

SERVICE INSTRUCTIONS

MULTI SPLIT TYPE AIR CONDITIONER

- **2-ROOM MULTI**

AO17A
AO19A/R
AO20R
AO24A/R

- **3-ROOM MULTI**

AO20A

- **4-ROOM MULTI**

AO32A/R

- **5-ROOM MULTI**

AO24A

WIRELESS REMOTE CONTROL MODEL

CONTENTS

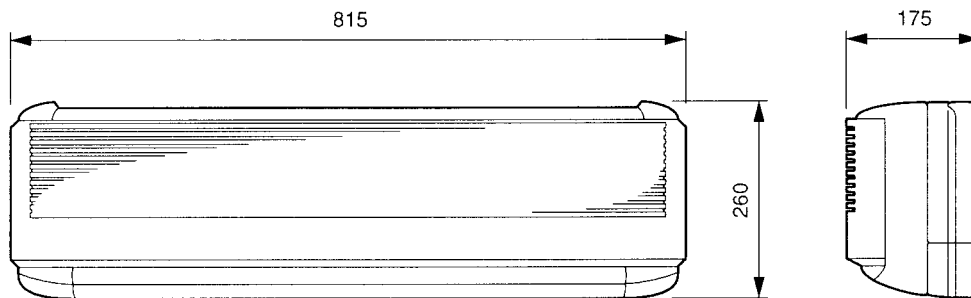
DIMENSIONS	1
DESCRIPTION OF FUNCTIONS	3
DEFROSTING OPERATION FLOW CHART	9
TROUBLESHOOTING GUIDE	15
INSTALLATION PRECAUTION	19

DIMENSIONS

1. MULTI SPLIT TYPE (WALL MOUNTED TYPE)

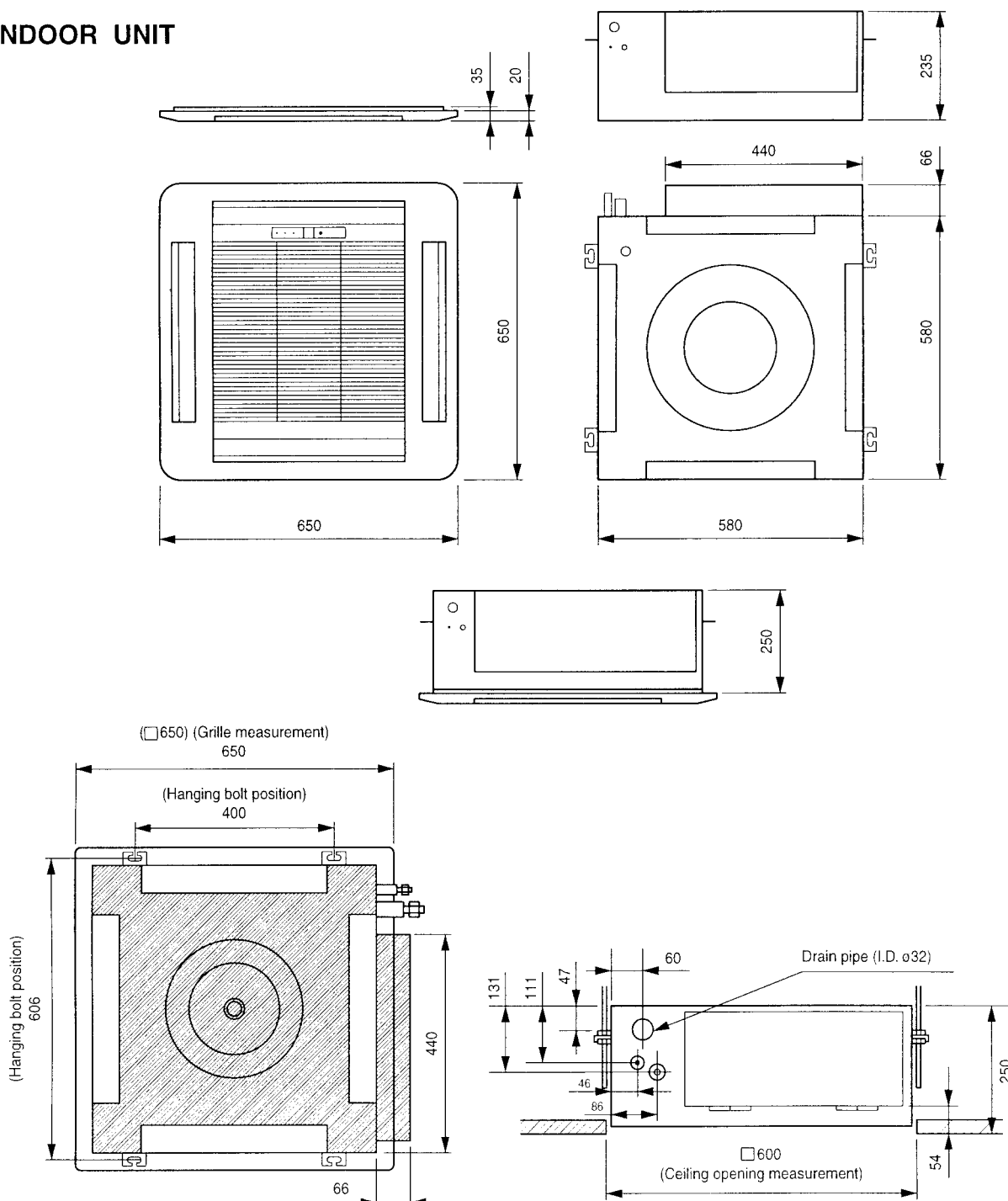
INDOOR UNIT

(Unit : mm)



2. MULTI SPLIT TYPE (CASSETTE TYPE)

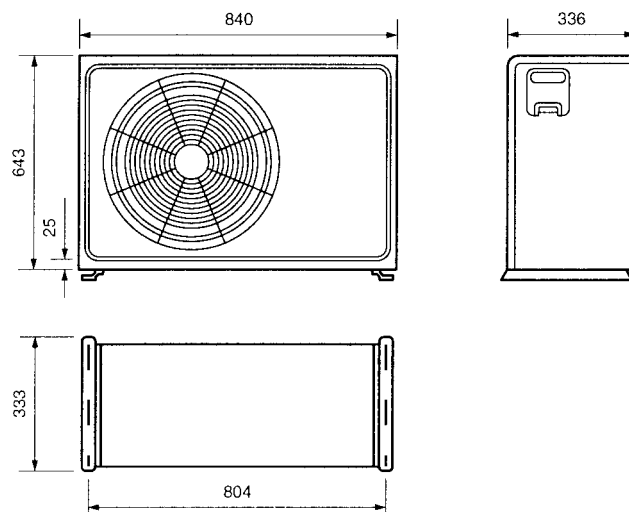
INDOOR UNIT



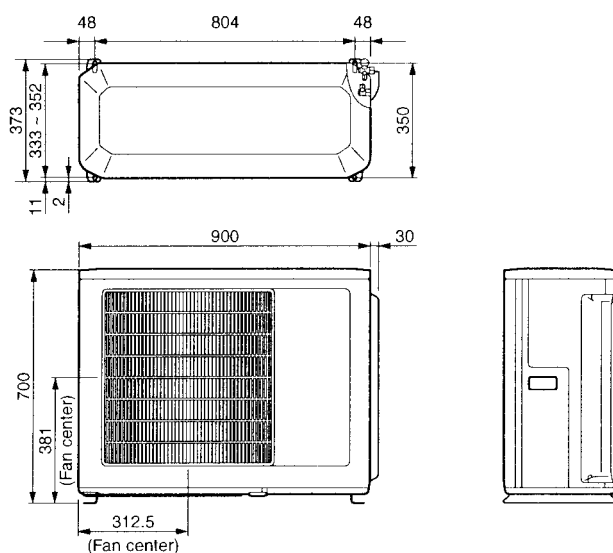
3. OUTDOOR UNIT

(Unit : mm)

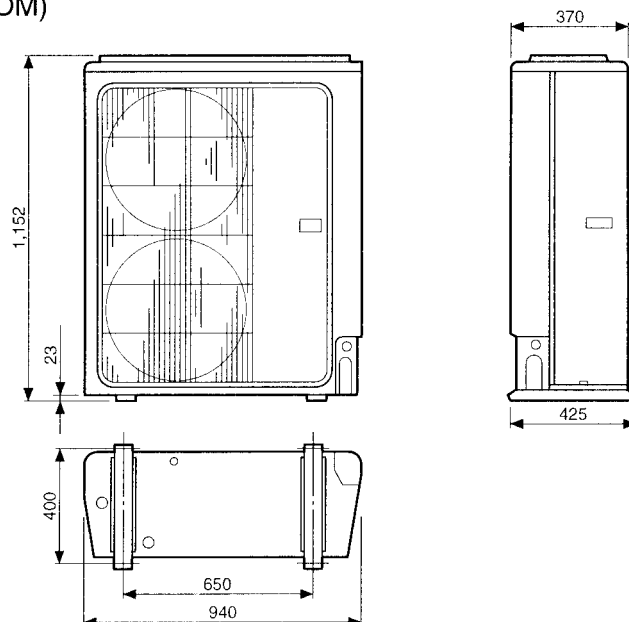
3-1. AO17A, AO19A/R, AO20A (2-ROOM, 3-ROOM)



3-2. AO20R, AO24A/R (2-ROOM, 5-ROOM)



3-3. AO32A/R (4-ROOM)



DESCRIPTION OF FUNCTIONS

1. THREE MINUTES DELAY FUNCTION (3ST)

- (1) The outdoor unit is not operated for three minutes after the power plug is inserted into the socket. (Compressor protection, breaker off prevention, etc.)
- (2) When test operation was performed in heating during continuous operation, it takes some time until air blows out from the indoor unit because "Three minutes delay" and "Cold air prevention" have priority over TEST operation.

2. THREE MINUTES CONTINUOUS OPERATION TIMER (3HT)

Operation continues for three minutes after the compressor starts.

3. INDOOR HEAT EXCHANGER DE-ICING FUNCTION (Cooling & dry operation)

• Cooling operation

When the temperature of the heat exchanger at the indoor side drops below 3°C during cooling operation, FAN CONTROL is switched to HIGH flow automatically.

After that, when the temperature of the indoor heat exchanger reaches 7°C or more, fan control returns to the specified air flow.

When the temperature of the indoor heat exchanger remains below 3°C for 3 minutes at HIGH flow, operation of the compressor stops.

• Dry operation

When the temperature of the heat exchanger is under 13°C at the start of operation, the compressor starts once.

But, the heat exchanger becomes more than 13°C, and the compressor does not start before the THREE MINUTES DELAY (3ST) function finishes.

When the temperature of the heat exchanger is under 13°C at the compressor stop, the indoor fan motor continues to operate until the THREE MINUTES DELAY (3ST) function.

4. DEFROSTING OPERATION [REVERSE CYCLE]

See Defrosting Flow Chart on Pages 9 to 12.

- (1) The defrosting operation is performed when frost is produced on the outdoor heat exchanger. At this time, the heating mode will stop temporarily.
- (2) The defrosting operation time differs with the conditions (temperature, humidity, etc.). (Approximately 6 ~ 9 to 13 minutes)
- (3) During defrosting operation, the indoor and outdoor fans are stopped and the operation lamp flashes.
- (4) "Bushhhh", "goh, goh, goh" and other sounds will be heard during the defrosting operation. These sounds are normal. (Four-way valve switching sound, refrigerant sound)

5. 4-WAY VALVE DELAY SWITCHING FUNCTION

[REVERSE CYCLE MODEL]

When heating operation is stopped, the 4-way valve is stopped 3 minutes later.

6. COLD AIR DISCHARGE PREVENTION FUNCTION

[REVERSE CYCLE MODEL]

- (1) When heating operation is started, the indoor unit fan operates continuous in the "S-Lo" mode. After the temperature of the indoor heat exchanger reaches more than 27°C, operation enters the specified air flow mode.
- (2) When the compressor is stopped by the thermostat, the indoor fan stops about 20 seconds later.

7. HEATING OVERLOAD PROTECTION FUNCTION

[REVERSE CYCLE MODEL]

During heating operation, the compressor is operated, but the outdoor fan may be stopped.

A function which suppresses the absorption of heat and protects the machine by stopping the outdoor fan when the indoor heat exchanger temperature has risen abnormally and the outdoor temperature is high is provided.

- (1) When the indoor heat exchanger temperature reaches 54°C for 12,000 BTU/H & 14,000 BTU/H models (New Multi models---56°C, 7,000 BTU/H---55°C, 9,000 BTU/H---51°C), the outdoor fan motor stops.
- (2) When the indoor heat exchanger temperature has recovered to 48°C, for 12,000 BTU/H & 14,000 BTU/H models (New Multi models---52°C, 7,000 BTU/H---50°C, 9,000 BTU/H---45°C), the outdoor fan motor starts.
- (3) When the indoor heat exchanger temperature rises to 58°C for 12,000 BTU/H & 14,000 BTU/H models (New Multi models---62°C, 7,000 BTU/H---59°C, 9,000 BTU/H---56°C), even when the outdoor fan motor is stopped, the compressor stops.

8. SET TEMPERATURE COMPENSATION AT OPERATION START

At the start of operation and when MASTER CONTROL is switched to cooling and heating, the set temperatures are compensated by +2°C for heating operation for 60 min. and by -1°C for cooling operation for 40 min.

9. TEST BUTTON AND OTHER OPERATION KNOBS

1) TEST RUN button

- This button is used when installing the conditioner, and should not be used under normal conditions, as it will cause the air conditioner's thermostat function to operate incorrectly.
- If this button is pressed during normal operation, the unit will switch to test operation mode, and the Indoor Unit's OPERATION Indicator Lamp and TIMER

Indicator Lamp will begin to flash simultaneously.

- To stop the test operation mode, either press the TEST RUN button once again, or press the START/STOP button to stop the air conditioner.

2) OTHER OPERATION KNOBS

① POWER SWITCH

ON : During normal operation, leave in this position.

OFF : Set to this position when not using the unit for an extended period of time.

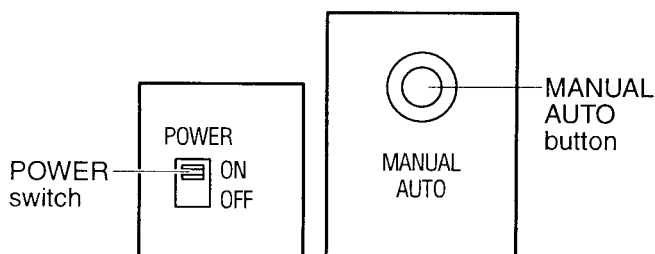
② MANUAL AUTO BUTTON

Use this button for temporary manual operation in the event that the remote control unit batteries die, or the remote control unit is lost. Press the MANUAL AUTO button on the main unit control panel.

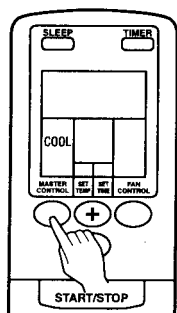
Press the MANUAL AUTO button on the main unit control panel.

To stop operation, press the MANUAL AUTO button once again, or set the POWER switch to OFF.

(Controls are located inside the Intake Grille.)



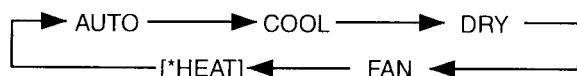
- When the air conditioner is operated with the controls on the Main Unit, it will operate under the same mode as the AUTO mode selected on the Remote Control Unit.
- The fan speed selected will be "AUTO" and the thermostat setting will be standard.



Example: When set to COOL

③ MASTER CONTROL BUTTON

- Press the MASTER CONTROL button to select the desired mode. Each time the button is pressed, the mode will change in the following order.



About three seconds later, the entire display will reappear.

NOTE:

Instructions relating to Heating (*) are applicable only to "HEAT & COOL MODEL (REVERSE CYCLE)".

④ SET TEMP. BUTTONS

- Press the SET TEMP. buttons

⊕ button : Press to raise the thermostat setting.

⊖ button : Press to lower the thermostat setting.

Thermostat setting range :

1. HEAT & COOL MODEL (REVERSE CYCLE)

Heating 16 to 30°C

Cooling / Drying 18 to 30°C

AUTO Standard temperature setting $\pm 2^\circ\text{C}$

The thermostat cannot be used to set room temperature during the FAN mode (the temperature will not appear on the remote control unit's display).

2. COOLING MODEL

Heating 17 to 30°C

Cooling / Drying 18 to 30°C

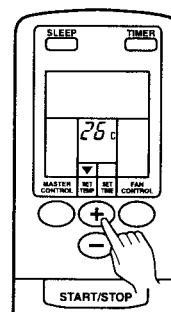
AUTO Standard temperature setting $\pm 2^\circ\text{C}$

(During use of FAN mode, if the thermostat is set at 17°C or lower, the display will show "--" and the fan will operate continuously, regardless of the room temperature.)

About three seconds later, the entire display will reappear.

NOTE:

The thermostat setting should be considered a standard value, and may differ somewhat from the actual room temperature.

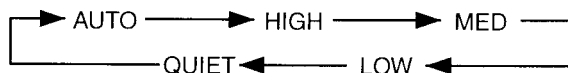


Example: When set to 26°

⑤ FAN CONTROL BUTTON

Press the FAN CONTROL button.

Each time the button is pressed, the fan speed changes in the following order:



About three seconds later, the entire display will reappear.

When set to AUTO :

***Heating:** Fan operates so as to optimally circulate warmed air.

However, the fan will operate at very low speed when the temperature of the air issued from the indoor unit is low.

Cooling: As the room temperature approaches that of the thermostat setting, the fan speed becomes slower.

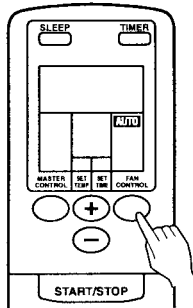
***Fan:**

1. **HEAT & COOL MODEL (REVERSE CYCLE)**
The fan alternately turns on and off ; when on, the fan runs at the low fan speed.
The fan will operate at very low setting during Monitor operation and at the start of the Heating mode.
2. **COOLING MODEL**
The fan will operate at the optimum speed in accordance with the room temperature in the vicinity of the indoor unit.

When set to QUIET:

SUPER QUIET operation begins. The indoor unit's air flow will be reduced for quieter operation.

- SUPER QUIET operation cannot be used during Dry mode. (The same is true when dry mode is selected during AUTO mode operation.)
- During SUPER QUIET operation, (*Heating and) Cooling performance will be reduced somewhat.



Example: When set to AUTO

⑥ SWING LOUVER BUTTON

- Press the **SWING LOUVER** button.

The SWING indicator lamp (orange) will light.

In this mode, the Air Flow Direction Louvers will swing automatically to direct the air flow both up and down.

- Press the **SWING LOUVER** button once again to stop SWING operation.

The SWING Indicator lamp (orange) will go out. Air flow direction will return to the setting before swing was begun.

About Swing Operation

- The range of swing is relative to the currently set air-flow direction.
- If the swing range is not as desired, use the Remote Control Unit's AIR FLOW DIRECTION button to change the range of swing.
- During Cooling/Dry modes, if SWING operation is continued at the lowest (downward) range for more than 30 minutes, the unit will automatically switch the swing range to the horizontal flow range, to prevent the condensation of moisture on the outlet.
- The SWING operation may stop temporarily when the air conditioner's fan is not operating or when operating at very low speeds.

⑦ MANUAL AUTO OPERATION

Use the MANUAL AUTO operation in the event the Remote Control Unit is lost or otherwise unavailable.

How to Use the Main Unit Controls :

- Press the **MANUAL AUTO** button on the main unit control panel.

To stop operation, press the MANUAL AUTO button once again, or set the POWER switch to OFF. (Controls are located inside the Intake Grille)

- When the air conditioner is operated with the controls on the Main unit, it will operate under the same mode as the AUTO mode selected on the Remote Control Unit.
- The fan speed selected will be "AUTO", and the thermostat setting will be standard.

⑧ ADJUSTING THE DIRECTION OF AIR CIRCULATION

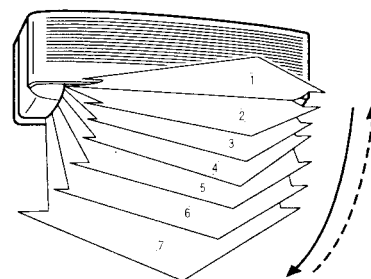
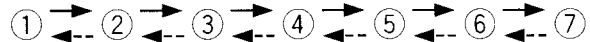
Vertical (up-down) direction of air flow is adjusted by pressing the Remote Control Unit's AIR FLOW DIRECTION button. Horizontal (right-left) air flow direction is adjusted manually, by moving the Air Flow Direction Louvers.

Whenever making horizontal air flow adjustments, start air conditioner operation and be sure that the vertical air direction louvers are stopped.

Vertical Air Direction Adjustment

Press the **AIR FLOW DIRECTION** button.

Each time the button is pressed, the air direction range will change as follows :



Type of Airflow Direction Setting:

- ①, ②, ③, ④ : During Cooling/Dry modes
- ⑤, ⑥, ⑦ : *During Heating mode

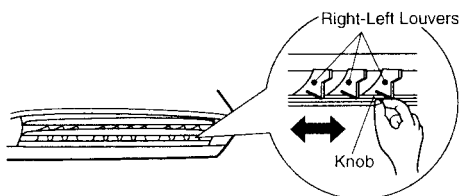
The Remote Control Unit's display does not change.

- Use the air direction adjustments within the ranges shown above.
- The vertical air flow direction is set automatically as shown, in accordance with the type of operation selected.
 - During Cooling/Dry mode : Horizontal flow ①
 - During Heating mode : Downward flow ⑦
- During AUTO mode operation, for the first minute after beginning operation, airflow will be horizontal ① ; the air direction cannot be adjusted during this period.

Right-Left Adjustment

Adjust the Right-Left Louvers.

- Move the Right-Left louvers to adjust air flow in the direction you prefer.



CAUTION

- Never place fingers or foreign objects inside the outlet ports, since the internal fan operates at high speed and could cause personal injury.

- Always use the remote control unit's AIR FLOW DIRECTION button to adjust the vertical airflow louvers. Attempting to move them manually could result in improper operation; in this case, stop operation and restart. The louvers should begin to operate properly again.
- During use of the Cooling and Dry modes, do not set the Air Flow Direction Louvers in the range (⑤ to ⑦) for long periods of time, since water vapor may condense near the outlet louvers and drops of water may drip from the air conditioner. During the Cooling and Dry modes, if the Air Flow Direction Louvers are left in the range (⑤ to ⑦) for more than 30 minutes, they will automatically return to position ④.
- When used in a room with infants, children, elderly or sick persons, the air direction and room temperature should be considered carefully when making settings.

10. TIMER

① ON timer or OFF timer

- (1) Press the START/STOP button.
(if the unit is already operating, proceed to step 2).
The indoor unit's OPERATION Indicator Lamp (red) will light.

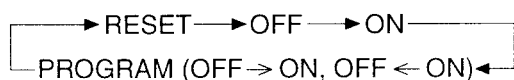
• To Cancel the Timer

Use the TIMER button to select "TIMER RESET."
The air conditioner will return to normal operation.

- (2) Press the TIMER button to select the OFF timer or ON timer operation.
Each time the button is pressed the timer function changes in the following order :
The indoor unit's TIMER Indicator lamp (green) will light.

• To Change the Timer Setting

Perform steps (2) and (3).



• To Stop Air Conditioner Operation while the Timer is Operating

Press the START/STOP button.

- (3) Use the SET TEMP/SET TIME button to adjust the desired OFF time or ON time.
Set the time while the time display is flashing (the flashing will continue for about five seconds).

⊕ button : Press to advance the time.

⊖ button : Press to reverse the time.

About five seconds later, the entire display will reappear.

• To Change Operating Conditions

If you wish to change operating conditions (Mode, Fan Speed, Thermostat Setting), after making the timer setting wait until the entire display reappears, then press the appropriate buttons to change the operating condition desired.

About the Program timer

- The PROGRAM timer allows you to integrate OFF timer and ON timer operations in a single sequence. The sequence can involve one transition from OFF timer to ON timer, or from ON timer to OFF timer, within a twenty-four hour period.
- The first timer function to operate will be the one set nearest to the current time. The order of operation is indicated by the arrow in the Remote Control Unit's display (OFF → ON, or OFF ← ON).
- One example of Program timer use might be to have the air conditioner automatically stop (OFF timer) after you go to sleep, then start (ON timer) automatically in the morning before you arise.

② Program timer

- (1) Press the START/STOP button.
(if the unit is already operating, proceed to step 2).
The indoor unit's OPERATION Indicator Lamp (red) will light.
- (2) Set the desired times for OFF timer and ON timer.
See the section "To Use the ON Timer or OFF Timer" to set the desired mode and times.
About three seconds later, the entire display will reappear.
The indoor unit's TIMER Indicator Lamp (green) will light.

• To Change the Timer Setting

1. Follow the instructions given in the section "To Use the ON Timer or OFF Timer" to select the timer setting you wish to change.

2. Press the TIMER button to select either OFF → ON or OFF ← ON.

- (3) Press the TIMER button to select the PROGRAM timer operation (either OFF → ON or OFF ← ON will display).
The display will alternately show "OFF timer" and "ON timer", then change to show the time setting for the operation to occur first.

The PROGRAM timer will begin operation. (If the ON timer has been selected to operate first, the unit will stop operating at this point).

About five seconds later, the entire display will reappear.

• To Stop Air Conditioner Operation while the Timer is Operating

Press the START/STOP button.

• **To Change Operating Conditions**

If you wish to change operating conditions (Mode, Fan Speed, Thermostat Setting), after making the timer setting wait until the entire display reappears, then press the appropriate buttons to change the operating condition desired.

③ **SLEEP Timer**

While the air conditioner is operating or stopped, press the SLEEP button. The indoor unit's OPERATION Indicator Lamp (red) will light.

• **To Cancel the Timer**

Use the TIMER button to select "TIMER RESET." The air conditioner will return to normal operation.

④ **Changing Timer Setting**

Press the SLEEP button once again and set the time using the SET TIME buttons.

Set the time while the Timer Mode Display is flashing (the flashing will continue about five seconds).

⊕ button : Press to advance the time.

⊖ button : Press to reverse the time.

About five seconds later, the entire display will reappear.

• **To Stop the Air Conditioner During Timer Operation:**

Press the START/STOP button.

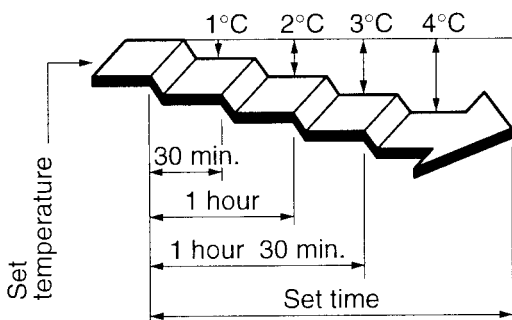
About the SLEEP Timer

To prevent excessive warming or cooling during sleep, the SLEEP timer function automatically modifies the thermostat setting in accordance with the time setting. When the set time has elapsed, the air conditioner completely stops.

During Heating operation :

When the SLEEP timer is set, the thermostat setting is automatically lowered 1°C every thirty minutes. When the thermostat has been lowered a total of 4°C, the thermostat setting at that time is maintained until the set time has elapsed, at which time the air conditioner automatically turns off.

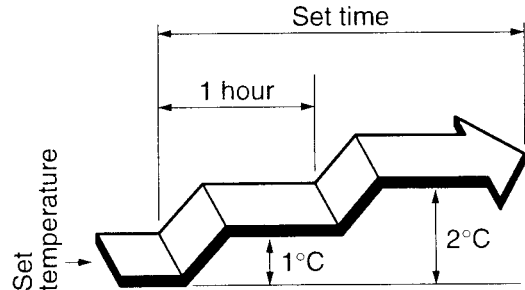
SLEEP timer setting



During Cooling/Dry operation :

When the SLEEP timer is set, the thermostat setting is automatically raised 1°C every sixty minutes. When the thermostat has been raised a total of 2°C, the thermostat setting at that time is maintained until the set time has elapsed, at which time the air conditioner automatically turns off.

SLEEP timer setting

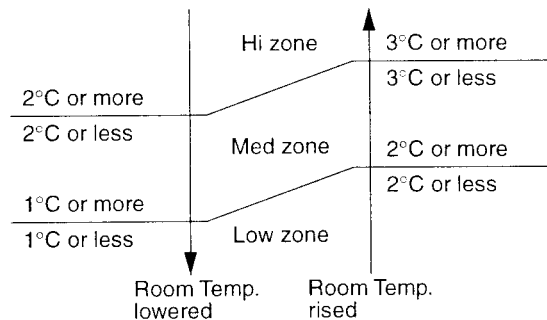


11. FAN CONTROL

A) "AUTO" POSITION

(1) COOLING OPERATION

Air flow mode is set automatically in accordance with the condition "(Room temp. - Set temp.)" as shown below.



(2) HEATING OPERATION

- (1) When the indoor heat exchanger temperature becomes 47°C or more, the fan mode switches to higher position for one step. ("LOW" → "MED", "MED" → "HIGH")
- (2) When the indoor heat exchanger temperature lowers less than 41°C while the compressor operates, the fan mode switches to lower position for one step. ("HIGH" → "MED", "MED" → "LOW")
- (3) After switching the fan mode, it does not switch within 2 minutes.
- (4) When "FAN CONTROL" is switched to "AUTO" while the unit is operated at the "FAN CONTROL" position of "HIGH", "MED" or "LOW", the unit operation is performed in the "MED" fan mode.

B) "LOW", "MED" AND "HIGH" POSITION

The indoor fan operates at the air flow set in FAN CONTROL mode.

12. OPERATING MODES

(1) "AUTO" position

• HEAT & COOL MODEL (REVERSE CYCLE)

- Depending on the room temperature at the time operation begins, the operating mode will be switched automatically as shown in the accompanying table.

Also, depending on the operating mode, the room temperature setting will cause the "standard" temperature to be set as shown.

Actual Room Temperature	Operating Mode	Thermostat Setting (standard setting)
30°C or above	→ Cooling	→ 27°C
27°C to 30°C	→ Cooling	→ 26°C
24°C to 27°C	→ Dry	→ 24°C
22°C to 24°C	→ Monitor	
Below 22°C	→ Heating	→ 23°C

The operating mode and standard thermostat settings are selected automatically when operation begins.

- When automatic operation is initiated, the fan will run at very low speed for about one minute while the unit detects and selects the proper operating mode.
- Once the operating mode has been set, the mode will not change even if the room temperature changes.

However, during the monitor operation mode, if the room temperature changes to below 22°C, the mode will automatically switch to Heat, and when it rises above 24°C the mode will automatically switch to Dry.

- When in the monitor mode, the fan will operate very slowly.
- If the START/STOP button is pressed to recommence operation within two hours after stopping automatic operation, the unit will begin operating from the same mode as before.

• COOLING MODEL

- Depending on the room temperature at the time operation begins, the operating mode will be switched automatically as shown in the accompanying table.

Also, depending on the operating mode, the room temperature setting will cause the "standard" temperature to be set as shown.

Actual Room Temperature	Operating Mode	Thermostat Setting (standard setting)
30°C or above	→ Cooling	→ 27°C
27°C to 30°C	→ Cooling	→ 26°C
25°C to 27°C	→ Dry	→ 24°C
23°C to 25°C	→ Dry	→ 22°C
Below 23°C	→ Dry	→ 20°C

The operating mode and standard thermostat settings are selected automatically when operation begins.

- When automatic operation is initiated, the fan will run at very low speed for about one minute while the unit detects and selects the proper operating mode.
- Once the operating mode has been set, the

mode will not change even if the room temperature changes.

- If the START/STOP button is pressed to recommence operation within two hours after stopping automatic operation, the unit will begin operating from the same mode as before.

(2) *Heating : Use to warm your room.

- When Heating mode is selected, the air conditioner will operate at very low fan speed for about 3 to 5 minutes, after which it will switch to the selected fan setting. This period of time is provided to allow the indoor unit to warm up before begin full operation.
- When the room temperature is very low, frost may form on the outside unit, and its performance may be reduced. In order to remove such frost, the unit will automatically enter the defrost cycle from time to time. During Automatic Defrosting operation, the OPERATION Indicator Lamp (red) will flash, and the heat operation will be interrupted.

(3) Cooling : Use to cool your room.

(4) Dry :

- Use for gently cooling while dehumidifying your room.
- You cannot heat the room during Dry mode.
- During Dry mode, the unit will operate at low speed; in order to adjust room humidity, the indoor unit's fan may stop from time to time. Also, the fan may operate at very low speed when detecting room humidity.
- The fan speed cannot be changed manually when Dry mode has been selected.

(5) Fan : Use to circulate the air throughout your room.

*During Heating mode :

Set the thermostat to a temperature setting that is higher than the current room temperature. The Heating mode will not operate if the thermostat is set lower than the actual room temperature.

During Cooling/Dry mode :

Set the thermostat to a temperature setting that is lower than the current room temperature. The Cooling and Dry modes will not operate if the thermostat is set higher than the actual room temperature (in Cooling mode, the fan alone will operate).

*During Fan mode :

HEAT & COOL MODEL (REVERSE CYCLE)

You can not use the unit to heat and cool your room.

During Fan mode : COOLING MODEL

- Fan operation begins when room temperature in the vicinity of the air conditioner rises above the set thermostat temperature; when the temperature drops, fan operation stops.
- If the air emitted feels to cool, raise the thermostat setting.

DEFROSTING OPERATION FLOW CHART (REVERSE CYCLE MODEL)

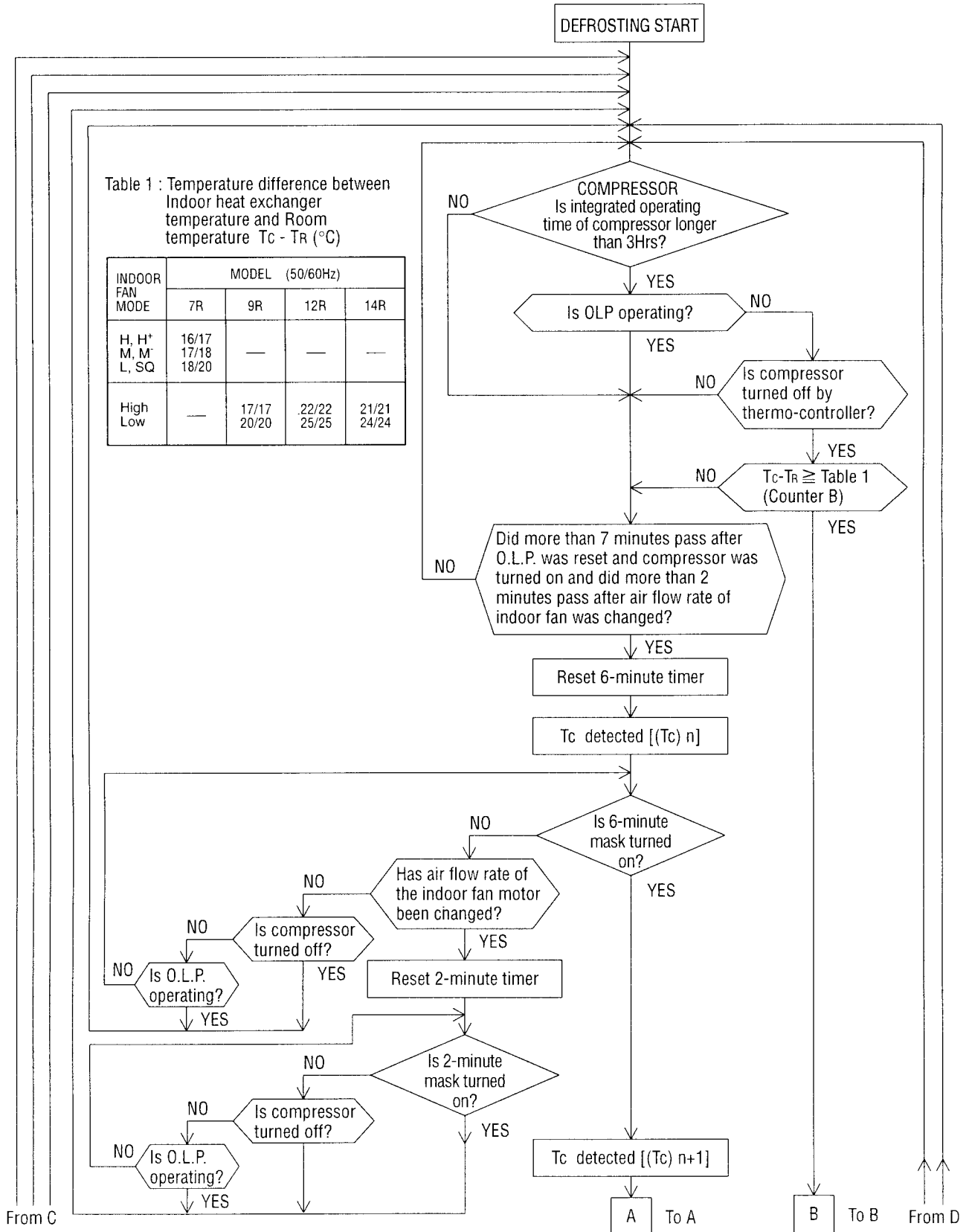
1. AO19R (2-ROOM)

Meaning of symbols

O.L.P. (Overload Protector) is operating : If the indoor heat exchanger temperature is too high, the outdoor fan is stopped to prevent the former from rising.

T_c : Indoor heat exchanger temperature (Indoor pipe thermistor detector)

T_R : Room temperature (Room thermistor detector)



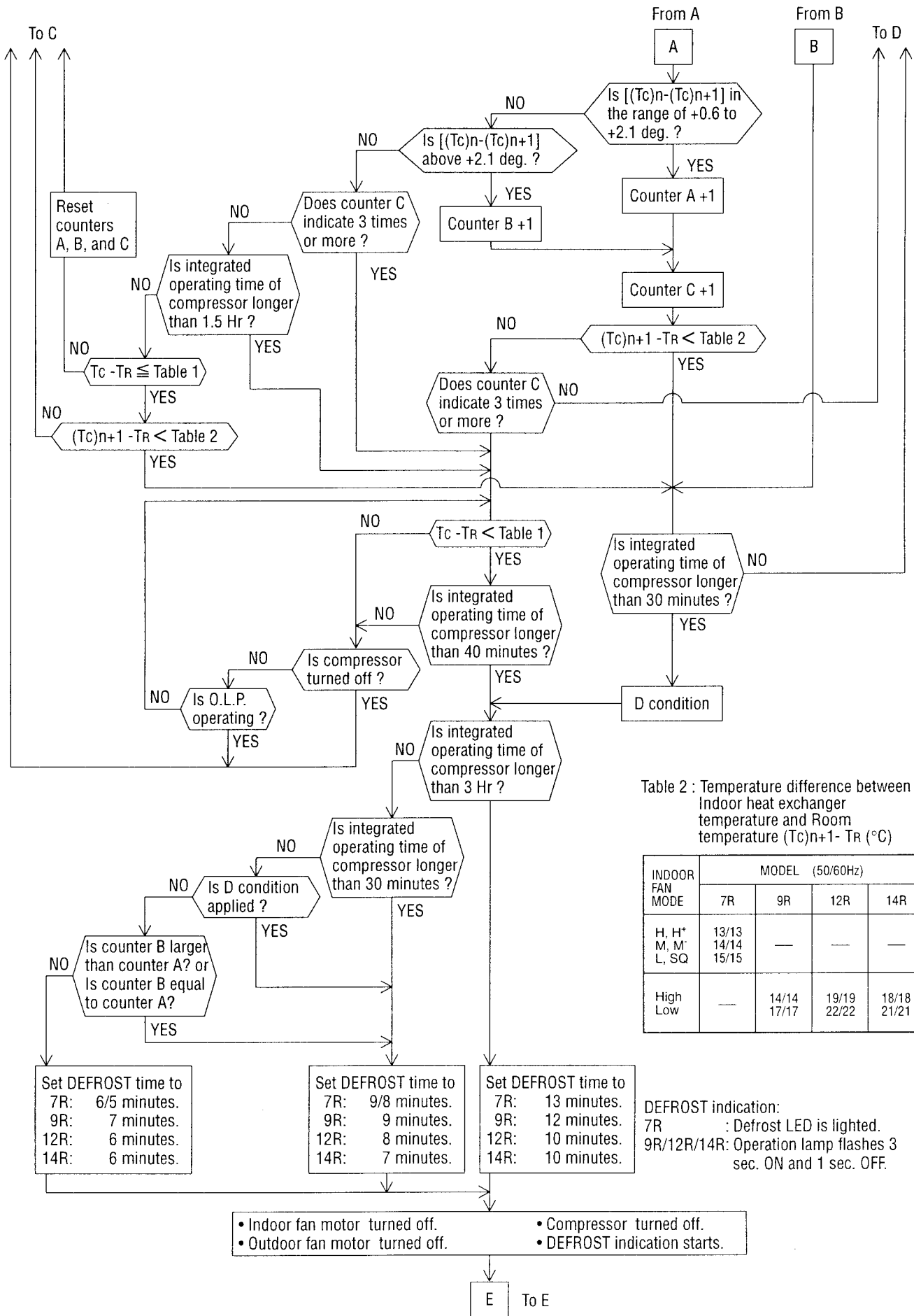
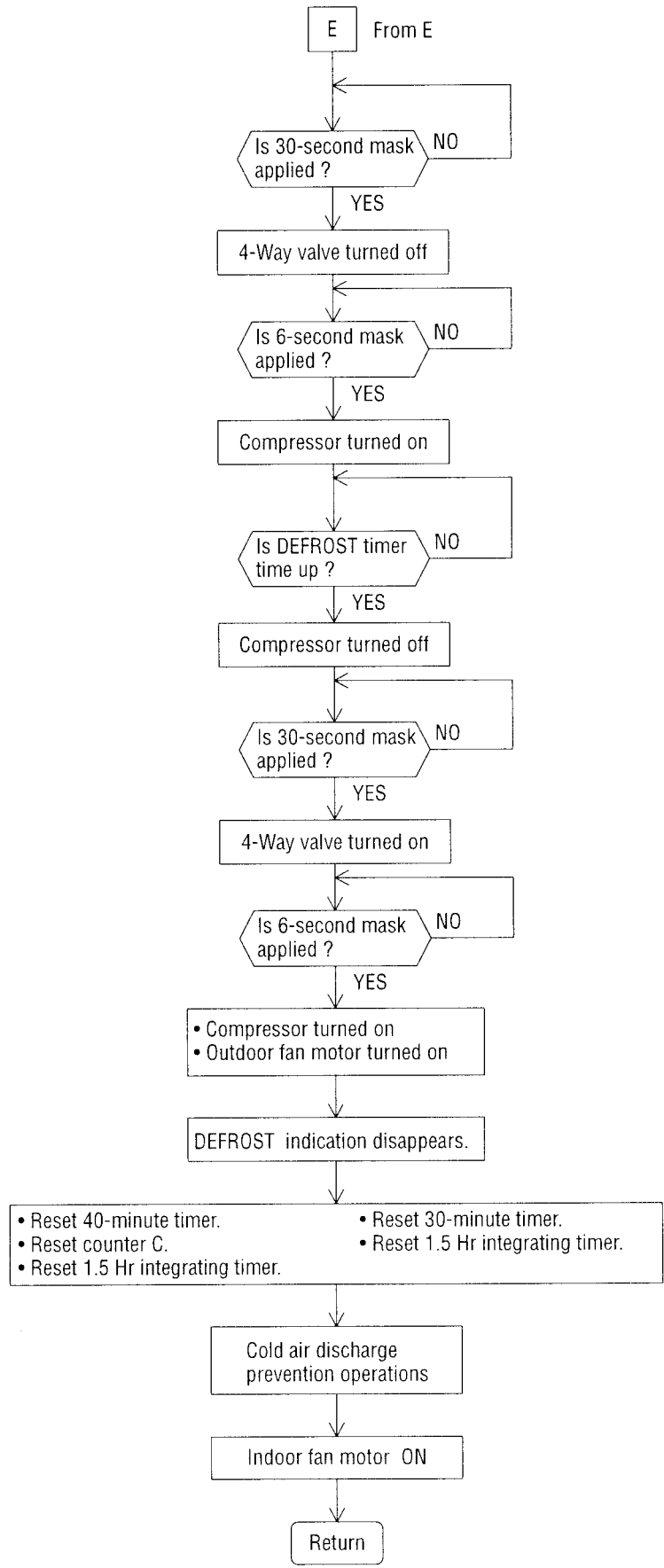


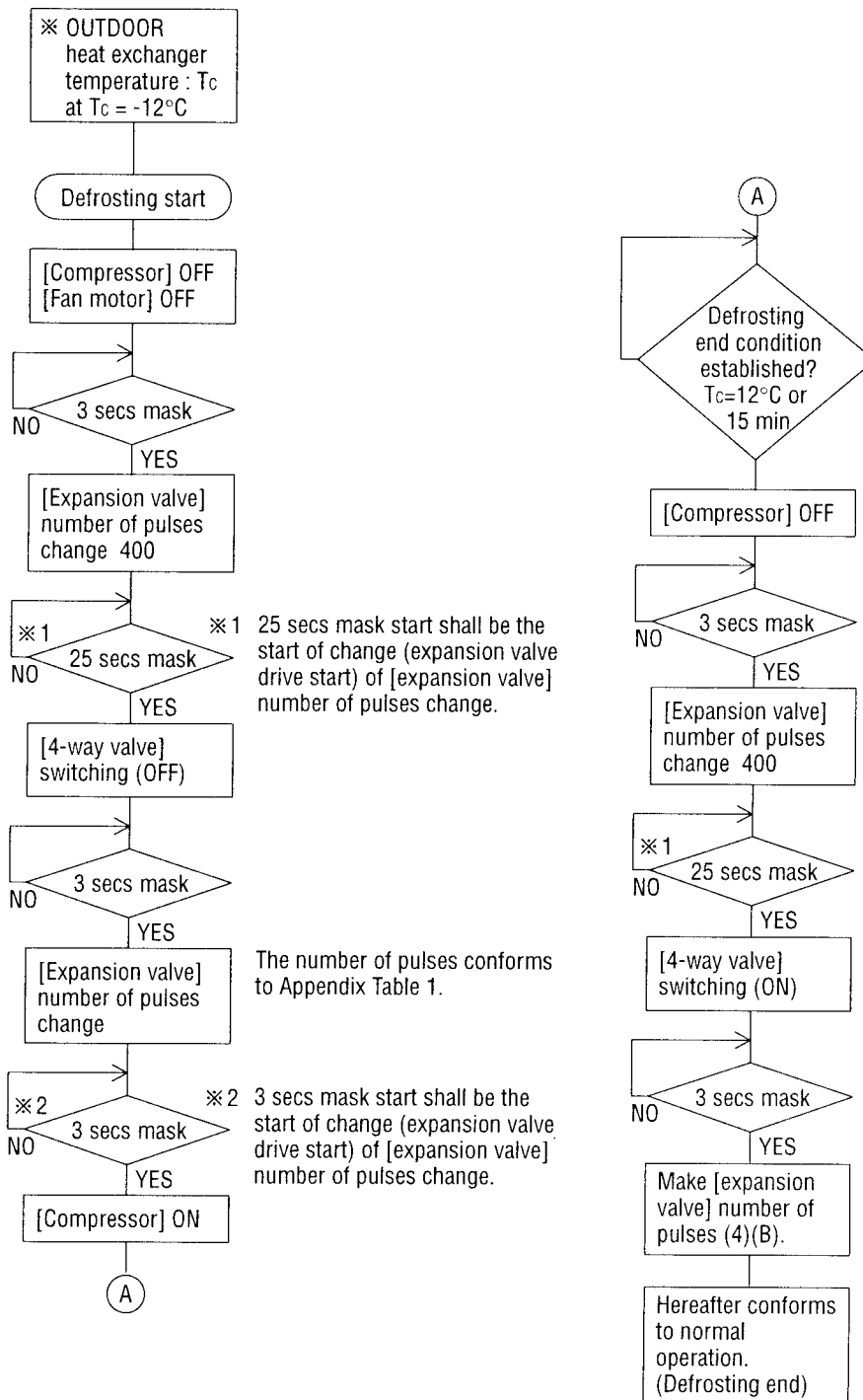
Table 2 : Temperature difference between Indoor heat exchanger temperature and Room temperature (Tc)n+1 - Tr (°C)

INDOOR FAN MODE	MODEL (50/60Hz)			
	7R	9R	12R	14R
H, H*	13/13	—	—	—
M, M*	14/14	—	—	—
L, SQ	15/15	—	—	—
High	—	14/14	19/19	18/18
Low	—	17/17	22/22	21/21

DEFROST indication:
 7R : Defrost LED is lighted.
 9R/12R/14R: Operation lamp flashes 3 sec. ON and 1 sec. OFF.



2. AO20R / 24R / 32R (2-ROOM, 4-ROOM)



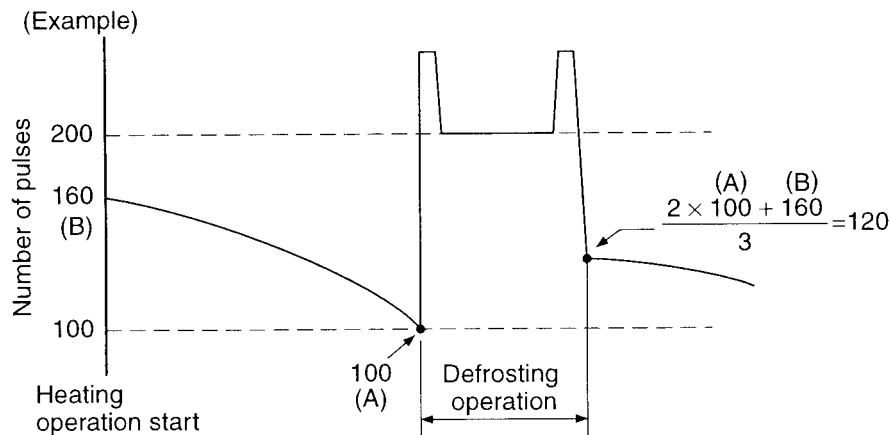
3. Defrosting end

- (A) When [both units] have independent [defrosting end condition] and the [defrosting end condition] of [both units] is established, [defrosting operation] is ended. However, when only one [unit] is performing [defrosting operation], and the [defrosting end condition] of that [unit] is established, [defrosting operation] is ended.
- (B) The electronic expansion valve number of pulses at the start of normal operation after the end of defrosting operation shall be the number of pulses calculated from the expression above.

$$\text{Electronic expansion valve number of pulses} = \frac{2 \times A + B}{3}$$

A = Appendix table 1 heating initial number of pulses

B = Number of pulses immediately before defrosting operation



4. Defrosting end condition

The defrosting end condition is independent for both units, but since the contents are the same for both units, unless otherwise specified, this item describes unit A and is applied to unit B by substituting B for A.

- (A) When even one of the following conditions was established, the defrosting end condition is established.
- When heat exchange temperature A reaches the value of Appendix table 3 or higher.
 - When the defrosting operation time exceeds 15 minutes. (Note 1) (Note 2)
 - When compressor A was stopped (OFF) even once by discharge temperature protection or pressure protection during defrosting operation.
 - When switched to a mode other than heating operation.

Note 1) The values of Appendix table 3 are set separately for unit A and unit B.

Note 2) Defrosting operation time timer is normally not independent for both units. The timer starts at defrosting operation start of the unit that started defrosting operation first of each unit and is reset at defrosting end of item (D)-a.

Note 3) The defrosting end condition is detected from after the end of 1 minute mask after compressor A is turned ON.

5. Discharge temperature protection

(1) Discharge temperature protection operation

- (A) When [discharge temperature A] reaches 115°C or more in any case, [compressor A] is stopped (turned OFF).
- (B) When [discharge temperature B] reaches 115°C or more in any case, [compressor B] is stopped (turned OFF).

(2) Discharge temperature protection reset

- (A) When 3 minutes (3 mins ST) have elapsed after [compressor A] was stopped (turned OFF) by [discharge temperature protection operation] and [discharge temperature A] has dropped to 105°C or less, [discharge temperature protection] of [compressor A] is reset.
- (B) When 3 minutes (3 mins ST) have elapsed after [compressor B] was stopped (turned OFF) by [discharge temperature protection operation], and [discharge temperature B] has dropped to 105°C or less, [discharge temperature protection] of [compressor B] is reset.

Appendix table 1

Model switching	Cooling initial number of pulses	Heating initial number of pulses	Number of pulses at defrosting
0	170	130	170
1	200	160	200
2	250	190	250
3	300	220	300

Appendix table 2

Model switching	Defrosting start temperature
0	-8°C
1	-12°C

Appendix table 3

Model switching	Defrosting end temperature
0	8°C
1	12°C

Appendix table 4

		Outside air temperature T_o		Model switching			
		When rises	When falls	0	1	2	3
Cooling	Control temperature	$50 < T_o$	$48 < T_o$	90	95	100	105
		$40 < T_o \leq 50$	$38 < T_o \leq 48$	85	90	95	100
		$30 < T_o \leq 40$	$28 < T_o \leq 38$	80	85	90	95
		$20 < T_o \leq 30$	$18 < T_o \leq 28$	70	75	80	85
		$10 < T_o \leq 20$	$8 < T_o \leq 18$	60	65	70	75
		$T_o \leq 10$	$T_o \leq 8$	55	60	65	70

		Outside air temperature T_o		Model switching			
		When rises	When falls	0	1	2	3
Heating	Control temperature	$18 < T_o$	$16 < T_o$	70	75	80	85
		$11 < T_o \leq 18$	$9 < T_o \leq 16$	70	75	80	85
		$5 < T_o \leq 11$	$3 < T_o \leq 9$	72	77	82	87
		$-1 < T_o \leq 5$	$-3 < T_o \leq 3$	75	80	85	90
		$-7 < T_o \leq -1$	$-9 < T_o \leq -3$	78	83	88	93
		$T_o \leq -7$	$T_o \leq -9$	75	80	85	90

Model switching table (Appendix table 5)

	UNIT A					UNIT B					Remarks
	Number of pulses	Defrosting start temperature	Defrosting end temperature	Cooling control temperature	Heating control temperature	Number of pulses	Defrosting start temperature	Defrosting end temperature	Cooling control temperature	Heating control temperature	
AO20R	3	1	1	1	1	1	1	1	0	0	A : 12R B : 7R
AO24R	0	1	1	2	1	0	1	1	2	1	A : 12R B : 12R

TROUBLESHOOTING GUIDE

1. WORKING INSPECTION (When cooling)

SYMPTOM	POSSIBLE CAUSES	REMEDY
(1) Indoor unit evaporator is coated with frost. a. Frost near inlet b. Frost all over	Gas leakage Clogged filter Low ambient temperature (less than 20°C)	Check leaking part, and charge gas. Clean filter. Check ambient temperature.
(2) Compressor operates, but it does not cool.	Stained condenser	Clean.
(3) Water does not come out of drain hose.	When the compressor operates normally, the gas leaks.	Charge gas and replace parts.
(4) Return pipe (low pressure) of compressor is not cold.	Gas leakage	Charge gas. Replace parts.
(5) Outlet pipe (high pressure) of compressor is not hot.	Gas leakage	Charge gas.
(6) Compressor operates, but does not cool. a. Indoor unit evaporator is cold. b. Outdoor unit condenser is hot, but it does not cool.	Overload operation Stained condenser	Eliminate overload. Clean.
(7) Indoor unit air outlet temperature is low, but it does not cool.	Clogged filter The cooled air is shorted. Overload operation	Clean. Isolate problem and correct. Eliminate overload.

2. SYMPTOMS AND CHECK ITEMS

SYMPTOM	CAUSES	CHECK ITEM	CHECK POINTS
No operation	Power supply circuit faulty Microcomputer reset circuit faulty Remote control faulty External wiring receiving section faulty	CHECK 1 CHECK 2	Power supply circuit Microcomputer input signal Remote control troubleshooting
Erroneous operation (Runaway)	Microcomputer runaway	CHECK 3	Reset circuit
Display does not light correctly.	Display unit faulty LED driver faulty	CHECK 4	Display unit Microcomputer output signal Driver output signal
Room temperature cannot be controlled.	Room thermistor faulty Pipe temperature thermistor faulty A/D converter input section faulty Compressor relay circuit faulty	CHECK 5 CHECK 8 CHECK 6	Thermistor resistance value Microcomputer input signal Relay output
Room fan does not run and wind speed cannot be switched.	Wind speed relay faulty	CHECK 7	Microcomputer output signal Driver output signal
Indication panel abnormal	Thermistor shorted or open	CHECK 9	Thermistor resistance value

CHECK 1

Symptom--- No operation
Remote control is not received.

Preliminary checks

- * Is the power cord plugged in?
- * Is power present at plug socket?
- * Is power turned off?

(1) Power connection check

- * Is power received at main PC board terminal K101/W101? (220 or 240V AC)
- * Is fuse (3A) blown?

(2) Power transformer check

- * Are CN103 [CN101] and CN102 [CN103] inserted firmly?
- * Is 15 to 20V AC output at CN102 [CN103]?

(3) Power supply circuit check

① 12V line

0V ----- D101, Q101 faulty
D104 [D102], C104 [CN106] shorted
R101 open

② 5V line

0V ----- D5 open, IC102 faulty
C9, C10 shorted.
Other parts shorted.

(4) Power interrupt signal faulty

R3, R5 open, C12 shorted,
IC3-1 faulty.

(5) Reset IC faulty
IC4 faulty.

(6) Microcomputer oscillator faulty

Is oscillator waveform (8.0 MHz) output at micro-computer pins 30 and 31?
If oscillation waveform is not output, X1 or micro-computer is faulty.

(7) Microcomputer faulty

CHECK 2

Preliminary checks

- * If air conditioner operates when remote control battery is changed, there are no problems. (Battery life is six months to one year.)
- * When receiving part of remote control unit is exposed to direct sunlight, the remote control receiver may not be received.
- * When infrared signal between remote control unit and receiver is blocked, the remote control is not received.

(1) Remote control unit check

If signal tone is heard when a transistor radio is tuned to an unused frequency in medium wave band and remote control button is pressed within 5cm of radio, remote control unit is normal.

(2) When the remote control unit is normal
Is CN9 disconnected?

Receiver at air conditioner indicator PC board is faulty, or main PC board is faulty.

CHECK 3

Symptom--- Erroneous operation (Runaway)

Preliminary checks

- * Set wall outlet to OFF and wait at least 30 seconds. Then, set wall outlet to ON again. If remote control unit is received normally, there is no trouble.

(1) Reset circuit faulty

IC4 faulty, C14 shorted

CHECK 4

Symptom--- Display does not light correctly.

Preliminary checks

- * Is display PC board connector CN9 inserted firmly?
- * Is display unit cable open?

(1) LED driver faulty

IC6 faulty, R16 to R18 open. If all of above are normal, display unit is faulty.

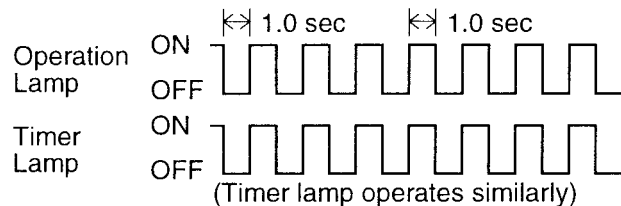
CHECK 5

Symptom--- Room temperature cannot be controlled.
(Compressor does not run or does not stop.)

Preliminary checks

- * Is TEST-MANUAL AUTO switch in TEST position?

TEST indication check



- * Is room temperature or thermistor connector CN12 inserted firmly?

- * Is set temperature correct?

(1) Thermistor faulty

Room temperature thermistor resistance values are shown on page 17.
When there is a large error, thermistor is faulty.

(2) A/D input circuit faulty

R32 open or shorted, R30 open, C26 and C32 shorted. If all of above are normal, advance to **CHECK 6.**

CHECK 6

Symptom--- Room temperature cannot be controlled.

Preliminary checks

- * Is each Faston terminal CN16-CN107 of power relay inserted firmly?
- * Is indoor unit and outdoor unit connection wiring open or loose?

(1) IC5 [IC6] faulty

IC5-5 [IC6-4] output port shorted.
K101 Power relay faulty

CHECK 7

Symptom--- Room fan does not run.

Preliminary checks

- * At dehumidification operation, room fan is stopped while compressor is stopped.
- * Turn fan once or twice by hand.
If fan does not turn easily, fan motor is faulty.

(1) Fan motor faulty

Fan motor winding open (check between all windings)

(2) Fan motor capacitor faulty, C101 [C105] open.

(3) Relay drive circuit faulty

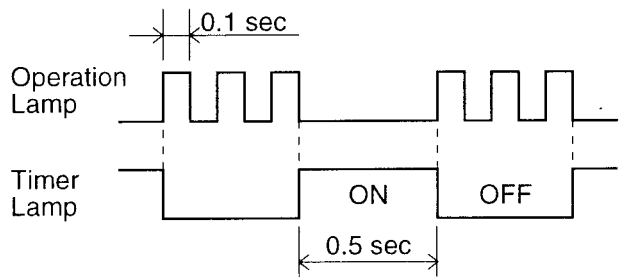
IC5 [IC6] faulty
IC5-2 [IC6-7] output port shorted
SSR101 faulty, L101 open

CHECK 8

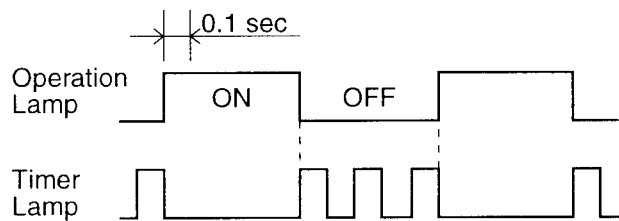
- Room temperature thermistor
- * CN12 disconnected. CN12 No.1-2 shorted.
 - * Thermistor faulty
 - * R32 open, shorted
C26, C32 shorted
R14, R15 open
 - * See **CHECK 9** for LED abnormal indications.

- Heat exchanger (Pipe) thermistor
- * CN13 disconnected. CN13 No.1-2 shorted.
 - * Thermistor faulty
 - * R33 open, shorted.
C27, C33 shorted.
R31 open.
 - * See **CHECK 9** for LED abnormal indications.

- 9,000 & 12,000 & 14,000 & 17,000 BTU/H Models
- * Room temperature thermistor abnormal



- * Heat exchanger (Pipe) thermistor abnormal

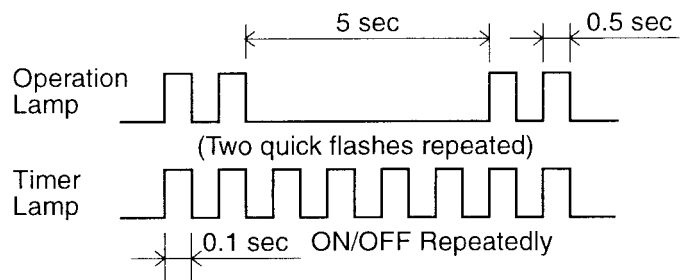


CHECK 9

Thermistor Abnormal Indication

- (1) Whether during operation or non-operation, when room temperature thermistor or heat exchanger thermistor is opened or shorted, operation is immediately stopped and failure indication (see item (3) described below) is displayed.
- (2) When this function stops operation, any operation instruction cannot resume operation.
- (3) Failure indications stated in (1) are shown at the right figure.

- 7,000 BTU/H Model
- * Room temperature and Heat exchanger (Pipe) thermistor abnormal



3. Thermistor resistance values

(1) Room temperature thermistor

Room temperature (°C)	3	5	8	10	15	20	25	29	31	33	36	40	44
Resistance value (kΩ)	28.7	25.9	22.3	20.1	15.8	12.5	10.0	8.4	7.7	7.0	6.2	5.3	4.5

(2) Heat exchanger (pipe) temperature thermistor

Pipe temperature (°C)	0	2	6	10	14	18	22	26
Resistance value (kΩ)	176.0	157.8	127.3	103.3	84.4	69.3	57.2	47.5
Pipe temperature (°C)	30	34	38	44	50	56	60	
Resistance value (kΩ)	39.6	33.2	27.9	21.7	17.0	13.5	11.6	

4. Troubleshooting check table

AO20R / 24R (2-ROOM)

Trouble and protection indicate (Indoor unit)

Operation lamp : Red lamp

Timer lamp : Green lamp

○ : 0.1s ON/OFF repeated

● : 0.5s ON/OFF repeated

LED Indication		Error contents
Red lamp Green lamp	● (2 times) ○	Indoor unit Thermistor (room temp.) error
Red lamp Green lamp	● (3 times) ○	Indoor Thermistor (heat exchanger) error
Red lamp Green lamp	● (4 times) ○	Signal reception (from outdoor unit) error
Red lamp Green lamp	● (6 times) ○	Indoor unit Fan motor lock protection
Red lamp Green lamp	○ ● (1 time)	Outdoor unit Thermistor (discharge pipe) A error
Red lamp Green lamp	○ ● (2 times)	Outdoor unit Thermistor (discharge pipe) B error
Red lamp Green lamp	○ ● (3 times)	Outdoor unit Thermistor (heat exchanger) A error
Red lamp Green lamp	○ ● (4 times)	Outdoor unit Thermistor (heat exchanger) B error
Red lamp Green lamp	○ ● (5 times)	Outdoor unit Thermistor (outdoor temp.) error
Red lamp Green lamp	○ ● (6 times)	Outdoor unit pressure SW A error
Red lamp Green lamp	○ ● (7 times)	Outdoor unit pressure SW B error
Red lamp Green lamp	○ ● (8 times)	Outdoor unit model information error
Red lamp Green lamp	○ ● (9 times)	Outdoor unit EEPROM ROM error

Trouble and protection indicate (Outdoor unit)

○ : 0.1s ON/OFF repeated

● : 0.5s ON/OFF repeated

LED Indication		Error contents	
D8	○	Signal reception (from indoor unit A) error	Model information error
	●	Pressure SW A error	
D15	○	Signal reception (from indoor unit B) error	0.1s ON/OFF (All LED blink)
	●	Pressure SW B error	
D10	● (2 times)	Thermistor (discharge pipe) A error	
	● (3 times)	Thermistor (discharge pipe) B error	
	● (4 times)	Thermistor (heat exchanger) A error	
	● (5 times)	Thermistor (heat exchanger) B error	
	● (6 times)	Thermistor (outdoor temp.) error	
D17		Not applied	
D9	● (2 times)	Heating overload protection	
	● (3 times)	Cooling deicing	
	● (4 times)	Over pressure protection	
	● (5 times)	Discharge temp. protection	
	3s ON/1s OFF repeated	Heating defrost operation	
D16	● (2 times)	Heating overload protection	
	● (3 times)	Cooling deicing	
	● (4 times)	Over pressure protection	
	● (5 times)	Discharge temp. protection	
	3s ON/1s OFF repeated	Heating defrost operation	

INSTALLATION PRECAUTIONS

1. DRAIN PIPE INSTALLATION (REVERSE CYCLE MODEL)

Since drain water flows from the outdoor unit during heating and cooling operation, when it is installed at a high place, install the drain pipe as shown in Fig. 1 and connect it to a 16mm (inside diameter) hose available anywhere. When installing the drain pipe, fill the holes indicated by the ● mark other than the hole for the drain pipe in the bottom of the outdoor unit with a drain cap to prevent water leakage. (Fig. 2 and 3)

Fig. 1

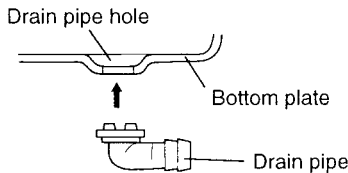


Fig. 2

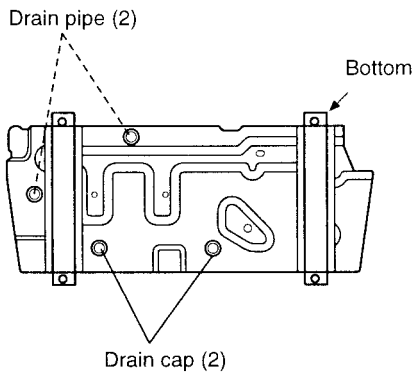


Fig. 3

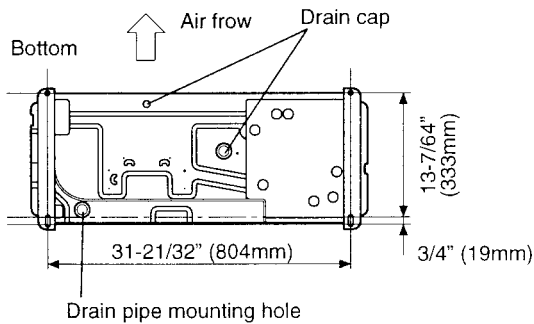
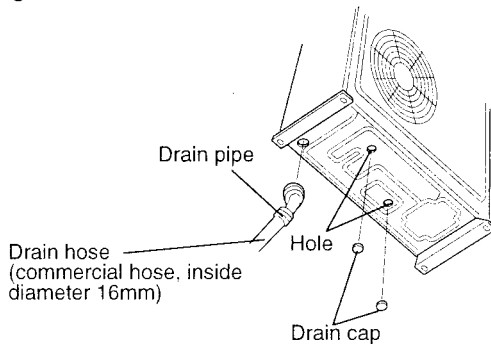


Fig. 4



NOTE :

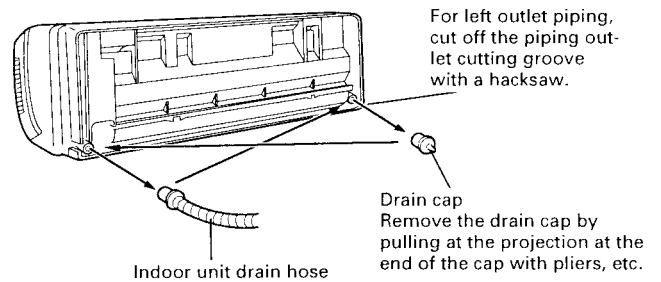
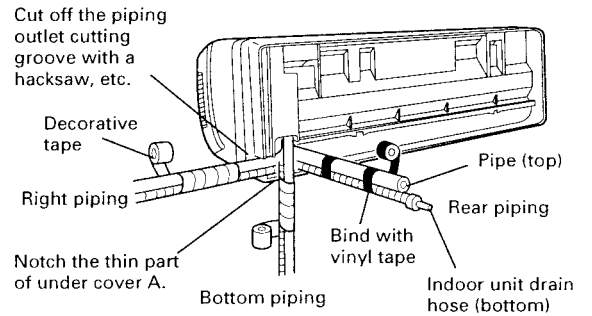
Installation in cold regions. Do not use the accessory drain pipe. (If the drain pipe is used, the drain water in the pipe may freeze in extremely cold weather.)

2. FORMING THE DRAIN HOSE AND PIPE

[Rear piping, Right piping, Bottom piping]

- Install the indoor unit piping in the direction of the wall hole and bind the drain hose and pipe together with vinyl tape. (Fig. 5)
- Install the piping so that the drain hose is at the bottom.
- Wrap the pipes of the indoor unit that are visible from the outside with decorative tape.

Fig. 5



[For Left rear piping, Left piping]

Interchange the drain cap and the drain hose.

- For left piping and left rear piping, align the marks on the wall hook bracket and shape the connection pipe.
- After passing the indoor piping and drain hose through the wall hole, hang the indoor unit on the hooks at the top and bottom of the wall hook bracket.

Fig. 6

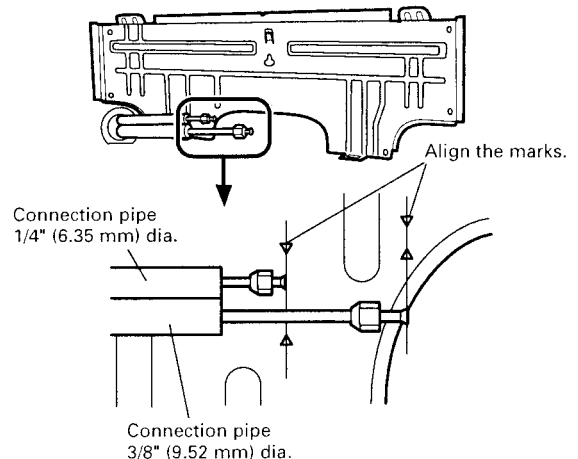
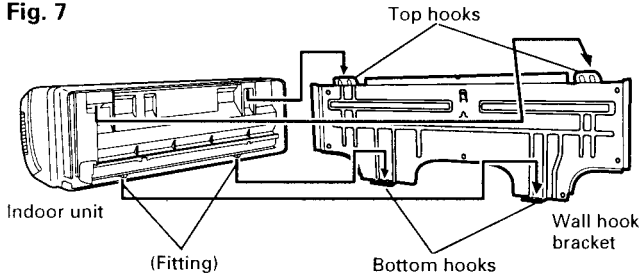


Fig. 7



After hooking the indoor unit to the top hook, hook the fittings of the indoor unit to the two bottom hooks while lowering the unit and pushing it against the wall.

[Installing the indoor unit]

- Hang the indoor unit from the hooks at the top of the wall hook bracket.
- Insert the spacer, etc. between the indoor unit and the wall hook bracket and separate the bottom of the indoor unit from the wall.

Fig. 8

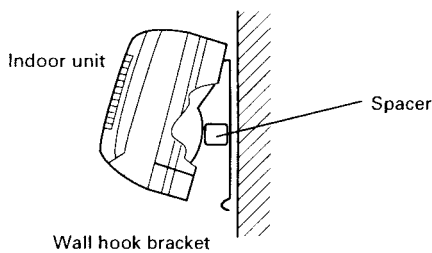
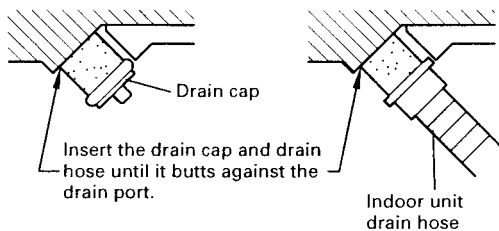


Fig. 9



CAUTION

After removing the drain hose, do not forget to install the drain cap.

NOTE:

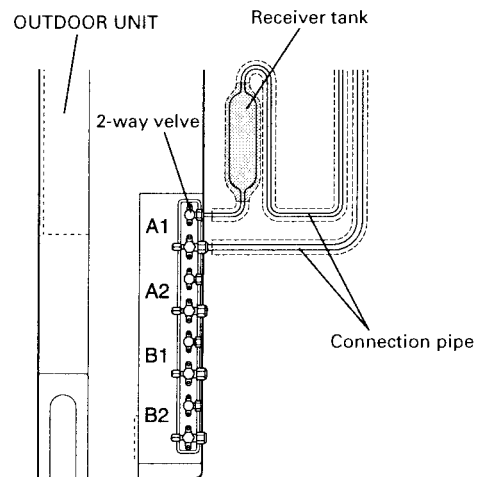
- To prevent breaking of the pipe, avoid sharp bends. Bend the pipe with a radius of curvature of 4" (100 mm) or more.
- If the pipe is bent repeatedly at the same place, it will break.
- Do not remove the flare nut from the indoor unit pipe until immediately before connecting the connection pipe.

3. RECEIVER TANK (Reverse cycle model only) : 4-ROOM MULTI type

The "Receiver tank" is not used for cooling models. (When only 1 or 2 indoor units are connected)

A "Receiver tank" is necessary when all indoor units (the max. of 4 units) are not being installed. When connecting only 1 indoor unit to unit A (A1, A2) or unit B (B1, B2), place a "Receiver tank" between the "2-way valve" and "Connection pipe". Use a 400 to 600 cc capacity "Receiver tank".

Fig. 10



4. AIR PURGE

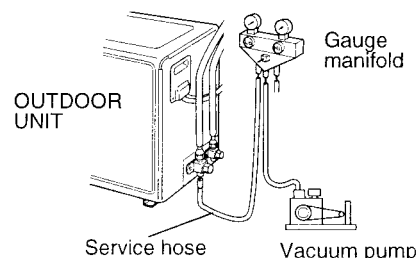
- (1) Purge the air inside the indoor unit and the piping to a pressure of 1.5 mmHg abs or less from the charging valve using a vacuum pump.
- (2) After purging the air inside the indoor unit and the piping, remove the cap of the two valves.
- (3) Open the spindle of the two valves from the closed state.
- (4) Tighten the cap of the two valves to the specified torque.

	Tightening torque kg·cm	
	2-way valve	3-way valve
Spindle	70 to 90	100 to 120
Cap	200 to 250	

- (5) Flare nut tightening torque

Flare nut tightening torque	
1/4" (6.35mm)	150~200 kgf·cm
3/8" (9.53mm)	310~350 kgf·cm
1/2" (12.70mm)	500~550 kgf·cm

Fig. 11



5. PUMP DOWN

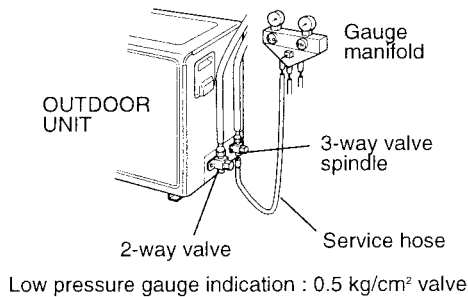
(Draining outdoor unit refrigerant)

When the connection pipe must be disconnected or the unit is moved to another place, the refrigerant in the indoor unit and pipes should be drained into the outdoor unit.

This procedure is called "Pump down".

- (1) Fully close the valve spindle of the two-way valve. (Turn clockwise.)
- (2) Connect the charging valve of the three-way valve to the low pressure gauge manifold with a charge hose.
- (3) Set the three-way valve to its middle position, slightly open the low pressure valve of the gauge manifold to discharge the air from the charge hose and close the valve.
- (4) While running the air conditioner, close the three-way valve (turn the valve spindle clockwise) when the low pressure gauge reads 0.5kg/cm^2 and stop the air conditioner.
- (5) After disconnecting the pipes, attach the screw caps and securely tighten the flare nut.

Fig. 12



6. COLLECTING AND CHARGING REFRIGERANT

Collecting

When the pipe must be unbrazed to repair the refrigeration cycle, carefully collect the refrigerant as follows.

Note : Since there is the danger of frostbite if the refrigerant is touched directly, perform this work carefully.

- (1) Remove the cap, and connect the refrigerant collecting device to the charging valve.
- (2) Collect the refrigerant in the unit into the collecting device or a special tank. (The collected refrigerant cannot be reused unless it is refined.)

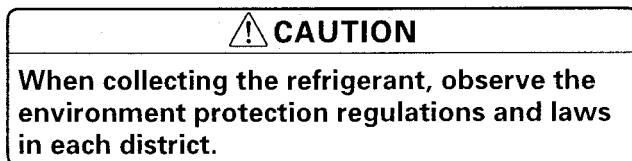
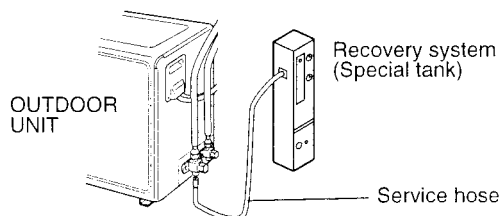


Fig. 13



Charging

To charge the refrigerant, proceed as described below.

- (1) Check that the refrigeration cycle is connected perfectly.
- (2) Evacuate the cycle to a vacuum from the charging valves connection to the outdoor unit.
- (3) After evacuation, charge the refrigerant from the large pipe charging valve.

Additional refrigerant charge :

Additional charging is not needed for multi model. (2-ROOM, 3-ROOM, 4-ROOM and 5-ROOM)

7. HEIGHT DIFFERENCE

Limit the height difference between the indoor unit and outdoor unit as stated below.

: Within 5 m (16 ft)

If the units are further apart than this, correct operation cannot be guaranteed.

8. ALLOWABLE LENGTH OF CONNECTING PIPE

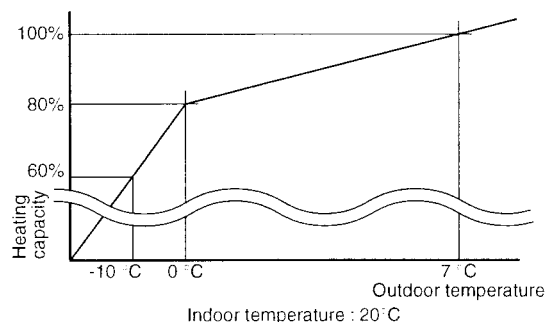
The maximum lengths of the piping are as follows.

- (a) 2-Room Multi type
Within 15 m (each unit)
- (b) 3-Room Multi type
A1 + A2 : Within 20 m
B : Within 15 m
- (c) 4-Room Multi type
A1 + A2 : 30 m
B1 + B2 : 30 m
- (d) 5-Room Multi type
A1 + A2 : 20 m
B1 + B2 + B3 : 30 m

9. AREA LIMIT ON USE BY HEATING OPERATION (REVERSE CYCLE MODEL)

- * These models are not designed for use in areas where the temperature in winter is less than 0°C .
- * Do not perform "Heating" operation when the outdoor temperature is below 0°C , otherwise the compressor may be damaged due to the Defrosting performance drop.
- * Heating capacity also drops extremely when the outdoor temperature is below 0°C . Relation between outdoor temperature and heating capacity is shown in the figure at the right. (Mean value)
- * AO20R / 24R model can operate down to -10°C .

Fig. 14



10. TEMPERATURE INDICATION

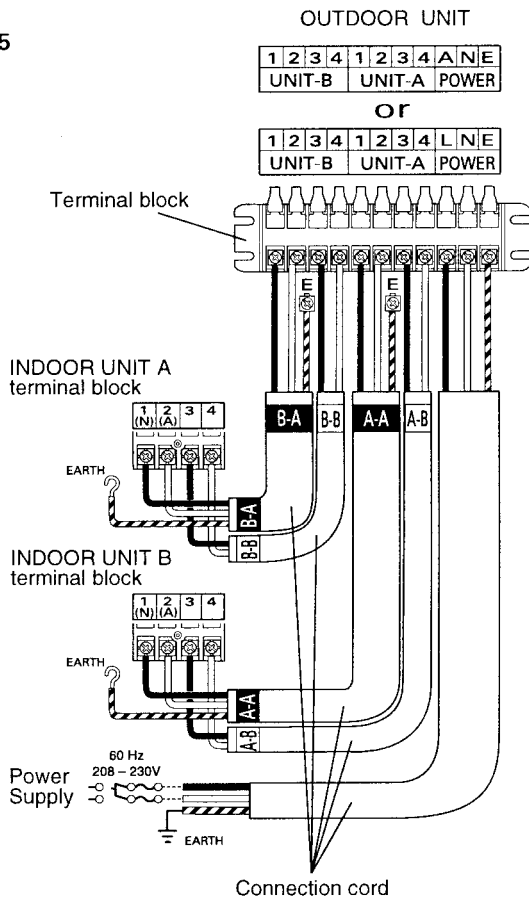
The temperature set on the remote controller may differ from the temperature at the installation place, distribution of the room temperature and sun-light approaching condition, etc..

11. WIRING CONNECTION BETWEEN INDOOR UNIT AND OUTDOOR UNIT

- * Match the terminal block numbers and connection cord colors with those of the indoor unit.
- * Erroneous wiring may cause burning of the electric parts.
- * Always fasten the outside covering of the connection cord with cable clamps.
- (If the insulator is clamped, electric leakage may occur.)

(1) 2-ROOM MULTI type

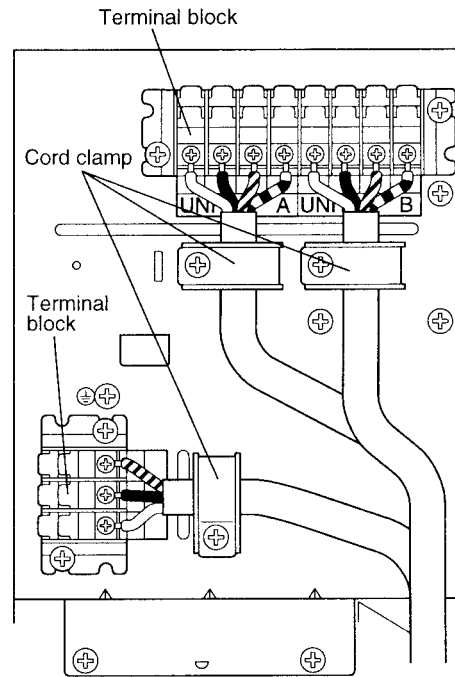
Fig. 15



(2) 2-ROOM MULTI type (AO20R / 24R)

Fig. 16

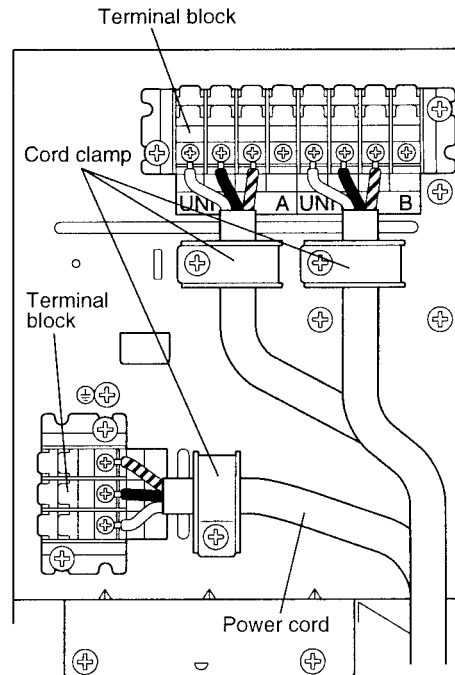
[Heat & Cool model (Reverse cycle model)]



(3) 2-ROOM MULTI type (AO24A)

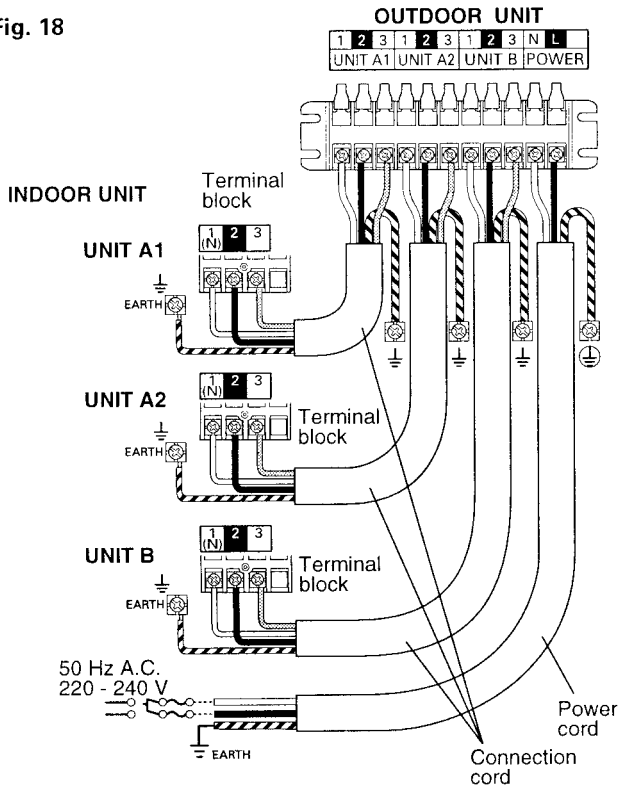
Fig. 17

[Cooling model]



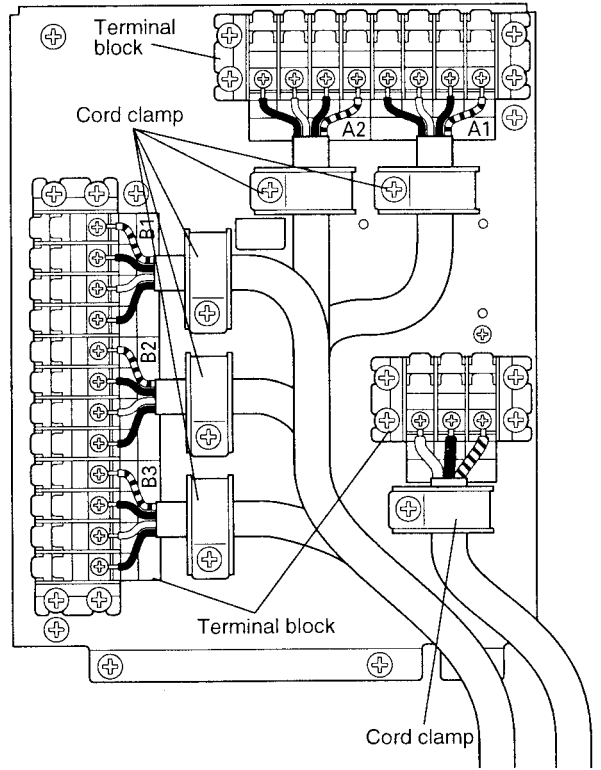
(4) 3-ROOM MULTI type

Fig. 18



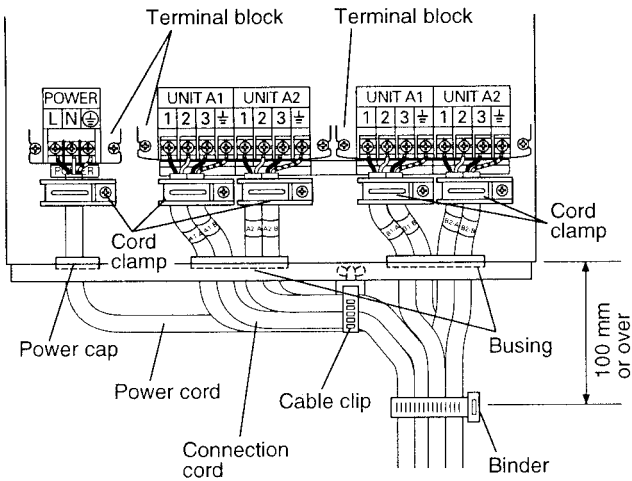
(6) 5-ROOM MULTI type

Fig. 20



(5) 4-ROOM MULTI type

Fig. 19



12. HOW TO CONNECT WIRING TO THE TERMINALS [NEW MULTI TYPE MODEL]

For solid core wiring (or F-cable)

- (1) Cut the wire end with a wire cutter or wire-cutting pliers, then strip the insulation to about 15/16" (25 mm) to expose the solid wire. (Fig. 21-1)
- (2) Using a screwdriver, remove the terminal screw(s) on the terminal board.
- (3) Using pliers, bend the solid wire to form a loop suitable for the terminal screw.
- (4) Shape the loop wire properly, place it on the terminal board and tighten securely with the terminal screw using a screwdriver.

Fig. 21-1

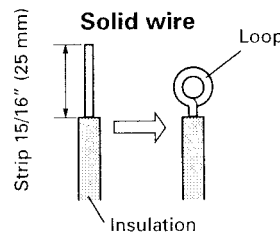


Fig. 21-2

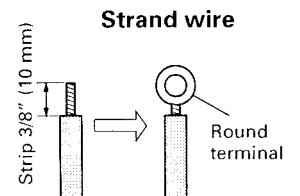
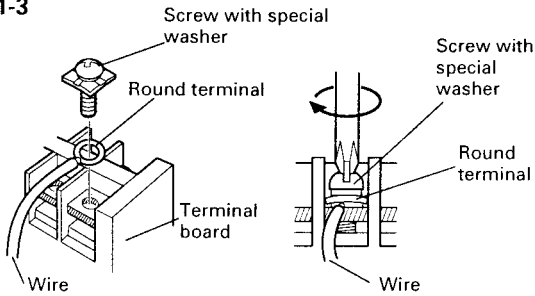


Fig. 21-3



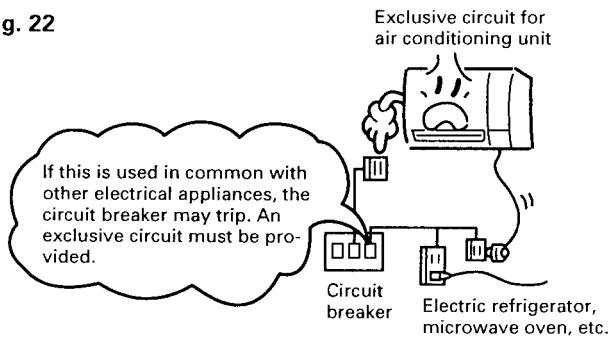
For strand wiring

- (1) Cut the wire end with a wire cutter or wire-cutting pliers, then strip the insulation to about 3/8" (10 mm) to expose the strand wiring. (Fig. 21-2)
- (2) Using a screwdriver, remove the terminal screw(s) on the terminal board.
- (3) Using a round terminal fastener or pliers, securely clamp a round terminal to each stripped wire end. (Fig. 21-2)
- (4) Position the round terminal wire, and replace and tighten the terminal screw using a screwdriver. (Fig. 21-3)

13.ELECTRICAL WORK (POWER SUPPLY)

As shown in the figure below, an exclusive power supply circuit must be provided.

Fig. 22

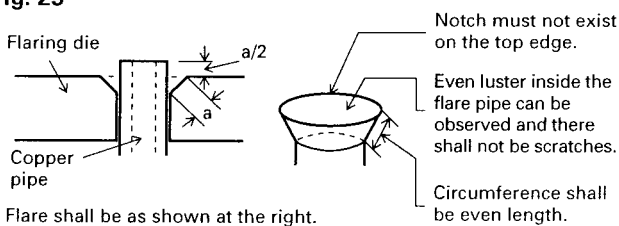


Note : Connecting another extension cord may cause trouble because the power cord or the connection cord between the indoor unit and outdoor unit is too short. Never connect the additional cord to extend the power cord or the connection cord.

14.PIPING

- (1) Flaring of Pipe
The following figure shows the optimum pipe flare position.

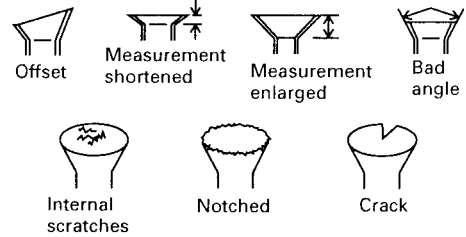
Fig. 23



*** Poor Flaring**

The figures shown below cause gas leakage.

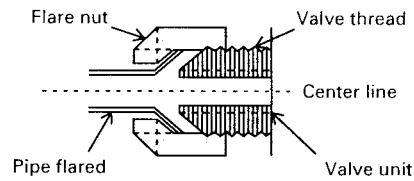
Fig. 24



(2) Flare Nut Tightening

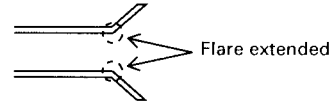
- ① As shown in Fig.25, adjust the pipe so that the center line of the pipe matches that of the valve, and then tighten the flare nut by hand. (Initially tightening the nut with a wrench will damage the thread and cause gas leakage.)

Fig. 25



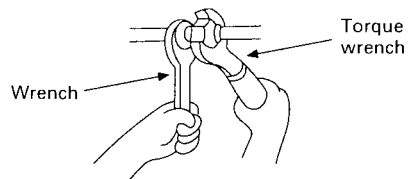
- ② To tighten the flare nut, use a torque wrench.
- ③ If excessive force is used to tighten the flare nut, the flare part will be extended as shown in Fig.26 and cause gas leakage.

Fig. 26



- ④ Tightening the flare nut at the indoor unit side should be done with 2 wrenches as shown in Fig.27.

Fig. 27



(3) When installing, observe the following precautions :

A. Drying :
Never allow water and air to enter the unit.

- ① Do not install piping on a rainy day.
- ② To store copper pipe, cap the pipe.
- ③ Always perform air purge.

Fig. 28

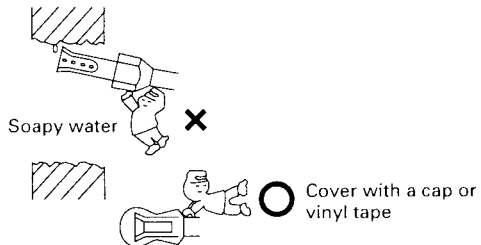


B. Cleaning :

Never allow dust or dirt to enter the unit.

- ① When removing burrs from the flare nuts, point the pipe opening downward.
- ② When passing the copper pipe through a through-hole, cover the opening with a cap or vinyl tape.

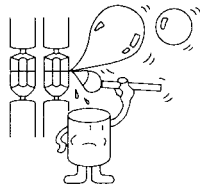
Fig. 29



C. Air tightness :

The coolant refrigerant should not leak.

- ① Connect the flare pipe so that it is tight.
- ② Use 2 wrenches to tighten the flare nuts.
- ③ Securely cover with caps.
- ④ Carefully check for air-tightness with soapy water.



FUJITSU GENERAL LIMITED