

Service Manual

Air Conditioner

CS-F50DTE5 CU-L50DBE8



⚠ WARNING

This service information is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

⚠ PRECAUTION OF LOW TEMPERATURE

In order to avoid frostbite, be assured of no refrigerant leakage during the installation or repairing of refrigeration circuit.

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1 Service Information

Notice of Address setting for NEW Ceiling / NEW Outdoor Unit.

The new Ceiling / New Outdoor models are possible to have address setting for twin control by automatic when main power supply is switched on.

(Manual address setting is also possible by using Dip switch on Indoor unit P.C. board.) However, **this address setting is only possible when made proper wiring connection and also Indoor unit should be original virgin unit.**

1.1. Example of trouble at test operation

If found out as following phenomenon at test operation on site, it may have possibility of wrong address setting. Therefore, please ensure of the address setting.

1. LCD display of wired remote control had not illuminate although the main power supply switch is 'on'.
2. LCD display had indicated as normal illumination when power supply switch is 'on', however outdoor unit cannot be operated.
(But, it is necessary to take 3 to 5 minutes for outdoor unit to start from the timing of remote control ON/OFF switch is 'on'.)
3. P.C. board had memorized wrong setting information.
 - a. If main power supply is switched 'on' with the wrong connection.
 - b. When changing the connection or combination of units due to re-installation etc.
 - When changing the system from twin control to normal one to one system.
 - When making the replacement of units as master and slave etc.

1.2. Caution of test operation

Do not touch the remote control switch and do not change any wirings for one minute when the main power supply switch is 'on'.
(Because the unit is having automatic address setting during the first one minute.)

1.3. Caution during automatic address setting

When main power supply switch is 'on', the P.C. board will automatically memorized the connecting system. Consequently, when initial power supply is 'on', there will not be interchangeability of units even of the same type and same capacity unit. Therefore unable to connect the unit to another system.

1.4. Operation range

1.4.1. Power Supply

The applicable voltage range for each unit is given in the following table. The working voltage among the three phases must be balanced within a 3% deviation from each voltage at the compressor terminals. The starting voltage must be higher than 85% of the rated voltage.

MODEL	Unit Main Power		Applicable Voltage	
	Phase, Volts	Hz	Max	Min
CU-				
L34DBE5	1~240	50	264	216
L43DBE5	1~220	50	242	198
	1~230	50	253	207
L50DBE8	3N~380	50	418	342
	3N~400	50	440	360
	3N~415	50	457	374

1.4.2. Indoor and Outdoor Temperature

- Model 50Hz CU-L34DBE5, CU-L43DBE5, CU-L50DBE8

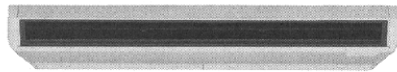
Operating	Hz	Indoor Temp. (D.B./W.B.) (°C)		Outdoor Temp. (D.B./W.B.) (°C)	
		Max	Min	Max	Min
Cooling	50	32/23	21/15	43/-	-15/-
Heating	50	27/-	16/-	24/18	-20/-

2 Features

2.1. New design

2.1.1. Gentle curved styling

- The base has gentle curves which express a functional beauty. It spreads the air quietly over a wide area.



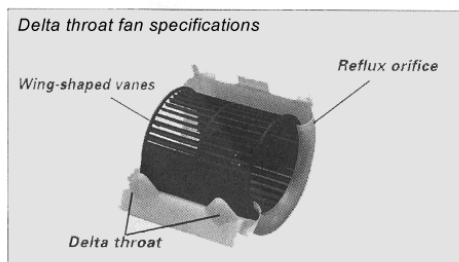
Front view

2.2. Such quietness!

2.2.1. Several new mechanism add up to low 46 dB noise (L50BT - High Fan Speed)

1. Delta throat fan

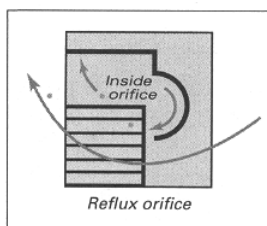
A delta throat (projection) has been attached to the fan outlet to suppress the generation of vortices. This helps maintain air flow speed even at lower fan speeds and is effective in reducing noise.



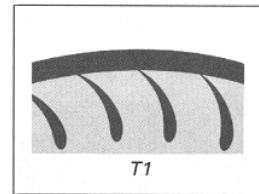
2. Reflux orifice

The orifice at the intake port is equipped with an air flow guide which minimizes the flow disturbances which occur at the orifice and inside the impeller.

This reduces pressure losses inside the casing and also helps reduce noise.



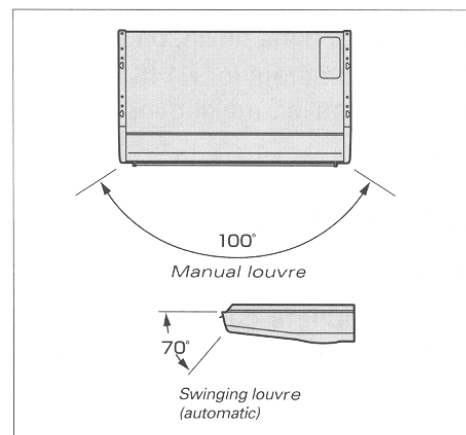
3. Adoption of wing-shaped vanes



- The vanes of the fan have been changed to "aerodynamic" shaped vanes, so that the air flow more smoothly over the vane surfaces and noise is thus suppressed.
- Side filters have been adopted in the pipe partitions. These allow the air intake space to be increased and also further reduce noise.

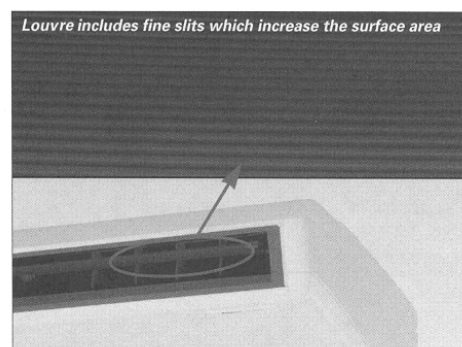
2.2.2. Automatic swinging louvre

- The horizontal air flow angle is a wide 100 degrees (manual). The louvre can swing automatically (through 70 degrees vertically) using the remote control. This increases the area of comfortable air flow and warms the air even to floor level.



2.2.3. Newly-shaped louvre

- The newly-shaped louvre and air outlet effectively distribute the air flow. During cooling, this stops warm air from collecting near the louvre, and prevents freezing.



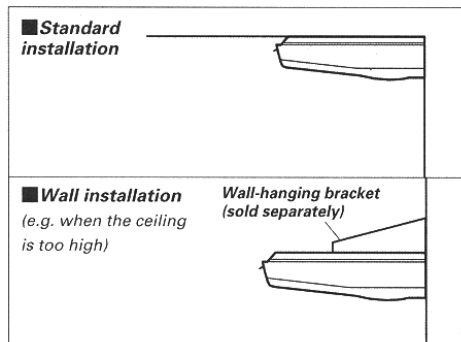
2.3. Easy installation

2.3.1. Easy suspension

- A suspension bolt fixing bracket with 4-point support is attached to the main unit, which increases the space available for installation.

2.3.2. Two installation methods : standard and wall

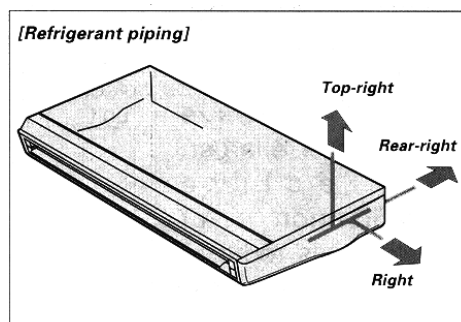
- In addition to the standard (1) ceiling installation, a wall (2) installation method (using a wall-hanging bracket) is available for cases where the ceiling is too high for the main unit to be suspended.



2.4. Piping

2.4.1. 3-direction pipe lead-out

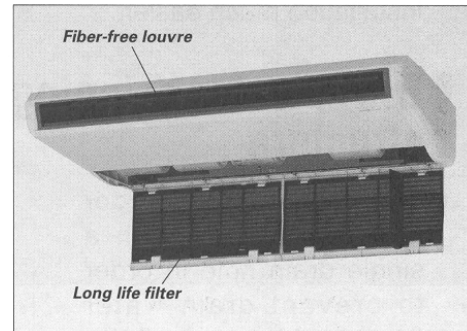
- The refrigerant piping can lead out in one of three directions (right, rear-right and top-right), and the drain pipe direction can be selected from four directions (right, rear-right, left and rear-left).



2.5. Easy maintenance

2.5.1. Long life filter (standard equipment)

- In general office environments, cleaning (maintenance) is not required until after approximately 2,500 hours of operation, thus reducing maintenance work.
- For optimum comfort, it is recommended to clean the air filter every 1-1/2 months.



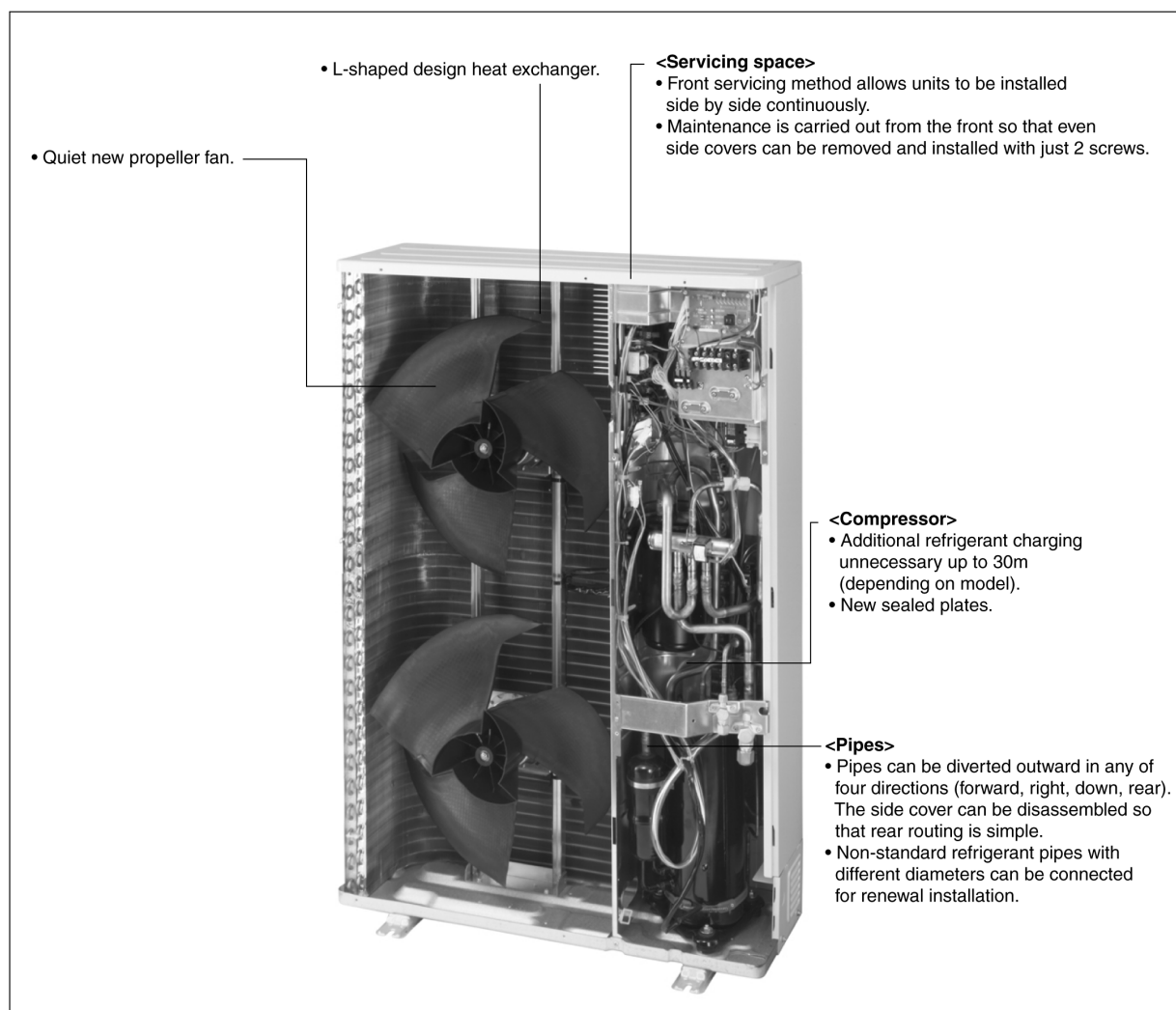
2.5.2. Maintenance is possible from underneath the unit.

- If the bottom panel is detached, the drain pan can then be removed and installed from underneath the unit, and inspection and servicing of component such as the control panel also becomes easier.

2.6. Auto fan mode (indoor unit)

- Auto fan mode is added besides high, medium and low. It automatically adjusts the fan speed according to the indoor unit's temperature.

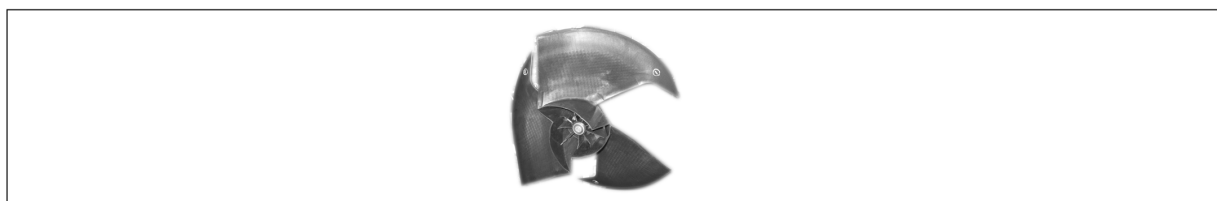
2.7. Low-noise outdoor units



[Product features]

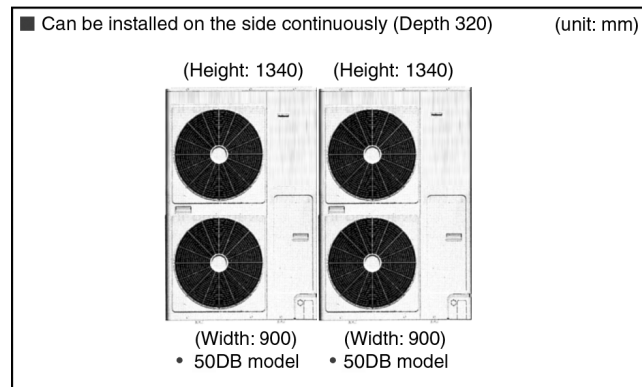
2.7.1. Low-noise design improves in surrounding areas

1. The noise-suppressing winglet fan is a result of new research into vane design theory. The unique curved shape suppresses the generation of vortices, thus reduces air flow noise.



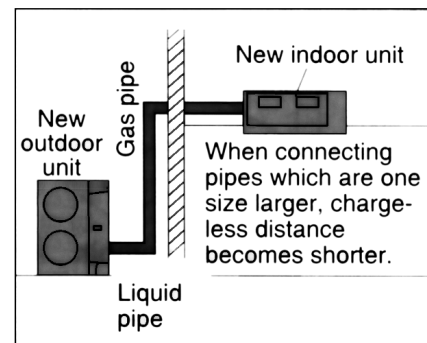
2. The adoption of double-orifice rings reduces air passage resistance.
3. Strengthening of the noise insulation materials in the compressor and the sealing-in of mechanical noise allows vibration noise to be greatly enclosed and suppressed.
4. The heat exchanger has an L-shaped design to allow air to flow more smoothly.
5. Noise is automatically reduced further during night time operation with lower outdoor air temperatures.

2.8. Improved workability



2.8.1. Pipes that are one size larger can also be connected for renewal

- If renewing the system, existing refrigerant pipes can be utilized so that only the indoor units need to be replaced.
- For example, liquid and gas pipes from 10 years ago can be connected to current pipes with the same size for one size larger. Effective utilization of materials reduces working time and trouble. (Adaptor sockets are not supplied.)

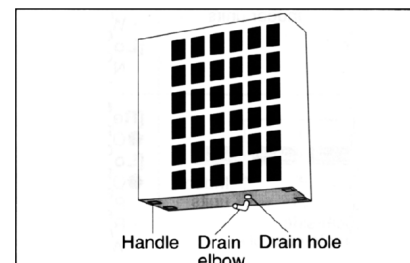


2.8.2. Additional refrigerant charging

- All models do not require any additional charging of refrigerant for 30m of pipe length. This makes installation much easier.

2.8.3. Drain water dripping-prevention structure

- The base of the outdoor unit is provided with a single drain hole in order to prevent drain water from leaking out of the unit. Body connecting a drain elbow and a discharge pipe, water leakages can be prevented even when the unit is installed against a wall.



2.8.4. Space saving design allows units to be installed side by side continuously

- Servicing after installation can be carried-out by removing the front covers.

2.8.5. Easy test operation

- Test operation can be carried out for both indoor and outdoor units.

2.8.6. Long pipe design

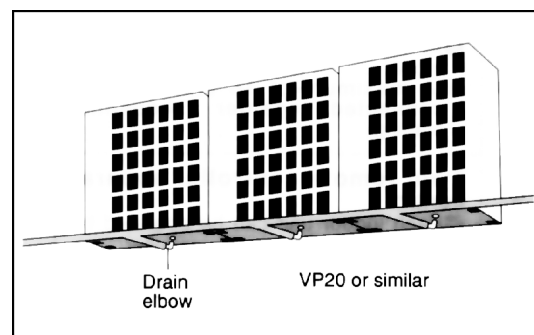
- Maximum piping length of 50m.

2.8.7. Internal pipe connection

- Pipes are connected inside the units (inside the side covers), making the final appearance more attractive.
- Pipes can be diverted outward in any of four directions (forward, right, down, rear).
- Small liquid pipe diameters of 9.53mm, making installation work much easier.

2.8.8. Centralized draining method

- Even when multiple outdoor units are installed to a wall, the drain outlets can be concentrated into a single drain pipe. This makes installation easier and also improve appearance.

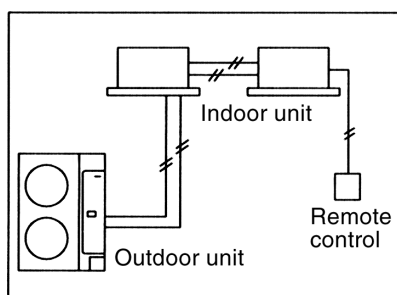


2.9. A brand-new control method

1. Easier power supply wiring connection

Power supply wiring and other wiring tasks can be carried out more easily.

- Twin non-polar wires used to connect indoor and outdoor units.
- Adoption of connection error prevention circuits for drive wires and signal wires. If a connection error is made, the relay does not operate and current does not flow to the circuit boards.



2. Twin operation

- Simultaneous air conditioning of wide spaces and corners is possible. Indoor units of same horsepowers can even be used in combination.
- Master unit and slave-units can be set automatically in twin systems. No address setting is necessary.
- Multiple indoor units can be operated simultaneously with a single remote control. Note that individual operation is not possible.

3. Separate indoor/outdoor unit power supplies

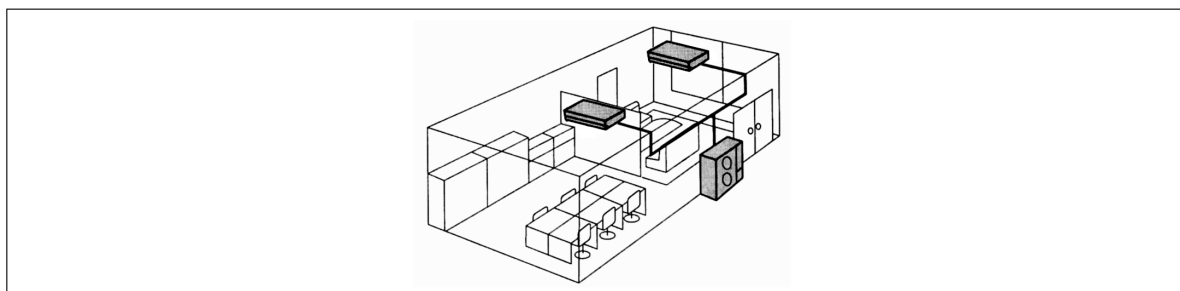
The power supply can be connected to (1) just the outdoor units, or (2) to both the indoor and outdoor units.

4. Easy test operation

Test operation can be carried out for both indoor and outdoor units.

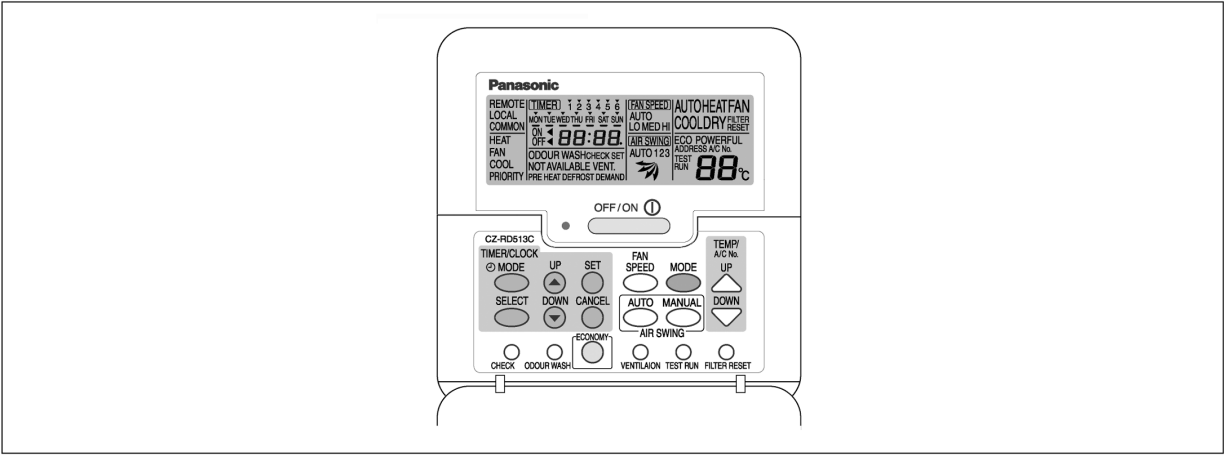
5. Automatic setting initialization function (Remote control and Indoor unit)

In accordance with the indoor and outdoor units connected and the connection methods, conditions such as the connection configuration (twin format) and remote-control functions such as automatic louvre operation and cooling or heating mode are automatically detected and set instantly.



2.10. Wired Remote Control

- 1. The new design includes an easily-visible red pilot lamp. The power can be turned on and off at a single touch, without opening the cover.
- 2. Has a build-in thermistor, allowing indoor temperature detection in accordance with indoor conditions by switching with main unit thermistor.
- 3. Twin non-polar wires make installation work easy. (10 m cable supplied as accessory.)



2.11. Wireless Remote Control

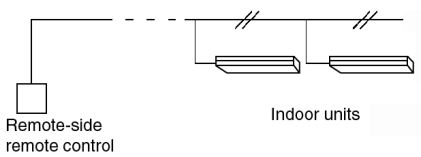
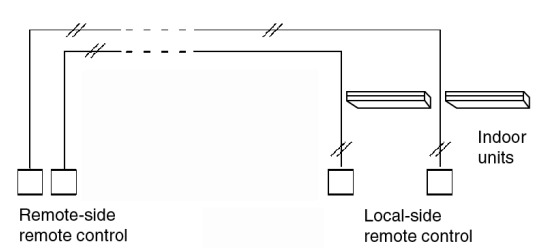
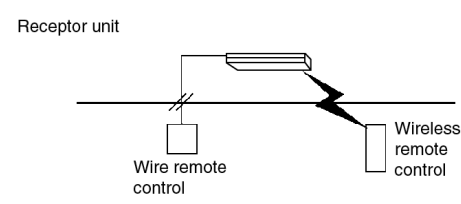


- 1. New design with compact size. (Operation range within approximately 8 m.)
- 2. Built-in timer with OFF/ON timer setting (within 24 hours)

Wired	Wireless
CZ-RD513C	CZ-RL513T

NOTE: Both of the above remote control is packed separately from the indoor unit.

2.12. Group Control Equipment

Wired remote control	Group control by one remote control <ul style="list-style-type: none"> • All air conditioner units are controlled as a whole by remote control. • All indoor units operate in the same mode. • A maximum of 16 units can be connected together (sequential starting) 		[Remote side] <ul style="list-style-type: none"> • Optional wired remote control CZ-RD513C [Local side] Not needed
	Twin remote control separate control <ul style="list-style-type: none"> • Each indoor unit can be operated by either one of the two remote control. • Apart from timer setting time, displays for two remote control are identical. • Last button pressed has priority (main or slave is set at remote control unit). 		[Remote side] <ul style="list-style-type: none"> • Optional wired remote control [Local side] <ul style="list-style-type: none"> • Optional wired remote control CZ-RD513C
Common control	Common control / group <ul style="list-style-type: none"> • Operation is possible using either wired or wireless remote control unit. • Last button pressed has priority. 		<ul style="list-style-type: none"> • Optional wired remote control and wireless remote control Wired CZ-RD513C Wireless CZ-RL513T

3 Specification

3.1. Product Specification

3.1.1. CS-F50DTE5 CU-L50DBE8

ITEM / MODEL				Indoor Unit			Outdoor Unit	
			Main Body	CS-F50DTE5			CU-L50DBE8	
			Remote Control	CZ-RD513C (Wired) CZ-RL513T (Wireless)				
Cooling Capacity			kW	14.0				
			BTU/h	47,700				
Heating Capacity			kW	16.0				
			BTU/h	54,600				
Refrigerant Charge-less			m	30				
Standard Air Volume for High, Medium and Low Speed			m³/min	Hi 32	Me 28	Lo 26	Hi 98	
			cfm	1130	1040	960	3460	
Outside Dimension (H x W x D)			mm	250 x 1600 x 700			1340 x 900 x 320	
			inch	9-27/32 x 62-31/32 x 27-9/16			52-7/8 x 35-7/16 x 12-19/32	
Net Weight			kg (lbs)	47 (104)			105 (231)	
Piping Connection	Refrigerant	Gas	mm (inch)	O.D Ø 15.88 (5/8) Flared Type				
		Liquid	mm (inch)	O.D Ø 9.53 (3/8) Flared Type				
	Drain		mm	O.D Ø 20			I.D Ø 20 x 1	
Compressor	Type, Number of Set			-			Hermetic - 2P (Rotary), 2	
	Starting Method			-			DC-INV control	
	Motor	Type		-			4-pole single phase brushless motor	
		Rated Output	kW	-			3.8	
Fan	Type, Number of Set			Sirocco fan-4			Propeller fan-1	
	Motor	Type		4-pole single phase induction motor			6-pole single phase induction motor	
		Rated Output	kW	0.14			0.07 x 2	
Air-heat Exchanger (Row x Stage x FPI)				Louver-fin type (3 x 14 x 18)			Corrugate-fin type (2 x 51 x 18)	
Refrigerant Control				-			Exp. Value	
Refrigerant Oil (Charged)			cm³	-			FV50S (1200)	
Refrigerant (Charged) R410A			kg (oz)	-			3.50 (123)	
Running Adjustment	Control Switch			Wireless or Wired Remote Control			-	
	Room Temperature			Thermostat			-	
Safety Devices				Internal protector for compressor, Internal thermostat for fan motor, Crankcase heater, High pressure switch, Current transformer				
Noise Level			dB (A)	Hi 50 Lo 46			Cooling 54, Heating 56	
			Power level dB	Cooling : Hi 67 Lo 63 Heating : Hi 67 Lo 63			Cooling 68, Heating 70	
Moisture Removal			L/h	9.0				
EER			W/W	2.91				
COP			W/W	3.41				

1. Cooling capacities are based on indoor temperature of 27°C D.B. (80.6°F D.B.), 19.0°C W.B. (66.2°F W.B.) and outdoor air temperature of 35°C D.B. (95°F D.B.), 24°C W.B. (75.2°F W.B.)

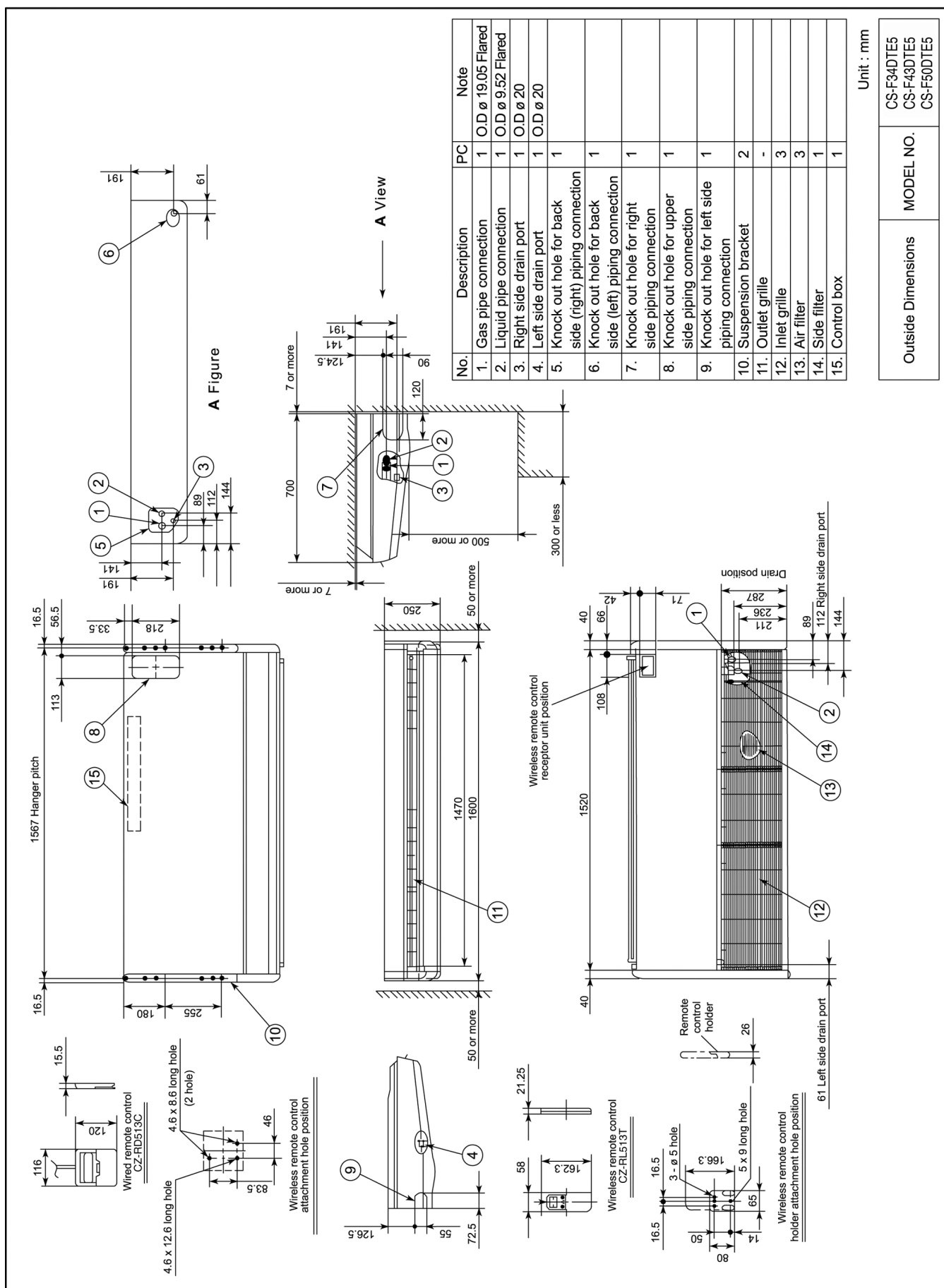
2. Heating capacities are based on indoor temperature of 20°C D.B. (68°F D.B.) and outdoor air temperature of 7°C D.B. (44.6°F D.B.), 6°C W.B. (42.8°F W.B.)

ELECTRICAL DATA (50 Hz)

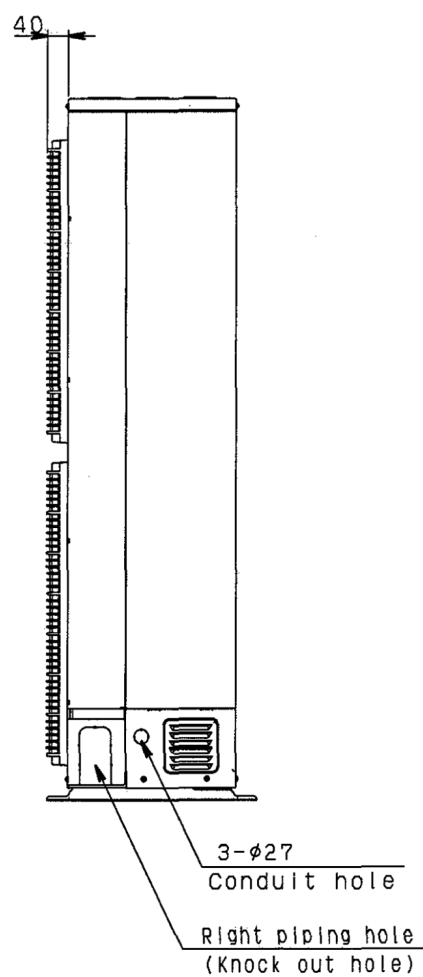
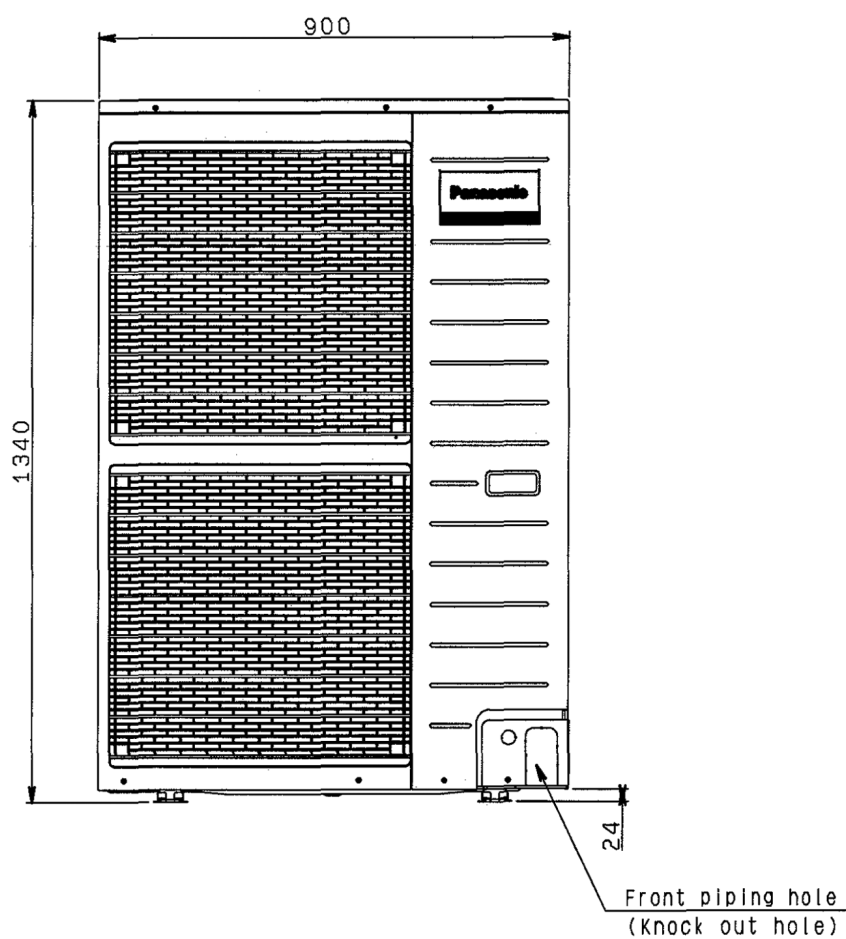
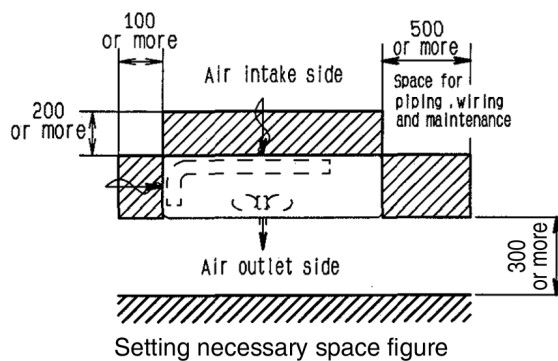
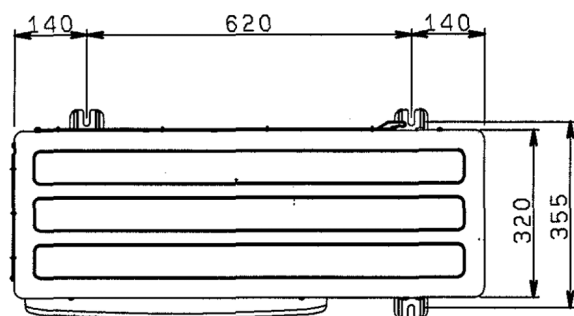
ITEM / MODEL			Condition by JIS-B8615		
Volts	V		380	400	415
Phase			3N	3N	3N
Power Consumption	kW	Cool	4.81	4.81	4.81
		Heat	4.69	4.69	4.69
Running Current	A	Cool	7.6	7.4	7.2
		Heat	7.4	7.2	7.0
Starting Current	A		7.6	7.4	7.2
Power Factor	%	Cool	96	94	93
		Heat	96	94	93
*Power Factor means total figure of compressor, indoor fan motor and outdoor fan motor.					
Panasonic	Power source		AC, 3N~380V, 400V, 415V 50Hz		

4 Dimensions

4.1. CS-F50DTE5

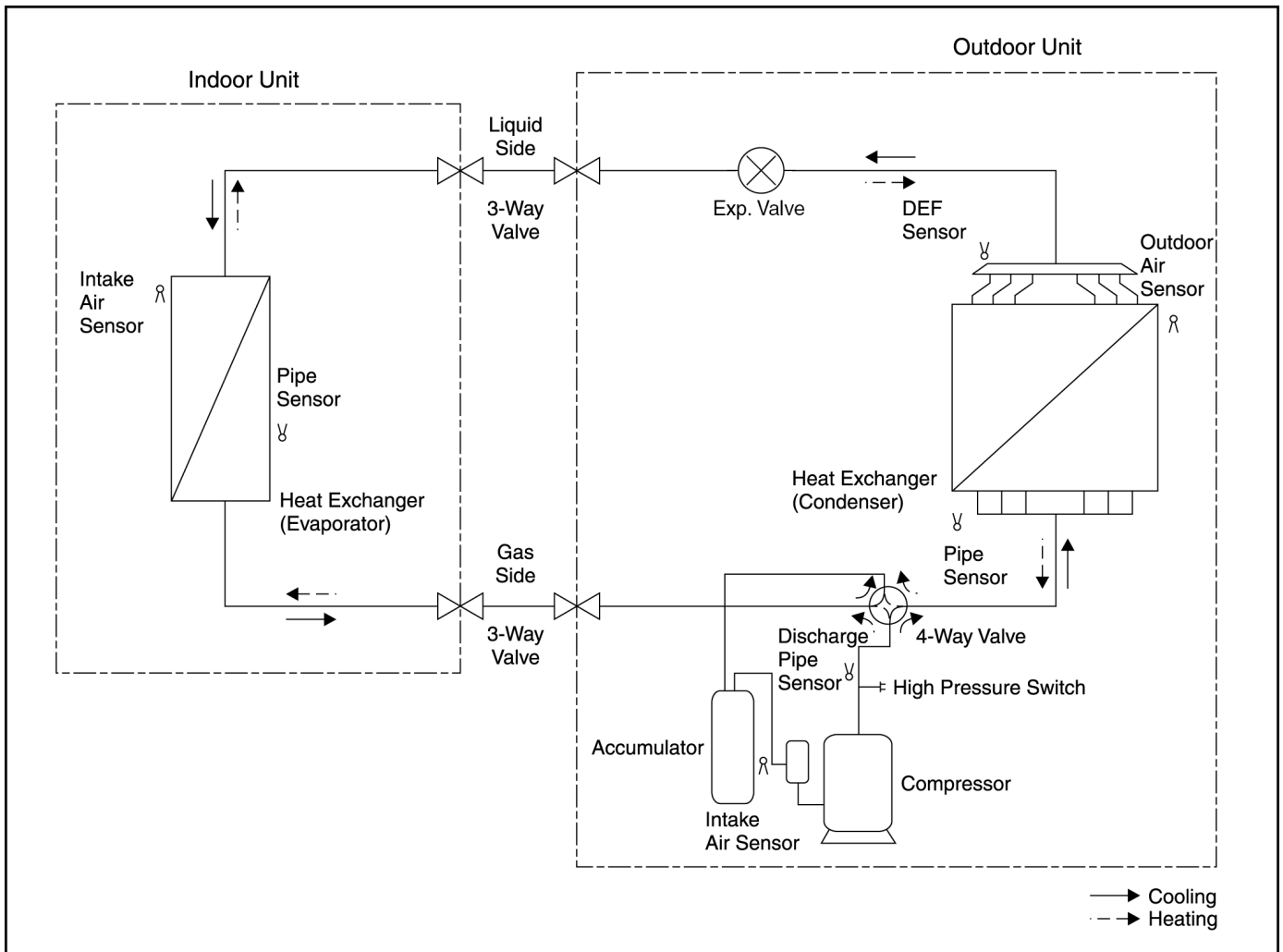


4.2. CU-L50DBE8



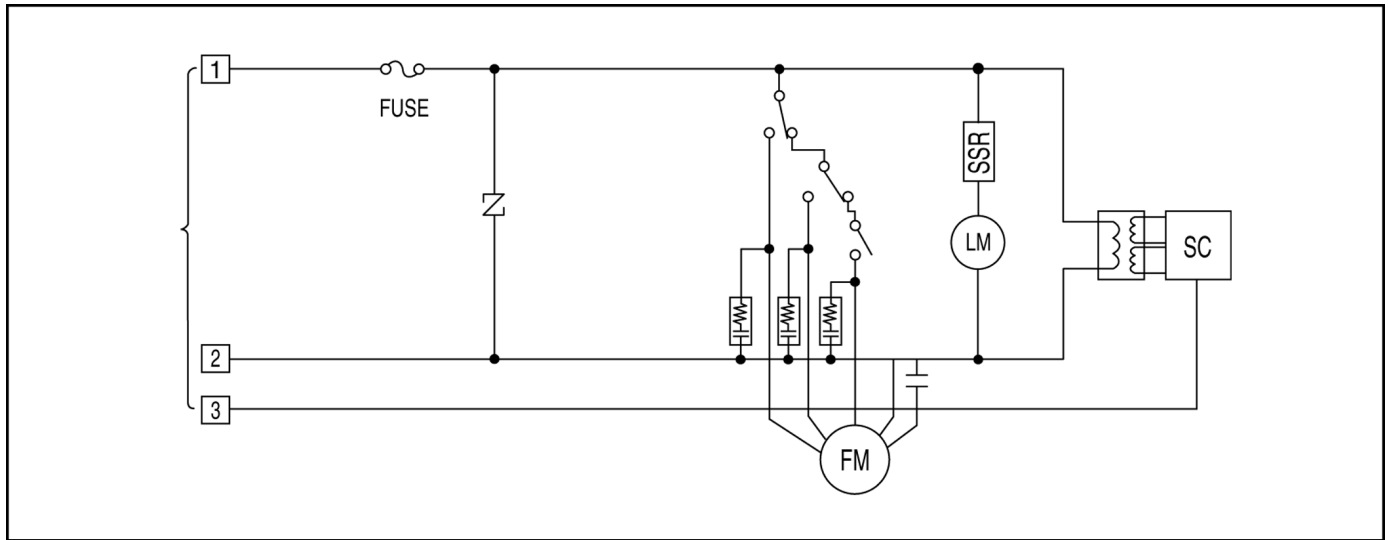
Unit : mm

5 Refrigeration Cycle

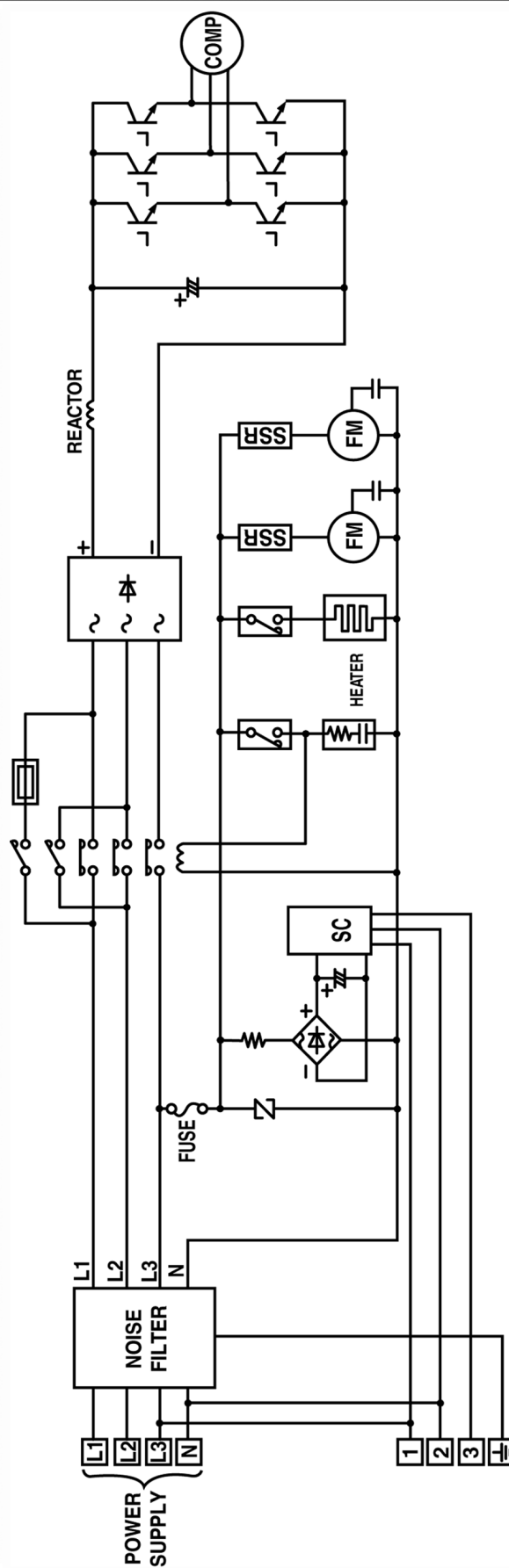


6 Block Diagram

6.1. CS-F50DTE5

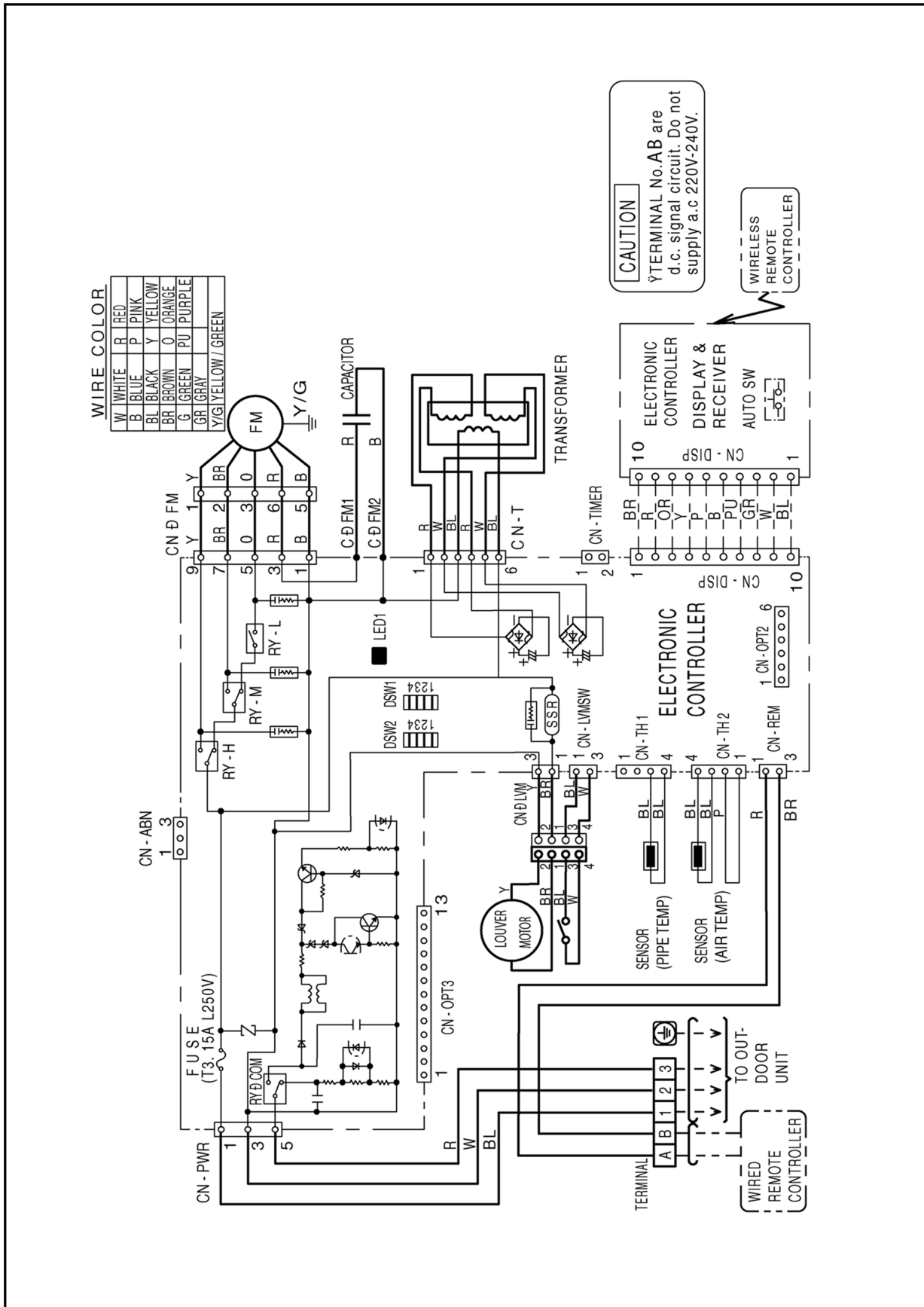


6.2. CU-L50DBE8

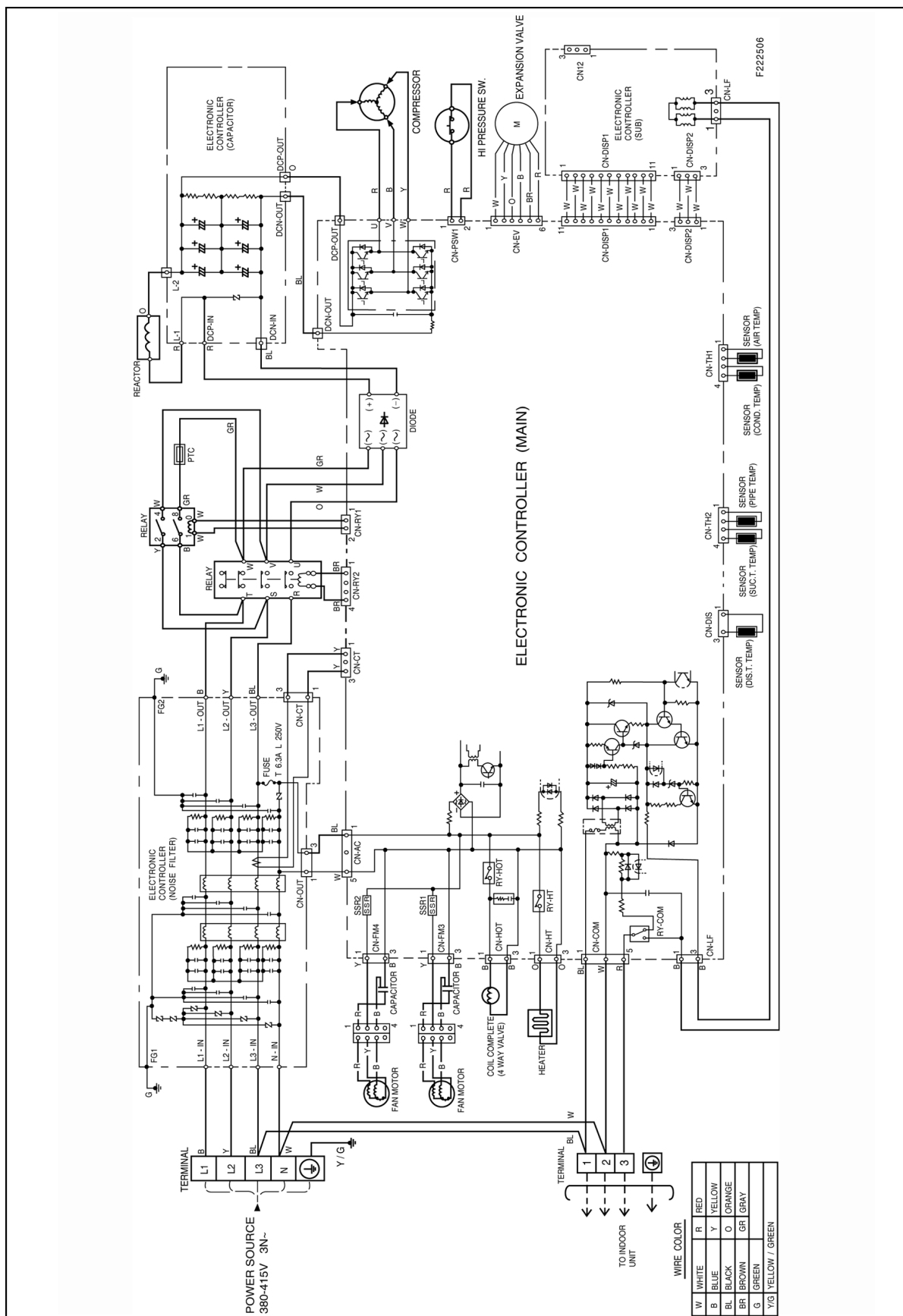


7 Wiring Diagram

7.1. CS-F50DTE5



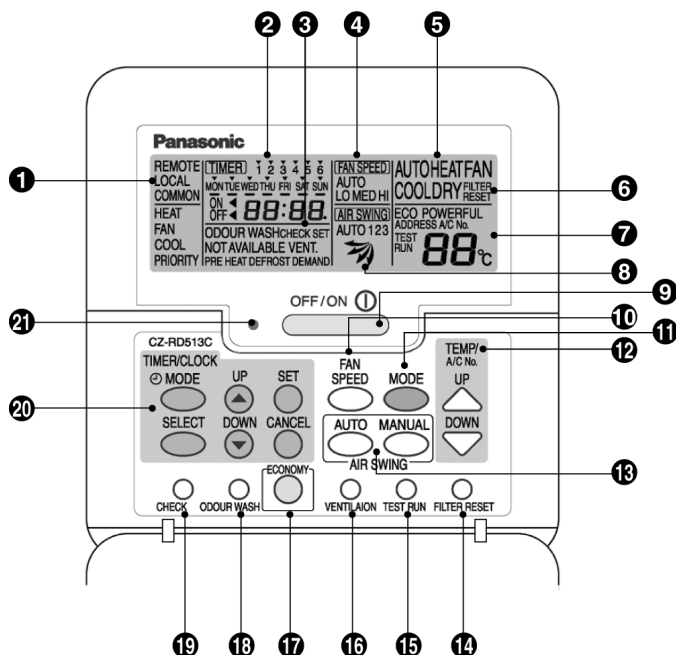
7.2. CU-L50DBE8



8 Operation Details

8.1. Wired Remote Control (Optional part)

Name and function of each part



- 9 OFF/ON button**
Used to start and stop the operation.
- 10 FAN SPEED button**
Used to select the fan speed of high (HI), medium (MED), low (LO) or auto (AUTO).
- 11 MODE button**
Used to select the operation of AUTO, HEAT, FAN, COOL, or DRY.
- 12 TEMP (UP/DOWN) buttons**
Used to select the desired temperature.
- 13 AIR SWING (AUTO/MANUAL) buttons**
Used to determine the air swing condition, either auto or manual.
- 14 FILTER RESET button**
Press to reset the "FILTER RESET" display after washing the filter.
- 15 TEST RUN button***
- 16 VENTILATION button***
- 17 ECONOMY operation button**
Provides Energy saving function
- 18 ODOUR WASH button**
Provides deodorizing function.
- 19 CHECK button**
Press this button if the check display is flashing.
- 20 TIMER/CLOCK SET buttons**
Used to set the timer operation and the current time.
- 21 Operation indicator**
Lights up when the unit is in operation.

- 1 REMOTE**
The OFF/ON button cannot be used.
LOCAL
All wired remote control buttons can be used.

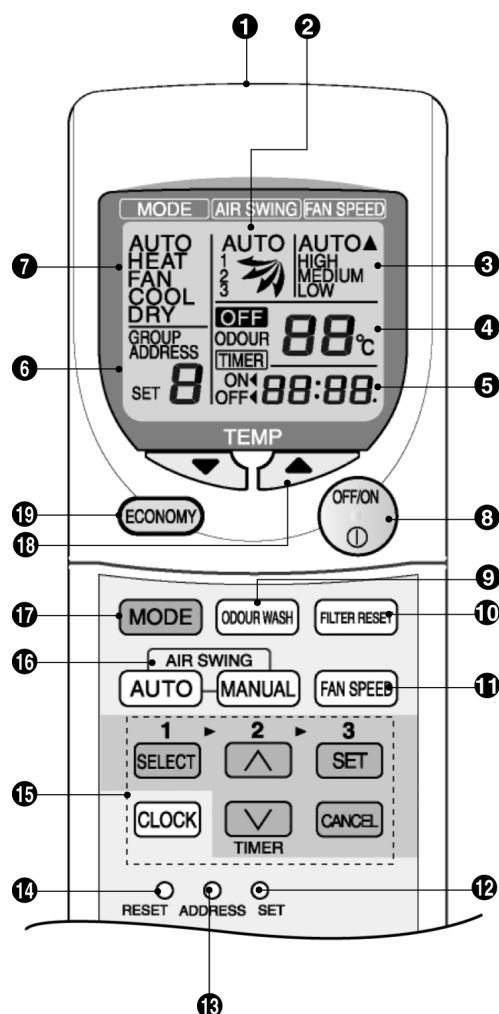
- 2 Time/time setting display**
- 3 Check display**
- 4 Fan speed display**
- 5 Operation mode selection display**
- 6 FILTER RESET display**
(Appears after the cumulative running time reaches approximately 2,500 hours of operation.)
- 7 Temperature setting display (16°C - 31°C)**
- 8 Airflow direction setting display**

NOTES

- Ensure that the correct button is pressed as simultaneous pressing of the multiple buttons will not make the setting correct.
- The illustration above is for explanatory purposes only. The appearance will be different during actual operation.
- Do not operate the remote control with wet hands. Otherwise, electric shock or malfunction may occur.
- Do not press the remote control buttons with sharp object as this may damage the remote control.
- Buttons marked with * are not needed for normal operation. If one of these buttons is pressed by mistake, press the same button once more to cancel the operation.
- When the power resumed after power failure, the unit will restart automatically with all the previous settings preserved by the memory function. (Auto restart function)

8.2. Wireless Remote Control (Optional part)

Name and function of each part



1 Transmitter
Transmits the remote control signal.

2 Airflow direction setting display

3 Fan speed display

4 Temperature setting display (16°C - 31°C)

5 Time/time setting display
Shows the timer operation setting time or the current time.

6 Address number display

7 Operation selection display

8 OFF/ON button
Used to start and stop the operation.

9 ODOUR WASH button

10 FILTER RESET button
Press to cancel the "FILTER" indicator light on the control panel.

11 FAN SPEED button
Used to select the fan speed of high (HI), medium (MED), low (LO) or auto (AUTO).

12 SET button*
Local setting function.

13 ADDRESS SET button*
Used to change the address setting when using more than one indoor unit.

14 RESET button
Pressing this button will clear all the settings from memory. You will then need to make the settings again.

15 TIMER/CLOCK SET buttons
Used to set the timer operation and the current time.

16 AIR SWING (AUTO/MANUAL) buttons
Used to determine the air swing condition, either auto or manual.

17 MODE button
Used to select the operation of AUTO, HEAT, FAN, COOL or DRY.

18 TEMP (UP/DOWN) buttons
Used to select the desired temperature.

19 ECONOMY operation button

NOTES

- Ensure that the correct button is pressed as simultaneous pressing of the multiple buttons will not make the setting correct.
- The illustration above is for explanatory purpose only. The appearance will be different during actual operation.
- If using the wireless remote control in conjunction with the wired remote control, the settings made from the wireless remote control will appear on the wired remote control display (except when making timer settings).
- Buttons marked with * are not needed for normal operation. If one of these buttons is pressed by mistake, press the same button once more to cancel the operation.
- When the power resumed after power failure, the unit will restart automatically with all previous settings preserved by the memory function. (Auto restart function)

9 Operation Control

Description of basic control functions

9.1. Operation Mode

1. Thermostat control
2. Depend on differences between room temperature and setting temperature, Compressor running frequency will be decided and start operation.

Temperature differences become same as below table, then thermostat is off.

Temperature Differences

				Unit: °C
Indoor type	Cassette	Ceiling	Duct D2	Duct D3
Cool mode	-1.5	-1.5	-2.0	-2.0
Dry mode	-2.5	-2.5	-3.0	-3.0
Heat mode	3.5	2.5	2.5	2.5

3. Select indoor temperature thermostat

When connected to wired remote controller, either indoor unit thermostat or remote controller thermostat is available, using remote control setting.

9.2. Compressor Start Control

- When the compressor start, compressor frequency will be fixed at lower level for certain time, to follow the below table, due to avoid the compressor oil discharge.
- Judging from compressor discharge temperature, decide the start condition to select either cool start control, or warm start control.

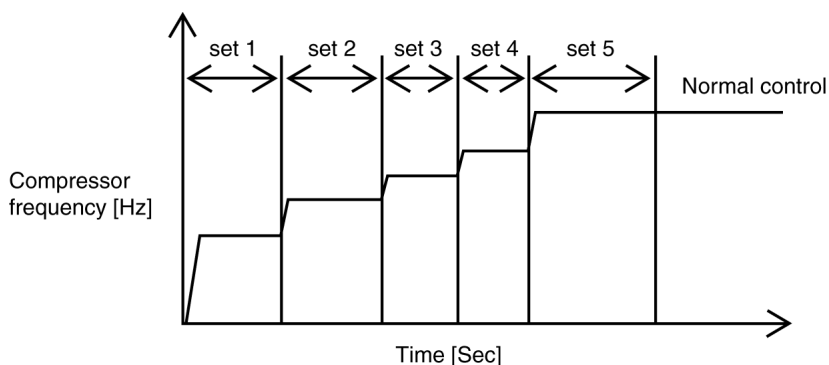
Discharge temp. [°C]	>15°C	15°C ≤
Start control	Cool start	Warm start

Warm start : set 1 → *set 5 → normal control

Cool start : set 1 → set 2 → set 3 → set 4 → *set 5 → normal control

- Note

- Frequency at *set 5 = frequency calculated by normal control
- In case of frequency at set n excess the frequency at set 5 in cool condition, skip from set n to set 4 and transfer to set 5.



9.3. Cooling Operation

9.3.1. Cool indoor fan control

- Fan speed manual

Common control for unit using DC motor / unit using AC motor.

Operation start at hi speed, or medium speed, or low speed set by remote control.

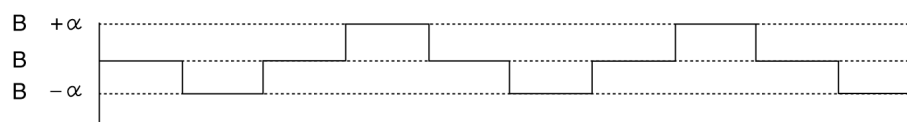
- Fan speed auto

When operation start, or shifting to thermostat ON condition from thermostat OFF condition, odour cut operation (refer odour cut operation page for detail), after thermostat ON condition, indoor fan operate as below control.

- Unit using DC motor

As follow the below figure, fan speed changing operation (program air).

(rpm center B and α is different if capacity rank is different)



- Unit using AC motor

When 1st thermostat on condition from operation start, fan speed is hi (same as manual fan speed), after 2nd thermostat on condition, fan speed change to medium speed (same as manual medium fan speed).

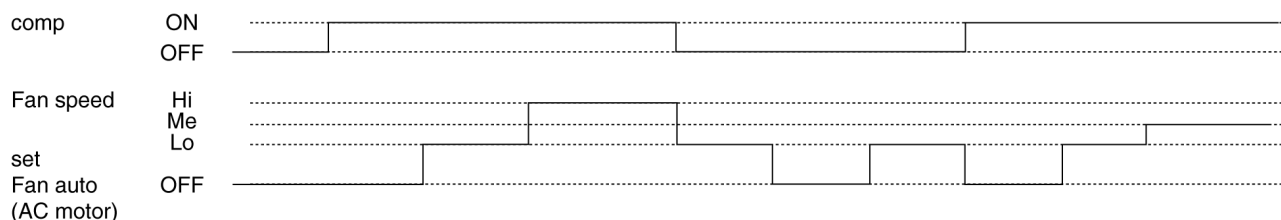
9.3.2. Odour cut control

- When cool or dry mode operation start, select odour cut mode or fan auto mode, by remote control, operation start at odour wash mode when compressor start or shift to thermostat on from thermostat off.
- Odour cut operation is under below condition.

Operation mode		Cool or dry mode	
Odour wash setting		Setting	No setting
Fan setting	Auto	Odour cut	Odour cut
	Manual	Odour cut	-

- Odour cut operation is to remove the odour generated at indoor heat exchanger to use the drain water come out from indoor heat exchanger.

Thermo & comp ON/OFF			Thermostat ON & comp ON			Thermostat ON			Thermostat ON & comp ON		
Time			40 [Sec]	50 [Sec]	-	20 [Sec]	120 [Sec]	20 [Sec]	40 [Sec]	50 [Sec]	-
Cool	Auto	DC motor	OFF	SSLo	Program air	SSLo	OFF	SSLo	OFF	SSLo	Program air
		AC motor	OFF	Lo	Hi	Lo	OFF	Lo	OFF	Lo	Me
Dry	Auto	DC motor	OFF	SSLo	SLo	SSLo	OFF	SSLo	OFF	SSLo	SLo
		AC motor	OFF	Lo	Lo	Lo	OFF	Lo	OFF	Lo	Lo



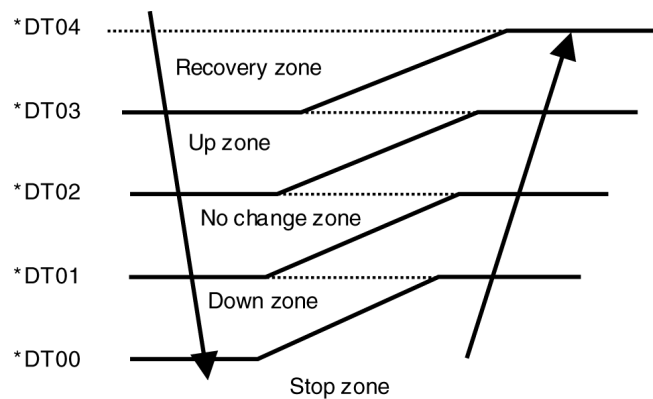
9.3.3. Cool powerful operation

- When cool or dry mode operation start, temperature differences between room temperature and setting temperature is more than 5 K, setting temperature shift to 2 K down.
- (But when temperature after shifting is less than 16°C, setting temperature is 16°C = no change)
- Micro computer judge that required indoor load is bigger than calculation base from temperature differences between room temperature and setting temperature, then increase the compressor frequency compared to normal to cool down indoor side immediately.
- Those kind of operation complete after 30 minutes when cool mode operation start.

9.3.4. Freezing prevention control

- During cool or dry mode operation, if indoor evaporator temperature is going down, freezing prevention control is operated.
- Detail of Freezing prevention control is as follows;

Indoor evaporator temperature area is divided into 5 zones, which consist of stop zone, down zone, no change zone, up zone, and recovery zone. When indoor evaporator temperature is going into each zone, compressor frequency change by following the below table.



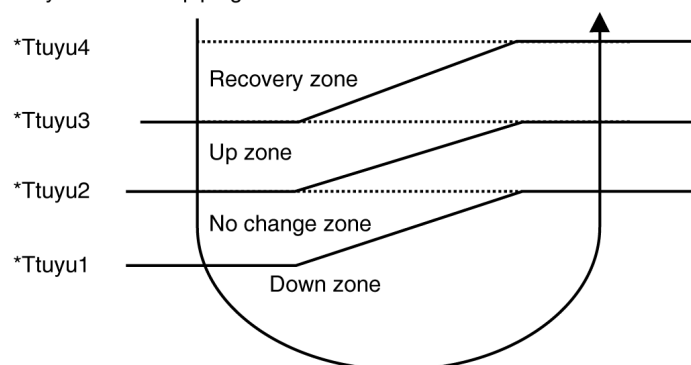
*DTn=indoor piping sensor

Recovery zone	Release freezing prevention operation
Up zone	Fan motor speed step up
No change zone	Operation no change
Down zone	Reduce the compressor frequency (check for 3 min, max 3 times)
Stop zone	If continue for 6 min, compressor stop (for 3 min after stop, compressor can be started due to restart delay control)

9.3.5. Dew form prevention control

- During cool or dry operation, if outdoor temperature is less than 30°C, and indoor fan speed is low or auto setting, indoor heat exchanger temperature become lower, dew form prevention control start to prevention dew form at indoor discharge grill.
- Indoor evaporator temperature area is divided into 4 zones, which consist of, down zone, no change zone, up zone, and recovery zone.
- When indoor evaporator temperature is going into each zone, change compressor frequency and louver angle by following the below table.

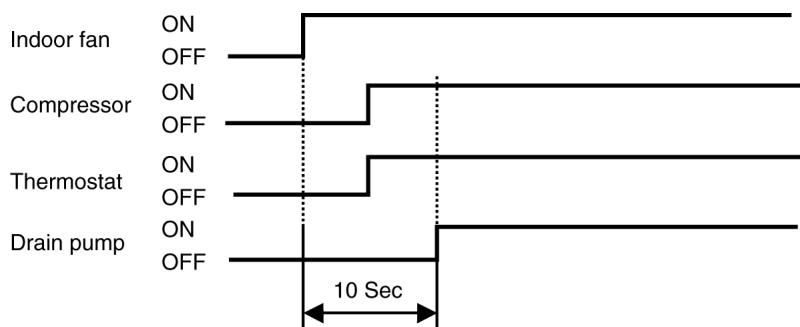
Ttuyu n = Indoor piping sensor



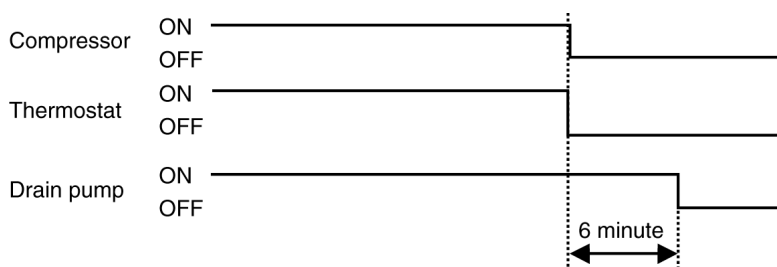
Recovery zone	Release dew form prevention operation
Up zone	Fix the indoor louver angle Cassette type : fix the manual 3rd position Ceiling type : fix the manual 2nd position
No change zone	Continue check the indoor heat exchanger temperature
Down zone	Reduce the compressor frequency (check for 3 min, max 3 times)

9.3.6. Drain pump control

- During cooling, dry, or defrost operation, drain pump operate by following the below table.
- When compressor start, drain pump operation start after 10 second of indoor fan starting.



- When operation stop or thermostat is off, drain pump continue operating for 6 minute to prevent the drain water from coming back.



9.3.7. Cooling low temperature protection control

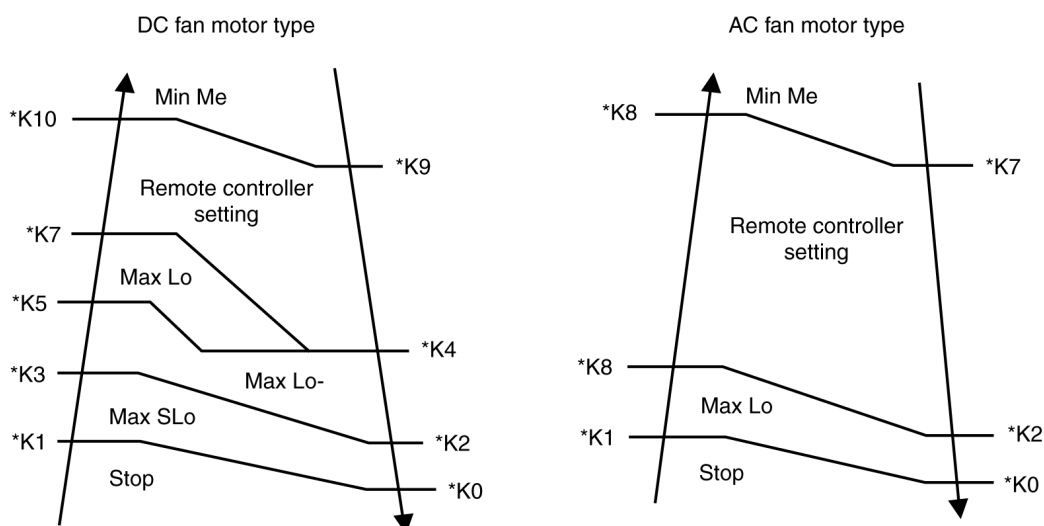
- During cooling, or dry operation, if outdoor temperature is less than -15°C .
 - And thermostat on condition continue for 15 min, compressor stop.
 - After 3 min waiting (restart delay), if thermostat is on, compressor restart.

9.4. Heating Mode Operation

9.4.1. Heating indoor fan control

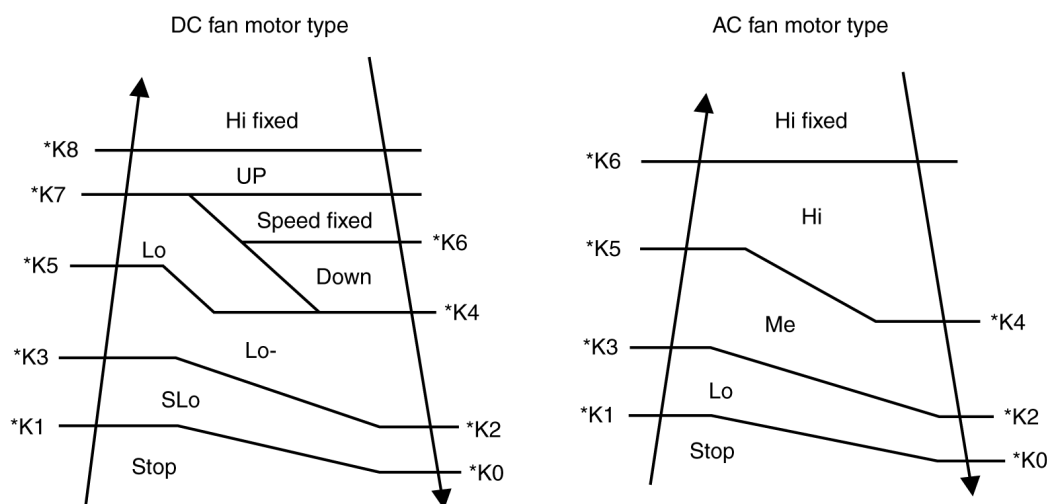
Fan speed manual

- Fan speed [Hi] [Me] [Lo] set by remote controller.
- However, when operation start, or during operation, fan speed control is limited to due to prevent a cold draft, for example, when heating operation start.
- (K10 = Indoor heat exchanger temperature, depend on indoor type)



Fan speed auto

- When operation start, or during operation, fan speed control by detecting indoor heat exchanger as follows:
- (*K10 = Indoor heat exchanger temperature, depend on indoor type)

**9.4.2. Hot start control**

- When heating operation start, hot start control carry out.
- During hot start operation, [PREHEAT] displayed at the wired remote controller.
- For wireless remote controller, [POWER LED] is blinking at the receiver of indoor unit. Indoor fan stop and louver angle fixed to upper side in spite of any setting of remote controller. When indoor heat exchanger temperature increase, or 4 minute past after operation start, hot start control finish and shift to normal fan control.

9.4.3. Heating indoor fan control at thermostat off heating mode operation

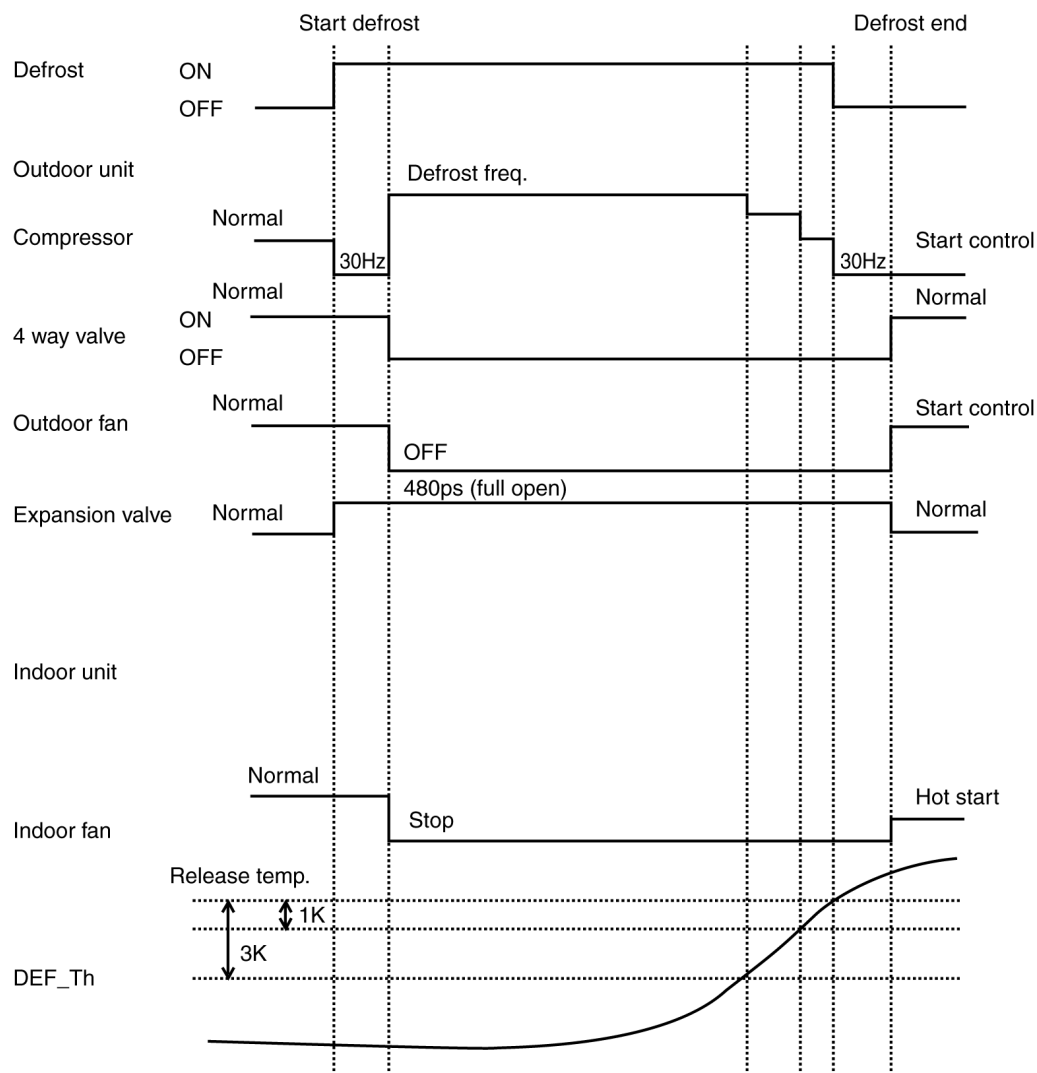
- During heating operation, if thermostat is off, indoor fan fixed low speed, Louver angle fixed upper side, even if remote control display shows any angle.
(cassette and ceiling model only)

9.4.4. Heating powerful operation

- When heating mode operation start, temperature differences between setting temperature and room temperature is more than 5 K, setting temperature increase 2 K and operation start.
(however, setting temperature after shifting is more than 31°C, setting temperature fixed 31°C.)
- Due to this control, micro computer judge indoor heat loss is big and increase compressor frequency compare to normal condition, then heat up indoor room quickly.
- This control will be finished after 60 min or thermostat is off.

9.4.5. Defrost control

- During heating operation at outdoor low temperature condition, defrost operation start timely to melt the ice formed on outdoor heat exchanger.
- When heating operation accumulated time is time up, and both outdoor temperature and outdoor unit heat exchanger temperature is less than setting temperature for 5 minute. When defrost temperature is more than setting temperature, defrost operation finish.
- During defrost operation, in spite of any change of remote controller, indoor fan stop and louver angle fixed at upper side.
(for louver control : cassette and ceiling model only)
- During defrost operation, [DEFROST] is displayed at wired remote controller (when using wireless controller, POWER LED is blinking in receiver of indoor unit), hot start operate after defrost operation finish.



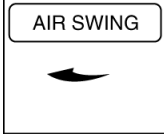
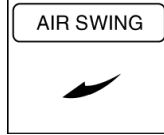
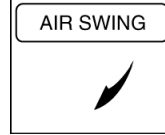
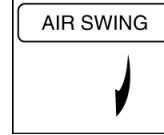
9.4.6. Heating high temperature protection

- During heating operation, when outdoor temperature is more than 35°C for 15 minute, compressor stop to protect compressor.
- After 3 minute (re-start delay control) waiting, if thermostat on condition, outdoor unit re-start.




9.5. Louver Control

9.5.1. Louver control for cassette type

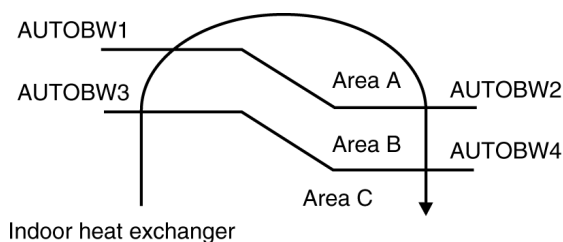
- When power is on, at the same time, louver start initializing toward to close Direction.
- During operation, stopping, thermostat off condition, louver angle set manual or auto depend on remote controller setting.
 - Louver manual setting

Operation mode	Display manual				
		Set 1	Set 2	Set 3	Set 4
Heating	Normal	20°	35°	50°	70°
	Defrost	10°			
	Hot start	10°			
	Thermostat off	20°			
Cooling (fan)	Fan	20°	35°	50°	70°
	Normal	20°	35°	50°	70°
	Dew control	50°			
	Thermostat off	20°	35°	50°	70°
Dry	Normal	30°			
	Dew control	50°			
	Thermostat off	20°	35°	50°	70°
Operation mode judge		20°	35°	50°	70°
Stop mode		0°			

– Louver auto setting

Operation	Display auto set			<div><div>AIR SWING</div><div>AUTO 1</div><div></div></div>	<div><div>AIR SWING</div><div>AUTO 2</div><div></div></div>	<div><div>AIR SWING</div><div>AUTO 3</div><div></div></div>
				AUTO 1	AUTO 2	AUTO 3
Heating	Normal	Sensor	A	70°	70°	70°
			B	20° - 70°	20° - 50°	40° - 70°
			C	20°	20°	20°
	Defrost			10°		
	Hot start			10°		
	Thermostat off			20°		
Cooling (Fan)	Fan			20° - 70°	20° - 50°	40° - 70°
	Normal			20° - 70°	20° - 50°	40° - 70°
	Dew control			50°		
	Thermostat off			20° - 70°	20° - 50°	40° - 70°
Dry	Normal			30°		
	Dew control			50°		
	Thermostat off			20° - 70°	20° - 50°	40° - 70°
Operation mode judge				20°	20°	20°
Stop mode				0°		






- Temperature range for louver control during heating operation is as follows; decide by indoor heat exchanger temperature.



AUTOBW1	AUTOBW2	AUTOBW3	AUTOBW4
60°C	57°C	30°C	25°C

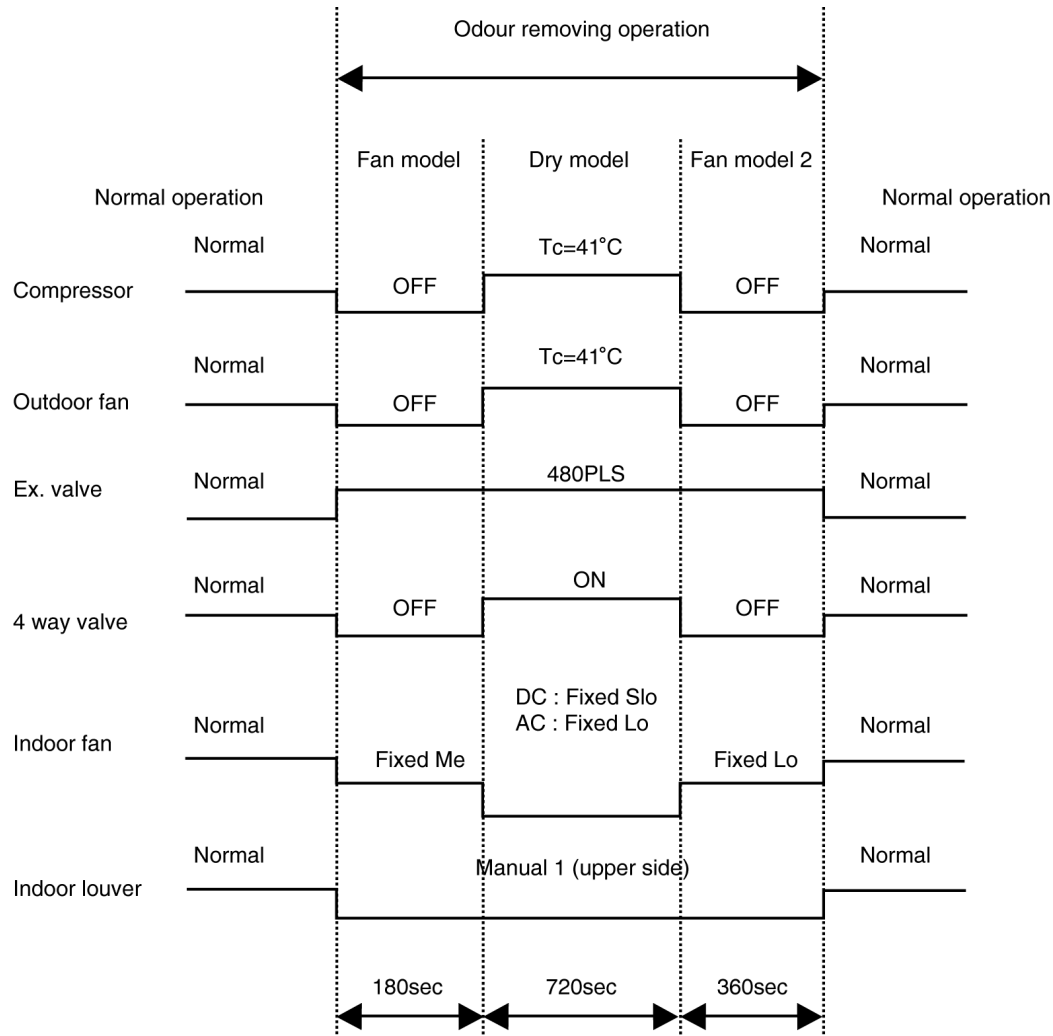
9.5.2. Ceiling type louver control

- When power is on, at the same time, louver initialize 2 times.
- During operation, stopping, thermostat is off condition, louver angle change as below table by manual setting or auto setting of remote controller.

Remote controller setting		Manual				Auto			
Operation mode	Display	<div>AIR SWING</div> <div></div> <div>Set 1</div>	<div>AIR SWING</div> <div></div> <div>Set 2</div>	<div>AIR SWING</div> <div></div> <div>Set 3</div>	<div>AIR SWING</div> <div></div> <div>Set 4</div>	<div>AIR SWING</div> <div></div> <div>Piping temp (heating)</div>	A	B	C
			20°	35°	50°	70°	70°	20° - 70°	Set 1
Heating	Normal	20°							
	Defrost	20°							
	Hot start	20°							
	Thermostat off	20°							
Cooling (fan)	Fan	20°	35°	50°	70°	20° - 70°			
	Normal	20°	35°	50°	70°	20° - 70°			
	Dew control	35°							
	Thermostat off	20°	35°	50°	70°	20° - 70°			
Dry	Normal	35°							
	Dew control	35°							
	Thermostat off	20°	35°	50°	70°	20° - 70°			
Operation mode judge		20°	35°	50°	70°	20°			
Stop mode		70°							

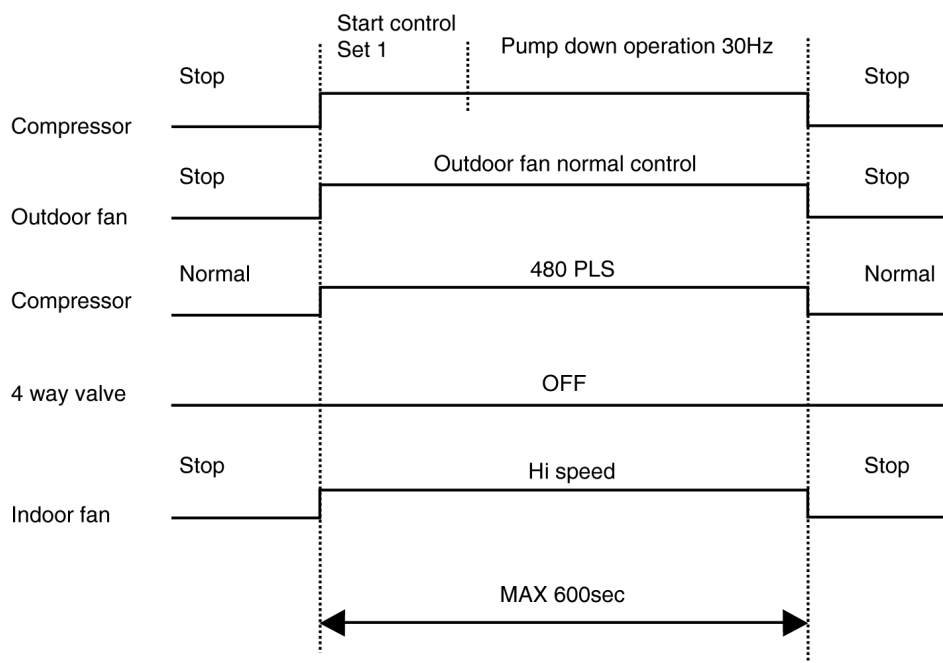
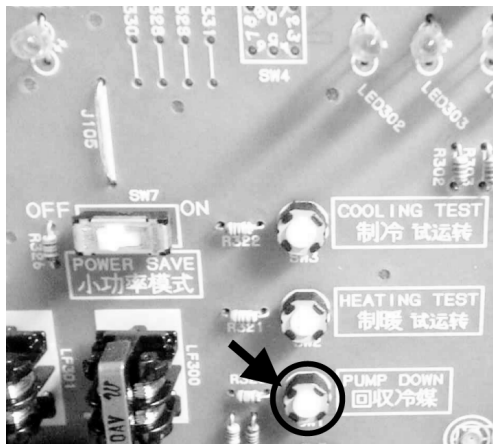
9.6. Odour Removing Operation

- During stop condition, or cooling operation, when pushing the [ODOUR] button for 5 second, operation change to the odour removing operation.
- Operation detail is as follows;
Fan mode operation for 180 second, then refrigerant cycle change to heating mode for 720 second, to heat up (dry) the indoor unit. Compressor frequency and indoor fan controlled to maintain the indoor heat exchanger temperature 41°C.
- Indoor fan revolution is fixed (for DC motor type, fan speed is Slo, for AC motor type, fan speed is Lo), and indoor louver angle is fixed manual set no.1.
- After that, fan mode operation continue for 360 second, then odour removing operation finish.
- During odour removing operation, [ODOUR] sign is blinking at LCD display panel of wired remote controller ([ODOUR WASH] sign is not displayed for wireless remote controller), when pushing the operation button, or [ODOUR] button, odour removing operation finish and set the odour cut operation.



9.11. Pump Down Operation

- When pushing the [PUMP DOWN] button on the outdoor PCB for 1 second, pump down operation start. Detail of pump down operation is shown at below table.
- During pump down operation, push the [PUMP DOWN] button once again for 1 second, pump down operation stop.
- After 600[Sec] past, pump down operation stop.



9.12. Indoor Air Volume Up Control (DC Fan Motor Type Only)

- Indoor air volume up control set by local setting mode of wired or wireless remote controller.
(item 01, 00: standard / 01: Air volume up mode)
(only for DC motor type)
- Due to air volume up control, indoor fan revolution increase in case of Hi speed setting only.
- This control is memorized in the micro computer, it cannot be reset by power off.

10 Installation Instruction

10.1. Pipe length

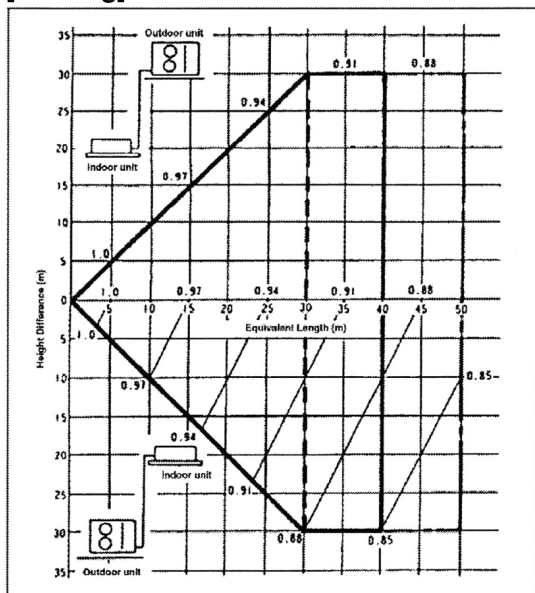
• CORRECTION OF COOLING CAPACITY AND HEATING CAPACITIES

1. Correction of cooling and heating capacities according to the connecting pipe length.

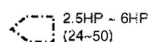
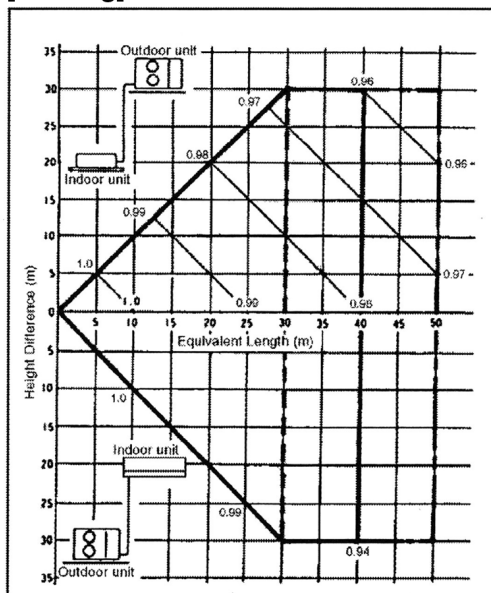
The Data of cooling capacities (marked on the name plate) are based on 5 meters connecting pipe and horizontal installation.

For other pipe length of other installation multiply by the following correction factor to determine the revised cooling capacity.

[Cooling]



[Heating]




Equivalent Length = actual pipe length + number of elbow x ELE + number of oil trap x ELO

ELE : equivalent length of elbow

ELO : equivalent length of oil trap

2. For other pipe length of other installation multiply by the following correction factor to determine the revised cooling capacity.

Outer diameter of gas side pipe mm (inch)	ELE 
12.7 (1/2)	0.20
15.88 (5/8)	0.25
19.05 (3/4)	0.35
6.35 (1/4)	0.18

10.2. Refrigerant additional charge

1. Piping installation by standard piping

- At the time of shipment from the factory, this unit is charged with enough refrigerant for an equivalent pipe length of 30 m. (Refer the following table)

But when the piping length exceeds 30m, additional charge is required according to the following table.

Example:

CU-L50DBE8

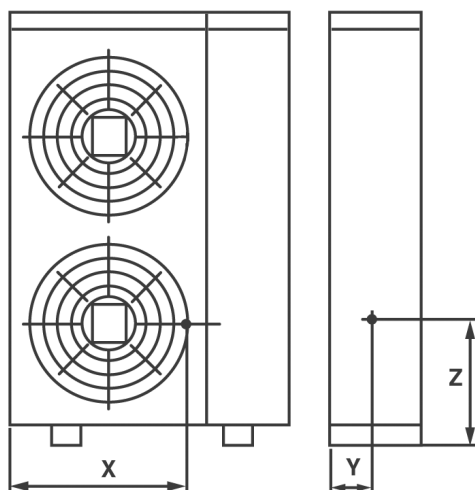
In case of 50m long pipe (one way), the amount of refrigerant to be replenished is: $(50 - 30) \times 50 = 1,000\text{g}$

Model Name	Standard piping specification			
	Liquid piping (dia.mm)	Gas piping (dia.mm)	Gas charge-less length (m)	Additional gas volume (g/m)
CU-L34DBE5	9.53	15.88	30	50
CU-L43DBE5	9.53	15.88	30	50
CU-L50DBE8	9.53	15.88	30	50

⚠ Attention

- Do not decrease the size of the gas piping. (It causes the breakdown of the compressor)

10.3. Position of the centre gravity



MODEL NAME	OUTSIDE DIMENSIONS			NET WEIGHT	CENTRE OF GRAVITY		
	WIDTH (mm)	DEPTH (mm)	HEIGHT (mm)		X (mm)	Y (mm)	Z (mm)
CU-L34DBE5	900	320	1340	110	720	160	460
CU-L43DBE5	900	320	1340	110	720	160	460
CU-L50DBE8	900	320	1340	110	720	160	460

10.4. Indoor unit installation




CEILING TYPE AIR CONDITIONERS INSTALLATION INSTRUCTIONS


REFRIGERANT
R410A

HP	Model name
2 HP	CS-F18DT**
2.5 HP	CS-F24DT**
3 HP	CS-F28DT**
4 HP	CS-F34DT**
5 HP	CS-F43DT**
6 HP	CS-F50DT**

Precautions in terms of safety


Carry out installation work with reliability after throughout reading of this "Precautions in terms of safety".


- Precautions shown here are differentiated between  Warnings and  Cautions. Those that have much chance for leading to significant result such as fatality or serious injury if wrong installation would have been carried out are listed compiling them especially into the column of .

However, even in the case of items which are listed in the column of , such items also have a chance for leading to significant result depending on the situations.

In either case, important descriptions regarding the safety are listed, then observe them without fail.

- As to indications with illustration

 This mark means "Caution" or "Warning".

 This mark means "Earth".

- After installation work has been completed, do not only make sure that the unit is free from any abnormal condition through the execution of trial run but also explain how to use and how to perform maintenance of this unit to the customer according to the instruction manual.

In addition, request the customer to keep this manual for installation work together with instruction manual.

Warnings

<p>▲ The appliance must be installed by technician, who takes into account the requirements given by ISO5149 or eventual equivalent requirements.</p>	<p>▲ If installing inside a small room, measures should be taken to prevent refrigerant levels from building up to critical concentrations in the event of a refrigerant leak occurring. Please discuss with the place of purchase for advice on what measures may be necessary to prevent critical concentrations being exceeded. If the refrigerant leaks and reaches critical concentration levels, there is the danger that death from suffocation may result.</p>
<p>▲ As to installation, request the distributor or vendor to perform it. Imperfection in installation caused by that having been carried out by the customer himself may leads to water leakage, electric shock, fire, etc.</p>	<p>▲ Securely attach the protective covers for the outdoor unit connection cables and power cord so that they do not lift up after installation. If the covers are not properly attached and installed, the terminal connections may overheat, and fire or electric shock may result.</p>
<p>▲ Carry out the installation work with reliability according to this manual for installation work. Imperfection in installation leads to water leakage, electric shock, fire, etc.</p>	<p>▲ Switch off all supplies before accessing any electrical part.</p>
<p>▲ Carry out the installation work with reliability on the place that can bear the weight of this unit sufficiently. Insufficient strength leads to injury due to falling of the unit.</p>	<p>▲ If refrigerant gas escapes during installation, ventilate the affected area. If the refrigerant gas comes into contact with sparks or naked flames, it will cause toxic gases to be generated.</p>
<p>▲ Carry out predetermined installation work in preparation for strong wind such as typhoon, earthquake. Imperfection in installation work may lead to accidents arisen from overturn, etc.</p>	<p>▲ Once installation work is completed, check that there are no refrigerant gas in the room that can come into contact with sparks or flames from a fan heater, stove or kitchen range, which will cause toxic gases to be generated.</p>
<p>▲ The unit must be installed in accordance with applicable national and local regulations. Any electrical work should only be carried out by qualified technician and use exclusive circuits without fail. Presence of insufficient capacity in power circuit or imperfection in execution leads to electric shock, fire, etc.</p>	<p>▲ When performing piping work do not mix air except for specified refrigerant (R410A) in refrigeration cycle. it causes capacity down, and risk of explosion and injury due to high tension inside the refrigerant cycle.</p>
<p>▲ Wiring shall be connected using specified cables and fix them securely so that external force of the cables may not transfer to the terminal connection section. Imperfect connection and fixing leads to fire, etc.</p>	

⚠ Cautions

- ▲ Carry out Earthing work.
Do not connect the Earth return to the gas pipe, water line pipe, lightning rod and telephone lines. Imperfection in Earth return may lead to electric shock.
- ▲ Do not install the unit at the place where the possibility of inflammable gas leakage exists. If gas leakage should arise and the gas builds up around the unit, such situation may lead to ignition.
- ▲ Mounting of the earth leakage circuit breaker is required.
Omission in mounting of the earth leakage circuit breaker may lead to electric shock.



- ▲ Drain piping should be made to ensure secure drainage according to the manual for installation work and carry out the thermal insulation to prevent the occurrence of condensation. Imperfection in piping work lead to water leakage and may cause the house and property, etc. to become wet
- ▲ Position the indoor unit and outdoor unit, power cords and indoor/outdoor unit connection cables in a way so that they are at least 1 meter away from televisions and radios. This is to avoid problem such as interference with picture and/or sound. (However, note that depending on the electromagnetic wave conditions, interference may still occur even if the separation distance is more than 1 meter.)

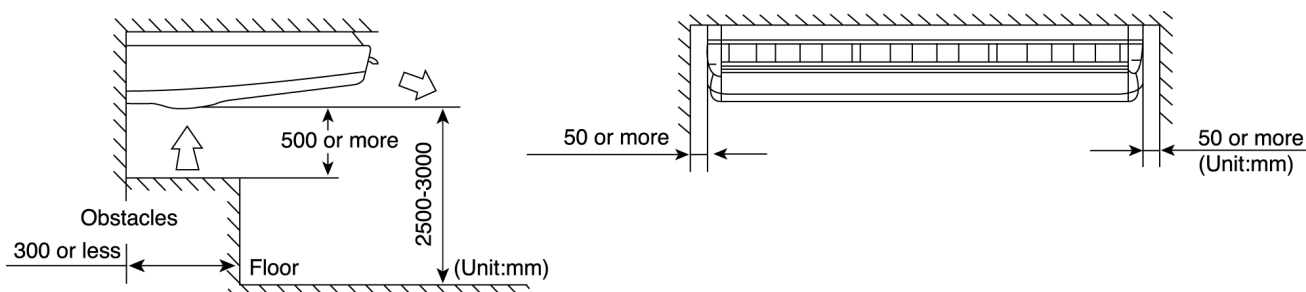
10.4.1. Accessories packed in the indoor unit container

Name	Q'ty	Appearance	Purpose	Name	Q'ty	Appearance	Purpose
Band	2		For fastening the heat insulator	Drain hose	1		For drain piping
Edge protection cover	1		To protect the end surface of the piping holes	Heat insulator	1		For insulating refrigerant pipe joint

10.4.2. Selecting the location for indoor unit

Provide a check port on the piping side ceiling for repair and maintenance.

- Install the indoor unit once the following conditions are satisfied and after receiving the customer approval.
 1. The indoor unit must keep a maintenance space.
 2. The indoor unit must be free from any obstacles in path of the air inlet and outlet, and must allow spreading of air throughout the room.

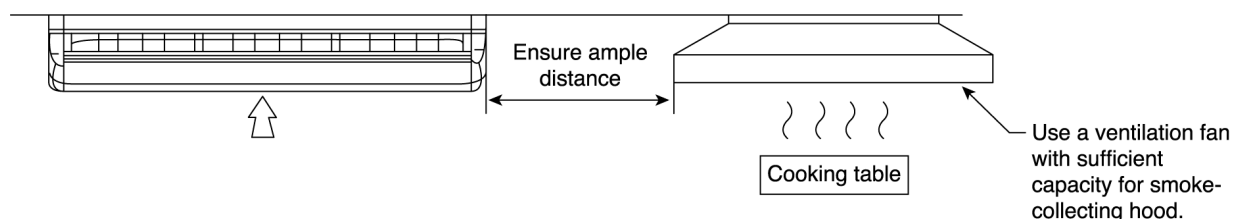


3. The installation position must be able to support a load four times the indoor unit weight. ⚠ Warnings
4. The indoor unit must be away from heat and steam sources, but avoid installing it near an entrance.
5. The indoor unit must allow easy draining.
6. The indoor unit must allow easy connection to the outdoor unit.
7. The indoor unit must allow easy connection to the outdoor unit.
8. The indoor unit must be at least 3m away from any noise-generating equipment. The electrical wiring must be shielded with a steel conduit.
9. If the power supply is subject to noise generation, add a suppressor.
10. Do not install the indoor unit at a laundry. Electric shocks may result.

NOTE

- Study thoroughly the following installation locations.
 1. In places such as restaurants and kitchens, considerable amount of oil steam and flour adhere to the fan, and the fin of the heat exchanger may result in heat exchange reduction, spraying or dispersing of water drops, etc.
In these cases, take the following actions:

- Make sure the ventilation fan for smoke-collection hood on a cooking table has sufficient capacity so that it draws oily steam which should not flow into the suction of the air conditioner.
- Make enough distance from cooking room to install the air conditioner in such place where it may not suck in oily steam.

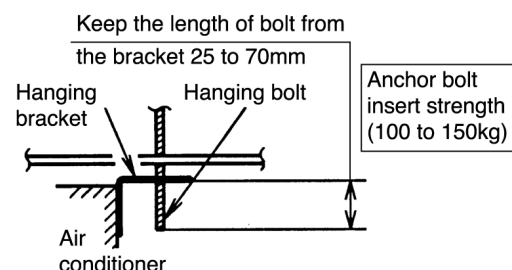
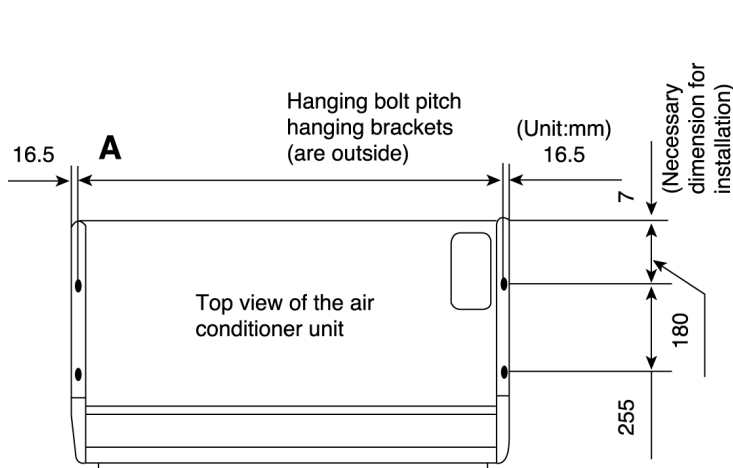


2. Avoid installing the air conditioner in such circumstances where cutting oil mist or iron powder exist especially in factories, etc.
3. Avoid places where inflammable gas can be generated, flows-in, contaminated, or leak.
4. Avoid places where sulphurous acid gas or corrosive gas can be generated.
5. Avoid places near high frequency generators.

10.4.3. Installation of indoor unit

The paper template for installation may expand or shrink according to temperature and humidity. Check the dimensions before using it.

CEILING OPENING DIMENSIONS AND HANGING BOLT LOCATION



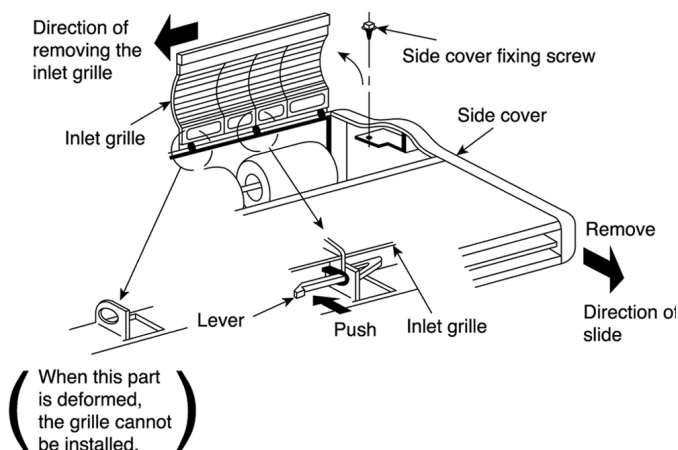
(Unit: mm)

Model Name	A
CS-F18DT** CS-F24DT** CS-F28DT**	1212
CS-F34DT** CS-F43DT** CS-F50DT**	1567

Caution During the installation, care must be taken not to damage the electric wires.

REMOVING THE SIDE COVER AND HANGING BRACKET

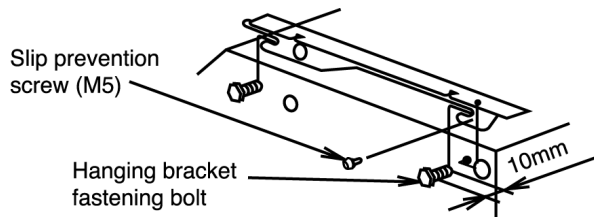
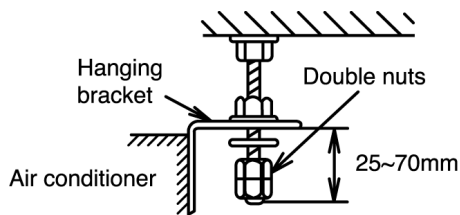
1. Open the inlet grille, and remove the side cover fixing screw (right and left) from the internal part of the unit.
2. Move the side cover to about 15mm forward to remove it.
Use the packing material (Styrene foam) to support, when you reverse the top and bottom of the indoor unit.
3. Remove the hanging bracket
 - a. Remove the slip prevention screws of the brackets (right and left).
 - b. Loosen the hanging bracket fastening bolts to about 10mm, and remove the hanging bracket.



Fastening the hanging bracket

* Use either W3/8 or M10 bolts and nuts (local supplied)

- Fastening the hanging bracket

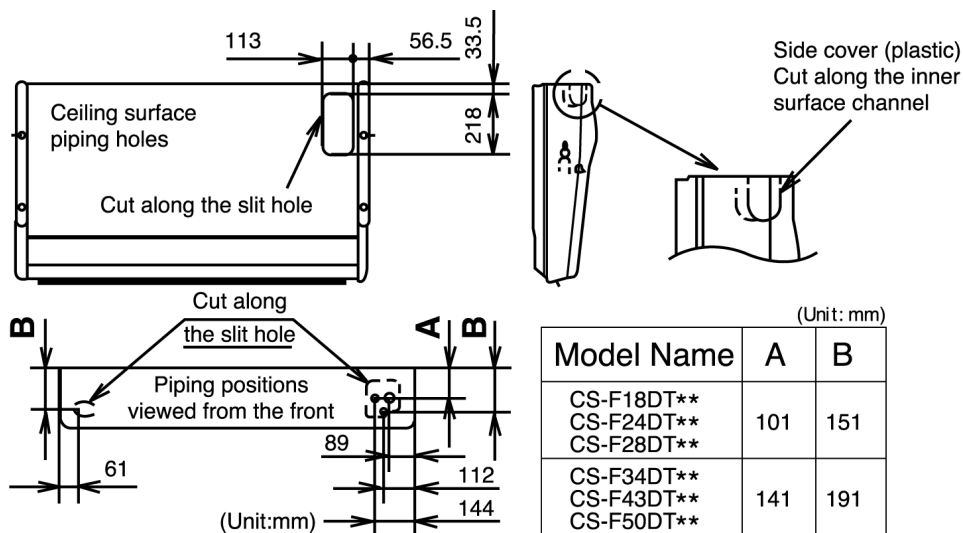


Caution : For safety, you must use washers and double nuts to ensure a secure installation.

⚠ Warning	Be sure to tighten the nut and bolt to prevent the unit from falling.
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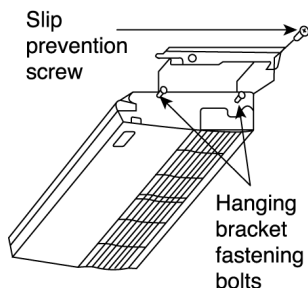
Piping hole positions

- The refrigerant piping can be installed on the right, right upper or right rear.
- The drain piping can be installed on the right, right rear, left or left rear (there are connection ports on both right and left sides.)
- Thermally insulate the drain and refrigerant piping to prevent dew condensation.
- After cutting the piping holes, use the edge protection cover (accessory) to protect the end surfaces.



Installing the unit

1. Insert the hanging bracket fastening bolts and both sides of the unit into the hanging brackets, and slide the unit to the rear. Fasten the bolts.
2. Tighten the slip prevention screws (M5) for brackets to prevent the unit from shifting.
3. To ensure correct drainage, after hanging the unit, use a level gauge to check the installation angle.

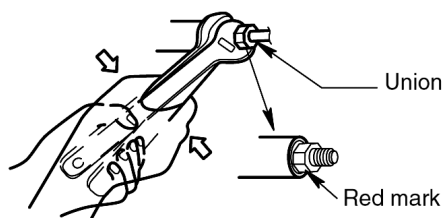


When the drain piping is connected to the right side	<ul style="list-style-type: none"> • The unit should be level, or the back right should be inclined down. (Within one degree).
When the drain piping is connected to the left side	<ul style="list-style-type: none"> • The unit should be level, or the back left should be inclined down. (Within one degree).

10.4.4. Refrigerant piping

Refrigerant is charged to the outdoor unit. For details, see the manual for installation work of outdoor unit.(Additional charging, etc.)

1. Brazing for piping.
 - a. Execute brazing before tightening the flare nut.
 - b. Brazing must be executed while blowing nitrogen gas.
(This prevents generation of oxidized scale in copper pipe.)
2. When there is a lot of brazing for long piping, install a strainer at the midway of the piping.
(The strainer is locally supplied.)
3. Use clean copper pipe with inner wall surface free from mist and dust. Blow nitrogen gas or air to blow off dust in the pipe before connection.
4. Form the piping according to its routing. Avoid bending and bending back the same piping point more than three times.
(This will result in hardening of the pipe).
5. After deforming the pipe, align centers of the union fitting of the indoor unit and the piping and tighten them firmly with wrenches.
6. Connect pipe to the service valve or ball valve which is located below the outdoor unit.
7. After completed the piping connection, be sure to check if there is gas leakage in indoor and outdoor connection.



- Confirm the red mark of the union (thin side) is always at lower direction after connecting piping.

Vacuum drying

After completing the piping connection, execute vacuum drying for the connecting piping and the indoor unit.

The vacuum drying must be carried out by using the service ports of both the liquid and gas side valves.

CAUTION Use two wrenches and tighten with regular torque.

Flare nut fastening torque N.m (kgf.cm)			
ø6.35 mm	18 (180)	ø15.88 mm	65 (660)
ø9.52 mm	42 (430)	ø19.05 mm	100 (1020)
ø12.7 mm	55 (560)		

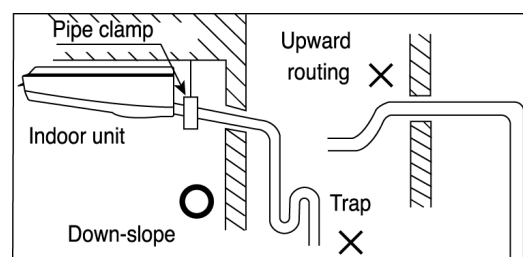
Liquid side piping	Gas side piping
ø9.52 mm	ø15.88 mm

10.4.5. Indoor unit drain piping

- Be sure to use the drain hose provided (accessory item.)
- Drain piping must have down-slope (1/50 to 1/100): be sure not to provide up-and-down slope to prevent reversal flow.
- During drain piping connection, be careful not to exert extra force on the drain port at the indoor unit.
- The outside diameter of the drain connection at the indoor unit is 20 mm.

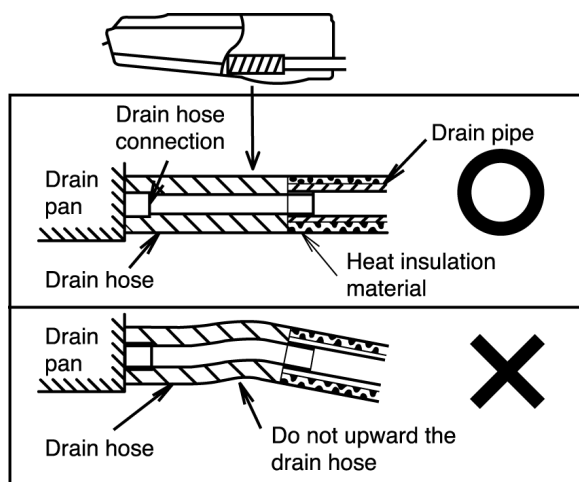
Piping material: Polyvinyl chloride pipe VP-20 and pipe fittings

Heat insulation material: Polyethylene foam with thickness more than 8mm (local supply).



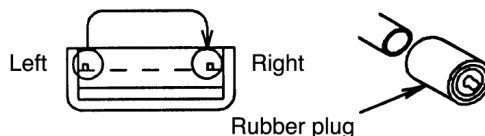
⚠ Caution	Be sure to perform heat insulation on the drain piping. If insulation is insufficient, dew may form. This causes water leakage.
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⚠ Caution	Prevent the drain hose from floating and hanging down. This causes water leakage. (down figure)
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In the case of left piping

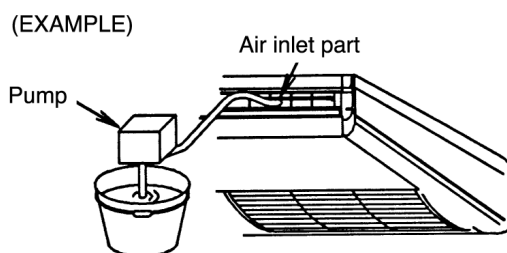
1. Remove both the internal and external plugs.
2. Use a wrench or pliers to remove the plugs.
 - Putting substitution of rubber plug.



Drain Test

Confirm the drain water flows smoothly after connecting the drain piping.

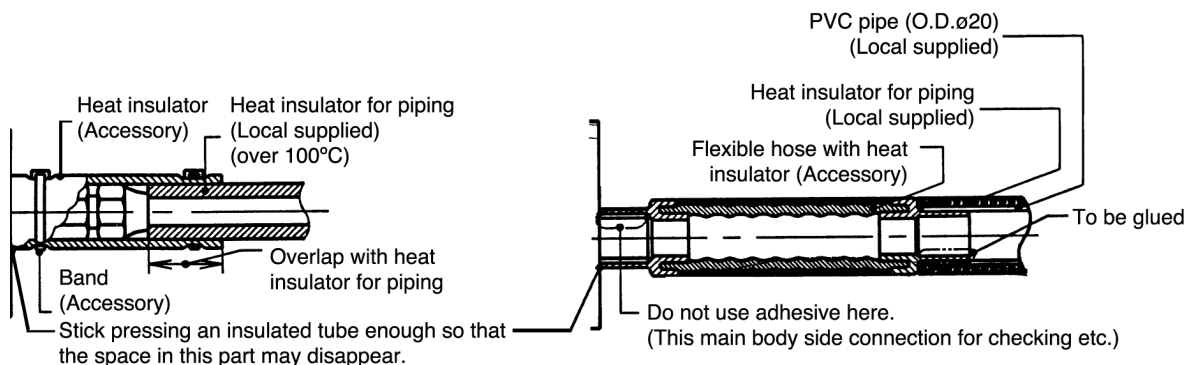
- Pour water to about 1.5 litres for the drain confirmation from the air inlet part which should gradually flow into the drain pan.



10.4.6. Heat insulation

⚠ Caution	Be sure to perform heat insulation on the drain, liquid and gas piping. Imperfection in heat insulation work leads to water leakage.
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1. Use the heat insulation material for the refrigerant piping which has an excellent heat-resistance (over 100°C).



2. Precautions in high humidity circumstance.

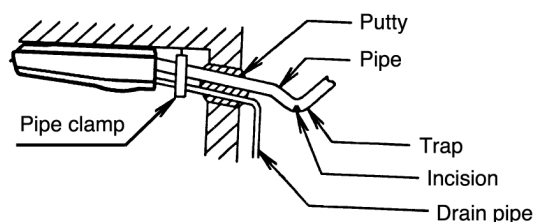
This air conditioner has been tested according to the "JIS Standard Conditions with Mist" and have been confirmed that there is no form of any faults. However, if it is operated for a long time in high humid atmosphere (dew point temperature: more than 23°C), water drops are liable to fall.

- In addition to the normal heat insulation (thickness: more than 8 mm) for refrigerant piping (gas piping: thick piping) and drain piping, add a further of 10 mm to 30 mm thickness material.

Wall seal

- When the outdoor unit is installed on a higher position than the indoor unit, install the trap so as not to instill rain water into the wall by transmitted in piping.
- Stuff the space among piping, the electric wire, and the drain hose with "Putty" and seal the penetration wall hole.

Make sure that rain water do not instill into the wall.



* Put the incision at the trap part of the heat insulator (for water drainage)

10.4.7. Electrical wiring

As to the main power source and cable size of outdoor unit, read the installation manual attached to the outdoor unit.

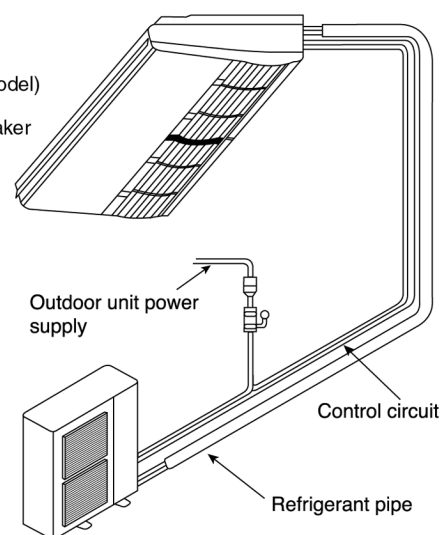
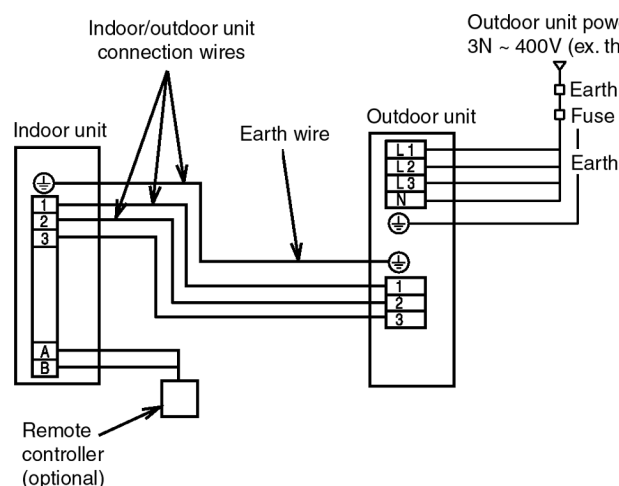
Warning	The units must be connected to the supply cables for fixed wiring by qualified technician. Feed the power source to the unit via a distribution switch board designed for this purpose, the switch should disconnected all poles with a contact separation of at least 3mm. When the supply cable is damaged, it must be replaced by qualified technician.
Caution	Be sure to install a current leakage breaker, main switch and fuse to the main power supply, otherwise electric shocks may result.
Caution	Be sure to connect the unit to secure earth connection. If the earthing work is not carried out properly, electric shock may result.
Warning	Wiring shall be connected securely using specified cables and fix them securely so that external force of the cables may not transfer to the terminal connection section. Imperfect connection and fixing leads to fire, etc.



1. Select a power source that is capable of supplying the current required by the air conditioner.
2. Be sure to connect the wires correctly to terminal board with connecting the crimp tyre ring terminal to the wires.
3. Be sure to turn off the main power before installing and connecting the remote controller.

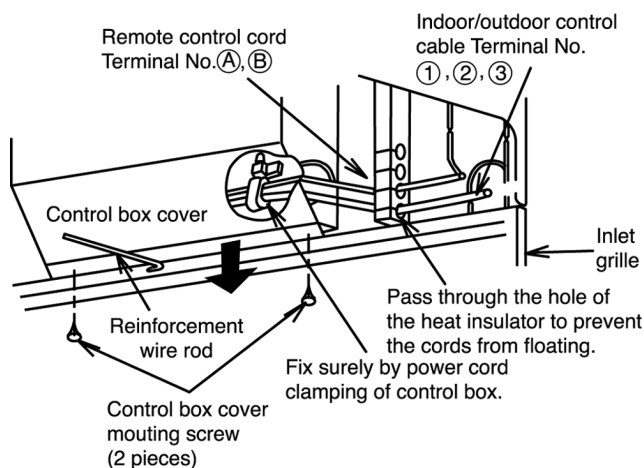
Note	If momentarily turning on the power supply for both the indoor and outdoor units, do not turn the power off after again until at least 1 minute has passed. (for the system's automatic setting.) Turning off the power supply on the way may cause an abnormal operation.
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- Use the standard power cord for Europe (such as HO5RN-F or HO7RN-F which conforms to CENELEC (HAR) rating specifications) or use the cable based on IEC standard. (245IEC57, 245IEC66)

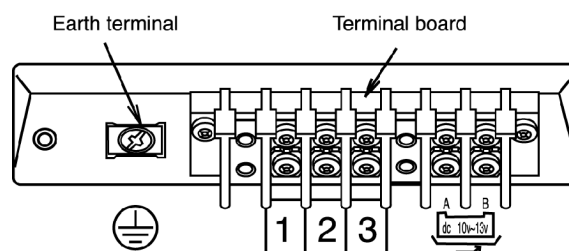


CONNECTING THE WIRES TO THE CONTROL BOX

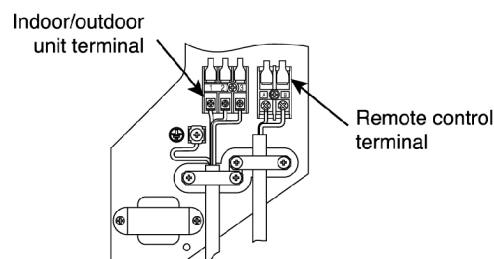
- Remove a two mounting screw, remove the control box cover, and then connect the wires by following the procedure given in the illustration.



Caution Make sure that screws of the terminal are securely tightened.



Detail of terminal board in the control box.



Earth lead wire shall be longer than other lead wires as shown in the figure for the electrical safety in case of the slipping out of the cord from anchorage.

10.4.8. Settings

- ✗ Do not operate the remote controller within 1 minute after turning on the power of the indoor unit.
- ✗ When using group control with the standard type, at least 1 unit must be set at No.1 at the indoor unit.
- ✗ Check the settings of the indoor unit in a case where there are no display at remote controller. If there is no problem to the settings, either group control or standard type should be set at No.16 at the indoor unit before turning the power on again.

- All sets in the group which uses the same remote controller thermistor settings can be controlled by the same remote controller thermistor.
- Up to a maximum of 16 indoor units can be connected at the time of group control. (Do not connect heat pump unit with cooling only unit.)
- Indoor unit No. will be set automatically at the time of group control. However, which indoor unit uses which number is unknown.

Indoor unit No. is also possible to be set manually with DIP switches. Since manual address setting has priority to automatic address setting. To perform automatic address settings after doing manual setting, turn off all DIP switches from No.1 to No.4, and then stop the operation. Then press three switches such as [AIR SWING AUTO] . [MODE]. [A/C No.] at the same time. (Do not use manual address setting and automatic address setting together.)

- Centralized control is possible for master unit and slave unit at the time of group control.

Manual Setting	Indoor unit No.	1	2	3	4	5	6	7	8
	DIP switch (SW2) address setting on indoor unit printed circuit board.								
	A/C No. setting	Unnecessary operation	1 ~ ON	2 ~ ON	1, 2 ~ ON	3 ~ ON	1, 3 ~ ON	2, 3 ~ ON	1, 2, 3 ~ ON
	Indoor unit No.	9	10	11	12	13	14	15	16
	DIP switch (SW2) address setting on indoor unit printed circuit board.								
	A/C No. setting	4 ~ ON	1, 4 ~ ON	2, 4 ~ ON	1, 2, 4 ~ ON	3, 4 ~ ON	1, 3, 4 ~ ON	2, 3, 4 ~ ON	1, 2, 3, 4 ~ ON

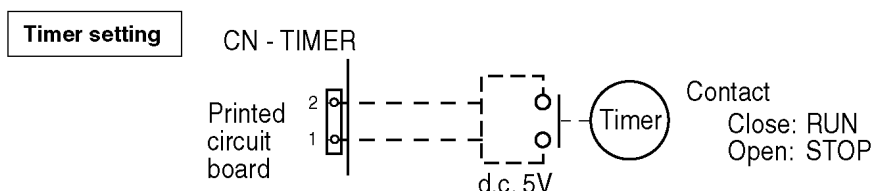
(Remote Control Address Setting)

(Refer to the Operation Manual which is provided with the remote controller for details.)

- Two remote controllers (including the wireless remote controller) can be connected. However, remote control thermistor setting is not possible.
- As for [master/slave] setting of remote controller, the automatic setting and manual setting are possible. Since manual setting is priority.
- Two remote controllers, which both are wireless, cannot be connected.

10.4.9. As for timer output

- Connect the timer cord to connector (CN-TIMER) on print circuit board.



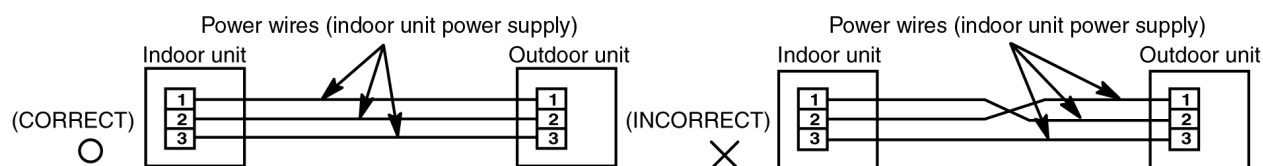
10.4.10. Precautions in test run

- The initial power supply must provide at least 90% of the rated voltage. Otherwise, the air conditioner may not operate.
- Test operation can be carried out using the remote control unit or at the outdoor unit. (If carrying out test operation at the outdoor unit, refer to "TEST OPERATION" in the outdoor unit installation manual.)
- If using the remote control unit to carry out test operation, follow the procedure given below.



- First, press the OFF/ON (①) button.
- Then press the TEST RUN button within 1 minute of pressing the OFF/ON (①) button.
- Next, select the operation modes.
- The temperature of the indoor unit pipes will be shown on the temperature setting display. (At the start of the test operation, it may take up to 1 minute for air conditioner number, switching time and other displays to appear.)
- After operation modes have been selected, stop the compressor for a moment.
- Press the OFF/ON (①) button of the TEST RUN button once more to cancel test operation mode.

NOTE 1 These units are equipped with connection error prevention circuits. If the units do not operate, it is possible that the connection error prevention circuits have operated. In such cases, check that the power wires (connected to terminals ① and ②) and the control wires (③) are connected correctly. If they are connected incorrectly, connect them correctly. Normal operation should then commence.



NOTE 2 Do not short the remote control unit wires to each other. (The protection circuit will be activated and the units will not operate.) Once the cause of the short is eliminated, normal operation will then be possible.

NOTE 3 When running the units in heating mode during test operation, be sure to run the units in cooling mode first before selecting this mode. If heating mode is selected first, it may cause problems with operation of the compressor. (Heat pump model only.)

NOTE 4 Test operation should be carried out for a minimum of 5 minutes. (Test operation will be cancelled automatically after 30 minutes.)

NOTE 5 Test operation mode should always be cancelled once test operation itself has been completed.

10.4.11. Check the following items when installation is complete

- After completing work, be sure to measure and record trial run properties, and store measuring data, etc.
- Measuring items are room temperature, outside temperature, suction temperature, blow out temperature, wind velocity, wind volume, voltage, current, presence of abnormal vibration and noise, operating pressure, piping temperature, compressive pressure, airtight pressure.
- As to the structure and appearance, check the following items .

<input type="checkbox"/> Is circulation of air adequate?	<input type="checkbox"/> Are the terminal screws loosened?
<input type="checkbox"/> Is draining smooth?	M3...69-98 N.cm {7-10 kgf.cm}
<input type="checkbox"/> Is heat insulation complete (refrigerant and drain piping)?	M4...157-196 N.cm {16-20 kgf.cm}
<input type="checkbox"/> Is there any leakage of refrigerant?	M5...196-245 N.cm {20-25 kgf.cm}
<input type="checkbox"/> Is remote controller switch operated?	
<input type="checkbox"/> Is there any faulty wiring?	

10.4.12. Hand over

- Teach the customer the operation and maintenance procedures, using the operation manual (air filter cleaning, temperature control, etc.)

As to parts to be sold separately

- With regards to installation of the parts sold separately, follow the installation manual which is provided with the parts sold separately

As for work specifications of the outdoor unit, read the OUTDOOR UNIT INSTALLATION MANUAL attached to the outdoor unit.

10.5. Outdoor unit installation




AIR CONDITIONERS OUTDOOR UNIT INSTALLATION INSTRUCTIONS


**REFRIGERANT
R410A**

HP	Model name
2.5 HP	CU-L24DB**
3 HP	CU-L28DB**
4 HP	CU-L34DB**
5 HP	CU-L43DB**
6 HP	CU-L50DB**

Precautions in terms of safety

Carry out installation work with reliability after thorough reading of this "Precautions in terms of safety".

- Precautions shown here are differentiated between  Warnings and  Cautions. Those that have much chances for leading to significant result such as fatality or serious injury if wrong installation would have been carried out are listed compiling them especially into the column of .

However, even in the case of items which are listed in the column of , such items also have a chance for leading to significant result depending on the situations.

In either case, important descriptions regarding the safety are listed, then observe them without fail.

- As to indications with illustration



This mark means "Caution" or "Warning".



This mark means "Earth".

- After installation work has been completed, do not only make sure that the unit is free from any abnormal condition through the execution of try run but also explain how to use and how to perform maintenance of this unit to the customer according to the instruction manual.

In addition, request the customer to keep this manual for installation work together with instruction manual.


Warnings

<p>▲ The appliance must be installed by technician, who takes into account the requirements given by ISO5149 or eventual equivalent requirements.</p>	<p>▲ If installing inside a small room, measures should be taken to prevent refrigerant levels from building up to critical concentrations in the event of a refrigerant leak occurring. Please discuss with the place of purchase for advice on what measures may be necessary to prevent critical concentrations being exceeded. If the refrigerant leaks and reaches critical concentration levels, there is the danger that death from suffocation may result.</p>
<p>▲ As to installation, request the distributor or vendor to perform it. Imperfection in installation caused by that having been carried out by the customer himself may lead to water leakage, electric shock, fire, etc.</p>	<p>▲ Securely attach the protective covers for the outdoor unit connection cables and power cord so that they do not lift up after installation. If the covers are not properly attached and installed, the terminal connections may overheat, and fire or electric shock may result.</p>
<p>▲ Carry out the installation work with reliability according to this manual for installation work. Imperfection in installation leads to water leakage, electric shock, fire, etc.</p>	<p>▲ Switch off all supplies before accessing any electrical part.</p>
<p>▲ Carry out the installation work with reliability on the place that can bear the weight of this unit sufficiently. Insufficient strength leads to injury due to falling of the unit.</p>	<p>▲ If refrigerant gas escapes during installation, ventilate the affected area. If the refrigerant gas comes into contact with sparks or naked flames, it will cause toxic gases to be generated.</p>
<p>▲ Carry out predetermined installation work in preparation for strong wind such as typhoon, earthquake. Imperfection in installation work may lead to accidents arisen from overturn, etc.</p>	<p>▲ Once installation work is completed, check that there are no refrigerant gas in the room that can come into contact with sparks or flames from a fan heater, stove or kitchen range, which will cause toxic gases to be generated.</p>
<p>▲ The unit must be installed in accordance with applicable national and local regulations. Any electrical work should only be carried out by qualified technician and use exclusive circuits without fail. Presence of insufficient capacity in power circuit or imperfection in execution leads to electric shock, fire, etc.</p>	<p>▲ When performing piping work do not mix air except for specified refrigerant (R410A) in refrigeration cycle. It causes capacity down, and risk of explosion and injury due to high tension inside the refrigerant cycle.</p>

⚠ Warnings

- ▲ Wiring shall be connected securely using specified cables and fix them securely so that external force of the cables may not transfer to the terminal connection section.
Imperfect connection and fixing leads to fire, etc.



⚠ Cautions


<p>▲ Carry out Earthing work. Do not connect the Earth return to the gas pipe, water line pipe, lightning rod and telephone lines. Imperfection in Earth return may lead to electric shock.</p>		<p>▲ Drain piping should be made to ensure secure drainage according to the manual for installation work and carry out the thermal insulation to prevent the occurrence of condensation. Imperfection in piping work leads to water leakage and may cause the house and property, etc. to become wet</p>
<p>▲ Do not install the unit at the place where the possibility of inflammable gas leakage exists. If such gas leakages should arise and the gas builds up around the unit, such situation may lead to ignition.</p>		<p>▲ Position the indoor unit and outdoor unit, power cords and indoor/outdoor unit connection cables in a way so that they are at least 1 meter away from televisions and radios. This is to avoid problem such as interference with picture and/or sound. (However, note that depending on the electromagnetic wave conditions, interference may still occur even if the separation distance is more than 1 meter.)</p>
<p>▲ Mounting of the earth leakage circuit breaker is required. Omission in mounting of the earth leakage circuit breaker may lead to electric shock.</p>		

10.5.1. Accessories supplied with outdoor unit

- The following parts are supplied as accessories with each outdoor unit.

Check that all accessory parts are present before installing the outdoor unit.

Part name	Q'ty	Diagram	Application
Protective bushing	2		For protecting electrical wires
Banding strap	3		For tying electrical wires together

Heat pump-types only			
Part name	Q'ty	Diagram	Application
Drain elbow AS	1		For connecting the drain pipe (with ring seat)

10.5.2. Before installation work

- This product is using new refrigeration (R410A). The basic way of installation work is the same as usual, but water and impurities should be controlled more strictly than before due to characteristic of refrigerating machine oil. Therefore, selection of materials to use and processing, storing and brazing need appropriate construction and control.

1. Tools and materials

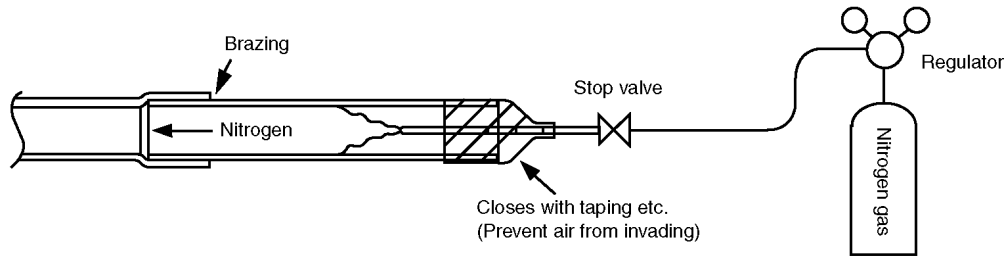
There are tools and materials for both new refrigeration and usual refrigeration you can use together and for either two of them you can use. Use the below for new refrigeration.

- Vacuum pump (with back flow preventor system)
- Gas leakage detection warning device
- Gauge manifold
- Charge hose

2. Installation work

a. Brazing work

Brazing work needs replacing air inside pipe with nitrogen gas in order to prevent oxidization scale from occurring. This is called nitrogen replacement, and one of very important work in brazing refrigerant piping. (Oxidation preventive is not possible to use)

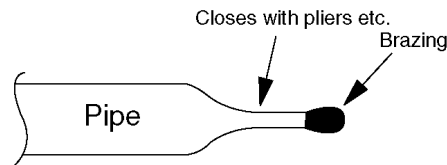
(Work method)**b. Prevention measure for refrigerant piping**

Prevention measure for refrigerant piping is very important work to prevent water-dust-rubbish from getting in. All piping terminals needs sealing such as shown below.

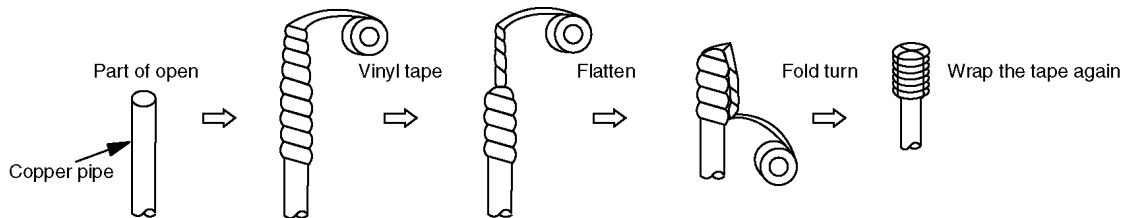
Place	Period of work	Method of seal
Outside	More than 1 month	Pinch
	Less than 1 month	Pinch or taping
Inside	Not specified	

– How to pinch

Close terminal part of piping with pliers and seal the gap with brazing.

**– How to tape**

Seal terminal part of piping with vinyl tape.

**3. Vacuum pumping**

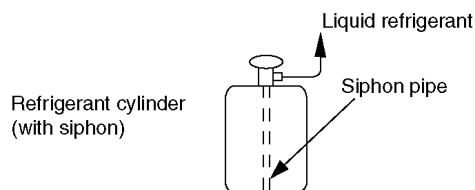
The purpose of vacuum pumping work is to remove and dry air inside the piping or nitrogen at air tightness test. Perform the work carefully.

⚠ Caution	Use the vacuum pump with the backflow prevention mechanism to prevent backflow of oil.
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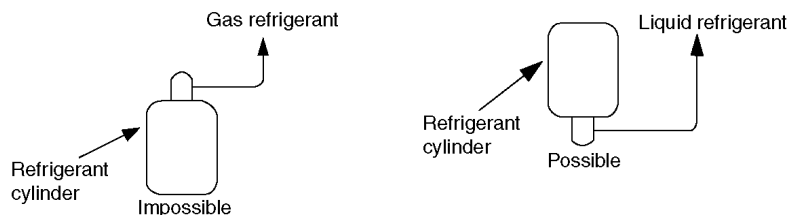
Vacuuming time	60 minutes or more	⚡ Vacuum pump capacity 60 l/min or more
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4. Refrigerant filling

Refrigerant filling must be done in the state of liquid refrigerant. If this is done in gas refrigerant, the balance of refrigerant composition will collapse and damage the operation.



For the use of a gas cylinder without siphon inside, turn it upside down and use it.
(We recommend manifold with sight glass.)



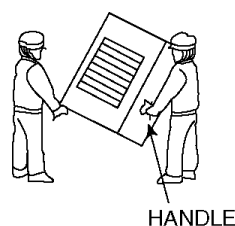
⚠ Caution	Do not use a "CHARGE CYLINDER".
⚠ Caution	As a rule, please collect all existing refrigerants in the system outside the system when the refrigerant leakage occurs by the system. After that, please fill new refrigerant of a regulated amount again.

DRY VACUUMING

- If vacuum pump possible vacuuming until less than -100.7kpa.
 1. Running vacuum pump at both liquid and gas side for more than 1 hour and vacuuming until -100.7kpa.
 2. After that keep the pressure -100.7kpa for 1 hour and confirm the vacuum gauge value not increasing.
 3. If vacuum gauge value is increase, there is possibility of water inside the unit or there is any leakage.

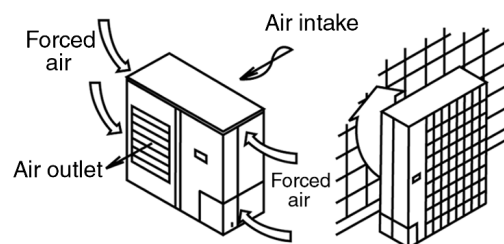
10.5.3. Regarding handling

Handling the unit by hold the handle at compressor side and hold the basepan bottom at fan side.



10.5.4. Selecting the outdoor unit installation locations

- Select location which satisfies the following condition, and then confirm with the customer that such a place is satisfactory before installing the outdoor unit.
 1. There should be sufficient ventilation.
 2. The outdoor unit should be sheltered as much as possible from rain and direct sunlight, and the air should be able to move around so that hot and cold air do not build up.
 3. There should not be animals or plants near the air outlet which could be adversely affected by hot or cold air coming out from the unit.
 4. The outlet air and operating noise should not be a nuisance to other occupants nearby.
 5. The location should be able to withstand the full weight and vibration of the outdoor unit, and it should also be level and safe for the unit to be installed.
 6. The intake and outlet should not be covered.
 7. There should not be danger of flammable gas or corrosive gas leaks.
 8. There should be as little back-ventilation (air blowing directly onto the fan) as possible.
(If strong wind blows directly onto the fan, it may cause problems with normal operation.)
 - If you know which direction the prevailing wind comes from during the operating season, set the outdoor unit at a right-angle to this wind direction, or so that air outlet faces toward a wall or fence.
 - If there are obstructions near the outdoor unit and the wind direction is not constant, install an optional air guider.
 9. Do not allow any obstacles near the outdoor unit which will interfere with air flow around the air intake and air outlet.
 10. If installing in a location which is prone to snowfall, place the installation base as high as possible, and be sure to install a roof or enclosure which does not allow snow to accumulate.
 11. Avoid installing the unit in places where petroleum products (such as machine oil), salinity, sulphurous, gases or high-frequency noise are present.



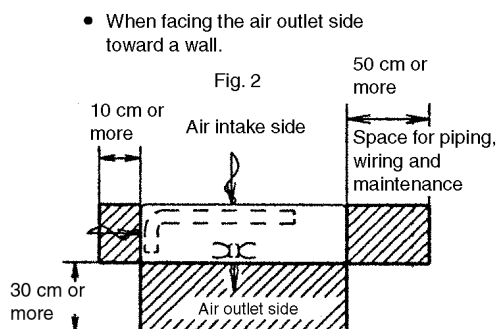
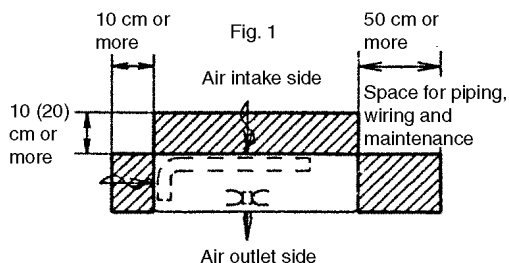
12. Be sure to leave enough space around the outdoor unit to maintain proper performance and to allow access for routine maintenance.

- Allow enough space from any obstacles as shown in Fig. 1.2 below in order to prevent short-circuits from occurring.

(If installing more than one outdoor unit, make the necessary space available as outlined in 13.)

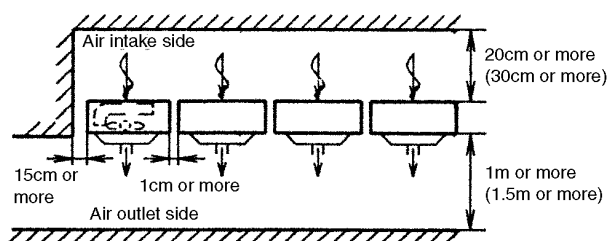
However, there should be at least 1 meter of free space above the unit.

- The height of any obstacles at the air intake and outlet sides should not be greater than the height of the outdoor unit.
- When facing the air intake side toward a wall.

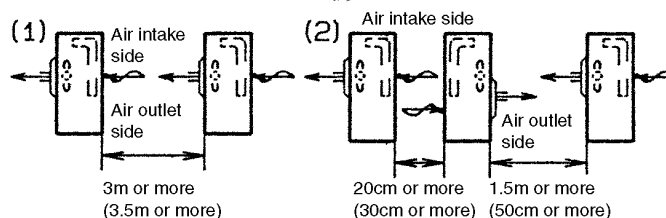


13. If installing more than one outdoor unit, allow enough space around each unit as shown below.

- When installing units side by side



- When installing units facing each other



✕ Maintain sufficient space above the unit.

Values inside brackets indicate distances when installing the 4HP - 6HP.

- The distance given above are the minimum distance required in order to maintain proper performance.

Allow as much space as possible in order to get the best performance from the units.

10.5.5. Transporting and installing the outdoor unit

- Transporting

1. The outdoor unit should be transported in its original packaging as close to the installation location as possible.
2. If suspending the outdoor unit, use a rope or belt, and use cloth or wood as padding in order to avoid damaging the unit.

- Installation

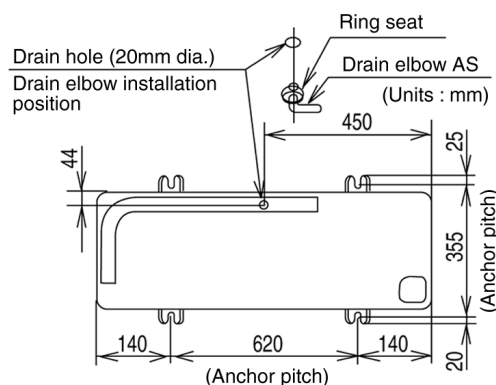
1. Read the "Selecting the outdoor unit installation location" section thoroughly before installing the outdoor unit.
2. If installing the unit to a concrete base or other solid base, use M10 or W3/8 bolts and nuts to secure the unit, and ensure that the unit is fully upright and level.

(The anchor bolt positions are shown in the diagram at the right side.)

In particular, install the unit at a distance from the neighbouring building which conforms to regulations specified by local noise emission regulation standards.

3. Do not install the outdoor unit to the building's roof.
4. If there is a possibility that vibration may be transmitted to the rooms of the building, place rubber insulation between the unit and the installation surface.
5. Drain water will be discharged from the outdoor unit when operating the system in heating or defrosting modes. Select an installation location which will allow the water to drain away properly, or provide a drainage channel so that the water can drain away.

(If this is not done, the drain water may freeze during winter, or the water may spill down to areas underneath the installation location.)



- If a drain pipe needs to be installed, insert the accessory drain elbow into the mounting hole at the bottom of the outdoor unit, and connect a hose with an inside diameter of 15mm to this drain elbow.

(The hose is not supplied.)

✕ If using the drain elbow, install the outdoor unit on a base which is at least 5cm high.

NOTE In cold regions (where the outdoor air temperature can drop to 0°C or below continuously for 2-3 days), the drain water may freeze, and this may prevent the fan from operating. Do not use the drain elbow in such cases.

10.5.6. Connecting the pipes

- Use a clean pipe which does not include water or dust for inside of piping.
- When cutting the refrigerant pipes, a piping cutter must be used. Before connecting the refrigerant pipes, blow nitrogen and blow off dust in the pipes.
(Never use tools which cause a lot of dust such as a saw and a magnet.)
- When waxing replace nitrogen inside the piping after removing dirt and dust. (In order to prevent oxidization scale from forming inside the piping).
- The refrigerant pipes are of particular importance.

The installation work for refrigerant cycles in separate-type air conditioners must be carried out perfectly.

1. Refer to the table below for the pipe diameters equivalent lengths and indoor/outdoor unit difference of elevation.

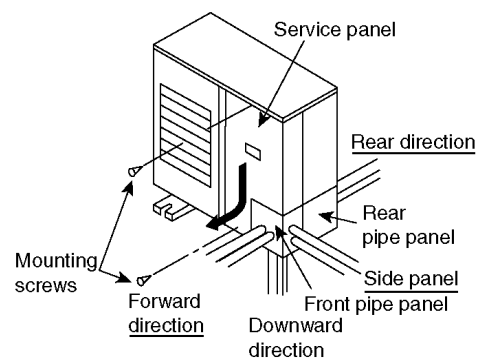
Pipe diameter (mm)		Equivalent length (m)	Difference of elevation (m)
Liquid-side pipes	Gas-side pipes		
ø9.52 x 0.8	ø15.88 x 1.0	50	30

2. Local pipes can project in any of four directions.

- Make holes in the pipe panels for the pipes to pass through.
- Be sure to install the pipe panels to prevent rain from getting inside the outdoor unit.

[Removing the service panel].

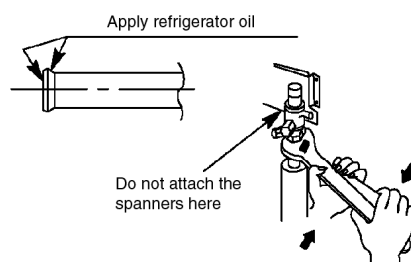
- (1) Remove the two mounting screws.
- (2) Slide the service panel downward to release the pawls. After this, pull the service panel toward you to remove it.



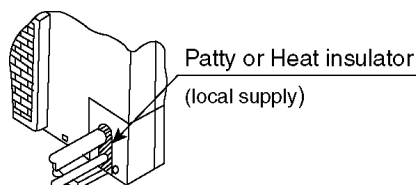
3. Notes when connecting the refrigerant pipes.

- Use clean copper, pipes with no water or dust on the insides.
- Use phosphorus-free, unjointed copper pipes for the refrigerant pipes.
- If it is necessary to cut the refrigerant pipes, be sure to use a pipe cutter, and use compressed nitrogen or an air blower to clean out any foreign particles from inside the pipe.
- Be careful not to let any dust, foreign materials or water get inside the pipes during connection.
- If bending the pipes, allow as large a bending radius as possible. Do not flex the pipes any more than necessary.
- If joining pipe ends, do so before tightening the flare nut.
- Always blow the pipe end with nitrogen while joining pipe ends.
(This will prevent any oxide scaling from occurring inside the pipe.)
- If using long pipe lengths with several joined pipe ends, insert strainers inside the pipes. (Strainers are not supplied.)
- When tightening the flare nuts, coat the flare (both inside surfaces) with a small amount of refrigerator oil, and screw in about 3-4 turns at first by hand.
- Refer to the following table for the tightening torques. Be sure to use two spanners to tighten.
(If the nuts are overtightened, it may cause the flares to break or leak.)

Flare nut fastening torque N•m (kgf•cm)			
ø6.35 mm	18 (180)	ø15.88 mm	65 (660)
ø9.52 mm	42 (430)	ø19.05 mm	100 (1020)
ø12.7 mm	55 (560)		



- After piping connection has been completed, make sure that the joint areas of the indoor and outdoor units are free from gas leakage by the use of nitrogen, etc.
- Air purge within connection piping shall be carried out by evacuation.
- Close the tube joining area with putty heat insulator (local supply) without any gap as shown in below figure.
(To prevent insects or small animal entering)



10.5.7. Heat insulation

⚠ Caution	Use a material with good heat-resistant properties as the heat insulation for the pipes. Be sure to insulate both the gas-side and liquid-side pipes. If the pipes are not adequately insulated, condensation or water leakages may occur.
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Liquid-side pipes	Material that can withstand 120°C or higher
Gas-side pipes	

10.5.8. Charging with refrigerant


- At the time of shipment from the factory, this unit is charged with enough refrigerant for an equivalent pipe length of 30m. If the equivalent pipe length used will be 30m or less, no additional charging will be necessary.
- If the equivalent pipe length will be between 30 and 50m, charge with additional refrigerant according to the equivalent length given in the table below.
 - For standard type

Additional charging amount	Equivalent length
0.05 kg/m	50m

- Pump down operation
 - Operate the pump down according to the following procedures.

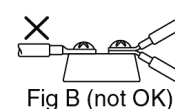
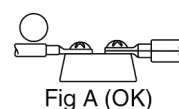
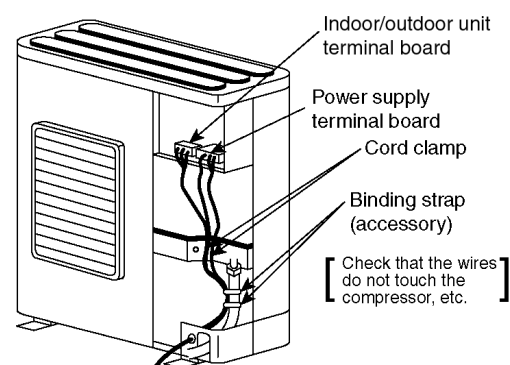
Procedure	Notes
1. Confirm the valve on the liquid side and the gas side is surely open.	
2. Press the PUMP DOWN switch on outdoor printed board for 1 second or more.	Perform the cooling operation for five minutes or more.
3. Shut the valve on the liquid side surely.	When the valve is shut halfway, the compressor is occasionally damaged.

10.5.9. Electrical wiring

⚠ Warning	The units must be connected to the supply cables for fixed wiring by qualified technician. Feed the power source to the unit via a distribution switch board designed for this purpose, the switch should disconnected all poles with a contact separation of at least 3mm. When the supply cable is damaged, it must be replaced by qualified technician.	
⚠ Caution	Be sure to install a current leakage breaker, main switch and fuse to the main power supply, otherwise electric shocks may result.	
⚠ Caution	Be sure to connect the unit to secure earth connection. If the earthing work is not carried out properly, electric shocks may result.	
⚠ Warning	Wiring shall be connected securely by using specified cables and fix them securely so that external force of the cables may not transfer to the terminal connection section. Imperfect connection and fixing leads to fire, etc.	

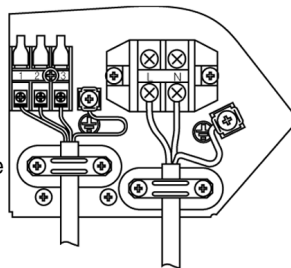
- Connect the power supply wiring and indoor/outdoor unit connection wiring according to the electrical circuit diagram instructions.
- Clamp the wires securely to the terminal connections using cord clamps so that no undue force is placed on the wires.
- Once all wiring work has been completed, tie the wires and cords together with the binding strap so that they do not touch other parts such as the compressor and pipes.

1. Connect the power supply line to a 3-phase/380-415V (or single-phase 220-240V) power supply.
2. The equipment shall be connected to a suitable mains network with a main impedance less than the value indicated in the table of power supply specifications.
3. Be sure to connect the wires correctly to terminal board with connecting the crimp type ring terminal to the wires.
4. The binding screws inside the power supply box may become loosened due to vibration during transportation, so check that they are tightened securely.
5. Tighten the binding screws to the specified torque while referring to the table below.
6. If connecting two separate wires to a single crimped terminal, place the two crimped terminal wires together as shown in Fig. A. (If the arrangement shown in Fig. B is used, poor contacts or contact damage may result.)
7. If momentarily turning on the power supply for both the indoor and outdoor units, do not turn the power off again until at least 1 minute has passed (except when a reversed phase has been detected).

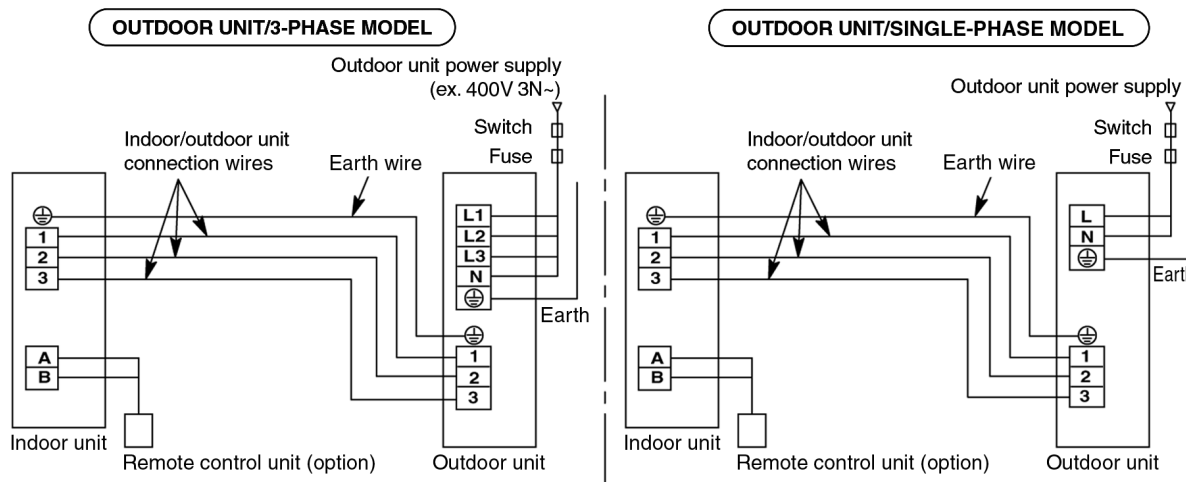


⚠ Warning	Use only the specified cables for wiring connections. Connect the cable securely, and secure them properly so that no undue force will be applied to the terminal connections. If the terminals are loose or if the wires are not connected securely, fire may result.
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Terminal screw	Tightening torque N.cm {kgf.cm}
M3	69 ~ 98 {7 ~ 10}
M4	157 ~ 196 {16 ~ 20}
M5	196 ~ 245 {20 ~ 25}

Example of
single phase
model

Earth lead wire shall be longer than other lead wires as shown in the figure for the electrical safety in case of the slipping out of the cord from the anchorage.



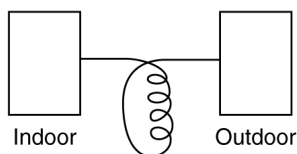
• Power supply specifications

Model name		Leakage current breaker (A)	Circuit breaker (Minimum Capacity)		Minimum power supply cables	4mm ² cable based on length (m)	Maximum permissible impedance (Ω)	Indoor/outdoor unit connection
			Switch (A)	Fuse (A)				power cables (terminals ①, ②, ③, ④)
CU-L24DB***	220V-240V~	30	30	20	4 mm ²	14	0.1	2.5 mm ² × 3
CU-L28DB***	220V-240V~	30	30	20		14	0.1	
CU-L34DB***	220V-240V~	40	40	30		9	0.05	
CU-L43DB***	220V-240V~	40	40	40		8	0.05	
CU-L50DB***	380V-415V 3N~	30	30	30		11	0.02	

NOTE



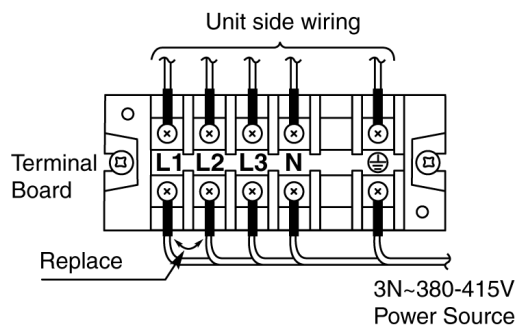
- Where ground work (earth) is carried out, do not connect the ground return to the gas pipe, water line pipe, grounded circuit of the telephone and lightning rod, or ground circuit of other product in which earth leakage breaker is incorporated. (Such action is prohibited by statute, etc.)



Make sure the indoor and outdoor connection wires are detangled. (There might be effect to received outside noise.)

- 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. (245IEC57, 245IEC66)
- Select the particular size of electrical wire for power supply cables in accordance with the standards of the given nation and region.

10.5.10. Connecting power supply cables



CAUTION

- For three phase model, never operate the unit by pressing the electromagnetic switch.
- Never correct the phase by switching over any of the wires inside the unit.

10.5.11. Precautions with regard to test operation

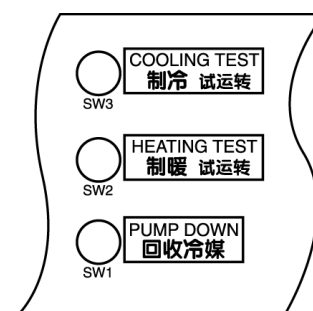
CAUTION

- Always be sure to use a properly-insulated tool to operate the switch on the circuit board. (Do not use your finger or a metallic object.)
- Never turn on the power supply until all installation work has been completed.
- Turn on the circuit breaker 12 hours or more before a test run. (By supplying power to crankcase heater, compressor is warmed and liquid compressing is prevented.)
- Check that the voltage is 90% of rated voltage or higher when starting the unit.
(The unit will not operate if the voltage is less than 90% of rated voltage.)

- Test operation can be carried out using the remote control unit or by using the switch on the printed circuit board inside the outdoor unit.

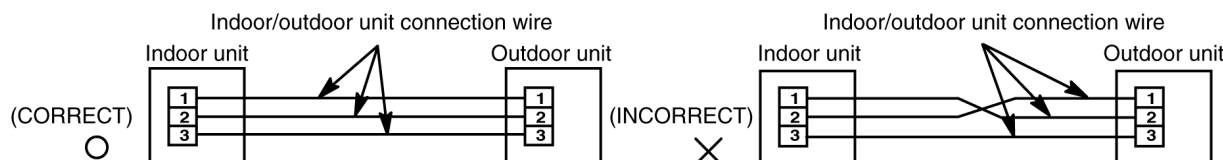
If carrying out test operation at the printed circuit board of the outdoor unit, follow the procedure given below. (If using the remote control unit to carry out test operation, refer to the installation manual which is supplied with the indoor unit.)

- Press the COOL or HEAT switch for 1 second or more.
(Be sure to select cooling mode first, and run the units in this mode for 5 minutes or more.)
- Press the TEST button once more to cancel test operation mode.
- When performing heating test operation when the outside temperature is high, or cooling test operation when the outside temperature is low, the protection circuits may sometimes operate within a few minutes.



NOTE 1

These units are equipped with connection error prevention circuits. If the units do not operate, it is possible that the connection error prevention circuits have been operated. In such cases, check that the Indoor/outdoor unit connection wire (connected to terminals ①, ② and ③) is connected correctly. If they are connected incorrectly, connect them correctly. Normal operation should then commence.



NOTE 2

Do not short the remote control unit wires to each other. (The protection circuit will be activated and the units will not operate.) Once the cause of the short is eliminated, normal operation will then be possible.

NOTE 3

When running the units in heating mode during test operation, be sure to run the units in cooling mode first before selecting this mode. If heating mode is selected first, it may cause problems with operation of the compressor.

NOTE 4

Test operation should be carried out for a minimum of 5 minutes. (Test operation will be cancelled automatically after 30 minutes.)

NOTE 5

Test operation mode should always be cancelled once test operation itself has been completed.

NOTE

If the self-diagnosis function reports a problem but more than one problem has developed at the indoor and/or outdoor units, the problem display on the remote control unit may not match the LED display on the outdoor unit printed circuit board. In such cases, check both locations and remove the causes of the problems.

10.5.12. As to making the inspection after completion of work fully understood

- At the time when the work has been completed, measure and record the characteristics of test run without fail and keep the measuring date, etc.
- Carry out the measurement regarding room temperature outside air temperature, suction and air discharge temperatures, wind velocity, wind volume, voltage current, presence of abnormal vibration, operating pressure, piping temperature, compressive pressure, airtight pressure as items to be measured.
- As to the structure and appearance, check following items.

- ☐ Short circuit of the blow-out air
- ☐ Smooth flow of the drain
- ☐ Reliable thermal insulation
- ☐ Leakage of refrigerant

- ☐ Mistake in wiring
- ☐ Reliable connection of the grand wire
- ☐ Looseness in terminal screw, fastening torque

M3... 69-98N.cm {7-10kgf.cm} M4... 157-196N.cm {16-20kgf.cm}
M5... 196-245N.cm {20-25kgf.cm}

10.5.13. As to delivery to the customer






- Request the customer to operate this air conditioner viewing instruction manual come with indoor unit in practice and explain how to operate.
- Deliver the instruction manual to the customer without fail.

10.6. Wired remote control installation

Wired Remote Control Installation Manual

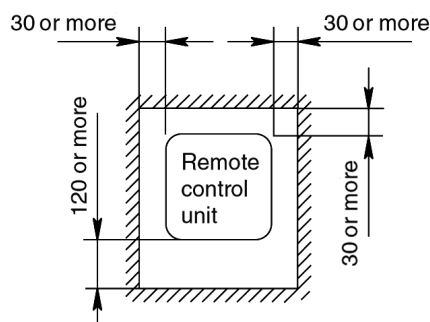
- Before installing the wired remote controller, be sure to thoroughly read the “Notes with regard to safety” section of the installation manual provided with the indoor unit.
- After installing the wired remote controller, carry out a test operation to check that the remote controller functions properly, and also explain the operation and cleaning procedures to the customer in accordance with the details in instruction manual. Furthermore, ask the customer to keep this installation manual and the instruction manual in a safe place for later reference.

10.6.1. Accessories supplied with wired remote controller

Name	Q'ty	Diagram	Remark
Remote controller	1		
Remote control cable	1		Length (10m)
4mm screw	3		Installing the remote controller to the wall
M4 screw	3		Installing the remote controller to an outlet box
Round terminal	2		Connecting to indoor unit terminal block

10.6.2. Notes regarding wired remote controller setting-up location

- Select a place where the remote controller can be operated easily (after obtaining approval from the building's owner).
- Install in a place which is away from direct sunlight and as free from humidity as possible.
- Install in a place which is as flat as possible to avoid warping of the remote controller.
(If installed to a wall an uneven surface, damage to the LCD case or operation problems may result.)
- Install in a place where the LCD can be seen easily. If the remote controller is installed somewhere which is too low or too high, it may be difficult to read the LCD. (Standard height from the floor is 1.2 to 1.5 meters.)
- Avoid installing the remote control cable near refrigerant pipes or drain pipes.
- Install the remote control cable at least 5cm away from other electric wires (including stereo and TV cables) to avoid misoperation (electromagnetic noise).
- If passing the remote control cable through a wall, be sure to install a water trap above the cable.
- Allow sufficient space around the remote controller as shown in the illustration at right.
Secure the remote controller lower case to the wall or to an outlet.



10.6.3. Remote controller installation

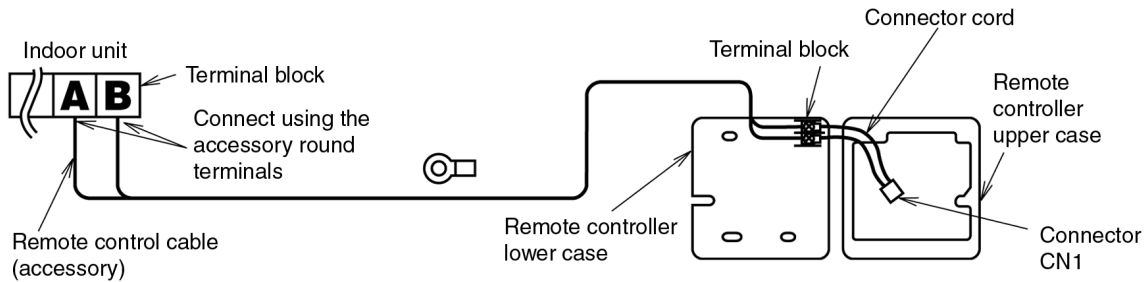
- Be sure to turn off the main power before installing and connecting the remote controller.
(If the remote controller is connected while the power is still turned on, the remote controller displays may not appear.)

If no displays appear on the remote controller, check while referring to “If no remote controller displays appear” in “5 Test operation”.

- The remote control cable is live during use, so please be careful with it.

Remote controller wiring

- Connect the indoor unit and the remote controller as shown in the illustration below.
- The remote control cable is non-polar.
- At the time of shipment from the factory, the connector cable used to connect the terminal block and connector CN1 is disconnected. When connecting the remote controller wiring and installing the remote controller, be sure to connect the cord to the connector CN1.



Extending the remote control cable

- Solder a sheathed PVC cord or cable (0.5 - 2 mm²) with specifications among those given below to the remote controller end of the accessory remote control cable (10 m).

* PVC round cable cord	IEC 502
* 600V PVC-insulated PVC sheathed round cable	IEC 227-4
* 600V PVC-insulated PVC sheathed flat cable	IEC 227-4

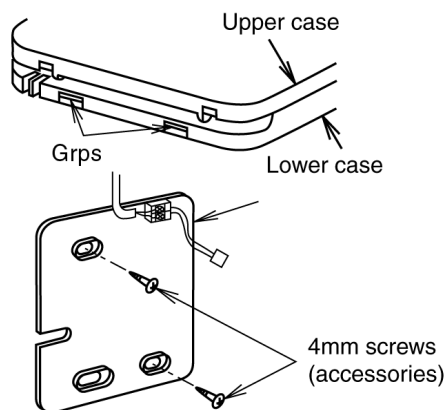
NOTE The maximum possible length for the remote control cable is 200 m.

Remote controller installation procedure

- Remove the remote controller lower case.

(Insert a flat-tipped screw driver or similar 2 to 3 mm into one of the gaps at the bottom of the case, and then twist the screw driver to open. [Refer to the illustration below.])

Be careful not to damage the lower case.



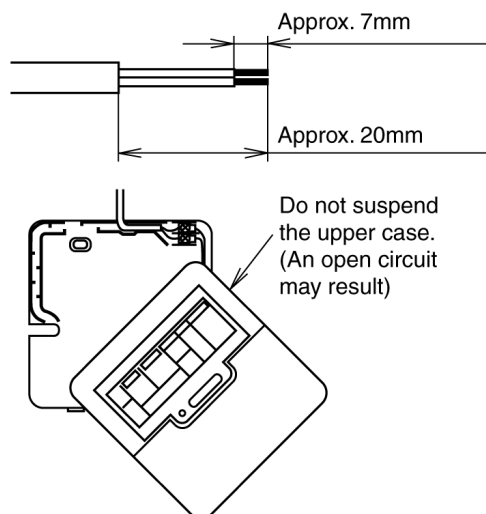
- Secure the lower case to the wall or outlet box.

(Refer to the illustration at right for the embedded and exposed positions for remote control cable.)

NOTE

- Be sure to use only the accessory screws.
- Do not bend the lower case when tightening the screws.
(If the screws are overtightened, damage may result.)
- Do not remove the protective tape which is affixed to the upper case circuit board.
- If installing the remote controller with the remote control cable exposed, use pliers to cut a notch into the upper case. (The feeding-out direction can be either up or to the left or right)

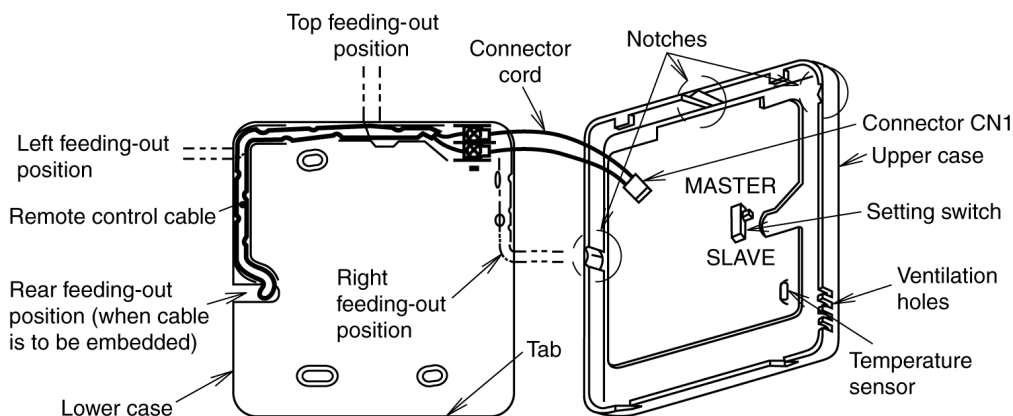
- Strip the end of the remote control cable which is to be connected to the remote controller. (Refer to the illustration below)



- Route the remote control cable inside the lower case in accordance with the intended feeding-out direction. (Refer to the illustration below.)

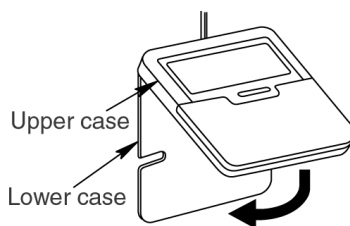
Securely connect connector CN1. (If it is not connected the remote controller will not operate.)

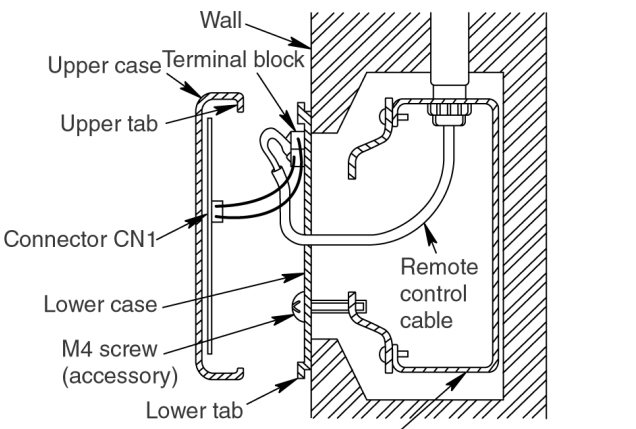
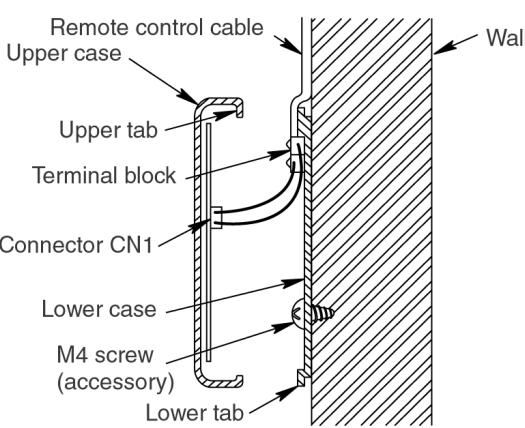
NOTE After connecting the connector, do not suspend the upper case by its own weight, otherwise the connector cord may break.



- If controlling using two remote controllers, refer to "Control using two remote controller-s" in "4 Settings".
- Secure the upper case to the lower case.

(Hook the upper tab of the upper case into the lower case, and then push the upper case until it snaps shut onto the lower case tab, while being careful not to clamp the remote control cable and the connector cord.)



If remote control cable is embedded	If installing with the remote control cable exposed
<p>1. Embed an outlet box (JIS C 8336) into the wall, and then secure the remote controller base plate to the outlet box with the two accessory M4 screws. Make sure that the base plate is flat against the wall at this time, with no bending (looseness)</p> <p>2. Pass the remote control cable into the box and then install the remote controller.</p> 	<p>1. Secure the remote controller base plate to the wall with two accessory 4 mm screws.</p> <p>2. The feeding-out direction for the remote control cable can be either up or to the left or right. (Refer to the illustration above.) After determining the feeding-out direction, use nippers to make a notch in the cover.</p> <p>3. Route the remote control cable as shown in the illustration above. Pull the cord firmly around the outside of the base plate at this time.</p> 

10.6.4. Settings

Control using two remote controllers

- Up to two remote controllers can be installed for a single indoor unit, and either remote controller can be used to operate the indoor unit.
- The indoor unit can be operated with the last switch pressed having priority.

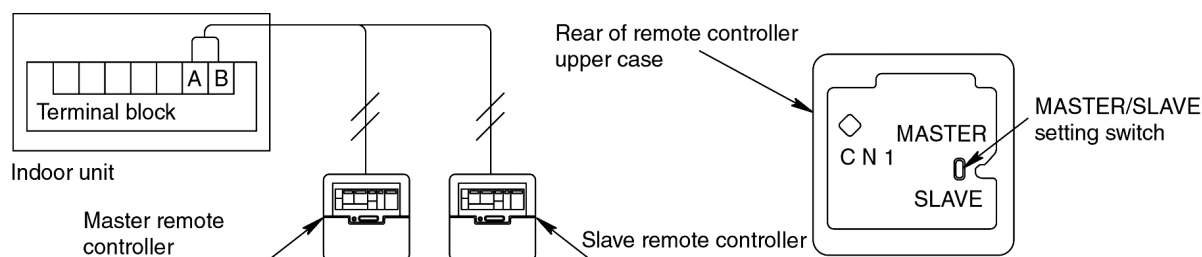
1. Decide which is to be the master and which is to be the slave remote controller.

The master or slave states of the remote controller are set automatically. The MASTER/SLAVE setting switch can also be used to make the setting manually, however if a manual setting is made, that manual setting has priority.

Be sure to turn off the main power before making a manual setting.

2. Connect the remote controllers.

Connect both remote controller to terminals (A) and (B) on the indoor unit terminal block (non-polar).



Group control

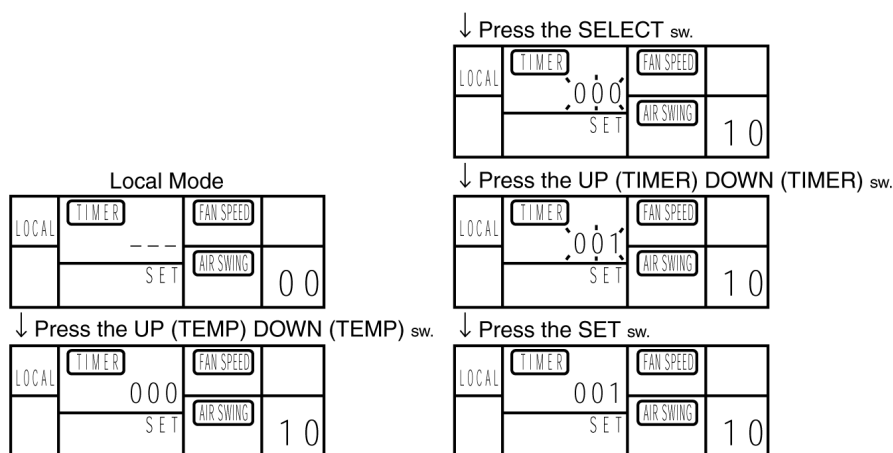
- All in group will be remote controller thermistor setting when using the remote controller thermistor.
- Up to a maximum of 16 indoor units can be connected at the time of group control.
(Do not connect heat pump unit with cooling only unit.)
- Indoor unit No. is possible to set automatically at the time of group control. However, what number would be assigned to which indoor units is unknown.

Indoor unit No. is also possible to set manually with DIP switches. Since manual address setting is priority during performing automatic address setting. (Do not use manual address setting and automatic address setting together.)

Indoor unit No.	1	2	3	4	5	6	7	8
DIP switch (SW2) address setting on indoor unit printed circuit board.								
A/C No. setting	Unnecessary operation	1 ~ ON	2 ~ ON	1, 2 ~ ON	3 ~ ON	1, 3 ~ ON	2, 3 ~ ON	1, 2, 3 ~ ON
Indoor unit No.	9	10	11	12	13	14	15	16
DIP switch (SW2) address setting on indoor unit printed circuit board.								
A/C No. setting	4 ~ ON	1, 4 ~ ON	2, 4 ~ ON	1, 2, 4 ~ ON	3, 4 ~ ON	1, 3, 4 ~ ON	2, 3, 4 ~ ON	1, 2, 3, 4 ~ ON

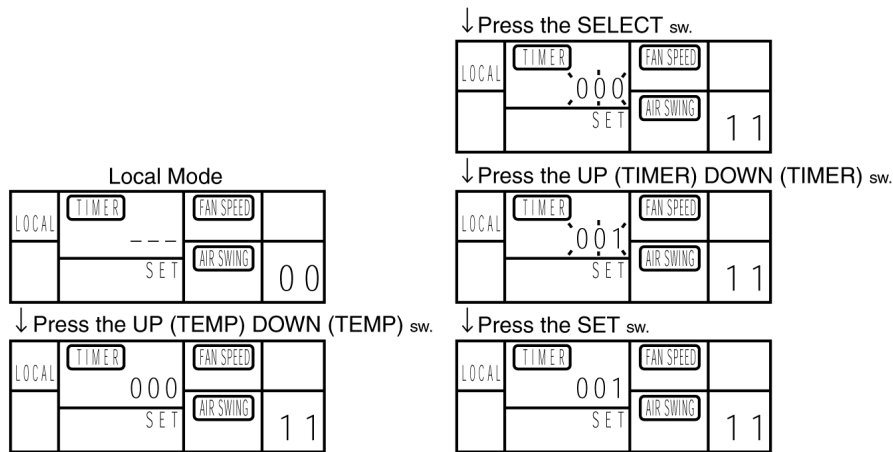
Automatic address resetting for group control

- The address settings for group control (air conditioner Nos. 1 to 16) can be reset automatically.
 - When operation is stopped, press for 5 seconds, continue the TEST RUN switch to display "00" (will be LOCAL MODE).
 - Press the UP (TEMP) DOWN (TEMP) switch to display 10.
 - Press the SELECT switch to display "000". It would blinks.
 - Press the UP (TIMER) DOWN (TIMER) switch to display "001". It would blinks.
 - Press the SET switch.



Switching the thermistor

- The temperature detection thermistor can be switched between the thermistor at the indoor unit and the thermistor at the remote controller. However, do not switch to the remote controller thermistor if using two remote controllers.
 - When operation is stopped, press for 5 seconds, continue the TEST RUN switch to display "00" (will be LOCAL MODE).
 - Press the UP (TEMP) DOWN (TEMP) switch to display 11.
 - Press the SELECT switch to display "000". It would blinks.
 - Press the UP (TIMER) DOWN (TIMER) switch to choose display "000" or "001".
 - "000"... Indoor unit setting (factory default)
 - "001"... Remote controller setting
 - Press the SET switch. (Be sure to press the SET switch so that normal operation mode can be resumed.)
- Repeat the procedure in steps (1) to (5) to change the setting again.



10.6.5. Test operation

- Turn on the main power.
- After 3 minutes have passed since the power was turned on, press the OFF/ON switch on the remote controller. (No operation occurs within 3 minutes after the power was turned on.)
- Press the TEST RUN switch within 1 minute of pressing the OFF/ON switch.
- Next, select the operation mode. (Be sure to select cooling mode first, and run the unit in this mode for 5 minutes or more.)
- Press the OFF/ON switch or the TEST RUN switch to cancel test operation.
- Test operation will be cancelled automatically after 30 minutes.



If remote controller displays nothing

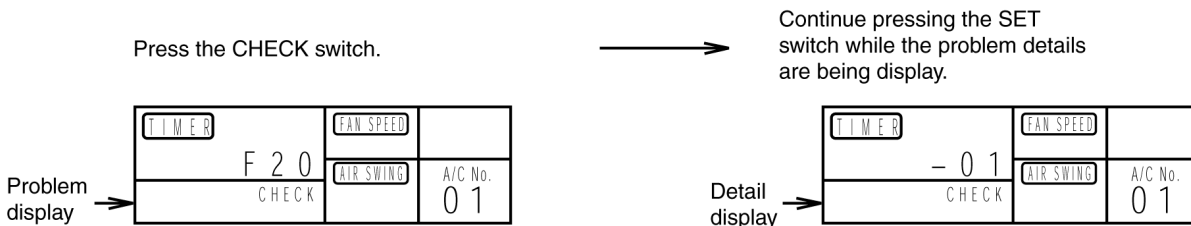
- Check once more that the remote control cable is securely connected. (Check for loose terminals, poor contacts, connection positions terminal block, etc.)
- If the above checks show that nothing is wrong but nothing appears on the remote controller display.
- It is possible that the remote controller was connected while the main power was still turned on. If such is the case, carry out the following.
- Set DIP switch (SW2) No. 1 to 4. The ON position, and then turn on the main power. If the display appears after about 30 seconds, turn DIP switches 2 to 4 to OFF position.

10.6.6. Self-diagnosis function

If "CHECK" is blinking on the timer

- If the "CHECK" display on the wired remote controller is blinking, the details of the problems are displayed on the timer display screen each time the CHECK switch is pressed.
- Further details of the problem can be displayed by pressing the SET switch while the general problem details are being displayed.

Example of current problem display

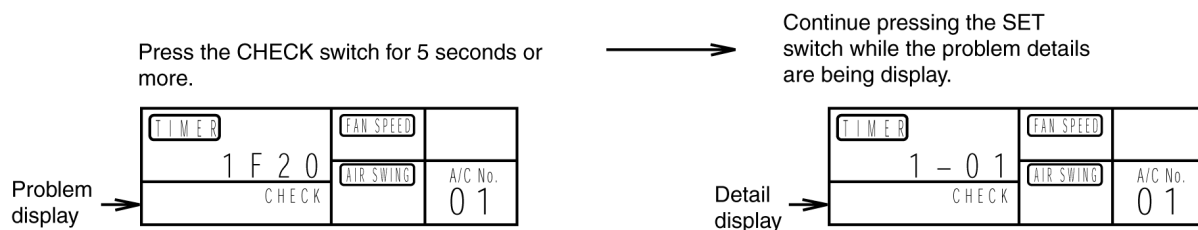


If "CHECK" is not blinking on the timer

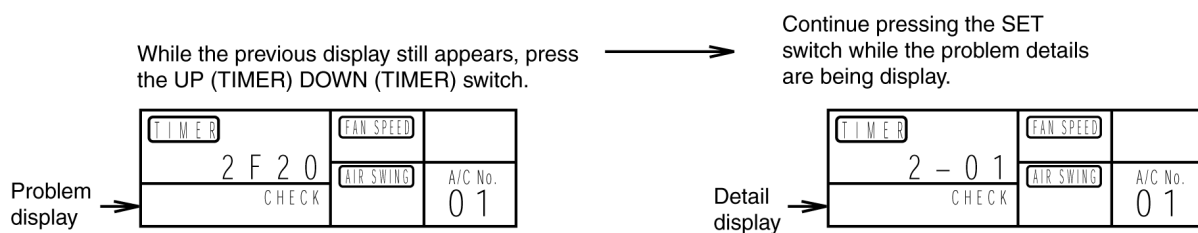
- If the "CHECK" display on the wired remote controller is not blinking, press the CHECK switch continuously for 5 seconds or more to display the problem details for the last problem or the problem before that.

- You can then switch between the display for the previous problem and the problem before that by pressing the UP (TIMER) DOWN (TIMER) switches.
- Press the CHECK switch once more to return to the normal display.

Example of previous problem display



Example of abnormality display before previous display



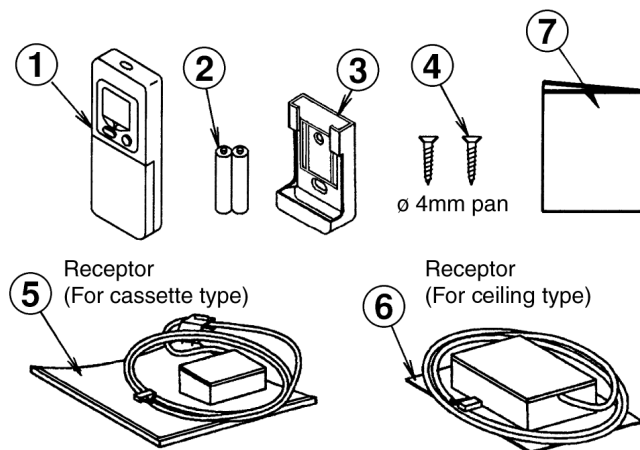
- The display can be switched between the previous problem and the one before that by pressing the UP (TIMER) DOWN (TIMER) switches.
- After eliminating the cause of the problem, press the CHECK switch once more to return to the normal display.

10.7. Wireless remote control installation manual

Wireless Remote Control Installation Manual

- Before installing the wireless remote controller, be sure to thoroughly read the “Notes with regard to safety” section of the installation manual provided with the indoor unit.
- After installing the wireless remote controller, carry out a test operation to check that the remote controller functions properly, and also explain the operation and cleaning procedures to the customer in accordance with the details in the instruction manual. Furthermore, ask the customer to keep this installation manual and the instruction manual in a safe place for later reference.

10.7.1. Accessories supplied with the wireless remote controller

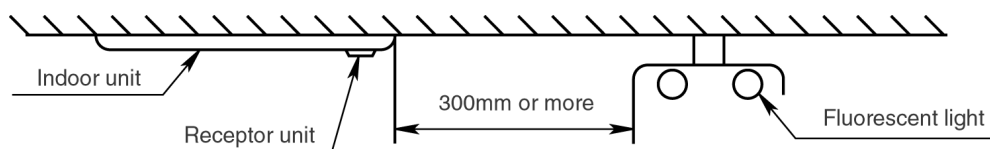


No.	Name	Q'ty	
		Cassette	Ceiling
1.	Wireless Remote Controller	1	1
2.	R03 battery	2	2
3.	Holder (For securing remote controller)	1	1
4.	Holder fixing screw	2	2
5.	Receptor unit (For Cassette Type)	1	-
6.	Receptor unit (For Ceiling Type)	-	1
7.	Installation manual	1	1

10.7.2. Points and notes regarding wireless remote controller setting-up location

- The wireless remote controller can be used to operate indoor units at a maximum range of 8 metres from directly facing in front of the indoor unit.
- If the remote controller is at an angle to the receptor unit, the operation range may become shortened.
- The accessory receptor unit must be attached to the veneer panel.
- The receptor unit for the wireless remote controller should be in a place where it will not be affected by direct light from fluorescent lights. (Refer to the illustration below.)

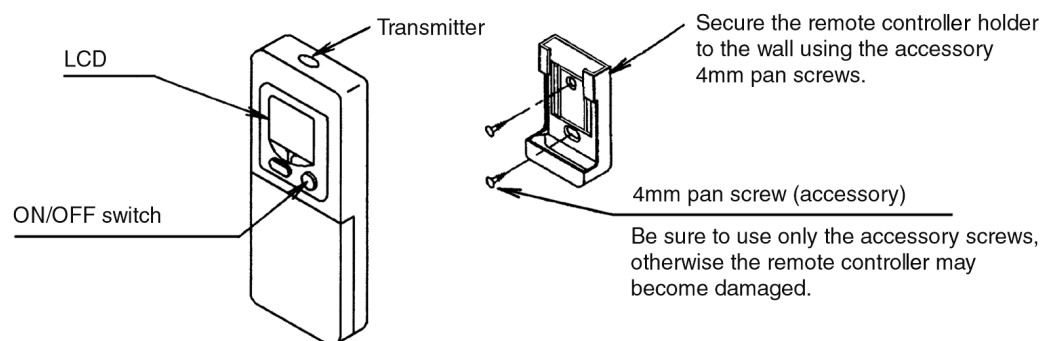
(If using an inverter-type fluorescent light, keep the receptor unit at least 1m away from the light, otherwise remote control operation may not work properly.)



- If installing in a place where a power supply is generating electromagnetic noise, take measures such as installing a noise filter.
- Install at least 3m away from any noise sources, and shield the electric cables using an iron conduit pipe.
- Install at least 1m away from equipment such as TVs and radios. (Otherwise picture distortion or static may occur.)

Wireless remote control installation procedure

- Installing the wireless remote controller to a wall (for remote control storage).



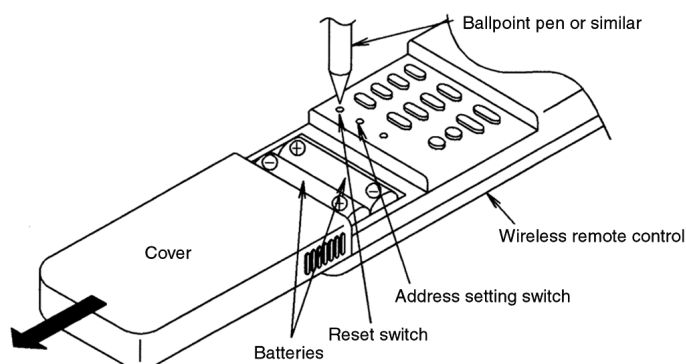
- If using a single remote controller to operate several air conditioners, address setting will be required. (Refer to later in this manual.)
- For twin and triple types, install to the main unit only. (Accordingly, the installation and wiring operations described later in this manual are for the main unit only.)

Inserting the batteries

- Remove the battery compartment cover of the wireless remote controller, and then insert the two accessory R03 size batteries. (Be sure not to make a mistake with the polarities.)

NOTE

The accessory batteries are to be used when checking operation. They should be replaced with new batteries as soon as possible. (Be sure not to make a mistake with the polarities.)



NOTE

- When inserting the batteries for the first time, or when replacing the batteries, the remote controller may stop working. In such case, use a ballpoint pen or similar object to push the reset switch. The remote controller should then start working normally.
- Replace the batteries with two new batteries of the same kind.
- Rechargeable (Ni-Cd) batteries differ in aspects such as shape and performance, and thus cannot be use.

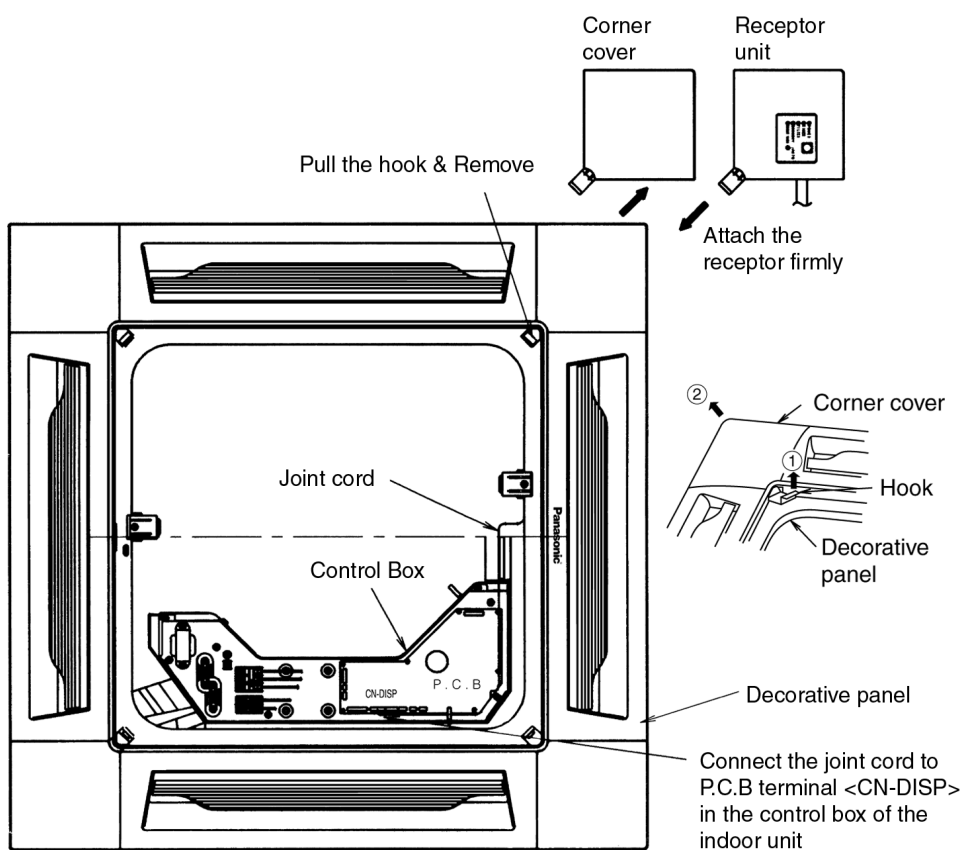
10.7.3. Installing the receptor unit

Receptor unit (for four-way cassette type) assembly procedure

- 1 Attach the receptor unit onto the decorative panel of the indoor unit as shown in the figure below.

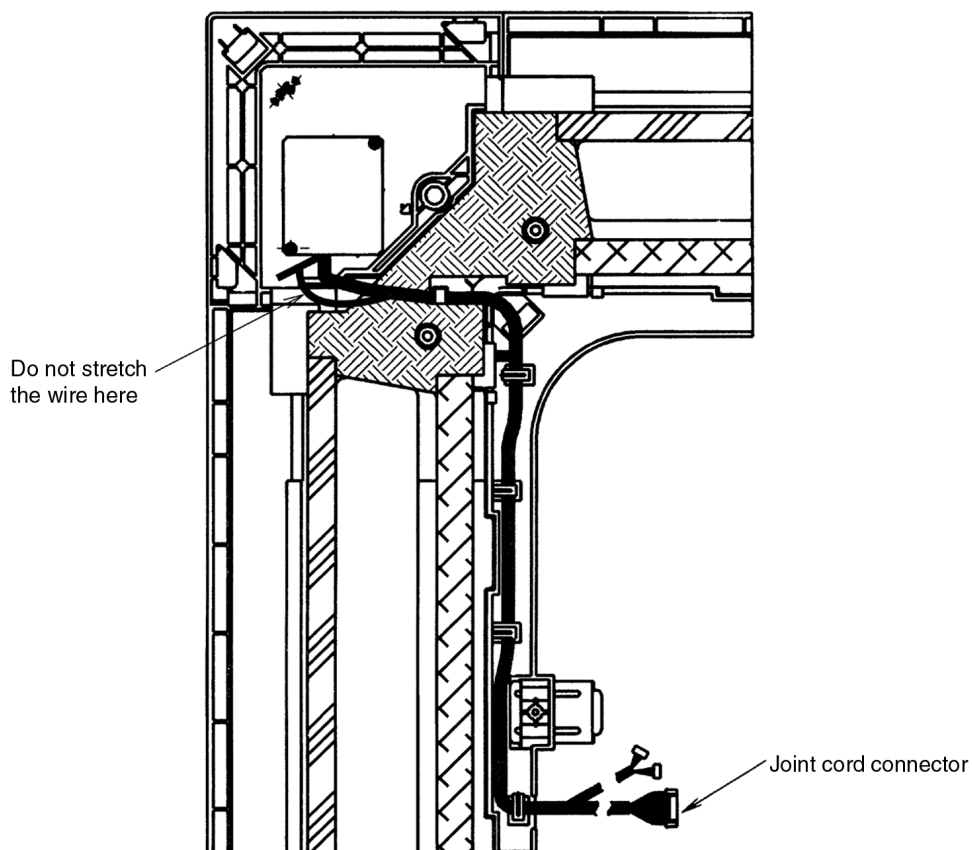
1. Remove the "corner cover" at the decorative panel indicate "Panasonic" logo left side.
2. Attach the receptor unit which same position.

- 2 Route the joint cord for wiring and connect it to P.C.B connector <CN-DISP> in the control box of the indoor unit.



1. Route the joint cord for wiring as shown in the figure (figure of the back of decorative panel) below.

Pass the cord through the hook of the decorative panel, taking care that the cord does not run on the heat insulator, etc.

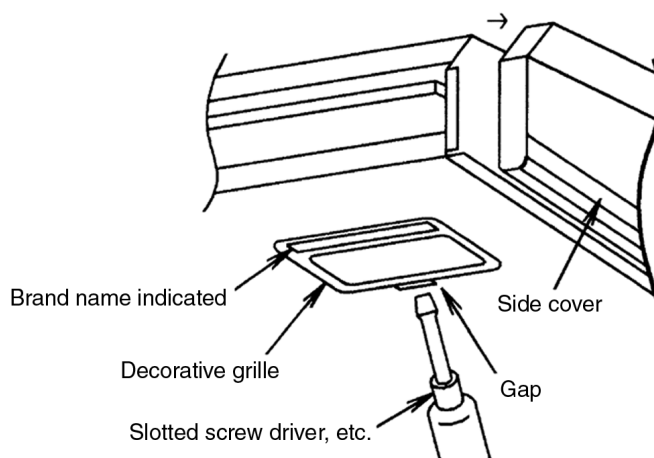


2. Remove the control box cover by removing the two fixing screws and connect the joint cord to P.C.B terminal <CN-DISP> in the control box.

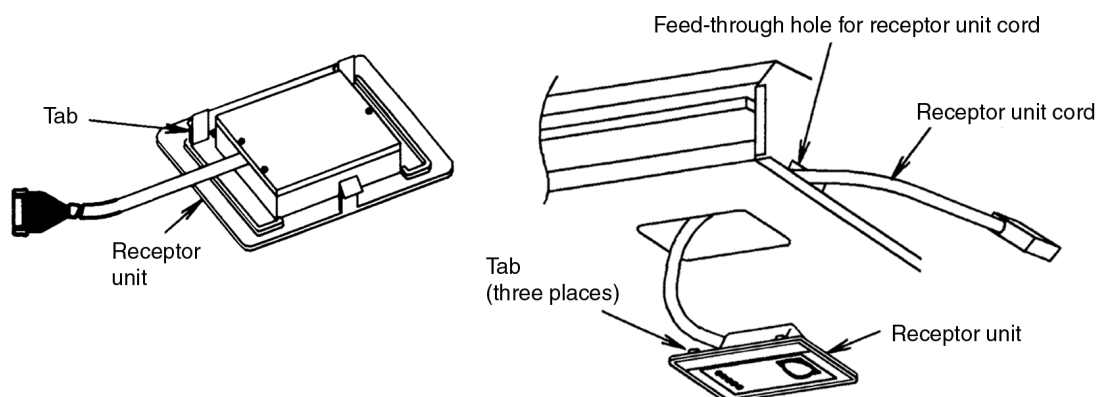
Receptor unit (for ceiling type) assembly procedure

- | | |
|---|----------------------------------------------------------------------------------|
| 1 | Attach the receptor unit onto the indoor main unit as shown in the figure below. |
|---|----------------------------------------------------------------------------------|

1. Remove the air-intake grille and the side cover.
To remove the side cover, remove the fixing screw each on the left and the right and pull the side cover towards you.
(Refer to the installation Manual supplied with the indoor main unit.)

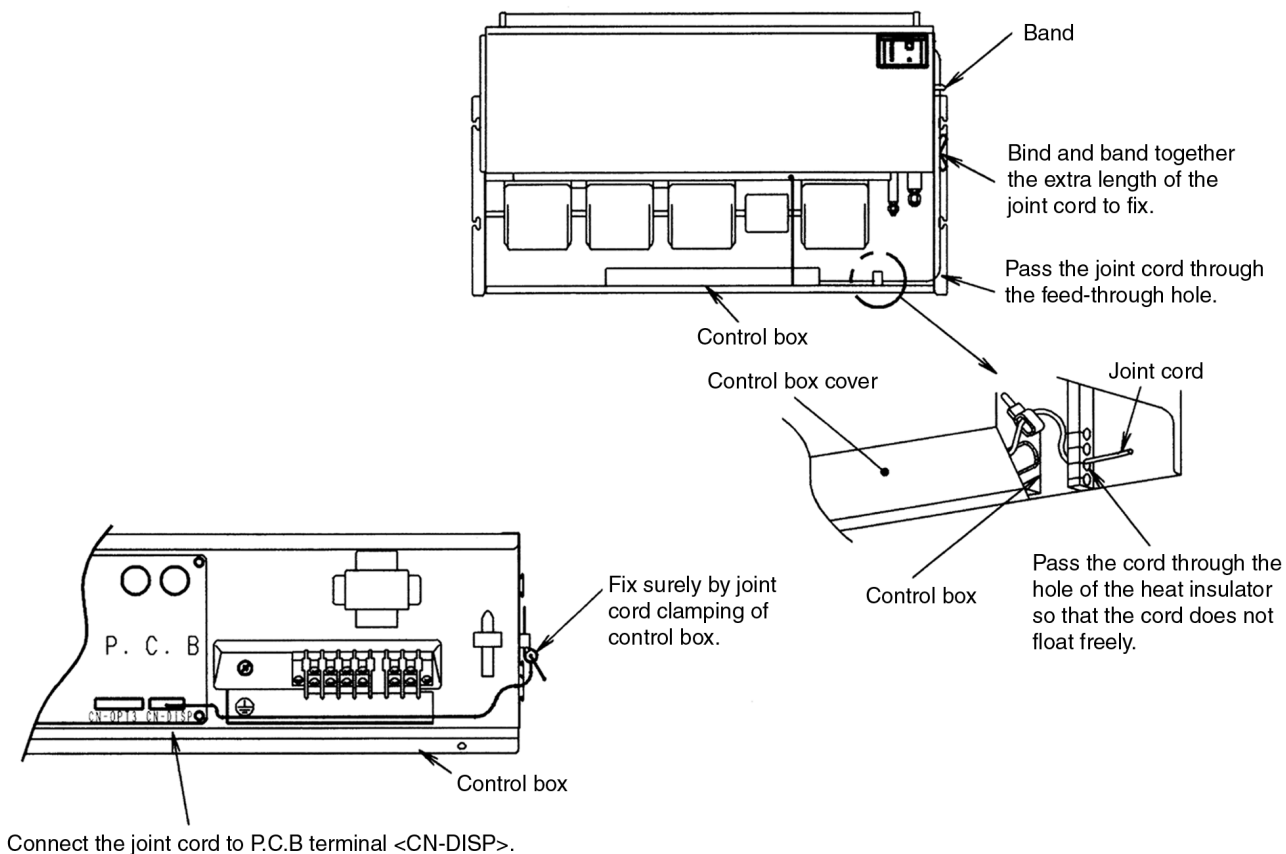


2. Remove the Decorative grille (component on which the brand name is shown) to the right on the air-blow opening. (Fixed with three tabs.)
(There is a gap at the rear center of the decorative grille. Insert the tip of a slotted screwdriver, etc., 2 to 3mm into the gap and pry of the decorative grille to remove.)
3. Draw out the cord of the receptor unit through the feed-through hole toward the side plate and attach the receptor unit onto the main unit. Hook the three tabs onto the receptor unit to attach the receptor unit on the main unit. (Press in the receptor unit until a click sound is heard.)



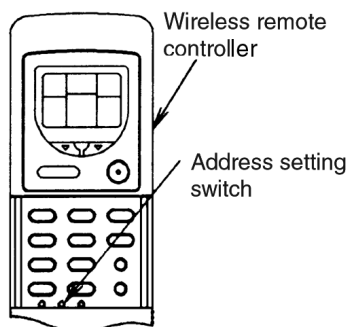
- | | |
|---|-------------------------------------------------------------------------------------------------------------------|
| 2 | Route the joint cord for wiring and connect it to P.C.B terminal <CN-DISP> in the control box of the indoor unit. |
|---|-------------------------------------------------------------------------------------------------------------------|

1. Route for wiring the cord as shown in the figure to the right.
2. Remove the control box cover by removing the two fixing screws and connect the joint cord to P.C.B terminal <CN-DISP> in the control box.



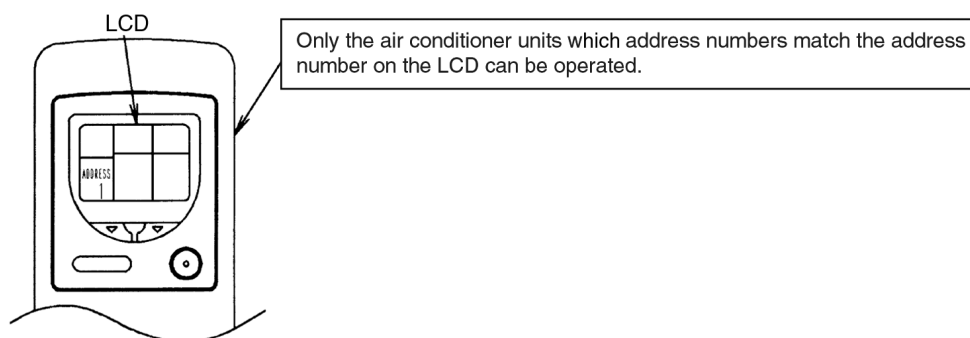
10.7.4. Address setting for wireless remote controller and receptor unit (only when using more than one indoor unit)

- Only the air conditioner units which receptor unit address numbers match the remote controller address number can be operated.
- At the time of shipment from the factory, the address numbers for both the wireless remote controller and the receptor unit are set to "1". (When using only one indoor unit, the indoor unit can be used without changing the factory default settings.)



Press the address setting switch with a ballpoint pen or similar object to change the address setting.

The address number displayed on the LCD change in the order [ADDRESS 1] → [ADDRESS 2] → [ADDRESS 3] → [GROUP] → [ADDRESS 1] each time the switch is pressed.



NOTE

- If the batteries are replaced or the remote controller is reset, the address setting will return to ADDRESS1, so you will need to repeat the address setting again.

All setting details which are stored in memory will be cleared, so you will need to repeat the setting.

- If the address is set to GROUP, more than one indoor unit can be operated at the same time.

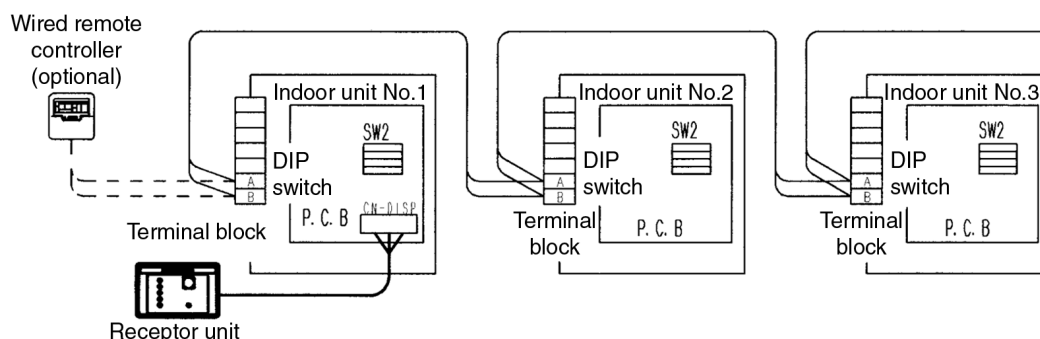
Example: If the address numbers for all indoor units are changed, other indoor units may operate accidentally due to signal interference.

Control using two remote controllers

- If both the wireless remote controller and the optional wired remote controller are being used together, either remote controller can be used to operate the indoor units.
- The optional wired remote controller can be connected to only one other indoor unit besides the one with the receptor unit.
- Two wireless remote controller cannot be connected at the same time.
- When using the wireless remote controller and the optional wired remote controller, the MASTER/SLAVE setting is not needed.

Group control

- When using group control, be sure to install the receptor unit to indoor unit No. 1. (Refer to the illustration below.)



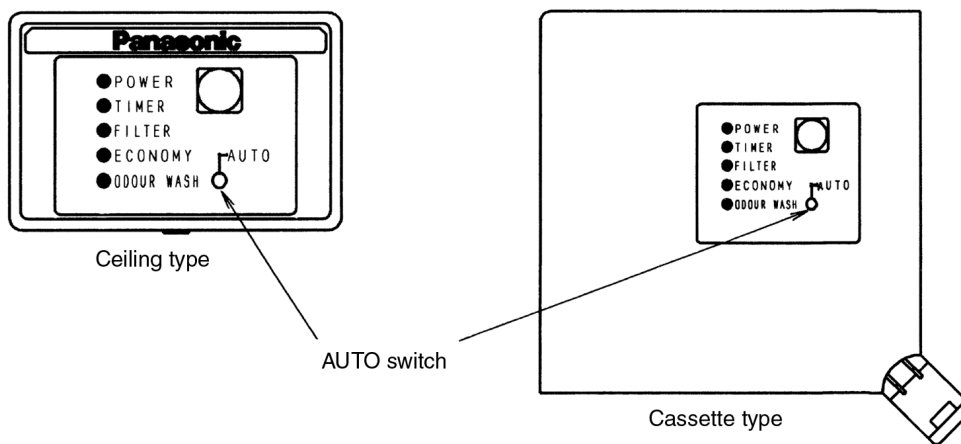
- When using group control, up to a maximum of 16 indoor units can be connected. (Do not mix heat pump units and cooling only units.)
- When using group control, the indoor unit address numbers can be set automatically. However, you will not know at this time which address number corresponds to which indoor unit.
- Setting of address numbers can be carried out manually using the DIP switches. Manual settings have priority. (Do not combine both manual settings and automatic settings.)

[Manual setting]

Indoor unit No.	1	2	3	4	5	6	7	8
DIP switch (SW2) address setting on indoor unit printed circuit board.								
A/C No. setting	Unnecessary operation	1 ~ ON	2 ~ ON	1, 2 ~ ON	3 ~ ON	1, 3 ~ ON	2, 3 ~ ON	1, 2, 3 ~ ON
Indoor unit No.	9	10	11	12	13	14	15	16
DIP switch (SW2) address setting on indoor unit printed circuit board.								
A/C No. setting	4 ~ ON	1, 4 ~ ON	2, 4 ~ ON	1, 2, 4 ~ ON	3, 4 ~ ON	1, 3, 4 ~ ON	2, 3, 4 ~ ON	1, 2, 3, 4 ~ ON

10.7.5. Emergency operation

- If you do not have the wireless remote controller (because the batteries are weak, or some other reason prevents the wireless remote controller from being used), emergency operation can be carried out at receptor unit.



- Press the AUTO switch to start emergency operation.
Press the AUTO switch once more to stop emergency operation.
- Press the AUTO switch continue 5 second to start cooling operation.
Again press the AUTO switch continue 5 second to start heating operation.
- The setting temperature, fan speed and louver control will be fixed at the settings shown in the table below.
- While the indoor unit is running, the OPERATION indicator on the receptor unit will illuminate, and it will switch off when the indoor units stops.
- Heating operation is not available for indoor units which are for cooling only. (If set to HEAT, the setting will change to FAN instead.)

Operation mode	Fan speed	Louver
Cooling	Hi	Previous setting
Heating	Hi	Previous setting

Instructions for users

Please refer to the instruction manual provided with the indoor unit for instruction on how to use the wireless remote controller.



10.8. Twin

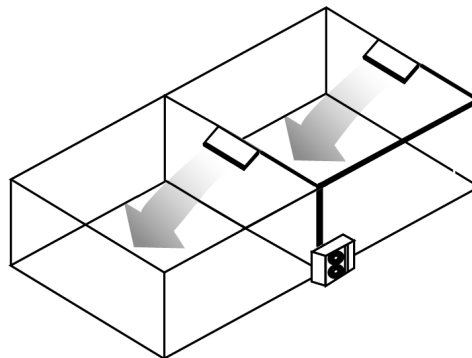
10.8.1. Twin Operation

- Simultaneous air conditioning of wide spaces and corners is possible. Indoor units with same horsepowers can even be used in combination.
- Master unit and slave-units can be set automatically in twin systems. No address setting is necessary.
- Multiple indoor units can be operated simultaneously with a single remote control unit. Note that individual operation is not possible.

Twin Combination Table

Outdoor unit	Simultaneous twin operation	
	Standard	
3.0 HP	3.0	1.5 1.5
4.0 HP	4.0	2.0 2.0
5.0 HP	5.0	2.5 2.5
6.0 HP	6.0	3.0 3.0

 : Outdoor unit capacity
 : Indoor unit capacity



11 Installation and Servicing Air Conditioner Using R410A

11.1. Outline

11.1.1. About R410A refrigerant

1. Converting air conditioners to R410A

Since it was declared in 1974 that chlorofluorocarbons (CFC), hydro chlorofluorocarbons (HCFC) and other substances pose a destructive danger to the ozone layer in the earth's upper stratosphere (20 to 40 km above the earth), measures have been taken around the world to prevent this destruction.

The R22 refrigerant which has conventionally been used in ACs is an HCFC refrigerant and, therefore, possesses this ozone-destroying potential. International regulations (the Montreal Protocol on Ozone-Damaging Substances) and the domestic laws of various countries call for the early substitution of R22 by a refrigerant which will not harm the ozone layer.

- In ACs, the HFC refrigerant which has become the mainstream alternative is called R410A. Compared with R22, the pressure of R410A is approximately 1.6 times as high at the same refrigerant temperature, but the energy efficiency is about the same. Consisting of hydrogen (H), fluorine (F) and carbon (C), R410A is an HFC refrigerant. Another typical HFC refrigerant is R407C. While the energy efficiency of R407C is somewhat inferior to that of R410A, it offers the advantage of having pressure characteristics which are about the same as those of R22, and is used mainly in packaged ACs.

2. The characteristics of HFC (R410A) refrigerants

a. Chemical characteristics

The chemical characteristics of R410A are similar to those of R22 in that both are chemically stable, non-flammable refrigerants with low toxicity.

However, just like R22, the specific gravity of R410A gas is heavier than that of air. Because of this, it can cause an oxygen deficiency if it leaks into a closed room since it collects in the lower area of the room. It also generates toxic gas when it is directly exposed to a flame, so it must be used in a well ventilated environment where it will not collect.

Table 1 Physical comparison of R410A and R22

	R410A	R22
Composition (wt%)	R32/R125 (50/50)	R22 (100)
Boiling point (°C)	-51.4	-40.8
Vaporizing pressure (25°C)	1.56 Mpa (15.9 kgf/cm ²)	0.94 Mpa (9.6 kgf/cm ²)
Saturated vapor density	64.0 kg/m ³	44.4 kg/m ³
Flammability	Non-flammable	Non-flammable
Ozone-destroying point (ODP)	0	0.055
Global-warming point (GWP)	1730	1700

b. Compositional change (pseudo-azeotropic characteristics)

R410A is a pseudo-azeotropic mixture comprising the two components R32 and R125. Multi-component refrigerants with these chemical characteristics exhibit little compositional change even from phase changes due to vaporization (or condensation), which means that there is little change in the circulating refrigerant composition even when the refrigerant leaks from the gaseous section of the piping.

Accordingly, R410A can be handled in almost the same manner as the single-component refrigerant R22. However, when charging, because there is a slight change in composition between the gas phase and the liquid phase inside a cylinder or other container, charging should basically begin with the liquid side.

c. Pressure characteristics

As seen in Table 2, the gas pressure of R410A is approximately 1.6 times as high as that of R22 at the same refrigerant temperature, which means that special R410A tools and materials with high-pressure specifications must be used for all refrigerant piping work and servicing.

Table 2 Comparison of R410A and R22 saturated vapor density

Refrigerant Temperature (°C)	Unit: MPa	
	R410A	R22
-20	0.30	0.14
0	0.70	0.40
20	1.35	0.81
40	2.32	1.43
60	3.73	2.33
65	4.15	2.60

d. R410A refrigerating machine oil

Conventionally, mineral oil or a synthetic oil such as alkylbenzene has been used for R22 refrigerating machine oil. Because of the poor compatibility between R410A and conventional oils like mineral oil, however, there is a tendency for the refrigerating machine oil to collect in the refrigerating cycle. For this reason, polyester and other synthetic oils which have a high compatibility with R410A are used as refrigerating machine oil.

Because of the high hygroscopic property of synthetic oil, more care must be taken in its handling than was necessary with conventional refrigerating machine oils. Also, these synthetic oils will degrade if mixed with mineral oil or alkylbenzene, causing clogging in capillary tubes or compressor malfunction. Do not mix them under any circumstances.

11.1.2. Safety measures when installing/servicing refrigerant piping

Cause the gas pressure of R410A is approximately 1.6 times as high as that of R22, a mistake in installation or servicing could result in a major accident. It is essential that you use R410A tools and materials, and that you observe the following precautions to ensure safety.

1. Do not use any refrigerant other than R410A in ACs that have been used with R410A.
2. If any refrigerant gas leaks while you are working, ventilate the room. Toxic gas may be generated if refrigerant gas is exposed to a direct flame.
3. When installing or transferring an AC, do not allow any air or substance other than R410A to mix into the refrigeration cycle. If it does, the pressure in the refrigeration cycle can become abnormally high, possibly causing an explosion and/or injury.
4. After finishing the installation, check to make sure there is no refrigerant gas leaking.
5. When installing or transferring an AC, follow the instructions in the installation instructions carefully. Incorrect installation can result in an abnormal refrigeration cycle or water leakage, electric shock, fire, etc.
6. Do not perform any alterations on the AC unit under any circumstances. Have all repair work done by a specialist. Incorrect repairs can result in a water leakage, electric shock, fire, etc.

11.2. Tools for installing/servicing refrigerant piping

11.2.1. Necessary tools

In order to prevent an R410A AC from mistakenly being charged with any other refrigerant, the diameter of the 3-way valve service port on the outdoor unit has been changed. Also, to increase its ability to withstand pressure, the opposing dimensions have been changed for the refrigerant pipe flaring size and flare nut. Accordingly, when installing or servicing refrigerant piping, you must have both the R410A and ordinary tools listed below.

Table 3 Tools for installation, transferring or replacement

Type of work	Ordinary tools	R410A tools
Flaring	Flaring tool (clutch type), pipe cutter, reamer	Copper pipe gauge for clearance Adjustment, flaring tool (clutch type)*1)
Bending, connecting pipes	Torque wrench (nominal diameter 1/4, 3/8, 1/2). Fixed spanner (opposing sides 12 mm, 17 mm, 19 mm). Adjustable wrench, Spring bender	
Air purging	Vacuum pump. Hexagonal wrench (opposing sides 4 mm)	Manifold gauge, charging hose, vacuum pump adaptor
Gas leak inspection	Gas leak inspection fluid or soapy water	Electric gas leak detector for HFC refrigerant*2)

*1) You can use the conventional (R22) flaring tool. If you need to buy a new tool, buy the R410A type.

*2) Use when it is necessary to detect small gas leaks.

For other installation work, you should have the usual tools, such as screwdrivers (+, -), a metal-cutting saw, an electrical drill, a hole core drill (65 or 70 dia.), a tape measure, a level, a thermometer, a clamp meter, an insulation tester, a voltmeter, etc.

Table 4 Tools for serving

Type of work	Ordinary tools	R410A tools
Refrigerant charging		Electronic scale for refrigerant charging. Refrigerant cylinder. Charging orifice and packing for refrigerant cylinder
Brazing (Replacing refrigerating cycle part*1)	Nitrogen blow set (be sure to use nitrogen blowing for all brazing), and brazing machine	

*1) Always replace the dryer of the outdoor unit at the same time. The replacement dryer is wrapped in a vacuum pack. Replace it last among the refrigerating cycle parts. Start brazing as soon as you have opened the vacuum pack, and begin the vacuuming operation within 2 hours.

11.2.2. R410A tools

1. Copper tube gauge for clearance adjustment
(used when flaring with the conventional flaring tool (clutch type))

- This gauge makes it easy to set the clearance for the copper tube to 1.0-1.5 mm from the clamp bar of the flaring tool.

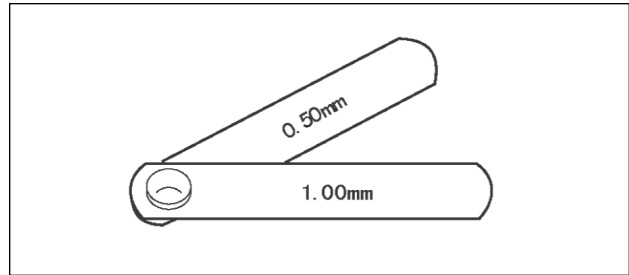


Fig. 1 Copper tube gauge for clearance adjustment

2. Flaring tool (clutch type)

- In the R410A flaring tool, the receiving hole for the clamp bar is enlarged so the clearance from the clamp bar can be set to 0-0.5 mm, and the spring inside the tool is strengthened to increase the strength of the pipe-expanding torque. This flaring tools can also be used with R22 piping, so we recommend that you select it if you are buying a new flaring tool.

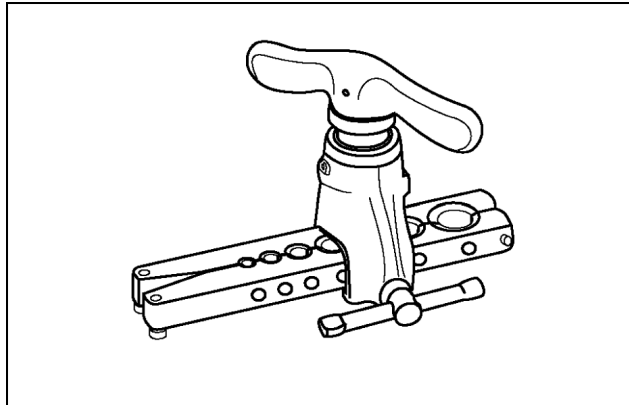


Fig. 2 Flaring tool (clutch type)

3. Torque wrenches

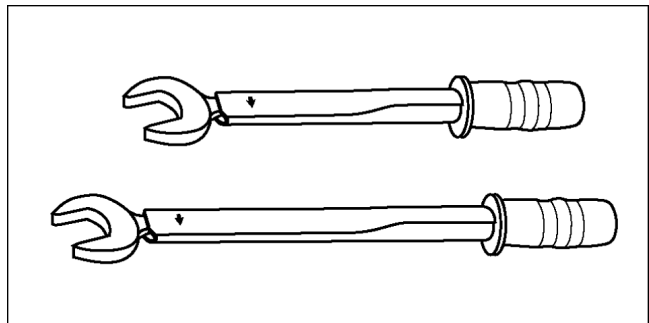


Fig. 3 Torque wrenches

Table 5

	Conventional wrenches	R410A wrenches
For 1/4 (opposite side x torque)	17 mm x 18 N.m (180 kgf.cm)	17 mm x 18 N.m (180 kgf.cm)
For 3/8 (opposite side x torque)	22 mm x 42 N.m (420 kgf.cm)	22 mm x 42 N.m (420 kgf.cm)
For 1/2 (opposite side x torque)	24 mm x 55 N.m (550 kgf.cm)	26 mm x 55 N.m (550 kgf.cm)

4. Manifold gauge

- Because the pressure is higher for the R410A type, the conventional type cannot be used.

Table 6 Difference between R410A and conventional high/low-pressure gauges

	Conventional gauges	R410A gauges
High-pressure gauge (red)	-76 cmHg - 35 kgf/cm ³	-0.1 - 5.3 Mpa -76 cmHg - 53 kgf/cm ³
Low-pressure gauge (blue)	-76 cmHg - 17 kgf/cm ³	-0.1 - 3.8 Mpa -76 cmHg - 38 kgf/cm ³

- The shape of the manifold ports has been changed to prevent the possibility of mistakenly charging with another type of refrigerant.

Table 7 Difference between R410A and conventional manifold port size

	Conventional gauges	R410A gauges
Port size	7/16 UNF 20 threads	1/2 UNF 20 threads

5. Charging hose

- The pressure resistance of the charging hose has been raised to match the higher pressure of R410A. The hose material has also been changed to suit HFC use, and the size of the fitting has been changed to match the manifold ports.

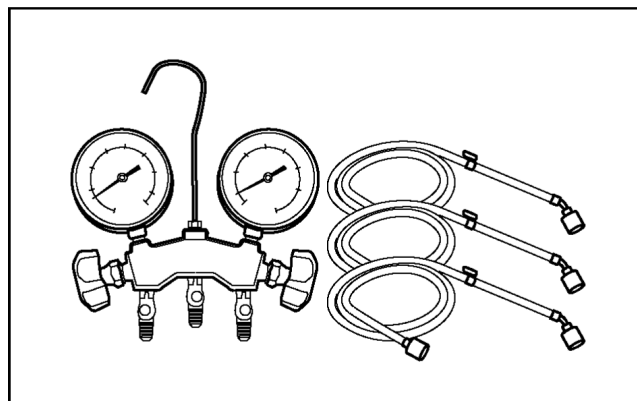


Fig. 4 Manifold gauge charging hose

Table 8 Difference between R410A and conventional charging hoses

		Conventional hoses	R410A hoses
Pressure resistance	Working pressure	3.4 MPa (35 kgf/cm ³)	5.1 MPa (52 kgf/cm ³)
	Bursting pressure	17.2 MPa (175 kgf/cm ³)	27.4 MPa (280 kgf/cm ³)
Material		NBR rubber	HNBR rubber Nylon coating inside

6. Vacuum pump adaptor

- When using a vacuum pump for R410A, it is necessary to install an electromagnetic valve to prevent the vacuum pump oil from flowing back into the charging hose. The vacuum pump adaptor is installed for that purpose. If the vacuum pump oil (mineral oil) becomes mixed with R410A, it will damage the unit.

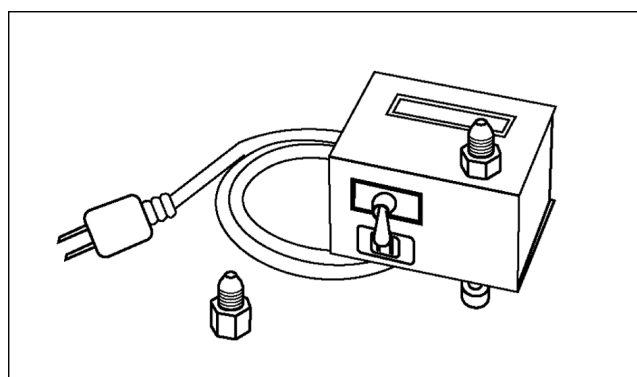


Fig. 5 Vacuum pump adaptor

7. Electric gas leak detector for HFC refrigerant

- The leak detector and halide torch that were used with CFC and HCFC cannot be used with R410A (because there is no chlorine in the refrigerant).
- The present R134a leak detector can be used, but the detection sensitivity will be lower (setting the sensitivity for R134a at 1, the level for R410A will drop to 0.6).
- For detecting small amounts of gas leakage, use the electric gas leak detector for HFC refrigerant. (Detection sensitivity with R410A is about 23 g/year).

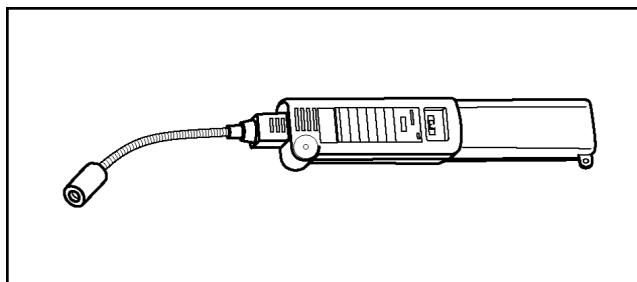


Fig. 6 Electric gas leak detector for HFC refrigerant

8. Electronic scale for refrigerant charging

- Because of the high pressure and fast vaporizing speed of R410A, the refrigerant cannot be held in a liquid phase inside the charging cylinder when charging is done using the charging cylinder method, causing bubbles to form in the measurement scale glass and making it difficult to see the reading. (Naturally, the conventional R22 charging cylinder cannot be used because of the differences in the pressure resistance, scale gradation, connecting port size, etc.)
- The electronic scale has been strengthened by using a structure in which the weight detector for the refrigerant cylinder is held by four supports. It is also equipped with two connection ports, one for R22 (7/16 UNF, 20 threads) and one for R410A (1/2 UNF, 20 threads), so it can also be used for conventional refrigerant charging.
- There are two types of electronic scales, one for 10-kg cylinders and one for 20-kg cylinders. (The 10-kg cylinder is recommended.)

Refrigerant charging is done manually by opening and closing the valve.

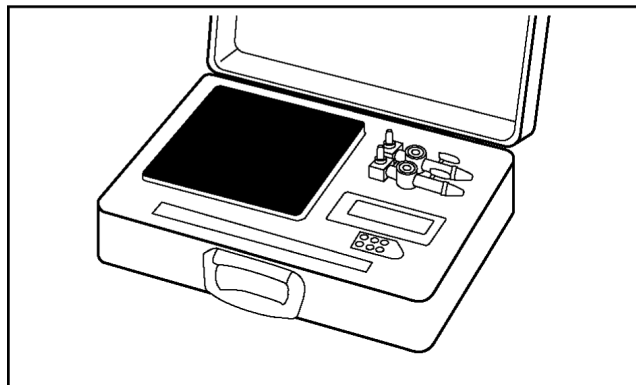


Fig. 7 Electronic scale for refrigerant charging

9. Refrigerant cylinders

- The R410A cylinders are labeled with the refrigerant name, and the coating color of the cylinder protector is pink, which is the color stipulated by ARI of the U.S.
- Cylinders equipped with a siphon tube are available to allow the cylinder to stand upright for liquid refrigerant charging.

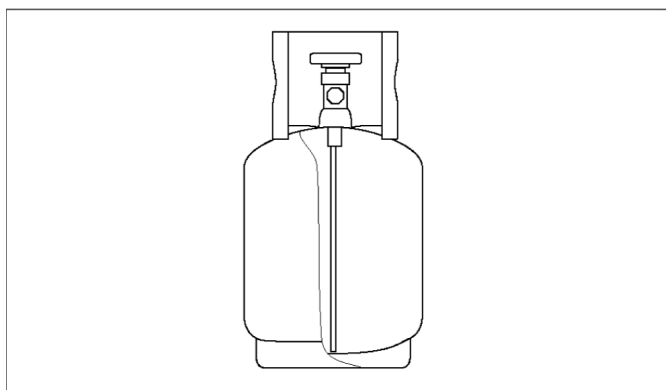


Fig. 8 Refrigerant cylinders

10. Charging orifice and packing for refrigerant cylinders

- The charging orifice must match the size of the charging hose fitting (1/2 UNF, 20 threads).
- The packing must also be made of an HFC-resistant material.

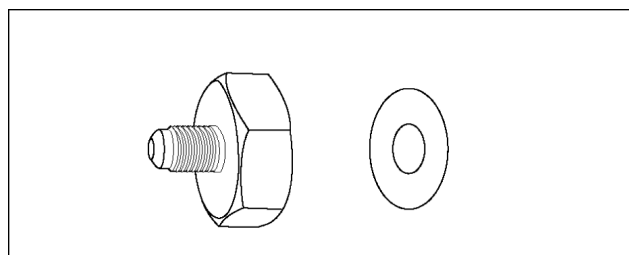


Fig. 9 Charging orifice and packing

11.2.3. R410A tools which are usable for R22 models

Table 9 R410A tools which are usable for R22 models

	R410A tools	Usable for R22 models
(1)	Copper tube gauge for clearance adjustment	OK
(2)	Flaring tool (clutch type)	OK
(3)	Manifold gauge	NG
(4)	Charging hose	NG
(5)	Vacuum pump adaptor	OK
(6)	Electric gas leak detector for HFC refrigerant	NG
(7)	Electronic scale for refrigerant charging	OK
(8)	Refrigerant cylinder	NG
(9)	Charging orifice and packing for refrigerant cylinder	NG

11.3. Refrigerant piping work

11.3.1. Piping materials

It is recommended that you use copper and copper alloy jointless pipes with a maximum oil adherence of 40 mg/10m. Do not use pipes that are crushed, deformed, or discolored (especially the inside surface). If these inferior pipes are used, impurities may clog the expansion valves or capillaries.

Because the pressure of ACs using R410A is higher than those using R22, it is essential that you select materials that are appropriate for these standards.

The thickness of the copper tubing used for R410A is shown in Table 10. Please be aware that tubing with a thickness of only 0.7 mm is also available on the market, but this should never be used.

Table 10 Copper tube thickness (mm)

Soft pipe		Thickness (mm)	
Nominal diameter	Outside diameter (mm)	R410A	(Reference) R22
1/4	6.35	0.80	0.80
3/8	9.52	0.80	0.80
1/2	12.7	0.80	0.80

11.3.2. Processing and connecting piping materials

When working with refrigerant piping, the following points must be carefully observed: no moisture or dust must be allowed to enter the piping, and there must be no refrigerant leaks.

1. Procedure and precautions for flaring work

a. Cut the pipe

Use a pipe cutter, and cut slowly so the pipe will not be deformed.

b. Remove burrs and clean shavings from the cut surface

If the shape of the pipe end is poor after removing burrs, or if shavings adhere to the flared area, it may lead to refrigerant leaks.

To prevent this, turn the cut surface downward and remove burrs, then clean the surface, carefully.

c. Insert the flare nut (be sure to use the same nut that is used on the AC unit)

d. Flaring

Check the clamp bar and the cleanliness of the copper pipe.

Be sure to use the clamp bar to do the flaring with accuracy. Use either an R410A flaring tool, or a conventional flaring tool. Flaring tools come in different sizes, so be sure to check the size before using. When using a conventional flaring tool, use the copper pipe gauge for clearance adjustment, etc., to ensure the correct A dimension (see Fig. 10)

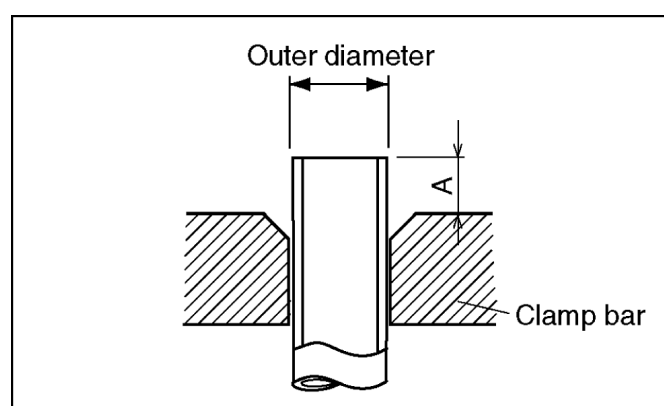


Fig. 10 Flaring dimensions

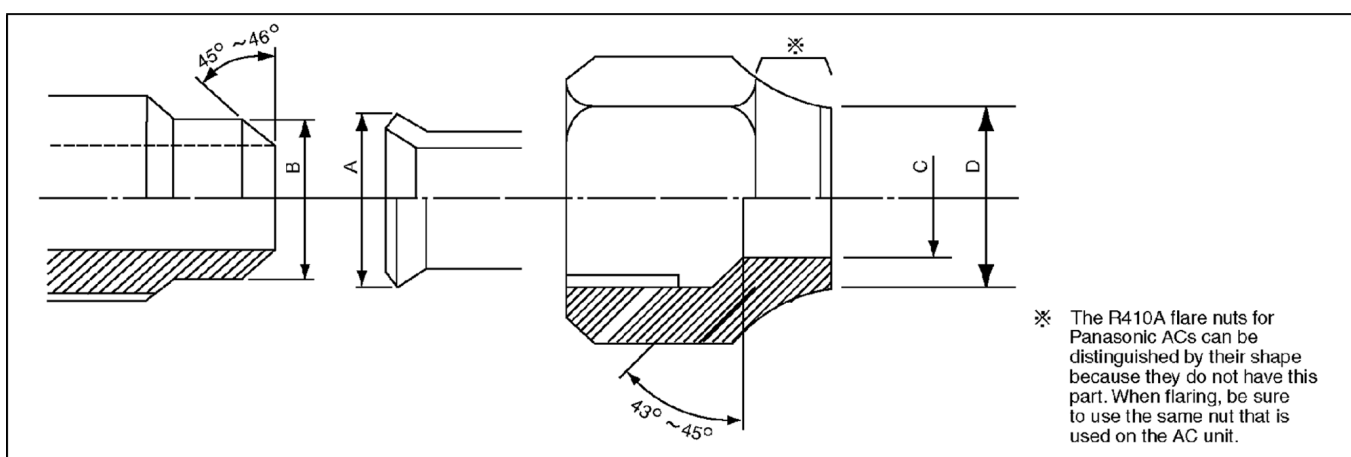


Fig. 11 Relation between the flare nut structure and flaring tool end

Table 11 R410A flaring dimensions

Nominal diameter	Outside diameter (mm)	Wall thickness (mm)	A (mm)		
			R410A flaring tool, clutch type	Conventional flaring tool	
				Clutch type	Wing-nut type
1/4	6.35	0.8	0 - 0.5	1.0 - 1.5	1.5 - 2.0
3/8	9.52	0.8	0 - 0.5	1.0 - 1.5	1.5 - 2.0
1/2	12.70	0.8	0 - 0.5	1.0 - 1.5	2.0 - 2.5

Table 12 R22 flaring dimensions

Nominal diameter	Outside diameter (mm)	Wall thickness (mm)	A (mm)		
			R410A flaring tool, clutch type	Conventional flaring tool	
				Clutch type	Wing-nut type
1/4	6.35	0.8	0 - 0.5	0.5 - 1.0	1.0 - 1.5
3/8	9.52	0.8	0 - 0.5	0.5 - 1.0	1.0 - 1.5
1/2	12.70	0.8	0 - 0.5	0.5 - 1.0	1.5 - 2.0

Table 13 R410A flare and flare nut dimensions Unit: mm

Nominal diameter	Outside diameter (mm)	Wall thickness (mm)	A +0, -0.4	B dimension	C dimension	D dimension	Flare nut width
1/4	6.35	0.8	9.1	9.2	6.5	13	17
3/8	9.52	0.8	13.2	13.5	9.7	20	22
1/2	12.70	0.8	16.6	16.0	12.9	23	26

Table 14 R22 flare and flare nut dimensions Unit: mm

Nominal diameter	Outside diameter (mm)	Wall thickness (mm)	A +0, -0.4	B dimension	C dimension	D dimension	Flare nut width
1/4	6.35	0.8	9.0	9.2	6.5	13	17
3/8	9.52	0.8	13.0	13.5	9.7	20	22
1/2	12.70	0.8	16.2	16.0	12.9	20	24

2. Procedure and precautions for flare connection

- Check to make sure there is no scratches, dust, etc., on the flare and union.
- Align the flared surface with the axial center of the union.
- Use a torque wrench, and tighten to the specified torque. The tightening torque for R410A is the same as the conventional torque value for R22. Be careful, because if the torque is too weak, it may lead to a gas leak. If it is too strong, it may split the flare nut or make it impossible to remove the flare nut.

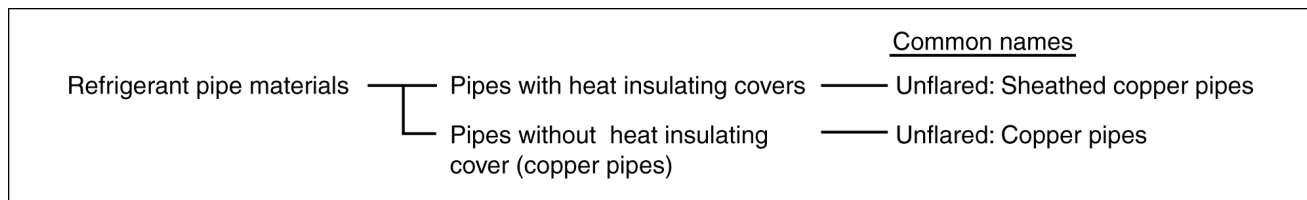
Table 15 R410A tightening torque

Nominal diameter	Outside diameter (mm)	Tightening torque N.m (kgf.cm)	Torque wrench tightening torque N.m (kgf.cm)
1/4	6.35	14 - 18 (140 - 180)	18 (180)
3/8	9.52	33 - 42 (330 - 420)	42 (420)
1/2	12.70	55 (550)	55 (550)

11.3.3. Storing and managing piping materials

1. Types of piping and their storage

The following is a general classification of the refrigerant pipe materials used for ACs.



Because the gas pressure of R410A is approximately 1.6 times as high as that of R22, copper pipes with the thickness shown in Table 10, and with minimal impurities must be used. Care must also be taken during storage to ensure that pipes are not crushed, deformed, or scratched, and that no dust, moisture or other substance enters the pipe interior. When storing sheathed copper pipes or plain copper pipes, seal the openings by pinching or taping them securely.

2. Makings and management

a. Sheathed copper pipes and copper-element pipes

When using these pipes, check to make sure that they are the stipulated thickness. For flare nuts, be sure to use the same nut that is used on the AC unit.

b. Copper pipes

Use only copper pipes with the thickness given in table 10, and with minimal impurities. Because the surface of the pipe is exposed, you should take special care, and also take measures such as marking the pipes to make sure they are easily distinguished from other piping materials, to prevent mistaken use.

3. Precautions during refrigerant piping work

Take the following precautions on-site when connecting pipes. (Keep in mind that the need to control the entry of moisture and dust is even more important than in conventional piping).

- Keep the open ends of all pipes sealed until connection with AC equipment is complete.
- Take special care when doing piping work on rainy days. The entering of moisture will degrade the refrigerating machine oil, and lead to malfunctions in the equipment.
- Complete all pipe connections in as short a time as possible. If the pipe must be left standing for a long time after removing the seal, it must be thoroughly purged with nitrogen, or dried with a vacuum pump.

11.4. Installation, transferring, servicing

11.4.1. Inspecting gas leaks with a vacuum pump for new installations (Using new refrigerant piping)

- From the viewpoint of protecting the global environment, please do not release refrigerant into the atmosphere.
 - Connect the projecting side (pin-pushing side) of the charging hose for the manifold gauge to the service port of the 3-way valve. (1)
 - Fully open the handle Lo of the manifold gauge and run the vacuum pump. (2) (If the needle of the low-pressure gauge instantly reaches vacuum, re-check step a).)
 - Continue the vacuum process for at least 15 minutes, then check to make sure the low-pressure gauge has reached -0.1 MPa (-76 cmHg). Once the vacuum process has finished, fully close the handle Lo of the manifold gauge and stop the vacuum pump operation, then remove the charging hose that is connected to the vacuum pump adaptor. (Leave the unit in that condition for 1-2 minutes, and make sure that the needle of the manifold gauge does not return.) (2) and (3)
 - Turn the valve stem of the 2-way valve 90° counter-clockwise to open it, then, after 10 seconds, close it and inspect for a gas leak (4)
 - Remove the charging hose from the 3-way valve service port, then open both the 2-way valve and 3-way valve. (1) (4) (Turn the valve stem in the counter-clockwise direction until it gently makes contact. Do not turn it forcefully).
 - Tighten the service port cap with a torque wrench (18 N.m (1.8 kgf.m)). (5) Then tighten the 2-way valve and 3-way valve caps with a torque wrench (42 N.m (4.2 kgf.m)) or (55 N.m (5.5 kgf.m)). (6)
 - After attaching each of the caps, inspect for a gas leak around the cap area. (5) (6)

Precautions

- Be sure to read the instructions for the vacuum pump, vacuum pump adaptor and manifold gauge prior to use, and follow the instructions carefully.
- Make sure that the vacuum pump is filled with oil up to the designated line on the oil gauge.
- The gas pressure back flow prevention valve on the charging hose is generally open during use. When you are removing the charging hose from the service port, it will come off more easily if you close this valve.

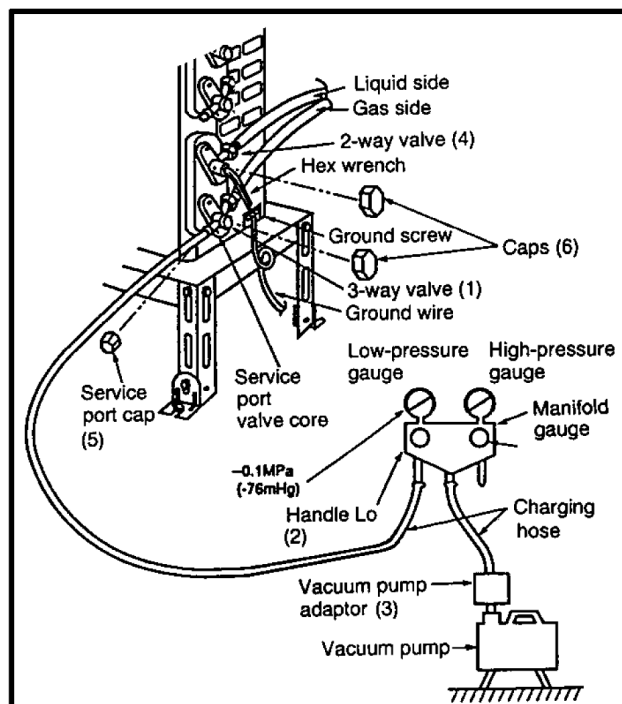


Fig. 12 Vacuum pump air purging configuration

11.4.2. Transferring (Using new refrigerant piping)

1. Removing the unit

a. Collecting the refrigerant into the outdoor unit by pumping down

The refrigerant can be collected into the outdoor unit (pumping down) by pressing the TEST RUN button, even when the temperature of the room is low.

- Check to make sure that the valve stems of the 2-way valve and 3-way valve have been opened by turning them counter-clockwise. (Remove the valve stem caps and check to see that the valve stems are fully opened position. Always use a hex wrench (with 4-mm opposing sides) to operate the valve stems.)
- Press the TEST RUN button on the indoor unit, and allow preliminary operation for 5-6 minutes. (TEST RUN mode)
- After stopping the operation, let the unit sit for about 3 minutes, then close the 2-way valve by turning the valve stem in the clockwise direction.
- Press the TEST RUN button on the indoor unit again, and after 2-3 minutes of operation, turn the valve stem of the 3-way valve quickly in the clockwise direction to close it, then stop the operation.
- Tighten the caps of the 2-way valve and 3-way valve to the stipulated torque.
- Remove the connection pipes (liquid side and gas side).

b. Removing the indoor and outdoor units

- Disconnect the pipes and connecting electric cables from between the indoor and outdoor units.
- Put capped flare nuts onto all of the pipe connections of the indoor and outdoor units, to make sure no dust or other foreign matter enters.
- Remove the indoor and outdoor units.

2. Installing the unit

Install the unit using new refrigerant piping. Follow the instructions in section 4.1 to evacuate the pipes connecting the indoor and outdoor units, and the pipes of the indoor unit, and check for gas leaks.

11.4.3. AC units replacement (Using existing refrigerant piping)

When replacing an R410A AC unit with another R410A AC unit, you should re-flare the refrigerant piping. Even though the replacement AC unit uses the R410A, problems occur when, for example, either the AC unit maker or the refrigerating machine oil is different.

When replacing an R22 AC unit with an R410A AC unit, the following checks and cleaning procedures are necessary but are difficult to do because of the chemical characteristics of the refrigerating machine oil (as described in items c) and d) of section **About R410A Refrigerant**). In this case, you should use new refrigerant piping rather than the existing piping.

1. Piping check

Because of the different pressure characteristics of R22 and R410A, the design pressure for the equipment is 1.6 times different. The wall thickness of the piping must comply with that shown in Table 10, but this is not easy to check. Also, even if the thickness is correct, there may be flattened or bent portions midway through the piping due to sharp curves. Buried sections of the piping also cannot be checked.

2. Pipe cleaning

A large quantity of refrigerating machine oil (mineral oil) adheres to existing pipes due to the refrigeration cycle circulation. If the pipes are used just as they are for the R410A cycle, the capacity will be lowered due to the incompatibility of this oil with the R410A, or irregularities may occur in the refrigeration cycle. For this reason, the piping must be thoroughly cleaned, but this is difficult with the present technology.

11.4.4. Refrigerant compatibility (Using R410A refrigerant in R22 ACs and vice versa)

Do not operate an existing R22 AC with the new R410A refrigerant. Doing so would result in improper functioning of the equipment or malfunction, and might lead to a major accident such as an explosion in the refrigeration cycle. Similarly, do not operate an R410A AC with R22 refrigerant. The chemical reaction between the refrigerating machine oil used in R410A ACs and the chlorine that is contained in R22 would cause the refrigerating machine oil to degrade and lead to malfunction.

11.4.5. Recharging refrigerant during servicing

When recharging is necessary, insert the specified amount of new refrigerant in accordance with the following procedure.

1. Connect the charging hose to the service port of the outdoor unit.
2. Connect the charging hose to the vacuum pump adaptor. At this time, fully open the 2-way valve and 3-way valve.

3. Fully open the handle Lo of the manifold gauge, turn on the power of the vacuum pump and continue the vacuum process for at least one hour.
4. Confirm that the low pressure gauge shows a reading of -0.1 Mpa (-76 cmHg), then fully close the handle Lo, and turn off the vacuum pump. Wait for 1-2 minutes, then check to make sure that the needle of the Low pressure gauge has not returned. See Fig. 13 for the remaining steps of this procedure.
5. Set the refrigerant cylinder onto the electronic scale, then connect the hose the cylinder and to the connection port for the electronic scale. (1)(2)

Precaution:

Be sure to set up the cylinder for liquid charging. If you use a cylinder equipped with a siphon tube, you can charge the liquid without having to turn the cylinder around

6. Remove the charging hose of the manifold gauge from the vacuum pump adaptor, and connect it to the connection port of the electronic scale. (2)(3)
7. Open the valve of the refrigerant cylinder, then open the charging valve slightly and close it. Next, press the check valve of the manifold gauge and purge the air. (2)(4) (Watch the liquid refrigerant closely at this point.)
8. After adjusting the electronic scale to zero, open the charging valve, then open the valve Lo of the manifold gauge and charge with the liquid refrigerant. (2)(5) (Be sure to read the operating instructions for the electronic scale.)
9. If you cannot charge the stipulated amount, operate the unit in the cooling mode while charging a little of the liquid at a time (about 150 g/time as a guideline). If the charging amount is insufficient from one operation, wait about one minute, then use the same procedure to do the liquid charging again.

Precaution:

Never use the gas side to allow a larger amount of liquid refrigerant to be charged while operating the unit.

10. Close the charging valve, and after charging the liquid refrigerant inside the charging hose, fully close the valve Lo of the manifold gauge, and stop the operation of the unit. (2)(5)
11. Quickly remove the charging hose from the service port. (6) If you stop midway through, the refrigerant that is in the cycle will be discharged.
12. After putting on the caps for the service port and operating valve, inspect around the caps for a gas leak. (6)(7)

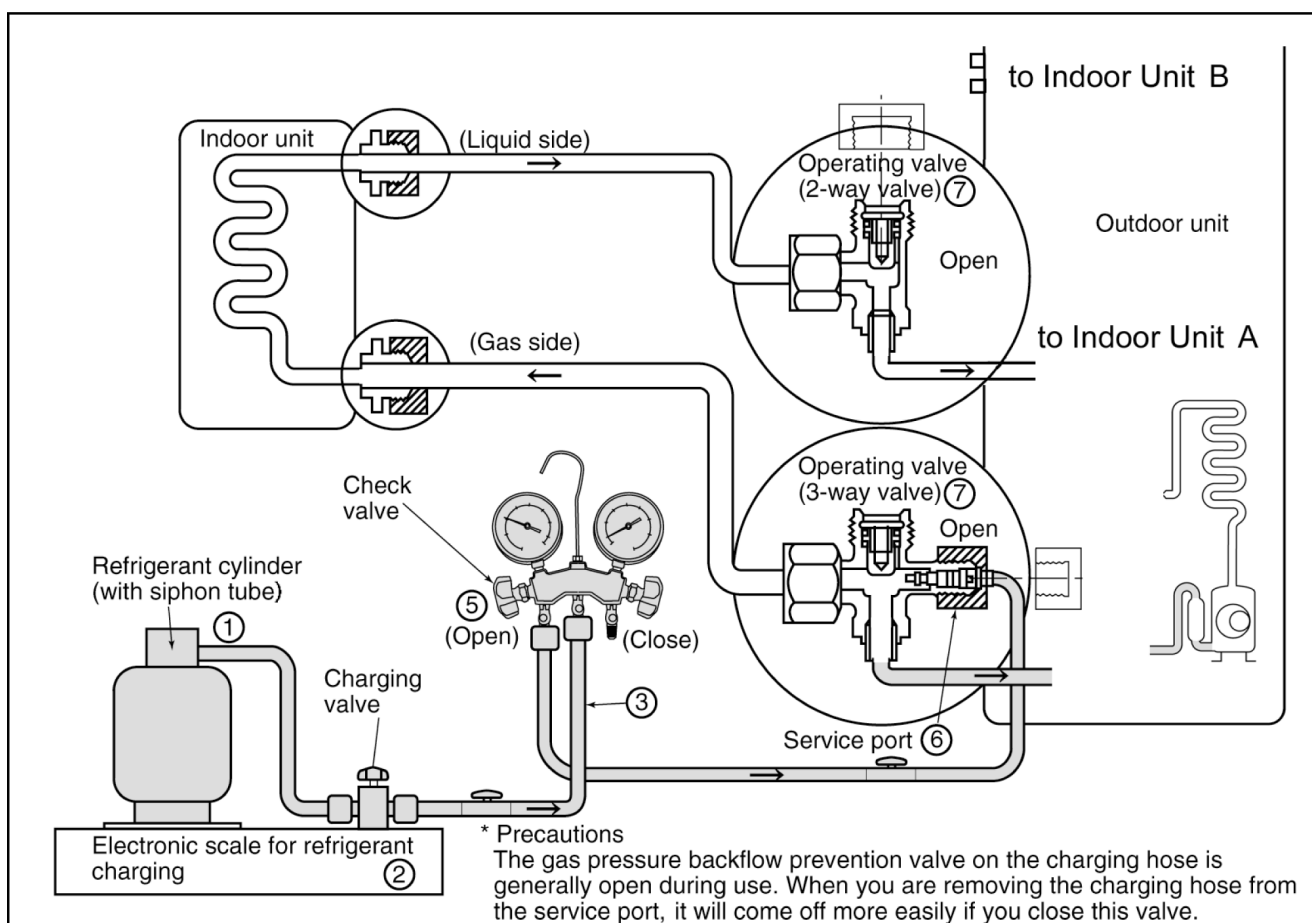


Fig. 13 Re-charging refrigerant

11.4.6. Brazing

As brazing requires sophisticated techniques and experiences, it must be performed by a qualified person.

In order to prevent the oxide film from occurring in the pipe interior during brazing, it is effective to proceed with brazing while letting dry nitrogen gas (N_2) flow.

<Brazing Method for Preventing Oxidation>

1. Attach a reducing valve to the nitrogen gas cylinder.
2. Apply a seal onto the clearance between the piping and inserted pipe for the nitrogen gas in order to prevent the nitrogen gas from flowing backward.
3. When the nitrogen gas is flowing, be sure to keep the piping end open.
4. Adjust the flow rate of nitrogen gas so that it is lower than $0.05 \text{ m}^3/\text{h}$, or 0.02 MPa (0.2 kgf/cm^2) by means of the reducing valve.
5. After taking the steps above, keep the nitrogen gas flowing until the piping cools down to a certain extent (i.e. temperature at which pipes are touchable with finger).
6. Completely remove the flux after brazing.

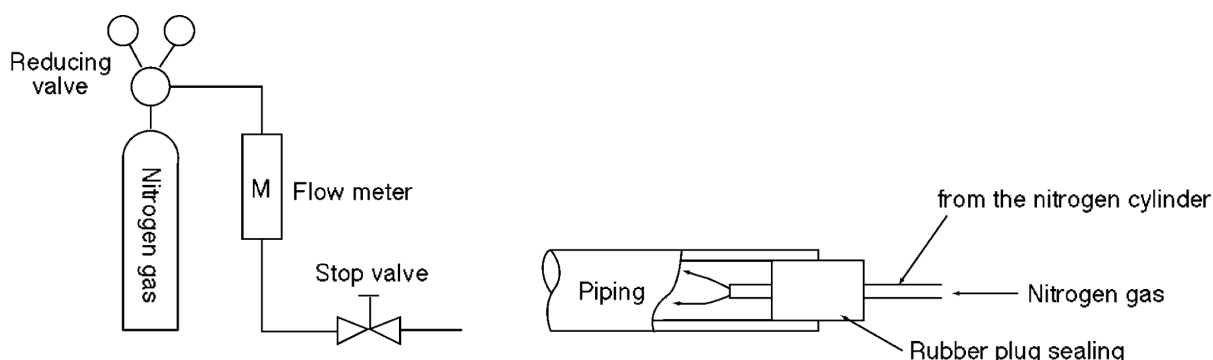


Fig. 14 Prevention of Oxidation during Brazing

Cautions during brazing

1. General Cautions

- a. The brazing strength should be high as required.
- b. After operation, airtightness should be kept under pressurized condition.
- c. During brazing do not allow component materials to become damaged due to overheating.
- d. The refrigerant pipe work should not become blocked with scale or flux.
- e. The brazed part should not restrict the flow in the refrigerant circuit.
- f. No corrosion should occur from the brazed part.

2. Prevention of Overheating

Due to heating, the interior and exterior surfaces of treated metal may oxidize. Especially, when the interior of the refrigerant circuit oxidizes due to overheating, scale occurs and stays in the circuit as dust, thus exerting a fatally adverse effect. So, make brazing at adequate brazing temperature and with minimum of heating area.

3. Overheating Protection

In order to prevent components near the brazed part from overheating damage or quality deterioration due to flame or heat, take adequate steps for protection such as (1) by shielding with a metal plate, (2) by using a wet cloth, and (3) by means of heat absorbent.

4. Movement during Brazing

Eliminate all vibration during brazing to protect brazed joints from cracking and breakage.

5. Oxidation Preventative

In order to improve the brazing efficiency, various types of antioxidant are available on the market. However, the constituents of these are widely varied, and some are anticipated to corrode the piping materials, or adversely affect HFC refrigerant, lubricating oil, etc. Exercise care when using an oxidation preventative.

11.4.7. Servicing tips

The drier must also be replaced whenever replacing the refrigerant cycle parts. Replacing the refrigerant cycle parts first before replacing the drier. The drier is supplied in a vacuum pack. Perform brazing immediately after opening the vacuum pack, and then start the vacuum within two hours. In addition, the drier also needs to be replaced when the refrigerant has leaked completely. (Applicable for drier models only)

12 Troubleshooting Guide

12.1. Self-diagnosis error code table

- The display screen on the wired remote control unit and the self-diagnosis LEDs (green) on the outdoor unit printed circuit board in the outdoor unit can be used to indicate where the location of a problem is.

Refer to the table below to remove the cause of the problem, and then re-start the air conditioner system.

- If the problem disappears and operation returns to normal, the CHECK display on the remote control unit will switch off, but the self-diagnosis LED will remain illuminated until operation is resumed. ●... illuminated ○... flashing Blank off.

Wired remote control unit display		Outdoor unit printed circuit board LED								Location or problem	Check location
Abnormal display	Detail display	302	303	304	305	306	307	308	309		
F15	-01		○	○	○	○		(※2)	(※2)	Drain level Float switch problem	Drain pump and drain pipe, indoor unit connectors CN-DRMTR&CN-TH2
F16	-01						○	(※2)	(※2)	Louver switch problem	Louver motor, decorative panel connection terminal, or indoor unit louver motor connectors
F17	-02	○	○				○	(※2)	(※2)	D. C Fan Motor problem	Indoor unit D. C Fan motor or connection terminals
F20	-01				○		○	(※2)	(※2)	Indoor temperature sensor problem	Indoor temperature sensor lead wire or indoor unit connector or CN-TH2
	-02	○			○		○	(※2)	(※2)	Remote control thermistor problem	Remote control thermistor
F21	-01		○		○		○	(※2)	(※2)	Pipe temp. sensor problem (indoor unit)	Pipe temperature sensor lead wire or indoor unit connector CN-TH1
F26	-01			○		○	○	(※2)	(※2)	Remote control transmission problem	Remote control unit cable and connection terminals
F27	-01		○	○		○	○	(※2)	(※2)	Indoor/outdoor unit disconnection problem	Indoor/outdoor unit connection cable and connection terminals, or indoor unit and outdoor unit power supplies (indoor side)
	-05	○	○	○		○	○	(※2)	(※2)	Indoor/outdoor unit connection problem	Indoor/outdoor unit connection wire (indoor side)
F27	-01	○		○		○				Indoor/outdoor unit disconnection problem	Indoor/outdoor unit connection cable and connection terminals, or indoor unit and outdoor unit power supplies (outdoor side)
	-05					○				Indoor/outdoor unit connection error problem	Indoor/outdoor unit connection wire (outdoor side)
F30	-01						○			System problem	Total capacity for the number of indoor units is insufficient, or over check the total capacity and the number of indoor units
	-02			○			○			Open phase, or reversed phase of supply	Check the main power supply terminal board connections, or switch over any two of the power supply wires.
F31	-01		○							Suction pressure protection	Insufficient refrigerant
	-02	○								High-pressure cut-off	Check the Refrigeration system
	-06			○	○					4 way valve problem	Check the 4 way valve or lead wire
	-08		○				○			Freezing problem (Cooling model)	Check the Refrigerant system
	-09		○	○	○					Leakage Refrigerant problem	Check the Refrigerant system
	-10		○	○		○				Refrigerant system problem	Insufficient refrigerant or valve operation (closed)
F32	-03			○		○				Inverter protection (Low DC voltage)	Check the Power supply
	-04	○	○			○				Inverter protection (IPM protection)	IPM fault or PCB (MAIN) fault
	-05	○	○							Compressor overcurrent protection	Open phase or lock in compressor
	-06	○	○		○					Compressor discharge temp. protection	Insufficient refrigerant
	-08	○		○	○					Inverter protection (PFC protection)	PFC fault (PCB-PFC fault)
	-09	○				○				Inverter protection (DC current protection)	IPM fault or lock in compressor
	-10	○	○	○	○					Number of rotation Compressor problem	IPM fault or lock in compressor
F35	-02		○			○				D. C Fan motor lock problem	D. C Fan motor lock

Wired remote control unit display		Outdoor unit printed circuit board LED								Location or problem	Check location
Abnormal display	Detail display	302	303	304	305	306	307	308	309		
F40	-01			○						Outlet temperature sensor problem	Outlet temperature sensor lead wire, connector CN-TH1
	-11				○					Compressor suction temperature sensor problem	Suction temperature sensor (SUC T. TEMP) lead wire, connector CN-TH2 or valve operation (closed)
	-21	○		○						Heat exchanger outlet temperature sensor problem	Heat exchanger outlet temperature sensor (COND TEMP) lead wire, connector CN-TH1
	-31	○	○	○						Pipe temperature sensor problem	Pipe temperature sensor (PIPE TEMP) lead wire, connector CN-TH2
	-51		○	○						Compressor discharge temperature sensor problem	Compressor discharge temperature sensor (DIS T. TEMP) lead wire, connector CN-DIS
F41	-02	○	○				○			High pressure switch open circuit problem	High-pressure switch lead wire, connector CN-PSW1
	-11	○					○			Low pressure sensor problem	Low-pressure sensor lead wire, connector
F42	-11		○		○					Current detector open circuit	Outdoor unit P.C. B (NOISE FILTER) fault or connector ACN2
F44	-01	○			○					Inverter protection (IPM temp. sensor problem)	IPM fault or PCB (MAIN) fault

(※2)

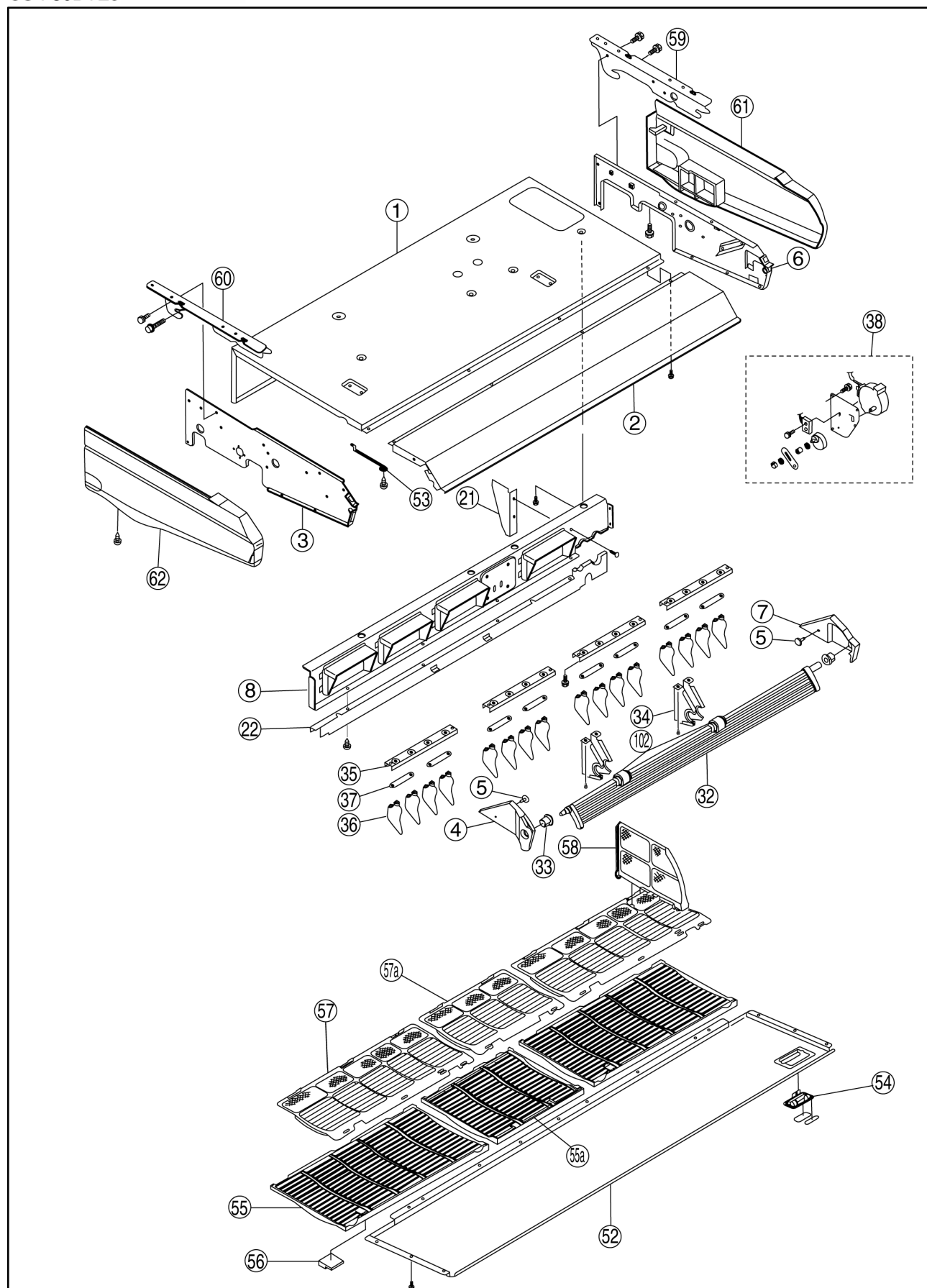
LED308	LED309	Unit No. (when twin or triple)
●		Master unit problem
	●	Slave No. 1 unit problem
●	●	Slave No. 2 unit problem

- The LED301 (green) illuminates to indicate that the microprocessor on the printed circuit board is operating normally.
If the LED is switched off or flashing irregularly. Check the power supply, and turn it off and then back on again

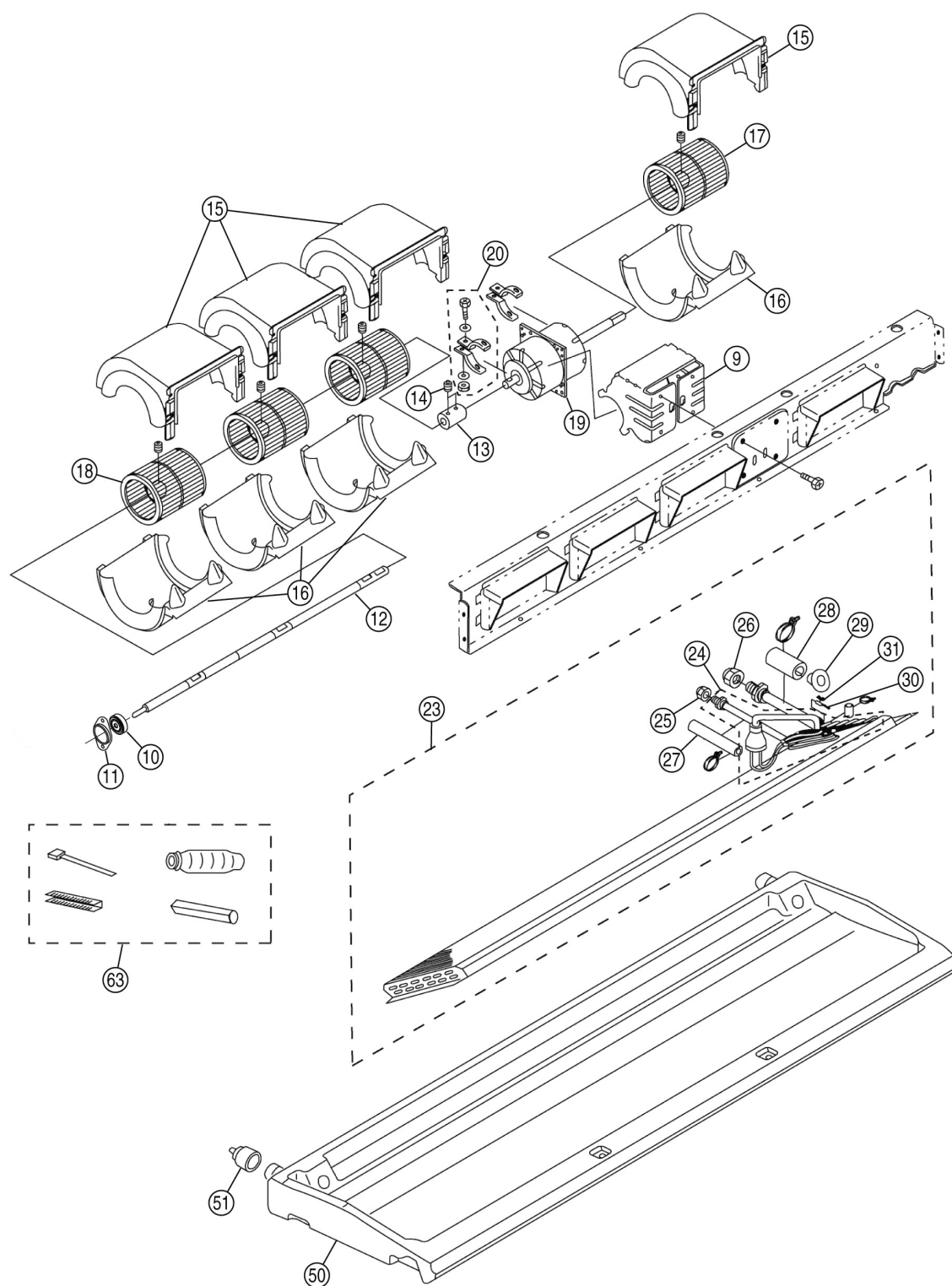
13 Replacement Parts

13.1. Indoor unit

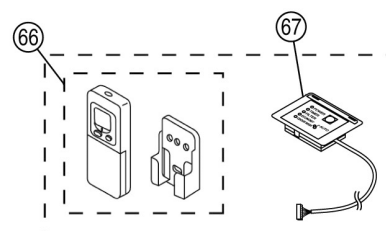
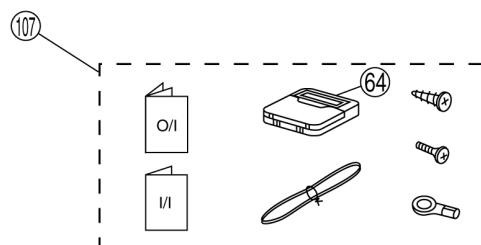
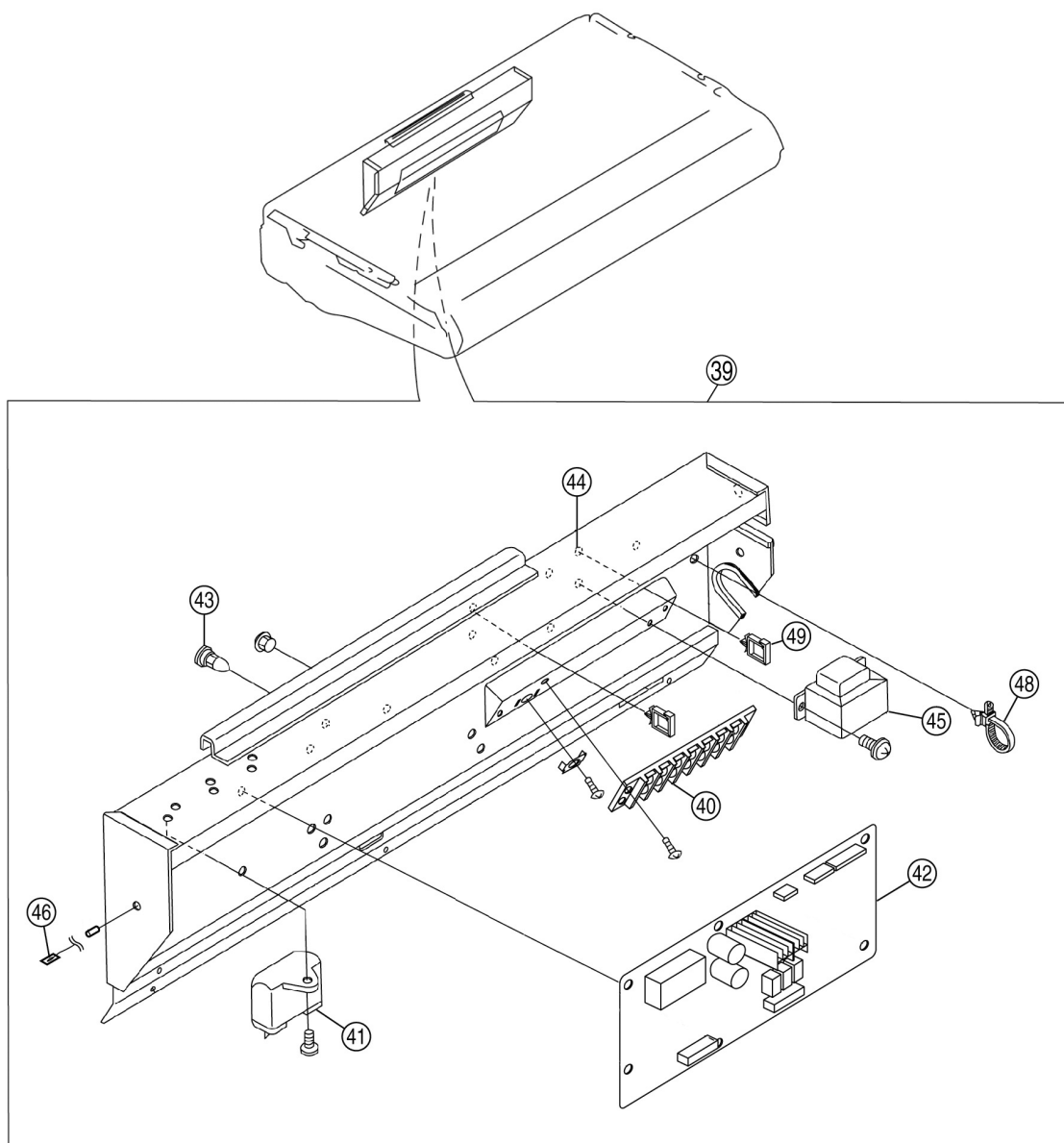
CS-F50DTE5



CS-F50DTE5



CS-F50DTE5



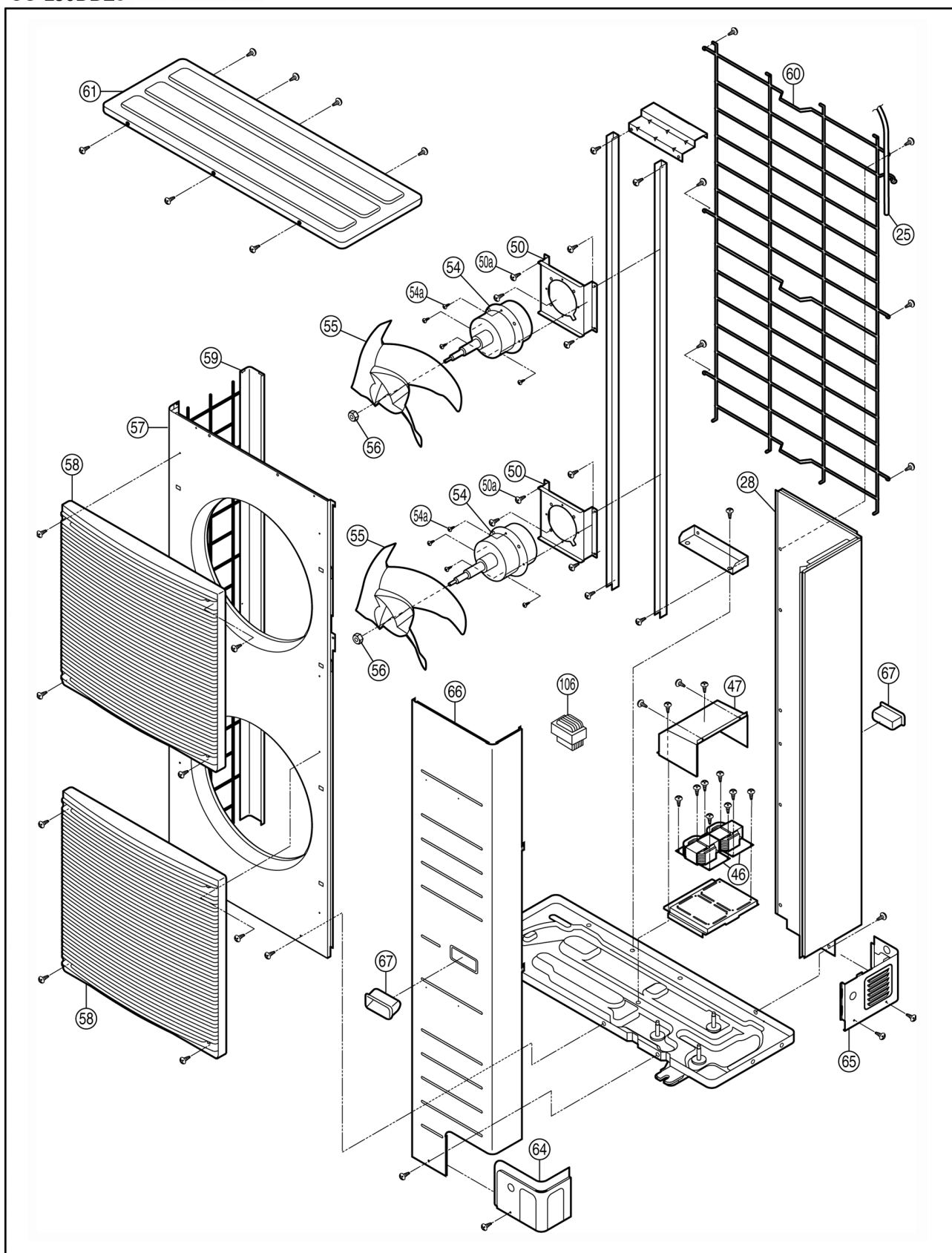
NO.	PART DESCRIPTION	QTY.	CS-F50DTE5
1	CABINET TOP PLATE	1	CWE001016
2	CABINET FRONT PLATE	1	CWG07K1008
3	CABINET SIDE PLATE (L)	1	CWD63K1003
4	VANE SUPPORTER (L)	1	CWG071144
5	CATCHER	1	CWH601005
6	CABINET SIDE PLATE (R)	1	CWD63K1004
7	VANE SUPPORTER (R)	1	CWG071145
8	BLOWER WHEEL BASE ASS'Y	1	CWD90K1008
9	BRACKET FAN MOTOR ASS'Y	1	CWD54K1005
10	BEARING	1	CWH64C1001
11	BEARING COVER	1	CWD911196
12	FAN SHAFT	1	CWH631031
13	COUPLING SHAFT COMPLETE	1	CWH08C1001
14	SCREW-COUPLING SHAFT COMPLETE	2	CWH55424
15	AIR GUIDER B. WHEEL (TOP)	4	CWD321032
16	AIR GUIDER B. WHEEL (BOTTOM)	4	CWD321033
17	BLOWER WHEEL	1	CWH011010
18	BLOWER WHEEL	3	CWH011005
19	FAN MOTOR	1	CWA921056
20	FAN MOTOR SUPPORTER	2	CWD93C1027
21	SIDE FILTER SEAL	1	CWD911158
22	SEPARATOR	1	CWD911113
23	EVAPORATOR COMPLETE	1	CWB30C1568
24	TUBE ASS'Y (CAPIL. TUBE-EVA)	1	CWT07K1208
25	FLARE NUT (3/8")	1	CWT251031
26	FLARE NUT (5/8")	1	CWT251033
27	HEATPROOF TUBE [LIQUID]	1	CWG021024
28	HEATPROOF TUBE [GAS]	1	CWG021022
29	WATERPROOF COVER	1	CWG251006
30	SENSOR-EVAPORATOR	1	CWA50C2285
31	HOLDER-SENSOR	1	CWH321044
32	VANE COMPLETE	1	CWE24C1024
33	VANE SIDE HOLDER	2	CWH511027
34	FULCRUM	2	CWH621008A
35	VERTICAL VANE HOLDER (MANUAL)	4	CWD911107
36	VERTICAL VANE (HORIZ.AIR FLOW)	16	CWE241051
37	CONNECTING BAR	8	CWE261019
38	AIR SWING MOTOR COMPLETE	1	CWA98C1004
39	CONTROL BOARD ASS'Y	1	CWH10K1050
40	TERMINAL BOARD	1	CWA281031
41	CAPACITOR-FAN MOTOR (MF/V)	1	DS441605BPQL
42	ELECTRONIC CONTROLLER - MAIN	1	CWA73C1699
43	LOCKING GUARD SPACER	6	CWH541026
44	CONTROL BOARD COVER-W/DIAGRAM	1	CWH13C1106
45	TRANSFORMER	1	CWA40C1031
46	SENSOR COMPLETE	1	CWA50C2233
48	CABLE CLIP (CORD CLAMPER)	1	CWH88133
49	WIRE SADDLE	4	CWH881016
50	DRAIN PAN ASS'Y	1	CWH40K1013
51	DRAIN PLUG	1	CWB821002
52	CABINET BOTTOM PLATE	1	CWE051002A
53	CURVED WIRE	1	CWH751002
54	RAY RECEIVER HOLDER	1	CWD911428
55	INTAKE GRILLE (LARGE)	2	CWE221029
55a	INTAKE GRILLE (SMALL)	1	CWE221030
56	GRILLE SLIDE HOOK	6	CWH891001
57	AIR FILTER (MAIN)	2	CWD001169
57a	AIR FILTER (MIDDLE)	1	CWD001042
58	AIR FILTER (SIDE)	1	CWD001041
59	BRACKET HANGER (R)	1	CWD601014
60	BRACKET HANGER (L)	1	CWD601015
61	CABINET SIDE COVER (R)	1	CWE041024
62	CABINET SIDE COVER (L)	1	CWE041025
63	FLEXIBLE PIPE-ACCESSORY	1	CWH82C1297
64	WIRED REMOTE CONTROL COMPLETE	1	CWA75C2586
66	WIRELESS REMOTE CONTROL COMP.	1	CWA75C2588
67	RAY RECEIVER	1	CWD76C1030
102	BEARING	2	CWH641004
107	WIRED REMOTE CONTROL CO. (ACCESSORY)	1	CWG50C2604
	OPERATING INSTRUCTION	1	CWF564532
	OPERATING INSTRUCTION	1	CWF564533
	OPERATING INSTRUCTION	1	CWF564534
	OPERATING INSTRUCTION	1	CWF564535
	OPERATING INSTRUCTION	1	CWF564882

	INSTALLATION INSTRUCTION	1	CWF612642
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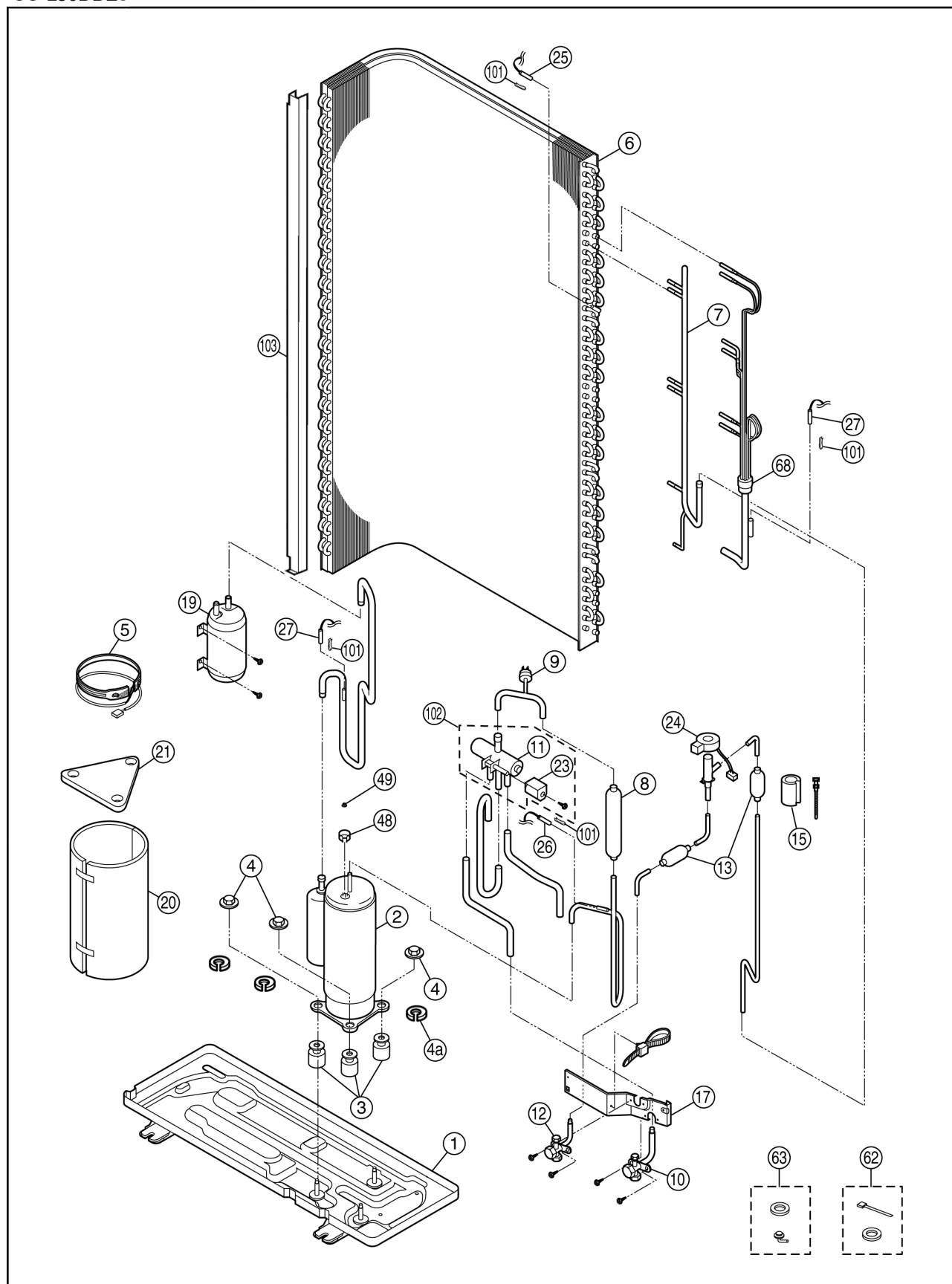
All parts are supplied from PHAAM, Malaysia (Vendor Code: 061)

13.2. Outdoor unit

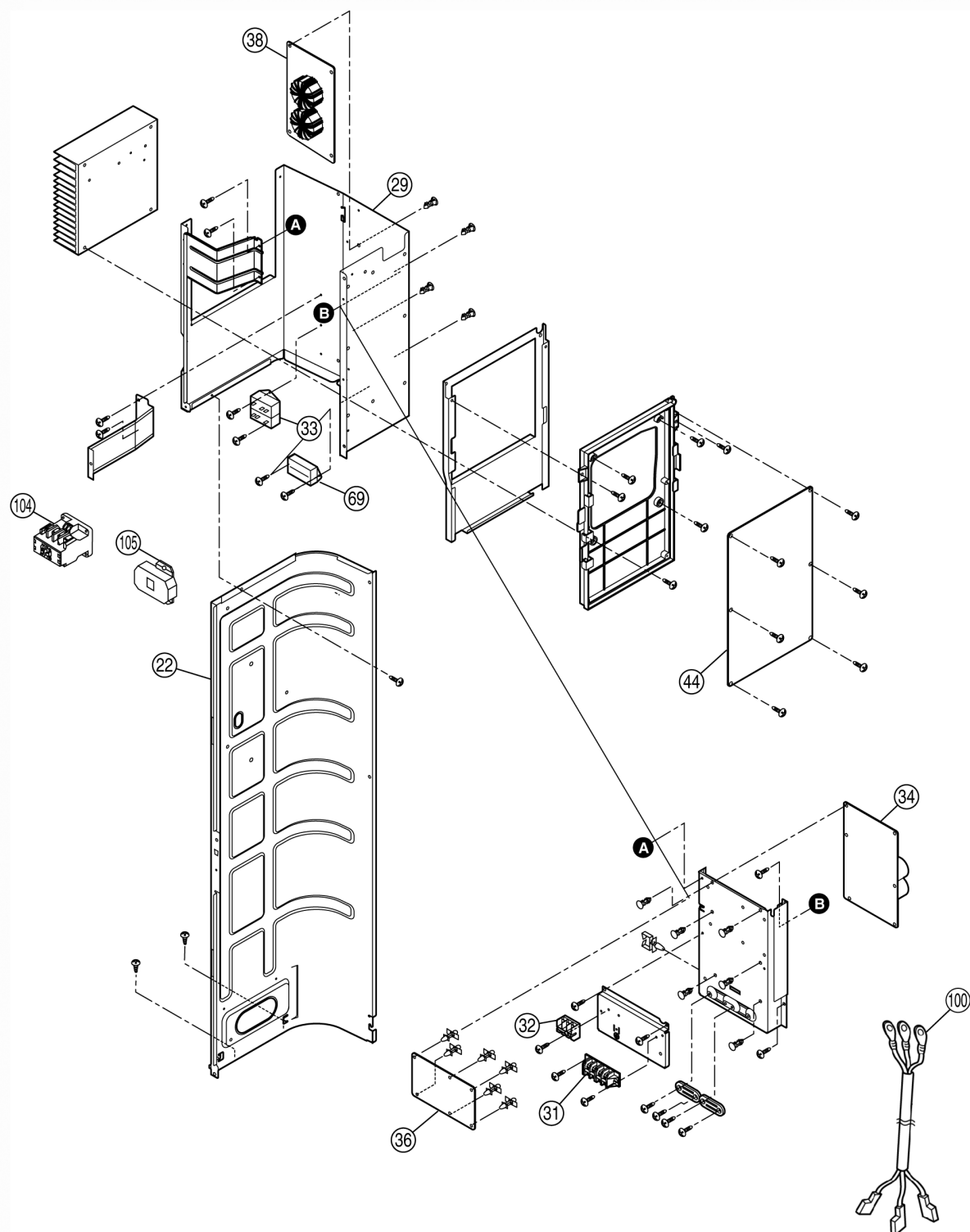
CU-L50DBE8



CU-L50DBE8



CU-L50DBE8



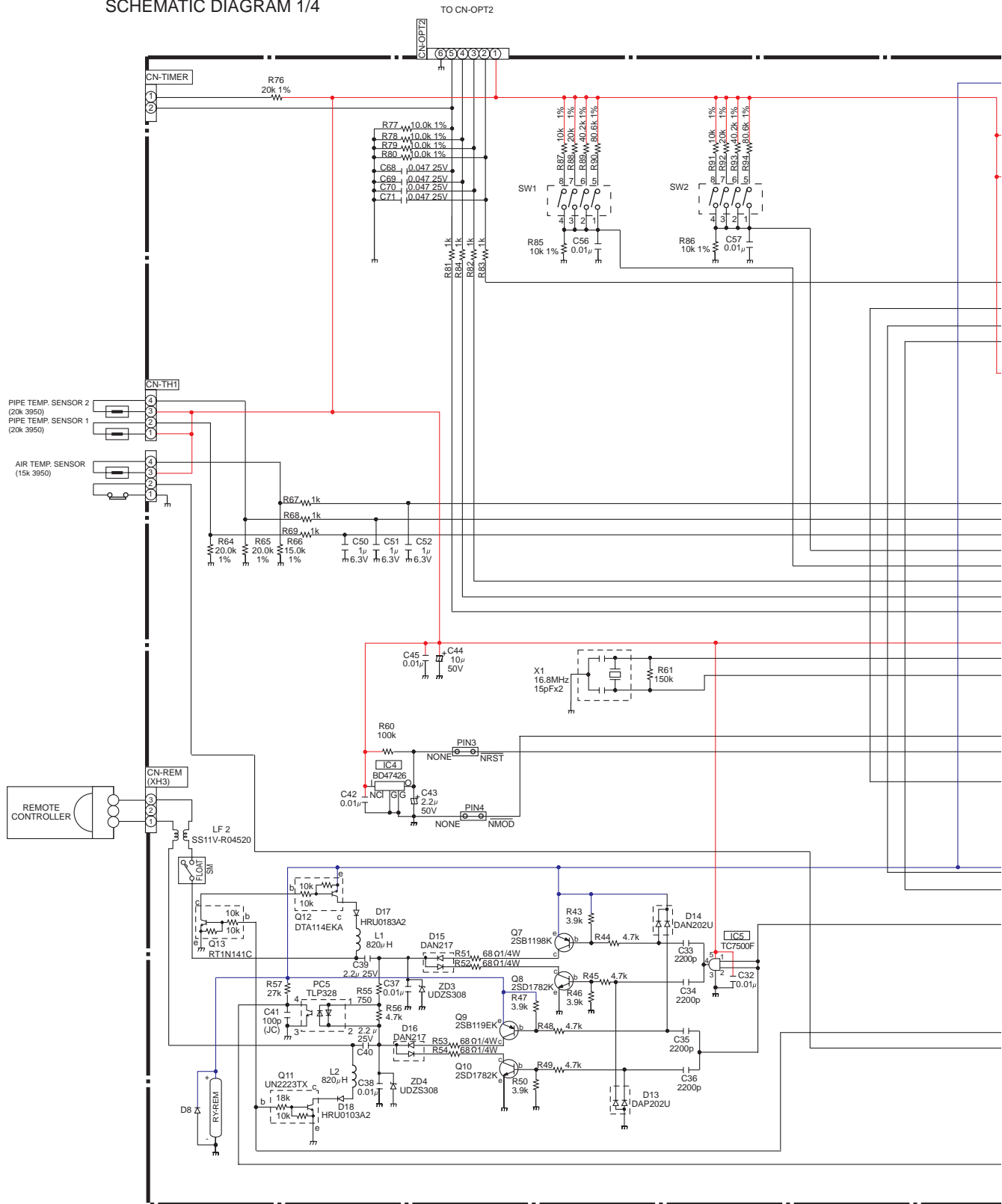
NO.	PART DESCRIPTION	QTY.	CU-L50DBE8
1	BASE PAN ASS'Y	1	CWD52K1110
2	COMPRESSOR	1	5JD420XBA22
3	ANTI-VIBRATION BUSHING	3	CWH50055
4	NUT FOR COMP. MOUNT.	3	CWH4582065
4a	PACKING	3	CWB811017
5	CRANKCASE HEATER	1	CWA341013
6	CONDENSER COMPLETE	1	CWB32C1594
7	TUBE ASS'Y(PRESSURE SWITCH)	1	CWT023392
8	DISCHARGE MUFFLER	1	CWB121014
9	HIGH PRESSURE SWITCH	1	CWA101007
10	3-WAYS VALVE (GAS)	1	CWB011251
11	4-WAYS VALVE	1	CWB001046
12	3-WAYS VALVE (LIQUID)	1	CWB011292
13	STRAINER	2	CWB111032
15	PIPE HOLDER RUBBER	5	CWG251021
17	HOLDER-SERVICE VALVE	1	CWD911425
19	ACCUMULATOR ASS'Y	1	CWB131026A
20	SOUND PROOF MATERIAL-COMP	1	CWG302265
21	SOUND PROOF MATERIAL	1	CWG302266
22	SOUND-PROOF BOARD ASS'Y	1	CWH15K1019
23	V-COIL COMPLETE	1	CWA43C2169
24	V-COIL COMPLETE	1	CWA43C2177
25	PIPE SENSOR (DISCHARGE)	1	CWA50C2229
26	PIPE SENSOR (COIL)	1	CWA50C2230
27	PIPING SENSOR	1	CWA50C2231
28	CABINET REAR PLATE	1	CWE02C1014
29	CONTROL BOARD ASS'Y	1	CWH10K1049
31	TERMINAL BOARD ASS'Y	1	CWA28K1111
32	TERMINAL BOARD ASS'Y	1	CWA28K1076
33	CAPACITOR-FAN MOTOR (3/460)	2	DS461305QP-A
34	ELECTRONIC CONTROLLER (P. SUPPLY)	1	CWA743633
36	ELECTRONIC CONTROLLER (DISPLAY)	1	CWA743403
38	ELECTRONIC CONTROLLER (NOISE FILTER)	1	CWA743814
44	ELECTRONIC CONTROLLER (MAIN)	1	CWA73C1798R
46	REACTOR	2	-
47	PARTICULAR PLATE COVER ASS'Y	1	-
48	TERMINAL COVER	1	CWH171035
49	NUT FOR TERMINAL COVER	1	CWH7080300
50	BRACKET FAN MOTOR	1	CWD54K1014
50a	SCREW-BRACKET FAN MOTOR	4	CWH551040
54	FAN MOTOR	2	CWA951363
54a	SCREW-FAN MOTOR	8	CWH551040
55	PROPELLER FAN	2	CWH001021
56	NUT for PROPELLER FAN	2	CWH561038
57	CABINET FRONT PLATE	1	CWE061098A
58	DISCHARGE GRILLE	2	CWE201073
59	CABINET SIDE PLATE	1	CWE04K1023A
60	WIRE NET	1	CWD041068A
61	CABINET TOP PLATE COMPLETE	1	CWE03C1021
62	ACCESSORY COMPLETE	1	CWH82C1105
63	BAG-COMPLETE (L-TUBE)	1	CWG87C2030
64	PIPE COVER (FRONT)	1	CWD601074A
65	PIPE COVER (BACK)	1	CWD601075A
66	CABINET FRONT PLATE COMPLETE	1	CWE06C1091
67	HANDLE	2	CWE161008
68	TUBE ASS'Y (CAPILLARY TUBE)	1	CWT07K1196
69	MAGNETIC SWITCH	1	K6C2AGA00002
100	LEADWIRE-COMPRESSOR	1	-
101	SPRING FOR SENSOR	4	CWH711010
102	4-WAYS VALVE COMPLETE	1	CWB00C1022
103	CONDENSER SIDE PLATE	1	CWD932477
104	ELECTRO MAGNETIC SWITCH	1	CWA001005
105	PTC THERMISTORS	1	D4DDG1010001
106	NORMAL - MODE LINE CHOKE COILS	1	G0A452N00002
	INSTALLATION INSTRUCTION	1	CWF612612

All parts are supplied from PHAAM, Malaysia (Vendor Code: 061)

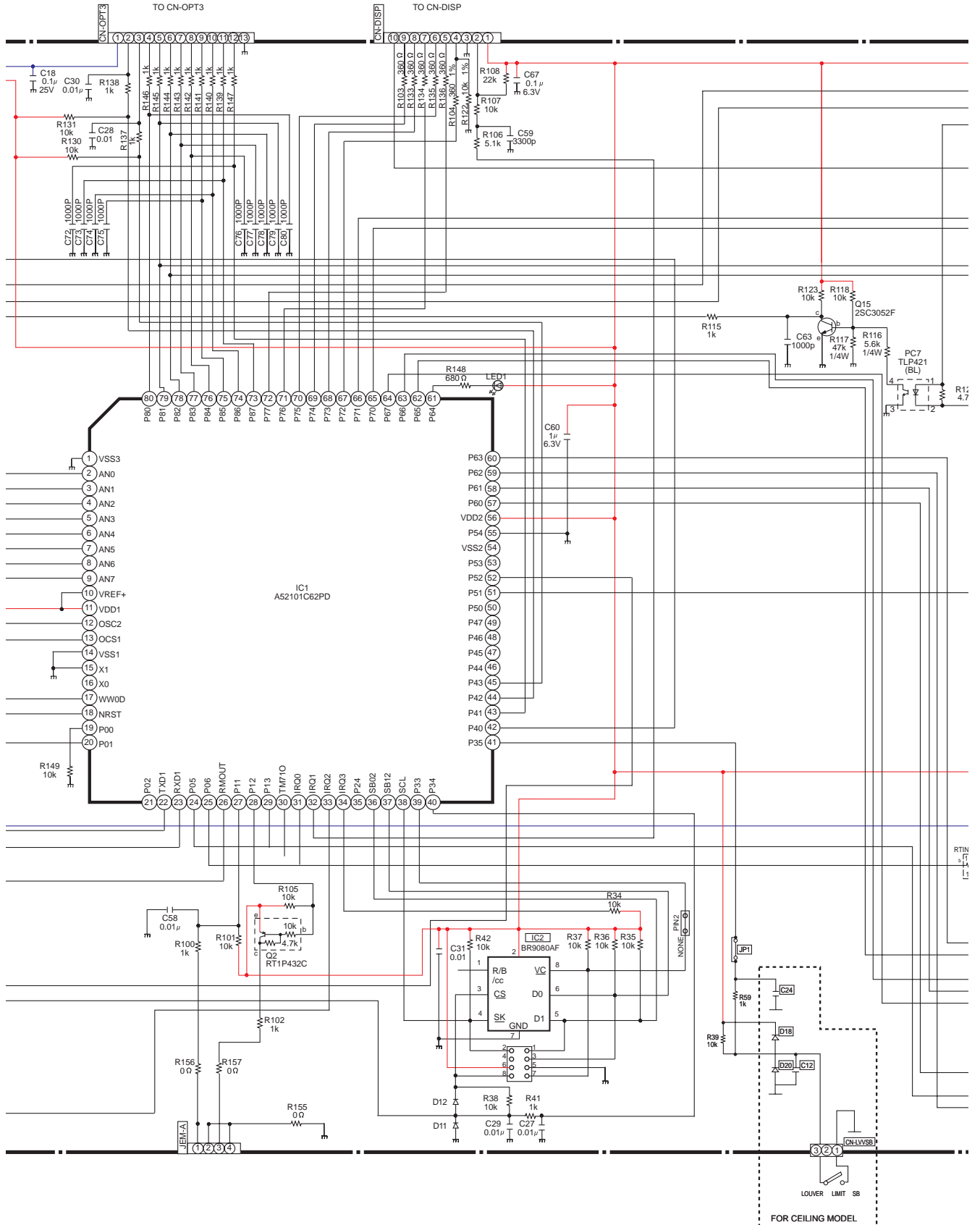
14 Electronic Circuit Diagram

14.1. Indoor unit

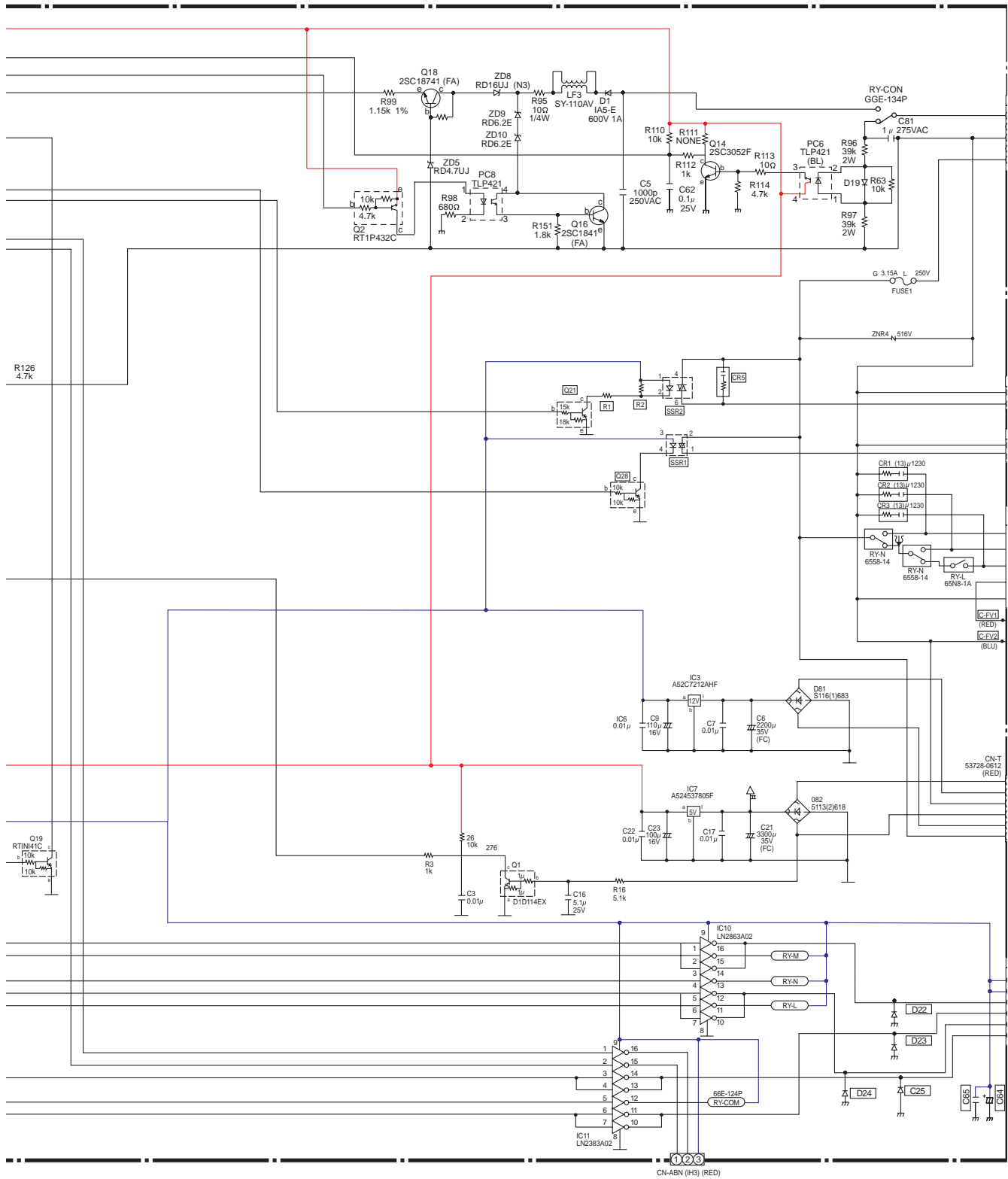
SCHEMATIC DIAGRAM 1/4



SCHEMATIC DIAGRAM 2/4

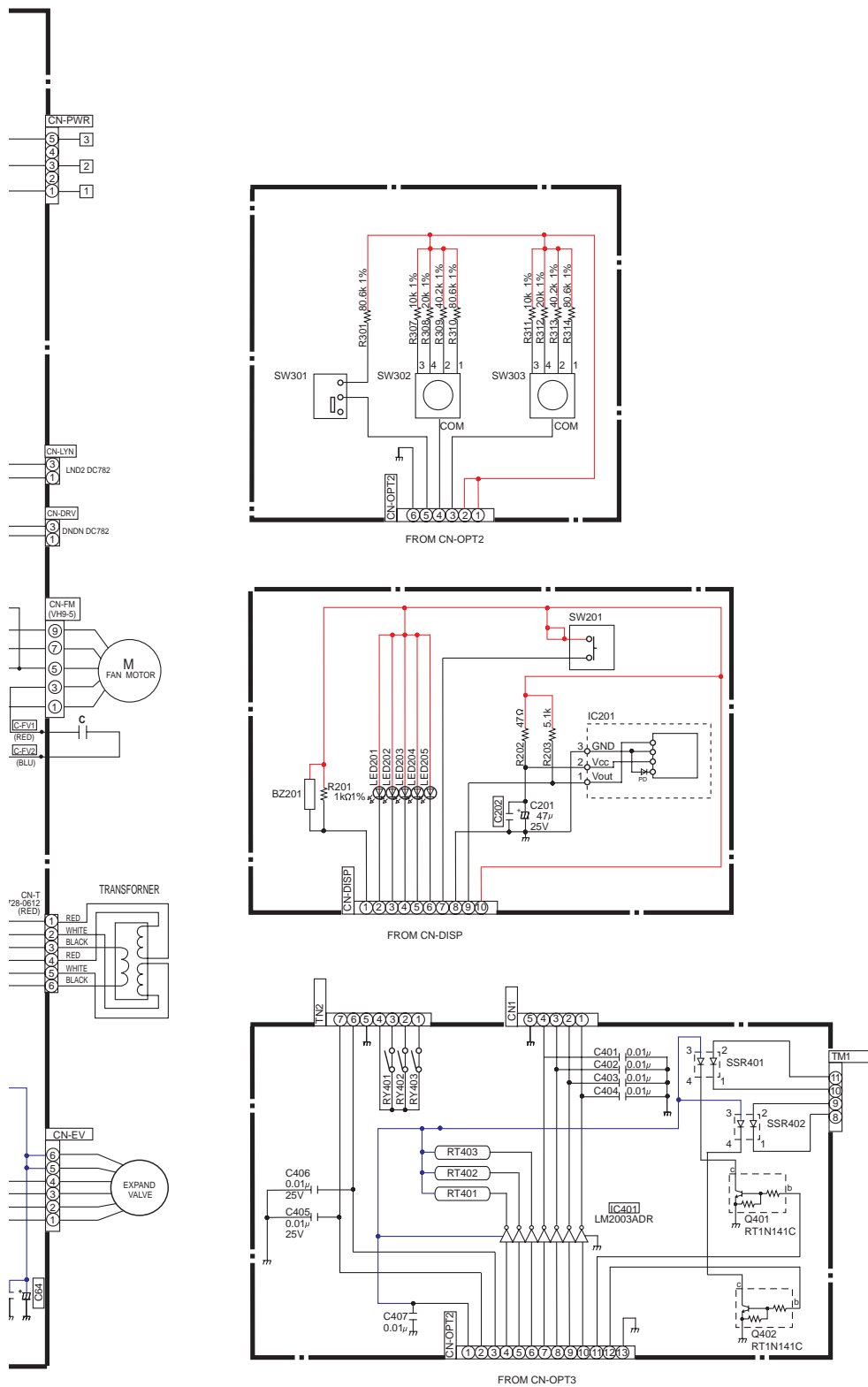


SCHEMATIC DIAGRAM 3/4



SCHEMATIC DIAGRAM 4/4

ELECTRONIC CONTROL UNIT

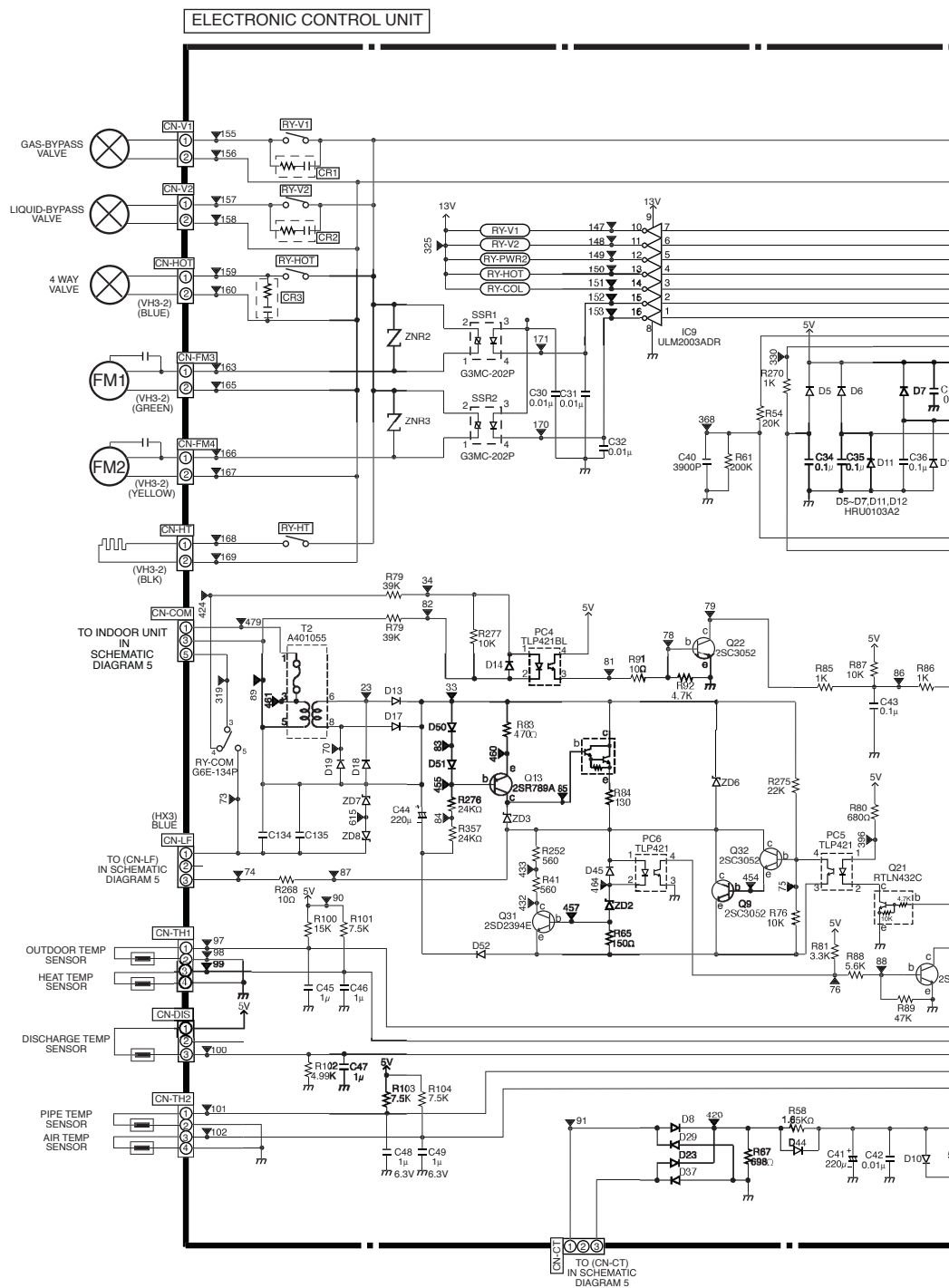


14.2. Outdoor unit

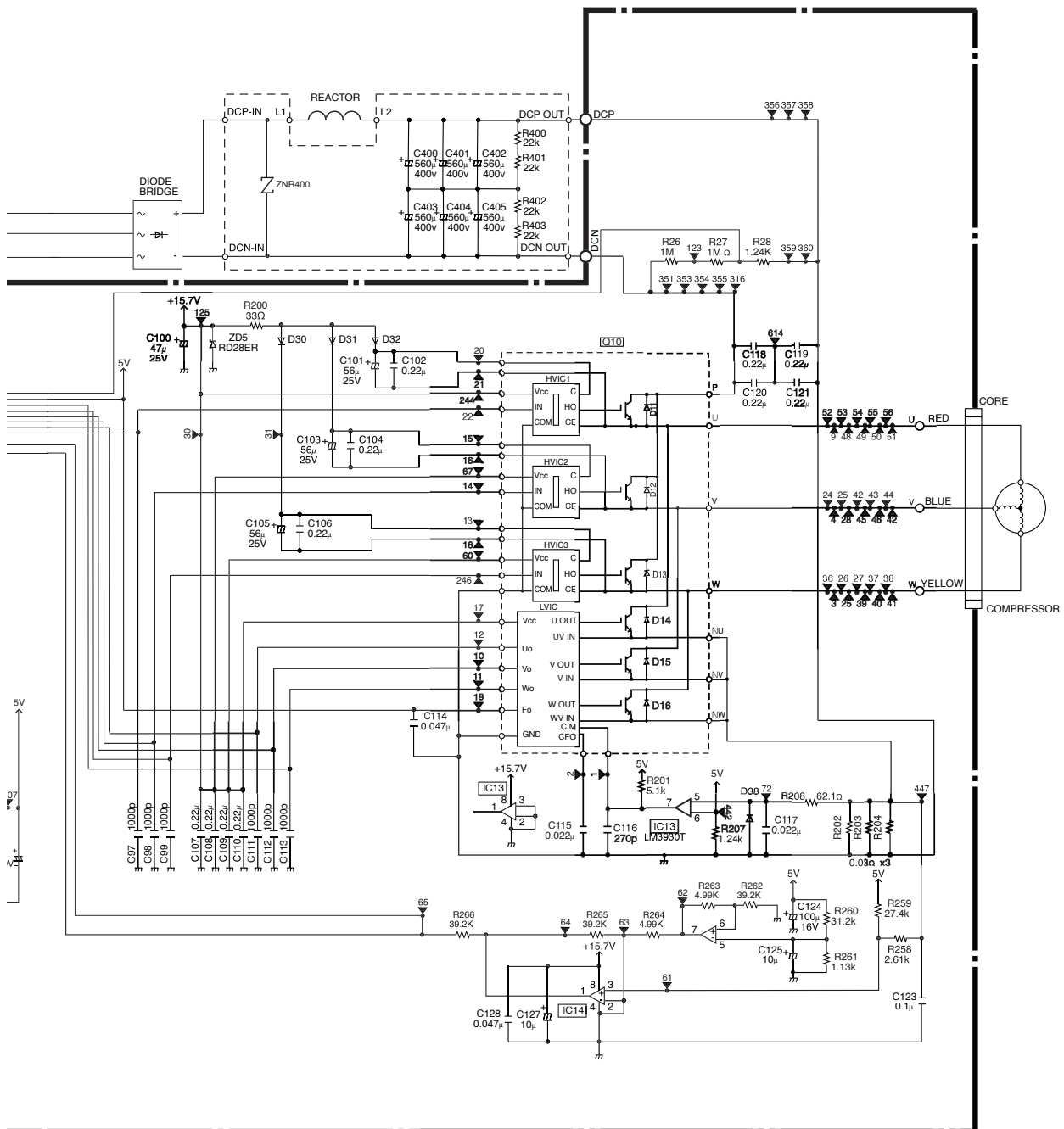
**** Electronic Circuit Diagram**

*** CU-L50DBE8

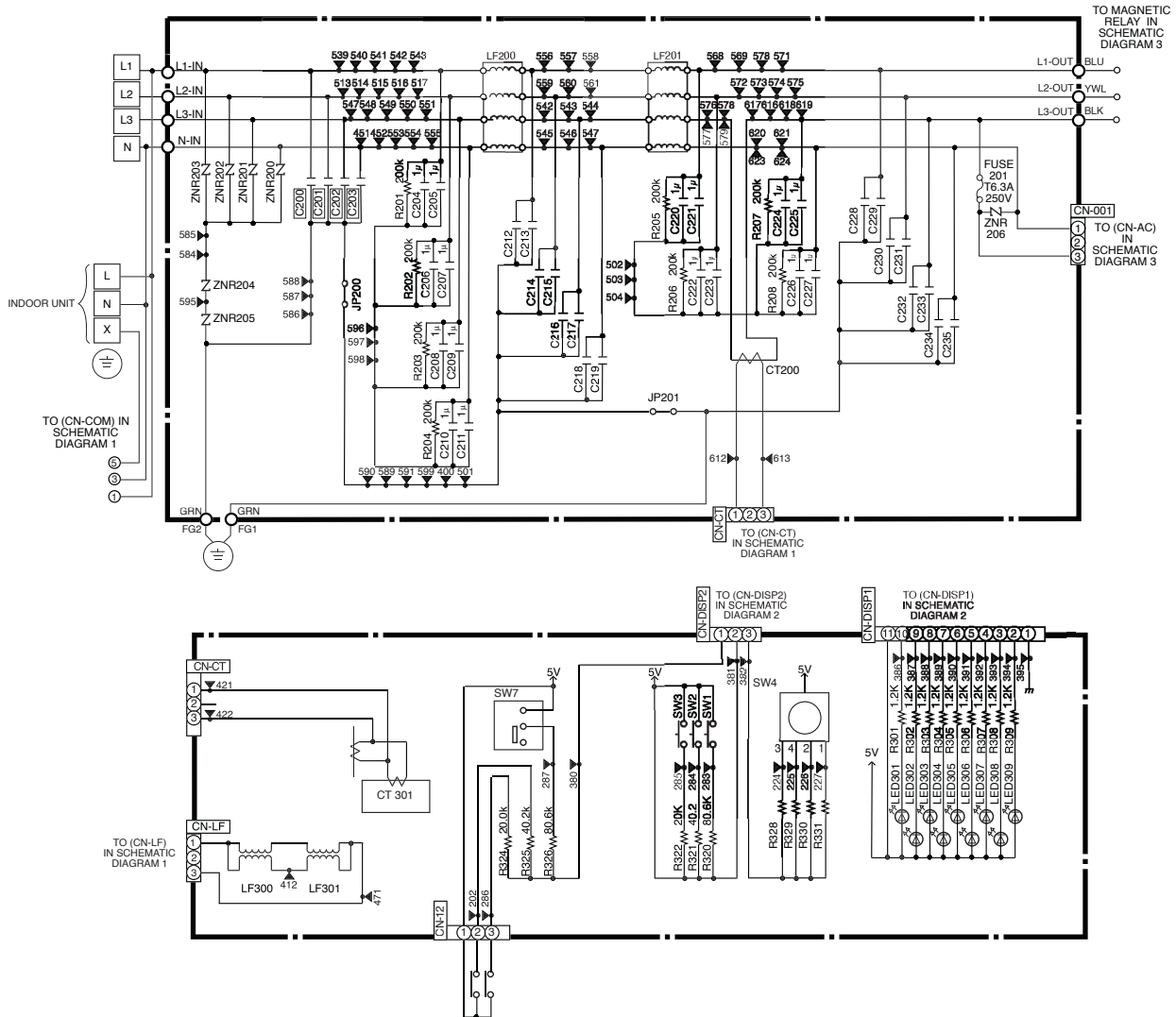
SCHEMATIC DIAGRAM 1/5



SCHEMATIC DIAGRAM 4/5

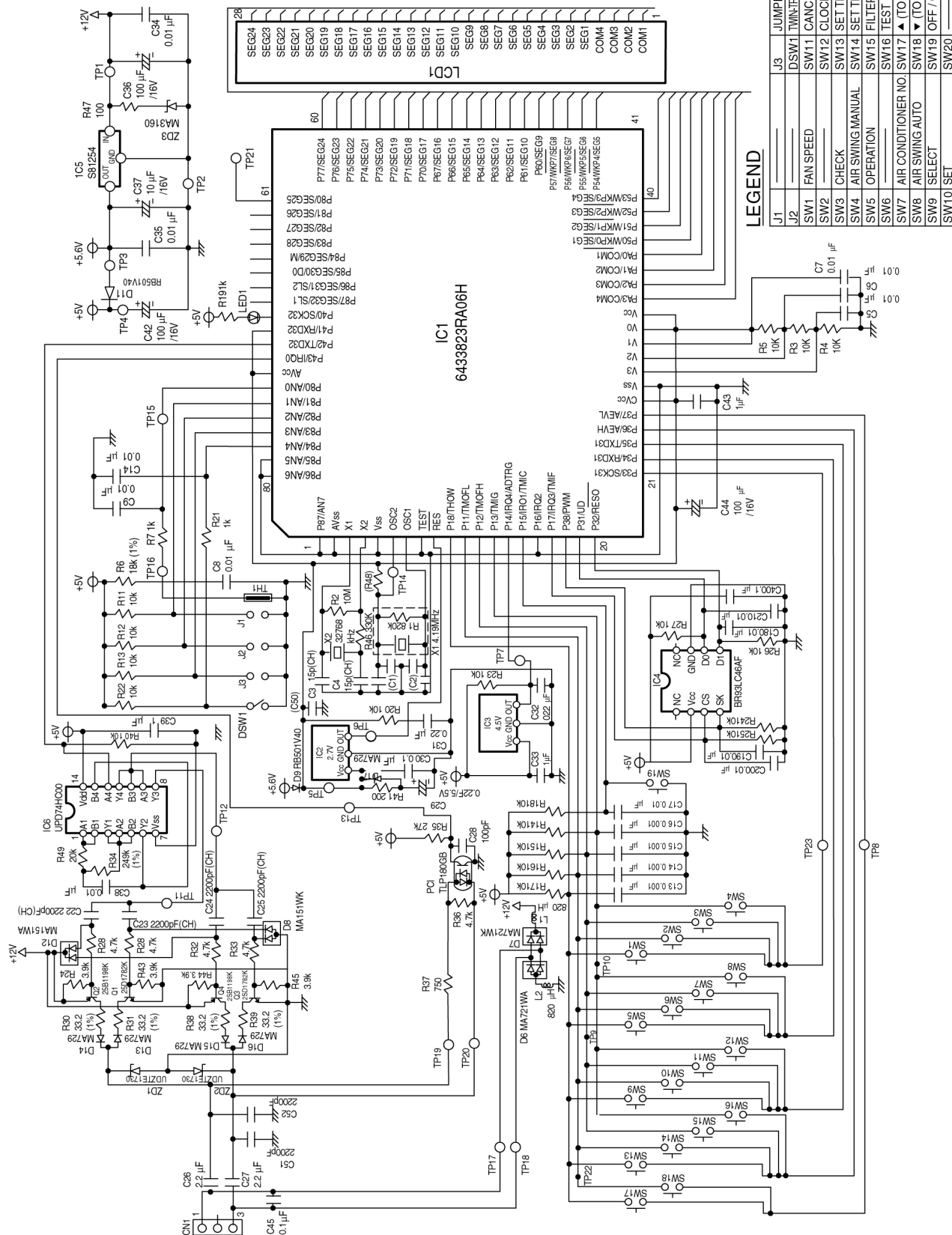


SCHEMATIC DIAGRAM 5/5



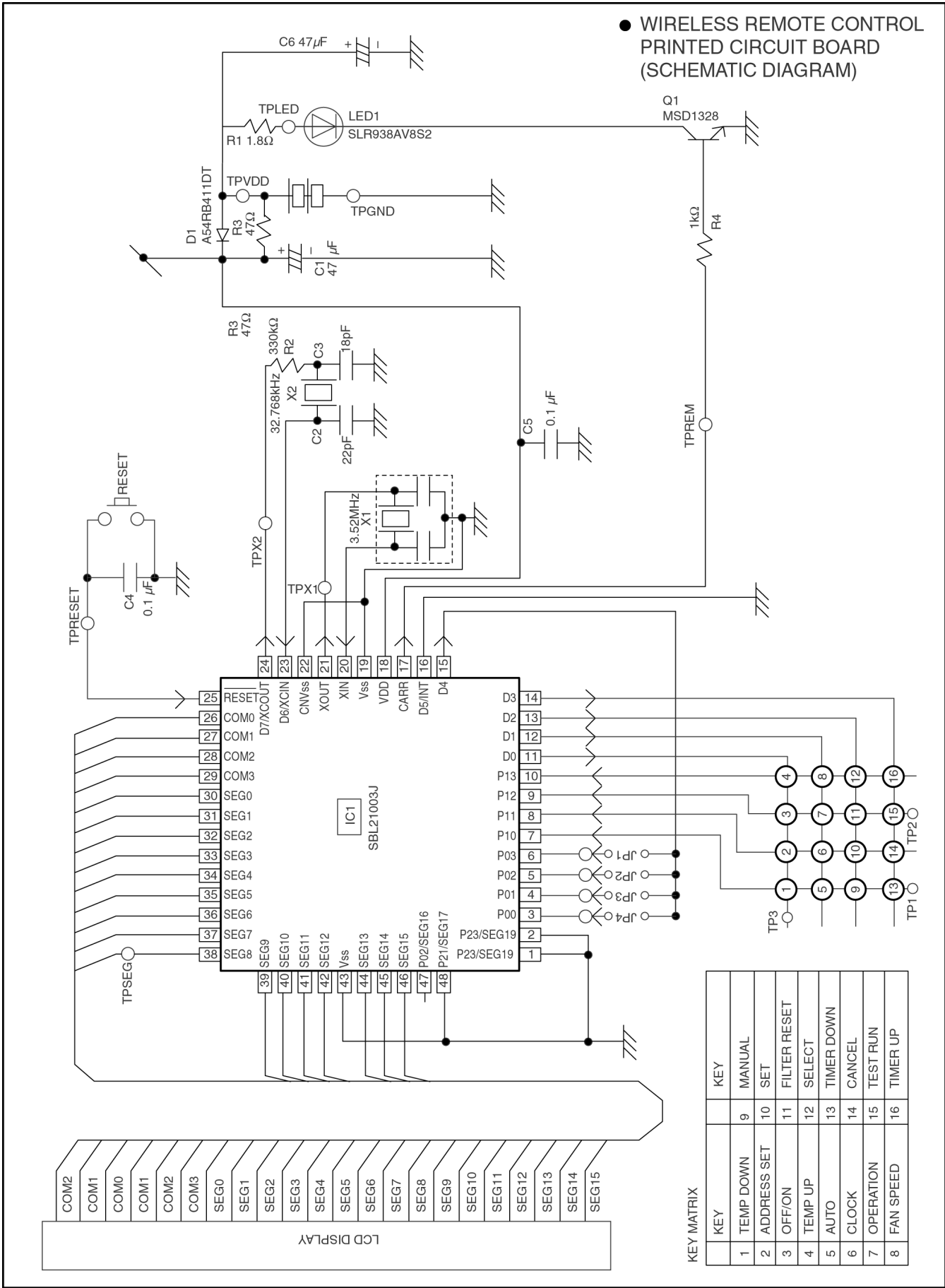
14.3. Wired remote control

● WIRED REMOTE CONTROL PRINTED CIRCUIT BOARD (SCHEMATIC DIAGRAM)

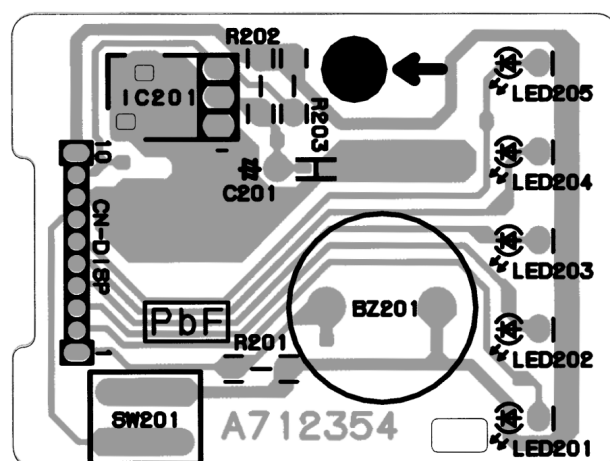


14.4. Wireless remote control

● WIRELESS REMOTE CONTROL
PRINTED CIRCUIT BOARD
(SCHEMATIC DIAGRAM)



- INDOOR UNIT
PRINTED CIRCUIT BOARD (INDICATOR)



14.5.2. Outdoor unit

- OUTDOOR UNIT
PRINTED CIRCUIT BOARD (MAIN)

