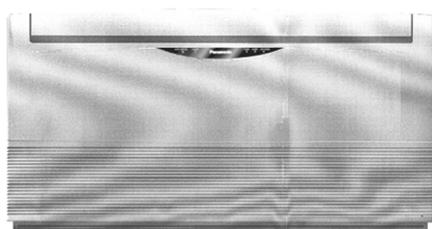


Service Manual

Room Air Conditioner



CS-W12CTP CU-W12CTP5
CS-W18CTP CU-W18CTP5
CS-W24CTP CU-W24CTP5

⚠ 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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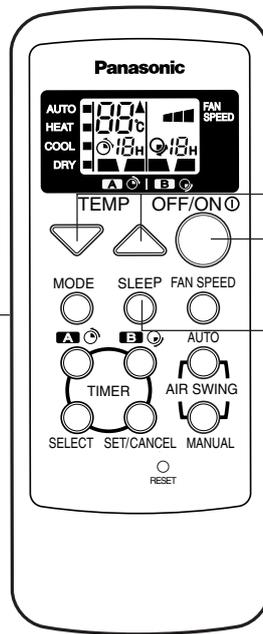
Panasonic

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1 Functions

Remote Control



Self illuminating button

OFF / ON **Operation OFF / ON**

MODE **Operation Mode Selection**

- AUTO Automatic Operation Mode
- HEAT Heating Operation Mode
- COOL Cooling Operation Mode
- DRY Soft Dry Operation Mode

FAN SPEED **Indoor Fan Speed Selection**

- Low Fan Speed
- Medium Fan Speed
- High Fan Speed
- AUTO Automatic Fan Speed

AIR SWING **Airflow Direction Control**

- AUTO Automatic Airflow Direction Control
- MANUAL Airflow Direction Manual Control

TEMP. **Room Temperature Setting**

Heating, Cooling, Soft Dry Operation.
 • Temperature Setting (16°C to 30°C)

Automatic Operation

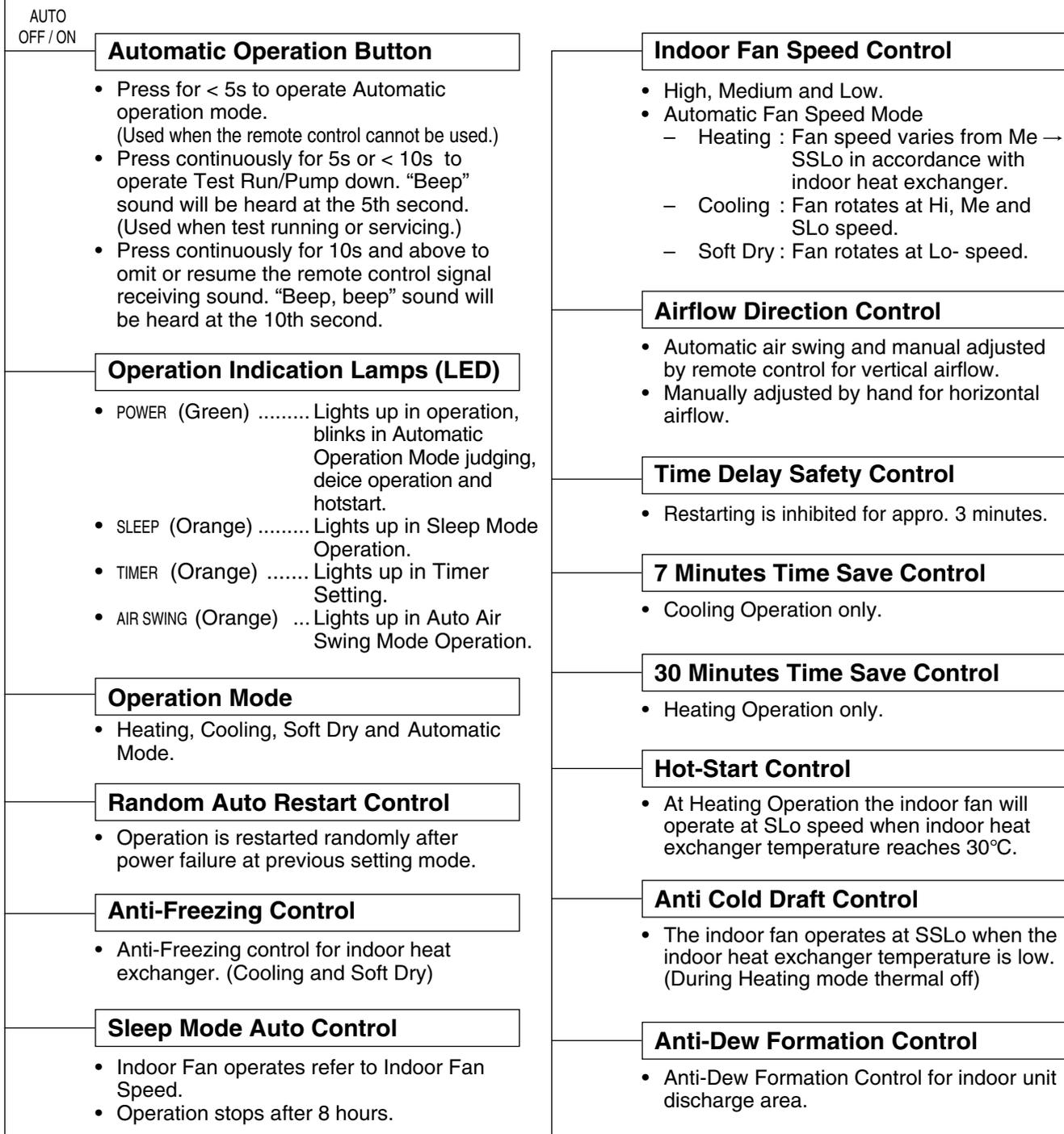
- Operation with 2°C higher than standard temperature.
- Operation with standard temperature.
- Operation with 2°C lower than standard temperature.

TIMER **12-hour Timer Setting**

- SELECT To select delay OFF Timer, ON Timer, OFF/ON Timer and ON/OFF Timer
- To set hours setting
- To set hours setting
- SET/CANCEL To start delay OFF and ON timer, cancellation

SLEEP **Sleep Mode Operation OFF / ON**

Indoor Unit



Outdoor Unit

CU-W12CTP5



Compressor Reverse Rotation Protection Control

- To protect compressor from reverse rotation when there is a instantaneous power failure.

Overload Protector

- OLP to protect the compressor for W12CT only.
Inner protector for W18CT & W24CT only.

60 Secs. Forced Operation Control

- Once the compressor is activated, it does not stop within the first 60 secs. However, it stops immediately with remote control stop signal.

Outdoor Fan Operation Control

W18 / 24CT

- 4-pole induction motor (2 speed).
- For Cooling or Soft Dry operation
Hi-speed When outdoor temperature reaches to 31°C.
Lo-speed When outdoor temperature reaches to 29°C.
- For Heating operation
Hi-speed When outdoor temperature reaches to 13.5°C.
Lo-speed When outdoor temperature reaches to 15.5°C.
- For Over-heating Protection, the Fan is switched ON or OFF depending on the piping temperature and the outdoor temperature.

W12CT

- 6-pole induction motor (1 speed).

CU-W18CTP5 CU-W24CTP5



Deice Control

- To prevent frosting at outdoor heat exchanger. (Only for Heating Operation)

Overload Protection Control

- Outdoor fan stops when indoor heat exchanger temperature rises to 51°C and above, and restarts when the indoor heat exchanger temperature drops to 49°C and below (W12CT).
- Compressor stop when indoor heat exchanger temperature reaches 65°C (W12CT), 68°C (W18CT & W24CT). (Heating Operation Only)

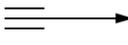
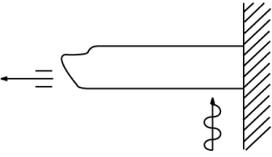
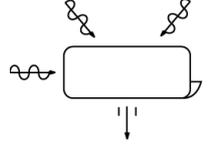
Compressor Protection Control

- If the outdoor fan motor is not running after compressor starts for 50 secs., compressor will stop. (Cooling and Soft Dry Operation only).

4-Way Valve Control

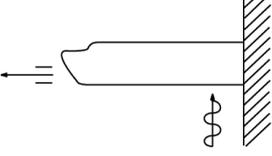
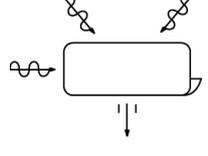
- When the unit is switched to "OFF" during Heating Operation, 4-way valve stays at Heating position for 5 minutes.

2 Product Specifications

		Unit	CS-W12CTP	CU-W12CTP5	
Power Source		Phase V Cycle	Single 230 50		
Cooling Capacity		kW Btu/h kcal/h	3.60 12,300 3,100		
Heating Capacity		kW Btu/h kcal/h	3.95 13,500 3,400		
Moisture Removal		l/h Pint/h	2.1 4.4		
Airflow Method		<p>OUTLET</p>  <p>INTAKE</p> 	<p>SIDE VIEW</p> 	<p>TOP VIEW</p> 	
Air Volume	Indoor Air (Lo)	m ³ /min (cfm)	Cooling: 7.5 (260) Heating: 7.5 (260)	—	
	Indoor Air (Me)	m ³ /min (cfm)	Cooling: 8.9 (310) Heating: 8.9 (310)	—	
	Indoor Air (Hi)	m ³ /min (cfm)	Cooling: 9.7 (340) Heating: 9.7 (340)	33.0 (1,160)	
Noise Level		dB (A)	Cooling: High 39; Low 33 Heating: High 39; Low 33	Cooling: High 49 Heating: High 49	
Power Noise Level		dB (A)	Cooling: High 52 Heating: High 52	Cooling: High 64 Heating: High 65	
Electrical Data	Input Power	W	Cooling: 1,150 Heating: 1,180		
	Running Current	A	Cooling: 5.1 Heating: 5.3		
	EER	W/W (Btu/hW)	3.13 (10.7)		
	COP	W/W (Btu/hW)	3.35 (11.4)		
	Starting Current	A	17.8		
Piping Connection Port (Flare piping)		inch inch	G ; Half Union 1/2" L ; Half Union 1/4"	G ; 3-way valve 1/2" L ; 2-way valve 1/4"	
Pipe Size (Flare piping)		inch inch	G (gas side) ; 1/2" L (liquid side) ; 1/4"	G (gas side) ; 1/2" L (liquid side) ; 1/4"	
Drain Hose	Inner diameter	mm	20		
	Length	m	0.6		
Power Cord Length		m	1.8		
Number of core-wire			3 (1.0 mm ²)		
Dimensions	Height	inch (mm)	21 - 9/32 (540)		
	Width	inch (mm)	40 - 1/2 (1,028)		
	Depth	inch (mm)	7 - 7/8 (200)		
Net Weight		lb (kg)	40 (18)		
Compressor	Type		—		
	Motor Type		—		
	Rated Output	kW	—		
Air Circulation	Type		SIROCCO		
	Material		ABS STYLAC 181		
	Motor Type		Induction (4-poles)		
	Input	W	79.0		
	Rated Output	W	29		
	Fan Speed	Low	rpm	Cooling: 640 Heating: 640	—
		Medium	rpm	Cooling: 760 Heating: 760	—
High		rpm	Cooling: 830 Heating: 830	845	

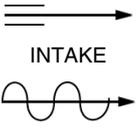
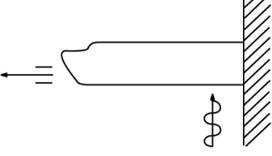
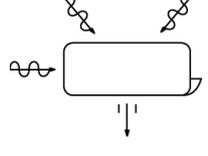
		Unit	CS-W12CTP	CU-W12CTP5
Heat Exchanger	Description		Evaporator	Condenser
	Tube material		Copper	Copper
	Fin material		Aluminium	Aluminium (Blue Coated)
	Fin Type		Louver Fin	Corrugated Fin
	Row / Stage		(Plate fin configuration, forced draft)	
			2 × 12	2 × 24
	FPI		20	17
Size (W × H × L)	mm	857 × 252 × 25.4	705.8 × 504 × 36.38 735.1	
Refrigerant Control Device			—	Capillary Tube
Refrigeration Oil		(c.c)	—	RB68A or Freol Alpha 68M (330)
Refrigerant (R410A)		g (oz.)	—	1,060 (37.4)
Thermostat			Electronic Control	—
Protection Device			—	Overload Protector
Capillary Tube	Length	mm	—	Cooling: 850, Heating: 590
	Flow Rate	l/min	—	Cooling: 4.5, Heating: 8.2
	Inner Diameter	mm	—	Cooling: 1.1, Heating: 1.3
Air Filter	Material Style		P.P. Honeycomb	—
Capacity Control			Capillary Tube	
Compressor Capacitor		μF, VAC	—	35 μF, 370VAC
Fan Motor Capacitor		μF, VAC	1.5 μF, 440VAC	2.0 μF, 450VAC

- Specifications are subject to change without notice for further improvement.

		Unit	CS-W18CTP	CU-W18CTP5	
Power Source		Phase V Cycle	Single 230 50		
Cooling Capacity		kW Btu/h kcal/h	5.20 17,700 4,470		
Heating Capacity		kW Btu/h kcal/h	5.80 19,800 4,990		
Moisture Removal		l/h Pint/h	2.9 6.1		
Airflow Method		<p>OUTLET</p>  <p>INTAKE</p> 	<p>SIDE VIEW</p> 	<p>TOP VIEW</p> 	
Air Volume	Indoor Air (Lo)	m ³ /min (cfm)	Cooling: 9.7 (340) Heating: 10.2 (360)	25.6 (900)	
	Indoor Air (Me)	m ³ /min (cfm)	Cooling: 10.7 (380) Heating: 10.7 (380)	—	
	Indoor Air (Hi)	m ³ /min (cfm)	Cooling: 12.4 (440) Heating: 12.4 (440)	40 (1,410)	
Noise Level		dB (A)	Cooling: High 45; Low 39 Heating: High 45; Low 39	Cooling: High 55 Heating: High 56	
Power Noise Level		dB (A)	Cooling: High 58 Heating: High 58	Cooling: High 68 Heating: High 69	
Electrical Data	Input Power	W	Cooling: 1,690 Heating: 1,740		
	Running Current	A	Cooling: 7.6 Heating: 7.9		
	EER	W/W (Btu/hW)	3.07 (10.5)		
	COP	W/W (Btu/hW)	3.33 (11.4)		
	Starting Current	A	27		
Piping Connection Port (Flare piping)		inch inch	G ; Half Union 1/2" L ; Half Union 1/4"	G ; 3-way valve 1/2" L ; 3-way valve 1/4"	
Pipe Size (Flare piping)		inch inch	G (gas side) ; 1/2" L (liquid side) ; 1/4"	G (gas side) ; 1/2" L (liquid side) ; 1/4"	
Drain Hose	Inner diameter	mm	20		
	Length	m	0.6		
Power Cord Length		m	1.8		
Number of core-wire			3 (1.5 mm ²)		
Dimensions	Height	inch (mm)	21 - 9/32 (540)		
	Width	inch (mm)	40 - 1/2 (1,028)		
	Depth	inch (mm)	7 - 7/8 (200)		
Net Weight		lb (kg)	44 (20)		
Compressor	Type		—		
	Motor Type		—		
	Rated Output	kW	—		
Air Circulation	Type		SIROCCO		
	Material		ABS STYLAC 181		
	Motor Type		Induction (4-poles)		
	Input	W	104.1		
	Rated Output	W	51		
	Fan Speed	Low	rpm	Cooling: 840 Heating: 880	
		Medium	rpm	Cooling: 920 Heating: 920	
High		rpm	Cooling: 1,070 Heating: 1,040		
			1,020		

		Unit	CS-W18CTP	CU-W18CTP5
Heat Exchanger	Description		Evaporator	Condenser
	Tube material		Copper	Copper
	Fin material		Aluminium	Aluminium (Blue Coated)
	Fin Type		Louver Fin	Corrugated Fin
	Row / Stage		(Plate fin configuration, forced draft) 2 × 12 + 1 × 10	2 × 26
	FPI		20	16
	Size (W × H × L)	mm	857 × 252 × 25.4 + 857 × 210 × 12.7	769.2 × 660.4 × 44 732.9
Refrigerant Control Device			—	Capillary Tube
Refrigeration Oil		(c.c)	—	RB68A or Freol Alpha 68M (670)
Refrigerant (R410A)		kg (oz.)	—	1.80 (63.5)
Thermostat			Electronic Control	Mecha. Control
Protection Device			—	Inner Protector
Capillary Tube	Length	mm	—	Cooling: 405, Heating: 1,048
	Flow Rate	l/min	—	Cooling: 7.8, Heating: 14.0
	Inner Diameter	mm	—	Cooling: 1.2, Heating: 1.8
Air Filter	Material Style		P.P. Honeycomb	—
Capacity Control			Capillary Tube	
Compressor Capacitor		μF, VAC	—	50 μF, 370VAC
Fan Motor Capacitor		μF, VAC	3.0 μF, 440VAC	3.0 μF, 450VAC

- Specifications are subject to change without notice for further improvement.

		Unit	CS-W24CTP	CU-W24CTP5	
Power Source		Phase V Cycle	Single 230 50		
Cooling Capacity		kW Btu/h kcal/h	6.90 23,500 5,930		
Heating Capacity		kW Btu/h kcal/h	7.65 26,100 6,580		
Moisture Removal		l/h Pint/h	3.9 8.2		
Airflow Method		<p>OUTLET</p> 	<p>SIDE VIEW</p> 	<p>TOP VIEW</p> 	
Air Volume	Indoor Air (Lo)	m ³ /min (cfm)	Cooling: 10.5 (370) Heating: 11.0 (390)	27.4 (970)	
	Indoor Air (Me)	m ³ /min (cfm)	Cooling: 11.8 (420) Heating: 11.8 (420)	—	
	Indoor Air (Hi)	m ³ /min (cfm)	Cooling: 12.9 (460) Heating: 12.9 (460)	47.2 (1,670)	
Noise Level		dB (A)	Cooling: High 47; Low 42 Heating: High 47; Low 42	Cooling: High 60 Heating: High 61	
Power Noise Level		dB (A)	Cooling: High 60 Heating: High 60	Cooling: High 74 Heating: High 75	
Electrical Data	Input Power	W	Cooling: 2,750 Heating: 2,890		
	Running Current	A	Cooling: 13.0 Heating: 13.7		
	EER	W/W (Btu/hW)	2.51 (8.6)		
	COP	W/W (Btu/hW)	2.65 (9.0)		
	Starting Current	A	65		
Piping Connection Port (Flare piping)		inch inch	G ; Half Union 5/8" L ; Half Union 1/4"	G ; 3-way valve 5/8" L ; 3-way valve 1/4"	
Pipe Size (Flare piping)		inch inch	G (gas side) ; 5/8" L (liquid side) ; 1/4"	G (gas side) ; 5/8" L (liquid side) ; 1/4"	
Drain Hose	Inner diameter	mm	20		
	Length	m	0.6		
Power Cord Length		m	1.8		
Number of core-wire			3 (2.5 mm ²)		
Dimensions	Height	inch (mm)	21 - 9/32 (540)		
	Width	inch (mm)	40 - 1/2 (1,028)		
	Depth	inch (mm)	7 - 7/8 (200)		
Net Weight		lb (kg)	44 (20)		
Compressor	Type		—		
	Motor Type		—		
	Rated Output	kW	—		
Air Circulation	Type		SIROCCO		
	Material		ABS STYLAC 181		
	Motor Type		Induction (4-poles)		
	Input	W	104.1		
	Rated Output	W	51		
	Fan Speed	Low	rpm	Cooling: 900 Heating: 940	171.3
		Medium	rpm	Cooling: 1,010 Heating: 1,010	680
High		rpm	Cooling: 1,130 Heating: 1,100	—	
			1,170		

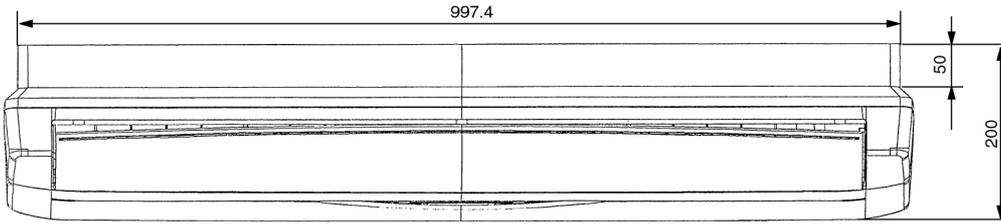
		Unit	CS-W24CTP	CU-W24CTP5
Heat Exchanger	Description		Evaporator	Condenser
	Tube material		Copper	Copper
	Fin material		Aluminium	Aluminium (Blue Coated)
	Fin Type		Louver Fin	Corrugated Fin
	Row / Stage		(Plate fin configuration, forced draft) 2 × 12 + 1 × 10	2 × 26
	FPI		20	16
	Size (W × H × L)	mm	857 × 252 × 25.4 + 857 × 210 × 12.7	769.2 × 660.4 × 44 732.9
Refrigerant Control Device			—	Capillary Tube
Refrigeration Oil		(c.c)	—	RB68A or Freol Alpha 68M (1,130)
Refrigerant (R410A)		kg (oz.)	—	1.87 (66.0)
Thermostat			Electronic Control	Mecha. Control
Protection Device			—	Inner Protector
Capillary Tube	Length	mm	—	Cooling: 663, Heating: 550
	Flow Rate	l/min	—	Cooling: 13.0, Heating: 29.0
	Inner Diameter	mm	—	Cooling: 1.6, Heating: 2.4
Air Filter	Material Style		P.P. Honeycomb	—
Capacity Control			Capillary Tube	
Compressor Capacitor		μF, VAC	—	45 μF, 370VAC
Fan Motor Capacitor		μF, VAC	3.0 μF, 440VAC	3.0 μF, 450VAC

- Specifications are subject to change without notice for further improvement.

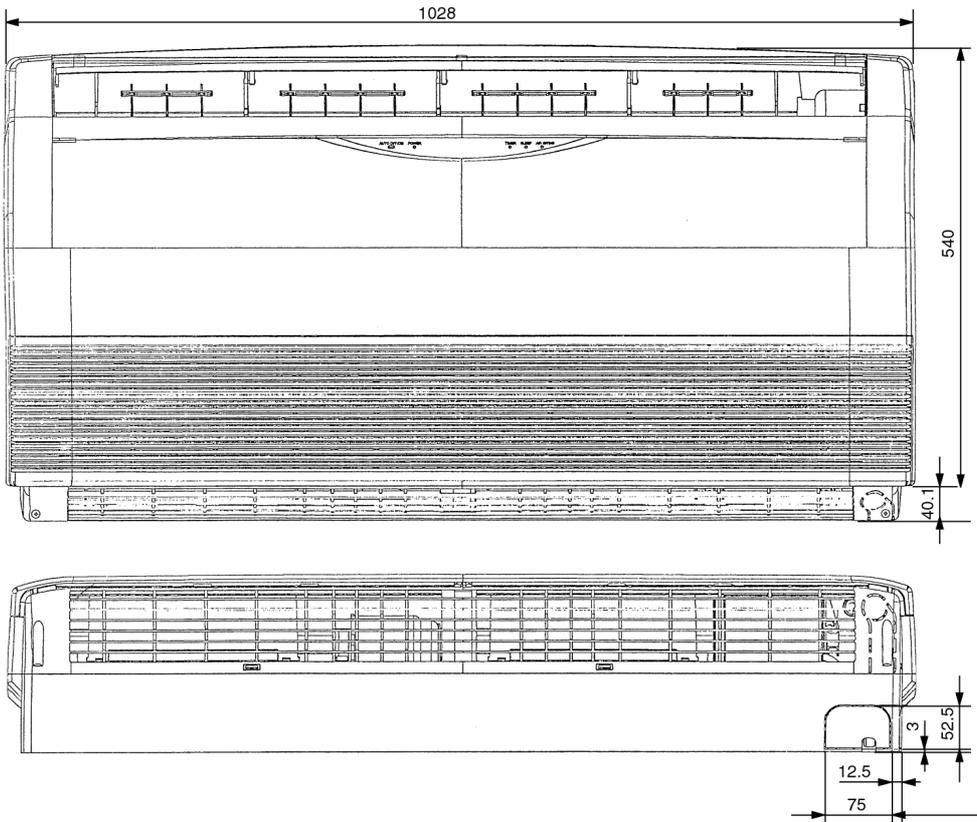
3 Dimensions

CS-W12CTP, CS-W18CTP, CS-W24CTP (Indoor Unit)

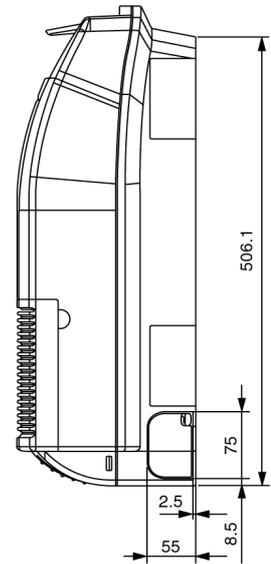
<Top View>



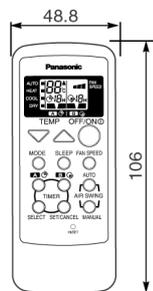
<Front View>



<Side View>

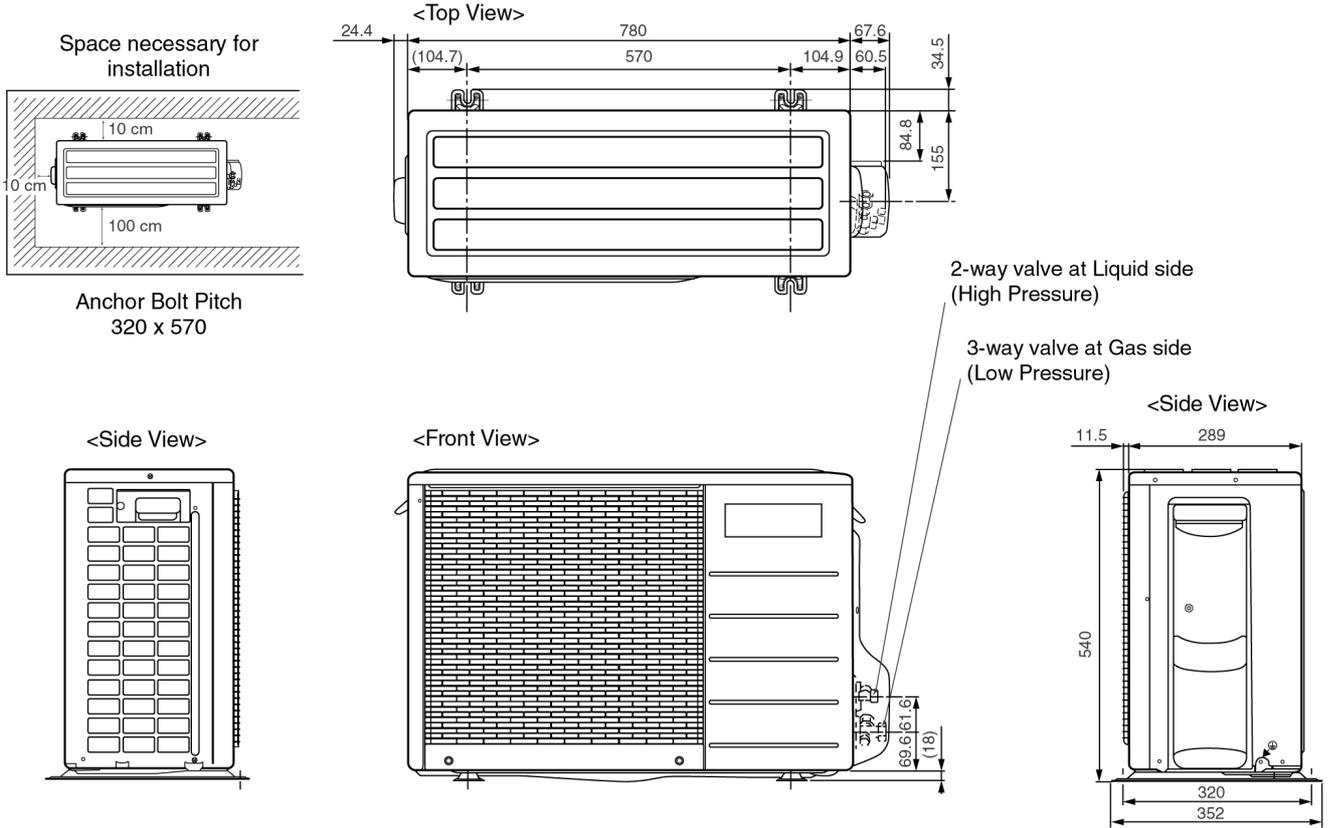


Wireless remote-control transmitter

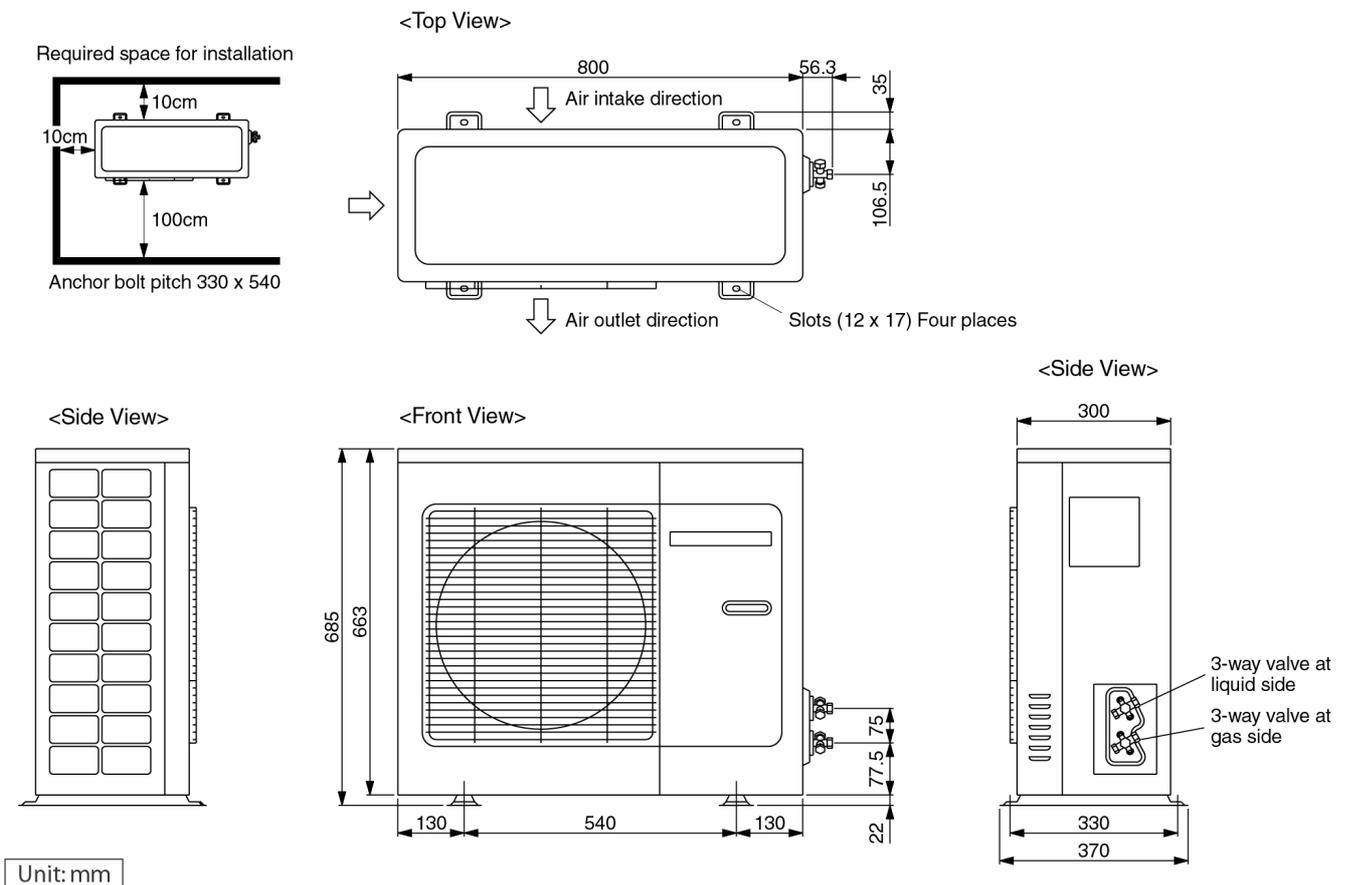


Unit : mm

CU-W12CTP5 (Outdoor Unit)

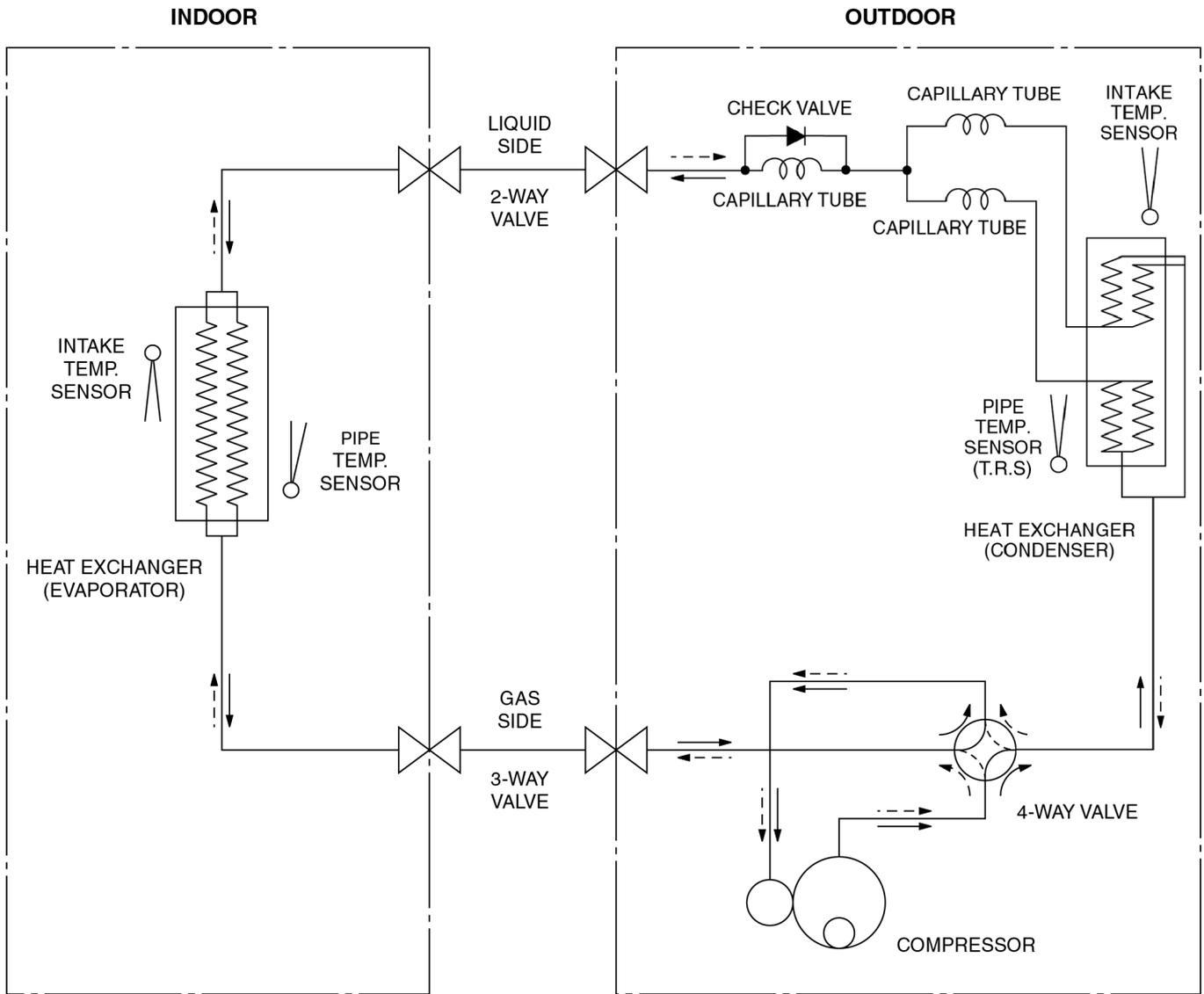


CU-W18CTP5, CU-W24CTP5 (Outdoor Unit)

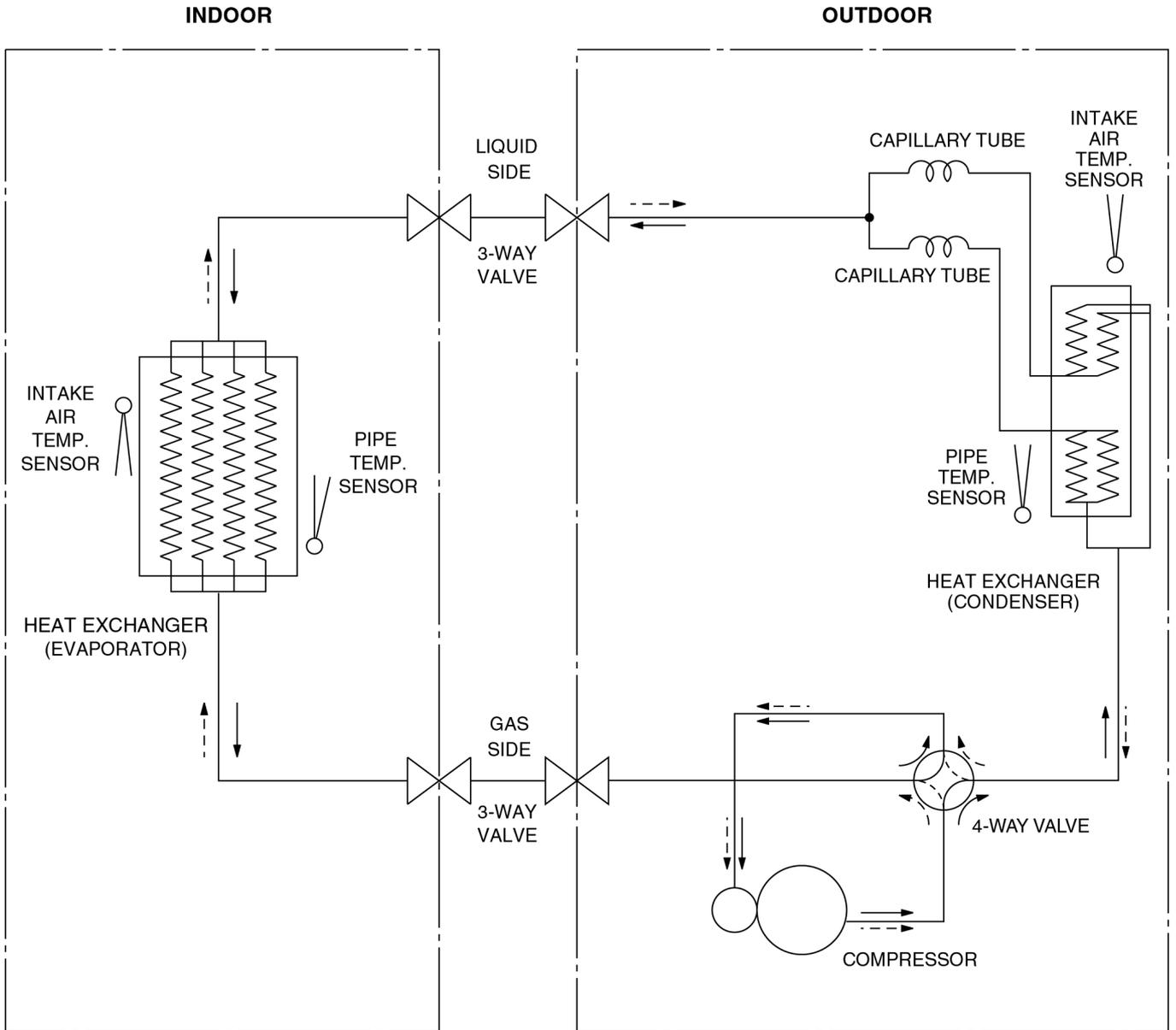


4 Refrigeration Cycle Diagram

CS-W12CTP / CU-W12CTP5



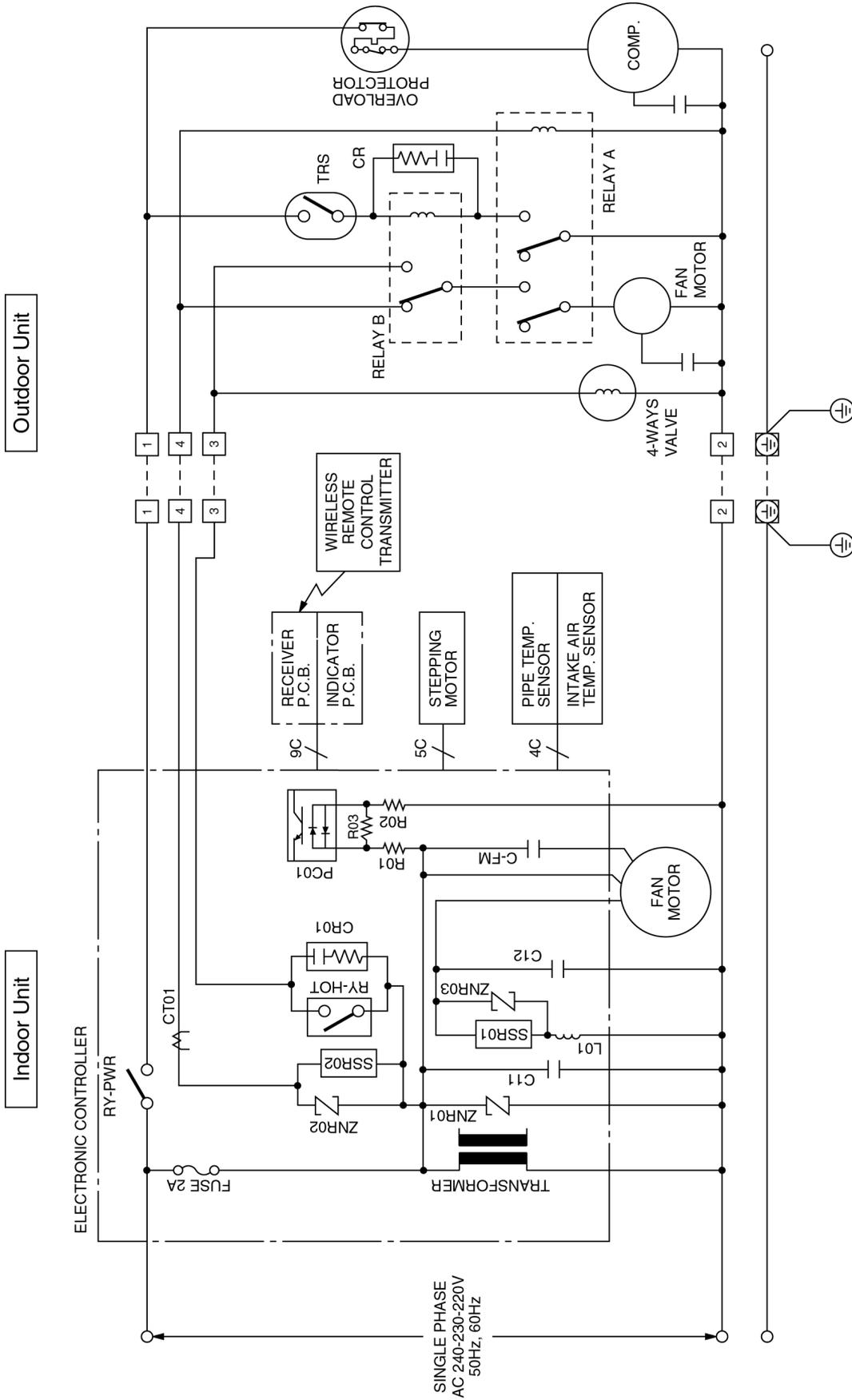
CS-W18CTP / CU-W18CTP5
CS-W24CTP / CU-W24CTP5



—→ COOLING
 - - - → HEATING

5 Block Diagram

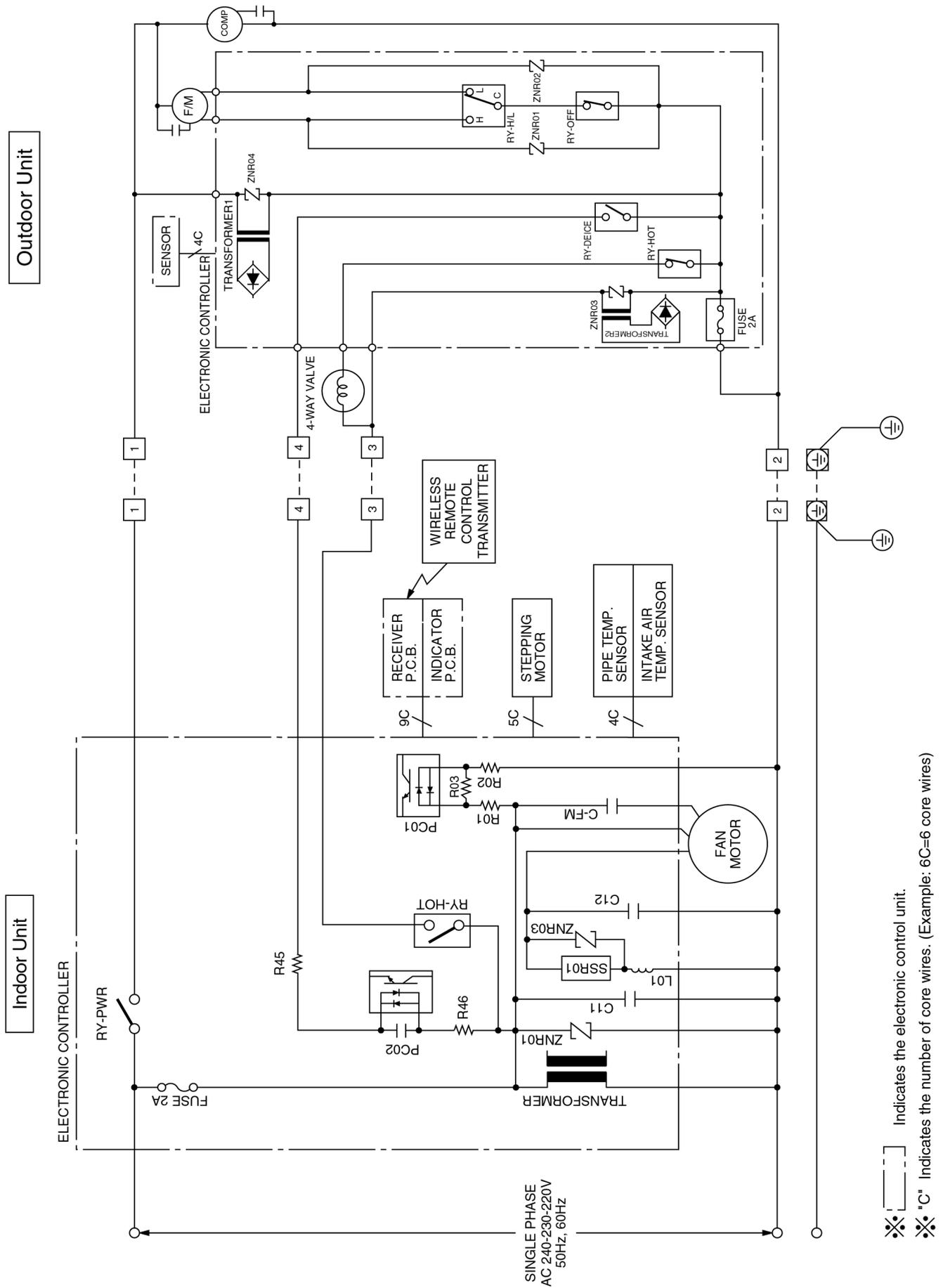
CS-W12CTP / CU-W12CTP5



⊠ Indicates the electronic control unit.

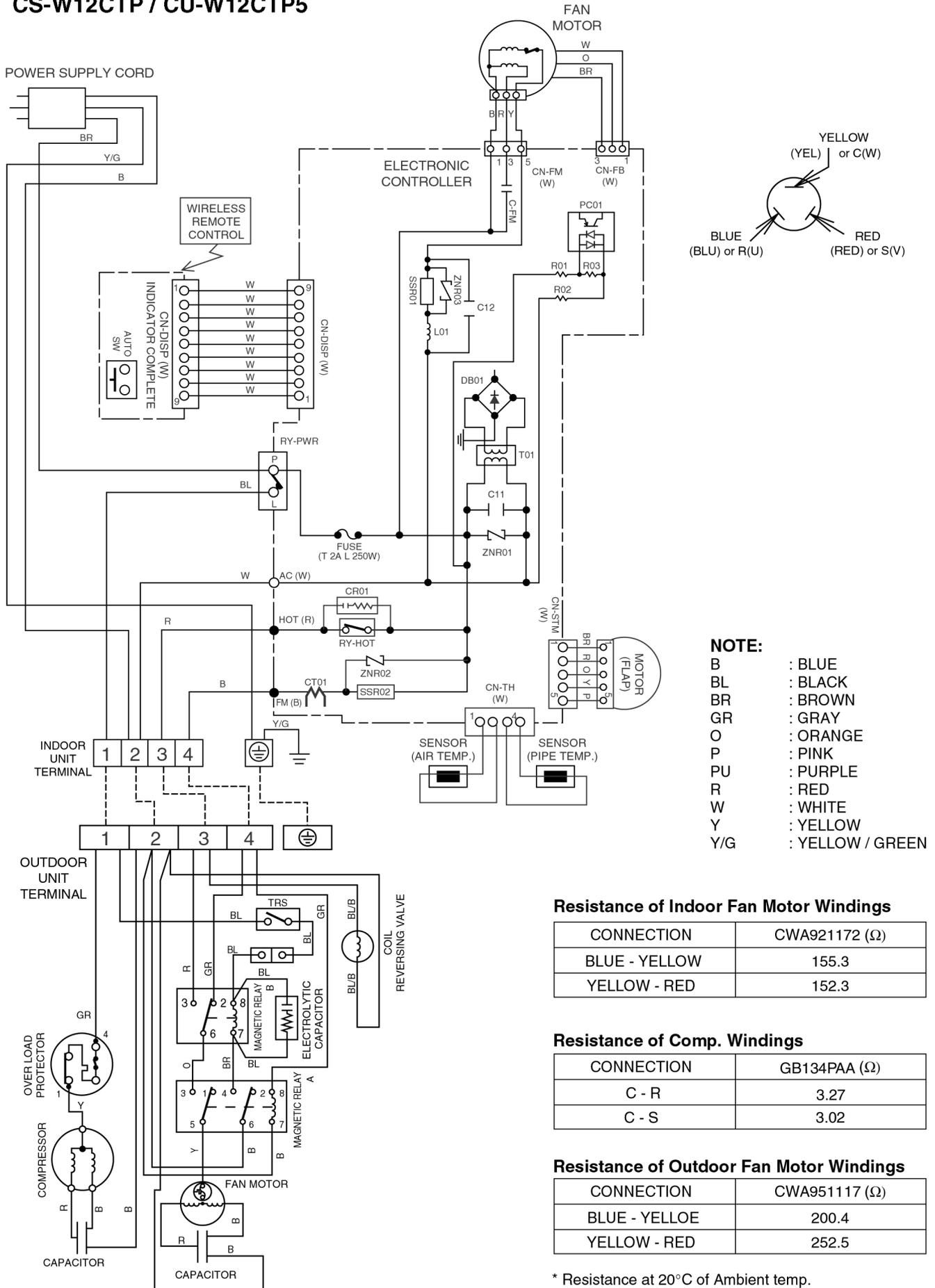
✱ "C" Indicates the number of core wires. (Example: 6C=6 core wires)

CS-W18CTP / CU-W18CTP5
CS-W24CTP / CU-W24CTP5



6 Wiring Diagram

CS-W12CTP / CU-W12CTP5



Resistance of Indoor Fan Motor Windings

CONNECTION	CWA921172 (Ω)
BLUE - YELLOW	155.3
YELLOW - RED	152.3

Resistance of Comp. Windings

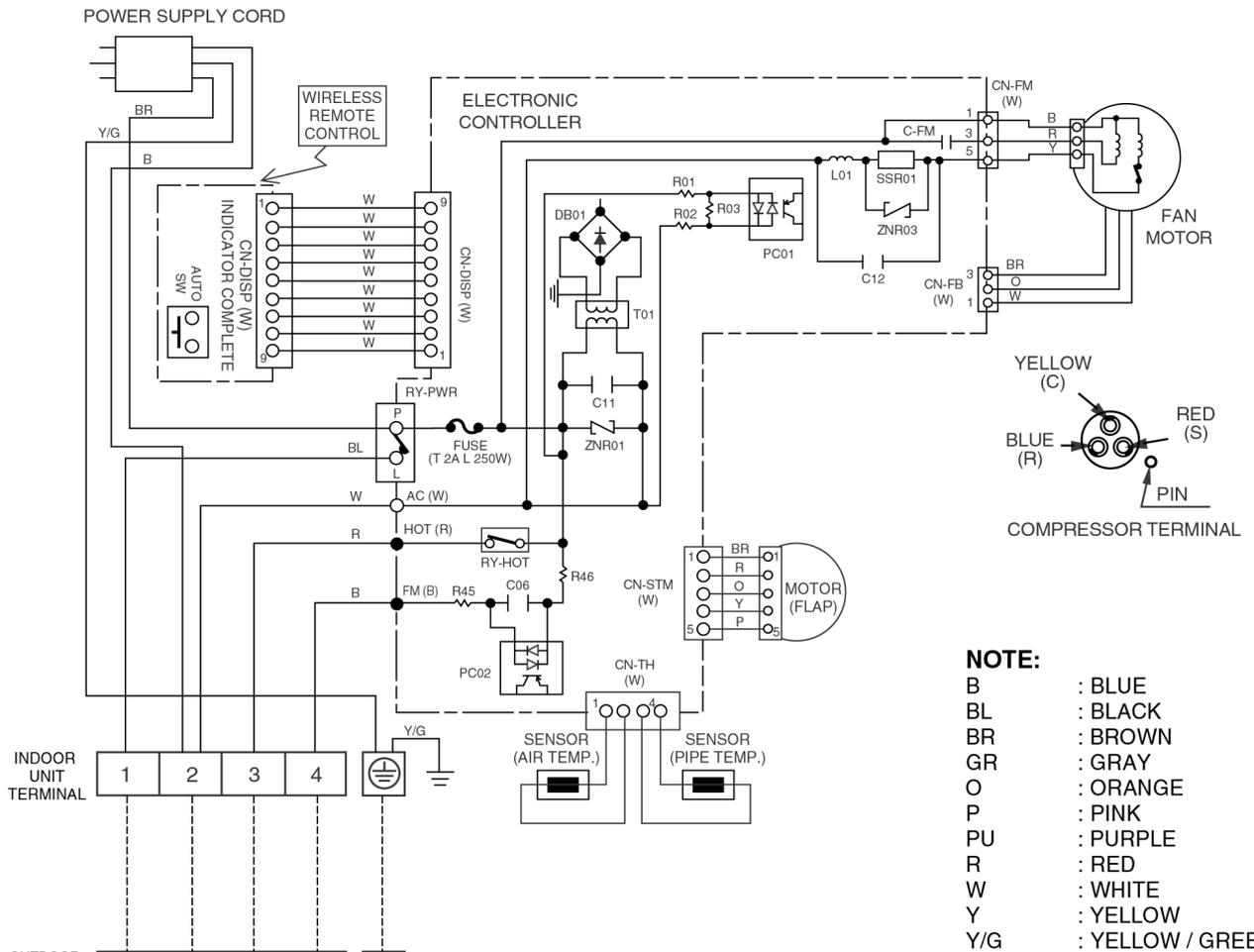
CONNECTION	GB134PAA (Ω)
C - R	3.27
C - S	3.02

Resistance of Outdoor Fan Motor Windings

CONNECTION	CWA951117 (Ω)
BLUE - YELLOW	200.4
YELLOW - RED	252.5

* Resistance at 20°C of Ambient temp.

CS-W18CTP / CU-W18CTP5 CS-W24CTP / CU-W24CTP5



- NOTE:**
- B : BLUE
 - BL : BLACK
 - BR : BROWN
 - GR : GRAY
 - O : ORANGE
 - P : PINK
 - PU : PURPLE
 - R : RED
 - W : WHITE
 - Y : YELLOW
 - Y/G : YELLOW / GREEN

Resistance of Indoor Fan Motor Windings

MODEL	W18 / 24CT
CONNECTION	CWA921158 (Ω)
BLUE - YELLOW	96.6
YELLOW - RED	94.0

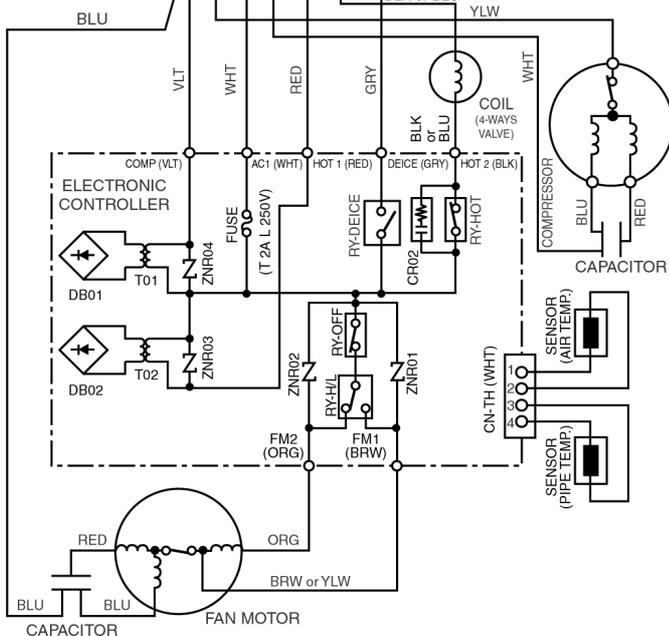
Resistance of Comp. Windings

MODEL	W24CT	W18CT
CONNECTION	5JS315DAA (Ω)	5KS205DAA (Ω)
C - R	0.830	1.780
C - S	2.257	2.175

Resistance of Outdoor Fan Motor Windings

MODEL	W24CT	W18CT
CONNECTION	CWA921081 (Ω)	CWA921182 (Ω)
BLUE- BROWN	46.8	97.8
BROWN - ORANGE	64.6	77.6
RED - BROWN	73.7	82.2

* Resistance at 20°C of Ambient temp.



7 Operation Details

7.1. Cooling Mode Operation

Cooling in operation according to Remote Control setting.

Time Delay Safety Control (3 minutes)

- When the compressor is stopped by Remote Control, it restarts after 3 minutes when it is turned ON by Remote Control.
- When the setting temperature is reached during cooling operation, the compressor stops and it will not start for 3 minutes.

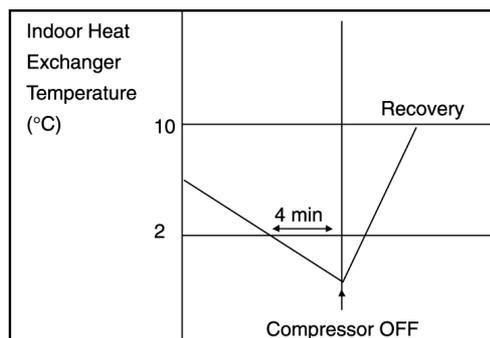
7 minutes Time Save Control

- The compressor will start automatically if it has stopped for 7 minutes even if the room temperature is between the compressor ON temperature and OFF temperature.

Anti-Freezing Control

- If the temperature of the indoor heat exchanger falls continuously below 2°C for 4 minutes or more, the compressor turns off to protect the indoor heat exchanger from freezing. The fan speed setting remains the same.
- Compressor will restart again when the indoor heat exchanger temperature rises to 10°C (Recovery).

✗ 3 minutes waiting of Time Delay Safety Control is valid for Cooling Operation.



Compressor Reverse Rotation Protection Control

- If the compressor is operating continuously for 5 minutes or longer and the temperature difference between intake air and indoor heat exchanger is 2.5°C or less for 2 minutes, compressor will stop and restart automatically. (Time Delay Safety Control is valid)



▲ T = Intake air temperature - Indoor heat exchanger temperature

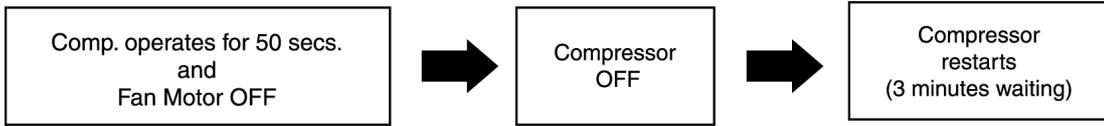
This is to protect reverse rotation of the compressor when there is a instantaneous power failure.

Anti-Dew Formation Control

- Purpose is to prevent dew formation on indoor unit air discharge area.
- When the following conditions occur for 30 minutes continuously, anti-dew formation is controlled by indoor fan speed shift to low (Changed to HLo):
 - Indoor intake air temperature is more than 24°C and less than 30°C.
 - Remote Control setting temperature is less than 25°C.
 - Compressor is on.
 - Cooling operation mode.
 - Indoor Fan motor operate at Low fan speed.
- This control is cancelled immediately when above condition is changed.

Compressor Protection Control

- After the compressor starts for 50 seconds but the outdoor fan motor is still OFF, the compressor will stop and restart automatically. (Time Delay Safety Control is valid).

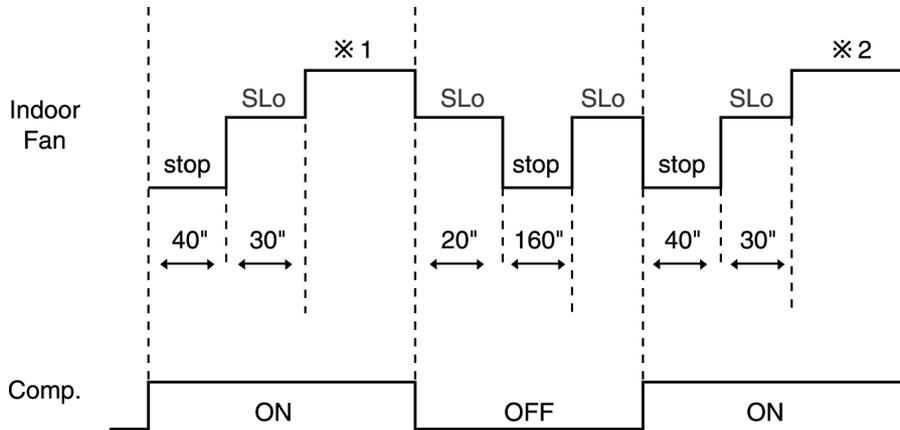


- If the above phenomenon is repeated for 3 times, the compressor will stop totally.
- The above phenomenon is reset when there is a change to heating mode or stopped by Remote Control Switch.

Automatic Fan Speed Mode

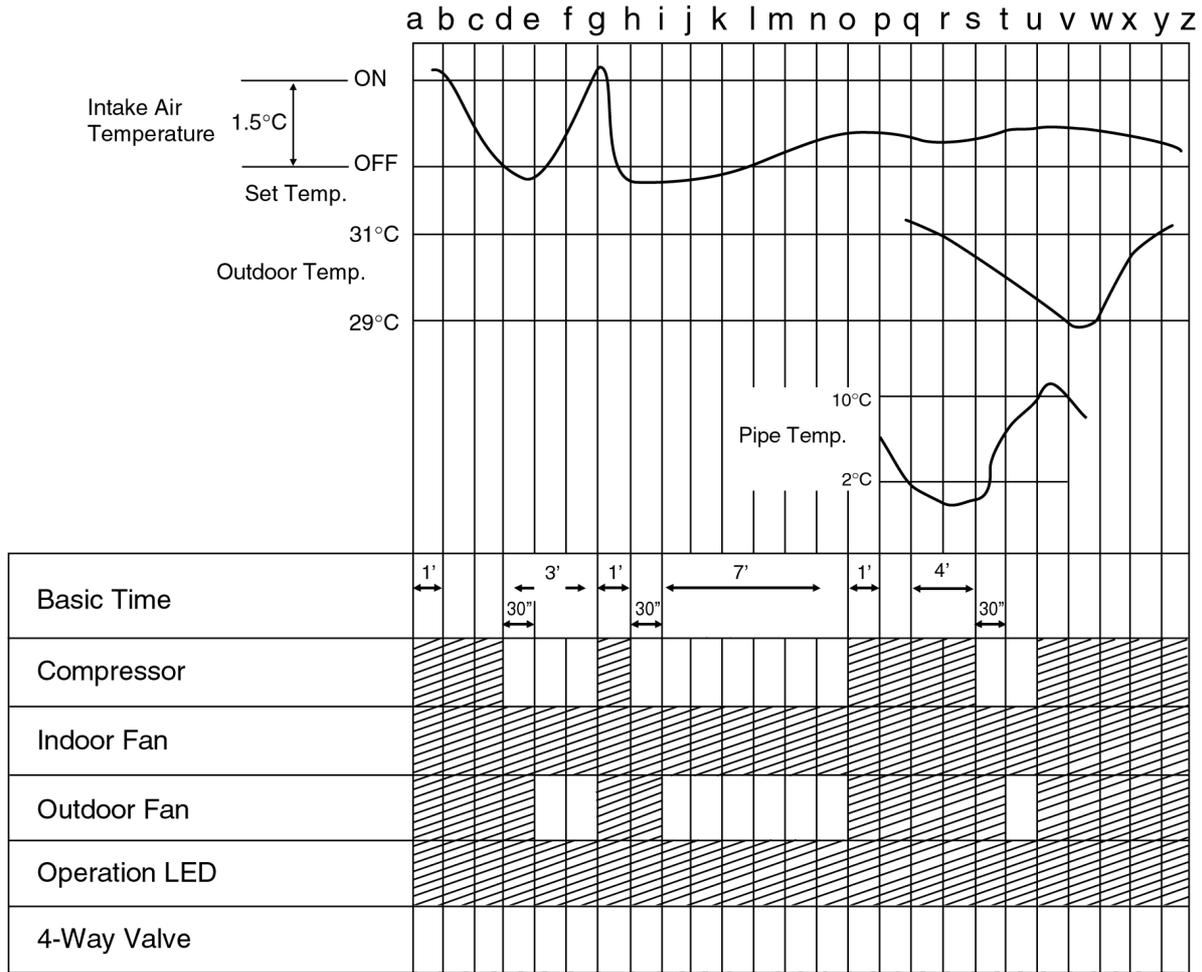
When Automatic Fan Speed is selected at Remote Control during cooling operation.

- Fan speed rotates in the range of Hi to Me.



- ※ 1 Fan Speed is Hi until the compressor stops (when the room temperature reaches setting temperature).
- ※ 2 Fan Speed is Me after the compressor restarts.

Cooling Operation Time Diagram

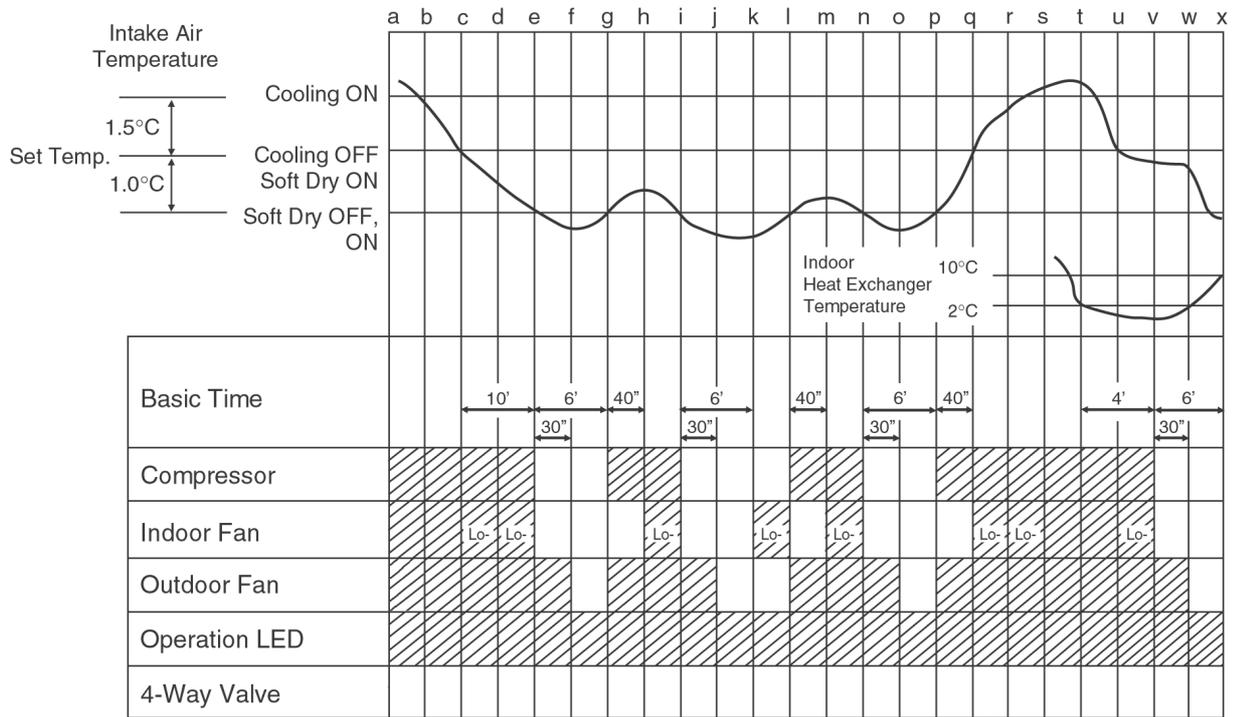


<Description of operation>

- d – g : Time Delay Safety Control (waiting for 3 minutes)
- g – h : 60 sec. Forced Operation
- h – o : 7 min. Time Save Control
- q – t : Anti Freezing Control
- v – y : Outdoor Fan Control

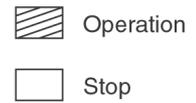
 Operation
 Stop

Soft Dry Operation Time Diagram



<Description of operation>

- a – c : Cooling Operation
- c – s : Soft Dry Operation
- e – g : Soft Dry OFF
- l – m : 60 sec. Forced Operation
- t – x : Anti Freezing Control



7.3. Heating Mode Operation

Heating in operation according to Remote Control setting.

Time Delay Safety Control

- When the compressor is stopped by Remote Control, it restarts after 3 minutes when the Remote Control is turned ON.
- When the setting temperature is reached during heating operation, the compressor stops and it will not start for 4 minutes.

30 minutes Time Save Control

- The compressor will start automatically if it has stopped for 30 minutes even if the room temperature is between the compressor ON temperature and OFF temperature.

Overload Protection Control

(a) Outdoor Fan Control

- W12CT

If the temperature of the indoor heat exchanger rises to 51°C, Outdoor Fan stops.

The Outdoor Fan restarts when the indoor heat exchanger temperature falls to 49°C.

- W18CT, W24CT

If the temperature of the Outdoor Heat Exchanger less than -3°C, Outdoor Fan is ON. The Outdoor Fan stop, when Outdoor Heat Exchanger temperature is T_b or more according to Outdoor Air Temperature region as table below:

The Outdoor Fan restarts when the indoor heat exchanger temperature falls to 49°C.

Outdoor Air Temperature	<10°C	≥10°C ~ <15°C	≥15°C ~ <20°C	≥20°C ~ <25°C	≥25°C	Outdoor Fan OFF
T_b	≥5°C	≥4°C	≥3°C	≥2°C	≥1°C	

During starting of Heating mode and after deice, Outdoor Fan ON for 90 sec.

(b) Compressor high pressure protection

- If the indoor heat exchanger becomes 65°C (W12CTP); 68°C (W18CTP & W24CTP) or more, the compressor will stop and restart automatically.

(Time Delay Safety Control - 4 minutes waiting).



Compressor Reverse Rotation Protection Control

- If the compressor is operating continuously for 5 minutes or longer and temperature difference between intake air and indoor heat exchanger is 5°C or less for 2 minutes, compressor will stop and restart automatically.

(Time Delay Safety Control is valid).



▲ T = Indoor heat exchanger temperature - intake air temperature.

This is to protect reverse rotation of the compressor when there is a instantaneous power failure.

4-way Valve Control

- 4-way valve always ON during Heating operation. (Except Deicing operation)
- When the unit is switched to "OFF" during Heating operation, 4-way valve stay at Heating position for 5 minutes.

Outdoor Fan Motor Control

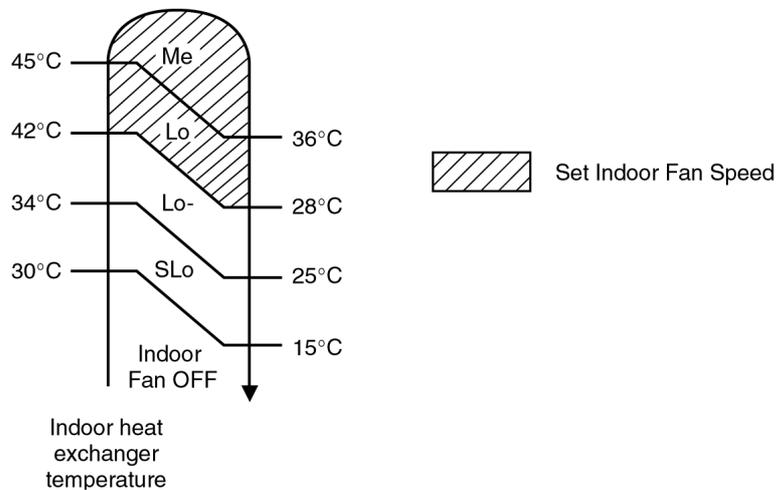
- When compressor stops (reaches room temperature), outdoor fan will operate for 30 seconds. (30 seconds Forced Operation).

Indoor Fan Motor Control

- When compressor stops (reaches room temperature), indoor fan will stop for 1 minutes, operate for 3 minutes, if still not yet reaches the room temperature, indoor fan Lo- for 40 sec. after that operate at SLo speed.

Hot Start Control

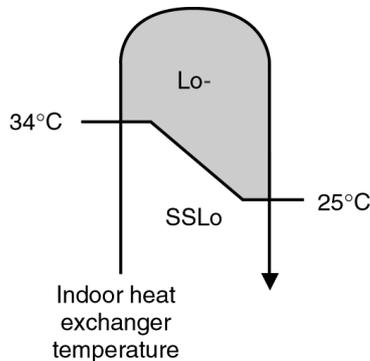
When Heating operation starts, Indoor Fan will not start until the indoor heat exchanger reaches 30°C as diagram shown.



Hot Start is completed when indoor heat exchanger rises to 42°C or over 4 minutes.

Anti Cold Draft Control

- This operation is to prevent the Cold Draft during Heating mode operation.
- The operation will start when compressor OFF (Thermo OFF) during Heating operation.
- For the first 30 sec. from compressor OFF (Thermo OFF), Indoor fan speed will operate accordingly to the Indoor heat exchanger temperature as shown below:



- After 30 sec. from compressor OFF (thermo OFF), Indoor fan will run at SSLo speed only.
- Anti Cold Draft Control will stop when:
 - Intake temperature < set temperature. (Time Delay Safety Control 4 minutes waiting is valid)
 - After 30 minutes time saved control.

Deicing Control

1) W12CT

Deice starts to prevent frosting at outdoor heat exchanger.

- Normal Deicing

Deice operations detection commences after 30 minutes of Heating operation starts or 60 minutes after previous deice operation. If the TRS (Thermal Reed Switch) senses the outdoor piping temperature drops to -3°C (TRS CLOSE) or less for 50 sec. continuously during compressor is in operation, deice will start.

(There is no detection during Outdoor Fan stops.)

- Overload Deicing

During heating operation, if the outdoor Fan OFF duration (due to overload control) is accumulated up to 60 minutes and after compressor starts for 1 minutes, deicing starts.

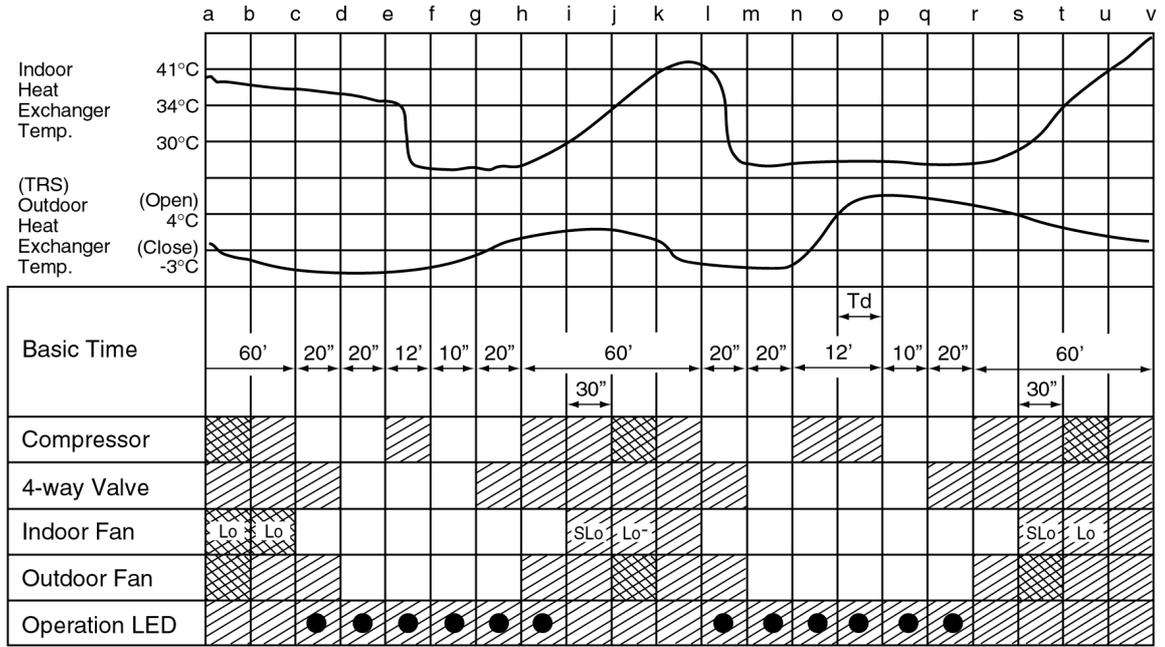
- Deicing ends when

1. 12 minutes after deicing operation starts;
2. TRS senses the outdoor piping temperature rises to 4°C (TRS OPEN).
3. Deicing will not end immediately as time delay (T_d) is valid as shown below.

Time taken from deicing starts to TRS OPEN (T)	Deice recovery time	T_d (seconds)
$T \leq 1$ minutes	1 min. wait (Min.)	0
1 minutes $< T < 3$ minutes	T	0
3 minutes $< T < 8$ minutes	T + 60 sec.	60
8 minutes $< T < 11$ minutes	T + 120 sec.	120
$T > 11$ minutes	12 min wait (Max.)	—

- Once deicing operation starts, it will not end for 60 seconds.
- After deicing operation, compressor stops for 30 seconds and 4-way valve stays at cooling position for 10 seconds.

Normal Deicing Time Diagram

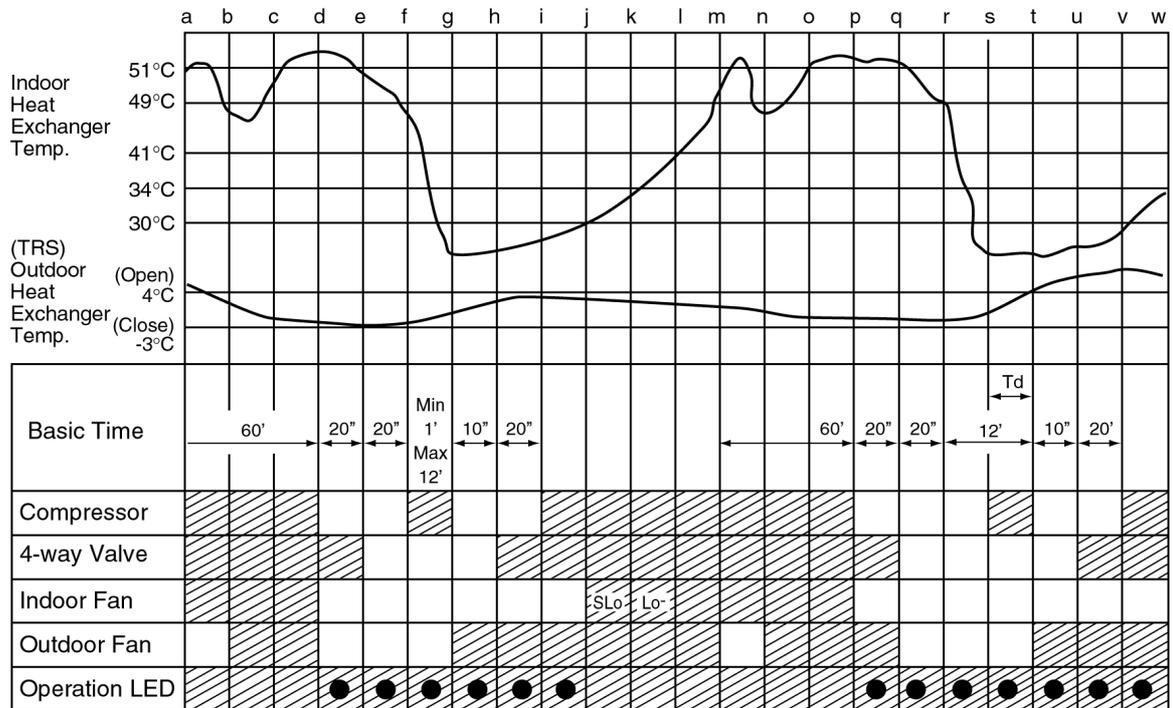


<Description of operation>

- a - c : Deicing operation judging condition established
- c - e, l - n : Deicing operation (timer detected)
- e - h : Deice operation (timer detected)
- h - i, r - s : Hot start (no thermo OFF)
- i - j, s - t : No thermo OFF (after finished hot start)
- n - r : Deicing operation (TRS detected)

- : Blinking
- ▨ : Operation
- : Stop
- ▩ : Operation or Stop

Overload Deicing Time Diagram



<Description of operation>

- a - d, m - p : Overload control. (intergrate)
- d - f, p - r : Preparation time for Deicing
- f - i : Overload deicing (timer detected)
- i - j : Hot start (indoor fan OFF)
- j - k : Hot start (indoor fan SLo)
- r - t : Overload control (TRS detected)

- : Blinking
- ▨ : Operation
- : Stop

2) W18CT, W24CT

Deice starts to prevent frosting at outdoor heat exchanger.

- Normal Deicing

Deice operation detection commences in Heating operation starts or 60 minutes after previous deice operation. If the outdoor piping temperature drops to -4°C for 50 sec. continuously during compressor is in operation, deice will start.

(There is no detection during Outdoor Fan stops.)

- Overload Deicing

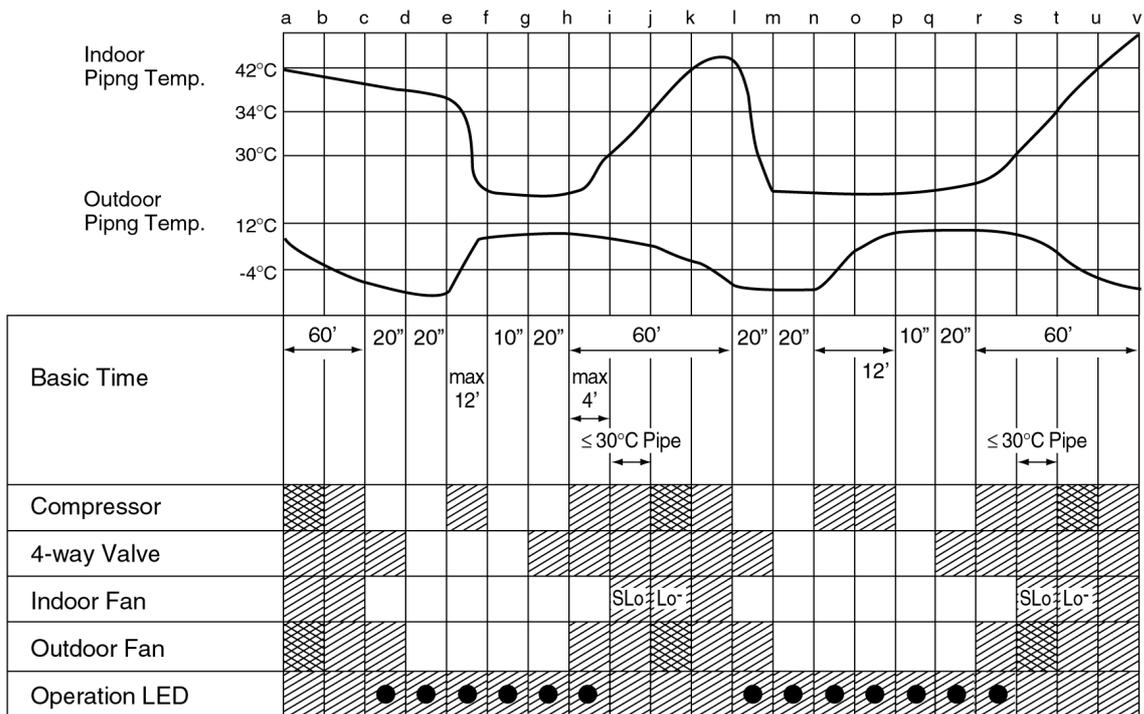
During heating operation, if the outdoor Fan OFF duration (due to overload control) is accumulated up to 60 minutes and after compressor starts for 1 minutes, deicing starts.

- Deicing ends when

- (a) 12 minutes after deicing operation starts;
- (b) The outdoor piping temperature rises to about 12°C .

- After deicing operation, compressor stops for 30 seconds and 4-way valve stays at cooling position for 10 seconds.

a) Normal Deicing Time Diagram



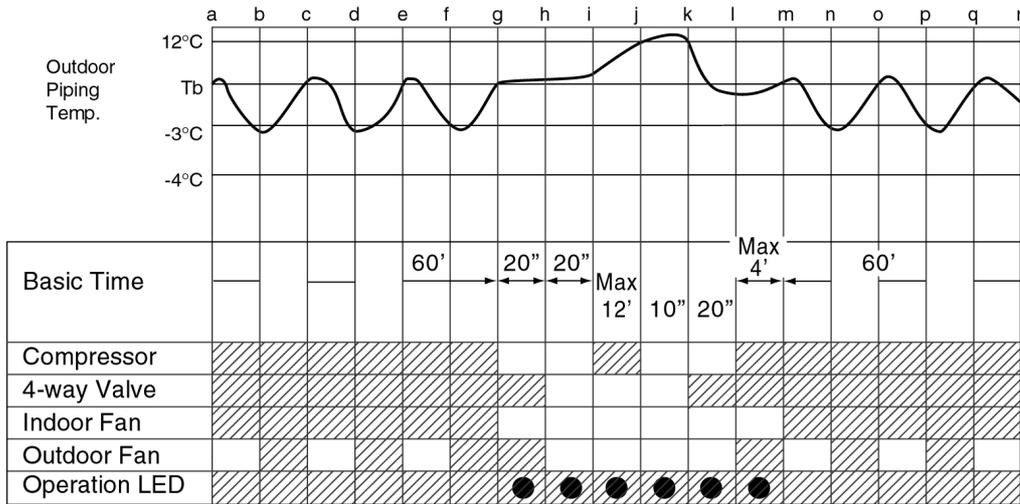
<Description of operation>

- a – c : Deicing operation judging condition established
- c – e, l – n : Preparation time for Deicing
- e – h : Deicing operation (timer detected)
- h – i, r – s : Hot start (no thermo OFF)
- i – j, s – t : No thermo OFF (after finished hotstart)

- : Blinking
- ▨ : Operation
- : Stop
- ▩ : Operation or stop

Note: After COMP ON, outdoor pipe temperature sensor is ignore for 30 sec.

(b) Overload Deicing Time Diagram



<Description of operation>

- a – i : Overload control
- i – l : Overload deicing
- l – m : Hot start
- m – r : Overload control
- g – i : Preparation for overload deicing (For normal R22 control, operation for g – i is not included, applicable only for new refrigerant model).

- : Blinking
- ▨ : Operation
- : Stop

7.4. Automatic Mode Operation

1. When the Automatic Mode Operation is selected, the indoor fan operates at SLo fan speed for 25 seconds to sense intake air temperature and determine the 1st operation mode. If indoor intake air temperature is less than 16°C, Heating mode will immediate operate.

Standard for Determining Operation Mode 1st Judgement

↑ Intake Air Temperature	23°C	Cooling Mode
	20°C	Soft Dry Mode
		Heating Mode

Operation Mode	Setting Temperature (Standard)
Cooling	25°C
Soft Dry	22°C
Heating	21°C

2. Operation mode will be determine again after 1 hour of operation, if the room temperature reaches to set temperature and compressor off time is over 7 minutes 30 seconds continuously.

⊗ The present operation mode will be continued, if the room temperature does not reach to set temperature (Compressor keeps running) eventhough after 1 hour from automatic operation mode started.

**Standard for Determining Operation Mode
2nd Judgement onwards**

Present Mode	Judgement	Next Mode		
		Cooling	Soft Dry	Heating
Cooling	23°C Cooling Heating	○ (Judgement: 23°C & Above)	Not Applicable	○ (Judgement: Below 23°C)
Soft Dry	23°C Soft Dry Heating	Not Applicable	○ (Judgement: 23°C & Above)	○ (Judgement: Below 23°C)
Heating	23°C Cooling Heating	○ (Judgement: 23°C & Above)	Not Applicable	○ (Judgement: Below 23°C)

✕ Automatic Set Temperature
Refer 3. as below.

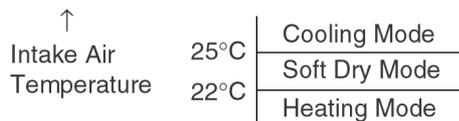
3. Automatic Set Temperature

For each operation, set temperature will automatically set as shown below.

However it can be selected 2°C higher or 2°C lower from standard set temperature by pressing the “Room Temperature Setting button”.

Operation	Hi	(Standard)	Lo
	(+2°C)	(±0°C)	(-2°C)
Cooling	27°C	25°C	23°C
Soft Dry	24°C	22°C	20°C
Heating	23°C	21°C	19°C

- The mode judging temperature and standard setting temperature can be increased by 2°C, by open the circuit of JX6 at indoor electronic controller.



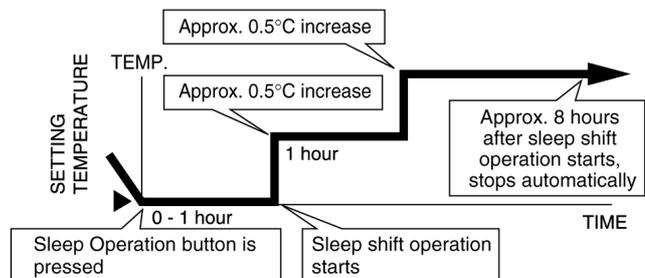
Operation Mode	Setting Temperature (Standard)
Cooling	27°C
Soft Dry	24°C
Heating	23°C

7.5. Sleep Mode Auto Operation

Cooling or Soft Dry Operation

Purpose is to obtain a comfortable room temperature while sleeping. When you press the SLEEP Mode, the following movement will start to avoid overcooling.

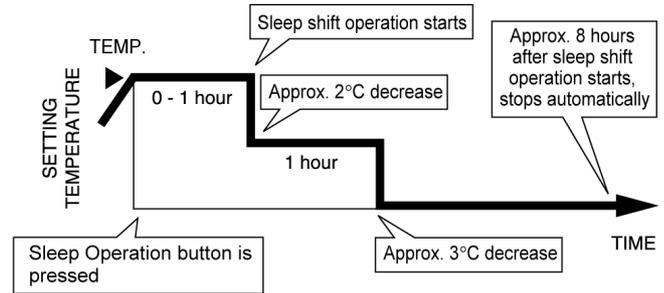
- Sleep shift operation starts, when the room temperature reaches the setting temperature or after 1 hour of operation.
- The setting temperature will be risen by 0.5°C at the start of operation and by 0.5°C one hour later .
- The airflow volume will automatically change to Lo- fan speed.
- Sleep Mode operation time is 8 hours, the operation will be stop after 8 hour.
- When used together with the Timer, the Timer has priority.



Heating Operation

Purpose is to obtain a comfortable room temperature while sleeping. When you press the SLEEP Mode, the following movement will start to avoid overheating.

- Sleep shift operation starts, when the room temperature reaches the setting temperature or after 1 hour of operation.
- The setting temperature will be decrease by 2°C at the start of operation and by 3°C one hour later.
- The fan speed refer to Indoor Fan Motor Control.
- Sleep Mode operation time is 8 hours, the operation will be stop after 8 hour.
- When used together with the Timer, the Timer has priority.



7.6. Random Auto Restart Control

- If there is a power failure during air conditioner operation, operation will be automatically restarted after 3 to 4 minutes when the power is resumed. It will start with previous operation mode and airflow direction.
- Restart time is decided randomly using 4 parameter:
Intake air temperature, setting temperature, fan speed and Air Swing Blade position.
- Random Auto Restart Control is not available when Timer is set.
- This control can be omitted by open the circuit of JX5. (Refer Circuit Diagram)

7.7. Delay ON Timer Control

- When the Delayed ON Timer is set by using the remote control, the unit will start operate slightly before the set time, so that the room will reach nearly to the set temperature by the desired time.
- For Cooling and Soft Dry mode, the operation will start 15 minutes before the set time.
- For Heating mode, the operation will start 30 minutes before the set time.
- For Automatic mode, the indoor fan will operate at SLo speed for 25 seconds, 30 minutes before the set time to detect the intake air temperature to determine the operation mode. The operation indication lamp will blink at this time.

7.8. Remote Control Signal Receiving Sound

- Long beep sound will be heard when:-
– Stopping the Air Conditioner using ON/OFF switch.
- Short beep sound will be heard for others.
- To switch off the beep sound:-
Press the “Automatic Operation Button” continuously for 10 seconds or more (“beep” “beep” will be heard at the 10th second). Repeat the above if you want to switch ON the beep sound.

✗ However, if the “Automatic Operation Button” has been pressed the Automatic operation will be activated. If you do not require this operation, you may change it by using the remote control.

7.9. Indoor Fan Speed Control

Auto Fan Speed Control

When set to Auto Fan Speed, the fan speed is shifted automatically between Stop to SHi depend on each operation as shown below.

Manual Fan Speed Control

Basic fan speed adjustment (3 settings, from Lo to Hi) can be carried out by using the Fan Speed selection button at the remote control.

Tap			S Hi	Hi	Me	H Lo	C Lo	Lo-	S Lo	SSLo	Stop
Cooling	Normal	Air flow volume Manual	Hi	○							
			Me		○						
		Lo				○	○				
		Air flow volume Auto		○	○				○		○
		Sleep Shift						○			
Dry	Normal	Air flow volume Manual						○			○
		Air flow volume Auto						○			○
		Sleep Shift						○			
Heating	Normal	Air flow volume Manual	Hi	○				○	○	○	○
			Me			○		○	○	○	○
			Lo				○	○	○	○	○
		Air flow volume Auto			○	○	○	○	○	○	
		Sleep Shift						○		○	○
Mode judgement								○			

Cooling / Dry	Heating	R.P.M.		
		W12CTP	W18CTP	W24CTP
S Hi	Hi	830	930	1100
Hi		830	930	1100
Me	Me	760	870	1010
Lo+	Lo	640	810	940
Lo		640	770	900
	Lo-	620	750	870
S Lo	S Lo	480	550	640
	SS Lo	370	370	370

7.10. Airflow direction control

1. Manual operation

When the airflow direction adjustment button of the remote control is pressed, the louver moves up/down in the movable range shown in the diagram at right, and can be stopped at the required position.

Only the up/down louvers are adjustable from the remote control.

2. Automatic airflow direction

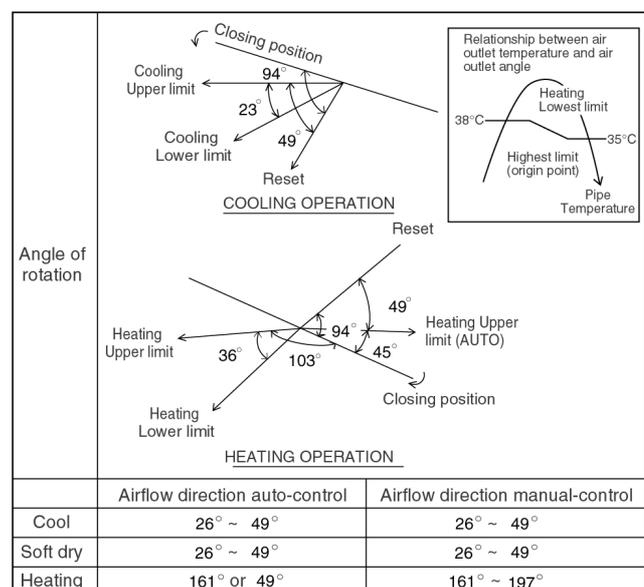
a. For cooling and soft dry

The up/down louver swings within the movable range.

b. For heating

As shown in the diagram at left, the blow out angle changes according to the blow out temperature.

* Angle of the left/right louver is manually adjusted.

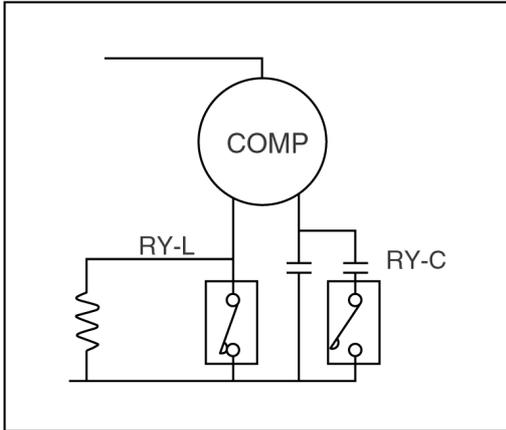


7.11. Soft starter (Applicable only for Australia market)

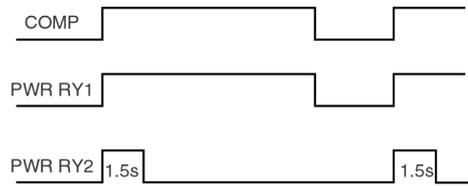
A. Purpose

To reduce starting current lower than 45A.

B. Basic Operation (W18CTP, W24CTP)

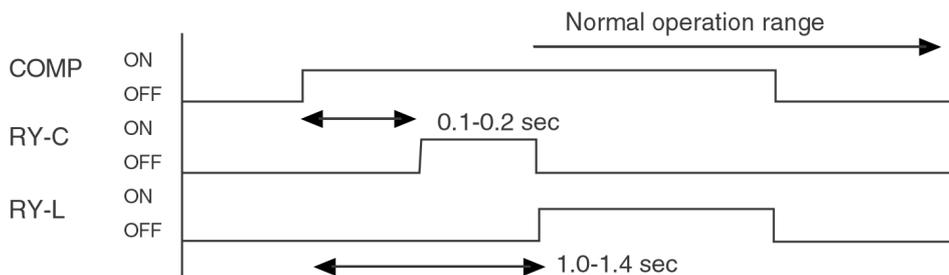


(A12CTP)



	RY-C	RY-L
Starting	ON	OFF
Running	OFF	ON

Note: RY-C = Relay starting capacitor
RY-L = Relay reactor



Note: RY-C = normally open
RY-L = normally open

1. When indoor relay is turn ON, starting capacitor will be turn ON through RY-C for ~ 1 second. After that reactor will be turn OFF through RY-L and in the same time RY-C will turn OFF causes starting capacitor to be OFF.
2. When the unit operation ON by remote controller or thermostat OFF → ON the starter kit will be functioned.
3. When the unit operation OFF → ON by the inner protector, the starter kit will be not function, mean the unit will be ON as a normal operation.

8 Operating Instructions

1 PRODUCT OVERVIEW

Your device can...

- COOL** Cooling
- HEAT** Heating
- DRY** Dehumidifying

1.1 Outdoor Unit

CU-W18CTP5, CU-W24CTP5

Air intake
Air outlet
Piping

1.2 Indoor Unit

CU-W12CTP5

Filters under front panel, see page 38

Indicator & Auto operation button

Direction louvers

0 - 10 m

Fluorescent lights may interfere with signal transmission

1.3 Remote Control

If Remote Control malfunctions/ is misplaced...

- 1 Open front panel
- 2 Press to START
- 3 Press again to STOP

see page

- 37 Set TEMPERATURE
- 37 Select MODE: AUTO • HEAT, COOL • DRY
- 38 Comfortable sleep temperature
- 38 TIMER functions

Switch OFF/ON of the device

Select Fan speed

Select air flow direction

Memory reset!

Proper way to operate the remote control

O.K. (Correct angle)

OUT (Incorrect angle)

Find on page



40



PREPARATIONS

41



TROUBLE-SHOOTING

42



SAFETY PRECAUTIONS

39



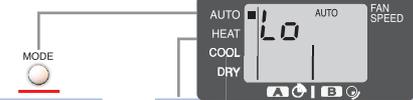
HELPFUL INFORMATION

OPERATION

START

Switch on

Press button



AUTO

Automatic

Select...

Hi = +2°C
Lo = -2°C
= standard Lo...-Hi

According to the room temperature the system automatically chooses

COOL 25°C
DRY 22°C
HEAT 21°C

HEAT

Heating

Select...

min. 16°C
max. 30°C

Choose the right temperature to be comfortably warm!

~20...24°C

COOL

Cooling

Select...

min. 16°C
max. 30°C

Choose the right temperature to be comfortably cool!

Recommended: ~26...28°C

DRY

Dehumidifying

Select...

min. 16°C
max. 30°C

Very gentle cooling and dehumidifying operation.

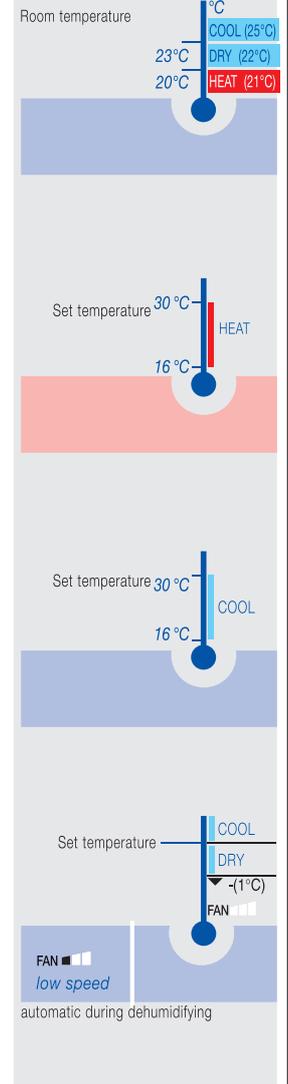
Recommended: Room temperature -(1-2)°C

STOP

Switch off



Automatic Internal Function



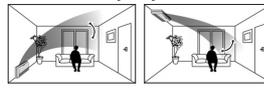
Additional comfort

Press button

Air Flow



Comfortable Airflow Operation



Horizontal Direction

adjust manually

Direction / volume

TIMER Operation



set Delay hour (1 ~ 12)

confirm or SET/CANCEL

Timer operation will activate after reaching the setting number of hours (1 ~ 12)

Start before «ON» time

COOL/DRY: 15 min.
 AUTO/HEAT: 30 min.

SLEEP Operation

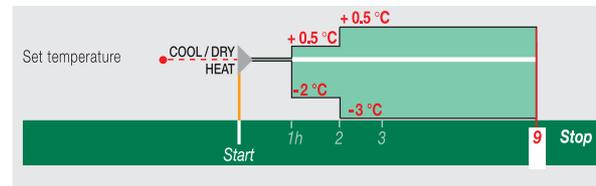


For a comfortable night temperature

ON OFF Activate / Deactivate

If TIMER + SLEEP set -> Priority TIMER

Automatic Internal Function



CARE & CLEANING

Indoor unit

Filters

Soaps Household detergents

Benzine / Thinner Scouring powder

Air filters

every 2 weeks

Remove

Vacuum

Wash

Dry

Damaged -> replace!

Reinstall

Part No. **CWD001088**

DIRTY FILTERS cause: unpurified air, low cooling/ heating capacity, more unpleasant smells, higher energy consumption!

HELPFUL INFORMATION

Automatic Operation

Save cost

≈ -10% TEMP

COOL + (1°C)

HEAT - (2°C)

Close

Vacuum

* Better performance

Use... SLEEP! TIMER!

-> see page 38

Thunder/Lightning

Built-in surge protection, BUT UNPLUG in case of very strong lightning!

Power Failure

When power resume...

3-4 Min. Random restart automatically

MODE	Restored
AIRFLOW direction	Restored
TIMER	Deleted ->set again!

PREPARATIONS



Installation: see enclosed installation instruction!

Press button

Plug/breaker

Insert batteries



Same type!

Rechargeable

Open/remove

Insert batteries/close

Pre-season inspection



2. Batteries OK?

check 1. Fans obstructed?

OFF/ON



START cooling or heating



~15 Min.

Check performance

8°C (COOL)
14°C (HEAT)



Call Service

For extended non-operation

OFF/ON



START

dry internal parts

2-3 [h]

OFF/ON

OFF



Unplug



Remove batteries

Recommended Inspections

▶ After several seasons and due to operational conditions, performance may be reduced by dust or there may be unpleasant smells.

▶ Consult an authorized distributor for inspection!

TRUBLESHOOTING

OK? ✓ No problem

1	Operation delayed for 3 minutes after successful restart	▶ Self protection procedure	✓
2	It sounds like water flowing...	▶ Caused by refrigerant flow inside	✓
3	Mist seems to emerge from the indoor unit	▶ Condensation effect due to cooling	✓
4	With setting «FAN AUTO» indoor fan sometimes stops	▶ Smell elimination procedure	✓
5	Outdoor unit emits water/steam	▶ Condensed moisture due to cooling	✓
6	«POWER» flashes, no warm air discharge	▶ Defrosting at outdoor unit, max. 12 min.	✓
7	During Automatic Airflow Volume setting, indoor fan stops occasionally	▶ This is to remove the smell emitted by the surroundings	✓

In case of...

- Abnormal noise during operation
- Water/foreign particles have entered the Remote Control
- Water leak from Indoor Unit
- Switches/buttons do not operate properly
- Circuit breaker switches off frequently
- Power plug/cord become unnaturally warm

 TURN OFF / UNPLUG

 CALL authorized distributor



1	No Operation	▶ Circuit breaker tripped?	▶ Power plug OK?	▶ TIMER used correctly?
2	Remote control/display doesn't work	▶ Batteries empty?	▶ Batteries correctly inserted? See page 40	
3	Noise too loud	▶ Installation work slanted?	▶ Front grille/panel closed properly?	
4	Cooling/heating efficiency low	▶ Temperature set correctly?	▶ Windows/doors closed?	▶ Filters cleaned/replaced?
		▶ Outdoor unit obstructed?	▶ Intake/outlet ventilators obstructed?	



SAFETY PRECAUTIONS

Before operating, read the safety precautions thoroughly

EMERGENCY!

SOS Immediately isolate from the mains supply (e.g. if there is a smell of burning)

Use only for...

COOL Cooling

HEAT Heating

DRY Dehumidifying

NEVER use this unit for purposes other than those listed in these Operating Instructions. In particular, do not use it for the preservation of food.

Installation



Never install, remove or reinstall yourself



Engage dealer/specialist



NOT in potentially explosive atmosphere



Connect drain hose properly

Mains connection

Engage dealer/specialist for mains connection including...



Used connectors/breakers easy reachable!



NEVER shared



! Connect protective earth!



Plug in properly



Australia (AS) Standard

The appliance is not intended for use by young children or infirm person without supervision. Young children should be supervised to ensure that they do not play with the appliance.



Nur für Deutschland

HINWEISE: Schalldruckpegel < 70dB(A) (JIS C9612)



United Kingdom only

Replacement or installation of power plugs shall be performed by authorised/qualified personnel only. The wires in this mains lead are coloured in accordance with the following code:

Terminal	Wires	Colour
L	live	brown
N	neutral	blue
E	earth	green- yellow

Operation



NEVER use the plug to switch on/off



Do NOT operate with wet hands



Do NOT stay long in the stream of cold air



Ventilate the room periodically



NEVER modify/damage mains cables/connectors



Do not pull out the plug by the cable



Do not sit or place anything on the indoor or outdoor unit



NO fingers or objects into the unit! -> especially dangerous for children!



Unused for a long time? -> OFF/unplug

If the supply cord is damaged or needed to be replaced, it must be replaced by the manufacturer or its service agent or a similar qualified person in order to avoid a hazard

SAFETY PRECAUTIONS & FEATURES

Defects

 Defect/suspicion of defect? -> Attend defects before use!

 Do NOT repair yourself

 Engage dealer/specialist

Cleaning

 OFF and unplug (connector or breaker)

 Do NOT wash!

Waste disposal

 Uninstalling and disposal of the unit ONLY by dealer/specialist.
Contains CHLORO-FLUORO-CARBONS (CFC)

 Packaging recyclable

Outdoor Unit

Wet Bulb ◀ Temperature ▶ Dry Bulb

Operational Condition		Cooling		Heating	
min	max	min	max	min	max
11	23	16	32	16	30
11	26	16	43	-5	24
[°C]		-6	-	-	18

TSM SUCCESS MANUAL® - safe to use - easy to understand due to TSM® - Total Security Management and ergonomic communication® -160103 by SEV-ASE



refer page 



Illuminating button: convenient in the dark!

36



Automatic Operation: indoor temp. is gauged to select the optimum mode

37



Sleep Mode: for a pleasant night temperature

38



Comfortable Airflow Operation: minute airflow direction control creates a pleasant room environment.

38



ON / OFF Dual Setting Timer: to program the room air conditioner to turn itself ON/OFF.

38



Auto Restart Control: After power failure, restart automatically when power resume

39



Environmental friendly (Refrigerant R410A model): Zero ozone depleting and low global warming potential

Manufactured by:

MATSUSHITA INDUSTRIAL CORP. SDN.BHD.
Lot 2, Persiaran Tengku Ampuan, Section 21, Shah Alam
Industrial Site Selangor, Malaysia

MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.
web site: <http://www.panasonic.co.jp/global/>

This TSM SUCCESS MANUAL® has been examined by SEV for conformity with the safety relevant standards, and has been analysed by an application oriented risk analysis for the completeness and correctness of the indications for a safe use of the appliance. Thereby we assume a use with which can be reckoned based on commonsense.

9 Installation Instructions

Required tools for Installation Works			
1. Philips screw driver	5. Spanner	9. Gas leak detector	13. Multimeter
2. Level gauge	6. Pipe cutter	10. Measuring tape	14. Torque wrench 18 N.m (1.8 kgf.m) 55 N.m (5.5 kgf.m) 65 N.m (6.5 kgf.m)
3. Electric drill, hole core drill (ϕ 70 mm)	7. Reamer	11. Thermometer	15. Charging cylinder
4. Hexagonal wrench (4 mm)	8. Knife	12. Megameter	16. Gauge manifold set

9.1. Safety Precautions

- Read the following “SAFETY PRECAUTIONS” carefully before installation.
- Electrical work must be installed by a licensed electrician. Be sure to use the correct rating of the power plug and main circuit for the model to be installed.
- The caution items stated here must be followed because these important contents are related to safety. The meaning of each indication used is as below.

Incorrect installation due to ignoring of the instruction will cause harm or damage, and the seriousness is classified by the following indications.

 WARNING	This indication shows the possibility of causing death or serious injury.
--------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------

 CAUTION	This indication shows the possibility of causing injury or damage to properties only.
--------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------

The items to be followed are classified by the symbols:

	Symbol with background white denotes item that is PROHIBITED from doing.
-------------------------------------------------------------------------------------	--------------------------------------------------------------------------

- Carry out test running to confirm that no abnormality occurs after the installation. Then, explain to user the operation, care and maintenance as stated in operating instructions. Please remind the customer to keep the operating instructions for future reference.

 WARNING	
1. Engage dealer or specialist for installation. If installation done by the user is defective, it will cause water leakage, electrical shock or fire.	
2. Install according to this installation instruction strictly. If installation is defective, it will cause water leakage, electrical shock or fire.	
3. Use the attached accessories parts and specified parts for installation. Otherwise, it will cause the set to fall, water leakage, fire or electrical shock.	
4. Install at a strong and firm location which is able to withstand the set's weight. If the strength is not enough or installation is not properly done, unit will drop and cause injury.	
5. For electrical work, please follow the local national wiring standard & regulation and this installation instruction. An independent circuit and single outlet must be used. If electrical circuit capacity is not enough or defect found in electrical work, it will cause electrical shock or fire.	
6. Use the specified cable and connect tightly for indoor-outdoor connection. Please clamp the cable firmly so that no external force will be acted on the terminal. If connection or fixing is not perfect, it will cause heat-up or fire at the connection. The outlet cable shall be fastened by the two clamps of the indoor unit.	
7. Wire routing must be properly arranged so that control board cover is fixed properly. If control board cover is not fixed perfectly, it will cause heat-up at connection point of terminal, fire or electrical shock.	
8. When carrying out piping connection, please take care not to let air or other substances other than the specified refrigerant go into refrigeration cycle. Otherwise, it will cause lower capacity, abnormal high pressure in the refrigeration cycle, explosion and injury.	
9. When connecting the piping, do not allow air or any substances other than the specified refrigerant (R410A) to enter the refrigeration cycle. Otherwise, this may lower the capacity, cause abnormally high pressure in the refrigeration cycle, and possibly result in explosion and injury. (only for models: CS/CU-V12CT, V18CT, V24CT,W12CT, W18CT, W24CT)	

<p>10. ● When connecting the piping, do not use any existing (R22) pipes and flare nuts. Using such same may cause abnormally high pressure in the refrigeration cycle (piping), and possibly result in explosion and injury. Use only R410A materials.</p> <p>● Thickness of copper pipes used with R410A must be more than 0.8 mm. Never use copper pipes thinner than 0.8 mm.</p> <p>● It is desirable that the amount of residual oil is less than 40 mg/10 m. (only for models: CS/CU-V12CT, V18CT, V24CT, W12CT, W18CT, W24CT)</p>	
<p>11. Do not modify the length of the power supply cord or use of the extension cord, and do not share the single outlet with other electrical appliances. Otherwise, it will cause fire or electrical shock.</p>	
 CAUTION	
<p>1. This equipment must be earthed. It may cause electrical shock if grounding is not perfect.</p>	
<p>2. Do not install the unit at place where leakage of flammable gas may occur. In case gas leaks and accumulates at surrounding of the unit, it may cause fire.</p>	
<p>3. Carry out drainage piping as mentioned in installation instructions. If drainage is not perfect, water may enter the room and damage the furniture.</p>	
ATTENTION	
<p>1. Selection of the installation location and installation. Select a installation location which is rigid and strong enough to support or hold the unit, and select a location for easy maintenance.</p>	
<p>2. Power supply connection to the room air conditioner. Connect the power supply cord of the room air conditioner to the mains using one of the following method. Power supply point shall be the place where there is ease for access for the power disconnection in case of emergency. In some countries, permanent connection of this room air conditioner to the power supply is prohibited.</p> <p>1. Power supply connection to the socket using a power plug. Use an approved 15A/16A power plug with earth pin for (V12CT, W12CT, V18CT, W18CT) and 20A for (V24CT, W24CT) for the connection to the socket.</p> <p>2. Power supply connection to a circuit breaker for the permanent connection. Use an approved 16A circuit breaker for V12CT, W12CT, V18CT, W18CT and 20A for V24CT, W24CT for the permanent connection. It must be a double pole switch with a minimum 3 mm contact gap.</p>	
<p>3. Do not release refrigerant. Do not release refrigerant during piping work for installation, re-installation and during repairing a refrigeration parts. Take care of the liquid refrigerant, it may cause frostbite.</p>	
<p>4. Installation work. It may need two people to carry out the installation work.</p>	
<p>5. Do not install this appliance in a laundry room or other location where water may drip from the ceiling, etc.</p>	

Attached accessories

No.	Accessories part	Qty.	No.	Accessories part	Qty.
1	Installation plate 	1	7	Remote Control holder 	1
2	Installation plate fixing screw 	6	8	Remote Control holder fixing screw 	2
3	Remote control 	1	9	Drain elbow (W12/18/24CT) 	1
4	Battery 	2	10	Drain hose 	1
5	Pre-bent tube 1 	1	11	Slide cover 	4
6	Pre-bent tube 2 	1	12	Band 	4
			13	Insulation material 	2

Applicable piping kit

CZ-4F5, 7, 10AN : CS-V12CT/W12CT

CS-V18CT/W18CT

CZ-52F5, 7, 10AN : CS-V24CT/W24CT

SELECT THE BEST LOCATION

INDOOR UNIT

- There should not be any heat source or steam near the unit.
- There should not be any obstacles blocking the air circulation.
- A place where air circulation in the room is good.
- A place where drainage can be easily done.
- A place where noise prevention is taken into consideration.
- Do not install the unit near the door way.
- Ensure the spaces indicated by arrows from the wall, ceiling, fence or other obstacles.

OUTDOOR UNIT

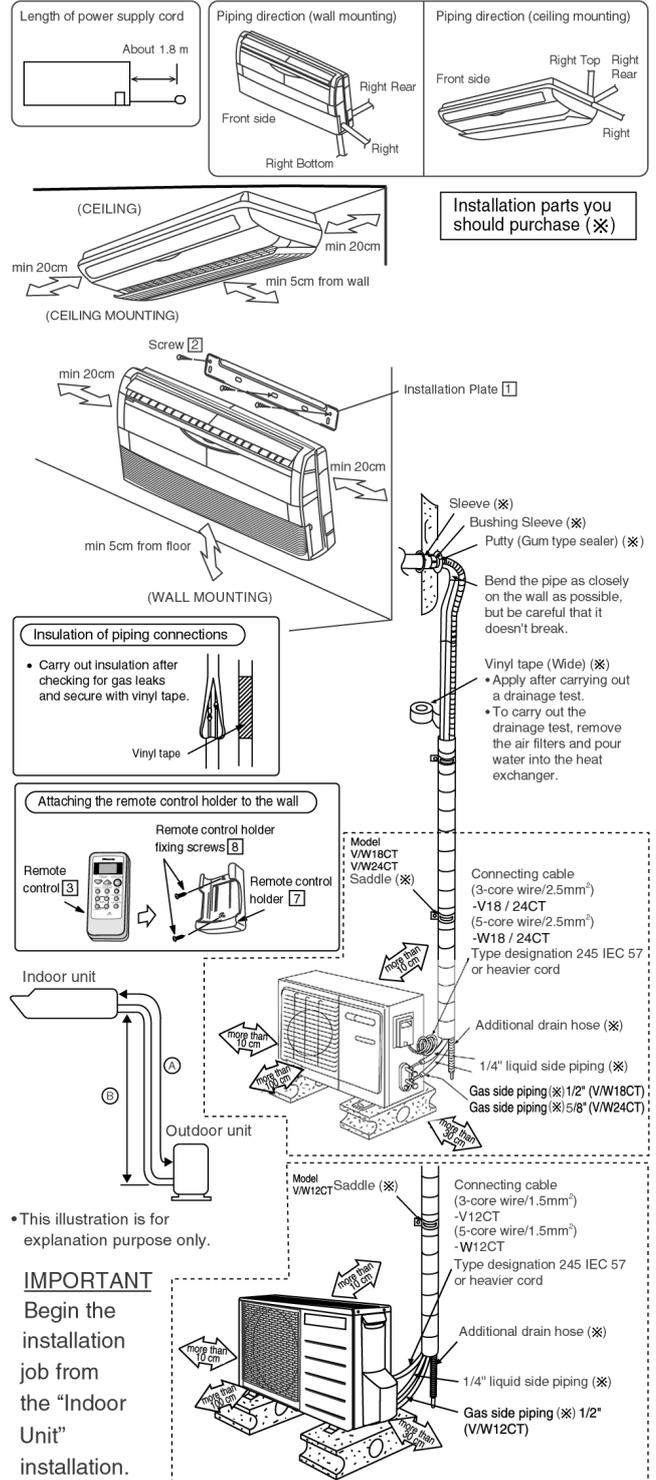
- If an awning is built over the unit to prevent direct sunlight or rain, be careful that heat radiation from the condenser is not obstructed.
- There should not be any animal or plant which could be affected by hot air discharged.
- Keep the spaces indicated by arrows from wall, ceiling, fence or other obstacles.
- Do not place any obstacles which may cause a short circuit of the discharged air.
- If piping length is over 7.5m, additional refrigerant should be added as shown in the table.

Model	Pipe size		Max. Piping Length (A) (m)	Max. Elevation (B) (m)	Rated Length (m)	Additional Refrigerant (g/m)
	Gas	Liquid				
W12CT	1/2"	1/4"	15	5	5	20
V12CT	1/2"	1/4"	15	5	5	15
V/W18CT	1/2"	1/4"	25	20	5	20
V/W24CT	5/8"	1/4"	25	20	5	30

Example: For W24CT

If the unit is installed at a 10m distance, the quantity of additional refrigerant should be 75g... (10-7.5)m x 30g/m = 75g

Indoor/Outdoor Unit Installation Diagram



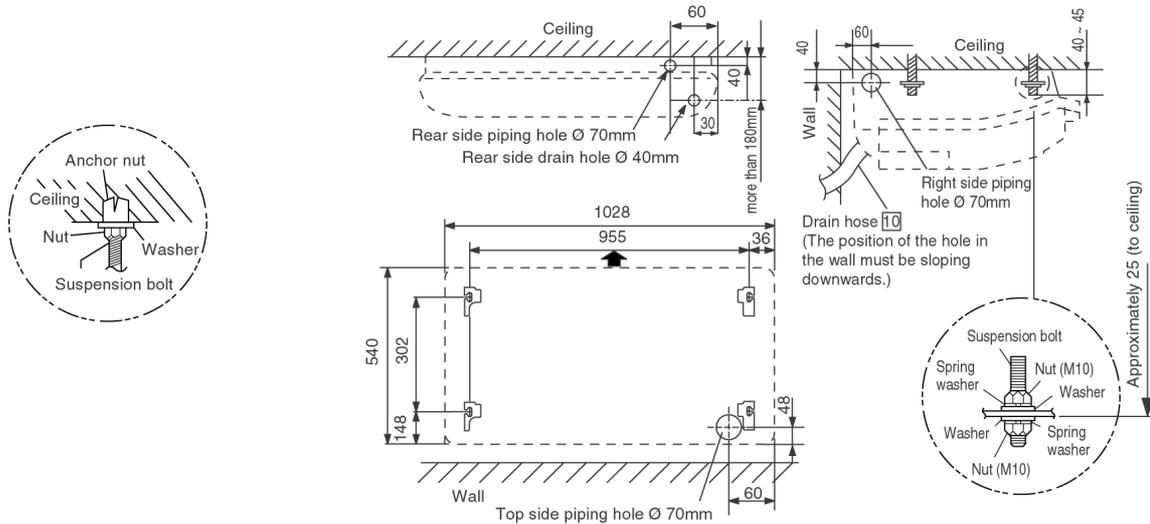
9.2. INDOOR UNIT

9.2.1. SELECT THE BEST LOCATION (Refer to “Select the best location” section)

9.2.2. HOW TO FIX INSTALLATION PARTS

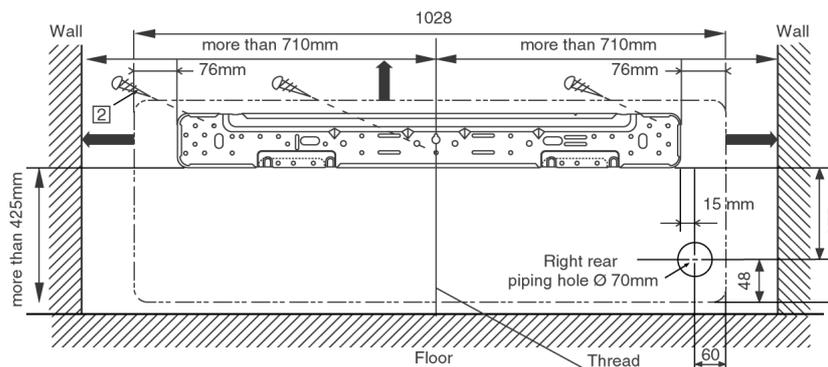
Installation on the ceiling

- Measure and mark the position for the Suspension bolts and the piping hole.
- Drill the hole for anchor nut on the ceiling.
- Drill the Piping hole slightly tilted to the outdoor side with a $\varnothing 70$ hole-core drill.
- Insert the nuts and washers onto the suspension bolts for locking the Suspension bolts on the ceiling.
- Mount the suspension bolts to the anchor-nuts firmly as shown in the diagram.



Installation on the wall

How to fix installation plate



The centre of installation plate should be at more than 710 mm at right and left of the wall.

The distance from installation plate edge to floor should more than 425 mm.

From installation plate left edge to unit's left side is 76 mm.

From installation plate right edge to unit's right is 76 mm.

1. Mount the installation plate on the wall with 3 screws or more.

(If mounting the unit on the concrete wall consider using anchor bolts.)

- Always mount the installation plate horizontally by aligning the marking-off line with the thread and using a level gauge.

2. Drill the piping plate hole with $\varnothing 70$ mm hole-core drill.

- Drill the piping hole slightly slanted to the outdoor side.

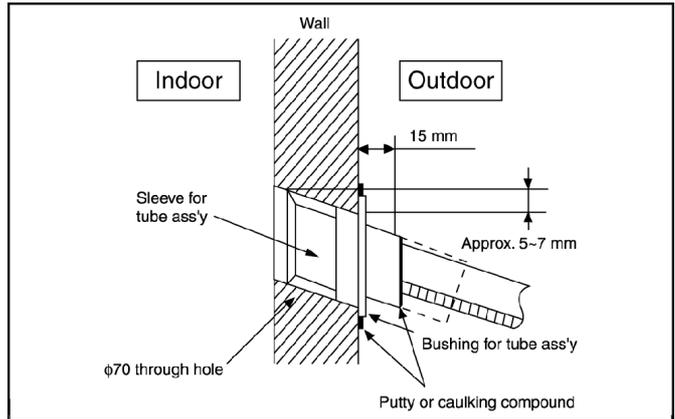
9.2.3. TO DRILL A HOLE IN THE WALL AND INSTALL A SLEEVE OF PIPING

1. Insert the piping sleeve to the hole.
2. Fix the bushing to the sleeve.
3. Cut the sleeve until it extrudes about 15 mm from the wall.

Caution

When the wall is hollow, please be sure to use the sleeve for tube ass'y to prevent dangers caused by mice biting the connecting cable.

4. Finish by sealing the sleeve with putty or caulking compound at the final stage.



9.2.4. INDOOR UNIT INSTALLATION

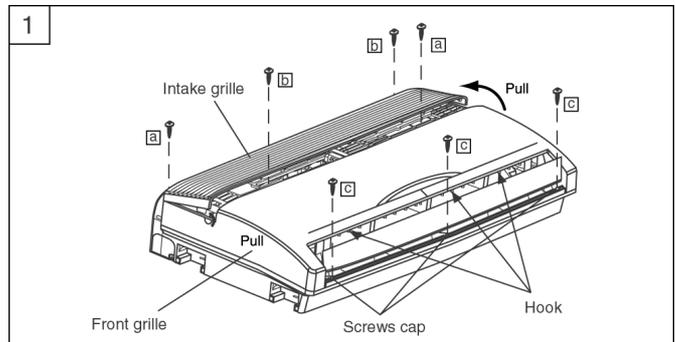
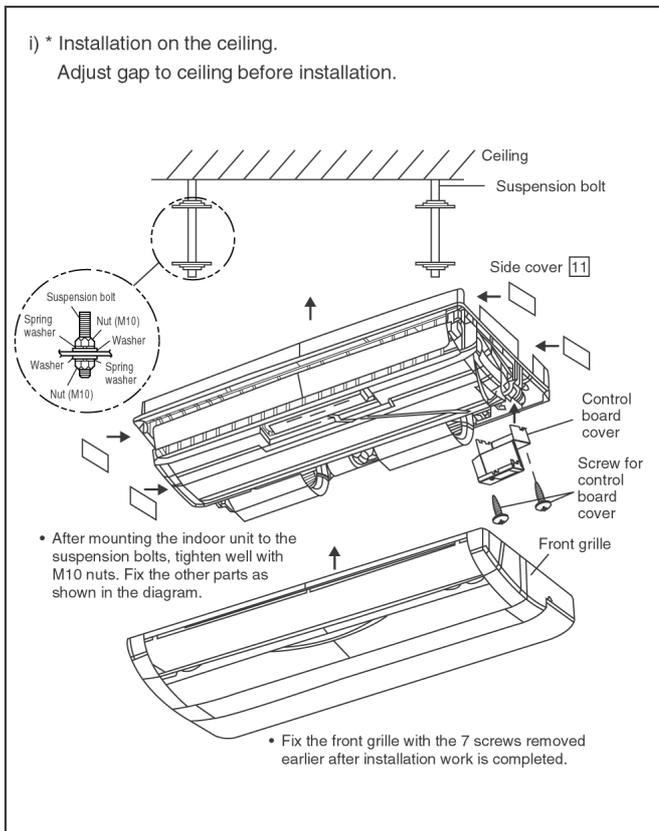
Indoor unit installation

1. Remove the Front Grille.

- Remove 2 screws [a] from the left and right corners.
- Pull the upper left and right side of the intake grille toward you, and it will stop at slightly tilted position.
- Remove 2 screws [b].
- Remove 3 screws cap, then remove 3 screws [c].
- Release 3 hooks as shown in the diagram.
- Lift up the front grille.

It is advisable to place whole unit horizontally flat on the floor before starting the installation. (to prevent unit from falling down easily.)

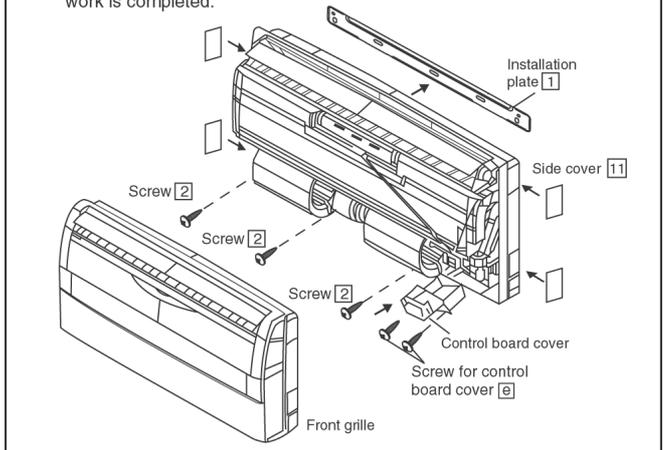
2a. For installation on the ceiling.



2b. For installation on the wall.

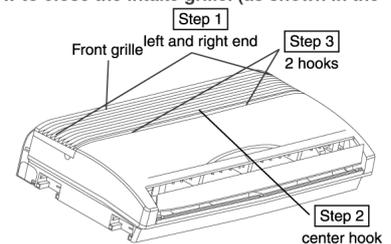
(i) Install the Indoor unit on the installation plate.

- Cut out the portion for piping with a nipper.
- Engage the slot at the back center of the unit with the installation plate.
- After mounting the indoor unit to installation plate, fix 3 screws [2] (provided inside accessory) from chassis to the wall for firmly mounting the unit and 2 screws [e] which are removed earlier. (as shown in the diagram)
- Fix the front grille with the 7 screws removed earlier after installation work is completed.



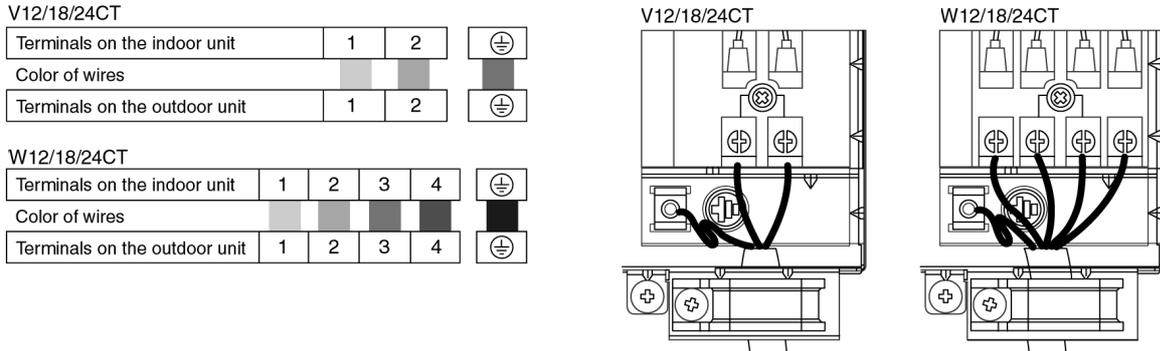
Please follow the steps below to close the intake grille. (as shown in the diagram)

1. Push down left and right end of intake grille until fully close.
2. Push down a center hook until fully close.
3. Finally push down 2 hooks to close tight.



9.2.5. CONNECT THE CABLE TO THE INDOOR UNIT

1. Open the control box at the bottom end of the chassis and connect the cable through the hole.
 - Connect the wires to the terminals on the control board individually according to the outdoor unit connection.
 - Ensure the color of wires of outdoor unit and the terminal Nos are the same to the indoor's respectively.

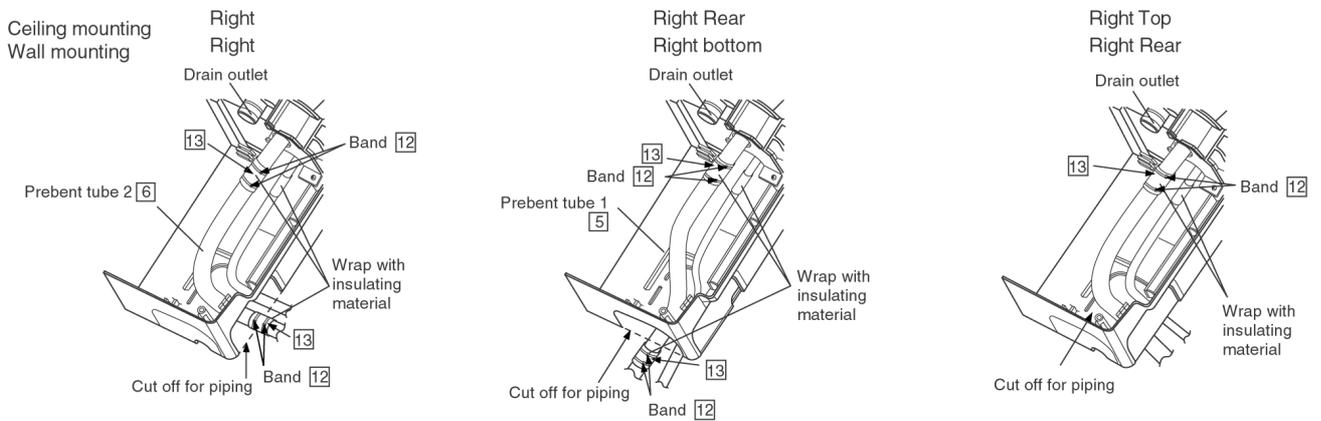


- Secure the cable onto the control board with the holder (clammer).
- Insert two tabs on the Side panel into two slots on the chassis, and secure it to the chassis with the screw.

9.2.6. PIPING AND DRAINAGE

Piping and Drainage

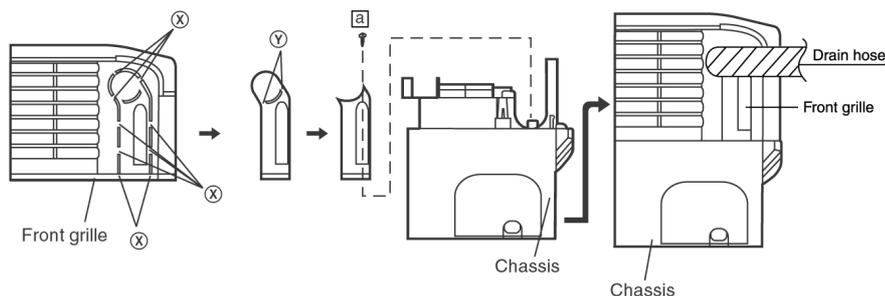
- Cut off the Chassis with a nipper according to the inner surface for the Pipings.
- Align the center of the pipings and sufficiently tighten the flare nut with fingers.
- Finally tighten the flare nut with torque wrench, ensure the direction for tightening follows the arrow on the wrench.
- Wrap the tube joining areas with insulating material so that there are no gaps (if it overlaps, cut the excess material) refer diagram in "Pipe formings, insulating and finishing".



- Connect the drain hose (insulated) to the drain outlet.

How to position drain hose (For installation on the ceiling)

- Cut off (X) area with nipper.
- Cut off (Y) area.
- Fix the remained part with screw (a) (which removed earlier) to chassis.
- Finally, after fixing the position of drain hose (as shown in diagram), fix the front grille to chassis at the hooks.



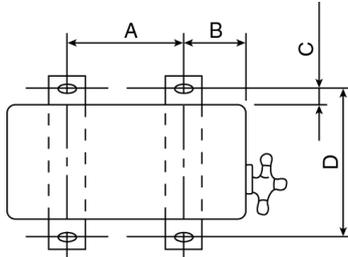
9.3. OUTDOOR UNIT

9.3.1. SELECT THE BEST LOCATION (Refer to “Select the best location” section)

9.3.2. INSTALL THE OUTDOOR UNIT

At the best location, start installation according to Indoor-Outdoor Unit Installation Diagram.

1. Fix the unit on concrete or rigid frame firmly and horizontally by bolt nut (ø10 mm).
2. When installing at roof, please consider strong wind. Please fasten the installation stand firmly with bolt or nails.



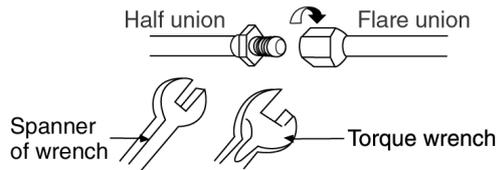
Model	A	B	C	D
12CT	570	105	18.5	320
18 / 24CT	540	129	15	330

9.3.3. CONNECTING THE PIPING

Connecting The Piping To Indoor Unit

Please make flare after inserting flare nut (locate at joint portion of indoor piping) onto the copper pipe.

(in case of using long piping)



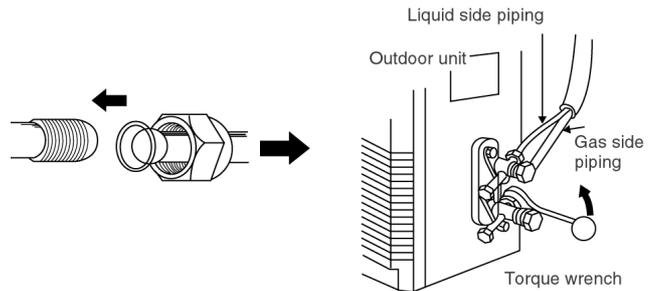
Connect the piping

- Align the center of piping and sufficiently tighten the flare nut with fingers
- Further tighten the flare nut with torque wrench to the specified torque as stated in the table.

Pipe size	Torque
Liquid Side 1/4"	18 N.m
Gas Side 1/2"	55 N.m
Gas Side 5/8"	65 N.m

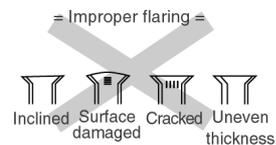
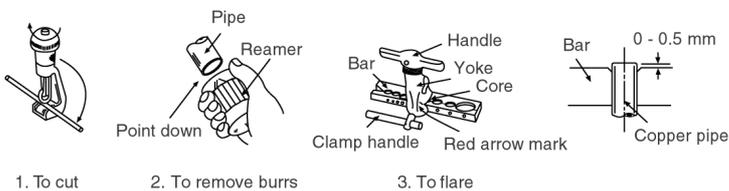
Connecting The Piping To Outdoor Unit

1. Align the center of the pipings and sufficiently tighten the flare nut with fingers.
2. Finally, tighten the flare nut with torque wrench until the wrench clicks.
 - When tightening the flare nut with torque wrench, ensure the direction for tightening follows the arrow on the wrench.



CUTTING AND FLARING THE PIPING

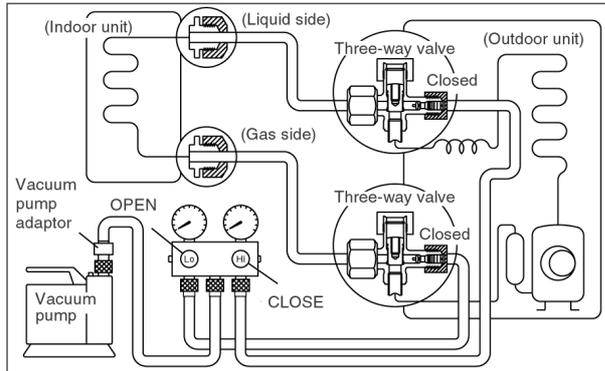
1. Please cut using pipe cutter and then remove the burrs.
2. Remove the burrs by using reamer. If burrs is not removed, gas leakage may be caused.
Turn the piping end down to avoid the metal powder entering the pipe.
3. Please make flare after inserting the flare nut onto the copper pipes.



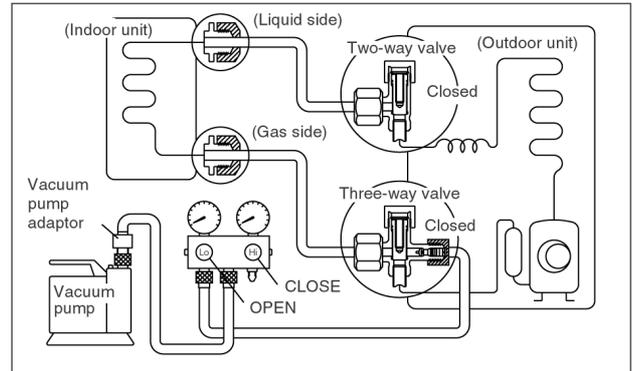
When properly flared, the internal surface of the flare will evenly shine and be of even thickness. Since the flare part comes into contact with the connections, carefully check the flare finish.

9.3.4. (a) EVACUATION OF THE EQUIPMENT (FOR EUROPE & OCEANIA DESTINATION)

WHEN INSTALLING AN AIR CONDITIONER, BE SURE TO EVACUATE THE AIR INSIDE THE INDOOR UNIT AND PIPES in the following procedure.



CS-V18/W18CT
CS-V24/W24CT



CS-V12/W12CT

1. Connect a charging hose with a push pin to the Low and High side of a charging set and the service port of the 3-way valve.
 - Be sure to connect the end of the charging hose with the push pin to the service port.
2. Connect the center hose of the charging set to a vacuum pump with check valve, or vacuum pump and vacuum pump adaptor.
3. Turn on the power switch of the vacuum pump and make sure that the needle in the gauge moves from 0 cmHg (0 MPa) to -76 cmHg (-0.1 MPa). Then evacuate the air approximately ten minutes.
4. Close the valve at the charging set and turn off the vacuum pump. Make sure that the needle in the gauge does not move after approximately five minutes.

Note: BE SURE TO TAKE THIS PROCEDURE IN ORDER TO AVOID REFRIGERANT GAS LEAKAGE.

5. Disconnect the charging hose from the vacuum pump and from the service port of the 3-way valve.
6. Tighten the service port caps of both of the 3-way valves at a torque of 18 N·m with a torque wrench.
7. Remove the caps of both of the 3-way valves. Position both of the valves to "OPEN" using a hexagonal wrench (4 mm).
8. Mount caps onto both of the 3-way valves.
 - Be sure to check for gas leakage.

CAUTION

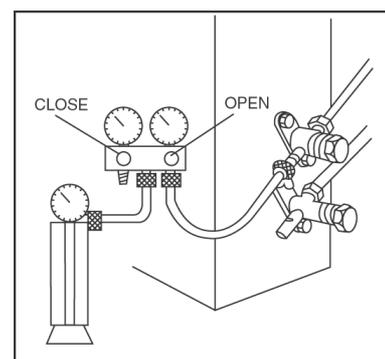
- If gauge needle does not move from 0 cmHg (0 MPa) to -76 cmHg (-0.1 MPa), in step 3 above take the following measure:
- If the leak stops when the piping connections are tightened further, continue working from step 3.
- If the leak does not stop when the connections are retightened, repair the location of leak.
- Do not release refrigerant during piping work for installation and reinstallation. Take care of the liquid refrigerant, it may cause frostbite.

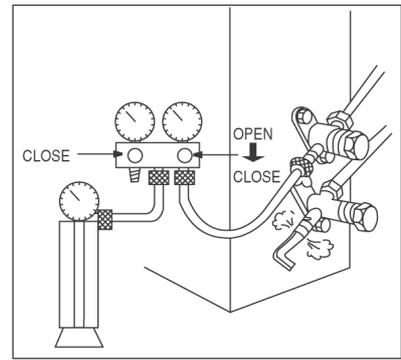
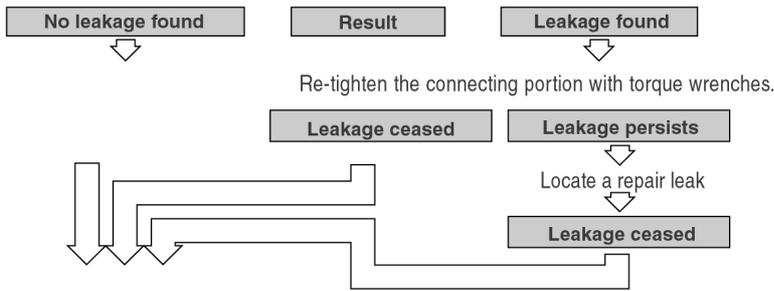
9.3.5. (b) AIR PURGING OF THE PIPING AND INDOOR UNIT

CS-V/W18/24CT

1) Checking a gas-leakage

1. Remove the Service port caps from both 3-way valves.
2. Connect the Manifold gauge set to the service port of Liquid side 3-way valve.
3. Connect the Charging Cylinder to the Manifold gauge set and open the valve of the Cylinder.
4. Open the low pressure side valve of the Manifold gauge for approx. 10 seconds and then close.
5. Check a gas-leakage of the connecting portion of pipings.
6. Open the low pressure side valve of the Manifold gauge again.





2) Air Purging

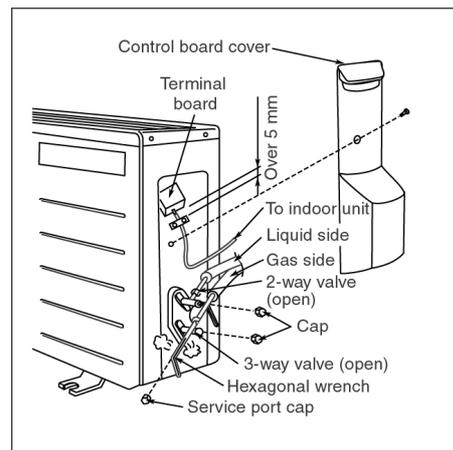
The air which contains a moisture is remaining in the Refrigeration cycle may cause a malfunction on the Compressor.

1. To purge the air, push the pin on the Gas side 3-way valve for three seconds using with a Hexagonal wrench and set it free for one minute.
 - Repeat this three times.
2. To balance the refrigerant, close the low pressure side valve on the Manifold gauge and release a refrigerant from the piping through service port until the gauge indicates 0.49 ~ 0.294 MPa.
3. Set the both 3-way valves to open position with the hexagonal wrench for the unit operation.

CS-V/W12CT

The remaining air in the Refrigeration cycle which contains moisture may cause malfunction on the compressor.

1. Remove the caps from the 2-way and 3-way valves.
2. Remove the service-port cap from the 3-way valves.
3. To open the valve, turn the valve stem of 2-way valve counter-clockwise approx. 90° and hold it there for ten seconds, then close it.
4. Check gas-leakage of the connecting portion of the pipings.
5. To open 2-way valve again, turn the valve stem counter-clockwise until it stops.



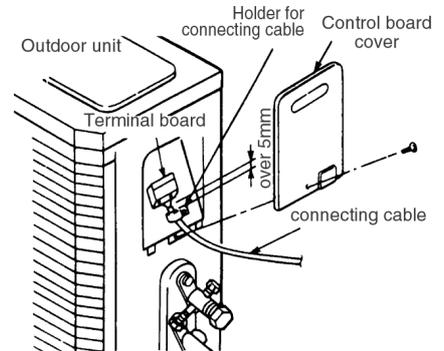
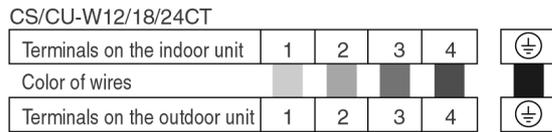
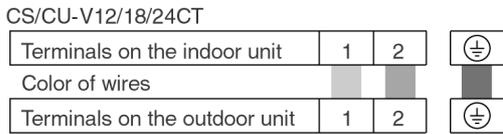
6. To purge the air, push the pin on the service port of 3-way valve for three seconds using with a hexagonal wrench and set it free for one minute.
 - Repeat this three times.

• Re-tighten the connecting portion with torque wrenches.

7. Set the both 2-way and 3-way valves to open position with the Hexagonal wrench for the unit operation.

9.3.6. CONNECT THE CABLE TO THE OUTDOOR UNIT

1. Remove the control board cover from the unit by loosening the screw.
2. Connecting cable between indoor unit and outdoor unit shall be approved polychloroprene sheathed 3 x 1.5mm² (V12CT) or 5 x 1.5mm² (W12CT) or 3 x 2.5mm² (V18/24CT) or 5 x 2.5mm² (W18/24CT) flexie cord, type designation 2451EC57 or heavier cord.



3. Secure the cable onto the control board with the holder (clammer).
4. Attach the control board cover back to the original position with the screw.

9.3.7. PIPE FORMINGS, INSULATION AND FINISHING

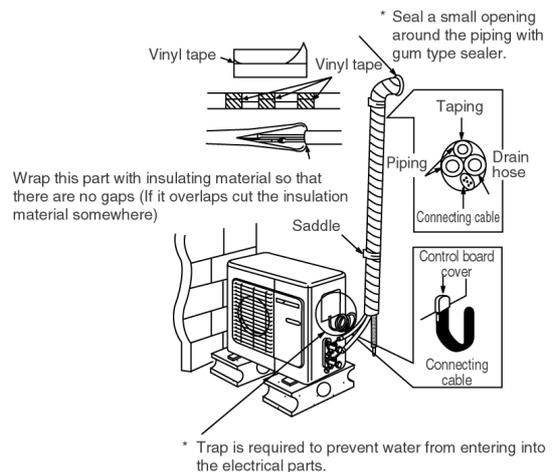
1. If you may connect an additional drain hose, the end of the drain-outlet should keep distance from the ground.

CAUTION

(Do not dip it into water, and fix it on the wall to avoid swinging in the wind.)

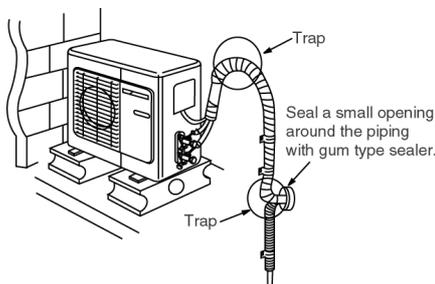
In case of the Outdoor unit is installed below position of the indoor unit.

2. Tape the Pippings, drain hose and Connecting Cable from down to up.
3. From the pippings gathered by taping along the exterior wall and fix it onto the wall by saddle or equivalent.
(Refer to the right side diagram)



* Trap is required to prevent water from entering into the electrical parts.
* Gas and Liquid side pippings are required.

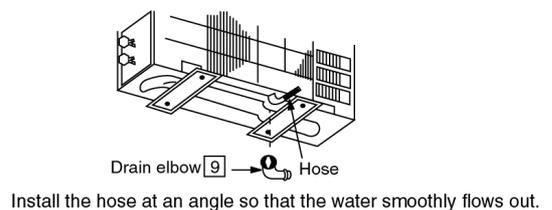
In case of the Outdoor unit is installed upper position of the indoor unit.



1. Tape the Pippings, and Connecting cable from down to up.
2. From the pippings gathered by taping along the exterior wall and the trap is required to prevent water from entering the room.
3. Fix the pippings onto the wall by saddle or equivalent.
(Refer to the left side diagram)

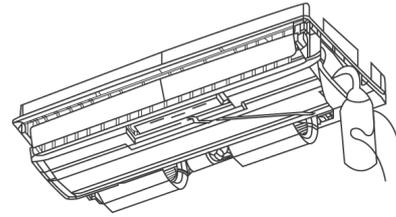
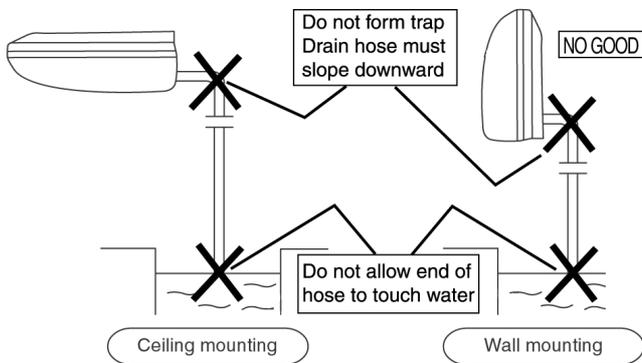
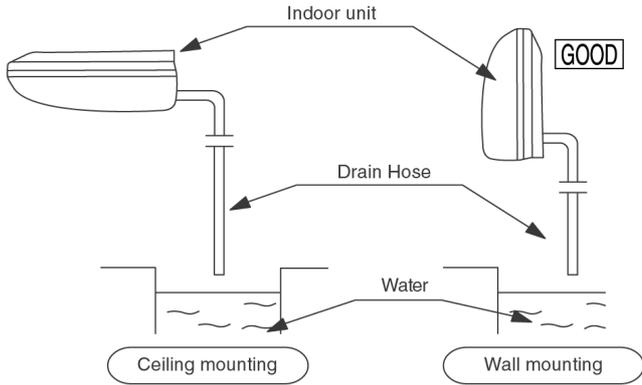
DISPOSAL OF OUTDOOR UNIT DRAIN WATER

- If a drain elbow is used, the unit should be placed on a stand which is taller than 3 cm.
- If the unit is used in an area where temperature falls below 0°C for 2 or 3 days in succession, it is recommended not to use a drain elbow, for the drain water freezes and the fan will not rotate.

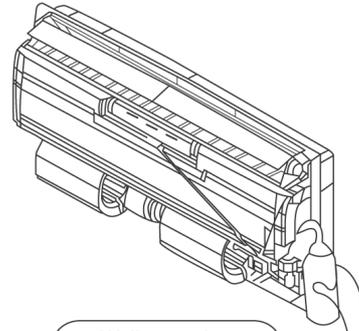


CHECK THE DRAINAGE

- Connect the drain hose, as described below.



Ceiling mounting



Wall mounting

- Pour water into the drain pan to ensure that water is drained smoothly through the drain hose.

AUTO SWITCH OPERATION

The below operations will be performed by pressing the "AUTO" switch.

1. AUTO OPERATION MODE

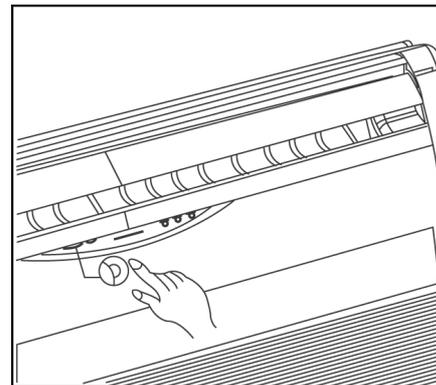
The Auto operation will be activated immediately once the Auto Switch is pressed.

2. TEST RUN OPERATION (FOR PUMP DOWN/SERVICING PURPOSE)

The Test Run operation will be activated if the Auto Switch is pressed continuously for more than 5 sec. to below 10 sec.. A "pep" sound will occur at the fifth sec., in order to identify the starting of Test Run operation.

3. REMOTE CONTROLLER RECEIVING SOUND ON/OFF

The ON/OFF of Remote Controller receiving sound can be changed over by pressing the "AUTO" Switch continuously for 10 sec. and above. A "pep", "pep" sound will occur at the tenth sec., in order to indicate the "ON/OFF" change over of remote control receiving sound.



NOTE:

These equipment shall be connected to a suitable mains network with a main impedance less than the following:
CS-V24CTP/CU-V24CTP5 : 0.13 Ω

CHECK ITEMS

- | | |
|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <input type="checkbox"/> Is there any gas leakage at flare nut connections? | <input type="checkbox"/> Is the cooling operation normal? |
| <input type="checkbox"/> Has the heat insulation been carried out at flare nut connection? | <input type="checkbox"/> Is the indoor unit properly secured to the installation plate? |
| <input type="checkbox"/> Is the connecting cable being fixed to terminal board firmly? | <input type="checkbox"/> Is the power supply voltage complied with rated value? |
| <input type="checkbox"/> Is the connecting cable ends being clamped firmly? | <input type="checkbox"/> Is there any abnormal sound? |
| <input type="checkbox"/> Is the drainage OK? | <input type="checkbox"/> Is the thermostat operation normal? |
| <input type="checkbox"/> Is the earth wire connection properly done? | <input type="checkbox"/> Is the remote control's LCD operation normal? |

10 Installation and Servicing Air Conditioner Using R410A

10.1. OUTLINE

10.1.1. 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 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 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 some what 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	0.005
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.

10.1.2. Safety Measure When Installing / Receiving 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.

10.2. TOOL FOR INSTALLING / SERVICING REFRIGERANT PIPING

10.2.1. 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), 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.

10.2.2. R410A Tools

1. Cooper 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.

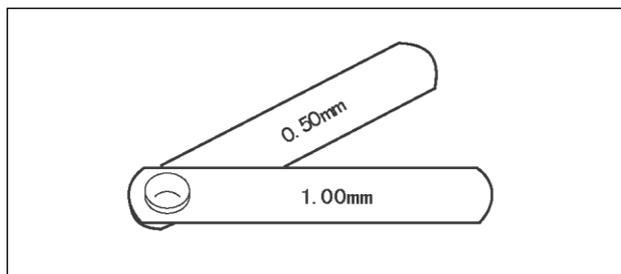


Fig. 1 Copper tube gauge for clearance adjustment

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.

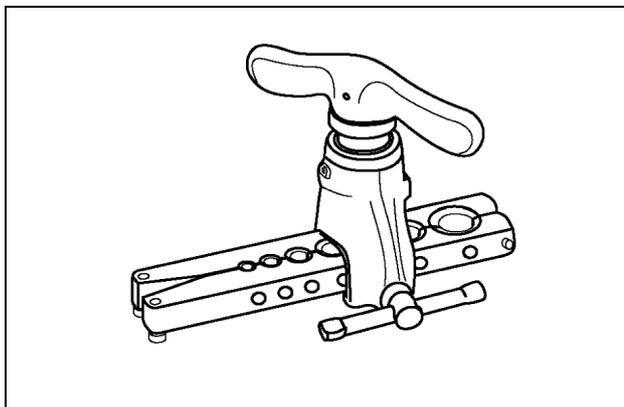


Fig. 2 Flaring tool (clutch type)

3. Torque wrenches

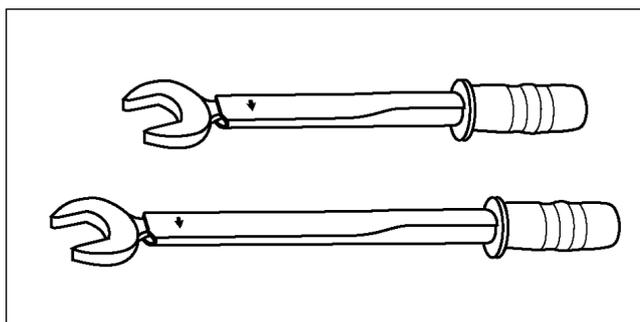


Fig. 3 Torque wrenches

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 3/3 (opposite side x torque)	22 mm x 42 N.m (180 kgf.cm)	22 mm x 42 N.m (180 kgf.cm)
For 1/2 (opposite side x torque)	24 mm x 55 N.m (180 kgf.cm)	26 mm x 55 N.m (180 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 wrenches	R410A wrenches
High-pressure gauge (red)	-76 cmHg - 35 kgf/cm ³	-0.1 - 5.3 Mpa -76 cmHg - 53 kgf/cm ³
High-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	7/6 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.

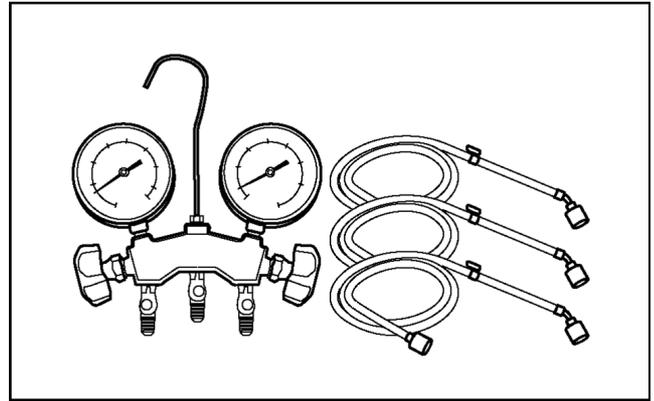


Fig. 4 Manifold gauge charging hose

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.

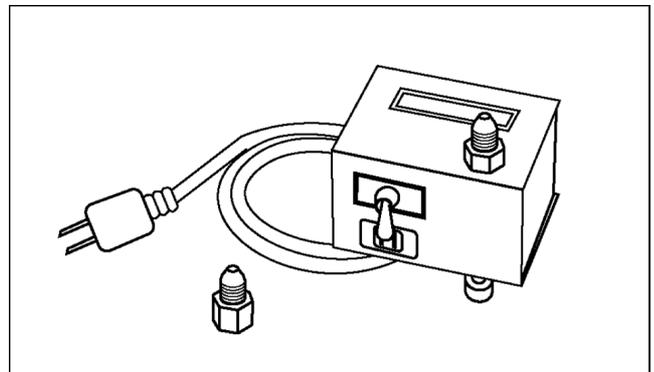


Fig. 5 Vacuum pump adaptor

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).

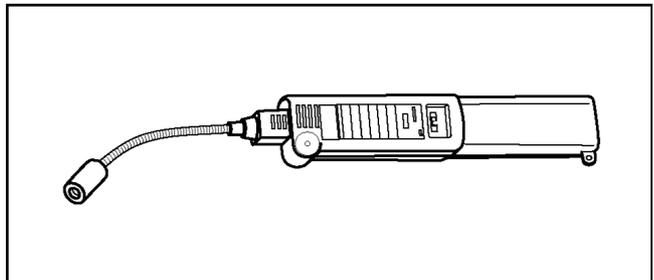


Fig. 6 Electric gas leak detector for HFC refrigerant

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.

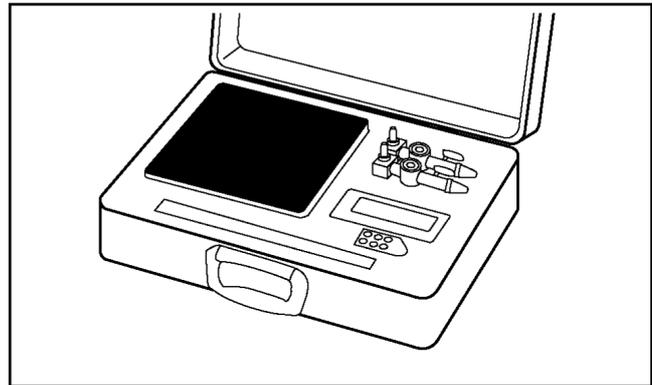


Fig. 7 Electronic scale for refrigerant charging

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.
- Cylinder equipped with a siphon tube are available to allow the cylinder to stand upright for liquid refrigerant charging.

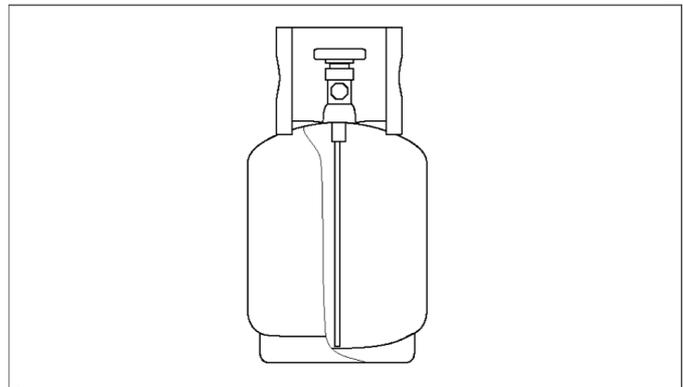


Fig. 8 Refrigerant cylinders

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.

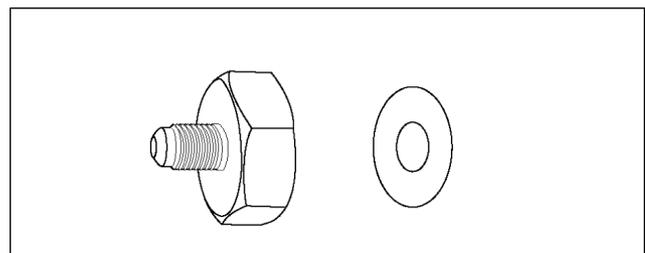


Fig. 9 Charging orifice and packing

10.2.3. 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

10.3. REFRIGERANT PIPING WORK

10.3.1. 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 Difference between R410A and conventional copper tube

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

10.3.2. 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).

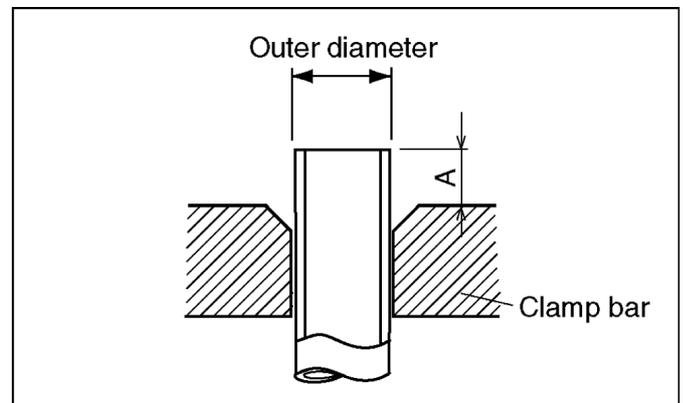


Fig. 10 Flaring dimensions

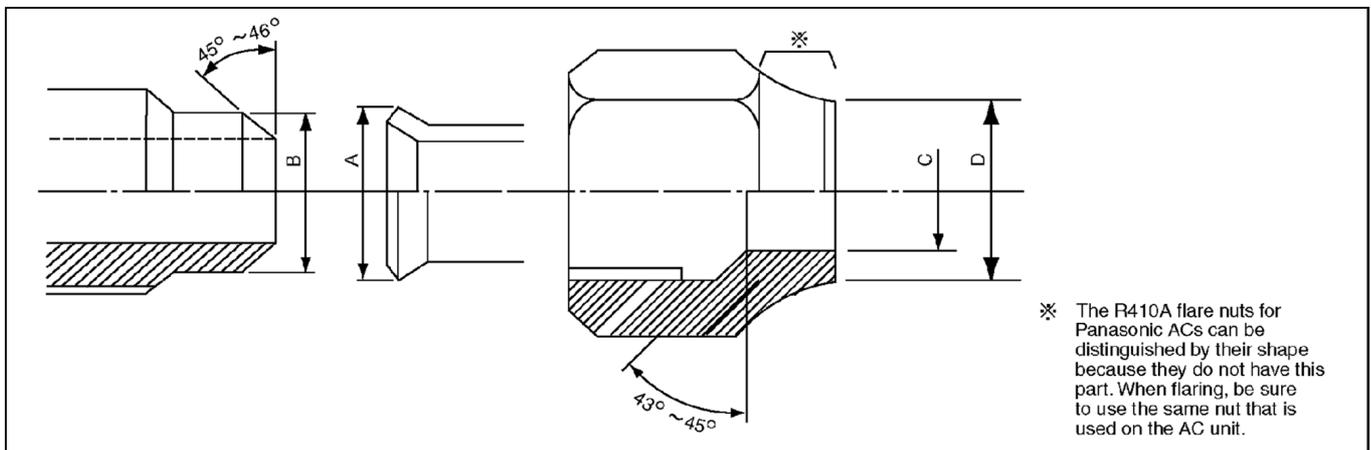


Fig. 11 Relation between the flare nut structure and flaring tool end

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 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	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 flaring 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 R410A flaring 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

- a. Check to make sure there are no scratches, dust, etc., on the flare and union.
- b. Align the flared surface with the axial center of the union.
- c. 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.

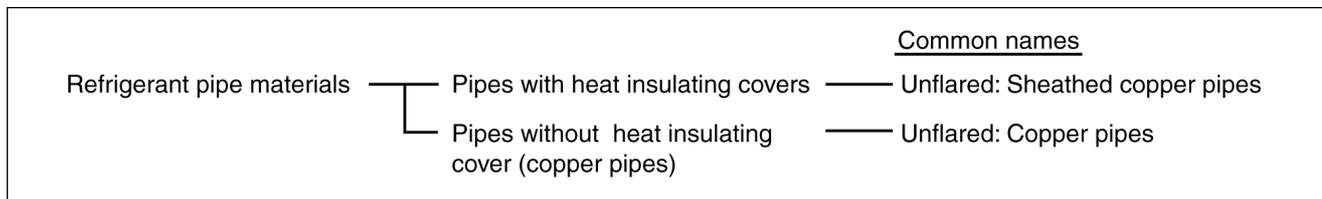
Table 15 R410A tightening torque

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)

10.3.3. 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.

10.4. INSTALLATION, TRANSFERRING, SERVICING

10.4.1. 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)).
 - 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.

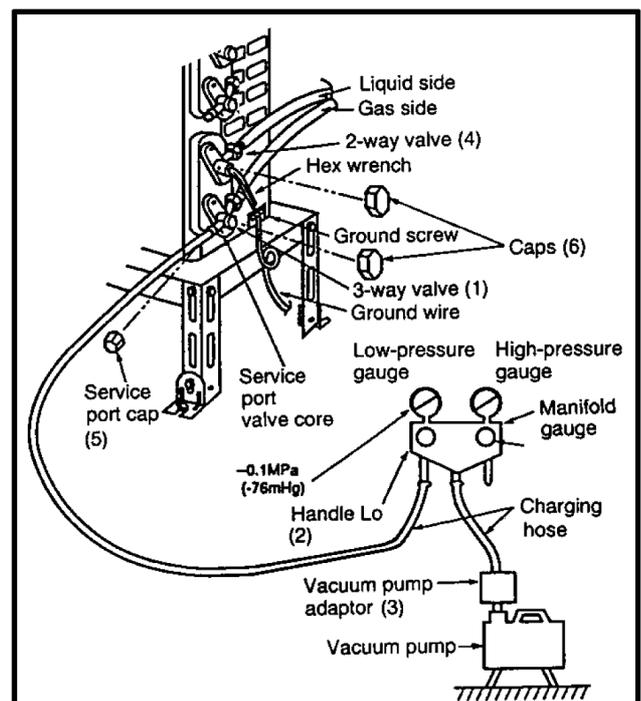


Fig. 12 Vacuum pump air purging configuration

10.4.2. 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 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).

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.

10.4.3. 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 10.1.1.(2)). 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.

10.4.4. 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.

10.4.5. 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 correct 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)

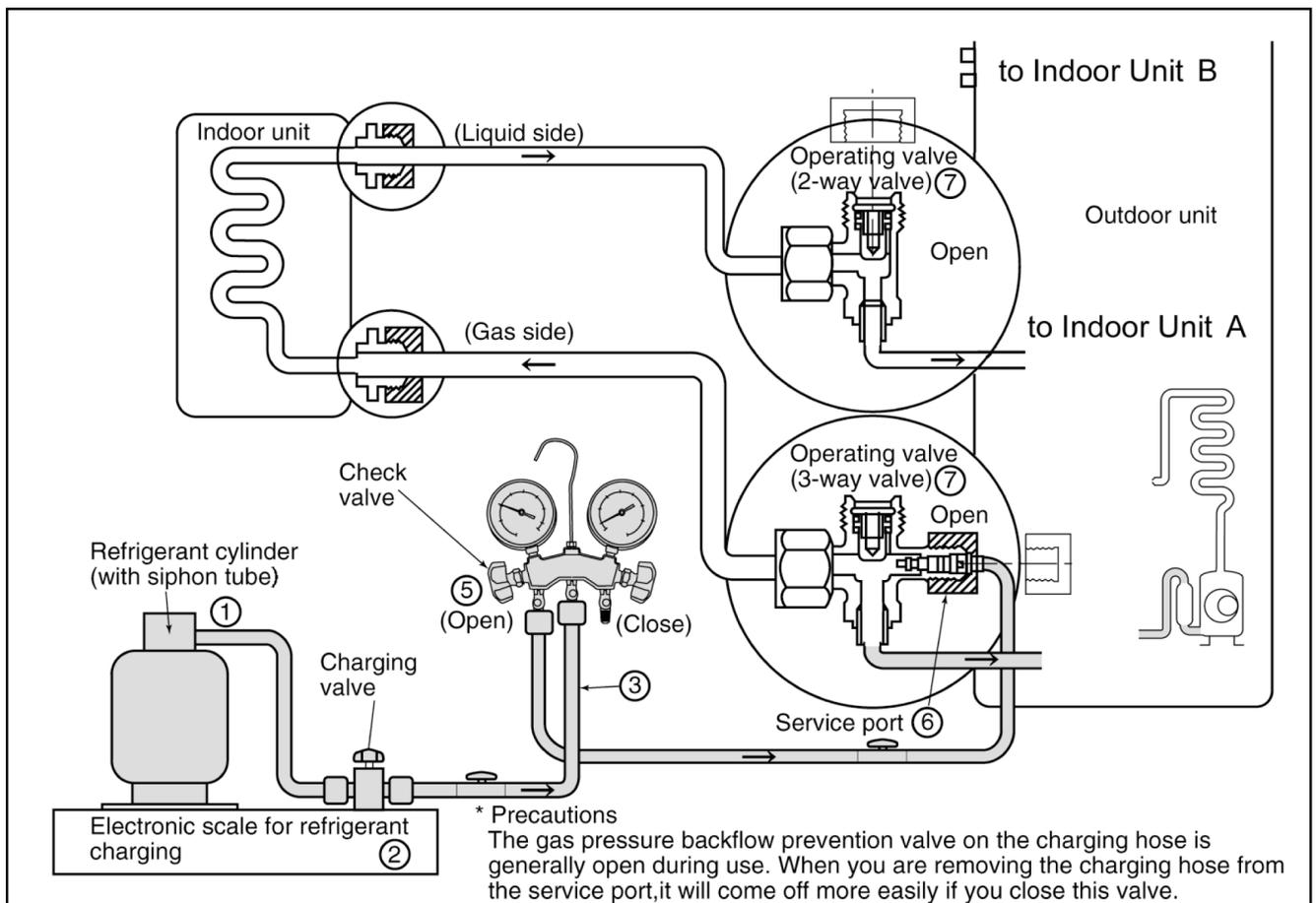


Fig. 13 Re-charging refrigerant

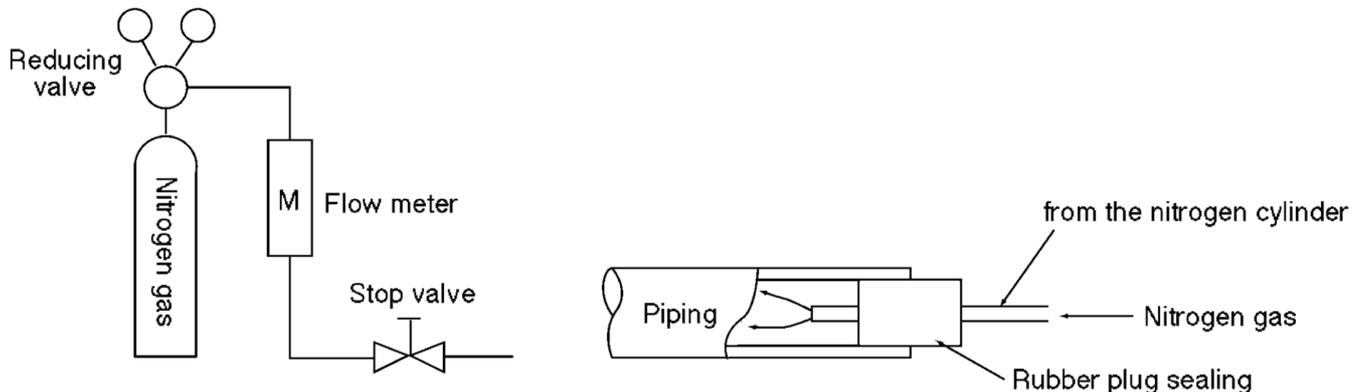
10.4.6. Brazing

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 (N₂) flow.

<Brazing Method for Preventing Oxidation>

1. Attach a reducing valve to the nitrogen gas cylinder.
2. Attach a reducing valve to the nitrogen gas cylinder.
3. 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.
4. When the nitrogen gas is flowing, be sure to keep the piping end open.
5. Adjust the flow rate of nitrogen gas so that it is lower than 0.05 m³/h, or 0.02 MPa (0.2 kgf/cm²) by means of the reducing valve.
6. 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).
7. Completely remove the flux after 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. Preventing 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 damaged 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.

10.4.7. 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.

11 Servicing Information

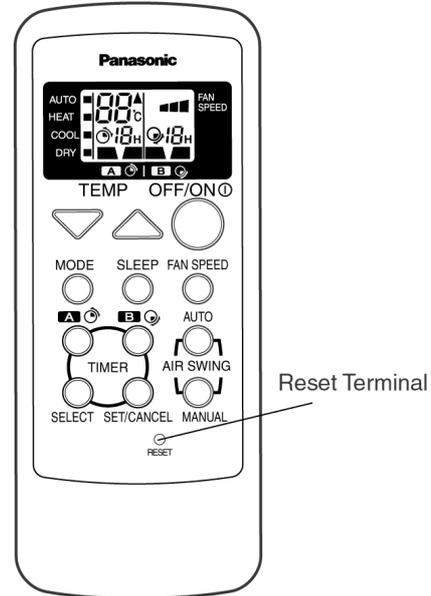
Caution:

- Pb free solder has a higher melting point than standard solder; Typically the melting point is 50 - 70°F (30 - 40°C) higher. Please use a high temperature soldering iron. In case of the soldering iron with temperature control, please set it to 700 ± 20°F (370 ± 10°C).
- Pb free solder will tend to splash when heated too high (about 1100° F/600°C).

• Remote Control Reset

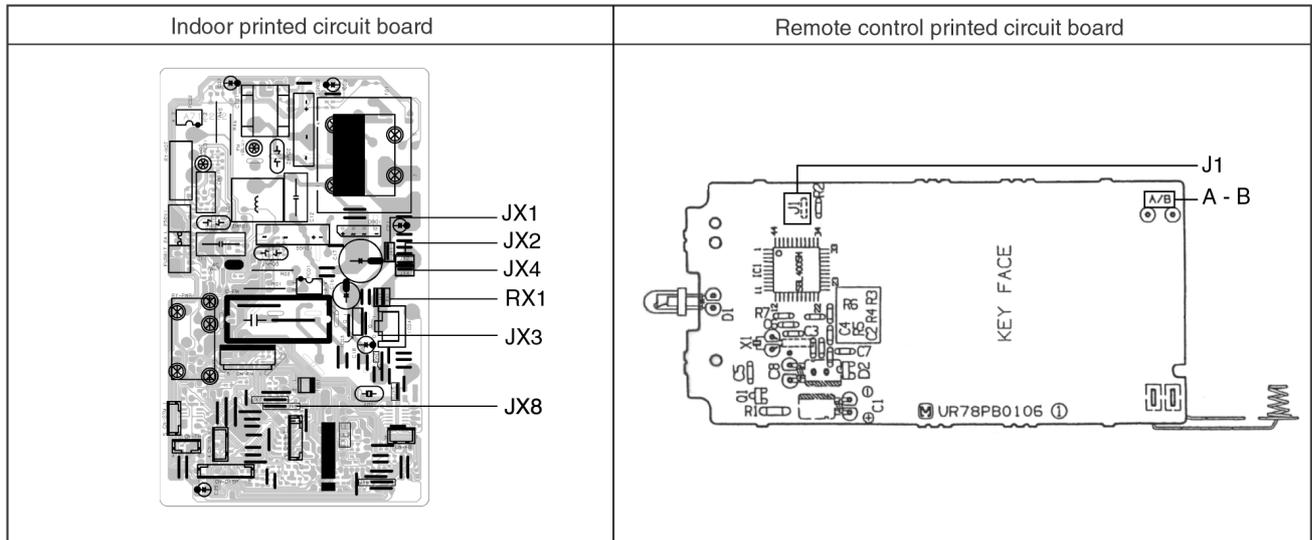
When the batteries are inserted for the first time, or the batteries are replaced, all the indications will blink and the remote control might not work.

If this happen, you will find a resetting terminal, and by shorting it with a minus screwdriver, it will return to normal.



• Changing the wireless remote control transmission code

When two indoor units are installed in the same room, in order to prevent operating errors caused by using two remote controls, cut a jumper wire at the remote control printed circuit board (A - B) and cut a jumper wire at the indoor printed circuit board (JX4). It is possible to select from 4 types of transmission codes including one at time of delivery condition (0).



	Remote control printed circuit board		Indoor printed circuit board					Note
	A - B	J1	JX1	JX2	JX3	JX4	RX 1	
0	SHORT	OPEN	SHORT	SHORT	SHORT	SHORT	—	At product delivery
1	OPEN	OPEN	SHORT	SHORT	SHORT	OPEN	—	
2	SHORT	SHORT	SHORT	OPEN	SHORT	OPEN	—	
3	OPEN	SHORT	OPEN	SHORT	SHORT	OPEN	—	

- Install indoor unit on the floor.
When you want to install indoor unit at the floor or wall mounting, you need to cut a jumper wire (JX8) at the indoor printed circuit board.

12 Troubleshooting Guide

12.1. Refrigeration cycle system

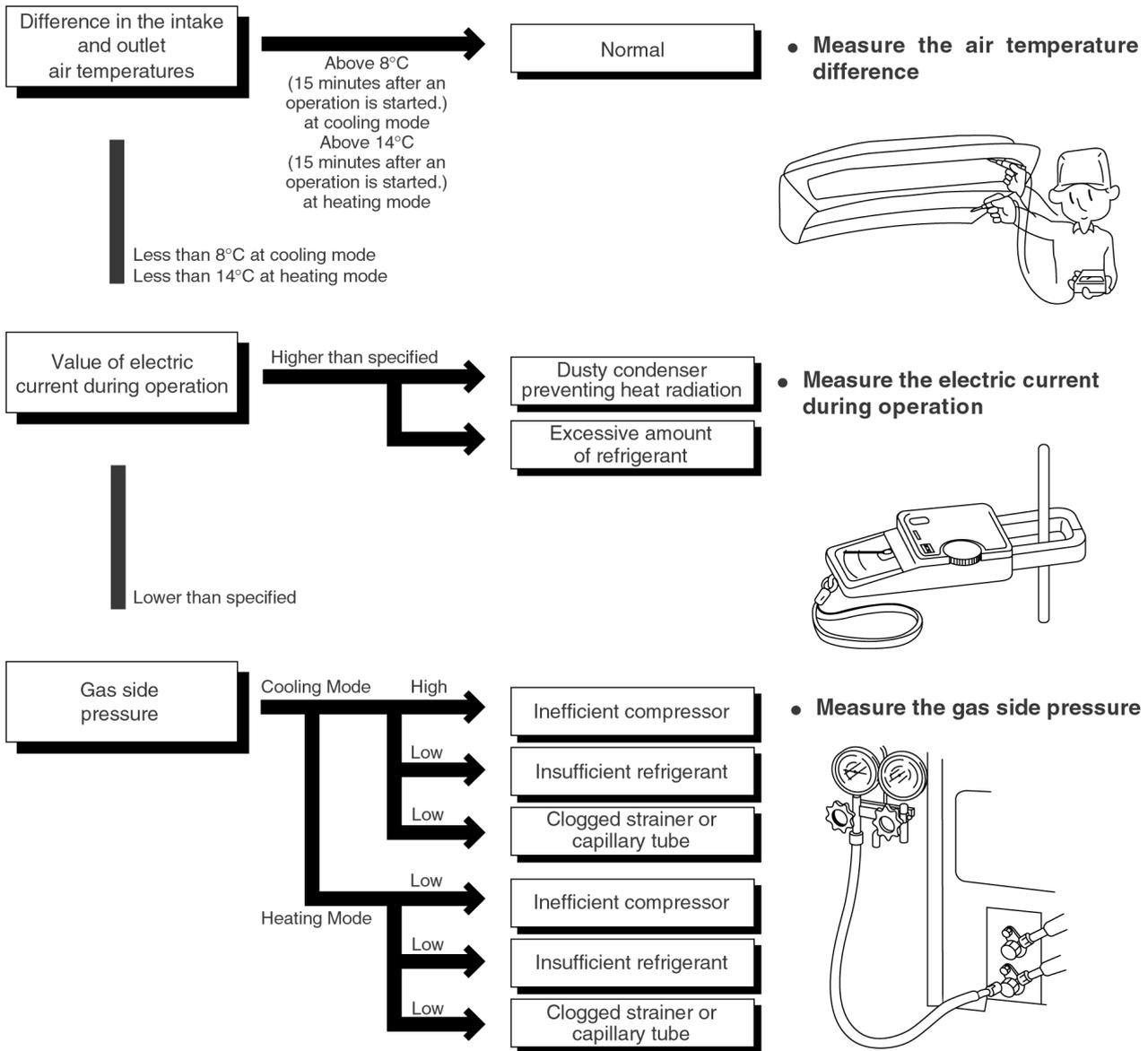
In order to diagnose malfunctions, make sure that there are no electrical problems before inspecting the refrigeration cycle. Such problems include insufficient insulation, problem with the power source, malfunction of a compressor and a fan.

The normal outlet air temperature and pressure of the refrigeration cycle depends on various conditions, the standard values for them are shown in the table on the right.

Normal Pressure and Outlet Air Temperature (Standard)

	Gas pressure MPa (kg/cm ² G)	Outlet air temperature (°C)
Cooling mode	0.4 ~ 0.6 (4 ~ 6)	12 ~ 16
Heating Mode	1.5 ~ 2.1 (15 ~ 21)	36 ~ 45

★ Condition: Indoor fan speed; High
Outdoor temperature is 35°C at cooling mode
and 7°C at heating mode



12.1.1. Relationship between the condition of the air conditioner and pressure and electric current

Condition of the air conditioner	Cooling Mode			Heating Mode		
	Low Pressure	High Pressure	Electric current during operation	Low Pressure	High Pressure	Electric current during operation
Insufficient refrigerant (gas leakage)						
Clogged capillary tube or Strainer						
Short circuit in the indoor unit						
Heat radiation deficiency of the outdoor unit						
Inefficient compression						

- Carry out the measurements of pressure, electric current, and temperature fifteen minutes after an operation is started.

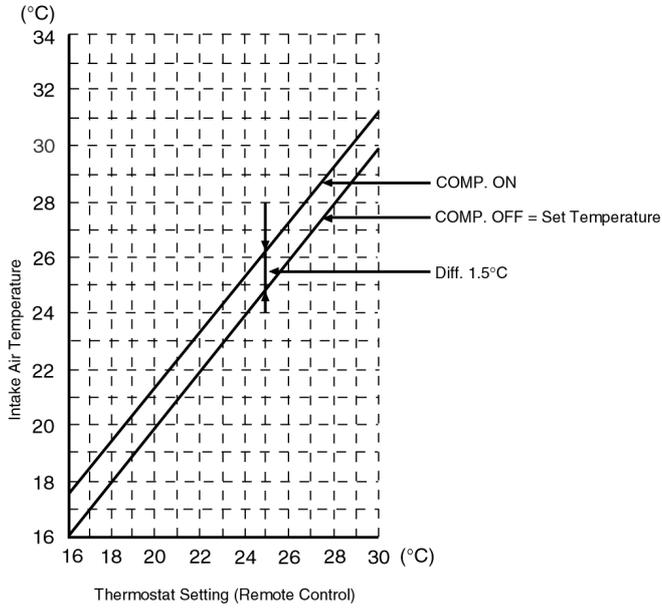
12.1.2. Diagnosis methods of a malfunction of a compressor and 4-way valve

Nature of fault	Symptom
Insufficient compressing of a compressor	<ul style="list-style-type: none"> • Electric current during operation becomes approximately 20% lower than the normal value. • The discharge tube of the compressor becomes abnormally hot (normally 70 to 90°C). • The difference between high pressure and low pressure becomes almost zero.
Locked compressor	<ul style="list-style-type: none"> • Electric current reaches a high level abnormally, and the value exceeds the limit of an ammeter. In some cases, a breaker turns off. • The compressor is a humming sound.
Insufficient switches of the 4-way valve	<ul style="list-style-type: none"> • Electric current during operation becomes approximately 80% lower than the normal value. • The temperature different between from the discharge tube to the 4-way valve and from suction tube to the 4-way valve becomes almost zero.

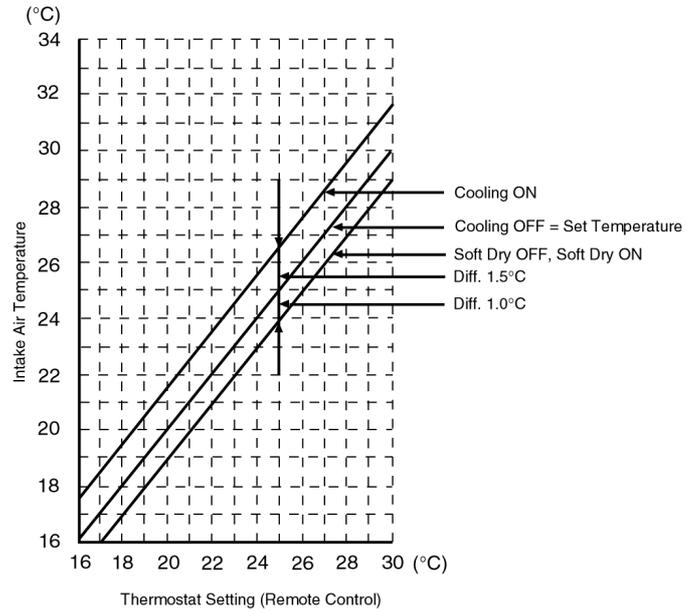
13 Technical Data

■ Thermostat characteristics

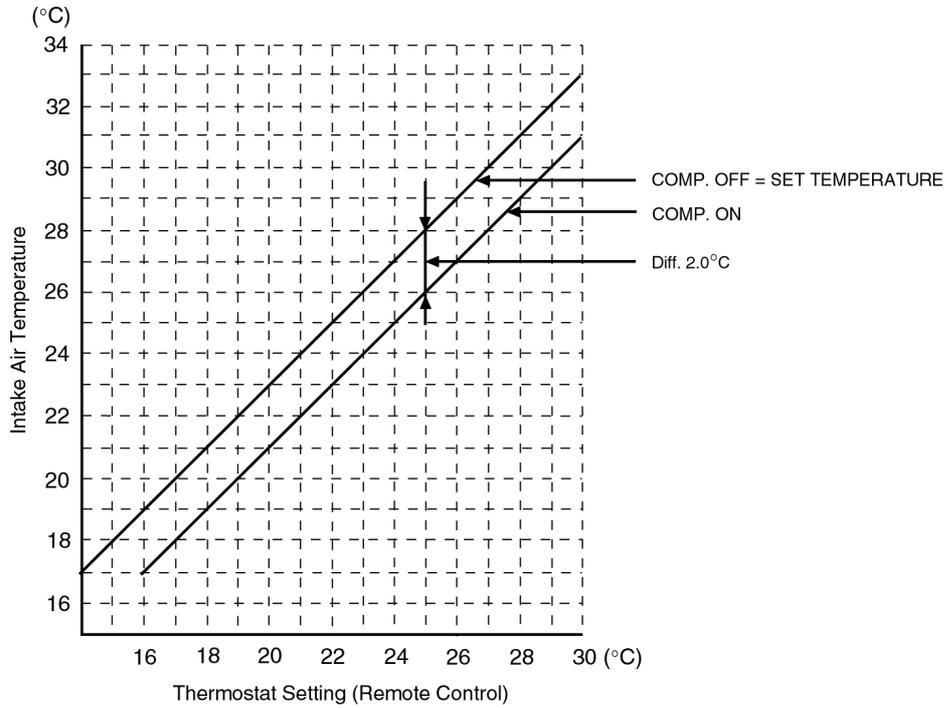
• Cooling



• Soft Dry



• Heating



■ Sensible Capacity Chart

• CS-W12CTP

230V	Outdoor Temp. (°C)											
Indoor wet bulb temp.	30			35			40			46		
	TC	SHC	IP	TC	SHC	IP	TC	SHC	IP	TC	SHC	IP
17.0°C	3.57	2.71	1.05	3.34	2.60	1.13	3.10	2.49	1.21	2.82	2.37	1.31
19.0°C				3.60		1.15						
19.5°C	3.92	2.83	1.07	3.66	2.72	1.15	3.41	2.62	1.24	3.10	2.50	1.33
22.0°C	4.27	2.94	1.09	3.99	2.83	1.18	3.72	2.73	1.26	3.38	2.60	1.36

• CS-W18CTP

230V	Outdoor Temp. (°C)											
Indoor wet bulb temp.	30			35			40			46		
	TC	SHC	IP	TC	SHC	IP	TC	SHC	IP	TC	SHC	IP
17.0°C	5.16	3.91	1.55	4.82	3.75	1.66	4.48	3.60	1.78	4.08	3.42	1.92
19.0°C				5.20		1.69						
19.5°C	5.66	4.09	1.58	5.29	3.93	1.70	4.92	3.79	1.82	4.48	3.60	1.96
22.0°C	6.17	4.25	1.61	5.77	4.08	1.73	5.37	3.94	1.85	4.88	3.76	1.99

• CS-W24CTP

230V	Outdoor Temp. (°C)											
Indoor wet bulb temp.	30			35			40			46		
	TC	SHC	IP	TC	SHC	IP	TC	SHC	IP	TC	SHC	IP
17.0°C	6.84	5.19	2.52	6.40	4.98	2.71	5.95	4.78	2.90	5.41	4.54	3.13
19.0°C				6.90		2.75						
19.5°C	7.51	5.43	2.57	7.02	5.22	2.76	6.53	5.02	2.95	5.94	4.78	3.18
22.0°C	8.19	5.63	2.61	7.65	5.42	2.81	7.12	5.23	3.01	6.47	4.98	3.24

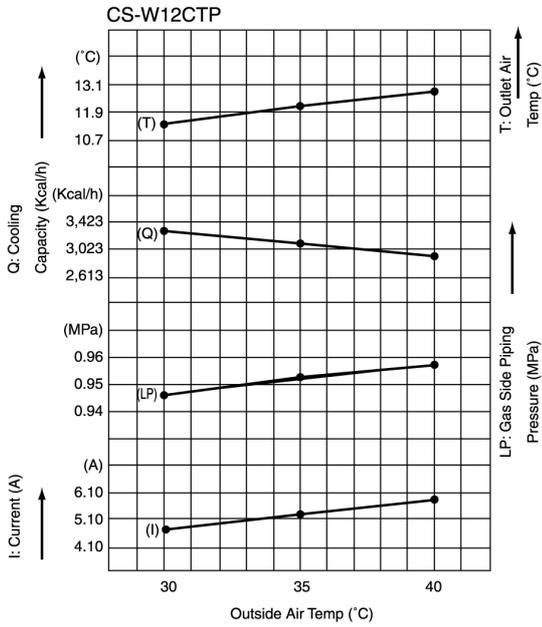
TC - Total Cooling Capacity (kW)
 SHC - Sensible Heat Capacity (kW)
 IP - Input Power (kW)

Indoor 27°C/19°C
 Outdoor 35°C/24°C

■ Operation Characteristics

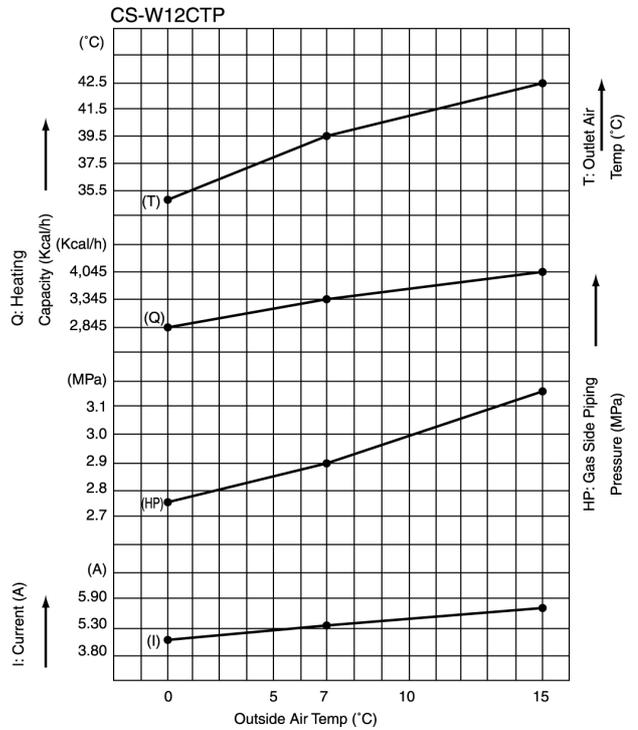
Cooling charactics - Outdoor temperature
 (Condition : Room Temperature ; 27°C (D.B.T)
 Cooling operation ; at High Fan

[1] a



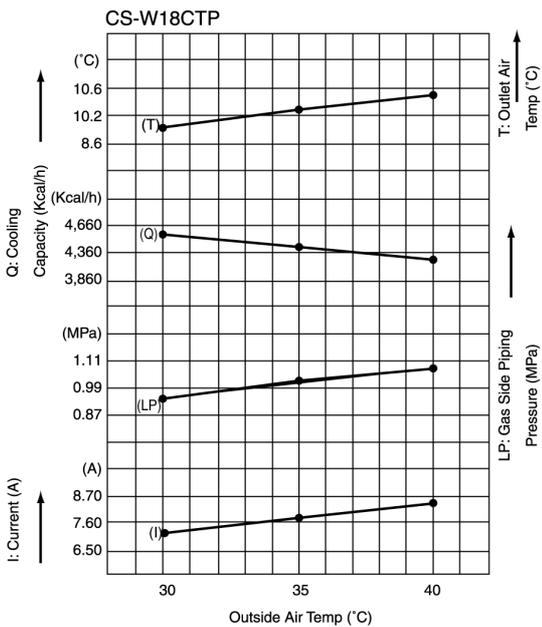
Heating charactics - Outdoor temperature
 (Condition : Room Temperature ; 20°C (D.B.T)
 Heating operation ; at High Fan

[1] b



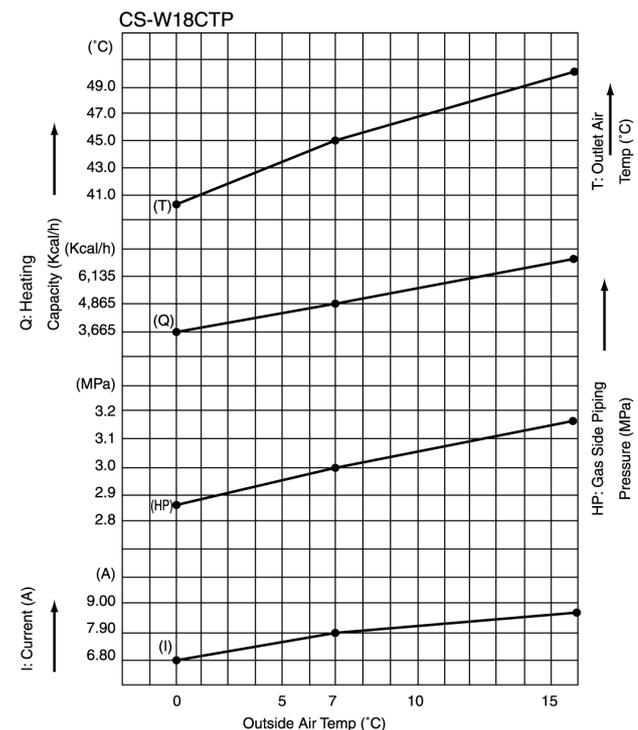
Cooling charactics - Outdoor temperature
 (Condition : Room Temperature ; 27°C (D.B.T)
 Cooling operation ; at High Fan

[2] a



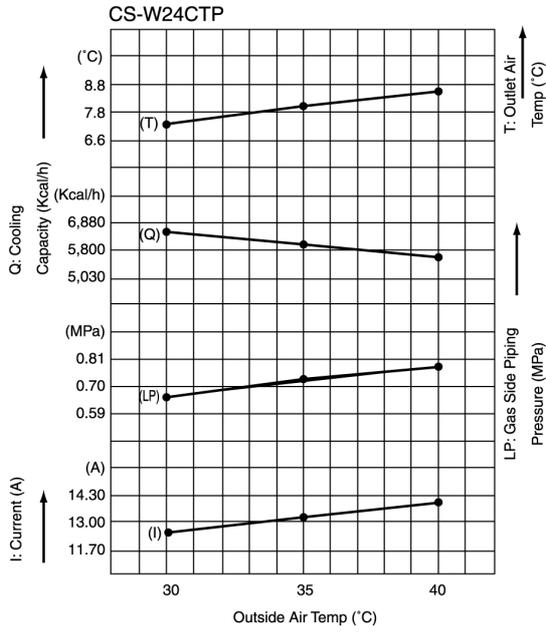
Heating charactics - Outdoor temperature
 (Condition : Room Temperature ; 20°C (D.B.T)
 Heating operation ; at High Fan

[2] b



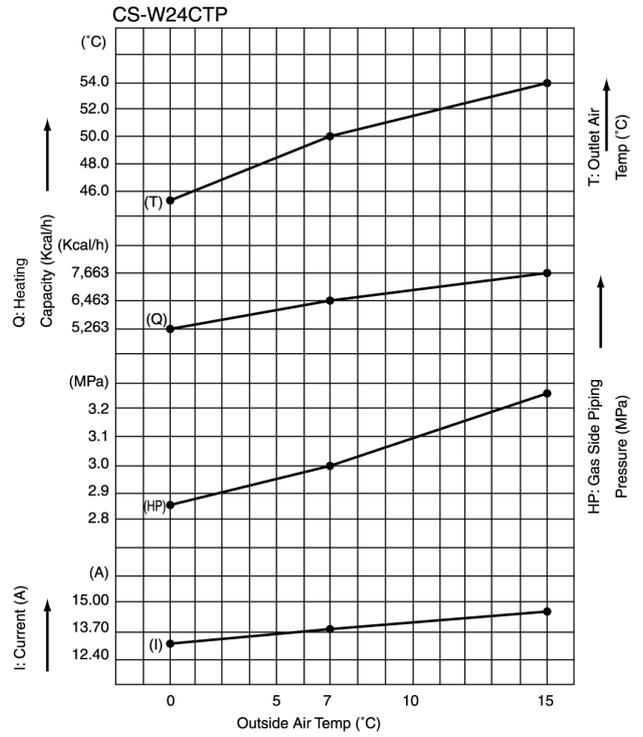
Cooling charactics - Outdoor temperature
 (Condition : Room Temperature ; 27°C (D.B.T)
 Cooling operation ; at High Fan

[3] a



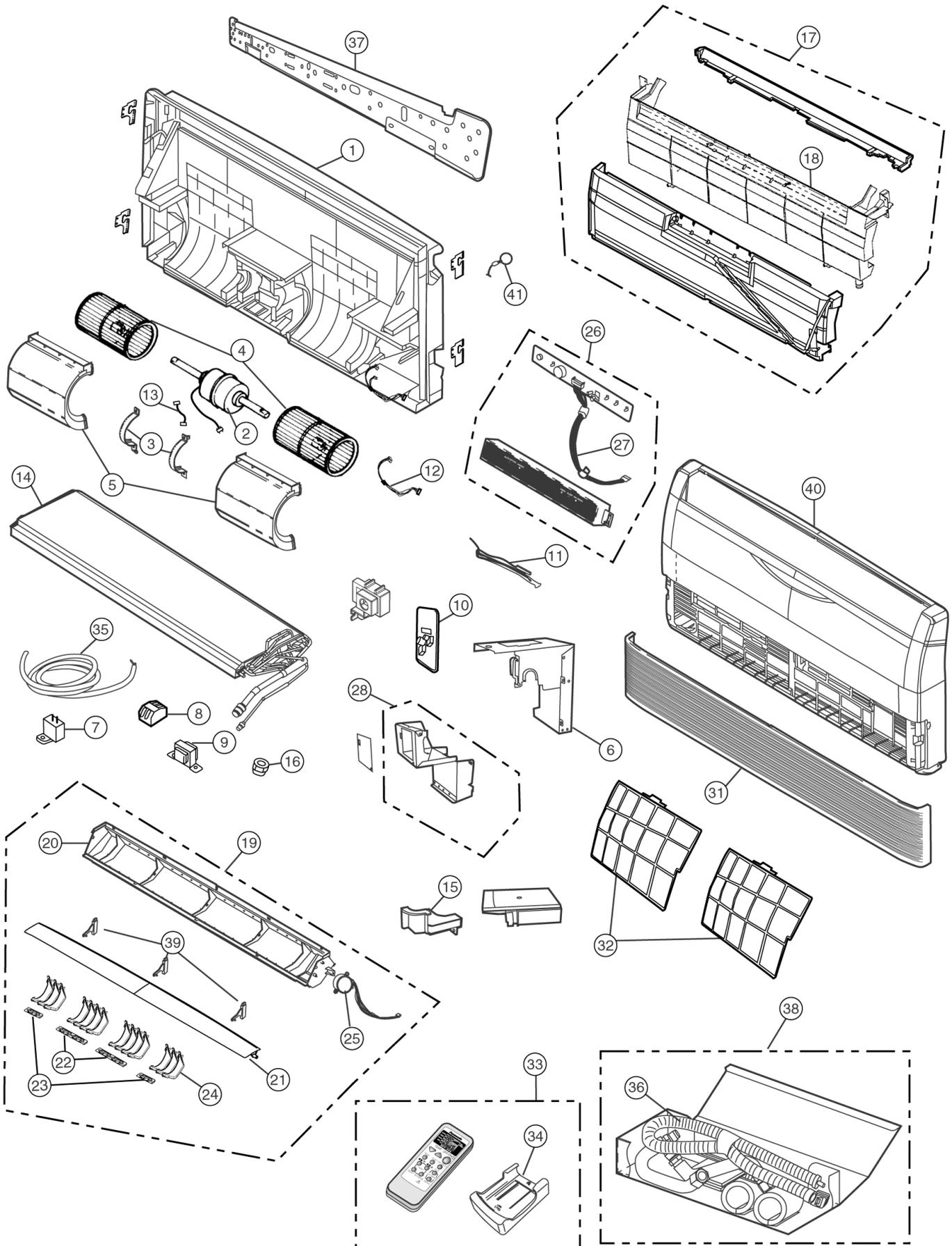
Heating charactics - Outdoor temperature
 (Condition : Room Temperature ; 20°C (D.B.T)
 Heating operation ; at High Fan

[3] b



14 Exploded View

CS-W12CTP / CS-W18CTP / CS-W24CTP



15 Replacement Parts List

<Model: CS-W12CTP / CS-W18CTP / CS-W24CTP>

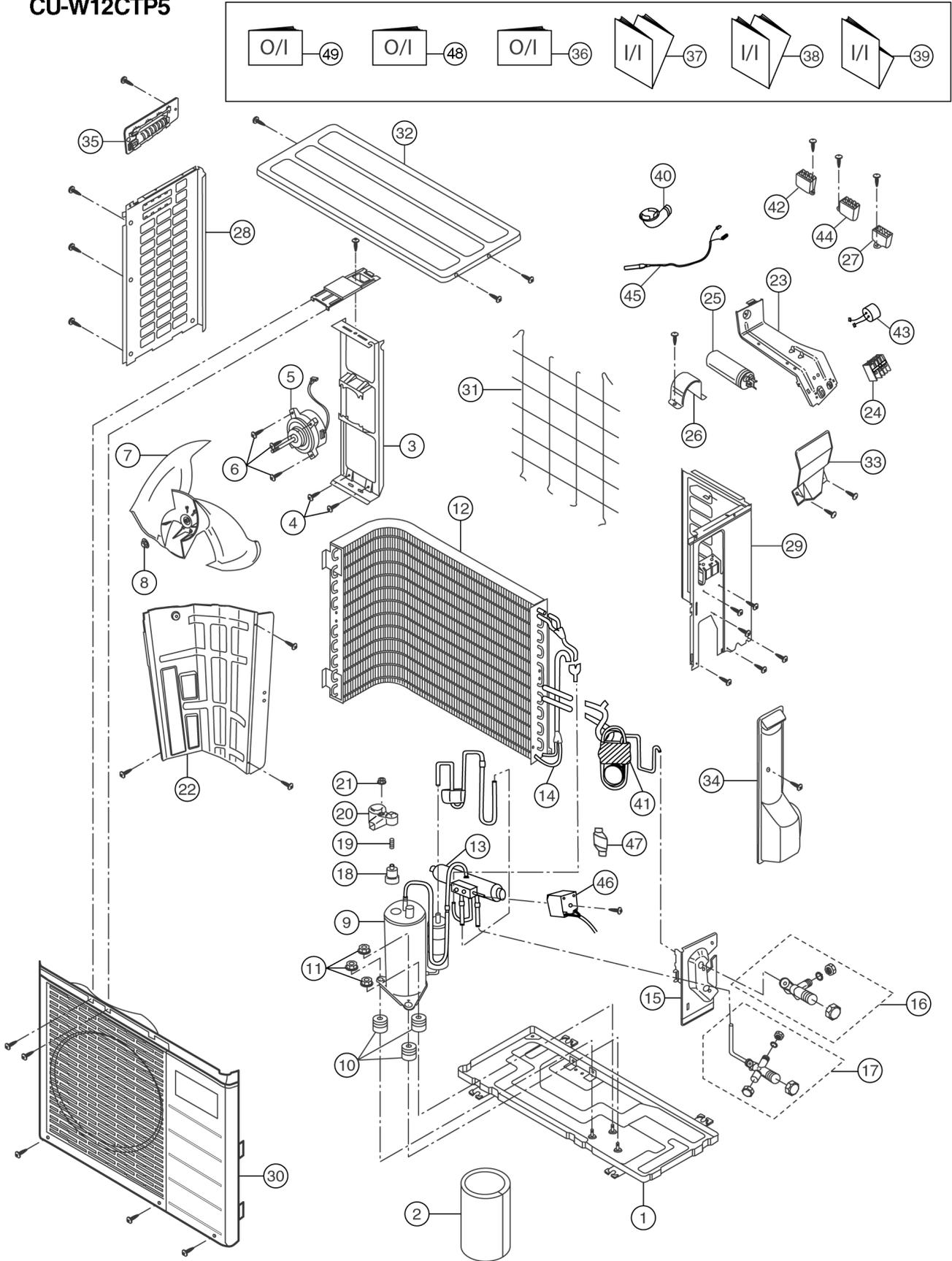
REF NO.	DESCRIPTION & NAME	QTY.	CS-W12CTP	CS-W18CTP	CS-W24CTP	REMARKS
1	CHASSY COMPLETE	1	CWD50C1258	←	←	
2	FAN MOTOR	1	CWA921172	CWA921158	←	O
3	SUPPORTER FAN MOTOR	2	CWD932270	←	←	
4	BLOWER WHEEL ASSY	2	CWH01K1014	←	←	
5	AIR GUIDER B.W.	2	CWD321046	←	←	
6	CONTROL BOARD ASSY	1	CWH10K1030	←	←	
7	CAPACITOR	1	DS441155BLSA (1.5 μF/440V)	DS441305BLSA (3.0 μF/440V)	←	O
8	TERMINAL BOARD ASSY	1	CWA28K1063	←	←	O
9	TRANSFORMER	1	CWA401030	←	←	O
10	ELECTRONIC CONTROLLER	1	CWA742919	CWA743209	CWA743208	O
11	SENSOR ASSY COMP	1	CWA50C2157	←	←	O
12	LEAD WIRE FAN MOTOR	1	CWA67C4431	←	←	
13	LEAD WIRE FAN MOTOR	1	CWA67C4474	←	←	
14	EVAPORATOR	1	CWB30C1329	CWB30C1331	CWB30C1378	
15	SUPPORTER TUBE ASSY	1	CWD932259	←	←	
16	FLARE NUT	1	CWT25007	←	CWT25004	
17	DRAIN PAN COMPLETE	1	CWH40C1023	←	←	
18	TAP DRAIN TRAY	1	CWH401031	←	←	
19	DISCHARGE GRILLE COMPLETE	1	CWE20C2223	←	CWE20C2189	
20	DISCHARGE GRILLE	1	CWE201046	←	←	
21	VANE-AIR SWING	1	CWE241124	←	←	
22	CONNECTING BAR	2	CWE261052	←	←	
23	CONNECTING BAR	2	CWE261053	←	←	
24	VANE	14	CWE241126	←	←	O
25	AIR SWING MOTOR	1	CWA981085	←	←	O
26	INDICATOR COMP.	1	CWE39C1069	←	←	
27	LEAD WIRE INDICATOR	1	CWA67C4433	←	←	
28	CONTROL BOARD CASING ASSY	1	CWH13K1009	←	←	
31	INTAKE GRILLE	1	CWE221084	←	←	
32	AIR FILTER	2	CWD001088	←	←	
33	REMOTE CONTROL COMPLETE	1	CWA75C2317	←	←	O
34	REMOTE CONTROL HOLDER	1	-	-	-	
35	POWER SUPPLY CORD	1	CWA20C2286	CWA20C2285	CWA20C2284	
36	DRAIN HOSE	1	CWH85284	←	←	
37	INSTALLATION HOLDER	1	CWH361018	←	←	
38	ACCESSORY COMPLETE	1	CWH82C1166	←	CWH82C1156	
39	FULCRUM	3	CWH621030	←	←	
40	FRONT GRILLE	1	CWE11C2872	←	←	
41	STRING COMPLETE	1	CWH84C1006	←	←	

(Note)

- All parts are supplied from MAICO, Malaysia (Vendor Code: 061).
- "O" marked parts are recommended to be kept in stock.

16 Exploded View

CU-W12CTP5



Note:

The above exploded view is for the purpose of parts disassembly and replacement.
 The non-numbered parts are not kept as standard service parts.

17 Replacement Parts List

<Model: CU-W12CTP5>

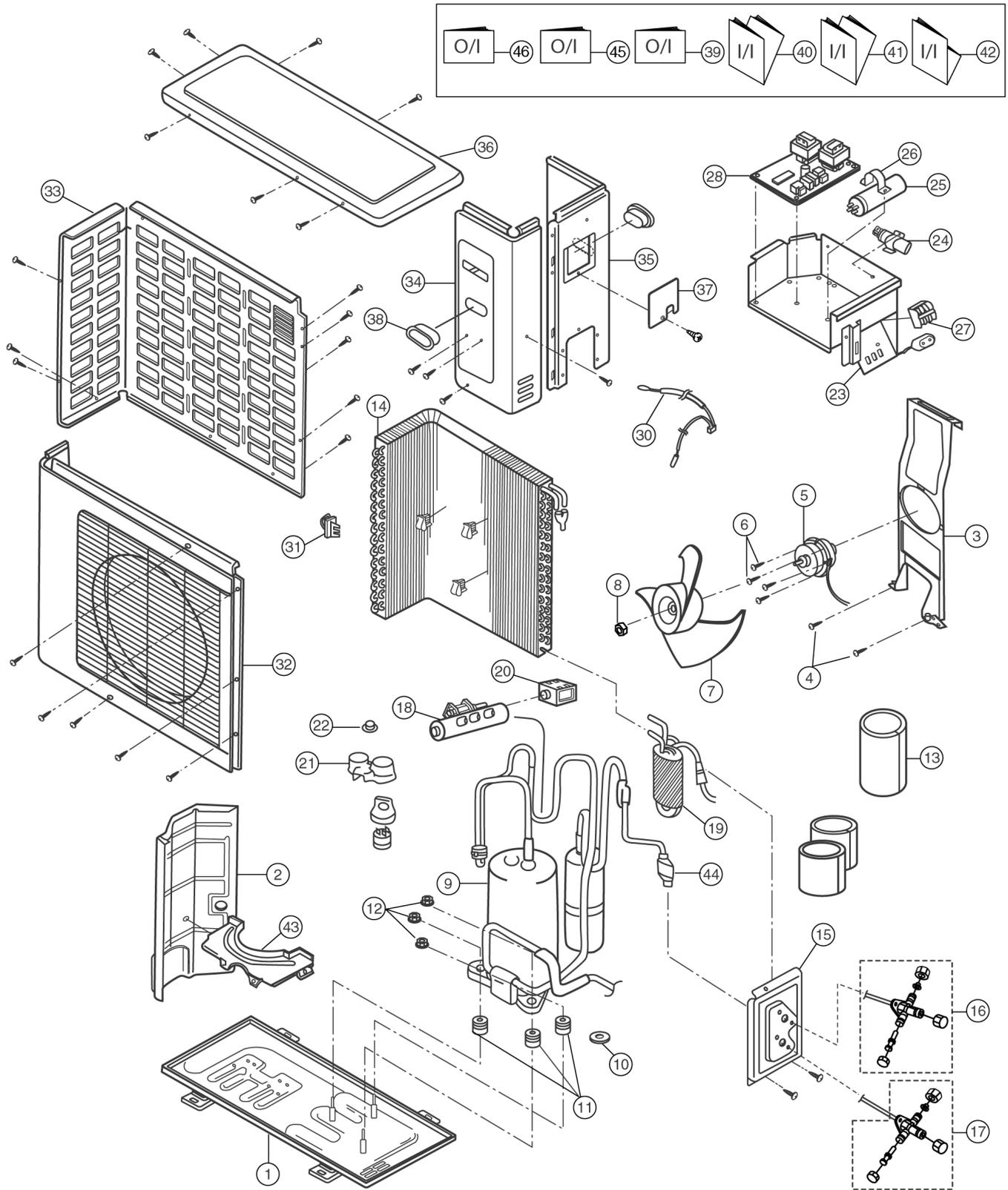
REF. NO.	PART NAME & DESCRIPTION	QTY.	CU-W12CTP5	REMARKS
1	CHASSY ASS'Y	1	CWD50K2074	
2	SOUND PROOF MATERIAL	1	CWG302088	
3	FAN MOTOR BRACKET	1	CWD541030	
4	SCREW - FAN MOTOR BRACKET	2	CWH551059	
5	FAN MOTOR	1	CWA951117	0
6	SCREW - FAN MOTOR MOUNT	3	CWH55406	
7	PROPELLER FAN ASS'Y	1	CWH03K1006	
8	NUT - PROPELLER FAN	1	CWH56053	
9	COMPRESSOR	1	GB134PAA	0
10	ANTI - VIBRATION BUSHING	3	CWH501024	
11	NUT - COMPRESSOR MOUNT	3	CWH4582065	
12	CONDENSER	1	CWB32C1108	
13	4-WAY VALVE	1	CWB001011	0
14	STRAINER	1	CWB11025	
15	HOLDER COUPLING ASS'Y	1	CWH351023	
16	2-WAY VALVE (LIQUID)	1	CWB021057	0
17	3-WAY VALVE (GAS)	1	CWB011062	0
18	OVERLOAD PROTECTOR	1	CWA121057	0
19	HOLDER - O.L.P.	1	-	
20	TERMINAL COVER	1	CWH171021	
21	NUT - TERMINAL COVER	1	CWH561020	
22	SOUND PROOF BOARD	1	CWH151023	
23	CONTROL BOARD	1	CWH102102	
24	TERMINAL BOARD ASS'Y	1	CWA28K1034	
25	CAPACITOR - COMPRESSOR	1	DS371356CPNA (35µF, 370VAC)	0
26	HOLDER CAPACITOR	1	CWH30057	
27	CAPACITOR - FAN MOTOR	1	DS441205NPQA (2.0µF, 450VAC)	0
28	CABINET SIDE PLATE (L)	1	CWE041031A	
29	CABINET SIDE PLATE (R)	1	CWE041037A	
30	CABINET FRONT PLATE	1	CWE06K1034	
31	WIRE NET	1	CWD041023A	
32	CABINET TOP PLATE	1	CWE031014A	
33	PLATE - C. B. COVER	1	CWH131088	
34	CONTROL BOARD COVER	1	CWH131092	
35	HANDLE	1	CWE161010	
36	OPERATION INSTRUCTIONS	1	CWF563973	
37	INSTALLATION INSTRUCTIONS (ENGLISH, FRANCAIS, ESPANOL & DEUTSCH)	1	CWF612430	
38	INSTALLATION INSTRUCTIONS (ITALIANO, NEDERLANDS, PORTUGUES & GREEK)	1	CWF612431	
39	INSTALLATION INSTRUCTIONS (RUSSIA)	1	CWF612432	
40	L-TUBE	1	CWH5850080	
41	TUBE ASS'Y (CHECK VALVE/CAPILLARY)	1	CWT01C2826	
42	ELECTRO MAGNETIC SWITCH	1	CWA00059	0
43	ELECTROLYTIC CAPACITOR	1	CWA32C067	0
44	ELECTRO MAGNETIC SWITCH	1	K6A2C7A00002	0
45	TEMPERATURE RELAY	1	CWA14C1009	0
46	V-COIL COMPLETE	1	CWA43C2069	0
47	TUBE ASS'Y (RECEIVER)	1	CWT01C2731	
48	OPERATION INSTRUCTIONS	1	CWF563974	
49	OPERATION INSTRUCTIONS	1	CWF563975	

(Note)

- All parts are supplied from MAICO, Malaysia (Vendor Code: 061).
- "O" marked parts are recommended to be kept in stock.

18 Exploded View

CU-W18CTP5 / CU-W24CTP5



Note:
 The above exploded view is for the purpose of parts disassembly and replacement.
 The non-numbered parts are not kept as standard service parts.

19 Replacement Parts List

<Model: CU-W18CTP5 / CU-W24CTP5>

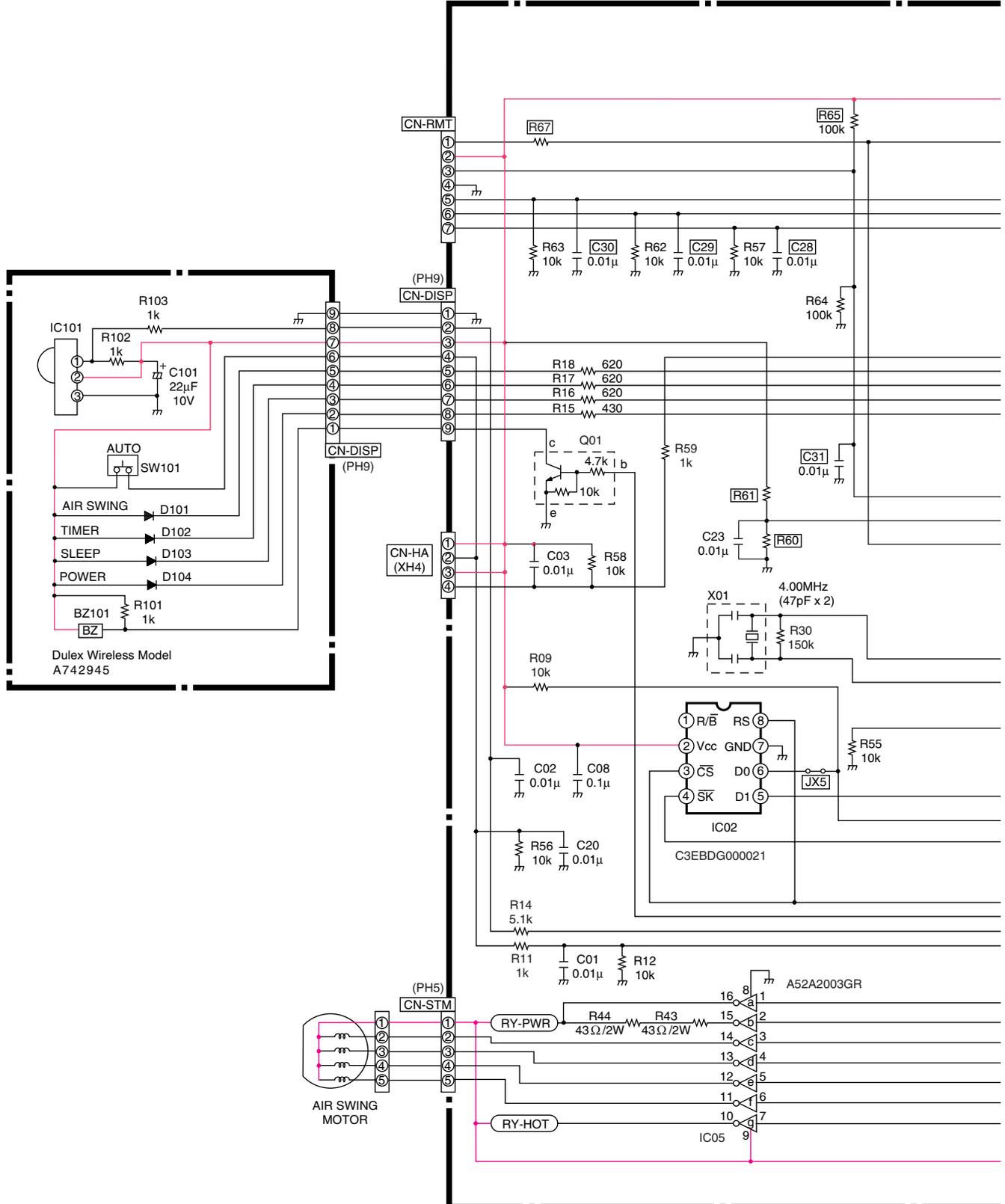
REF. NO.	PART NAME & DESCRIPTION	QTY.	CU-W18CTP5	CU-W24CTP5	REMARKS
1	CHASSY ASS'Y	1	CWD50K515B	CWD50K514B	
2	SOUND PROOF BOARD	1	CWH15223	←	
3	FAN MOTOR BRACKET	1	CWD54237	←	
4	SCREW - FAN MOTOR BRACKET	4	CWH55027	←	
5	FAN MOTOR	1	CWA921182	CWA921081	0
6	SCREW - FAN MOTOR MOUNT	4	CWH55252	←	
7	PROPELLER FAN ASS'Y	1	CWH00K087	CWH00K1001	
8	NUT - PROPELLER FAN	1	CWH56053	CWH56060	
9	COMPRESSOR	1	5KS205DAA	5JS315DAA	0
10	PACKING	1	CWB81043	←	
11	ANTI - VIBRATION BUSHING	3	CWH50055	←	
12	NUT - COMPRESSOR MOUNT	3	CWH4582065	←	
13	SOUND PROOF MATERIAL	1	CWG30894	←	
14	CONDENSER	1	CWB32C1298	CWB32C1300	
15	HOLDER COUPLING ASS'Y	1	CWH35K029B	CWH35K030B	
16	3-WAY VALVE (LIQUID)	1	CWB021165	←	0
17	3-WAY VALVE (GAS)	1	CWB011155	CWB011156	0
18	4-WAY VALVE ASS'Y	1	CWB00K1011	CWB00K1012	0
19	TUBE ASS'Y (CAPILLARY TUBE & STRAINER)	1	CWT01C2808	CWT01C2444	
20	V-COIL COMPLETE	1	CWA443C2121	←	0
21	TERMINAL COVER	1	CWH171012	←	
22	NUT - TERMINAL COVER	1	CWH7080300	←	
23	CONTROL BOARD	1	CWH10K1019	←	
24	CAPACITOR - FAN MOTOR	1	F0GAH305A002	←	0
25	CAPACITOR - COMPRESSOR	1	DS371506CPNA	DS371456CPNA	0
26	HOLDER CAPACITOR	1	CWH30060	←	
27	TERMINAL BOARD ASS'Y	1	CWA28K1021	←	
28	ELECTRONIC CONTROLLER	1	CWA743072	←	
30	SENSOR COMPLETE	1	CWA50C618	←	
31	HOLDER - SENSOR	1	CWH32089	←	
32	CABINET FRONT PLATE	1	CWE06K034B	←	
33	CABINET REAR PLATE	1	CWE02096B	←	
34	CABINET FRONT PLATE	1	CWE06075B	←	
35	CABINET SIDE PLATE	1	CWE04111B	←	
36	CABINET TOP PLATE	1	CWE03101B	←	
37	CONTROL BOARD COVER	1	CWH13336A	←	
38	HANDLE	2	CWE16000E	←	
39	OPERATION INSTRUCTIONS	1	CFW563973	←	
40	INSTALLATION INSTRUCTIONS (ENGLISH, FRANCAIS, ESPANOL & DEUTSCH)	1	CFW612430	←	
41	INSTALLATION INSTRUCTIONS (ITALIANO, NEDERLANDS, PORTUGUES & GREEK)	1	CFW612431	←	
42	INSTALLATION INSTRUCTIONS (RUSSIA)	1	CFW612432	←	
43	PARTICULATE PLATE	1	CWD90830	←	
44	TUBE ASS'Y (RECEIVER)	1	CWT01C2821	CWT01C2495	
45	OPERATION INSTRUCTION	1	CFW563974	←	
46	OPERATION INSTRUCTION	1	CFW563975	←	

- All parts are supplied from MAICO, Malaysia (Vendor Code: 061).
- "O" marked parts are recommended to be kept in stock.

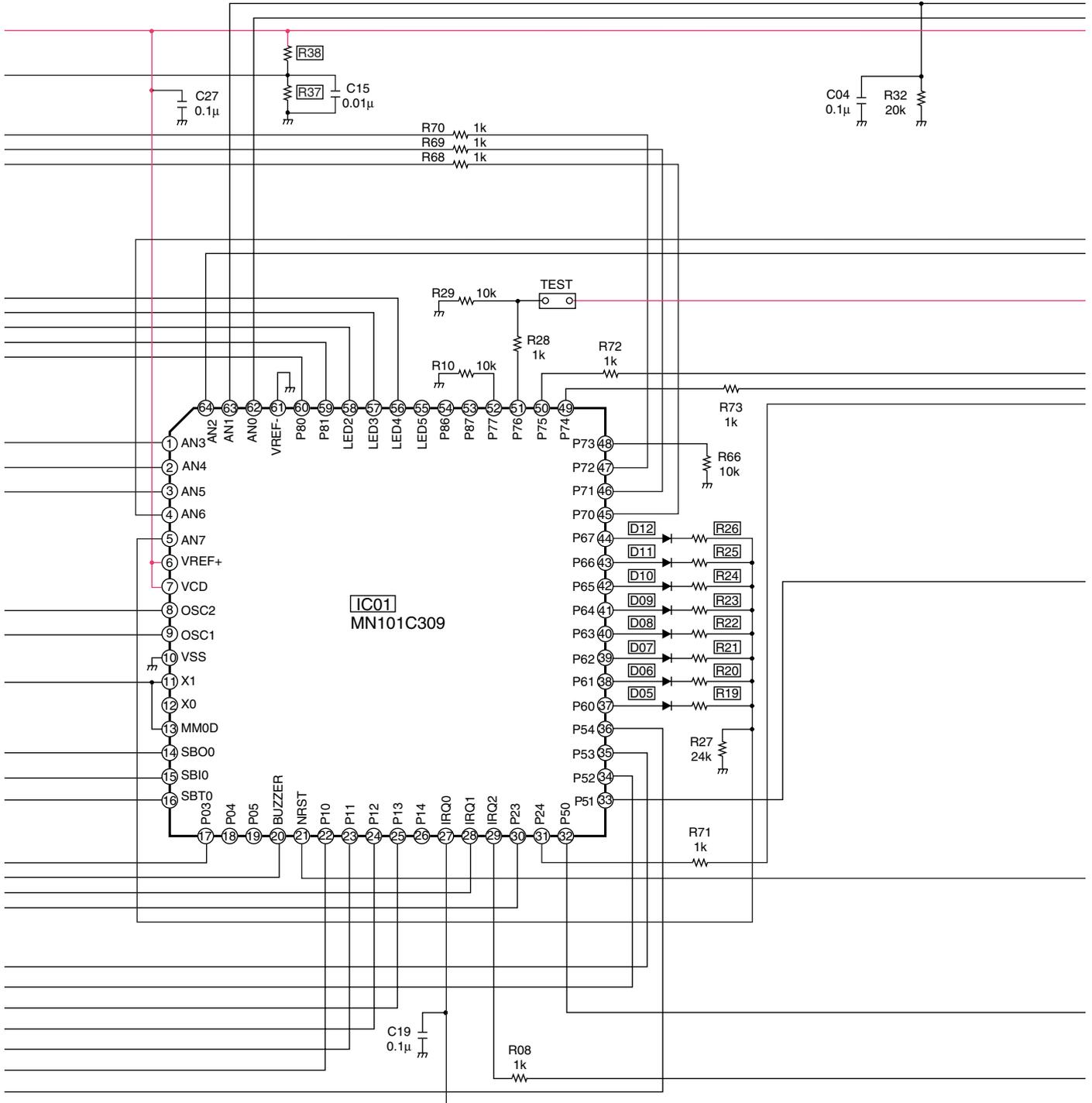
20 Electronic Circuit Diagram

• CS-W12CTP / CU-W12CTP5

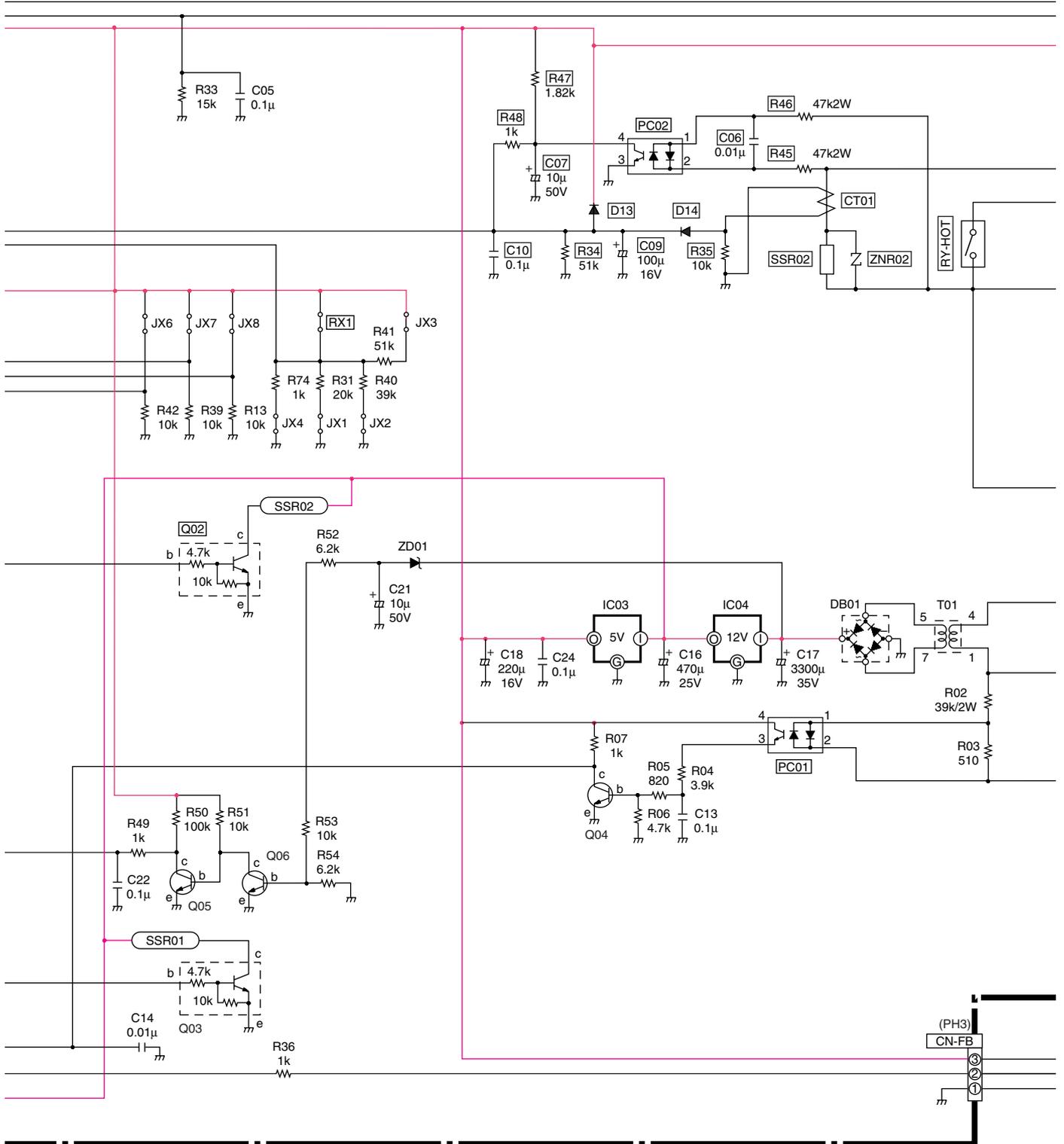
SCHEMATIC DIAGRAM 1/4



SCHEMATIC DIAGRAM 2/4

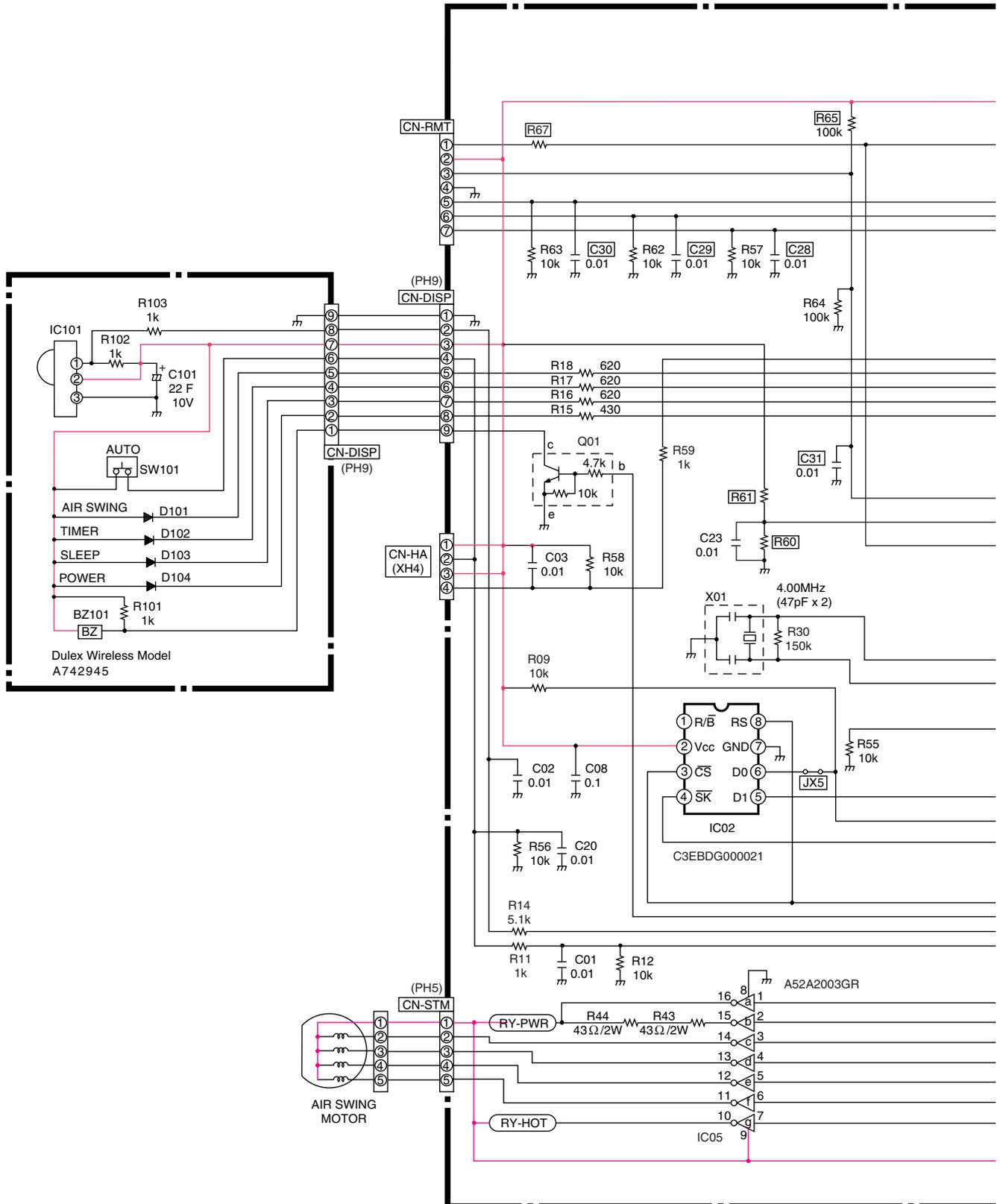


SCHEMATIC DIAGRAM 3/4

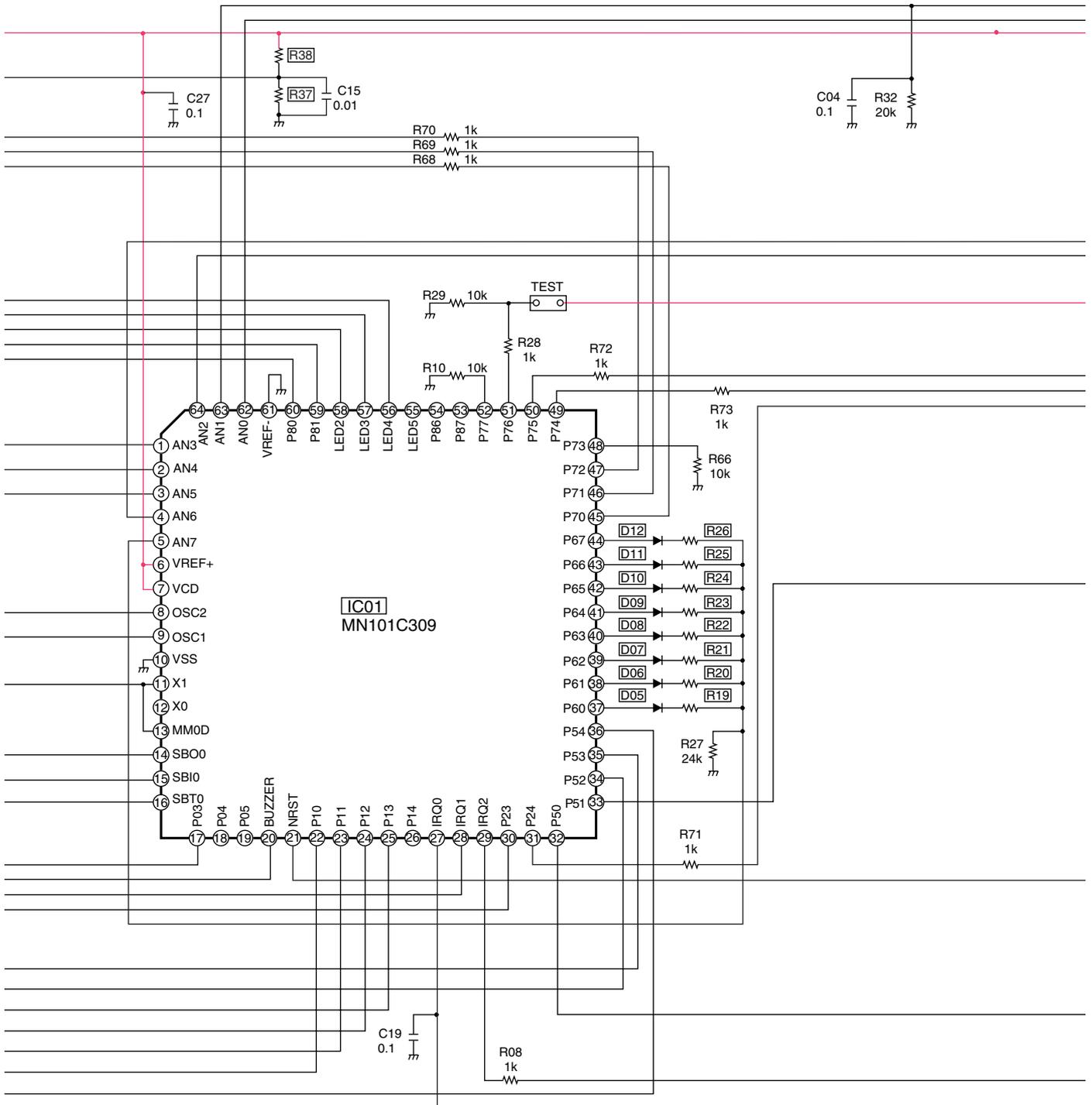


- CS-W18CTP / CU-W18CTP5
- CS-W24CTP / CU-W24CTP5

SCHEMATIC DIAGRAM 1/4



SCHEMATIC DIAGRAM 2/4



SCHEMATIC DIAGRAM 3/4

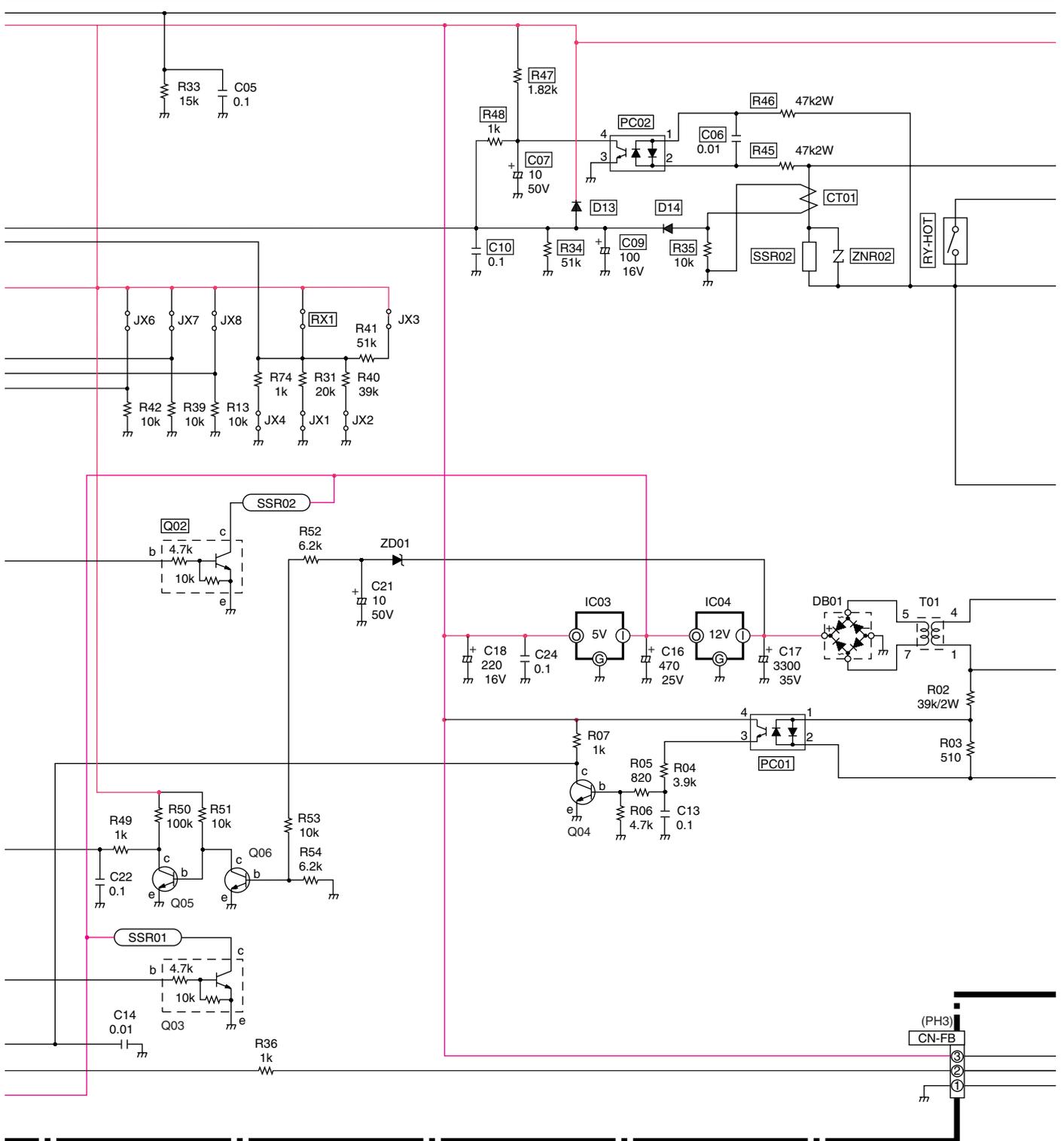


Fig. 1

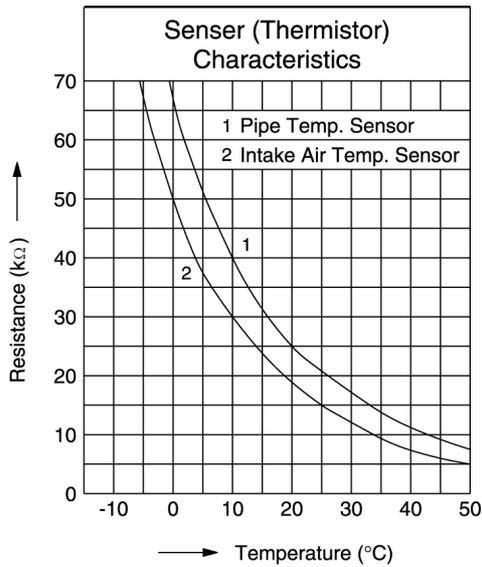


Fig. 2

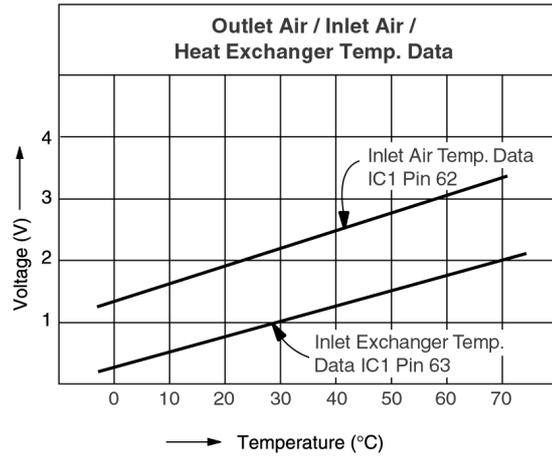
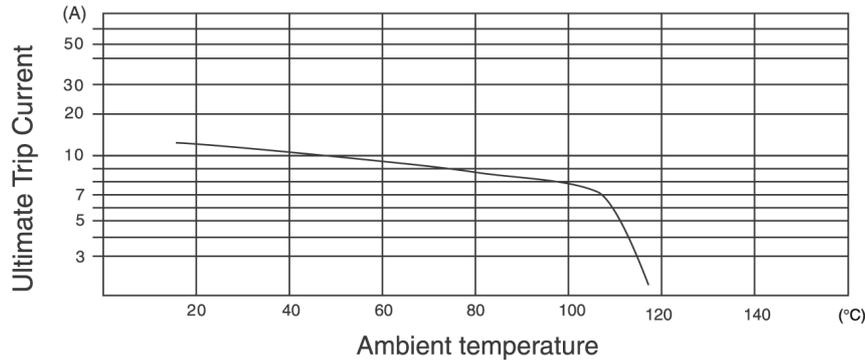


Fig. 3 OLP Characteristics (Compressor) (W12CT)



How to use electronic circuit diagram

Before using the circuit diagram, read the following carefully.

*** Voltage measurement**

Voltage has been measured with a digital tester when the indoor fan is set at high fan speed under the following conditions without setting the timer. Use them for servicing. Voltage indication is in Red at all operations.

	Intake air temperature	Temperature setting	Discharge air temperature	Pipe temperature
Cooling	27°C	16°C	17°C	15°C
Heating	20°C	30°C	40°C	50°C

*** Indications for resistance**

- a. K...kΩ M...MΩ
- W...watt Not indicated....1/4W
- b. Type
- Not indicated.....carbon resistor
-metal oxide resistor
-Tolerance±5%
-Tolerance±1%

*** Indications for capacitor**

- a. Unit μ...μF P...pF
- b. Type Not indicated....ceramic capacitor
- (S).....S series aluminium electrolytic capacitor
- (Z).....Z series aluminium electrolytic capacitor
- (SU).....SU series aluminium electrolytic capacitor
- (P).....P series polyester system
- (SXE).....SXE series aluminium electrolytic capacitor
- (SRA).....SRA series aluminium electrolytic capacitor
- (KME).....KME series aluminium electrolytic capacitor

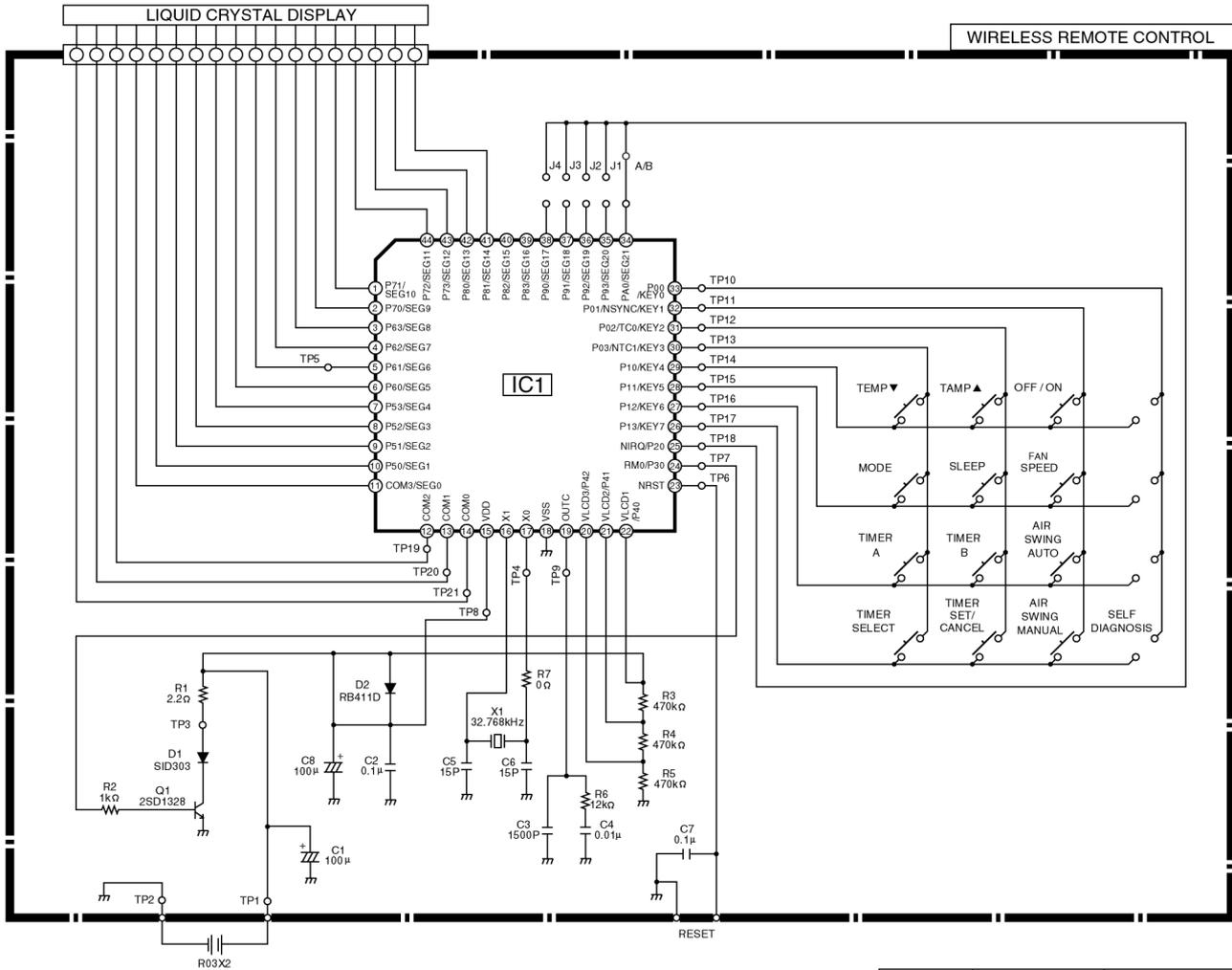
* Diode without indication.....MA165

※ Circuit Diagram is subject to change without notice for further development.

TIMER TABLE

Name		Time	Test Mode (When test point Short-circuited)	Remarks
Real Timer		1 hr.	1 min.	
		10 min.	10 sec.	
		1 min.	1 sec.	
Time Delay Safety Control		2 min. 58 sec.	0 sec.	
Forced Operation		60 sec.	0 sec.	
Time Save Control		7 min.	4.2 sec.	
Anti-Freezing		4 min.	0 sec.	
Auto Mode Judgement		25sec.	0 sec.	
Soft Dry	OFF	6 min.	36 sec.	
	ON	10 min.	60 sec.	Soft Dry: 10 min. operation
Deodorizing Control	Cooling	40 sec.	4 sec.	
		70 sec.	7 sec.	
		20 sec.	2 sec.	
		180 sec.	18 sec.	
	Soft Dry	40 sec.	4 sec.	
		360 sec.	36 sec.	
Comp. Reverse Rotation Detection		5 min.	30 sec.	Comp. ON 5 min. and above
		2 min.	0 sec.	
Sleep Mode Operation		8 hrs.	48 sec.	
Sleep Mode Waiting		1 hr.	6 sec.	
Random Auto Restart Control		0 ~ 62 sec.	0 ~ 6.2 sec.	
4 Way Valve		5 min.	30 sec.	
After Deice Ended		30 sec.	3 sec.	Comp. OFF after deice (2.0 & 2.5 Hp)
Hotstart Delay Times		4 min.	0 sec.	(2.0 & 2.5 Hp)
Hotstart Finish Times		2 min.	0 sec.	(2.0 & 2.5 Hp)
Deice Operation Occurs (1.5 HP)		60 min.	6 sec.	60 min. after previous deice
		4 min.	24 sec.	Continuously 4 min. Comp. ON
		50 sec.	0 sec.	TRS ON continuously for 50 sec. check
Overload Deice Timer (1.5 HP)		1 min.	6 sec.	Comp. ON continuously for 1 min. check
Deice End (1.5 HP)		12 min.	72 sec.	Max. Operation time
		30 sec.	3 sec.	30 sec. Comp. OFF after deice
		10 sec.	1 sec.	4-Way Valve ON 10 sec. later after deice
Deice Operation (Extend) (1.5 HP)		60 sec.	0 sec.	
		120 sec.	0 sec.	
		180 sec.	0 sec.	
Hotstart Finish (1.5 HP)		30 sec.	0 sec.	

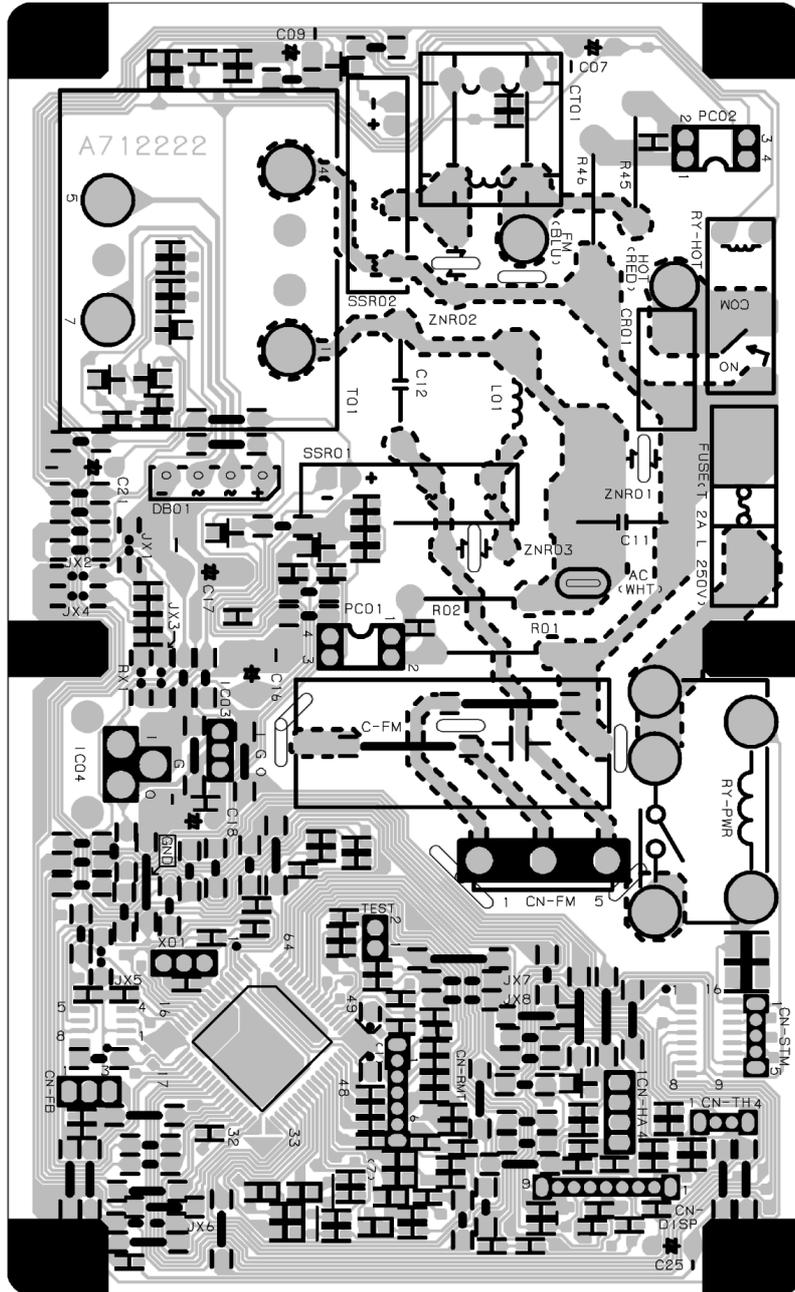
20.1. REMOTE CONTROL



	A - B	J1
0	SHORT	OPEN
1	OPEN	OPEN
2	SHORT	SHORT
3	OPEN	SHORT

20.2. PRINT PATTERN INDOOR UNIT PRINTED CIRCUIT BOARD

Side A (Bottom View)



Side B (Top View)

