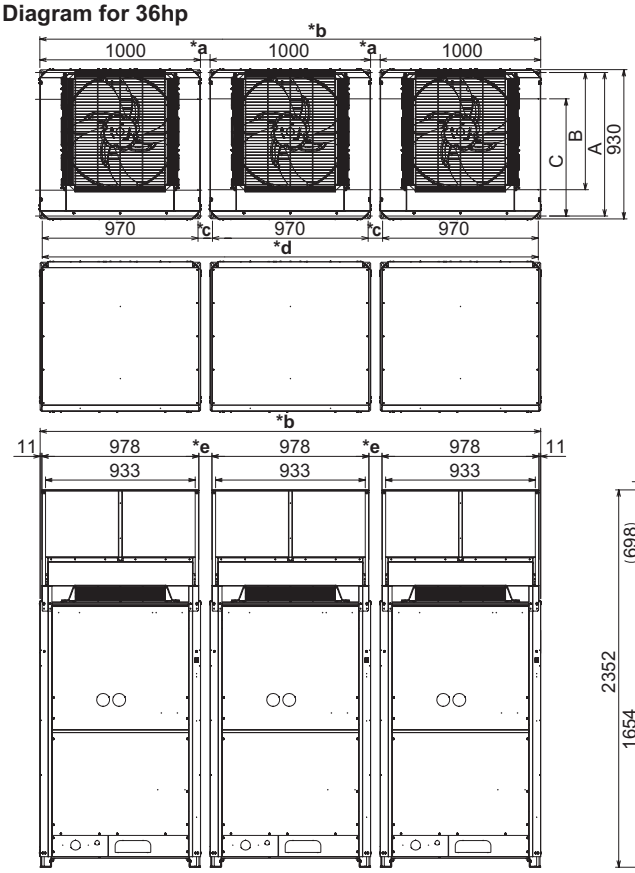
### Reference diagram for air-discharge chamber (field supply) (continued)

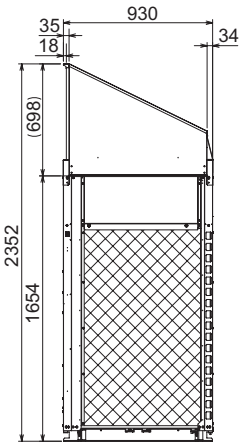
### Unit combinations for High-COP mode

Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 36hp**

unit: mm



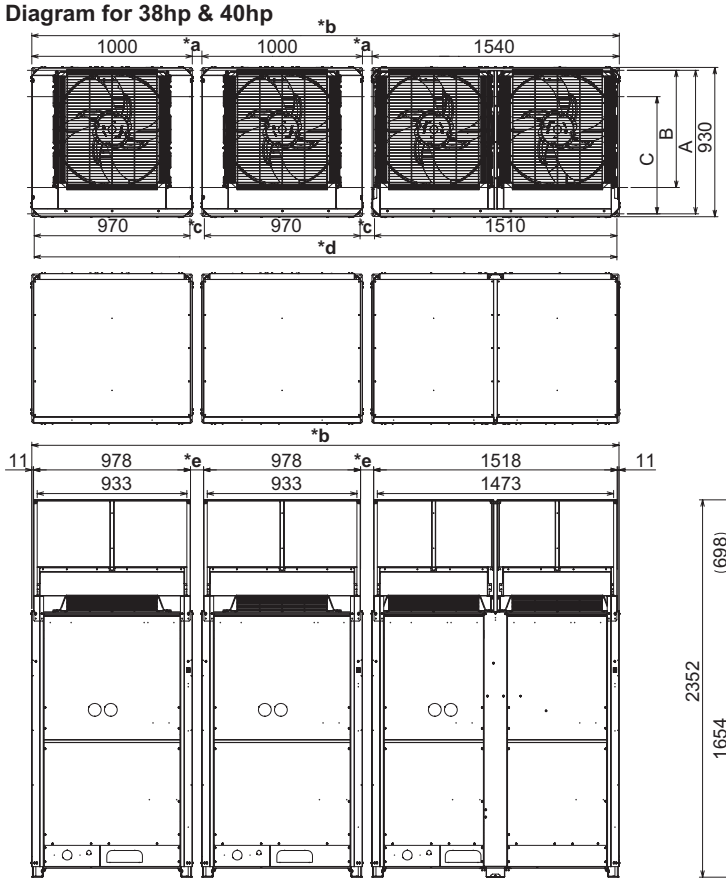



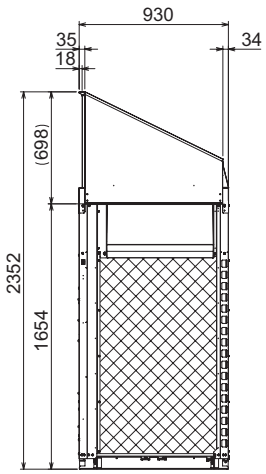

Air direction: Front direction

| | For 36hp | | | | |
|---|---|---|---|---|---|
| | *a | *b | *c | *d | *e |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 3120 | 90 | 3090 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 3360 | 210 | 3330 | 202 |
| C : 730 (Installation hole pitch) | 180 | 3360 | 210 | 3330 | 202 |

**Diagram for 38hp & 40hp**

unit: mm




Air direction: Front direction

| | For 38hp & 40hp | | | | |
|---|---|---|---|---|---|
| | *a | *b | *c | *d | *e |
| A : 894 (Installation hole pitch)<br>* The tubing is routed out from the front. | 60 | 3360 | 90 | 3630 | 82 |
| B : 730 (Installation hole pitch)<br>* The tubing is routed out from the bottom. | 180 | 3900 | 210 | 3870 | 202 |
| C : 730 (Installation hole pitch) | 180 | 3900 | 210 | 3870 | 202 |

# 4. Installation Instructions

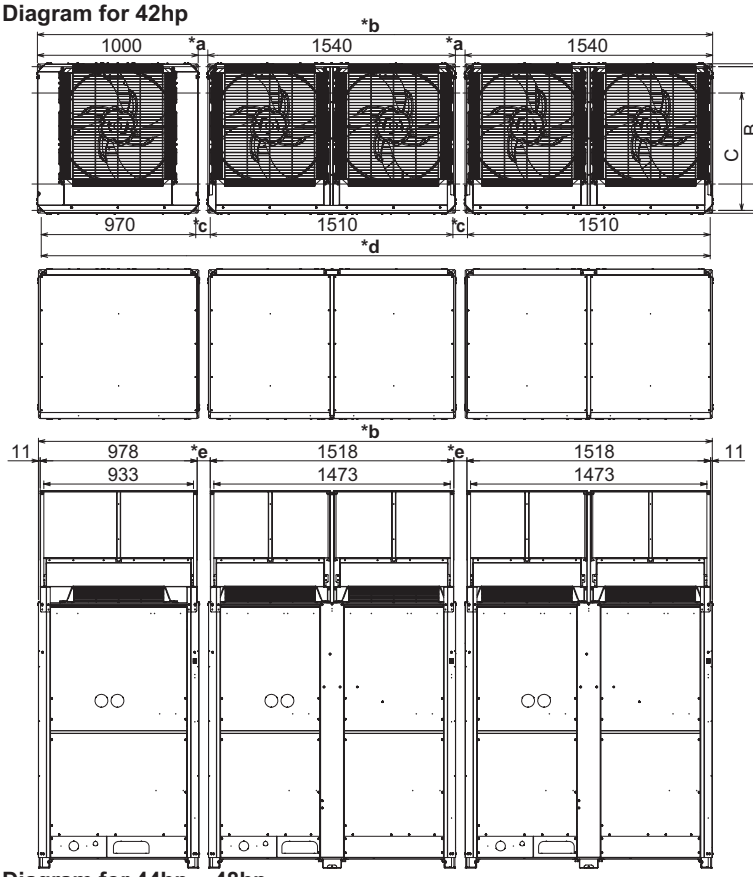


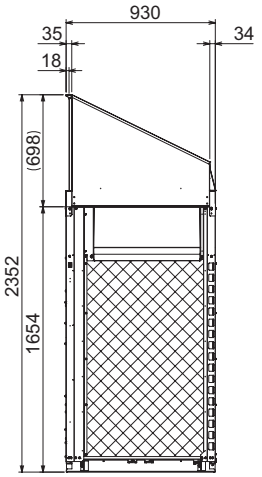
### Reference diagram for air-discharge chamber (field supply) (continued)

### Unit combinations for High-COP mode

Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 42hp**



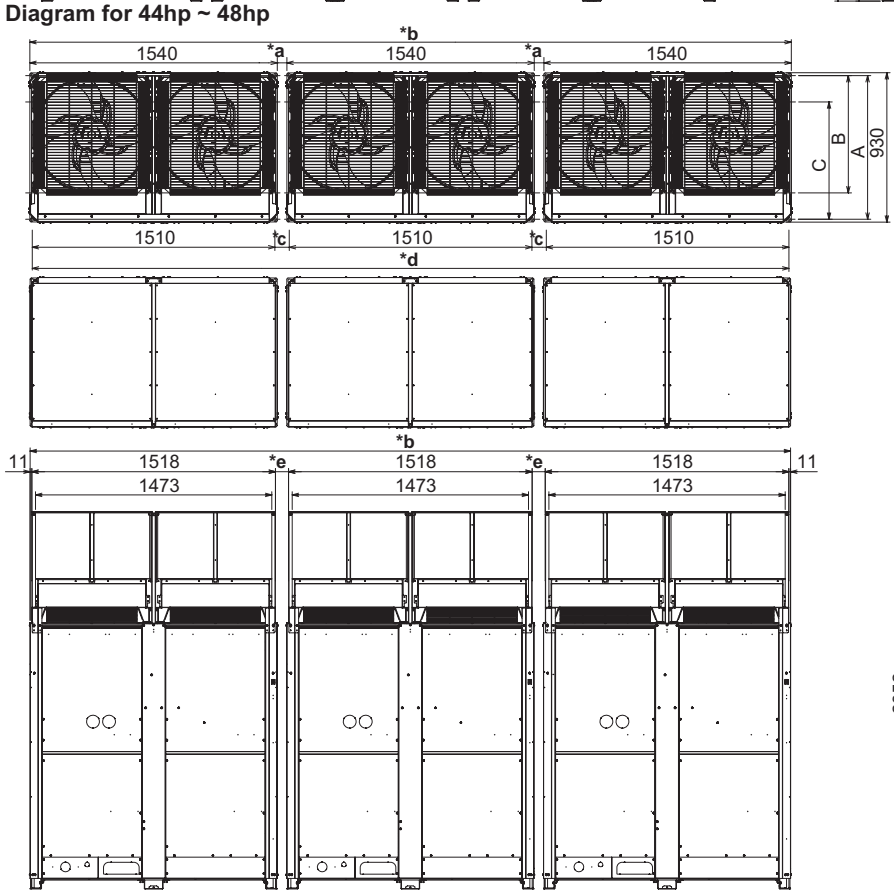



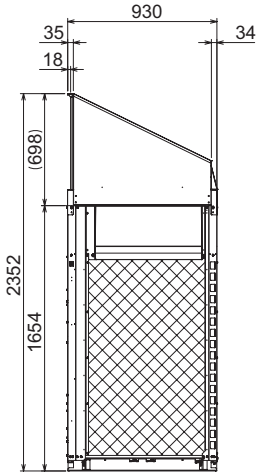

Air direction: Front direction

unit: mm

| | For 42hp | | | | |
|---|---|---|---|---|---|
| | *a | *b | *c | *d | *e |
| A : 894 (Installation hole pitch) * The tubing is routed out from the front. | 60 | 4200 | 90 | 4170 | 82 |
| B : 730 (Installation hole pitch) * The tubing is routed out from the bottom. | 180 | 4440 | 210 | 4410 | 202 |
| C : 730 (Installation hole pitch) | 180 | 4440 | 210 | 4410 | 202 |

**Diagram for 44hp ~ 48hp**




Air direction: Front direction

unit: mm

| | For 44hp ~ 48hp | | | | |
|---|---|---|---|---|---|
| | *a | *b | *c | *d | *e |
| A : 894 (Installation hole pitch) * The tubing is routed out from the front. | 60 | 4740 | 90 | 4710 | 82 |
| B : 730 (Installation hole pitch) * The tubing is routed out from the bottom. | 180 | 4980 | 210 | 4950 | 202 |
| C : 730 (Installation hole pitch) | 180 | 4980 | 210 | 4950 | 202 |

# 4. Installation Instructions

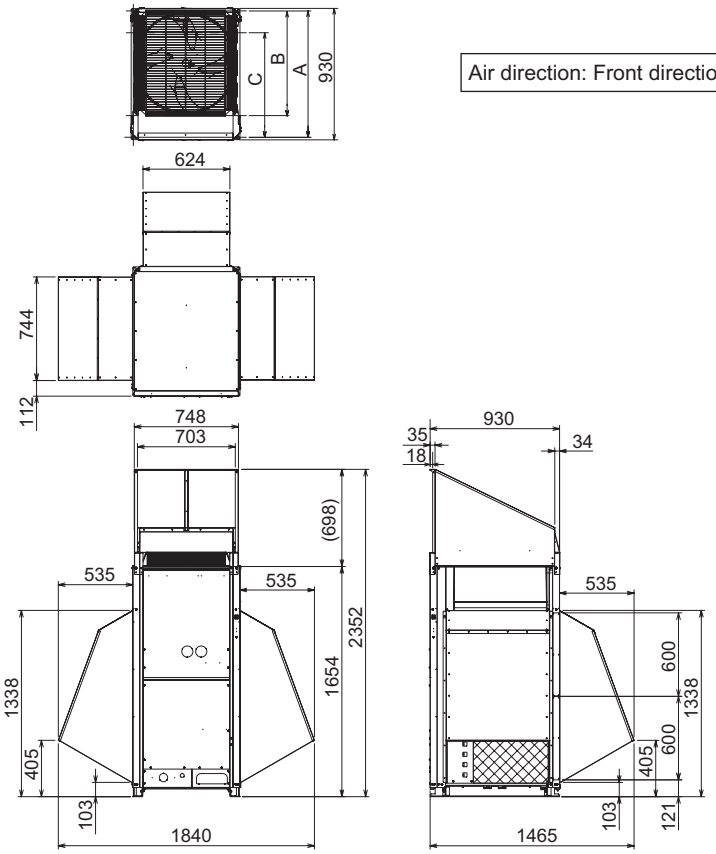
## 4-6. Dimensions of Snow Ducting

### Reference diagram for snow-proof vents (field supply)

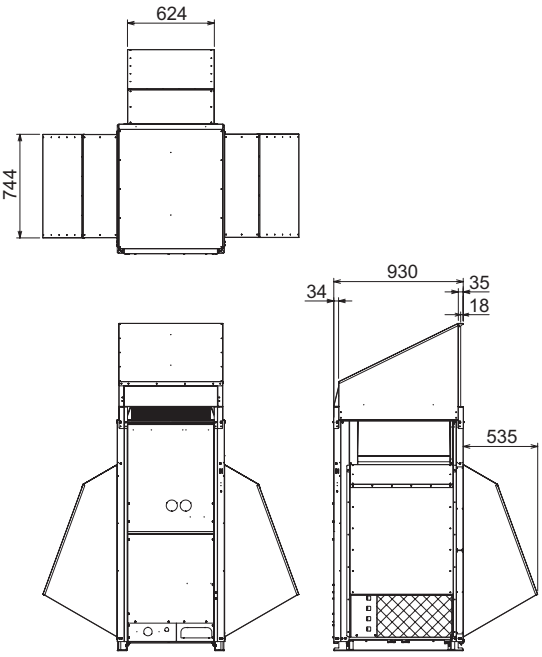
Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**U-8ME1E8(E), 10ME1E8(E), 12ME1E8(E)** unit: mm

Air direction: Front direction

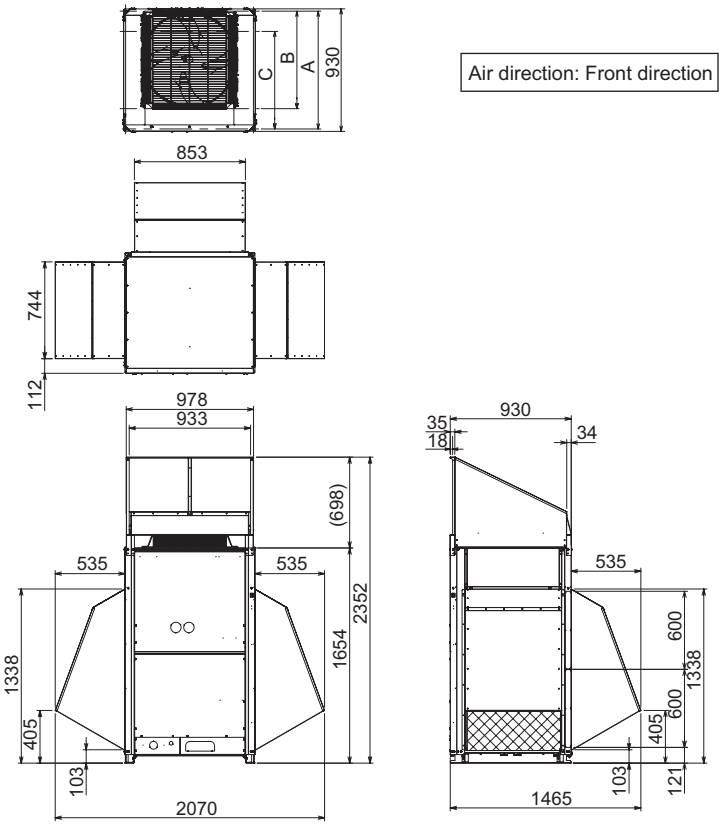



Air direction: Rear direction

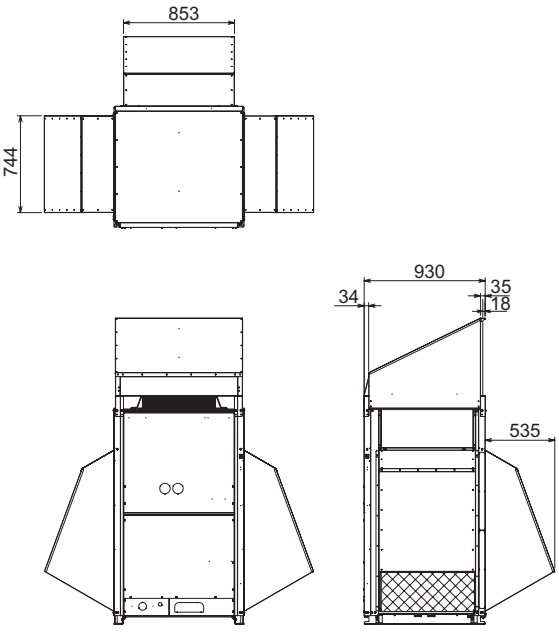



**U-14ME1E8(E), 16ME1E8(E)** unit: mm

Air direction: Front direction




Air direction: Rear direction



# 4. Installation Instructions

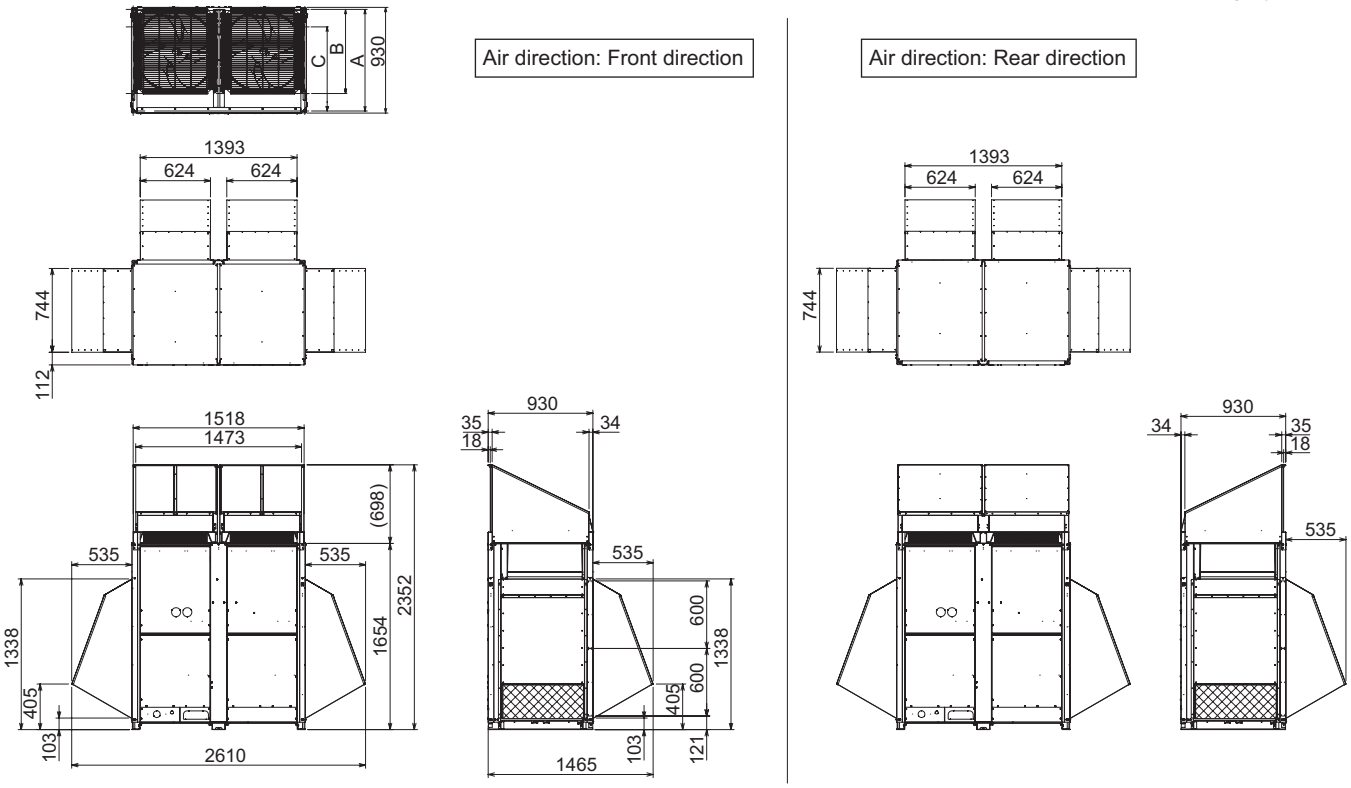


### Reference diagram for snow-proof vents (field supply)

Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”

**U-18ME1E8(E), 20ME1E8(E)**

unit: mm



# 4. Installation Instructions



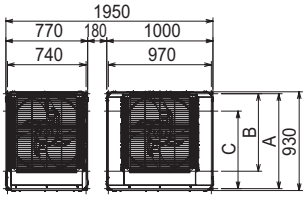
### Reference diagram for snow-proof vents (field supply) (continued)

### Unit combinations for Standard-COP mode

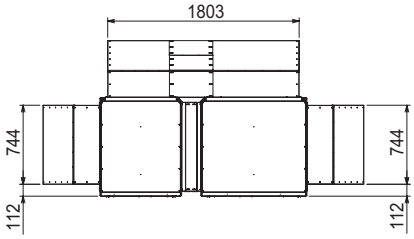
Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 22hp ~ 28hp**

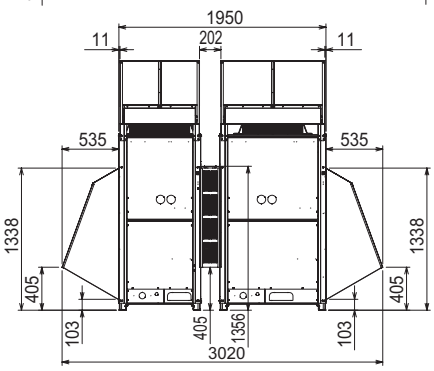
unit: mm

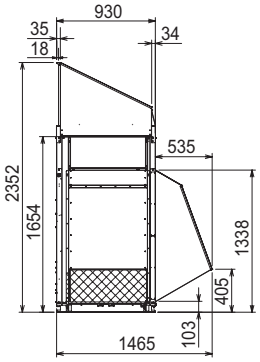


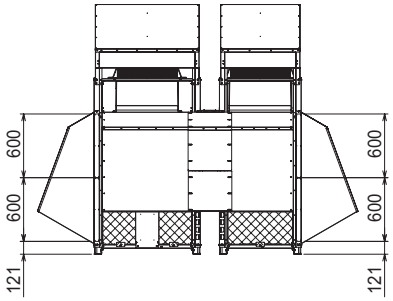

A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)




Air direction: Front direction

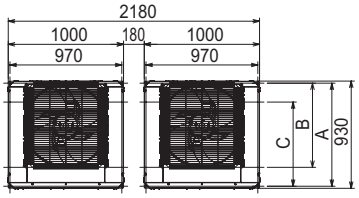


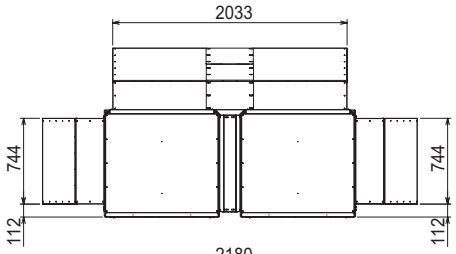




unit: mm

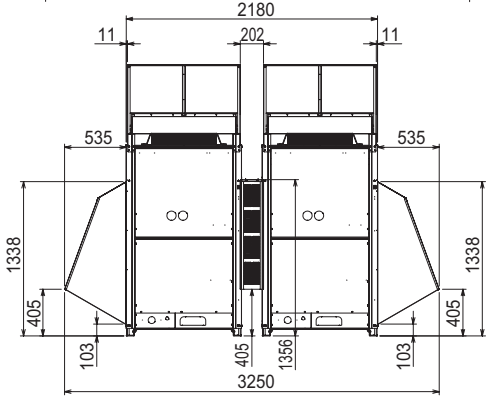
**Diagram for 30hp & 32hp**

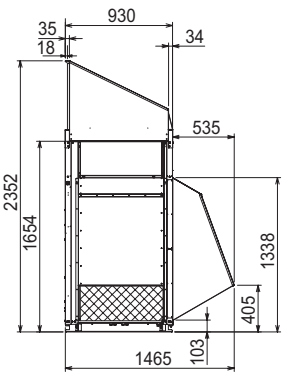


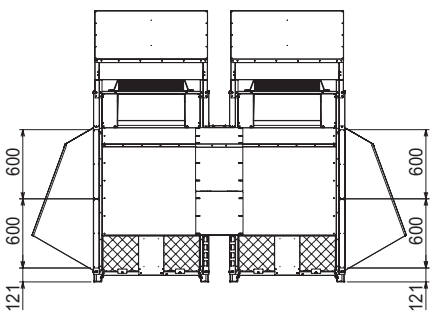

A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)




Air direction: Front direction



# 4. Installation Instructions



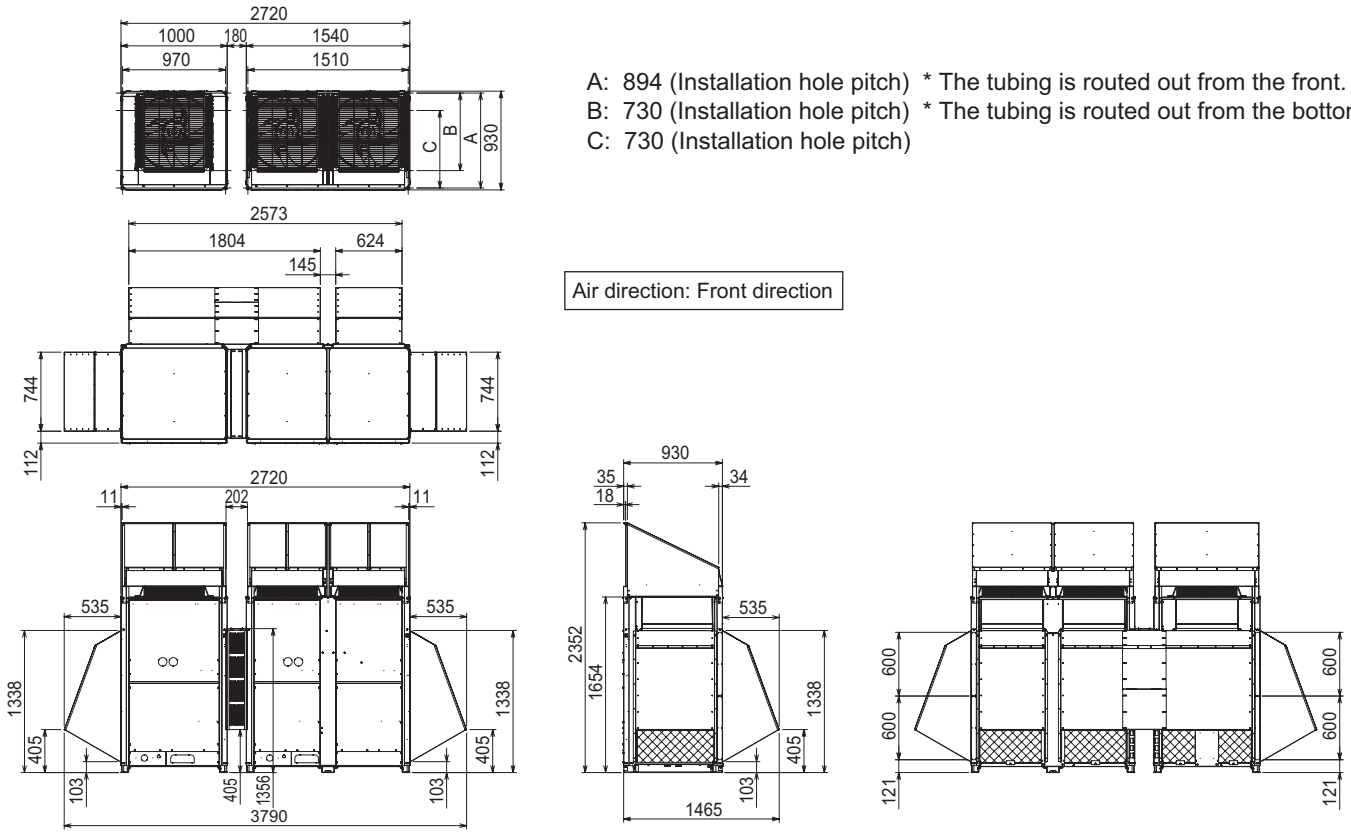
### Reference diagram for snow-proof vents (field supply) (continued)

### Unit combinations for Standard-COP mode

Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 34hp & 36hp**

unit: mm

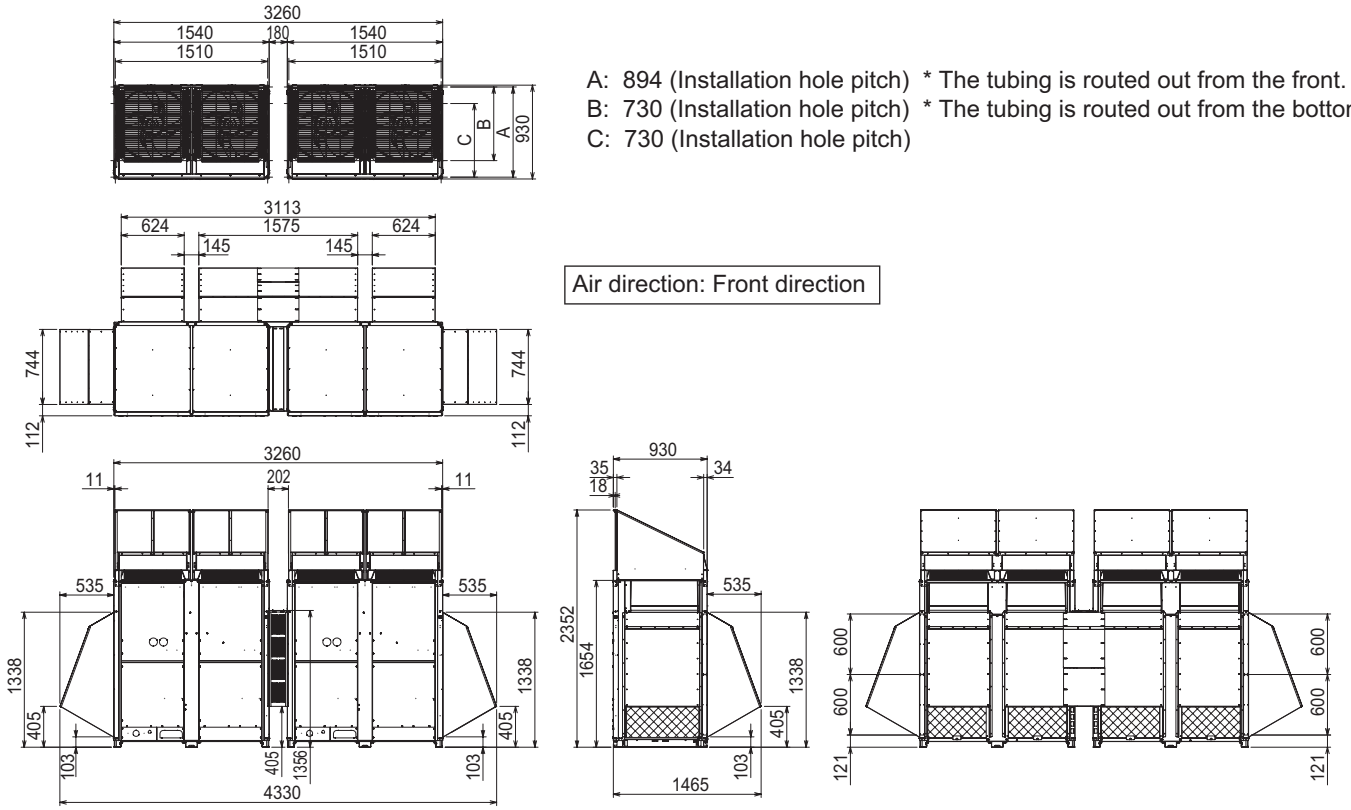



A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)

Air direction: Front direction

**Diagram for 38hp & 40hp**

unit: mm




A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)

Air direction: Front direction

# 4. Installation Instructions



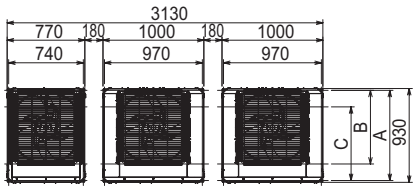
### Reference diagram for snow-proof vents (field supply) (continued)

### Unit combinations for Standard-COP mode

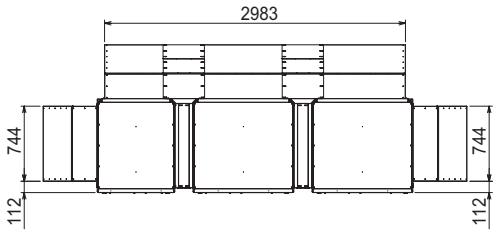
Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 42hp & 44hp**

unit: mm




A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)




Air direction: Front direction

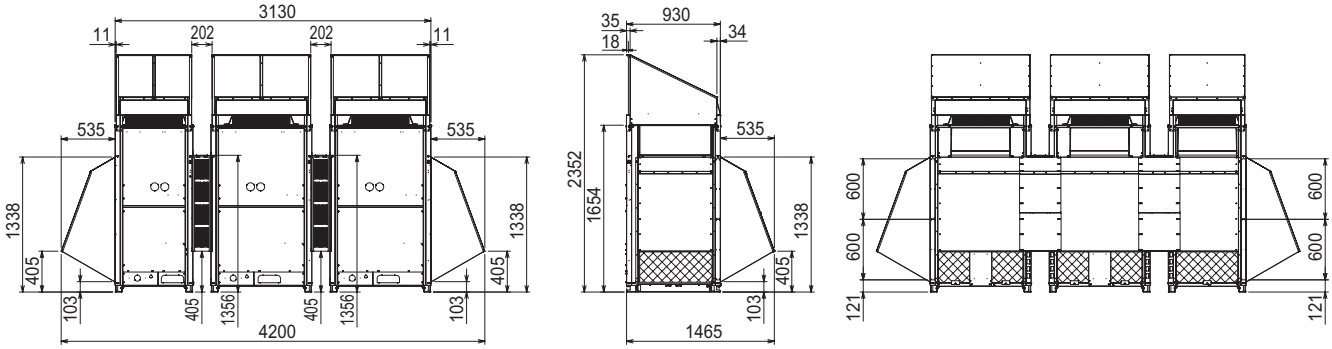
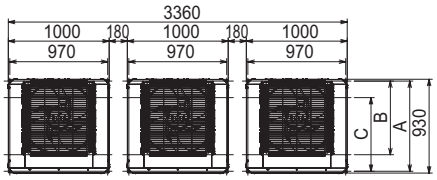
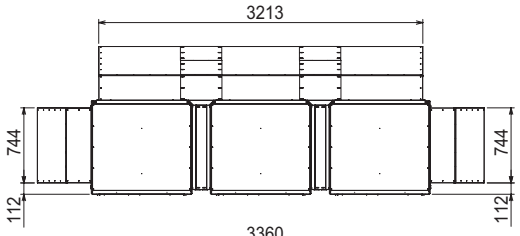



**Diagram for 46hp & 48hp**

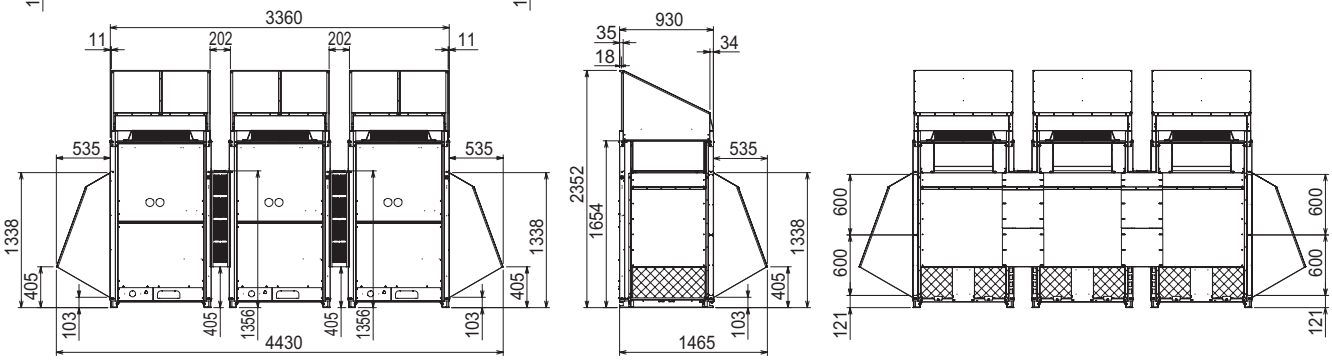
unit: mm




A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)




Air direction: Front direction



# 4. Installation Instructions



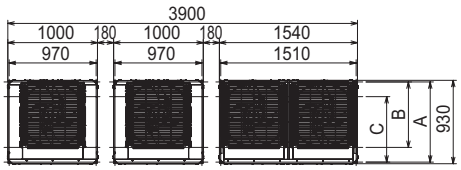
### Reference diagram for snow-proof vents (field supply) (continued)

### Unit combinations for Standard-COP mode

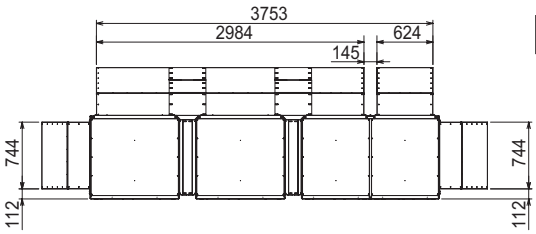
Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 50hp & 52hp**

unit: mm




A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)




Air direction: Front direction

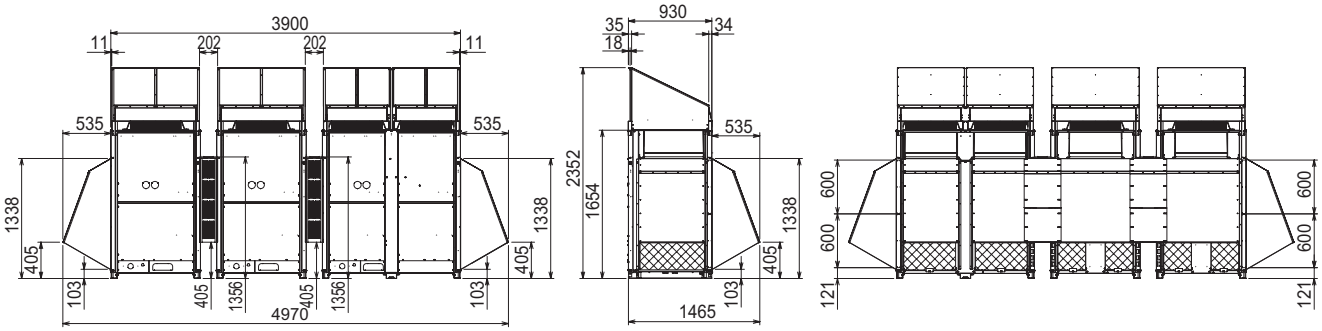
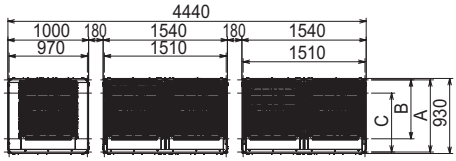
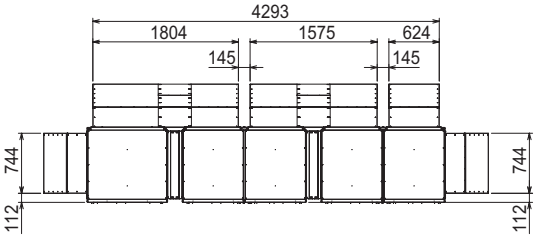



**Diagram for 54hp**

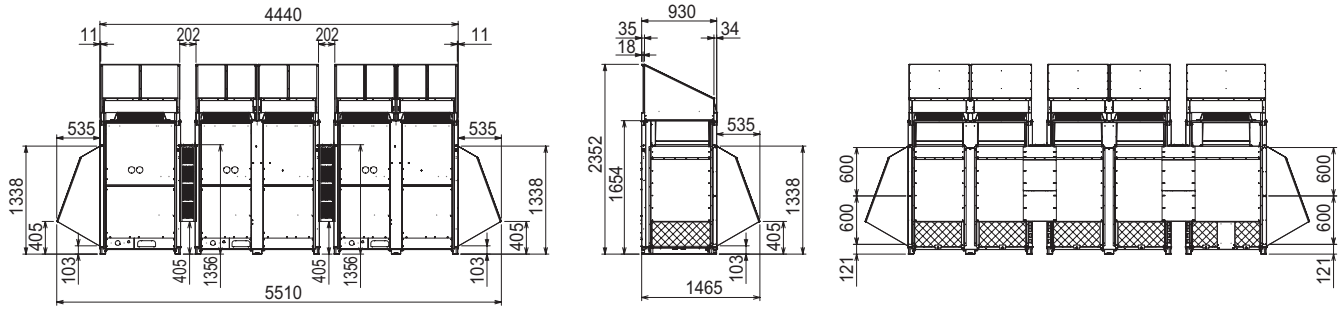
unit: mm




A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)




Air direction: Front direction



# 4. Installation Instructions

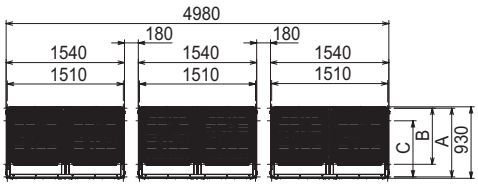
### Reference diagram for snow-proof vents (field supply) (continued)

### Unit combinations for Standard-COP mode

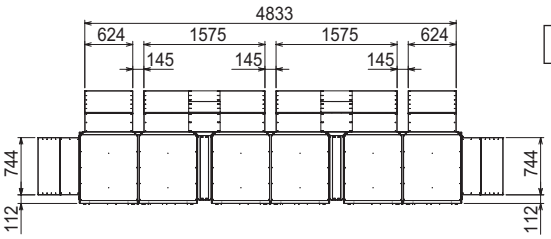
Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 56hp ~ 60hp**

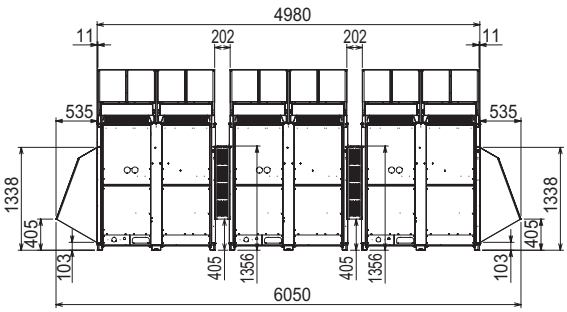
unit: mm

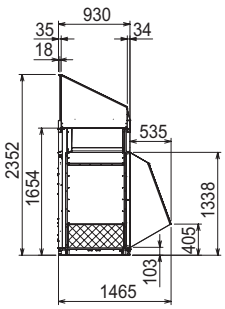


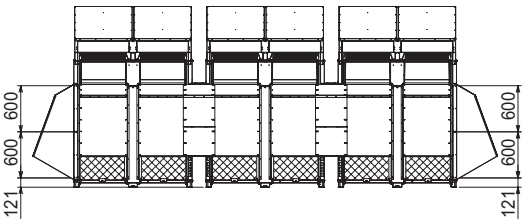

A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)




Air direction: Front direction




2

# 4. Installation Instructions



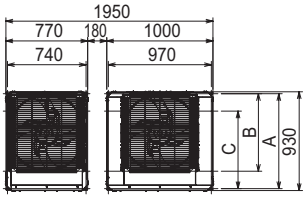
### Reference diagram for snow-proof vents (field supply) (continued)

### Unit combinations for High-COP mode

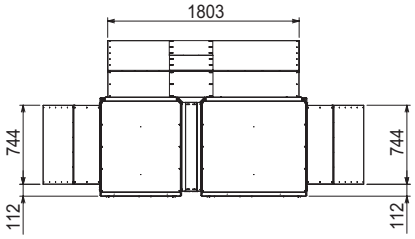
Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 18hp & 20hp**

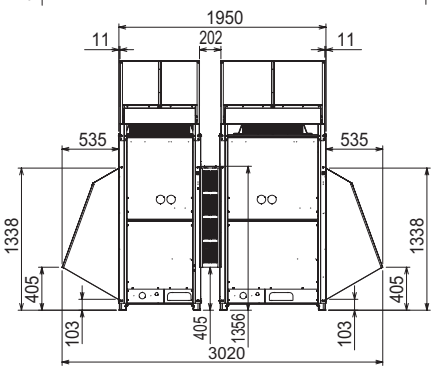
unit: mm

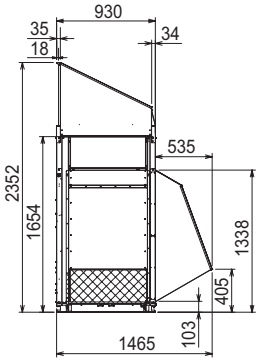



A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)




Air direction: Front direction



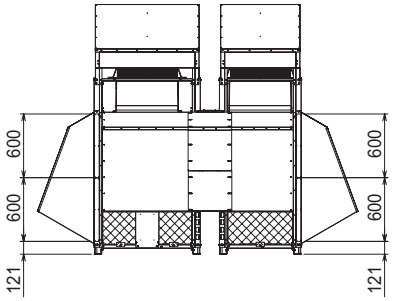
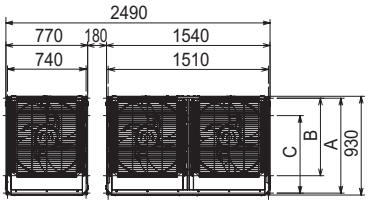
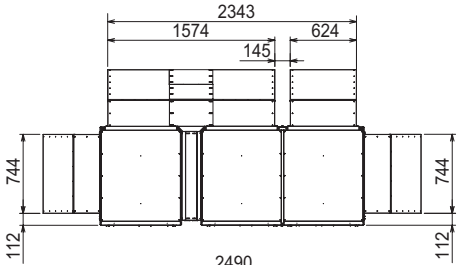




**Diagram for 22hp**

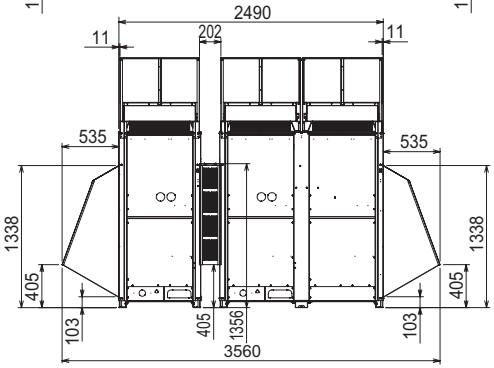
unit: mm

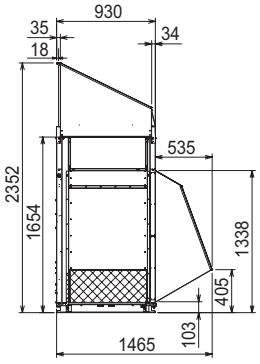


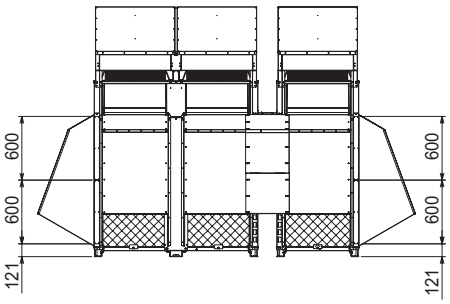

A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)




Air direction: Front direction



# 4. Installation Instructions



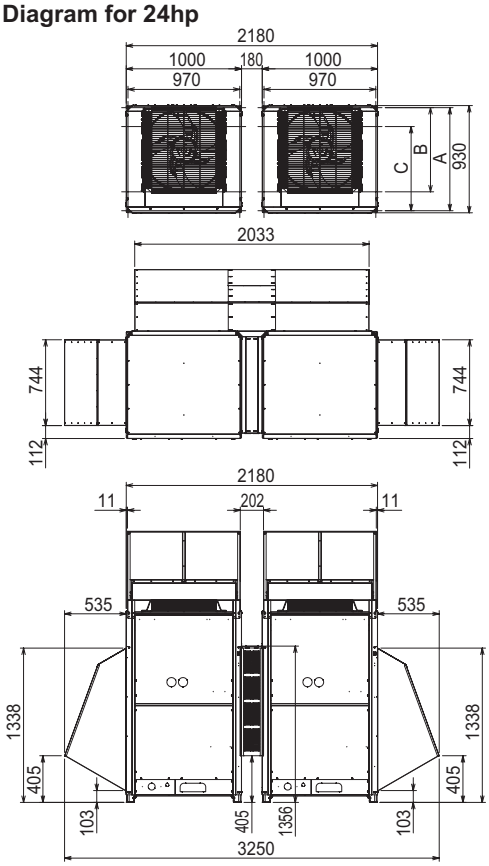
### Reference diagram for snow-proof vents (field supply) (continued)

### Unit combinations for High-COP mode

Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

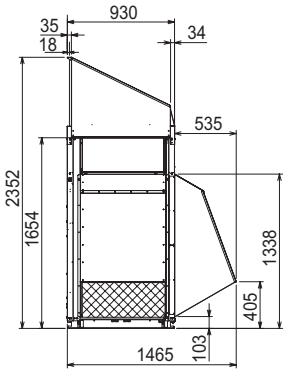
unit: mm

**Diagram for 24hp**




A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)

Air direction: Front direction



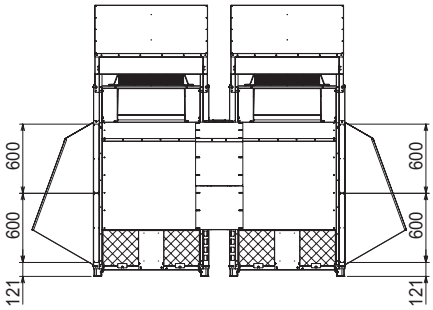
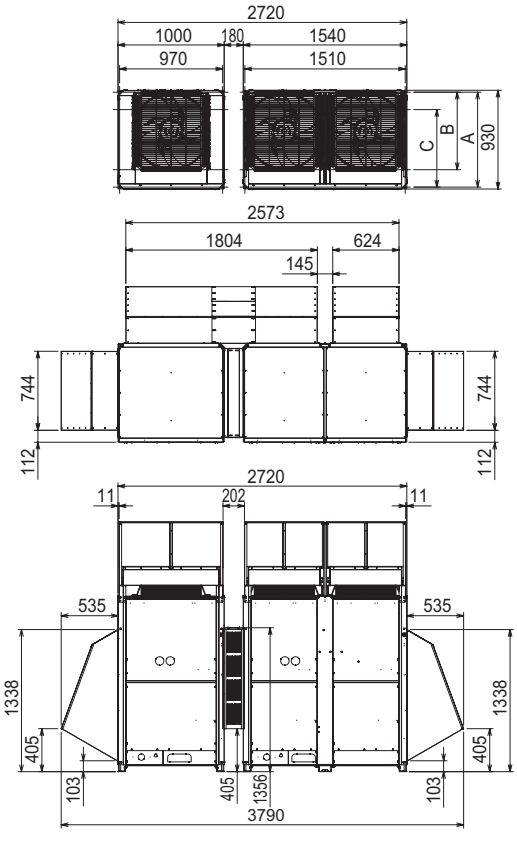



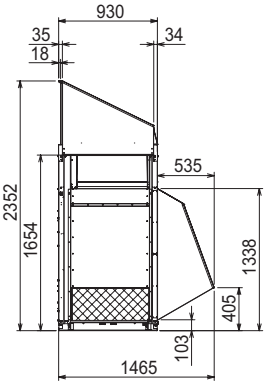

**Diagram for 26hp & 28hp**

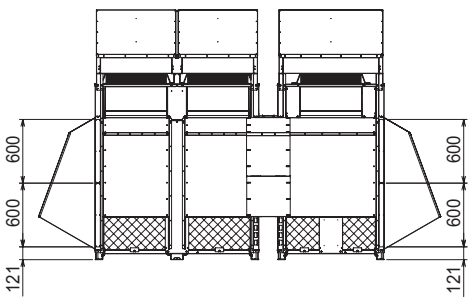
unit: mm




A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)

Air direction: Front direction



# 4. Installation Instructions



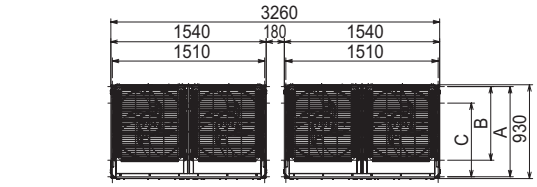
### Reference diagram for snow-proof vents (field supply) (continued)

### Unit combinations for High-COP mode

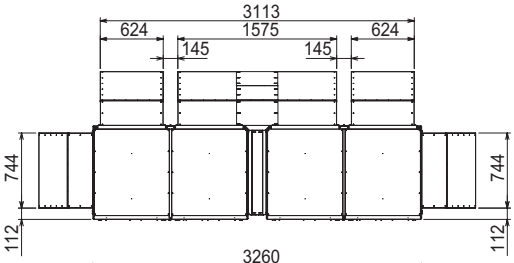
Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 30hp & 32hp**

unit: mm




A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)




Air direction: Front direction

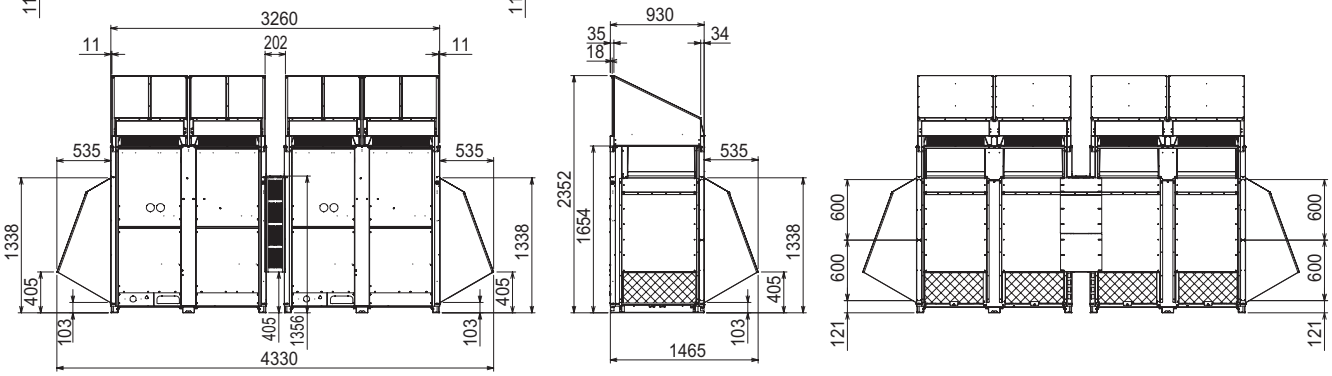
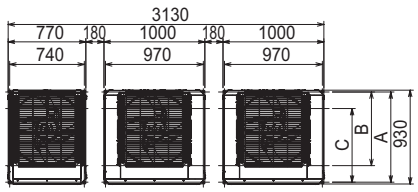
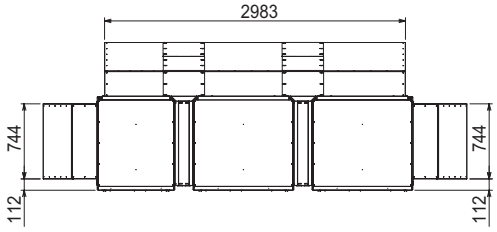



**Diagram for 34hp**

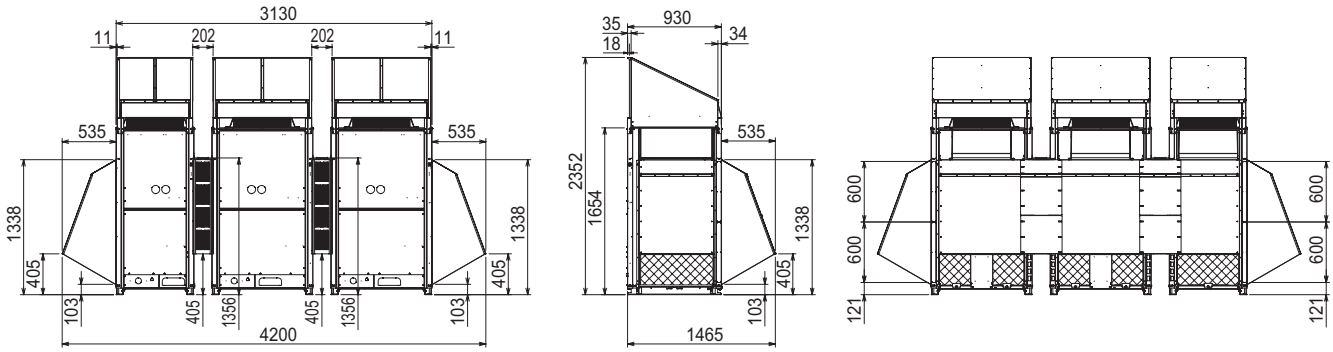
unit: mm




A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)




Air direction: Front direction



# 4. Installation Instructions



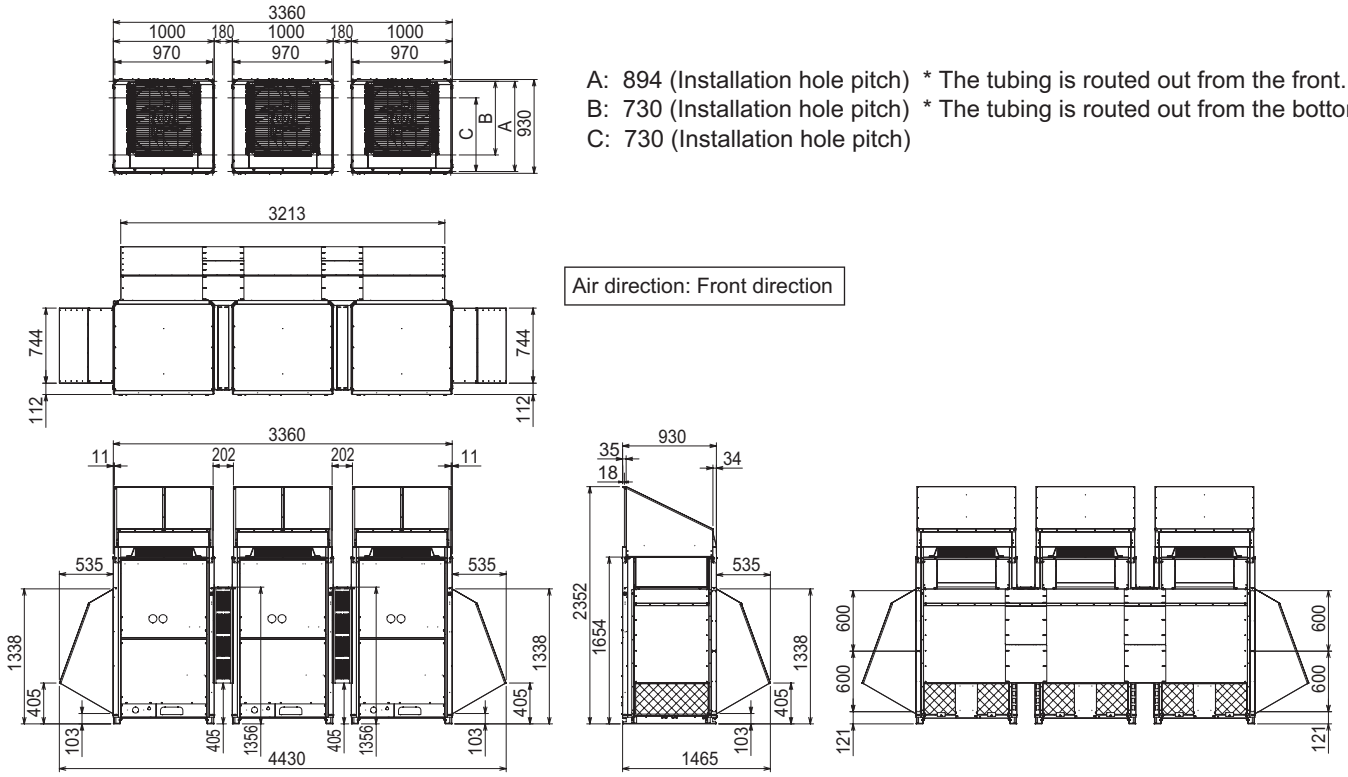
### Reference diagram for snow-proof vents (field supply) (continued)

### Unit combinations for High-COP mode

Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 36hp**

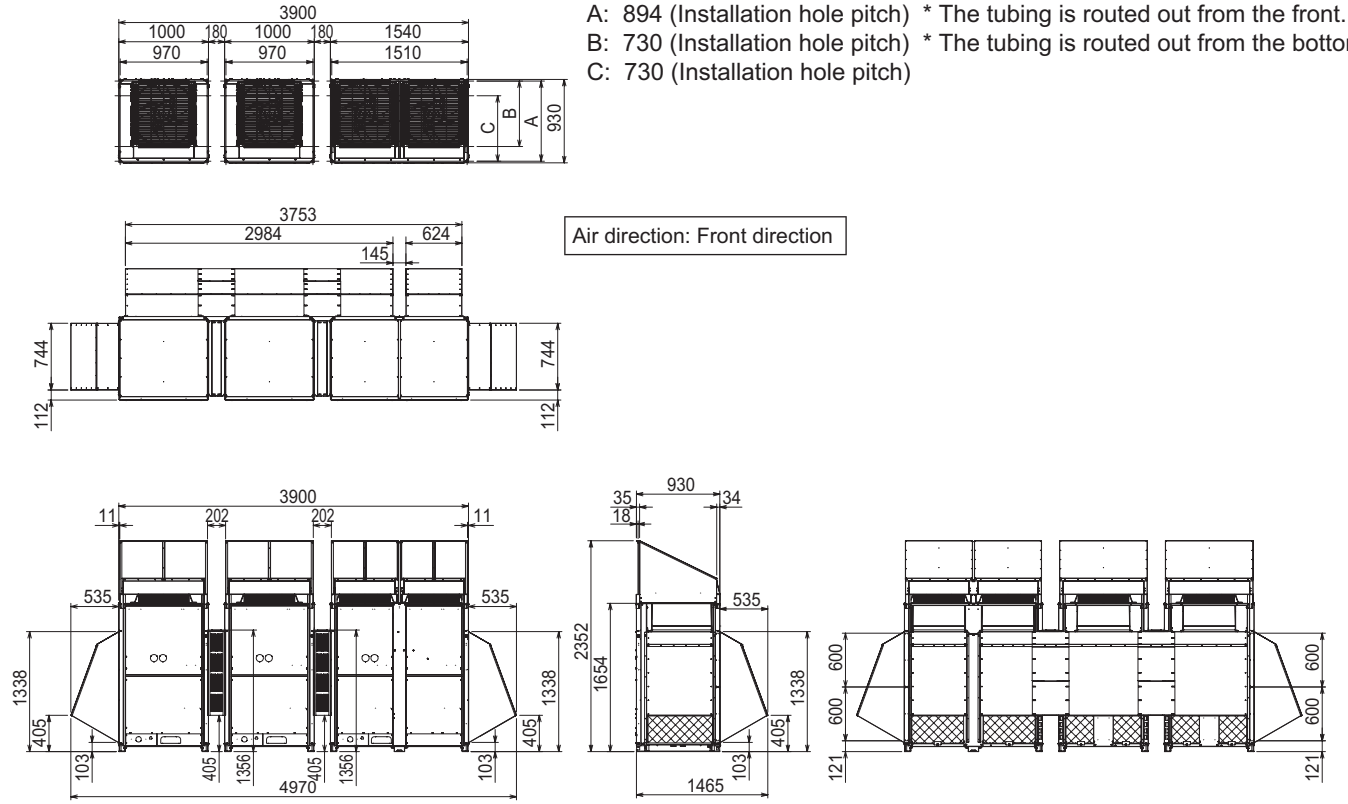
unit: mm




A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)

**Diagram for 38hp & 40hp**

unit: mm




A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)

# 4. Installation Instructions



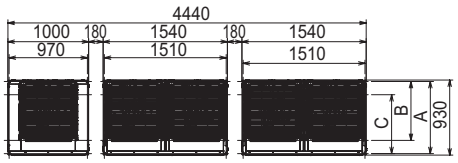
### Reference diagram for snow-proof vents (field supply) (continued)

### Unit combinations for High-COP mode

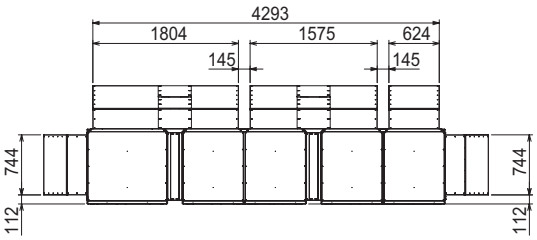
Can be installed so that the air direction is to the front, right, left or rear direction.
According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.

**Diagram for 42hp**

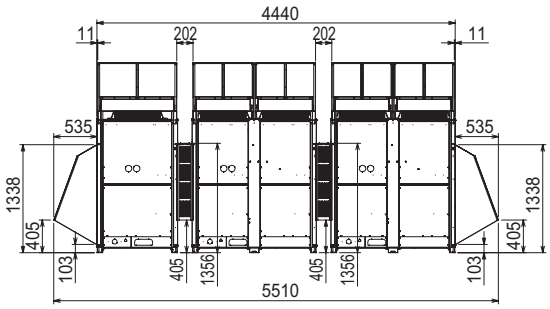
unit: mm

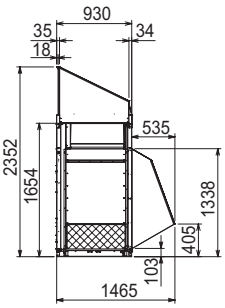



A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)




Air direction: Front direction



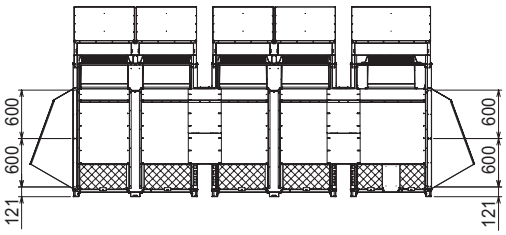
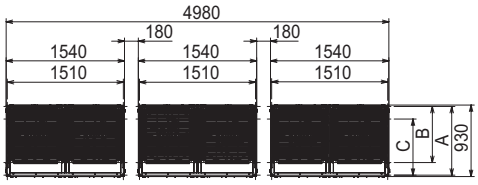
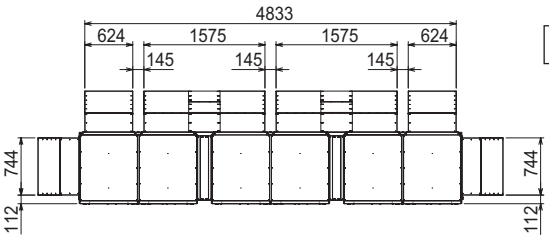




**Diagram for 44hp ~ 48hp**

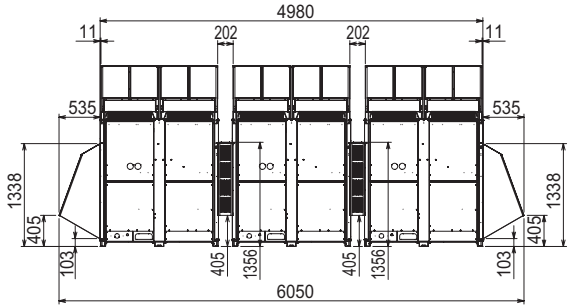
unit: mm

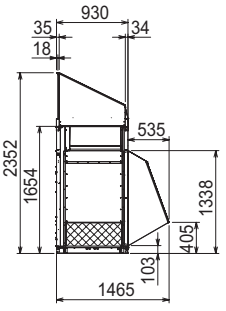


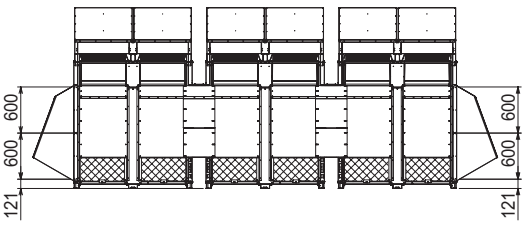

A: 894 (Installation hole pitch) * The tubing is routed out from the front.
B: 730 (Installation hole pitch) * The tubing is routed out from the bottom.
C: 730 (Installation hole pitch)




Air direction: Front direction



# 4. Installation Instructions

## 4-7. Transporting the Outdoor Unit

When transporting the unit, have it delivered as close to the installation site as possible without unpacking.
Use a hook for suspending the unit. (Fig. 2-23)

**CAUTION**

- When hoisting the outdoor unit, pass ropes through the left and right holes of the bottom plate as shown in the Figs. 2-18-1 to 2-18-3.
  The angle between the rope and top panel must be 70°or more so that the rope does not come into contact with the fan guard.
  Use two lengths of rope 7.5 meters long or longer.
- Hang the rope at an oblique angle of the four corners of the bottom plate.
  If it is hung at other areas, the rope becomes loose and the outdoor unit will be damaged or you may be injured.
- Use protective panels or padding at all locations where the rope contacts the outer casing or other parts to prevent scratching. In particular, use protective material (such as cloth or cardboard) to prevent the edges of the top panel from being scratched.

**U-8ME1E8(E), 10ME1E8(E), 12ME1E8(E)**

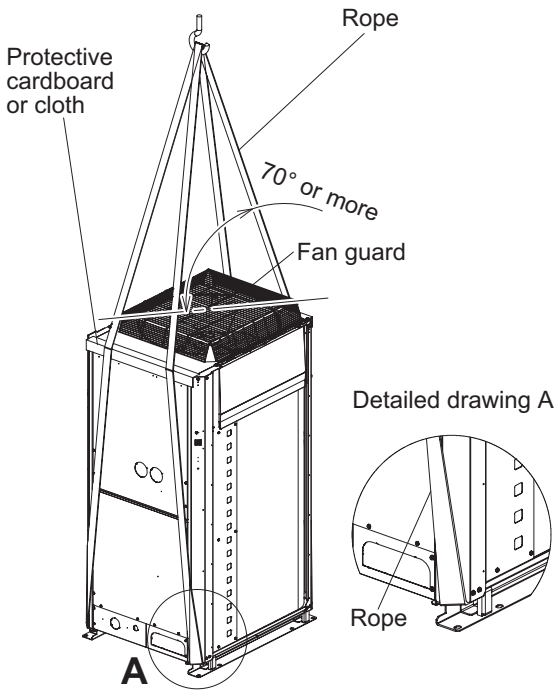



**Fig. 2-18-1**

**U-14ME1E8(E), 16ME1E8(E)**

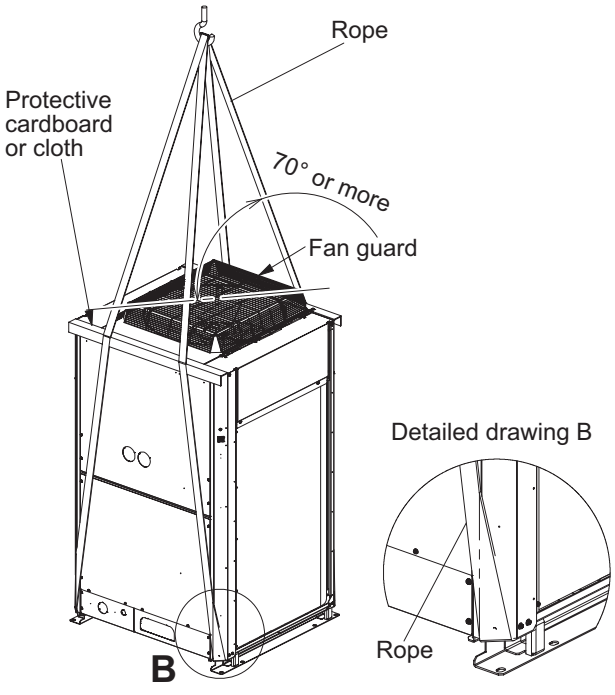



**Fig. 2-18-2**

**U-18ME1E8(E), 20ME1E8(E)**

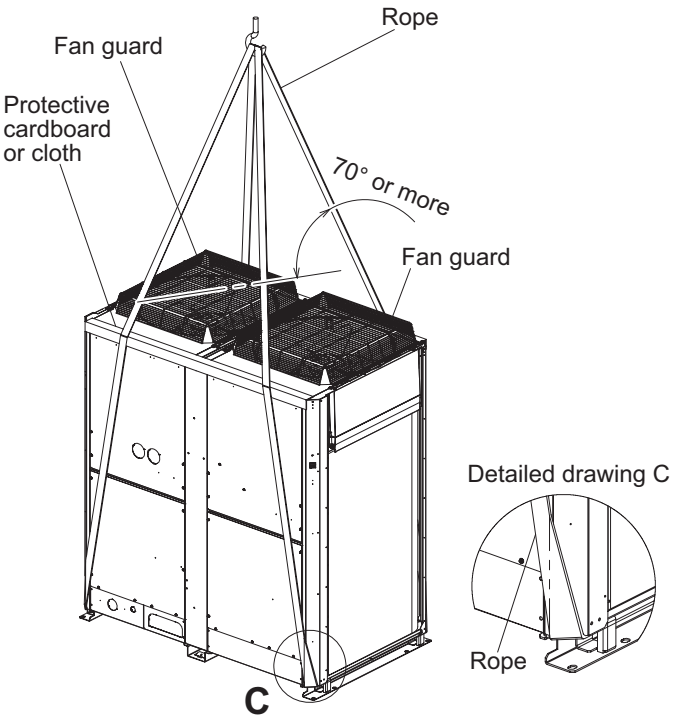



**Fig. 2-18-3**

# 4. Installation Instructions

## 4-8. Installing the Outdoor Unit

(1) Use four (4) anchor bolts (M12 or similar) to securely anchor the unit.
Regarding the positioning anchor bolts of the depth direction, select one of three types according to the installation site. (See Fig. 2-19 a, b, c.)
Normally, select the position “A”. When removing the connection tube in a downward direction, select the position “B”.

(2) When only using a single outdoor unit, see the Figure 2-19.
When making a combination of more than 2 units, refer to pages from 1-8 to 1- 17 regarding the confirmation of the unit installation holes and unit size.

* When positioning the anchor bolt at “B” or “C”, make a sufficient space bewteen the units or from the wall for installation. (Make a space between the units wider than 180mm and left and right space wider than 250mm from the wall.)

(3) The vibration insulator or the like should be kept secure to satisfy the width and depth of 100mm for the plate legs. (See the dimensions marked by the asterisk at Fig. 2-21d - 2-21g.) Use a washer from the upper direction larger than the hole size for fixing the installation. The models 18 and 20 have four (4) anchor volts respectively as same as others.
Two models, however, additionally need the vibration insulator under the plate leg at the central location for the installation site.
Screw or wire the vibration insulator at the center of the unit to the rack or the basement.
Be sure to use the same thickness of all vibration insulators and make adjustment so that they will become the same height each other. (Fig. 2-20 and Fig. 2-21)

2

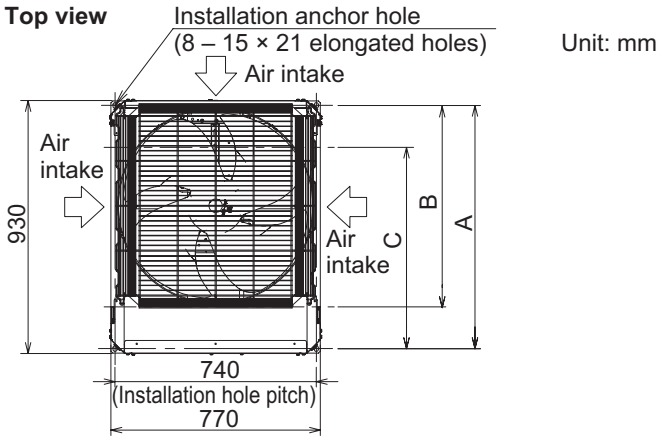



**Fig. 2-19a**

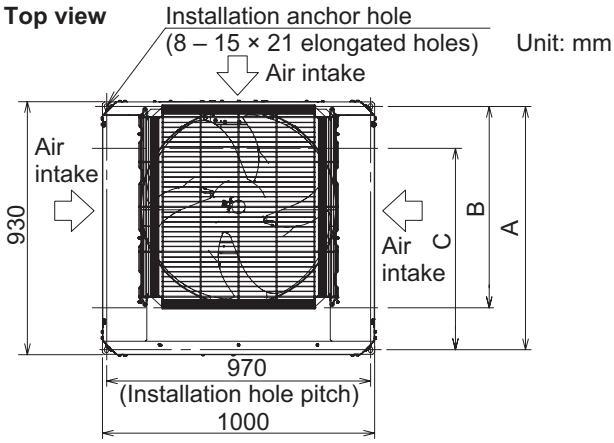



**Fig. 2-19b**

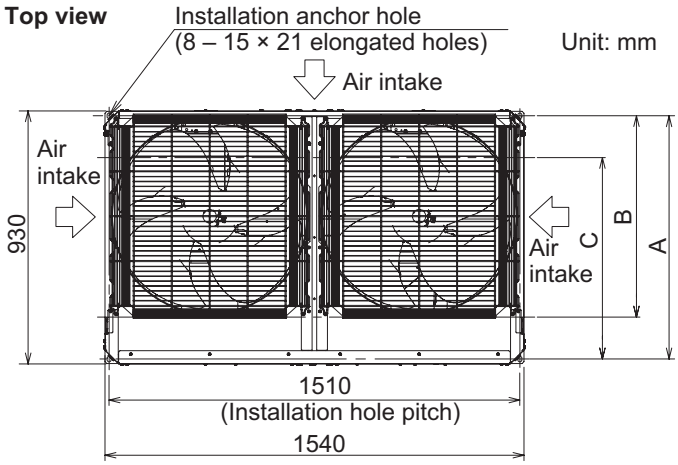



**Fig. 2-19c**

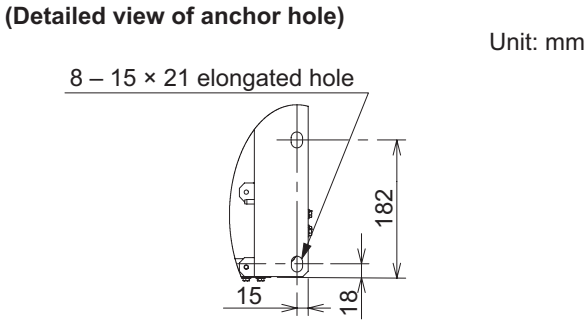


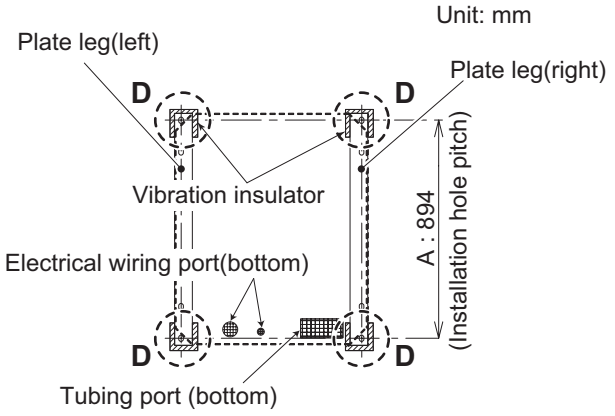

**Fig. 2-20**

- According to the installation site, you may choose the setting position in the depth direction of the anchor bolt from “A”, “B” or “C”.
  A :894 (Installation hole pitch) * The tubing is routed out from the front.
  B :730 (Installation hole pitch) * The tubing is routed out from the bottom.
  C :730 (Installation hole pitch)

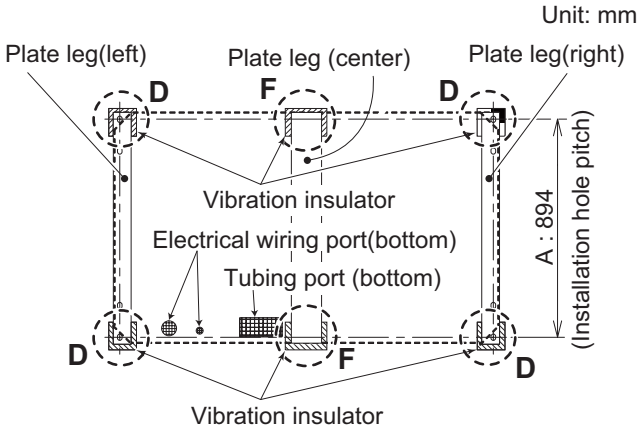
# 4. Installation Instructions

• Below shows vibration insulator position when setting anchor bolt at position A (Fig.2-19).

**U-8ME1E8(E), 10ME1E8(E), 12ME1E8(E), 14ME1E8(E), 16ME1E8(E)**




**U-18ME1E8(E), 20ME1E8(E)**

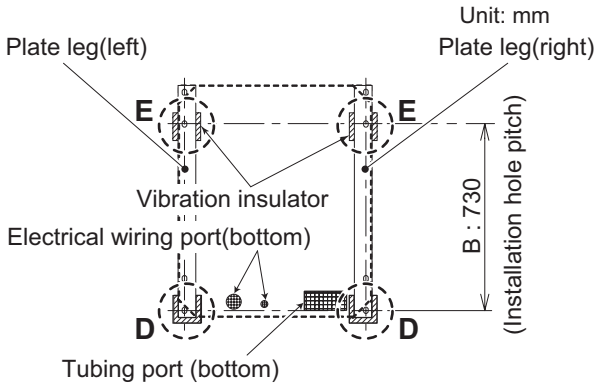



* Need the vibration insulator under the plate leg at the central location for the installation site.

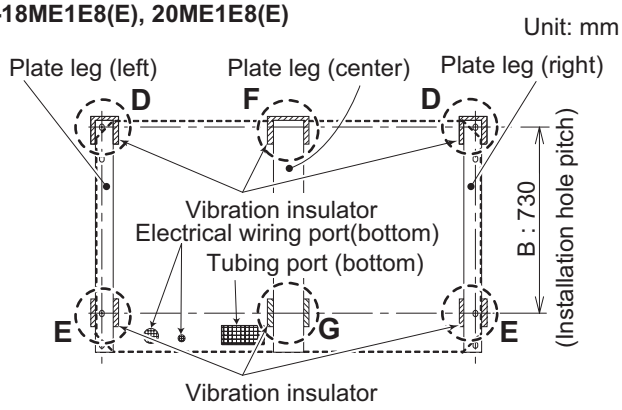
**Fig. 2-21a**

• Below shows vibration insulator position when setting anchor bolt at position B (Fig.2-19).

**U-8ME1E8(E), 10ME1E8(E), 12ME1E8(E), 14ME1E8(E), 16ME1E8(E)**




**U-18ME1E8(E), 20ME1E8(E)**

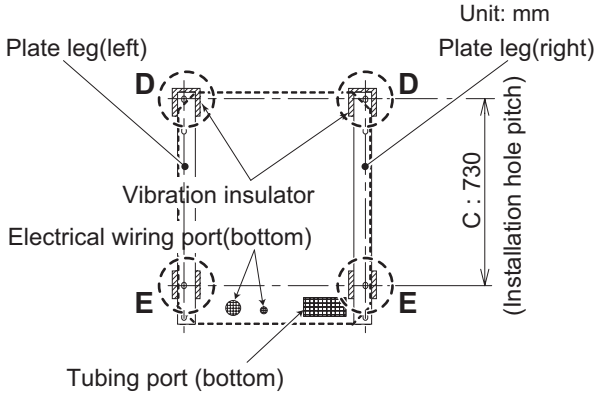



* Need the vibration insulator under the plate leg at the central location for the installation site.

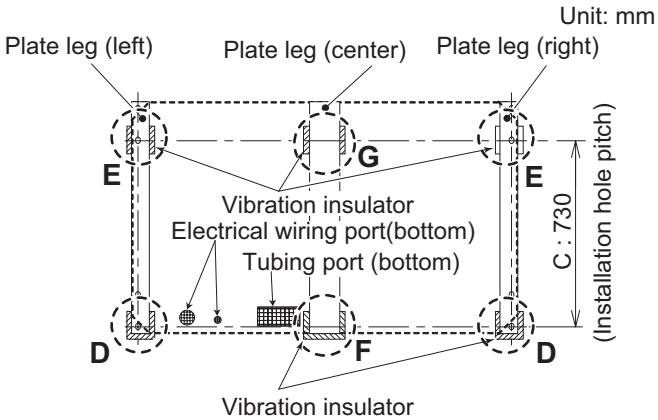
**Fig. 2-21b**

• Below shows vibration insulator position when setting anchor bolt at position C (Fig.2-19).

**U-8ME1E8(E), 10ME1E8(E), 12ME1E8(E), 14ME1E8(E), 16ME1E8(E)**




**U-18ME1E8(E), 20ME1E8(E)**




* Need the vibration insulator under the plate leg at the central location for the installation site.

**Fig. 2-21c**

# 4. Installation Instructions

**Detailed view of “D” & “E”**

**Front view**

Unit: mm

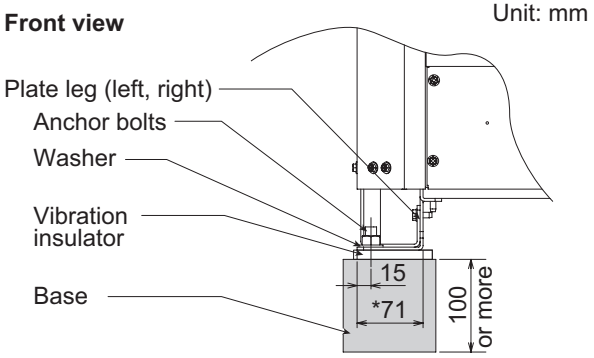



**Fig. 2-21d**

**Detailed view of “F” & “G”**

**Front view**

Unit: mm

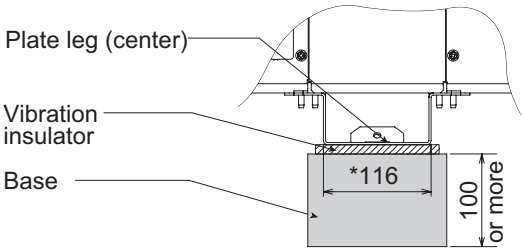
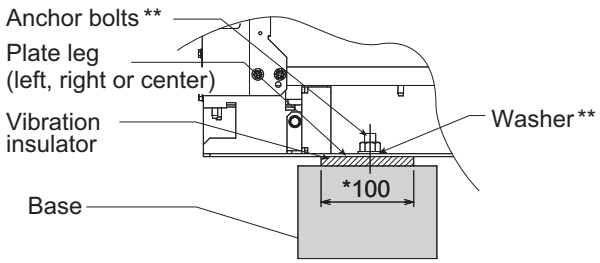



**Fig. 2-21e**

**Detailed view of “E” & “G”**

**Side view**

Unit: mm



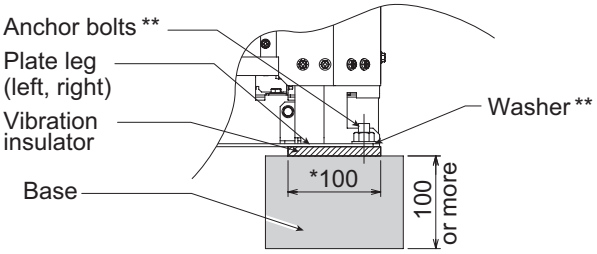

** Anchor bolt & washer are not reqired at the central plate leg (G).

**Fig. 2-21f**

**Detailed view of “D” & “F ”**

**Side view**

Unit: mm




** Anchor bolt & washer are not reqired at the central plate leg (F).

**Fig. 2-21g**

2

# 4. Installation Instructions

## 4-9. Routing the Tubing

- The tubing can be routed out either from the front or from the bottom. (Fig. 2-22a)
- The connecting valve is contained inside the unit. Therefore, remove the front panel. (Fig. 2-22b)

(1) If the tubing is routed out from the front, punch out the slit part ( ▨ ). (Fig. 2-23a )

- Be careful not to damage the tubing cover.

(2) If the tubing is routed out from the bottom, use cutting pliers or a similar tool to cut out the tubing outlet slit (part indicated by ▨ ) from the tubing cover. (Figs. 2-22c and 2-23b)

- Be careful not to damage the tubing cover.

**U-8ME1E8(E), 10ME1E8(E), 12ME1E8(E)** **U-14ME1E8(E), 16ME1E8(E)** **U-18ME1E8(E), 20ME1E8(E)**

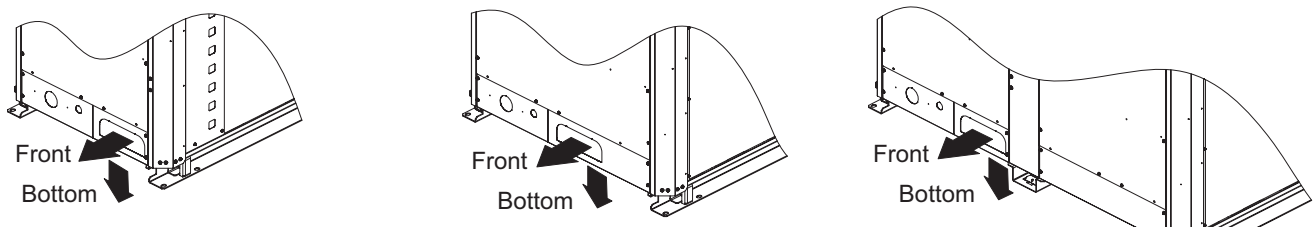



**Fig. 2-22a**

**U-8ME1E8(E), 10ME1E8(E), 12ME1E8(E)** **U-14ME1E8(E), 16ME1E8(E)** **U-18ME1E8(E), 20ME1E8(E)**

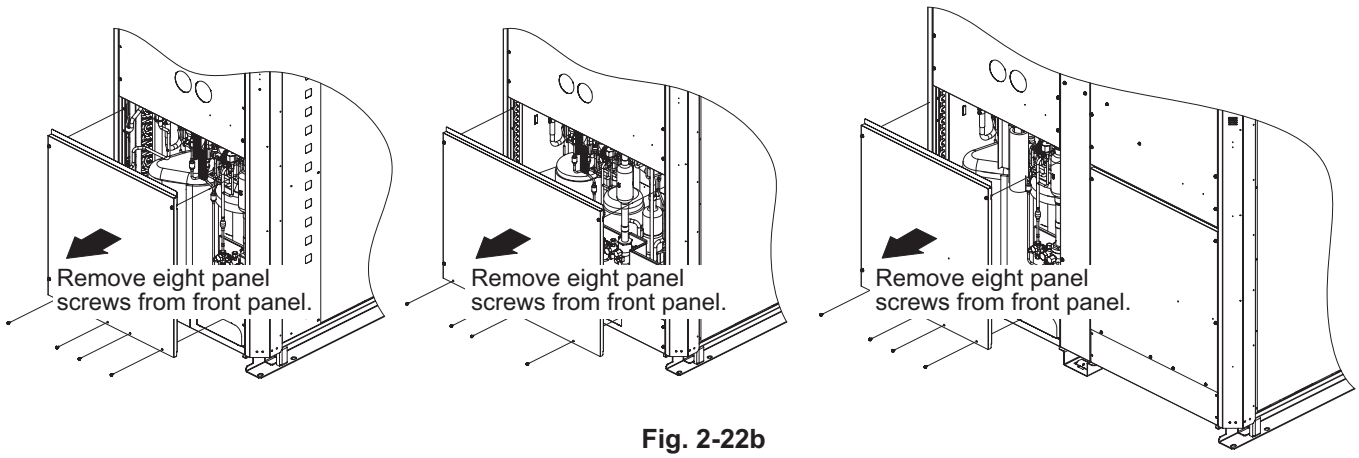



**Fig. 2-22b**

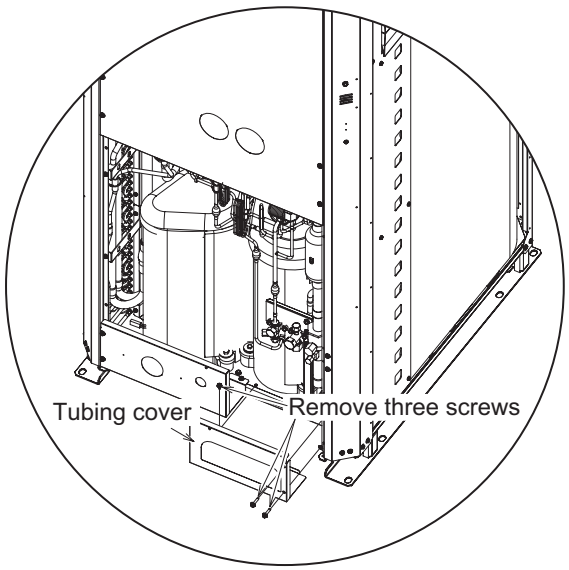



**Fig. 2-22c**

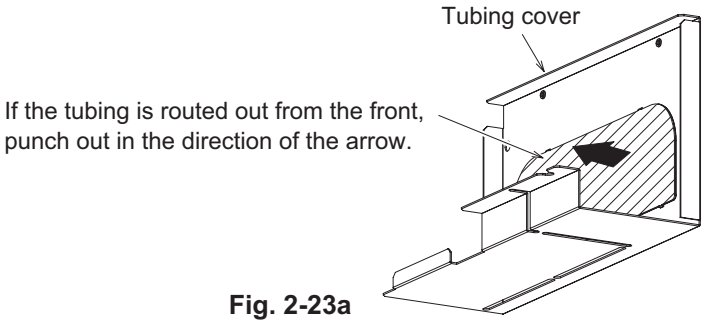



**Fig. 2-23a**

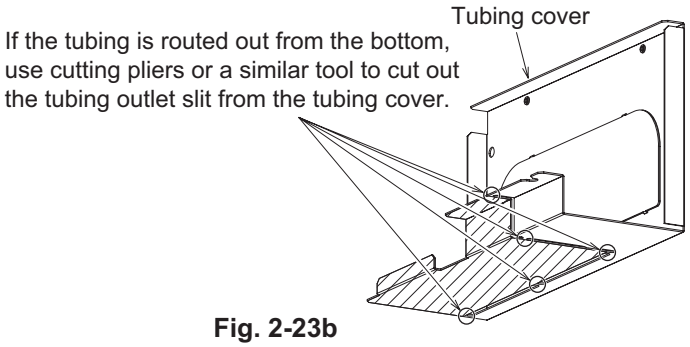



**Fig. 2-23b**

# 4. Installation Instructions

### 4-10. Prepare the Tubing

- Material: Use C1220 phosphorous deoxidized copper as described in JIS H3300, “Copper and Copper Alloy Seamless Pipes and Tubes.” (For tubes that are ø22.22 or larger, use 1/2H material or H material. For all others use O material.)
- Tubing size
  Use the tubing size indicated in the table below.
- When cutting the tubing, use a tube cutter, and be sure to remove any burrs.
  (The same applies to distribution tubing (optional).)
- When bending the tubes, bend each tube using a radius that is at least 4 times the outer diameter of the tube.
  When bending, use sufficient care to avoid crushing or damaging the tube.
- For flaring, use a flare tool, and be sure that flaring is performed correctly.

**CAUTION**

**Use sufficient caution during preparation of the tubing.**
**Seal the tube ends by means of caps or taping to prevent dust, moisture, or other foreign substances from entering the tubes.**

**Refrigerant tubing**

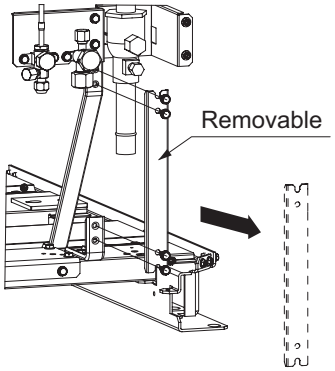
| Tubing size (mm) | | | |
|---|---|---|---|
| **Outer dia.** | **Thickness** | **Outer dia.** | **Thickness** |
| ø6.35 | t0.8 | ø22.22 | t1.0 |
| ø9.52 | t0.8 | ø25.4 | t1.0 |
| ø12.7 | t0.8 | ø28.58 | t1.0 |
| ø15.88 | t1.0 | ø31.75 | t1.1 |
| ø19.05 | t1.2 | ø38.1 | over t1.35 |
| | | ø41.28 | over t1.45 |

# 4. Installation Instructions



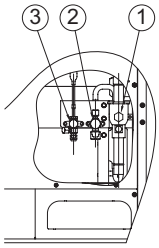
### 4-11. Connect the Tubing

- When operating the refrigerant tube installation in the field, do not apply the flame of welding to the surrounding sheet-metal parts. If necessary, use a wet rag to prevent overheating of the heat exchanger.
- If you have difficulty installing the refrigerant tube, you may remove the fixing bracket.
  Since this bracket is only used for transportation, it is not necessary to reinstall in its original position.
  If not used for transportation, dispose of the bracket in a proper way.



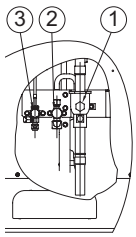

- Except for the 16HP model, do not use the supplied connector tubing. (See figure below.)

U-8ME1E8(E), 10ME1E8(E), 12ME1E8(E), 14ME1E8(E), 18ME1E8(E), 20ME1E8(E) (Except 16HP)




| | Refrigerant tubing | Connection method | Supplied parts used? |
|---|---|---|---|
| 1 | Gas tubing | Brazing | No |
| 2 | Liquid tubing | Flare connection | No |
| 3 | Balance tube | Flare connection | No |

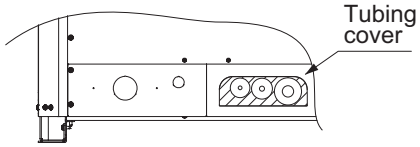
U-16ME1E8(E)



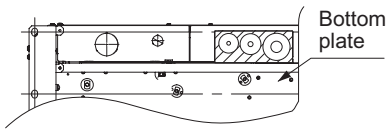

| | Refrigerant tubing | Connection method | Supplied parts used? |
|---|---|---|---|
| 1 | Gas tubing | Brazing | yes<br>ø25.4 → ø28.58 |
| 2 | Liquid tubing | Flare connection | No |
| 3 | Balance tube | Flare connection | No |

### Refrigerant tube port

- Use caulking, putty, or a similar material to fill any gaps at the refrigerant tube port ( ▨ ) in order to prevent rainwater, dust or foreign substances from entering the unit.
  * Perform this work even if the tubing is routed out in a downward direction.




Tubing routed out through the front side




Tubing routed out through the bottom

# 4. Installation Instructions

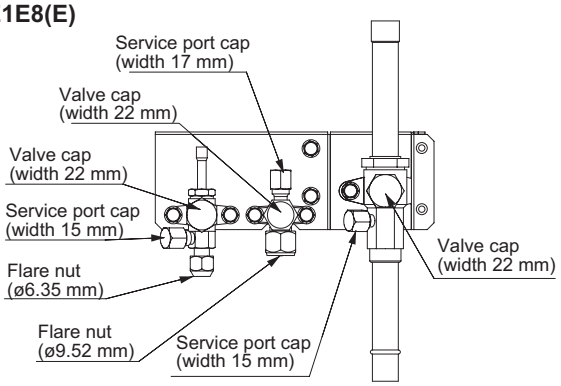
● Tighten each cap as specified below.

### Tightening torque for each cap

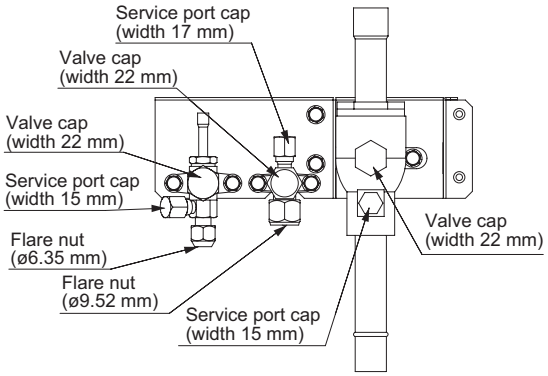
**Cap tightening torque**

| | | |
|---|---|---|
| Service port cap (width 15 mm, 17 mm) | | 8 – 10 N · m (80 – 100 kgf · cm) |
| Valve cap | width 22 mm | 19 – 21 N · m (190 – 210 kgf · cm) |
| | width 24 mm | 24 – 26 N · m (240 – 260 kgf · cm) |
| | width 27 mm | 28 – 32 N · m (280 – 320 kgf · cm) |

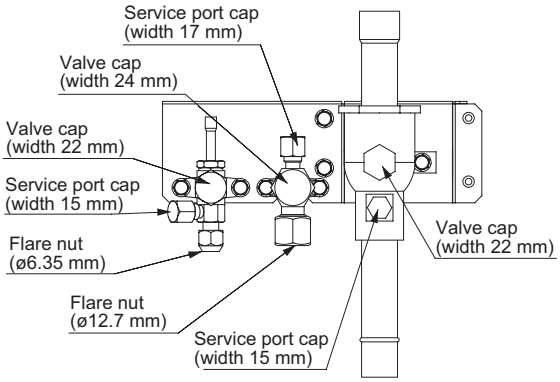
**U-8ME1E8(E)**



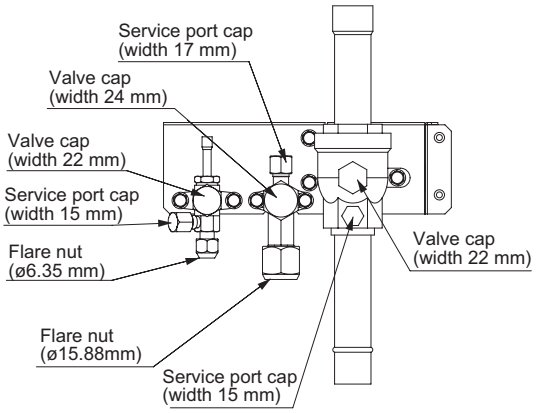

**U-10ME1E8(E)**



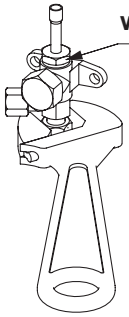

**U-12ME1E8(E), 14ME1E8(E), 16ME1E8(E)**




**U-18ME1E8(E), 20ME1E8(E)**



# 4. Installation Instructions



**Do not apply an adjustable wrench to the hexagonal part.**

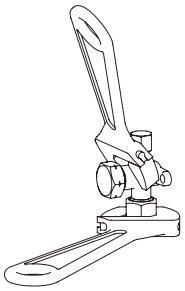
Do not use two adjustable wrenches when removing or installing the balance tube flare nut. In particular, do not apply an adjustable wrench to the hexagonal part at the top of the valve.
(If force is applied to this part, gas leakage will occur.)

**Use two adjustable wrenches, as shown in the figure, when removing the liquid tube valve flare nut.**

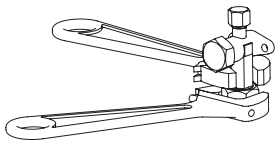
1. Do not apply a wrench to the valve cap when removing or installing the flare nuts. Doing so may damage the valve.
2. If the valve cap is left off for a long period of time, refrigerant leakage will occur. Therefore, do not leave the valve cap off.
3. Applying refrigerant oil to the flare surface can be effective in preventing gas leakage, however be sure to use a refrigerant oil which is suitable for the refrigerant that is used in the system.

   (This unit utilizes R410A refrigerant, and the refrigerant oil is ether oil (synthetic oil). However, hub oil (synthetic oil) can also be used.)

**Model : 8~16HP**
(Size : ø9.52 mm~ø12.7 mm)



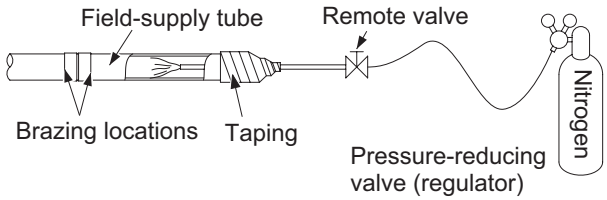
**Model : 18HP, 20HP**
(Size : ø15.88 mm)



2

- Precautions for brazing
  Be sure to replace the air inside the tube with nitrogen to prevent oxide film from forming during the brazing process.
  Be sure to use a damp cloth or other means to cool the valve unit during brazing.

**Work method**




**CAUTION**

1. Be sure to use nitrogen
   (Oxygen, $CO_2$, and CFC must not be used.)
2. Use a pressure-reducing valve on the nitrogen tank.
3. Do not use agents intended to prevent the formation of oxide film.
   They will adversely affect the refrigeration oil, and may cause equipment failure.
4. The balance tube is not used if only 1 outdoor unit is installed.
   Use the unit in the same conditions as when it was shipped from the factory.

# 4. Installation Instructions

- Charging procedure

  Be sure to charge with R410A refrigerant **in liquid form.**

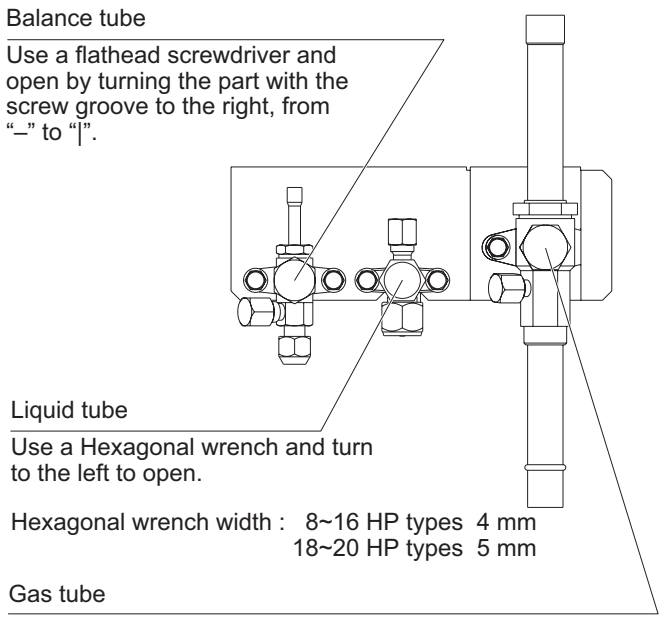
  1. After performing a vacuum, charge with refrigerant from the liquid tubing side. At this time, all valves must be in the “fully closed” position.
  2. If it was not possible to charge the designated amount, operate the system in Cooling mode while charging with refrigerant from the gas tubing side. (This is performed at the time of the test run. For this, all valves must be in the “fully open” position. However if only one outdoor unit is installed, a balance tube is not used.
     Therefore, leave the valves fully closed.) Charge with R410A refrigerant in liquid form.
     With R410A refrigerant, charge while adjusting the amount being fed a little at a time in order to prevent liquid refrigerant from backing up.

- After charging is completed, turn all valves to the “fully open” position.
- Replace the tubing covers as they were before.

**CAUTION**

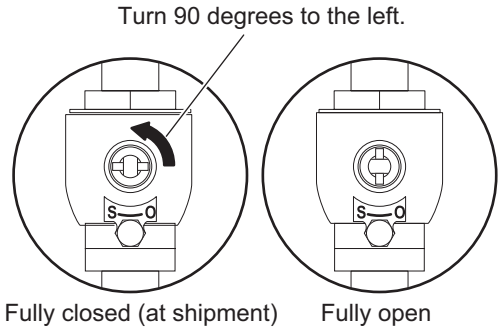
1. **R410A additional charging absolutely must be done through liquid charging.**
2. **The R410A refrigerant cylinder has a gray base color, and the top part is pink.**
3. **The R410A refrigerant cylinder includes a siphon tube. Check that the siphon tube is present. (This is indicated on the label at the top of the cylinder.)**
4. **Due to differences in the refrigerant, pressure, and refrigerant oil involved in installation, it is not possible in some cases to use the same tools for R22 and for R410A.**






8HP type :
Use a flathead screwdriver and open by turning the part with the screw groove to the left, from “–” to “|”.

10~20HP types :
Use pliers and turn 90 degrees to the left and open.




How to turn the tub
(10~20HP types)

# 4. Installation Instructions

## 4-12. Selecting the Installation Site for Indoor Unit

**AVOID:**

- Areas where leakage of flammable gas may be expected.
- Places where large amounts of oil mist exist.
- Direct sunlight.
- Locations near heat sources which may affect the performance of the unit.
- Locations where external air may enter the room directly.
  This may cause “sweating” on the air discharge ports, causing them to spray or drip.
- Locations where the remote controller will be splashed with water or affected by dampness or humidity.
- Installing the remote controller behind curtains or furniture.
- Locations where high-frequency emissions are generated.
- Places where blocks air passages.
- Places where the false ceiling is not noticeably on an incline.

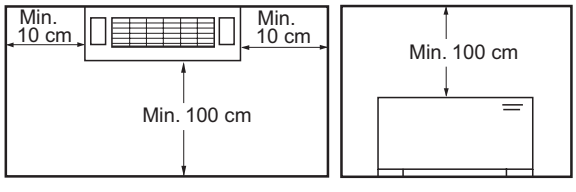
**DO:**

- Select an appropriate position from which every corner of the room can be uniformly cooled.
- Select a location where the ceiling is strong enough to support the weight of the unit.
- Select a location where tubing and drain pipe have the shortest run to the outdoor unit.
- Allow room for operation and maintenance as well as unrestricted air flow around the unit.
- Install the unit within the maximum elevation difference above or below the outdoor unit and within a total tubing length (L) from the outdoor unit as detailed in Table 2-1.
- Allow room for mounting the remote controller about 1 m off the floor, in an area that is not in direct sunlight nor in the flow of cool air from the indoor unit. Air delivery will be degraded if the distance from the floor to the ceiling is greater than 3 m (for D1 type, greater than 3.5 m).
- Places where optimum air distribution can be ensured.
- Places where sufficient clearance for maintenance and service can be ensured. (Refer to the diagram.)

**NOTE**

Air delivery will be degraded if the distance from the floor to the ceiling is greater than 3 m (for D1 type, greater than 3.5 m).

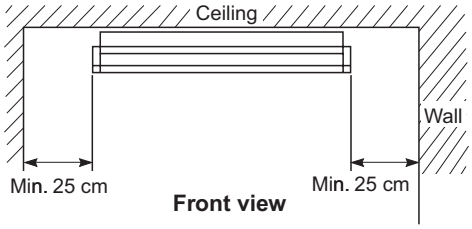
**Floor Standing, Concealed Floor Standing Type**




**Horizontal view** **Vertical view**

**Fig. 2-27**

**Ceiling Type**




**Front view**

**NOTE**

The rear of the indoor unit can be installed flush against the wall.

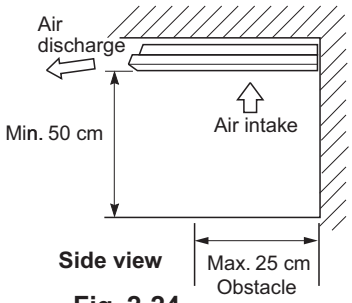



**Fig. 2-24**

**Low Silhouette Ducted Type**
**2-Way, 4-Way Cassette Type**

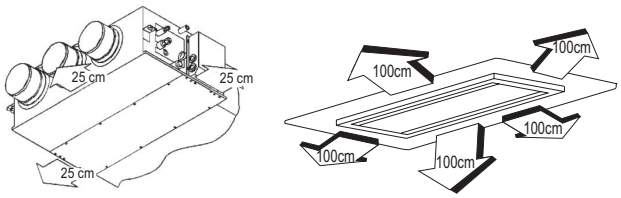



**Fig. 2-25**

**1-Way Casstte Type**

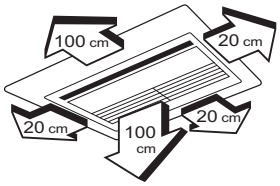
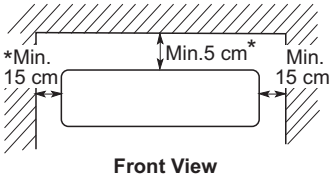



**Fig. 2-26**

**Wall Mounted Type**




**Front View**

* S-45MK1E5/56MK1E5/73MK1E5/106MK1E5 : Min. 7.5 cm

**Fig. 2-28**

# 4. Installation Instructions

## 4-13. How to install the indoor unit

### ● 4-Way Cassette Type (U1 Type)

### 4-13-1. Preparation for Suspending

This unit uses a drain pump. Use a carpenter's level to check that the unit is level.

### 4-13-2. Suspending the Indoor Unit

(1) Fix the suspension bolts securely in the ceiling using the method shown in the diagrams (Figs. 2-29 and 2-30), by attaching them to the ceiling support structure, or by any other method that ensures that the unit will be securely and safely suspended.

(2) Follow Fig. 2-30 and Table 2-11 to make the holes in the ceiling.

**Table 2-11** Unit: mm

| Type \ Length | A | B | C | D |
|---|---|---|---|---|
| **22, 28, 36, 45, 56, 73, 106, 140, 160** | 786 | 745 | 860 to 910 | 860 to 910 |

(3) Determine the pitch of the suspension bolts using the supplied full-scale installation diagram. The diagram and table (Fig. 2-31 and Table 2-12) show the relationship between the positions of the suspension fitting, unit, and panel.
Use the nut (field supply) and washer (supplied) for upper and lower position of the suspension lug.

**Table 2-12** Unit: mm

| Type \ Length | A | B | C | D | E |
|---|---|---|---|---|---|
| **22, 28, 36, 45, 56** | 121 | 171 | 256 | 180 | 130 |
| **73, 106, 140, 160** | 121 | 171 | 319 | 180 | 130 |

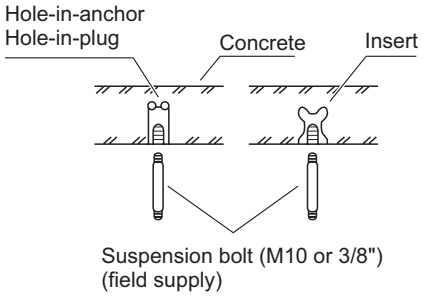



**Fig. 2-29**

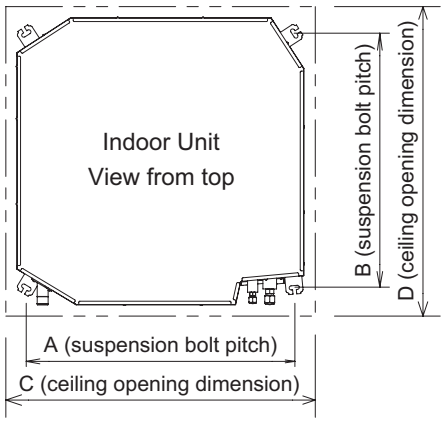



**Fig. 2-30**

Unit: mm

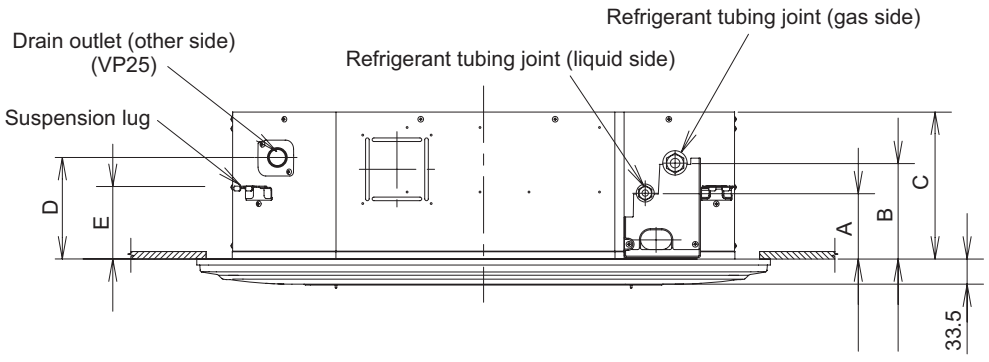



**Fig. 2-31**

### 4-13-3. Placing the Unit Inside the Ceiling

**This unit is equipped with the drain pump. Check a tape measure or carpenter's level.**
**Before installing the ceiling panel, complete the work of drain pipe and refrigerant pipe installation.**

(1) When placing the unit inside the ceiling, determine the pitch of the suspension bolts using the supplied full-scale installation diagram. (Fig. 2-32)
Tubing and wiring must be laid inside the ceiling when suspending the unit. If the ceiling is already constructed, lay the tubing and wiring into position for connection to the unit before placing the unit inside the ceiling.

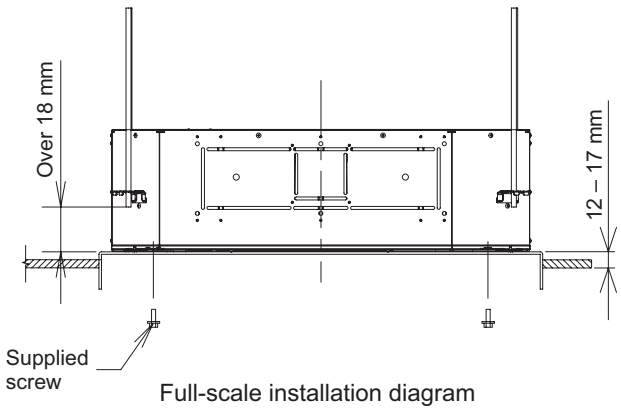



**Fig. 2-32**

# 4. Installation Instructions

(2) The length of suspension bolts must be appropriate for a distance between the bottom of the bolt and the bottom of the unit of more than 18 mm as shown in Fig. 2-32.
(3) Thread the 3 hexagonal nuts and 2 washers (field supply) onto each of the 4 suspension bolts as shown in Fig. 2-33. Use 1 nut and 1 washer for the upper side, and 2 nuts and 1 washer for the lower side, so that the unit will not fall off the suspension lugs.
(4) Adjust so that the distance between the unit and the ceiling bottom is 12 to 17 mm. Tighten the nuts on the upper side and lower side of the suspension lug.
(5) Remove the protective polyethylene used to protect the fan parts during transport.
(6) Check with a tape measure or carpenter's level.

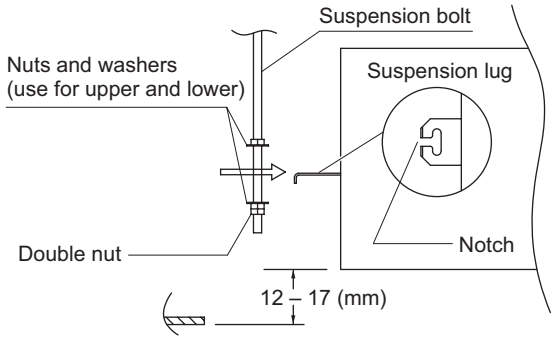



**Fig. 2-33**

### 4-13-4. How to Process Tubing

Refer to the section "5. HOW TO PROCESS TUBING".

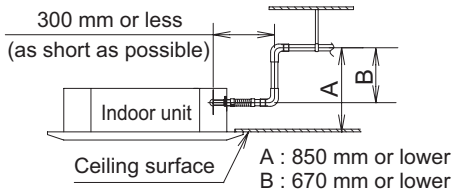
### 4-13-5. Installing the Drain Pipe

### 4-13-5-1 Before Performing the Installation Drain Piping

(1) Limitations of Raising the Drain Pipe Connection

**CAUTION**

- The drain pipe can be raised to a maximum height of 850 mm from the bottom surface of the ceiling. Do not attempt to raise it higher than 850 mm. Doing so will result in water leakage. (Fig. 2-34)




* Length of supplied drain pipe = 250 mm

**Fig. 2-34**

(2) Limitations of Drain Pipe Connection

**CAUTION**

- Do not install the drain pipe with an upward gradient from the drain port connection. This will cause the drain water to flow backward and leak when the unit is not operating. (Fig. 2-35)
- Do not install an air bleeder as this may cause water to spray from the drain pipe outlet. (Fig. 2-35)
- Do not provide U-trap or bell-shaped trap in the middle of the drain pipe. Doing so will cause abnormal sound. (Fig. 2-35)
- Make sure the drain pipe has a downward gradient (1/100 or more; downward from drain port connection). (Fig. 2-36)

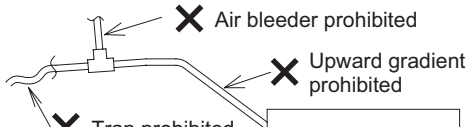



**Fig. 2-35**

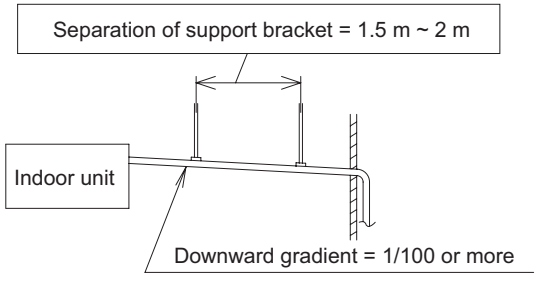



**Fig. 2-36**

(3) Limitations of Drain Hose Connection

**CAUTION**

- Do not bend the supplied drain hose 90° or more. Bend it less than 45°. (Fig. 2-37)
- Do not make a trap in the middle of the supplied drain hose. Doing so will cause abnormal sound. (Fig. 2-38)

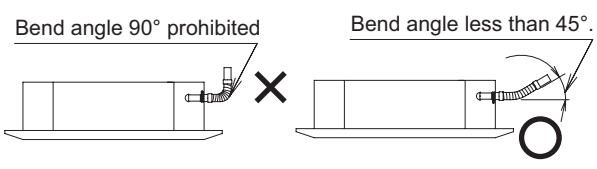



**Fig. 2-37**

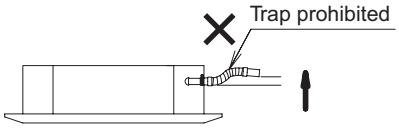



**Fig. 2-38**

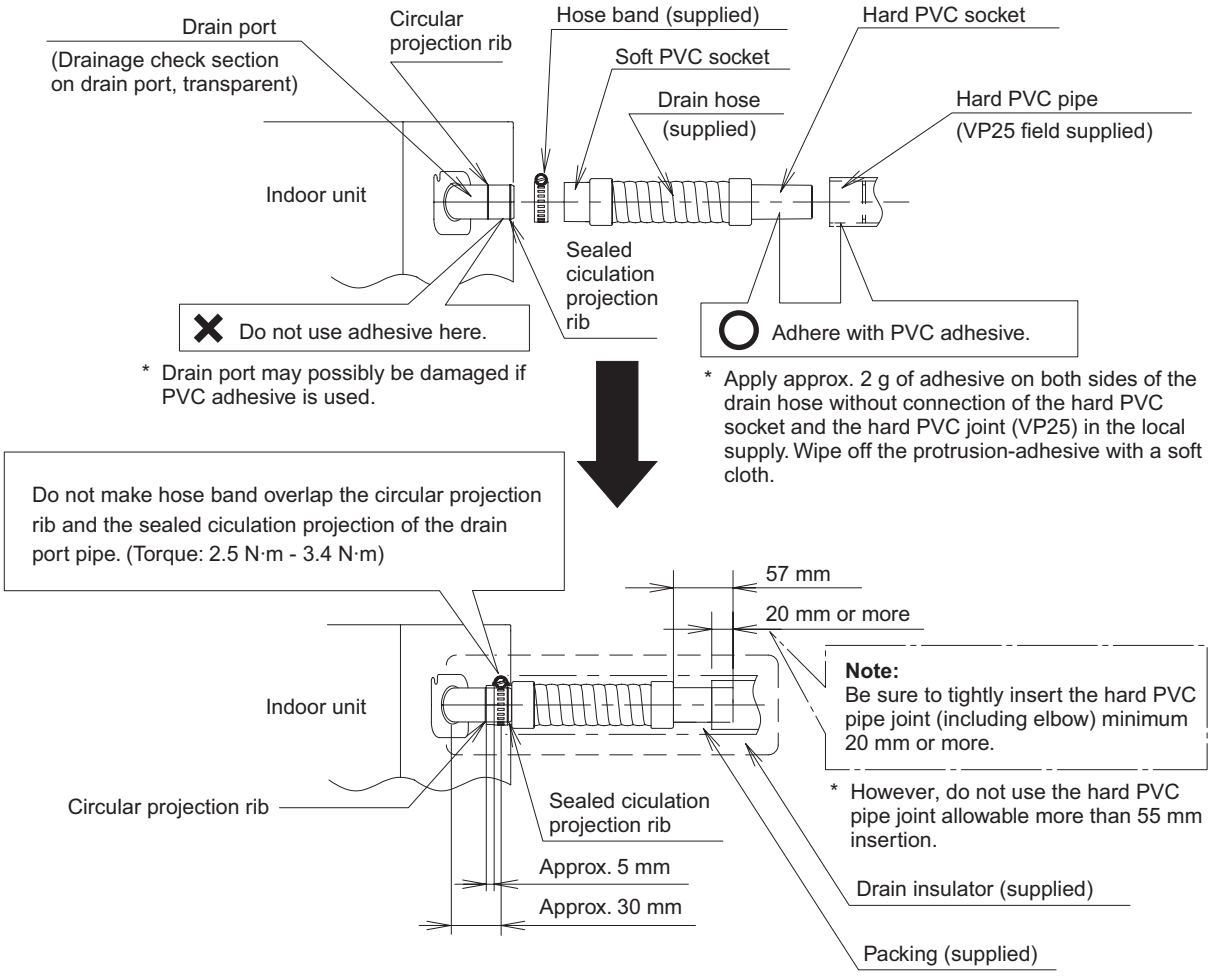
### 4-13-5-2. Installing the Drain Pipe

**CAUTION**

- Do not apply force to the drain port when connecting the drain pipe. Install and fix it near the indoor unit as close as possible.
- Do not use adhesive when connecting the drain port pipe and the drain hose.

(1) How to Install the Drain Pipe

1) First insert the supplied hose band into the drain port pipe. Then make sure the head of the screw is facing toward a technical engineer when placing the screw of the hose band at an upward angle.
2) Insert the soft PVC socket of the supplied drain hose to the drain port pipe. Do not use adhesive when connecting the drain hose to the drain port pipe. Insert it until the tip of the drain hose contacts the circular projection rib of the drain port pipe.
3) Move the hose band so that the center position of the hose band can be placed approx. 30 mm away from the external plate of the indoor unit. (Fig. 2-39)
4) Screw the drain hose tightly facing the screw of the hose band upward. (Torque: 2.5 N·m - 3.4 N·m) (If the screw is tightened beneath the drain hose, the troubles will be generated.) Pay attention not to make hose band overlap the circular projection rib and the sealed ciculation projection of the drain port pipe.
5) Apply approx. 2 g of adhesive on both sides of the drain hose without connection of the hard PVC socket and the hard PVC joint (VP25) in the local supply.
6) Connect the drain hose and the hard PVC joint so that the adhesive area of both sides can be overlapped. Wipe off the protrusion-adhesive with a soft cloth.




* After checking the drainage, wrap the supplied packing and drain pipe insulator around the pipe.

**Fig. 2-39**

# 4. Installation Instructions

### 4-13-5-3. Checking the Drainage

**CAUTION** **Be careful since the fan will start when you short the pin on the indoor control board.**

After wiring and drain piping are completed, use the following procedure to check that the water will drain smoothly. For this, prepare a bucket and wiping cloth to catch and wipe up spilled water.

(1) Connect power to the power terminal board (R, S terminals) inside the electrical component box.
(2) Slowly pour about 1,200 cc of water into the drain pan to check drainage. (Fig. 2-40)
(3) Short the check pin (CHK) on the indoor control board and operate the drain pump. Check the water flow through the transparent drain pipe and see if there is any leakage.
(4) When the check of drainage is complete, open the check pin (CHK) and remount the tube cover.
(5) Checkpoint after installation

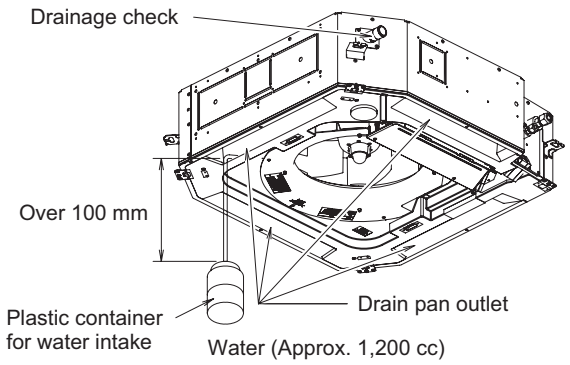


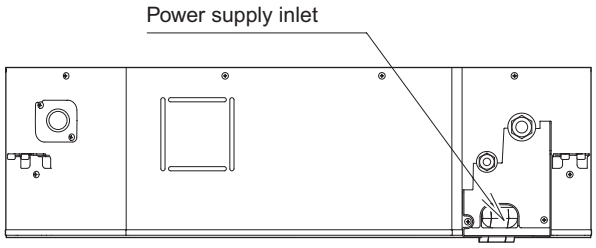

**Fig. 2-40**

After installation of indoor and outdoor units, panels and electrical wiring, check the following items.

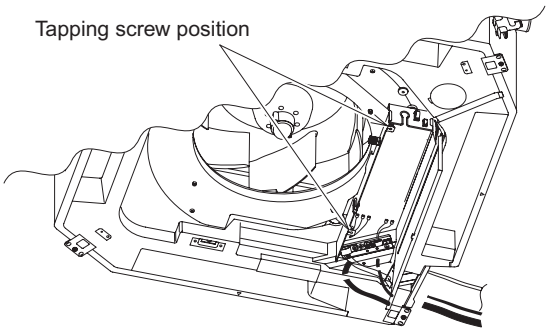
| | Checkpoint | Symptom | Check | Remark |
|---|---|---|---|---|
| 1 | Make sure whether indoor and outdoor units are correctly installed. | Fall, vibration, noise | | |
| 2 | Make sure whether gas leakage is tested. | No cooling, no heating | | |
| 3 | Make sure whether insulation is completed. (Refrigerant piping and drain piping) | Water leakage | | |
| 4 | Make sure whether drain water is running smoothly. | Water leakage | | |
| 5 | Make sure whether the power voltage matches the nameplate. | Inoperative, burnout | | |
| 6 | Make sure whether there is miswiring or incorrect connection. | Inoperative, burnout | | |
| 7 | Make sure whether the ground construction is completed. | Ground leakage | | |
| 8 | Make sure whether the wire gauge is followed by the recommended specifications. | Inoperative, burnout | | |
| 9 | Make sure whether the air intake and air outlet of the indoor and outdoor units are sealed by obstacles. | No cooling, no heating | | |

# 4. Installation Instructions

### 4-13-6. Important Note for Wiring 4-Way Cassette Type




(1) The power supply inlet is located at the lower area of the refrigerant tubing side of the unit.
The electrical component box is located at the air intake of the bottom of the unit.
(2) Before installing the ceiling panel, be sure to carry out the wiring connection.
(3) Remove the lid located on the bottom of the indoor unit attaching the electrical component box by unscrewing the philip head tapping screws (x2).




(4) Lead the wires from the power supply inlet to the unit. Be sure to lead the wires through the power supply inlet.
Make sure that no wire is caught between the indoor unit and ceiling panel. Otherwise, the unit may cause a fire.
(5) Connect the wires into the terminals through the power supply inlet for the electrical component box.
Fix the wires with a clamping clip.
(6) Reinstall the lid of the electrical component box in its original position with paying attention not to have the wires caught in the lid. Refer to “3. ELECTRICAL WIRING”.

# 4. Installation Instructions

## ● 4-Way Cassette 60x60 Type (Y1 Type)

### 4-13-7. Preparation for Ceiling Suspension

This unit uses a drain pump. Use a carpenter's level to check that the unit is level.

### 4-13-8. Mounting the Suspension Bolts

(1) Fix the suspension bolts securely to the ceiling using the method shown in the diagrams (Figs. 2-41 and 2-42), by attaching them to the ceiling support structure, or by any other method that ensures that the unit will be securely and safely suspended.

(2) Follow the diagram to make the holes in the ceiling. (Refer to Fig. 2-42)

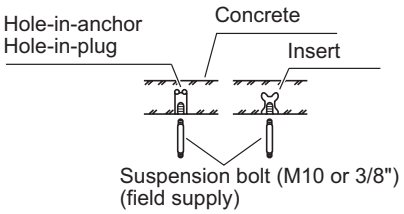
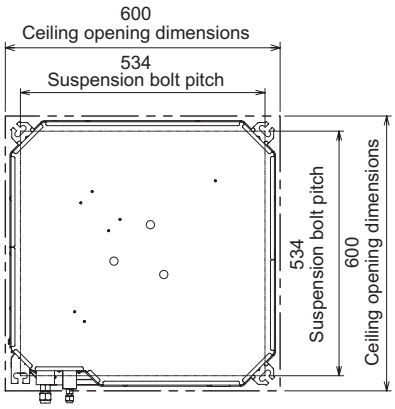


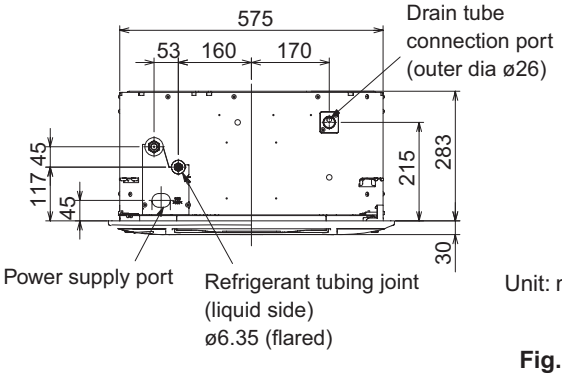

**Fig. 2-41**




Unit: mm

**Fig. 2-42**

(3) Determine the pitch of the suspension bolts using the supplied full-scale installation diagram.
The diagram shows the relationship between the positions of the suspension fitting, the unit, and the panel.




Unit: mm

**Fig. 2-43**

### 4-13-9. Placing the Unit Inside the Ceiling

(1) When placing the unit inside the ceiling, determine the pitch of the suspension bolts using the supplied full-scale installation diagram. (Fig. 2-44)
Tubing and wiring must be laid inside the ceiling when suspending the unit. If the ceiling is already constructed, lay the tubing and wiring into position for connection to the unit before placing the unit inside the ceiling.

(2) The length of suspension bolts must be appropriate for a distance between the bottom of the bolt and the bottom of the unit of more than 15 mm. (Fig. 2-44)

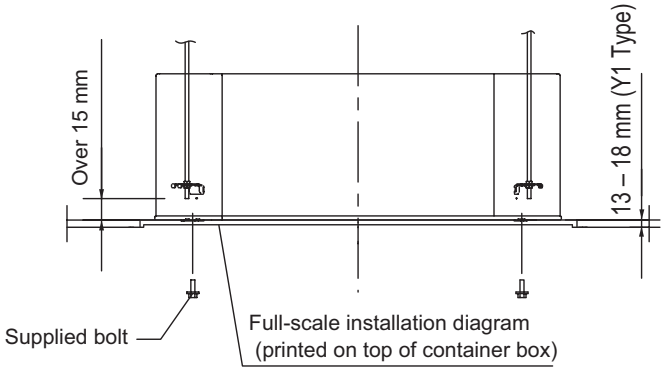



**Fig. 2-44**

# 4. Installation Instructions

(3) Thread the 3 hexagonal nuts and 2 washers (field supply) onto each of the 4 suspension bolts (Fig. 2-45).
Use 1 nut and 1 washer for the upper side, and 2 nuts and 1 washer for the lower side, so that the unit will not fall off the suspension lugs.

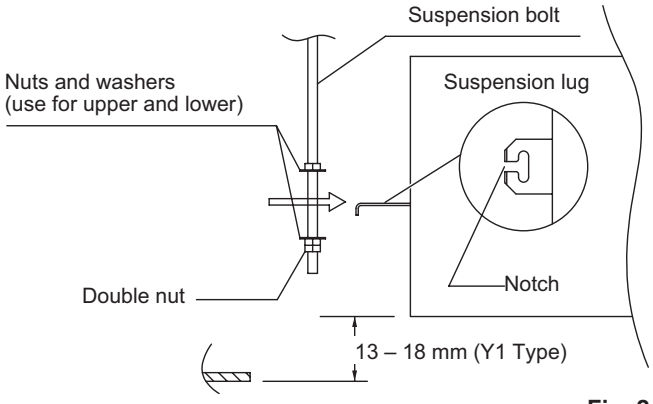



**Fig. 2-45**

(4) Adjust so that the distance between the unit and the ceiling bottom is 13 to 18 mm. Tighten the nuts on the upper side and lower side of the suspension lug.

(5) Remove the protective polyethylene used to protect the fan parts during transport.

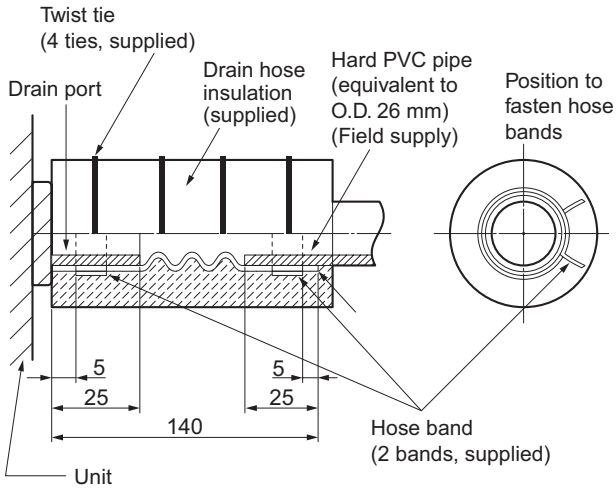
2

### 4-13-10. Installing the Drain Pipe

(1) Prepare a standard hard PVC pipe (O.D. 26 mm) for the drain and use the supplied drain hose and hose band to prevent water leaks. The PVC pipe must be purchased separately. The unit's transparent drain port allows you to check drainage.

(2) Installing the drain hose

- **To install the drain hose, first place 1 of the 2 hose bands over the unit drain port and the other hose band over the hard PVC pipe (not supplied). Then connect both ends of the supplied drain hose. (Fig. 2-46)**




Unit: mm

**Fig. 2-46**

- **On the unit drain side, grasp the hose band with pliers and insert the drain hose all the way to the base.**
- **If other commercially available hose bands are used, the drain hose may become pinched or wrinkled and there is danger of water leakage. Therefore be sure to use the supplied hose bands. When sliding the hose bands, be careful to avoid scratching the drain hose.**
- **Do not use adhesive when connecting the supplied drain hose to the drain port (either on the main unit or the PVC pipe).**

Reasons: 1. It may cause water to leak from the connection.
Since the connection is slippery just after the adhesive has been applied, the pipe easily slips off.
2. The pipe cannot be removed when maintenance is needed.

# 4. Installation Instructions

- **Wrap the hose with the supplied drain hose insulation and use the 4 twist ties so that the hose is insulated with no gaps.**
- **Do not bend the supplied drain hose 90° or more. The hose may slip off.**

**⚠ CAUTION**

- **Attach so that the hose band fastener is on the side of the drain port.**
- **Attach the hose bands so that each is approximately 5 to 25 mm from the end of the supplied drain hose.**

**NOTE**

Make sure the drain pipe has a downward gradient (1/100 or more) and that there are no water traps.

**⚠ CAUTION**

- **Do not install an air bleeder as this may cause water to spray from the drain pipe outlet. (Fig. 2-47)**

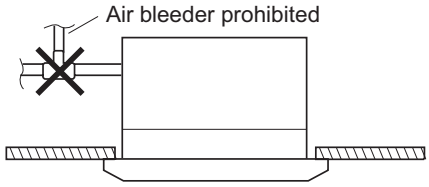



**Fig. 2-47**

- **In cases where it is necessary to raise the height of the drain piping, the drain piping can be raised to a maximum height of 850 mm above the bottom surface of the ceiling. Under no conditions attempt to raise it higher than 850 mm above the bottom surface of the ceiling. Doing so will result in water leakage. (Fig. 2-48)**

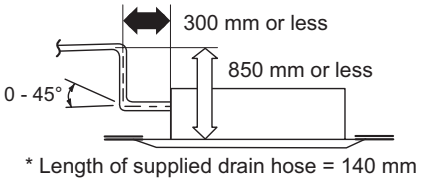



**Fig. 2-48**

- **Do not use natural drainage.**
- **Do not install the pipe with an upward gradient from the connection port. This will cause the drain water to flow backward and leak when the unit is not operating. (Fig. 2-49)**

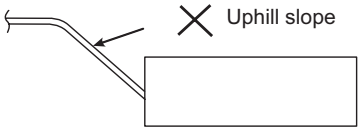



**Fig. 2-49**

- **Do not apply force to the piping on the unit side when connecting the drain pipe. The pipe should not be allowed to hang unsupported from its connection to the unit. Fasten the pipe to a wall, frame, or other support as close to the unit as possible. (Fig. 2-50)**

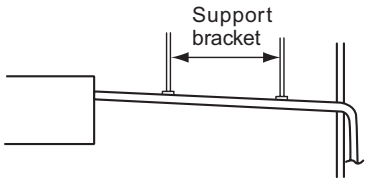



**Fig. 2-50**

- **Provide insulation for any pipes that are run indoors.**

### 4-13-11. Checking the Drainage

After wiring and drain piping are completed, use the following procedure to check that the water will drain smoothly. For this, prepare a bucket and wiping cloth to catch and wipe up spilled water.

(1) Connect power to the power terminal board (R, S terminals) inside the electrical component box.
(2) Slowly pour about 500 cc of water into the drain pan to check drainage. (Fig. 2-51)
(3) Short the check pin (CHK) on the indoor control board and operate the drain pump. Check the water flow through the transparent drain pipe and see if there is any leakage.
(4) When the check of drainage is complete, open the check pin (CHK) and remount the tube cover.

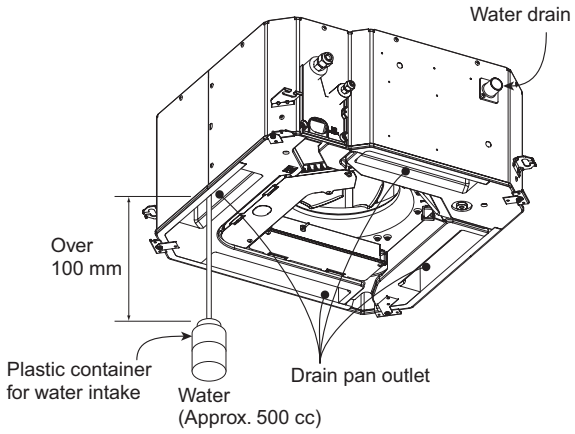



**Fig. 2-51**

**⚠ CAUTION**

**Be careful since the fan will start when you short the pin on the indoor control board.**

# 4. Installation Instructions



## ● Ceiling Type (T1 Type)

### 4-13-12. Required Minimum Space for Installation and Service

**(1) Dimensions of suspension bolt pitch and unit**

| Type \ Length | A | B | C |
|---|---|---|---|
| **36, 45, 56** | 855 | 910 | 210 |
| **73** | 1125 | 1180 | 210 |
| **106, 140** | 1540 | 1595 | 210 |

Unit: mm

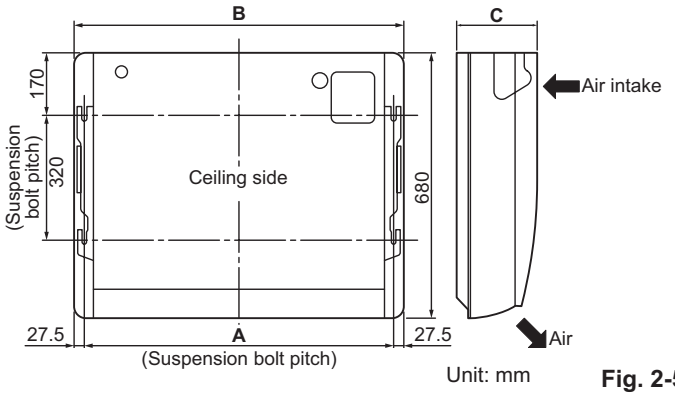



**Fig. 2-52**

**(2) Refrigerant tubing • drain hose position**

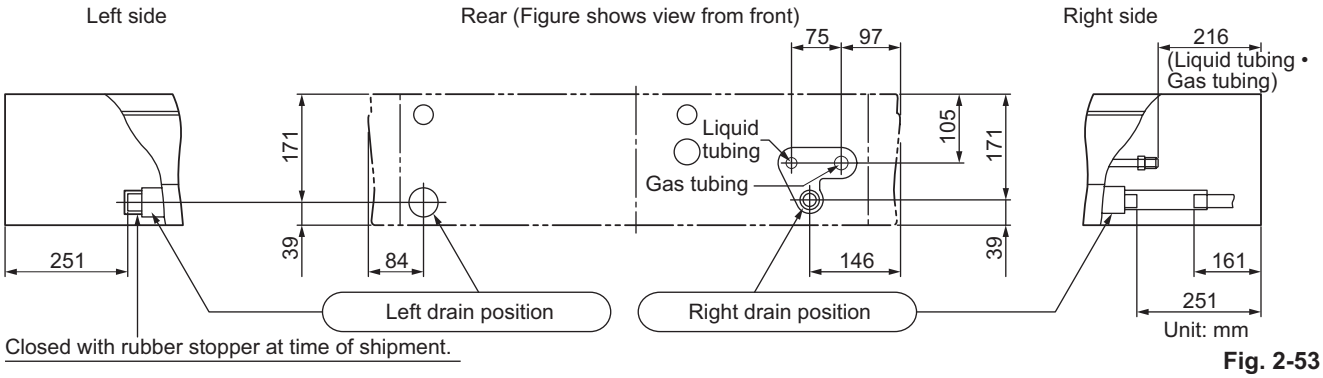
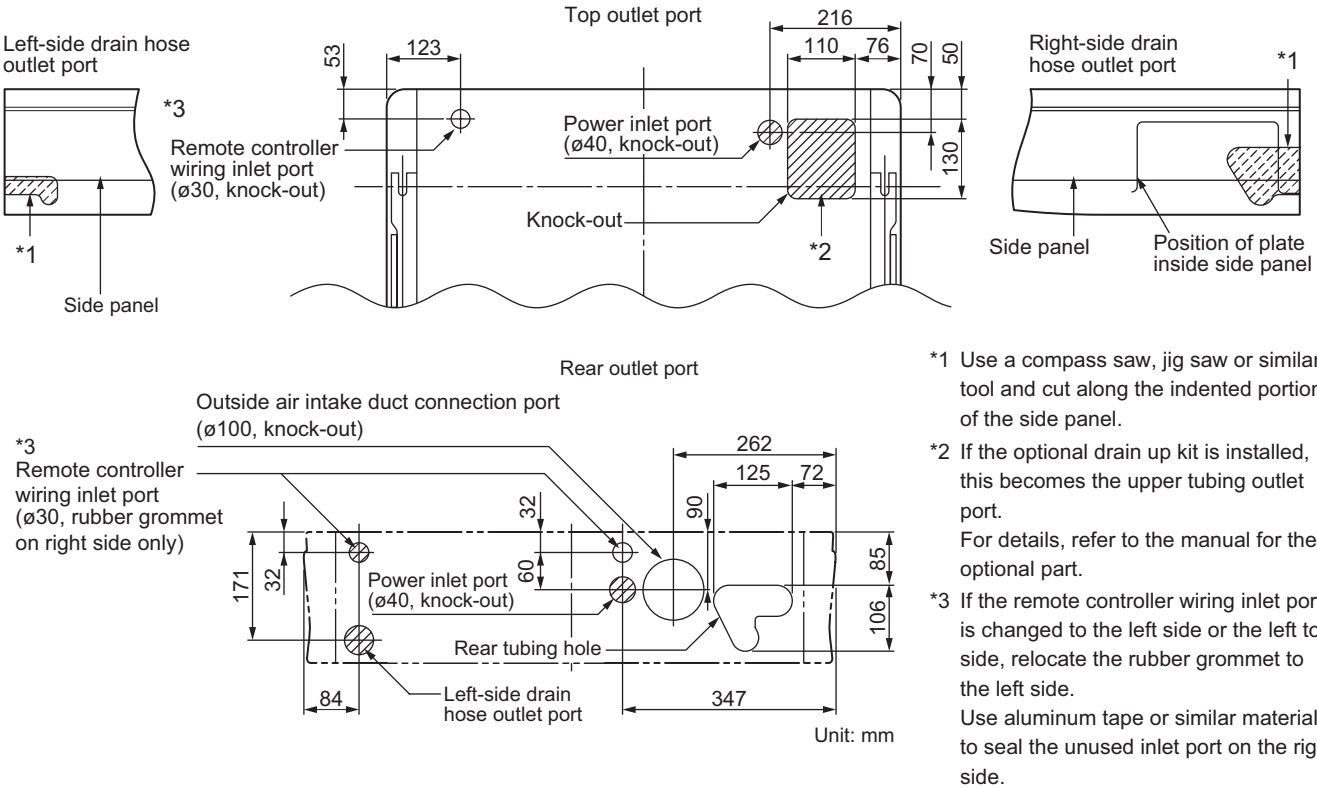



**Fig. 2-53**

**(3) Unit opening position (Refrigerant tubing • drain hose • power inlet port • remote controller wiring inlet port)**




*1 Use a compass saw, jig saw or similar tool and cut along the indented portion of the side panel.

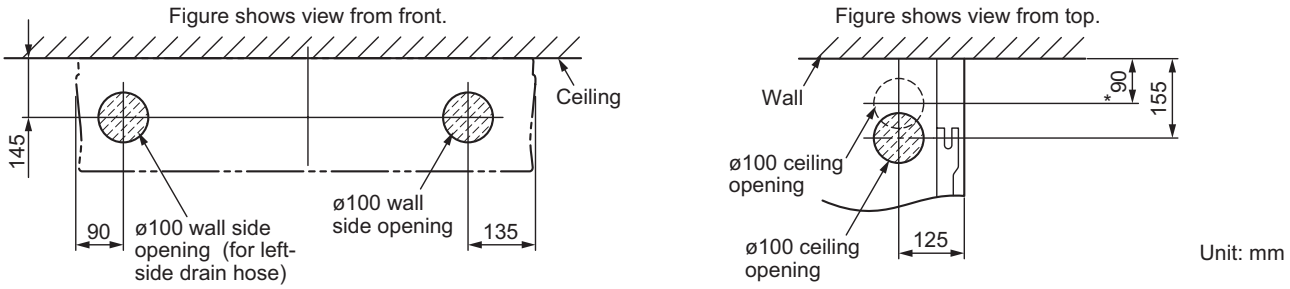
*2 If the optional drain up kit is installed, this becomes the upper tubing outlet port.
For details, refer to the manual for the optional part.

*3 If the remote controller wiring inlet port is changed to the left side or the left top side, relocate the rubber grommet to the left side.
Use aluminum tape or similar material to seal the unused inlet port on the right side.

**Fig. 2-54**

# 4. Installation Instructions

**(4) Wall and ceiling side opening position**




* If the optional drain up kit is installed, create a ø100 hole along the dotted line (part marked with * in figure).

**Fig. 2-55**

### 4-13-13. Suspending the Indoor Unit

(1) Place the full-scale diagram (supplied) on the ceiling at the location where you want to install the indoor unit. Use a pencil to mark the drill holes (Fig. 2-56).

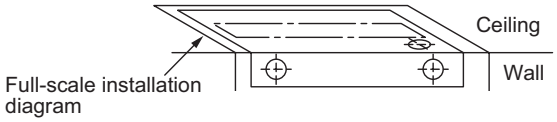



**Fig. 2-56**

(2) Drill holes at the 4 points indicated on the full-scale diagram.

(3) Depending on the ceiling type:

a) Insert suspension bolts (Fig. 2-57).
or

b) Use existing ceiling supports or construct a suitable support (Fig. 2-58).

**⚠ WARNING**

**It is important that you use extreme care in supporting the indoor unit from the ceiling. Ensure that the ceiling is strong enough to support the weight of the unit. Before hanging the ceiling unit, test the strength of each attached suspension bolt.**

(4) Screw in the suspension bolts, allowing them to protrude from the ceiling (Figs. 2-57 and 2-58). The distance of each exposed bolt must be of equal length within 50 mm. (Fig. 2-59)

(5) Before suspending the indoor unit, remove the 2 or 3 screws on the latch of the air-intake grilles, open the grilles, and remove them by pushing the claws of the hinges (Fig. 2-60). Then remove both side panels sliding them along the unit toward the front after removing the 2 attachment screws. (Fig. 2-61)

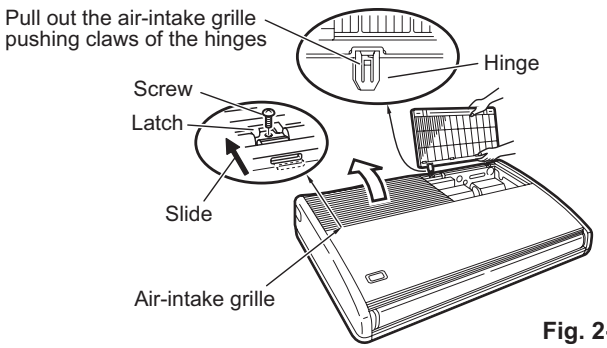



**Fig. 2-60**

**NOTE**

Since the diagram is made of paper, it may shrink or stretch slightly because of high temperature or humidity.
For this reason, before drilling the holes maintain the correct dimensions between the markings.

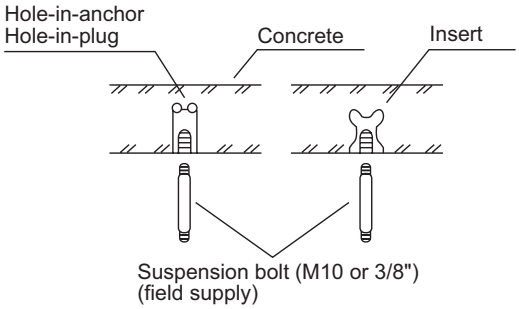



**Fig. 2-57**

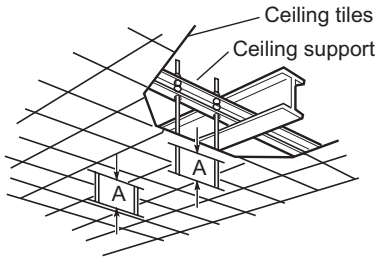



**Fig. 2-58**

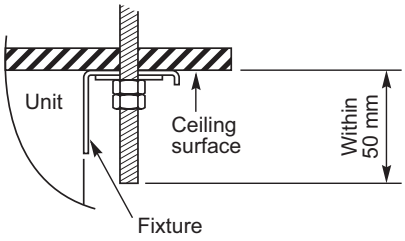



**Fig. 2-59**

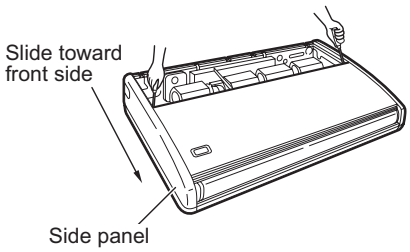



**Fig. 2-61**

# 4. Installation Instructions

(6) Carry out the preparation for suspending the indoor unit. The suspension method varies depending on whether there is a suspended ceiling or not. (Figs. 2-62 and 2-63)

(7) Suspend the indoor unit as follows:

a) Mount 1 washer and 2 hexagonal nuts on each suspension bolt (Fig. 2-64).

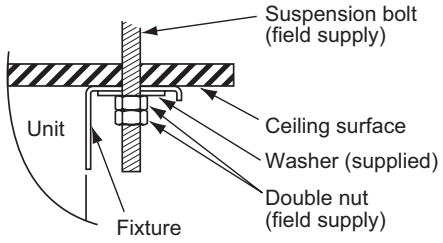



**Fig. 2-62**

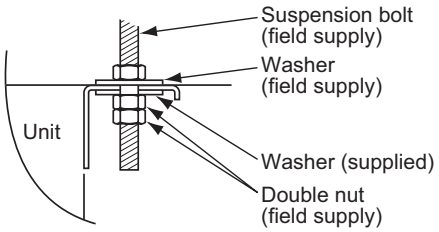



**Fig. 2-63**

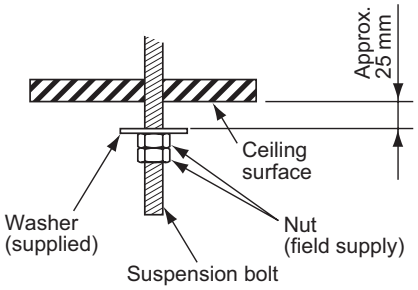



**Fig. 2-64**

b) Lift the indoor unit, and place it on the washers through the notches, in order to fix it in place. (Fig. 2-65)

c) Tighten the 2 hexagonal nuts on each suspension bolt to suspend the indoor unit as shown in Fig. 2-66.

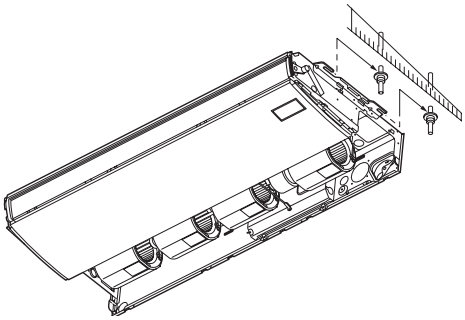


**Fig. 2-65**

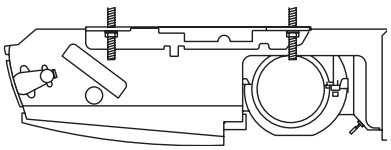


**Fig. 2-66**

**NOTE**

The ceiling surface is not always level. Confirm that the indoor unit is evenly suspended.
For the installation to be correct, leave a clearance of about 10 mm between the ceiling panel and the ceiling surface and fill the gap with an appropriate insulation or filler material.

(8) If the tubing and wiring are to go towards the rear of the unit, make holes in the wall. (Fig. 2-67)

(9) Measure the thickness of the wall from the inside to the outside and cut PVC pipe at a slight angle to fit. Insert the PVC pipe in the wall. (Fig. 2-68)

**NOTE**

The hole should be made at a slight downward slant to the outside.

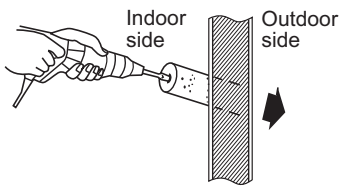



**Fig. 2-67**

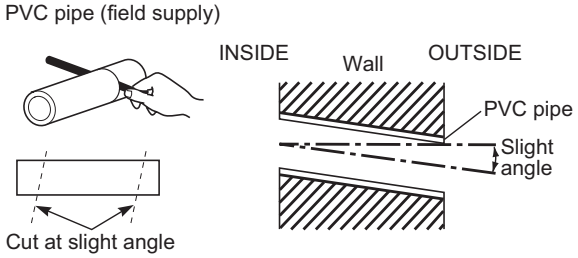
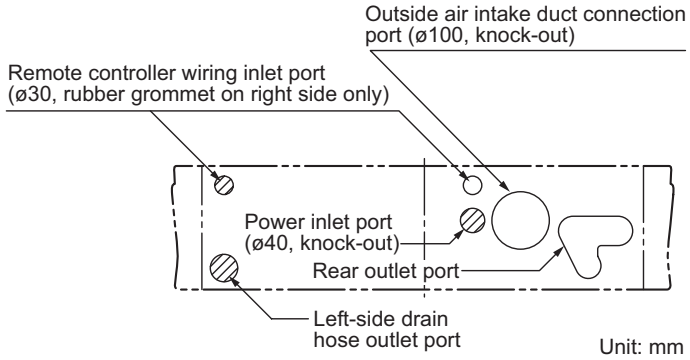



**Fig. 2-68**

# 4. Installation Instructions

### 4-13-14. Duct for Fresh Air

There is a duct connection port (knock-out hole) at the right-rear of the top panel of the indoor unit for drawing in fresh air. If it is necessary to draw in fresh air, remove the cover by opening the hole and connecting the duct to the indoor unit through the connection port. (Fig. 2-69)




Unit: mm

**Fig. 2-69**

### 4-13-15. Shaping the Tubing

- The positions of the refrigerant tubing connections are shown in the figure below. (The tubing can be routed in 3 directions.) (Fig. 2-70)

* When routing the tubing out through the top or right sides, knock out the appropriate parts in the top panel and cut notches in the side panel (Fig. 2-69).

* When routing the tubing out through the top, the optional L-shape tubing kit is required.

If the tubing is to be routed out together, use a box cutter or similar tool to cut out the part of the rear cover indicated by the marked area (Fig. 2-71), to match the positions of the tubes. Then draw out the tubing.

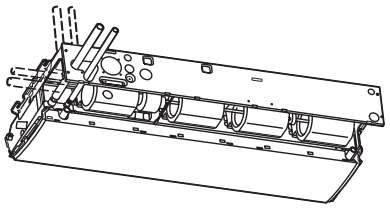


**Fig. 2-70**

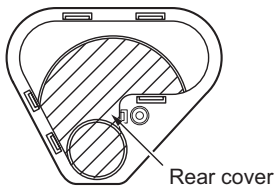



**Fig. 2-71**

### 4-13-16. Installing the Drain Pipe

- Prepare standard PVC pipe for the drain and connect it to the indoor unit drain pipe with the supplied hose clamps to prevent water leaks.

(1) Drain hose connection

- The drain hose is connected below the refrigerant tubing.

(2) Installing the drain hose

- To install the drain hose, first place 1 of the 2 hose bands over the unit drain port and the other hose band over the hard PVC pipe (not supplied). Then connect both ends of the supplied drain hose.
- On the unit drain side, grasp the hose band with pliers and insert the drain hose all the way to the base.

**⚠ CAUTION**

- **Attach so that the hose band fastener is on the side ofthe drain port. (Fig. 2-73)**
- **Attach the hose bands so that each is approximately 5 to 25 mm from the end of the supplied drain hose.**
- If other commercially available hose bands are used, the drain hose may become pinched or wrinkled and there is danger of water leakage. Therefore be sure to use the supplied hose bands. When sliding the hose bands, be careful to avoid scratching the drain hose.
- Do not use adhesive tape when connecting the supplied drain hose to the drain port (either on the main unit or the PVC pipe).
- Wrap the hose with the supplied drain hose insulation and use the 4 twist ties so that the hose is insulated with no gaps.
- Connect the drain pipe so that it slopes downward from the unit to the outside. (Fig. 2-72)

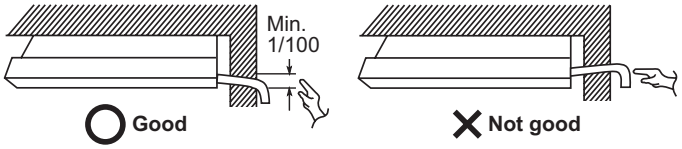
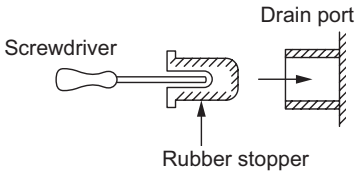



**Fig. 2-72**

# 4. Installation Instructions

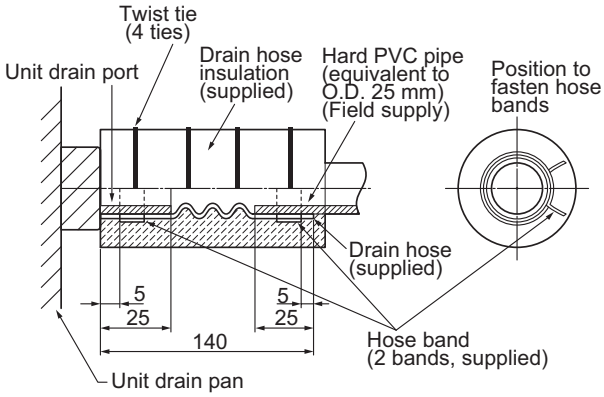
- Never allow water traps to occur in the course of the piping.
- Insulate any piping inside the room to prevent dripping.
- After the drain piping, pour water into the drain pan to check that the water drains smoothly.
- If the drain hose is to be raised, use the optional drain up kit. The drain hose can be raised 60 cm above the top of the main unit. (For details, refer to the manual for the optional part.)

* If the drain hose is routed through the left side, refer to Fig. 2-70, and follow the procedure above to install the hose. Reattach the rubber stopper removed earlier onto the right side.
The rubber stopper can be inserted easily by using a screwdriver or similar tool to press the stopper into the drain port on the main unit. Press the stopper into the main unit drain port as far as it will go.




**⚠ CAUTION**

**Check local electrical codes and regulations before wiring. Also, check any specified instruction or limitations.**




Unit: mm

**Fig. 2-73**

**How to carry out power supply wiring**

(1) Wiring connection ports

The power inlet ports are located at the rear and top.
The remote controller wiring inlet ports are located at the rear and top (for use with the wired remote controller).
For details, refer to Fig. 2-69. For the method used to insert the wiring, refer to Fig. 2-74.

Attach the supplied eyelet to the power wiring inlet port with adhesive material (field supply).
(Refer to Fig. 2-74)

**⚠ CAUTION**

**When removing the fastening bracket from the cover of the electrical component box, use caution to avoid dropping the bracket.**

Remote controller wiring and inter-unit control wiring inlet port

* Insert the remote controller wiring and inter-unit control wiring into the electrical component box from the inlet port as shown in the figure.
This is done regardless of whether the wiring was inserted from the top, rear, or left side of the main unit.

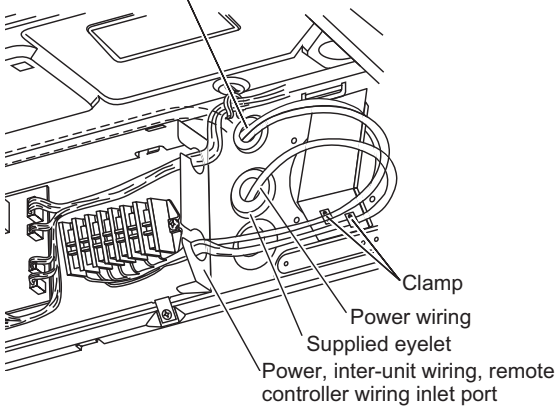



**Fig. 2-74**

(2) How to carry out wiring

- Open the knock-out hole on the rear or top of the main unit.
  Attach the supplied rubber grommet and pull the power wiring into the main unit.
- Feed the wiring into the wiring inlet port on the electrical component box.
  Connect the wiring to the terminal plate and fasten in place with the supplied clamp.
- Perform electrical and grounding work in accordance with the package A/C power specifications, and following local electrical codes and regulations.

# 4. Installation Instructions

## ● Low Silhouette Ducted Type (F1 Type)

### 4-13-17. Required Minimum Space for Installation and Service

- This air conditioner is usually installed above the ceiling so that the indoor unit and ducts are not visible. Only the air intake and air outlet ports are visible from the unit bottom.
- The minimum space for installation and service is shown in Fig. 2-75 and Table 2-13.

**Table 2-13** Unit: mm

| Type | 22, 28, 36, 45, 56 | 73, 90 | 106, 140, 160 |
|---|---|---|---|
| A (Length) | 780 | 1,080 | 1,560 |

- It is recommended that space be provided (450 × 450 mm) for checking and servicing the electrical system.
- The detailed dimensions of the indoor unit is shown in Fig. 2-76 and Table 2-14.

Unit: mm

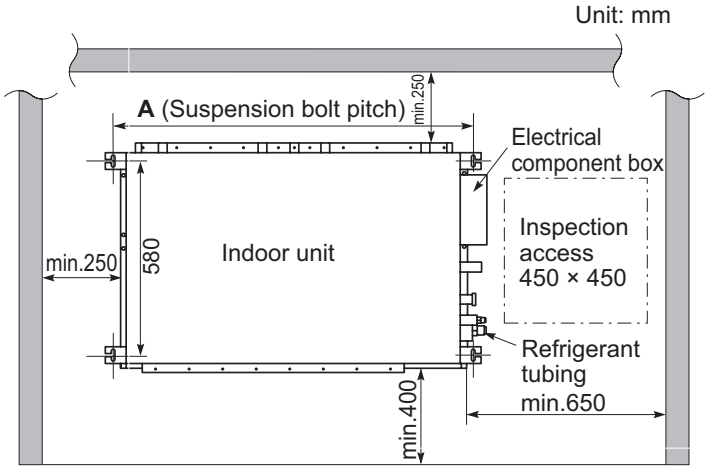



**Fig. 2-75**

**Table 2-14** Unit: mm

| Dimension / Type | A | B | C | D | No. of holes E | No. of holes F | G | H | I | G | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **22, 28, 36, 45, 56** | 646 | 500 (100 × 5) | 700 | 780 | 18 | 12 | 73 | 96 | 300 (100 × 3) | 492 | 161 |
| **73, 90** | 946 | 900 (100 × 9) | 1,000 | 1,080 | 26 | 20 | 23 | 41 | 700 (100 × 7) | 782 | 171 |
| **106, 140, 160** | 1,426 | 1,300 (100 × 13) | 1,480 | 1,560 | 26 | 28 | 63 | 81 | 1,100 (100 × 11) | 1,262 | 182 |

Power, inter-unit wiring

① Refrigerant tubing joint (liquid tube)
② Refrigerant tubing joint (gas tube)
③ Upper drain port VP25 (O.D. 32 mm)
ℓ 200 flexible hose supplied
④ Bottom drain port VP25 (O.D. 32 mm)
⑤ Suspension lug (4 – 12 × 37 mm)
⑥ Power supply outlet (2 – ø30 mm)
⑦ Fresh air intake port (ø150 mm)
⑧ Flange for flexible air outlet duct
⑨ Tube cover
⑩ Electrical component box
⑪ Wind pressure endurance
⑫ Flange for air intake duct
⑬ Filter

Unit: mm

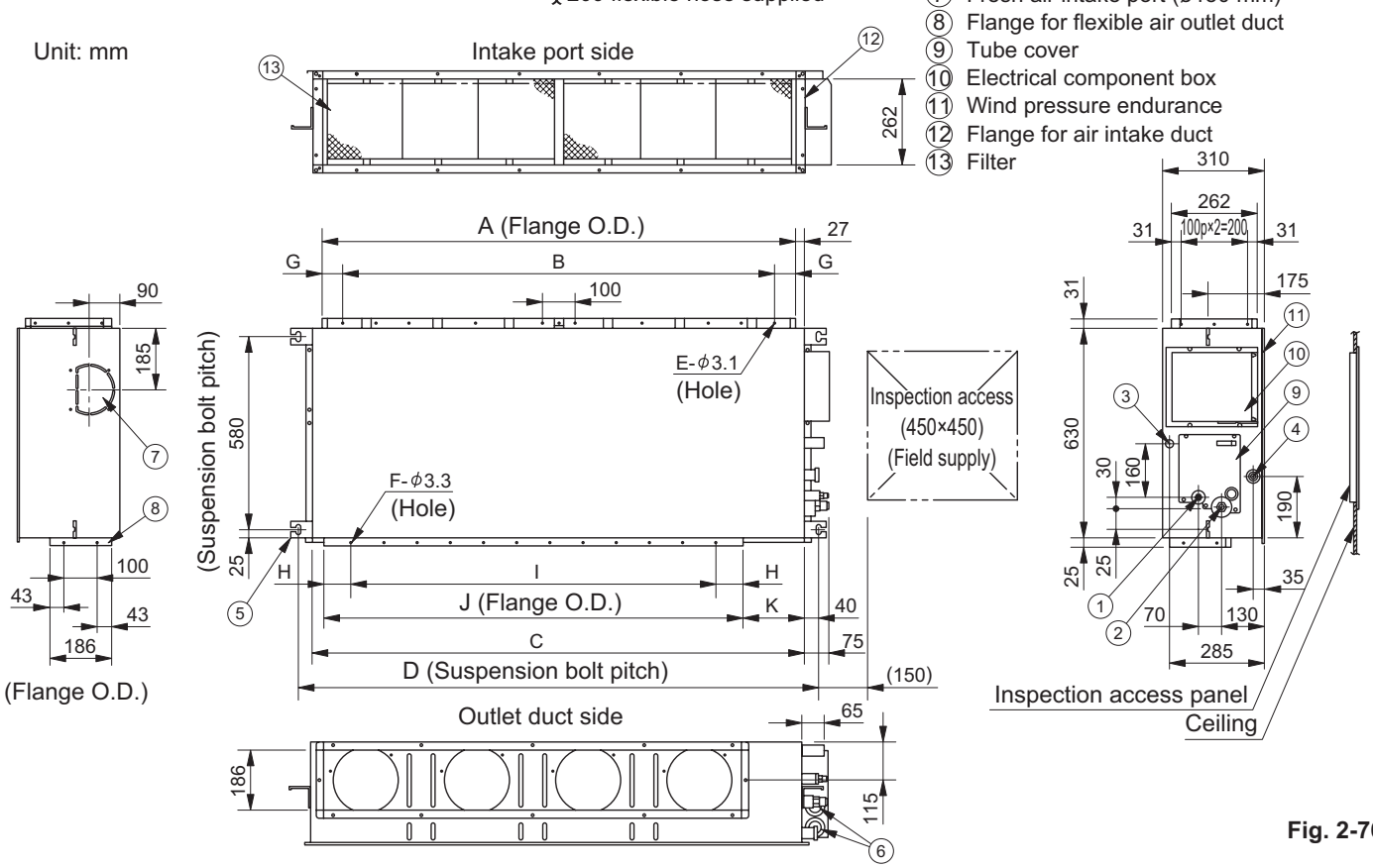



**Fig. 2-76**

# 4. Installation Instructions

## 4-13-18. Suspending the Indoor Unit

Depending on the ceiling type:

- Insert suspension bolts (Fig. 2-77)
  or
- Use existing ceiling supports or construct a suitable support (Fig. 2-78).

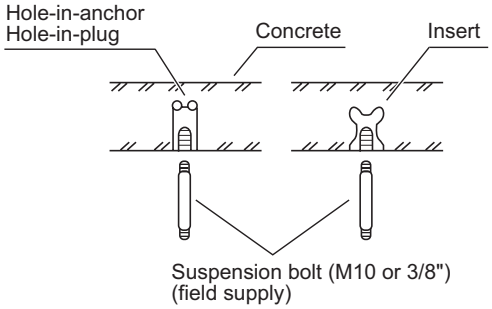



**Fig. 2-77**

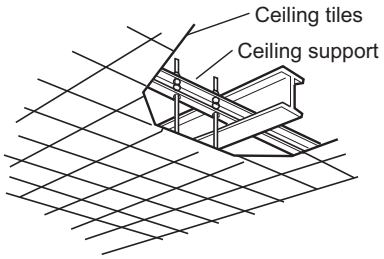



**Fig. 2-78**

**⚠ WARNING**

**It is important that you use extreme care in supporting the indoor unit inside the ceiling.**
**Ensure that the ceiling is strong enough to support the weight of the unit. Before hanging the unit, test the strength of each attached suspension bolt.**

(1) When placing the unit inside the ceiling, determine the pitch of the suspension bolts referring to the dimensional data as shown in Fig. 2-75 and Table 2-14. Tubing must be laid and connected inside the ceiling when suspending the unit. If the ceiling is already constructed, lay the tubing into position for connection to the unit before placing the unit inside the ceiling.

(2) Screw in the suspension bolts allowing them to protrude from the ceiling (Fig. 2-77).
(Cut the ceiling material, if necessary.)

(3) Thread the 3 hexagonal nuts and 2 washers (field supply) onto each of the 4 suspension bolts (Figs. 2-79 and 2-80). Use 1 nut and 1 washer for the upper part, and 2 nuts and 1 washer for the lower part, so that the unit will not fall off the suspension lugs.

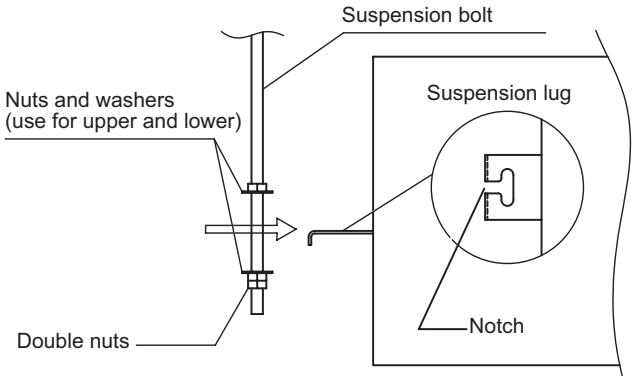



**Fig. 2-79**

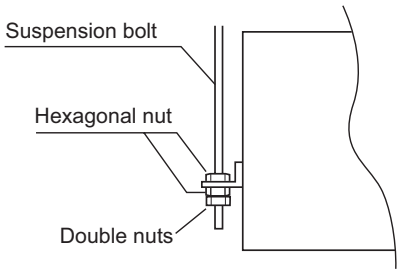



**Fig. 2-80**

● This shows an example of installation.

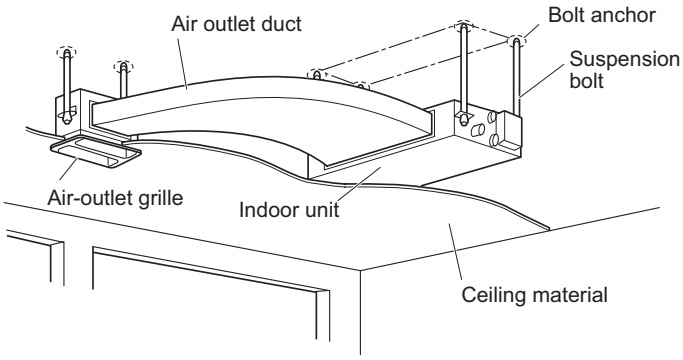



**Fig. 2-81**

# 4. Installation Instructions

### 4-13-19. Installing the Drain Pipe

(1) Prepare standard hard PVC pipe (O.D. 32 mm) for the drain and use the supplied hose band to prevent water leaks.
The PVC pipe must be purchased separately.
The transparent drain part on the unit allows you to check drainage. (Fig. 2-82)

**⚠ CAUTION**

- **Do not use adhesive tape at the drain connection port on the indoor unit.**
- **Insert the drain pipe until it contacts the socket, and then secure it tightly with the hose band.**
- **Do not use the supplied drain hose bent at a 90° angle. (The maximum permissible bend is 45°.)**
- **Tighten the hose clamps so their locking nuts face upward. (Fig. 2-82)**

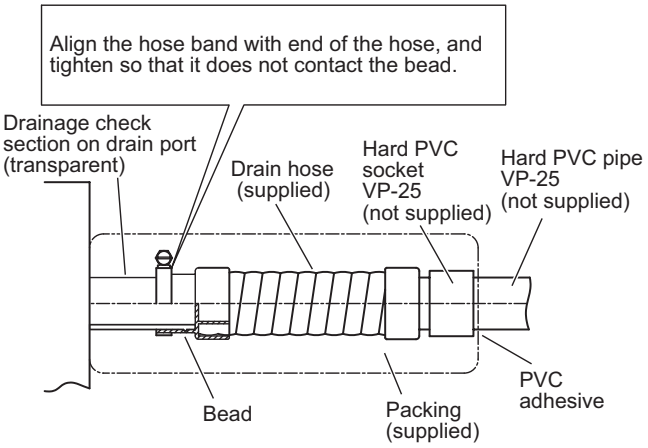



**Fig. 2-82**

(2) After connecting the drain pipe securely, wrap the supplied packing and drain pipe insulator around the pipe, then secure it with the vinyl clamps . (Fig. 2-83)

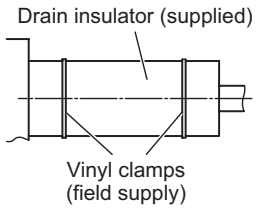



**Fig. 2-83**

**NOTE**

Make sure the drain pipe has a downward gradient (1/100 or more) and that there are no water traps.

**⚠ CAUTION**

- **Do not install an air bleeder as this may cause water to spray from the drain pipe outlet. (Fig. 2-84)**

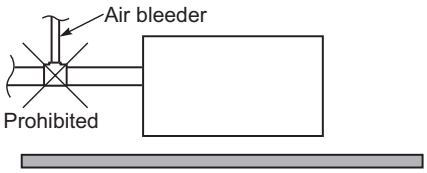



**Fig. 2-84**

- **If it is necessary to increase the height of the drain pipe, the section directly after the connection port can be raised a maximum of 500 mm. Do not raise it any higher than 500 mm, as this could result in water leaks. (Fig. 2-85)**

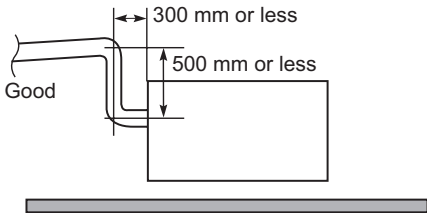



**Fig. 2-85**

- Do not install the pipe with an upward gradient from the connection port. This will cause the drain water to flow backward and leak when the unit is not operating. (Fig. 2-86)

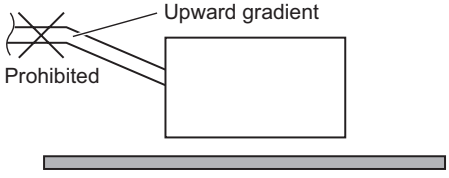



**Fig. 2-86**

- Do not apply force to the piping on the unit side when connecting the drain pipe. The pipe should not be allowed to hang unsupported from its connection to the unit. Fasten the pipe to a wall, frame, or other support as close to the unit as possible. (Fig. 2-87)

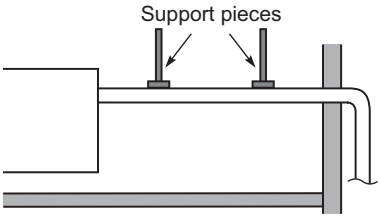



**Fig. 2-87**

### 4-13-20. Checking the Drainage

After wiring and drain piping are completed, use the following procedure to check that the water will drain smoothly. For this, prepare a bucket and wiping cloth to catch and wipe up spilled water.

(1) Connect power to the power terminal board (R, S terminals) inside the electrical component box.

(2) Remove the tube cover and slowly pour about 1,200 cc of water through the opening into the drain pan to check drainage.

(3) Short-circuit the check pin (CHK) on the indoor control circuit board and operate the drain pump.
Check the water flow through the transparent drain port and see if there is any leakage.

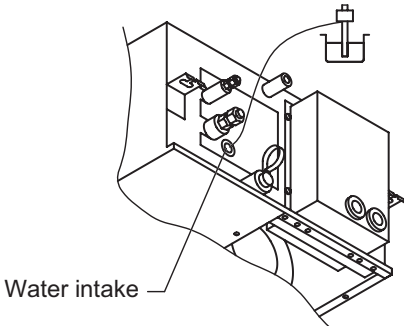



**Fig. 2-88**

**⚠ CAUTION**

**Be careful since the fan will start when you short the pin on the indoor control board.**

(4) When the drainage check is complete, open the check pin (CHK) and remount the insulator and drain cap onto the drain inspection port.



### 4-13-21. Installing the Air-intake Filter

(1) Standard installation
Install the filter onto the intake port. (Fig. 2-89)

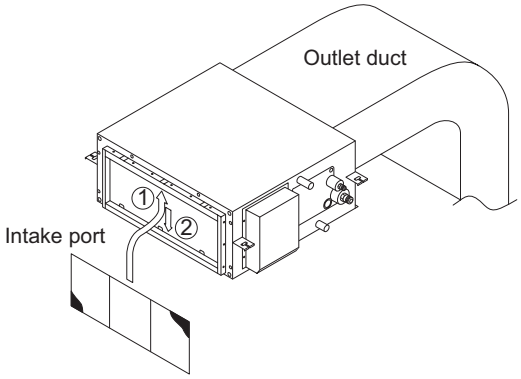



**Fig. 2-89**

(2) If a duct is connected to the intake port:
First remove the bottom cover, then install the filter inside the unit. (Fig. 2-90)

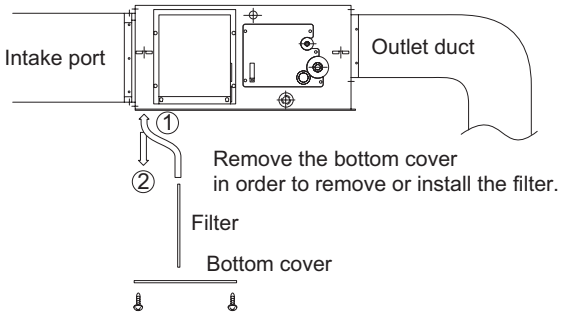



**Fig. 2-90**

(3) If the intake is on the bottom:
Remove the intake port chamber from the side, then reattach the chamber onto the bottom of the unit. (Fig. 2-91)

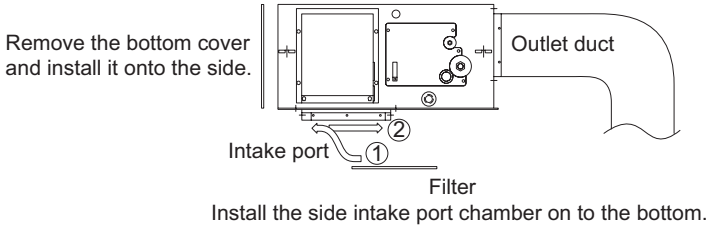



**Fig. 2-91**

# 4. Installation Instructions

### 4-13-22. Increasing the Fan Speed

If external static pressure is too great (due to long extension of ducts, for example), the air flow volume may drop too low at each air outlet. This problem may be solved by increasing the fan speed using the following procedure:

(1) Remove 4 screws on the electrical component box and remove the cover plate.

(2) Disconnect the fan motor sockets in the box.

(3) Take out the booster cable (sockets at both ends) clamped in the box.

(4) Securely connect the booster cable sockets between the disconnected fan motor sockets in step 2 (Fig. 2-92).

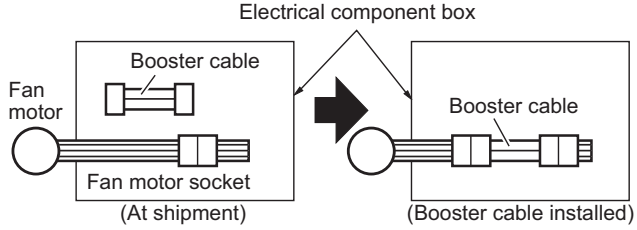
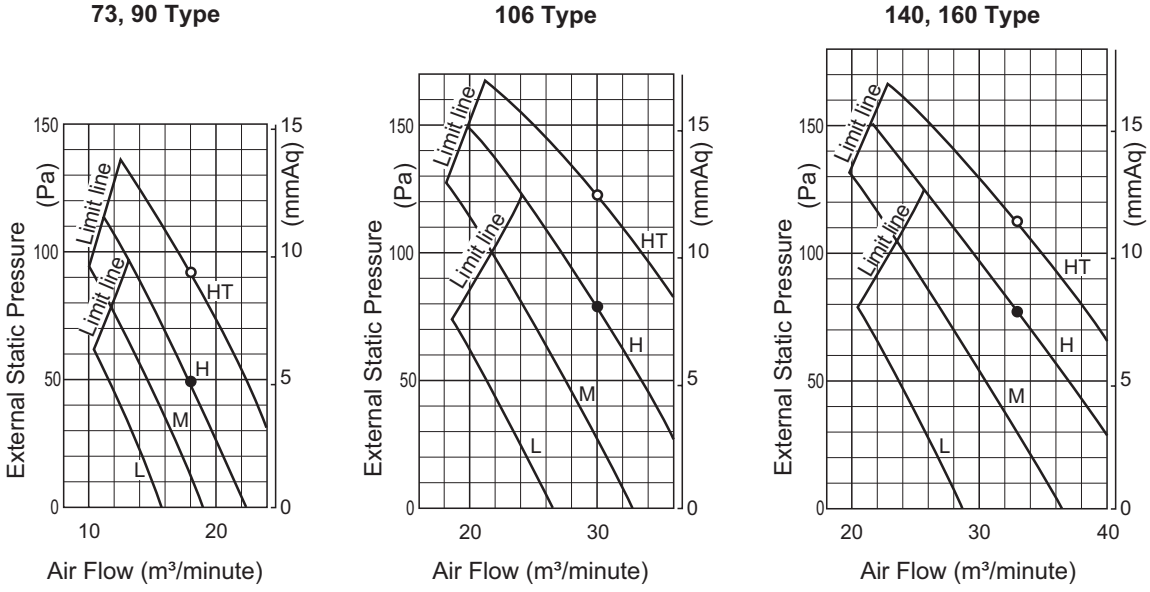



**Fig. 2-92**

(5) Place the cable neatly in the box and reinstall the cover plate.

**Indoor Fan Performance**




NOTE HT: Using the booster cable

H: At shipment

**Fig. 2-93**

■ **How to read the diagram**

The vertical axis is the external static pressure (Pa) while the horizontal axis represents the air flow ($m^3$/minute). The characteristic curves for “HT”, “H”, “M” and “L” fan speed control are shown. The nameplate values are shown based on the “H” air flow. For the 73 type, the air flow is 18 $m^3$/minute, while the external static pressure is 49 Pa at “H” position. If external static pressure is too great (due to long extension of ducts, for example), the air flow volume may drop too low at each air outlet. This problem may be solved by increasing the fan speed as explained above.

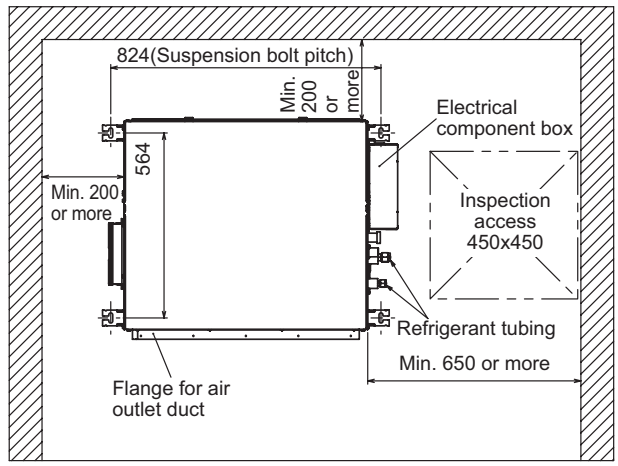
# 4. Installation Instructions



## ● Slim Low Static Ducted Type (M1 Type)

### 4-13-23. Required Minimum Space for Installation and Service

- This air conditioner is usually installed above the ceiling so that the indoor unit and ducts are not visible. Only the air intake and air outlet ports are visible from below.
- The minimum space for installation and service is shown in the diagram. (Fig. 2-94)
- *H dimension means the minimum height of the unit.
- Select the *H dimension such that a downward slope of at least 1/100 is ensured as indicated in "**4-13-28. Installing the Drain Pipe**".




Unit: mm

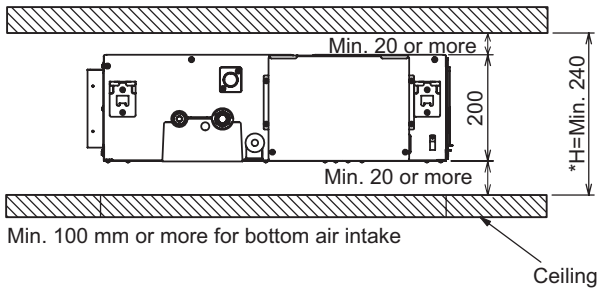
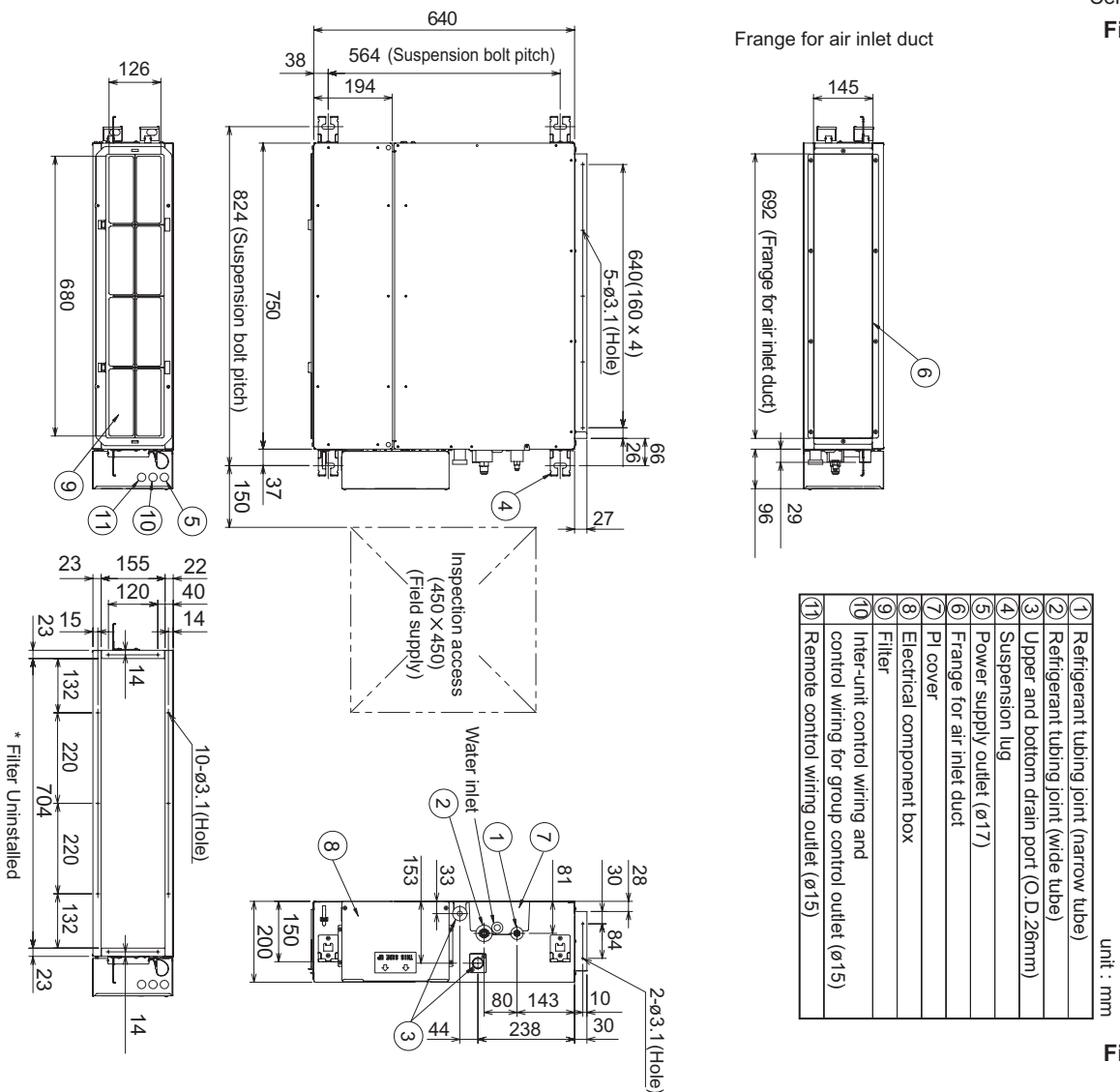



**Fig. 2-94**

- The diagram shows the detailed dimensions of the indoor unit. (Fig. 2-95)




| | |
|---|---|
| ① | Refrigerant tubing joint (narrow tube) |
| ② | Refrigerant tubing joint (wide tube) |
| ③ | Upper and bottom drain port (O.D.26mm) |
| ④ | Suspension lug |
| ⑤ | Power supply outlet (ø17) |
| ⑥ | Frange for air inlet duct |
| ⑦ | PI cover |
| ⑧ | Electrical component box |
| ⑨ | Filter |
| ⑩ | Inter-unit control wiring and control wiring for group control outlet (ø15) |
| ⑪ | Remote control wiring outlet (ø15) |

unit : mm

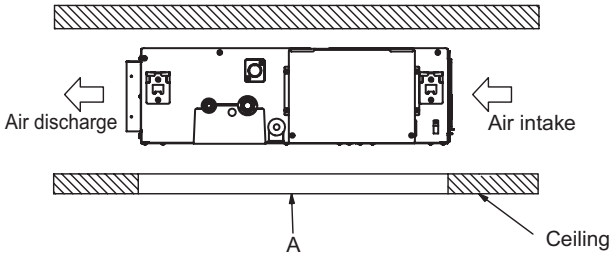
**Fig. 2-95**

# 4. Installation Instructions

### 4-13-24. Preparations Before Installation

(1) Confirm the positional relationship between the unit and suspension bolts. (Fig. 2-96)

● Install the inspection opening on the control box side where maintenance and inspection of the control box and drain pump are easy. Install the inspection opening also in the lower part of the unit.



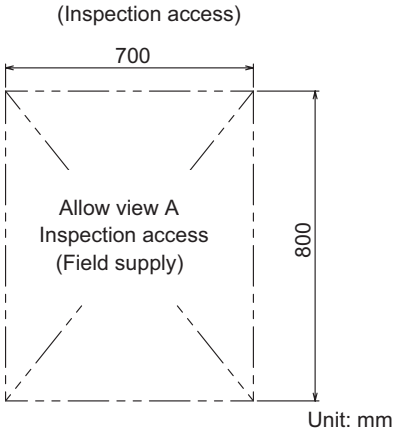




**Fig. 2-96**

(2) Make sure the range of the unit's external static pressure is not exceeded.
(See the technical documentation for the range of the external static pressure setting.)

(3) Open the installation hole. (Pre-set ceilings)

● Once the installation hole is opened in the ceiling where the unit is to be installed, pass refrigerant piping, drain piping, transmission wiring, and remote controller wiring (It is not necessary if using a wireless remote controller) to the unit's piping and wiring holes. See " **5. HOW TO PROCESS TUBING** ", " **4-13-28. Installing the Drain Pipe** " and " **3. ELECTRICAL WIRING** ".

● After opening the ceiling hole, make sure ceiling is level if needed. It might be necessary to reinforce the ceiling frame to prevent shaking. Consult an architect or carpenter for details.

### 4-13-25. For Bottom Intake

For bottom intake, replace the chamber lid and protection net in the procedure shown in the diagram.

(1) Remove the frame filter assy.
Remove the chamber lid. (Fig. 2-97-1)

(2) Refer to the diagram to attach the chamber lid and frame filter assy in the direction of the arrow. (Fig. 2-97-2)
Note: Attach the lid with the dummy holes downward.

(3) Attach the frame filter assy (supplied) in the manner shown in the diagram. (Fig. 2-97-3)

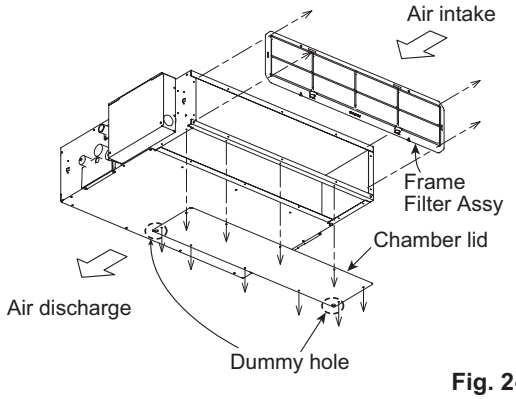



**Fig. 2-97-1**

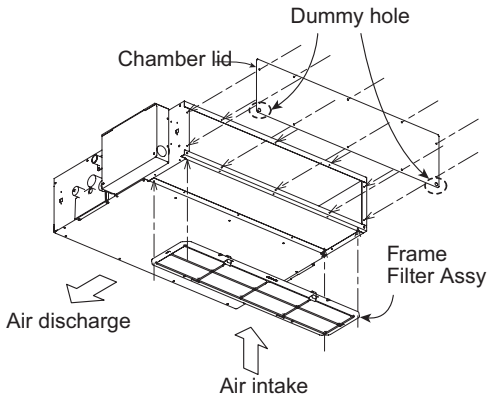



**Fig. 2-97-2**

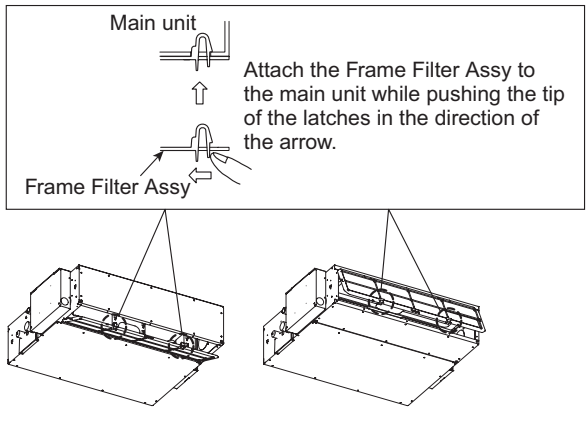



**Fig. 2-97-3**

# 4. Installation Instructions

## 4-13-26. Installing the Duct

Connect the duct supplied in the field as shown in Fig. 2-98.

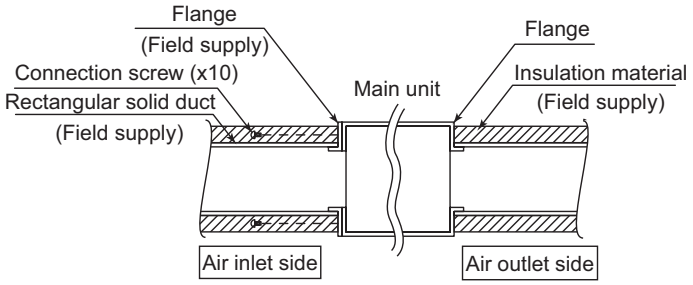



**Fig. 2-98**

**Air inlet side**

- Attach the duct and intake-side flange (field supply).
- Connect the flange to the main unit with 10 - ø3.1 (Hole) screws.
- Wrap the intake-side flange and duct connection area with aluminum tape or something similar to prevent air escaping.

**⚠ CAUTION**

**When attaching a duct to the intake-side, be sure to attach an air filter inside the air passage on the intake-side. (Use an air filter whose dust collecting efficiency is at least 50% in a gravimetric technique.) The included filter is not used when the intake duct is attached.**

**Air outlet side**

- Connect the duct according to the air outside of the outlet-side flange.
- Wrap the outlet-side flange and the duct connection area with aluminum tape or something similar to prevent air escaping.

**⚠ CAUTION**

- Be sure to insulate the duct to prevent condensation from forming. (Material: glass wool or polyethylene foam, 25 mm thick)
- Use electric insulation between the duct and the wall when using metal ducts to pass metal laths of the net or fence shape or metal plating into wooden buildings.
- Be sure to explain about the way of maintaining and cleaning local procurements (air filter, grille [both air outlet and suction grille], etc.) to your customer.

## 4-13-27. Suspending the Indoor Unit

Depending on the ceiling type:

- Insert suspension bolts as shown in the diagram. (Fig. 2-99) or
- Use existing ceiling supports or construct a suitable support as shown in the diagram. (Fig. 2-100)

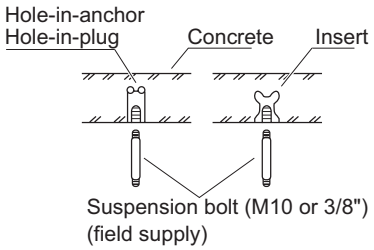



**Fig. 2-99**

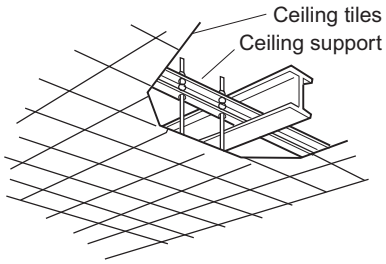



**Fig. 2-100**

**⚠ WARNING**

**It is important that you use extreme care in supporting the indoor unit inside the ceiling. Ensure that the ceiling is strong enough to support the weight of the unit.**
**Before hanging the unit, test the strength of each attached suspension bolt.**

(1) When placing the unit inside the ceiling, determine the pitch of the suspension bolts referring to the dimensional data as shown in Fig. 2-54.
Tubing must be laid and connected inside the ceiling when suspending the unit. If the ceiling is already constructed, lay the tubing into position for connection to the unit before placing the unit inside the ceiling.

(2) Screw in the suspension bolts allowing them to protrude from the ceiling as shown in Fig. 2-99. (Cut the ceiling material, if necessary.)

(3) Thread the 3 hexagonal nuts and 2 washers (field supply) onto each of the 4 suspension bolts as shown in Fig. 2-101 and 2-102. Use 1 nut and 1 washer for the upper part, and 2 nuts and 1 washer for the lower part, so that the unit will not fall off the suspension lugs.

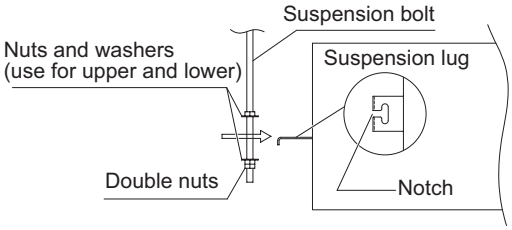



**Fig. 2-101**

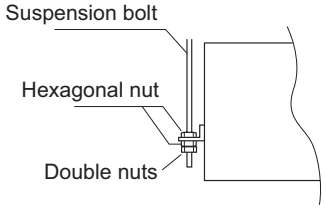



**Fig. 2-102**

(4) Adjust the height of the unit.
(5) Check the unit is horizontally level.

**⚠ CAUTION**

- Make sure the unit is installed level using a level or a vinyl hose filled with water. In using a vinyl hose instead of a level, adjust the top surface of the unit to the surface of the water at both ends of the vinyl hose and adjust the unit horizontally. (One thing to watch out for in particular is if the unit is installed so that the slope is not in the direction of the drain piping, this might cause leaking.) (Fig. 2-103)

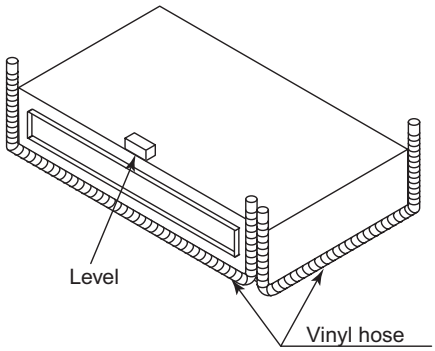



**Fig. 2-103**

(6) Tighten the upper nut.

### 4-13-28. Installing the Drain Pipe

(1) Prepare standard hard PVC pipe (O.D. 26 mm) for the drain and use the supplied hose band to prevent water leaks. (Fig. 2-104)
The PVC pipe must be purchased separately.
The transparent drain part on the unit allows you to check drainage.

**⚠ CAUTION**

- Attach so that the hose band fastener is on the side of the drain port. (Fig. 2-104)
- Attach the hose bands so that each is approximately 5 to 25 mm from the end of the supplied drain hose. (Fig. 2-104)
- **Do not use adhesive at the drain connection port on the indoor unit.**
- **Insert the drain pipe until it contacts the socket, as shown in the figure above, then secure it tightly with the hose band.**
- **Do not use the supplied drain hose bent at a 90° angle. (The maximum permissible bend is 45°.)**
- **Tighten the hose clamps so their locking nuts face in the horizontal direction.**
- **Make sure that the drain port is not a downward gradient from the joint section (may lead to abnormal noise).**

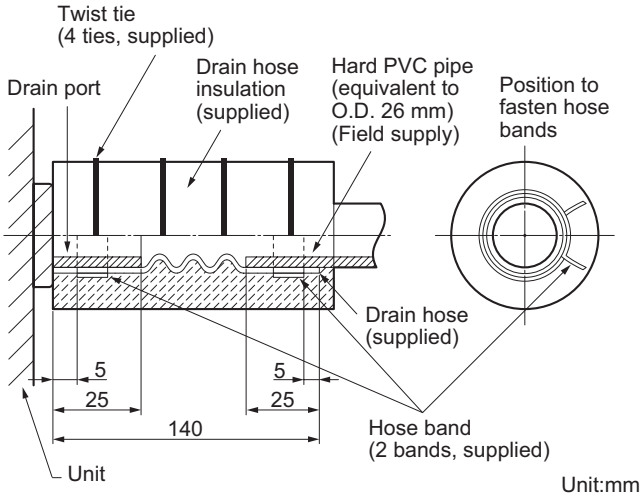



**Fig. 2-104**

**NOTE**

Make sure the drain pipe has a downward gradient (1/100 or more) and that there are no water traps.

**⚠ CAUTION**

- **Do not install an air bleeder as this may cause water to spray from the drain pipe outlet. (Fig. 2-105-1)**
- **If it is necessary to increase the height of the drain pipe, the section directly after the connection port can be raised a maximum of 500 mm. Do not raise it any higher than 500 mm, as this could result in water leaks. (Fig. 2-105-2)**
- **Do not install the pipe with an upward gradient from the connection port. This will cause the drain water to flow backward and leak when the unit is not operating. (Fig. 2-105-3)**

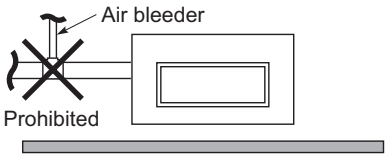



**Fig. 2-105-1**

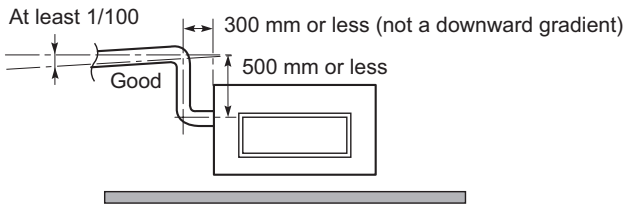



**Fig. 2-105-2**

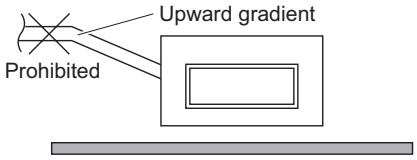



**Fig. 2-105-3**

# 4. Installation Instructions

- **Do not apply force to the piping on the unit side when connecting the drain pipe. The pipe should not be allowed to hang unsupported from its connection to the unit. Fasten the pipe to a wall, frame, or other support as close to the unit as possible. (Fig. 2-105-4)**

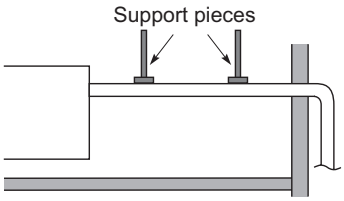



**Fig. 2-105-4**

### 4-13-29. Checking the Drainage

After wiring and drain piping are completed, use the following procedure to check that the water will drain smoothly. For this, prepare a bucket and wiping cloth to catch and wipe up spilled water.

(1) Connect power to the power terminal board (R, S terminals) inside the electrical component box.

(2) Remove the eyelet cap and through the opening, slowly pour about 500 cc of water into the drain pan to check drainage.

(3) Short the check pin (CHK) on the indoor control board and operate the drain pump. Check the water flow through the transparent drain port and see if there is any leakage.

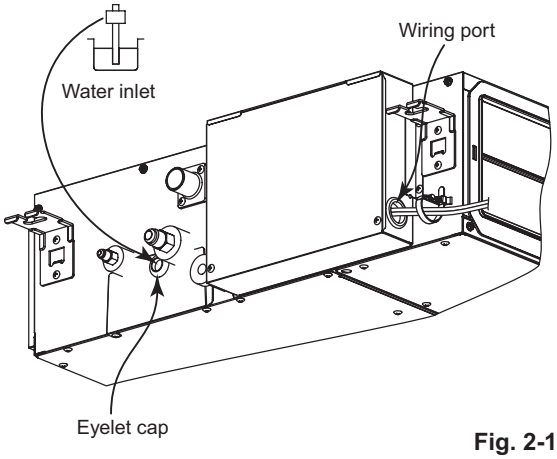



**Fig. 2-106**

⚠ **CAUTION**

**Be careful since the fan will start when you short the pin on the indoor control board.**

(4) When the check of drainage is complete, open the check pin (CHK) and remount the insulator and drain cap onto the drain inspection port.

# 4. Installation Instructions

## 4-13-30. Increasing the Fan Speed

### ■ For Short Circuit Connection

- The standard (before shipment) external static pressure is shown in the table below.
- When using with a higher static pressure, it is necessary to change to the high static pressure mode.

External static pressure

| Type | 22 | 28 | 36/45/56 |
|---|---|---|---|
| Standard (Pa) | 10 | 15 | 15 |
| High static pressure (Pa) | 30 | 30 | 40 |

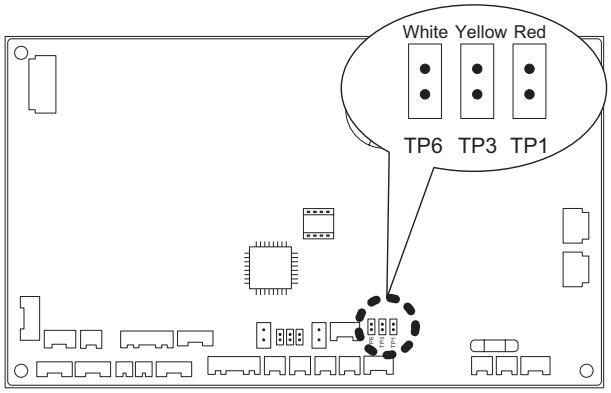
When using with high static pressure mode, set the indoor unit control board as shown in Fig. 2-107.

Follow the below procedure while the unit is turned off.

(1) Open the cover of the electrical box and confirm that it is the indoor unit control board.

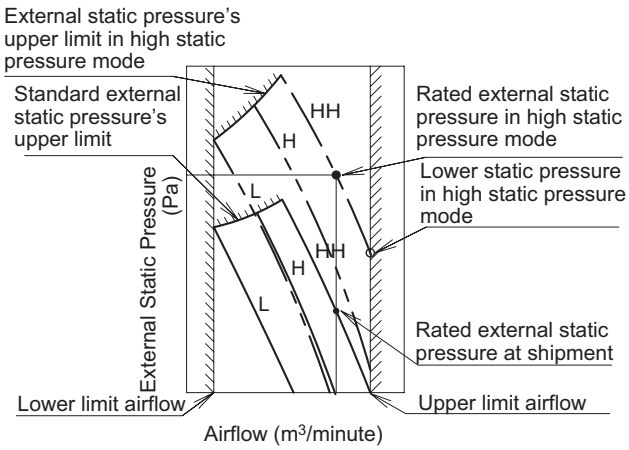
(2) Connect the short circuit connector to the short circuit pin TP3 (2P: Yellow) of the indoor unit control board.

- In case of wired remote control setting, do not use the short circuit connector.

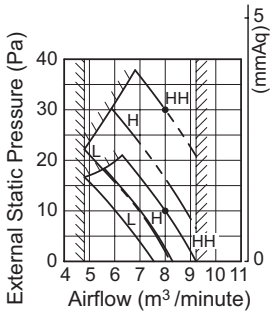



**Indoor control board**

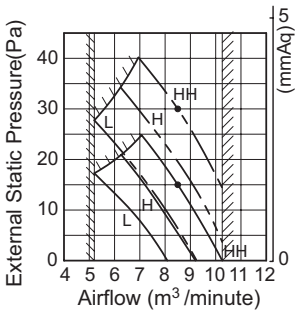
**Fig. 2-107**



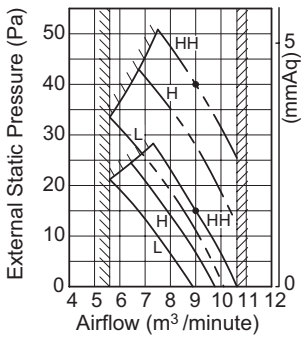

**S-22MM1E5**



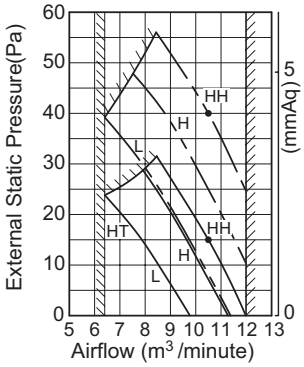

**S-28MM1E5**




**S-36MM1E5**




**S-45MM1E5**




**S-56MM1E5**

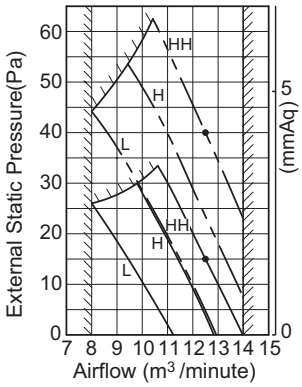



**Fig. 2-108**

# 4. Installation Instructions

## ● High Static Pressure Ducted Type (E1 Type)

### 4-13-31. Required Minimum Space for Installation and Service (73, 106, 140 Types)

- This air conditioner is usually installed above the ceiling so that the indoor unit and ducts are not visible. Only the air intake and air outlet ports are visible from below.
- The minimum space for installation and service is shown in Fig. 2-109.
- It is recommended that space be provided (600 × 600 mm) for checking and servicing the electrical system.
- Fig. 2-110 and Table 2-15 show the detailed dimensions of the indoor unit.



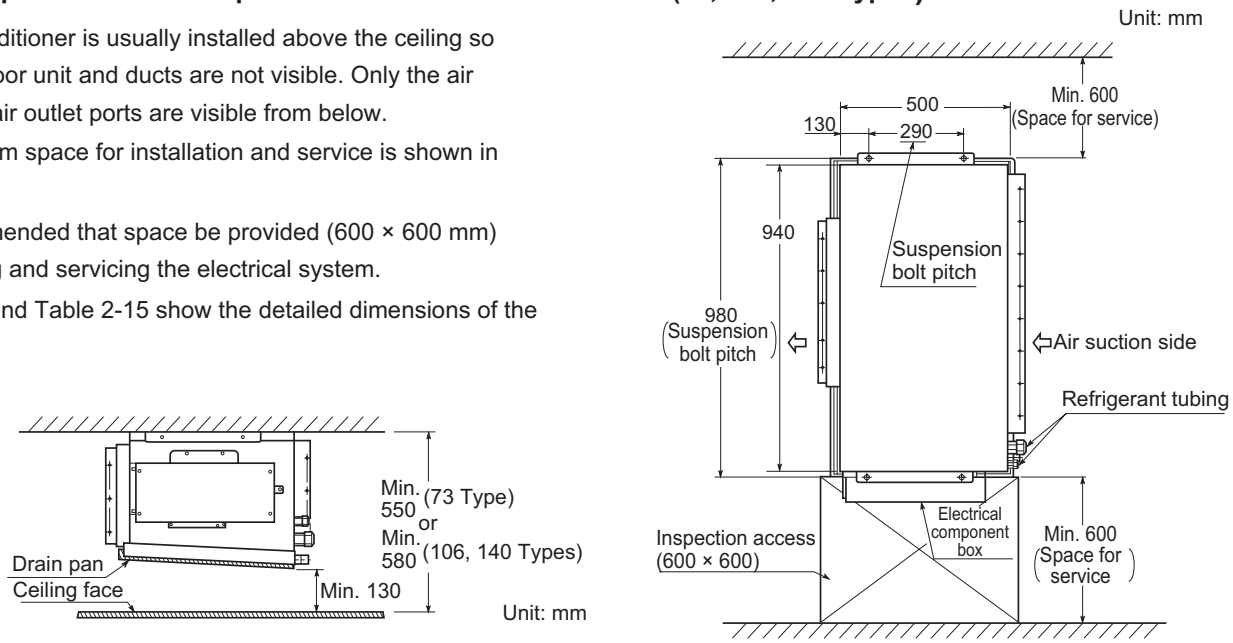



**Fig. 2-109**

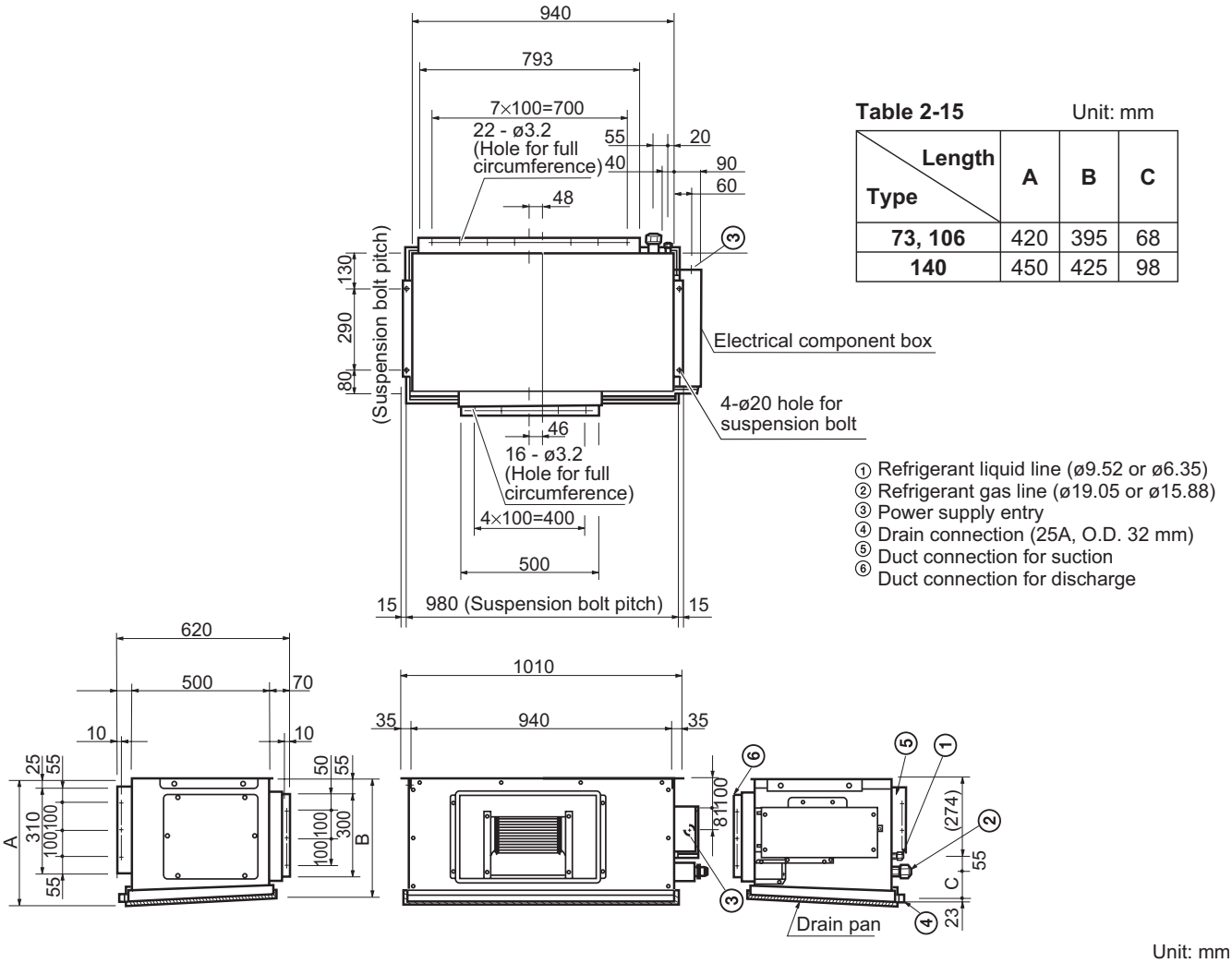



**Table 2-15** Unit: mm

| Type \ Length | A | B | C |
|---|---|---|---|
| **73, 106** | 420 | 395 | 68 |
| **140** | 450 | 425 | 98 |

① Refrigerant liquid line (ø9.52 or ø6.35)
② Refrigerant gas line (ø19.05 or ø15.88)
③ Power supply entry
④ Drain connection (25A, O.D. 32 mm)
⑤ Duct connection for suction
⑥ Duct connection for discharge

Unit: mm

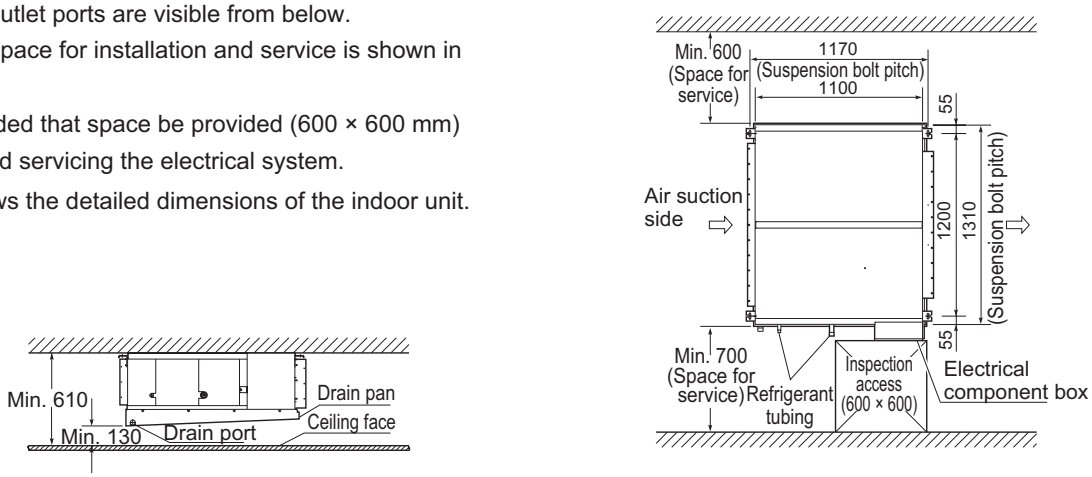
**Fig. 2-110**

# 4. Installation Instructions

### 4-13-32. Required Minimum Space for Installation andService (224, 280 Types)

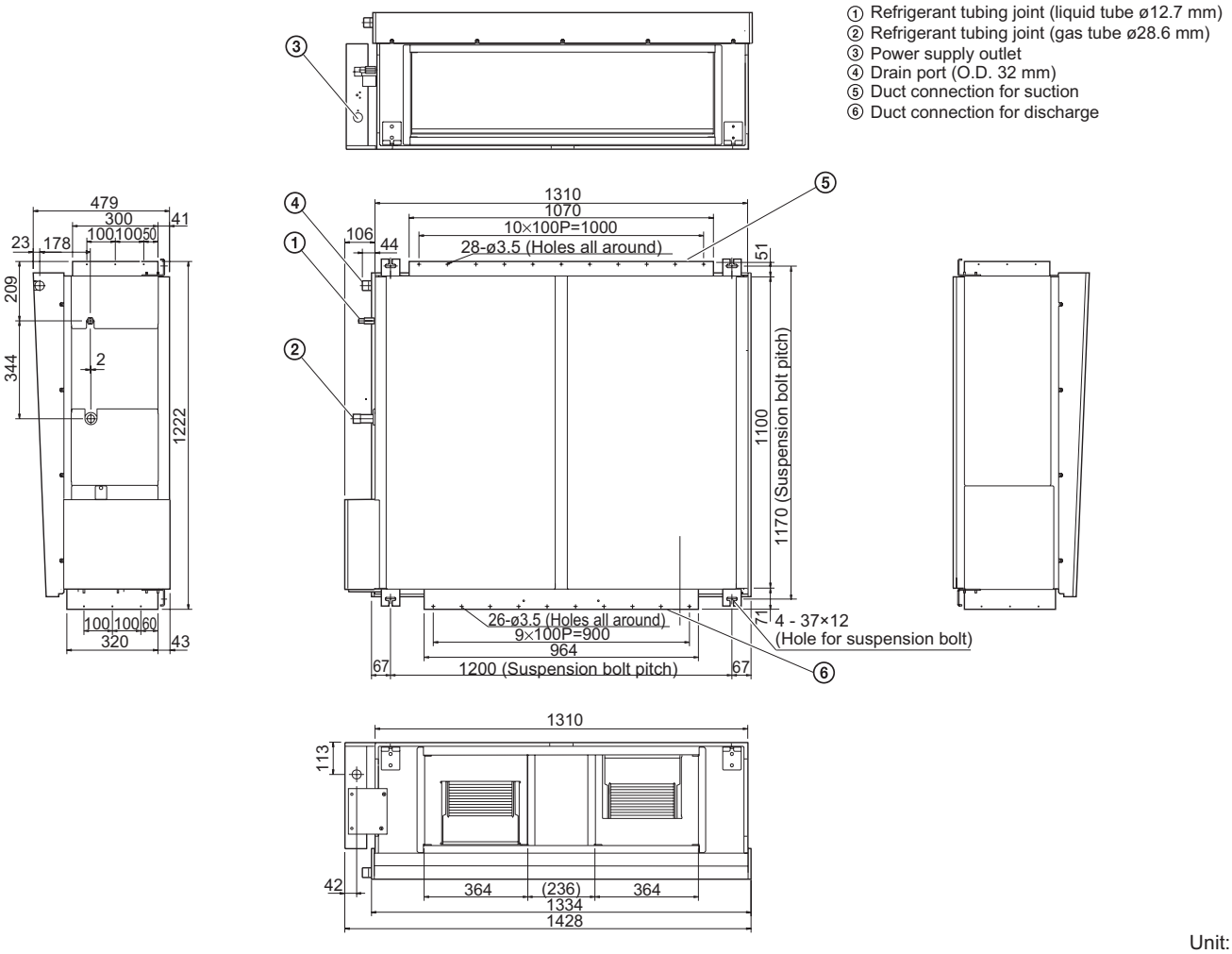
- This air conditioner is usually installed above the ceiling so that the indoor unit and ducts are not visible. Only the air intake and air outlet ports are visible from below.
- The minimum space for installation and service is shown in Fig. 2-111.
- It is recommended that space be provided (600 × 600 mm) for checking and servicing the electrical system.
- Fig. 2-112 shows the detailed dimensions of the indoor unit.

Unit: mm




Unit: mm

**Fig. 2-111**




Unit: mm

**Fig. 2-112**

### 4-13-33. Suspending the Indoor Unit

Depending on the ceiling type:

- Insert suspension bolts as shown in Fig. 2-113

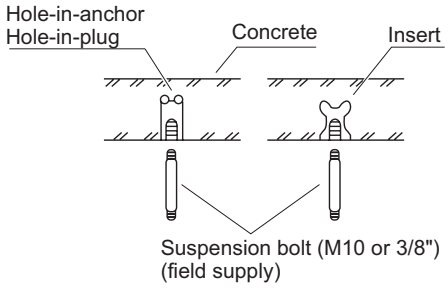



**Fig. 2-113**

or

- Use existing ceiling supports or construct a suitable support as shown in Fig. 2-114.

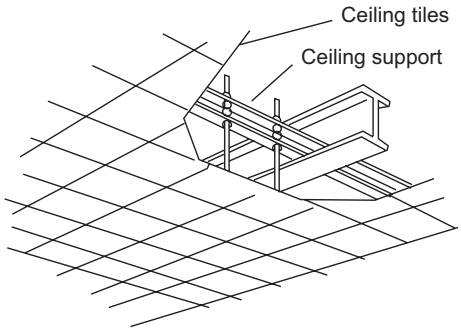



**Fig. 2-114**

**⚠ WARNING**

**It is important that you use extreme care in supporting the indoor unit inside the ceiling.**
**Ensure that the ceiling is strong enough to suport the weight of the unit. Before hanging the unit, test the strength of each attached suspension bolt.**

2

(1) When placing the unit inside the ceiling, determine the pitch of the suspension bolts referring to the dimensional data given previously. (Figs. 2-109 and 2-110)
Tubing must be laid and connected inside the ceiling when suspending the unit. If the ceiling is already constructed, lay the tubing into position for connection to the unit before placing the unit inside the ceiling.

(2) Screw in the suspension bolts allowing them to protrude from the ceiling as shown in Fig. 2-113. (Cut the ceiling material, if necessary.)

(3) Suspend and fix the indoor unit using the 2 hexagonal nuts (field supply) and special washers (supplied with the unit) as shown in Fig. 2-115.

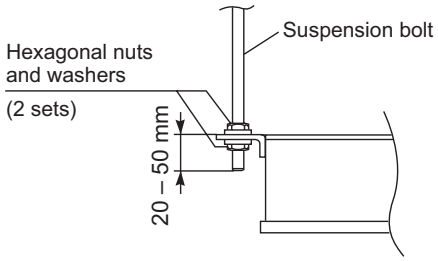
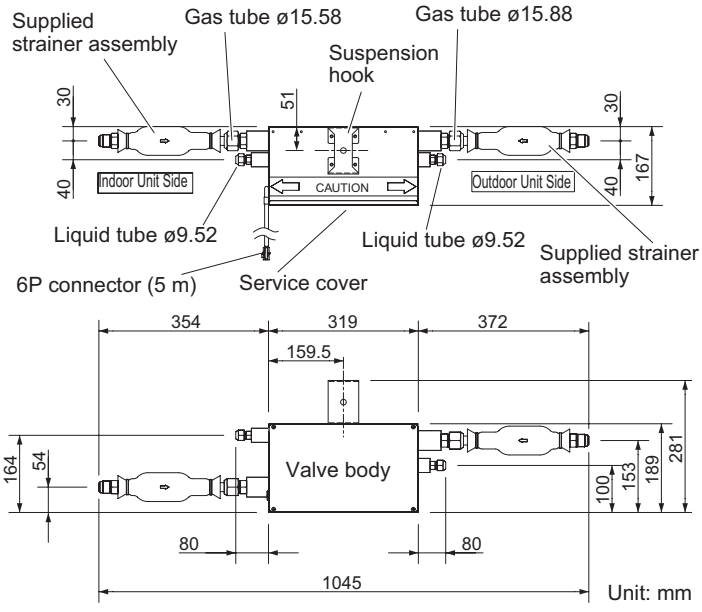



**Fig. 2-115**

### ■ RAP Valve Kit (Refrigenrant Accumulation Protector Valve Kit) (CZ-P160RVK2)

When installing a E1 type indoor unit (either the 8-hp 224 type or 10-hp 280 type), you must also install the RAP Valve Kit (CZ-P160RVK2).

- Connect 2 RAP valve kits in parallel for 224 or 280 type.
- Secure the RAP valve kit using suspension bolts, etc. within 30 meters from the indoor unit.
- Do not place the RAP valve kit directly on the ceiling.




**Note:** This figure shows the valve body with the suspension hook and strainer assemblies installed.

**Fig. 2-116**

# 4. Installation Instructions

### 4-13-34. Installing the Refrigerant Tubing

The size of the refrigerant tubing is as shown in the table below.

**Table 2-16**

| | 224 Type | 280 Type |
|---|---|---|
| Gas tube | ø19.05 (Brazing connection) | ø22.22 (Brazing connection) |
| Liquid tube | ø9.52 (Flare connection) | ø9.52 (Flare connection) |

- When brazing the gas tubing, cool the tubing with dampened shopcloths as you work, as shown in the figure below, to protect the unit's thermistor from the heat generated by brazing.
- Be sure to insulate both the gas tubing and liquid tubing. In addition, wrap the supplied insulation material around the tubing joints, and fasten in place with vinyl tape or other means. Failure to insulate the tubing may result in water leakage from condensation.
- Plug all gaps at tube through-holes in the unit with insulation or a similar substance to prevent air leakage.
- When connecting an embedded ceiling type unit (like this one) to a refrigerant system where individual operation is possible, install 2 RAP valve kits (CZ-P160RVK2) in parallel.
  (For details on connecting the RAP valve kit, refer to the manual that came with the kit.)

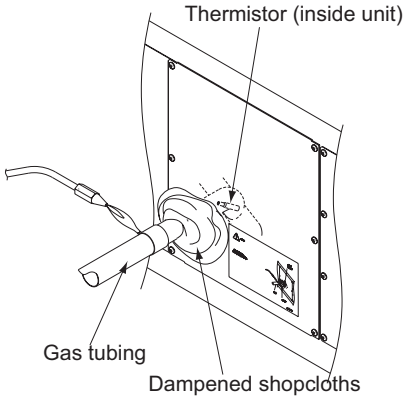



**Fig. 2-117**

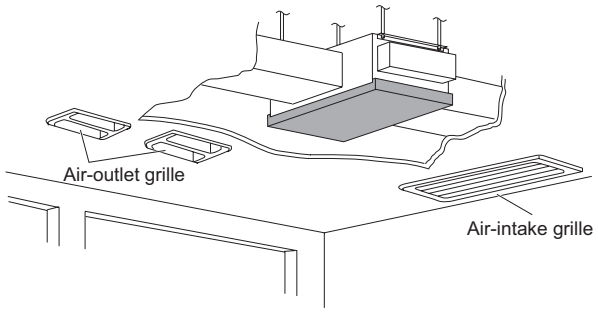



**Fig. 2-118**

### 4-13-35. Installing the Drain Piping

(1) Prepare standard hard PVC pipe (O.D. 32 mm) for the drain and use the supplied drain socket to prevent water leaks. The PVC pipe must be purchased separately. When doing this, apply adhesive for the PVC pipe at the connection point.

(2) If connecting a drain joint (supplied) to the threaded drain port, first wrap the drain port threads with sealing tape, then connect the joint. (Fig. 2-119)

(3) After connecting the drain pipe securely, wrap insulator (field supply) around the pipe.

(4) Ensure the drain pipe has a downward gradient (1/100 or more) and prepare traps as indicated in Fig. 2-120.

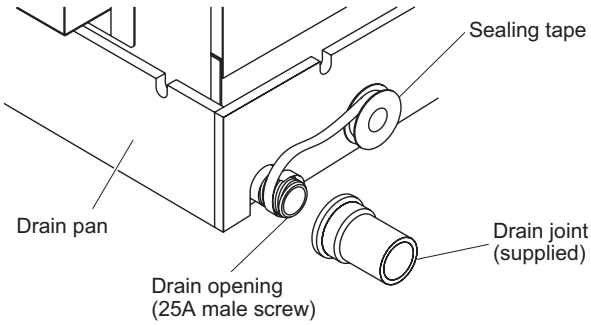



**Fig. 2-119**

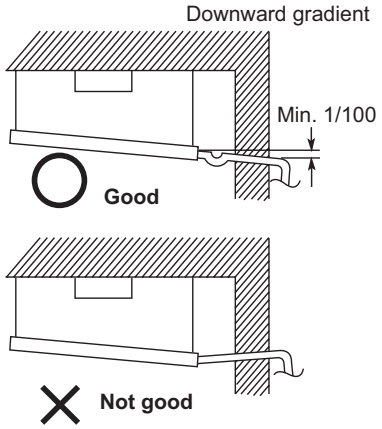



**Fig. 2-120**

# 4. Installation Instructions

(5) Also, in another part of the pipe arrangement, prepare traps with an inspection plug to clean dust or debris that may cause leaking of water. (Fig. 2-121)

(6) After connecting the drain piping, slowly pour water into the drain pan to check that the water drains smoothly.

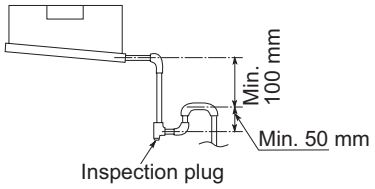



**Fig. 2-121**

### 4-13-36. Caution for Ducting Work

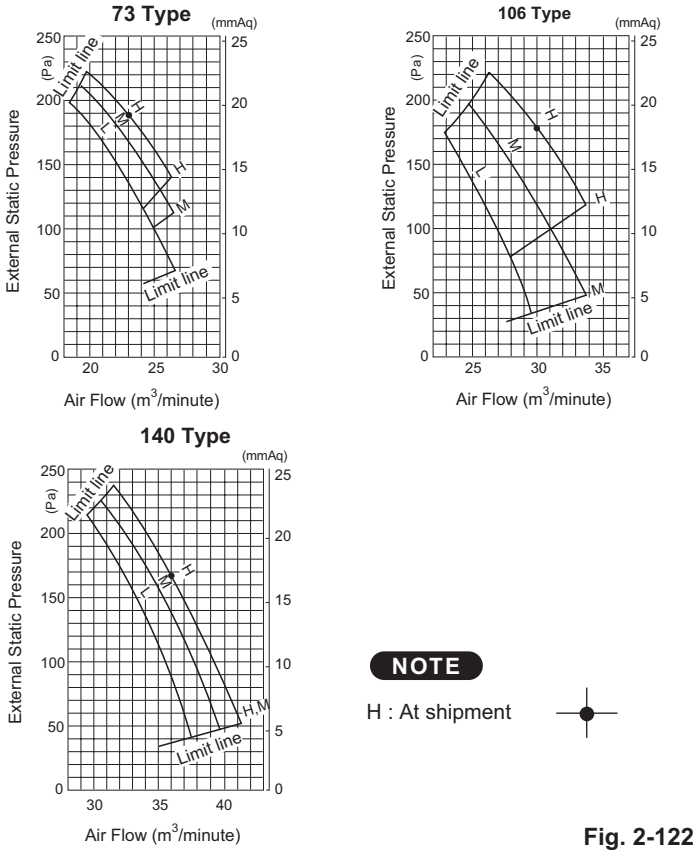
- This unit has high static pressure (applicable external static pressure Max. 167 to 216 Pa (17–22 mm Aq). In the case of small pressure resistance (for instance, a short duct), install a damper for adjusting air flow volume as air flow volume / air flow noise increases.
- If the air conditioner is to be installed in a room such as an office or meeting room which needs a low sound level, provide a supply and return noise absorption chamber with an acoustic liner.
- Include an air filter (field supply) at the return duct.

2

**Indoor Fan Performance**

**How to Read the Diagram**

The vertical axis is the External Static Pressure (Pa) while the horizontal axis represents the Air Flow ($m^3$/minute). The characteristic curve for the “H,” “Med,” and “Lo” fan speed control. The nameplate values are shown based on the “H” air flow. Therefore in the case of 73 Type, the flow is 23 $m^3$/minute, while the External Static Pressure is 190 Pa at “H” position. If the external static pressure is too great (due to long extension of duct, for example), the air flow volume may drop too low at each air outlet.




**NOTE**

H : At shipment

**Fig. 2-122**

### 4-13-37. Increasing the Fan Speed (280 Type Only)

If external static pressure is too great (due to long extension of ducts, for example), the air flow volume may drop too low at each air outlet. This problem may be solved by increasing the fan speed using the following procedure:

(1) Remove 4 screws on the electrical component box and remove the cover plate.

(2) Disconnect the fan motor sockets in the box.

(3) Take out 2 booster cables from option carton box (sockets at both ends).

(4) Securely connect the booster cable’s 2 sockets between the disconnected fan motor sockets in step 2 as shown in Fig. 2-123.

(5) Place the cable neatly in the box and reinstall the cover plate.

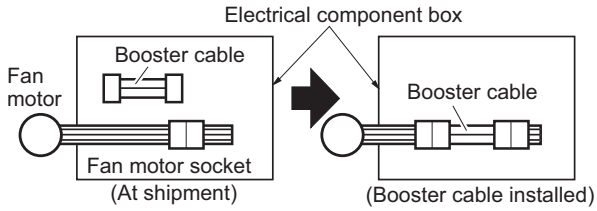
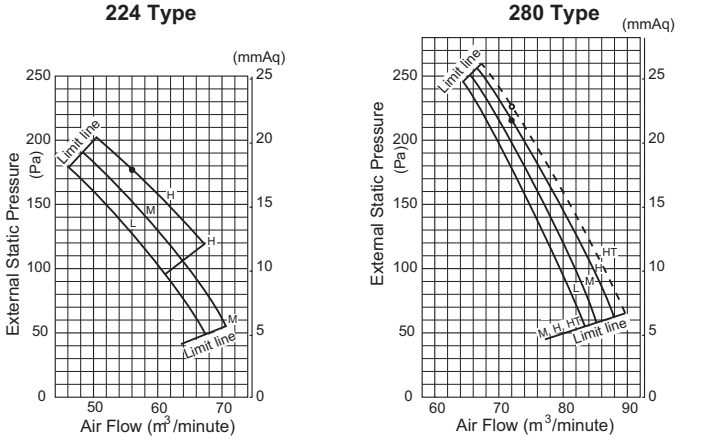



**Fig. 2-123**




**NOTE** HT : Using booster cable H : At shipment

**Fig. 2-124**

# 4. Installation Instructions



- **1-Way Cassette Type (D1 Type)**

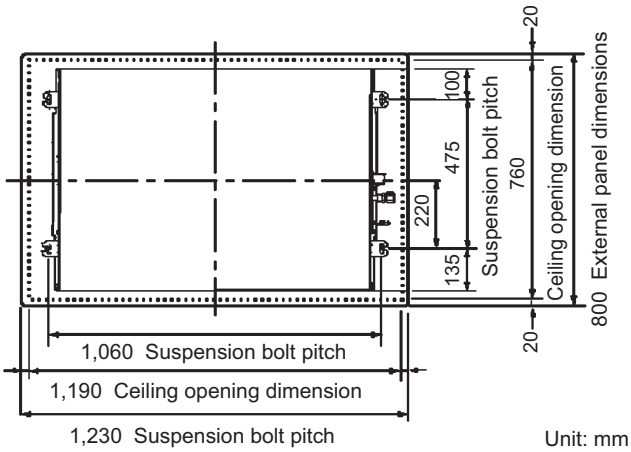
### 4-13-38. Preparation for Suspending

This unit uses a drain pump. Use a carpenter's level to check that the unit is level.

### 4-13-39. Suspending the Indoor Unit

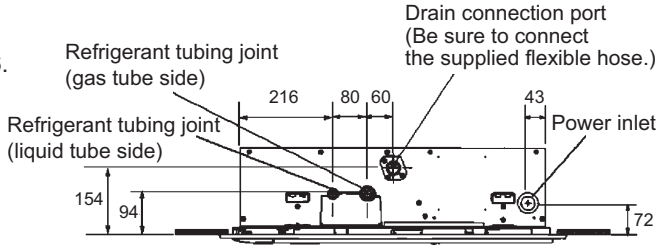
(1) The measurements of the ceiling hole and suspension bolt positions should be as shown in Fig. 2-125. The length of the suspension bolts should extend a minimum of 15 mm beyond the bottom of the unit suspension bracket. Refer to Fig. 2-130.

(2) Use the full-scale installation diagram (printed on the package) to determine the suspension bolt pitch. The positional relationships between the suspension brackets and the unit, and between the brackets and the ceiling panel, should be as shown in Figs. 2-125 & 2-126.




Unit: mm

**Fig. 2-125**




Unit: mm

**Fig. 2-126**

(3) Depending on the ceiling type:

- Insert suspension bolts as shown in Fig. 2-127

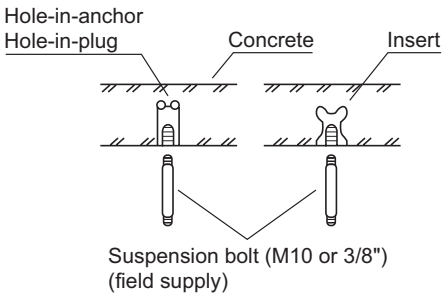



**Fig. 2-127**

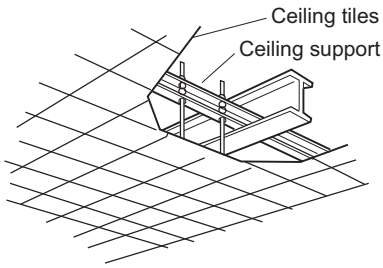



**Fig. 2-128**

or

- Use existing ceiling supports or construct a suitable support as shown in Fig. 2-128.

**⚠ WARNING**

**It is important that you use extreme care in supporting the indoor unit from the ceiling. Ensure that the ceiling is strong enough to support the weight of the unit. Before hanging the unit, test the strength of each attached suspension bolt.**

(4) Cut the ceiling material, if necessary. (Figs. 2-125 and 2-126)

(5) If the system requires fresh air to be drawn into the unit, cut and remove the insulation (both externally and internally) at the location shown as Ⓐ in Fig. 2-129.

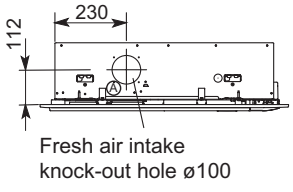



**Fig. 2-129**

# 4. Installation Instructions

## 4-13-40. Placing the Unit Inside the Ceiling

(1) When suspending the unit, attach gauges A and B (with packaging pad) to the indoor unit suspension brackets using the supplied M5 screws (2 for each bracket) to create the ceiling opening dimensions.

**⚠ CAUTION**

- **Tubing and wiring work will be necessary inside the ceiling after the unit has been suspended. Therefore, if the ceiling is already installed, perform tubing and wiring up to the connection position before suspending the unit.**

(2) Attach the special washers (supplied) and nuts (field supply) to the suspension bolts (4 locations).

**⚠ CAUTION**

- **Use 3/8" or M10 nuts.**
- **The length of the suspension bolts should be such that there is clearance of at least 15 mm below the bottom of the bracket, as shown in Fig. 2-131. If the suspension bolts are too long, they will contact the ceiling panel and louver motor cover, making installation impossible.**

(3) Thread the 3 hexagonal nuts and 2 washers (field supply) onto each of the the 4 suspension bolts as shown in Fig. 2-131. Use 1 nut and 1 washer for the upper side, and 2 nuts and 1 washer for the lower side, so that the unit will not fall off the suspension lugs.

(4) The indoor unit should be suspended from the suspension bolts (Fig. 2-131) so that the distance between the bottom of the suspension lug and the bottom surface of the ceiling is 17 to 22 mm. (Fig. 2-130) Clearance between the indoor unit and the bottom surface of the ceiling is adjustable after the ceiling panel is attached to the unit.
Use gauges A and B to adjust the height of the indoor unit as shown below.

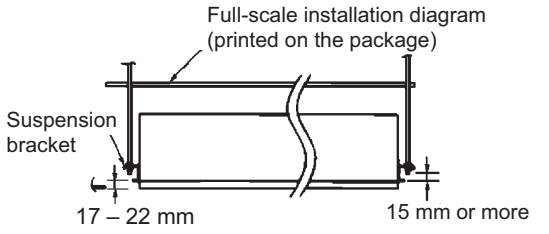



**Fig. 2-130**

**Supplied with the unit**

| | | | |
|---|---|---|---|
| Installation gauge (Use the packaging side pad.) |  | 1 | Gauge A (Install on tubing side.) |
| |  | 1 | Gauge B (Install on opposite side of tubing.) |

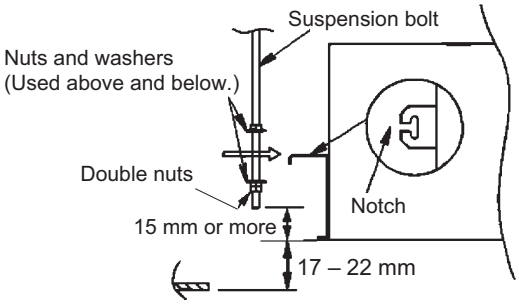



**Fig. 2-131**

(5) The unit should be adjusted using water level or as shown in Fig. 2-132 so that the drain pipe side is slanted 5 mm lower than the opposite side.

(6) After completing the adjustment of the clearance, fasten all upper and lower suspension nuts tightly.

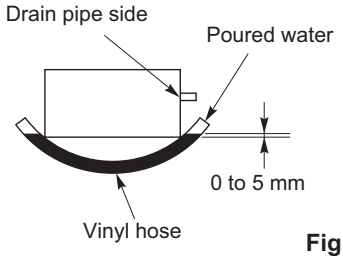



**Fig. 2-132**

# 4. Installation Instructions

### 4-13-41. Installing the Drain Piping

(1) Prepare standard hard PVC pipe (O.D. 32 mm) for the drain and use the supplied drain hose and hose band to prevent water leaks. The PVC pipe must be purchased separately. The unit's transparent drain port allows you to check drainage. (Fig. 2-133)

**⚠ CAUTION**

- Do not use adhesive at the drain connection port on the indoor unit.
- Insert the drain pipe until it contacts the socket, as shown in Fig. 2-133, then secure it tightly with the hose band.
- Tighten the hose clamps so their locking nuts face upward. (Fig. 2-133)
- Do not use the supplied drain hose bent at a 90° angle. (The maximum permissible bend is 45°.)

(2) After checking the drainage, wrap the supplied packing and drain pipe insulator around the pipe, then secure it with the clamps. (Fig. 2-134)

**NOTE**

- Make sure the drain pipe has a downward gradient (1/100 or more) and that there are no water traps.

**⚠ CAUTION**

Do not install an air bleeder as this may cause water to spray from the drain pipe outlet. (Fig. 2-135)

- If it is necessary to increase the height of the drain pipe, the pipe can be raised a maximum of 590 mm from the bottom of the ceiling. Do not raise it any higher than 590 mm, as this could result in water leaks. (Fig. 2-136)
- Do not install the pipe with an upward gradient from the connection port. This will cause the drain water to flow backward and leak when the unit is not operating. (Fig. 2-137)
- Do not apply force to the piping on the unit side when connecting the drain pipe. The pipe should not be allowed to hang unsupported from its connection to the unit. Fasten the pipe to a wall, frame, or other support as close to the unit as possible. (Fig. 2-138)
- Provide insulation for any pipes that are run indoors.

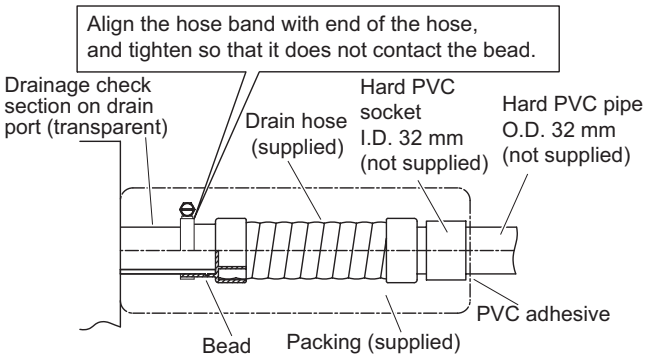



**Fig. 2-133**

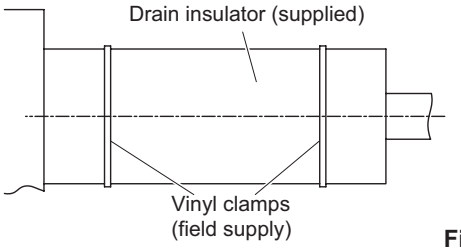



**Fig. 2-134**

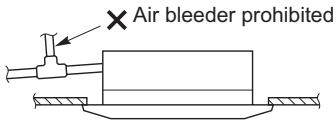



**Fig. 2-135**

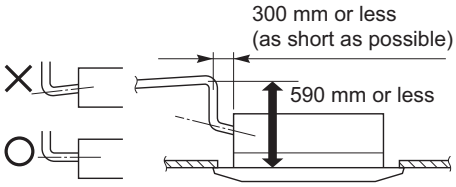



**Fig. 2-136**

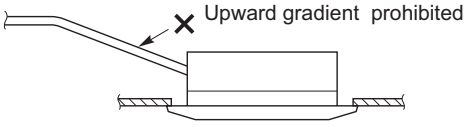



**Fig. 2-137**

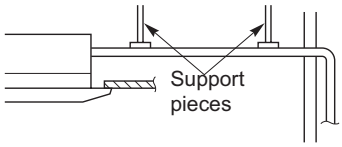



**Fig. 2-138**

# 4. Installation Instructions

### 4-13-42. Checking the Drainage

After wiring and drain piping are completed, use the following procedure to check that the water will drain smoothly.
For this, prepare a bucket and wiping cloth to catch and wipe up spilled water.

(1) Connect power to the power terminal board (R, S terminals) inside the electrical component box.
(2) Short the check pin (CHK) on the indoor control board and operate the drain pump.

**⚠ CAUTION**

**Be careful since the fan will start when you short the pin on the indoor control board.**

(3) Pour about 1,200 cc of water into the drain pan using a siphon pump through the air outlet grille. (Fig. 2-139) Check the water flow through the transparent drain pipe and see if there is any leakage.
(4) When the check of drainage is complete, open the check pin (CHK) and remount the insulator.

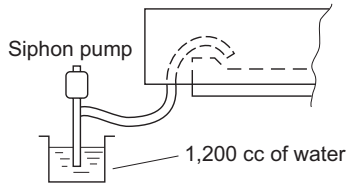



**Fig. 2-139**

**⚠ CAUTION**

**Use 4 × 8 tapping screws to fasten the drainage cover. If the screws used are longer than 8 mm, it may make a hole in the drain pan and cause leakage.**

2

### Removing the side panel

(1) Push the tab on both sides of the side panel inward (a) to disengage the tab (first stage) and move the panel horizontally (b).
(2) Push the area in the vicinity of the tab (second stage) inward while holding both sides of the side panel to remove the side panel.

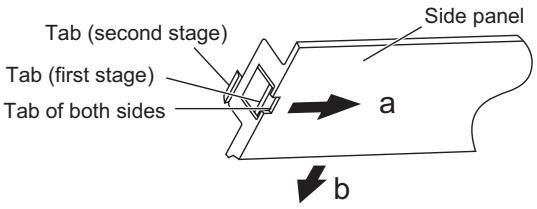



**Fig. 2-140**

- **2-Way Cassette Type (L1 Type)**

### 4-13-43. Preparation for Suspending

This unit uses a drain pump. Use a carpenter's level to check that the unit is level.

### 4-13-44. Suspending the Indoor Unit

(1) Follow the diagrams to make the holes in the ceiling.
(2) Depending on the ceiling type:

- Insert suspension bolts as shown in Fig. 2-141

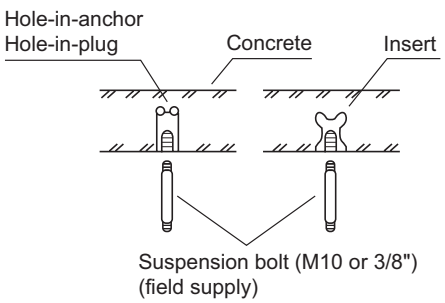



**Fig. 2-141**

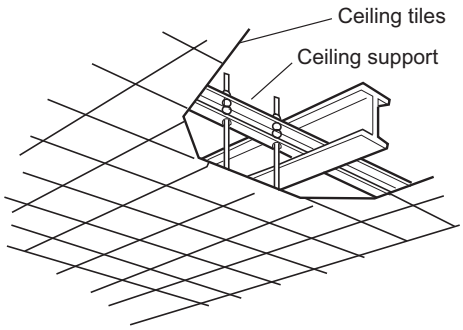



**Fig. 2-142**

or

- Use existing ceiling supports or construct a suitable support as shown in Fig. 2-142.

**⚠ WARNING**

**It is important that you use extreme care in supporting the indoor unit from the ceiling. Ensure that the ceiling is strong enough to support the weight of the unit. Before hanging the unit, test the strength of each attached suspension bolt.**

# 4. Installation Instructions

(3) Cut the ceiling material, if necessary.
(Refer to Figs. 2-143 and 2-144, and Table 2-17.)

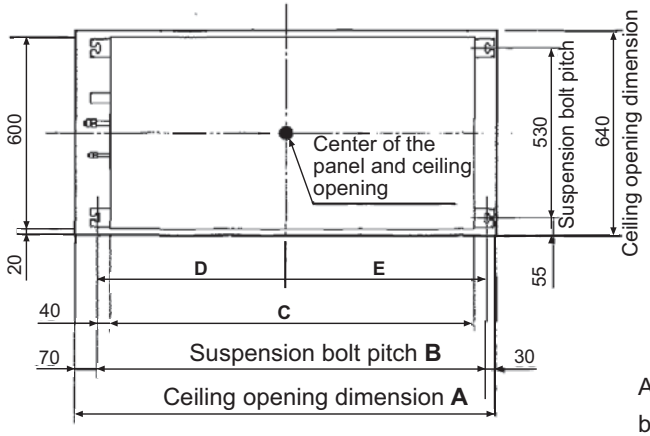
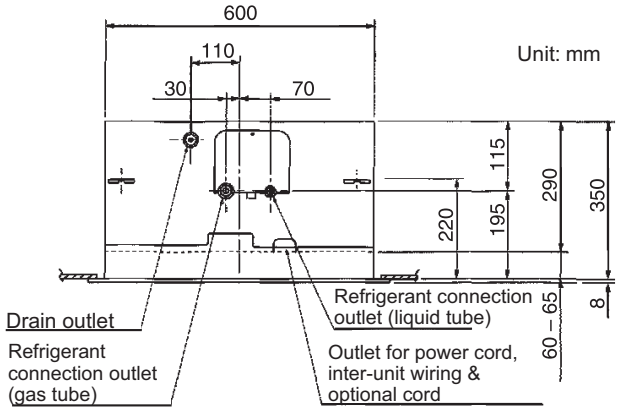



**Fig. 2-143**




Adjust so that the distance between the indoor unit and the bottom surface of the ceiling is 60 to 65 mm.

**Fig. 2-144**

**Table 2-17** Unit: mm

| | A | B | C | D | E |
|---|---|---|---|---|---|
| **22, 28, 36, 45, 56** | 1,020 | 920 | 840 | 440 | 480 |
| **73** | 1,320 | 1,220 | 1,140 | 550 | 590 |

(4) If the system requires fresh air to be drawn into the unit, cut and remove the insulation (both externally and internally) at the location shown as Ⓐ in Fig. 2-145.

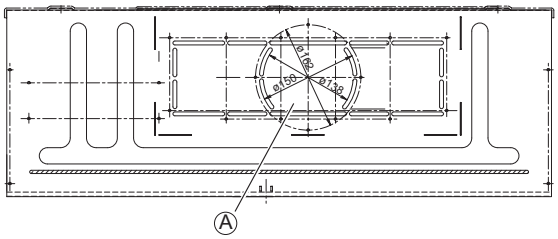



**Fig. 2-145**

**⚠ CAUTION**

**When making the cuts to the insulation, be careful not to damage the drain pan.**

### 4-13-45. Placing the Unit Inside the Ceiling

(1) When placing the unit inside the ceiling, determine the pitch of the suspension bolts.
Tubing must be laid and connected inside the ceiling when suspending the unit. If the ceiling is already constructed, lay the tubing into position for connection to the unit before placing the unit inside the ceiling.

(2) Thread the 3 hexagonal nuts and 2 washers (field supply) onto each of the the 4 suspension bolts as shown in Fig. 2-147. Use 1 nut and 1 washer for the upper side, and 2 nuts and 1 washer for the lower side, so that the unit will not fall off the suspension lugs.

(3) The distance between the unit and the opening in the ceiling and the distance between the bottom surface of the ceiling and the bottom surface of the flange of the unit should follow the dimensions given in Fig. 2-146. Use the supplied installation gauge to check.

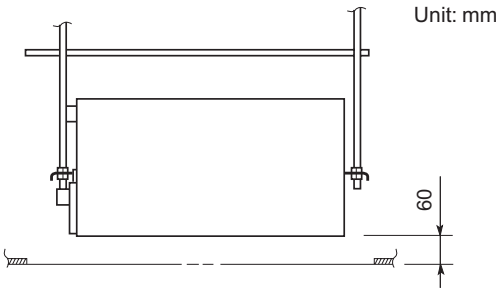



**Fig. 2-146**

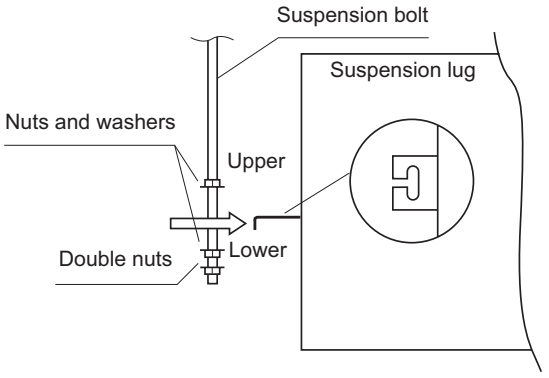



**Fig. 2-147**

### 4-13-46. Installing the Drain Piping

(1) Prepare a standard hard PVC pipe (O.D. 32 mm) for the drain and use the supplied drain hose and hose band to prevent water leaks. The PVC pipe must be purchased separately.
When doing this, leave a gap between the drain socket and the PVC pipe to allow the drainage to be checked.
The unit's transparent drain port allows you to check the drainage. (Fig. 2-148)

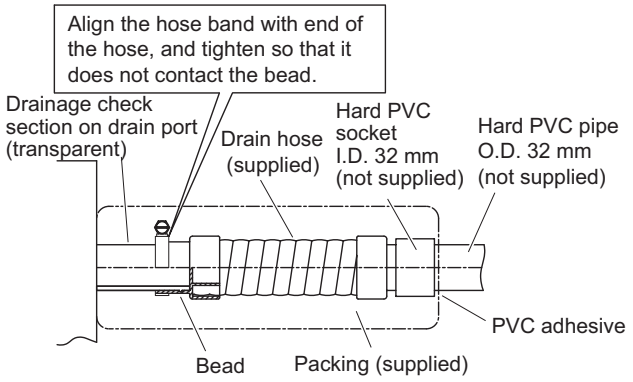



**Fig. 2-148**

**⚠ CAUTION**

- Do not use adhesive at the drain connection port on the indoor unit.
- Insert the drain pipe until it contacts the socket, as shown in Fig. 2-148, then secure it tightly with the hose band.
- Tighten the hose clamps so their locking nuts face upward. (Fig. 2-148)
- Do not use the supplied drain hose bent at a 90° angle. (The maximum permissible bend is 45°.)

(2) After checking the drainage, wrap the supplied packing and drain pipe insulator around the pipe, then secure it with the supplied clamps. (Fig. 2-149)

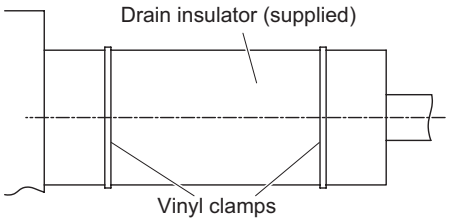



**Fig. 2-149**

**NOTE**

Make sure the drain pipe has a downward gradient (1/100 or more) and that there are no water traps.

**⚠ CAUTION**

- **Do not install an air bleeder as this may cause water to spray from the drain pipe outlet. (Fig. 2-150)**
- **If it is necessary to increase the height of the drain pipe, the section directly after the connection port can be raised a maximum of 500 mm. Do not raise it any higher than 500 mm, as this could result in water leaks. (Fig. 2-151)**
- **Do not install the pipe with an upward gradient from the connection port. This will cause the drain water to flow backward and leak when the unit is not operating. (Fig. 2-152)**
- **Do not apply force to the piping on the unit side when connecting the drain pipe. The pipe should not be allowed to hang unsupported from its connection to the unit. Fasten the pipe to a wall, frame, or other support as close to the unit as possible. (Fig. 2-153)**
- **Provide insulation for any pipes that are run indoors.**

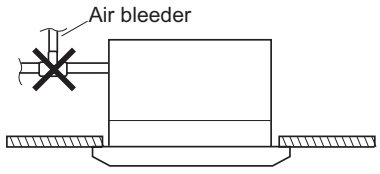



**Fig. 2-150**

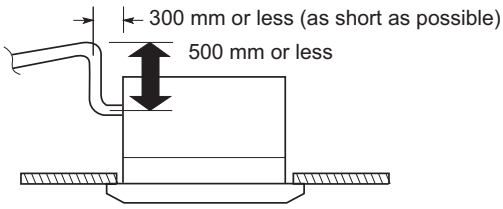



**Fig. 2-151**

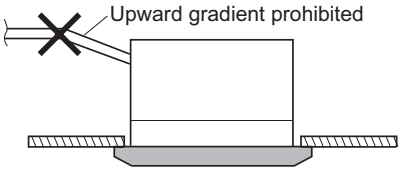



**Fig. 2-152**

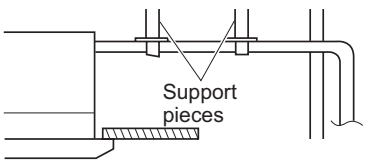



**Fig. 2-153**

# 4. Installation Instructions

### 4-13-47. Checking the Drainage

After wiring and drain piping are completed, use the following procedure to check that the water will drain smoothly. For this, prepare a bucket and wiping cloth to catch and wipe up spilled water.

(1) Connect power to the power terminal board (R, S terminals) inside the electrical component box.

(2) Remove the tube cover and through the opening, slowly pour about 1,200 cc of water into the drain pan to check the drainage.

(3) Short the check pin (CHK) on the indoor control board and operate the drain pump. Check the water flow through the transparent drain port and see if there is any leakage.

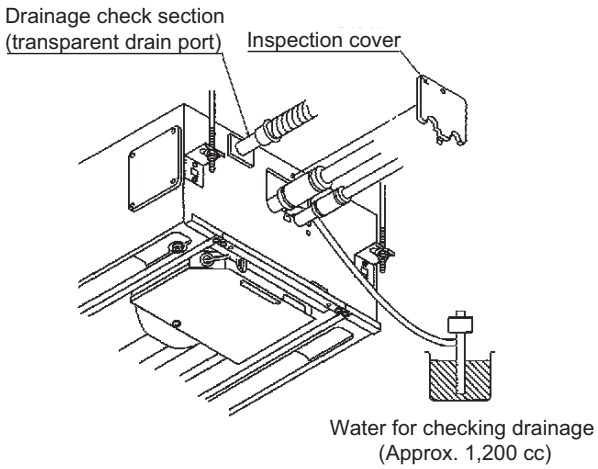



**Fig. 2-154**

**⚠ CAUTION**

**Be careful since the fan will start when you short the pin on the indoor control board.**

(4) When the check of drainage is complete, open the check pin (CHK) and remount the tube cover. (Fig. 2-154)

**⚠ CAUTION**

**To mount the tube cover, use 4 × 8 tapping screws.(Fig. 2-154) Do not use long screws as they may puncture the drain pan and cause water leakage.**

2

## ● Wall Mounted Type (K1 Type) 22, 28, 36 types

### 4-13-48. Remove the Rear Panel from the Unit

(1) Remove and discard the set screw on the rear panel. (Fig. 2-155)

(2) Press the 2 △ marks on the frame cover and disengage the stationary tabs from the frame. (Fig. 2-156)

(3) Remove the rear panel.

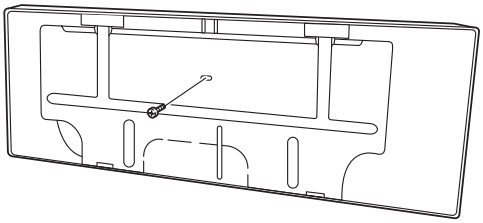



**Fig. 2-155**

**NOTE**

Tubing can be extended in 5 directions as shown in Fig. 2-157. Select the direction you need providing the shortest run to the outside unit.

- When left tubing is to be done, switch the drain hose and drain cap. (For details, refer to “Switching drain hose and drain cap”.)

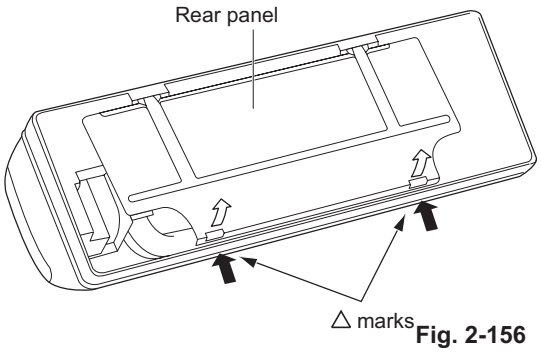



**Fig. 2-156**

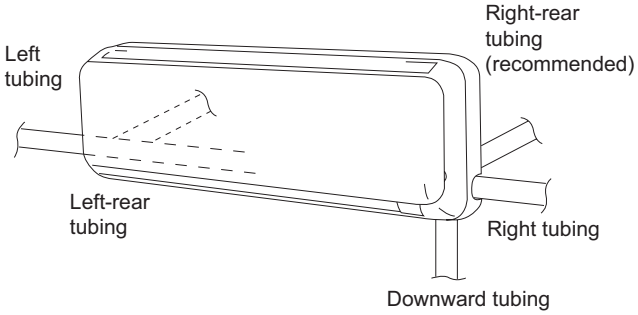



**Fig. 2-157**

# 4. Installation Instructions

### 4-13-49. Make a Hole

(1) Place the rear panel from the indoor unit on the wall at the location selected. Make sure the panel is horizontal, using a carpenter's level or tape measure to measure down from the ceiling. Wait until after cutting the hole before attaching the rear panel to the wall.

(2) Determine which side of the unit you should make the hole for tubing and wiring. (Fig. 2-158)

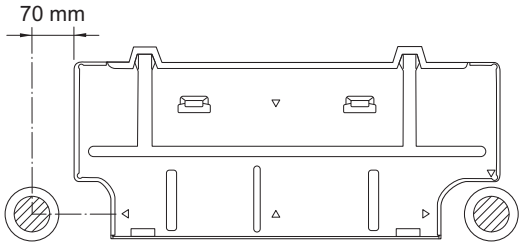



**Fig. 2-158**

**NOTE**

In the case of left-rear tubing, use the measurement points from the edge of the rear panel for precise placement of the hose outlet. (Fig. 2-158)

(3) Before making the hole, check carefully that no studs or pipes are directly run behind the spot to be cut.

**⚠ CAUTION**

**Also avoid areas where electrical wiring or conduits are located.**

The above precautions are also applicable if tubing goes through the wall in any other location.

(4) Using a sabre saw, key hole saw or hole-cutting drill attachment, cut a hole in the wall. (Fig. 2-159)

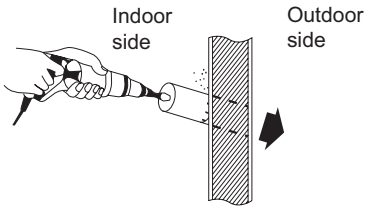



**Fig. 2-159**

**NOTE**

Hole should be made at a slight downward slant to the outdoor side.

**Table 2-18**

| Hole Dia. (mm) |
|---|
| **S-22MK1E5 / S-28MK1E5 / S-36MK1E5** |
| 65 |

(5) Measure the thickness of the wall from the inside edge to the outside edge and cut PVC pipe at a slight angle 6 mm shorter than the thickness of the wall. (Fig. 2-160)

(6) Place the plastic cover over the end of the pipe (for indoor side only) and insert the pipe in the wall. (Fig. 2-161)

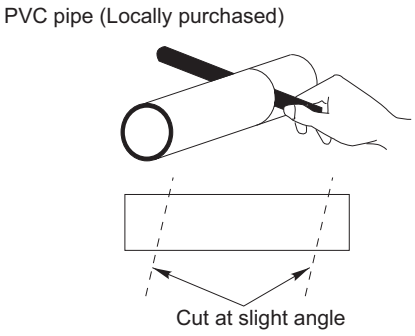



**Fig. 2-160**

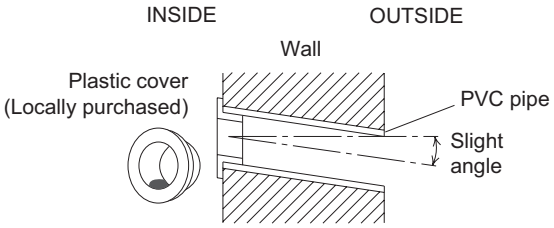



**Fig. 2-161**

# 4. Installation Instructions

### 4-13-50. Install the Rear Panel on the Wall

Be sure to confirm that the wall is strong enough to suspend the unit.

**NOTE**

Be sure to install the unit within the range of the wall.

**If Wooden Wall**

(1) Attach the rear panel to the wall with the 8 screws provided. (Fig. 2-162)

If you are not able to line up the holes in the rear panel with the beam locations marked on the wall, use rawl plugs or toggle bolts to go through the holes on the panel or drill 5 mm dia. holes in the panel over the stud locations and then mount the rear panel.

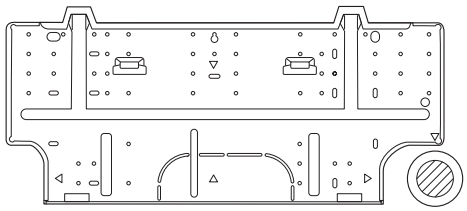


**Fig. 2-162**

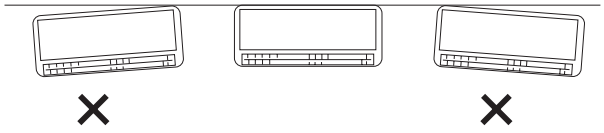


**Fig. 2-163**

(2) Double check with a carpenter's level or tape measure that the panel is level. This is important to install the unit properly. (Fig. 2-163)

(3) Make sure the panel is flush against the wall. Any space between the wall and unit will cause noise and vibration.

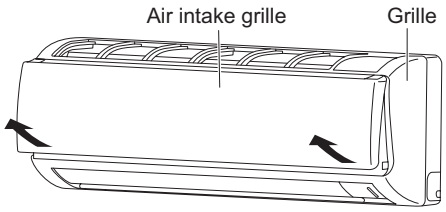



**Fig. 2-164**

### 4-13-51. Remove the Grille to Install the Indoor Unit

Basically, these models can be installed and wired without removing the grille. If access to any internal part is needed, follow the steps as given below.

**How to remove the grille**

(1) Grasp both ends of the air intake grille, and remove it by opening towards the front and pulling towards you. (Fig. 2-164)

(2) Remove the 2 screws. (Fig. 2-165)

(3) Press the 3 tabs at the top of the grille and the 3 tabs on the front face to separate the grille from the frame. (Fig. 2-166)

(4) Pull the grille toward you to remove it.

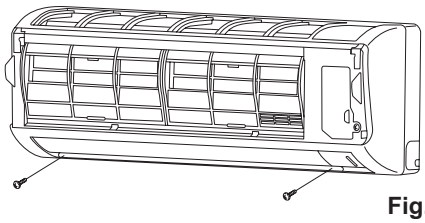


**Fig. 2-165**

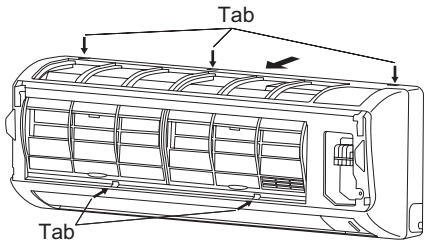



**Fig. 2-166**

**How to replace the grille**

(1) When installing the grille, place the bottom of the grille into the frame first. (Fig. 2-167)
Then insert the tabs on the top of the grille and on the front face into the frame.

(2) Make sure that the grille and frame are firmly fitted together by engaging the tabs.

(3) Affix the grille with the 2 previously removed screws. (Fig. 2-165)

(4) Install the air intake grille.
   (a) Allow the edge of the air intake grille to slide into the top of the indoor unit, and then insert it all the way inside. (Fig. 2-168)

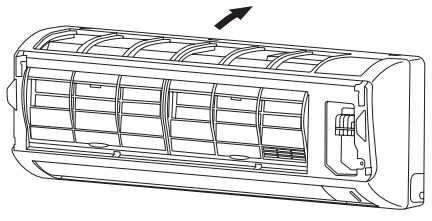


**Fig. 2-167**

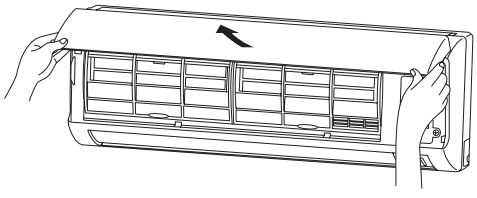


**Fig. 2-168**

(b) Press the bottom right and left corners and center of the air intake grille to attach it to the indoor unit. (Fig. 2-169)

**NOTE**

Attach so that the round pins at the top right and left corners of the air intake grille are inserted into the grooves at the top right and left of the indoor unit.

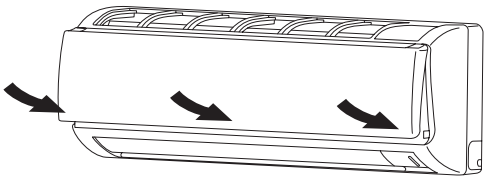


**Fig. 2-169**

### 4-13-52. Shape the Indoor Side Tubing

(1) Arrangement of tubing by directions

a) Right or left tubing
Cut out the corner of the right/left frame with a hacksaw or the like. (Figs. 2-170 and 2-171)

b) Right-rear or left-rear tubing
In this case, the corner of the frame need not be cut.

(2) To mount the indoor unit on the rear panel:
Hang the 2 mounting slots of the unit on the upper tabs of the rear panel. (Fig. 2-172)

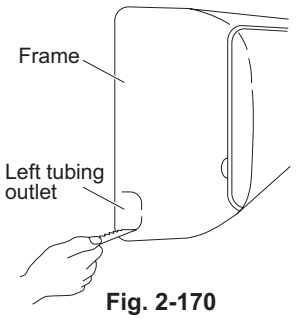



**Fig. 2-170**

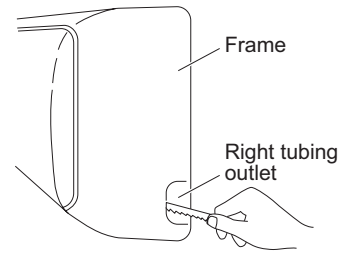



**Fig. 2-171**

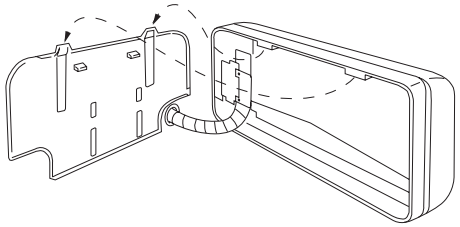


**Fig. 2-172**

### 4-13-53. Wiring Instructions

**General precautions on wiring**

(1) Before wiring, confirm the rated voltage of the unit as shown on its nameplate, then carry out the wiring closely following the wiring diagram.

(2) Provide a power outlet to be used exclusively for each unit, with a power supply disconnect and circuit breaker for overcurrent protection provided in the exclusive line.

(3) To prevent possible hazard due to insulation failure, the unit must be grounded.

(4) Each wiring connection must be done tightly and in accordance with the wiring system diagram. Wrong wiring may cause the unit to misoperate or become damaged.

(5) Do not allow wiring to touch the refrigerant tubing, compressor, or any moving parts of the fan.

(6) Unauthorized changes in the internal wiring can be very dangerous. The manufacturer will accept no responsibility for any damage or misoperation that occurs as a result of such unauthorized changes.

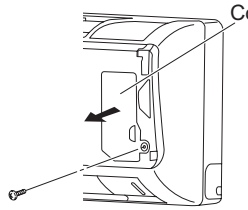



**Fig. 2-173**

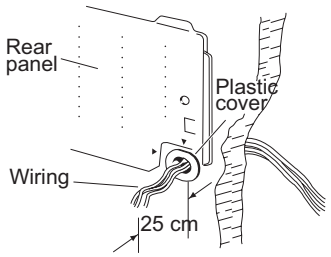



**Fig. 2-174**

### 4-13-54. Wiring Instructions for Inter-unit Connections

(1) Grasp both ends of the air intake grille, and remove it by opening toward the front and pulling it toward you.

(2) Remove the screw on the right side cover plate and open the cover. (Fig. 2-173)

(3) Insert the inter-unit wiring into the through-the-wall PVC pipe. Lead the power wiring into the room allowing approx. 25 cm to extend from the wall face. (Fig. 2-174)

(4) Route the inter-unit wiring from the back of the indoor unit and pull it toward the front for connection. (Fig. 2-175)

(5) Connect the inter-unit wiring to the corresponding terminals on the terminal plate (Fig. 2-175) while referring to the wiring diagram.

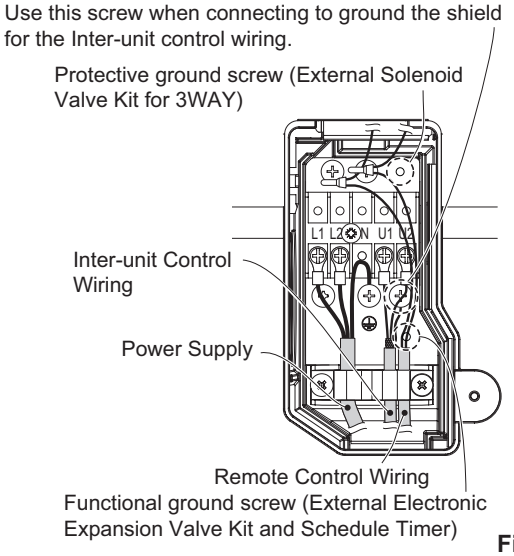



**Fig. 2-175**

# 4. Installation Instructions

(6) Be sure to secure the wiring with the provided clamp.

**NOTE**

When closing the air intake grille, press the bottom right and left corners and center. (Fig. 2-176)

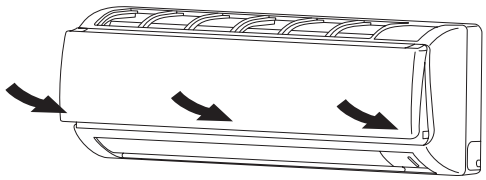


**Fig. 2-176**

Please refer to “How to replace the grille” for installing the air intake grille.

**WARNING**

**Loose wiring may cause the terminal to overheat or result in unit malfunction. A fire hazard may also exist. Therefore, be sure all wiring is tightly connected.**

When connecting each power wire to the corresponding terminal, follow the instructions “How to connect wiring to the terminal” and fasten the wire securely tight with the fixing screw of the terminal plate.

**How to connect wiring to the terminal**

**a) For Indoor Unit**

(1) Cut the wire end with a cutting pliers, then strip the insulation to expose the wire about 8 mm. See the label (Fig. 2-177) near the terminal plate.

(2) Using a screwdriver, loosen the terminal screw on the terminal plate.

(3) Insert the wire and tighten the terminal screw completely using a screwdriver.

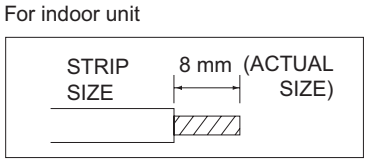



**Fig. 2-177**

**b) For Outdoor Unit**

**■ For solid core wiring (or F-cable)**

(1) Cut the wire end with a cutting pliers, then strip the insulation to expose the solid wire about 25 mm. (Fig. 2-178)

(2) Using a screwdriver, remove the terminal screw(s) on the terminal plate.

(3) Using the pliers, bend the solid wire to form a loop suitable for the terminal screw.

(4) Shape the loop wire properly, place it on the terminal plate and fix it securely with the removed terminal screw using a screwdriver.

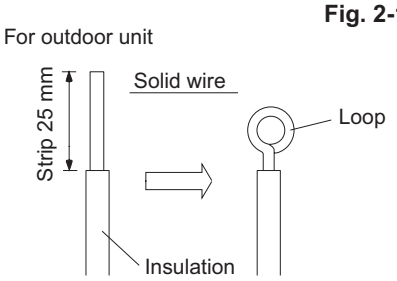



**Fig. 2-178**

**■ For stranded wiring**

(1) Cut the wire end with a cutting pliers, then strip the insulation to expose the stranded wiring about 10 mm and tightly twist the wire ends. (Figs. 2-179 and 2-180)

(2) Using a screwdriver, remove the terminal screw(s) on the terminal plate.

(3) Using a ring connector fastener or pliers, securely clamp each stripped wire end with a ring connector. (Fig. 2-179)

(4) Place the ring connector wire, and replace and tighten the removed terminal screw using a screwdriver. (Fig. 2-181)

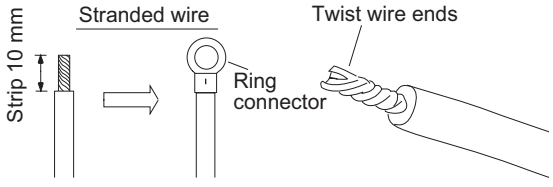



**Fig. 2-179** **Fig. 2-180**

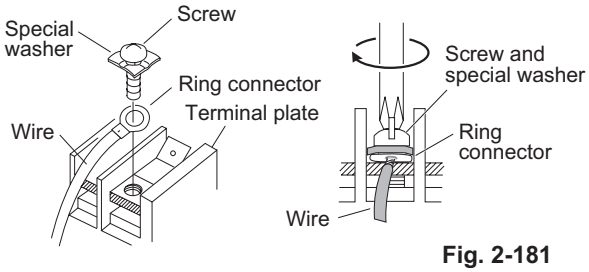



**Fig. 2-181**

### 4-13-55. Mounting

(1) To install the indoor unit, mount the indoor unit onto the 2 tabs on the upper part of the rear plate.

(2) Hold down the air discharge outlet and press the lower part of the indoor unit until it clicks to securely fasten to the 2 tabs on the lower part of the rear plate. (Fig. 2-182)

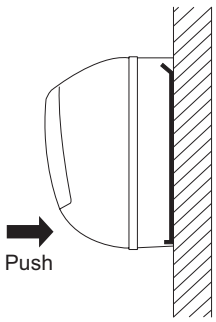



**Fig. 2-182**

# 4. Installation Instructions

**NOTE**

For tubing, choose either the right or left tubing direction and follow the steps below. This work can be made easier by placing padding material (such as styrofoam) at the rear right side of the indoor unit. (Fig. 2-183)

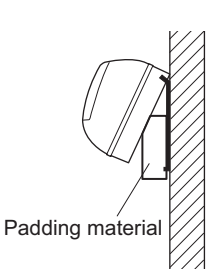



**Fig. 2-183**

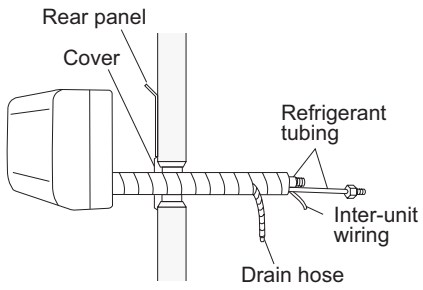



**Fig. 2-184**

### ■ Right-side tubing

(1) Shape the refrigerant tubing so that it can easily go into the wall hole. (Fig. 2-184)

(2) Push the wiring, refrigerant tubing, and drain hose through the hole in the wall. Adjust the indoor unit so it is securely seated on the rear panel. (Fig. 2-185)

(3) Carefully bend the tubing (if necessary) to run along the wall in the direction of the outdoor unit and then tape as far as the fittings. The drain hose should come straight down the wall to a point where water runoff won't stain the wall.

(4) Connect the refrigerant tubing to the outdoor unit. (After performing a leak test on the connecting part, insulate it with the tubing insulation.) (Fig. 2-186)

(5) Assemble the refrigerant tubing, drain hose, and inter-unit wiring as shown in Fig. 2-186.

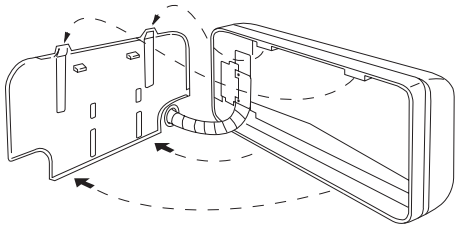


**Fig. 2-185**

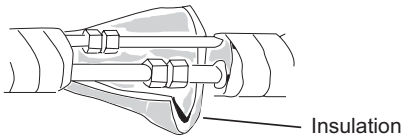



**Fig. 2-186**

### ■ Left-side tubing

(1) Lead the tubing and drain hose through the wall, allowing sufficient length for connection. Then bend the tubing using a tube bender to make the attachment. (Fig. 2-187)

(2) Switch the drain hose and drain cap.

**Switching drain hose and drain cap**

(a) Locate the drain hose and the drain cap. (Fig. 2-188)

(b) Remove the screws fastening the drain hose on the right side, and pull out the drain hose to remove it. (Fig. 2-188)

(c) Apply moderate force to pull off the drain cap on the left side. (If you cannot pull it off by hand, use a long-nose pliers.)

(d) Reattach the drain hose to the left side and the drain cap to the right side. (Fig. 2-189)

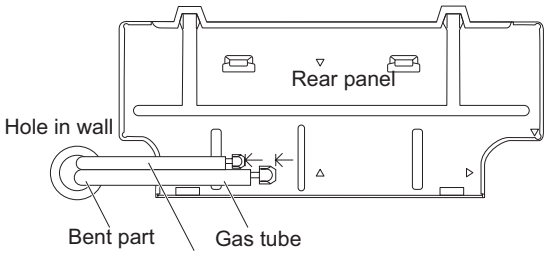



**Fig. 2-187**

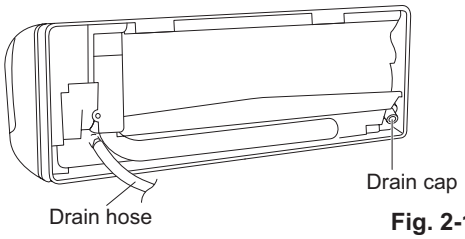



**Fig. 2-188**

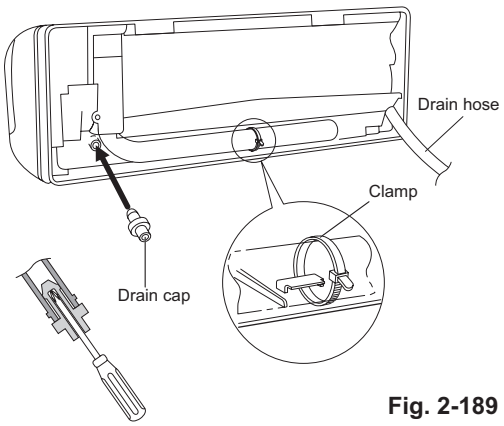



**Fig. 2-189**

# 4. Installation Instructions

**Drain hose**

Slide the drain hose fully onto the drain pan outlet until the drain hose edge is pushed into the insulation. Check that the screw holes in the drain bracket and the drain pan outlet are aligned and securely in contact, then fasten them with the screw. (After attaching the drain hose, check that it is attached securely.) (Fig. 2-190)

**Drain cap**

Use a Phillips screwdriver to push the drain cap in firmly. (If it is difficult to push in, wet the cap with water first.)

(3) Install the indoor unit on the rear panel.

(4) Connect the tubing and wiring led inside from outdoors.

(5) After completing a leak test, bundle the tubing together with armoring tape and store it inside the tubing storage area at the back of the indoor unit and hold it with clamps. (Fig. 2-191)

**To unmount indoor unit**

Press the 2 △ marks on the lower part of the indoor unit and unlatch the tabs. Then lift the indoor unit and unmount. (Fig. 2-192)

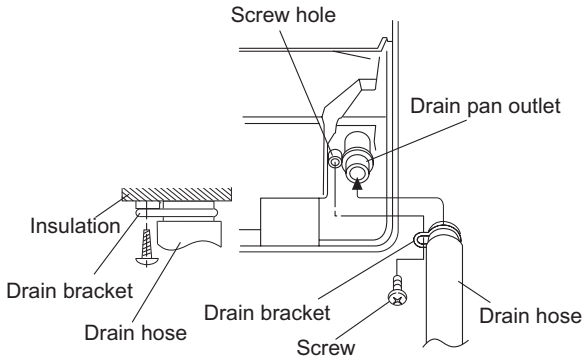



**Fig. 2-190**

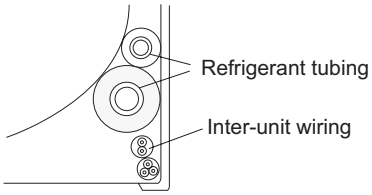



**Fig. 2-191**

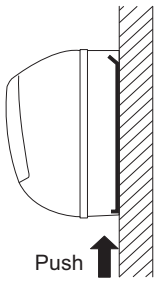



**Fig. 2-192**

## 4-13-56. Drain Hose

a) The drain hose should be slanted downward to the outdoors. (Fig. 2-193)

b) Never allow a trap to form in the course of the hose.

c) If the drain hose will run in the room, insulate the hose with insulation* so that chilled condensation will not damage furniture or floors. (Fig. 2-194)

* Foamed polyethylene or its equivalent is recommended.

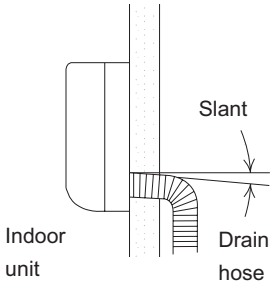



**Fig. 2-193**

**⚠ WARNING**

**Do not supply power to the unit or operate it until all tubing and wiring to the outside unit are completed.**

**Risk of Electric Shock**

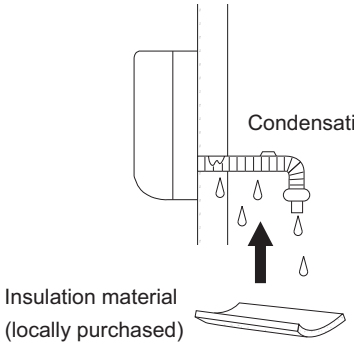



**Fig. 2-194**

# 4. Installation Instructions



● **Wall Mounted Type (K1 Type) 45, 56, 73, 106 types**

### 4-13-57. Remove the Rear Panel from the Unit

(1) Remove and discard the set screw on the rear panel. (Fig. 2-195)

(2) Press the 2 △ marks on the frame cover and disengage the stationary tabs from the frame. (Fig. 2-196)

(3) Remove the rear panel by grasping the sections shown in Fig. 2-197 and pulling it in the direction shown by the arrow.

**NOTE**

Tubing can be extended in 6 directions as shown in Fig. 2-199. Select the direction you need providing the shortest run to the outside unit.

● When left tubing is to be done, switch the drain hose and drain cap. (For details, refer to “Switching drain hose and drain cap”.)

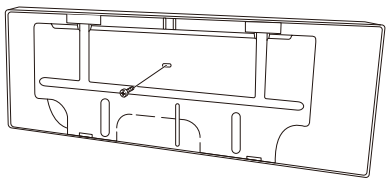



**Fig. 2-195**

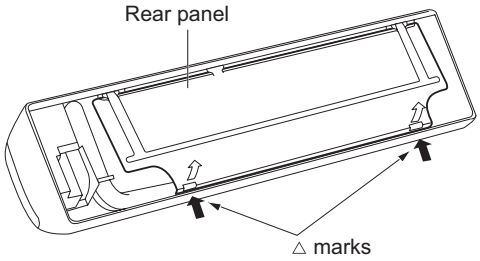



**Fig. 2-196**

### 4-13-58. Make a Hole

(1) Place the rear panel from the indoor unit on the wall at the location selected. Make sure the panel is horizontal, using a carpenter’s level or tape measure to measure down from the ceiling. Wait until after cutting the hole before attaching the rear panel to the wall.

(2) Determine which side of the unit you should make the hole for tubing and wiring. (Fig. 2-200)

**NOTE**

In the case of left-rear tubing, use the measurement points 158 mm from the marked position on the rear panel for precise placement of the hose outlet. (Fig. 2-200)

(3) Before making the hole, check carefully that no studs or pipes are directly run behind the spot to be cut.

**CAUTION** **Also avoid areas where electrical wiring or conduits are located.**

The above precautions are also applicable if tubing goes through the wall in any other location.

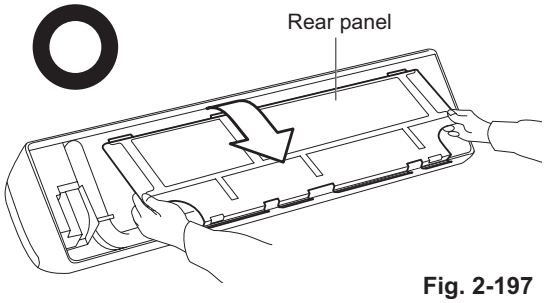



**Fig. 2-197**

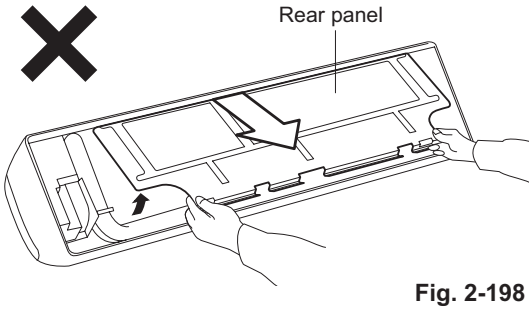



**Fig. 2-198**

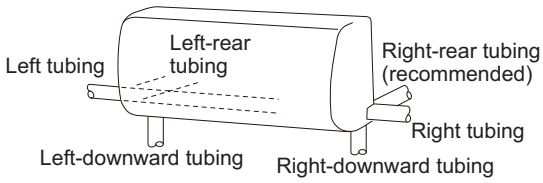
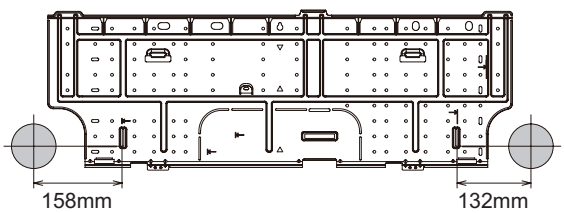



**Fig. 2-199**




Unit: mm

**Fig. 2-200**

# 4. Installation Instructions

(4) Using a sabre saw, key hole saw or hole-cutting drill attachment, cut a hole in the wall. See Table 2-19 and Fig. 2-201.

**Table 2-19**

| Hole Dia. |
|---|
| 80 mm |

(5) Measure the thickness of the wall from the inside edge to the outside edge and cut PVC pipe at a slight angle 6 mm shorter than the thickness of the wall. (Fig. 2-202)

(6) Place the plastic cover over the end of the pipe (for indoor side only) and insert the pipe in the wall. (Fig. 2-203)

### 4-13-59. Install the Rear Panel on the Wall

Be sure to confirm that the wall is strong enough to suspend the unit.

There are a number of screw holes on the rear panel.
Using the 8 screw holes with ⇦ mark is recommended to attach the rear panel securely to the wall.

**NOTE**

Be sure to install the unit within the range of the wall.

### If Wooden Wall

(1) Attach the rear panel to the wall with the 8 screws provided. (Fig. 2-204)
If you are not able to line up the holes in the rear panel with the beam locations marked on the wall, use rawl plugs or toggle bolts to go through the holes on the panel or drill 5 mm dia. holes in the panel over the stud locations and then mount the rear panel.

(2) Double check with a carpenter's level or tape measure that the panel is level. This is important to install the unit properly. (Fig. 2-205)

(3) Make sure the panel is flush against the wall. Any space between the wall and unit will cause noise and vibration.

**NOTE**

Hole should be made at a slight downward slant to the outdoor side.

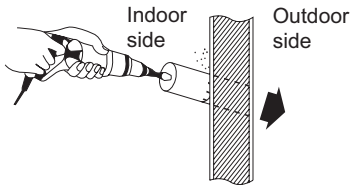



**Fig. 2-201**

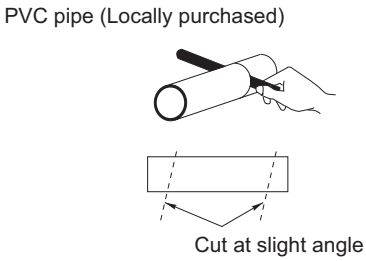



**Fig. 2-202**

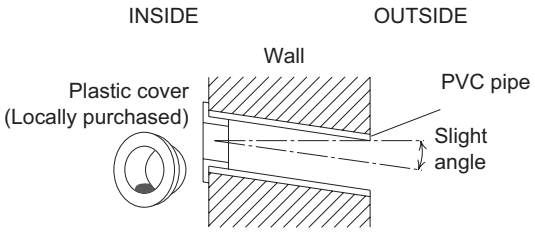



**Fig. 2-203**

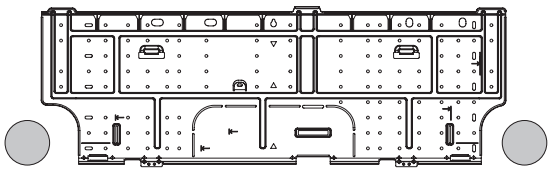


**Fig. 2-204**

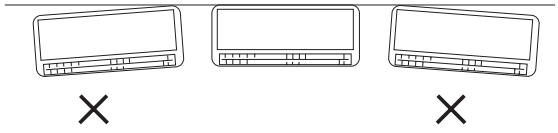


**Fig. 2-205**

# 4. Installation Instructions



### 4-13-60. Removing and Installing the Grille

Basically, these models can be installed and wired without removing the grille. If access to any internal part is needed, follow the steps as given below.

#### How to remove the grille

(1) Open the front panel until it is nearly horizontal, grasp the sections near the front panel arms on both sides, and then remove the panel by pushing the arms towards the outside while pulling the panel towards you.
If the front panel is difficult to remove, grasp both ends of it and lift it up slightly. Move it to the left and disengage the left arm, then move it to the right and disengage the right arm. (Fig. 2-206)

(2) Lift the anti-mold filter up slightly to disengage it from the protrusions on the unit, and then pull downward to remove the filter from the unit. (Fig. 2-206)

(3) Remove the 3 screws from the front of the unit and remove the screw covers on the bottom surface. Then remove the 2 screws. (Fig. 2-207)

(4) Remove the screw on the right side cover plate and remove the cover. (Fig. 2-207)

(5) Remove the lower flap by disengaging 4 pins of the lower flap in order. (Figs. 2-208 and 2-209)
(The flap is so flexible that it can be easily removed.)

(6) Lift up the grille in the direction shown by the arrow and pull the grille towards you to remove it. (Fig. 2-210)

#### How to replace the grille

(1) While aligning the top edge of the grille with the frame, move the grille horizontally and insert the top and bottom into the frame.

(2) Press the grille firmly with your hand to ensure no gap exists between the frame and grille.

(3) Tighten the 6 screws. And fix the removed covers in place.

(4) Grasp the sections near the front panel arms on both sides, and hold the front panel so that it is nearly horizontal. Push the arm shafts towards the outside so that they come into contact with the top of the indentations on the right and left sides of the air conditioner. Then push firmly until the arm shafts click into place. (Fig. 2-211)

(5) Remount the lower flap.
(In remounting the flap, it cannot be turned end for end because the right and left pins of the flap differ in form. (Fig. 2-209))

(6) Insert the top of the anti-mold filter, and then secure the bottom of the filter with the protrusions on the unit.

(7) When closing the front panel, push the central part of the front panel first and then press the bottom right and left corners in place until you feel a click. (Fig. 2-212)

**NOTE**

Check that no gap exists between the frame and the grille.

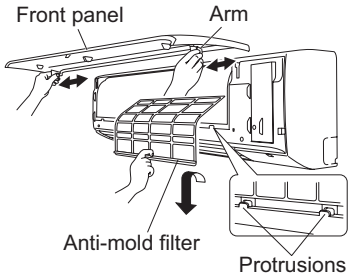



**Fig. 2-206**

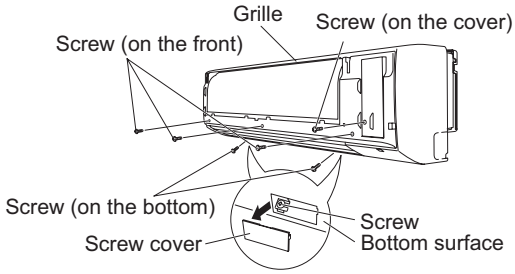



**Fig. 2-207**

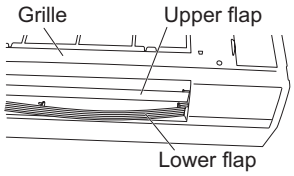



**Fig. 2-208**

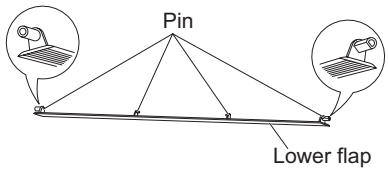



**Fig. 2-209**

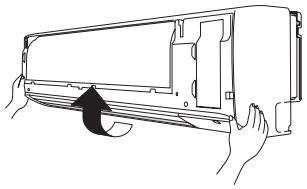


**Fig. 2-210**

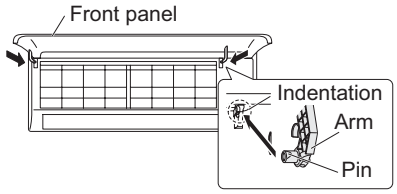



**Fig. 2-211**

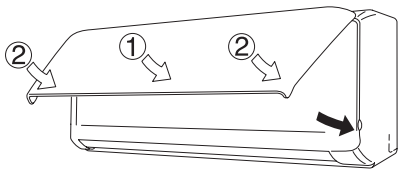



**Fig. 2-212**

# 4. Installation Instructions

### 4-13-61. Shape the Indoor Side Tubing

(1) Arrangement of tubing by direction
   a) Right or left tubing
      Cut out the corner of the right/left frame with a hacksaw or the like. (Figs. 2-213 and 2-214)
   b) Right-rear or left-rear tubing
      In this case, the corner of the frame need not be cut.

(2) To mount the indoor unit on the rear panel:
   Hang the 3 mounting slots of the unit on the upper tabs of the rear panel. (Fig. 2-215)

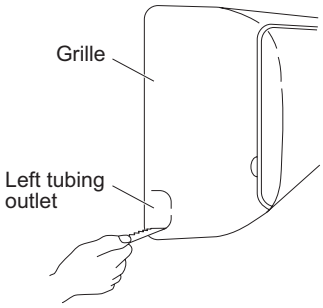



**Fig. 2-213**

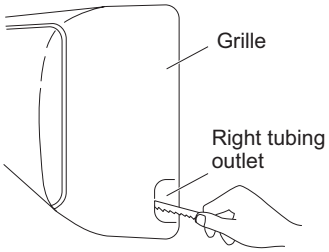



**Fig. 2-214**

### 4-13-62. Wiring Instructions

#### General precautions on wiring

(1) Before wiring, confirm the rated voltage of the unit as shown on its nameplate, then carry out the wiring closely following the wiring diagram.
(2) Provide a power outlet to be used exclusively for each unit, with a power supply disconnect and circuit breaker for overcurrent protection provided in the exclusive line.
(3) To prevent possible hazards due to insulation failure, the unit must be grounded.
(4) Each wiring connection must be done tightly and in accordance with the wiring system diagram. Wrong wiring may cause the unit to misoperate or become damaged.
(5) Do not allow wiring to touch the refrigerant tubing, compressor, or any moving parts of the fan.
(6) Unauthorized changes in the internal wiring can be very dangerous. The manufacturer will accept no responsibility for any damage or misoperation that occurs as a result of such unauthorized changes.

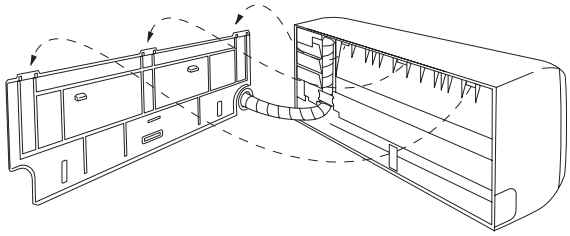


**Fig. 2-215**

### 4-13-63. Mounting

(1) To install the indoor unit, mount the indoor unit onto the 3 tabs on the upper part of the rear plate.
(2) Hold down the air discharge outlet and press the lower part of the indoor unit until it clicks to securely fasten to the 2 tabs on the lower part of the rear plate. (Fig. 2-216)

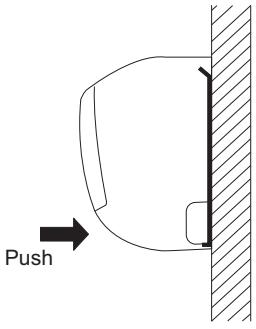



**Fig. 2-216**

**NOTE**

For tubing, choose either the right or left tubing direction and follow the steps below. Also, extend the support on the back of the indoor unit as a stand to make your work easier. (Fig. 2-217)

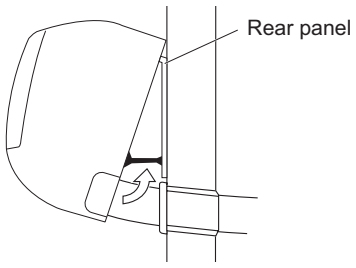



**Fig. 2-217**

# 4. Installation Instructions

## ■ Right-side tubing

(1) Shape the refrigerant tubing so that it can easily go into the wall hole. (Fig. 2-218)

(2) Push the wiring, refrigerant tubing, and drain hose through the hole in the wall. Adjust the indoor unit so it is securely seated on the rear panel. (Fig. 2-219)

(3) Carefully bend the tubing (if necessary) to run along the wall in the direction of the outdoor unit and then tape as far as the fittings. The drain hose should come straight down the wall to a point where water runoff won't stain the wall.

(4) Connect the refrigerant tubing to the outdoor unit. (After performing a leak test on the connecting part, insulate it with the tubing insulation. (Fig. 2-220)).

(5) Assemble the refrigerant tubing, drain hose, and conduit (including inter-unit wiring) as shown in Fig. 2-221.

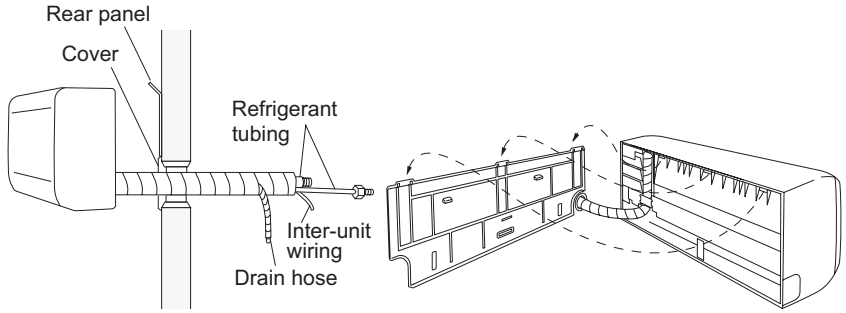



**Fig. 2-218**



**Fig. 2-219**

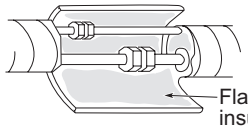



**Fig. 2-220**

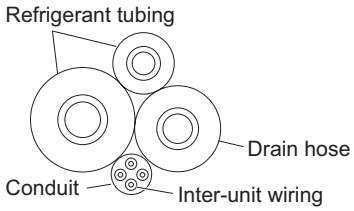



**Fig. 2-221**

## ■ Left-side tubing

(1) Lead the tubing and drain hose through the wall, allowing sufficient length for connection. Then bend the tubing using a tube bender to make the attachment. (Fig. 2-222)

(2) Switch the drain hose and drain cap.

### Switching drain hose and drain cap

(a) Locate the drain hose and the drain cap. (Fig. 2-223)

(b) Remove the screw fastening the drain hose on the right side, and pull out the drain hose to remove it. (Fig. 2-223)

(c) Apply moderate force to pull off the drain cap on the left side. (If you cannot pull it off by hand, use a long-nose pliers.)

(d) Reattach the drain hose to the left side and the drain cap to the right side. (Fig. 2-224)

### Drain hose

Slide the drain hose fully onto the drain pan outlet. (It will be easy to slide when water is added.) Check that the screw holes in the drain bracket and the drain pan outlet are aligned and securely in contact, then fasten them with the screw. (After attaching the drain hose, check that it is attached securely.) (Fig. 2-225)

### Drain cap

Use a Phillips head screwdriver to push the drain cap in firmly. (If it is difficult to push in, wet the cap with water first.)

(3) Install the indoor unit on the rear panel.

(4) Connect the tubing and wiring led inside from outdoors.

(5) After completing a leak test, bundle the tubing together with armoring tape and store it inside the tubing storage area at the back of the indoor unit and hold it with clamps. (Figs. 2-224 and 2-226)

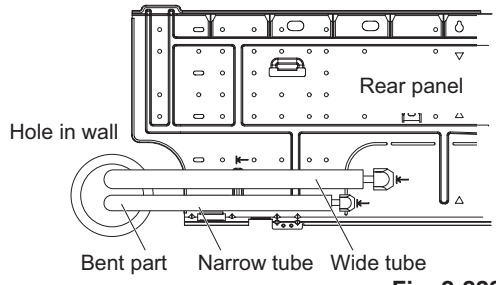



**Fig. 2-222**

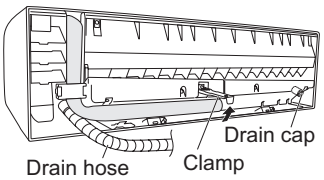



**Fig. 2-223**

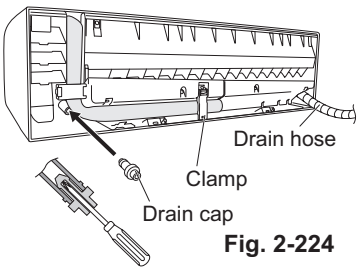



**Fig. 2-224**

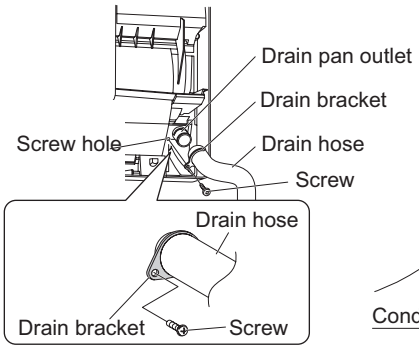



**Fig. 2-225**

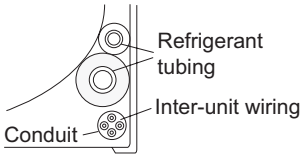



**Fig. 2-226**

# 4. Installation Instructions

### To unmount indoor unit

(1) Remove the screw cover on the bottom surface. (Fig. 2-228)
(2) Fasten the frame to the rear panel using the 2 supplied tapping screws 4 x 10 mm. (Fig. 2-228)
(3) Press the 2 △ marks on the lower part of the indoor unit and unlatch the tabs. Then lift the indoor unit and unmount. (Fig. 2-227)

**NOTE**

Under normal conditions, the installation design calls for a less than 2 mm gap between the air conditioner unit and the wall. Confirm that the gap is appropriate (less than 2 mm).

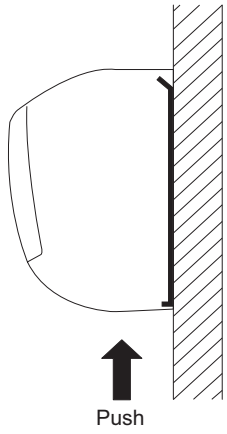



**Fig. 2-227**

### 4-13-64. Drain Hose

a) The drain hose should be slanted downward to the outdoors. (Fig. 2-229)
b) Never form a trap in the course of the hose.
c) If the drain hose will run in the room, insulate the hose with insulation* so that chilled condensation will not damage furniture or floors. (Fig. 2-230)
*Foamed polyethylene or its equivalent is recommended.

**WARNING**

**Do not supply power to the unit or operate it until all tubing and wiring to the outside unit are completed.**

**Risk of Electric Shock**

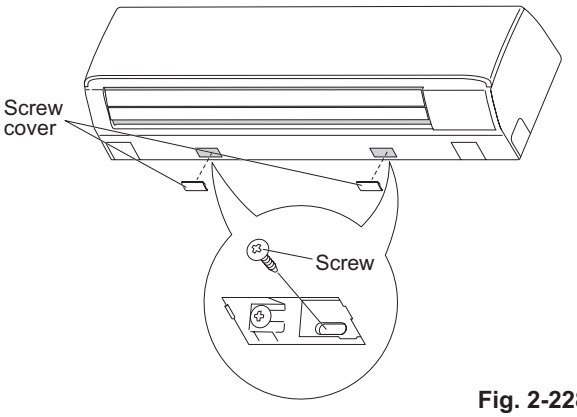



**Fig. 2-228**

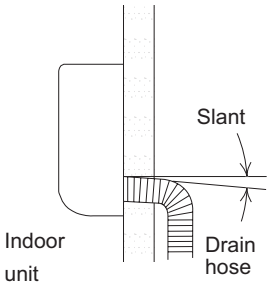



**Fig. 2-229**

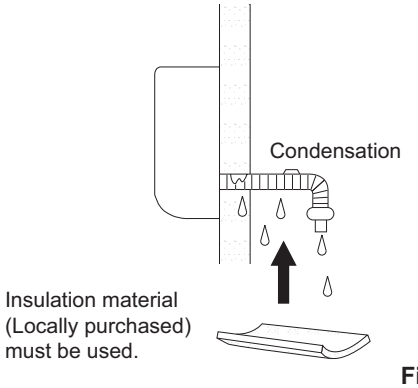



**Fig. 2-230**

# 4. Installation Instructions

- **Floor Standing Type (P1 Type)**
  **Concealed Floor Standing Type (R1 Type)**

## 4-13-65. Required Minimum Space for Installation and Service

Install the unit where cooled or heated air from the unit can circulate well in the room. Do not put obstacles which may obstruct the air flow in front of the air intake and outlet grilles.

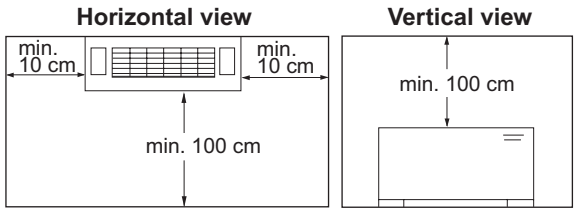



**Fig. 2-231**

**NOTE**

Ensure there is adequate space for maintenance of the electrical component box, air filter, and refrigerant tubes.

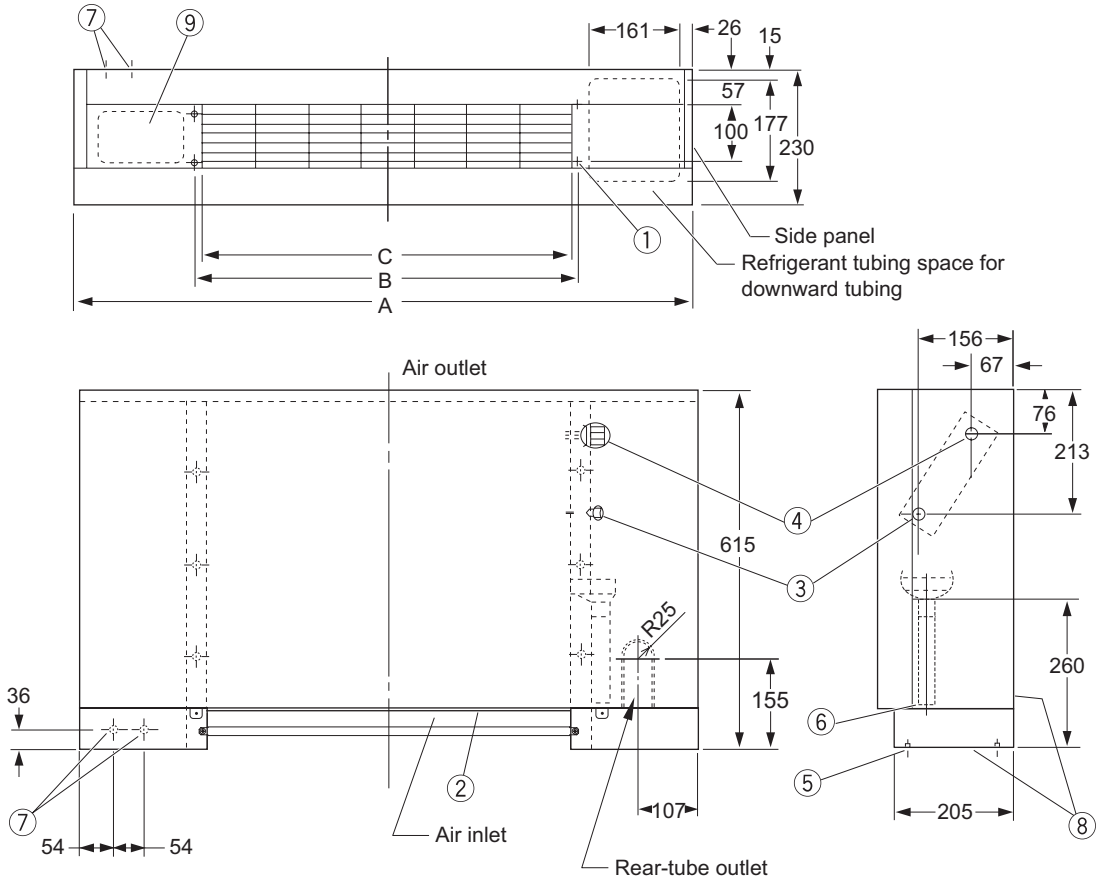
## 4-13-66. Dimensions and Part Names

**Floor Standing Type (P1 Type)**

① 4-ø12 holes (for fastening the indoor unit to the floor with screws)
② Air filter
③ Refrigerant connection outlet (liquid tube)
④ Refrigerant connection outlet (gas tube)
⑤ Level adjusting bolt
⑥ Drain outlet (20 A)
⑦ Power cord outlet (downward, rear)
⑧ Refrigerant tubing outlet (downward, rear)
⑨ Location for mounting the remote controller (remote controller can be attached within the room)

**Table 2-20** Unit: mm

| Type \ Length | A | B | C | Liquid tube | Gas tube |
|---|---|---|---|---|---|
| 22, 28, 36 | 1065 | 665 | 632 | ø6.35 | ø12.7 |
| 45, 56 | 1380 | 980 | 947 | | |
| 73 | | | | ø9.52 | ø15.88 |




Unit: mm

**Fig. 2-232**

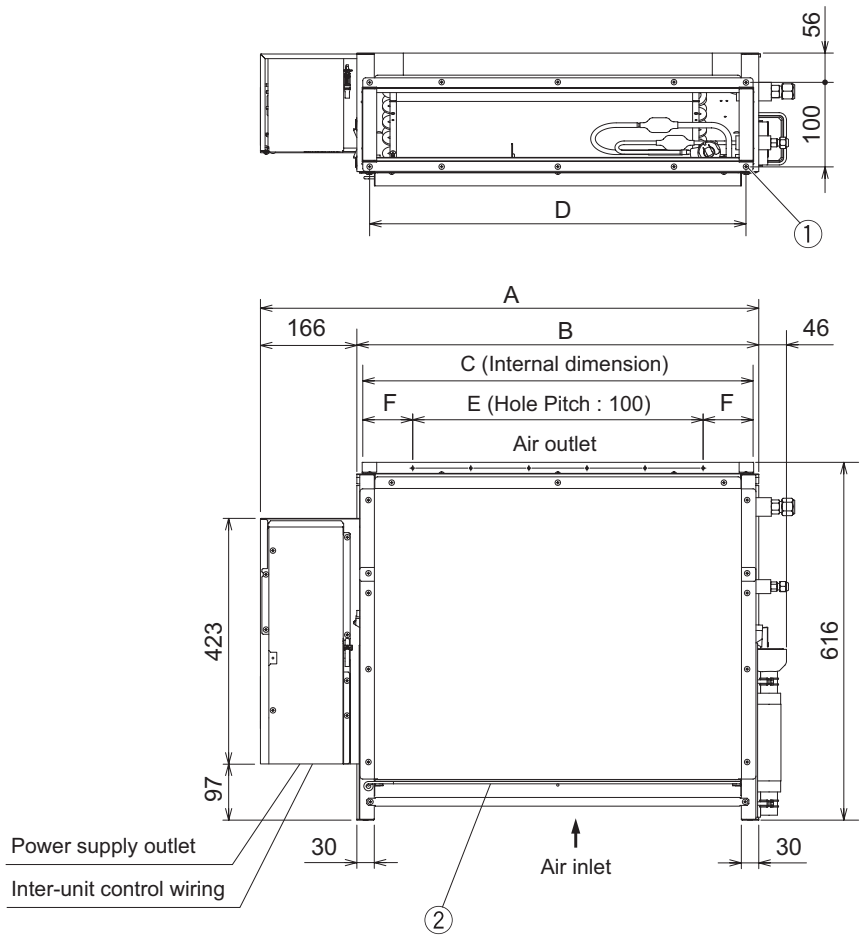
# 4. Installation Instructions

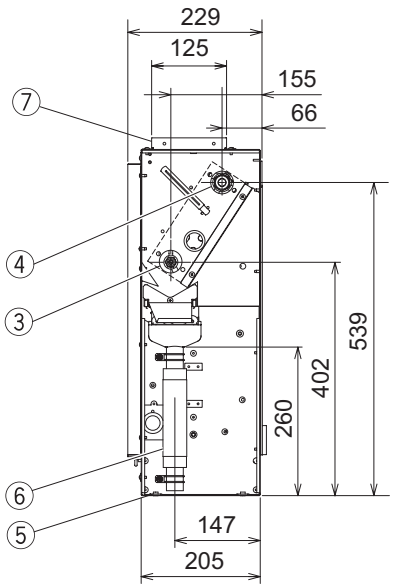
**Concealed Floor Standing Type (R1 Type)**

① 4-ø12 holes (for fastening the indoor unit to the floor with screws)
② Air filter
③ Refrigerant connection outlet (liquid tube)
④ Refrigerant connection outlet (gas tube)
⑤ Level adjusting bolt
⑥ Drain outlet (20A)
⑦ Flange for air-outlet duct

**Table 2-21** Unit: mm

| Length / Type | A | B | C | D | E | F | Liquid tube | Gas tube |
|---|---|---|---|---|---|---|---|---|
| 22, 28, 36 | 904 | 692 | 672 | 665 | 500 | 86 | ø6.35 | ø12.7 |
| 45, 56 | 1219 | 1007 | 1002 | 980 | 900 | 51 | | |
| 73 | | | | | | | ø9.52 | ø15.88 |




Unit: mm

**Fig. 2-233**

**NOTE**

Make an opening in the housing of the unit so that maintenance service can be peformed on the electrical component box, air filter, refrigerant tubing connection, and drain pipe.

## 4-13-67. Removing and Attaching the Front Panel (Floor Standing Type)

**NOTE**

A dew-prevention heater is secured behind the front panel. When removing or attaching the panel, take care not to damage the lead wire to the heater.

**How to remove the front panel**

(1) Remove the 2 screws at the lower part of the front panel.
(2) Holding **A** at the upper right of the unit, push up **B** at the lower right of the panel. The right side of the front panel is removed. Then remove the left side of the front panel following the same procedure.
(3) Disengage the lead wire connector (2P red) for the dew-prevention heater.
(4) Remove the string connecting the front panel of the unit by unhooking it from the fixture attached to the panel.

**How to attach the front panel**

(1) Hook the string to the fixture of the front panel.
(2) Connect the lead wire connector.
(3) Align the slots at the lower part of the front panel to the tabs at the lower part of the indoor unit and put the upper trim tab of the front panel on the groove of the unit. Then press down the panel.
(4) Insert the 2 screws at the lower part of the front panel.

## 4-13-68. Installing the Refrigerant Tubing

(1) When connecting the gas tube use the supplied tubing.
(2) Tubes can be extended in 2 directions: downward and at rear.

For Floor Standing type

- When a rear tube is required, it can run through the rear-tube outlet of the rear panel.
- When a downward tube is required, refer to the opening dimensions shown in Fig. 2-236.

**⚠ CAUTION**

**Insulate both gas and liquid tubes.**

- To insulate tubes

(1) Wrap the flare nuts with the supplied white insulating tape.
(2) Wrap the flare nuts with the supplied flare insulator.
(3) Fill the clearance between the union insulator and flare insulator with black insulating tape. Fasten both ends of the flare insulator with the supplied vinyl clamps.

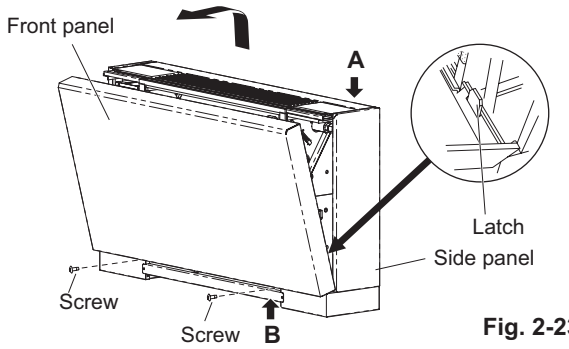



**Fig. 2-234**

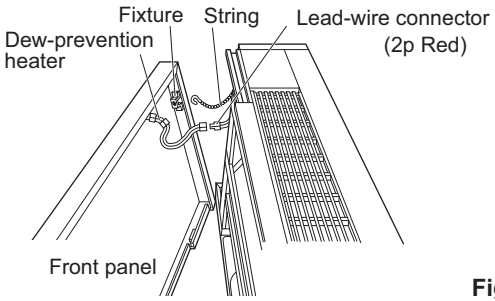



**Fig. 2-235**

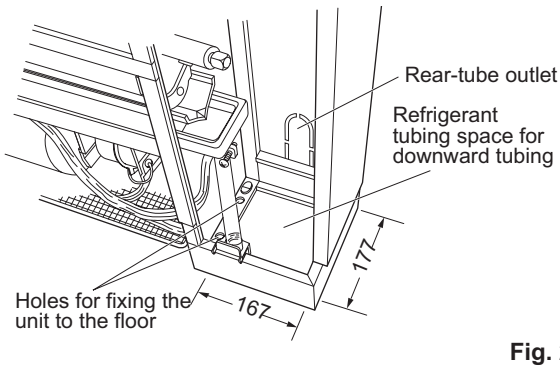



**Fig. 2-236**

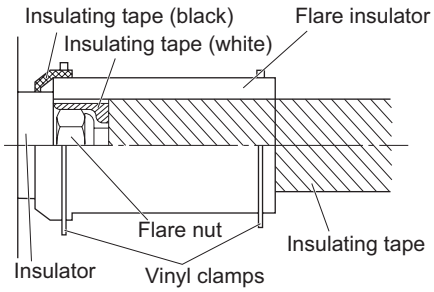



**Fig. 2-237**

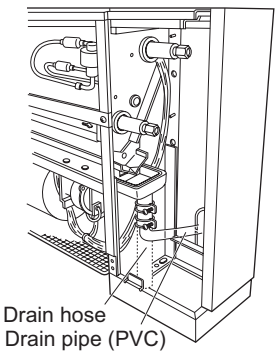



**Fig. 2-238**

# 4. Installation Instructions

### 4-13-69. Installing the Drain Piping

⚠ **CAUTION**

**Water leaks may occur if the drain pipes are connected inadequately.**

(1) When rear-side drain piping is required bend the drain hose attached to the indoor unit by 90°. Connect a drain pipe (field supply) to the drain hose through the rear tubing outlet in the rear panel. Use a hard PVC pipe (O.D. 25 mm) for the drain piping.

(2) Ensure that the drain pipe has a downward gradient of 1/100 or more and that there are no water traps.

(3) Provide insulation for the drain pipe.

(4) After the drain piping is completed, pour water into the drain pan to check that the water drains smoothly.

(5) Remove any dust or debris in the drain pan so that the pipe is not clogged.

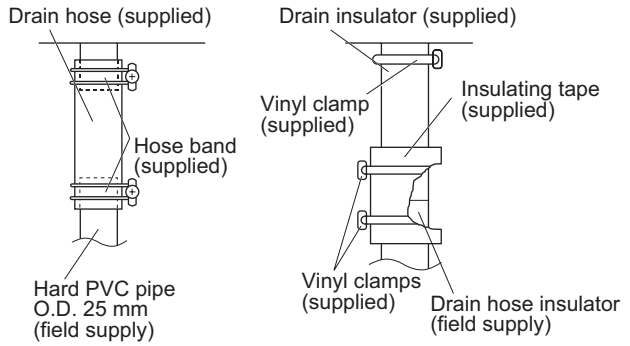



**Fig. 2-239**

### 4-13-70. Installing the Remote Controller

A remote controller (optional wired remote controller) can be mounted in the indoor unit (Floor Standing type).

(1) Remove the cover of the optional wired remote controller. (Fig. 2-240)

(2) Remove the front panel. Remove the screws and fixture. (Fig. 2-241)

(3) Place the remote controller into the space in the unit as shown in Fig. 2-241. Assemble the lead wires of the remote controller to its rear side center and route them to the lead wire guide.

(4) Secure the fixture using the supplied screws.

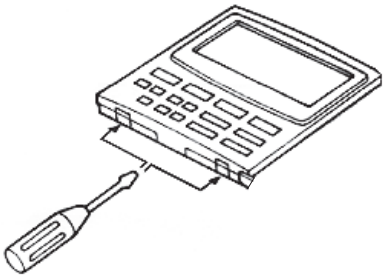


**Fig. 2-240**

To remove the cover from the remote controller, insert a screwdriver between the cover and the controller as shown in the figure above, and pry off the cover.

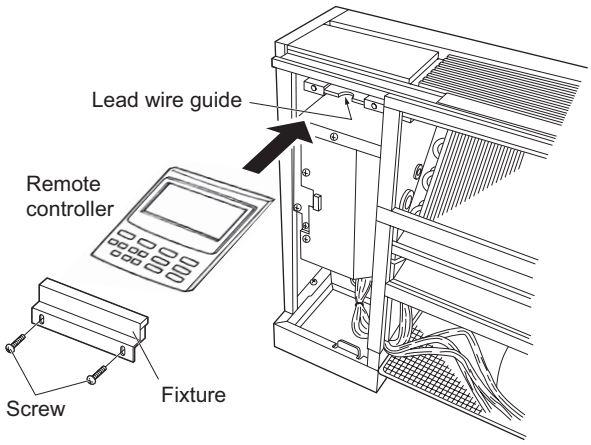



**Fig. 2-241**

2

# 5. HOW TO PROCESS TUBING

## 5. HOW TO PROCESS TUBING

The liquid tubing side is connected by a flare nut, and the gas tubing side is connected by brazing.

### 5-1. Connecting the Refrigerant Tubing

#### Use of the Flaring Method

Many of conventional split system air conditioners employ the flaring method to connect refrigerant tubes which run between indoor and outdoor units. In this method, the copper tubes are flared at each end and connected with flare nuts.

#### Flaring Procedure with a Flare Tool

(1) Cut the copper tube to the required length with a tube cutter. It is recommended to cut approx. 30 – 50 cm longer than the tubing length you estimate.

(2) Remove burrs at each end of the copper tubing with a tube reamer or file. This process is important and should be done carefully to make a good flare. Be sure to keep any contaminants (moisture, dirt, metal filings, etc.) from entering the tubing. (Figs. 2-242 and 2-243)

**NOTE**

When reaming, hold the tube end downward and be sure that no copper scraps fall into the tube. (Fig. 2-243)

(3) Remove the flare nut from the unit and be sure to mount it on the copper tube.

(4) Make a flare at the end of copper tube with a flare tool. (Fig. 2-244)

**NOTE**

A good flare should have the following characteristics:

- Inside surface is glossy and smooth
- Edge is smooth
- Tapered sides are of uniform length

#### Caution Before Connecting Tubes Tightly

(1) Apply a sealing cap or water-proof tape to prevent dust or water from entering the tubes before they are used.

(2) Be sure to apply refrigerant lubricant (ether oil) to the inside of the flare nut before making piping connections. This is effective for reducing gas leaks. (Fig. 2-245)

(3) For proper connection, align the union tube and flare tube straight with each other, then screw in the flare nut lightly at first to obtain a smooth match. (Fig. 2-246)

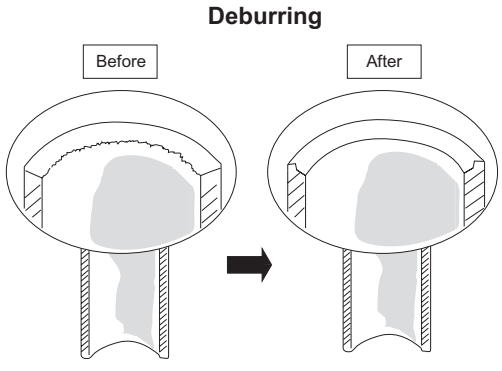



**Fig. 2-242**

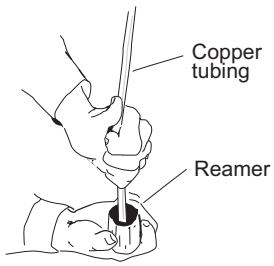



**Fig. 2-243**

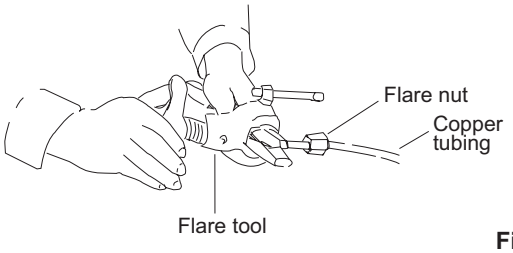



**Fig. 2-244**

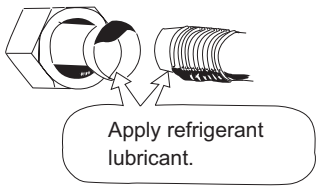



**Fig. 2-245**

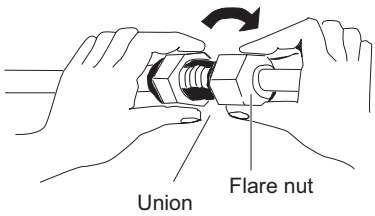



**Fig. 2-246**

- Adjust the shape of the liquid tube using a tube bender at the installation site and connect it to the liquid tubing side valve using a flare.

#### Cautions During Brazing

- **Replace air inside the tube with nitrogen gas to prevent copper oxide film from forming during the brazing process. (Oxygen, carbon dioxide and Freon are not acceptable.)**
- **Do not allow the tubing to get too hot during brazing. The nitrogen gas inside the tubing may overheat, causing refrigerant system valves to become damaged. Therefore allow the tubing to cool when brazing.**
- **Use a reducing valve for the nitrogen cylinder.**
- **Do not use agents intended to prevent the formation of oxide film. These agents adversely affect the refrigerant and refrigerant oil, and may cause damage or malfunctions.**

# 5. HOW TO PROCESS TUBING

## 5-2. Connecting Tubing Between Indoor and Outdoor Units

(1) Tightly connect the indoor-side refrigerant tubing extended from the wall with the outdoor-side tubing.

(2) To fasten the flare nuts, apply specified torque as at right:

- When removing the flare nuts from the tubing connections, or when tightening them after connecting the tubing, be sure to use 2 adjustable wrenches or spanners as shown. (Fig. 2-247)
  If the flare nuts are over-tightened, the flare may be damaged, which could result refrigerant leakage and cause in injury or asphyxiation to room occupants.
- For the flare nuts at tubing connections, be sure to use the flare nuts that were supplied with the unit, or else flare nuts for R410A (type 2).
  The refrigerant tubing that is used must be of the correct wall thickness as shown in the table at right.
- In order to prevent damage to the flare caused by over-tightening of the flare nuts, use the table above as a guide when tightening.
- When tightening the flare nut on the liquid tube, use an adjustable wrench with a nominal handle length of 200 mm.

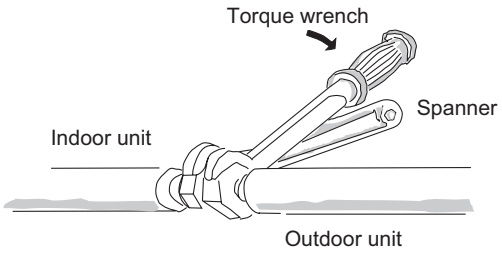



**Fig. 2-247**

| Tube diameter | Tightening torque, approximate | Tube thickness |
|---|---|---|
| ø6.35 (1/4”) | 14 – 18 N · m (140 – 180 kgf· cm) | 0.8 mm |
| ø9.52 (3/8”) | 34 – 42 N · m (340 – 420 kgf· cm) | 0.8 mm |
| ø12.7 (1/2”) | 49 – 61 N · m (490 – 610 kgf· cm) | 0.8 mm |
| ø15.88 (5/8”) | 68 – 82 N · m (680 – 820 kgf· cm) | 1.0 mm |
| ø19.05 (3/4”) | 100 – 120 N · m (1000 – 1200 kgf· cm) | 1.2 mm |

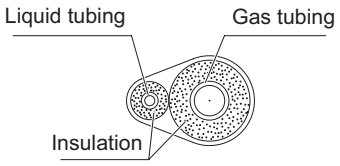
Because the pressure is approximately 1.6 times higher than conventional refrigerant pressure, the use of ordinary flare nuts (type 1) or thin-walled tubes may result in tube rupture, injury, or asphyxiation caused by refrigerant leakage.

## 5-3. Insulating the Refrigerant Tubing

### Tubing Insulation

- Standard Selection of Insulation Material
  Under the environment of the high temperature and high humidity, the surface of the insulation material is easy to become condesation. This will result in leakage and dew drop. Refer to the chart shown below when selecting the insulation material.
  In case that the ambient temperature and relative humidity are placed above the line of the insulation thickness, the condensation may occasionally make a dew drop on the surface of the insulation material. In this case, select the better insulation efficiency.
  * However, since the condition will be different due to the sort of the insulaton material and the environmental condition of the installation place, see the chart shown below as a reference when making a selection.

**Two tubes arranged together**




**Three tubes arranged together**

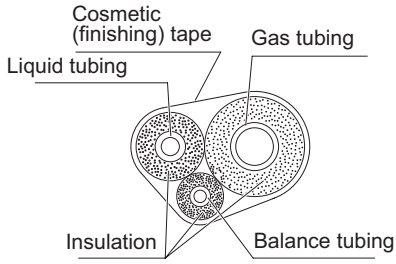


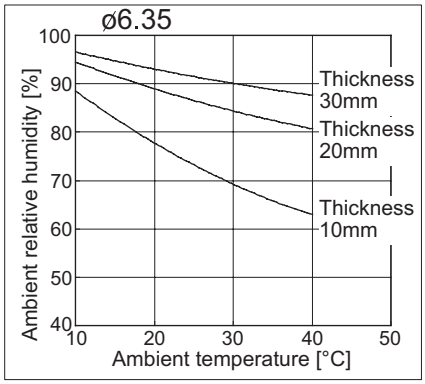

**Fig. 2-248**

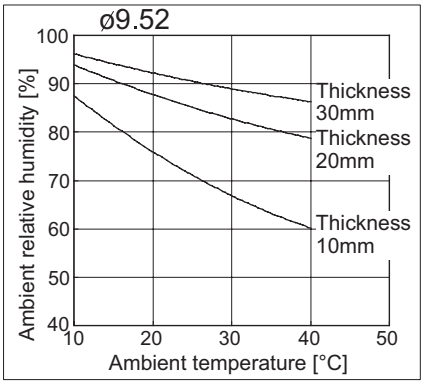
Standard Selection of Tubing Insulation

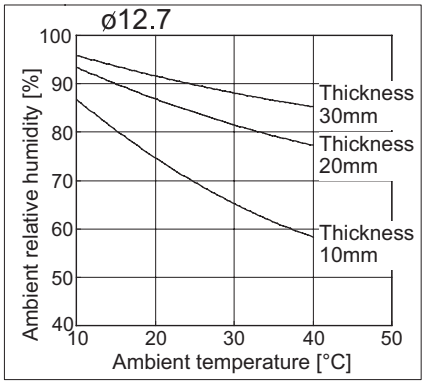
| Calculating condition | |
|---|---|
| Sort of insulation material | Polyethylene heat resisting material |
| Thermal conductivity of insulation material | Based on JIS A9501 |
| Calculating formula used when calculating thickness | Based on JIS A9501 |
| Refrigerant temperature | 2°C |

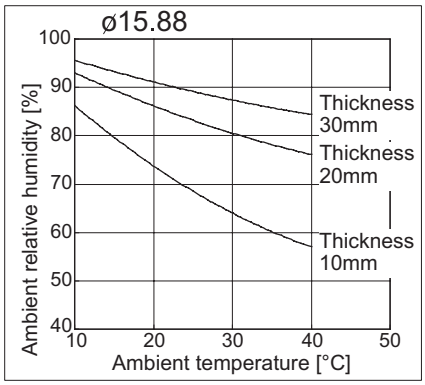
# 5. HOW TO PROCESS TUBING

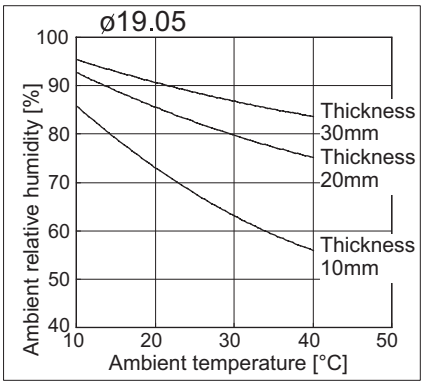


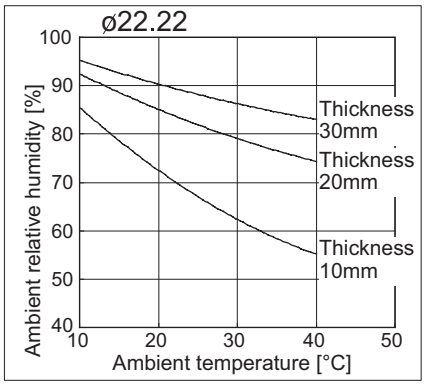


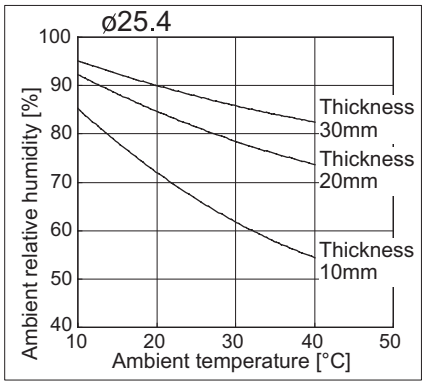



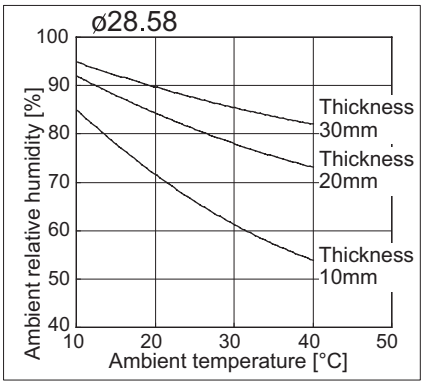



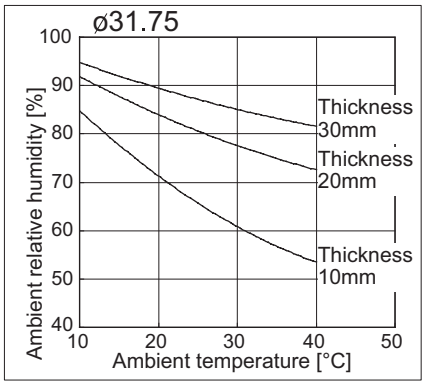



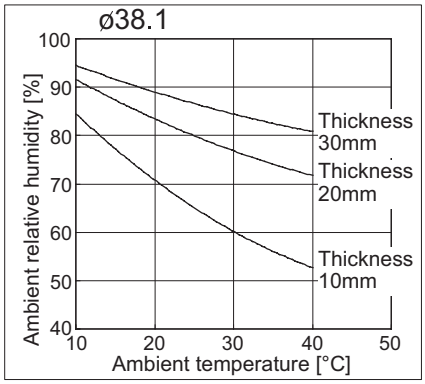



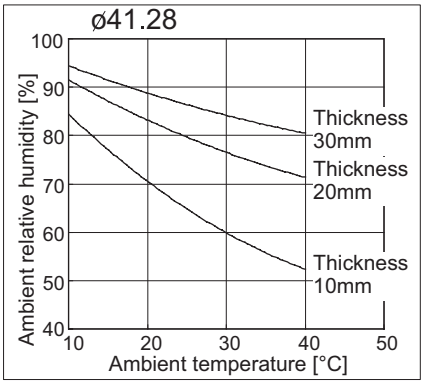



# 5. HOW TO PROCESS TUBING

**CAUTION**

**If the exterior of the outdoor unit valves has been finished with a square duct covering, make sure you allow sufficient space to use the valves and to allow the panels to be attached and removed.**

**Taping the flare nuts**

Wind the white insulation tape around the flare nuts at the gas tube connections. Then cover up the tubing connections with the flare insulator, and fill the gap at the union with the supplied black insulation tape. Finally, fasten the insulator at both ends with the supplied vinyl clamps. (Fig. 2-249)

**Insulation material**

The material used for insulation must have good insulation characteristics, be easy to use, be age resistant, and must not easily absorb moisture.

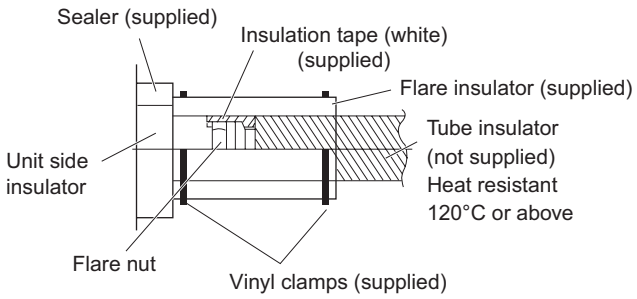



**Fig. 2-249**

**CAUTION**

**After a tube has been insulated, never try to bend it into a narrow curve because it can cause the tube to break or crack.**

**Never grasp the drain or refrigerant connecting outlets when moving the unit.**

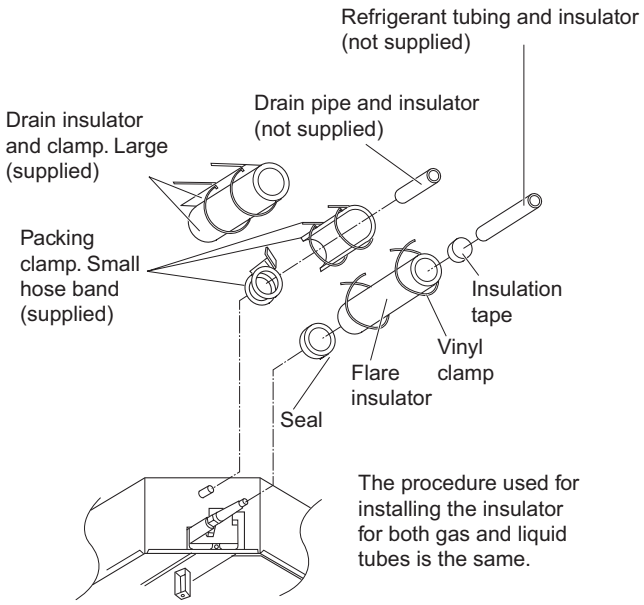



**Fig. 2-250**

## 5-4. Taping the Tubes

(1) At this time, the refrigerant tubes (and electrical wiring if local codes permit) should be taped together with armoring tape in 1 bundle. To prevent the condensation from overflowing the drain pan, keep the drain hose separate from the refrigerant tubing.

(2) Wrap the armoring tape from the bottom of the outdoor unit to the top of the tubing where it enters the wall. As you wrap the tubing, overlap half of each previous tape turn.

(3) Clamp the tubing bundle to the wall, using 1 clamp approx. each meter. (Fig. 2-251)

**NOTE**

Do not wind the armoring tape too tightly since this will decrease the heat insulation effect. Also ensure that the condensation drain hose splits away from the bundle and drips clear of the unit and the tubing.

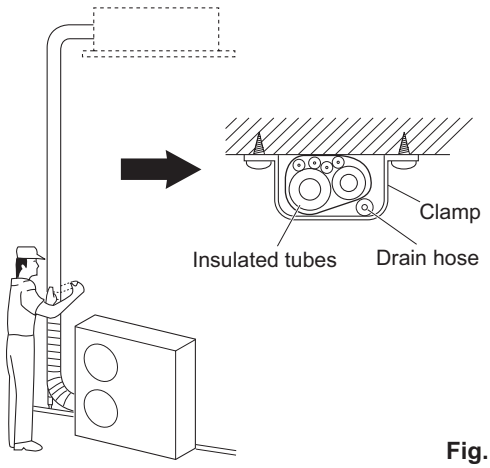



**Fig. 2-251**

## 5-5. Finishing the Installation

After finishing insulating and taping over the tubing, use sealing putty to seal off the hole in the wall to prevent rain and draft from entering. (Fig. 2-252)

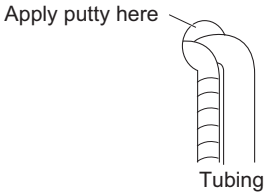



**Fig. 2-252**

## 6. AIR PURGING

Air and moisture in the refrigerant system may have undesirable effects as indicated below.

- pressure in the system rises
- operating current rises
- cooling (or heating) efficiency drops
- moisture in the refrigerant circuit may freeze and block capillary tubing
- water may lead to corrosion of parts in the refrigerant system

Therefore, the indoor unit and tubing between the indoor and outdoor unit must be leak tested and evacuated to remove any noncondensables and moisture from the system.

**Manifold gauge**

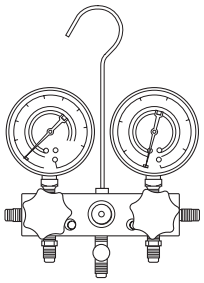


**Fig. 2-253**

### ■ Air Purging with a Vacuum Pump (for Test Run) Preparation

Check that each tube (both liquid and gas tubes) between the indoor and outdoor units have been properly connected and all wiring for the test run has been completed. Remove the valve caps from both the gas and liquid service valves on the outdoor unit. Note that both liquid and gas tube service valves on the outdoor unit are kept closed at this stage.

**Vacuum pump**

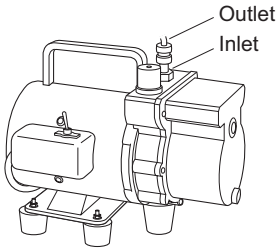



**Fig. 2-254**

#### Leak test

(1) With the service valves on the outdoor unit closed, remove the 1/4 in. flare nut and its bonnet on the gas tube service valve. (Save for reuse.)

(2) Attach a manifold valve (with pressure gauges) and dry nitrogen gas cylinder to this service port with charge hoses.

**CAUTION**

**Use a manifold valve for air purging. If it is not available, use a stop valve for this purpose. The "Hi" knob of the manifold valve must always be kept closed.**

(3) Pressurize the system to no more than 3.8 MPa with dry nitrogen gas and close the cylinder valve when the gauge reading reaches 3.8 MPa. Then, test for leaks with liquid soap.

**CAUTION**

**To avoid nitrogen entering the refrigerant system in a liquid state, the top of the cylinder must be higher than the bottom when you pressurize the system. Usually, the cylinder is used in a vertical standing position.**

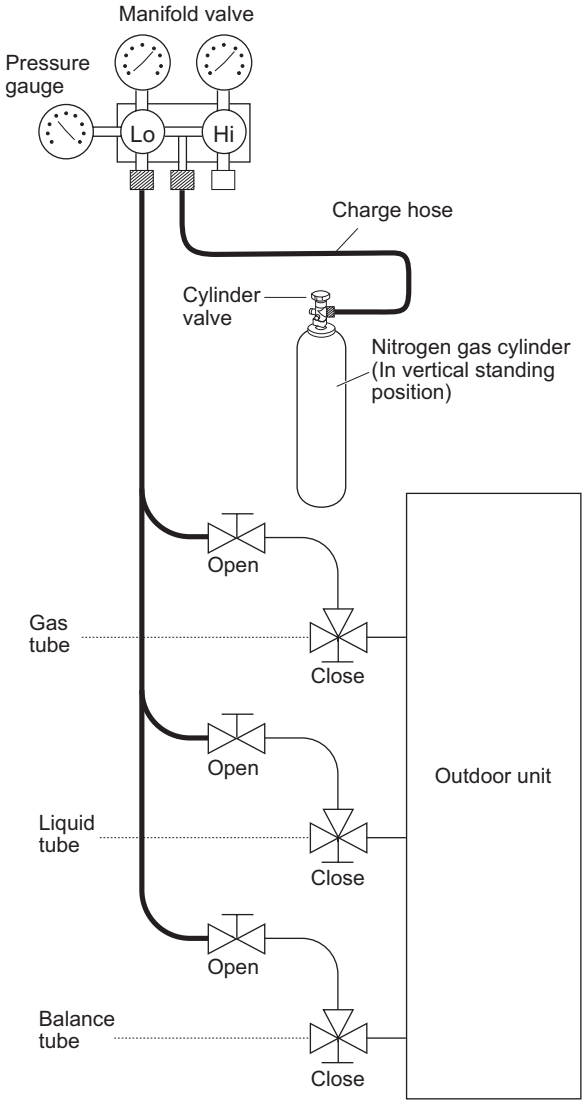



**Fig. 2-255**

# 6. AIR PURGING

(4) Do a leak test of all joints of the tubing (both indoor and outdoor) and both gas and liquid service valves. Bubbles indicate a leak. Wipe off the soap with a clean cloth after a leak test.

(5) After the system is found to be free of leaks, relieve the nitrogen pressure by loosening the charge hose connector at the nitrogen cylinder. When the system pressure is reduced to normal, disconnect the hose from the cylinder.

### Evacuation

(1) Attach the charge hose end described in the preceding steps to the vacuum pump to evacuate the tubing and indoor unit. Confirm that the “Lo” knob of the manifold valve is open. Then, run the vacuum pump. The operation time for evacuation varies with the tubing length and capacity of the pump. The following table shows the amount of time for evacuation:

| **Required time for evacuation when 30 gal/h vacuum pump is used** | |
|---|---|
| If tubing length is less than 15 m | If tubing length is longer than 15 m |
| **45 min. or more** | **90 min. or more** |

**NOTE**

The required time in the above table is calculated based on the assumption that the ideal (or target) vacuum condition is less than –101 kPa (–755 mmHg, 5 Torr).

(2) When the desired vacuum is reached, close the “Lo” knob of the manifold valve and turn off the vacuum pump. Please confirm that the gauge pressure is under –101 kPa (–755 mmHg, 5 Torr) after 4 to 5 minutes of vacuum pump operation.

**CAUTION** **Use a cylinder designed for use with R410A respectively.**

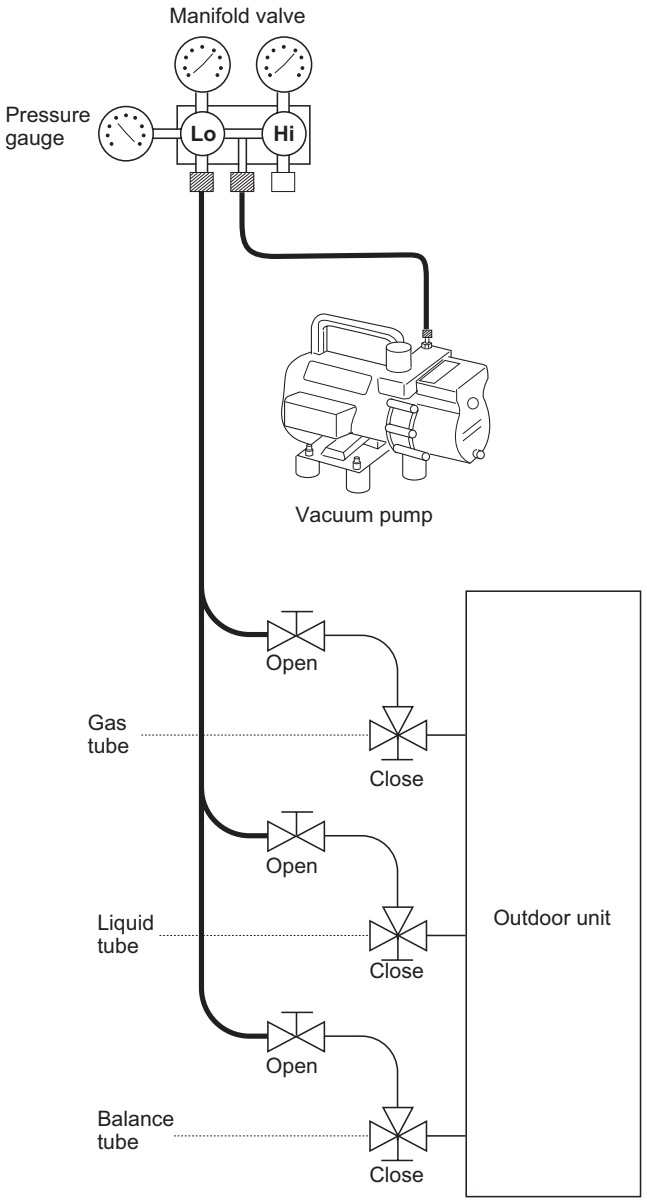



**Fig. 2-256**

# 6. AIR PURGING

### Charging additional refrigerant

- Charging additional refrigerant (calculated from the liquid tube length as shown in Section “1-8. Additional Refrigerant Charge”) using the liquid tube service valve. (Fig. 2-257)
- Use a balance to measure the refrigerant accurately.
- If the additional refrigerant charge amount cannot be charged at once, charge the remaining refrigerant in liquid form by using the gas tube service valve with the system in cooling operation mode at the time of test run. (Fig. 2-258)

### Finishing the job

(1) With a hex wrench, turn the liquid tube service valve stem counter-clockwise to fully open the valve.

(2) Turn the gas tube service valve stem counter-clockwise to fully open the valve.

**CAUTION**

**To avoid gas from leaking when removing the charge hose, make sure the stem of the gas tube is turned all the way out (“BACK SEAT” position).**

(3) Loosen the charge hose connected to the gas tube service port (1/4 in.) slightly to release the pressure, then remove the hose.

(4) Replace the 1/4 in. flare nut and its bonnet on the gas tube service port and fasten the flare nut securely with an adjustable wrench or box wrench. This process is very important to prevent gas from leaking from the system.

(5) Replace the valve caps at both gas and liquid service valves and fasten them securely.

This completes air purging with a vacuum pump.
The airconditioner is now ready for a test run.

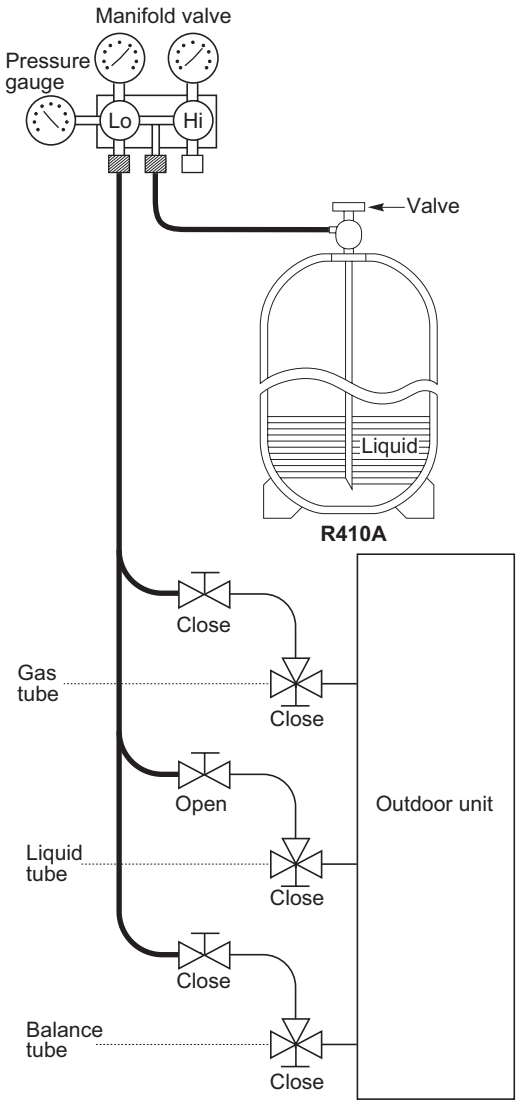



**Fig. 2-257**

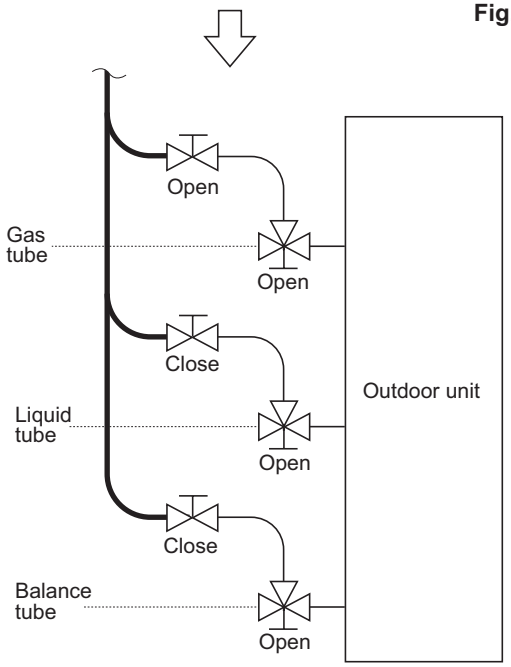



**Fig. 2-258**

# 7. Optional Parts

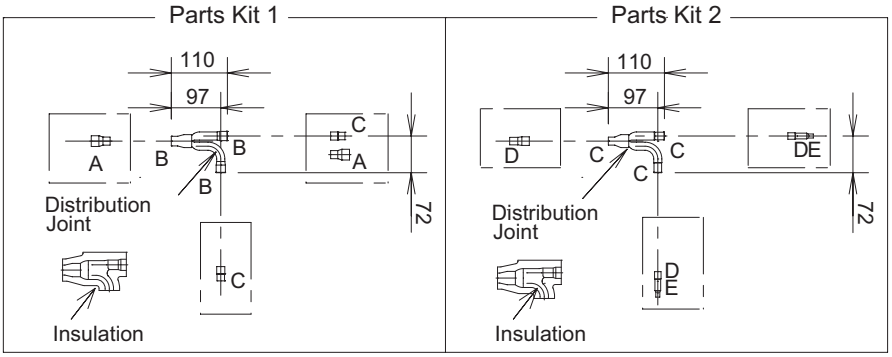
## 7-1. Distribution Joint Kits

### ■ CZ-P160BK2 (for R410A)

### How to Attach Distribution Joint

1. Accompanying Parts
   Check the contents of your distribution joint kit.

2. Distribution Joint Kits (with insulation)




- Size of connection point on each part (Shown are inside diameters of tubing)

| Size | mm | Inch |
|---|---|---|
| Part A | ø19.05 | 3/4 |
| Part B | ø15.88 | 5/8 |
| Part C | ø12.7 | 1/2 |
| Part D | ø9.52 | 3/8 |
| Part E | ø6.35 | 1/4 |

3. Making Branch Connections

- For branching tubes, install 150mm or larger (including reducer) straight tubing up to the point where the tube branches (or after the point where the tubes join together). (Fig. 2-259)
- Using a tube cutter, cut the joints at the diameter required to match the outside diameter of the tubing you are connecting. (This is usually done at the installation site.) The tube diameter depends on the total capacity of the indoor unit. Note that you do not have to cut the joints if it already matches the tubing end size. For size selection of the tube diameter, refer to the installation instructions provided with the outdoor unit.

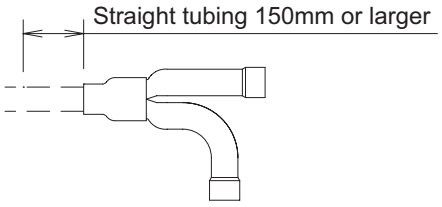



Fig. 2-259

**NOTE**

Avoid forceful cutting that may harm the shape of the joints or tubing. (Inserting the tubing will not be possible if the tube shape is not proper.)

- Cut off as far away from stopper as possible. (Fig. 2-260)

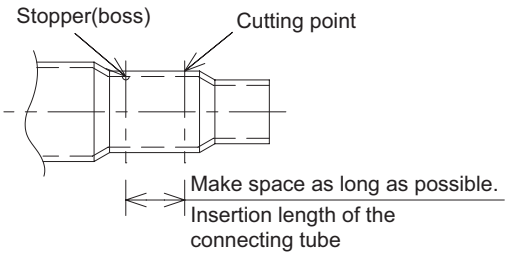
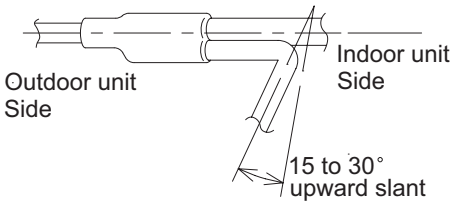
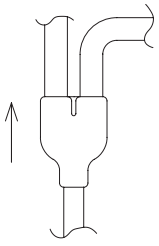



Fig. 2-260

- After cutting the joints, be sure to remove burrs on the inside of the joints. (If the joints have been squashed or dented badly, reshaped them using a tube spreader.)
- Make sure there is no dirt or other foreign substances inside the distribution joint.
- The distribution joint can be either horizontal or vertical. (Fig. 2-261) In the case of horizontal, the L-shaped tubing must be slanted slightly upward (15˚ to 30˚).
- When brazing a pipe E to the reducer of which middle pipe inner dimension is D as shown above chart, cut the middle pipe as long as possible so that the pipe E can be inserted.
- When brazing, replace air inside the tube with nitrogen gas to prevent copper oxide from forming.
- To insulate the distribution joint, use the supplied tubing insulation. (If using insulation other than that supplied, make sure that its heat resistance is 120 ˚C or higher.)
- For additional details, refer to the installation instructions provided with the outdoor unit.




**In case of horizontal position**



**In case of vertical position (directed upward)**

Fig. 2-261

# 7. Optional Parts

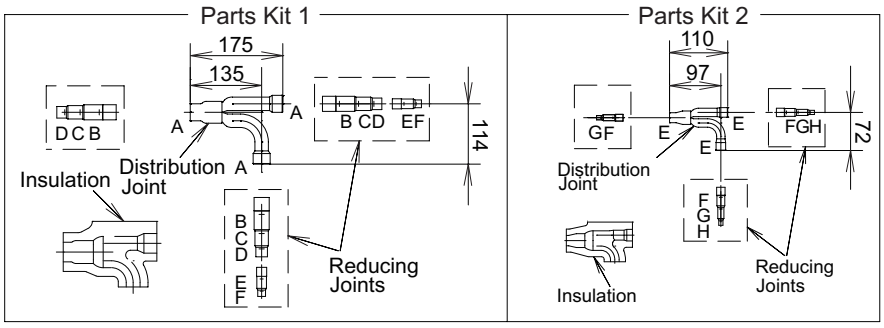
## ■ CZ-P680BK2 (for R410A)

### How to Attach Distribution Joint

1. Accompanying Parts
   Check the contents of your distribution joint kit.

| Part Name | Parts Kit 1 | Parts Kit 2 |
|---|---|---|
| Distribution Joints | 1 | 1 |
| Insulations | 1 | 1 |
| Reducing Joints | 5 | 3 |

2. Distribution Joint Kits (with insulation)




- Size of connection point on each part (Shown are inside diameters of tubing)

| Size | mm | Inch |
|---|---|---|
| Part A | ø28.58 | 1-1/8 |
| Part B | ø25.4 | 1 |
| Part C | ø22.22 | 7/8 |
| Part D | ø19.05 | 3/4 |
| Part E | ø15.88 | 5/8 |
| Part F | ø12.7 | 1/2 |
| Part G | ø9.52 | 3/8 |
| Part H | ø6.35 | 1/4 |

3. Making Branch Connections

- For branching tubes, install 150mm or larger (including reducer) straight tubing up to the point where the tube branches (or after the point where the tubes join together). (Fig. 2-262)
- Using a tube cutter, cut the joints at the diameter required to match the outside diameter of the tubing you are connecting. (This is usually done at the installation site.)
  The tube diameter depends on the total capacity of the indoor unit. Note that you do not have to cut the joints if it already matches the tubing end size. For size selection of the tube diameter, refer to the installation instructions provided with the outdoor unit.

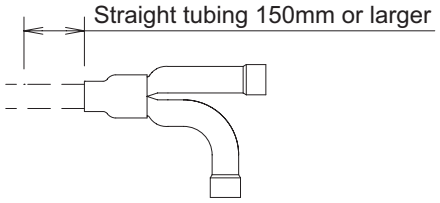



**Fig. 2-262**

**NOTE**

Avoid forceful cutting that may harm the shape of the joints or tubing. (Inserting the tubing will not be possible if the tube shape is not proper.)

- Cut off as far away from stopper as possible. (Fig. 2-263)

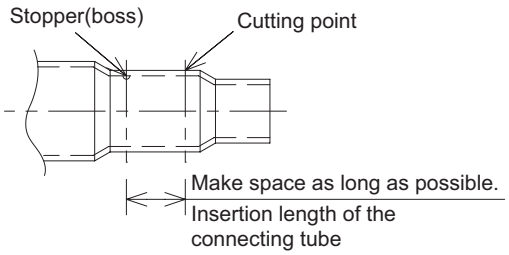
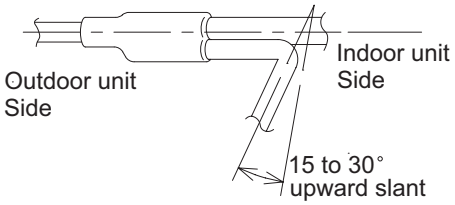
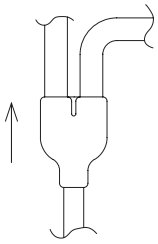



**Fig. 2-263**

- After cutting the joints, be sure to remove burrs on the inside of the joints. (If the joints have been squashed or dented badly, reshaped them using a tube spreader.)
- Make sure there is no dirt or other foreign substances inside the distribution joint.
- The distribution joint can be either horizontal or vertical. (Fig. 2-264)
  In the case of horizontal, the L-shaped tubing must be slanted slightly upward (15˚ to 30˚).
- When brazing, replace air inside the tube with nitrogen gas to prevent copper oxide from forming.
- To insulate the distribution joint, use the supplied tubing insulation. (If using insulation other than that supplied, make sure that its heat resistance is 120 ˚C or higher.)
- For additional details, refer to the installation instructions provided with the outdoor unit.




**In case of horizontal position**



**In case of vertical position (directed upward or downward)**

**Fig. 2-264**

# 7. Optional Parts

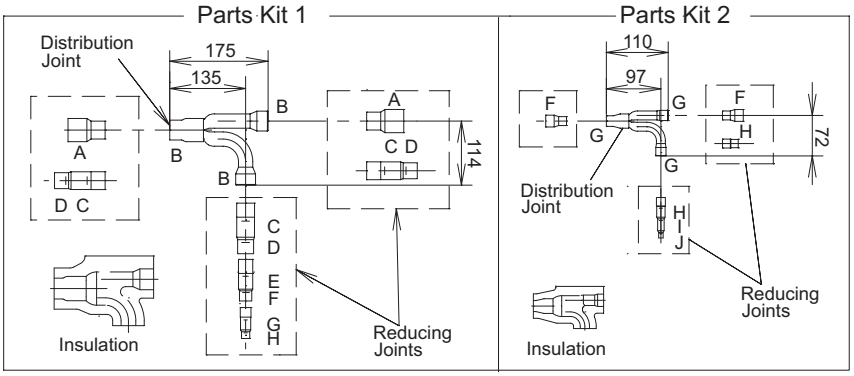
## ■ CZ-P1350BK2 (for R410A)

### How to Attach Distribution Joint

1. Accompanying Parts
   Check the contents of your distribution joint kit.

| Part Name | Parts Kit 1 | Parts Kit 2 |
|---|---|---|
| Distribution Joints | 1 | 1 |
| Insulations | 1 | 1 |
| Reducing Joints | 7 | 4 |

2. Distribution Joint Kits (with insulation)




- Size of connection point on each part (Shown are inside diameters of tubing)

| Size | mm | Inch |
|---|---|---|
| Part A | ø38.1 | 1-1/2 |
| Part B | ø31.75 | 1-1/4 |
| Part C | ø28.58 | 1-1/8 |
| Part D | ø25.4 | 1 |
| Part E | ø22.22 | 7/8 |
| Part F | ø19.05 | 3/4 |
| Part G | ø15.88 | 5/8 |
| Part H | ø12.7 | 1/2 |
| Part I | ø9.52 | 3/8 |
| Part J | ø6.35 | 1/4 |

3. Making Branch Connections

- For branching tubes, install 150mm or larger (including reducer) straight tubing up to the point where the tube branches (or after the point where the tubes join together). (Fig. 2-265)
- Using a tube cutter, cut the joints at the diameter required to match the outside diameter of the tubing you are connecting. (This is usually done at the installation site.)
  The tube diameter depends on the total capacity of the indoor unit. Note that you do not have to cut the joints if it already matches the tubing end size. For size selection of the tube diameter, refer to the installation instructions provided with the outdoor unit.

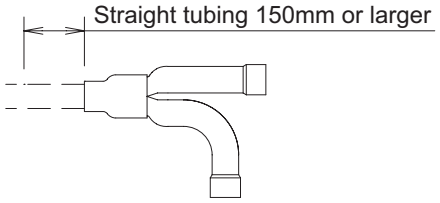



**Fig. 2-265**

**NOTE**

Avoid forceful cutting that may harm the shape of the joints or tubing. (Inserting the tubing will not be possible if the tube shape is not proper.)

- Cut off as far away from stopper as possible. (Fig. 2-266)
- After cutting the joints, be sure to remove burrs on the inside of the joints. (If the joints have been squashed or dented badly, reshaped them using a tube spreader.)
- Make sure there is no dirt or other foreign substances inside the distribution joint.
- When brazing, replace air inside the tube with nitrogen gas to prevent copper oxide from forming.
- To insulate the distribution joint, use the supplied tubing insulation. (If using insulation other than that supplied, make sure that its heat resistance is 120 ˚C or higher.)
- For additional details, refer to the installation instructions provided with the outdoor unit.

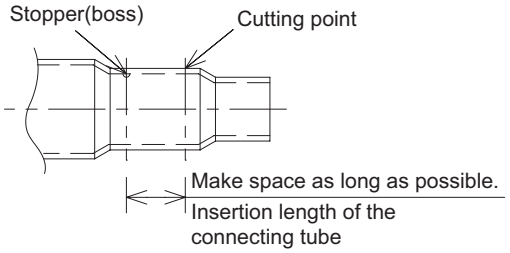



**Fig. 2-266**

# 7. Optional Parts

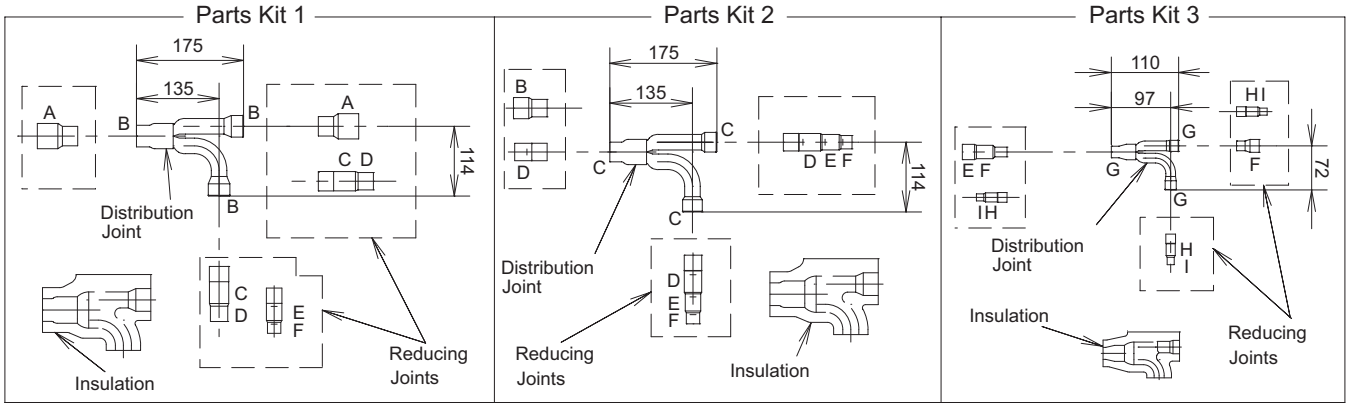
## ■ CZ-P680PJ2, CZ-P1350PJ2 (for R410A)

| Model | Capacity | Parts Kit Combination | |
|---|---|---|---|
| CZ-P1350PJ2 | 135kW or less | Parts Kit 1 | Parts Kit 3 |
| CZ-P680PJ2 | 68kW or less | Parts kit 2 | Parts Kit 3 |

### How to Attach Distribution Joint

1. Accompanying Parts
   Check the contents of your distribution joint kit.

2. Distribution Joint Kits (with insulation)




- Size of connection point on each part (Shown are inside diameters of tubing)

| Size | Part A | Part B | Part C | Part D | Part E | Part F | Part G | Part H | Part I | Part J |
|---|---|---|---|---|---|---|---|---|---|---|
| mm | ø38.1 | ø31.75 | ø28.58 | ø25.4 | ø22.22 | ø19.05 | ø15.88 | ø12.7 | ø9.52 | ø6.35 |
| Inch | 1-1/2 | 1-1/4 | 1-1/8 | 1 | 7/8 | 3/4 | 5/8 | 1/2 | 3/8 | 1/4 |

3. Making Branch Connections

- For branching tubes, install 150mm or larger (including reducer) straight tubing up to the point where the tube branches (or after the point where the tubes join together). (Fig. 2-267)
- Using a tube cutter, cut the joints at the diameter required to match the outside diameter of the tubing you are connecting. (This is usually done at the installation site.)
  The tube diameter depends on the total capacity of the indoor unit. Note that you do not have to cut the joints if it already matches the tubing end size. For size selection of the tube diameter, refer to the installation instructions provided with the outdoor unit.

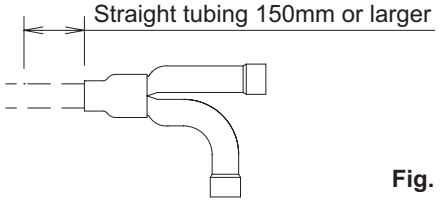



**Fig. 2-267**

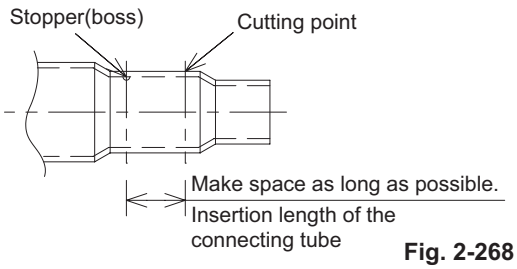



**Fig. 2-268**

**NOTE**

Avoid forceful cutting that may harm the shape of the joints or tubing. (Inserting the tubing will not be possible if the tube shape is not proper.)

- Cut off as far away from stopper as possible. (Fig. 2-268)
- After cutting the joints, be sure to remove burrs on the inside of the joints. (If the joints have been squashed or dented badly, reshaped them using a tube spreader.)
- Make sure there is no dirt or other foreign substances inside the distribution joint.
- The distribution joint can be either horizontal or vertical. (Fig. 2-269)
  In the case of horizontal, the L-shaped tubing must be slanted slightly upward (15˚ to 90˚).
- When brazing, replace air inside the tube with nitrogen gas to prevent copper oxide from forming.
- To insulate the distribution joint, use the supplied tubing insulation. (If using insulation other than that supplied, make sure that its heat resistance is 120˚C or higher.)
- For additional details, refer to the installation instructions provided with the outdoor unit.

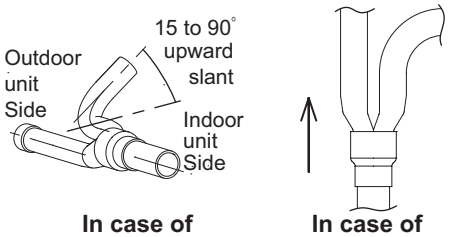



**Fig. 2-269**

**Direction of Distribution Joint**

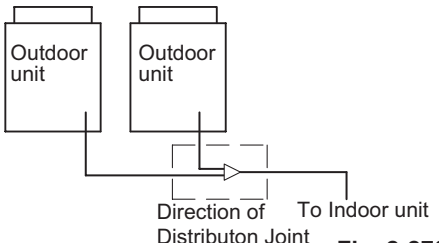



**Fig. 2-270**

# 7. Optional Parts

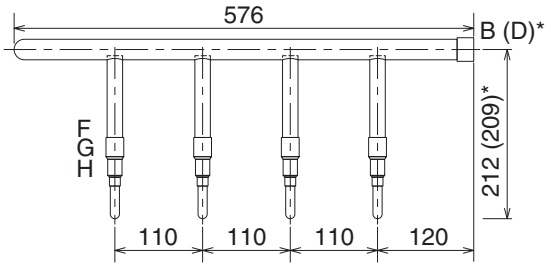
## ■ CZ-P4HPC2, CZ-P4HP2C2, CZ-P4HP1C2 (for R410A)

**Header Tube Installation**

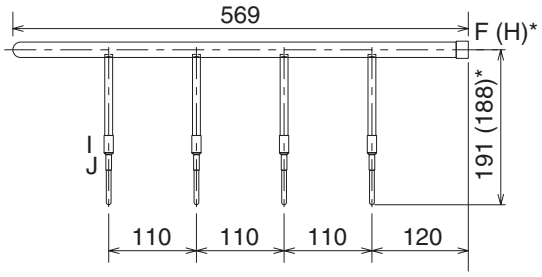
### Tube size

Unit : mm

Part No.1



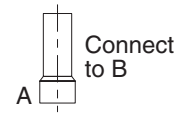

Part No.2



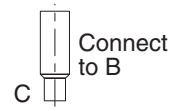

Part No.3

Part No.4

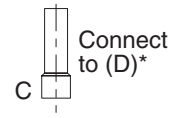
Part No.5



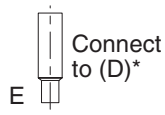

Part No.6



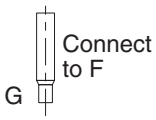

Part No.7



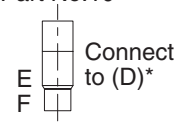

Part No.8



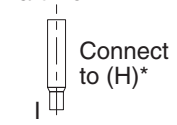

Part No.9




Part No.10




Part No.11




**NOTE** * The values and alphabets given in the parenthesis indicate the size of CZ-P4HPC2, P4HP1C2.

- Size of connection joint on each part (shown are inside diameter of tubing)

| Size | mm | Inch |
|---|---|---|
| Part A | ø38.1 | 1-1/2 |
| Part B | ø31.75 | 1-1/4 |
| Part C | ø28.58 | 1-1/8 |
| Part D | ø25.4 | 1 |
| Part E | ø22.22 | 7/8 |
| Part F | ø19.05 | 3/4 |
| Part G | ø15.88 | 5/8 |
| Part H | ø12.7 | 1/2 |
| Part I | ø9.52 | 3/8 |
| Part J | ø6.35 | 1/4 |

### Check!

Confirm the parts supplied in the header tube set. The content shows as shown in the table below.

| | Content |
|---|---|
| Part No.1 | Header tube to gas side |
| Part No.2 | Header tube to liquid side |
| Part No.3 | Insulator for part No.1 |
| Part No.4 | Insulator for part No.2 |
| Part No.5 | Reducer(attached to P4HP2C2) |
| Part No.6 | Reducer(attached to P4HP2C2) |
| Part No.7 | Reducer(attached to P4HPC2) |
| Part No.8 | Reducer(attached to P4HPC2) |
| Part No.9 | Reducer(attacked to P4HP2C2) |
| Part No.10 | Reducer(attached to P4HP1C2) |
| Part No.11 | Reducer(attached to P4HP1C2) |

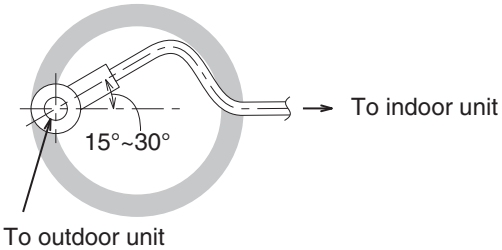
### Installation

- Be sure to handle the header tube in the correct direction as shown below.

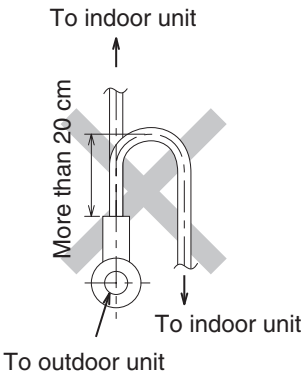
**<Horizontal use>**

- Be sure to use the tube in the 15-degree to 30-degree tilt position. Regarding the branch tube of the indoor unit side, raise the tube correctly as shown in “Horizontal sideways use” and joint the tube sideways.

Horizontal sideways use

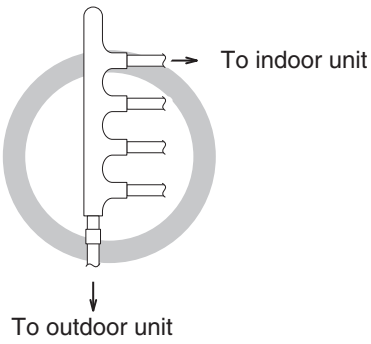


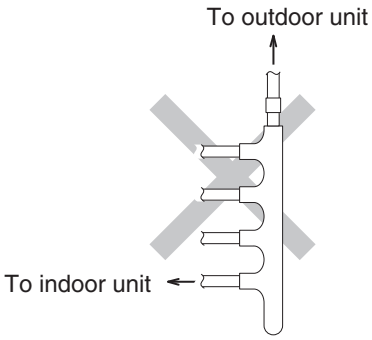

Horizontal upward use



# 7. Optional Parts

**<Vertical use>**



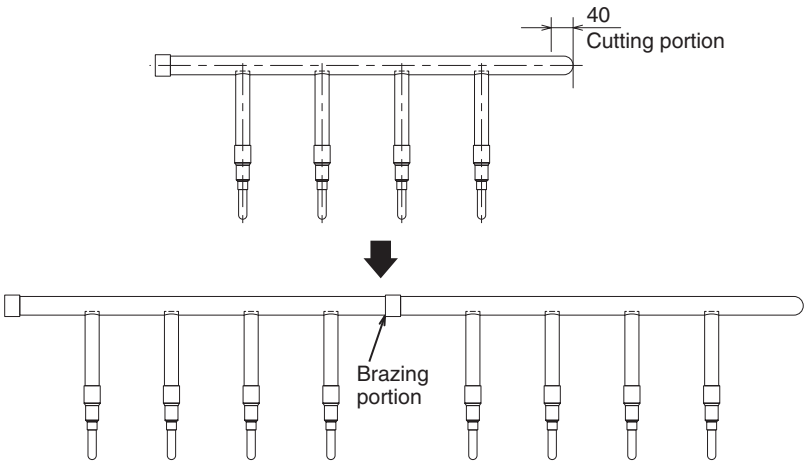

- Cut off the header tube by the pipe cutter according to meet the demand of the local tube size selected in consideration of the total amount of indoor units.
  (It is not necessary to cut off the tube if it is identical to the tip of the size.)

**NOTE**

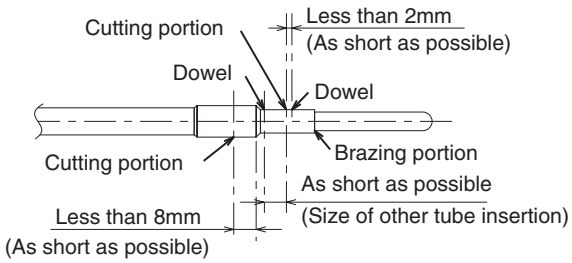
Do not forcibly cut off the tube to escape deformation. (If doing so, connection tube cannot be inserted.)
When selecting the size, refer to “Installation Instructions” supplied with the outdoor unit.

- When using with 3 indoor units, cut off the tube and joint in the position fitted to the refrigerant tubing size at the side of 3 indoor units. When not to use some of the header tubes, leave as-is.
- When using with 5 to 8 indoor units, joint two header tubes as shown below.

**In case of using header tube :**




**Tube cutting portion :**




- After cutting off the tubing, carefully remove burrs from the cut cross section of the tube and make a smooth finish.
  (If there is any hollow on the tube, enlarge the opening port by a mechanical pipe expander.)
- Use the supplied reducer according to the tube size from the side of outdoor unit. In this case, braze it in the local field.
- Check that there is no foreign substance inside the branch tube.
- Use the supplied insulator for the insulation of the branch tube.
  (When using other than that, be sure to insulate it to tolerate the temperature of more than 120°C.)
- For the details, refer to “Installation Instructions”.

**Request for Replacement of Nitrogen When Brazing**

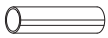
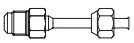
If the replacement of nitrogen was not carried out when brazing the refrigerant tube of the outdoor unit and indoor unit, oxidized scale occurs and the motor valve and strainer become clogged.
This will cause malfunction. It is necessary to replace the air in the tube with the nitrogen gas when brazing the tube and prevent the trouble caused by the oxidized scale.

# 7. Optional Parts

## 7-2. RAP Valve Kit (Refrigerant Accumulation Protector Valve Kit)

### ■ CZ-P160RVK2 (for R410A)

1. Accessories

| Part name | Figure | Q'ty | Remarks |
|---|---|---|---|
| Strainer assembly for gas tube |  | 2 | For gas tube<br>NOTE Two pieces were joined at the time of shipment from the factory. Separate them for use. |
| Flare insulator |  | 2 | For gas tube |
| |  | 2 | For liquid tube |
| Insulating tape |  | 4 | For flare nut sections of gas and liquid tube |
| Vinyl clamp |  | 14 | For both ends of insulator |
| Washer |  | 2 | For suspension bolt |
| Suspension hook |  | 1 | Used to suspend RAP valve kit |
| M4 screw |  | 4 | Used to suspend RAP valve kit |
| Connecting tube |  | 2 | For ø12.7 gas tube connection |
| |  | 2 | For ø9.52 liquid tube connection |

2. Valve Kit Dimensions and Components

The maximum capacity of the indoor unit that can be connected is 14 kW (5 hp).

For 22.4 kW (8 hp) and 28 kW (10 hp) units, use 2 RAP valve kits connected in parallel. (Refer to Fig. 2-277)

**Dimensions and Components**

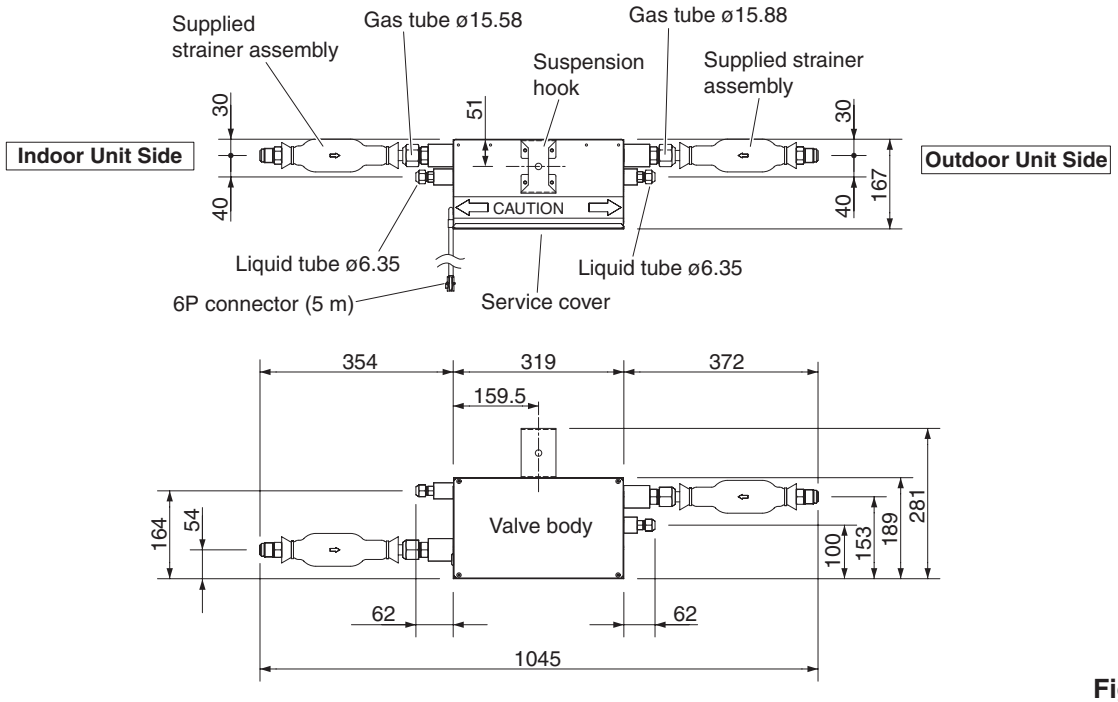



Fig. 2-271

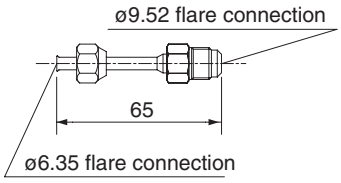
**NOTE**

This figure shows the valve body with the suspension hook and strainer assemblies installed.

# 7. Optional Parts

**Connecting Tube Shape**
**(For ø9.52 liquid tube connection)**

**Accessories**

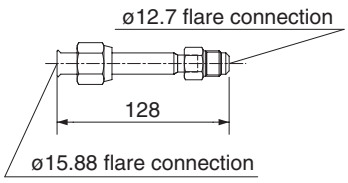



- When insulating this tube, use the thermal insulation provided for the liquid tubes.
- This insulation is used when connecting the ø9.52 liquid tube.

**Fig. 2-272**

**Connecting Tube Shape**
**(For ø12.7 gas tube connection)**

**Accessories**




- Thermal insulation for this tube is not supplied. Use field-supply insulation.
- This insulation is used when connecting the ø12.7 gas tube. (It is used between the strainer assy and the connected tubing.)

**Fig. 2-273**

3. Air-tightness Test

Nitrogen is sealed inside the main unit. Before loosening the flare section, perform the following air-tightness check. Use pliers or a similar tool to bend the end of the indoor unit hermetically sealed tubing so that a crack is formed. Verify that a "pffft" sound occurs.

**Air-tightness Test**

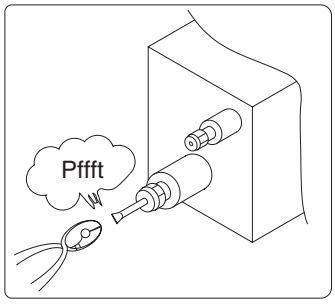



**Fig. 2-274**

4. Installation

(1) Preparation

- Fit the supplied suspension hook to the valve body with 4 screws.
- Next, fit the strainer assemblies to the gas tube inlet and outlet and tighten the flare nut.
- In doing this, **be sure to use 2 spanners** together and tighten the flare nut with the tightening torque shown in Table 2-22.
- Since the RAP Valve Kit contains nitrogen, be careful when removing the flare nut.
- The diameter of the indoor unit tubing may be different from the diameter of the tubing for this unit.
  If this is the case, refer to Figs. 2-272 and 2-273 (for the liquid tube and gas tube, respectively) and follow the instructions there.
  For 22.4 kW (8hp) and 28 kW (10hp) indoor units, connect 2 RAP Valve Kits in parallel.

**Assembly Drawing**

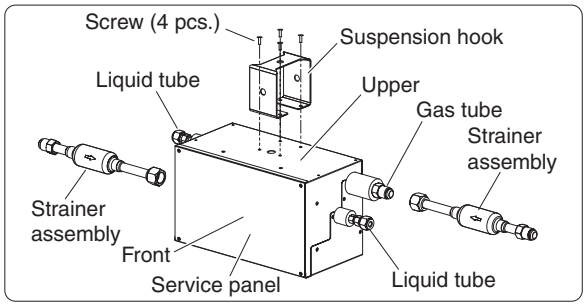



**Fig. 2-275**

**Service Space**

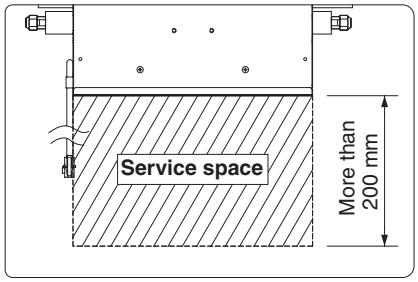



**Fig. 2-276**

**Example of RAP Valve Kit Installation**

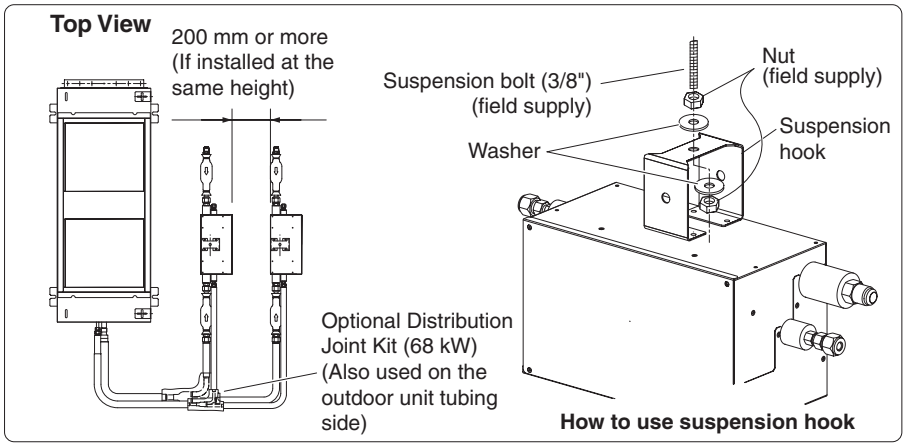



**Fig. 2-277**

# 7. Optional Parts

(2) Notes on Installation

- **For the direction for connecting the indoor and outdoor unit and RAP Valve Kit, be sure to follow the instructions on the label of the valve body.**

- Be sure to secure the valve body by using its structure with the suspension bolt, etc.
- Install the valve body within **a distance of 30 m from the indoor unit** as shown in Fig. 2-277.
- Be sure to install the valve body **with its upper surface facing upward**.
- When installing the valve, ensure a service space of 200 mm or more (Fig. 2-276).
- Secure the valve body by using the upper or side holes of the suspension hook.
- Do not place the valve body directly on the ceiling surface. Also, do not install near conference rooms or other rooms where extremely quiet operation is required.
- **Never do drilling or welding** on the sheet metal of the valve body.
- Place the valve body so that it does not hinder draining.
  If using the optional tubing kit, refer to the installation manual for the kit.

**Connection**

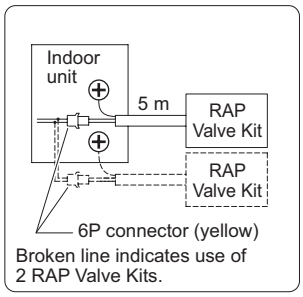



**Fig. 2-278**

5. Wiring, Tubing, and Insulation

(1) Wiring

- Put the 6P connector from the RAP Valve Kit through the power inlet and connect it to the 6P connector (yellow). (See Fig. 2-278)
- Secure the supplied cable with the binding band inside the unit.
- Do not run the supplied cable through the same wiring conduit together with the remote control line and inter-unit control line.

(2) Refrigerant Tubing

- **Be sure to use 2 spanners** together for removing the flare nut at the tubing connection or when tightening the flare nut during tubing connection.
- To prevent destruction in the flared portion due to over-tightening the flare nut, tighten the nut using the table at the right as a standard torque.

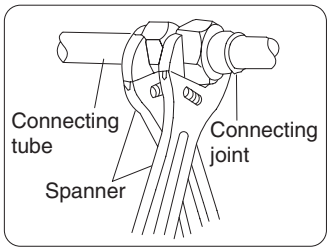



**Table 2-22. Tightening Torque**

| Tubing size | Tightening torque | |
|---|---|---|
| | (N•m) | (kgf•cm) |
| ø6.35 (1/4") | 16±2 | Approx. 140 – 180 |
| ø9.52 (3/8") | 38±4 | Approx. 340 – 420 |
| ø12.7 (1/2") | 55±6 | Approx. 490 – 610 |
| ø15.88 (5/8") | 75±7 | Approx. 680 – 820 |
| ø19.05 (3/4") | 110±10 | Approx. 1,000 – 1,200 |

(3) Insulation

**Be sure to provide insulation after finishing leak inspection.**

- Be sure to provide insulation to the tubing.
- Use insulation with a thickness of 10 mm or more, with heat resistance of 120°C or more for gas tubes and 80°C or more for liquid tubes. If the ambient conditions exceed DB 30°C and RH 70%, increase the thickness of the thermal insulation by one step.
- Put the supplied insulating tape, 2 pieces of each, around the flare nut portion of the liquid tube.

**Insulation**

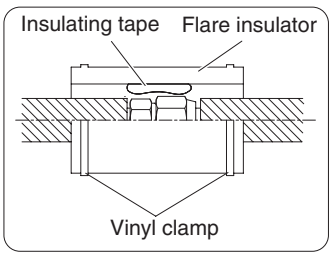



**Fig. 2-279**

- Next, put the supplied flare insulator around the flare nut portion and secure both ends with the vinyl clamps.
- Failure to provide insulation may cause water leakage due to condensation.
- Thermal insulation is not supplied with the connecting tube (for connecting to the ø12.7 gas tube).
  If this tube is used, obtain insulation (field supply) separately.

# 7. Optional Parts

## 7-3. External Electronic Expansion Valve Kit for Indoor Unit

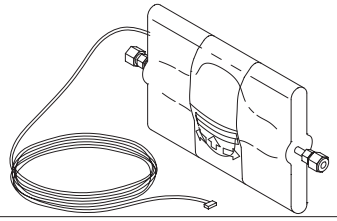
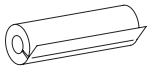
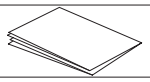
### ■ CZ-P56SVK2, CZ-P160SVK2 (for R410A)

Precautions in this manual are given in the form of “Warnings” or “Cautions.
” Both types of precautions contain important information related to your safety, the safety of users, and the correct operation, installation, or maintenance of the air conditioning system. Be sure to carefully observe all relevant precautions.

**WARNING** This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.

**CAUTION** This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.

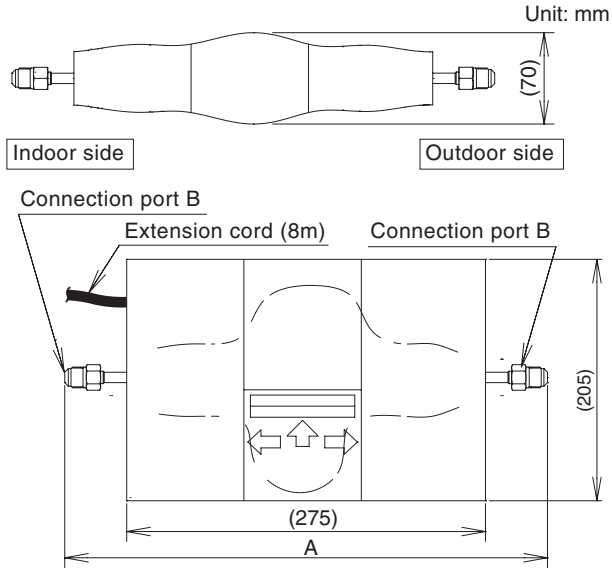
- This external electronic expansion valve is compatible with the refrigerants listed below.
  R410A, R407C, R22
- **Checking Parts**
  Please check these parts below that came in the box.

| | Description | Shape | Q'ty |
|---|---|---|---|
| 1 | External electronic expansion valve (Extension cord 8 m) |  | 1 |
| 2 | Flare insulator |  | 2 |
| 3 | Clamp (Large: 350 mm, Small: 200 mm) |  | Large: 2 Small: 4 |
| 4 | Connector-converter cable |  | 1 |
| 5 | Installation manual |  | 1 |
| 6 | Insulating tape |  White (heat resisting) | 2 |

**Installation Procedure**

**1. Positioning for Installation**

- The valve should be connected to the liquid tube.
  Determine the position for installation referring to the diagram of outer dimensions. (Fig. 2-280)
  Refrigerant-flow noise may occur from the external electronic expansion valve. As a guide, the distance from the indoor unit should be a minimum of 5 m, but less than 8 m. (Install away from locations where strictly quiet operation is required.) If this distance is unavailable, install inside the ceiling or in another location where noise insulation is possible.
  This is a functional component, and therefore may require inspection and replacement.
  Consider this when deciding the installation location.
  (For example, place near an inspection port, or provide one.)
- This valve is for indoor use. Do not install the valve outdoors.




| Type | A (mm) | B (mm) |
|---|---|---|
| 56 | 325 | ø6.35 |
| 160 | 360 | ø9.52 |

**Fig. 2-280 Diagram of outer dimensions**

# 7. Optional Parts



**2. Cutting and Flaring of Liquid Tube**

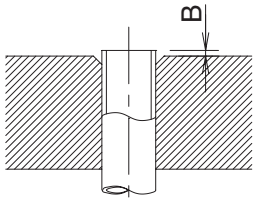
After determining the position for installation, cut the liquid tube and flare the connecting portion.
(Pay attention to the notes below when flaring the tubes.)

**NOTE**

- After cutting the tube, deburr and finish the end face smoothly and correctly.
- Do not damage tubes while flaring.
- Take care not to allow dirt and deburred chips into the tube.
- Use the flare nut which came with External Electronic Expansion Valve Kit.
- The flaring dimensions for R410A are different from the conventional dimensions for R407C and R22. For R410A, the specially created flaring tool is recommended.
  However a conventional tool can be used by adjusting the amount of copper tube projection as shown in the table below.

Unit: mm

| Rigid (clutch type) | | |
|---|---|---|
| R410A | | R407C, R22 |
| If special R410A tool is used | If conventional tool is used | If conventional tool is used |
| B=0~0.5 | 1.0~1.5 | 0~0.5 |




Copper tube projection for flaring: B (mm)

**Fig. 2-281**

**3. Connection of External Electronic Expansion Valve with Tubing**

In connection with tubing, take care to fit the external electronic expansion valve in the right direction. Be sure to install with the UP mark on the label pointing upwards. Also when connecting the flare, use the arrow marks on the label to check the directions of the indoor unit side and outdoor unit side.
(The wiring outlet side faces the indoor unit.)
(Refer to Fig. 2-282.)

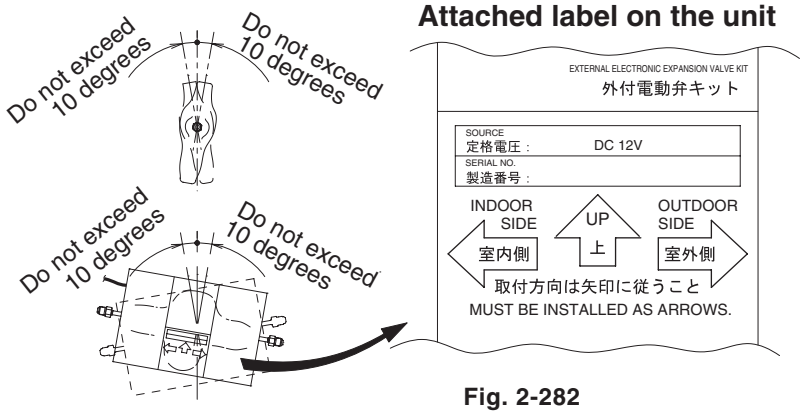



**Fig. 2-282**

- Tightening flare nuts

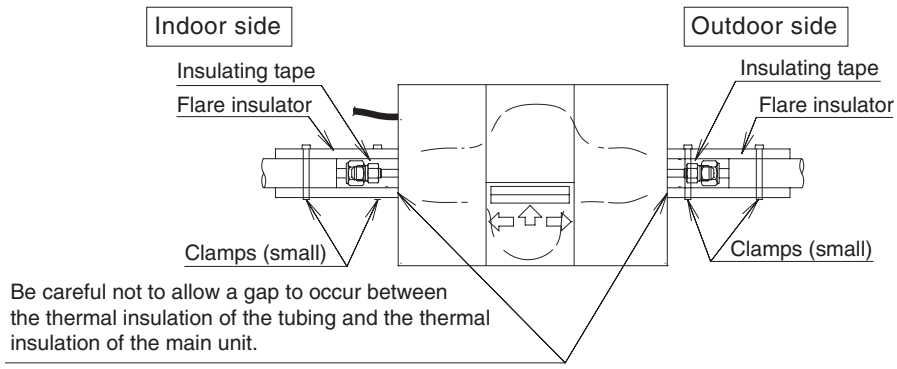
CAUTION

**Be sure to use 2 spanners together when removing or tightening the flare nuts. After connection with the tubing, tighten the flare nuts by the correct torque. Failure to tighten the nuts correctly can cause loosening and damage on the flared portion, resulting in accidents by oxygen deficiency due to refrigerant leaks.**

| Tubing size | Tightening torque |
|---|---|
| ø6.35 (1/4") | 14~ 18 N · m (140~180 kgf · cm) |
| ø9.52 (3/8") | 34~ 42 N · m (340~ 420 kgf · cm) |

**4. Flare Insulation of Tubing**

After completing a leakage test, apply heat insulation. (Fig. 2-283)



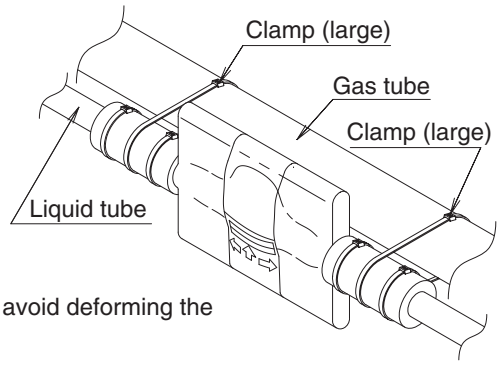

* Use the flare insulator provided with the product.

**Fig. 2-283**

# 7. Optional Parts

**5. Securing the External Electronic Expansion Valve After Connection with Tubing**

After connection with tubing, secure the external electronic expansion valve using the supplied clamps (large) to hold it against the gas tube. (Fig. 2-284)




**NOTE**

Be careful not to tighten the clamps with excessive force, in order to avoid deforming the tubing or other parts.

**Fig. 2-284**

## Wiring Procedure

**WARNING** **Be sure to turn the power off at the mains before removing or connecting connectors to avoid electric shock hazard.**

● **Connection of External Electronic Expansion Valve with Extension Cord**

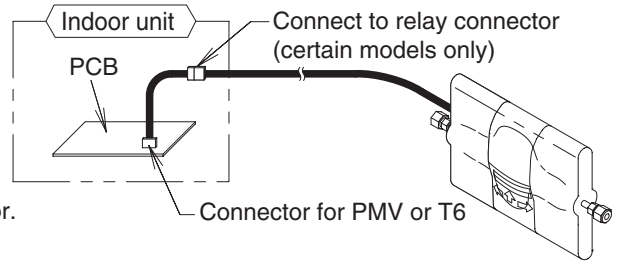
(1) Turn the power off.

(2) Turn the power on. (This step is unnecessary if the model does not have an electronic expansion valve.)

(3) Wait 1 minute after the power is on and then turn the power off again at the mains.
(This step is unnecessary if the model does not have an electronic expansion valve.)
* The electronic expansion valve becomes full-open in the 1 minute.
Do not give instructions for operation through the remote control during this time.

(4) Open the electrical component box. From the control PCB, disconnect the connector to the indoor unit internal electronic expansion valve. (This step is unnecessary if the model does not have an electronic expansion valve.)

(5) Connect the external electronic expansion valve. (Fig. 2-285)
Connect the external electronic expansion valve connector to the indoor unit control PCB (PMV or T6).
After completing the wiring process, close the cover of the electrical component box.
* With some models that do not include an electronic expansion valve, a relay connector is included. Connect this relay connector.




(6) Turn the mains power breaker back on.
This procedure is now completed.

**Fig. 2-285**

## Wiring Procedure (Using the Attached Cable)

Depending on the model of indoor unit that is connected, this product may require the use of a supplied connector-converter cable. Refer to the below for the corresponding units and the method of use.

● **If the indoor unit control PCB has a 5P plug, use the supplied connector-converter cable.**

● **Using the connector-converter cable**
The connector-converter cable is used by connecting it to the extension cable (8 m) that runs from the electronic expansion valve unit. (Refer to Fig. 2-286.)
After connecting the connector-converter cable, follow the above wiring procedure and connect the cable to the indoor unit control PCB.
* Depending on the model, a relay connector may be connected on the indoor unit control PCB. If this supplied cable is used, disconnect the relay connector and connect the supplied cable directly to the indoor unit control PCB.

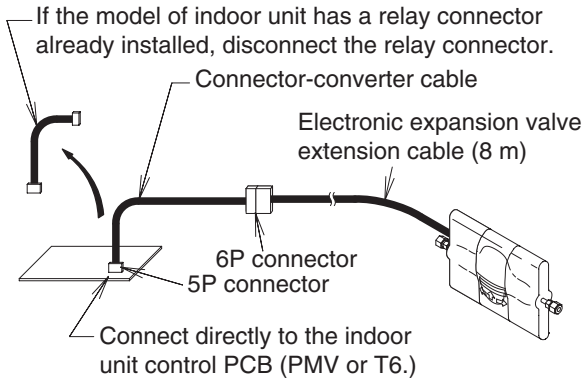



**Fig. 2-286**

# 7. Optional Parts

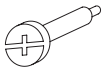
## 7-4. Filter Chamber for Indoor Unit

### ■ CZ-FDU2

**Installation Instructions**

**1. Accessories**

● Check that the following parts are in the box when unpacking.

| Supplied parts | Q'ty | Remarks | Supplied parts | Q'ty | Remarks |
|---|---|---|---|---|---|
| Installation screws (5x40)  | 4 | Fixture for filter chamber | Short-circuit connector  | 1 | |
| Washer  | 4 | Fixture for filter chamber | Instructions  | Each | Installation Instructions, Fan tap |

**2. Installation**

**NOTE**

1. **Be careful handling the unit when installing it inside the ceiling. Use particular care to avoid allowing any impact to strike the side of the filter chamber, as this can result in damage.**
2. Remove the cardboard inserted in the air outlet (4 locations) before installation.

(1) Installing Filter Chamber (Fig. 2-287)

● Align the black sealing material on the filter chamber with the indoor unit. (The filter chamber must be installed in a specific direction, therefore align the shape of the filter chamber with the shape of the indoor unit.)

● Fasten with the supplied installation screws (x4).

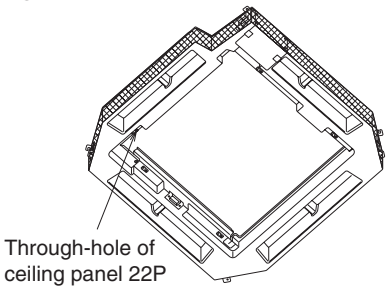
(2) Installing Indoor Unit

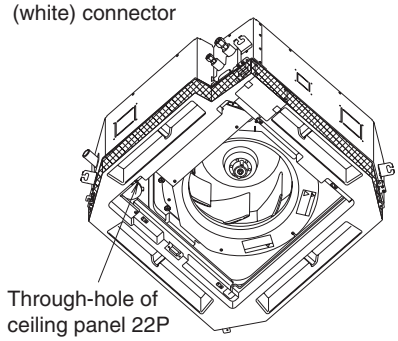
● Install the indoor unit (attached to the filter chamber) in the ceiling. (Install the indoor unit according to instructions supplied with the indoor unit.)

(3) Installing Ceiling Panel (Fig. 2-288)

● Install the ceiling panel to the chamber. (Install the ceiling panel according to instructions supplied with the ceiling panel.)

● First cut off the bundled clamper and insert the ceiling panel 22P (white) connector into the through-hole of the chamber. Then connect it to the 22P connector in the electric component box.



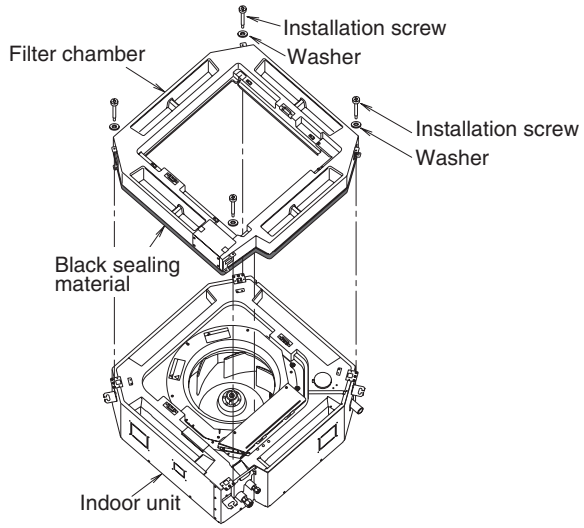




**Fig. 2-287**

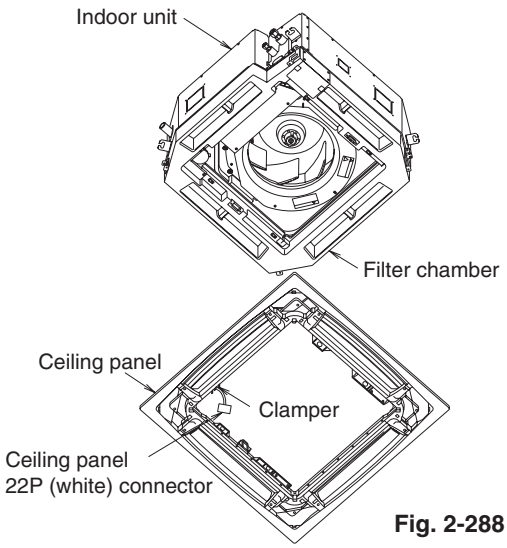



**Fig. 2-288**

# 7. Optional Parts

## 7-5. Air Intake Kit for Chamber

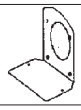
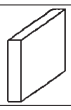
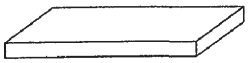
■ **CZ-ATU2**

Duct connection box

**Installation Instructions**

**1. Accessories**

● Check that the following parts are in the box when unpacking.

| Supplied parts | Q'ty | Remarks |
|---|---|---|
| Duct connection box  | 1 | |
| Duct connection box installation bracket  | 1 | |
| Installation flange ( ø100)  | 1 | Duct flange |
| Instruction screw  | 14 | |
| Thermal insulation for installation screws A  | 2 | Polyethylene foam T2 |
| Thermal insulation for installation screws B  | 2 | Polyethylene foam T5 |

**2. Installation**

**NOTE**

**Install the duct connection box after installing the indoor unit. Also, because the duct connection box is attached to the aif-intake plenum, use sufficient care when handling it. Especially avoid any impacts on the side of the air-intake plenum, as this can result in damage.**

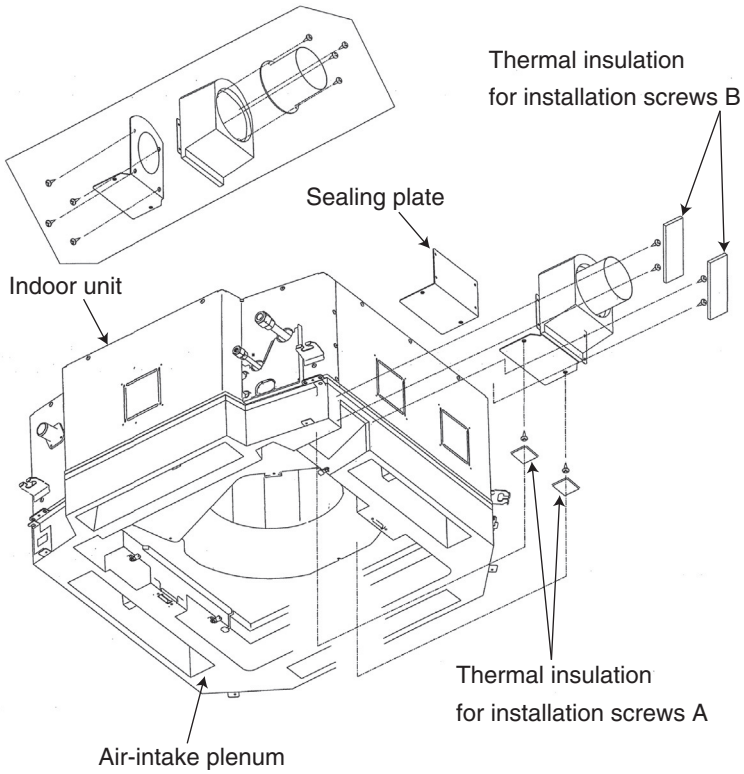
● Follow the instructions in the air-intake plenum installation instructions and install the air-intake plenum on the indoor unit.

(1) Remove the sealing plate from the air-intake plenum.

(2) Fit the duct connection flange and installation bracket into the duct connection box. Fasten with the supplied 8 installation screws.

(3) Fasten the duct connection box to the air-intake plenum with the 6 installation screws.

(4) Apply the supplied thermal insulation A and B to the installation screws.



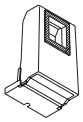
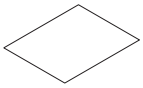
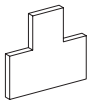
# 7. Optional Parts

## 7-6. Air Intake Kit for Unit

■ **CZ-BCU2**

**Installation Instructions**

**1. Accessories**

| Supplied parts | Q'ty | Supplied parts | Q'ty | Supplied parts | Q'ty |
|---|---|---|---|---|---|
| Connecting box for main unit  | 1 | Instructions  | 1 | Installation screw (4 x 10)  | 4 |
| Sealing insulation "A"  | 2 | Sealing insulation "B"  | 2 | Duct connection flange ($\phi$100, for fresh air intake)  | 1 |

**2. Installation**

(1) Cut and remove the sheet-metal together with an insulation (styrofoam) with a nipper or a cutter knife paying attention to the incision as a marker on the indoor unit. (Fig. 2-289)

**NOTE**

When cutting out the styrofoam, do not insert the blade more than 30mm depth. (If the inside of the drain pan is damaged, this will result in water leakage.)
Also, be careful not to let the chips invade the unit.

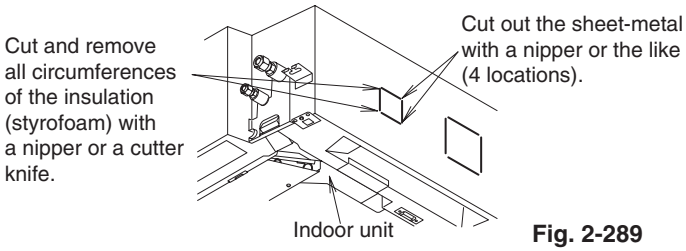



**Fig. 2-289**

**(2) Peel off the insulation of the shaded portion and insert the connecting box for the main unit from the air outlet of the main unit. (Fig. 2-290)**

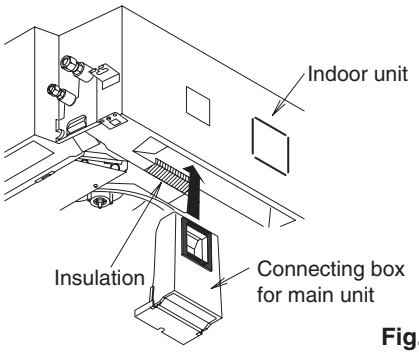



**Fig. 2-290**

**(3) If there is a space between the styrofoam and the sheet-metal, this will result in condensation forming.**
**First seal the supplied insulation "A" to meet the hole of the screw and then seal that of "B". (Fig. 2-291)**

Procedures for sealing insulation

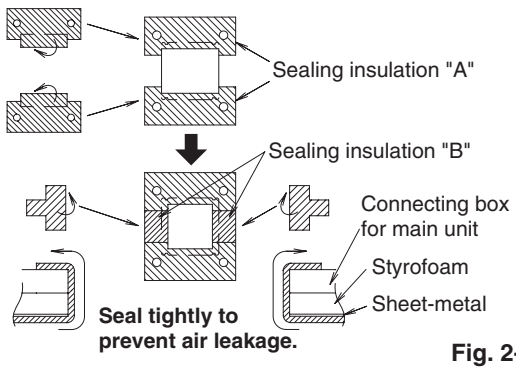



**Fig. 2-291**

**(4) Fasten the flange to the indoor unit supplied with the installation screws (x4). (Fig. 2-292)**

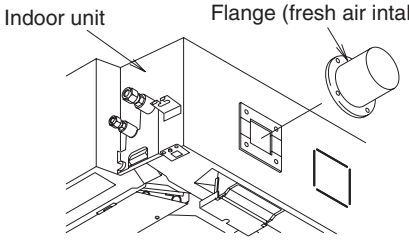



**Fig. 2-292**

# 7. Optional Parts

## 7-7. Air Cut Insulation

### ■ CZ-CFU2

**Installation Instructions**

Use this part to close air flow when setting 3-way or 2-way air discharge, or connecting the duct connection flange ($\phi$150) according to the situation of the unit installation.

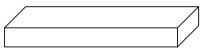
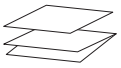
**NOTE**

**When using an optional high-performance filter, a filter grille or a natural evaporation type humidifier, it is impossible to shift the 3-way or 2-way air discharge or make a connection of duct connection flange ($\phi$150).**

**1. Applicable Model & Use**

| Model | Use |
|---|---|
| CZ-CFU2 | ● Close off in case of 3-Way or 2-Way Air Discharge<br>● Close off in case of connecting the duct connection flange ($\phi$150) |

**2. List of Parts**

| Model | Supplied parts | Dimensions | Shape | Q'ty |
|---|---|---|---|---|
| CZ-CFU2 | Part to close air flow | 490 ×70× T40 |  | 2 |
| | Packing | 650 ×100× T2 |  | 2 |
| | Short-circuit connector | |  | 1 |
| | Instructions | | Instructions & Change Procedures of DC Fan Tap  | 2 |

**3. Installation**

**When using the part to close air flow, follow the change procedures of DC Fan Tap and change the fan tap. If not changed, air discharge temperature in the cooling mode drops due to the reduction in airflow. This may result in condensation forming.**

(1) Indoor Unit Installation

● Install the indoor unit in the ceiling. (Install the indoor unit according to instructions supplied with the indoor unit.)

(2) Cut off the part to close air flow and the packing according to the installation dimensions as shown in the right table.
Be careful as the dimensions are different due to the installation location.
Be careful they should be no shorter than the installation dimensions. The excessive cut may result in condensation forming.

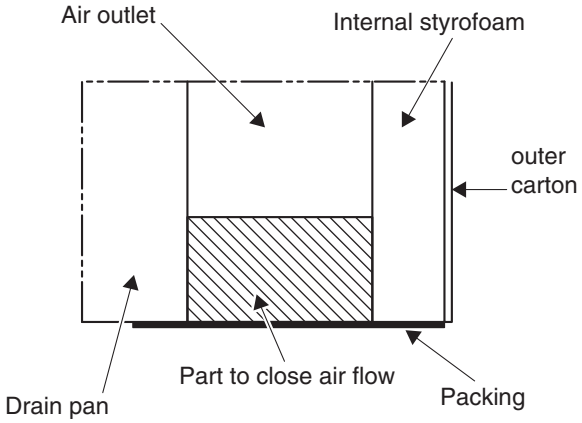
(3) Part to close air flow Installation

● Insert the part to close air flow into the air outlet (styrofoam) of the indoor unit and apply the packing and close. (See Fig. 2-293 and Fig. 2-294.)

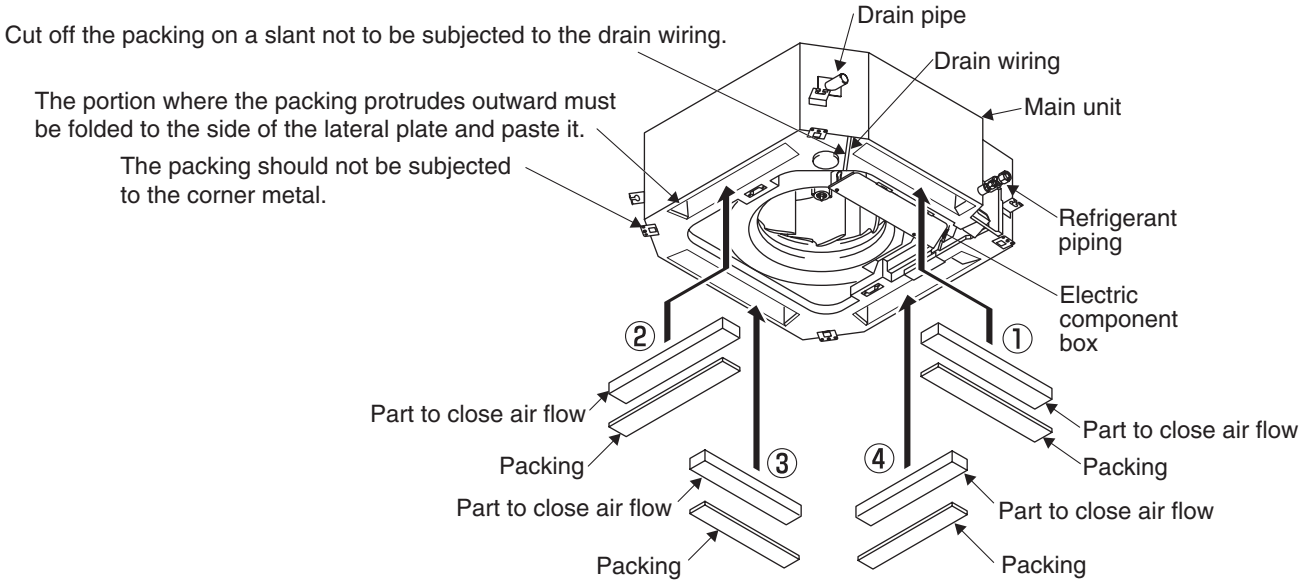
● Paste the packing to cover the internal styrofoam in the unit more than 15mm. (If not covered over 15mm, this may result in condensation forming.)

| Installation location | Name | Installation dimension |
|---|---|---|
| ① | Part to close air flow | 450×70 |
| | Packing | 490×100 |
| ② | Part to close air flow | 490×70 |
| | Packing | 610×100 |
| ③ | Part to close air flow | 490×70 |
| | Packing | 650×100 |
| ④ | Part to close air flow | 400×70 |
| | Packing | 620×100 |

# 7. Optional Parts




**(Fig. 2-293)**

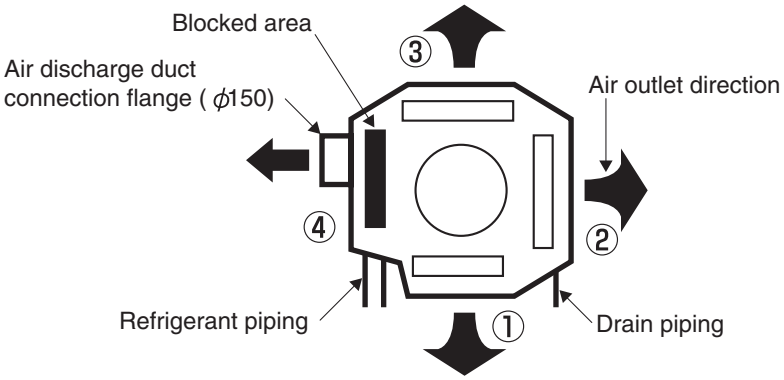



**(Fig. 2-294)**

(4) Block Pattern of Air Outlet (seen from the unit bottom)

- In case of 3-way or 2-way air discharge and connecting the duct connection flange ( $\phi$150), block the air outlet according to the block pattern of air outlet as shown on the next page. Also, select the appropriate piping position referring to the following table. (See Fig. 2-295 to correctly understand the illustration.)

**NOTE** Be careful not to cause condensation, cool wind leak and insulation shortage when installing the duct connection flange ( $\phi$150).

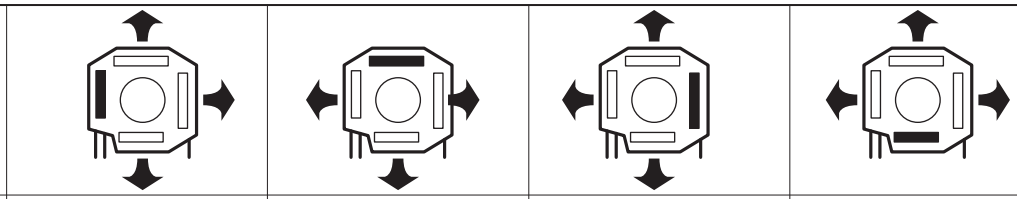



**(Fig. 2-295)**

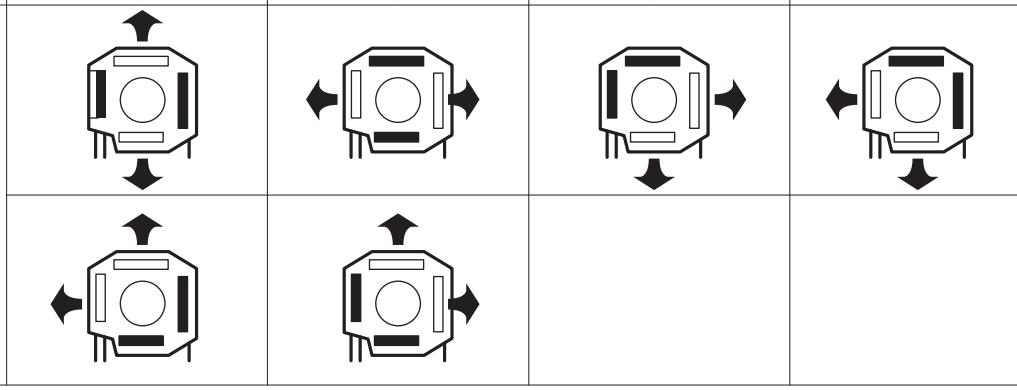
# 7. Optional Parts

● Do not apply any other block pattern of air outlet as listed below.

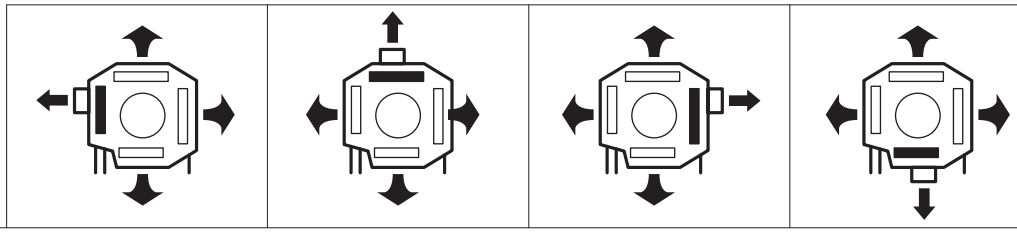
**3-way air discharge**
Capable of blocking
1 direction



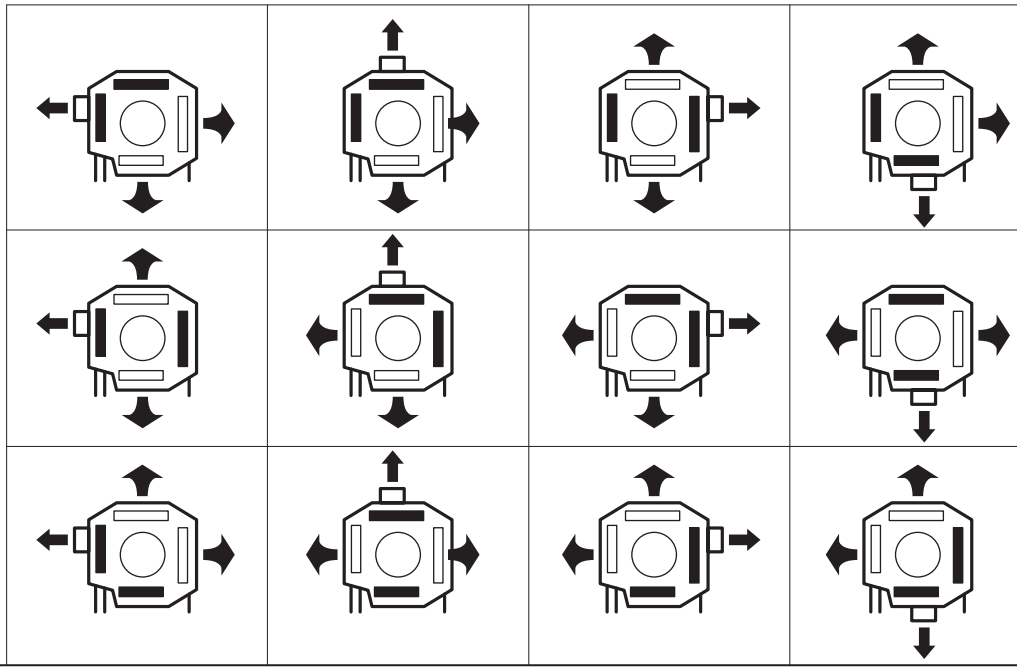
**2-way air discharge**
Capable of blocking
2 directions



**3-way air discharge + connecting air outlet duct connection flange ( $\phi$150)**
Block one of the air outlet and connect the duct connection flange.
Then the air is discharged from the air discharge duct connection flange.



**2-way air discharge + connecting air outlet duct connection flange ( $\phi$150)**
Block two (2) air outlet and connect either of the duct connection flanges. Then the air is discharged from the air discharge duct connection flange. There is, however, only capable of discharging the air from one set of air outlet duct connection flange.



(5) Setting Changes of DC Fan Tap

● Make settings of the wired remote control, timer remote control or indoor unit control P.C. board (using supplied short-circuit connector) according to separate instructions.

● Make settings of 3-way air discharge and 2-way air discharge according to separate instructions.